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FLOODPLAIN DELINEATION STUDY FOR THE SOLDIER TRAIL WASH

PIMA COUNTY DEPT. OF TRANSPORTATION AND FLOOD CONTROL DISTICT

FLOODPLAIN MANAGEMENT SECTION

RGA HYDRAULIC REPORT NO. 1

BY
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JUNE 1992

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1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this floodplain delineation study is to determine the 100-year limits of the floodplain and the associated flood hazards for the *Soldier Trail Wash* in the vicinity of the bridge crossing on *Mount Lemmon Short Road* and through the existing westerly portion of the *Soldier Trail Wash* across the recorded *"La Bella Vista"* Subdivision.

This information will be used by *Pima County* to update existing floodplain regulatory information as part of the regular phase of the *National Flood Insurance Program (NFIP)*. In addition this information will be available to local and regional planners to further promote sound land use and floodplain development.

1.2 Authority and Acknowledgements

The sources of authority for this floodplain delineation study is the *Pima County Department of Transportation and Flood Control District* under duties assigned to the *Director*, acting as *County Engineer*, by the "Floodplain and Erosion Hazard Management Ordinance No. 1988-FC2."

Although no detailed study has been performed for this tributary of the *Agua Caliente Wash*, floodplain limits have been identified for the *Soldier Trail Wash* under a

study made for the *Federal Emergency Management Agency*, "Panel 1690 of 4700, Flood Insurance Rate Map (FIRM), Pima County, Arizona (Unincorporated Areas), Revised September 6, 1989." [1]

In addition, various independent hydrologic and hydraulic studies have been performed for the purpose of obtaining a *Floodplain Use Permit* from the *Pima County Department of Transportation and Flood Control District* (**PCDOTFCD**) throughout isolated parcels within the limits of the *Soldier Trail Wash* watershed. These have been reviewed and considered during the analyses performed for the subject delineation study. A listing of these independent studies will be found under Section 5.0.

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2.0 AREA STUDIED

2.1 Scope of Study

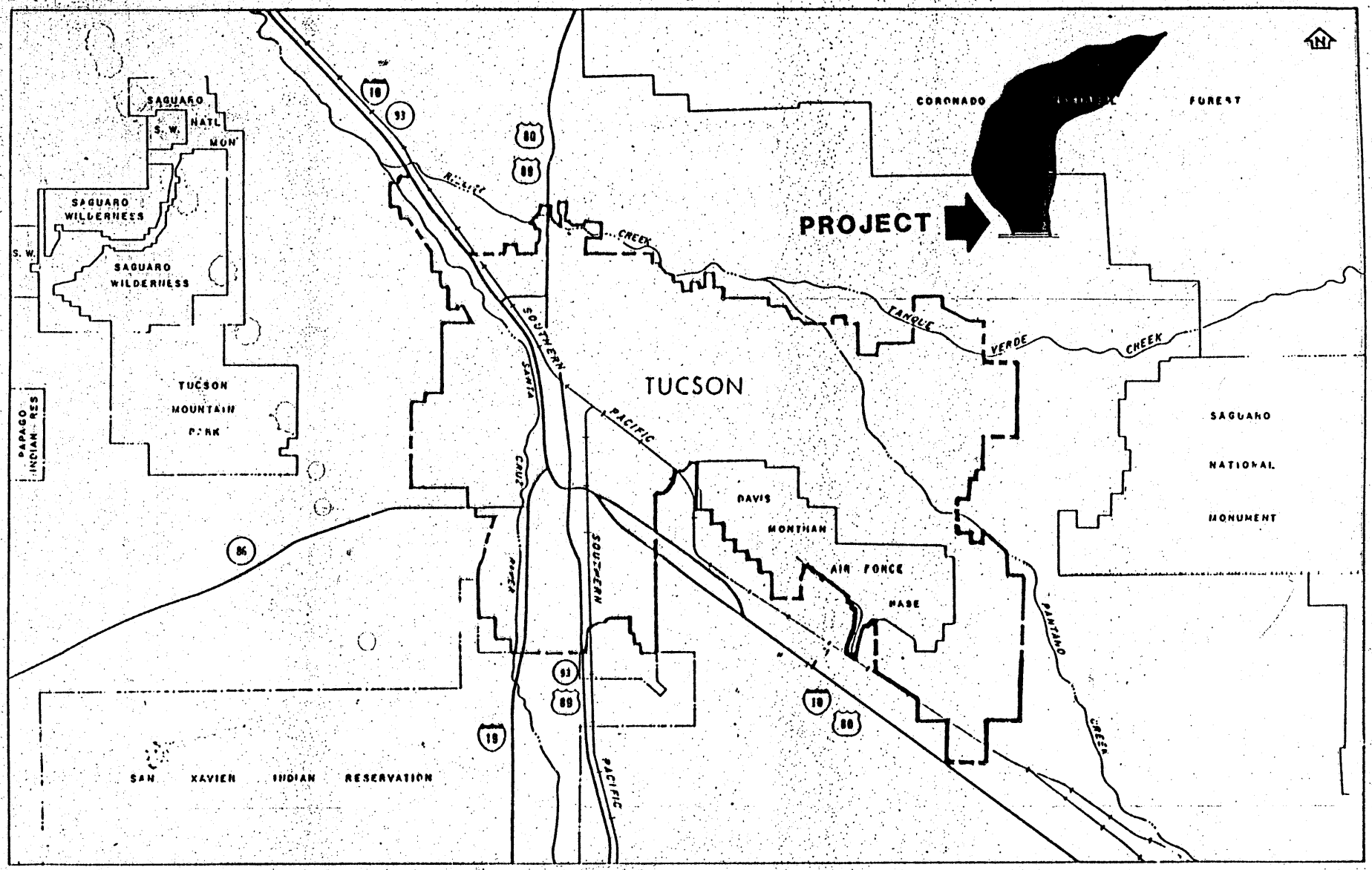
This Floodplain Delineation Study covers a portion of unincorporated areas of *Pima County* in the vicinity of the recorded subdivision named "*La Bella Vista*," Book 22, Page 53 of the records of the *County of Pima, Arizona*. The area of study is shown on the **Vicinity Map** (Figure 2.1).

In the initial study identified in Section 1.0 above, only the *Agua Caliente Wash* itself was studied by detailed methods while the *Soldier Trail Wash* was studied by approximate methods.

The principal purpose of this study is to determine the 100-year floodplain limits and the associated flood hazards of the *Soldier Trail Wash* through the study reaches. The detailed investigation includes determination of existing basin characteristics, analyses of existing drainage structures, and determination of the floodplain and erosion hazards through the cited existing subdivision downstream of *Snyder Road*. The **Floodplain and Erosion Hazards Map** is shown on Figures 4.1 and 4.2. The detailed scope of services is attached in **Exhibit No. 1.**

2.2 Description of the Study Area

The study area is located in the extreme northeast portion of the *Tucson Metropolitan Area* at the base of the *Santa Catalina Mountains* in east-central *Pima County*. Where development has occurred in the watershed, the floodplains are slight to moderately developed, with the major portion of the watershed still being relatively



SOLDIER TRAIL WASH FLOODPLAIN DELINEATION STUDY

FIG. 2-1

PIMA COUNTY DEPARTMENT OF TRANSPORTATION
AND
FLOOD CONTROL DISTRICT

PIMA COUNTY, ARIZONA

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

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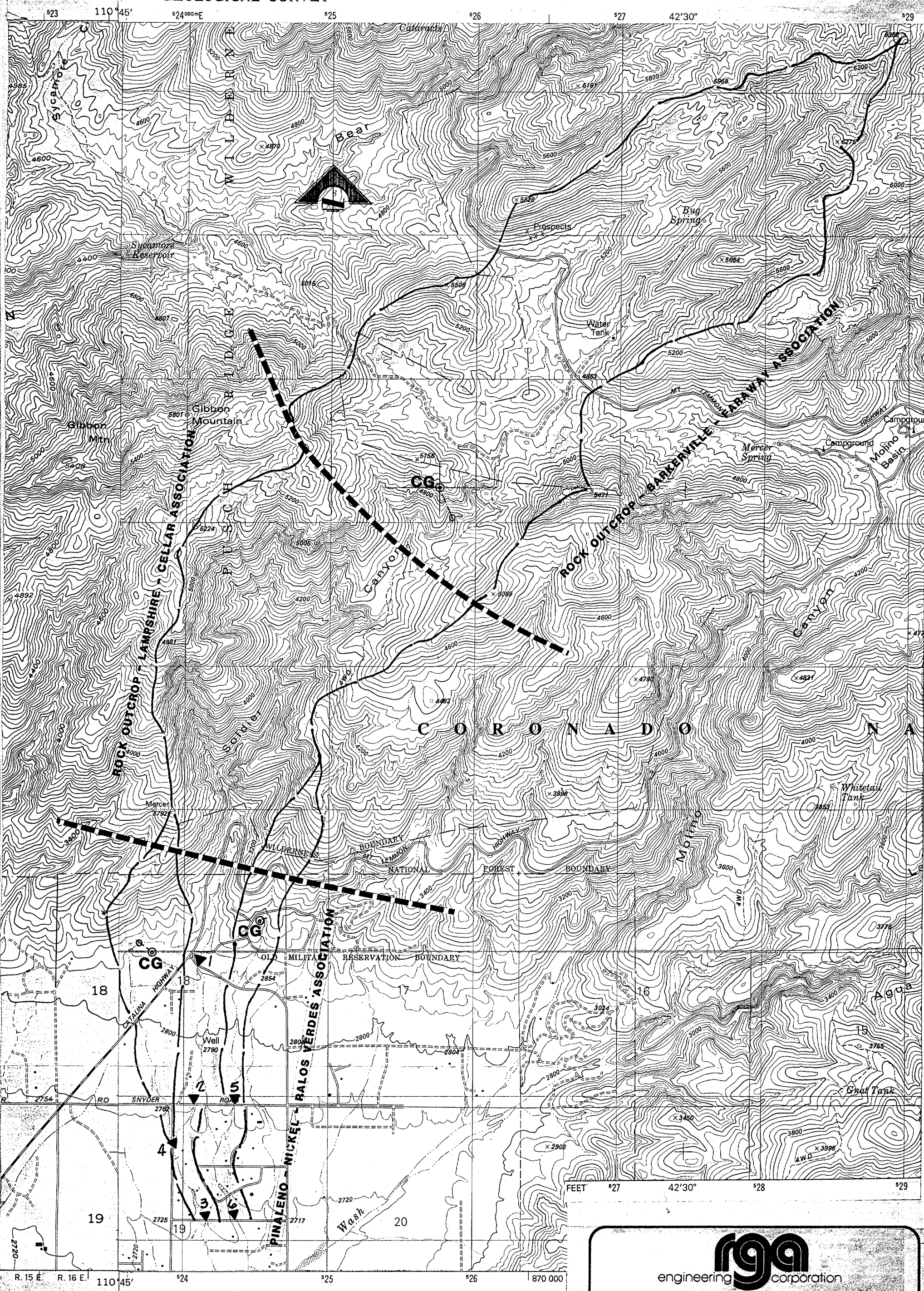
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



SCALE 1:24000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DASHED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

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SOLDIER TRAIL WASH FLOODPLAIN DELINEATION STUDY

WATERSHED MAP

U. S GEOLOGICAL SURVEY QUADRANGLE MAP

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undeveloped. The subdivision to be studied lies at an elevation of approximately 2720 feet. The *Santa Catalina Mountains* to the north rise to elevations of over 8,000 feet with the headwaters of the *Soldier Trail Wash* being in these mountains at a maximum elevation of 6362 feet.

Much of the vegetation of the Study Area consists of natural trees and shrubs even within the recorded subdivision. The foothills of the mountains are covered with chaparral intermixed with cacti, paloverde, and mesquite while, above elevations of approximately 6000 feet, the mountains are covered with pine trees, as shown on *Figures 2.3* through *2.11*.

The greater portion of the *Soldier Trail Wash* watershed lies within the limits of the *Coronado National Forest* and the *Pusch Ridge Wilderness Area*, having well-defined and incised channels through the mountainous areas. Downstream of the existing bridge crossing on *Mount Lemmon Short Road* the streamed has wandered over the entire floodplain as runoff flows onto the alluvial fan of the *Santa Catalina Mountains*. Southward from the bridge on *Mount Lemmon Short Road*, the streamed presents flow patterns that have changed from one runoff event to another. Clear evidences of deposition and/or scour phenomenon are present throughout the downstream portions of the study area. The limits of the watershed are shown on the **Watershed Map** (*Figure 2.2*).

2.3 Principal Flood Problems

The *Tucson Metropolitan Area* has a long history of flood related problems, the majority resulting from intense local thunderstorms of short duration. Although flow velocities are usually not hazardous in most of the wide floodplains in the valley floor, streams such as the

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Soldier Trail Wash that convey runoff flows from the mountains onto the alluvial fan areas do result in relatively high-velocity flows. Deposition of sediment and debris on roads and in structures as well as highly erosive velocities have traditionally caused widespread damage in the community. Deaths and vehicle losses are not uncommon in the area as a result of people trying to cross dip sections during these runoff events (See typical roadway dip section crossing on *Figure No. 2.11*).

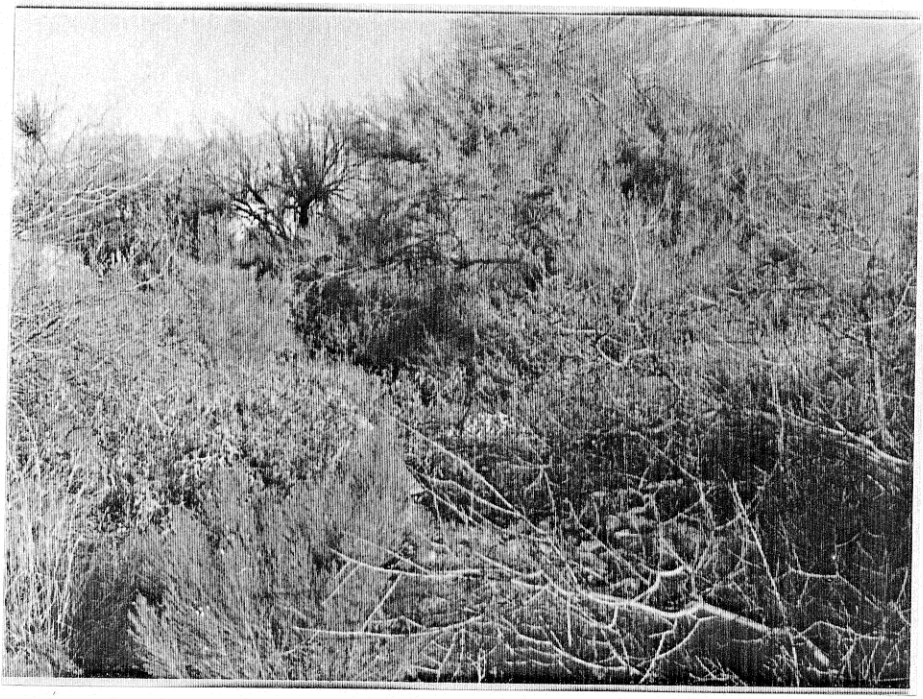
Downstream of the bridge crossing on *Mount Lemmon Short Road*, the *Soldier Trail Wash* is poorly defined causing the 100-year floodwaters to spread over relatively large areas. The wash configuration is highly braided with evidence of high velocity flows changing from one channel to another during storm events of the past.

2.4 Flood Protection Measures

Although some portions of the *Soldier Trail Wash* channel(s) are large enough to convey the 100-year flood, sharp bends in the channels and limited capacity of culverts along *Snyder Road* and the bridge on *Mount Lemmon Short Road (See Figure No. 2.4)*, result in occasional overflow and overtopping of the channel banks. In addition, dip crossings within the "*La Bella Vista*" subdivision present periodic hazards to the public safety.

The county-wide **Floodplain and Erosion Hazard Management Ordinance No. 1922-FC2** regulates development along all streams. These regulations will meet or exceed existing state and federal requirements relating to floodplain management, enabling *Pima County* residents to purchase low-cost flood insurance, receive disaster relief should the need arise, and to fulfill the requirements to seek residential and commercial real estate loans.

Flood and erosion protection measures must be in conformance with the requirements of this ordinance. The management of any development within the existing floodplains of the county are regulated by the issuance of a *Floodplain Use Permit*, pending submittal of the required information and analyses outlined in the ordinance, and subject to conditions or restrictions intended to protect the safety and welfare of the public.



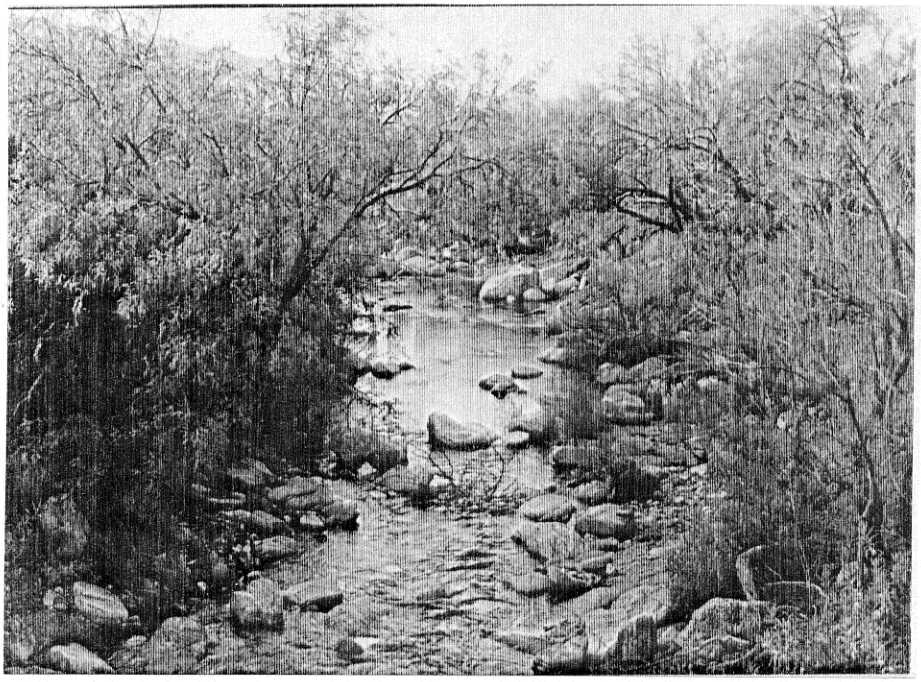


FIGURE 2.3 - TYPICAL VEGETATION ALONG SOLDIER TRAIL WASH MAINSTREAM CHANNELS

FIG. 2.4.
EXISTING MOUNT LEMMON SHORT ROAD BRIDGE CROSSING ON SOLDIER TRAIL WASH - UPSTREAM SIDE LOOKING DOWNSTREAM

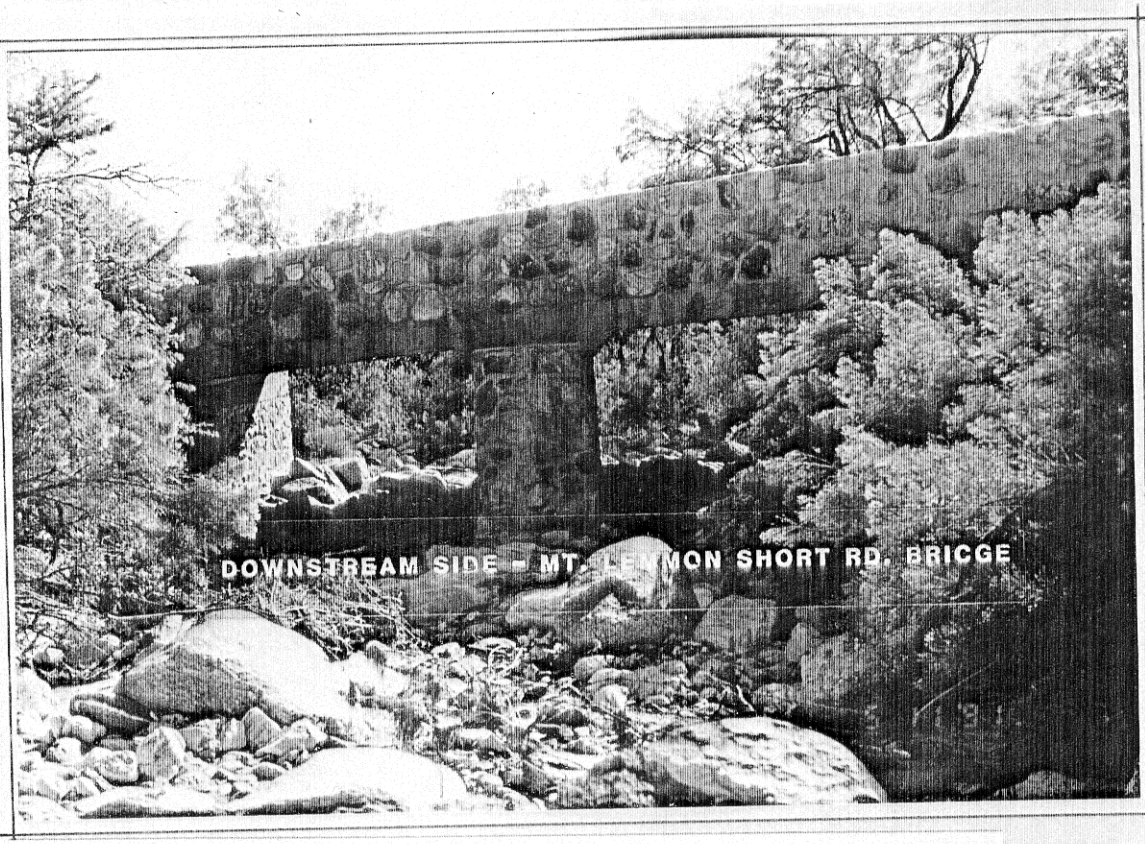


FIG. 2.5
EXISTING MOUNT LEMMON SHORT ROAD BRIDGE CROSSING ON SOLDIER TRAIL WASH - DOWNSTREAM SIDE LOOKING UPSTREAM

FIG. 2.6
SOLDIER TRAIL WASH MAINSTREAM CHANNEL DOWNSTREAM OF THE MOUNT LEMMON SHORT ROAD BRIDGE.

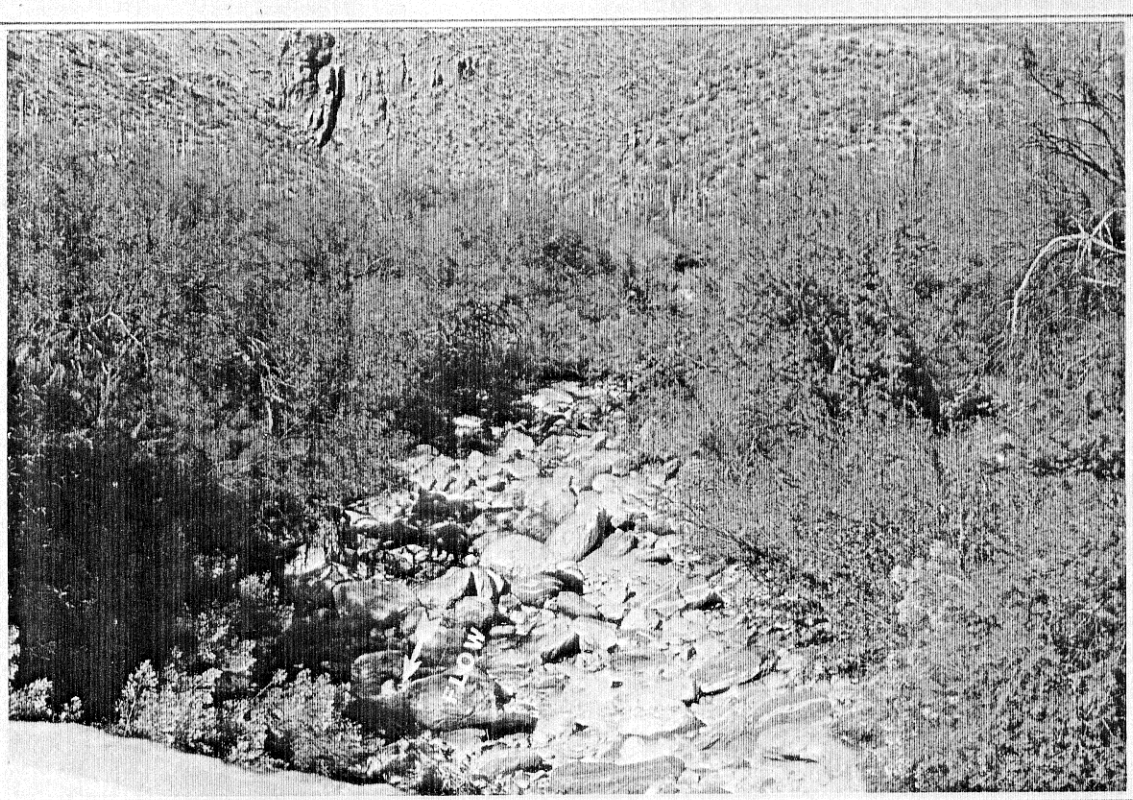


FIG. 2.7
SOLDIER TRAIL WASH MAINSTREAM CHANNEL UPSTREAM OF THE MOUNT LEMMON SHORT ROAD BRIDGE.

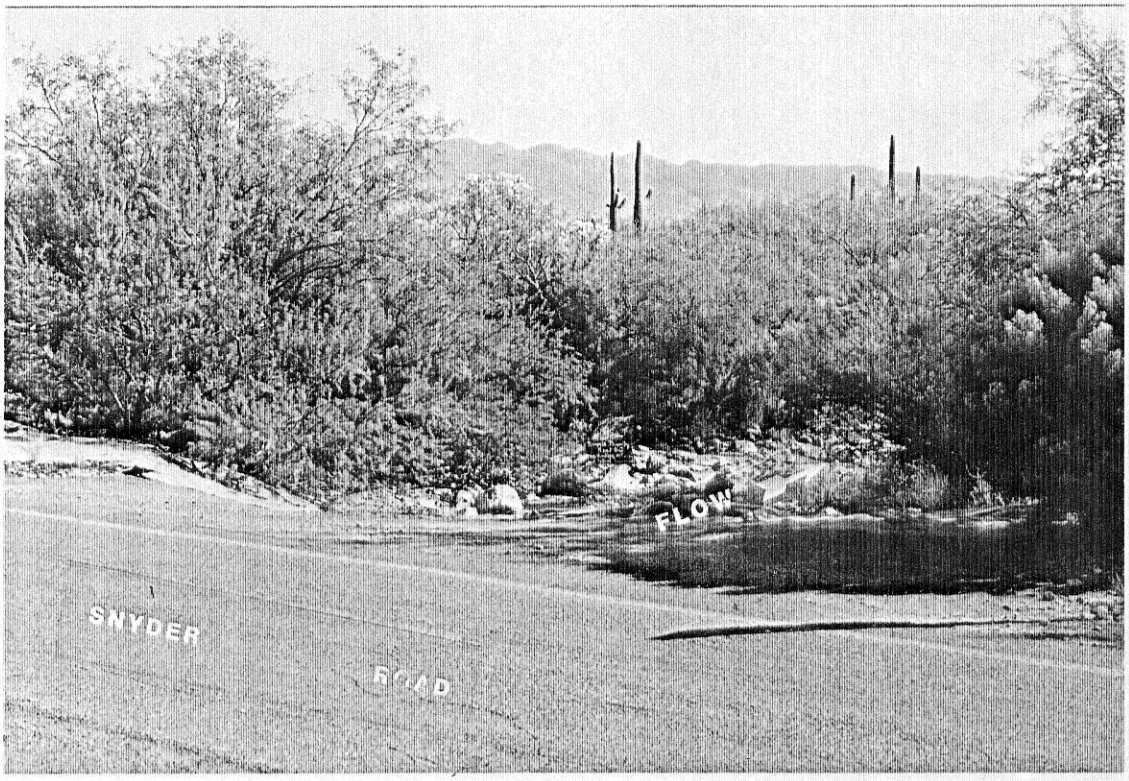


FIG. 2.8
CULVERT CROSSING ON SNYDER ROAD UPSTREAM LIMITS OF THE BELLA VISTA SUBDIVISION.

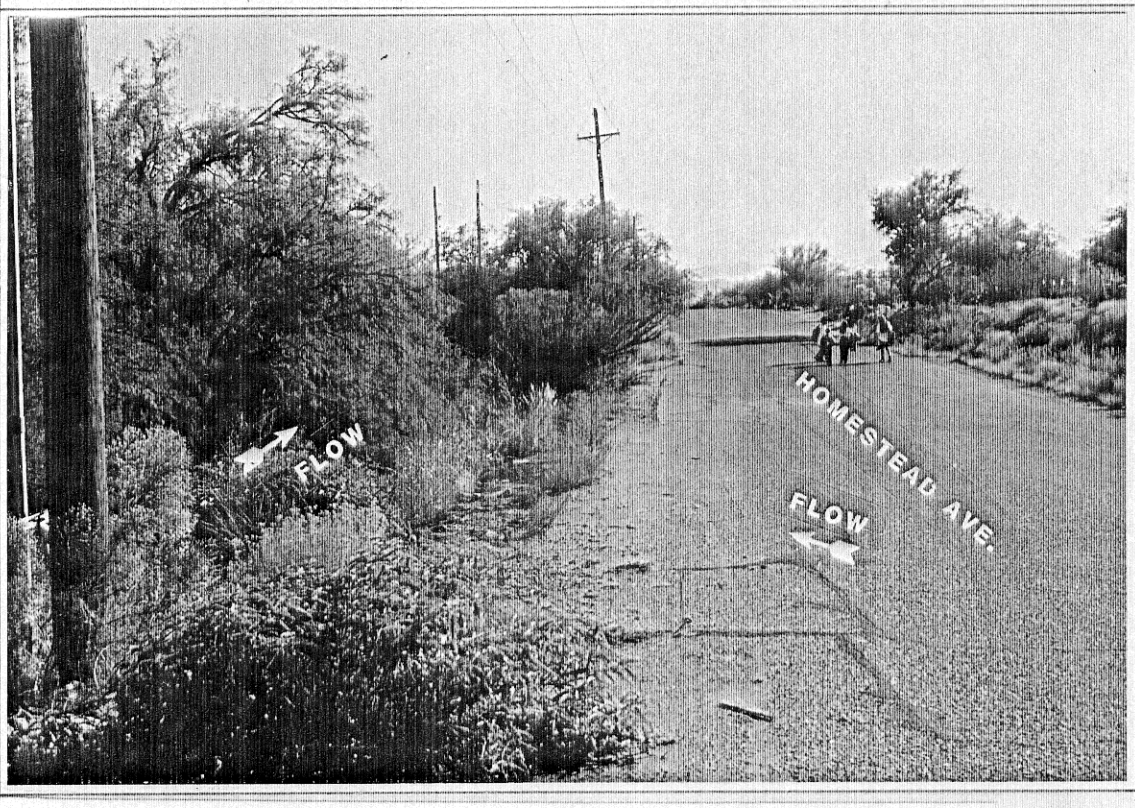


FIG. 2.9
SOLDIER TRAIL WASH CONFLUENCE WITH WESTERLY SUB-BASIN ALONG DIP SECTION ON HOMESTEAD AVENUE.

FIG. 2.10
TYPICAL CULVERT INSTALLATION ON SNYDER ROAD CROSSINGS OF THE SOLDIER TRAIL WASH

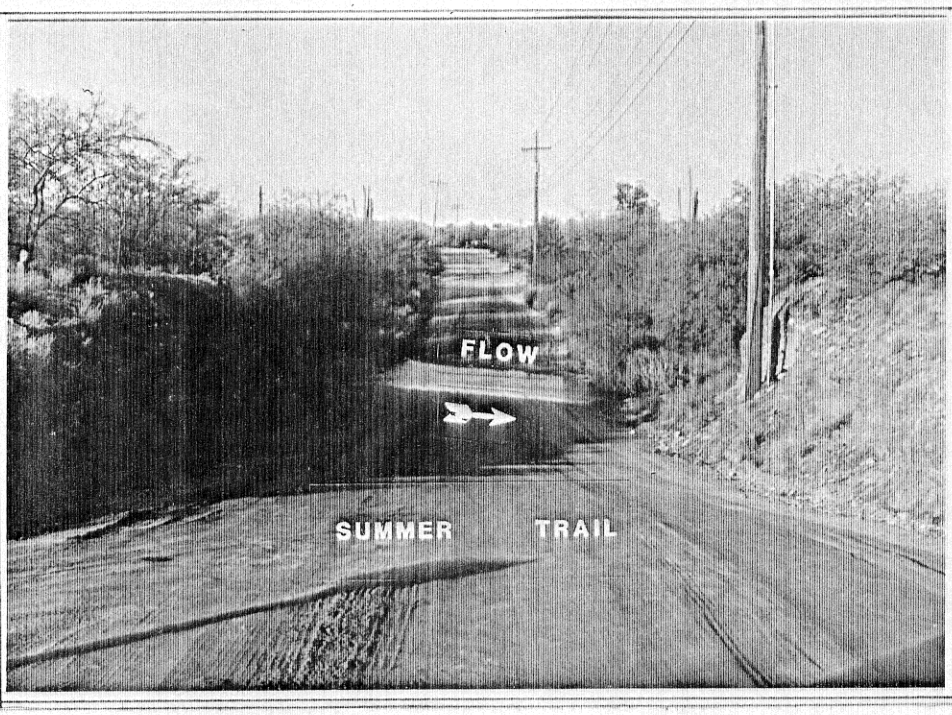


FIG. 2.11
TYPICAL ROADWAY DIP SECTION ON SUMMER TRAIL DOWNSTREAM LIMITS OF THE BELLA VISTA SUBDIVISION

3.0 ENGINEERING METHODOLOGIES

3.1 Hydrologic Analyses

The hydrologic analyses carried out to establish the peak discharge - frequency relationships for each subbasin within the *Soldier Trail Wash* watershed are discussed in the following paragraphs.

The traditional method utilized locally to predict runoff magnitudes during the past few years is the empirical equation[2], based upon the well-known Rational Method, developed by the *Pima County Floodplain Management Section*. It is well documented in the professional community that this method results in over-prediction of the magnitude for the 100-year runoff event, and consequently, other methodologies were investigated because of the practical importance of providing adequate flood protection measures and the desire to obtain accurate estimates in the context of the economics of these flood protection measures.

Certainly one of the important factors affecting the determination of the peak discharge from a watershed is the "basin factor" (n_b), defined as "a dimensionless constant which represents the visually estimated mean of the "n-factor," or roughness coefficient, of all principal watercourses within a watershed."

It should be pointed out that one of the more difficult tasks faced by hydraulic engineers is the selection of appropriate roughness coefficients for natural streams. "Indeed, a great deal of experience, and a certain amount of luck, are required to make the correct choice, in view of the varying factors bearing on *n* (such) as channel material, alinement and uniformity, surface irregularity and vegetative cover, and characteristics of channel obstructions." (*Leutheusser & Chisholm*)[3]. Consequently, it is invaluable that field observations be made, rather than "visual" evaluations, particularly when they apply

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to channel conditions which are frequently encountered in practice and yield unexpected results.

As an example, studies made by Leutheusser and Chisholm yielded the surprising result that the traditional estimation of *n* was found to be overestimated by as much as 30%, "certainly a most unsatisfactory state of affairs," that is, a lower value was assumed for *n*. The Geological Survey has also conducted studies on natural streams to determine roughness coefficients, "*Water Supply Paper 1849, Roughness Characteristics of Natural Channels*."[4]

This reference mentions the importance of having experience necessary for the proper selection of roughness coefficients. The USGS suggests that this experience can be obtained in several ways, "namely (1) to understand the factors that affect the value of the roughness coefficient, and thus acquire the basic knowledge of the problem, (2) to consult a table of typical roughness coefficients for channels of various types, and (3) to examine and become acquainted with the appearance of some typical channels whose roughness coefficients are known."

Results of a testing program conducted by the Geological Survey for training young engineers in the evaluation of channel roughness coefficients, and critique by veteran engineers, has indicated that trained engineers can select roughness coefficients with an accuracy of plus or minus fifteen percent under most conditions.

Although the vegetation types are different for the *Soldier Trail Wash*, the stream characteristics may not be unlike those depicted on pages 205 and 209 of this reference, and reproduced in the present report on pages 17 and 18, *Figures 3.1* and *3.2*. Much field reconnaissance and evaluations were conducted for the subject stream in order to judiciously select an appropriate roughness coefficient for both the hydrologic

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and hydraulic design calculations that are discussed in subsequent paragraphs.

Another of the important factors to be determined in the Pima County method is the precipitation rate which is obtained from the *National Weather Service's NOAA-2 Atlas* (Reference No. 2 and Appendix E). In a study made by Reich[5,6], it has been pointed out that this atlas was prepared from pre-1970 data that was based on very short series, mainly daily rainfall totals. He pointed out that "Topographic parameters were used to synthesize 1-hour and other short-duration rainfall intensities. Very intricately convoluted isolines thus give NOAA-2 deceptively "detailed" maps." Further on he states, "Surveys of the need to improve rainfall-intensity manuals are becoming common in southwestern communities." And, "Before 1970, of the western states, only California was reasonably equipped with recording rain gages. Consequently, data shortage was a basic problem when NOAA-2 was prepared for the *U. S. Conservation Service* with pre-1970 data."

Consequently, for the analyses to be made in the subject study, it is proposed that the "basin factor" may be in the order of 0.075 - 0.085 and as will be pointed out in the following paragraphs, it may in be appropriately accepted to be n_b = 0.083, in light of the results obtained by the methodology outlined hereinafter, *Table 3.2*, and *Figure E2.2* in Appendix E.

