SUPERSTITION FREEWAY
COMPREHENSIVE OFFSITE DRAINAGE PLAN

February, 1987

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Prepared for:

TUDOR ENGINEERING COMPANY
3030 North Central Avenue
Suite 401
Phoenix, Arizona 85012

Prepared by:

A-N WEST, INC.
4120 North 20th Street
Phoenix, Arizona 85016

A-N West Job Number 7005

Registered Professional Engineer (Civil)
CERTIFICATE NO. 17744
LARRY STEVEN MILLER
Date Signed 2-9-87
ARIZONA, U.S.A.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 14395
R. LARRY MORSE
Date Signed 2-9-87
ARIZONA, U.S.A.

MARICOPA COUNTY SPEEDLETTER

FILE No.

TO JJT

FROM HSK

SUBJECT SUPERSTITION FREEWAY OFF SITE DRAINAGE

DATE 11/23/87

MESSAGE

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SIGNED

REPLY

SIGNED

DATE

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Registered Professional Engineer (Civil) CERTIFICATE NO. 17711 LARRY STEVEN MILLER Date Signed 3-9-87 ARIZONA, U.S.A.

Registered Professional Engineer (Civil) CERTIFICATE NO. 14395 R. LARRY MORSE Date Signed 3-9-87 ARIZONA, U.S.A.

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SUPERSTITION FREEWAY

OFFSITE DRAINAGE STUDY

INTRODUCTION

This report was prepared by A-N West, Inc. under contract for services with Tudor Engineering (Contract No. 86-35). The project is known as the Superstition Freeway Comprehensive Offsite Drainage Plan. This study was initiated to provide a wholistic approach to the offsite freeway drainage from Power Road to U.S. 60. Three separate design consultants have responsibility to design collection and distribution systems to handle the offsite and onsite drainage. The three reaches are: Power Road to Ellsworth, Ellsworth to Ironwood, and Ironwood to U.S. 60. The study is limited to existing conditions for the 100- and 50-year storm events. The existing development runoff condition was chosen because it represented a definable worst case scenario for much of the study area. Three factors influenced this decision. First, this area is developing very rapidly and zoning and development densities are being changed continuously. Second, the City of Mesa and City of Apache Junction are annexing the area continuously. Third, each of the four jurisdiction agencies have their own retention policy (see Appendix A). Maricopa county and the City of Mesa have retention ordinances which will limit runoff from developing parcels to at or below present conditions. Currently, Pinal County has no retention ordinance and the City of Apache Junction has a 10-year 24-hour retention policy for developments of more than one single home.

Contractor

3 Phases

Storm EVENTS

3 FACTORS for This

Because a majority of the study area is influenced by Maricopa County and the City of Mesa, and the inability to determine under which policy a parcel of land will be developed, the existing condition was chosen. Existing floodplain limits for the 50- and 100-year storm events at the north and south rights-of-way were established to insure that the hydraulic structures recommended to pass offsite drainage under the freeway did not adversely impact existing floodplain limits.

History:

Due to recent flooding conditions within the study area, the Flood Control District of Maricopa County contracted with A-N West, Inc. in 1984 to produce an Area Drainage Master Plan for the 68-square miles containing this section of the Superstition Freeway. The Master Drainage Plan Report was completed in January, 1987 and a copy of the developed master plan is provided in Appendix B.

One of the significant flooding events in the study area occurred September 30 through October 3, 1983. Floodwaters rose as existing channels and street capacities were exceeded, damaging and flooding many residences in the developed portions of the study area.

Again, on July 17-18, 1984, the study area was subjected to localized flooding as a result of runoff from an intense rainstorm. The rainstorm was centered near University Drive and the Central Arizona Project (CAP) Canal and produced rainfall intensities in excess of the 100-year point precipitation values. According to the Flood Control District of Maricopa County (FCD), the partially completed Signal Butte Floodway and CAP Canal effectively reduced the peak flows from the storm event through retention of almost 200 acre-feet of water before embankment failures occurred (see Report on Flooding in Eastern Maricopa County, July 17-18, 1984, Flood Control District of Maricopa County, November 15, 1984). In some areas, three to four feet of water ponded and flows were estimated as high as 2,500 cfs.

In 1981 the City of Apache Junction initiated a hydraulic investigation to determine management recommendations for the Weekes Wash floodplain. The study concluded that for the FEMA 100-year discharge of 6,680 cfs (D.A. = 10.6 square miles), 18% of the flow (1,200 cfs) breaks out of the Weekes Wash channel and flows to the southwest. The remaining 5,488 cfs continued to the south in the Weekes Wash channel. These breakout flows appear to reach the CAP just north of the Freeway alignment. Weekes Wash

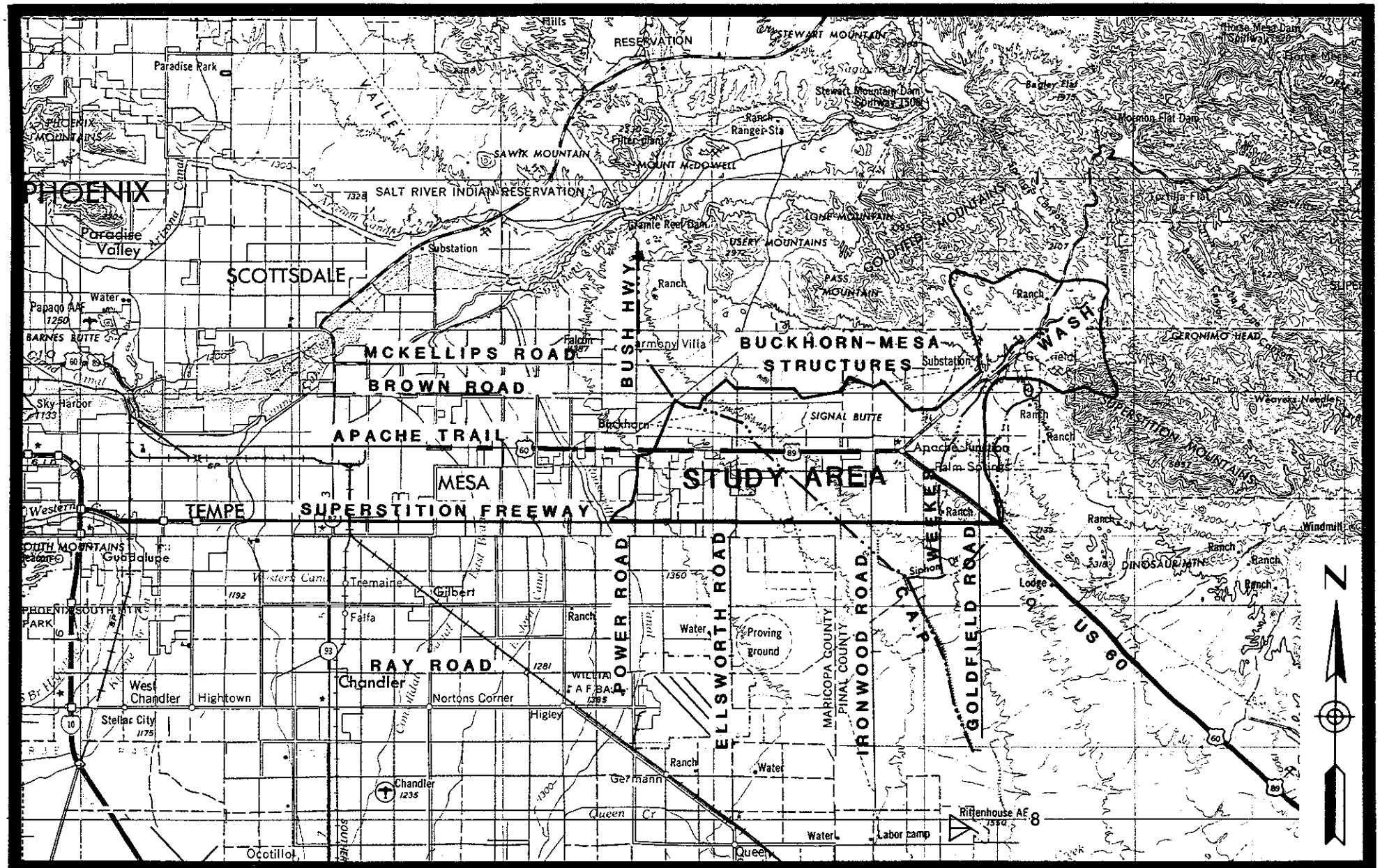
Numerous additional studies relating to the hydrology of the study area have been completed and a majority of them are referenced in Appendix C. Published reports were received and read. Unpublished information from SCS concerning the proposed Weekes Wash Dam and the Powerline Dam analysis (1985) was used to model the Weekes Wash watershed above the Superstition Freeway right-of-way (see Appendix D, Weekes Wash Basin Analysis - Backup Material). WW

STUDY AREA BOUNDARY

The study area for the Superstition Freeway Comprehensive Drainage Plan is bounded on the north by the Soil Conservation Service (SCS) Buckhorn Mesa flood control structures and the Weekes Wash northern drainage boundary. It is bounded on the east by the Siphon Draw western drainage boundary at approximately one-half mile east of Goldfield Road and on the south by the south right-of-way of the Superstition Freeway (SR 360). The western boundary is Power Road (see Figure 1, Location Map).

The study area is divided into three design reaches. Reach I is from Power Road to Ellsworth, Reach II is from Ellsworth to Ironwood Road, and Reach III is from Ironwood to U.S. 60.

In Reach I, there are two municipal jurisdictions, the City of Mesa and Maricopa County. In Reach II, there are three municipal jurisdictions, Maricopa County, the City of Apache Junction, and Pinal County. Reach III has three municipal jurisdictions, Pinal County, the City of Apache Junction, and the upper Weekes Wash drainage area is in Maricopa County.



SCALE: 1"=4 MILES

LOCATION MAP

FIGURE 1

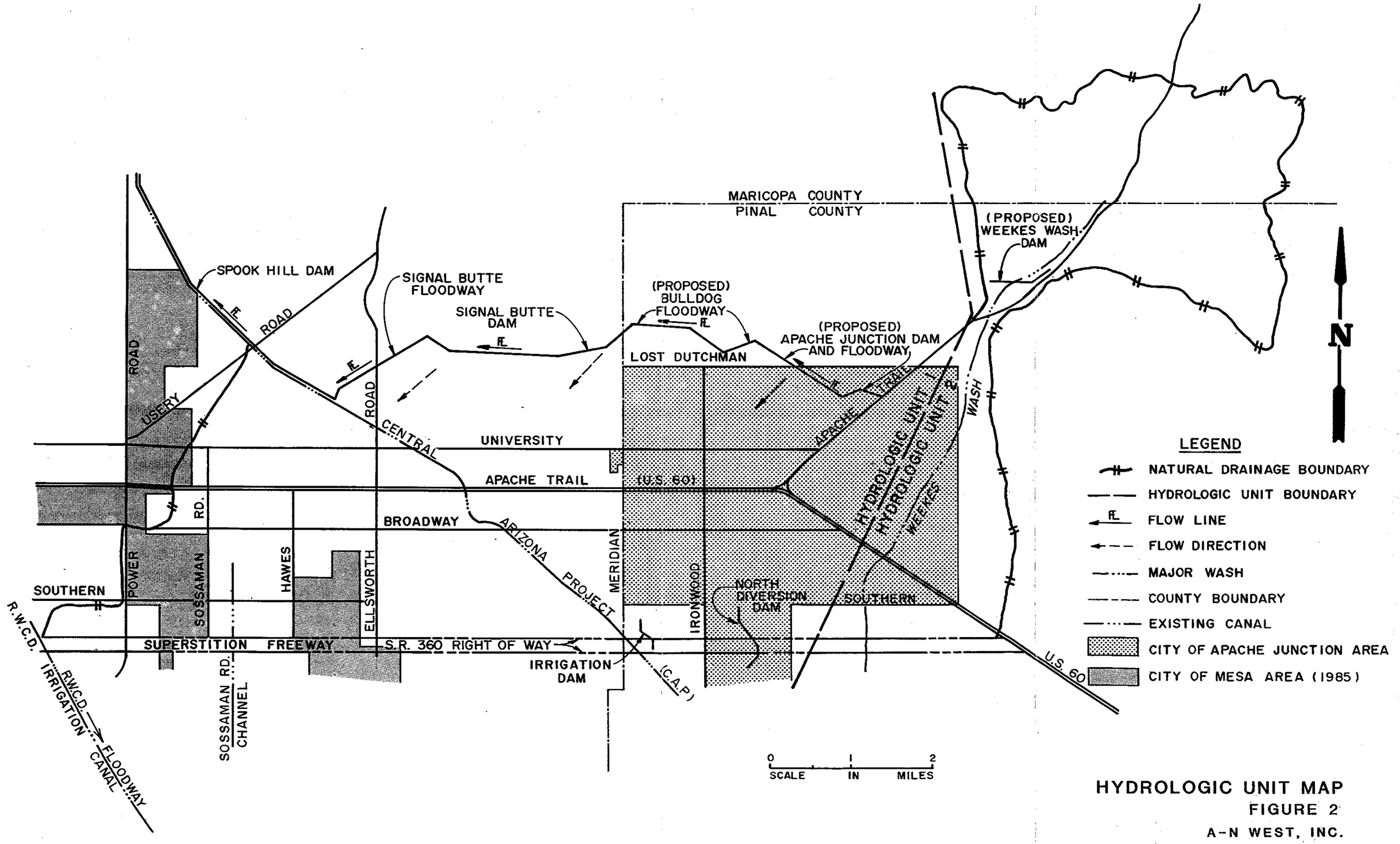
A-N WEST INC.

GENERALIZED WATERSHED DESCRIPTION

The watershed is located in east Maricopa County and northwest Pinal County between the Salt and Gila Rivers.

The study area contains two markedly different hydrologic units as shown on Figure 2. Hydrologic Unit 1 (western) is generally characterized by uniform slopes of less than two percent from northeast to southwest, hydrologic soil type B (see Figure 7 - Hydrologic Soils Map), man-made structures that effect natural stormwater runoff patterns, and natural drainage systems consisting of numerous small discontinuous shallow, braided washes of limited capacities with intermittent sheetflow areas. The runoff patterns in Hydrologic Unit 1 are typical of developments on alluvial fans in the arid southwest where the continuity of natural stormwater conveyance has been of little or no importance. The eastern quarter of this unit is less developed and has more defined drainage patterns, however, braided channels still predominate. About two-thirds of this unit is urbanized. Higher density urbanization occurs in the western area and decreases eastward. At the present time, this area is one of the fastest growing areas in the State of Arizona. Large developments are being built continuously.

Hydrologic Unit 1 contains area in all four municipalities. The western part of this unit is in either the City of Mesa or Maricopa County (see Figure 2, Hydrologic Unit Map). New developments in the City of Mesa are to provide stormwater retention of the runoff associated with the 50-year, 24-hour storm. Developments in Maricopa County are to provide retention for the increase in runoff due to the development for the 100-year, 2-hour storm unless the development requests water or sewer services from the City of Mesa, in which case the development must provide City of Mesa retention volumes. The City of Mesa is currently acquiring private water companies and annexing the area in Maricopa County. The eastern part of this unit is in either Apache Junction or Pinal County. For developments in the Apache Junction (east of Meridian Drive) area, the runoff from the 10-year, 24-hour storm is to be retained. This does not apply where a single home is constructed. In this case, no retention is required. The City of Apache Junction was incorporated in 1978 and has only recently been enforcing their retention policy. Most of the residential development is single home



HYDROLOGIC UNIT MAP
FIGURE 2
A-N WEST, INC.

construction and therefore, only limited retention is being provided. Pinal County currently has no retention policy.

Development above the Central Arizona Project typically consists of single family residences on medium to large lots and numerous trailer and recreational vehicle parks typically having small lots.

Most of the area between the CAP and Sossaman Road is developed in trailer parks with residential small lots.

The area between Sossaman Road and the RWCD Canal has been developed into planned area developments consisting mainly of single family homes. These are typically large-scale developments incorporating residential, commercial, multi-family, and recreational land uses.

The major structures in Hydrologic Unit 1 which have an effect on the natural drainage patterns of the area are the Central Arizona Project Aqueduct, Apache Trail (U.S. 60), the Sossaman Road Channel, the North Diversion Dam, the irrigation dam near Meridian, and the Superstition Freeway. Existing roads and streets in the study area are designed to pass runoff across the road in approximately the natural drainage path using roadway dip sections. Very few culverts exist in the study area except along Apache Trail (U.S. 60). STRUCTURES

The ultimate stormwater outlet for the study area is the RWCD floodway currently being designed and built by the SCS. It is scheduled to be completed to the Superstition Freeway by the end of 1989 and completed in total by the end of 1990. These dates are subject to change due to changes in appropriations and priorities by the Soil Conservation Service. RWCD

Hydrologic Unit 2 (eastern) is generally characterized by headwater slopes of up to 30 percent, and lower basin slopes of 2 percent or less. Weekes Wash, the only large wash in this unit, has a drainage area at the Superstition Freeway of about 12 square miles. There are several other well-defined washes with drainage areas of less than 2.5 square miles (see Figure 6, HEC-1 Schematic). All of the washes in Hydrologic Unit 2 discharge into the Powerline Dam, two miles south of the Superstition Freeway. UNIT 2

Except the area along Weekes Wash below Apache Trail, the area is characterized by indulating ground surfaces with gulleys 5 to 15 feet deep, 30 to more than 100 feet wide, and longitudinal slopes of one percent and greater. The runoff potential for this unit is extremely variable; all four hydrologic soil types are found in this unit (see Figure 7 - Hydrologic Soils Map). There are significant amounts of rock outcroppings with high runoff potential and very pervious sandy bottom washes with low runoff potential. Washes are generally sandy bottomed with vegetation reducing runoff carrying capacities.

The unit is generally undeveloped in the upland areas above Lost Dutchman Road (3½ miles north of the freeway). The development between U.S. 60 and Lost Dutchman Road is mainly clusters of homes built on high ground between washes. Streets and arterials are built to allow stormwater runoff to flow over the roadways in dip sections. Therefore, the developments in this area have only a small effect on the natural runoff conditions.

Developments below U.S. 60 have regraded the developed property and have significantly altered the natural drainage patterns. For example, Weekes Wash above U.S. 60 is in it's natural channel. It has been channelized between two developments from U.S. 60 to Southern and is typically overland flow below Southern because the channelization has rerouted it away from it's natural course. W.W.

STUDY APPROACH

The study area was modeled using the U.S. Army Corps of Engineers Hydrology Computer Model HEC-1 Flood Hydrograph Package (January, 1985). Two computer models with two of the analysis techniques available in the HEC-1 computer program (the Kinematic Wave and the SCS - Storage Routing Procedures) were used to simulate the two distinct hydrologic units in the study area.

Because of these two distinct hydrologic units (see Figure 2), two types of analyses were used in evaluating runoff in the study area. The Kinematic Wave runoff and routing procedures were developed to evaluate the stormwater runoff from urbanized areas. Overland flow from property adjacent to streets, street gutter flow, and major stormwater collectors are the Kinematic Wave input parameters used to simulate runoff from developed areas.

Most of the area in Hydrologic Unit 1 is currently or is in the process of being developed so the Kinematic Wave analysis was used to model this area. The SCS curve number method was used to transform rainfall to runoff. This same analysis was also chosen by the Flood Control District of Maricopa County to analyze the runoff characteristics of this area for their Area Drainage Master Plan Study (1984-1986).

Hydrologic Unit 2 is sparsely developed and is characterized by natural drainage conditions. The Soil Conservation Service (SCS) curve number lag time method of runoff analysis and the modified puls storage routing method were used to simulate runoff from this area. The SCS curve number transforms the rainfall increment to a runoff quantity and the lag time displaces the runoff timewise. These two characteristics were evaluated for each sub-basin. Storage routing methods are typically used when overbank flow is significant, when very large or long channels are used to transport stormwater, or when routing flows through reservoirs. Typically, washes in this area have small low flow channels. During larger flood events flows are also in the overbank areas. The SCS modeled the Weekes Wash drainage in the fall of 1985 and used similar analysis techniques in their TR-20 hydrologic model.

Weekes Wash is the major wash in this Hydrologic Unit. Because of the indication of breakout flows from Weekes Wash influencing the runoff in the

eastern portion of Hydrologic Unit 1 (ref. 18), a detailed analysis was performed. Results of this analysis are presented under the Weekes Wash Analysis section.

Modeling Assumptions:

In modeling Hydrologic Unit 1, the following assumptions were made:

1. All the SCS Buckhorn-Mesa flood retarding structures from Power Road to Apache Trail were in place and provide 100-year flood protection. These structures are currently in place, under design or being constructed. The projected completion date for all the Buckhorn-Mesa flood retarding structures except Weekes Wash Dam is July 1989,

2. Apache Trail (U.S. 60) did not alter runoff patterns and the numerous culverts under Apache Trail had 100-year capacity (see Appendix E). The Buckhorn-Mesa structures have significantly reduced the drainage areas to these culverts,

3. HEC-1 kinematic wave subroutine adequately represented the routing characteristics of the runoff occurring in the subareas, and

4. Excepting the four CAP overchutes effected by the Weekes Wash breakout (see Appendix E), the CAP overchutes functioned is designed and passed concentrated flows without altering the runoff hydrograph (i.e., minimal ponding and detention at overchutes).

In modeling Hydrologic Unit 2, the following assumptions were made:

1. U.S. 60 did not significantly alter the runoff pattern, excepting at Weekes Wash, and the culverts had 100-year capacity (see Appendix E), flows in excess of the culvert capacity weir across the roadway and tend to re-enter the original wash system by the time the flows reach the freeway corridor,

2. The flow distribution at the Weekes Wash breakout could be estimated by the normal depth analysis using a constant water surface elevation (see Appendix E), across the cross section,

3. The proposed SCS Weekes Wash Dam (Buckhorn-Mesa flood control structure over Weekes Wash) was not constructed (see Appendix E) ,

4. Excepting Weekes Wash, existing washes had 100-year capacity (see Appendix E), and

5. Stormwater runoff enters and passes through developments similar to the natural condition.

6 Flows for both the 50-year and 100-year stormwater runoff events were generated for use in the study. The 50-year peak flows were used to size culverts under the freeway. Fifty year flows through the culverts were not supposed to surcharge the culverts. The 100-year 24-hour peak flow was used to define the floodplain limits at the freeway rights-of-way and the 100-year 24-hour volumes were used to size the detention basins.

7. The HEC-1 computer models were oriented to model the 100-year, 24-hour flood event. The 100-year, 24-hour storm was used for consistency with the Soil Conservation Service RWCD Floodway design storm. The 24-hour duration would also produce a reasonable worst case volume for detention facility design. The 2- and 50-year rainfall-runoff events were also computed with the same model, only changing the precipitation volume and the Weekes Wash breakout hydrograph. Detailed printouts for the 100- and 50-year events have been given to ADOT.

8. Channels were designed for subcritical flow to eliminate the hazard of underestimating required flow depths due to a change in flow regime. Also, the need for energy dissipaters at entrances to basins and or subcritical channels is eliminated.

PRECIPITATION DATA

Typically, there are two seasonal precipitation patterns that cause flooding in the study area. The summer thunderstorm or monsoonal rains are short in duration and produce high intensity rainfall. They consist of sporadic showers and cloud bursts over small areas. The variable winter low pressure rains are of longer duration and produce lower intensity rainfall.

All precipitation values used in the study were interpreted form the U.S. Department of Commerce's publication entitled "NOAA Atlas No. 2, Precipitation - Frequency Atlas of the Western United States, Volume VIII - Arizona", dated 1973. The NOAA Atlas gives precipitation values for return intervals of 2, 5-, 10-, 25-, 50-, and 100-year for 6- and 24-hour durations. Procedures used to determine precipitation values for various return interval storms and rainfall durations based on the NOAA Atlas are outlined in the ADOT publication entitled "Addendum to Hydrologic Design for Highway Drainage in Arizona" dated April, 1975. These procedures were used to generate the following rainfall values used in the study.

TABLE 1

Precipitation Values

24-HOUR

RETURN INTERVAL (years)	POWER ROAD TO NORTH DIVERSION DAM SECTION	NORTH DIVERSION DAM TO U.S. 60 SECTION
2	1.35	1.70
50	3.20	3.65
100	3.65	4.03

The SCS Type II rainfall distribution was used by the HEC-1 computer program in computing all rainfall-runoff relationships. The derivation of the Type II distribution is in Appendix F. The Type II distribution is a dimensionless rainfall distribution based on U.S. Weather Bureau technical

papers. The Type II rainfall distribution is used for the State of Arizona for areas less than 400 square miles, rainfall durations up to 24-hours, and return intervals of 1 to 100 years. Calculation sheets are in Appendix F.

WEEKES WASH ANALYSIS

In 1981 the City of Apache Junction initiated a hydraulic investigation to determine management recommendations for the Weekes Wash floodplain. The study concluded that for the FEMA 100-year discharge of 6,680 cfs, 18 percent of the flow (1,200 cf) breaks out of the Weekes Wash channel and flows to the southwest. Because these breakout flows appear to reach the CAP just north of the Freeway alignment, a detailed analysis of Weekes Wash was performed to quantify breakout flows.

A HEC-1 computer model of the Weekes Wash watershed above SR-360 was developed to determine the appropriate breakout hydrograph. The HEC-1 model was chosen for consistency with the Superstition Freeway and Eastern Maricopa County Area Drainage Master Study computer analyses.

Reason for HEC-1 Use

The Kinematic Wave runoff and routing analysis procedure is not applicable to the Weekes Wash watershed so the SCS curve number lag time runoff analysis and the modified Puls routing method were used to simulate runoff from this area.

HEC-1 Method

Drainage boundaries were defined using the USGS 7.5 minute quadrangle maps (Apache Junction and Goldfield). The upper Weekes Wash watershed (above Lost Dutchman Road) was divided into 7 drainage areas according to the 1985 SCS TR-20 analysis of the watershed. The drainage areas of the subareas for the two studies compare for these subareas (6, 8, 10, 12, and 14). The HEC-1 subareas 16 and 18 are larger than the TR-20 subareas because the HEC-1 analysis has a concentration point 1,200 feet south of the proposed Weekes Wash Dam location. The HEC-1 total drainage area (1,000 feet south of dam) is 9.78 square miles while the TR-20 indicates D.A. = 8.73 square miles at the dam location.

Area Diferences

HEC-1 subbasin lag time was also correlated with the TR-20 subbasin time of concentration (T_c) using Lag=0.6 T_c.

TC

Curve numbers for the HEC-1 subarea were determined independently of the TR-20 analysis, however, the TR-20 analysis curve numbers (before the 24-hour

CN USED

reduction) are almost exactly the same as those generated for the HEC-1 analysis.

The HEC-1 program is sensitive to the calculation interval used in the program. Since the estimated time of concentration for the Weekes Wash above SR 360 was approximately one hour, a Δt=0.05 hours (3 minutes) was used to get a good resolution of the hydrograph. Inc. Time.

It was found during the review of the draft report that the HEC-1 model makes an unrealistic assumption that the total rainfall must fall within the simulation period when that interval is less than the duration of the rainfall distribution curve input in the model. For simulation periods that exceed the duration of the rainfall distribution curve, the total rainfall is distributed over the rainfall distribution curve duration time.

The HEC-1 computer model as distributed by the U.S. Army Corps of Engineers has a program limitation of 300 computational ordinates. Therefore, at a Δt = .05 hours, the maximum simulation period is 15 hours.

The HEC-1 model, therefore, will distribute the precipitation over only the 15 hour simulation period instead of the intended 24-hour, effectively increasing the incremental rainfall intensity and producing higher peak flows. After consulting with the corps of Engineers HEC staff, the computer model for this reach of the offsite drainage was adjusted by A-N West to account for this quirk of the HEC-1 computer model.

The HEC-1 program generated a 100-year 24-hour peak discharge of about 10,100 cfs just above Lost Dutchman Road. This represents a 48 percent increase in the 1982 FEMA 100-year discharge of 6,840 (D.A. = 9.37). Peak Comp to FIRM

This flow appears to be contained in the channel and overbank areas near this location (see cross sections in Appendix D). This flow begins to break out to the west into Palm Wash and to the east to East Weekes Wash between Scenic Street and 4th Avenue. (see cross-sections and flood distribution map in Appendix D). Breakout flow into Palm Wash eventually reaches the SR 360 alignment west of Meridian Road after being distributed by the CAP overchutes. About 3,850 cfs or 45 percent of the 100-year flow breakouts out of Weekes Wash into Palm Wash. The Weekes Wash and East Weekes Wash flows recombined downstream of 4th Avenue and continue to the south to U.S. 60. Breakout

Six cross-sections were used to determine the flooded area between Superstition Boulevard and 4th Avenue. These cross-sections were determined from the 400 scale, 4 foot contour interval FEMA mapping. Sup. BLVD & WW

The effect of U.S. 60 on the Weekes Wash flows was evaluated using the same 4 foot contour interval mapping and the ADOT "as-built" drawings of U.S. 60 near Weekes Wash. The analysis sheets for developing the rating curve are in Appendix D (Figure D-1). Essentially, the 100-year 24-hour Weekes Wash flow (4,250 cfs) passes through the U.S. 60 bridge (2,000 cfs), through the 2 culverts (250 cfs) under U.S. 60, weirs over Tomahawk Street (885 cfs) about 1.95 feet deep to the east and weirs over U.S. 60 (1,100 cfs) about 1.95 feet deep. U.S. 60 & WW

The effect of the proposed Weekes Wash Dam was also evaluated using the HEC-1 model. The 100-year discharge from the uncontrolled drainage area below the dam at the freeway was approximately 2,000 cfs. Therefore, the minimum effective discharge from the proposed dam would also be about 2,000 cfs. The implementation of the dam did reduce the Weekes Wash breakout significantly. However, after an in-depth review of land ownership and mining claims, the expense of acquiring the land for the Weekes Wash Dam appeared to be grossly prohibitive. Dam Effect

US 60 Bridge	2000 CFS
2 - Culverts	250
Weirs over Tomahawk	885
Weirs over U.S. 60	1100
Total	4,235 CFS.

HYDROLOGIC AND HYDRAULIC ANALYSIS BY REACH

POWER TO ELLSWORTH ROAD - REACH 1

Hydrologic Analysis:

Computer Modeling - The HEC-1 computer model was used to evaluate stormwater runoff from the large drainage areas contributing to this reach of SR 360. The Kinematic Wave runoff and routing procedure was used to determine offsite runoff because of the high degree of development in this area.

The reach was divided into seven concentration points (1-4 and 6-8) to determine existing flow conditions. The discharges associated with each of these concentration points are tabulated on the Figure 3 - Superstition Freeway Offsite Drainage, Power Road to Ellsworth, Sheet 1 of 3.