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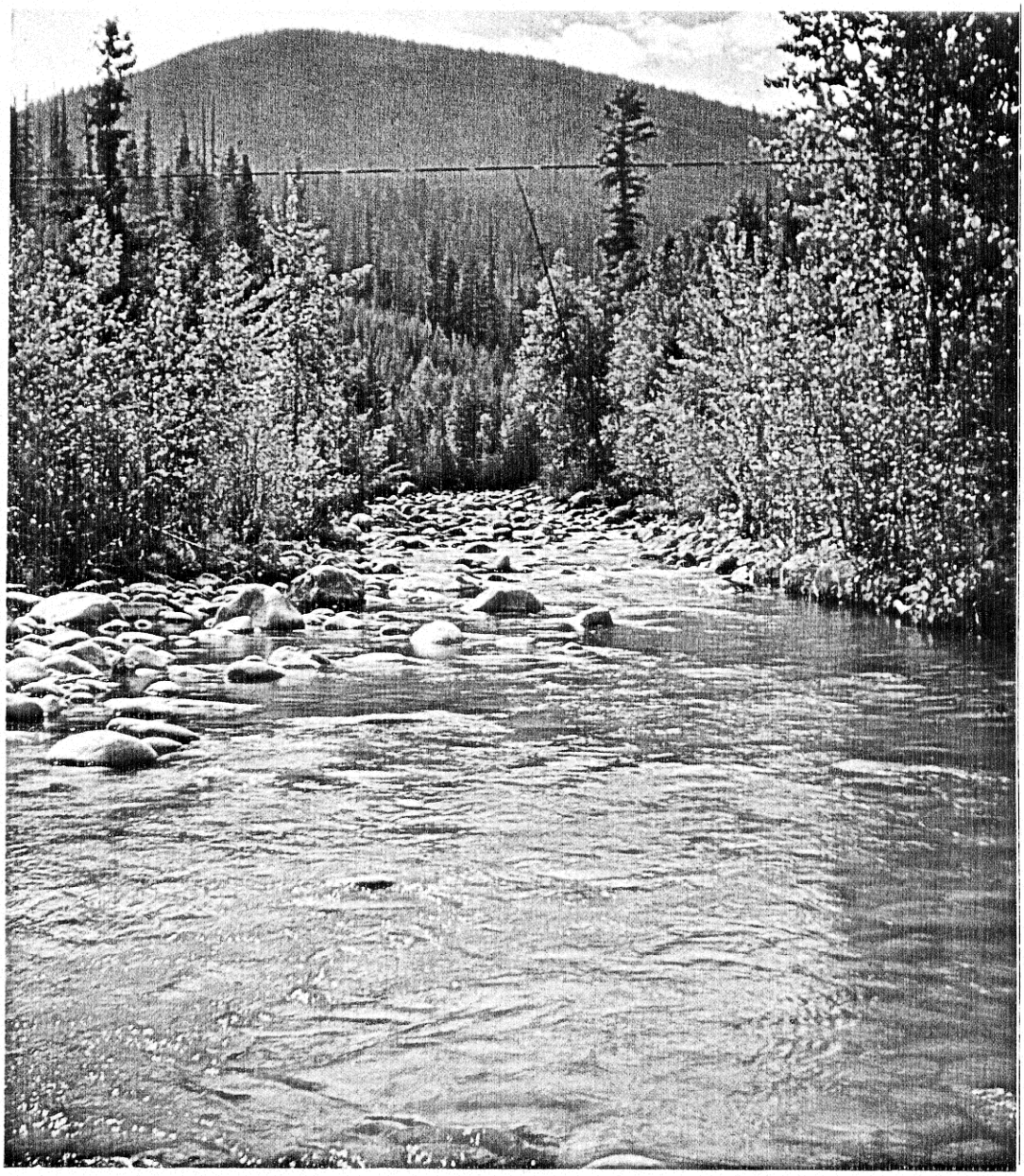
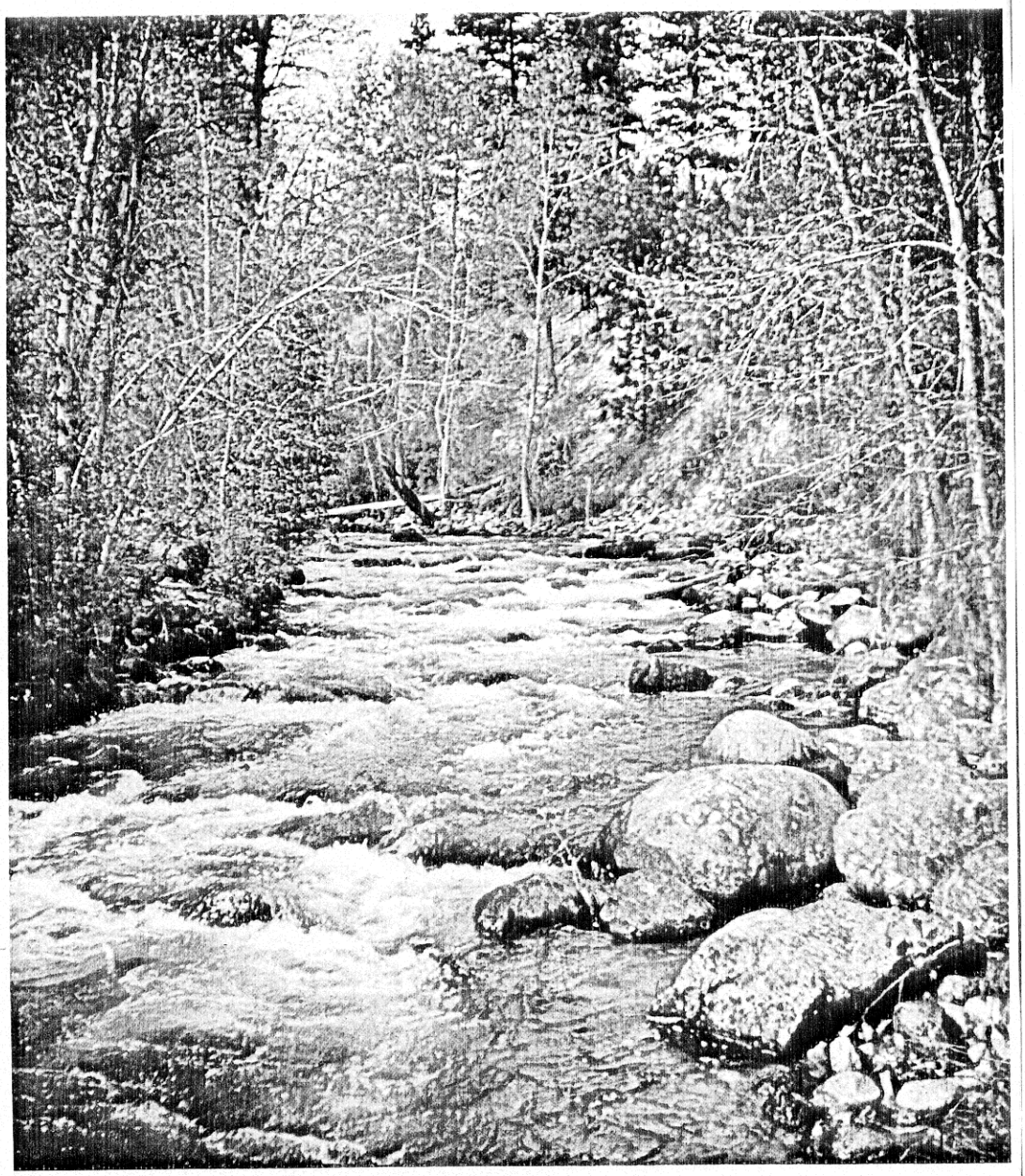


No. 8 upstream from below section 4,
Boundary Creek near Porthill, Idaho.



No. 133, upstream from below section 3,
Rock Creek near Darby, Mont.

Furthermore, "It should not be overlooked that safety of projects is affected by a variety of causes for some of which no "scientific" risk-assessment rationale exists and protection measures are governed by tradition or regulations" *(V. Klemes)*[7]. As a result, it can safely be concluded that the chief and only claim in favor of mathematical "exactness" and "accuracy" in engineering decision making is false. In flood situations, often it is those factors whose probabilities do not enter into the picture - debris, sediment, erosion, mud flows, etc.- that cause more damage than the flood discharge itself.

Another methodology to be considered is the result of a study conducted for the *Arizona Dept. of Transportation* by the *University of Arizona's Engineering Experiment Station*[8] which adopted the concept of a "maximum expected" flood envelope for 3604 station years of record of maximum annual flows for the 151 gaging stations throughout the *State of Arizona*. The following definitions are taken from the cited reference:

- *Maximum "Possible" Flood* - a flood of such magnitude that anything greater cannot be accepted as possible when storm intensity and runoff are considered. Such a flood would have zero probability.

- *Maximum "Probable" Flood* - a flood of such magnitude that it is possible but very unlikely, that is, its probability is very small but not zero.

- *Maximum "Expected" Flood* - a flood of a magnitude that has happened in the general region and has been "measured."

Both of the first two concepts or definitions suggest very large floods for which there is really no evidence. In the last definition, the term "maximum" is intended to

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suggest that designing for a greater flood cannot be justified by the economics at a particular site since any additional expenditure should be considered to be in competition with other safety features of any improvements proposed.

A rastor plot by computer made of the 3604 station years of record appears to determine an upper envelope, thus reinforcing the concept of a "maximum expected" flood as defined above. Based on analyses performed, a family of curves for different return intervals was developed (**Figure 3.1**) and a table of flood magnitude versus return interval was prepared (**Table 3.1**).

TABLE 3.1 - FLOOD MAGNITUDE VS RETURN INTERVAL

Return Interval	Ratio Q/Qmax
10	0.129
25	0.217
50	0.306
100	0.413
200	0.535
500	0.699

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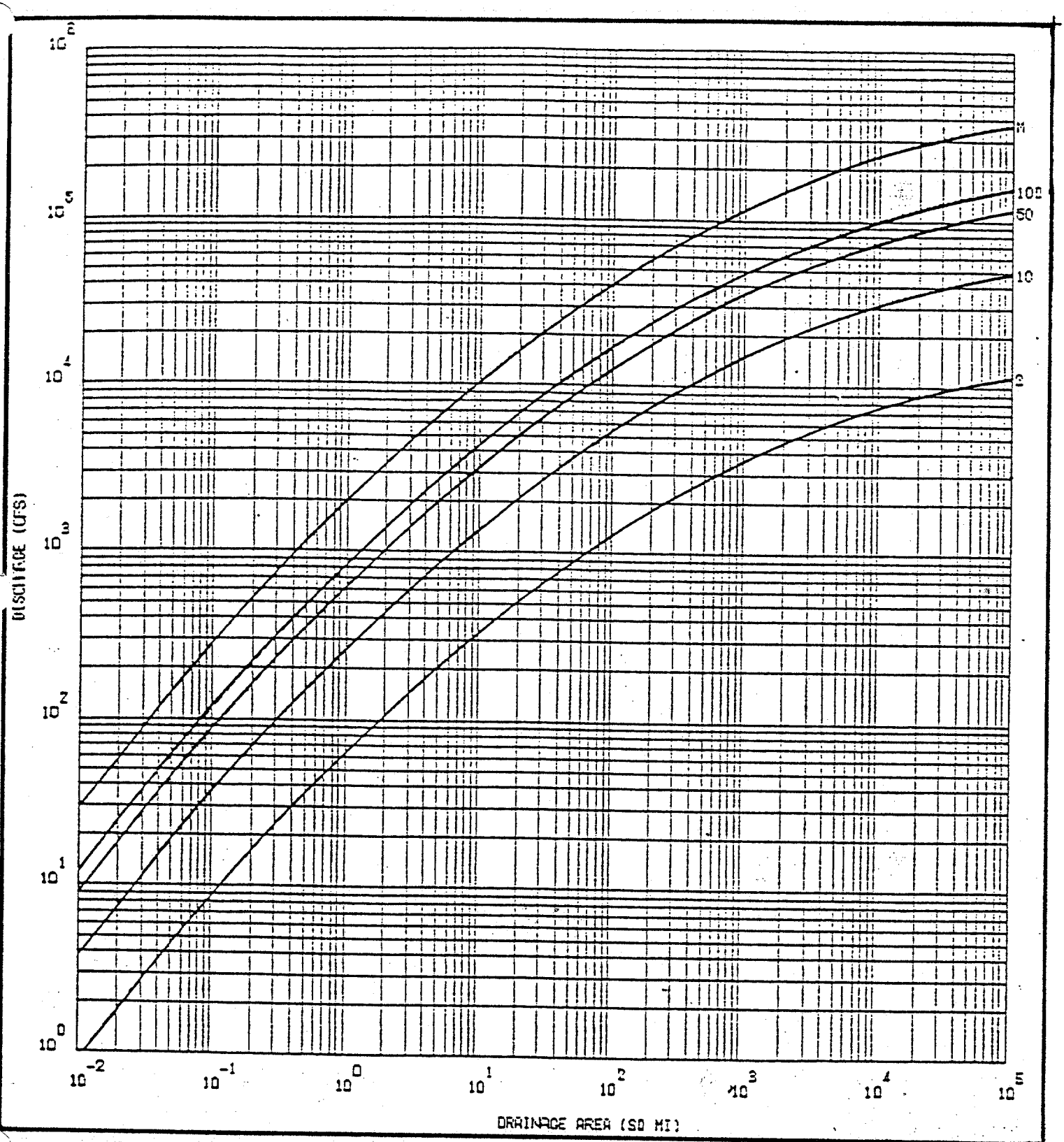

FIGURE 3.3 - MAGNITUDE-DRAINAGE AREA CURVES FOR VARIOUS RETURN INTERVALS (YR.), TAKEN FROM FIG. 6, REFERENCE NO. 6

The analyses performed for this study compared the results of the two methodologies for Concentration Point #1, the bridge at *Mount Lemmon Short Road*, where it can be deduced that with a "basin factor" of n_b = 0.083, similar results will be obtained for the 100-year design discharge. The results are presented in the following **Table 3.2.** Obviously, no value will be determined for the "Maximum Expected" Flood by the Pima County method.

TABLE 3.2 - SUMMARY OF DISCHARGES
CONCENTRATION POINT NO. 1
BRIDGE @ MOUNT LEMMON SHORT ROAD

R.I.	Pima Co. Method ($n_b = 0.083$)	"Max. Exp." Envelope
10	720	730
25	1,200	1,230
50	1,740	1,730
100	2,340	2,330
200	n.a.	3,020
500	n.a	3,950

Although the results of the findings of the report cited in Reference No. 8 were tested by means of a fictitious record and the proposed magnitude-frequency-area relation was deemed usable in its form, a subsequent study made at the *University's Engineering Experiment Station* (Reference No. 9) proposed to "examine critically the published magnitudes of these past large floods before attempting to establish a functional relationship to predict their magnitudes."

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As was noted in the first report prepared by the *University's Engineering Experiment Station* (Reference No. 8), certain points that fell on, above, or just below the reasonably selected envelope were not considered in order that the data not be biased by these rare events. The second report cited (Reference No. 9), conducted a detailed investigation of *United States Geological Survey* original records, field notes and office calculations, as well as with pertinent correspondence filed on microfilm in its offices in *Tucson*, for nineteen of these rare event points in order to assess the selected placement of the envelope. "In each case evidence was found to indicate that the reported magnitude was overstated; in some cases the evidence was rather firm, while in others a certain degree of ambiguity remains."

To quote further, "In taking the results of this study as a whole, the conclusion is that the placement of the envelope is proper with regard to establishing a design criterion; that is, in identifying a maximum flood to be <u>expected</u> on a given watershed. This concept allows for the extremely small chance that a greater flood might occur, but the chance is so small and the magnitude is so nebulous that it is considered unwise to account for it in design. In effect, an upper limit is being established, based on data available at this time to serve as a reference for estimating lesser-magnitude floods of any return interval whatever to design structures with a desired degree of risk."

The foregoing points out the critical need that exists for competent hydraulic engineering expertise and knowledge since for the characteristics of any watershed the appropriate basic design parameters must be evaluated and ascertained. Much can be done to "fix" these parameters to fit what one would judge appropriate or correct to arrive at an anticipated result. Objectivity, based on knowledge, education, and experience, must therefore be of primary importance in order that one's personal biases not influence the outcome of the

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evaluations and consequently compromise the necessity to meet the performance of one's duties in safeguarding the public safety and welfare.

Taking into consideration that a flood of large proportions is not necessarily catastrophic, the biggest flood to be considered should be one that can realistically be expected and it should have some small, indeterminable probability of being exceeded. Based on all of the foregoing, then, the proposed design values to be utilized in the subsequent hydraulic and erosion and sedimentation analyses for the *Soldier Trail Wash* will be as follows:

TABLE 3.3 - DESIGN DISCHARGES

POINT	10-YR. R.I.	25-YR. R.I.	50-YR. R.I.	100-YR. R.I.	500-YR. R.I.
#1	730 CFS	1225 CFS	1730 CFS	2330 CFS	3945 CFS
#2	755 CFS	1270 CFS	1790 CFS	2415 CFS	4085 CFS
#3	850 CFS	1430 CFS	2020 CFS	2720 CFS	4605 CFS
#4	95 CFS	160 CFS	230 CFS	305 CFS	520 CFS
#5	80 CFS	140 CFS	195 CFS	260 CFS	445 CFS
#6	95 CFS	160 CFS	230 CFS	305 CFS	520 CFS

NOTE: For detailed calculations, see **Exhibit No. 2 - Hydrologic Calculations.** Discharges have been rounded off to the nearest ten (10) cfs.
Concentration points are as noted on **Figure No. 2.2 - Watershed Map**, and as follows:

Pt. #1 - Bridge @ Mt. Lemmon Short Road
Pt. #2 - Culverts on Snyder Road
Pt. #3 - Extreme downstream end @ Summer Tr.
Pt. #4 - Confl. @ Homestead Ave. - West Sub-basin
Pt. #5 - Culvert on Snyder Rd. - East Sub-basin
Pt. #6 - D. S. end @ Summer Tr.- East Sub-basin

027

3.2 HYDRAULIC ANALYSES

The hydraulic design calculations and analyses performed to determine the floodplain limits and to evaluate the potential erosion hazards through the project limits are discussed in the following paragraphs.

The various hydraulic analyses were conducted by utilization of the well-known *U.S. Army Corps of Engineers HEC-2 Water Surface Profile Computer Program.*[10] It goes without saying that the results obtained by utilization of this program were evaluated meticulously, and changes were made as deemed necessary, in order to arrive at an appropriate and logical conclusion in conformance with the design parameters and assumptions.

3.2.2 Bridge on Mount Lemmon Short Road

The existing stone masonry and concrete bridge over the *Soldier Trail Wash* for the *Mount Lemmon Short Road* crossing was found to be inadequate to completely pass the 100-year storm runoff discharge underneath the deck structure. The bridge is shown on **Figure 3.3.**

Alternative runs were made by means of HEC-2 for the 100-year, 50-year, 25-year, and 10-year discharge values as noted in **Table 3.3**, for Concentration Point #1.

The area immediately upstream of the bridge location, starting at Cross Section #113 (downstream from Coronado Road dip crossing), under most cases studied will cause diversion of flows onto the left (easterly) overbank areas. These diverted flows will not return into the *Soldier Trail Wash* streamed until someplace past the bridge location on the fan area.

028

By means of the analyses performed, it was determined that the maximum discharge that will be contained entirely within the *Soldier Trail Wash* streamed and within the bridge opening will be in the order of *Q = 1200 cfs*.

The detailed analyses are attached as **Exhibit No. 3**, while the floodplain limits for the 100-year runoff condition are as shown on **Figure 4.4**. Other results obtained from the analyses performed are noted in the following **Table 3.4**.

TABLE 3.4 - RESULTS OF HYDRAULIC ANALYSIS
HEC - 2 RESULTS

DISCHARGE	BRIDGE FLOW	U.S. BREAKOUT FLOW	OVERTOPPING FLOW
2330 cfs	1201 cfs	161 cfs	968 cfs
1730 cfs	1200 cfs	79 cfs	451 cfs
1225 cfs	1198 cfs	27 cfs	0 cfs
730 cfs	730 cfs	0 cfs	0 cfs

The headings in **Table 3.4** above have the following definitions:

Discharge: The total *Soldier Trail Wash* discharge determined in Section 3.1 above.

Bridge Flow: Total discharge passing through the bridge opening, below the concrete deck.

U.S. Breakout Flow: Discharge flow lost from the mainstream to the left overbank area at Cross Section 113. This flow (may) will return to the mainstream some undetermined distance below the bridge location.

Overtopping Flow: Discharge flow that reaches the bridge location, but is in excess of that passing through the bridge opening, i.e, greater than the **Bridge Flow**.

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3.2.3 Bella Vista Subdivision (South of Snyder Road)

The area between the *Mount Lemmon Short Road* and *Snyder Road* is relatively undeveloped. This area comprises the beginning of the fan area of the *Soldier Trail Wash* as it leaves the mountainous portions of the watershed and consequently it is quite apparent that discharges have wandered over the entire fan area at different times in the past. As this area begins to develop, man's activities and facilities will affect the ability of the runoff discharges to seek their paths as has been the case during past events. A detailed investigation of this area is not a part of this study, where because of this, it has been assumed that the total discharge may impact any one of the existing natural drainageways at any given time.

The study area in *La Bella Vista Subdivision* has three clearly defined natural drainageways adjacent to *Snyder Road along the northern limits, however the two eastern most join within the boundaries of Lot 20 and subsequently discharges are conveyed through the subdivision in one well-defined causeway. The western most natural drainageway, generally following the western limits of the subdivision along Homestead Avenue*, will also receive additional flow from the smaller watershed to the west of the *Soldier Trail Wash*, as may be noted on the enclosed maps.

During the investigation, field-surveyed cross sections were obtained throughout the study reaches, in addition to 200-scale, two-foot contour aerial maps of the study area. The field-surveyed cross section information generally was found to be in agreement with the aerial topographic maps. Data input to the hydraulic profile computer program was made with field-surveyed cross section information with supplementary cross section information being utilized as necessary, specially in the lower reaches of the study area.

For the reasons cited in the first paragraph above, it was determined that the entire magnitude of the runoff discharge would be used in the analyses of each one of the separate, existing natural drainageways, even though certain amounts of the flow quantities will breakout to the east along *Snyder Road*. In addition, three existing corrugated metal pipe culverts under *Snyder Road* were not considered in the analyses for the 100-year storm runoff discharges because they are relatively small with respect to the magnitude of the flows under consideration.

The computer results of the hydraulic analyses are included in the appendixes and are summarized in the following **Table 3.5** and graphically represented on the following aerial topographic and subdivision maps, **Figure 4.5** and **Figure 4.6**. The elevations of the existing homes on the various lots noted in the table were determined by field surveying techniques except for those noted thereon. These latter home's elevations were estimated from the 200-scale aerial topographic maps dated April 1986.

It should be noted that no homes have been constructed on lot numbers 31 and 32 in the upper reaches of the study area, adjacent to *Snyder Road*, while the majority of the homes constructed on the lots adjacent to the lower reaches of the study area are deemed to be above the calculated water surface elevations for the design storm by more than the minimum one foot requirement.

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TABLE 3.5 - RESULTS OF HYDRAULIC ANALYSIS
LA BELLA SUBDIVISION

SECTION NO.	100-YR. W.S. ELEVATION	LOT NUMBER	HOUSE F. F. ELEVATION	FLOW VELOCITY
WEST BRANCH				
84	2746.3	35	2746.7[1]	11.8 fps
83	2739.0	36	2742.7	16.6 "
82	2735.5	37	2737.9	13.4 "
81	2734.2	38	2741.4	12.2 "
80	2730.1	39	2733.8	15.7 "
79	2727.4	40	2729.8[2]	14.4 "
78	2725.5	41	2731.5	9.9 "
77	2724.1	41	2731.5	11.6 "
76	2720.2	48	2722.6	10.8 "
75	2715.3	45	2722.0[3]	13.5 "
74	2712.5	47	2718.0[3]	9.4 "
EAST BRANCH				
63	2749.7	28	2754.2	11.8 "
62	2745.0	27	2747.3	9.5 "
62	2739.5	19	2744.0[3]	11.0 "
55	2753.7	29	2762.5	9.5 "
54	2748.3	30/31	------[4]	9.5 "
53	2742.3	30/33	2743.8	13.1 "
52	2736.0	20	2739.7	11.3 "
51	2733.0	21	2735.8	13.1 "
50	2728.7	22	2730.3	11.7 "
48	2724.4	73	2737.7[3]	11.2 "
47	2722.3	72	2725.5	12.2 "
46	2719.1	77	2720.3	9.5 "
44	2712.2	54	2715.4	13.1 "
43	2709.4	53	2712.3	12.6 "

NOTES:

1.- Higher ground exists between House F.F.E. and calculated 100-year water surface elevation (Gr. El. = 2747.50 vs 100-yr. W.S. El = 2746.3; Diff. = 1.20 ft.)

2.- Building noted is a barn and not a dwelling.

3.- F.F.E. determined from aerial topo map.

4.- Intermediate cross section, no dwelling.

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3.3 EROSION AND SEDIMENTATION ANALYSES

The evaluation of the potential for a steam to change due to channel migration, scour of the streamed, or deposition tendencies of the stream involves the thorough study of the stream channel at specific crossings, along with a site investigation by an experienced hydraulic engineer, and the application of sound criteria. Although the notion that velocity and sediment size have little effect on scour depth has been difficult if not impossible to accept or understand by many in the field, it has been demonstrated by numerous experiments and studies that scour will occur principally because of an imbalance between the capacity of the flow to remove sediment from an area and the supply of sediment to that area by the flow.

"Those who are aware of scour holes around piers and abutments are often more impressed by the velocity of the flood water than the depth of the flood water; therefore, they naturally attribute the scour which occurs to the increase in the velocity of flow."[11] The limit to the scour or deposition phenomenon is a geometry function, such that if the capacity to remove sediment exceeds the supply, there will be scour. Conversely, if the supply exceeds the capacity of the flow to remove sediment, there will be deposition.

The activities of man will reflect themselves in changes in a natural stream channel because of their alteration of the discharge of water and sediment characteristics reaching the stream. Urbanization during relatively short construction periods will generally result in increased sediment concentrations, while later results will manifest themselves in increased rates of runoff and decreased sediment concentrations.

When the flow area of a stream is decreased from the normal either by a natural constriction or by a man-made structure, scour from a contraction will occur. With the decrease in flow area there is an increase in stream velocities and bed shear stress with the consequence that at the contraction more

bed material is transported through this reach than is transported into the reach. As the bed elevation is lowered because of this increase in transport of bed material through the contracted reach, the flow area increases and the velocity and shear stress decrease until equilibrium is obtained so that the bed material transported into the reach is equal to that which is transported out of the reach.

Factors that can cause contraction scour included the following:

- a natural stream constriction
- debris accumulation
- growth of vegetation in the channel or flood plain
- long approaches over the flood plain to a bridge
- berm forming along the stream beds by sediment deposits
- island or bar formations up- and downstream of bridge openings

Often the magnitude of scour can not be predicted adequately and inspection is the only solution for these problems. However, there are several methodologies for estimating the magnitude of contraction scour that are available.

For the conditions of overbank flow on a flood plain being forced back to the main channel by approaches to a bridge and for no overbank flow but with the stream channel narrowing either naturally or by the bridge abutments encroaching on the channel, the recommended methodology is the Laursen Equation. Under this study of the *Soldier Trail Wash*, a comparison was made with the application of methodologies developed for the design and construction of the Trans Alaska (Oil) Pipeline (1973)[12] and by the Straub "Clear Water" Equation (1940)[13] which have been used in the recent past with some success.

Four reaches were identified, where the stream channel is constricted by natural causes, with the results of the HEC-2 water surface analysis program.

- Reach 1: Snyder Road to Westerly Subarea Confluence (Between cross sections 84 and 83).
- Reach 2: Westerly Subarea Confluence to Summer Tr. (Between cross sections 81 and 80).
- Reach 3: Snyder Road to Easterly Subarea Confluence (Between cross sections 55 and 52).
- Reach 4: Easterly Subarea Confluence to Summer Tr. (Between cross sections 51 and 50).

TABLE 3.6 - RESULTS OF SCOUR ANALYSES
LA BELLA SUBDIVISION

REACH	LAURSEN	ALYESKA	STRAUB
1	1.9 Ft.	1.2 Ft.	1.6 Ft.
2	3.7 Ft.	3.6 Ft.	1.7 Ft.
3	------	2.0 Ft.	------
4	1.7 Ft.	0.7 Ft.	4.5 Ft.

The detailed calculations are found in Appendix No. 3.

The results of the scour analyses denote that under somewhat extreme conditions, the subdivision in general will be safe from erosion hazards. However, when new homes are built on the existing vacant lots of the subdivision, consideration should be given to these results and if warranted, setback requirements specified in the Flood Plain Management Ordinance should be considered.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

4.1 Flood Plain Boundaries

The following topographic maps (200-scale aerial photogrametric) for the existing *Mount Lemmon Short Road Bridge* and for the *La Bella Vista Subdivision* denote the calculated flood plain boundaries for the 100-year runoff event (***Figures 4.1*** and ***4.2*** respectively). In addition, the flood plain boundaries and the field surveyed cross section information, including vertical and horizontal information regarding existing homes, have been transferred to copies of the final plat for the *La Bella Vista Subdivision* (***Figure 4.3, 2 Sheets***).

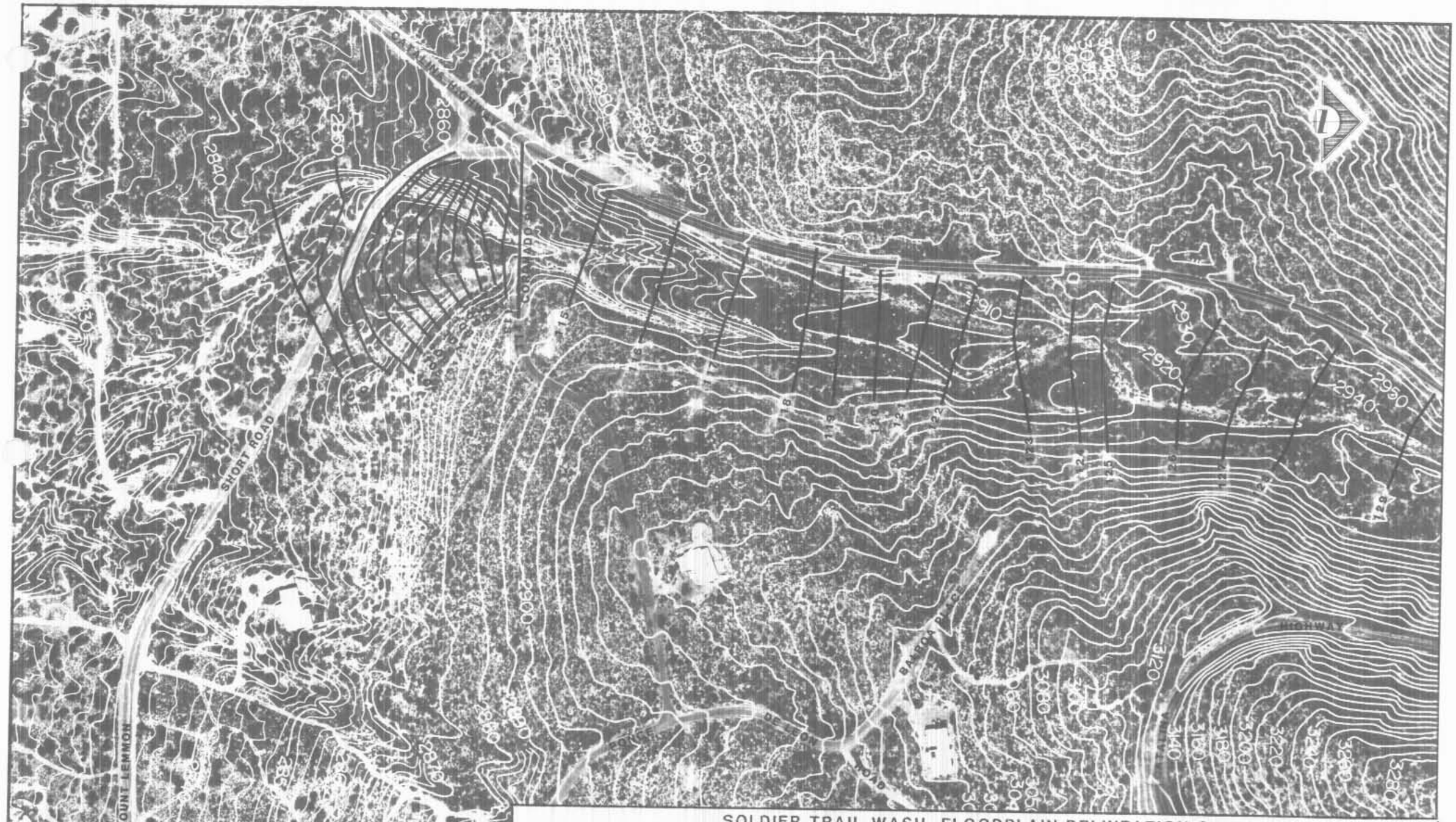
4.2 Erosion Setback Requirements

The results of the scour potential calculations (Appendix No. 3) have determined that in general the existing homes are not subject to a serious erosion hazard. In addition, if one is to consider that the existing stream channels through the subdivision have substantial vegetation of considerable size along their banks, any potential erosion hazards will be further mitigated. Finally, although the streamed is composed of sandy materials, major portions of the bank materials are composed of hard materials such as boulders and bedrock.

In addition, the 100-year runoff discharges have been considered to impact each of the existing stream channels through *La Bella Vista Subdivision,* although as noted in **Section 3**, interchannel breakouts are certainly possible along *Snyder Road* crossings. This conservative condition has been used in the flood plain limit determination and in the erosion hazard calculations.

A word of caution, however, is necessary since, as pointed out in previous sections of this study, the area between the *Mount Lemmon Short Road* and *La Bella Subdivision* is relatively undeveloped. Sediment supply

conditions, as well as locations of stream channels, will be altered considerably as this area is subjected to homesite development. Whenever this situation occurs to any great extent, this study must be revised to account for these changed conditions.



SOLDIER TRAIL WASH FLOODPLAIN DELINEATION STUDY

FIG.

PIMA COUNTY DEPARTMENT OF TRANSPORTATION
AND
FLOOD CONTROL DISTRICT

PIMA COUNTY, ARIZONA

APPROXIMATE SCALE
200 0 200 400 600 FEET

MOUNT LEMMON SHORT ROAD BRIDGE
FLOODPLAIN LIMITS MAP

038

T.13 S.,R.16 E.
SEC. 19

SECTION MAPS ARE FOR PLANNING AND PRELIMINARY ENGINEERING USE ONLY.