A split flow occurs in the watershed at the intersection of Broadway and Hawes Roads (see Figure DIV21 5, HEC-1 Schematic). A portion of the flow at that intersection splits out to the west, while the majority of the flow goes to the south along Hawes Road. Other than this split flow, the watershed generally runs off from northeast to southwest to mile streets which tend to concentrate the flow to the south.

One quarter mile east of Sossaman Road the Sossaman Channel collects flow from one-half mile north of Southern to the south. The design discharge for the Sossaman channel at Baseline is estimated by the Flood Control District of Maricopa County to be 3,200 cfs. This will be used as the maximum peak discharge allowable in the channel.

There is an existing channel along the Superstition Freeway south right-of-way between Ellsworth and the Sossaman Channel. This channel presently collects overland flow crossing the SR 360 right-of-way and carries flows to the Sossaman channel.

The three existing channels between Sossaman and Power Roads are at one-quarter and one-half mile west of Sossaman Road and along Power Road. These three channels flow into an earth-lined channel which eventually flows through the existing 2BBL- 10 x 6 RCB culvert under Power Road which flows into the existing ADOT channel along the north side of the existing portion of the Superstition Freeway. According to the Design Report for the

Superstition Freeway (Val Vista to Power Road section), this culvert was designed to pass 1,575 cfs under super critical flow conditions. (See Appendix H, Culvert Hydraulics Analysis sheets.)

The HEC-1 model schematic diagram is provided on Figure 5 and the computer input and output is in Appendix J.

SCS Method - The SCS method of developing discharges was used in this study for small drainage areas contributing directly to the SR 360 right-of-way. The Ellsworth to Power Road reach is typified by overland flow and very shallow channel flow. Because there are no definable washes in this reach, the SCS method was not used.

Hydraulic Analysis:

Floodplain Analysis - The Superstition Freeway is generally depressed throughout this reach and, therefore, a pass through drainage alternative is not feasible. A depressed collection channel concentrating stormwater flow between Ellsworth and Sossaman channel was the only feasible alternative. Since the depressed channel section will be designed to cause no backwater up existing washes, no floodplain analysis was required for the Ellsworth to Power Road reach.

Offsite Drainage System Alternatives - Because of the depressed freeway profile, the only feasible offsite drainage concept is to collect all runoff entering the right-of-way east of the Sossaman Channel and transport it to the Sossaman Channel and for flows entering the right-of-way between the Sossaman Channel and Power Road to be outlet into the the existing ADOT offsite drainage channel west of Power Road.

Peak flows in the Sossaman Channel below the Freeway's south right-of-way channel (Ellsworth to Sossaman Channel) would have a 100-year discharge of approximately 4,100 cfs, exceeding the Sossaman Channel capacity (3,200 cfs). Currently a significant amount of runoff from east of Ellsworth flows in this earthen channel along the south right-of-way and enters the Sossaman Channel (±1,000 cfs). In order to regulate flows into the Sossaman Channel to the design capacity, it is recommended that detention be provided on the east side of Ellsworth Road to eliminate the flows from east of Ellsworth flowing to the west along the south right-of-way channel. There is insufficient room along the south right-of-way to provide enough in-channel storage to reduce

flows to an acceptable level to allow them to enter the already at capacity Sossaman Channel. Also, the relief of the land precludes off-channel storage from draining by gravity back to the Sossaman Channel in the south right-of-way channel. Therefore, the flows from east of Ellsworth Road should be incorporated into the detention basin being proposed in the Reach II drainage plan (see Reach II - Hydrology, Ellsworth to Ironwood).

The 2BBL 10 X 6 box culvert under Power Road was designed to pass 1,575 cfs flowing supercritical. If the approach channel is at a supercritical slope the culvert will pass more than 1,575 cfs which will overtax the existing channel west of Power Road. Therefore, it is proposed to provide out of channel storage to divert flows in excess of 1,575 cfs.

Power Rd Retention

Because of the aforementioned Sossaman and ADOT channel capacity limitations, stormwater detention will be required to limit flows to their existing capacities.

The recommended drainage concept for Reach I is to collect all flow along the Superstition Freeway north right-of-way in a depressed channel and outlet the channel into the Sossaman channel (1/4 miles east of Sossaman Road) for the area between Ellsworth and the Sossaman channel. The concept west of the Sossaman channel is to collect stormwater runoff in another depressed channel and outlet it into the existing SR 360 channel west of Power Road. This concept requires detention east of Ellsworth to limit the discharge into the Sossaman Channel to 3,200 cfs or less. A significant inflow of approximately 2,400 cfs enters the Superstition Freeway right-of-way east of Hawes Road. The 100-year discharge under Hawes Road will be limited to about 3,320 cfs. The calculated 100-year peak flow in the Sossaman Channel under the Superstition Freeway is 3,233 cfs (see detailed printout), which is approximately equal to the estimated channel capacity (see Plate I).

To limit the flow under Power Road into the existing ADOT Drainage channel to 1,575 cfs, two small out of channel detention basins are proposed (see Plate I). The 100-year flow under Power Road will be decreased to about 1,400 cfs (see detailed printout) by these two detention basins. These basins will be

constructed in the right-of-way between the ramp embankment and the north right-of-way channel. The east and west basins will need to store 11 and 16 acre-feet of water, respectively. The 11 acre-foot basin will allow only 890 cfs to pass 74th Street. The 16 acre-foot basin will only allow 1,265 cfs to pass 72nd Street.

All detention basins are designed with a low flow gravity drain culvert. A 24-inch diameter CMP should be used to outlet these basins for ease of maintenance and reasonable drain time of the basins (less than 24 hours).

ELLSWORTH TO IRONWOOD---REACH II

Hydrologic Analysis:

Computer Modeling - As in Reach I, the HEC-1 computer model was utilized to evaluate stormwater runoff from the large drainage areas contributing to Reach II of the Superstition Freeway. The Kinematic Wave runoff and routing procedure, as previously described, was utilized for all drainage areas within this reach.

Reach II was divided into 18 drainage concentration points (8 through 25) to determine the existing flow conditions. The discharges at each of these concentration points are tabulated on Figure 3 - Superstition Freeway Offsite Drainage, Sheet 2 of 3. Drainage subbasins along the eastern one-half of Reach II are affected by a breakout of floodwaters from the upper Weekes Wash drainage area (see Table E-2, CAP Overchute Discharges). The resulting impacts of this breakout are an increase in peak discharges and a substantial increase in runoff volume. The Central Arizona Project (CAP) canal drainage collection and overchute facilities will have some effect on attenuating peak discharges contributing along the freeway alignment, however, it has little to no impact on volumes of runoff reaching the proposed freeway alignment.

The HEC-1 model schematic diagram is provided in Figure 5 and the computer input and output is in Appendix J.

SCS Method - The SCS Method for developing peak discharges from a rainfall runoff event was utilized to further define small localized drainages. Discharge quantities for 8 of the 17 concentration points in Reach II were calculated using the SCS Part 1 Peak Discharge Determination Methods. The concentration points associated with the SCS manual calculation method are numbers 9, 11, 12, 14, 15, 16, 19, and 20 as shown on Figure 3 - Superstition Freeway Offsite Drainage, Sheet 2 of 3. Analysis sheets for these subareas are in Appendix G.

Hydraulic Analysis:

Floodplain Analysis - Throughout Reach II (Ellsworth to Ironwood) of the proposed Superstition Freeway alignment, peak discharges for the 50- and 100-

year return periods generally exceed the natural drainage channel capacity in the vicinity of the alignment. The resulting flow patterns are generalized by sheet flooding of 1 to 2 feet in depth with localized small channels reaching depths of up to 4 feet.

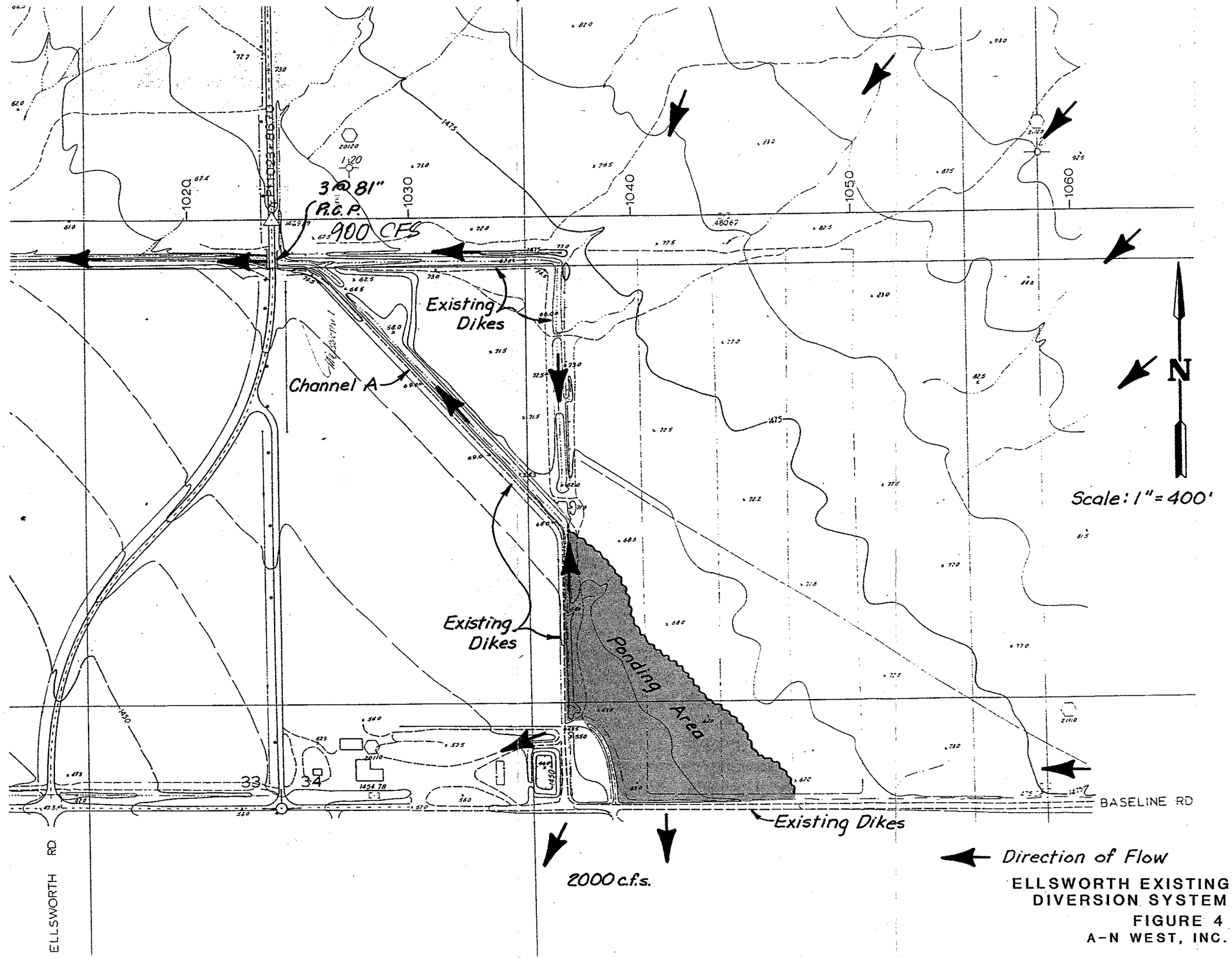
Offsite Drainage System Alternatives - The only section of Reach II of the Superstition Freeway (Ellsworth to Ironwood) currently developed is the half-mile west of Ironwood Road. The development adjacent to the south and north right-of-way is moderate. The rest of Reach II contains no development adjacent to or near the right-of-way.

Where no adjacent development has occurred, the drainageways (stream courses) are in their natural state. These drainageways exhibit ill-defined channels incapable of carrying significant quantities of floodwaters. As previously discussed, the results are shallow-sheet flooding with overland flow depths averaging 1 to 2 feet, and channel depths on the order of 2 to 4 feet during a 100-year rainfall/runoff event.

Where development adjacent to the right-of-way has occurred, watercourses have been significantly altered. Typically, the modifications to the existing drainages by the development has not provided the capacity necessary to pass a 100-year discharge.

Two significant problem areas have been identified for Reach II. The first is the Ellsworth Road/Superstition Freeway intersection area. This area is especially complicated in that there exists a system of dikes, levees, and channels to divert floodwaters to the northwest away from agricultural land and into an adjacent watershed. (See Figure 4 - Ellsworth Existing Diversion System). A brief discussion for the operation of the diversion facilities during a 100-year rainfall runoff event is as follows: 1st Problem

Concentration points 8 through 17 contribute runoff to an area south of the freeway alignment and north of Baseline Road east of Ellsworth (see Figure 4 - Ellsworth Existing Diversion System). Retention occurs behind the existing dikes at this location and ponds to the elevation which allows flow to progress westerly in Channel A as shown on Figure 4. Flows from Channel A then pass through three 81-inch (I.D.) RCP's beneath Ellsworth Road and continue westerly eventually reaching the Sossaman channel. The hydraulic analysis of this dike channel system indicates that during a 100-year storm



ELLSWORTH EXISTING DIVERSION SYSTEM

FIGURE 4

A-N WEST, INC.

event approximately 900 cubic feet per second (cfs) continues westerly beneath Ellsworth Road with the balance of approximately 2,000 cfs weiring over the diversion dike structure and heading southwesterly as exhibited on Figure 4. As discussed in Reach I, Hydraulic Analysis Section, the flow along the south right-of-way west of Ellsworth will need to be retained in a basin east of Ellsworth due to Sossaman Channel capacity limitations. Additionally, the Arizona Statewide Management Consultants, Sverdrup Corporation, has indicated that the channel conveying flows to the west along the south side of the Superstition Freeway alignment will no longer be operational with the construction of Reach I (Power to Ellsworth Road). This condition results in a need for retention of approximately 540 acre-feet of floodwaters which would have passed to the west beneath Ellsworth Road.

The second problem area exists between Signal Butte Road and Meridian Road. Drainage contributing along this mile of the Superstition Freeway alignment is inordinately high in peak and volume due to the location of drainage overchutes along the CAP channel. Between Signal Butte Road and Meridian Road, A-N West has identified five drainage concentration points numbered 18 through 22 as shown on Figure 3 - Superstition Freeway Offsite Drainage, Sheet 2 of 3. The combined 100-year peak discharge for these concentration points is in excess of 5,000 cfs. Natural drainage channels in this area are not capable of conveying significant quantities of floodwaters, therefore, sheet flooding occurs with depths of up to 2 feet for overland flow, and up to 4 feet for in-channel flow. The Weekes Wash breakout flows significantly increase the runoff volumes to this area. A description of the Weekes Wash breakout is described in detail in the section, Weekes Wash Analysis.

2nd Problem

Several drainage concepts were evaluated for Reach II and ranged from pass-through drainage to collection, retention, and metered outflows through the freeway.

Of the drainage concept alternatives considered, two concepts were analyzed. The first concept was a pass-through drainage system consisting of a series of upstream spur dikes to concentrate sheet flooding, culverts to pass flows under the Freeway, and a downstream flow distribution system to outlet concentrated flows as sheetflow. The second concept was the use of collector channels upstream of the freeway and conveyance to a retention/detention structure where the outflows could be regulated to impose minimum impacts on downstream properties.

Alternatives for 2nd Problem

Several constraints limited the use of the pass-through drainage concept throughout most of Reach II. The major constraint is as follows:

> The elimination of the south right-of-way channel along Reach I has an adverse impact on downstream properties. The increase in volume of approximately 540 acre-feet (during a 100-year storm event) will have the effect of adversely impacting the properties to the south as the system of dikes and channels will have a tendency to overtop much more frequently and pass significant flows over property where none have been observed in the recent past. Therefore, a retention facility should be incorporated into the stormwater handling concept to mitigate this increase in flooding.

The recommended drainage concept for Reach II is a combination of collection, detention/retention, and pass-through (see Plate II-1 and 2).

Concentration points 8 through 21 exclusive of the contribution of CAP overchute flows in concentration points 17 through 21 will be conveyed westerly to a detention/retention basin located either on the north or south side of the freeway alignment near the Ellsworth intersection (see Plate II-1). Two alternative detention/retention basin locations have been proposed to control these flows. Evaluation of these locations is based on ADOT 5-foot contour interval topographic mapping (1974). This topo is adequate for conceptual level evaluation, however, more detailed topographic information should be used for the design level evaluation. The advantages and disadvantages of each are as follows:

> A basin at location A ,north of the freeway alignment (see Plate II-1), has the advantage of not requiring large magnitudes of flow to be conveyed beneath the proposed Superstition Freeway. Additionally, an outfall of approximately 20 cfs can be conveyed to the Sossaman Channel system in the north side of the Superstition Freeway west of Ellsworth. These additional flows will not represent a significant impact on the peak discharges for the Sossaman Channel system. There are two disadvantages of the detention basin on the north side of the proposed Superstition Freeway. It is anticipated that the land values in this area may be higher than what they might be for location B. The same approximate land acreage is required for both basins A and B. Also, the configuration of the basin which was predicated by the land topography in

an effort to minimize non-storage excavation has the effect of dividing a relatively large usable parcel of property.

Location B, south of the freeway alignment (see Plate II-1), has the advantage that land costs may be somewhat less expensive and the disadvantage that a large structure will be required to pass the collected flows beneath the freeway into the basin. A two-tiered retention basin would be required in the Superstition Freeway right-of-way to collect stormwater runoff west of the structure under the freeway. This basin (in the right-of-way) is required to regulate flows into the Reach I collection channel west of Ellsworth. Also, the low flow gravity drain for this basin has no appropriate outfall other than an existing barditch which flows to the south along Ellsworth Road.

Solution To Prob. #1

Considering the advantages and disadvantages of the retention/detention basin as proposed in the Ellsworth area, A-N West supports Location A (above the freeway alignment) as being the most practical engineering solution for proper drainage. The basin outflow is conceptually shown on Plate II-1 as a 48-inch diameter CMP. This pipe would need a valve to restrict basin outflow during the storm event. Once the storm has passed the valve could be opened and the basin would empty in approximately 48-hours. If manually operated gates are not deemed acceptable, a 24-inch diameter outlet pipe could be used without a gate valve. However, it will take seven days to drain the basin with the smaller pipe outlet.

Solution To Prob. #2

For the section between Signal Butte and Meridian, it is proposed that two detention basins be constructed downstream of the Central Arizona Project (CAP) overchutes for the drainage contributing to concentration points 17 through 21. These detention basins will have the effect of capturing and regulating the discharges from five of the CAP overchutes and conveying these concentrated discharges beneath the proposed Superstition Freeway. Once the flows pass beneath the proposed freeway, a combination of weirs and channels are proposed to distribute the detention basin outflow to the existing washes downstream of the freeway right-of-way in a manner which would approximate the current volume each of the water courses now receives. The proposed east and west detention basins (see Plate II-2) will attenuate the 100-year peak inflows of approximately 3,500 and 3,000 cfs to outflows of approximately 1,450 and 315 cfs, respectively. Therefore, the entire volume of water which passes through the five CAP overchutes will be conveyed through the basins

with only minor seepage losses. The storage volumes for the east and west basins are 445 and 270 acre-feet, respectively. The resulting outflows are proposed to be distributed to the major water courses by a series of channels and weirs (see Plates II-1 and 2). The distribution channel can be designed North of the freeway if detailed information concerning the freeway design deems this location more acceptable. The outflow to these natural drainageways downstream of the Superstition Freeway alignment will be significantly reduced in peak, however, the volume should remain approximately the same. The analysis for these two basins are based on ADOT 5-foot contour interval topographic mapping (1974). This topo is adequate for conceptual-level evaluation. However, more detailed topographic information should be used for the design-level evaluation.

The emergency spillways were sized to pass the lesser of 20 percent of the inflow hydrograph or 50 percent of the outflow hydrograph peak. The last basin along the CAP has an emergency spillway discharge of 700 cfs at a flow depth of two feet. The west basin at the CAP has an emergency spillway discharge of 200 cfs at a flow depth of one foot.

Concentration Point No. 22 is intended to be passed through the freeway utilizing a 48-inch CMP.

Concentration Point No. ~~23~~ 23 is proposed to be collected in a small channel along the north right-of-way and conveyed beneath the freeway alignment in two 30-inch CMP culverts and into a Central Arizona Project collection channel.

Concentration Points No. 24 and 25 are proposed to be collected in a channel and routed to the location as indicated on Plate II-2 and passed beneath the proposed freeway in a 3-barrel 8 foot by 6 foot reinforced concrete box. The existing condition drainage concentrates and outlets near the proposed outlet.

Profiles for the pass through drainage culverts are provided in Appendix H.

Subsidence and earth fissuring will be of significant importance throughout Reach II of the Superstition Freeway. The geotechnical consultant for Reaches II and III, Sergent, Hauskins and Beckwith, has indicated that the area between Signal Butte Road and Meridian Drive has the greatest potential

for subsidence and fissures. The potential for subsidence and fissures is less for the other reaches of the freeway. Special consideration should be given to the design of the detention basins at the CAP and Meridian Drive (see Plate II-2). The geotechnical consultant suggested the following special considerations:

- No lining of the proposed basin,
- Provide an additional 1 foot of freeboard,
- Periodic inspection of basin for subsidence and fissures, and
- Periodic maintenance of detention basin and facilities.

IRONWOOD DRIVE TO U.S.-60 - REACH III

HYDROLOGIC ANALYSIS

Computer Modeling - The HEC-1 computer model was used to evaluate stormwater runoff from the large drainage areas contributing to this reach of SR 360. The SCS unit hydrograph method of runoff analysis and Modified Puls storage routing procedure was used to determine offsite runoff because of the lightly developed, natural runoff conditions.

This reach was divided into 18 concentration points (26 to 43) to determine existing flow conditions in the reach. The discharges associated with each of the 18 subreaches are tabulated on Exhibit 3 - Superstition Freeway Offsite Drainage Ironwood Road to U.S. 60, Sheet 3 of 3.

Runoff conditions in the western two miles of this reach (Ironwood to Tomahawk) are characterized by shallow, low capacity, washes with significant amounts of shallow sheet flooding on a 100-year storm rainfall-runoff event. The flow regime for this area was modeled to determine the amount of stormwater runoff crossing the north right-of-way for a one-quarter to one-half mile subreach. This runoff is typically in shallow (less than 2-feet deep) washes and shallow overland flow.

Results from the Eastern Maricopa County Area Drainage Master Study (EMCADMS) were predicated upon the Superstition Freeway (SR 360) being in-place and that Weekes Wash did not break out to the west into the EMCADMS study area. A detailed hydrologic and hydraulic investigation of the Weekes Wash Basin by A-N West during the course of this study (See section, Weekes Wash Analysis) indicated that the 100-year 24-hour Weekes Wash discharge at Superstition Boulevard, 2 miles below the proposed Weekes Wash Dam, is 8,600 cfs (see Appendix D, Weekes Wash Basin Analysis - Backup Material). This detailed analysis indicates that approximately 3,860 cfs breaks out to the west during the 100-year event. The remaining 4,759 cfs continues to flow to U.S. 60 and, eventually, to the SR 360 right-of-way. Weekes Wash

The eastern one and one-half miles, Tomahawk to U.S. 60, is characterized by an undulating ground surface which defines wash flow areas. Because of this flow regime, individual wash flows are better determined. The HEC-1 model was used to compute wash flows in four of the twelve concentration points

east of Tomahawk (Nos. 32, 33, 37, and 40). These washes have large enough drainage areas to be able to predict peak runoff values using a computer model that also predicts runoff from very large areas (i.e., Weekes Wash).

The two significant hydraulic conditions modeled were the Weekes Wash breakout and the effect of U.S. 60. Analyses performed to define these conditions will be presented individually. The Weekes Wash drainage area extends seven miles to the north and 8 miles to the northeast of where Weekes Wash crosses the SR 360 alignment. Flows from the 10.5 square mile area above McKellips Boulevard concentrate and flow south to about Superstition Boulevard where about one-third of the flows breakout and flow toward the southwest. A detailed hydraulic analysis of the flow distribution in Weekes Wash between McKellips and Superstition Boulevards, was performed using four foot contour interval, 400-scale mapping received from the City of Apache Junction. The normal depth flow was calculated and floodwaters distributed to evaluate the amount of stormwater breaking out toward the Superstition Freeway Reach II drainage area.

The effect of U.S. 60 (southeast of Broadway) on the peak flows at SR 360 was evaluated using the same topographic mapping as in the Weekes Wash analysis. ADOT as-built plans for U.S. 60 were used to determine culvert sizes, locations and top of roadway elevations. Peak flows for the 100-year event for Weekes Wash pond upstream of U.S. 60 and eventually flow over the top of the roadway and a portion of runoff is diverted to the southeast into subarea 26 (see Figure 6, Superstition Freeway Offsite Drainage, HEC-1 Schematic, Ironwood to U.S. 60). The diverted flow appears to be contained in drainage area 26. Flows in excess of culvert capacities from subareas 30 and 32 (just east of Tomahawk) overflow to the southeast to subarea 28 and 36 and over the top of the U.S. 60 roadway. Flows from subareas 28, 30, 32, and 36 combine downstream from U.S. 60, and, therefore, even though routing flows through and over U.S. 60 does have an impact on the peak flows downstream of U.S. 60, a hydraulic analysis was not evaluated in detail. The discharge computed for the flow at SR 360 at concentration point 32 will be somewhat conservative.

The HEC-1 model schematic diagram is provided on Figure 6 and the computer input and output is in Appendix J.

SCS Method - The SCS method of developing discharges was used in this study for small drainage areas contributing directly to the SR 360 right-of-way. The SCS method was used to evaluate runoff from 8 of the subareas east of Tomahawk (Nos. 34, 35, 36, 38, 39, 41, 42, and 43). These subareas are too small to be evaluated using the computer model developed. Analysis sheets for these subareas are in Appendix G.

Hydraulic Analysis:

Floodplain Analysis - The Superstition Freeway through this reach is on an embankment of 5 to 20 feet. The Freeway is to bridge over the section line arterial roads. The embankment scheme requires a floodplain analysis of existing condition runoff and the future floodplain due to the hydraulics of drainage structures used to pass offsite discharges under SR 360.

Existing and post-freeway floodplain analyses were performed for the drainage from Tomahawk to U.S. 60. For the existing condition floodplain analysis at the north and south rights-of-way, a level water surface was assumed to distribute flows over the flooded area. This water surface elevation was used to compare to the ponding elevation caused by the culverts being recommended to pass the offsite flows. Profiles for each culvert comparing these water surface elevations are in Appendix H.

Offsite Drainage System Alternatives - The offsite drainage alternatives for Reach III are dictated by the existing condition flow regimes. The flow between Ironwood and Tomahawk is typified by shallow sheetflow and shallow washes as discussed previously. This natural flow condition requires a collection channel or basin to collect runoff and transport it under the freeway. The offsite flows will be collected in a channel from the North Diversion Dam to Ironwood Road. Collected flows will then pass under the freeway just east of Ironwood Road (see Plate III-1).

Offsite flows between Idaho Road and the North Diversion Dam will be collected in a 1,300-foot basin which outlets into a 900-foot channel and discharges into the channel on the upstream side of the North Diversion Dam (see Plate III-1). The 3 barrel 8 x 6 box culvert will pass approximately 860 cfs during the 100-year rainfall event under SR 360 at the North Diversion Dam. The channel along the upstream face of the dam has about 900-950 cfs capacity. However, some minor regrading may be necessary to bring the entire 3,000-foot length up to this capacity.

The area from Tomahawk to Idaho Road is characterized by shallow sheet flooding. The drainage concept for this one-mile is to collect the flows, which include Weekes Wash, into a large detention basin. The basin effectively reduces the 100-year peak inflow of 4,300 cfs to an outlet peak flow of approximately 2,810 cfs. The basin depth varies from 15 to 25 feet below the natural ground. The basin extends from Idaho Road on the west where there would need to be about a 5-foot embankment to Mariposa Road on the east (one-quarter mile west of Tomahawk Road) where the basin depth would be about 25 feet below the natural ground. A collection channel would collect the flows between Tomahawk and Mariposa and discharge into this basin. Because of the large amount of storage required (200 acre-feet) to reduce the 100-year peak flow from 4,300 cfs to 2,810 cfs, a 28 foot wide single span bridge or equivalent box culvert is required over the outlet of the basin. The depth of the basin required an outlet channel from the Freeway to Baseline Road in order to contain the flows. Figure Plate III-1 shows the outlet channel. A HEC-2 Step Backwater Program was used to insure that the designed channel would function properly.

The remaining length of freeway, Tomahawk to U.S. 60, will be handled by pass through drainage concept. The washes in this area are fairly well-defined and naturally concentrate runoff at locations where culverts can pass the peak discharges under the freeway without increasing the flooded area at the north right-of-way (see Plate III-2).

SPECIAL CONSIDERATIONS

The following considerations are presented in an effort to provide guidance to the design consultants for the drainage handling systems:

1. The geotechnical consultant, Sergent, Hauskins and Beckwith, has indicated that the section between Chrismon Road and Meridian Road has the greatest potential for development of earth fissures.

2. Detention/retention basins lining is not recommended by the geotechnical consultant such that any earth fissures which may result could be detected at the earliest occurrence.

3. The recommended concept plan for the drainage system has made every attempt to mitigate upstream and downstream negative impacts to properties. Careful design of said system should be undertaken to assure the resulting structures operate consistent with the recommendations presented herein and the Drainage Design Criteria/Guidelines - Appendix I.

4. Throughout Hydrologic Unit 1, the soils are highly erosive, therefore, very flat slopes (less than 0.3%) and unlined channel sections are not recommended. A siltation basin has been provided for in the Ellsworth/SR 360 retention basin.

5. The designer should add an additional foot of freeboard to the detention basin as proposed to account for long-term subsidence. This recommendation is pursuant to the geotechnical engineers recommendations.

CONCLUSIONS

The concept plan for conveyance of drainage through the proposed freeway was conceived utilizing the basic premise that adjacent property upstream or downstream, will not be adversely impacted. Where the freeway depressed section dictates, drainage interception and conveyance as in Reach I, or the natural terrain enables the use of pass through drainage as in the eastern one-third of Reach III, every attempt has been made to preserve and/or improve floodplain related impacts to properties effected by the freeway construction.

The selected alternatives for each reach are the culmination of many manhours of evaluation. The concepts presented are just that - concepts - which are represented as being the best alternatives based upon engineering, economic, topographic, along with project needs and/or criteria. With the availability of more detailed information such as updated topography and preliminary freeway design, more suitable alternatives to handling drainage may result. Any such changes to the concept as outlined should be reviewed by A-N West to assure the basic intent of the drainage plan is upheld.

APPENDIX A

RETENTION ORDINANCES

RETENTION ORDINANCES

There are four jurisdictional agencies within the watershed and all four have different ordinances establishing procedures for addressing stormwater runoff. The agencies and their respective criteria are as follows:

1. Maricopa County - Detention of the difference between the 100-year, 2-hour pre- and post-development runoff volumes.

2. City of Mesa - Retention of 50-year, 24-hour storm runoff (3.2 inches).

3. City of Apache Junction - Retention of 10-year, 24-hour storm runoff (2.4").

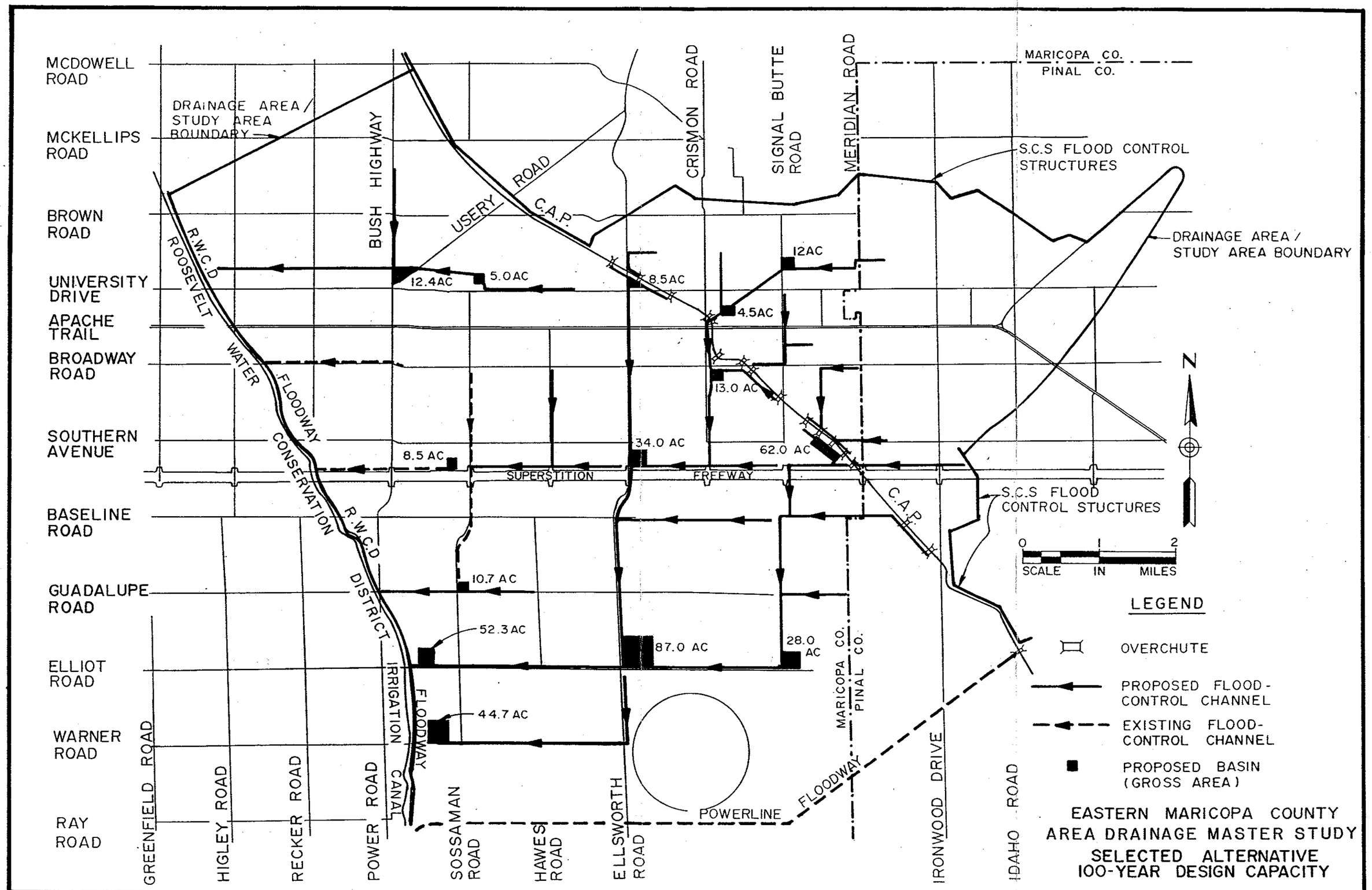
4. Pinal County - No established policy.

The Cities of Mesa and Apache Junction have only had jurisdictional authority in the study area for the last three and five years, respectively. For the most part, retention of floodwaters is nonexisting in the study area excepting a couple of large developments in the western portion of the study area. These developments are using a series of lakes on their golf courses to provide the retention.

Only a small portion of the study area is in Pinal County and that area is continually being annexed in the City of Apache Junction.

APPENDIX B

EAST MARICOPA COUNTY ADMS



PREPARED BY: A N WEST, INC. May 7-'86

APPENDIX C

HYDROLOGIC STUDIES

HYDROLOGIC STUDIES

1. Soil Survey, Eastern Maricopa and Northern Pinal Counties Area, Arizona, November 1974, USDA, SCS.

2. Soil Survey, Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona, Advance copy, 1985, USDA, SCS.

3. Master Storm Drainage Study for the City of Apache Junction, April 1986, A-N West, Inc.

4. East Side Stormwater Drainage Study for the City of Mesa, May 1981, Yost and Gardner Engineers.

5. Design Review and Analysis for Sossaman Road Drainage Channel, July 1980, B.R. Jolly Consulting Engineer - Water Resources.

6. Design Concept Report for Superstition Freeway, State Route 360, Gilbert Road to U.S. Route 60-80-89, June 1975, ADOT.

7. Drainage Report for the Superstition Freeway (Val Vista to Power Road Section), May 1981, ADOT.

8. Section 7, Analysis of CAP Design and Construction Implementation, October 1984, International Engineering Company, Inc.

9. Report on Flooding in Eastern Maricopa County, November 1984, Flood Control District of Maricopa County.

10. Plan and Profile RWCD Floodway Buckhorn-Mesa WPP, 1974, Soil Conservation Service.

11. Central Arizona Project, Salt-Gila Aqueduct, Reach 1B, Plan and Profile, and Overchute Details, May 1982, USBR.

12. Central Arizona Project, Salt-Gila Aqueduct, Reach 2, Plan and Profile, and Overchute Details, May 1980, USBR.

13. Review of Specifications, Design Data for Reach 1, Salt-Gila Aqueduct, Central Arizona Project, Arizona, May 1980, USBR.

14. Review of Specifications, Design Data for Reach 2, Salt-Gila Aqueduct, Central Arizona Project, Arizona, November 1980, USBR.

15. Apache Trail (State Highway 60) As-Built, 1962 and 1963, ADOT.

16. Superstition Freeway As-Builts and Right-of-Way Drawings, 1974, 1975, and 1983, ADOT.

17. Weekes Wash Powerline Dam TR-20 Analysis (not published), SCS, November 1985.

18. Hydraulic Investigation and Floodplain Management Recommendations for Weekes Wash Floodplain, City of Apache Junction, CBA, May 27, 1981.

APPENDIX D

WEEKES WASH BASIN ANALYSIS BACKUP MATERIAL

WEEKES WASH BASIN ANALYSIS

The Weekes Wash watershed was modeled using 10 subareas ranging from 0.3 square miles to 2.27 square miles. The upper watershed above Apache Trail was divided into seven subareas (0.80 to 2.27 square miles). These subareas are very similar to those used by the SCS in their 1985 TR-20 analysis of the basin. Because the SCS was interested in the proposed Weekes Wash dam, they developed a model concentration point that would represent the inflow to the dam. The drainage area for the proposed dam was modeled at 8.74 square miles.

The 1985 TR-20 model developed by the SCS for the Weekes Wash dam evaluation used the Convex routing method which has since been discontinued. To reconstitute the TR-20 model A-N West developed new Att-Kin routing parameters which duplicated the original TR-20. Next, A-N West developed a HEC-1 model for the area above the proposed Weekes Wash dam, using the 1985 TR-20 input parameters for CN's, rainfall, computation interval, drainage areas and times of concentration (input as lag time). The routing parameters, length, and slope were developed independent from the TR-20 since HEC-1 does not use the Att-Kin or Convex routing methods. The results from the HEC-1 model were comparable to the TR-20 analyses (see Table D-1 Comparison of Model Results). Because the 1985 TR-20 model was developed for a 46 square mile drainage area using reduced curve numbers, A-N West made the following model changes:

1. The Weekes Wash dam concentration point (TR-20) was moved to just upstream of Apache Trail (adding 1.04 square miles).

2. The areal reduction was removed from the precipitation volume.

3. The computational interval was reduced.

4. The reduction was removed from the runoff curve numbers.

A tabulation of the results of this modeling effort follows in Table D-1.

It was found during the review of the draft report that the HEC-1 model makes an unrealistic assumption that the total rainfall must fall within the

TABLE D-1

COMPARISON OF MODEL RESULTS

TR-20								HEC-1					
SCS				A-N WEST				A-N WEST					
1985		t = 6 min		1986		t = 6 min		1986		t = 6 min	1986		t = 3 min
ID	DA	CN	Q_{100}	ID	DA	CN	Q_{100}	DA	CN	Q_{100}	DA	CN	Q_{100}
15	1.72	80	1803	06	1.72	80	1842	1.88	80	1879	1.86	87	2694
14	1.16	79	1238	08	1.16	79	1245	1.19	79	1360	1.19	86.5	1752
16	2.24	82	1962	10	2.24	82	2025	2.27	82	2004	2.27	88.5	28.19
13	1.35	83	1735	12	1.35	83	1745	1.37	83	1776	1.37	90	2220
12	1.43	86	1670	14	1.43	86	1705	1.39	86	1538	1.39	92	2050
17	0.21	79	227	16	0.21	79	229	0.90	79	744	0.90	87	1149
11	0.63	82	714	18	0.63	82	731	0.80	82	864	0.80	91	1149
117	8.73		6432	118	8.74		6614	9.80		6491	9.78		10101

simulation period when that interval is less than the duration of the rainfall distribution curve input in the model. For simulation periods that exceed the duration of the rainfall distribution curve, the total rainfall is distributed over the rainfall distribution curve duration time.

HEC-1 computer model as distributed by the U.S. Army Corps of Engineers has a program limitation of 300 computational ordinates. Therefore, at a $\Delta t = 0.5$ hours, the maximum simulation period is 15 hours. HEC-1 therefore will distribute the precipitation over only the 15 hours simulation period instead of the intended 24 hours, effectively increasing the incremental rainfall intensity and producing higher peak and flows. After consulting with the U.S. Army Corps of Engineers HEC staff, the computer model for this reach of the offsite drainage was adjusted by A-N West to account for this quirk of HEC-1 computer model. Table D-1 compares the results of these models.

A-N West expanded the HEC-1 model to include the area between the north right-of-way of the Superstition Freeway and Apache Trail. Two significant hydraulic points of interest exist within this reach. The Weekes Wash breakout, as indicated i 1981 study of Weekes Wash floodplain, study for the city of Apache Junction, occurs just below Superstition Boulevard (approximately 1 mile upstream of U.S. 60). The other point of interest is U.S. 60. To obtain discharge information at these two points, A-N West developed model concentration points at each location. The 100-year peak discharge of the breakout location is about 8,600 cfs of which 45 percent breaks out in Palm Wash. The remaining 4,750 cfs continue to U.S. 60 in Weekes Wash.

Using this discharge information, A-N West evaluated the breakout flows in Weekes Wash between Superstition Boulevard and 4th Avenue. The seven cross-sections used were taken from the FEMA 400 scale, 4 foot contour interval topographic map. Those cross-sections are provided in this appendix (see Figures D-1 through D-6). The Flow Distribution Map is provided on Figure D-7.

The A-N West HEC-1 computer model calculated a 100-year peak flow in Weekes Wash of U.S. 60 of 4,250 cfs. Of this, about 885 cfs breaks out to the southeast over Tomahawk Road. The flow distribution between this breakout and the flows through the bridge, the 2 culverts under U.S. 60 and weiring over U.S. 60 are provided in this appendix. See Figure D-8.

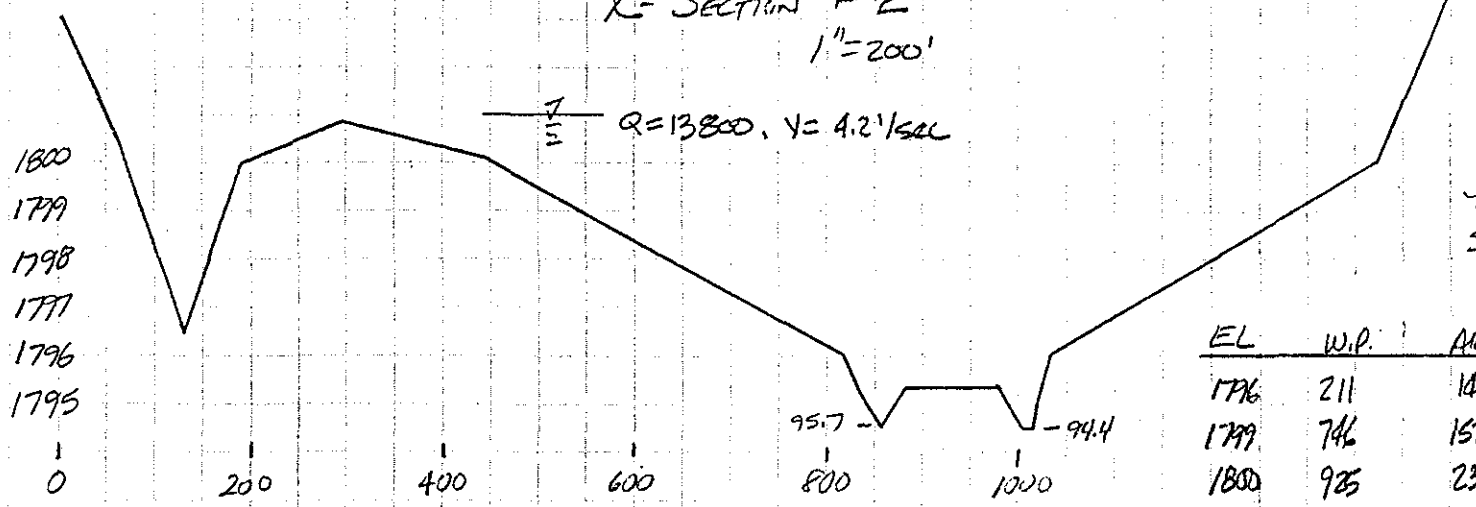
Between U.S. 60 and Southern Avenue Weekes Wash has been channelized in an earthen channel. Below Southern Avenue Weekes Wash is nearly non-existent and stormwaters become sheetflows across a large area of undeveloped desert. The A-n West HEC-1 model does not evaluate this return to sheet flow because as this undeveloped parcel becomes developed, it is anticipated that Weekes Wash will be channelized to the Freeways north right-of-way.

FIGURE D-1

WEEKES WASH @ SUPERSTITION BLVD.

X-SECTION #2

1" = 200'



$n = 0.075$,

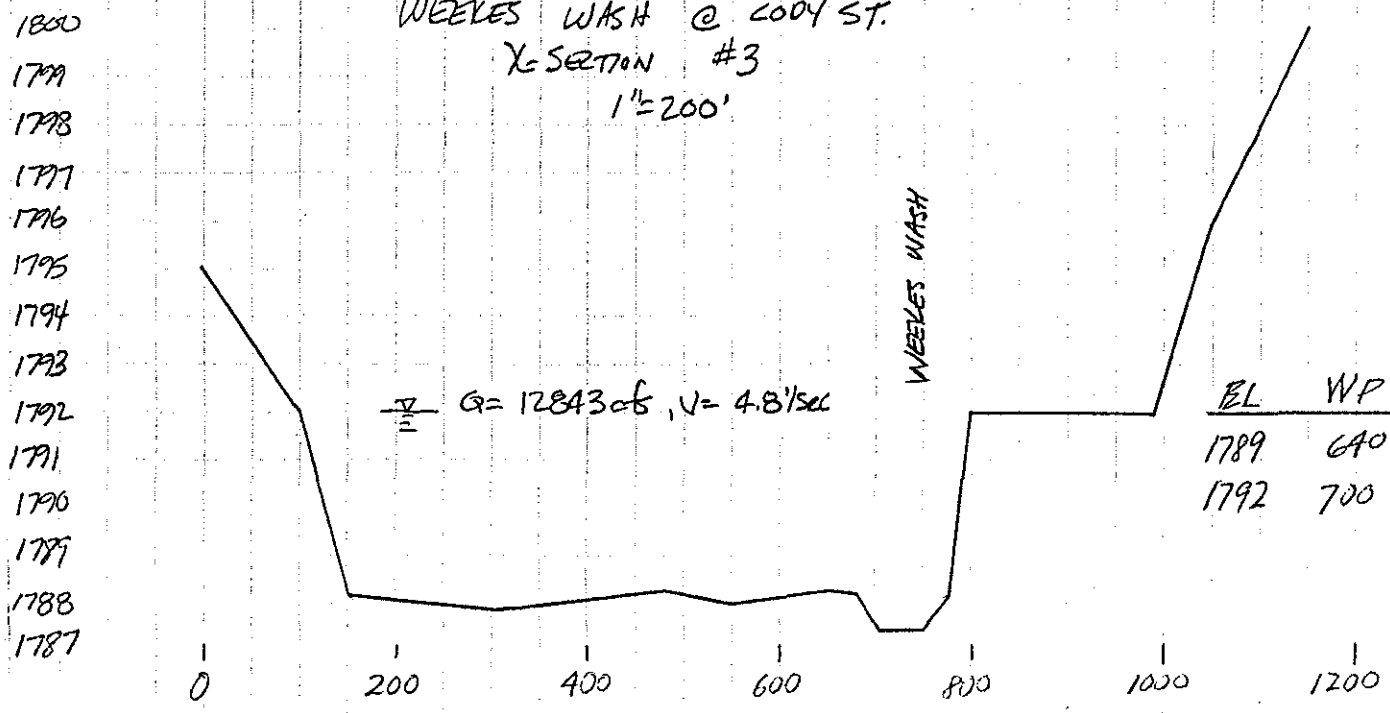
$S = \frac{8'}{800'} = .01$

EL	W.P.	AREA	Q	V
1796	211	140	212	1.5
1799	746	1570	5135	3.27
1800	925	2306	8442	3.66
1801	1100	3318	13812	4.16

WEEKES WASH @ COOY ST.

X-SECTION #3

1" = 200'



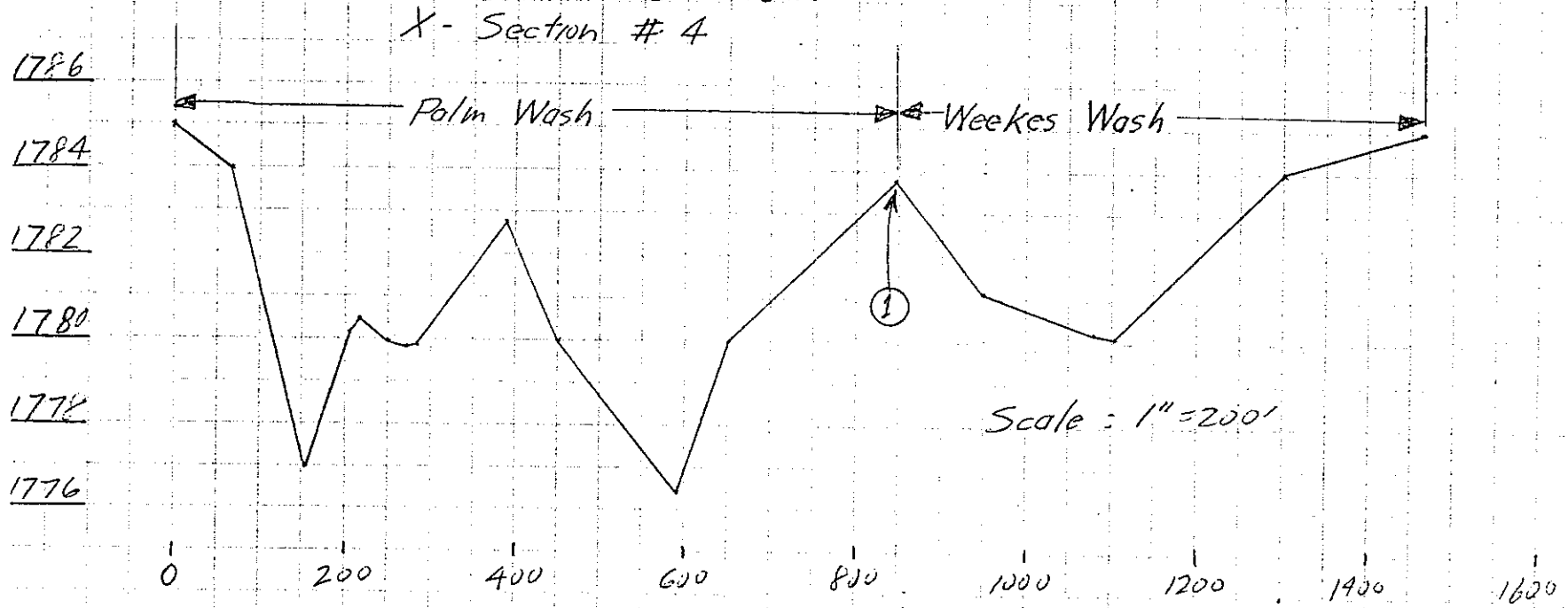
$n = 0.075$

$S = 0.01$

EL	WP	AREA	Q	V
1789	640	640	1272	2.0
1792	700	2650	12843	4.8

FIGURE D-2

Weekes Wash @ Scenic
X-Section # 4



Weekes Wash					Diversion				
EL.	A	WP	Q	V	C	L	H	Q	Q_T
1785	1605	622	6018	3.7	2.63	7	0.5	7	6025
1785.6	1978.2	622	8532	4.3	2.63	12	0.75	20	8552

$n = 0.075$, $S = 0.01$

Weekes-Palm Wash Diversion

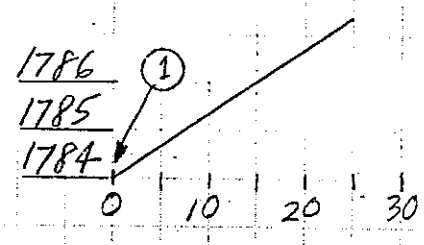
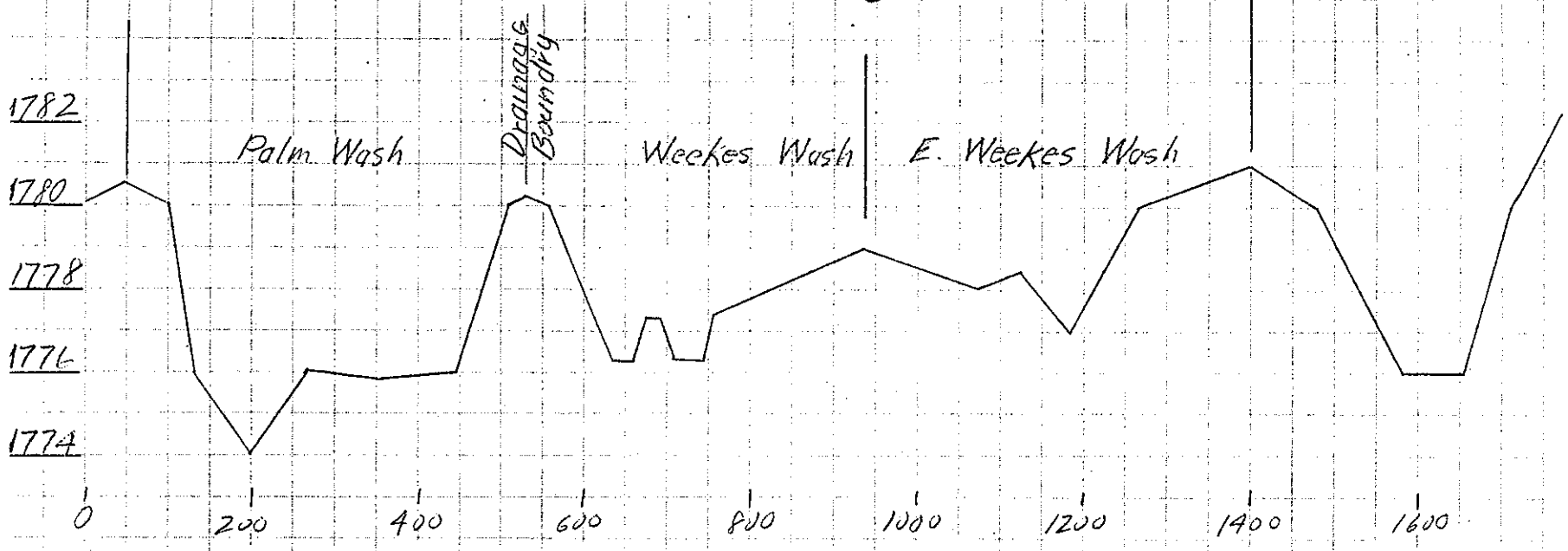
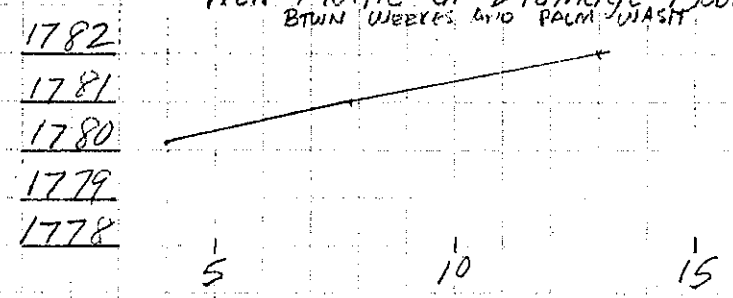


FIGURE D-3

Weekes Wash Below Scenic St. @ X-Section #5



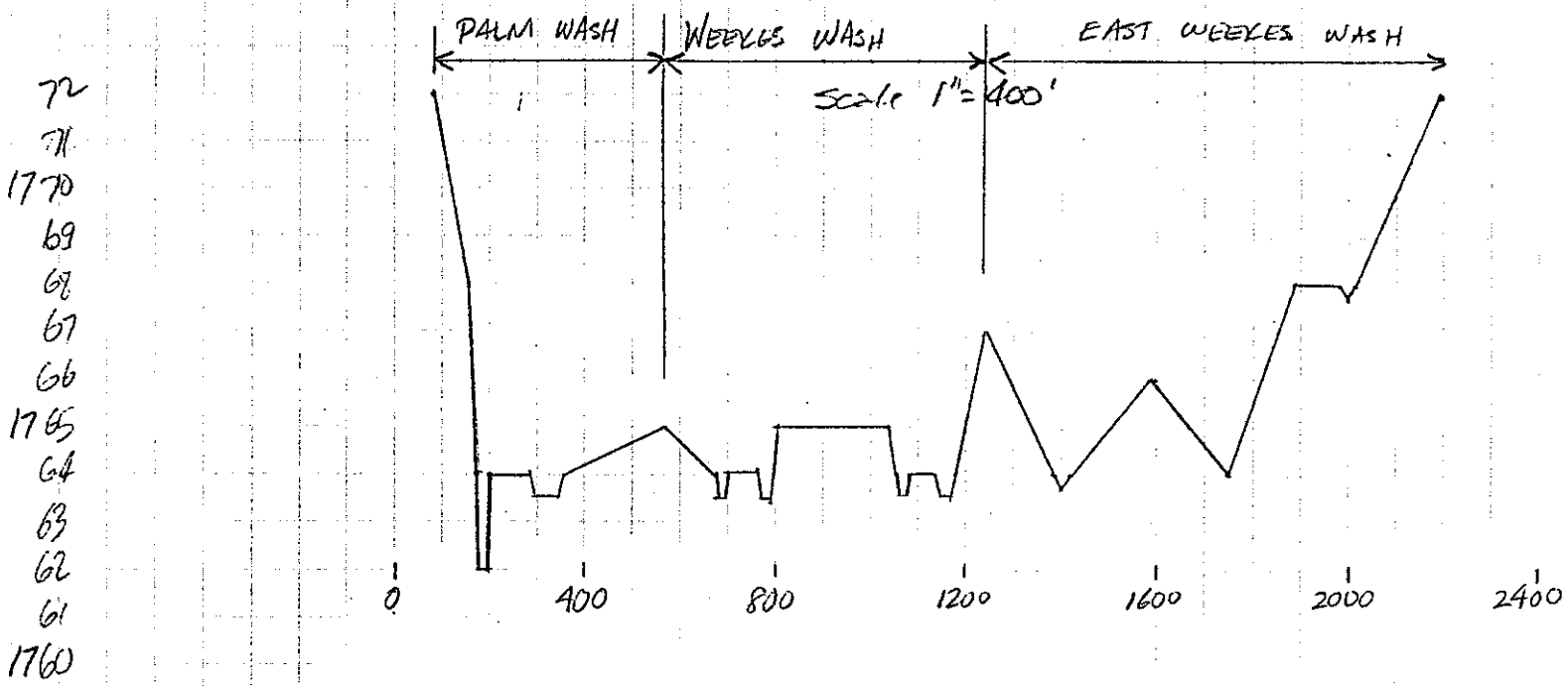
Weir Profile at Drainage Boundry
BTWN WEEKES AND PALM WASH



	Divert to Palm Wash				Weekes Wash				E. Weekes Wash			
EL:	C	L	$\bar{H}$	Q	A	WP	Q	V	A	WP	Q	V
1780.2	–	0	0	0	930	410	3198	3.4	626	360	1802	2.9
1781	2.63	400	.8/2	266	1258	410	5297	4.2	958	470	3067	3.2