RESALE ONLY BY: McLAIN AERIAL MAPPING

APRIL, 1986

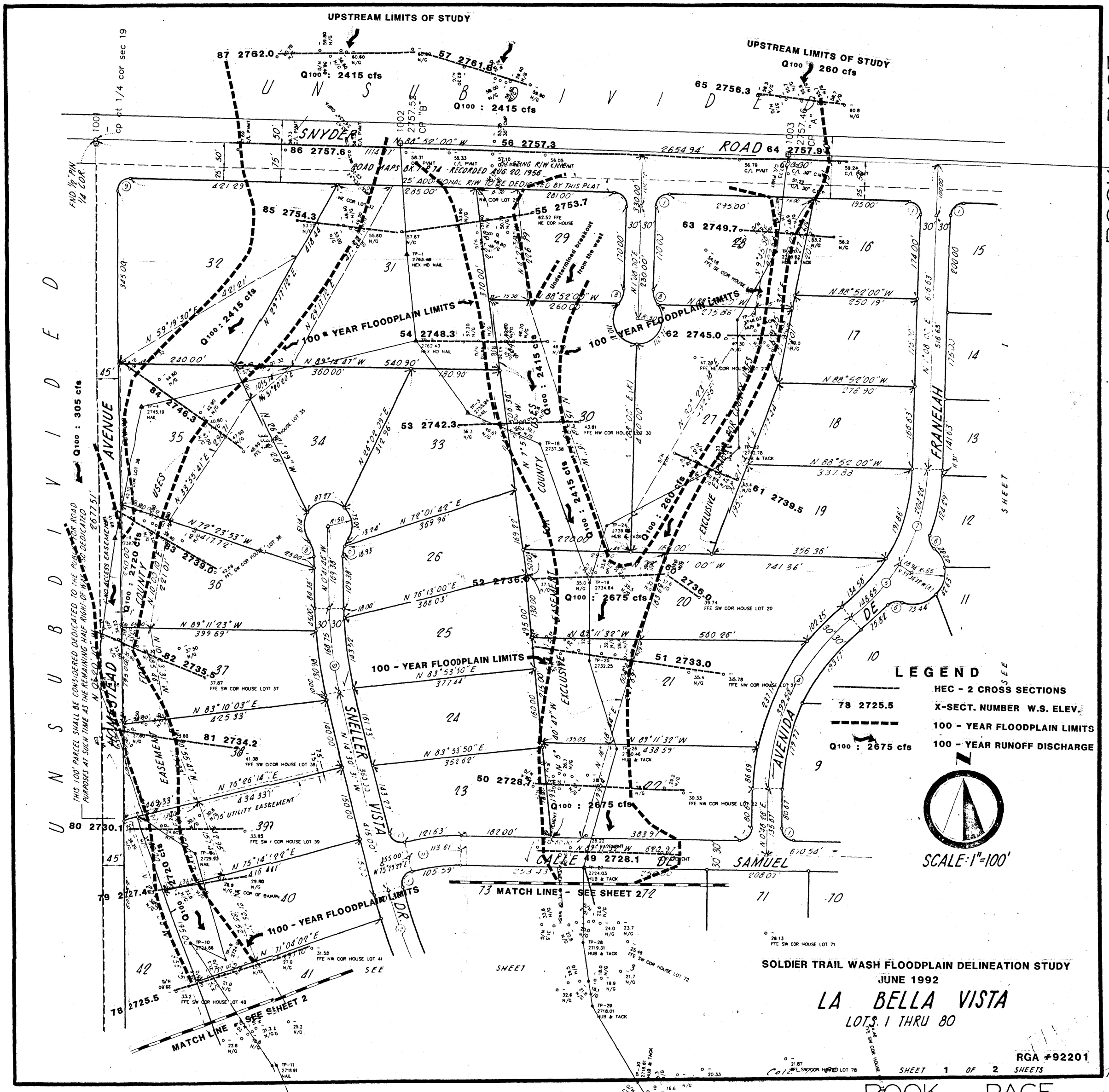
CITY OF TUCSON

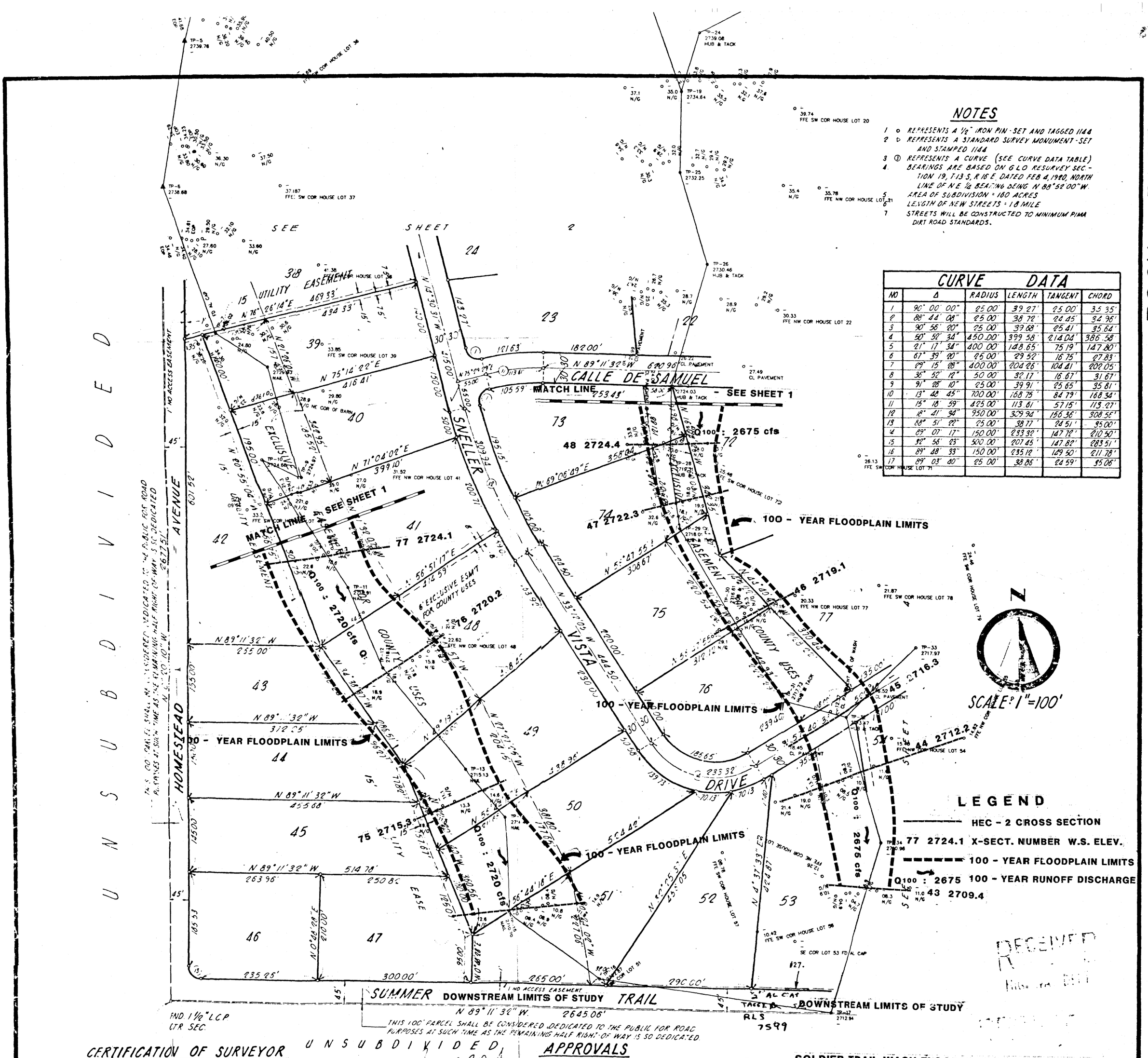
DEPARTMENT OF TRANSPORTATION, ENGINEERING DIVISION

1" 200'

CONTOURS AT 2' INTERVALS

McLAIN AERIAL MAPPING & SURVEYING, INC.
1665 E 18 th STREET TUCSON, ARIZONA
622-7272


UPSTREAM LIMITS OF STUDY
Q100 : 2415 cfs
UPSTREAM LIMITS OF STUDY
Q100 : 260 cfs
UNSUBDIVIDED
SNYDER ROAD
ROAD MAPS BK 7 PG 74 - RECORDED AUG. 20, 1956
25' ADDITIONAL R/W TO BE DEDICATED BY THIS PLAT
100 - YEAR FLOODPLAIN LIMITS
Undetermined breakout from the west
Q100 : 305 cfs
Q100 : 2720 cfs
Q100 : 2675 cfs
Q100 : 260 cfs
EXCLUSIVE EASEMENT FOR COUNTY USES
NO ACCESS EASEMENT
THIS 100' PARCEL SHALL BE CONSIDERED DEDICATED TO THE PUBLIC FOR ROAD PURPOSES AT SUCH TIME AS THE REMAINING HALF RIGHT-OF-WAY IS DEDICATED
HOMESTEAD AVENUE
SNELLER VISTA DR.
FRANELAH AVENIDA
SAMUEL DE
CALLE
15' UTILITY EASEMENT
1100 - YEAR FLOODPLAIN LIMITS
MATCH LINE - SEE SHEET 2
MATCH LINE - SEE SHEET 2
SEE SHEET 3
LEGEND
HEC - 2 CROSS SECTIONS
78 2725.5
X-SECT. NUMBER W.S. ELEV.
100 - YEAR FLOODPLAIN LIMITS
Q100 : 2675 cfs
100 - YEAR RUNOFF DISCHARGE
SCALE: 1"=100'
SOLDIER TRAIL WASH FLOODPLAIN DELINEATION STUDY
JUNE 1992
LA BELLA VISTA
LOTS 1 THRU 80
RGA #92201
SHEET 1 OF 2 SHEETS



NOTES

1. o REPRESENTS A 1/2" IRON PIN - SET AND TAGGED 1144
2. ▷ REPRESENTS A STANDARD SURVEY MONUMENT - SET AND STAMPED 1144
3. ③ REPRESENTS A CURVE (SEE CURVE DATA TABLE)
4. BEARINGS ARE BASED ON G.L.O. RESURVEY SECTION 19, T13S, R16E, DATED FEB 4, 1920, NORTH LINE OF N.E. 1/4 BEARING BEING N 88°52'00" W.
5. AREA OF SUBDIVISION = 160 ACRES
6. LENGTH OF NEW STREETS = 1.8 MILE
7. STREETS WILL BE CONSTRUCTED TO MINIMUM PIMA DIRT ROAD STANDARDS.

CURVE DATA

NO	Δ	RADIUS	LENGTH	TANGENT	CHORD
1	90° 00' 00"	25.00'	39.27'	25.00'	35.35'
2	88° 44' 08"	25.00'	38.72'	24.45'	34.96'
3	90° 56' 20"	25.00'	39.68'	25.41'	35.64'
4	50° 52' 34"	450.00'	399.58'	214.04'	386.58'
5	21° 17' 34"	400.00'	148.65'	75.19'	147.80'
6	67° 39' 20"	25.00'	29.52'	16.75'	27.83'
7	29° 15' 28"	400.00'	204.26'	104.41'	202.05'
8	36° 52' 12"	50.00'	32.17'	16.67'	31.67'
9	91° 28' 10"	25.00'	39.91'	25.65'	35.81'
10	13° 48' 45"	700.00'	168.75'	84.79'	168.34'
11	15° 18' 59"	425.00'	113.61'	57.15'	113.27'
12	18° 41' 34"	950.00'	309.94'	156.36'	308.56'
13	88° 51' 22"	25.00'	38.77'	24.51'	35.00'
14	89° 07' 17"	150.00'	233.32'	147.72'	210.50'
15	32° 56' 23"	500.00'	207.45'	147.82'	283.51'
16	89° 48' 33"	150.00'	235.12'	149.50'	211.78'
17	89° 03' 40"	25.00'	38.86'	24.59'	35.06'

CERTIFICATION OF SURVEYOR

I HEREBY CERTIFY THAT THE SURVEY OF LAND AS SHOWN ON THIS PLAT HAS BEEN COMPLETED UNDER MY DIRECTION, AND THAT THE MONUMENTS ACTUALLY EXIST AS SHOWN HEREON, OR A BOND HAS BEEN POSTED FOR THEIR EVENTUAL INSTALLATION

Robert L. Frazer — ARIZ. 1144
ROBERT L. FRAZER — REGISTRATION NUMBER
REGISTERED LAND SURVEYOR
Nov. 29, 1971

APPROVALS

Donald R. Pista — 1-4-72
ASSOC. PIMA COUNTY PLANNING DIRECTOR — DATE

D. G. DiCino — 1/3/72
PIMA COUNTY ENGINEER — DATE

E. W. Dooley — 1-4-72
PIMA COUNTY DEPARTMENT OF SANITATION — DATE

SOLDIER TRAIL WASH FLOODPLAIN DELINEATION STUDY
JUNE 1992

LA BELLA VISTA

LOTS 1 THRU 80

RGA #92201

Co12-71-80 SHEET 2 OF 2 SHEETS

5.0 OTHER STUDIES

The records and files of the **Flood Plain Management Section** of the ***Pima County Department of Transportation and Flood Control District*** were researched for previous studies and information. The following is a list of pertinent studies and other information that was reviewed:

- **Flood Plain Use Permit No. 88-572 - Greta DeLuca Residence - Parcel of land on T13S, R16E, Sec. 18.**

  This homesite is located downstream of the location of the *Mount Lemmon Short Road Bridge*, in the undeveloped land between this bridge and *Snyder Road* to the south.

  An engineering study was prepared where no erosion hazard was found to exist. A 50-foot setback requirement was recommended for the construction of the proposed DeLuca residence.

- **Flood Plain Use Permit No. 89-431 - Ruben Valenzuela Residence - Pardel of land on T13S, R16E, Sec. 18.**

  This homesite is located downstream and easterly of the *Mount Lemmon Short Road Bridge*, in the undeveloped land between the bridge and *Snyder Road* to the south.

  An engineering study was not prepared for this proposed construction. However, a site investigation and subsequent office calculations were performed by staff members of the *Flood Control District* in order to determine conditions for the approval of the Flood Plain Use Permit. A 250-foot setback from the existing main channel of the *Soldier Trail Wash* and a 93-foot setback from an existing secondary channel adjacent to the proposed site, were required. In addition, a two-foot elevation difference between the lowest floor

elevation and the existing natural grade of the wash channels at the north end of the house location was also required.

The study subject of the present report has determined that this parcel may be subject to a breakout runoff discharge over the existing *Mount Lemmon Short Road* because of both the inadequacy of the bridge crossing and the low-lying area easterly of the bridge crossing location (Refer to **Section 3** - potential breakout runoff discharge $Q_{100} \sim 1100$ cfs).

- **Flood Plain Use Permit No. 91-001 - Richard & Patricia Snow Residence - Lot 53, La Bella Vista Subdivision.**

This homesite is located at the extreme downstream end of the easterly channel of the *Soldier Trail Wash* adjacent to *Summer Trail*, on the east side of the stream channel.

2 engineering studies prepared and a LOMR was approved by FEMA for this area on 12 Dec. 1990. The Flood Plain Use Permit required that construction of bank protection be made in accordance with the engineering studies.

The study subject of the present report has determined that the subject homesite is not subject to flooding nor erosion hazards under the present conditions of development in the upstream portions of the area (between *Snyder Road* and *Mount Lemmon Short Road Bridge*).

- **No Flood Plain Use Permit Required - Cynthia Paiziale Residence - T13S, R16E, Sec. 18.**

This homesite is located approximately three-quarters of a mile upstream of *Snyder Road* in the undeveloped land between this point and the *Mount*

Lemmon Short Road Bridge. An application was submitted was for the construction of a patio wall adjacent to the existing channel along the westerly side of the parcel.

Based on field surveyed information, the *Flood Plain Management Section* determined that a use permit was not required for this proposed construction. A construction permit was issued, however, by the Pima County Central Permit section.

- **Other Permits in the General Area**

Additional permits were issued for eight lots in the Elin Ranch development to the east of the subject watershed.

This is a clear indication of future development possibilities for that area that is presently under-developed, but that has a good potential for changing the impacts from changes to the sediment/erosion conditions between *Mount Lemmon Short Road Bridge* and *La Bella Vista Subdivision*.

6.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the *Flood Plain Management Section* of the *Pima County Department of Transportation and Flood Control District, Public Works Building, 201 North Stone Avenue, Fourth Floor, Tucson, Arizona 85701-1207.*

7.0 BIBLIOGRAPHY AND REFERENCES

1. Federal Emergency Management Agency, Flood Insurance Study, Pima County, Arizona (Unincorporated Areas), Revised 6 September 1989.

2. Pima County Department of Transportation & Flood Control District, Hydrology Manual for Engineering Design and Flood Plain Management Within Pima County, Arizona, September 1979.

3. Leutheusser, H.J. and Chisholm, W. O., Extreme Roughness of Natural River Channel, *Journal of the Hydraulics Division*, ASCE, Vol. 99, No. HY7, **Proc. Paper 9831**, July 1973, pp. 1027-1041.

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047

SCOPE OF WORK

Soldier Trail Wash Floodplain Delineation Study

The purpose of this floodplain delineation study is to determine the 100-year floodplain limits and the associated flood hazards of the Soldier Trail Wash. The scope of the project will be to investigate existing basin characteristics, existing drainage structures and delineate the extent of the 100-year floodplain of Soldier Trail Wash and the split flow through the recorded subdivision, La Bella Vista, Book 22, Page 53. Project boundaries are shown on Exhibit "A". This study will be performed in two phases with specific tasks for each phase.

PHASE 1: ANALYSIS OF EXISTING DRAINAGE CONDITIONS

Task 1. Data Collection and Field Reconnaissance

Item A: Review all relevant information available including but not limited to:

1. Drainage complaints filed with the Floodplain Management Section and elsewhere.

2. Drainage reports and studies prepared for projects in the area : a) Elin Ranch Hydrology CO12-90-15 by McGovern, Mcvittie, and Lodge. b) Drainage studies prepared for Floodplain Use Permit Files (i.e. Deluca).

3. FEMA Flood Insurance Rate Maps and any pending revisions or amendments.

4. Watershed basin hydrologic characteristics such as soils, vegetative cover, and geology.

5. Aerial photographs, topographic maps (if available), field surveys, and the recorded subdivision plat with drainage easements.

Item B: Perform field Reconnaissance and Investigation.

1. Inspect and evaluate general watershed characteristics, stream channels and drainage improvements.

2. Inspect and catalog all drainage structures within the study area, including the box culvert on Mt. Lemmon Short Road.

3. Identify any obvious or potential flooding/erosion hazards.

Task 2: Analyze existing drainage conditions.

Item A: Hydrologic Analysis.

1. Where applicable, use calculated discharge values from approved drainage studies completed with currently acceptable hydrologic methods. Any errors should be documented and corrected. (A15-33-104)

2. Survey hydrologic cross-sections at the upstream end of all the potentially floodprone houses as shown on Exhibit "B".

2a. A right-of entry will be required by the survey crew as they will be working on private property.

3. Survey three upstream cross-sections at locations shown on Exhibit "B".

4. Survey is to be tied to the National Geodetic Vertical Datum of 1929 (NGVD) as shown on the Flood Insurance Rate Maps.

Item B: Hydraulic Analysis.

1. Compute the capacities of all the existing drainage structures in the study area, including the box culvert under Mt. Lemmon Short Road. Also compute the capacities of the stream channels and the drainageways.

2. Analyze the split flow distribution for the box culvert at Mt. Lemmon Short Road.

3. Using available topography, County survey data, and the surveyed cross-sections, perform:

3a. a backwater profile for the 100-year frequency flood starting at Snyder Road, for both of the main channels of the Soldier Trail Wash, downstream to Summer Trail Road.

3b. **Or**, compute manning's ratings of the surveyed cross-sections.

4. Run calculations for best and worst case conditions (Worst case is with total Q100 in each channel vs. best case with the split flow analyzed).

Task 3: Report Preparation and Review.

Item A: Preliminary Report Preparation.

1. The report shall discuss the results of the previous tasks such as existing drainage conditions, field investigation, and data collection.

2. Include all data sheets, tables and maps prepared for the hydrologic and hydraulic analysis.

3. Include IBM PC compatible diskettes of input data for computer hydrologic and/or hydraulic models if applicable.

Item B: Project Status Reports and Report Review.

The Consultant shall set up a meeting approximately bi-monthly to report on the status of the project. Two copies of the preliminary Phase 1 report on the status of the project shall be submitted for review to Floodplain Management Section Staff.

PHASE II : ANALYSIS AND EVALUATION OF FLOOD AND EROSION HAZARDS

Task 1: Evaluate Flood and Erosion Hazards

Item A: Determination of Homes within Flood and/or Erosion Hazards

1. Based on the information from Phase I, determine which residences may be subject to flooding and/or erosion during the 100-year event.

2. Determine whether the 100-year flood is contained in the platted Drainage Easements.

3. Identify where the FEMA mapping of the 100-year floodplain (Panel 1690) is outside of the actual 100-year floodplain as determined in Phase I and identify where the actual 100-year floodplain is outside of the FEMA mapped 100-year floodplain.

Item B: Mapping the 100-year Floodplain

1. Delineate on a 1 inch equals 100 feet scale (1" = 100') subdivision base map the 100-year flood limits showing the cross sections.

2. Delineate the distribution of the split flow on the 100 scale subdivision map showing the discharge in each channel.

3. Show which homes on the base map that may be subject to flooding and/or erosion hazards during the 100-year event.

Item C: Final Report

1. Prepare a final report encompassing the results of both phases of the project.

2. Prepare and submit a reproducible mylar (100 scale subdivision plat) of the 100-year floodplain from Snyder Road south to the downstream end of La Bella Vista Subdivision. It will include the cross sections used and show any potentially floodprone structures. All sections will show the depth of the thalweg, water surface elevation and the average channel velocity.

3. Submit a total of six (6) copies of the final approved report including the reproducible mylars of the delineated 100 -year floodplain, any figures and IBM compatible PC diskettes of computer input data.

Schedule:

The consultant shall provide a schedule for this scope of work. The schedule should not exceed four (4) months from Notice to Proceed.

EXHIBIT NO. 2 - HYDROLOGIC CALCULATIONS

2.1 - Pima County Method

The watershed for the *Soldier Trail Wash* is denoted on *USGS Quadrangle Maps, Figure No. 2.2.*

There are three distinct soils classifications to be found within the watershed, as *Figure E1.1, "General Soil Map, Pima County, Arizona."*[14]

1.- Upper reaches of the Watershed.- "Rock Outcrop - Barkerville - Faraway Association," consisting of rock outcrop and very shallow and shallow subhumid soils of the mountains.

From *Reference No. 14*, Table A - Estimated Properties and Features of the Soils of Pima County, Pages 20 - 22, the major soil components of this classification consist of 30% of the unit in rock outcrop (Hydrologic Soil Group D), 30% of the unit of Barkerville gravelly or cobbly sandy loam (Hydrologic Soil Group C), and 15% of the unit of Faraway very gravelly or very cobbly loam (Hydrologic Soil Group D). The remaining 25% consists of moderately fine-textured Gaddes soils intermixed with Barkerville soils, Tortugas soils on areas of limestone, and small amounts of Luzena soils intermixed with Faraway soils.

Consequently, use for this region of the watershed,
Hydrologic Soil Group "D" = 60%
Hydrologic Soil Group "C" = 40%

2.- Middle reaches of the Watershed.- "Rock Outcrop - Lampshire - Cellar Association," consisting of rock outcrop and very shallow and shallow semiarid soils of the mountains and foothills.

From *Reference No. 14*, the major soils components of this classification consist of 30% of the unit of rock outcrop (Hydrologic Soil Group D), 20% of the unit of Lampshire very gravelly or very cobbly loam (Hydrologic Soil Group D), and 15% of the unit of Cellar very gravelly or cobbly sandy loam (Hydrologic Soil Group D). The remaining 35% is made up of a number of other shallow and very shallow gravelly and cobbly soils.

Consequently, use for this region of the watershed,
Hydrologic Soil Group "D" = 100%

3.- Lower reaches of the Watershed.- "Pinaleño - Nickel - Palos Verdes Association," consisting of deep, arid, gravelly soils on deeply dissected uplands.

From *Reference No. 7*, the major soils components of this classification consist of 35% of Pinaleño soils, 30% of the unit of Nickel soils, and 15% Palos Verdes soils, all Hydrodlogic Soil Group B. The remaining 20% of the unit consists of intermixed areas of Eba, Rillino, and Tres Hermanos soils.

Consequently, use for this region of the watershed,
Hydrologic Soil Group "B" = 100%

The watershed area to Concentration Point No. 1, the bridge on Mount Lemmon Short Road was determined to be 2,580 acres, with the following portions falling within the above denoted soils classification groups:

Upper reaches of the Watershed	64% x 2580 =	1652 acres
Hydrologic Soil Group D,	60% x 1652 =	991 acres
Hydrologic Soil Group C,	40% x 1652 =	661 acres
Middle reaches of the Watershed	33% x 2580 =	851 acres
Hydrologic Soil Group D,	100% x 851 =	851 acres

Lower reaches of the Watershed	3% x 2580 =	77 acres
Hydrologic Soil Group B,	100% x 77 =	77 acres

Totals,

Hydrologic Soil Group D,	(70%)	= 1842 acres
Hydrologic Soil Group C,	(25%)	= 661 acres
Hydrologic Soil Broup B,	(5%)	= 77 acres

The westerly subbasin will consist entirely of Hydrologic Soil Group B while the easterly subbasin will consist of 49 acres of Hydrologic Soil Group D and the remainder of Hydrologic Soil Group B.

Rather than visually estimating the "center of gravity" of the watershed areas, a cutout of the watershed was made from moderately heavy stock and the center of gravity was obtained for each of the subbasin areas. These points are shown on the **Watershed Map,** *Figure 2.2.*

One of the important parameters to be determined is the basin factor (n_b), which "represents the visually estimated mean of the n-factor (Manning's) or roughness coefficient of all principal watercourses within a watershed." Based on site visits and review of specifics references, aerial photographs, and other existing information and data, the Manning's roughness coefficient for the *Soldier Trail Wash* streambed and overbank areas has been judged to be as follows:

Streambed channels	n = .030
Overbank areas	n = .080

It should be pointed out that channel roughness as measured by the Manning coefficient is accepted to be a function of both stage and discharge. Because the n-value of the brush covered floodplain is undoubtly larger than the channel proper, and because the channels in the greater portion of the watershed are quite incised, it appears very probable that the larger values associated with the watershed as a whole are associated with the larger rates of discharge flow in the present instance.

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By means of a computerized version of the Pima County Hydrologic Method, the results shown on the following sheets, and summarized on *Table E2.1* that follows hereinafter, were obtained for the existing bridge on Mount Lemmon Short Road.

TABLE E2.1
PIMA COUNTY METHOD - SUMMARY OF DISHCARGES

R.I.	nb=.055	nb=.056	nb=.058	nb=.060
10	715	696	660	626
25	1219	1186	1125	1070
50	1788	1740	1652	1570
100	2427	2364	2244	2134

The basin factor thus determined in the analyses above, however, must be adjusted somewhat for the lower reaches of the watershed, since while it may be considered appropriate for those upper and middle reaches of the watershed, the channel roughness coefficients in the lower areas may be smaller.

2.2 - Maximum "Expected" Flood Method

The principal documents that outline the methodologies proposed under this section are the two studies performed for the *Arizona Department of Transportation* at the *University of Arizona's Engineering Experiment Station* in January and February 1980. These investigations are noted as *Reference No. 8* and *Reference No. 9* in Section 7 of this report study.

Although these two studies were prepared specifically for assessing the vulnerability of bridges to floods of extreme probablity for ADOT, they are appropriate in determining the magnitude of a flood at any particular concentration point in a watershed, whatever the reason for wanting this information.

The first study, *Reference No. 8*, attempted to "obtain a relation which will provide reasonable estimates of the magnitude of the maximum expected flood and the mangitude of floods of various frequencies for any bridge site in the State of Arizona." It was determined, however, that existing flood records in Arizona are hardly considered adequate to provide for an accurate flood peak prediction with available methodologies, i.e., flood frequency analysis. Of the available records to be found at the USGS offices in Tucson, it was found that "seldom was a competent hydraulic engineer present to actually observe the peak - or even any part of the event. It is reasonable to expect that the person estimating the flow from the depth made conservative assumptions that tend to make the flow estimate larger."

A rastor plot was made by computer of all recorded flood experience in Arizona with the exception of a few (38) isolated historic peaks because they would bias the analysis in favor of the larger flows. Each point was compared with the corresponding information in the USGS Statistical Summaries of Arizona Streamflow Data, where, although some of this information could be questioned for the reasons mentioned above, all data presumably based on gaging measurements was accepted as is. An upper envelope was determined for the 3604 points plotted and a parabolic curve was calculated for it, as follows:

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$$Q_{max} = 2000\ A^{(0.789\ -\ 0.067\ \log A)}$$

where, Q = runoff discharge in cfs,
A = watershed area in square miles

The curve thus developed happens to fall above all of the 38 isolated historic peaks which were initially ignored. It was further determined that this simple formula appears to be "not unreasonable over the tremendous range $0.01 < A < 100,000$ square miles."

There was found to be a definite bend at the upper end of the curve (*Figure E2.2*) which would reinforce the conviction that there must be a maximum flow that might be reasonably expected. This would be contrary to the implications of the conventional log-normal, log-Pearson III, or Gumbel curves that extrapolate to infinitely large flows.

The study conducted various exercises to determine how appropriate the resulting solution might be in relation with the data that is available at the present time. In conclusion, it was determined that a bridge (or any facility, for that matter) "should be designed for the maximum expected flood." "Some small, nagging uncertainty about whether the bridge is completely, unquestionably safe may remain, but flood magnitudes estimated as proposed herein should be the least of the uncertainty. The possible hydraulics of the flow, the sediment movement, and the geometry of the future situation will be more of a problem."

The proposed "Magnitude-Drainage Area Curves for Various Return Intervals (Yr.)" shown as *Figure E2.2*, on the following sheet, together with the formula for the maximum envelope denoted above, will be utilized to arrive at the runoff discharge at various concentration points of interest in the *Soldier Trail Wash* watershed.

The results obtained by the application of this methodology are as cited in the following *Table E2.1*:

TABLE E2.1
MAXIMUM ENVELOPE - SUMMARY OF MAX. DISCHARGES

Point	Drainage Area	Runoff Discharge
#1	4.0 sq. mi.	5645 cfs
#2	4.2 sq. mi.	5845 cfs
#3	4.6 sq. mi.	6230 cfs
#4	0.3 sq. mi.	740 cfs
#5	0.25sq. mi.	635 cfs

The report also determined factors that relate the Maximum "Expected" Flood to various return intervals. By application of these factors, the following table of discharges was determined:

TABLE E2.2
SUMMARY OF DISCHARGES

POINT	10-YR. R.I.	25-YR. R.I.	50-YR. R.I.	100-YR. R.I.	500-YR. R.I.
#1	730 cfs	1225 cfs	1730 cfs	2330 cfs	3945 cfs
#2	755 cfs	1270 cfs	1790 cfs	2415 cfs	4085 cfs
#3	805 cfs	1350 cfs	1910 cfs	2575 cfs	4355 cfs
#4	95 cfs	160 cfs	230 cfs	305 cfs	520 cfs
#5	80 cfs	140 cfs	195 cfs	260 cfs	445 cfs
#6	95 cfs	160 cfs	230 cfs	305 cfs	520 cfs

The second report[7] prepared by the *University of Arizona Engineering Experiment Station* investigated the accuracy of the largest flood magnitudes with special consideration of those points which fall on, above, or just below the proposed envelope. A search into the data at the USGS offices was undertaken and an evaluation of each of these points was investigated on an individual basis.

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To quote from this reference, "The nineteen points taken under consideration here were investigated in order to assess the selected placement of the envelope of maximum expected flood vs. drainage area. In each case evidence was found to indicate that the reported magnitude was overstated; in some cases the evidence was rather firm, while in others a certain degree of ambiguity remains."

In the final analysis, the results of the study as a whole determined that the placement of the envelope was proper with regard to establishing a design criterion, that is, in identifying a maximum flood to be expected on a given watershed. "This concept allows for the extremely small chance that a greater flood might occur, but the chance is so small and the magnitude so nebulous that it is considered unwise to account for it in design. In effect, an upper limit is being established, based on data available at this time to serve as a reference for estimating clesser-magnitude floods of any given return interval whatever to design structures with a desired degree of risk."

Consequently, the discharge magnitudes outlined in *Table E2.2* are adopted for subsequent hydraulic analyses of the stream channels.

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Consequently, use for this region of the watershed,
Hydrologic Soil Group "D" = 60%
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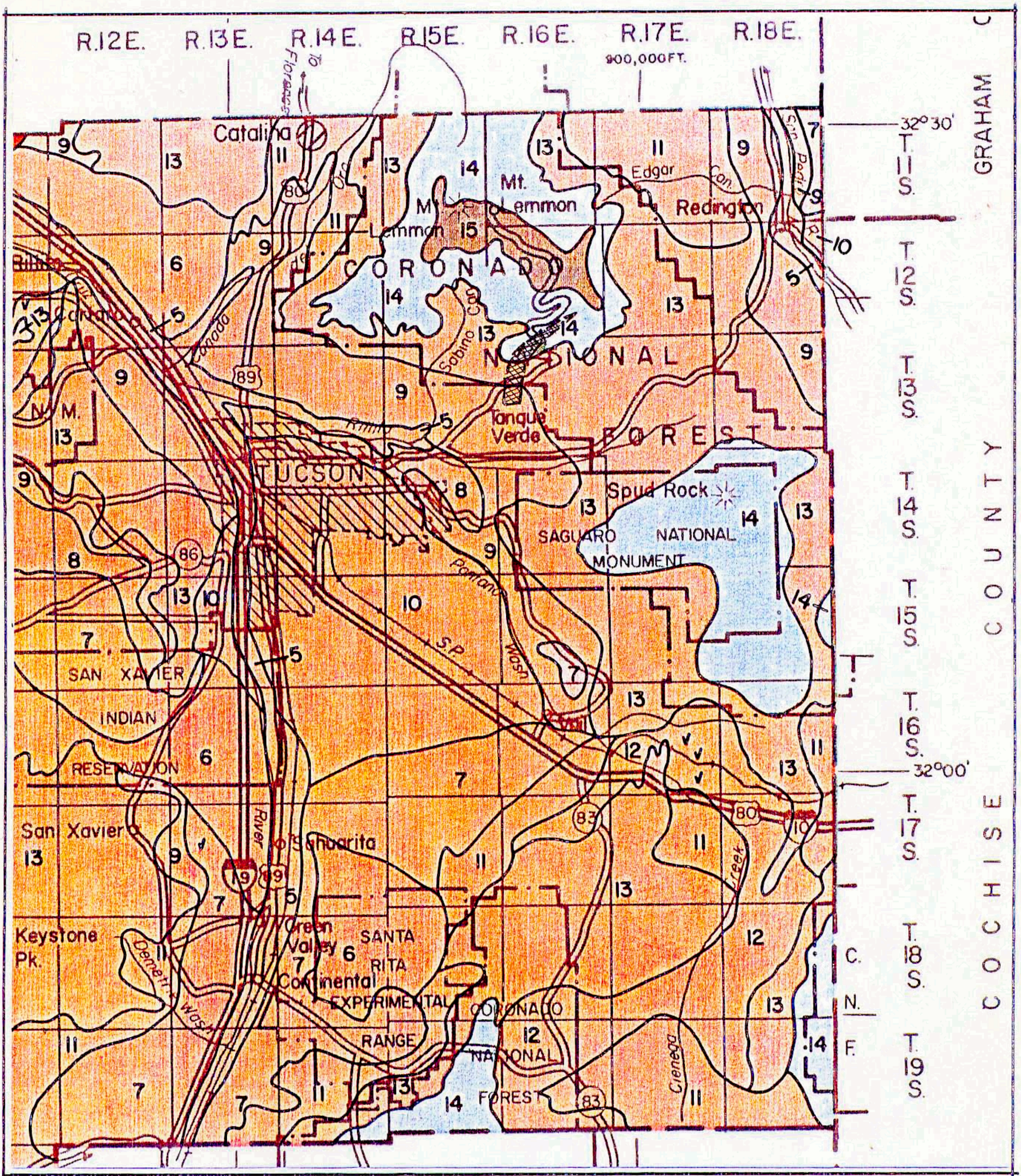

PIMA COUNTY DEPARTMENT OF TRANSPORTATION & FLOOD CONTROL DISTRICT

SOLDIER TRAIL WASH FLOODPLAIN DELINEATION STUDY

GENERAL SOIL MAP, PIMA COUNTY, ARIZONA

"FIGURE E2.1"

THIS RUN EXECUTED 6/ 2/92 8:19:36

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HEC2 RELEASE DATED SEPT 88

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T1 PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT
T2 FLOODPLAIN MANAGEMENT SECTION UPSTREAM OF MT. LEMMON SHORT ROAD
T3 SOLDIER TRAIL WASH FILE NAME: BOXNORBR.DAT

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	0	0	1	0	0	.5	2330	2946	0

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	-1	0	0	0	0	0	-1	0	0	0

NC	.06	.06	.03	.1	.3					
	ONE-HUNDRED YEAR STORM RUNOFF DISCHARGE ANALYSIS									
	SPECIAL BRIDGE ALTERNATIVE AT MOUNT LEMMON SHORT RD. CROSSING									
X1	129	9	60	170	400	200	200			
GR	2960	0	2960.5	45	2960	70	2950	80	2940	108
GR	2940	120	2950	170	2960	188	2970	210		
X1	128	8	90	220	120	140	140			
GR	2960	0	2950	30	2940	90	2930	110	2930	125
GR	2940	220	2950	280	2960	330				
X1	127	9	70	155	105	110	125			
GR	2950	0	2940	50	2930	70	2925	80	2925	100
GR	2930	155	2930	210	2940	250	2950	280		
X1	126	8	75	230	250	210	300			
GR	2950	0	2940	30	2930	75	2920	140	2920	155
GR	2930	230	2940	290	2950	320				
X1	125	9	80	285	70	70	70			
GR	2950	0	2940	20	2930	60	2920	80	2910	220
GR	2910	245	2920	285	2930	305	2940	325		
X1	124	14	40	260	105	115	100			
GR	2940	0	2930	25	2920	40	2910	60	2910	75
GR	2910.2	105	2910	140	2910	180	2906	210	2906	220
GR	2910	235	2920	260	2930	275	2940	310		
NH	5	.06	45	.03	185	.06	215	.03	235	06
NH	340									

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X1	123	12	45	185	150	100	200			
X3	10							2910	2910	
GR	2930	0	2920	30	2910	45	2900	150	2900	160
GR	2910	185	2910	200	2900	215	2900	235	2910	255
GR	2920	305	2930	340						
NH	5	.06	30	.03	80	.06	170	.03	205	.06
NH	270									
X1	122	14	30	80	70	85	80			
X3	10							2910	2910	
GR	2920	0	2910	20	2900	30	2890	50	2890	60
GR	2900	80	2910	100	2910	130	2900	170	2896	180
GR	2896	195	2900	205	2910	255	2920	270		
NH	5	.06	50	.03	110	.06	170	.03	220	.06
NH	270									
X1	121	14	50	90	70	90	80			
X3	10							2903	2903	
GR	2910	0	2900	20	2890	50	2887	60	2887	75
GR	2890	90	2900	110	2903	140	2900	170	2893	190
GR	2893	205	2900	220	2910	260	2920	270		
NH	5	.06	55	.03	130	.06	225	.03	240	.06
NH	280									
X1	120	12	55	130	180	170	175			
X3	10							2897.5	2897.5	
GR	2910	0	2900	25	2890	55	2883.5	95	2883.5	110
GR	2890	130	2897.5	175	2890	225	2890	240	2900	265
GR	2910	270	2920	280						
NH	5	.06	70	.03	155	.06	210	.03	250	.06
NH	300									
X1	119	12	70	155	80	80	80			
X3	10							2894	2894	
GR	2900	0	2890	70	2880	110	2880	120	2890	155
GR	2894	180	2890	210	2886	230	2886	240	2890	250
GR	2900	285	2910	300						
NH	5	.06	80	.03	110	.06	175	.03	250	.06
NH	325									
X1	118	14	80	110	180	170	175			
X3	10							2890	2890	
GR	2900	0	2890	45	2880	80	2878	95	2878	100
GR	2880	110	2890	140	2890	175	2884	210	2884	220
GR	2890	250	2900	275	2909.5	290	2910	325		
NH	5	.06	20	.03	100	.06	140	.03	215	.06
NH	250									
X1	117	20	20	100	160	160	160			
X3	10							2881.8	2881.8	
GR	2890	0	2880	20	2878	30	2876	40	2874	50
GR	2872	60	2872	65	2874	70	2876	80	2878	90
GR	2880	100	2881.8	120	2880	140	2878	160	2880	180
GR	2878	190	2878	205	2880	215	2890	240	2900	250