$n = 0.075$, $S = 0.01$

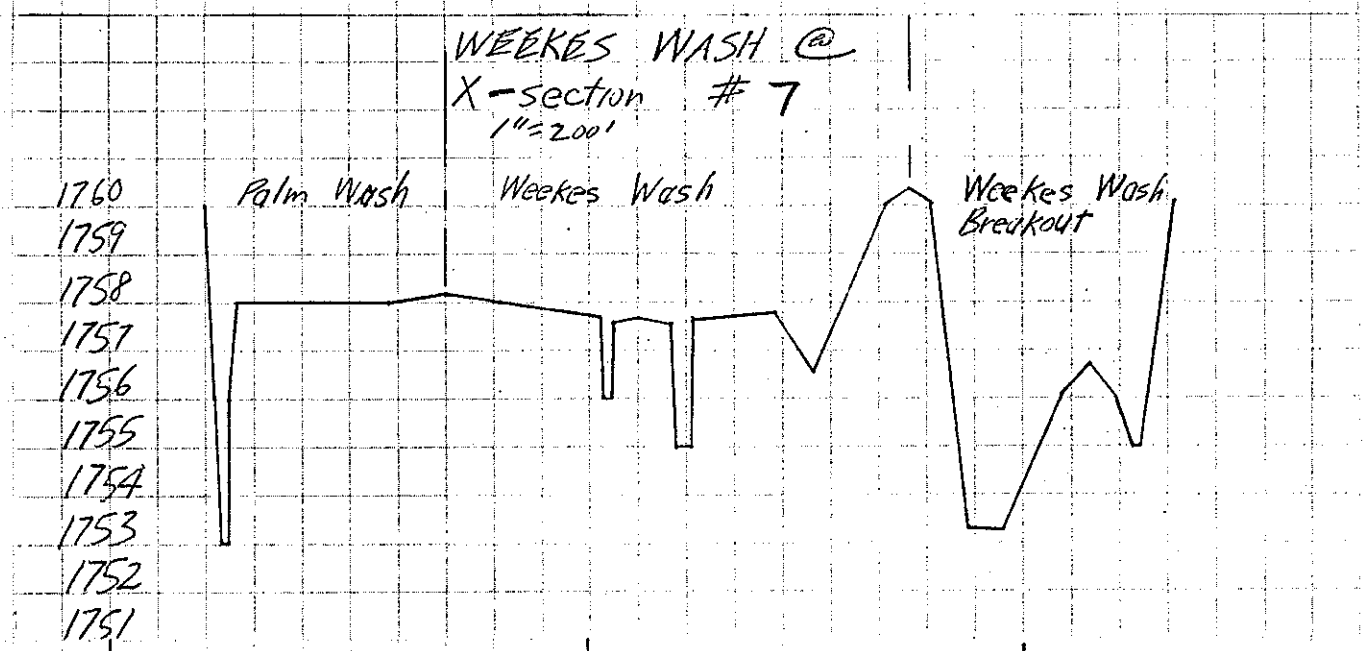
FIGURE D-4 WEEKES WASH @ X-SECTION #6



Palm Wash					Weekes Wash					E. Weekes Wash			
EL.	A	WP	Q	V	A	WP	Q	V	Q_T	A	WP	Q	V
1765	375	400	713	1.9	205	240	366	2.3	735				
					175	160	369	2.1					
1766.5	527	405	1249	2.4	565	240	1992	3.5	4477				
					353	235	921	2.6					
					445	190	1564	3.5					
1767	577	407	1448	2.5	685	240	2748	4.0	6289	1120	615	3325	3.0
					470	235	1486	3.2					
					535	200	2055	3.8					

$n = 0.075$, $S = 0.01$

FIGURE D-5

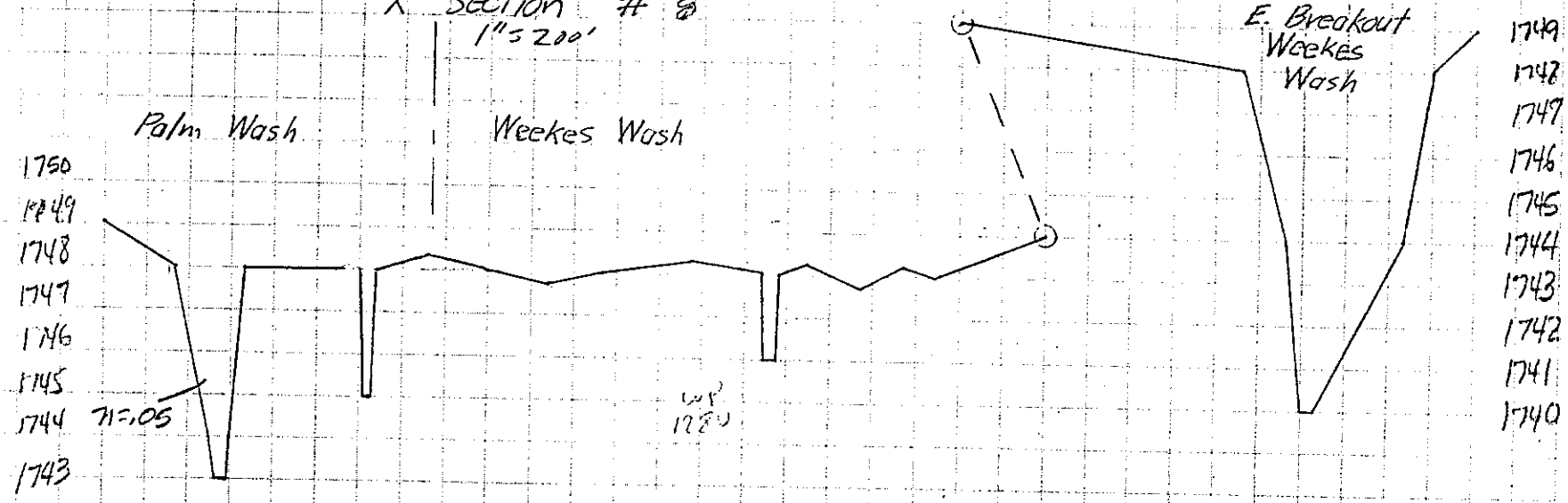


	PALM WASH				WEEKES WASH				WEEKES WASH BREAKOUT			
EL	AREA	WP	Q	V	AREA	WP	Q	V	EL	AREA	Q	V
1759.5	920	500	3062	3.3	1156	890	2736	2.4	1758	1195	4534	3.8

FIGURE D-6

WEEKES WASH @ X-SECTION # 8

1" = 200'



EL	PALM WASH AREA	WP	Q	$\bar{V}$	WEEKES WASH AREA	WP	Q	$\bar{V}$	E. BREAKOUT WEEKES WASH EL	AREA	WP	Q	$\bar{V}$
1748	565	200	2260	4.0	16, 70, 34	120, 40, 270	8, 202, 26 } 246	2.1	1743.8	285	130	958	3.4
1748.3	521, 68, 105	210, 270, 80	3157	4.5	115, 86, 154	40, 40, 645	90, 285, 121 } 496	1.4	1748	1031	225	5680	5.5
1749	668, 505, 563	210, 560, 210	5258	4.5	495, 110, 715, 425, 90, 325	625, 90, 780, 475, 40, 780	841, 344, 1341 } 2525; 764, 308, 422 } 1514	1.9; 1.8					
1748.75	265	480	3601	4.3									
			3861					1700				3050	

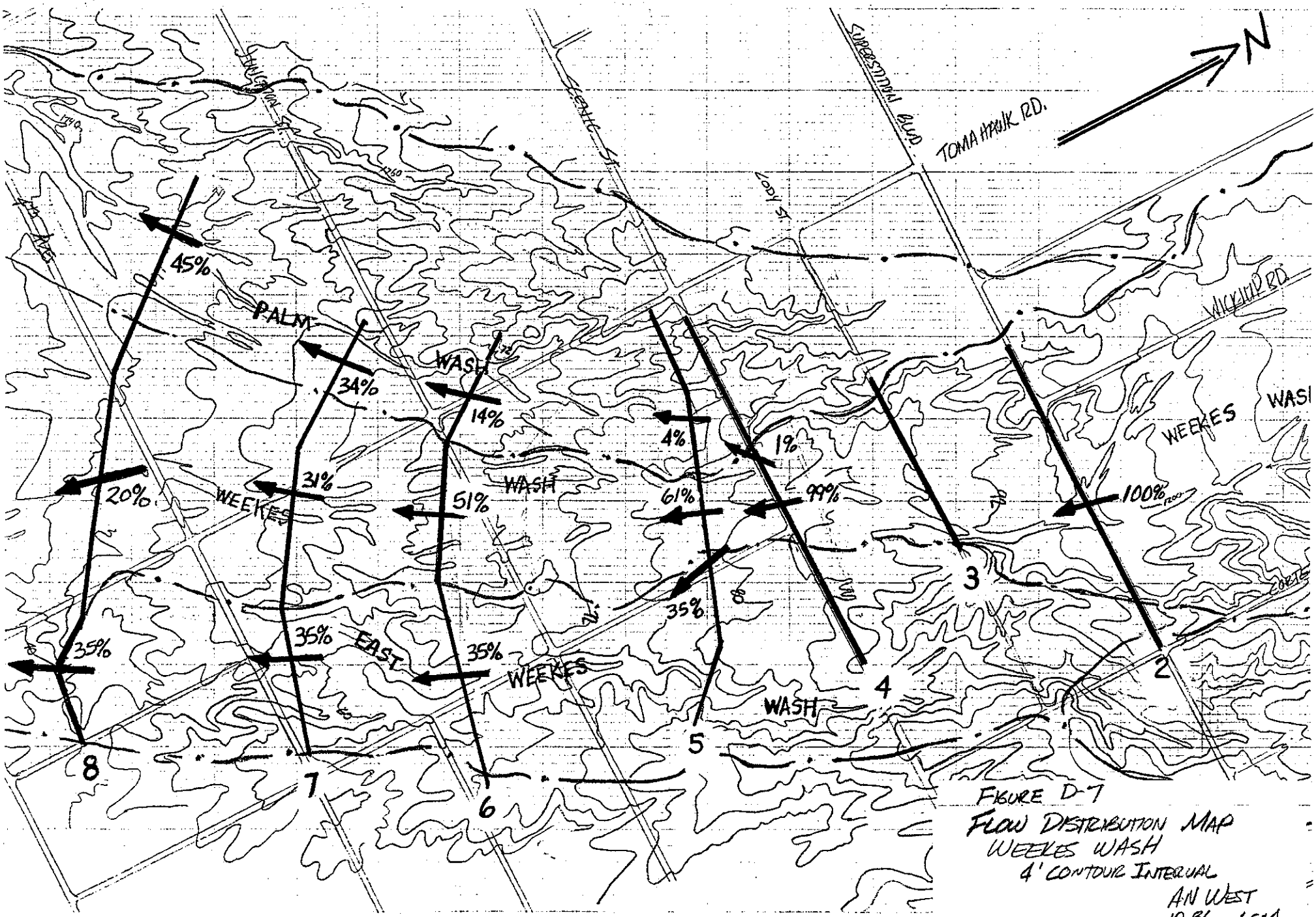
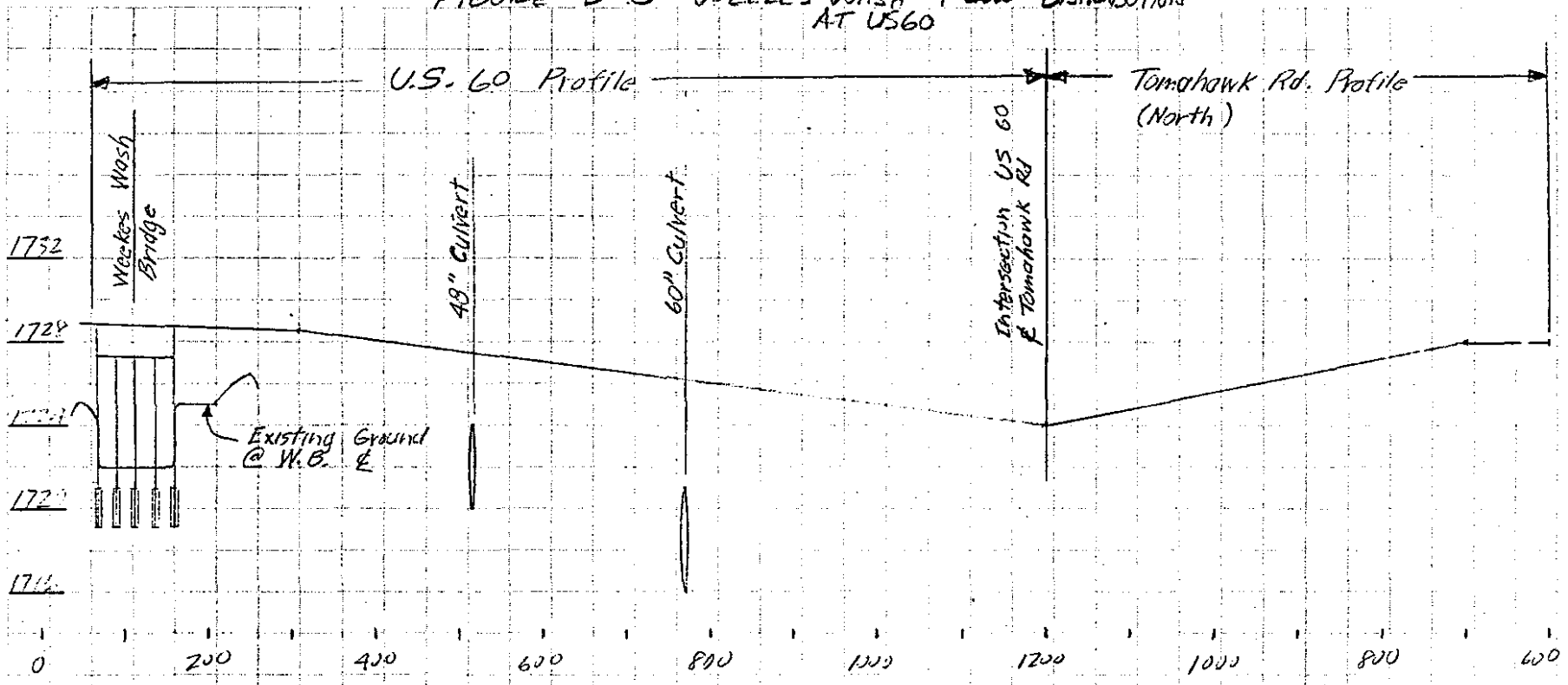


FIGURE D-7
FLOW DISTRIBUTION MAP
WEEKES WASH
4' CONTOUR INTERVAL

AN WEST
10-86 LSM

FIGURE D-8 WEEKES WASH FLOW DISTRIBUTION AT US60



Weekes Wash Bridge (L = 80')				48" Culvert				60" Culvert				U.S. 60			Tomahawk Rd.			
EL.	d	Q/ft	Q_{Br}	d	$\frac{d_c+d}{2}$	H	Q_{48}	d	$\frac{d_c+d}{2}$	H	Q_{60}	d	L	Q_{US60}	d	L	Q_T	Q Total
24	2	8.5	680									0	0	0	0	0	0	680
24.5				0			0	0			0							
25	3	16	1280	5	3.30	1.70	73	9	4.10	4.9	165	1	86	226	1	62.5	164	1,908
26	4	24	1920	6	3.45	2.55	88	10	4.20	5.8	180	2	172	1279	2	12.5	930	4,397
27	5	33	2640	7	3.55	3.45	103	11	4.25	6.75	192	3	258	3526	3	187.5	2563	9,024
28	6	43	3440	8	3.65	4.35	116	12	4.30	7.7	210	4	344	7238	4	250	5260	16,264

Note: U.S. 60 and Tomahawk were rated using weir equation $Q = 2.63\,L\,H^{3/2}$

APPENDIX E

MODELING ASSUMPTIONS BACKUP MATERIAL

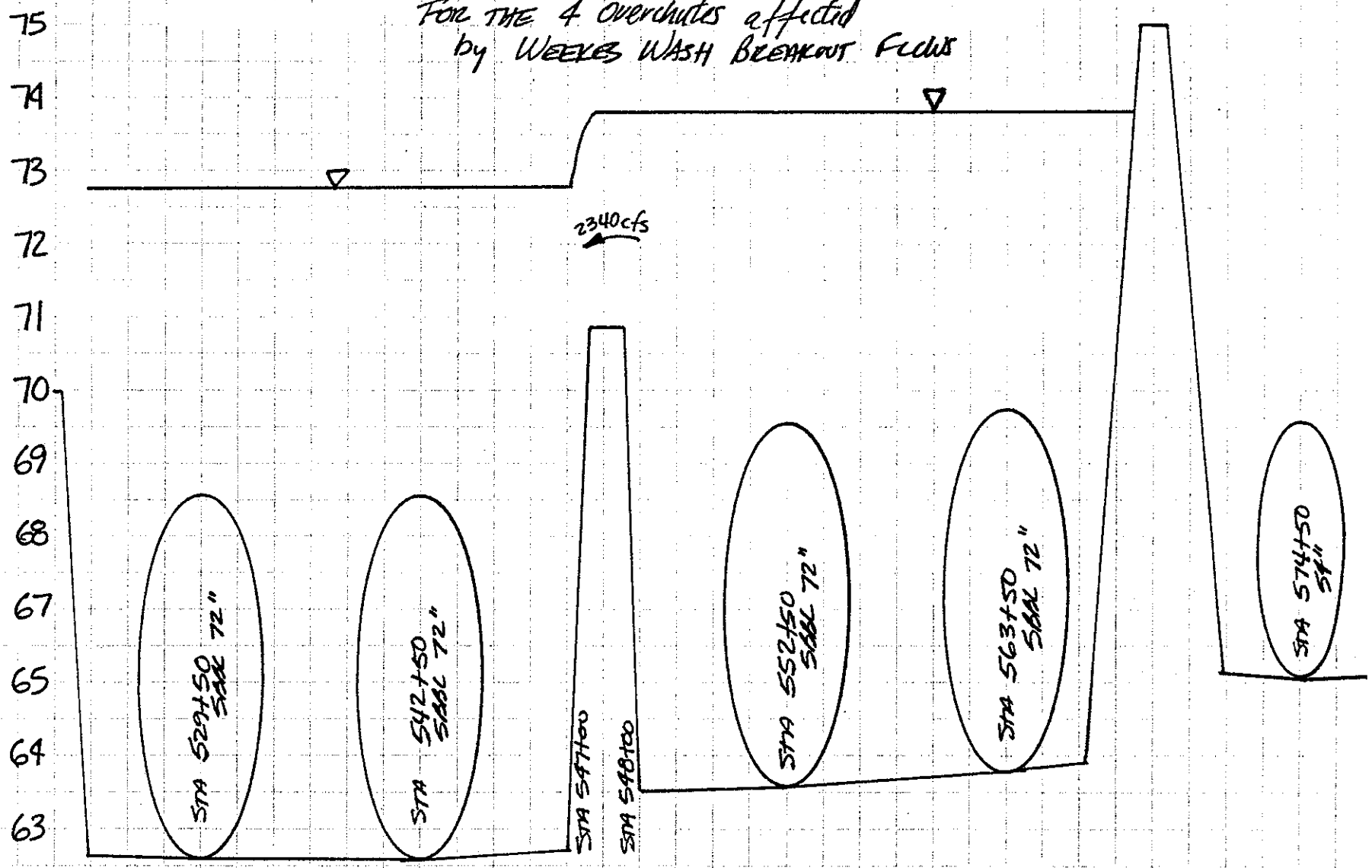
APPENDIX E-1

COMPARISON OF U.S. 60 CULVERT CAPACITIES
TO 100-YEAR DRAINAGE
(CRISMON ROAD TO MERIDIAN ROAD)

LOCATION	U.S. 60 STATION	NO. OF CELLS	SPAN	RISE	LENGTH	TYPE	$\frac{HW}{D}$ ASSUMED	Q	HEC-1 SUBAREA	Q_{100}
E. of Crismon	636+35	3	8'	4'	58'	RCB	1.0	550		
	645+20	1	10'	4'	72'	RCB	1.0	230		
	656+15	1	6'	3'	50'	RCB	1.0	90		
	663+24	1	6'	3'	52'	RCB	1.0	90		
	676+57	2	10'	4'	59'	RCB	1.0	460		
								1420	SUB34	754
Signal Butte	686+96	1	6'	3'	49'	RCB	1.0	90		
	695+34	1	6'	3'	50'	RCB	1.0	90		
	706+50	1	8'	3'	50'	RCB	1.0	120		
	714+99	1	8'	3'	50'	RCB	1.0	120		
	727+25	1	10'	4'	51'	RCB	1.0	230		
								650	SUB38	639

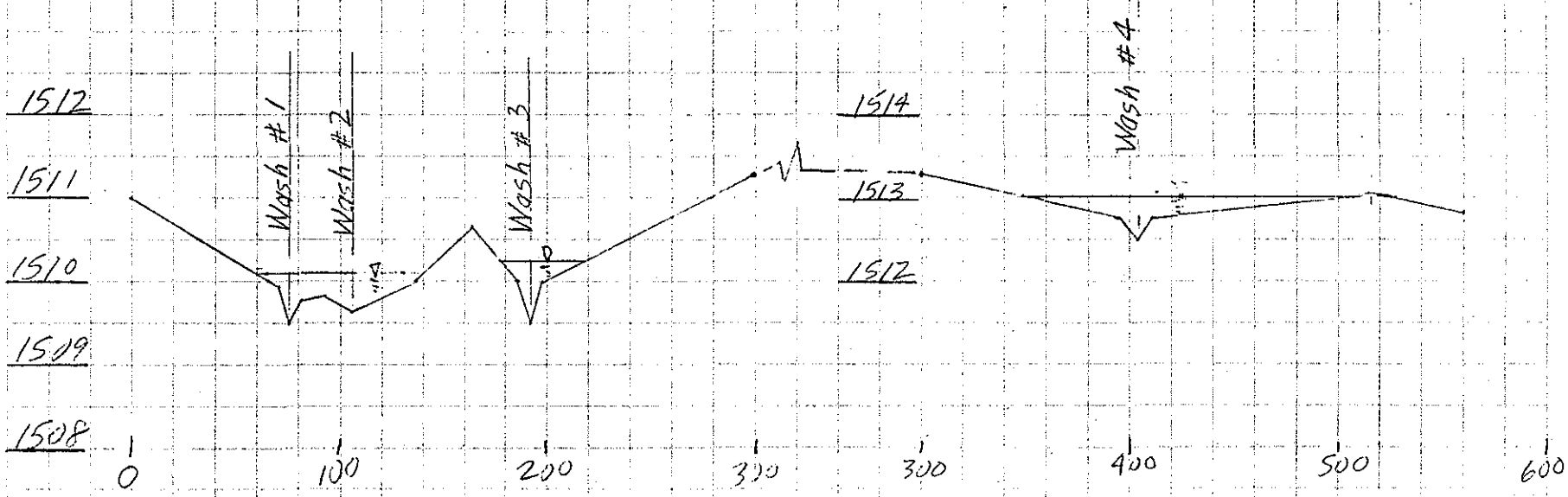
RATING TABLE FOR C.A.P. OVERCHUTES

FOR THE 4 Overchutes affected by WEEKES WASH BREAKOUT FLOW



ELEV	Hw/D	Q/pipe	Q_T	Hw/D	Q/pipe	Q_T	L	h	Q	Hw/D	Q/pipe	Q_T	Hw/d	Q/pipe	Q_T
70.8	1.37	290	1450	1.37	290	1450	0	0	0			1225			1200
71.8	1.53	320	1600	1.53	320	1600	50	1	132	1.37	290	1450	1.33	280	1400
72.8	1.70	350	1750	1.70	350	1750	100	2	744	1.53	320	1600	1.5	315	1575
73.8	1.87	380	1900	1.87	380	1900	150	3	2050	1.70	350	1750	1.67	345	1725
74.5	1.99	400	2000	1.99	400	2000	160	3.7	2795	1.82	370	1850	1.78	365	1825

Typical Cross Section
For Reach II (Concentration Point #14) Q_{100} = 97 c.f.s.



Wash #1 & 2						Wash #3						Wash #4					
EL.	$S_{1,2}$	$n_{1,2}$	$A_{1,2}$	$WP_{1,2}$	$Q_{1,2}$	EL.	S_3	n_3	A_3	WP_3	Q_3	EL	S_4	A_3	WP_3	Q_3	Q_{TOT}
1510.15	2.0%	0.35	24.35	86	63.2	1510.30	0.80%	0.35	10.90	46	15.9	1513.05	0.70%	31.10	168	36.0	115.1
1510.10	2.0%	0.35	20.25	78	49.6	1510.25	0.80%	0.35	8.75	40	12.1	1513.00	0.70%	23.15	150	23.7	85.4

APPENDIX F

PRECIPITATION DERIVATION CALCULATION SHEETS

ADDENDUM to "HYDROLOGIC DESIGN FOR HIGHWAY DRAINAGE IN ARIZONA" April 1975

Steps to be used to determine precipitation values for various durations and return periods.

STEP 1. From the precipitation maps in the manual "Hydrologic Design for Highway Drainage in Arizona", determine the precipitation values for the 6 and 24 hour duration storms for return periods of 2, 5, 10, 25, 50 and 100 years. Tabulate these values in Table 1 in the column headed 'Map Values'

FOR: SUPERSTITION FREEWAY REACH I AND II
POWER ROAD TO U.S. 60
9/86 LSM

TABLE 1

Return Period (Years)			Precipitation Values (inches)			
			6 hour duration		24 hour duration	
	1 Hour	2 Hour	Map Value	Corrected Value	Map Value	Corrected Value
2	0.91	0.99	1.15	1.15	1.35	1.35
5	1.30	1.40	1.60	1.60	1.90	1.90
10	1.52	1.65	1.65	1.90	2.30	2.30
25	1.85	2.02	2.35	2.35	2.85	2.80
50	2.13	2.32	2.70	2.70	3.20	3.20
100	2.42	2.63	3.05	3.05	3.60	3.65

NOTE: There is a possibility of making an error while reading the maps because, (1) a site is not easy to locate precisely on a series of 12 maps, (2) there may be some slight registration differences in printing, and (3) precise interpolation between isolines is difficult. In order to minimize any errors in reading the maps, these values should be plotted on the diagram "Precipitation Depth versus Return Period" Fig. 1.

Project No. 7005

Station Superstition Freeway
Power Road to U.S. 60
Reach I and II

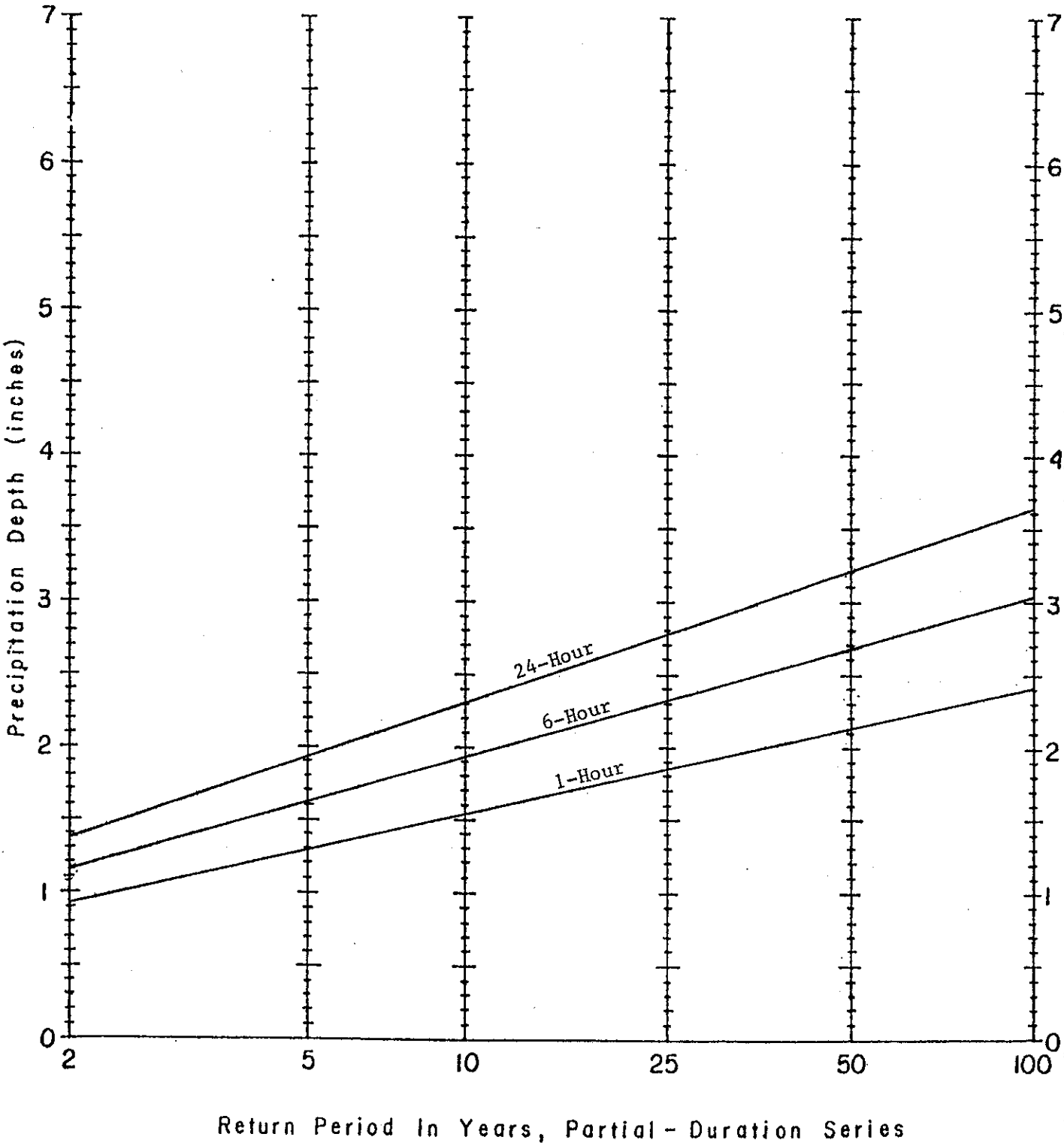


Figure I Precipitation Depth Versus Return Period for Partial – Duration Series

ADDENDUM to "HYDROLOGIC DESIGN FOR HIGHWAY DRAINAGE IN ARIZONA" April 1975

Steps to be used to determine precipitation values for various durations and return periods.

STEP 1. From the precipitation maps in the manual "Hydrologic Design for Highway Drainage in Arizona", determine the precipitation values for the 6 and 24 hour duration storms for return periods of 2, 5, 10, 25, 50 and 100 years. Tabulate these values in Table 1 in the column headed 'Map Values'

FOR: SUPERSTITION FREEWAY REACH III
IRONWOOD TO U.S. 60
9/86 LSM

TABLE 1

Return Period (Years)			Precipitation Values (inches)				
			6 hour duration		24 hour duration		
	1 Hour	2 Hour	Map Value	Corrected Value	Map Value	Corrected Value	Aeral Reduce
2	0.93	1.06	1.3	1.3	1.7	1.7	1.67
5	1.29	1.47	1.8	1.8	2.2	2.3	2.25
10	1.52	1.70	2.1	2.1	2.7	2.7	2.65
25	1.82	2.05	2.6	2.5	3.2	3.2	3.14
50	2.11	2.37	2.9	2.87	3.6	3.65	3.59
100	2.38	2.65	3.2	3.2	4.1	4.1	4.03

NOTE: There is a possibility of making an error while reading the maps because, (1) a site is not easy to locate precisely on a series of 12 maps, (2) there may be some slight registration differences in printing, and (3) precise interpolation between isolines is difficult. In order to minimize any errors in reading the maps, these values should be plotted on the diagram "Precipitation Depth versus Return Period" Fig. 1.

Project No. 7005

Station Superstition Freeway
Ironwood to U.S. 60
Reach III

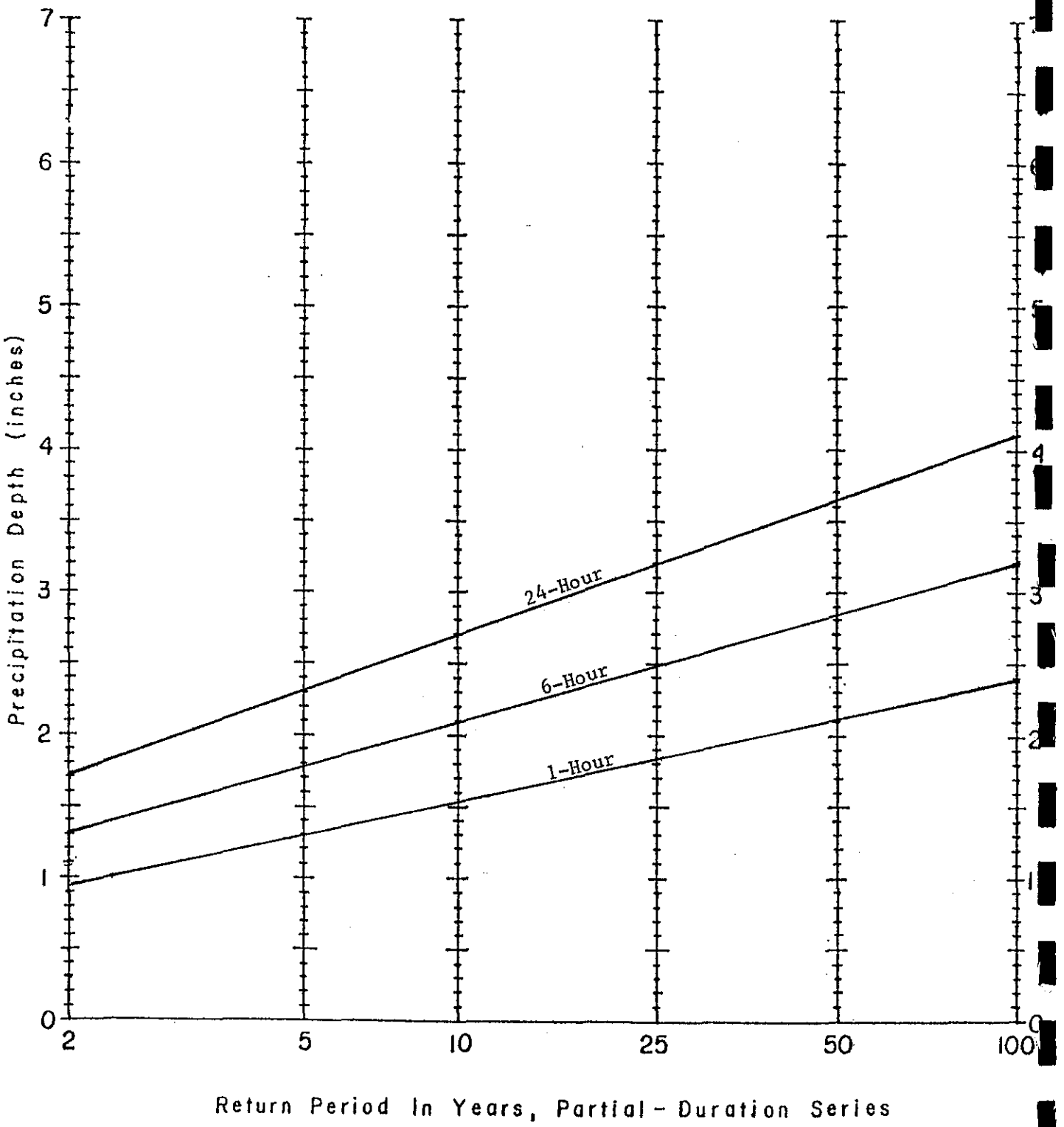


Figure 1 Precipitation Depth Versus Return Period for Partial-Duration Series

Ordinates of the SCS Type II Precipitation Distribution

Storm Time (hours)	Precipitation Ratio Type II Accumulative	Incremental	P_{100}=3.65	P_{100}=4.03
0.0	0.0000			
0.5	0.0053	0.0053	0.019	0.021
1.0	0.0108	0.0055	0.020	0.022
1.5	0.0164	0.0056	0.020	0.023
2.0	0.0223	0.0059	0.022	0.024
2.5	0.0284	0.0061	0.022	0.025
3.0	0.0347	0.0063	0.023	0.025
3.5	0.0414	0.0067	0.025	0.027
4.0	0.0483	0.0069	0.025	0.028
4.5	0.0555	0.0072	0.026	0.029
5.0	0.0632	0.0077	0.028	0.031
5.5	0.0712	0.0080	0.029	0.032
6.0	0.0797	0.0085	0.031	0.034
6.5	0.0887	0.0090	0.033	0.036
7.0	0.0984	0.0097	0.035	0.039
7.5	0.1089	0.0105	0.038	0.042
8.0	0.1203	0.0114	0.042	0.046
8.5	0.1328	0.0125	0.046	0.050
9.0	0.1467	0.0139	0.051	0.056
9.5	0.1625	0.0158	0.057	0.064
10.0	0.1808	0.0183	0.067	0.074
10.5	0.2042	0.0234	0.085	0.094
11.0	0.2351	0.0309	0.113	0.125
11.5	0.2833	0.0482	0.176	0.194
12.0	0.6632	0.3799	1.387	1.531
12.5	0.7351	0.0719	0.262	0.290
13.0	0.7724	0.0373	0.136	0.150
13.5	0.7989	0.0265	0.097	0.107
14.0	0.8197	0.0208	0.076	0.084
14.5	0.8380	0.0183	0.067	0.074
15.0	0.8538	0.0158	0.058	0.064
15.5	0.8676	0.0138	0.050	0.056
16.0	0.8801	0.0125	0.046	0.050
16.5	0.8914	0.0113	0.041	0.046
17.0	0.9019	0.0105	0.038	0.042
17.5	0.9115	0.0096	0.035	0.039
18.0	0.9206	0.0090	0.033	0.037
18.5	0.9291	0.0085	0.031	0.034
19.0	0.9371	0.0080	0.029	0.032
19.5	0.9446	0.0075	0.027	0.030
20.0	0.9519	0.0073	0.027	0.029
20.5	0.9588	0.0069	0.025	0.028
21.0	0.9653	0.0065	0.024	0.026
21.5	0.9717	0.0064	0.023	0.026
22.0	0.9777	0.0060	0.022	0.024
22.5	0.9836	0.0059	0.022	0.024
23.0	0.9892	0.0056	0.020	0.023
23.5	0.9947	0.0055	0.020	0.022
24.0	1.0000	0.0053	0.019	0.021

APPENDIX G

HYDROLOGIC DATA SHEETS

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Maricopa
Location Concentration Point #9
Project No. 7005 Station 1038
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.0484	square miles
Drainage Length	2,100	feet
Elevation		
Top of Drainage Area	1490	feet
At Structure	1470	feet
Drainage Area Slope	1.0	%
Drainage Width	≤ 600	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.05 / 2.70	inches
P = 24 hour =	3.65 / 3.20	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.42 / 2.13	inches
Curve Number		83	
Runoff	Q =	.996 / .79	inches
Time of Concentration	Tc*	0.20	hours
Time of Peak	Tp = (Tc)(W_f)	0.20 (1.24) = .25	hours
Peak Discharge	$Qp = \frac{484\ AQ}{Tp}$ =	$\frac{484\ (.0484)(Q)}{.25}$	
	=	93cfs / 74cfs	cfs

Computed by L. S. Miller Date 9/86

* Tc calc

250' overland flow @ 1'/sec = 0.07 hrs
1850' channel flow @ 4'/sec = 0.13 hrs
Σ = 0.20 hrs

$\bar{V} = \frac{2100'}{.20 \times 3600} = 2.9$ '/sec

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Maricopa
Location Concentration Point # 11
Project No. 7005 Station 1064
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.019	square miles
Drainage Length	1600	feet
Elevation		
Top of Drainage Area	1505	feet
At Structure	1490	feet
Drainage Area Slope	1.0	%
Drainage Width	400	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.05 / 2.70	inches
P = 24 hour =	3.65 / 3.20	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.42 / 2.13	inches
Curve Number		83	
Runoff	Q =	.996 / .79	inches
Time of Concentration	Tc*	0.17	hours
Time of Peak	Tp = (Tc)(W_f)	0.17 (1.24) = 0.21	hours

Peak Discharge $Qp = \frac{484\,AQ}{Tp} = \frac{484(.019)\,Q}{.21}$

= 44 / 35 cfs

Computed by LSMILLER Date 9/86

*Tc Calc

250' Overland Flow @ 1'/sec = 0.07 hr
1400' Channel Flow @ 4'/sec = 0.10 hr
Σ 0.17 hr

$\bar{V} = \frac{1600}{.17 \times 3600} = 2.6'/sec$

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Maricopa
Location Concentration Point #12
Project No. 7005 Station 1071
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.113	square miles
Drainage Length	5300	feet
Elevation		
Top of Drainage Area	1540	feet
At Structure	1500	feet
Drainage Area Slope	0.75	%
Drainage Width	600	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.05 / 2.70	inches
P = 24 hour =	3.65 / 3.20	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.42 / 2.13	inches
Curve Number		83	
Runoff	Q =	.996 / .79	inches
Time of Concentration	Tc*	0.42	hours
Time of Peak	$Tp = (Tc)(W_f)$	.42 (1.24) = .52	hours
Peak Discharge	$Qp = \frac{484\ AQ}{Tp} =$	$\frac{484\ (.113)(Q)}{.52}$	
	=	105 / 83	cfs

Computed by LS MILLER Date 9/86

* Tc Calc

250' OVERLAND FLOW @ 1'/sec = 0.07 hr
5050' Channel FLOW @ 4'/sec = 0.35 hr
Σ 0.42 hr

$\bar{V} = \frac{5300}{.42} = 3.5$ '/sec

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Maricopa
Location Concentration Point # 14
Project No. 7005 Station 1097
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.115	square miles
Drainage Length	6000	feet
Elevation		
Top of Drainage Area	1560	feet
At Structure	1510	feet
Drainage Area Slope	.83	%
Drainage Width	500	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.05 / 2.70	inches
P = 24 hour =	3.65 / 3.20	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.42 / 2.13	inches
Curve Number		83	
Runoff	Q =	.996 / .79	inches
Time of Concentration	Tc*	.47	hours
Time of Peak	Tp = (Tc)(W_f)	.47 (1.24) = .57	hours

Peak Discharge $Qp = \frac{484\,AQ}{Tp} = \frac{484\,(.115)\,Q}{.57}$

= 97 / 77 cfs

Computed by LS Miller Date 9/86

*Tc Calc

250' overland flow @ 1'/sec = 0.07 hr
5750' Channel flow @ 4'/sec = 0.40 hr
Σ 0.47 hr

$\bar{V} = \frac{6000}{.47} = 3.5$ '/sec

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Maricopa
Location Concentration Point #15
Project No. 7005 Station 1104
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.042	square miles
Drainage Length	2800	feet
Elevation		
Top of Drainage Area	1535	feet
At Structure	1510	feet
Drainage Area Slope	.89	%
Drainage Width	350	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.05 / 2.70	inches
P = 24 hour =	3.65 / 3.20	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.42 / 2.13	inches
Curve Number		83	
Runoff	Q =	.996 / .79	inches
Time of Concentration	Tc*	.31	hours
Time of Peak	Tp = (Tc)(W_f)	.31 (1.24) = .38	hours
Peak Discharge	$Qp = \frac{484\,AQ}{Tp} =$	$\frac{484\,(.042)\,Q}{.38}$	
	=	52 / 42	cfs

Computed by LSMillar Date 9/86

* Tc Calc

250' overland Flow @ 1'/sec = .07 hr
2550' channel Flow @ 3'/sec = .24 hr
Σ .31 hr

$\bar{V} = \frac{2800'}{.31\,hr} = 2.5'/sec$

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I PROPOSED CONDITION

LOCATION DATA:

Highway SUPERSTITION FREEWAY County MARICOPA
Location Concentration Point # 18
Project No. 7005 Station
Name of Stream Unnamed WASH

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.025	square miles
Drainage Length	1300	feet
Elevation		
Top of Drainage Area		feet
At Structure		feet
Drainage Area Slope	1.0	%
Drainage Width	540	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.05 / 2.70	inches
P = 24 hour =	3.65 / 3.20	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.42 / 2.13	inches
Curve Number		33	
Runoff	Q =	0.996 / 0.79	inches
Time of Concentration	Tc*	0.17	hours
Time of Peak	$T_p = (T_c)(W_f)$	.17 (1.24) = .21	hours
Peak Discharge	$Q_p = \frac{484\,AQ}{T_p} =$	$\frac{484\,(.025)\,Q}{.21}$	
	=	57 / 46	cfs

Computed by LSMiller Date 2/87

*Tc Calc

250' OVERLAND FLOW @ 1'/sec = 0.07 hr
1050 Channel FLOW @ 3'/sec = 0.10
Σ 0.17 hr

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Maricopa
Location Concentration Point #19
Project No. 7005 Station 1135
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.019	square miles
Drainage Length	1500	feet
Elevation		
Top of Drainage Area	1550	feet
At Structure	1535	feet
Drainage Area Slope	1.0	%
Drainage Width	250	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.05 / 2.70	inches
P = 24 hour =	3.65 / 3.20	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.42 / 2.13	inches
Curve Number		83	
Runoff	Q =	.996 / .79	inches
Time of Concentration	Tc*	.18	hours
Time of Peak	Tp = (Tc)(W_f)	.18 (1.24) = .22	hours
Peak Discharge	$Qp = \frac{484\,AQ}{Tp} = \frac{484\,(.019)\,Q}{.22}$		
	=	40 / 33	cfs

Computed by LSMiller Date 9/86

*Tc Calc

250' overland flow @ 1'/sec = 0.07 hr
1250' channel flow @ 3'/sec = 0.11 hr
Σ 0.18 hr

$\bar{V} = \frac{1500}{.18(3600)} = 2.3'/sec$

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I PROPOSED CONDITION

LOCATION DATA:

Highway SUPERSTITION FREEWAY County MARICOPA
Location Concentration Point # 19
Project No. 7005 Station
Name of Stream Unnamed WASH

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.014	square miles
Drainage Length	800	feet
Elevation		
Top of Drainage Area		feet
At Structure		feet
Drainage Area Slope	1.0	%
Drainage Width	475	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.05 / 2.70	inches
P = 24 hour =	3.65 / 3.20	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.42 / 2.13	inches
Curve Number		83	
Runoff	Q =	0.996 / 0.79	inches
Time of Concentration	Tc*	0.12	hours
Time of Peak	Tp = (Tc)(W_f)	0.12 (1.24) = .15	hours
Peak Discharge	$Qp = \frac{484\,AQ}{Tp} =$	$\frac{484(.014)\,Q}{.15}$	
	=	45 / 37	cfs

Computed by LSMiller Date 2/87

*Tc Calc

250' OVERLAND FLOW @ 1'/sec = 0.07 hr
550 Channel Flow @ 3'/sec = 0.05 hr
Σ = 0.12 hr

$\bar{V} = \frac{800}{.12\,(3600)} = 1.9$ '/sec

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Maricopa
Location Concentration Point #20
Project No. 7005 Station 1148
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.065	square miles
Drainage Length	2300	feet
Elevation		
Top of Drainage Area	1570	feet
At Structure	1545	feet
Drainage Area Slope	1.1	%
Drainage Width	600	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.05 / 2.70	inches
P = 24 hour =	3.65 / 3.20	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.42 / 2.13	inches
Curve Number		83	
Runoff	Q =	.996 / .79	inches
Time of Concentration	Tc*	0.21	hours
Time of Peak	Tp = (Tc)(Wf)	0.21(1.24) = .26	hours
Peak Discharge	$Qp = \frac{484\,AQ}{Tp} =$	$\frac{484(.065)\,Q}{.26}$	
	=	120 / 95	cfs

Computed by _____ Date _____

*Tc Calc

250' overland Flow @ 1'/sec = 0.07 hr
2050' Channel Flow @ 4'/sec = 0.14 hr
Σ 0.21 hr

$\bar{U} = \frac{2300}{.21(3600)} = 3'/sec$

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Pinal
Location Concentration Point # 29
Project No. 7005 Station 1317
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.101	square miles
Drainage Length	4700	feet
Elevation		
Top of Drainage Area	1710	feet
At Structure	1655	feet
Drainage Area Slope	1.2	%
Drainage Width	600	feet
Width factor W_f	1.10	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.20 / 2.87	inches
P = 24 hour =	4.10 / 3.65	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.38 / 2.11	inches
Curve Number		83	
Runoff	Q =	.966 / .77	inches
Time of Concentration	Tc*	0.38	hours
Time of Peak	Tp = (Tc)(W_f)	.38(1.1) = .42	hours

Peak Discharge $Qp = \frac{484\,AQ}{Tp} = \frac{484\,(.101)\,Q}{.42}$

= 112 / 90 cfs

Computed by LS Miller Date 9/86

*Tc Calc

250' overland flow @ 1'/sec = 0.07 hr
4450' channel flow @ 4'/sec = 0.31 hr
Σ 0.38 hr

$\bar{V} = \frac{4700}{.38(3600)} = 3.4'/sec$

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Pinal
Location Concentration Point #34
Project No. 7005 Station 1373 + 1375
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100/50	years
Drainage Area	0.048	square miles
Drainage Length	1200	feet
Elevation		
Top of Drainage Area	1700	feet
At Structure	1670	feet
Drainage Area Slope	2.5	%
Drainage Width	1115	feet
Width factor W_f	1.1	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.20/2.87	inches
P = 24 hour =	4.10/3.65	inches

$\frac{Vol.}{(.048\ mi^2)(1.18)} = 3.02$ Ac ft.

$\frac{196}{2} \times 3(.13\ hr) = 3.16$ Ac

$\frac{102}{2} \times 3(.22) = 2.78$ hr.

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.38/2.11	inches
Curve Number		86.5	
Runoff	Q =	1.18/0.96	inches
Time of Concentration	Tc	0.13	hours
Time of Peak	Tp = (Tc)(W_f)	0.13(1.10) = 0.14	hours

Peak Discharge $Qp = \frac{484\ AQ}{Tp} = \frac{484\ (0.048)\ Q}{0.14}$

= 196/159 cfs

Computed by L. S. Miller Date 12/86

* T_c Calc.

250' Overland Flow @ 1'/sec = 0.07 hr.
950' Channel Flow @ 4'/sec. = 0.06 hr.
0.13 hr.

$\bar{V} = \frac{1200}{0.13}(3600) = 2.6$'/sec.

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Pinal
Location Concentration Point # 35
Project No. _____ Station 1379+50
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.065	square miles
Drainage Length	3500	feet
Elevation		
Top of Drainage Area	1720	feet
At Structure	1670	feet
Drainage Area Slope	1.43	%
Drainage Width	517	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.20 / 2.87	inches
P = 24 hour =	4.10 / 3.65	inches

$\frac{Vol.}{0.065(1.28)} = 4.44$ Ac.ft

$\frac{108}{2} \times 3(.3) = 4.02$ Ac.ft.

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.38 / 2.11	inches
Curve Number		88	
Runoff	Q =	1.28 / 1.05	inches
Time of Concentration	Tc	0.30	hours
Time of Peak	Tp = (Tc)(W_f)	0.30(1.24) = 0.37	hours

Peak Discharge $Qp = \frac{484\ AQ}{Tp} = \frac{484\ (.065)Q}{0.37}$

= 108 / 89 cfs

Computed by L. S. Miller Date 12/86

* T_c Calc.

250' Overland Flow @ 1'/sec. = 0.07 hr.
3250' Channel Flow @ 4'/sec = 0.23 hr
0.30 hr.

$\bar{V} = \frac{3600}{0.30(3600)} = 3.3$ '/sec.

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Pinal
Location Concentration Plant #36
Project No. 7005 Station 1382+00
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100/50	years
Drainage Area	0.079	square miles
Drainage Length	3000	feet
Elevation		
Top of Drainage Area	1720	feet
At Structure	1670	feet
Drainage Area Slope	1.67	%
Drainage Width	734	feet
Width factor W_f	1.1	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.20/2.87	inches
P = 24 hour =	4.10/3.65	inches

$\frac{Vol.}{(.079)1.27} = 5.35$ Ac.ft.

$\frac{147}{2} \times 0.3(0.3) = 5.47$ Ac ft

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.38/2.11	inches
Curve Number		87.8	
Runoff	Q =	1.27/1.04	inches
Time of Concentration	Tc	0.30	hours
Time of Peak	Tp = (Tc)(W_f)	0.30(1.1) = 0.33	hours

Peak Discharge $Qp = \frac{484\ AQ}{Tp} = \frac{484(0.079)Q}{0.33}$

= 147/121 cfs

Computed by L. S. Miller Date 12/86

*Tc Calc.

250' overland Flow @ 1'/sec = 0.07 hr.
2750' Channel Flow @ 4'/sec = 0.19 hr.
0.26 hr.

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Pinal
Location Concentration Point #38
Project No. 7005 Station 1394
Name of Stream

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	.0075	square miles
Drainage Length	900	feet
Elevation		
Top of Drainage Area	1705	feet
At Structure	1690	feet
Drainage Area Slope	1.67	%
Drainage Width	232	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.20 / 2.87	inches
P = 24 hour =	4.10 / 3.65	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.38 / 2.11	inches
Curve Number		86.4	
Runoff	Q =	1.17 / .9565	inches
Time of Concentration	Tc *	0.11	hours
Time of Peak	Tp = (Tc)(W_f)	0.11 (1.24) = .136	hours
Peak Discharge	$Qp = \frac{484\,AQ}{Tp} =$	$\frac{484(.0075)Q}{.136}$	
	=	31 / 25	cfs

Computed by LSMiller Date 9/86

* Tc Calc

250' overland flow @ 1'/sec = 0.07 hr
650' channel flow @ 4'/sec = 0.04 hr
0.11 hr

$\bar{U} = \frac{900}{.11(3600)} = 2.3$ '/sec

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Pinal
Location Concentration Point #39
Project No. 7005 Station 1399
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.012	square miles
Drainage Length	1100	feet
Elevation		
Top of Drainage Area	1705	feet
At Structure	1690	feet
Drainage Area Slope	1.36	%
Drainage Width	304	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.20 / 2.87	inches
P = 24 hour =	4.10 / 3.65	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.38 / 2.11	inches
Curve Number		86.4	
Runoff	Q =	1.17 / .9565	inches
Time of Concentration	Tc*	0.13	hours
Time of Peak	Tp = (Tc)(W_f)	0.13(1.24) = .16	hours
Peak Discharge	$Qp = \frac{484\,AQ}{Tp} =$	$\frac{484(.012)Q}{.16}$	
	=	42 / 35	cfs

Computed by LS Miller Date 9/86

*Tc Calc

250' overland flow @ 1'/sec = 0.07 hr
850' channel flow @ 4'/sec = 0.06 hr
0.13 hr

$\bar{V} = \frac{1100}{.13} = 22.4$ '/sec

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Pinal
Location Concentration Point # 41
Project No. 7005 Station 1410
Name of Stream Unnamed Wash

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	.086	square miles
Drainage Length	9800	feet
Elevation		
Top of Drainage Area	1745	feet
At Structure	1690	feet
Drainage Area Slope	0.56	%
Drainage Width	245	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.20 / 2.87	inches
P = 24 hour =	4.10 / 3.65	inches

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.38 / 2.11	inches
Curve Number		86	
Runoff	Q =	1.15 / .933	inches
Time of Concentration	Tc*	0.73	hours
Time of Peak	Tp = (Tc)(W_f)	0.73(1.24) = .90	hours
Peak Discharge	$Qp = \frac{484\,AQ}{Tp} =$	$\frac{484(.086)Q}{.90}$	
	=	53 / 43	cfs

Computed by LSMiller Date 9/86

* Tc Calc

250' overland flow @ 1'/sec = 0.07 hr
9550' Channel flow @ 4'/sec = 0.66 hr
0.73 hr

$\bar{V} = \frac{9800}{.73(3600)} = 3.7'/sec$

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Pinal
Location Concentration Point #42
Project No. _____ Station 1417 & 1414+50
Name of Stream _____

DESIGN DATA:

Design Frequency	100 / 50	years
Drainage Area	0.04	square miles
Drainage Length	2000	feet
Elevation		
Top of Drainage Area	1720	feet
At Structure	1690	feet
Drainage Area Slope	1.5	%
Drainage Width	557	feet
Width factor W_f	1.1	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.20 / 2.87	inches
P = 24 hour =	4.10 / 3.65	inches

$\frac{Vol.}{0.04(1.15)} = 2.45$ Ac.ft.

$\frac{88}{2}(0.23(0.3) = 2.51$ Ac.

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.38 / 2.87	inches
Curve Number		86	
Runoff	Q =	1.15 / 0.933	inches
Time of Concentration	Tc	0.23	hours
Time of Peak	Tp = (Tc)(W_f)	0.23(1.1) = 0.25	hours

Peak Discharge $Qp = \frac{484\,AQ}{Tp} = \frac{484(0.04)\,Q}{0.25}$

= 88 / 71 cfs

Computed by L. S. Miller Date 12/86

* T_c Calc.

250' Overland Flow @ 1'/sec. = 0.07 hr.
1750' Channel Flow @ 4'/sec. = 0.12 hr.
0.19 hr.

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET

S C S METHOD: PART I

LOCATION DATA:

Highway Superstition Freeway County Pinal
Location Concentration Point #43
Project No. 7005 Station 1422
Name of Stream Unnamed

DESIGN DATA:

Design Frequency	100/50	years
Drainage Area	0.016	square miles
Drainage Length	1100	feet
Elevation		
Top of Drainage Area	1710	feet
At Structure	1695	feet
Drainage Area Slope	1.36	%
Drainage Width	400	feet
Width factor W_f	1.24	
Vegetative Cover Type		
Vegetative Cover Density		%
Soil Group		
Precipitation		
P = 6 hour =	3.20/2.87	inches
P = 24 hour =	4.10/3.65	inches

$\frac{Vol}{.016(1.15)} = 0.98$ Acft.

$\frac{47}{2}(.15)3 = 0.87$ Acft

DESIGN COMPUTATION:

Precipitation	P = 1 hour =	2.38/2.11	inches
Curve Number		86	
Runoff	Q =	1.15/1.933	inches
Time of Concentration	Tc	0.15	hours
Time of Peak	Tp = (Tc)(W_f)	1.24(0.15) = .19	hours

Peak Discharge $Qp = \frac{484\ AQ}{Tp} = \frac{484\ (0.016)\ Q}{0.19}$

= 47/38 cfs

Computed by L. S. Miller Date 12/86

* T_c Calc.