069

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NH      5     .06     55     .03     80     .06    170     .03    185     .06
NH    260
X1    116      17     55      80    170     170    175
X3     10                                             2874   2874
GR   2890       0   2880      35   2870      55   2868      60   2868      70
GR   2870      80   2872      85   2874     120   2874     135   2872     150
GR   2870     170   2870     185   2872     195   2874     220   2876     240
GR   2878     250   2880     260

NC    .06     .06    .03      .1     .3
X1    115      18     40     190    150     200    140
GR   2860       0   2870      40   2868      45   2866      50   2864      62
GR   2862      75   2864      80   2864      95   2862     120   2864     130
GR   2866     140   2868     170   2870     190   2872     200   2874     210
GR   2876     220   2878     235   2880     245

        DIP CROSSING AT CORONADO ROAD - PAVED ROADWAY
X1    114      14    135     185     80      60     70
GR   2870       0   2868      20   2866      55   2864      90   2862     110
GR   2860     135   2858     150   2858     165   2860     185   2862     225
GR   2864     260   2866     285   2868     330   2870     355

        BREAKOUT OCCURS OVER THE LEFT OVERBANK - Qbo = 161 CFS
X1    113      10    115     155     30      40     50                      1
X2                                                                          15
GR   2866       0   2864      10   2862      25   2860      65   2858     115
GR   2856     125   2856     140   2858     155   2860     180   2862     200

        MAINSTREAM DISCHARGE AFTER BREAKOUT Q = 2169 CFS
X1    112      10    104     195     30      30     30
X2   2169                                                                  15
X3     10                                             2858.5 2858.5
GR   2860       0   2858      45   2858.6     75   2858     104   2856     115
GR   2854     130   2854     140   2856     165   2858     180   2860     195

X1    111      15    160     235     30      20     30
X2                                                                          15
X3     10                                             2858   2858
GR   2860       0   2858      20   2858      40   2857      55   2858      60
GR   2857.4    95   2858     140   2858     150   2856     160   2852     170
GR   2852     175   2854     200   2856     210   2858     220   2860     235

X1    110      17    190     270     30      15     15
X2                                                                          15
X3     10                                             2857   2857
GR   2860       0   2858      18   2856      28   2855.5    40   2856      60
GR   2856.8    90   2856     125   2856     145   2857     175   2856     190
GR   2854     200   2852     203   2852     220   2854     235   2856     248
GR   2858     258   2860     270
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070

X1	109	19	238	300	30	15	20			
X2										15
X3	10							2856	2856	
GR	2860	0	2858	15	2856	30	2854	40	2854	50
GR	2856	80	2856	110	2855	160	2856	200	2856	220
GR	2854	230	2852	238	2850	244	2850	250	2852	257
GR	2854	270	2856	280	2858	290	2860	300		
X1	108	20	280	355	30	15	15			
X2										15
X3	10							2854	2854	
GR	2860	0	2858	19	2856	30	2854	45	2853.1	55
GR	2854	80	2855	110	2854	160	2852	200	2852	220
GR	2854	255	2854	275	2852	280	2850	300	2850	305
GR	2852	315	2854	328	2856	335	2858	345	2860	355
X1	107	19	320	350	30	15	15			
X2										15
X3	10							2853.6	2853.6	
GR	2860	0	2858	20	2856	31	2854	44	2852.2	60
GR	2854	105	2854.1	135	2854	140	2852	225	2850	230
GR	2850	240	2852	285	2853.6	305	2852	320	2850	330
GR	2849	340	2850	350	2858	388	2860	392		
X1	106	23	325	380	30	40	35			
X2										15
X3	10							2853	2853	
GR	2860	0	2858	20	2856	32	2854	45	2852	65
GR	2851.2	75	2852	80	2852.6	100	2852	115	2852	130
GR	2853	150	2852	190	2852	210	2850	250	2849	265
GR	2850	275	2852	300	2853	325	2852	345	2850	355
GR	2848.5	370	2850	380	2860	420				
X1	105	20	390	435	50	50	50			
X2										15
X3	10							2852	2860	
GR	2860	0	2854	50	2852	70	2850	90	2850	110
GR	2852	120	2851	140	2852	160	2850	220	2850	255
GR	2848	290	2848	300	2850	335	2852	365	2850	390
GR	2846	395	2846	429	2850	435	2858	460	2860	470
NC			.013	.3	.5					
SB	1.05	1.56	3.0		34	3	160	0	2846	2845.5

SP. BRIDGE ALT. - WEIR FLOW OVER THE LEFT OVERBANK - Qlob = 983 CFS
MAINSTREAM DISCHARGE AFTER WEIR FLOW - Q = 1201 CFS

X1	104	23	488	522	28	28	28			
X2	0	0	1	2850.93	2851.8	0	0	0	0	
X3	10							2851.8	2851.8	1
BT	16	0	2860		120	2850		155	2848.5	
BT	190	2850		220	2850		270	2849		340
BT	2848		390	2848		430	2850		455	2850.3
BT		485	2851.8		488	2851.8		522	2853.2	
BT	525	2853.3		595	2858		650	2860		

071

GR	2860	0	2850	120	2848.5	155	2850	190	2850	220
GR	2849	270	2848	340	2848	390	2850	430	2850.3	455
GR	2851.7	485	2851.8	488	2845.9	488	2846	503.5	2851.5	503.5
GR	2851.5	505	2846	505	2847.9	522	2852.37	522	2853.3	525
GR	2854.8	552	2858	595	2860	650				
NC			.03	.1	.3					
X1	103	22	463	497	30	160	100			
X2	1201									15
X3	10							2852.8	2854.4	
GR	2856	0	2850	50	2848	125	2848	145	2849	200
GR	2848	250	2847	335	2848	390	2850	410	2852	440
GR	2852.7	460	2852.8	463	2845.2	463	2845.2	478.5	2853.21	478.5
GR	2853.2	481.5	2845.2	481.5	2847.2	497	2853.81	497	2854.51	500
GR	2855	540	2858	610						
X1	102	20	495	530	40	160	170			
X2										15
X3	10									
GR	2856	0	2850	80	2848	110	2847	160	2848	240
GR	2846	305	2844	360	2844	390	2846	420	2847.6	470
GR	2846	495	2844	500	2843.9	505	2844	510	2846	530
GR	2848	540	2850	550	2851	565	2850	580	2850	675
X1	101	13	105	140						
X2										15
X3	10									
GR	2838	0	2838	10	2836	60	2834	70	2832	90
GR	2830	105	2828	120	2828	130	2830	140	2832	160
GR	2834	175	2836	188	2838	200				

072

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300
*SECNO 129.000
ONE-HUNDRED YEAR STORM RUNOFF DISCHARGE ANALYSIS
SPECIAL BRIDGE ALTERNATIVE AT MOUNT LEMMON SHORT RD. CROSSING

129.00	6.00	2946.00	2946.04	2946.00	2947.87	1.87	.00	.00	2950.00
2330.	0.	2330.	0.	0.	212.	0.	0.	0.	2950.00
.00	.00	10.97	.00	.000	.030	.000	.000	2940.00	91.20
.009178	0.	0.	0.	0	4	0	.00	58.80	150.00

*SECNO 128.000

1645 INT SEC ADDED BY RAISING SEC 128.00, 7.500 FT AND MULTIPLYING BY 952

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.01	3.63	2941.13	2942.80	.00	2946.61	5.48	.89	.36	2947.50
2330.	0.	2330.	0.	0.	124.	0.	0.	0.	2947.50
.00	.00	18.79	.00	.000	.030	.000	.000	2937.50	97.81
.048788	100.	50.	50.	8	11	0	.00	54.04	151.85

1645 INT SEC ADDED BY RAISING SEC 1.01, -2.500 FT AND MULTIPLYING BY 1.017

1.02	3.58	2938.58	2940.27	.00	2944.13	5.55	2.48	.01	2945.00
2330.	0.	2330.	0.	0	123.	0.	0	0	2945.00
.00	.00	18.91	.00	.000	.030	.000	.000	2935.00	99.56
.050228	100.	50.	50.	4	11	0	.00	54.35	153.91

1645 INT SEC ADDED BY RAISING SEC 1.02, -2.500 FT AND MULTIPLYING BY 1.017

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	QLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
1.03	3.54	2936.04	2937.73	.00	2941.60	5.56	2.53	.00	2942.50
2330.	0.	2330.	0.	0.	123.	0.	0.	0.	2942.50
.00	.00	18.93	.00	.000	.030	.000	.000	2932.50	101.28
.050904	100.	50.	50.	4	11	0	.00	54.81	156.08

1645 INT SEC ADDED BY RAISING SEC 1.03, -2 500 FT AND MULTIPLYING BY 1.016

128.00	3.50	2933.50	2935.17	.00	2939.04	5.54	2.55	.01	2940.00
2330.	0	2330.	0.	0.	123.	0.	1.	0.	2940.00
.00	.00	18.89	.00	.000	.030	.000	.000	2930.00	102.99
.051199	100.	50.	50.	2	14	0	.00	55.33	158.31

*SECNO 127.000

1645 INT SEC ADDED BY RAISING SEC 127.00, 3.333 FT AND MULTIPLYING BY .883

3301 HV CHANGED MORE THAN HVINS

1.01	3.51	2931.84	2933.43	.00	2936.64	4.80	2.18	.22	2933.33
2330.	0.	2330.	0.	0.	133.	0	1.	0.	2933.33
.00	.00	17.58	.00	.000	.030	.000	.000	2928.33	64.42
.042820	40.	47.	47.	2	14	0	.00	57.91	122.32

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.667 FT AND MULTIPLYING BY 1.067

1.02	3.44	2930.11	2931.50	.00	2934.60	4.49	1.95	.09	2931.67
2330.	0.	2330.	0.	0.	137.	0.	1.	0.	2931.67
.00	.00	17.00	.00	.000	.030	.000	.000	2926.67	68.83
.040845	40.	47.	47.	3	11	0	.00	60.90	129.73

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.667 FT AND MULTIPLYING BY 1.062

127.00	3.36	2928.36	2929.69	.00	2932.65	4.29	1.89	.06	2930.00
2330.	0.	2330	0.	0.	140.	0.	1.	0.	2930.00
.01	.00	16.62	.00	.000	.030	.000	.000	2925.00	73.29
.040027	40.	47.	47.	3	11	0	.00	63.60	136.89

074

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 126.000

126.00	3.57	2923.57	2924.90	.00	2927.70	4.14	4.90	.05	2930.00
2330.	0.	2330.	0.	0.	143.	0.	1.	1.	2930.00
.01	.00	16.32	.00	.000	.030	.000	.000	2920.00	116.79
.038402	105.	125.	110.	5	11	0	.00	64.98	181.78

*SECNO 125.000

1645 INT SEC ADDED BY RAISING SEC 125.00, 5.000 FT AND MULTIPLYING BY .850

1.01	3.25	2918.25	2919.44	.00	2921.97	3.72	5.61	.12	2925.00
2330.	0.	2330.	0.	0.	150.	0.	2.	1.	2925.00
.01	.00	15.49	.00	.000	.030	.000	.000	2915.00	148.31
.036396	125.	150.	105.	5	11	0	.00	71.12	219.44

1645 INT SEC ADDED BY RAISING SEC 1.01, -5.000 FT AND MULTIPLYING BY 1.176

125.00	3.01	2913.01	2914.10	.00	2916.43	3.42	5.45	.09	2920.00
2330.	0.	2330.	0.	0.	157.	0.	2.	1.	2920.00
.01	.00	14.83	.00	.000	.030	.000	.000	2910.00	177.81
.036290	125.	150.	105.	5	11	0	.00	79.25	257.06

*SECNO 124.000

1645 INT SEC ADDED BY RAISING SEC 124.00, 2.000 FT AND MULTIPLYING BY 1.467

1.01	3.49	2911.49	2912.66	.00	2915.14	3.65	1.26	.02	2922.00
2330.	0.	2330.	0.	0.	152.	0.	3.	1.	2922.00
.01	.00	15.34	.00	.000	.030	.000	.000	2908.00	269.71
.035949	35.	35.	35.	7	20	0	.00	72.32	342.03

1645 INT SEC ADDED BY RAISING SEC 1.01, -2.000 FT AND MULTIPLYING BY .682

3301 HV CHANGED MORE THAN HVINS

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV.	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

124.00	4.27	2910.27	2911.00	.00	2913.12	2.85	1.78	.24	2920.00
2330.	0.	2330.	0.	0.	172.	0.	3.	1.	2920.00
.01	.00	13.54	.00	.000	.030	.000	.000	2906.00	59.45
.077610	35.	35.	35.	9	14	0	.00	176.25	235.69

1490 NH CARD USED
*SECNO 123.000

1645 INT SEC ADDED BY RAISING SEC 123.00, 4.000 FT AND MULTIPLYING BY 1.045

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

1.01	2.64	2906.64	2907.93	.00	2910.89	4.25	2.09	.14	2914.00
2330.	0.	1110.	1220.	0.	75.	68.	3.	1.	2914.00
.01	.00	14.63	17.97	.000	.030	.032	.000	2904.00	127.76
.048043	35.	33.	38.	7	11	0	.00	76.84	251.03

1645 INT SEC ADDED BY RAISING SEC 1.01, -2.000 FT AND MULTIPLYING BY 979

3265 DIVIDED FLOW

1.02	2.63	2904.63	2905.98	.00	2909.10	4.46	1.77	.02	2912.00
2330.	0.	1110.	1220.	0.	73.	66.	3.	1.	2912.00
.02	.00	15.19	18.41	.000	.030	.032	.000	2902.00	125.08
.050580	35	33.	38	2	14	0	.00	75.11	245.64

1645 INT SEC ADDED BY RAISING SEC 1.02, -2.000 FT AND MULTIPLYING BY .978

076

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2910.00 ELREA= 2910.00

123.00	4.27	2904.27	2905.29	.00	2907.50	3.23	1.22	.37	2910.00
2330.	0.	2330.	0.	0.	162.	0.	3.	1.	2910.00
.02	.00	14.43	.00	.000	.030	.000	.000	2900.00	105.12
.026033	35.	33.	38.	11	17	0	.00	65.57	170.69

1490 NH CARD USED
*SECNO 122.000

1645 INT SEC ADDED BY RAISING SEC 122.00, 7.500 FT AND MULTIPLYING BY 1.779

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2910.00 ELREA= 2910.00

1.01	4.25	2901.75	2903.12	.00	2906.05	4.30	1.35	.11	2907.50
2330.	0.	2330.	0.	0.	140.	0.	3.	2.	2907.50
.02	.00	16.63	.00	.000	.030	.000	.000	2897.50	73.79
.027953	38.	50	25.	2	11	0	.00	48.06	121.85

1645 INT SEC ADDED BY RAISING SEC 1.01, --2.500 FT AND MULTIPLYING BY .854

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2910.00 ELREA= 2910.00

1.02	4.49	2899.49	2901.12	.00	2904.51	5.01	1.47	.07	2905.00
2330.	0.	2330.	0.	0.	130.	0.	3	2.	2905.00
.02	.00	17.97	.00	.000	.030	.000	.000	2895.00	62.29
.031079	38.	50.	25.	4	11	0	.00	42.51	104.80

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.02, -2.500 FT AND MULTIPLYING BY .829

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2910.00 ELREA= 2910.00

1.03	4.95	2897.45	2899.20	.00	2902.91	5.45	1.55	.04	2902.50
2330.	0.	2330.	0.	0.	124.	0.	4.	2.	2902.50
.02	.00	18.74	.00	.000	.030	.000	.000	2892.50	50.49
.031003	38.	50.	25.	5	14	0	.00	37.57	88.06

1645 INT SEC ADDED BY RAISING SEC 1.03, -2.500 FT AND MULTIPLYING BY .794

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2910.00 ELREA= 2910.00

122.00	5.69	2895.69	2897.51	.00	2901.39	5.70	1.50	.02	2900.00
2330.	0.	2330.	0.	0.	122.	0.	4.	2	2900.00
.02	.00	19.16	.00	.000	.030	.000	.000	2890.00	38.62
.028906	38.	50.	25.	6	14	0	.00	32.75	71.38

1490 NH CARD USED
*SECNO 121 000

1645 INT SEC ADDED BY RAISING SEC 121.00, 2.250 FT AND MULTIPLYING BY .742

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2908.25 ELREA= 2908.25

1.01	4.71	2893.96	2895.96	.00	2900.68	6.73	.60	.10	2892.25
2330.	0.	2330.	0.	0.	112.	0.	4.	2.	2892.25
.02	.00	20.81	.00	.000	.030	.000	.000	2889.25	37.09
.031392	18.	20.	21.	5	8	0	.00	29.67	66.76

078

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -.750 FT AND MULTIPLYING BY 1.116

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2906.50 ELREA= 2906.50

1.02	4.19	2892.69	2894.78	.00	2899.92	7.23	.71	.05	2891.50
2330.	0.	2330.	0.	0.	108.	0.	4.	2.	2891.50
.02	.00	21.58	.00	.000	.030	.000	.000	2888.50	41.39
.040662	18.	20.	21.	8	11	0	.00	33.11	74.50

1645 INT SEC ADDED BY RAISING SEC 1.02, -.750 FT AND MULTIPLYING BY 1.104

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2904.75 ELREA= 2904.75

1.03	3.86	2891.61	2893.70	.00	2899.02	7.41	.88	.02	2890.75
2330.	0.	2330.	0.	0	107.	0.	4.	2.	2890.75
.02	.00	21.85	.00	.000	.030	.000	.000	2887.75	45.70
.048072	18.	20.	21.	7	11	0	.00	36.56	82.25

1645 INT SEC ADDED BY RAISING SEC 1.03, -.750 FT AND MULTIPLYING BY 1.094

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2903.00 ELREA= 2903.00

121.00	3.61	2890.61	2892.64	.00	2898.00	7.39	1.01	.01	2890.00
2330.	0.	2330.	0.	0.	107.	0.	4.	2.	2890.00
.02	.00	21.82	.00	.000	.030	.000	.000	2887.00	50.00
.053648	18.	20.	21.	6	14	0	.00	40.00	90.00

1490 NH CARD USED
*SECNO 120.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 120.00, 2.333 FT AND MULTIPLYING BY .957

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2901.17 ELREA= 2901.17

1.01	3.64	2889.47	2891.44	.00	2896.36	6.89	1.49	.15	2892.33
2330.	0.	2330.	0.	0.	111.	0.	4.	2.	2892.33
.02	.00	21.06	.00	.000	.030	.000	.000	2885.83	69.47
.058340	23.	27.	30.	3	14	0	.00	46.48	115.95

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.167 FT AND MULTIPLYING BY 1.023

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2899.33 ELREA= 2899.33

1.02	3.67	2888.34	2890.21	.00	2894.72	6.38	1.49	.15	2891.17
2330.	0.	2330.	0.	0.	115.	0.	4.	2.	2891.17
.02	.00	20.27	.00	.000	.030	.000	.000	2884.67	70.81
.053374	23.	27.	30.	3	14	0	.00	47.87	118.69

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.167 FT AND MULTIPLYING BY 1.022

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2897.50 ELREA= 2897.50

120.00	3.68	2887.18	2888.99	.00	2893.24	6.05	1.38	.10	2890.00
2330.	0.	2330.	0.	0.	118.	0.	4.	2.	2890.00
.02	.00	19.74	.00	.000	.030	.000	.000	2883.50	72.31
.050406	23.	27.	30.	2	14	0	.00	49.03	121.34

080

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1490 NH CARD USED
*SECNO 119.000

1645 INT SEC ADDED BY RAISING SEC 119.00, 2.625 FT AND MULTIPLYING BY 1.259

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2896.63 ELREA= 2896.63

1.01	4.37	2886.99	2888.27	.00	2890.99	4.00	1.63	.62	2892.62
2330.	0.	2330.	0.	0.	145.	0.	4.	2.	2892.62
.02	.00	16.04	.00	000	.030	.000	.000	2882.62	116.45
.028582	45.	44.	43.	7	14	0	.00	53.86	170.31

1645 INT SEC ADDED BY RAISING SEC 1.01, -.875 FT AND MULTIPLYING BY .931

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2895.75 ELREA= 2895.75

1.02	5.02	2886.77	2887.60	.00	2889.69	2.92	.98	.32	2891.75
2330.	0	2330	0.	0.	170.	0.	4.	2.	2891.75
.02	.00	13.71	00	.000	.030	.000	.000	2881.75	105.41
.017870	45.	44	43.	6	11	0	.00	55.92	161.32

1645 INT SEC ADDED BY RAISING SEC 1.02, -.875 FT AND MULTIPLYING BY .926

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2894.88 ELREA= 2894.88

1.03	5.51	2886.39	2886.93	.00	2888.88	2.50	.68	.13	2890.87
2330.	0.	2330.	0.	0.	184.	0.	5.	2.	2890.87
.02	.00	12.68	.00	.000	.030	.000	.000	2880.87	95.53
.013794	45.	44	43	5	11	0	.00	55.79	151.32

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.03, -.875 FT AND MULTIPLYING BY .921

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2894.00 ELREA= 2894.00

119.00	5.79	2885.79	2886.32	.00	2888.29	2.51	.59	.00	2890.00
2330.	0.	2330.	0.	0.	183.	0.	5.	2.	2890.00
.02	.00	12.70	.00	.000	.030	.000	.000	2880.00	86.85
.013173	45.	44	43.	4	8	0	.00	53.40	140.25

1490 NH CARD USED
*SECNO 118.000

1645 INT SEC ADDED BY RAISING SEC 118.00, 1.000 FT AND MULTIPLYING BY 1.117

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2892.00 ELREA= 2892.00

1.01	5.89	2884.89	2885.12	.00	2887.82	2.93	.43	.04	2881.00
2330.	0.	2330.	0.	0.	170.	0.	5.	2.	2881.00
.03	.00	13.74	.00	.000	.030	.000	.000	2879.00	89.38
.008955	40.	40.	40.	2	6	0	.00	33.52	122.90

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.000 FT AND MULTIPLYING BY .895

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2890.00 ELREA= 2890.00

118.00	6.27	2884.27	2884.54	.00	2887.44	3.17	.36	.02	2880.00
2330.	0.	2330.	0.	0.	163.	0.	5.	2.	2880.00
.03	.00	14.29	.00	.000	.030	.000	.000	2878.00	80.00
.008844	40.	40	40.	-4	8	0	.00	30.00	110.00

1490 NH CARD USED
*SECNO 117.000

1645 INT SEC ADDED BY RAISING SEC 117.00, 4.500 FT AND MULTIPLYING BY .857

082

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	QLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2887.95 ELREA= 2887.95

1.01	5.53	2882.03	2883.52	.00	2886.64	4.61	.66	.14	2884.50
2330.	0.	2330.	0.	0.	135.	0.	5.	2.	2884.50
.03	.00	17.23	.00	.000	.030	.000	.000	2876.50	27.75
.031141	45.	44.	43.	7	8	0	.00	47.39	75.14

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.500 FT AND MULTIPLYING BY 1.055

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2885.90 ELREA= 2885.90

1.02	5.30	2880.30	2881.85	.00	2885.17	4.88	1.44	.03	2883.00
2330	0	2330.	0.	0.	131.	0.	5.	2.	2883.00
.03	.00	17.72	.00	.000	.030	.000	.000	2875.00	30.33
.034608	45.	44.	43.	6	11	0	.00	47.93	78.26

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.500 FT AND MULTIPLYING BY 1.053

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2883.85 ELREA= 2883.85

1.03	5.13	2878.63	2880.21	.00	2883.61	4.98	1.56	.01	2881.50
2330.	0.	2330.	0.	0.	130.	0.	6.	2.	2881.50
.03	.00	17.91	.00	.000	.030	.000	.000	2873.50	32.72
.036648	45.	44.	43.	5	11	0	.00	48.86	81.58

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.500 FT AND MULTIPLYING BY 1.050

083

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV.	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2881.80 ELREA= 2881.80

117.00	5.02	2877.02	2878.58	.00	2881.98	4.96	1.62	.01	2880.00
2330.	0.	2330.	0.	0.	130.	0.	6.	2.	2880.00
.03	.00	17.87	.00	.000	.030	.000	.000	2872.00	34.96
.037502	45.	44.	43.	4	11	0	.00	50.07	85.04

1490 NH CARD USED
*SECNO 116.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2874.00 ELREA= 2874.00

116.00	5.99	2873.99	2874.14	.00	2878.64	4.65	3.35	.09	2870.00
2330.	0.	2330.	0.	0.	135.	0.	6.	2.	2870.00
.03	.00	17.30	.00	.000	.030	.000	.000	2868.00	55.00
.013322	160.	160.	160.	20	10	0	.00	25.00	80.00

CCHV= .100 CEHV= .300
*SECNO 115.000

1645 INT SEC ADDED BY RAISING SEC 115.00, 4.500 FT AND MULTIPLYING BY .657

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.01	3.46	2869.96	2871.89	.00	2877.20	7.23	1.18	.26	2874.50
2330.	0.	2330.	0.	0.	108.	0.	6.	2.	2874.50
.03	.00	21.58	.00	.000	.030	.000	.000	2866.50	34.95
.080759	43.	44.	43.	8	11	0	.00	55.24	90.20

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.500 FT AND MULTIPLYING BY 1.174

084

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3301 HV CHANGED MORE THAN HVINS

1.02	3.48	2868.48	2870.00	.00	2873.64	5.17	2.94	.62	2873.00
2330.	0.	2330.	0.	0.	128.	0.	6.	3.	2873.00
.03	.00	18.24	.00	.000	.030	.000	.000	2865.00	40.97
.056643	43.	44.	43.	2	14	0	.00	64.99	105.96

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.500 FT AND MULTIPLYING BY 1.148

3301 HV CHANGED MORE THAN HVINS

1.03	3.42	2866.92	2868.21	.00	2871.09	4.17	2.25	.30	2871.50
2330.	0.	2330.	0.	0.	142.	0.	7.	3.	2871.50
.03	.00	16.39	.00	.000	.030	.000	.000	2863.50	47.37
.046878	43.	44.	43.	3	11	0	.00	74.04	121.41

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.500 FT AND MULTIPLYING BY 1.129

3301 HV CHANGED MORE THAN HVINS

115.00	3.31	2865.31	2866.45	.00	2868.97	3.66	1.97	.15	2870.00
2330.	0.	2330.	0.	0.	152.	0.	7.	3.	2870.00
.03	.00	15.34	.00	.000	.030	.000	.000	2862.00	54.11
.043221	43.	44.	43.	4	11	0	.00	82.46	136.57

*SECNO 114.000

1645 INT SEC ADDED BY RAISING SEC 114.00, 2.000 FT AND MULTIPLYING BY 1.081

1.01	3.48	2863.48	2864.55	.00	2866.68	3.21	2.15	.14	2862.00
2330.	45.	2213.	72.	15.	150.	24.	7.	3.	2862.00
.04	3.05	14.73	3.05	.060	.030	.060	.000	2860.00	125.91
.022726	75.	70.	100.	4	11	0	.00	106.04	231.95

085

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -2.000 FT AND MULTIPLYING BY .925

DIP CROSSING AT CORONADO ROAD - PAVED ROADWAY

114.00	3.56	2861.56	2862.71	.00	2865.01	3.45	1.64	.02	2860.00
2330.	50.	2200.	80.	15.	144.	25.	7.	3.	2860.00
.04	3.23	15.32	3.24	.060	.030	.060	.000	2858.00	115.34
.023556	75.	70.	100.	3	11	0	.00	101.11	216.46

*SECNO 113.000

BREAKOUT OCCURS OVER THE LEFT OVERBANK - Qbo = 161 CFS

113.00	3.92	2859.92	2861.07	.00	2863.44	3.52	1.57	.01	2858.00
2330.	161.	2089.	80.	46.	132.	23.	8.	3.	2858.00
.04	3.50	15.87	3.50	.060	.030	.060	.000	2856.00	67.09
.021185	80.	70.	60.	5	11	0	.00	111.87	178.96

FLOW DISTRIBUTION FOR SECNO= 113.00 CWSEL= 2859.92

STA=	67.	115.	155.	179.
PER Q=	6.9	89.7	3.4	
AREA=	45.9	131.7	23.0	
VEL=	3.5	15.9	3.5	
DEPTH=	1.0	3.3	1.0	

*SECNO 112.000

1645 INT SEC ADDED BY RAISING SEC 112.00, 1.333 FT AND MULTIPLYING BY .822

1.01	3.88	2859.22	2860.55	.00	2863.00	3.78	.42	.03	2859.33
2276.	0.	2276.	0.	0.	146.	0.	8.	3.	2861.33
.04	.00	15.60	.00	.000	.030	.000	.000	2855.33	86.00
.031591	10.	17.	13.	2	11	0	.00	61.28	147.28

FLOW DISTRIBUTION FOR SECNO= 1.01 CWSEL= 2859.22

STA=	86.	160.
PER Q=	100.0	
AREA=	145.9	
VEL=	15.6	
DEPTH=	2.4	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -.667 FT AND MULTIPLYING BY 1.108

1.02	3.48	2858.15	2859.62	.00	2862.36	4.21	.59	.04	2858.67
2223.	0.	2223.	0.	0.	135.	0.	8.	3.	2860.67
.04	.00	16.47	.00	.000	.030	.000	.000	2854.67	97.36
.040511	10.	17.	13.	9	11	0	.00	63.06	160.42

FLOW DISTRIBUTION FOR SECNO= 1.02 CWSEL= 2858.15

STA= 97. 178.
PER Q= 100.0
AREA= 134.9
VEL= 16.5
DEPTH= 2.1

1645 INT SEC ADDED BY RAISING SEC 1.02, -.667 FT AND MULTIPLYING BY 1.098

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2858.50 ELREA= 2858.50

MAINSTREAM DISCHARGE AFTER BREAKOUT Q = 2169 CFS

112.00	3.19	2857.19	2858.70	.00	2861.61	4.42	.73	.02	2858.00
2169	0.	2169.	0.	0.	129.	0.	8.	3.	2860.00
.04	.00	16.86	.00	.000	.030	.000	.000	2854.00	108.46
.047471	10.	17.	13.	7	15	0	.00	65.45	173.92

FLOW DISTRIBUTION FOR SECNO= 112.00 CWSEL= 2857.19

STA= 108. 195.
PER Q= 100.0
AREA= 128.6
VEL= 16.9
DEPTH= 2.0

*SECNO 111.000

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2858.00 ELREA= 2858.00

111.00	4.11	2856.11	2857.44	.00	2860.40	4.29	1.17	.04	2856.00
2169.	0.	2169.	0.	0.	130.	0.	8.	3.	2860.00
.04	.00	16.63	.00	.000	.030	.000	.000	2852.00	160.00
.032717	30.	30.	30.	10	14	0	.00	50.54	210.54

FLOW DISTRIBUTION FOR SECNO= 111.00 CWSEL= 2856.11

STA= 160 235
PER Q= 100.0
AREA= 130.4
VEL= 16.6
DEPTH= 2.6

*SECNO 110.000

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2857.00 ELREA= 2857.00

110.00	4.16	2856.16	2857.24	.00	2859.22	3.06	.81	.37	2856.00
2169	0.	2169.	0.	0.	154.	0.	8.	3.	2860.00
.04	.00	14.05	.00	.000	.030	.000	.000	2852.00	190.00
.022757	30	30.	20.	2	11	0	.00	58.81	248.81

FLOW DISTRIBUTION FOR SECNO= 110.00 CWSEL= 2856.16

STA= 190. 270.
PER Q= 100.0
AREA= 154.4
VEL= 14.0
DEPTH= 2.6

*SECNO 109.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VCL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2856.00 ELREA= 2856.00

109.00	5.96	2855.96	2856.53	.00	2859.28	3.32	.29	.04	2852.00
2169.	0.	2169.	0.	0.	148.	0.	8.	3.	2860.00
.04	.00	14.61	.00	.000	.030	.000	.000	2850.00	238.00
.016555	30.	15.	15.	20	14	0	.00	41.81	279.81

FLOW DISTRIBUTION FOR SECNO= 109.00 CWSEL= 2855.96

STA= 238. 300.
PER Q= 100.0
AREA= 148.4
VEL= 14.6
DEPTH= 3.6

*SECNO 108.000

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2854.00 ELREA= 2854.00

108.00	4.00	2854.00	2854.67	.00	2858.84	4.85	.47	.15	2852.00
2169.	0.	2169.	0.	0.	123.	0.	8.	3.	2860.00
.04	.00	17.67	.00	.000	.030	.000	.000	2850.00	280.00
.036785	30.	20.	15.	20	15	0	.00	47.97	327.97

FLOW DISTRIBUTION FOR SECNO= 108.00 CWSEL= 2854.00

STA= 280. 355.
PER Q= 100.0
AREA= 122.8
VEL= 17.7
DEPTH= 2.6

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 107.000

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2853.60 ELREA= 2853.60

107.00	4.57	2853.57	2853.67	.00	2859.93	6.36	.51	.53	2852.00
2169	0.	2169	0.	0.	107.	0.	8.	3	2850.00
.04	.00	20.24	.00	.000	.030	.000	.000	2849.00	320.00
.030975	30.	15.	15.	20	17	0	.00	30.00	350.00

FLOW DISTRIBUTION FOR SECNO= 107.00 CWSEL= 2853.57

STA= 320. 350.
PER Q= 100.0
AREA= 107.2
VEL= 20.2
DEPTH= 3.6

*SECNO 106.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2853.00 ELREA= 2853.00

106.00	4.13	2852.63	2853.00	.00	2859.27	6.64	.64	.03	2853.00
2169.	0.	2169	0.	0.	105.	0.	8.	3.	2850.00
.04	.00	20.68	.00	.000	.030	.000	.000	2848.50	332.35
.061544	30.	15.	15.	5	7	0	.00	47.65	380.00

FLOW DISTRIBUTION FOR SECNO= 106.00 CWSEL= 2852.63

STA= 332. 380.
PER Q= 100.0
AREA= 104.9
VEL= 20.7
DEPTH= 2.2

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 105.000

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2852.00 ELREA= 2860.00

105.00	2.52	2848.52	2850.64	.00	2356.74	8.22	2.37	.16	2850.00
2169.	0.	2169.	0.	0.	94.	0.	8.	3.	2850.00
.04	.00	23.01	.00	.000	.030	.000	.000	2846.00	391.85
.074778	30.	35.	40.	7	8	0	.00	40.92	432.77

FLOW DISTRIBUTION FOR SECNO= 105.00 CWSEL= 2848.52

STA= 392. 435.
PER Q= 100.0
AREA= 94.3
VEL= 23.0
DEPTH= 2.3

CCHV= .300 CEHV= .500

SPECIAL BRIDGE

SB	XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	1.05	1.56	3.00	.00	34.00	3.00	160.00	.00	2846.00	2845.50

*SECNO 104.000
PRESS FLOW BECAUSE EGLWC OF 2868.91 EXCEEDS 1.5 DEPTH
6180 SUPERCRITICAL FLOW, PRESSURE FLOW
6870 D.S. ENERGY OF 2856.74 IS HIGHER THAN COMPUTED ENERGY OF 2849.88

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3302 WARNING- CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

PRESSURE AND WEIR FLOW

EGPRS	EGLWC	H3	QWEIR	QPR	BAREA	TRAPEZOID AREA	ELLC	ELTRD	WEIRLN
2852.97	2868.91	.00	983.	1201.	160.	153.	2850.93	2851.80	266.

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2851.80 ELREA= 2851.80

SP. BRIDGE ALT. - WEIR FLOW OVER THE LEFT OVERBANK - Qlob = 983 CFS
MAINSTREAM DISCHARGE AFTER WEIR FLOW - Q = 1201 CFS

104.00	3.68	2849.56	.00	.00	2856.74	7.16	.00	.00	2851.80
2169.	0.	2169.	0.	0.	101.	0.	8.	4.	2852.37
.04	.00	21.48	.00	.000	.013	.000	.000	2845.90	488.00
.012064	50.	50.	50.	5	0	6	.00	32.50	522.00

CCHV= 100 CEHV= .300
*SECNO 103.000

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2852.80 ELREA= 2854.40

103.00	2.15	2847.35	2849.29	.00	2855.98	8.64	.61	.15	2852.80
1201	0.	1201.	0.	0.	51.	0.	8.	4.	2853.81
.04	.00	23.59	.00	.000	.030	.000	.000	2845.20	463.00
.151853	28.	28.	28.	16	8	0	.00	31.00	497.00

FLOW DISTRIBUTION FOR SECNO= 103.00 CWSEL= 2847.35

STA= 463. 497.
PER Q= 100.0
AREA= 50.9
VEL= 23.6
DEPTH= 1.8

092

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 102.000

1645 INT SEC ADDED BY RAISING SEC 102.00, .975 FT AND MULTIPLYING BY 1.061

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2851.10 ELREA= 2852.30

1.01	2.58	2847.45	2848.85	.00	2852.59	5.14	2.34	1.05	2846.98
1201.	0.	1201.	0.	0.	66.	0.	8.	4.	2846.98
.04	.00	18.19	.00	.000	.030	.000	.000	2844.88	524.98
.063602	8.	25.	40.	9	17	0	.00	37.12	562.10

FLOW DISTRIBUTION FOR SECNO= 1.01 CWSEL= 2847.45

STA= 525. 562.
PER Q= 100.0
AREA= 66.0
VEL= 18.2
DEPTH= 1.8

1645 INT SEC ADDED BY RAISING SEC 1.01, -.325 FT AND MULTIPLYING BY .981

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2849.40 ELREA= 2850.20

1.02	3.02	2847.57	2848.56	.00	2850.99	3.42	1.08	.52	2846.65
1201.	0.	1201.	0.	0.	81.	0.	8.	4.	2846.65
.04	.00	14.84	.00	.000	.030	.000	.000	2844.55	514.98
.031485	8.	25.	40.	6	14	0	.00	36.41	551.40

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV.	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 1.02 CWSEL= 2847.57

STA= 515. 551.
PER Q= 100.0
AREA= 80.9
VEL= 14.8
DEPTH= 2.2

1645 INT SEC ADDED BY RAISING SEC 1.02, -.325 FT AND MULTIPLYING BY .981

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2847.70 ELREA= 2848.10

1.03	3.47	2847.70	2847.71	.00	2850.16	2.46	.58	.28	2846.33
1201	0.	1201.	0.	0.	95.	0.	8.	4.	2846.33
.04	.00	12.58	.00	.000	.030	.000	.000	2844.23	504.99
.017711	8.	25.	40.	20	17	0	.00	35.71	540.70

FLOW DISTRIBUTION FOR SECNO= 1.03 CWSEL= 2847.70

STA= 505. 541.
PER Q= 100.0
AREA= 95.4
VEL= 12.6
DEPTH= 2.7

1645 INT SEC ADDED BY RAISING SEC 1.03, -.325 FT AND MULTIPLYING BY .980

3265 DIVIDED FLOW

094

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV.	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF

102.00	2.11	2846.01	2846.10	.00	2846.82	.81	.43	.49	2846.00
1201.	752.	449.	0.	146.	46.	0.	9.	4.	2846.00
.05	5.15	9.78	.00	.060	.030	.000	.000	2843.90	304.66
.027701	8.	25.	40.	20	23	0	.00	150.89	530.05

FLOW DISTRIBUTION FOR SECNO= 102.00 CWSEL= 2846.01

STA=	305.	360.	390.	420.	530.
PER Q=	19.2	33.0	10.5	37.4	
AREA=	55.6	60.3	30.3	45.9	
VEL=	4.1	6.6	4.1	9.8	
DEPTH=	1.0	2.0	1.0	1.3	

*SECNO 101.000

1645 INT SEC ADDED BY RAISING SEC 101.00, 11.925 FT AND MULTIPLYING BY .954

3301 HV CHANGED MORE THAN HVINS

1.01	3.34	2843.27	2844.13	.00	2845.89	2.63	.75	.18	2841.93
1201.	17.	1161.	23.	6.	88.	9.	9.	4	2841.93
.05	2.66	13.22	2.67	.060	.030	.060	.000	2839.93	90.55
.019898	10.	43	40.	10	17	0	.00	55.82	146.37

FLOW DISTRIBUTION FOR SECNO= 1.01 CWSEL= 2843.27

STA=	91.	100.	134.	146.
PER Q=	1.4	96.7	1.9	
AREA=	6.5	87.8	8.6	
VEL=	2.7	13.2	2.7	
DEPTH=	.7	2.6	.7	

095

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -3.975 FT AND MULTIPLYING BY 1.016

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.02	2.55	2838.50	2840.12	.00	2844.18	5.68	1.41	.31	2837.95
1201.	3.	1194.	4.	1.	62.	1.	9.	4.	2837.95
05	2.70	19.18	2.71	.060	.030	.060	.000	2835.95	97.78
.067608	10.	43.	40.	8	11	0	.00	43.25	141.03

FLOW DISTRIBUTION FOR SECNO= 1.02 CWSEL= 2838.50

STA=	98.	102.	136.	141.
PER Q=	.2	99.4	.3	
AREA=	1.1	62.3	1.5	
VEL=	2.7	19.2	2.7	
DEPTH=	.3	1.8	.3	

1645 INT SEC ADDED BY RAISING SEC 1.02, -3.975 FT AND MULTIPLYING BY 1.016

3301 HV CHANGED MORE THAN HVINS

1.03	2.42	2834.39	2836.11	.00	2840.88	6.49	3.22	.08	2833.97
1201.	2.	1197.	2.	1.	58.	1.	9.	4.	2833.97
05	2.51	20.48	2.51	.060	.030	.060	.000	2831.97	100.35
.085522	10.	43.	40.	6	14	0	.00	41.55	141.90

FLOW DISTRIBUTION FOR SECNO= 1.03 CWSEL= 2834.39

STA=	100.	103.	138.	142.
PER Q=	.1	99.7	.2	
AREA=	.6	58.5	.8	
VEL=	2.5	20.5	2.5	
DEPTH=	.2	1.7	.2	

096

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.03, -3.975 FT AND MULTIPLYING BY 1.016

101.00	2.37	2830.37	2832.11	.00	2837.09	6.72	3.77	.02	2830.00
1201.	1.	1198.	2.	0.	58.	1.	9.	4.	2830.00
.05	2.38	20.83	2.38	.060	.030	.060	.000	2828.00	102.31
.092277	10.	43.	40.	4	14	0	.00	41.27	143.58

FLOW DISTRIBUTION FOR SECNO= 101.00 CWSEL= 2830.37

STA=	102.	105.	140.	144.
PER Q=	.1	99.8	.1	
AREA=	.5	57.5	.6	
VEL=	2.4	20.8	2.4	
DEPTH=	.2	1.6	.2	

CROSS SECTION 113.00
STREAM SOLDIER TRAIL WASH
DISCHARGE= 2330.

PLOTTED POINTS (BY PRIORITY)-B=BOTTOM BRIDGE,T=TOP BRIDGE,X=GROUND,W=WATER SUR,E=ENERGY GRADIENT,C=CRITICAL WSEL

ELEV 2856.0 2857.0 2858.0 2859.0 2860.0 2861.0 2862.0 2863.0 2864.0 2865.0 2866.0

STA-FEET

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 2   0. .        .        .        .        .        .        .        .        .        .        X        .
     5. .        .        .        .        .        .        .        .        .        X        .        .
 3  10. .        .        .        .        .        .        .        .        X        .        .        .
    15. .        .        .        .        .        .        .        . XE     .        .        .        .
    20. .        .        .        .        .        .        .     X  .  E     .        .        .        .
 4  25. .        .        .        .        .        .        X        .  E     .        .        .        .
    30. .        .        .        .        .        .      X .        .  E     .        .        .        .
    35. .        .        .        .        .        .   X    .        .  E     .        .        .        .
    40. .        .        .        .        .        . X      .        .  E     .        .        .        .
    45. .        .        .        .        .        XC       .        .  E     .        .        .        .
    50. .        .        .        .        .      X .C       .        .  E     .        .        .        .
    55. .        .        .        .        .    X   .C       .        .  E     .        .        .        .
    60. .        .        .        .        .  X     .C       .        .  E     .        .        .        .
 5  65. .        .        .        .        X        .C       .        .  E     .        .        .        .
    70. .        .        .        .      XW.        .C       .        .  E     .        .        .        .
    75. .        .        .        .    X  W.        .C       .        .  E     .        .        .        .
    80. .        .        .        .  X   W.        .C       .        .  E     .        .        .        .
    85. .        .        .        . X    W.        .C       .        .  E     .        .        .        .
    90. .        .        .        X      W.        .C       .        .  E     .        .        .        .
    95. .        .        .      X .      W.        .C       .        .  E     .        .        .        .
   100  .        .        .    X   .      W.        .C       .        .  E     .        .        .        .
   105. .        .        .  X     .      W.        .C       .        .  E     .        .        .        .
   110. .        .        . X      .      W.        .C       .        .  E     .        .        .        .
 6 115. .        .        X        .      W.        .C       .        .  E     .        .        .     BANK.
   120  .        X        .        .      W.        .C       .        .  E     .        .        .        .
 7 125. X        .        .        .      W.        .C       .        .  E     .        .        .        .
   130. X        .        .        .      W.        .C       .        .  E     .        .        .        .
   135. X        .        .        .      W.        .C       .        .  E     .        .        .        .
 8 140. X        .        .        .      W.        .C       .        .  E     .        .        .        .
   145. .     X  .        .        .      W.        .C       .        .  E     .        .        .        .
   150. .        .  X     .        .      W.        .C       .        .  E     .        .        .        .
 9 155. .        .        X        .      W.        .C       .        .  E     .        .        .     BANK.
   160. .        .        .  X     .      W.        .C       .        .  E     .        .        .        .
   165. .        .        .      X .      W.        .C       .        .  E     .        .        .        .
   170. .        .        .        . X    W.        .C       .        .  E     .        .        .        .
   175. .        .        .        .    X W.        .C       .        .  E     .        .        .        .
10 180. .        .        .        .        X        .C       .        .  E     .        .        .        .
   185. .        .        .        .        .    X   .C       .        .  E     .        .        .        .
   190. .        .        .        .        .        XC       .        .  E     .        .        .        .
   195. .        .        .        .        .        .   X    .        .  E     .        .        .        .
11 200. .        .        .        .        .        .        X        .  E     .        .        .        .
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NRD= 0 ELLC= 9999999.00 ELTRD= 9999999.00

EL(I),STA(I)

2866.00	.00	2864.00	10.00	2862.00	25.00	2860.00	65.00	2858.00	115.00
2856.00	125.00	2856.00	140.00	2858.00	155.00	2860.00	180.00	2862.00	200.00

098

THIS RUN EXECUTED 6/ 2/92 8:20:31

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HEC2 RELEASE DATED SEPT 88

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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SOLDIER TRAIL WASH

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	129.000	.00	.00	.00	2940.00	2330.00	2946.00	2946.04	2947.87	91.78	10.97	212.40	243.21
	128.000	200.00	.00	.00	2930.00	2330.00	2933.50	2935.17	2939.04	511.99	18.89	123.32	102.97
	127.000	140.00	.00	.00	2925.00	2330.00	2928.36	2929.69	2932.65	400.27	16.62	140.19	116.46
	126.000	125.00	.00	.00	2920.00	2330.00	2923.57	2924.90	2927.70	384.02	16.32	142.77	118.90
	125.000	300.00	.00	.00	2910.00	2330.00	2913.01	2914.10	2916.43	362.90	14.83	157.10	122.31
	124.000	70.00	.00	.00	2906.00	2330.00	2910.27	2911.00	2913.12	776.10	13.54	172.12	83.64
	123.000	100.00	.00	.00	2900.00	2330.00	2904.27	2905.29	2907.50	260.33	14.43	161.50	144.41
	122.000	200.00	.00	.00	2890.00	2330.00	2895.69	2897.51	2901.39	289.06	19.16	121.61	137.05
	121.000	80.00	.00	.00	2887.00	2330.00	2890.61	2892.64	2898.00	536.48	21.82	106.81	100.60
	120.000	80.00	.00	.00	2883.50	2330.00	2887.18	2888.99	2893.24	504.06	19.74	118.03	103.78
	119.000	175.00	.00	.00	2880.00	2330.00	2885.79	2886.32	2888.29	131.73	12.70	183.42	203.01
	118.000	80.00	.00	.00	2878.00	2330.00	2884.27	2884.54	2887.44	88.44	14.29	163.01	247.76
	117.000	175.00	.00	.00	2872.00	2330.00	2877.02	2878.58	2881.98	375.02	17.87	130.35	120.32
*	116.000	160.00	.00	.00	2868.00	2330.00	2873.99	2874.14	2878.64	133.22	17.30	134.67	201.87
	115.000	175.00	.00	.00	2862.00	2330.00	2865.31	2866.45	2868.97	432.21	15.34	151.87	112.07
	114.000	140.00	.00	.00	2858.00	2330.00	2861.56	2862.71	2865.01	235.56	15.32	183.83	151.81
	113.000	70.00	.00	.00	2856.00	2330.00	2859.92	2861.07	2863.44	211.85	15.87	200.53	160.08

099

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	112.000	50.00	.00	.00	2854.00	2169.00	2857.19	2858.70	2861.61	474.71	16.86	128.62	99.55
	111.000	30.00	.00	.00	2852.00	2169.00	2856.11	2857.44	2860.40	327.17	16.63	130.45	119.92
	110.000	30.00	.00	.00	2852.00	2169.00	2856.16	2857.24	2859.22	227.57	14.05	154.41	143.78
*	109.000	15.00	.00	.00	2850.00	2169.00	2855.96	2856.53	2859.28	165.55	14.61	148.44	168.57
*	108.000	20.00	.00	.00	2850.00	2169.00	2854.00	2854.67	2858.84	367.85	17.67	122.78	113.09
*	107.000	15.00	.00	.00	2849.00	2169.00	2853.57	2853.67	2859.93	309.75	20.24	107.17	123.24
*	106.000	15.00	.00	.00	2848.50	2169.00	2852.63	2853.00	2859.27	615.44	20.68	104.89	87.43
	105.000	35.00	.00	.00	2846.00	2169.00	2848.52	2850.64	2856.74	747.78	23.01	94.25	79.32
*	104.000	50.00	2851.80	2850.93	2845.90	2169.00	2849.58	.00	2856.74	120.64	21.48	100.98	197.48
*	103.000	28.00	.00	.00	2845.20	1201.00	2847.35	2849.29	2855.98	1518.53	23.59	50.92	30.82
	102.000	100.00	.00	.00	2843.90	1201.00	2846.01	2846.10	2846.82	277.01	9.78	192.08	72.16
	101.000	170.00	.00	.00	2828.00	1201.00	2830.37	2832.11	2837.09	922.77	20.83	58.66	39.54

SOLDIER TRAIL WASH

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	129.000	2330.00	2946.00	.00	.00	.00	58.80	.00
	128.000	2330.00	2933.50	.00	-2.54	.00	55.33	200.00
	127.000	2330.00	2928.36	.00	-1.75	.00	63.60	140.00
	126.000	2330.00	2923.57	.00	-4.79	.00	64.98	125.00
	125.000	2330.00	2913.01	.00	-5.24	.00	79.25	300.00
	124.000	2330.00	2910.27	.00	-1.22	.00	176.25	70.00
	123.000	2330.00	2904.27	.00	-.36	.00	65.57	100.00
	122.000	2330.00	2895.69	.00	-1.77	.00	32.75	200.00
	121.000	2330.00	2890.61	.00	-1.00	.00	40.00	80.00
	120.000	2330.00	2887.18	.00	-1.15	.00	49.03	80.00
	119.000	2330.00	2885.79	.00	-.60	.00	53.40	175.00
	118.000	2330.00	2884.27	.00	-.62	.00	30.00	80.00
	117.000	2330.00	2877.02	.00	-1.61	.00	50.07	175.00
*	116.000	2330.00	2873.99	.00	-3.03	.00	25.00	160.00
	115.000	2330.00	2865.31	.00	-1.61	.00	82.46	175.00
	114.000	2330.00	2861.56	.00	-1.91	.00	101.11	140.00
	113.000	2330.00	2859.92	.00	-1.65	.00	111.87	70.00
	112.000	2169.00	2857.19	.00	-.95	.00	65.45	50.00
	111.000	2169.00	2856.11	.00	-1.09	.00	50.54	30.00
	110.000	2169.00	2856.16	.00	.05	.00	58.81	30.00
*	109.000	2169.00	2855.96	.00	-.19	.00	41.81	15.00
*	108.000	2169.00	2854.00	.00	-1.97	.00	47.97	20.00
*	107.000	2169.00	2853.57	.00	-.42	.00	30.00	15.00
*	106.000	2169.00	2852.63	.00	-.94	.00	47.65	15.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	105.000	2169.00	2848.52	.00	-4.11	.00	40.92	35.00
*	104.000	2169.00	2849.58	.00	1.06	.00	32.50	50.00
*	103.000	1201.00	2847.35	.00	-2.23	.00	31.00	28.00
	102.000	1201.00	2846.01	.00	-1.69	.00	150.89	100.00
	101.000	1201.00	2830.37	.00	-4.02	.00	41.27	170.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=   116.000  PROFILE=  1  WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO=   116.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   109.000  PROFILE=  1  WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO=   109.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   108.000  PROFILE=  1  WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO=   108.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=   107.000  PROFILE=  1  WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO=   107.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=   106.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=   104.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=   103.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

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*****************************************************
*  WATER SURFACE PROFILES                           *
   VERSION OF SEPTEMBER 1988                        *
   ERROR: 01                                        *
*  UPDATED: 16 FEBRUARY 1989                        *
*  RUN DATE      6/22/92   TIME   13: 1:16          *
*************************************************  ***********************************
```

```
X   X XXXXXX  XXXX         XXXX
X   X X     X   X        X   X
X   X X     X               X
XXXXXX XXX   X      XXXX  XXXX
X   X X     X            X
X   X X     X   X        X
X   X XXXXXX  XXXX        XXXXXX
```

END OF BANNER

THIS RUN EXECUTED 6/22/92 13: 1:16

****
HEC2 RELEASE DATED SEPT 88

****

T1 PIMA COUNTY DEPARTMENT OF TRASPORTATION 1& FLOOD CONTROL DISTRICT
T2 FLOODPLAIN MANAGEMENT SECTION - TUCSON, ARIZONA 85710 - 1207
T3 SOLDIER TRAIL WASH WEST BR. - 100-YR. DISCHARGE - FILE: SNY100YR

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	0	0	1	0	0	0.5	2415	2772	0

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	-1	0	0	0	0	0	-1	0	0	0

NC	0.06	0.06	0.03	0.1	0.3					
	99	13	210	255	130	120	130			
	2790	0	2788	80	2788	130	2786	150	2784	170
GR	2782	210	2780	220	2780	240	2782	255	2782	275
GR	2784	285	2786	290	2788	320				
X1	98	10	85	125	120	120	120			
GR	2784	0	2782	60	2780	80	2778	85	2776	95
GR	2776	110	2778	125	2780	130	2782	150	2784	170
X1	97	10	130	175	120	110	120			
GR	2780	0	2780	100	2778	125	2776	130	2774	150
GR	2774	160	2776	175	2778	185	2780	200	2782	260
X1	96	12	160	205	50	50	50			
X3	10							2776		
GR	2776	0	2776.7	40	2776	80	2776	100	2775.2	140
GR	2776	155	2774	160	2772	170	2772	190	2774	205
GR	2776	220	2778	230						
X1	95	12	160	190	110	110	110			
X3	10							2777		
GR	2774	0	2774	50	2776	115	2777	135	2776	150
GR	2774	155	2772	160	2770	165	2770	180	2772	190
GR	2774	205	2776	220						
	94	10	60	115	120	110	120			
	2775	0	2774	50	2772	60	2770	65	2769	70
GR	2769	80	2770	90	2772	115	2774	160	2777	240

```
X1      93       9      90     140      60      90      90
GR    2774       0    2772      60    2770      90    2769     110    2770     140
GR    2771     170    2770     210    2772     225    2774     265

X1      92      16      40     220     110      70     100
X3      10                                                   2769
GR    2772       0    2770      20    2768      40    2766      50    2766      65
GR    2768      70    2769     110    2768     155    2767     160    2768     180
GR  2768.1     190    2768     200    2766     205    2766     210    2768     220
GR    2770     280

X1      91      19     330     375      55      75      65
GR    2770       0    2768      70    2766      80  2764.1     110    2766     120
GR    2768     135  2768.2     155    2768     180  2768.2     230    2768     260
GR    2766     265    2766     275  2766.4     300    2766     330    2764     360
GR    2764     365    2766     375    2768     390    2770     395

X1      90      15     155     170      75      90      80
X3      10                                                  2766.1
GR    2768       0    2766      40    2764      50    2764      55    2766      65
GR  2766.1      85    2766     100    2764     150    2762     155    2760     160
GR    2760     165    2762     170    2764     172    2766     180    2768     200

      89       16      40     135      60      45      55
...   10                                                   2763
GR    2766       0    2766      20    2764      35    2762      40    2760      45
GR    2760      55    2762      65    2763      80    2762      95    2760     105
GR    2758     107    2758     120    2760     122    2762     135    2764     185
GR    2766     210

X1      88      10      50     105     120     140     125
GR    2764       0    2764      25    2762      40    2760      50    2758      52
GR    2758      60    2760     105    2762     140    2764     175    2766     185

X1      87       6     145     190      65      70      70
X2                                                                                15
GR  2760.9       0  2760.6     135  2759.6     145  2756.4     170  2759.8     190
GR  2760.7     280

NC     .02     .02     .02
        CENTERLINE OF SNYDER ROAD - U.S LIMITS BELLA VISTA SUBDIVISION
X1      86       5      85     337     160     145     150
X2                                                                                15
GR  2758.3       0  2758.31      85  2756.15     205  2756.73     337  2757.69     430

NC     .06     .06     .03      .1      .3
X1      85       7      75     130     560     480     500
X2                                                                                15
    2757.7       0  2755.6      75  2752.6      92  2749.3     105  2749.4     120
    2753.0     130  2753.2     215
```

X1	84	7	92	118	230	275	250			
GR	2746.7	0	2747.5	45	2747.0	92	2742.8	105	2742.9	118
GR	2744.6	225	2748.1	315						

CONFLUENCE WESTERLY SUBAREA - CONCENTRATION PT. #4 - Q100 = 305 CFS

X1	83	7	145	214	220	260	240			
X2	2720									15
GR	2742.7	0	2740.5	94	2739.4	145	2735.9	155	2736.2	165
GR	2737.0	214	2741.68	260						
NC	.06	.02	.03							
X1	82	8	168	215	170	190	180			
GR	2737.9	0	2737.5	80	2736.3	168	2730.5	195	2730.5	210
GR	2730.6	215	2734.23	220	2734.29	247				
X1	81	8	230	260	180	210	210			
GR	2741.4	0	2733.6	150	2729.5	230	2727.6	240	2728.1	250
GR	2734.4	260	2734.61	272	2734.46	300				
NC	.06	.06	.03							
X1	80	7	140	185	135	130	135			
GR	2733.8	0	2730.6	100	2730.1	140	2724.4	175	2724.8	185
GR	2734.3	215	2736.2	250						
X1	79	6	100	205	190	210	200			
GR	2729.8	0	2728.9	55	2728.0	100	2723.6	125	2723.4	150
GR	2732.0	205								
X1	78	9	135	265	130	130	130			
GR	2731.5	0	2727.0	75	2725.0	135	2723.5	180	2721.0	195
GR	2721.3	220	2724.4	240	2726.6	265	2729.6	290		
X1	77	8	110	150	250	285	270			
GR	2727	0	2725.2	50	2721.2	110	2718.3	120	2718.6	130
GR	2720.6	150	2722.6	185	2725.0	235				
X1	76	9	25	80	305	280	310			
GR	2722.6	0	2721.4	2	2719.4	25	2715.9	45	2715.8	65
GR	2717.8	80	2718.2	110	2718.9	180	2721.9	230		
X1	75	7	115	170	310	290	290			
GR	2717.6	0	2714.6	50	2713.3	115	2711.1	140	2711.0	160
GR	2717.0	170	2719.0	205						

DOWNSTREAM STUDY LIMITS - SUMMER TRAIL @ BELLA VISTA SUBDIVISION

X1	74	10	15	130	190	180	170			
GR	2714.9	0	2711.9	15	2710.8	70	2708.4	85	2708.9	100
GR	2709.4	125	2711.1	130	2710.7	150	2712.6	225	2715.6	275

X1	73	6	25	46	100	100	100			
GR	2720	0	2720	13	2710	25	2710	46	2712	56
GR	2714	68								
X1	72	9	40	85						
GR	2720	0	2710	20	2708	30	2706	40	2704	50
GR	2704	70	2706	85	2708	200	2710	215		

```
  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
  TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=     .100 CEHV=     .300
*SECNO 99.000
3720 CRITICAL DEPTH ASSUMED
   99.00     4.68  2784.68  2784.68  2772.00  2786.11     1.43      .00      .00  2782.00
   2415.     198.    1955.     262.     70.     186.     71.       0.       0.   2782.00
      00     2.84    10.53     3.68    .060     .030    .060     .000  2780.00   163.17
 .006886      0.       0.       0.       0       14       0      .00   123.54   286.71


*SECNO 98.000

1645 INT SEC ADDED BY RAISING SEC     98.00,   3.000 FT AND MULTIPLYING BY   1.108

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    1.01     5.22  2784.22  2784.22      .00  2786.13     1.91      .22      .08  2781.00
   2415.      54.    2308.      54.     21.     204.     21.       0.       0.   2781.00
     .00     2.61    11.33     2.61    060     .030    .060     .000  2779.00    75.11
 .006900      33.      33.      30.     20        8       0      .00    82.49   157.61


1645 INT SEC ADDED BY RAISING SEC      1.01,  -1.000 FT AND MULTIPLYING BY    .967


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE*

    1.02     4.34  2782.34  2783.34      .00  2785.67     3.32      .32      .14  2780.00
   2415.      27.    2361.      27.      8.     160.      8.       0.       0.   2780.00
     .00     3.39    14.78     3.39    .060     .030    .060     .000  2778.00    82.01
 .015566      33.      33.      30.       6        5       0      .00    61.12   143.13
```

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IOC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.000 FT AND MULTIPLYING BY .966

3301 HV CHANGED MORE THAN HVINS

1.03	4.23	2781.23	2782.43	.00	2785.06	3.83	.55	.05	2779.00
2415.	24.	2367.	24.	7.	149.	7.	0.	0.	2779.00
.00	3.59	15.85	3.59	.060	.030	.060	.000	2777.00	80.52
.018728	33.	33.	30.	3	11	0	.00	56.54	137.06

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.000 FT AND MULTIPLYING BY .965

98.00	4.19	2780.19	2781.52	.00	2784.39	4.19	.64	.04	2778.00
2415.	23.	2369.	23.	6.	143.	6.	1.	0.	2778.00
.00	3.73	16.58	3.73	.060	.030	.060	.000	2776.00	78.03
.020752	33.	33.	30.	2	11	0	.00	53.93	131.97

*SECNO 97.000

1645 INT SEC ADDED BY RAISING SEC 97.00, 1.000 FT AND MULTIPLYING BY .965

1.01	4.15	2779.15	2780.38	.00	2783.05	3.90	1.25	.09	2777.00
2415.	21.	2351.	43.	6.	147.	11.	1.	0.	2777.00
.00	3.66	16.05	3.85	.060	.030	.060	.000	2775.00	118.75
.020880	60.	60.	60.	2	11	0	.00	60.83	179.58

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.000 FT AND MULTIPLYING BY 1.037

97.00	4.17	2778.17	2779.27	.00	2781.76	3.59	1.20	.09	2776.00
2415.	21.	2350.	44.	6.	153.	12.	1.	0.	2776.00
.00	3.53	15.40	3.72	.060	.030	.060	.000	2774.00	122.90
.019117	60.	60.	60.	2	11	0	.00	63.36	186.26

*SECNO 96.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2776.00 ELREA= 2774.00

96.00	4.00	2776.00	2777.16	.00	2779.55	3.55	2.25	.03	2774.00
2415.	0.	2365.	50.	0.	155.	15.	2.	1.	2774.00
.01	.00	15.26	3.34	.000	.030	.060	.000	2772.00	160.00
.018444	120.	120.	110.	20	11	0	.00	59.99	219.99

*SECNO 95.000
3280 CROSS SECTION 95.00 EXTENDED 1.32 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2777.00 ELREA= 2772.00

95.00	5.32	2775.32	2776.22	.00	2778.77	3.45	.74	.03	2772.00
2415.	0.	2235.	180.	0.	145.	41.	2.	1.	2772.00
.01	.00	15.44	4.35	.000	.030	.060	.000	2770.00	160.00
.012236	50.	50.	50.	10	14	0	.00	54.93	214.93

*SECNO 94.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

94.00	3.96	2772.96	2774.27	.00	2776.81	3.84	1.93	.04	2772.00
2415.	6.	2383.	26.	2.	150.	10.	2.	1.	2772.00
.01	2.47	15.84	2.50	.060	.030	.060	.000	2769.00	55.18
.027106	110.	110.	110.	6	5	0	.00	81.49	136.68

*SECNO 93.000

1645 INT SEC ADDED BY RAISING SEC 93.00, .000 FT AND MULTIPLYING BY .968

1.01	2.59	2771.59	2772.73	.00	2775.70	4.11	1.08	.03	2770.00
2415.	87.	1849.	479.	18.	101.	83.	2.	1.	2770.00
.01	4.80	18.32	5.80	.060	.030	.060	.000	2769.00	64.16
.051486	30.	30.	28.	7	11	0	.00	150.72	214.88

111

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, .000 FT AND MULTIPLYING BY 1.011

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.02	3.08	2772.08	2772.71	.00	2774.17	2.10	.92	.60	2770.00
2415.	120.	1707.	588.	32.	126.	124.	2.	1.	2770.00
.01	3.77	13.50	4.73	.060	.030	.060	.000	2769.00	56.32
.021002	30.	30.	28.	6	14	0	.00	165.56	221.88

1645 INT SEC ADDED BY RAISING SEC 1.02, .000 FT AND MULTIPLYING BY 1.011

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1.03	3.70	2772.70	2772.70	.00	2773.76	1.06	.37	.26	2770.00
2415.	172.	1569.	674.	58.	158.	182.	3.	1.	2770.00
.01	2.98	9.92	3.71	.060	.030	.060	.000	2769.00	38.72
.008536	30.	30.	28.	20	11	0	.00	197.68	236.40

1645 INT SEC ADDED BY RAISING SEC 1.03, .000 FT AND MULTIPLYING BY 1.011

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

93.00	3.68	2772.68	2772.68	.00	2773.74	1.05	.25	.05	2770.00
2415.	171.	1571.	673.	57.	159.	183.	3.	1.	2770.00
.01	2.97	9.87	3.68	.060	.030	.060	.000	2769.00	39.52
.008498	30.	30.	28.	20	5	0	.00	199.13	238.65

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 92.000

1645 INT SEC ADDED BY RAISING SEC 92.00, 2.250 FT AND MULTIPLYING BY .623

1.01	3.96	2772.21	2772.42	.00	2773.49	1.27	.23	.02	2770.25
2415.	33.	2282.	100.	12.	246.	36.	3.	1.	2770.25
.01	2.74	9.29	2.76	.060	.030	.060	.000	2768.25	12.65
.012689	15.	23.	23.	4	8	0	.00	161.39	174.04

1645 INT SEC ADDED BY RAISING SEC 1.01, -.750 FT AND MULTIPLYING BY 1.201

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.02	3.21	2770.71	2771.37	.00	2772.93	2.22	.46	.09	2769.50
2415.	19.	2339.	57.	6.	193.	17.	3.	1.	2769.50
.01	3.44	12.14	3.45	.060	.030	.060	.000	2767.50	20.88
.037957	15.	23.	23.	8	5	0	.00	171.14	192.02

1645 INT SEC ADDED BY RAISING SEC 1.02, -.750 FT AND MULTIPLYING BY 1.168

1.03	3.02	2769.77	2770.44	.00	2772.00	2.23	.93	.00	2768.75
2415.	15.	2354.	46.	5.	194.	14.	3.	1.	2768.75
.02	3.36	12.12	3.37	.060	.030	.060	.000	2766.75	26.08
.045764	15.	23.	23.	7	8	0	.00	193.00	219.09

1645 INT SEC ADDED BY RAISING SEC 1.03, -.750 FT AND MULTIPLYING BY 1.144

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2769.00 ELREA= 2768.00

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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST

    92.00      2.94  2768.94   2769.51       .00  2770.94      2.00       .99       .07   2768.00
    2415.        0.     2375.       40.        0.     207.       13.        3.        2.   2768.00
      .02       .00     11.45      3.09      .000     .030      .060      .000   2766.00     40.00
   .042840       15.       23.       23.         4       11         0       .00    202.48    248.04

*SECNO 91.000

1645 INT SEC ADDED BY RAISING SEC     91.00,   1.000 FT AND MULTIPLYING BY   1.626

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

     1.01      2.80  2767.80   2768.21       .00  2769.24      1.43      1.53        17   2767.00
    2415.       811.     1596.        8.      188.     140.        4.        4.        2.   2767.00
      .02      4.31     11.41      2.01      .060     .030      .060      .000   2765.00    123.60
   .022451       55.       50.       35.         4        8         0       .00    273.20    619.60

1645 INT SEC ADDED BY RAISING SEC      1.01,  -1.000 FT AND MULTIPLYING BY    .615

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    91.00      3.87  2767.87   2767.87       .00  2768.91      1.04       .75       .41   2766.00
    2415.     1009.     1375.       31.      249.     134.       13.        4.        2.   2766.00
      .02      4.05     10.25      2.36      .060     .030      .060      .000   2764.00     70.66
   .010064       55.       50.       35.        20       11         0       .00    192.05    389.02

*SECNO 90.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    90.00      7.83  2767.83   2767.83       .00  2769.00      1.18       .39       .37   2762.00
    2415.     1024.     1257.      133.      337.     107.       49.        5.        2.   2762.00
      .02      3.04     11.71      2.72      .060     .030      .060      .000   2760.00      3.49
   .004329       55.       65.       75.        20       14         0       .00    194.77    198.26
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 89.000

1645 INT SEC ADDED BY RAISING SEC 89.00, 1.500 FT AND MULTIPLYING BY .573

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2765.33 ELREA= 2762.00

1.01	5.74	2765.24	2766.24	.00	2768.61	3.37	.17	.22	2763.50
2415.	0.	2338.	77.	0.	156.	22.	5.	2.	2763.50
.02	.00	14.96	3.54	.000	.030	.060	.000	2759.50	22.92
.024569	19.	20.	23.	7	15	0	.00	79.44	102.36

1645 INT SEC ADDED BY RAISING SEC 1.01, -.500 FT AND MULTIPLYING BY 1.248

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2764.55 ELREA= 2762.00

1.02	5.07	2764.07	2765.27	.00	2767.95	3.88	.61	.05	2763.00
2415.	0.	2382.	33.	0.	150.	10.	5.	3.	2763.00
.02	.00	15.91	3.21	.000	.030	.060	.000	2759.00	28.62
.038422	19.	20.	23.	7	8	0	.00	87.22	115.84

1645 INT SEC ADDED BY RAISING SEC 1.02, -.500 FT AND MULTIPLYING BY 1.199

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2763.78 ELREA= 2762.00

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
1.03	4.70	2763.20	2764.40	.00	2767.14	3.94	.81	.01	2762.50
2415.	0.	2401.	14.	0.	150.	5.	5.	3.	2762.50
.02	.00	15.96	2.55	.000	.030	.060	.000	2758.50	34.31
.042460	19.	20.	23.	8	11	0	.00	89.06	130.93

1645 INT SEC ADDED BY RAISING SEC 1.03, -.500 FT AND MULTIPLYING BY 1.166

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2763.00 ELREA= 2762.00

89.00	4.44	2762.44	2763.55	.00	2766.25	3.81	.85	.04	2762.00
2415.	0.	2410.	5.	0.	154.	2.	5.	3.	2762.00
.02	.00	15.69	1.87	.000	.030	.060	.000	2758.00	40.00
.042627	19.	20.	23.	5	11	0	.00	89.30	146.05

*SECNO 88.000

1645 INT SEC ADDED BY RAISING SEC 88.00, .000 FT AND MULTIPLYING BY .853

1.01	3.91	2761.91	2763.11	.00	2765.66	3.75	.57	.02	2760.00
2415.	28.	2286.	101.	8.	143.	27.	5.	3.	2760.00
.02	3.66	15.95	3.72	.060	.030	.060	.000	2758.00	34.53
.024042	20.	18.	15.	9	8	0	.00	83.58	118.10

1645 INT SEC ADDED BY RAISING SEC 1.01, .000 FT AND MULTIPLYING BY 1.086

3301 HV CHANGED MORE THAN HVINS

1.02	3.91	2761.91	2762.90	.00	2765.08	3.18	.40	.17	2760.00
2415.	28.	2286.	101.	8.	156.	30.	5.	3.	2760.00
.02	3.37	14.68	3.42	.060	.030	.060	.000	2758.00	37.49
.020296	20.	18.	15.	0	11	0	.00	90.78	128.26

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SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


1645 INT SEC ADDED BY RAISING SEC      1.02,    .000 FT AND MULTIPLYING BY   1.079


3301 HV CHANGED MORE THAN HVINS

   88.00     3.95  2761.95  2762.72      .00  2764.59     2.64      .33      .16  2760.00
   2415.      29.    2281.     104.      10.     170.      33.       5.       3.  2760.00
     .02     3.09    13.40     3.13     .060     .030     .060     .000  2758.00    40.25
 .016577      20.      18.      15.        2       11        0      .00    98.86   139.12


*SECNO 87.000

1645 INT SEC ADDED BY RAISING SEC     87.00,   1.200 FT AND MULTIPLYING BY   1.482

3280 CROSS SECTION      1.01 EXTENDED       .24 FEET


3301 HV CHANGED MORE THAN HVINS

    1.01     4.54  2762.14  2762.67      .00  2763.87     1.73      .45      .27  2760.80
   2415.      64.    2153.     197.      50.     193.      92.       6.       3.  2761.00
     .02     1.29    11.16     2.15     .060     .030     .060     .000  2757.60      .00
 .012390      30.      31.      35.        6       11        0      .00   414.89   414.89


FLOW DISTRIBUTION FOR SECNO=      1.01          CWSEL=   2762.14

STA=       0.     200.     215.     282.     415.
  PER Q=     1.4      1.3     89.2      8.2
   AREA=    37.7     12.4    193.0     91.8
    VEL=      .9      2.4     11.2      2.1
  DEPTH=      .2       .8      2.9       .7


1645 INT SEC ADDED BY RAISING SEC      1.01,   -.400 FT AND MULTIPLYING BY    .892

3280 CROSS SECTION      1.02 EXTENDED       .52 FEET

    1.02     4.82  2762.02  2762.40      .00  2763.43     1.41      .34      .10  2760.40
   2415.     162.    1979.     274.      99.     189.     115.       6.       3.  2760.60
     .03     1.64    10.48     2.38     .060     .030     .060     .000  2757.20      .00
 .009672      30.      31.      35.        5       11        0      .00   369.93   369.93
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 1.02 CWSEL= 2762.02

STA=	0.	178.	192.	251.	370.
PER Q=	5.1	1.6	81.9	11.4	
AREA=	83.8	14.8	188.8	115.3	
VEL=	1.5	2.6	10.5	2.4	
DEPTH=	.5	1.1	3.2	1.0	

1645 INT SEC ADDED BY RAISING SEC 1.02, -.400 FT AND MULTIPLYING BY .878

3280 CROSS SECTION 1.03 EXTENDED .83 FEET

1.03	5.12	2761.92	2762.20	.00	2763.08	1.16	.27	.07	2760.00
2415	270.	1805.	340.	139.	182.	134.	6	3.	2760.20
.03	1.94	9.91	2.54	.060	.030	.060	.000	2756.80	.00
.007561	30.	31.	35.	5	8	0	.00	324.96	324.96

FLOW DISTRIBUTION FOR SECNO= 1.03 CWSEL= 2761.92

STA=	0.	157.	168.	221.	325.
PER Q=	9.3	1.9	74.7	14.1	
AREA=	122.3	16.6	182.1	133.8	
VEL=	1.8	2.7	9.9	2.5	
DEPTH=	.8	1.4	3.5	1.3	

1645 INT SEC ADDED BY RAISING SEC 1.03, -.400 FT AND MULTIPLYING BY .862

3280 CROSS SECTION 87.00 EXTENDED 1.26 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

87.00	5.56	2761.96	2761.96	.00	2762.86	.90	.21	.08	2759.60
2415.	395.	1615.	405.	182.	176.	154.	7.	4.	2759.80
.03	2.17	9.17	2.63	.060	.030	.060	.000	2756.40	.00
.005633	30.	31.	35.	20	8	0	.00	280.00	280.00

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 87.00 CWSEL= 2761.96

STA=	0.	135.	145.	190.	280.
PER Q=	14.2	2.2	66.9	16.8	
AREA=	163.2	18.6	176.2	153.9	
VEL=	2.1	2.8	9.2	2.6	
DEPTH=	1.2	1.9	3.9	1.7	

*SECNO 86.000

1645 INT SEC ADDED BY RAISING SEC 86.00, .188 FT AND MULTIPLYING BY .668

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.01	1.34	2757.68	2758.67	.00	2762.26	4.58	.23	.37	2758.50
2415.	0.	2230.	185.	0.	126.	19.	7.	4.	2756.92
.03	.00	17.65	9.85	.000	.020	.020	.000	2756.34	87.19
.063595	16.	18.	18.	12	18	0	.00	187.45	274.64

FLOW DISTRIBUTION FOR SECNO= 1.01 CWSEL= 2757.68

STA=	87.	225.	275.
PER Q=	92.3	7.7	
AREA=	126.3	18.8	
VEL=	17.7	9.8	
DEPTH=	.9	.4	

1645 INT SEC ADDED BY RAISING SEC 1.01, -.063 FT AND MULTIPLYING BY 1.165

3301 HV CHANGED MORE THAN HVINS

1.02	1.34	2757.62	2758.43	.00	2760.95	3.33	.94	.38	2758.44
2415.	0.	2228.	187.	0.	148.	22.	7.	4.	2756.86
.03	.00	15.04	8.41	.000	.020	.020	.000	2756.28	101.35
.045862	16.	18.	18.	2	14	0	.00	219.13	320.48

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 1.02 CWSEL= 2757.62

STA=	101.	263.	320.
PER Q=	92.3	7.7	
AREA=	148.1	22.3	
VEL=	15.0	8.4	
DEPTH=	.9	.4	

1645 INT SEC ADDED BY RAISING SEC 1.02, -.063 FT AND MULTIPLYING BY 1.142

3301 HV CHANGED MORE THAN HVINS

1.03	1.37	2757.58	2758.23	.00	2760.00	2.42	.67	.27	2758.37
2415.	0.	2221.	194.	0.	173.	27.	7.	4.	2756.79
.03	.00	12.85	7.23	000	020	020	000	2756.21	114.72
.032721	16.	18.	18.	3	14	0	.00	253.00	367.71

FLOW DISTRIBUTION FOR SECNO= 1.03 CWSEL= 2757.58

STA=	115.	300.	368.
PER Q=	92.0	8.0	
AREA=	172.9	26.8	
VEL=	12.8	7.2	
DEPTH=	.9	.4	

1645 INT SEC ADDED BY RAISING SEC 1.03, -.063 FT AND MULTIPLYING BY 1.124

3301 HV CHANGED MORE THAN HVINS

CENTERLINE OF SNYDER ROAD - U.S LIMITS BELLA VISTA SUBDIVISION

86.00	1.40	2757.55	2758.08	.00	2759.33	1.78	.48	.19	2758.31
2415.	0.	2212.	203.	0.	201.	32.	7.	4.	2756.73
.03	.00	11.03	6.26	.000	.020	.020	.000	2756.15	127.34
.023396	16.	18.	18.	3	11	0	.00	288.89	416.23

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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


FLOW DISTRIBUTION FOR SECNO=     86.00          CWSEL=   2757.55

STA=     127.      337.      416.
  PER Q=     91.6       8.4
   AREA=    200.5      32.4
    VEL=     11.0       6.3
  DEPTH=      1.0        .4

CCHV=      .100 CEHV=      .300
*SECNO 85.000
3280 CROSS SECTION     85.00 EXTENDED      1.14 FEET

    85.00      5.04  2754.34  2754.99       .00  2756.59      2.25      2.69       .05  2755.60
    2415.        0.     2059.      356.       0.      159.      105.        8.        5.  2753.00
      .03       .00     12.97      3.38     .000      .030      .060      .000  2749.30    82.16
  .014309      160.      150.      145.       13        23         0       .00   132.84   215.00


FLOW DISTRIBUTION FOR SECNO=     85.00          CWSEL=   2754.34

STA=      82.      130.      215.
  PER Q=     85.3      14.7
   AREA=    158.8     105.2
    VEL=     13.0       3.4
  DEPTH=      3.3       1.2

*SECNO 84.000

1645 INT SEC ADDED BY RAISING SEC     84.00,   3.250 FT AND MULTIPLYING BY   1.777


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

     1.01      2.10  2748.15  2748.80       .00  2750.34      2.19      6.23       .02  2750.25
    2415.        0.      999.     1416.       0.       60.      221.        9.        6.  2746.15
      .04       .00     16.79      6.41     .000      .030      .060      .000  2746.05   175.00
  .056280      280.      250.      240.        7        11         0       .00   238.51   413.51
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


1645 INT SEC ADDED BY RAISING SEC      1.01,  -3.250 FT AND MULTIPLYING BY     .563


3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    84.00      3.48  2746.28  2746.28       .00  2747.27       .99      6.59      3.67  2747.00
    2415.        0.      747.     1668.       0.      63.      307.       11.       7.   2742.90
      .05       .00     11.80      5.43     .000     .030      .060      .000  2742.80     94.23
  .015834      280.      250.      240.       20       14         0       .00   173.98    268.21


*SECNO 83.000

1645 INT SEC ADDED BY RAISING SEC     83.00,   5.175 FT AND MULTIPLYING BY     .504

3280 CROSS SECTION      1.01 EXTENDED       .28 FEET


3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     1.01      6.06  2747.14  2747.14       .00  2748.83      1.69       .58       .49  2744.57
    2491.      193.     2083.      216.      75.     184.       61.       12.       7.   2742.18
      .05      2.57     11.31      3.54     .060     .030      .060      .000  2741.07     15.84
  .005897       58.       63.       69.       20       14         0       .00   115.26    131.11


FLOW DISTRIBUTION FOR SECNO=      1.01          CWSEL=   2747.14

STA=       16.       47.       73.      108.      131.
  PER Q=     1.4       6.3      83.6       8.7
   AREA=    23.1      51.8     184.1      60.9
    VEL=     1.5       3.0      11.3       3.5
  DEPTH=      .7       2.0       5.3       2.6
```