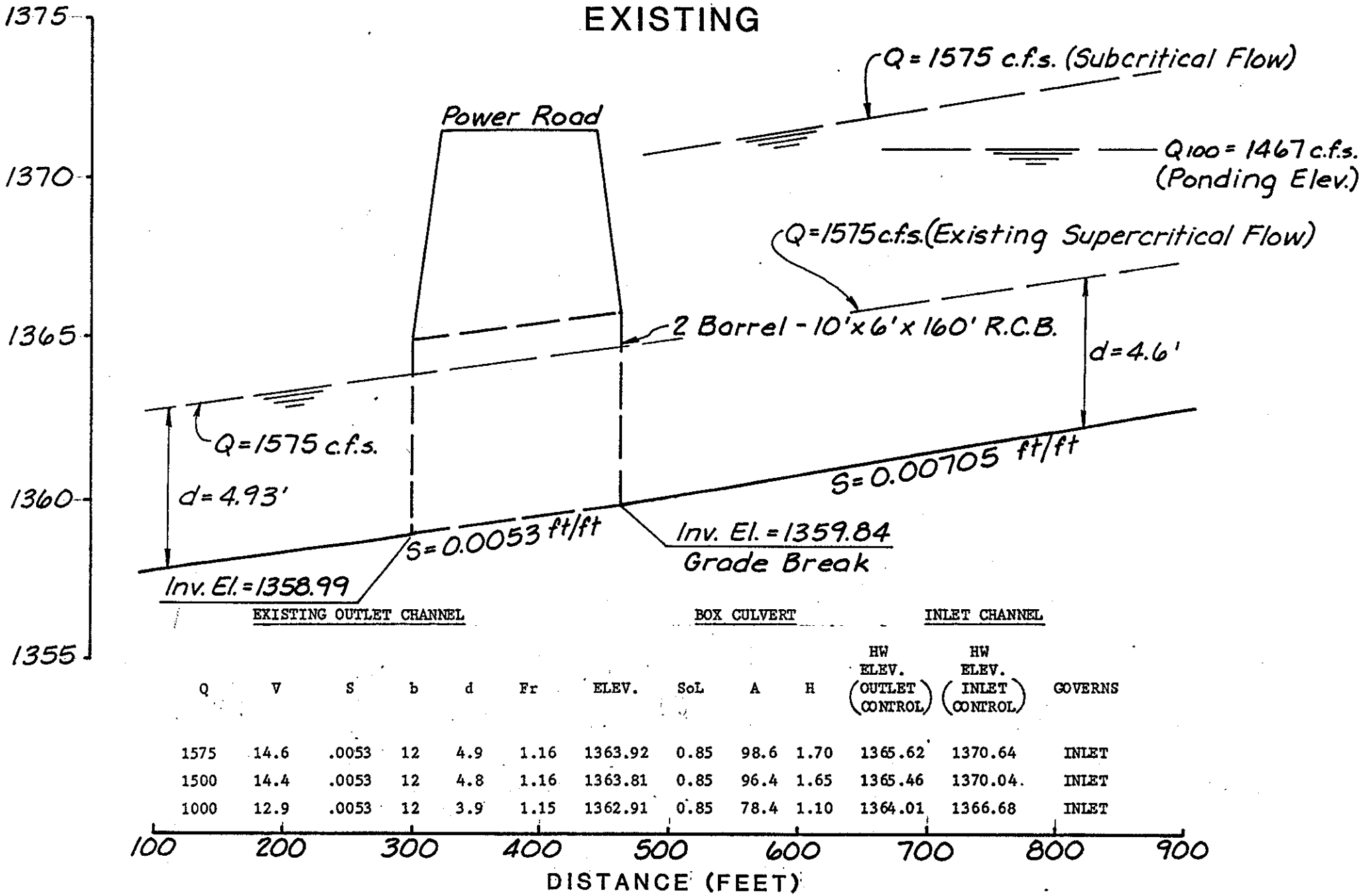
250' overland Flow @ 1'/sec = 0.07 hr.
850' Channel Flow @ 4'/sec = 0.06 hr.
0.13 hr

$\bar{V} = \frac{2200}{.21(3600)} = 2.9'/sec.$

APPENDIX H

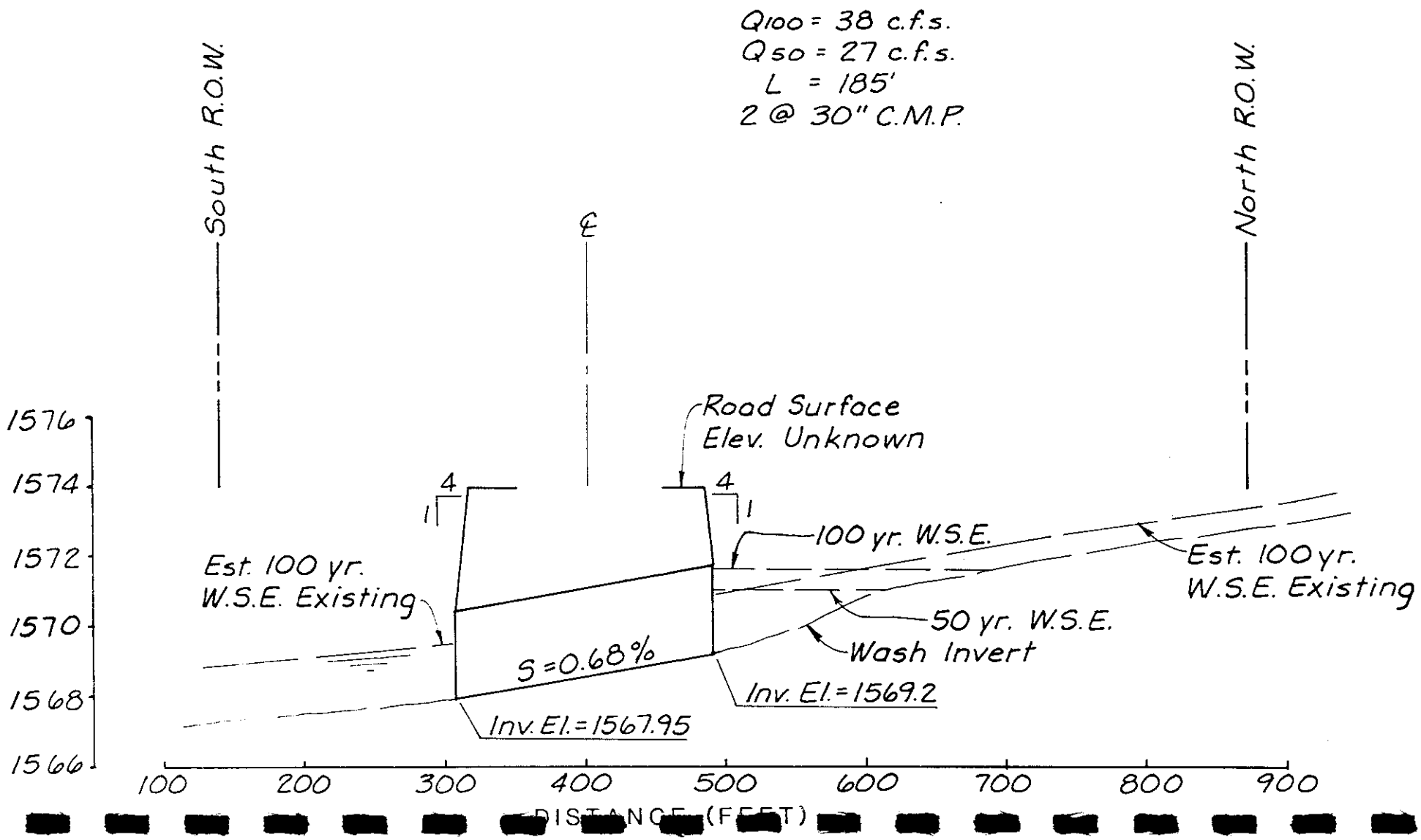
CULVERT HYDRAULICS CALCULATION SHEETS

SUPERSTITION FREEWAY
POWER ROAD CULVERT
EXISTING

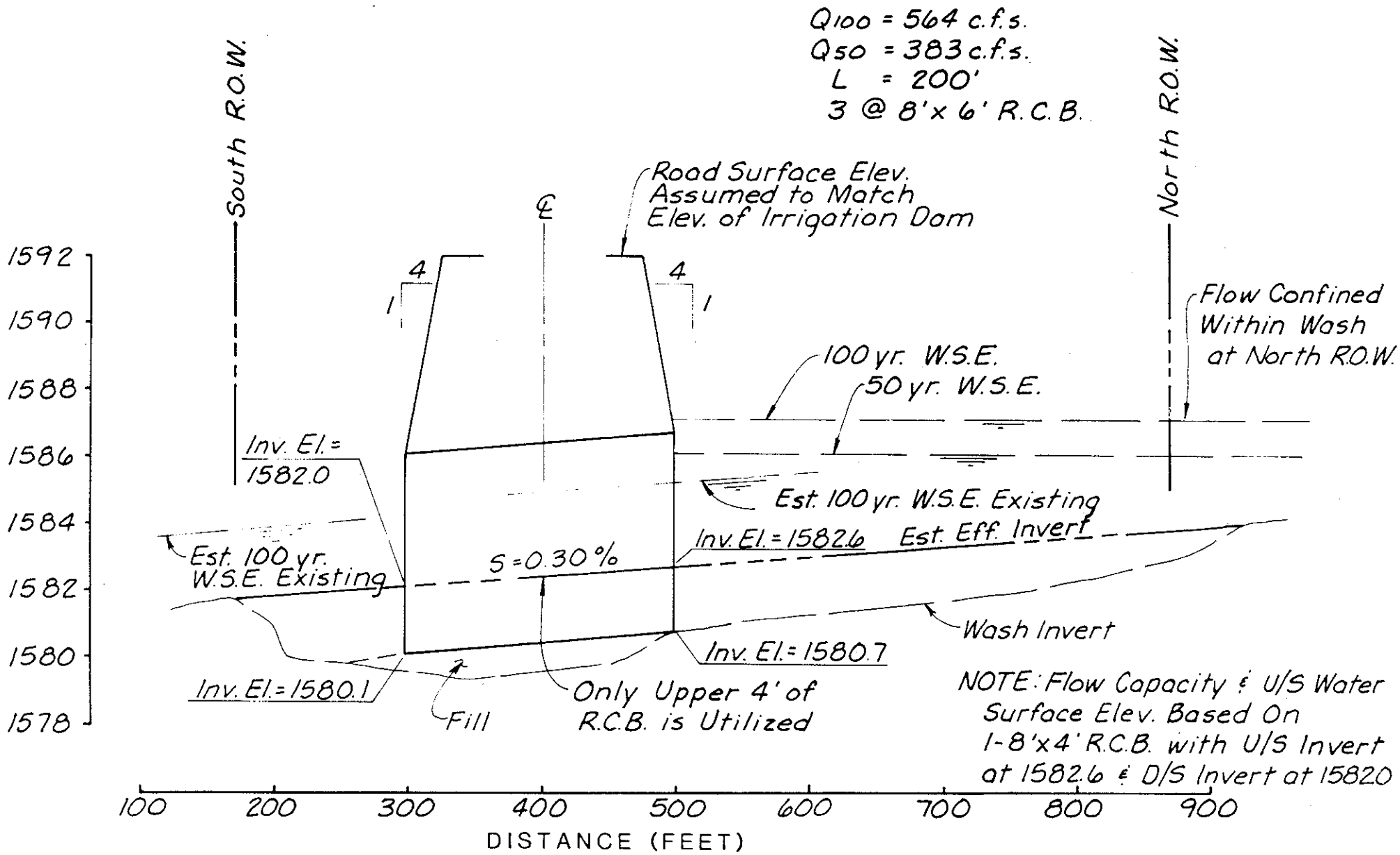


EXISTING OUTLET CHANNEL						BOX CULVERT				INLET CHANNEL		
Q	V	S	b	d	Fr	ELEV.	SoL	A	H	HW ELEV. (OUTLET CONTROL)	HW ELEV. (INLET CONTROL)	GOVERNS
1575	14.6	.0053	12	4.9	1.16	1363.92	0.85	98.6	1.70	1365.62	1370.64	INLET
1500	14.4	.0053	12	4.8	1.16	1363.81	0.85	96.4	1.65	1365.46	1370.04	INLET
1000	12.9	.0053	12	3.9	1.15	1362.91	0.85	78.4	1.10	1364.01	1366.68	INLET

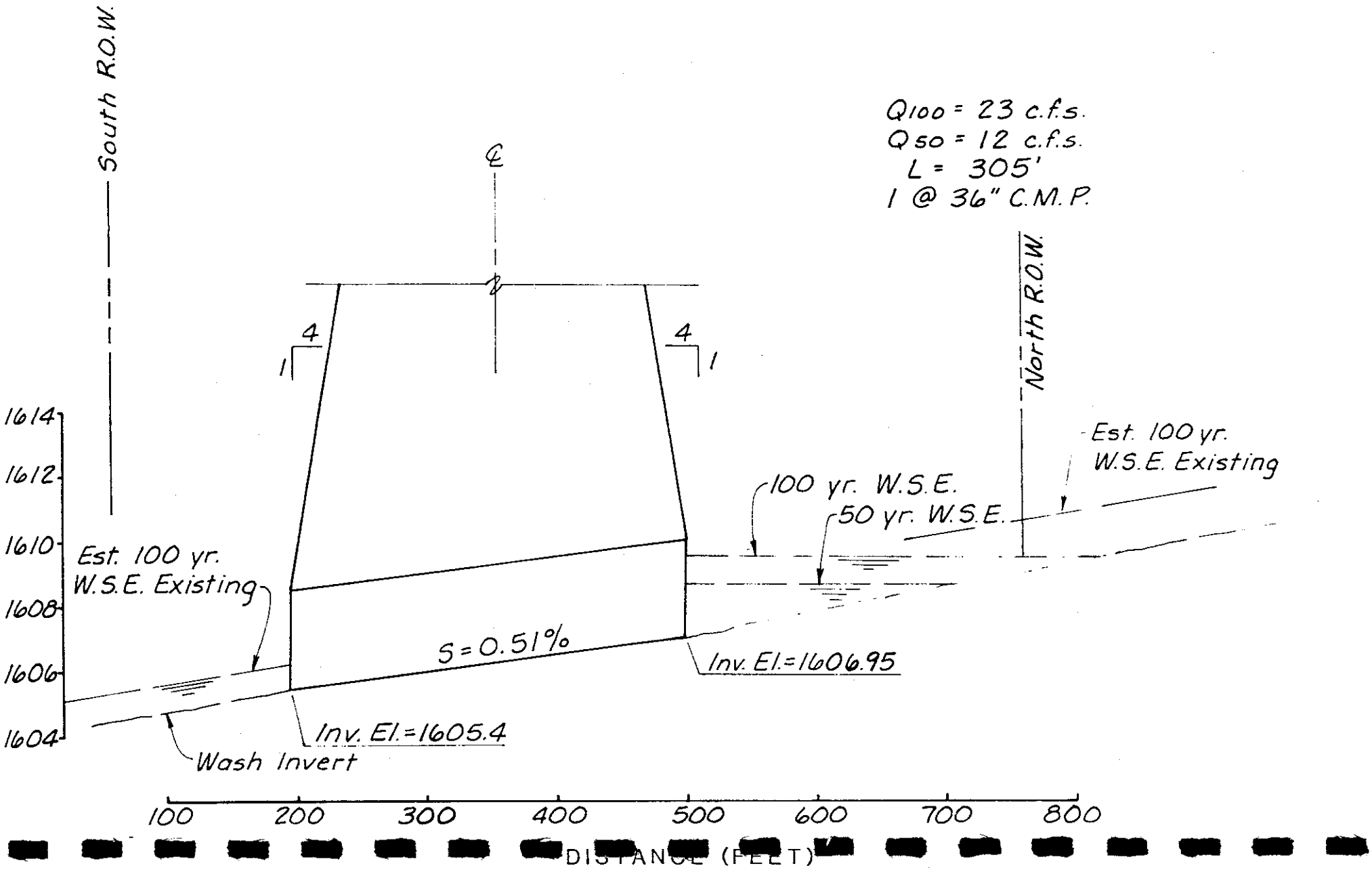
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1186+00



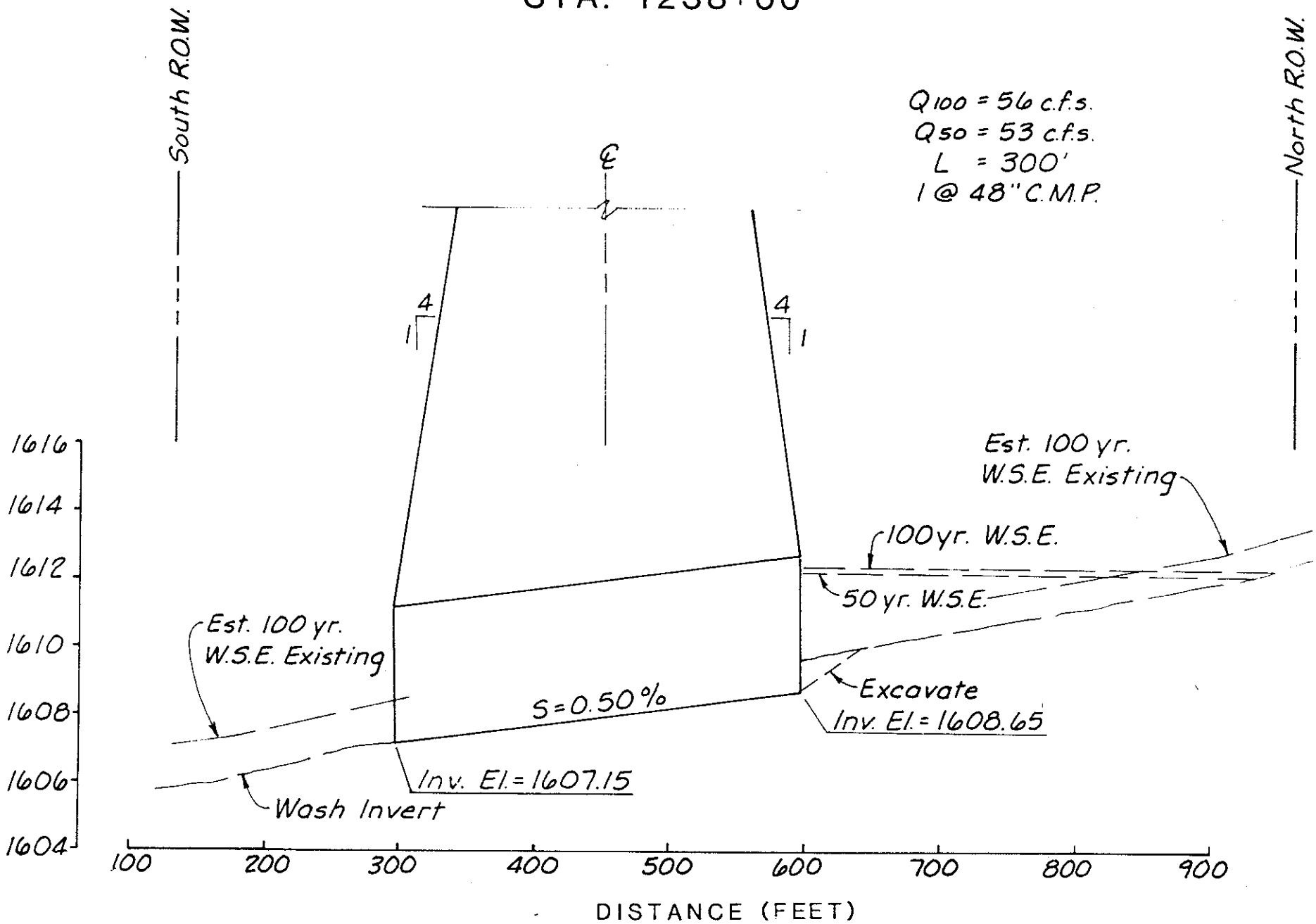
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1205+25



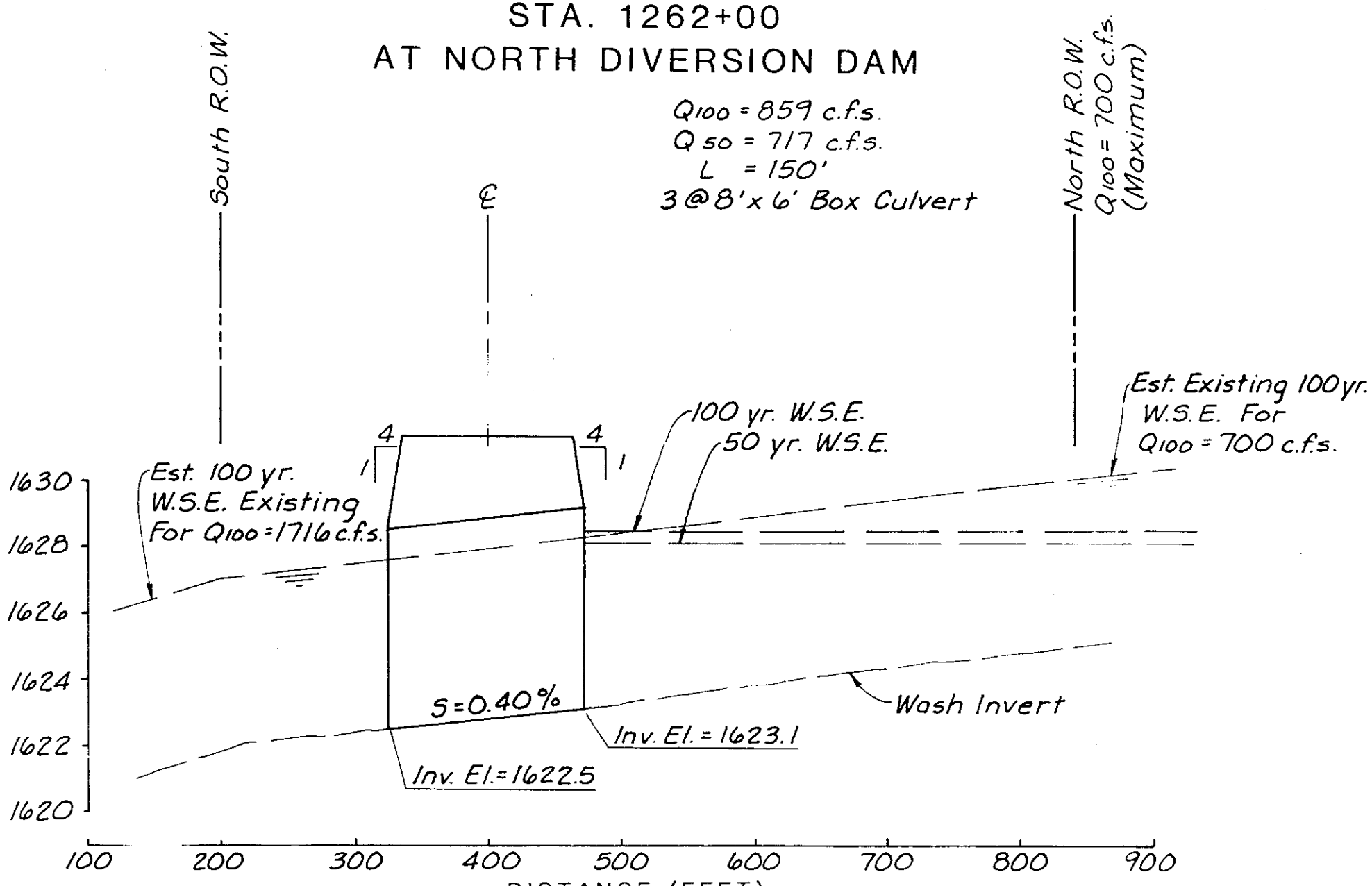
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1236+00



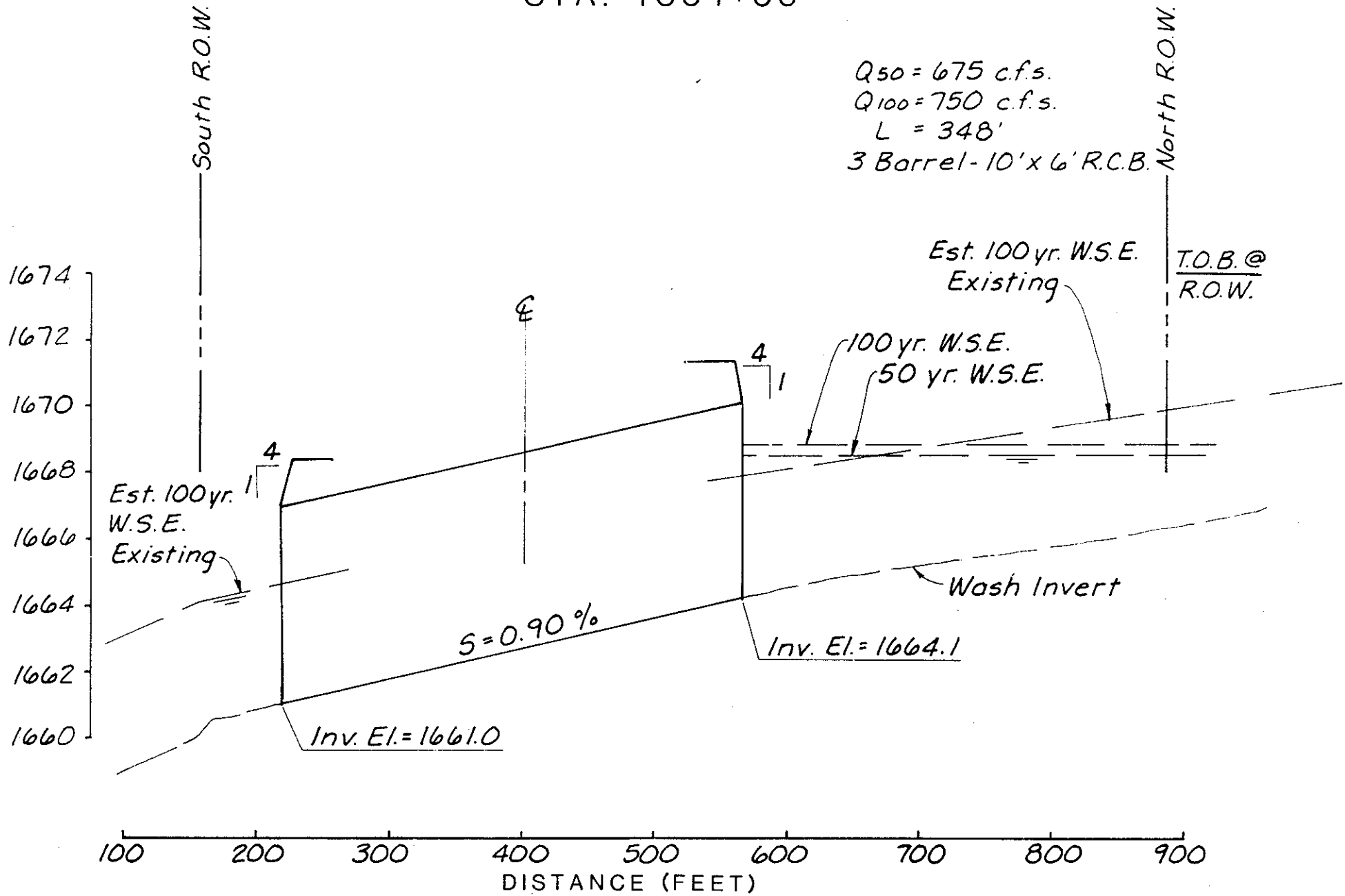
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1238+00



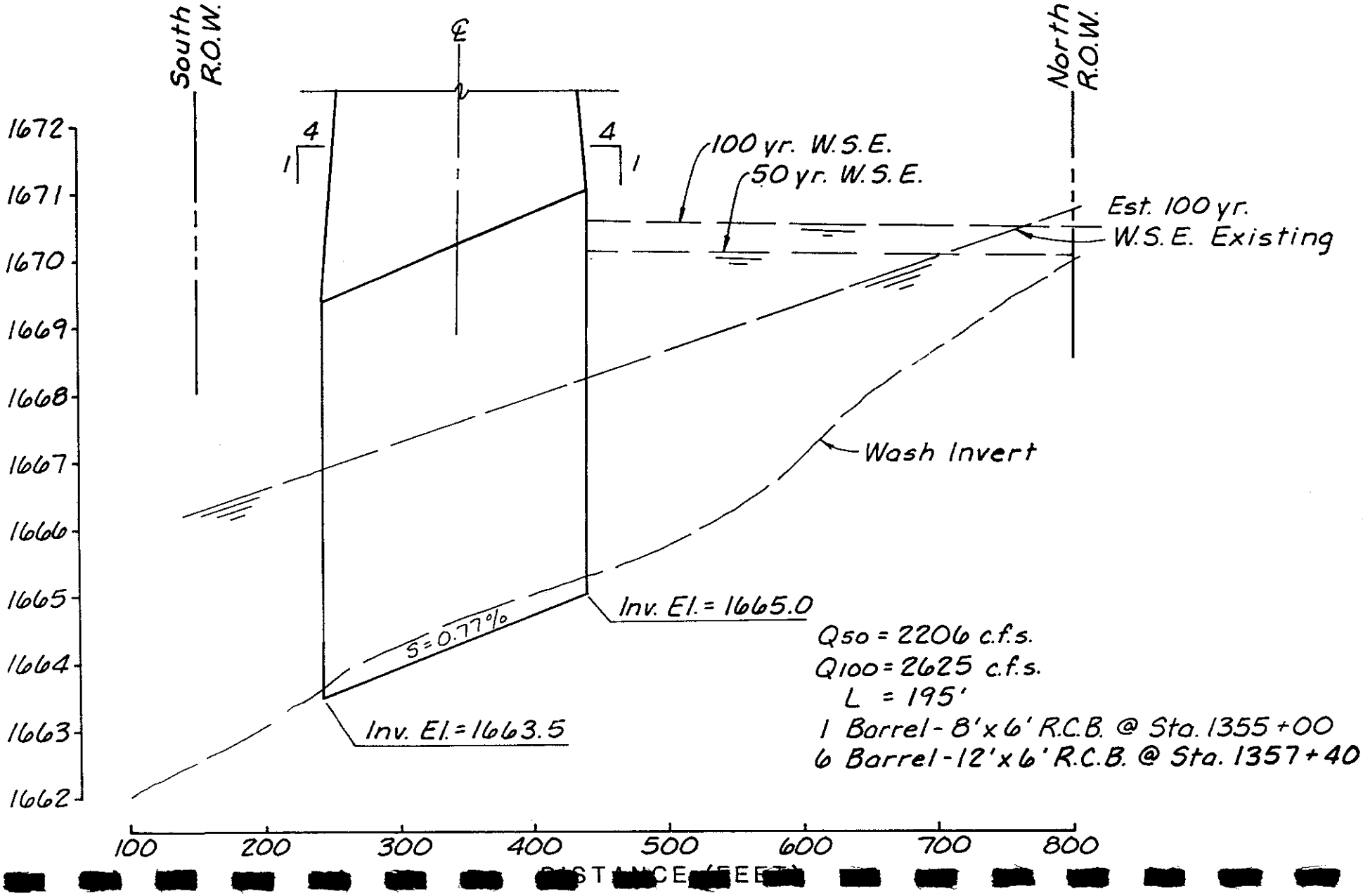
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1262+00
AT NORTH DIVERSION DAM



SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1351+50



SUPERSTITION FREEWAY
CULVERT PROFILE
APPROX. STA. 1355+00 - 1358+00



SUPERSTITION FREEWAY
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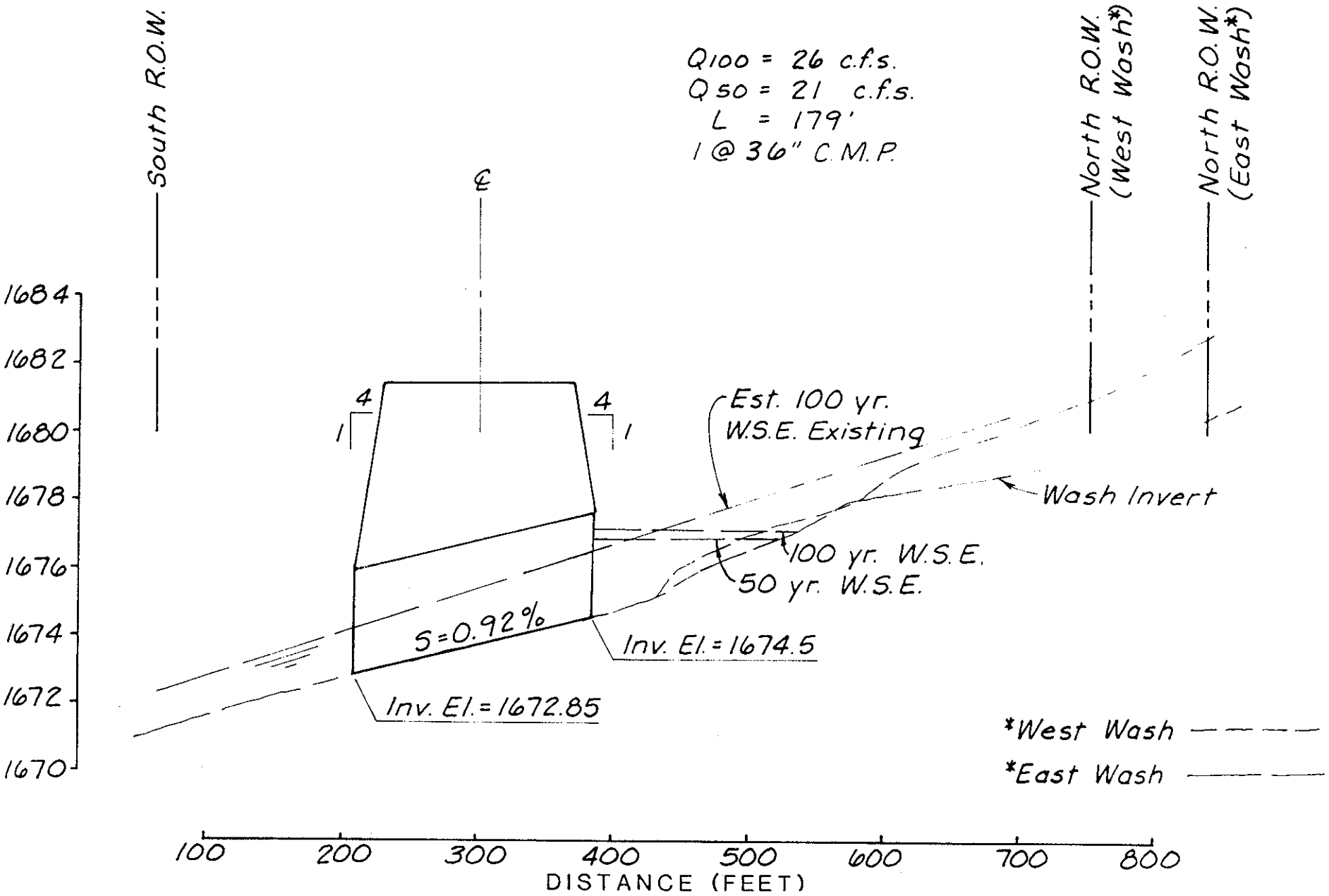
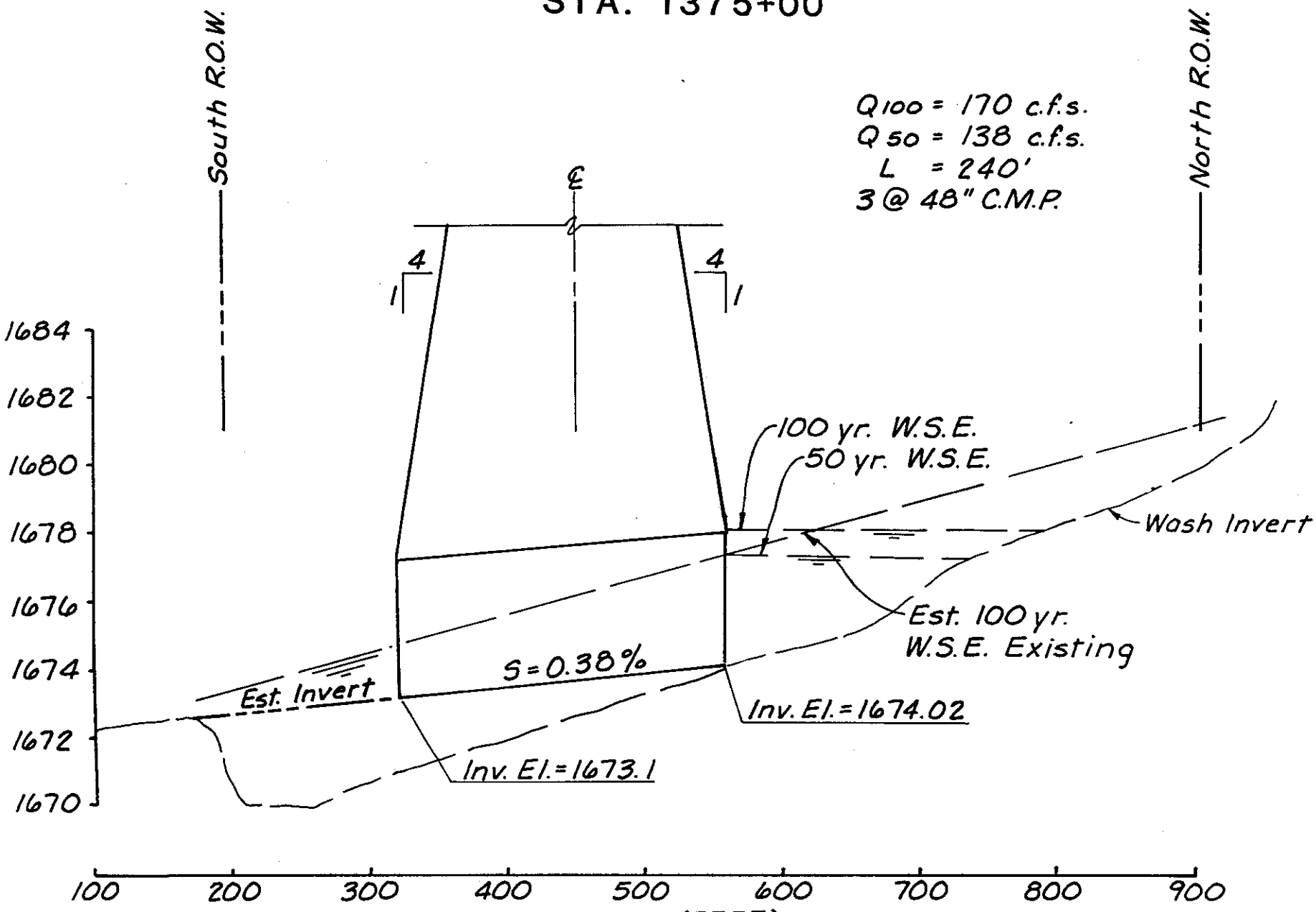
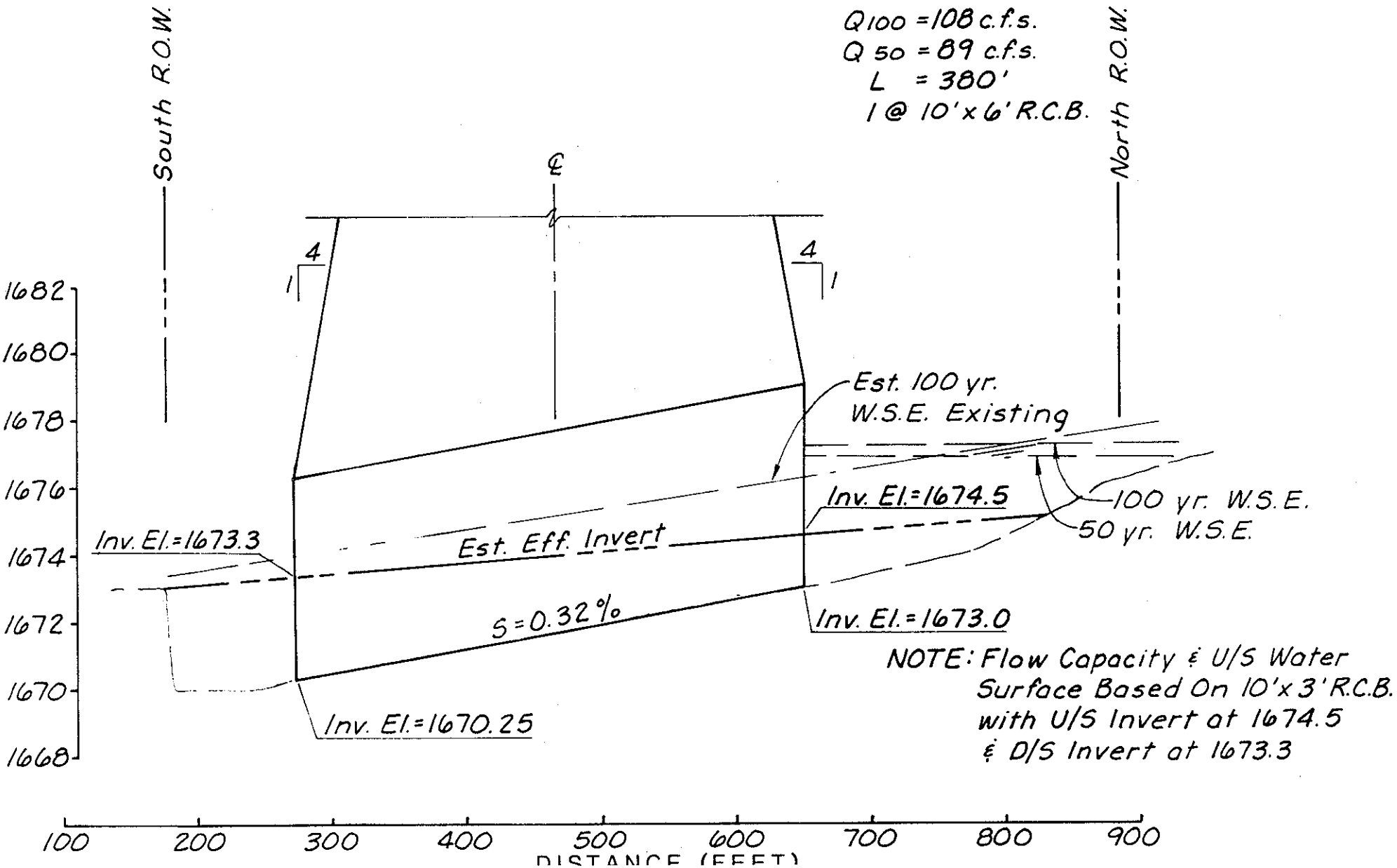
STA. 1371+00



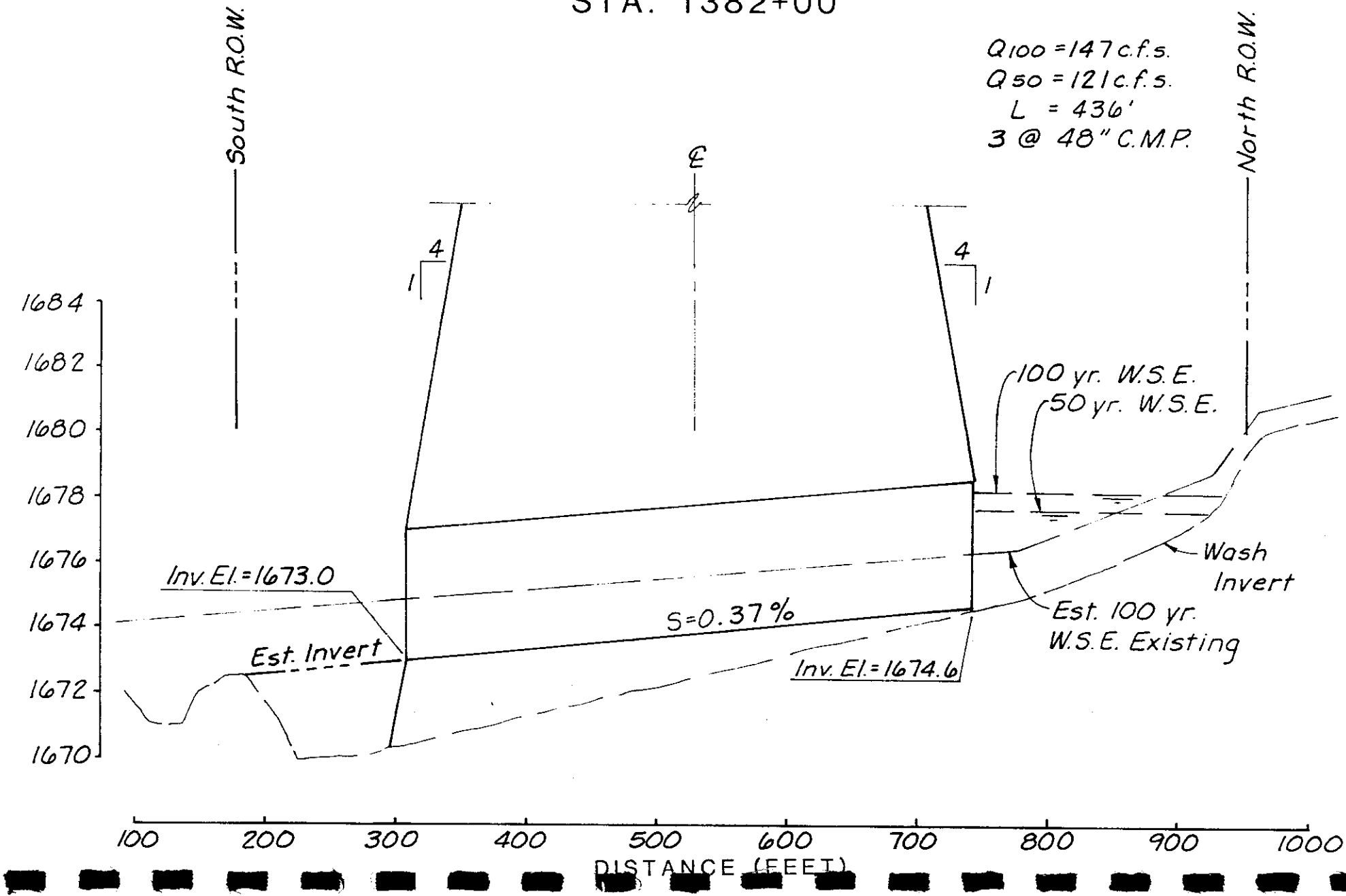
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1375+00



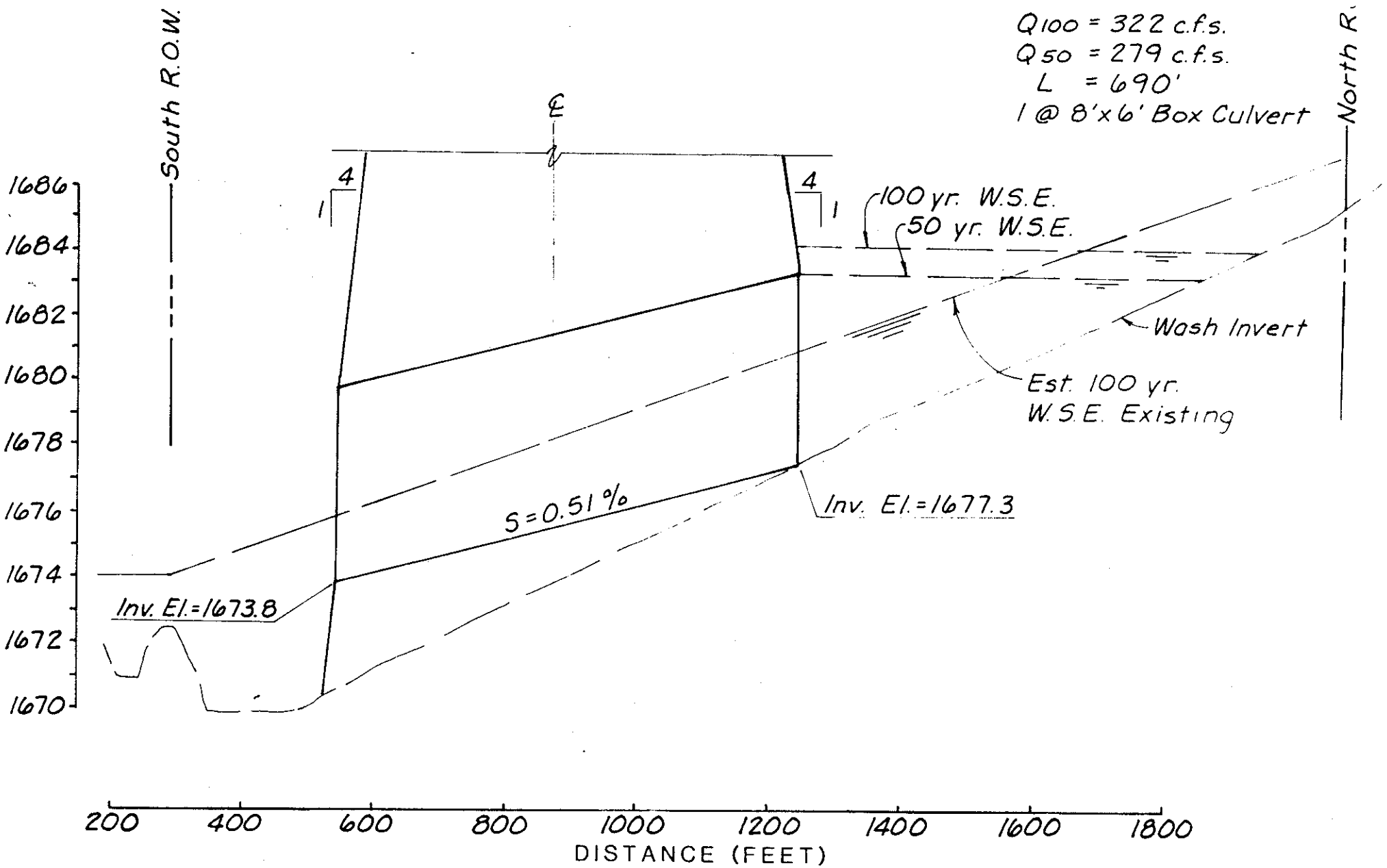
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1379+50



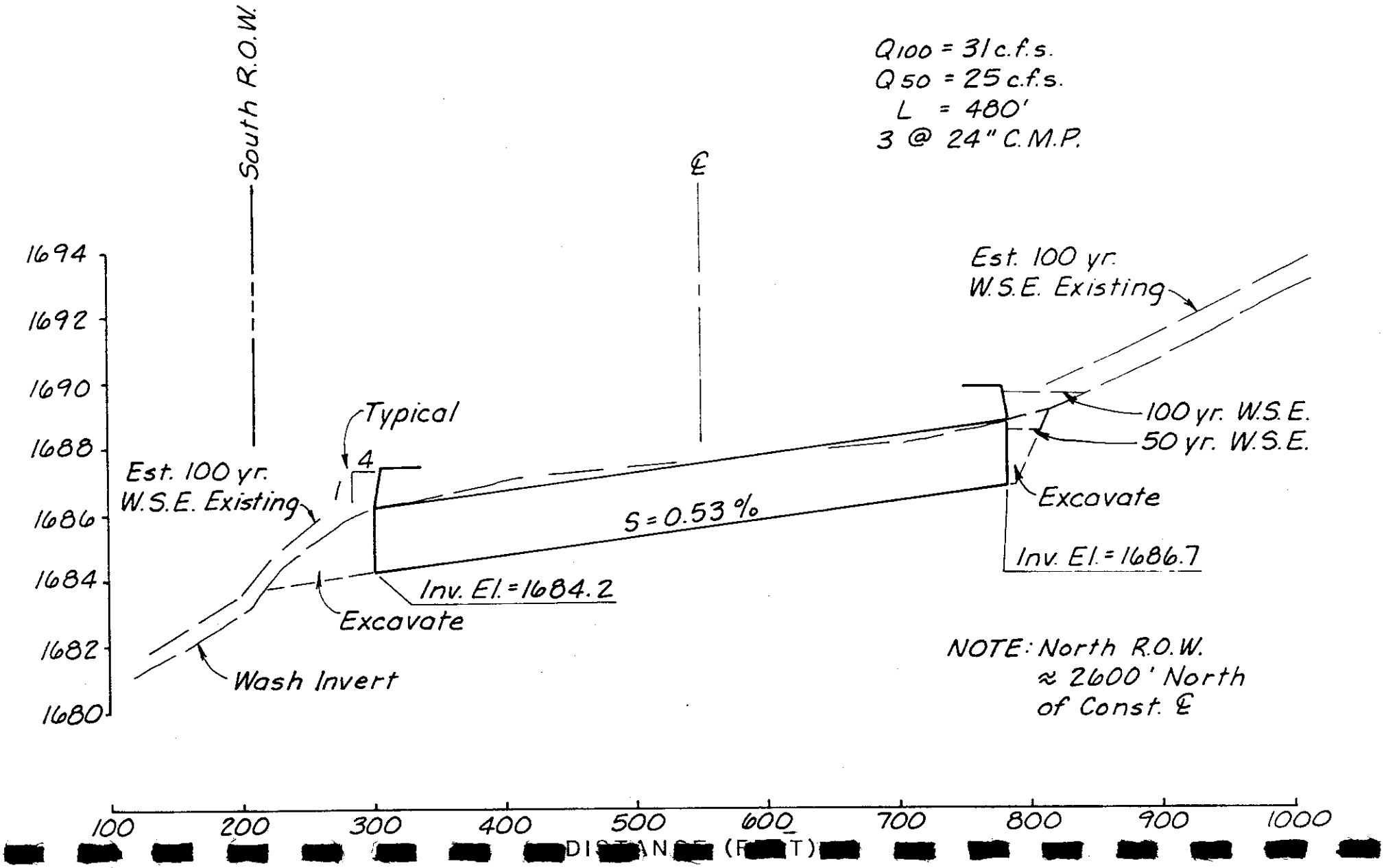
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1382+00



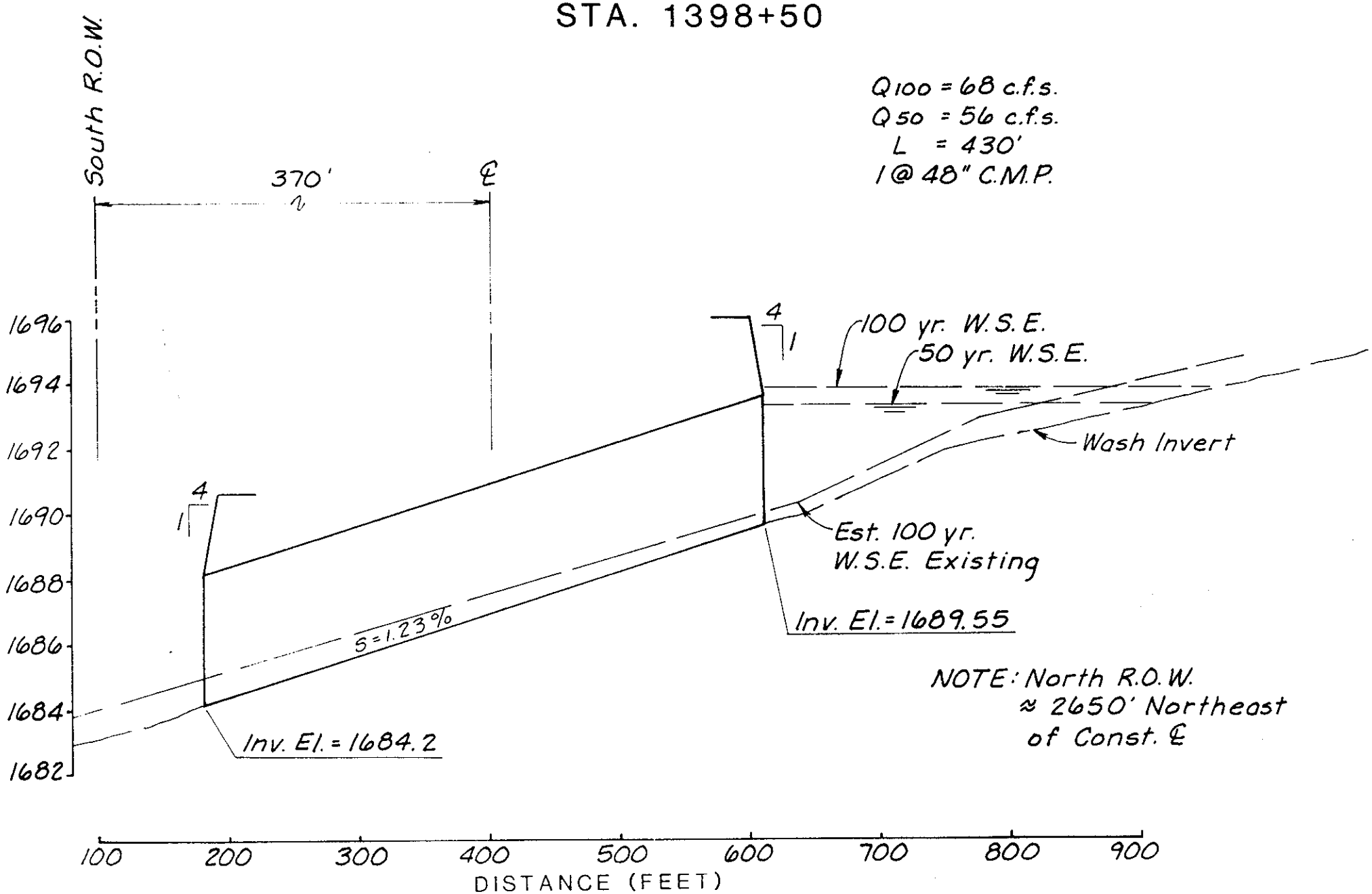
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1386+00



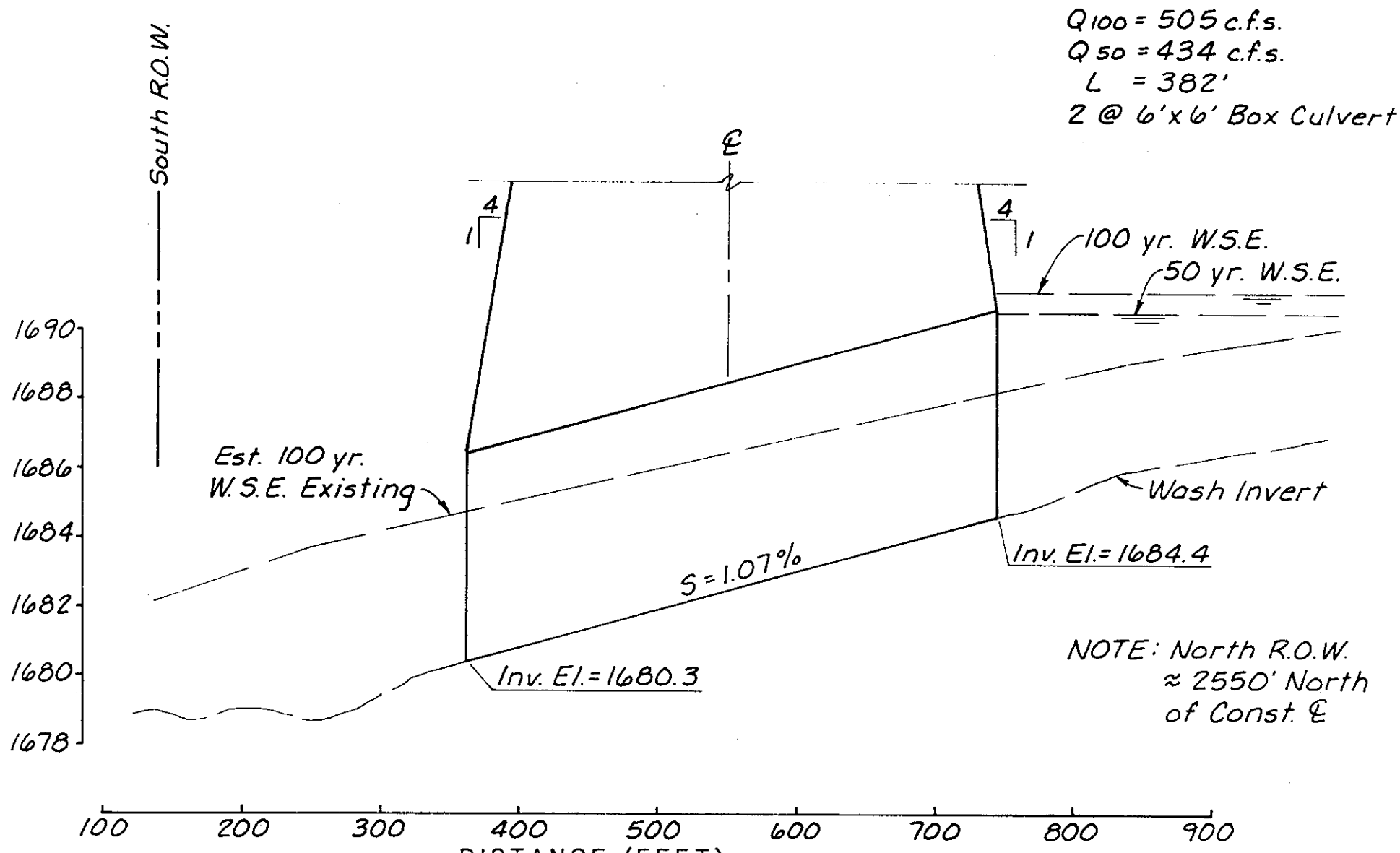
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1395+00



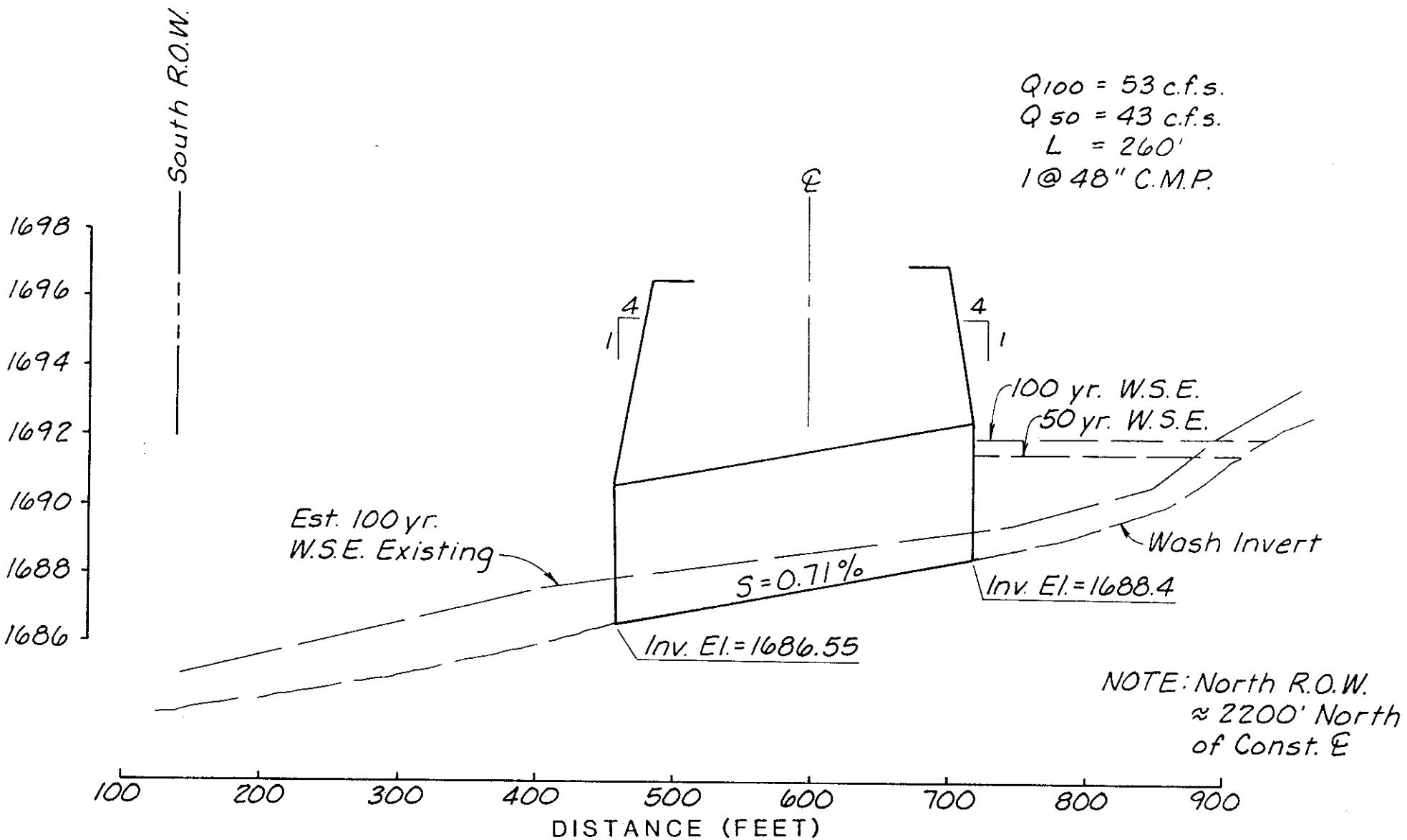
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1398+50