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.725 FT AND MULTIPLYING BY 1.328

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.02	3.75	2743.10	2744.67	.00	2747.80	4.70	.72	.30	2742.85
2568.	1.	2446.	120.	1.	138.	23.	12.	7.	2740.45
.05	1.09	17.78	5.21	.060	.030	.060	.000	2739.35	89.31
.030844	58.	63.	69.	6	11	0	.00	71.40	160.71

FLOW DISTRIBUTION FOR SECNO= 1.02 CWSEL= 2743.10

STA=	89.	97.	143.	161.
PER Q=	.0	95.3	4.7	
AREA=	1.0	137.6	23.1	
VEL=	1.1	17.8	5.2	
DEPTH=	.1	3.0	1.3	

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.725 FT AND MULTIPLYING BY 1.247

1.03	3.26	2740.88	2742.45	.00	2745.64	4.75	2.16	.01	2741.12
2644.	0.	2547.	97.	0.	143.	19.	12.	7.	2738.72
.05	.00	17.80	5.08	.000	.030	.060	.000	2737.62	121.62
.038437	58.	63.	69.	9	11	0	.00	74.70	196.33

FLOW DISTRIBUTION FOR SECNO= 1.03 CWSEL= 2740.88

STA=	122.	179.	196.
PER Q=	96.3	3.7	
AREA=	143.1	19.1	
VEL=	17.8	5.1	
DEPTH=	2.5	1.1	

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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


1645 INT SEC ADDED BY RAISING SEC      1.03,  -1.725 FT AND MULTIPLYING BY   1.198


3301 HV CHANGED MORE THAN HVINS

        CONFLUENCE WESTERLY SUBAREA - CONCENTRATION PT. #4 - Q100 = 305 CFS
   83.00      3.07  2738.97  2740.29      .00  2743.11      4.13      2.34       .19  2739.40
   2720.        0.     2631.      89.       0.     159.       19.       12.        7.   2737.00
     .05       .00     16.57     4.66     .000     .030      .060      .000  2735.90    146.23
 .036319       58.       63.      69.        4       11         0       .00    87.14    233.37


FLOW DISTRIBUTION FOR SECNO=     83.00          CWSEL=   2738.97

STA=     146.      214.      233.
  PER Q=     96.7       3.3
   AREA=    158.8      19.1
    VEL=     16.6       4.7
  DEPTH=      2.3       1.0

*SECNO 82.000

1645 INT SEC ADDED BY RAISING SEC     82.00,   4.050 FT AND MULTIPLYING BY   1.681


3301 HV CHANGED MORE THAN HVINS

    1.01      3.79  2738.34  2739.22      .00  2741.22      2.88      1.52       .38  2740.35
   2720.        0.     2492.     228.       0.     183.       17.       13.        8.   2734.65
     .05       .00     13.63    13.55     .000     .030      .020      .000  2734.55    298.11
 .018457       55.       60.      65.        6       14         0       .00   113.32    411.42


1645 INT SEC ADDED BY RAISING SEC      1.01,  -1.350 FT AND MULTIPLYING BY    .865

3280 CROSS SECTION      1.02 EXTENDED       .29 FEET

    1.02      4.07  2737.27  2738.14      .00  2740.11      2.84      1.09       .01  2739.00
   2720.        0.     2421.     299.       0.     175.       28.       13.        8.   2733.30
     .06       .00     13.85    10.54     .000     .030      .020      .000  2733.20    255.85
 .017568       55.       60.      65.        4       11         0       .00   103.22    359.08
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.350 FT AND MULTIPLYING BY .844

3280 CROSS SECTION 1.03 EXTENDED .69 FEET

1.03	4.48	2736.33	2737.11	.00	2739.08	2.75	1.00	.03	2737.65
2720.	0.	2295.	425.	0.	167.	40.	13.	8.	2731.95
.06	.00	13.74	10.70	.000	.030	.020	.000	2731.85	213.64
.015622	55.	60.	65.	6	11	0	.00	89.40	303.04

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.350 FT AND MULTIPLYING BY .815

3280 CROSS SECTION 82.00 EXTENDED 1.24 FEET

82.00	5.02	2735.52	2736.18	.00	2738.18	2.66	.87	.03	2736.30
2720.	0.	2140.	580.	0.	159.	50.	14.	8.	2730.60
.06	.00	13.45	11.63	.000	.030	.020	.000	2730.50	171.59
.013246	55.	60.	65.	6	11	0	.00	75.41	247.00

*SECNO 81.000

1645 INT SEC ADDED BY RAISING SEC 81.00, 1.450 FT AND MULTIPLYING BY 1.260

1.01	5.45	2734.50	2735.30	.00	2736.95	2.44	1.17	.06	2730.95
2720.	638.	2082.	0.	156.	147.	0.	14.	8.	2735.85
.06	4.10	14.16	.00	.060	.030	.000	.000	2729.05	202.35
.012727	85.	90.	95.	5	11	0	.00	122.60	324.95

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.450 FT AND MULTIPLYING BY .794

3301 HV CHANGED MORE THAN HVINS

81.00	6.61	2734.21	2734.34	.00	2735.85	1.64	.86	.24	2729.50
2720.	890.	1830.	0.	217.	150.	0.	15.	8.	2734.40
.06	4.10	12.20	.00	.060	.030	.000	.000	2727.60	138.14
.007621	85.	90.	95.	7	12	0	.00	121.57	259.71

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 80.000

1645 INT SEC ADDED BY RAISING SEC 80.00, 2.400 FT AND MULTIPLYING BY .825

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1.01	7.52	2734.32	2734.32	.00	2736.10	1.77	.35	.43	2732.50
2720.	169.	2266.	285.	75.	195.	66.	15.	9.	2727.20
.06	2.27	11.59	4.31	.060	.030	.060	.000	2726.80	48.36
.006104	45.	53.	53.	20	8	0	.00	122.85	171.21

1645 INT SEC ADDED BY RAISING SEC 1.01, -.800 FT AND MULTIPLYING BY 1.071

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.02	6.29	2732.29	2733.31	.00	2735.48	3.19	.47	.14	2731.70
2720.	18.	2415.	287.	12.	160.	48.	16.	9.	2726.40
.07	1.45	15.08	5.93	.060	.030	.060	.000	2726.00	85.84
.014708	45.	53.	53.	7	8	0	.00	94.02	179.86

1645 INT SEC ADDED BY RAISING SEC 1.02, -.800 FT AND MULTIPLYING BY 1.066

1.03	5.92	2731.12	2732.30	.00	2734.60	3.48	.85	.03	2730.90
2720.	1.	2432.	286.	2.	155.	45.	16.	9.	2725.60
.07	.77	15.68	6.32	.060	.030	.060	.000	2725.20	115.21
.018053	45.	53.	53.	6	8	0	.00	75.42	190.63

1645 INT SEC ADDED BY RAISING SEC 1.03, -.800 FT AND MULTIPLYING BY 1.062

80.00	5.70	2730.10	2731.30	.00	2733.61	3.51	.99	.00	2730.10
2720.	0.	2434.	286.	0.	155.	44.	16.	9.	2724.80
.07	.00	15.74	6.45	.000	.030	.060	.000	2724.40	140.01
.019724	45.	53.	53.	6	8	0	.00	61.72	201.73

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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST


*SECNO 79.000
   79.00      3.99  2727.39  2728.40       .00  2730.62      3.23      2.91       .08  2728.00
   2720.        0.    2720.       0.        0.     189.        0.       17.        9.  2732.00
     .07       .00    14.42       .00      .000     .030      .000      .000  2723.40   103.49
 .023749      135.     135.      130.         7       11         0       .00    71.99   175.49


*SECNO 78.000

1645 INT SEC ADDED BY RAISING SEC     78.00,   1.800 FT AND MULTIPLYING BY    .909


3301 HV CHANGED MORE THAN HVINS

    1.01      4.39  2727.19  2727.73       .00  2729.22      2.03      1.03       .36  2726.80
   2720.        2.    2718.       0.        2.     238.        0.       17.        9.  2728.40
     .07      1.14    11.43       .00      .060     .030      .000      .000  2722.80   111.81
 .018186       48.      50.      53.         5       11         0       .00   116.57   228.38


1645 INT SEC ADDED BY RAISING SEC      1.01,   -.600 FT AND MULTIPLYING BY   1.034


3301 HV CHANGED MORE THAN HVINS

    1.02      4.73  2726.93  2727.08       .00  2728.34      1.41       .69       .18  2726.20
   2720.       10.    2710.       0.        8.     284.        0.       17.        9.  2727.80
     .07      1.34     9.55       .00      .060     .030      .000      .000  2722.20   105.93
 .010951       48.      50.      53.         4        8         0       .00   133.75   239.68


1645 INT SEC ADDED BY RAISING SEC      1.02,   -.600 FT AND MULTIPLYING BY   1.032

    1.03      4.50  2726.10  2726.43       .00  2727.71      1.61       .61       .02  2725.60
   2720.        4.    2716.       0.        4.     267.        0.       17.       10.  2727.20
     .07      1.17    10.18       .00      .060     .030      .000      .000  2721.60   116.00
 .013707       48.      50.      53.         8        5         0       .00   128.94   244.94
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


1645 INT SEC ADDED BY RAISING SEC      1.03,   -.600 FT AND MULTIPLYING BY   1.031

   78.00     4.50  2725.49  2725.74      .00  2727.02      1.52       .67       .03  2725.00
   2720.       4.     2716.       0.       4.     274.       0.       18.       10.  2726.60
     .08     1.13      9.91      .00     .060     .030     .000      .000  2721.00    119.90
 .013026      48.       50.      53.        0        8        0       .00    132.64    252.54


*SECNO 77.000
   77.00     5.76  2724.06  2724.26      .00  2725.78      1.72      1.22       .02  2721.20
   2720.      163.     2192.     366.      62.     189.     109.       19.       10.  2720.60
     .08     2.64     11.62     3.37     .060     .030     .060      .000  2718.30     67.03
 .007083      130.      130.     130.        7       11        0       .00    148.48    215.51


*SECNO 76.000

1645 INT SEC ADDED BY RAISING SEC     76.00,   1.667 FT AND MULTIPLYING BY    .973


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

    1.01     3.61  2721.08  2722.10      .00  2724.46      3.38      1.15       .17  2721.07
   2720.       0.     2273.     447.       0.     142.     102.       19.       10.  2719.47
     .08      .04     16.03     4.37     .000     .030     .060      .000  2717.47     24.17
 .028891      83.       90.      95.        7       15        0       .00    159.28    183.45


1645 INT SEC ADDED BY RAISING SEC      1.01,   -.833 FT AND MULTIPLYING BY   1.014


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

    1.02     4.39  2721.02  2721.25      .00  2722.48      1.45      1.41       .58  2720.23
   2720.       5.     2042.     673.       4.     186.     192.       20.       11.  2718.63
     .08     1.31     10.98     3.51     .060     .030     .060      .000  2716.63     15.68
 .009610      83.       90.      95.        7       11        0       .00    183.11    198.80
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.02, -.833 FT AND MULTIPLYING BY 1.014

76.00	4.39	2720.19	2720.38	.00	2721.60	1.41	.87	.01	2719.40
2720.	5.	2042	673.	4.	188.	194.	21.	11.	2717.80
.09	1.29	10.83	3.46	.060	.030	.060	.000	2715.80	15.91
.009357	83.	90.	95.	0	8	0	.00	185.61	201.51

*SECNO 75.000

1645 INT SEC ADDED BY RAISING SEC 75.00, 3.200 FT AND MULTIPLYING BY 1.022

1.01	4.68	2718.88	2719.20	.00	2720.61	1.73	.96	.03	2716.50
2720.	414.	2306.	0.	125.	202.	0.	22.	12.	2720.20
.09	3.31	11.39	.00	.060	.030	.000	.000	2714.20	32.66
.009378	102.	103.	93.	4	8	0	.00	138.90	171.57

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.600 FT AND MULTIPLYING BY .989

3301 HV CHANGED MORE THAN HVINS

1.02	4.29	2716.89	2717.60	.00	2719.35	2.46	1.19	.07	2714.90
2720.	326.	2394.	0.	92.	179.	0.	22.	12.	2718.60
.09	3.55	13.35	.00	.060	.030	.000	.000	2712.60	38.95
.014658	102.	103.	93.	8	8	0	.00	130.07	169.02

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.600 FT AND MULTIPLYING BY .989

75.00	4.30	2715.30	2716.02	.00	2717.81	2.51	1.53	.01	2713.30
2720.	326.	2394.	0.	91.	177.	0.	23.	12.	2717.00
.09	3.59	13.50	.00	.060	.030	.000	.000	2711.00	38.52
.015001	102.	103.	93.	0	11	0	.00	128.63	167.15

*SECNO 74.000

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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


1645 INT SEC ADDED BY RAISING SEC     74.00,   1.733 FT AND MULTIPLYING BY    .752


3301 HV CHANGED MORE THAN HVINS

     1.01      4.39  2714.52  2714.87       .00  2716.14      1.62      1.40       .27  2713.63
    2720.        2.     2386.      332.       1.      220.      93.       24.       12.  2712.83
      .10      1.66     10.83      3.57      .060      .030      .060      .000  2710.13     7.94
  .013899      103.       97.       97.        3         8         0       .00   163.66   171.59


1645 INT SEC ADDED BY RAISING SEC      1.01,   -.867 FT AND MULTIPLYING BY   1.165

     1.02      4.36  2713.63  2713.75       .00  2714.86      1.23      1.17       .12  2712.77
    2720.        2.     2391.      327.       2.      254.     106.       24.       13.  2711.97
      .10      1.43      9.41      3.08      .060      .030      .060      .000  2709.27     9.36
  .010608      103.       97.       97.        2         8         0       00   190.15   199.50


1645 INT SEC ADDED BY RAISING SEC      1.02,   -.867 FT AND MULTIPLYING BY   1.141

        DOWNSTREAM STUDY LIMITS - SUMMER TRAIL @ BELLA VISTA SUBDIVISION
    74.00      4.09  2712.49  2712.68       .00  2713.74      1.26      1.11       .00  2711.90
    2720.        1.     2438.      281.       1.      258.      95.       25.       13.  2711.10
      .10      1.21      9.45      2.96      .060      .030      .060      .000  2708.40    12.06
  .012455      103.       97.       97.        4         5         0       .00   208.49   220.55


*SECNO 73.000

1645 INT SEC ADDED BY RAISING SEC     73.00,  -1.067 FT AND MULTIPLYING BY   2.337

3280 CROSS SECTION      1.01 EXTENDED       .12 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     1.01      4.12  2713.05  2713.05       .00  2714.65      1.60       .54       .41  2708.93
    2720.       80.     2234.      406.      24.      202.     104.       26.       14.  2708.93
      .10      3.34     11.04      3.89      .060      .030      .060      .000  2708.93    46.87
  .007524       63.       57.       60.       20         5         0       .00   112.06   158.93
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


1645 INT SEC ADDED BY RAISING SEC      1.01,     .533 FT AND MULTIPLYING BY    .714

3280 CROSS SECTION      1.02 EXTENDED       .95 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     1.02      4.95  2714.41  2714.41      .00  2716.38      1.96       .43       .32  2709.47
    2720.       89.     2155.      476.      24.      173.      105.      26.       14.   2709.47
      .11      3.64     12.43      4.54     .060      .030      .060     .000  2709.47     31.81
  .007474       63.       57.       60.       20        11         0      .00    81.65    113.46


1645 INT SEC ADDED BY RAISING SEC      1.02,     .533 FT AND MULTIPLYING BY    .599

3280 CROSS SECTION     73.00 EXTENDED      2.57 FEET


3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    73.00      6.57  2716.57  2716.57      .00  2719.31      2.74       .43       .37  2710.00
    2720.      102.     2063.      554.      26.      138.      99.      26.       14.   2710.00
      .11      3.95     14.95      5.62     .060      .030      060     .000  2710.00     17.11
  .007398       63.       57.       60.       20        11         0      .00    50.89     68.00


*SECNO 72.000

1645 INT SEC ADDED BY RAISING SEC     72.00,   4.500 FT AND MULTIPLYING BY    .785


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

     1.01      3.71  2712.21  2713.86      .00  2718.58      6.38       .37       .36  2710.50
    2720.       25.     2396.      298.       6.      111.      66.      27.       14.   2710.50
      .11      4.45     21.53      4.54     .060      .030      .060     .000  2708.50     24.70
  .041527       25.       25.       25.        9        15         0      .00   119.06    143.76
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SECNO	DEPTH	QWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.500 FT AND MULTIPLYING BY 1.091

3301 HV CHANGED MORE THAN HVINS

1.02	3.45	2710.45	2712.19	.00	2717.40	6.95	1.13	.06	2709.00
2720.	20.	2471.	229.	5.	112.	52.	27.	14.	2709.00
.11	4.35	22.15	4.43	.060	.030	.060	.000	2707.00	28.06
.049119	25.	25.	25.	7	11	0	.00	116.17	144.23

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.500 FT AND MULTIPLYING BY 1.084

1.03	3.25	2708.75	2710.54	.00	2716.06	7.31	1.31	04	2707.50
2720.	15.	2528.	177.	4.	112.	42.	27.	14.	2707.50
.11	4.20	22.48	4.26	.060	.030	.060	000	2705.50	31.34
.055605	25.	25.	25.	7	14	0	.00	114.16	145.50

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.500 FT AND MULTIPLYING BY 1.077

72.00	3.09	2707.09	2708.90	.00	2714.59	7.50	1.45	.02	2706.00
2720.	12.	2571.	138.	3.	114.	34.	27.	14.	2706.00
.11	4.01	22.58	4.07	.060	.030	.060	.000	2704.00	34.58
.060908	25.	25.	25.	6	14	0	.00	112.81	147.39

THIS RUN EXECUTED 6/22/92 13: 2:21

****
HEC2 RELEASE DATED SEPT 88

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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

ER TRAIL WASH WEST B

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	
*	99.000	.00	.00	.00	2780.00	2415.00	2784.68	2784.68	2786.11	68.86	10.53	326.50	29
	98.000	130.00	.00	.00	2776.00	2415.00	2780.19	2781.52	2784.39	207.52	16.58	155.21	16
	97.000	120.00	.00	.00	2774.00	2415.00	2778.17	2779.27	2781.76	191.17	15.40	170.36	17
*	96.000	120.00	.00	.00	2772.00	2415.00	2776.00	2777.16	2779.55	184.44	15.26	169.91	17
	95.000	50.00	.00	.00	2770.00	2415.00	2775.32	2776.22	2778.77	122.36	15.44	186.14	21
*	94.000	110.00	.00	.00	2769.00	2415.00	2772.96	2774.27	2776.81	271.06	15.84	163.25	14
	93.000	120.00	.00	.00	2769.00	2415.00	2772.68	2772.68	2773.74	84.98	9.87	399.28	26
	92.000	90.00	.00	.00	2766.00	2415.00	2768.94	2769.51	2770.94	428.40	11.45	220.50	11
	91.000	100.00	.00	.00	2764.00	2415.00	2767.87	2767.87	2768.91	100.64	10.25	396.63	24
*	90.000	65.00	.00	.00	2760.00	2415.00	2767.83	2767.83	2769.00	43.29	11.71	492.84	36
	89.000	80.00	.00	.00	2758.00	2415.00	2762.44	2763.55	2766.25	426.27	15.69	156.09	11
	88.000	55.00	.00	.00	2758.00	2415.00	2761.95	2762.72	2764.59	165.77	13.40	212.98	18
	87.000	125.00	.00	.00	2756.40	2415.00	2761.96	2761.96	2762.86	56.33	9.17	511.86	32
	86.000	70.00	.00	.00	2756.15	2415.00	2757.55	2758.08	2759.33	233.96	11.03	232.93	15
	85.000	150.00	.00	.00	2749.30	2415.00	2754.34	2754.99	2756.59	143.09	12.97	263.95	20
	84.000	500.00	.00	.00	2742.80	2415.00	2746.28	2746.28	2747.27	158.34	11.80	370.42	19
	83.000	250.00	.00	.00	2735.90	2720.00	2738.97	2740.29	2743.11	363.19	16.57	177.89	14

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.0
82.000	240.00	.00	6.9 .00	2730.50	2720.00	2735.52	2736.18	2738.18	132.46	13.45	209.00	236
81.000	180.00	.00	6.6 .00	2727.60	2720.00	2734.21	2734.34	2735.85	76.21	12.20	367.03	311
80.000	210.00	.00	6.7 .00	2724.40	2720.00	2730.10	2731.30	2733.61	197.24	15.74	198.99	193
79.000	135.00	.00	4.0 .00	2723.40	2720.00	2727.39	2728.40	2730.62	237.49	14.42	188.61	176
78.000	200.00	.00	4.5 .00	2721.00	2720.00	2725.49	2725.74	2727.02	130.26	9.91	277.82	238
77.000	130.00	.00	6.8 .00	2718.30	2720.00	2724.06	2724.26	2725.78	70.83	11.62	358.74	323
76.000	270.00	.00	4.4 .00	2715.80	2720.00	2720.19	2720.38	2721.60	93.57	10.83	386.54	281
75.000	310.00	.00	4.0 .00	2711.00	2720.00	2715.30	2716.02	2717.81	150.01	13.50	268.29	222
74.000	290.00	.00	4.1 .00	2708.40	2720.00	2712.49	2712.68	2713.74	124.55	9.45	353.70	243
73.000	170.00	.00	.00	2710.00	2720.00	2716.57	2716.57	2719.31	73.98	14.95	262.52	316
72.000	100.00	.00	.00	2704.00	2720.00	2707.09	2708.90	2714.59	609.08	22.58	150.61	110

ER TRAIL WASH WEST B

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	99.000	2415.00	2784.68	.00	.00	12.68	123.54	.00
	98.000	2415.00	2780.19	.00	-1.04	.00	53.93	130.00
	97.000	2415.00	2778.17	.00	-.98	.00	63.36	120.00
*	96.000	2415.00	2776.00	.00	-2.17	.00	59.99	120.00
	95.000	2415.00	2775.32	.00	-.68	.00	54.93	50.00
*	94.000	2415.00	2772.96	.00	-2.36	.00	81.49	110.00
	93.000	2415.00	2772.68	.00	-.01	.00	199.13	120.00
	92.000	2415.00	2768.94	.00	-.84	.00	202.48	90.00
	91.000	2415.00	2767.87	.00	.07	.00	192.05	100.00
*	90.000	2415.00	2767.83	.00	-.04	.00	194.77	65.00
	89.000	2415.00	2762.44	.00	-.77	.00	89.30	80.00
	88.000	2415.00	2761.95	.00	.04	.00	98.86	55.00
	87.000	2415.00	2761.96	.00	.04	.00	280.00	125.00
	86.000	2415.00	2757.55	.00	-.03	.00	288.89	70.00
	85.000	2415.00	2754.34	.00	-3.21	.00	132.84	150.00
	84.000	2415.00	2746.28	.00	-1.87	.00	173.98	500.00
	83.000	2720.00	2738.97	.00	-1.91	.00	87.14	250.00
	82.000	2720.00	2735.52	.00	-.81	.00	75.41	240.00
	81.000	2720.00	2734.21	.00	-.29	.00	121.57	180.00
	80.000	2720.00	2730.10	.00	-1.02	.00	61.72	210.00
	79.000	2720.00	2727.39	.00	-2.71	.00	71.99	135.00
	78.000	2720.00	2725.49	.00	-.61	.00	132.64	200.00
	77.000	2720.00	2724.06	.00	-1.44	.00	148.48	130.00
	76.000	2720.00	2720.19	.00	-.84	.00	185.61	270.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
75.000	2720.00	2715.30	.00	-1.59	.00	128.63	310.00
74.000	2720.00	2712.49	.00	-1.14	.00	208.49	290.00
73.000	2720.00	2716.57	.00	2.16	.00	50.89	170.00
72.000	2720.00	2707.09	.00	-1.66	.00	112.81	100.00

SUMMARY OF ERRORS AND SPECIAL NOTES

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CAUTION SECNO=     99.000  PROFILE=  1  CRITICAL DEPTH ASSUMED

CAUTION SECNO=     96.000  PROFILE=  1  WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO=     96.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=     94.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     90.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     90.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     90.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
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THIS RUN EXECUTED 6/23/92 6:58: 4

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HEC2 RELEASE DATED SEPT 88

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T1 PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT
T2 FLOODPLAIN MANAGEMENT SECTION - TUCSON, ARIZONA 85710 - 1207
T3 SOLDIER TRAIL WASH, BREAKOUT EAST - 100 YR. DISCH. - FILE:SNDEST

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	0	0	1	0	0	.5	2415	2772	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLOC	IBW	CHNIM	ITRACE
	-1	0	0	0	0	0	-1	0	0	0

NC	.06	.06	.03	.1	.3					
X1	99	13	210	255	130	120	130			
GR	2790	0	2788	80	2788	130	2786	150	2784	170
GR	2782	210	2780	220	2780	240	2782	255	2782	275
GR	2784	285	2786	290	2788	320				
X1	98	10	85	125	120	120	120			
GR	2784	0	2782	60	2780	80	2778	85	2776	95
GR	2776	110	2778	125	2780	130	2782	150	2784	170
X1	97	10	130	175	120	110	120			
GR	2780	0	2780	100	2778	125	2776	130	2774	150
GR	2774	160	2776	175	2778	185	2780	200	2782	260
X1	96	12	160	205	50	50	50			
X3	10							2776		
GR	2776	0	2776.7	40	2776	80	2776	100	2775.2	140
GR	2776	155	2774	160	2772	170	2772	190	2774	205
GR	2776	220	2778	230						
X1	95	12	160	190	110	110	110			
X3	10							2777		
GR	2774	0	2774	50	2776	115	2777	135	2776	150
GR	2774	155	2772	160	2770	165	2770	180	2772	190
GR	2774	205	2776	220						
X1	94	10	60	115	120	110	120			
GR	2775	0	2774	50	2772	60	2770	65	2769	70
GR	2769	80	2770	90	2772	115	2774	160	2777	240

X1	93	9	90	140	60	90	90			
GR	2774	0	2772	60	2770	90	2769	110	2770	140
GR	2771	170	2770	210	2772	225	2774	265		
X1	92	16	40	220	110	70	100			
X3	10							2769		
GR	2772	0	2770	20	2768	40	2766	50	2766	65
GR	2768	70	2769	110	2768	155	2767	160	2768	180
GR	2768.1	190	2768	200	2766	205	2766	210	2768	220
GR	2770	280								
X1	91	19	330	375	80	75	75			
GR	2770	0	2768	70	2766	80	2764.1	110	2766	120
GR	2768	135	2768.2	155	2768	180	2768.2	230	2768	260
GR	2766	265	2766	275	2766.4	300	2766	330	2764	360
GR	2764	365	2766	375	2768	390	2770	395		
X1	59	10	45	65	160	170	165			
GR	2767	0	2766	30	2764	35	2762	45	2760	50
GR	2760	55	2762	65	2764	70	2766	80	2767	120
X1	58	8	35	75	135	120	125			
GR	2762.5	0	2762	25	2760	35	2758	60	2756	70
GR	2760	75	2762	95	2763	135				
X1	57	7	45	140	140	210	155			
GR	2759.9	0	2759.4	40	2759.4	45	2758	55	2759.5	70
GR	2762.2	140	2760.5	250						
NC	.02	.02	.02							
X1	56	6	0	800	135	140	140			
GR	2756.8	0	2756.05	400	2757.10	505	2758.33	595	2758.31	685
GR	2756.2	800								
NC	0	.06	.03							
X1	55	8	75	115	250	240	240			
GR	2762.5	0	2750.9	55	2750.7	75	2748.8	90	2749.1	100
GR	2751.4	115	2753.9	160	2757.67	270				
X1	54	9	85	120	170	170	170			
GR	2746.5	0	2746.70	70	2743.90	80	2750.60	85	2743.30	95
GR	2749.4	120	2746.10	140	2757.20	170	2762.43	270		
X1	53	7	40	190	340	340	340			
GR	2743.8	0	2741.9	40	2740.8	100	2739.1	110	2739.6	140
GR	2749.6	190	2756.3	250						
X1	52	10	18	90	140	125	130			
GR	2737.5	0	2737.6	18	2732.1	45	2732.3	55	2735.5	90
GR	2735.8	125	2733.8	150	2733.7	190	2735	200	2737.1	275

X1	51	11	190	250	260	240	250			
X2	2675									
GR	2735.8	0	2735.4	70	2734.3	190	2729.2	200	2729.4	220
GR	2732.7	250	2732	300	2729.9	310	2730.3	335	2733.3	350
GR	2734.6	390								
X1	50	10	0	280	170	180	175			
GR	2730.3	0	2729.2	40	2728.9	110	2728.7	200	2725.3	230
GR	2725.7	250	2725	260	2724.7	270	2725.4	280	2736.4	310
X1	49	4	0	240	150	160	155			
GR	2727.5	0	2726.22	135	2724.09	170	2729.99	240		
X1	48	8	40	135	110	120	120			
GR	2723.7	0	2724	40	2722.6	55	2719.2	60	2720	90
GR	2722.8	105	2731.5	135	2733.8	160				
X1	47	7	0	90	260	270	260			
GR	2721.7	0	2719.9	40	2718	55	2718.1	70	2721.6	90
GR	2725.3	110	2732.6	140						
X1	46	8	0	160	240	250	245			
GR	2720.3	0	2717.6	50	2716.6	85	2715.3	100	2715.6	120
GR	2715.2	135	2726.7	160	2729.1	160				
X1	45	4	0	325	160	120	140			
GR	2718	0	2716.5	120	2712.37	215	2718.45	325		
X1	44	10	240	290	230	210	220			
GR	2714.6	0	2715.4	135	2711.6	180	2710.5	240	2708.3	260
GR	2708.5	270	2710.3	290	2713.4	330	2719	360	2721.4	400
X1	43	7	65	150	230	220	230			
GR	2711	0	2708.3	65	2706.9	105	2704.7	120	2704.9	130
GR	2710.9	150	2712.3	180						
X1	42	9	30	175	110	130	115			
GR	2710	0	2708	5	2706	30	2704	70	2702	80
GR	2704	120	2706	175	2708	190	2710	220		
X1	41	9	65	210						
GR	2708	0	2706	50	2704	65	2702	70	2700	85
GR	2700	100	2702	115	2704	210	2710	235		

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV= .100 CEHV= .300
*SECNO 99.000
3720 CRITICAL DEPTH ASSUMED

99.00	4.68	2784.68	2784.68	2772.00	2786.11	1.43	.00	.00	2782.00
2415.	.96	1955.	262.	70.	186.	71.	0.	0.	2782.00
.00	2.84	10.53	3.68	.060	.030	.060	.000	2780.00	163.17
.006886	0.	0.	0.	0	14	0	.00	123.54	286.71

*SECNO 98.000

1645 INT SEC ADDED BY RAISING SEC 98.00, 3.000 FT AND MULTIPLYING BY 1.108

3665 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1.01	5.22	2784.22	2784.22	.00	2786.13	1.91	.22	.08	2781.00
2415.	54	2308	54	21	204	21.	0.	0.	2781.00
.00	2.61	11.33	2.61	.060	.030	.060	.000	2779.00	75.11
.006900	33.	33.	30	20	8	0	.00	82.49	157.61

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.000 FT AND MULTIPLYING BY .967

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.02	4.34	2782.34	2783.34	.00	2785.67	3.32	.32	.14	2780.00
2415.	27.	2361.	27.	8.	160.	8.	0.	0.	2780.00
.00	3.39	14.78	3.39	.060	.030	.060	.000	2778.00	82.01
.015566	33.	33.	30.	6	5	0	.00	61.12	143.13

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.000 FT AND MULTIPLYING BY .966

3301 HV CHANGED MORE THAN HVINS

1.03	4.23	2781.23	2782.43	.00	2785.06	3.83	.55	.05	2779.00
2415.	24.	2367.	24.	7.	149.	7.	0.	0.	2779.00
00	3.59	15.85	3.59	060	.030	.060	000	2777.00	80.52
.018726	33.	33.	30.	3	11	0	.00	56.54	137.06

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.000 FT AND MULTIPLYING BY .965

98.00	4.19	2780.19	2781.52	.00	2784.39	4.19	.64	.04	2778.00
2415.	23.	2368.	23.	6.	143.	6.	1	0.	2778.00
.00	3.73	16.58	3.73	.060	030	.060	.000	2776.00	78.03
.020752	33.	33.	30.	2	11	0	.00	53.93	131.97

*SECNO 97.000

1645 INT SEC ADDED BY RAISING SEC 97.00, 1.000 FT AND MULTIPLYING BY .965

1.01	4.15	2779.15	2780.38	.00	2783.05	3.90	1.25	.09	2777.00
2415.	21.	2351.	43.	6.	147.	11	1.	0.	2777.00
.00	3.66	16.05	3.85	060	.030	.060	.000	2775.00	118.75
.020880	60.	60	60	2	11	0	.00	60.83	179.58

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.000 FT AND MULTIPLYING BY 1.037

97.00	4.17	2778.17	2779.27	.00	2781.76	3.59	1.20	.09	2776.00
2415.	21.	2350.	44.	6.	153	12.	1.	0.	2776.00
.00	3.53	15.40	3.72	.060	.030	.060	.000	2774.00	122.90
.019117	60.	60.	60.	2	11	0	.00	63.36	186.26

*SECNO 96.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2776.00 ELREA= 2774.00

96.00	4.00	2776.00	2777.16	.00	2779.55	3.55	2.25	.03	2774.00
2415.	0.	2365.	50.	0.	155.	15.	2.	1.	2774.00
.01	.00	15.26	3.34	.000	.030	.060	.000	2772.00	160.00
.018444	120.	120.	110.	20	11	0	.00	59.99	219.99

*SECNO 95.000
3280 CROSS SECTION 95.00 EXTENDED 1 32 FEET

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2777 00 ELREA= 2772.00

95.00	5.32	2775.32	2776 22	.00	2778.77	3 45	.74	.03	2772.00
2415	0.	2235.	180.	0	145.	41	2.	1.	2772 00
.01	.00	15.44	4.35	.000	.030	.060	.000	2770 00	160.00
012236	50	50.	50.	10	14	0	.00	54.93	214.93

*SECNO 94.000

3302 WARNING- CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

94 00	3.96	2772.96	2774.27	00	2776.81	3.84	1.93	.04	2772.00
2415.	6.	2360	26.	2.	150.	10.	2.	1.	2772.00
.01	2 47	15.84	2.50	.060	030	.060	.000	2769.00	55.18
.027106	110.	110.	110	6	5	0	00	81.49	136.68

*SECNO 93.000

1645 INT SEC ADDED BY RAISING SEC 93.00, .000 FT AND MULTIPLYING BY .968

1.01	2.59	2771.59	2772.73	.00	2775 70	4.11	1 08	.03	2770.00
2415.	87.	1849	479.	18.	101.	83.	2.	1.	2770.00
.01	4.80	18.32	5 80	.060	030	.060	.000	2769.00	64.10
051486	30.	30.	28.	7	11	0	.00	150.72	214.88

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, .000 FT AND MULTIPLYING BY 1.011

3301 HV CHANGED MORE THAN HVINS

3302 WARNING- CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.02	3.08	2772.08	2772.71	.00	2774.17	2.10	.92	60	2770.00
2415.	120.	1707.	568.	32	126.	124.	2.	1.	2770.00
.01	3.77	13.50	4.73	060	.030	.060	.000	2769.00	56.32
.021002	30.	30.	28.	6	14	0	.00	165.56	221.88

1645 INT SEC ADDED BY RAISING SEC 1.02, .000 FT AND MULTIPLYING BY 1.011

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1.03	3.70	2772.70	2772.70	.00	2773.76	1.06	.37	26	2770.00
2415.	172.	1569.	674.	58.	158.	182.	3.	1.	2770.00
.01	2.96	9.92	3.71	060	.030	.060	.000	2769.00	38.72
.008536	30.	30.	28.	20	11	0	.00	197.68	236.40

1645 INT SEC ADDED BY RAISING SEC 1.03, .000 FT AND MULTIPLYING BY 1.011

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

93.00	3.68	2772.68	2772.68	.00	2773.74	1.05	.25	.05	2770.00
2415.	171.	1571.	673.	57.	159.	183.	3.	1.	2770.00
.01	2.97	9.87	3.68	060	.030	.060	.000	2769.00	38.52
.008498	30.	30.	28.	20	5	0	.00	199.13	238.65

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 92.000

1645 INT SEC ADDED BY RAISING SEC 92.00, 2.250 FT AND MULTIPLYING BY .623

1.01	3.96	2772.21	2772.42	.00	2773.49	1.27	.23	.02	2770.25
2415.	33.	2282.	100.	12.	246.	36.	3.	1.	2770.25
.01	2.74	9.29	2.76	.050	.030	.060	.000	2768.25	12.65
.012689	15.	23.	23.	4	8	0	.00	161.39	174.04

1645 INT SEC ADDED BY RAISING SEC 1.01, -.750 FT AND MULTIPLYING BY 1.201

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.02	3.21	2770.71	2771.37	.00	2772.93	2.22	.46	.09	2769.50
2415.	19.	2339.	57.	6.	193.	17.	3.	1.	2769.50
.01	3.44	12.14	3.45	.060	.030	.060	.000	2767.50	20.88
.037957	15.	23.	23.	8	5	0	.00	171.14	192.02

1645 INT SEC ADDED BY RAISING SEC 1.02, -.750 FT AND MULTIPLYING BY 1.168

1.03	3.02	2769.77	2770.44	.00	2772.00	2.23	.93	.00	2768.75
2415.	15.	2354.	46.	5.	194.	14.	3.	1.	2768.75
.02	3.36	12.12	3.37	.060	.030	.060	.000	2766.75	26.08
.045764	15.	23.	23.	7	8	0	.00	193.00	219.09

1645 INT SEC ADDED BY RAISING SEC 1.03, -.750 FT AND MULTIPLYING BY 1.144

3265 DIVIDED FLOW

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 2769.00 ELREA= 2768.00

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
92.00	2.94	2768.94	2769.51	.00	2770.94	2.00	.99	.07	2768.00
2415.	0.	2375.	40.	0.	207.	13.	3.	2.	2768.00
.02	.00	11.45	3.09	.000	.030	.060	.000	2766.00	40.00
.042840	15.	23.	23.	4	11	0	.00	202.48	248.04

*SECNO 91.000

1645 INT SEC ADDED BY RAISING SEC 91.00, 1.000 FT AND MULTIPLYING BY 1.626

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

1.01	2.80	2767.80	2768.21	.00	2769.24	1.43	1.53	.17	2767.00
2415.	811.	1596.	8.	168.	140.	4.	4.	2.	2767.00
.02	4.31	11.41	2.01	.060	.030	.060	.000	2765.00	123.60
.022451	55.	50.	35.	4	8	0	.00	273.20	619.60

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.000 FT AND MULTIPLYING BY .615

3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

91.00	3.87	2767.87	2767.87	.00	2768.91	1.04	.75	.41	2766.00
2415.	1009.	1375.	31.	249.	134.	13.	4.	2.	2766.00
.02	4.05	10.25	2.36	.060	.030	.060	.000	2764.00	70.66
.010064	55.	50.	35.	20	11	0	.00	192.05	389.02

*SECNO 59.000

1645 INT SEC ADDED BY RAISING SEC 59.00, 2.000 FT AND MULTIPLYING BY 1.575

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1.01	6.23	2768.23	2768.23	.00	2770.08	1.85	.29	.32	2764.00
2415.	233.	2035.	147.	62.	173.	46.	5.	2.	2764.00
.02	3.77	11.79	3.17	.060	.030	.060	.000	2762.00	36.45
.005964	40.	38.	38.	20	14	0	.00	103.94	140.39

1645 INT SEC ADDED BY RAISING SEC 1.01, -2.000 FT AND MULTIPLYING BY .635

3280 CROSS SECTION 59.00 EXTENDED .24 FEET

3301 HV CHANGED MORE THAN HVINS

59.00	7.34	2767.24	2767.90	.00	2769.76	2.53	.25	.07	2762.00
2415.	307.	1866.	242.	76.	130.	73.	5.	2.	2762.00
.02	4.05	14.37	3.30	.060	.030	.060	.000	2760.00	.00
.007223	40.	38.	38.	5	8	0	.00	120.00	120.00

*SECNO 58.000

1645 INT SEC ADDED BY RAISING SEC 58.00, 1.500 FT AND MULTIPLYING BY .766

3280 CROSS SECTION 1.01 EXTENDED .11 FEET

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.01	4.60	2764.10	2765.61	.00	2769.03	4.93	.50	.24	2761.50
2415.	76.	2200.	138.	19.	118.	30.	5.	2.	2761.50
.02	3.99	18.61	4.58	.060	.030	.060	.000	2759.50	.00
.003943	40.	41.	43.	9	15	0	.00	91.40	91.40

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -.500 FT AND MULTIPLYING BY 1.102

1.02	4.49	2763.49	2764.89	.00	2767.93	4.44	.95	.15	2761.00
2415.	67.	2222.	127.	18.	126.	29.	5.	3.	2761.00
.02	3.78	17.58	4.32	.060	.030	.060	.000	2759.00	.35
.022155	40.	41.	43.	3	11	0	.00	96.46	96.81

1645 INT SEC ADDED BY RAISING SEC 1.02, -.500 FT AND MULTIPLYING BY 1.092

1.03	4.38	2762.88	2764.19	.00	2766.93	4.04	.89	.12	2760.50
2415.	60.	2240.	116.	16.	134.	28.	5.	3.	2760.50
.02	3.70	16.72	4.10	.060	.030	.060	.000	2758.50	5.46
.020785	40.	41.	43.	3	11	0	.00	96.22	101.68

1645 INT SEC ADDED BY RAISING SEC 1.03, -.500 FT AND MULTIPLYING BY 1.084

58.00	4.28	2762.28	2763.52	.00	2766.00	3.71	.83	.10	2760.00
2415.	54.	2255.	105.	15.	141.	27.	5.	3.	2760.00
.02	3.62	15.97	3.90	.060	.030	.060	.000	2758.00	10.94
.019622	40.	41.	43.	3	11	0	.00	95.31	106.25

*SECNO 57.000

1645 INT SEC ADDED BY RAISING SEC 57.00, 1.500 FT AND MULTIPLYING BY 1.285

3280 CROSS SECTION 1.01 EXTENDED .65 FEET

3301 HV CHANGED MORE THAN HVINS

1.01	4.54	2762.04	2762.99	.00	2764.92	2.88	.83	.25	2760.90
2415.	243.	2172.	0.	54.	152.	0.	6.	3.	2763.70
.02	4.51	14.28	.00	.060	.030	.000	.000	2757.50	.00
.037133	34.	31.	30.	5	11	0	.00	140.75	140.75

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -.500 FT AND MULTIPLYING BY .924

3265 DIVIDED FLOW

3280 CROSS SECTION 1.02 EXTENDED 1.22 FEET

3301 HV CHANGED MORE THAN HVINS

1.02	5.12	2762.12	2762.60	.00	2763.75	1.63	.80	.37	2760.40
2415.	350.	2063.	2.	81.	188.	3.	6.	3.	2763.20
.03	4.33	10.55	.77	.060	.030	.060	.000	2757.00	.00
.018246	34.	31.	30.	6.	11.	0.	.00	165.82	299.13

1645 INT SEC ADDED BY RAISING SEC 1.02, -.500 FT AND MULTIPLYING BY .918

3265 DIVIDED FLOW

3280 CROSS SECTION 1.03 EXTENDED 1.87 FEET

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1.03	5.77	2762.27	2762.27	.00	2763.22	.95	.40	.20	2759.90
2415.	410.	1957.	46.	106.	230.	35.	6.	3.	2762.70
.03	3.86	8.50	1.35	.060	.030	.060	.000	2756.50	.00
.009186	34.	31.	30.	20.	8.	0.	.00	225.76	274.57

1645 INT SEC ADDED BY RAISING SEC 1.03, -.500 FT AND MULTIPLYING BY .911

3265 DIVIDED FLOW

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 SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
 Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
 TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
 SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST

3280 CROSS SECTION     57.00 EXTENDED      1.93 FEET

   57.00     5.83  2761.83  2761.91      .00  2762.90     1.07      .31      .01  2759.40
   2415.     413.     1947.      55.     100.     215.      37.       6.       3.  2762.20
     .03     4.15     9.05     1.50     .060     .030     .060     .000  2756.00      .00
 .010261      34.      31.      30.        2        8        0      .00   212.11   250.00

*SECNO 56.000

1645 INT SEC ADDED BY RAISING SEC     56.00,   -.033 FT AND MULTIPLYING BY    .645

3265 DIVIDED FLOW

3280 CROSS SECTION      1.01 EXTENDED       67 FEET

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

    1.01       82  2756.84  2757.57       00  2761.23     4.39     1.34      .33  2756.77
   2415.        0     2415.       0.       0.     144.       0.       7.       4.  2755.17
     .03       00     16.81      .00     000     .020     .000     .000  2756.02      .00
 .158286       47       52       70.        7       14        0       00   304.16   515.92


1645 INT SEC ADDED BY RAISING SEC      1.01,    .017 FT AND MULTIPLYING BY   1.275

3265 DIVIDED FLOW

3280 CROSS SECTION      1.02 EXTENDED      .96 FEET

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
1.02	1.10	2757.14	2757.42	.00	2758.07	.93	2.12	1.04	2756.78
2415.	0.	2415.	0.	0.	311.	0.	7.	4.	2756.18
.03	.00	7.76	.00	.000	.020	.000	.000	2756.03	.00
.018447	47.	52.	70.	9	14	0	.00	461.58	657.96

1645 INT SEC ADDED BY RAISING SEC 1.02, .017 FT AND MULTIPLYING BY 1.216

3265 DIVIDED FLOW

3280 CROSS SECTION 56.00 EXTENDED 1.12 FEET

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

56.00	1.27	2757.32	2757.32	.00	2757.73	.41	.52	.45	2756.80
2415.	0.	2415.	0.	0.	472	0.	7	5.	2756.20
.03	.00	5.12	.00	.000	.020	.000	.000	2756.05	.00
.006283	47.	52.	70	20	8	0	.00	582.08	800.00

*SECNO 55.000

1645 INT SEC ADDED BY RAISING SEC 55.00, 5.437 FT AND MULTIPLYING BY 17.412

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.01	.94	2755.18	2755.70	.00	2757.02	1.84	.56	.14	2756.14
2415.	0.	2415.	0.	0.	222.	0.	8.	5.	2756.84
.03	.00	10.90	.00	.000	.030	.000	.000	2754.24	1437.86
.097973	34.	35.	35.	7	8	0	.00	376.07	1813.93

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.812 FT AND MULTIPLYING BY .686

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.02	1.41	2753.83	2754.16	.00	2754.90	1.07	1.89	.23	2754.32
2415.	0.	2415.	0.	0	291.	0.	8.	5.	2755.02
.04	.00	8.29	.00	.000	.030	.000	.000	2752.42	942.04
.034207	34.	35.	35.	9	17	0	.00	338.37	1280.41

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.812 FT AND MULTIPLYING BY .542

1.03	1.93	2752.55	2752.99	.00	2753.81	1.27	1.07	.02	2752.51
2415.	0.	2415.	0.	0	267.	0.	8.	6.	2753.21
.04	.83	9.03	.00	.020	.030	.000	.000	2750.61	462.71
.027287	34.	35.	35.	9	14	0	.00	253.36	716.07

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.812 FT AND MULTIPLYING BY .155

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

55.00	4.91	2753.71	2753.71	.00	2755.16	1.45	.38	.27	2750.70
2415.	808.	1507.	100.	77.	159.	46.	8.	6.	2751.40
.04	10.51	9.49	2.09	.020	.030	.060	.000	2748.80	41.69
.005899	34.	35.	35	20	17	0	.00	114.84	156.53

*SECNO 54.000

1645 INT SEC ADDED BY RAISING SEC 54.00, 4.125 FT AND MULTIPLYING BY 2.059

3265 DIVIDED FLOW

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3280 CROSS SECTION 1.01 EXTENDED .20 FEET

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.01	3.80	2751.23	2752.01	.00	2754.26	3.03	.74	.16	2754.72
2415	1207	1181.	27.	89.	81.	9.	9.	6.	2753.52
.04	13.60	14.50	3.01	.020	.030	.060	.000	2747.42	.00
.037396	63	60.	60	8	10	0	.00	230.54	293.81

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.375 FT AND MULTIPLYING BY .829

3265 DIVIDED FLOW

3280 CROSS SECTION 1.02 EXTENDED .56 FEET

3301 HV CHANGED MORE THAN HVINS

1.02	4.16	2750.21	2750.81	.00	2752.26	2.05	1.71	.30	2753.35
2415	1435.	941.	39	124	81.	14.	9.	6.	2752.15
.04	11.54	11.63	2.80	.020	.030	.060	.000	2746.05	.00
.021555	63	60.	60.	8	11	0	.00	200.25	245.11

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.375 FT AND MULTIPLYING BY .793

3265 DIVIDED FLOW

3280 CROSS SECTION 1.03 EXTENDED .92 FEET

1.03	4.52	2749.19	2749.70	.00	2751.07	1.88	1.13	.05	2751.97
2415	1579.	787.	49.	138.	75.	17.	9.	7.	2750.77
.04	11.44	10.44	2.79	.020	.030	.060	.000	2744.67	.00
.015911	63.	60.	60.	7	11	0	.00	165.95	195.69

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.375 FT AND MULTIPLYING BY .739

3265 DIVIDED FLOW

3280 CROSS SECTION 54.00 EXTENDED 1.42 FEET

54.00	5.01	2748.31	2748.78	.00	2750.22	1.91	.85	.00	2750.60
2415.	1699.	655.	61.	144.	69.	22.	10.	7.	2749.40
.04	11.82	9.51	2.85	.020	.030	.060	.000	2743.30	.00
.012002	63.	60.	60.	6	11	0	.00	130.17	145.99

*SECNO 53.000

1645 INT SEC ADDED BY RAISING SEC 53.00, 3.150 FT AND MULTIPLYING BY .438

3280 CROSS SECTION 1.01 EXTENDED .26 FEET

1.01	4.96	2747.23	2747.79	.00	2749.62	2.39	.55	.05	2745.05
2415.	215.	2200.	0.	22.	174.	0.	10.	7.	2752.75
.04	9.95	12.63	.00	.020	.030	.000	.000	2742.25	.00
.013855	43.	43.	43.	2	8	0	.00	71.13	71.13

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.050 FT AND MULTIPLYING BY 1.427

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

1.02	3.69	2744.89	2746.07	.00	2748.58	3.69	.91	.13	2744.00
2415.	44.	2371.	0.	5.	153.	0.	10.	7.	2751.70
.04	8.34	15.51	.00	.020	.030	.000	.000	2741.20	13.21
.036841	43.	43.	43.	6	8	0	.00	84.37	97.58

SECNO	DEPTH	OWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.050 FT AND MULTIPLYING BY 1.299

1.03	3.32	2743.47	2744.49	.00	2746.81	3.35	1.67	.10	2742.95
2415.	14.	2401.	0.	2.	163.	0.	10.	7.	2750.65
.05	6.18	14.71	.00	.020	.030	.000	.000	2740.15	23.63
.041866	43.	43.	43.	8	11	0	.00	101.61	125.24

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.050 FT AND MULTIPLYING BY 1.230

3301 HV CHANGED MORE THAN HVINS

53.00	3.17	2742.27	2743.10	.00	2744.94	2.66	1.67	.20	2741.90
2415.	7.	2408.	0.	1.	184.	0.	10.	7.	2745.60
.05	4.62	13.12	.00	.020	.030	.000	.000	2739.10	32.24
.037022	43.	43.	43.	4	11	0	.00	121.10	153.34

*SECNO 52.000

1645 INT SEC ADDED BY RAISING SEC 52.00, 4.667 FT AND MULTIPLYING BY 1.513

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

1.01	3.28	2740.04	2740.48	.00	2741.46	1.41	3.10	.37	2742.27
2415.	0.	1792.	623.	0.	166.	141.	11.	8.	2740.17
.05	.00	10.77	4.41	.000	.030	.060	.000	2736.77	43.75
.021075	113.	113.	113.	4	11	0	.00	216.28	323.05

1645 INT SEC ADDED BY RAISING SEC 1.01, -2.333 FT AND MULTIPLYING BY .830

3265 DIVIDED FLOW

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
1.02	3.66	2736.09	2738.38	.00	2739.34	1.25	2.07	.05	2739.93
2415.	0.	1725.	690.	0.	168.	167.	12.	8.	2737.83
.05	.00	10.29	4.14	.000	.030	.060	.000	2734.43	33.98
.015945	113.	113.	113.	6	11	0	.00	244.61	285.37

1645 INT SEC ADDED BY RAISING SEC 1.02, -2.333 FT AND MULTIPLYING BY .796

52.00	3.90	2736.00	2736.37	.00	2737.46	1.46	1.86	.02	2737.60
2415.	0.	1676.	739.	0.	149.	167.	13.	9.	2735.50
.06	.00	11.26	4.43	.000	.030	.060	.000	2732.10	25.85
.016350	113.	113.	113.	4	11	0	.00	209.91	235.76

*SECNO 51.000

1645 INT SEC ADDED BY RAISING SEC 51.00, 1.450 FT AND MULTIPLYING BY .989

[illegible]	3.75	2734.44	2734.51	.00	2736.27	1.63	1.15	.04	2735.75
2545.	0.	1796.	749.	0.	144.	141.	13.	9.	2734.15
.06	.00	12.45	5.32	.000	.030	.060	.000	2730.65	190.46
.018703	70.	65.	63.	3	8	0	.00	154.15	344.63

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.450 FT AND MULTIPLYING BY 1.011

51.00	3.76	2732.96	2733.55	.00	2734.98	2.02	1.27	.02	2734.30
2675.	0.	1891.	784.	0.	144.	140.	13.	9.	2732.70
.06	.00	13.09	5.60	.000	.030	.060	.000	2729.20	192.62
.020905	70.	65.	63.	2	8	0	.00	155.68	348.31

*SECNO 50.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3710 WSEL ASSUMED BASED ON MIN DIFF

50.00	3.99	2728.69	2729.45	.00	2730.79	2.09	4.26	.23	2730.30
2675.	0.	2615.	59.	0.	223.	15.	15.	10.	2725.40
.07	.00	11.73	3.97	.000	.030	.060	.000	2724.70	200.05
.014333	260.	250.	240.	20	13	0	.00	88.94	288.99

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SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS   BANK ELEV
Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA   LEFT/RIGHT
TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN     SSTA
SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID    ENDST


*SECNO 49.000

1645 INT SEC ADDED BY RAISING SEC     49.00,    .407 FT AND MULTIPLYING BY    .758

3280 CROSS SECTION      1.01 EXTENDED       .92 FEET


3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    1.01     4.33  2728.82  2728.82      .00  2729.84     1.02      .73      .51  2727.91
   2675.       0.   2675.       0.        0.     330.       0.      15.      10.  2730.40
     .07      .00     8.11      .00     .000     .030     .000     .000  2724.50      .00
  .010981     57.      58.      60.       20        8        0      .00   167.83   167.83


1645 INT SEC ADDED BY RAISING SEC      1.01,   -.203 FT AND MULTIPLYING BY   1.159

3280 CROSS SECTION      1.02 EXTENDED       .82 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    1.02     4.23  2728.52  2728.52      .00  2729.36       84       60      .54  2727.70
   2675.       0.   2675.       0.        0.     364.       0.      16.      10.  2730.19
     .07      .00     7.36      .00     .000     .030     .000     .000  2724.29      .00
  .009591     57.      58.      60.       20        6        0      .00   193.56   193.56


1645 INT SEC ADDED BY RAISING SEC      1.02,   -.203 FT AND MULTIPLYING BY   1.137

3280 CROSS SECTION     49.00 EXTENDED       .63 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   49.00     4.04  2728.13  2728.13      .00  2728.93      .80      .58      .18  2727.50
   2675.       0.   2675.       0.        0.     372.       0.      16.      11.  2729.99
     .07      .00     7.19      .00     .000     .030     .000     .000  2724.09      .00
  .010379     57.      58.      60.       20       10        0      .00   217.91   217.91
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SECNO	DEPTH	OWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 48.000

1645 INT SEC ADDED BY RAISING SEC 48.00, 3.667 FT AND MULTIPLYING BY 2.099

3301 HV CHANGED MORE THAN HVINS

1.01	3.22	2726.09	2726.74	.00	2728.26	2.17	.54	.14	2727.67
2675.	0.	2675.	0.	0.	226.	0.	16.	11.	2735.17
.07	.00	11.82	.00	.000	.030	.000	.000	2722.87	116.00
.019364	38.	39.	40.	7	8	0	.00	100.08	216.08

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.222 FT AND MULTIPLYING BY .825

1.02	3.63	2725.27	2725.89	.00	2727.52	2.25	.73	.01	2726.45
2675.	0.	2675.	0.	0	222.	0.	17.	11.	2733.95
.07	.00	12.03	.00	.000	.030	.000	.000	2721.55	91.02
.018174	38.	39.	40.	5	11	0	.00	91.08	182.10

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.222 FT AND MULTIPLYING BY .789

1.03	4.33	2724.75	2725.52	.00	2726.84	2.09	.63	.05	2725.22
2675.	0.	2675.	0.	0.	231.	0.	17.	11.	2732.72
.06	.00	11.59	.00	.000	.030	.000	.000	2720.42	61.44
.014811	38.	39.	40.	6	15	0	.00	85.48	146.93

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.222 FT AND MULTIPLYING BY .732

3280 CROSS SECTION 48.00 EXTENDED 72 FEET

48.00	5.21	2724.41	2724.82	.00	2726.29	1.87	.49	.06	2724.00
2675.	119.	2556.	0.	23.	229.	0.	17.	11.	2731.50
.08	5.26	11.18	.00	.020	.030	.000	.000	2719.20	.00
.010954	38.	39.	40.	6	8	0	.00	110.57	110.57

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  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
  TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST


*SECNO 47 000
3280 CROSS SECTION     47.00 EXTENDED       .57 FEET

   47.00     4.27  2722.27  2722.81      .00  2724.56     2.29     1.68      .04  2721.70
   2675.       0.    2674.       1.       0.     220.       1.      18.      11.  2721.60
     .08      .00    12.16     1.55     .000     .030     .060     .000  2718.00      .00
  .018586     110.     120.     120.       6       11        0      .00    91.73    91.73


*SECNO 46 000

1645 INT SEC ADDED BY RAISING SEC     46.00,   1.400 FT AND MULTIPLYING BY    .873


3301 HV CHANGED MORE THAN HVINS

    1.01     3.98  2720.56  2720.91      .00  2722.28     1.70     2.10       18  2721.70
   2675.       0.    2675.       0.       0.     256.       0.      16.      12.  2726.10
     .08      .00    10.45      .00     .000     .030     .000     .000  2716.50    16.08
  .014206     130.     130.     135.       4        5        0      .00   107.27   125.34


1645 INT SEC ADDED BY RAISING SEC      1.01,  -1.400 FT AND MULTIPLYING BY   1.146

   46.00     3.89  2719.09  2719.26      .00  2720.49     1.41     1.70      .09  2720.30
   2675.       0.    2675.       0.       0.     281.       0.      19.      12.  2726.70
     .09      .00     9.52      .00     .000     .030     .000     .000  2715.20    22.54
  .012119     130.     130.     135.       3        5        0      .00   120.90   143.44


*SECNO 45.000
   45.00     3.89  2716.26  2716.35      .00  2717.41     1.15     3.00      .08  2718.00
   2675.       0.    2675.       0.       0.     311.       0.      21.      13.  2718.45
     .09      .00     8.50      .00     .000     .030     .000     .000  2712.37   125.48
  .012413     240.     245.     250.       2        8        0      .00   159.94   285.41


*SECNO 44.000

1645 INT SEC ADDED BY RAISING SEC     44.00,   3.053 FT AND MULTIPLYING BY   1.810
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3301 HV CHANGED MORE THAN HVINS

1.01	3.05	2714.40	2715.15	.00	2716.71	2.31	.58	.12	2713.55
2675.	191.	2452.	32.	30.	195.	13.	21.	13.	2713.35
.10	6.42	12.60	2.46	.020	.030	.060	.000	2711.35	364.54
.023359	40.	35.	30.	7	8	0	.00	185.00	549.54

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.018 FT AND MULTIPLYING BY .851

1.02	3.28	2713.61	2714.30	.00	2715.92	2.31	.78	.00	2712.53
2675.	290.	2342.	43.	41.	183.	16.	21.	13.	2712.33
.10	7.14	12.79	2.66	.020	.030	.060	.000	2710.33	294.27
.021061	40.	35.	30.	5	11	0	.00	177.78	472.05

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.018 FT AND MULTIPLYING BY .825

1.03	3.53	2712.85	2713.57	.00	2715.20	2.36	.72	.00	2711.52
2675.	436.	2184.	55.	50.	167.	15.	22.	13.	2711.32
.10	8.53	13.06	2.87	.020	.030	.060	.000	2709.32	237.05
.019194	40.	35.	30.	5	11	0	.00	156.41	393.46

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.018 FT AND MULTIPLYING BY .787

44.00	3.92	2712.22	2712.93	.00	2714.57	2.36	.63	.00	2710.50
2675.	623.	1979.	72.	61.	151.	24.	22.	13.	2710.30
.10	10.20	13.12	3.06	.020	.030	.060	.000	2708.30	181.06
.016171	40.	35.	30.	6	11	0	.00	133.68	314.74

*SECNO 43.000

1645 INT SEC ADDED BY RAISING SEC 43.00, 1.800 FT AND MULTIPLYING BY 1.023

3301 HV CHANGED MORE THAN HVINS

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SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA      LEFT/RIGHT
TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN    SSTA
SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID   ENDST


3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    1.01     5.41  2711.91  2711.91      .00  2713.11     1.20     1.14      .61  2710.10
    2675      238.     2437.       0.      40.      270.       0.      22.      14.  2712.70
     .10     5.88     9.03      .00     .020     .030     .000     .000  2706.50    21.87
  .007158     115.     110.     105.       20       11        0      .00   128.96   150.83


1645 INT SEC ADDED BY RAISING SEC      1.01,  -1.800 FT AND MULTIPLYING BY    .977


3301 HV CHANGED MORE THAN HVINS


3302 WARNING- CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

   43.00     4.69  2709.39  2710.14      .00  2711.79     2.40     1.21       12  2708.30
    2575       96.     2579.       0.      14.      205.       0.      23.      14.  2710.90
      10     6.77    12.60      .00     .020     .030     .000     .000  2704.70    38.84
  018728     115.     110.     105.        7        5        0      .00   106.12   144.96


*SECNO 42.000

1645 INT SEC ADDED BY RAISING SEC     42.00,   1.800 FT AND MULTIPLYING BY    .775

    1.01     4.41  2706.21  2708.71      .00  2710.20     1.99     1.47      .12  2707.80
    2575.       3.     2671.       1.       1.      236.       0.      23.      14.  2707.80
     .11     3.60    11.33     1.19     .020     .030     .060     .000  2703.80    19.26
  .018533       77.      77.      73.        5        8        0      .00   118.67   137.94


1645 INT SEC ADDED BY RAISING SEC      1.01,   -.900 FT AND MULTIPLYING BY   1.146


3301 HV CHANGED MORE THAN HVINS

    1.02     4.46  2707.36  2707.58      .00  2708.79     1.43     1.24      .17  2706.90
    2675.       4.     2670.       1.       1.      278.       1.      24.      14.  2705.60
     .11     3.28     3.61     1.53     .020     .030     .060     .000  2702.50    21.41
  013546       77.      77.      73.        2        8        0      .00   136.98   158.40
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.02, -.900 FT AND MULTIPLYING BY 1.127

42.00	4.23	2706.23	2706.51	.00	2707.67	1.44	1.12	.00	2706.00
2675.	1.	2674.	0.	0.	278.	0.	24.	15.	2706.00
.11	2.18	9.63	.73	.020	.030	.060	.000	2702.00	27.18
.015944	77.	77.	73.	6	5	0	.00	149.51	176.69

*SECNO 41.000

41.00	4.12	2704.12	2704.45	.00	2705.69	1.57	1.97	.01	2704.00
2675.	0.	2675.	0.	0.	266.	0.	25.	15.	2704.00
.11	.10	10.05	.03	.020	.030	.060	.000	2700.00	64.17
.018456	110.	115.	130.	4	8	0	.00	146.29	210.46

THIS RUN EXECUTED 6/23/92 6:59: 4

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HEC2 RELEASE DATED SEPT 88

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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SOLDIER TRAIL WASH, 8

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	99.000	.00	.00	.00	2780.00	2415.00	2784.68	2784.68	2786.11	68.86	10.53	326.50	291.04
	98.000	130.00	.00	.00	2776.00	2415.00	2780.19	2781.52	2784.39	207.52	16.58	155.21	167.64
	97.000	120.00	.00	.00	2774.00	2415.00	2778.17	2779.27	2781.76	191.17	15.40	170.36	174.66
*	96.000	120.00	.00	.00	2772.00	2415.00	2776.00	2777.16	2779.55	184.44	15.26	169.91	177.83
	95.000	50.00	.00	.00	2770.00	2415.00	2775.32	2776.22	2778.77	122.36	15.44	186.14	218.33
*	94.000	110.00	.00	.00	2769.00	2415.00	2772.96	2774.27	2776.81	271.06	15.84	163.25	146.69
	93.000	120.00	.00	.00	2769.00	2415.00	2772.68	2772.68	2773.74	84.98	9.87	399.28	261.97
	92.000	90.00	.00	.00	2766.00	2415.00	2768.94	2769.51	2770.94	428.40	11.45	220.50	116.68
	91.000	100.00	.00	.00	2764.00	2415.00	2767.87	2767.87	2768.91	100.64	10.25	396.63	240.73
	59.000	75.00	.00	.00	2760.00	2415.00	2767.24	2767.90	2769.76	72.23	14.37	278.92	284.16
	58.000	165.00	.00	.00	2758.00	2415.00	2762.28	2763.52	2766.00	196.22	15.97	183.25	172.40
	57.000	125.00	.00	.00	2756.00	2415.00	2761.83	2761.91	2762.90	102.61	9.05	351.69	238.41
	56.000	155.00	.00	.00	2756.05	2415.00	2757.32	2757.32	2757.73	62.83	5.12	471.91	304.67
	55.000	140.00	.00	.00	2748.80	2415.00	2753.71	2753.71	2755.16	58.99	9.49	283.54	314.43
	54.000	240.00	.00	.00	2743.30	2415.00	2748.31	2748.78	2750.22	120.02	9.51	234.11	220.44
	53.000	170.00	.00	.00	2739.10	2415.00	2742.27	2743.10	2744.94	370.22	13.12	185.06	125.51
	52.000	340.00	.00	.00	2732.10	2415.00	2736.00	2736.37	2737.46	169.90	11.26	315.69	185.26

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	51.000	130.00	.00	.00	2729.20	2675.00	2732.96	2733.55	2734.98	209.05	13.09	284.40	185.01
*	50.000	250.00	.00	.00	2724.70	2675.00	2728.69	2729.45	2730.79	143.33	11.73	237.87	223.44
	49.000	175.00	.00	.00	2724.09	2675.00	2728.13	2728.13	2728.93	103.79	7.19	372.05	262.56
	48.000	155.00	.00	.00	2719.20	2675.00	2724.41	2724.82	2726.29	109.54	11.18	251.27	255.59
	47.000	120.00	.00	.00	2718.00	2675.00	2722.27	2722.81	2724.56	185.86	12.16	220.50	196.22
	46.000	260.00	.00	.00	2715.20	2675.00	2719.09	2719.26	2720.49	121.19	9.52	281.04	242.99
	45.000	245.00	.00	.00	2712.37	2675.00	2716.26	2716.35	2717.41	124.13	8.60	311.23	240.10
	44.000	140.00	.00	.00	2708.30	2675.00	2712.22	2712.93	2714.57	161.71	13.12	235.73	210.36
	43.000	220.00	.00	.00	2704.70	2675.00	2709.39	2710.14	2711.79	187.28	12.60	218.92	195.47
	42.000	230.00	.00	.00	2702.00	2675.00	2706.23	2706.51	2707.67	159.44	9.63	278.18	211.85
	41.000	115.00	.00	.00	2700.00	2675.00	2704.12	2704.45	2705.69	184.58	10.05	266.11	196.89

SOLDIER TRAIL WASH, B

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	99.000	2415.00	2784.68	.00	.00	12.68	123.54	.00
	98.000	2415.00	2780.19	.00	-1.04	.00	53.93	130.00
	97.000	2415.00	2778.17	.00	-.98	.00	63.36	120.00
*	96.000	2415.00	2776.00	.00	-2.17	.00	59.99	120.00
	95.000	2415.00	2775.32	.00	-.68	.00	54.93	50.00
*	94.000	2415.00	2772.96	.00	-2.36	.00	81.49	110.00
	93.000	2415.00	2772.68	.00	-.01	.00	199.13	120.00
	92.000	2415.00	2768.94	.00	-.84	.00	202.48	90.00
	91.000	2415.00	2767.87	.00	.07	.00	192.05	100.00
	59.000	2415.00	2767.24	.00	-.99	.00	120.00	75.00
	58.000	2415.00	2762.28	.00	-.60	.00	95.31	165.00
	57.000	2415.00	2761.63	.00	-.44	.00	212.11	125.00
	56.000	2415.00	2757.32	.00	.18	.00	582.08	155.00
	55.000	2415.00	2753.71	.00	1.16	.00	114.84	140.00
	54.000	2415.00	2748.31	.00	-.88	.00	130.17	240.00
	53.000	2415.00	2742.27	.00	-1.19	.00	121.10	170.00
	52.000	2415.00	2736.00	.00	-2.09	.00	209.91	340.00
	51.000	2675.00	2732.96	.00	-1.49	.00	155.68	130.00
*	50.000	2675.00	2728.69	.00	-4.26	.00	88.94	250.00
	49.000	2675.00	2728.13	.00	-.39	.00	217.91	175.00
	48.000	2675.00	2724.41	.00	-.34	.00	110.57	155.00
	47.000	2675.00	2722.27	.00	-2.14	.00	91.73	120.00
	46.000	2675.00	2719.03	.00	-1.50	.00	120.90	260.00
	45.000	2675.00	2716.26	.00	-2.82	.00	159.94	245.00

SECNO	Q	OWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
44.000	2675.00	2712.22	.00	-.63	.00	133.68	140.00
43.000	2675.00	2709.39	.00	-2.53	.00	106.12	220.00
42.000	2675.00	2706.23	.00	-1.13	.00	149.51	230.00
41.000	2675.00	2704.12	.00	-2.11	.00	146.29	115.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=    99.000  PROFILE=  1  CRITICAL DEPTH ASSUMED

CAUTION SECNO=    96.000  PROFILE=  1  WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO=    96.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=    94.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=    50.000  PROFILE=  1  WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO=    50.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
```

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****************************************************
*  WATER SURFACE PROFILES                          *
*  VERSION OF SEPTEMBER 1988                       *
*  ERROR: 01                                       *
*  UPDATED: 16 FEBRUARY 1989                       *
*  RUN DATE     6/17/92   TIME   14: 7:42          *
****************************************************
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*********************************
*  U.S. ARMY CORPS OF ENGINEERS
*  THE HYDROLOGIC ENGINEERING CENTE
*  609 SECOND STREET, SUITE D
*  DAVIS, CALIFORNIA 95616
*  (916) 756-1104
*********************************
```

```
X     X  XXXXXXX   XXXXX              XXXXX
X     X  X       X     X            X     X
X     X  X       X                        X
XXXXXXX  XXXX     X         XXXXX    XXXXX
X     X  X       X                  X
X     X  X       X     X            X
X     X  XXXXXXX   XXXXX            XXXXXXX
```

END OF BANNER

THIS RUN EXECUTED 6/17/92 14: 7:42

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**************************************************
 HEC2 RELEASE DATED SEPT 88

**************************************************

T1   PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT
T2   FLOODPLAIN MANAGEMENT SECTION  -  TUCSON, ARIZONA  85710 - 1207
T3       SOLDIER TRAIL WASH, EAST BRANCH - 100 YR. DISCH. - FILE: SYNE100

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        0        0        1        0        0        .5      260     2766      0

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

     -1        0        0        0        0        0       -1        0        0        0


NC     .06      .06      .03      .1       .3
X1      69        8       65      170       65       70       65
GR    2770        0     2768       40     2766       65     2764      100     2764      155
GR    2766      170     2768      220     2770      335                                  *

X1      68        8       55      150      120       90      100
GR    2768        0     2766       25     2764       55     2762       90     2762      130
GR    2764      150     2766      175     2768      235

X1      67        8       25      140       90      120      125
GR    2766        0     2764       15     2762       25     2760       40     2760      130
GR    2762      140     2764      160     2766      180

X1      66       10       90      185      170      140      140
GR    2766        0     2764       65     2762       75     2760       90     2759      100
GR    2759      160     2760      185     2762      205     2762      250     2764      360

X1      65        7        0      130      130      135      125
GR  2760.8        0   2758.7       40   2755.7       50   2755.8       87   2755.7      120
GR  2757.4      130   2759.3      180

NC     .02      .02      .02
X1      64        3        0      205      145      140      145
GR  2759.2        0  2757.73      105  2756.79      205

X1      63        7       60      135      230      260      240
GR  2756.2        0   2753.2       60   2749.9       80   2748.9      100   2749.0      120
GR  2753.1      135   2753.1      190
```

engineering corporation

project SOLDIER TRAIL WASH - FP DELINEATION no. 92201
client PCDOT & FCD design AFI date 7/92
subject EROSION & SEDIMENTATION checked _____ date _____

REACH 2: WESTERLY AREA CONFLUENCE TO SUMMER TRAIL

CROSS SECTION 81: $Y_1 = 6.6$ ft ; $W_1 = 122$ ft ; $S_{f_1} = 0.0076$

$\therefore \tau_1 = 62.4(6.6)(0.0076) = 3.1$ psf

CROSS SECTION 80: $Y_1 = 5.7$ ft ; $W_1 = 62$ ft ; $S_{f_2} = 0.0197$

$\therefore \tau_2 = \tau_c = 62.4(5.7)(0.0197) = 7.0$ psf

FROM WHICH:

$$\frac{Y_2}{Y_1} = \left(\frac{122}{62}\right)^{6/7}\left(\frac{3.1}{7}\right)^{3/7} = 1.26$$

$Y_2 = 1.26(6.6) = 8.32$ ft.

$\therefore$ $d_s = 8.32 - 6.6 = 1.7$ ft.

REACH 3: SNYDER RD. TO EASTERLY CONFLUENCE

NO CHANNEL CONSTRICTIONS IDENTIFIED.

REACH 4: EASTERLY CONFLUENCE TO SUMMER TRAIL

CROSS SECTION 51: $Y_1 = 3.76$ ft. ; $W_1 = 156$ ft ; $S_{f_1} = 0.0209$

$\therefore \tau_1 = 62.4(3.76)(0.0209) = 4.9$ psf.

CROSS SECTION 50: $Y_1 = 3.99$ ft. ; $W_1 = 89$ ft ; $S_{f_1} = 0.0143$

$\therefore \tau_2 = \tau_c = 62.4(3.99)(0.0143) = 3.6$ psf

```
SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    BANK ELEV
Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA    LEFT/RIGHT
TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN      ELMIN      SSTA
SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR    TOPWID     ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS


CCHV=     .100 CEHV=     .300
*SECNO 69.000
3720 CRITICAL DEPTH ASSUMED
   69.00      .83  2764.83  2764.83  2766.00  2765.19      .36      .00      .00  2766.00
    260.       0.     260.       0.       0.      54.       0.       0.       0.  2766.00
     .00      .00     4.61      .00     .000     .030     .000     .000  2764.00    85.52
  .014798       0.       0.       0.        0       13        0      .00    75.68   161.20


*SECNO 68.000

1645 INT SEC ADDED BY RAISING SEC     68.00,   1.000 FT AND MULTIPLYING BY   1.136


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

    1.01      .67  2763.67  2763.90      .00  2764.40      .73      .75      .04  2765.00
    260.       0.     260.       0.       0.      38.       0.       0.       0.  2765.00
     .00      .00     6.86      .00     .000     .030     .000     .000  2763.00    88.78
  .040683      33.      33.      35.        5        8        0      .00    66.58   155.36


1645 INT SEC ADDED BY RAISING SEC      1.01,  -1.000 FT AND MULTIPLYING BY    .880

   68.00      .85  2762.85  2762.97      .00  2763.38      .53      .96      .06  2764.00
    260.       0.     260.       0.       0.      45.       0.       0.       0.  2764.00
     .00      .00     5.84      .00     .000     .030     .000     .000  2762.00    74.96
  .022397      33.      33.      35.        7       11        0      .00    63.63   138.59


*SECNO 67.000
   67.00      .54  2760.54  2760.63      .00  2760.95      .41     2.39      .04  2762.00
    260.       0.     260.       0.       0.      51.       0.       0.       0.  2762.00
     .01      .00     5.14      .00     .000     .030     .000     .000  2760.00    35.94
  .025631     120.     100.      90.        4       15        0      .00    96.77   132.71
```

```
SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


*SECNO 66.000
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   66.00      .77  2759.77  2759.77      .00  2760.10      .33      2.42      1.00  2760.00
    260.       0.     260.       0.       0.      57.       0.        0.        1.  2760.00
     .02      .00     4.58      .00     .000     .030     .000      .000   2759.00    92.28
  .015142     90.     125.     120.       20       11        0       .00     87.02   179.30


*SECNO 65.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

   65.00      .61  2756.31  2756.49      .00  2756.93      .62      3.14       .03  2760.80
    260.       0.     260.       0.       0.      41.       0.        0.        1.  2757.40
     .02      .00     6.31      .00     .000     .030     .000      .000   2755.70    47.95
  .036497    170.     140.     140.        5        5        0       .00     75.66   123.61


*SECNO 64.000
3280 CROSS SECTION     64.00 EXTENDED      1.08 FEET

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   64.00     1.08  2757.87  2757.87      .00  2758.15      .28      1.70      1.38  2759.20
    260.       0     260.       0.       0.      61.       0.        1.        1.  2756.79
     .03      .00     4.24      .00     .000     .020     .000      .000   2756.79    95.20
  .007055    130.     125.     135.       20       14        0       .00    109.80   205.00


*SECNO 63.000

1645 INT SEC ADDED BY RAISING SEC     63.00,   5.918 FT AND MULTIPLYING BY   1.610


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE

    1.01      .58  2755.40  2755.87      .00  2757.38     1.98       .59       .17  2759.12
    260.       0.     260.       0.       0.      23.       0.        1.        1.  2759.02
     .03      .00    11.30      .00     .000     .020     .000      .000   2754.82   142.44
  .071521     36.      36.      35.        6        8        0       .00     53.60   196.04
```

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -1.973 FT AND MULTIPLYING BY .874

1.02	.68	2753.53	2753.97	.00	2755.17	1.64	2.11	.10	2757.15
260.	0.	260.	0.	0.	25.	0.	1.	1.	2757.04
.03	.00	10.29	.00	.000	.020	.000	.000	2752.84	121.45
.048228	36.	36.	35.	8	14	0	.00	50.37	171.82

1645 INT SEC ADDED BY RAISING SEC 1.02, -1.973 FT AND MULTIPLYING BY .855

1.03	.74	2751.61	2752.09	.00	2753.41	1.80	1.74	.02	2755.17
260.	0.	260.	0.	0.	24.	0.	1.	1.	2755.07
.03	.00	10.78	.00	.000	.020	.000	.000	2750.87	102.51
.048001	36.	36.	35.	7	14	0	.00	44.72	147.23

1645 INT SEC ADDED BY RAISING SEC 1.03, -1.973 FT AND MULTIPLYING BY .831

63.00	.82	2749.72	2750.24	.00	2751.68	1.97	1.71	.02	2753.20
260.	0.	260.	0.	0.	23.	0.	1.	1.	2753.10
.03	.00	11.26	.00	.000	.020	.000	.000	2748.90	83.59
.046442	36.	36.	35.	7	14	0	.00	39.05	122.64

*SECNO 62.000

1645 INT SEC ADDED BY RAISING SEC 62.00, 2.700 FT AND MULTIPLYING BY 1.649

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE *

1.01	1.27	2747.47	2747.77	.00	2748.44	.97	2.94	.30	2751.70
260.	0.	260.	0.	0.	33.	0.	1.	1.	2749.70
.04	.00	7.92	.00	.000	.020	.000	.000	2746.20	26.84
.015140	115.	120.	130.	9	17	0	.00	40.58	67.42

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1645 INT SEC ADDED BY RAISING SEC 1.01, -2.700 FT AND MULTIPLYING BY .606

62.00	1.55	2745.05	2745.50	.00	2746.46	1.41	1.94	.04	2749.00
260.	0.	260.	0.	0.	27.	0.	1.	1.	2747.00
.04	.00	9.53	.00	.000	.020	.000	.000	2743.50	15.19
.017296	115.	120.	130.	8	14	0	.00	28.09	43.28

*SECNO 61.000

1645 INT SEC ADDED BY RAISING SEC 61.00, 2.550 FT AND MULTIPLYING BY 1.085

1.01	1.50	2742.45	2743.00	.00	2744.20	1.75	2.22	.03	2742.05
260.	3.	257.	0.	1.	24.	0.	1.	2.	2743.25
.04	3.54	10.68	.00	.020	.020	.000	.000	2740.95	68.11
.019934	110.	120.	130.	4	11	0	.00	27.60	95.71

1645 INT SEC ADDED BY RAISING SEC 1.01, -2.550 FT AND MULTIPLYING BY .922

61.00	1.54	2739.94	2740.54	.00	2741.80	1.85	2.39	.01	2739.50
260.	4.	256.	0	1.	23.	0.	1.	2.	2740.70
.05	3.85	11.00	.00	.020	.020	.000	.000	2738.40	62.24
.020008	110.	120.	130.	4	11	0	.00	26.12	88.36

*SECNO 60.000

60.00	1.44	2733.54	2734.08	.00	2735.00	1.46	6.68	.12	2737.60
260.	0.	260.	0.	0.	27.	0.	1.	2.	2735.50
.06	.00	9.70	.00	.000	.020	.000	.000	2732.10	37.94
.020477	310	330.	360.	4	18	0	.00	30.59	68.53

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THIS RUN EXECUTED 6/17/92 14: 7:51

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HEC2 RELEASE DATED SEPT 88

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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SOLDIER TRAIL WASH, E

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.(
*	69.000	.00	.00	.00	2764.00	260.00	2764.83	2764.83	2765.19	147.98	4.81	54.05	2
	68.000	65.00	.00	.00	2762.00	260.00	2762.85	2762.97	2763.38	223.97	5.84	44.53	17
	67.000	100.00	.00	.00	2760.00	260.00	2760.54	2760.63	2760.95	256.31	5.14	50.57	1
*	66.000	125.00	.00	.00	2759.00	260.00	2759.77	2759.77	2760.10	151.42	4.58	56.75	21
*	65.000	140.00	.00	.00	2755.70	260.00	2756.31	2756.49	2756.93	364.97	6.31	41.23	1
*	64.000	125.00	.00	.00	2756.79	260.00	2757.87	2757.87	2758.15	70.55	4.24	61.39	3
	63.000	145.00	.00	.00	2748.90	260.00	2749.72	2750.24	2751.68	464.42	11.26	23.09	1
	62.000	240.00	.00	.00	2743.50	260.00	2745.05	2745.50	2746.46	172.96	9.53	27.29	1
	61.000	240.00	.00	.00	2738.40	260.00	2739.94	2740.54	2741.80	200.08	11.00	24.33	1
	60.000	330.00	.00	.00	2732.10	260.00	2733.54	2734.08	2735.00	204.77	9.70	26.82	1

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SOLDIER TRAIL WASH, E

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	69.000	260.00	2764.83	.00	.00	-1.17	75.68	.00
	68.000	260.00	2762.85	.00	-.82	.00	63.63	65.00
	67.000	260.00	2760.54	.00	-2.31	.00	96.77	100.00
*	66.000	260.00	2759.77	.00	-.77	.00	87.02	125.00
*	65.000	260.00	2756.31	.00	-3.46	.00	75.66	140.00
*	64.000	260.00	2757.87	.00	1.55	.00	109.80	125.00
	63.000	260.00	2749.72	.00	-1.89	.00	39.05	145.00
	62.000	260.00	2745.05	.00	-2.42	.00	28.09	240.00
	61.000	260.00	2739.94	.00	-2.50	.00	26.12	240.00
	60.000	260.00	2733.54	.00	-6.40	.00	30.59	330.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=     69.000  PROFILE=  1  CRITICAL DEPTH ASSUMED

CAUTION SECNO=     66.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     66.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     66.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=     65.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     64.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     64.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     64.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
```

THE LAURSEN RELATIONSHIP

THE SOLUTION FOR THE SCOUR THAT CAN OCCUR NATURALLY IN A STREAM SOLELY BECAUSE OF THE CHANGE IN CROSS SECTION FROM REACH TO REACH IS GIVEN BY LAURSEN'S EQUATION,

$$\frac{Y_2}{Y_1} = \left(\frac{Q_t}{Q_c}\right)^{6/7} \left(\frac{W_1}{W_2}\right)^{C_1} \left(\frac{n_2}{n_1}\right)^{C_2}$$

WHERE, FOR THE CASE OF A PURELY OVERBANK CONTRACTION IN WHICH THE OVERBANK FLOW RETURNS TO THE MAIN CHANNEL,

$$\frac{Y_2}{Y_1} = \left(\frac{Q_t}{Q_c}\right)^{6/7}$$

FOR FLOW CONFINED WITHIN THE MAIN CHANNEL, THE EXPONENT OF THE CONTRACTION RATIO DEPENDS ON THE MODE OF MOVEMENT, WHERE FOR THE CASE OF SOME SUSPENDED BED MATERIAL,

$$\frac{Y_2}{Y_1} = \left(\frac{B_1}{B_2}\right)^{0.64}.$$

REACH 1: SNYDER RD. TO CONFLUENCE OF WESTERLY SUBAREA:

FROM HEC-2 RESULTS, BETWEEN CROSS SECTIONS 84 & 83:

AT 84: $Y_1 = 3.48$ FT. ; $B_1 = 174$ FT.

AT 83: $B_2 = 87$ FT.

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$$\therefore \frac{B_1}{B_2} = \frac{174}{87} = 2$$

THEN, FROM LAURSEN'S FIG. 2 (SHEET)

$$\frac{d_s}{Y_1} = 0.56$$

$$d_s = 0.56(3.48)$$

$$\underline{d_s = 1.9 \text{ Ft.}}$$

REACH 2 = ~~SNYDER RD.~~ OF WESTERLY SUBAREA TO SUMMER TR.

FROM HEC-2 RESULTS, BETWEEN CROSS SECTIONS ~~79~~ 81 & ~~78~~ 80;

81 AT ~~79~~: $Y_1 = \overset{6.6}{4.0}$ Ft. ; $B_1 = \cancel{72}$ 122 Ft.

80 AT 78: $B_2 = \cancel{133}$ 62 Ft.

$$\therefore \frac{B_1}{B_2} = \frac{122}{62} \doteq 2$$

$$\therefore \frac{d_s}{Y_1} = 0.56$$

$$d_s = 0.56(6.6)$$

$$\underline{d_s = 3.7 \text{ Ft.}}$$

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REACH 3: SNYDER RD TO EASTERLY CONFLUENCE:

FROM HEC-2 RESULTS, NO CHANNEL CONSTRACTIONS WERE IDENTIFIED, WHERE MAIN CHANNEL WIDTHS BETWEEN CROSS SECTIONS 55 & 52 REMAINED FAIRLY CONSTANT.

REACH 4: EASTERLY CONFLUENCE TO SUMMER TRAIL

FROM HEC-2 RESULTS:

X-SECT. 51: $Y_1 = 3.76$ FT.; $B_1 = 156$ FT.

X-SECT. 50: $B_2 = 89$ FT.

$$\frac{B_1}{B_2} = \frac{156}{89} \doteq 1.8$$

$$\therefore \frac{d_s}{Y_1} = 0.45$$

$$\therefore d_s = 0.45(3.76)$$

$$d_s = 1.7 \text{ FT.}$$

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TRANS ALASKA PIPELINE DESIGN CRITERIA

DESIGN DATA & ASSUMPTIONS:

BASIC HYDRAULIC PARAMETERS ARE TAKEN FROM THE HEC-2 ANALYSIS IN APPENDIX NO. 3.

REACH 1: SNYDER ROAD TO CONFLUENCE OF WESTERLY SUBAREA:

FROM FIELD DATA, INVERT SLOPE BETWEEN CROSS SECTIONS 85 & 83,

$$S_0 = \frac{2749.3 - 2735.9}{750} = 0.018$$

FROM HEC-2 ANALYSIS,

$$Q = 2415 \text{ CFS}$$
$$d \doteq 3.0 \text{ FT.}$$

FROM FIELD VISUAL OBSERVATIONS, ASSUME BED MATERIALS CONSIST OF SAND ($d_{50} \doteq 0.02$ FT.).

$$\therefore \frac{d}{d_{50}} \doteq \frac{3.0}{0.02} \doteq 150$$

THEN FROM FIG. 6.5 OF THE TRANS ALASKA PIPELINE DESIGN CRITERIA, WHERE

$$S = \frac{S_0}{2} \doteq 0.009$$

$$C \doteq 1300$$

THE BED FACTOR IS DETERMINED FROM THE LARGEST VALUE OF THE FOLLOWING EQUATIONS:

$$F_b = F_{bo}(1 + 0.12C)$$

$$F_{bo} = 48\left(\frac{d_{50}}{d}\right)^{0.5} \text{ OR } F_{bo} = 7.3(d_{50})^{0.25}$$

$$\therefore F_{bo} = 48\left(\frac{0.02}{3.0}\right)^{0.5} = 3.9$$

$$F_{bo} = 7.3(0.02)^{0.25} = 2.7 < 3.9, \text{ USE } 3.9$$

$$\therefore F_b = 3.9(1 + 0.12 \times 1300)$$

$$F_b = 612$$

THE REGIME DEPTH IS GIVEN BY THE FOLLOWING EXPRESSION:

$$d_r = \left[\frac{q^2}{F_b}\right]^{1/2}$$

WHERE, $q = \frac{2415}{87} = 27.8$ CFS/FT.

$$\therefore d_r = \left(\frac{27.8^2}{612}\right)^{1/2} = 1.12 \text{ FT.}$$

THE SCOUR DEPTH IS THEN CALCULATED BY APPLYING A MULTIPLICATION FACTOR (Z) TO THE REGIME DEPTH, WHERE RECOMMENDED Z FACTORS HAVE BEEN BASED ON BOTH FIELD AND MODEL RESULTS.

CONSEQUENTLY, FOR FREE, ERODING BENDS,

$1.4 \leq z \leq 2.5$

$\therefore$ IF $z = 1.4$; $d_c = 1.4(1.12) = 1.6$ Ft.

IF $z = 2.5$; $d_c = 2.5(1.12) = 2.8$ Ft.

THESE SCOUR DEPTHS ARE MEASURED FROM THE DESIGN STAGE AND CONSEQUENTLY WOULD IMPLY AN AGGREDATION CONDITION IS PRESENT.

HOWEVER, IF WE APPLY A FACTOR OF SAFETY OF 1.5,

$d_c = 1.5(1.6) = 2.4$ Ft.

$d_c = 1.5(2.8) = 4.2$ Ft.

CONSEQUENTLY, FOR THIS REACH UNDER PRESENT CONDITIONS, NEAR EQUILIBRIUM CONDITIONS WILL BE EXISTING, WHERE

$d - d_c = 3.0 - 2.4 = 0.6$ Ft. (deposition)

$d - d_c = 3.0 - 4.2 = 1.2$ Ft. (erosion)

<u>REACH 2: CONFLUENCE OF WESTERLY SUBAREA TO SUMMER TRAIL</u>

FROM FIELD DATA,

$$S_o = \frac{2730.5 - 2708.4}{1725} \doteq 0.013$$

FROM HEC-2 ANALYSIS RESULTS,

$Q = 2720$ CFS

$d \doteq 4.5$ Ft. (ave.)

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AS BEFORE,

$$\therefore \frac{d}{d_{50}} = \frac{4.5}{0.02} = 225$$

THEN FROM FIG. 6.5, FOR $S = \frac{1}{2}S_0 = 0.0065$,

$$c \doteq 1100$$

AND,

$$F_{b0} = 48\left(\frac{0.02}{4.5}\right)^{0.5} = 3.2$$

$$F_{b0} = 7.3(0.02)^{0.25} = 2.7 < 3.2, \text{ USE } 3.2$$

$$\therefore F_b = 3.2(1 + 0.12 \times 1100) \doteq 426$$

$$q = \frac{2720}{61.7} = 44.1 \text{ CFS/Ft.}$$

$$\therefore d_r = \left(\frac{44.1^2}{426}\right)^{1/2} = 2.14 \text{ Ft.}$$

THEN, IF $z = 1.4$; $d_c = 1.4(2.14) = 3.0$ Ft.
IF $z = 2.5$; $d_c = 2.5(2.14) = 5.4$ Ft.

WITH F.S. = 1.5; $d_c = 3.0(1.5) = 4.5$ Ft.
$d_c = 5.4(1.5) = 8.1$ Ft.

THE RESULTS INDICATE THAT THE APPARENT MAXIMUM SCOUR POTENTIAL WILL OCCUR WHERE THE EXISTING NATURAL

CHANNEL CONSTRICTS, APPROX. AT CROSS SECTION 80 (LOT 39), WHERE THE SCOUR DEPTH BELOW STREAMBED COULD APPROACH,

$$d_s = 4.5 - 8.1 = 3.6 \text{ ft.}$$

FROM FIELD SURVEY INFORMATION, THE EXISTING HOME IS WELL BEYOND ANY POTENTIAL SCOUR OF THIS MAGNITUDE.

REACH 3: SNYDER ROAD TO EASTERLY CONFLUENCE:

FROM FIELD DATA, INVERT SLOPE BETWEEN CROSS SECTIONS 55 & 52,

$$S_o = \frac{2748.8 - 2732.1}{750} \doteq 0.022$$

FROM HEC-2 ANALYSIS,

$$Q = 2415 \text{ CFS}$$
$$d = 3.7 \text{ ft.}$$

$$\therefore \frac{d}{d_{50}} = \frac{3.7}{0.02} = 185$$

THEN FROM FIG. 6.5, FOR $S = \frac{1}{2} S_o = 0.011$,

$$C \doteq 400$$

$$\therefore F_{\infty} = 48\left(\frac{0.02}{3.7}\right)^{1/2} = 3.5 > 2.7, \text{ USE } 3.5$$

$$F_b = 3.5(1 + 0.12 \times 400)$$

$$F_b = 172$$

$$q = \frac{2415}{121} = 20.0$$

$$\therefore d_r = \left(\frac{20^2}{172}\right)^{1/2} = 1.52 \text{ Ft.}$$

WHERE, IF $z = 1.4$, $d_c = 1.4(1.52) = 2.1$ Ft.

IF $z = 2.5$, $d_c = 2.5(1.52) = 3.8$ Ft.

AND WITH F.S. = 1.5,

$$d_c = 1.5(2.1) = 3.2 \text{ Ft.}$$

$$d_c = 1.5(3.8) = 5.7 \text{ Ft.}$$

IN THIS REACH, THE MAXIMUM SCOUR POTENTIAL OCCURS AT CROSS SECTION 53,

$$d_s = 5.7 - 3.7 = 2.0 \text{ Ft.}$$

<u>REACH 4: EASTERLY CONFLUENCE TO SUMMER TRAIL</u>

FROM FIELD DATA, INVERT SLOPE BETWEEN CROSS SECTIONS 52 & 43,

$$S_o = \frac{2732.1 - 2704.7}{1695} = 0.016$$

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FROM THE HEC-2 ANALYSIS RESULTS,

$Q = 2675$ CFS
$d = 3.8$ Ft. (AVE.)

$$\therefore \frac{d}{d_{50}} = \frac{3.8}{0.02} \doteq 190$$

FROM FIG 6.5, FOR $S = 1/2 S_0 = 0.008$

$C \doteq 800$

$$\therefore F_{bo} = 48\left(\frac{0.02}{3.8}\right)^{1/2} = 3.5 > 2.7, \text{ USE } 3.5$$

$$F_b = 3.5(1 + 0.12 \times 800) = 340$$

$$q \doteq \frac{2675}{121} \doteq 22.1 \qquad \text{(CROSS SECTION 46)}$$

$$\therefore d_r = \left(\frac{22.1^2}{340}\right)^{1/2} = 1.20 \text{ Ft.}$$

~~WHERE~~, IF $Z = 1.4$; $d_c = 1.4(1.20) = 1.7$ Ft.
IF $Z = 2.5$; $d_c = 2.5(1.20) = 3.0$ Ft.

FOR F.S. = 1.5,

$d_c = 1.5(1.7) = 2.6$ Ft.
$d_c = 1.5(3.0) = 4.5$ Ft.

MAX. SCOUR POTENTIAL,

$d_s = 3.8 - 4.5 = 0.7$ Ft.

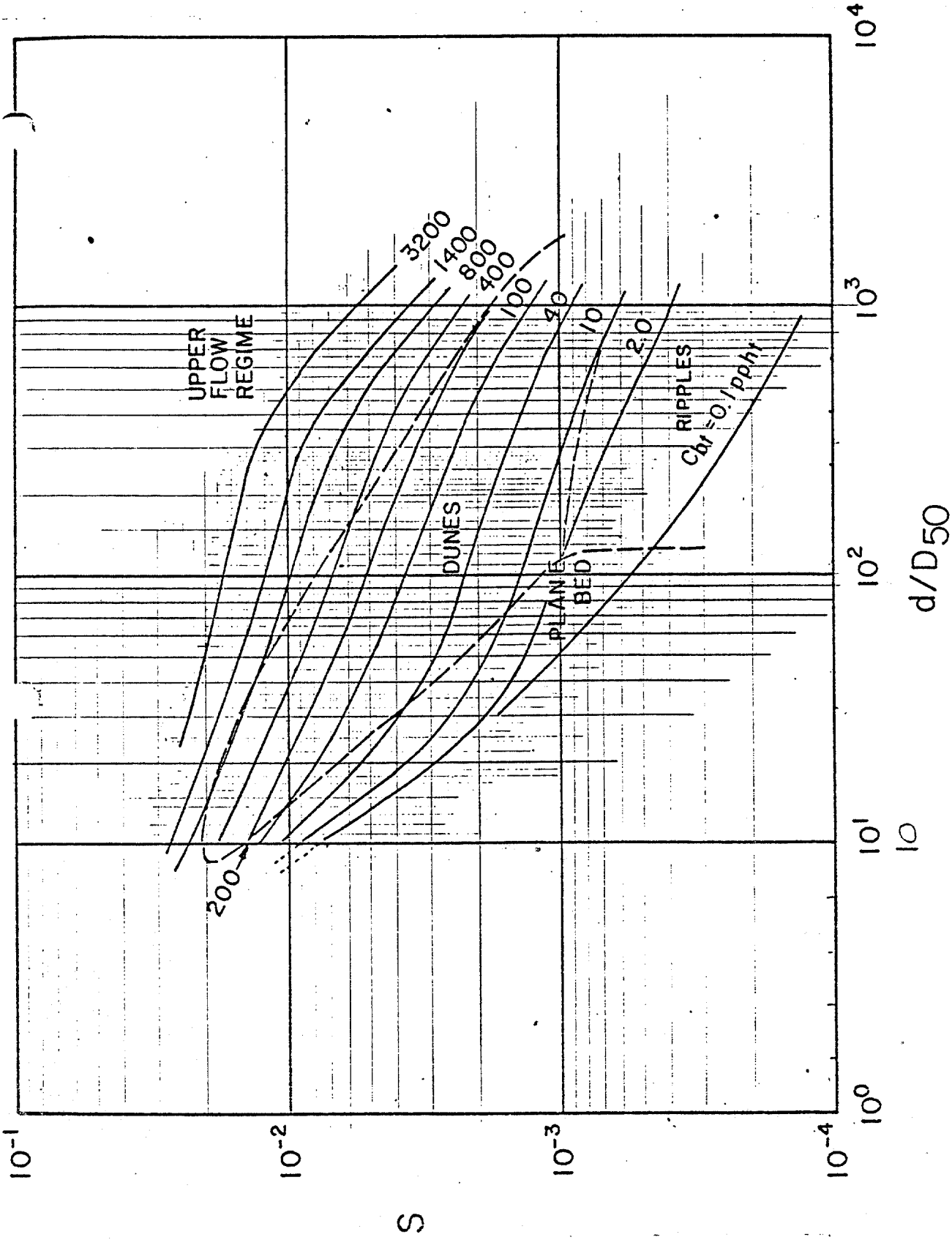

FIGURE 6.5

S–d/D_{50} RELATION FOR FLOW IN ALLUVIAL CHANNELS AT VARIOUS VALUES OF C_{bt} (AFTER COOPER, PETERSON BLENCH REFERENCE)

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STRAUBS "CLEAR WATER" SCOUR EQUATION

STRAUBS SOLUTION TO THE LONG CONTRACTION ASSUMES THAT SCOUR OCCURS UNTIL THE BED SHEAR STRESS IN THE LONG CONTRACTION HAS BEEN REDUCED TO THE CRITICAL SHEAR STRESS.

$$\frac{Y_2}{Y_1} = \left(\frac{W_1}{W_2}\right)^{6/7}\left(\frac{\tau_1}{\tau_c}\right)^{3/7}$$

REACH 1 - SNYDER RD. TO CONFLUENCE OF WESTERLY AREA

CROSS SECTION 84: $Y_1 = 3.48$ Ft.; $W_1 = 174$ Ft.; $S_{f_1} = 0.0158$

$\therefore \tau_1 = 62.4(3.48)(0.0158) = 3.4$ psf

CROSS SECTION 83: $Y_2 = 3.07$ Ft.; $W_2 = 87$ Ft.; $S_{f_2} = 0.0363$

$\therefore \tau_2 = \tau_c = 62.4(3.07)(0.0363) = 6.95$ psf.

FROM WHICH; $\frac{Y_2}{Y_1} = \left(\frac{174}{87}\right)^{6/7}\left(\frac{3.4}{7}\right)^{3/7} = 1.34$

$Y_2 = 1.37(3.48) = 4.66$

$\therefore$ $d_s = 4.66 - 3.48 = 1.6$ Ft.

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REACH 2: WESTERLY AREA CONFLUENCE TO SUMMER TRAIL

CROSS SECTION 81: $Y_1 = 6.6$ ft ; $W_1 = 122$ ft ; $S_{f_1} = 0.0076$

$\therefore \tau_1 = 62.4(6.6)(0.0076) = 3.1$ psf

CROSS SECTION 80: $Y_1 = 5.7$ ft ; $W_1 = 62$ ft ; $S_{f_2} = 0.0197$

$\therefore \tau_2 = \tau_c = 62.4(5.7)(0.0197) = 7.0$ psf

FROM WHICH:

$$\frac{Y_2}{Y_1} = \left(\frac{122}{62}\right)^{6/7}\left(\frac{3.1}{7}\right)^{3/7} = 1.26$$

$Y_2 = 1.26(6.6) = 8.32$ ft.

$\therefore$ $d_s = 8.32 - 6.6 = 1.7$ ft.

REACH 3: SNYDER RD. TO EASTERLY CONFLUENCE

NO CHANNEL CONSTRICTIONS IDENTIFIED.

REACH 4: EASTERLY CONFLUENCE TO SUMMER TRAIL

CROSS SECTION 51: $Y_1 = 3.76$ ft. ; $W_1 = 156$ ft ; $S_{f_1} = 0.0209$

$\therefore \tau_1 = 62.4(3.76)(0.0209) = 4.9$ psf.

CROSS SECTION 50: $Y_1 = 3.99$ ft. ; $W_1 = 89$ ft ; $S_{f_1} = 0.0143$

$\therefore \tau_2 = \tau_c = 62.4(3.99)(0.0143) = 3.6$ psf

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SINCE $\tau_c < \tau_1$,

$$\frac{Y_2}{Y_1} = \left(\frac{156}{89}\right)^{6/7}\left(\frac{4.9}{3.6}\right)^{3/7} = 2.2$$

$$Y_2 = 2.2(3.76) = 8.27 \text{ ft.}$$

$$d_s = 8.27 - 3.76 = 4.5 \text{ ft.}$$