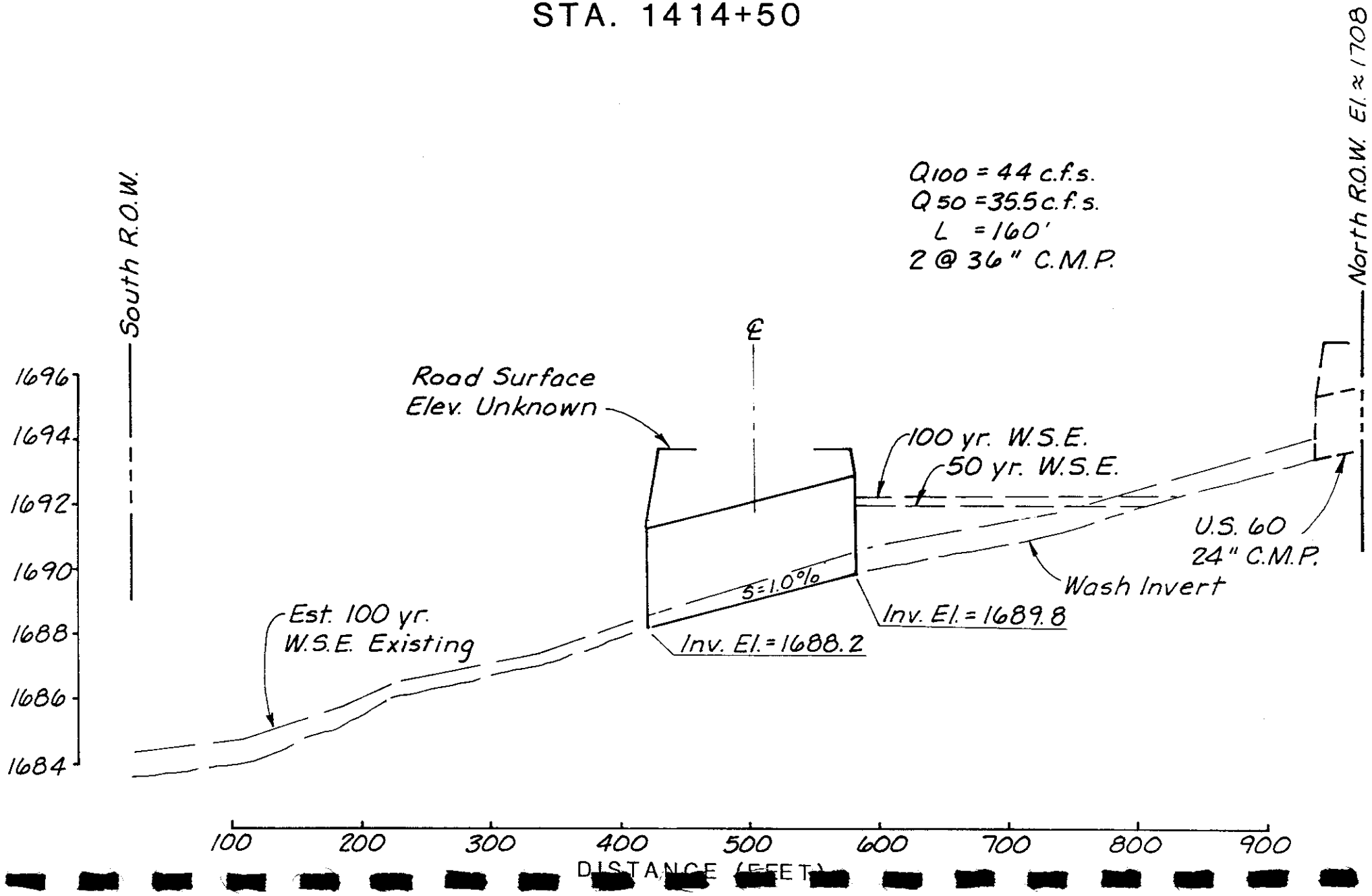
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1403+20



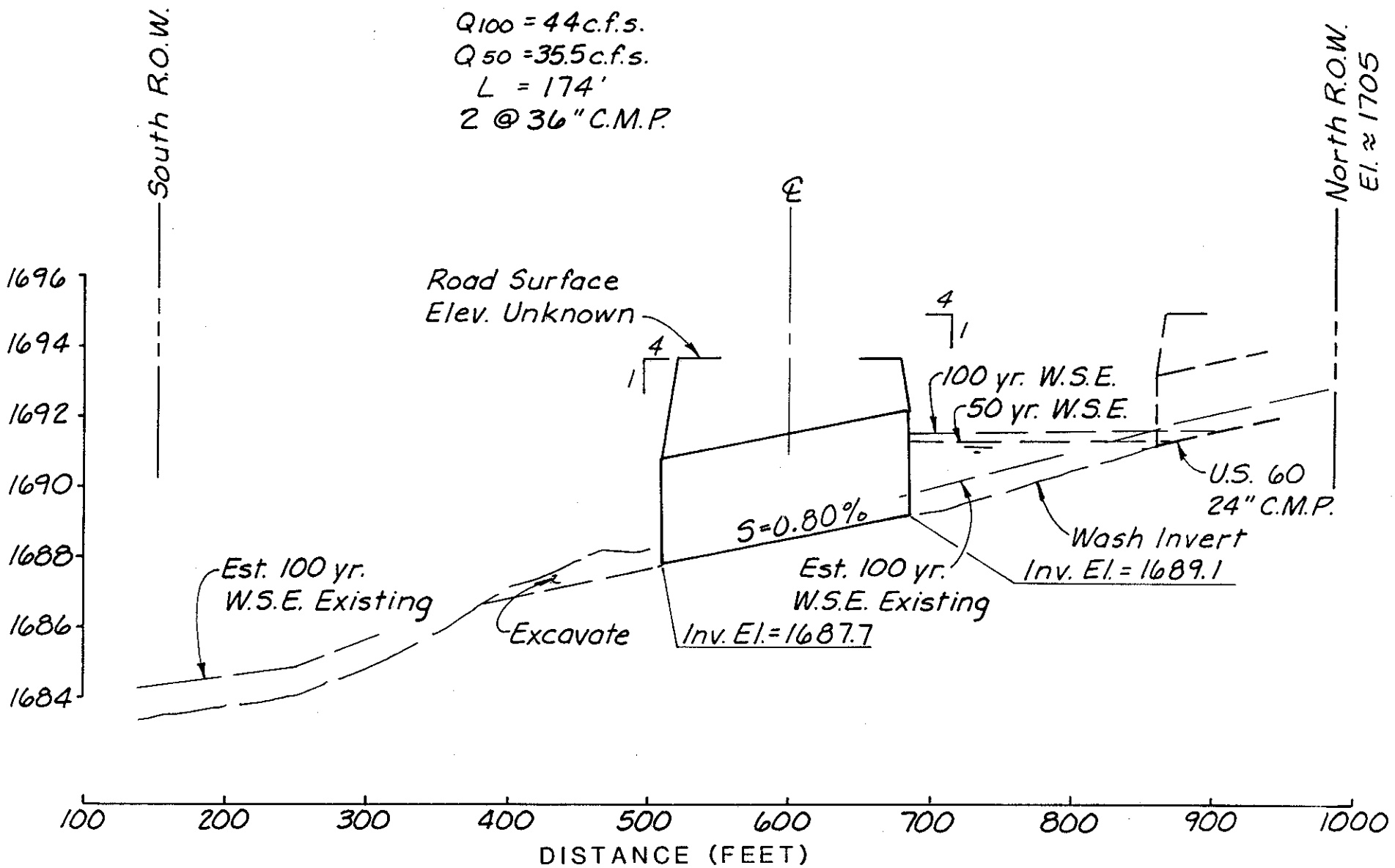
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1410+50



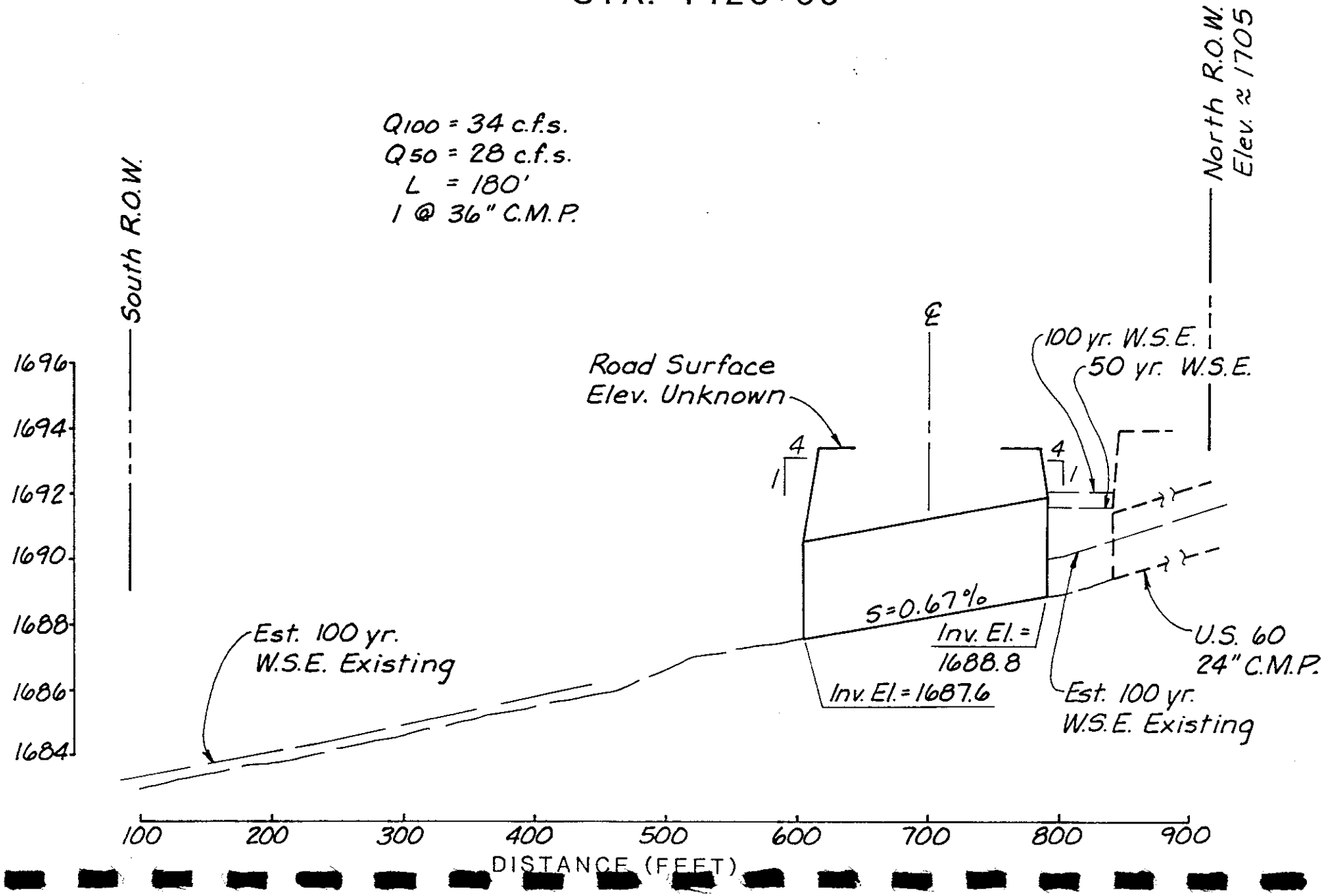
SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1414+50



SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1417+00



SUPERSTITION FREEWAY
CULVERT PROFILE
STA. 1420+00



①

PROJECT: 7005

DESIGNER: _____

DATE: 1/12/87

HYDROLOGIC AND CHANNEL INFORMATION

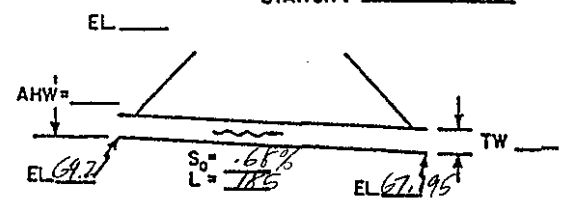
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1186+00



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	27	2-30"	.77	2.31	0.5	.86	1.2	1.85		1.85	1.25	1.46	2.31			
Q_{100}	38	2-30"	.955	2.86	0.5	1.75	1.5	2.0		2.0	1.25	2.5	2.86			

SUMMARY & RECOMMENDATIONS: Inlet Control

PROJECT: 7005

DESIGNER: _____

DATE: 1/12/87

HYDROLOGIC AND CHANNEL INFORMATION

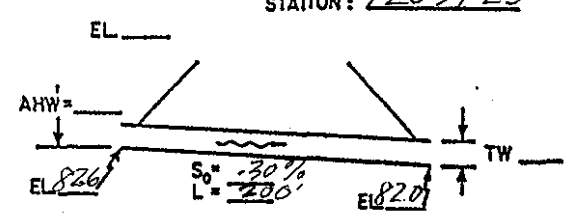
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1205+25



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	383	3-8x4	.85	3.4	0.5	0.37	1.99	3.0		3.0	0.6	2.77	3.4			
	564	3-8x4	1.11	4.44	0.5	0.8	2.58	3.29		3.3	0.6	3.5	4.44			

SUMMARY & RECOMMENDATIONS: Inlet Control – Caculations Based on upper 4' of 8'x6' Box, Lower 2' Allowing for Sedimentation

PROJECT: 7005 DESIGNER: _____

DATE: 1/12/87

HYDROLOGIC AND CHANNEL INFORMATION

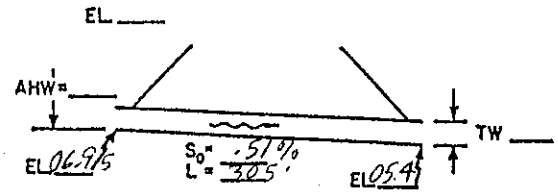
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1236+00



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	12	36"	.55	1.65	0.5	3.7	1.1	2.05		2.05	1.55	2.87	1.65			
Q_{100}	23	36"	.81	2.43	0.5	1.48	1.6	2.3		2.3	1.55	2.23	2.43			

SUMMARY & RECOMMENDATIONS: Inlet Control

PROJECT: 7005 DESIGNER: _____

DATE: 1/12/87

HYDROLOGIC AND CHANNEL INFORMATION

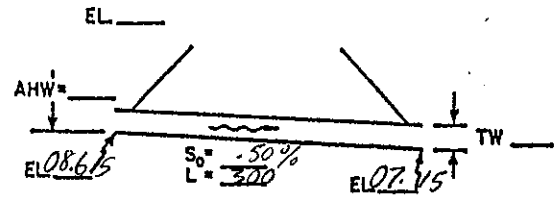
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1238+00



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	53	48"	.88	3.52	0.5	1.75	2.2	3.1		3.1	3.1	3.52				
Q_{100}	56	48"	.91	3.64	0.5	1.98	2.3	3.15		3.15	3.63	3.64				

SUMMARY & RECOMMENDATIONS: Inlet Control

PROJECT: 7005 DESIGNER: _____

DATE: 1/12/87

HYDROLOGIC AND CHANNEL INFORMATION

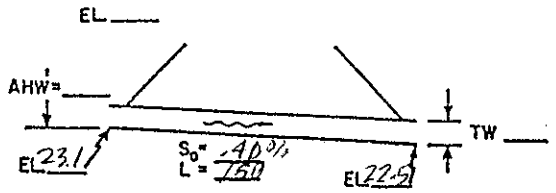
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1262+00



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q50	859	3-8'x6'	0.93	5.58	0.5	0.65	3.27	4.64		4.64	0.6	4.69	5.58			
Q100	717	3-8'x6'	1.02	6.12	0.5	0.89	3.59	4.80		4.80	0.6	5.09	6.12			

SUMMARY & RECOMMENDATIONS: Inlet Control

PROJECT: 7005 DESIGNER: _____

DATE: 1/12/87

HYDROLOGIC AND CHANNEL INFORMATION

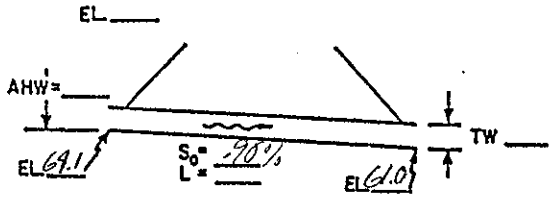
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1351+50



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q50	675	3-10'x6'	0.72	4.32	0.5	0.5	2.51	4.26		4.26	3.1	1.66	4.32			
Q100	750	3-10'x6'	0.77	4.12	0.5	0.58	2.69	4.34		4.34	3.1	1.82	4.62			

SUMMARY & RECOMMENDATIONS: Inlet Control

PROJECT: 7005 DESIGNER: _____ DATE: 1/22/87

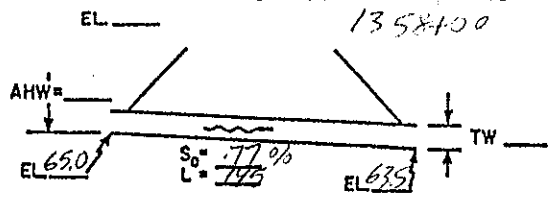
HYDROLOGIC AND CHANNEL INFORMATION

Q_1 = _____ TW_1 = _____
Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1355+00 – 1358+00



MEAN STREAM VELOCITY = _____
MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q =	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o-LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q50	2206	BE-LOW	.84	5.04	0.5	.67	2.92	4.46		4.46	1.5	3.63	5.04			
Q100	2625	BE-LOW	.92	5.52	0.5	.95	3.28	4.64		4.64	1.5	4.09	5.52			

SUMMARY & RECOMMENDATIONS: Inlet Control
1-8X6 @ STA. 1355+00
3-10X6 @ STA. 1357+00
4-10X6 @ STA. 1357+80

PROJECT: 7005 DESIGNER: _____ DATE: 1/29/87

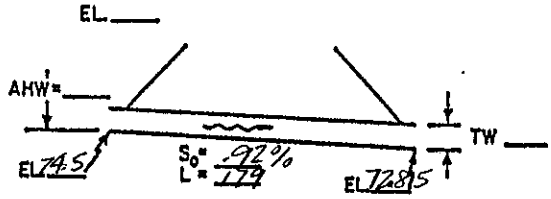
HYDROLOGIC AND CHANNEL INFORMATION

Q_1 = _____ TW_1 = _____
Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1371+00



MEAN STREAM VELOCITY = _____
MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q =	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o-LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q50	21	1-36"	.77	2.31	0.5	.82	1.45	2.23		2.23	1.65	1.4	2.31			
Q100	26	1-36"	.87	2.61	0.5	1.28	1.65	2.33		2.33	1.65	1.96	2.61			

SUMMARY & RECOMMENDATIONS: Inlet Control

PROJECT: 7005 DESIGNER: _____

DATE: 1/29/87

HYDROLOGIC AND CHANNEL INFORMATION

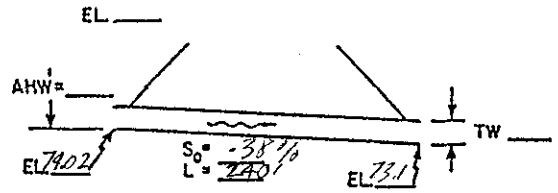
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1375+00



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q50	138	3-48"	.8	3.2	0.5	1.15	2.05	3.03	0.6	3.03	.92	3.26				
Q100	170	3-48"	.92	3.68	0.5	1.8	2.25	3.13	0.6	3.13	.92	4.01				

SUMMARY & RECOMMENDATIONS: Outlet Control

PROJECT: 7005 DESIGNER: _____

DATE: 1/29/87

HYDROLOGIC AND CHANNEL INFORMATION

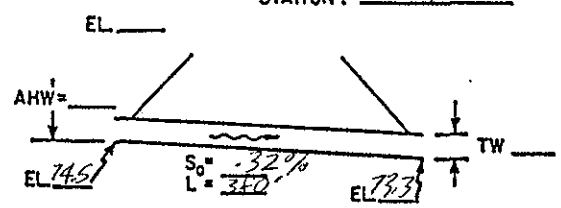
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1379+50



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q50	89	10x3	.77	2.31	0.5	.36	1.35	2.2	0.7	2.2	1.2	1.36	2.31			
Q100	108	10x3	.87	2.61	0.5	.51	1.54	2.3	0.7	2.3	1.2	1.61	2.61			

SUMMARY & RECOMMENDATIONS: Inlet Control – Caculations Based on upper 3' of 10'x6' Box, Lower 3' Allowing for sedimentation.

PROJECT: 7005 DESIGNER: _____

DATE: _____

HYDROLOGIC AND CHANNEL INFORMATION

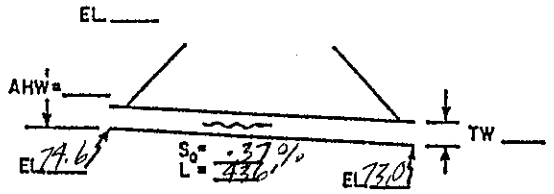
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1382+00



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	121	3-48"	.745	2.98	0.5	1.45	1.9	2.95	0.9	2.95	1.6	2.8	2.98			
Q_{100}	147	3-48"	.83	3.32	0.5	2.08	2.1	3.05	0.9	3.05	1.6	3.53	3.53			

SUMMARY & RECOMMENDATIONS: Q_{50} => Inlet Control
Q_{100} => Outlet Control

PROJECT: 7005 DESIGNER: _____

DATE: 1/16/87

HYDROLOGIC AND CHANNEL INFORMATION

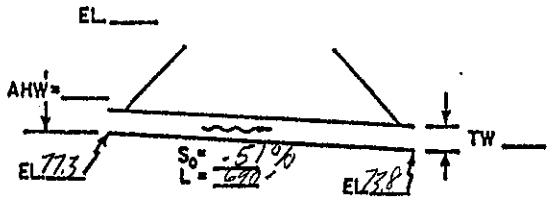
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1386+00



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	279	8x6	.96	5.76	0.5	1.55	3.36	4.68	1.4	4.68	3.5	2.73	5.76			
Q_{100}	322	8x6	1.1	6.6	0.5	2.1	3.7	4.85	1.6	4.85	3.5	3.45	6.6			

SUMMARY & RECOMMENDATIONS: Inlet Control

(7)

PROJECT: 7005

DESIGNER: _____

DATE: 1/16/87

HYDROLOGIC AND CHANNEL INFORMATION

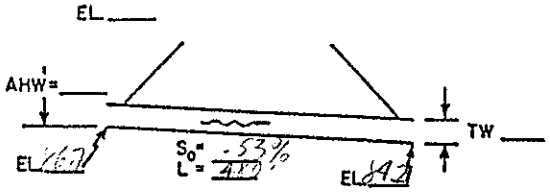
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1395+00



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q =	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	25	3-24"	.7	1.6	0.5	2.3	1.02	1.51		1.51	2.5	1.41	1.6			
Q_{100}	31	3-24"	.94	1.88	0.5	3.7	1.58	1.58		1.58	2.5	2.88	2.88			

SUMMARY & RECOMMENDATIONS: Q_{50} => Inlet Control
Q_{100} => Outlet Control

PROJECT: 7005

DESIGNER: _____

DATE: 11/22/87

HYDROLOGIC AND CHANNEL INFORMATION

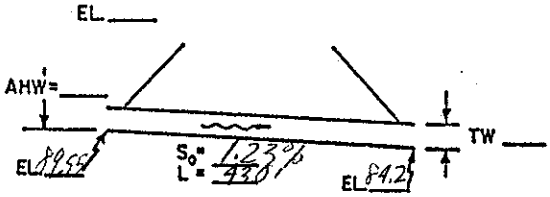
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1398+50



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q =	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	56	1-48"	.91	3.64	0.5	2.7	2.25	3.12		3.12	5.35	0.47	3.64			
Q_{100}	68	1-48"	1.03	4.12	0.5	4.2	2.51	3.25		3.25	5.35	2.1	4.12			

SUMMARY & RECOMMENDATIONS: Inlet Control

PROJECT: 7005

DESIGNER: _____

DATE: 1/22/87

HYDROLOGIC AND CHANNEL INFORMATION

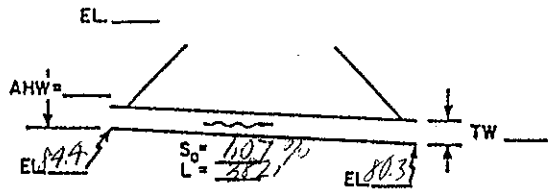
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1403+20



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	434	2-6x6	.98	5.88	0.5	1.12	3.44	4.72		4.72	4.1	1.74	5.88			
Q_{100}	505	2-6x6	1.08	6.66	0.5	1.55	3.81	4.90		4.90	4.1	2.35	6.66			

SUMMARY & RECOMMENDATIONS: Inlet Control

PROJECT: 7005

DESIGNER: _____

DATE: 1/22/87

HYDROLOGIC AND CHANNEL INFORMATION

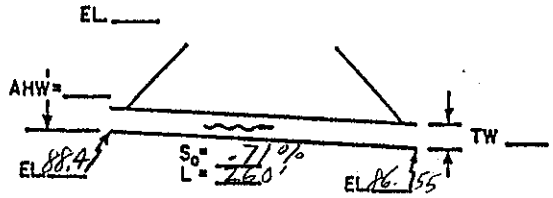
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1410+50



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	43	1-48"	.77	3.1	0.5	1.1	1.95	2.98		2.98	1.85	2.23	3.1			
Q_{100}	53	1-48"	.88	3.5	0.5	1.6	2.2	3.1		3.1	1.85	2.85	3.5			

SUMMARY & RECOMMENDATIONS: Inlet Control

PROJECT: 7055

DESIGNER: _____

DATE: 1/29/87

HYDROLOGIC AND CHANNEL INFORMATION

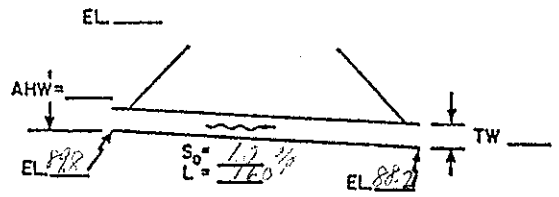
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1414+50



MEAN STREAM VELOCITY= _____

MAX. STREAM VELOCITY= _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. $\frac{HW}{D}$	HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	35.5	2-36"	.69	2.07	0.5	.53	1.3	2.15		2.15	1.6	1.08	2.07			
Q_{100}	44	2-36"	.78	2.34	0.5	.82	1.6	2.3		2.3	1.6	1.52	2.34			

SUMMARY & RECOMMENDATIONS: Inlet Control

PROJECT: 7055

DESIGNER: _____

DATE: 1/29/87

HYDROLOGIC AND CHANNEL INFORMATION

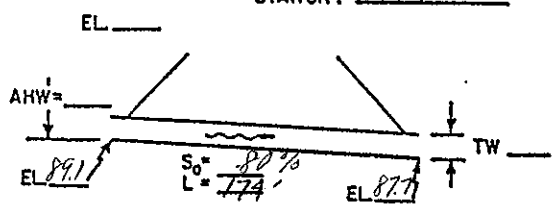
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1417+00



MEAN STREAM VELOCITY= _____

MAX. STREAM VELOCITY= _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. $\frac{HW}{D}$	HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	35.5	2-36"	.69	2.07	0.5	.56	1.3	2.15		2.15	1.4	1.31	2.07			
Q_{100}	44	2-36"	.78	2.34	0.5	.84	1.6	2.3		2.3	1.4	1.74	2.34			

SUMMARY & RECOMMENDATIONS: Inlet Control

PROJECT: _____ DESIGNER: _____

DATE: 1/29/87

HYDROLOGIC AND CHANNEL INFORMATION

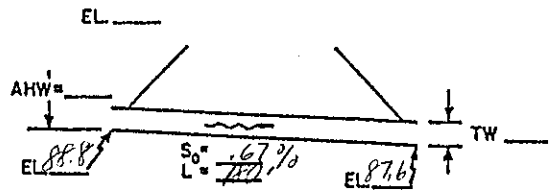
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: 1420+00



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q =	SIZE	HEADWATER COMPUTATION: INLET CONT. $\frac{HW}{D}$	HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Q_{50}	28	1-36"	.92	2.76	0.5	1.4	1.75	2.38		2.38	1.2	2.58	2.76			
Q_{100}	34	1-36"	1.05	3.15	0.5	2.1	1.9	2.45		2.45	1.2	3.35	3.35			

SUMMARY & RECOMMENDATIONS: Q_{50} => Inlet Control
Q_{100} => Outlet Control

PROJECT: _____ DESIGNER: _____

DATE: _____

HYDROLOGIC AND CHANNEL INFORMATION

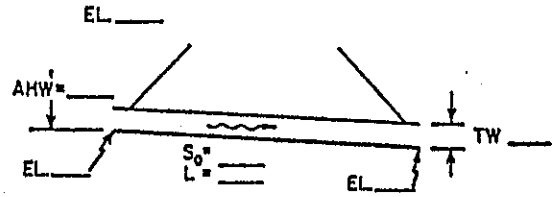
Q_1 = _____ TW_1 = _____

Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: _____



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q =	SIZE	HEADWATER COMPUTATION: INLET CONT. $\frac{HW}{D}$	HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS

SUMMARY & RECOMMENDATIONS:

APPENDIX I

DRAINAGE DESIGN CRITERIA

SECTION 102

DRAINAGE DESIGN CRITERIA/GUIDELINE

102.1 DESIGN REFERENCES

American Iron and Steel Institute, "Handbook of Steel Drainage and Highway Construction Products," latest edition.

Arizona Highway Department Bridge Division, "Hydrologic Design for Highway Drainage in Arizona." (ADOT Manual I)

Arizona Highway Department Structures Section Hydraulics Division, "Hydrologic and Hydraulic Training Session," Revised December 1973. (ADOT Manual II)

Federal Highway Administration, "Federal-Aid Highway Program Manual," Volume 6, Chapter 7, Section 3, Subsection 2, April, 1984.

Federal Highways Administration, "Guidelines for Erosion and Sediment Control Planning and Implementation," October, 1974.

Federal Highway Administration, "Suggestions for Temporary Erosion and Siltation Control Measures," 1973.

State of Arizona Department of Transportation, "Construction Division of Highways Standard Drawings," June 1986. (ADOT Standards C-__.__)

U.S. Department of Transportation, Federal Highway Administration, "Design of Stable Channels with Flexible Linings," Hydraulic Engineering Circular No. 15, latest edition. (HEC No. 15).

U.S. Department of Transportation, Federal Highway Administration, "Hydraulic Charts for the Selection of Highway Culverts," Hydraulic Engineering Circular No. 5, latest edition (HEC No. 5).

U.S. Department of Transportation, Federal Highways Administration, "Hydraulic Design of Energy Dissipators for Culverts and Channels," Hydraulic Engineering Circular No. 14, latest edition. (HEC No. 14)

102.2 HYDROLOGIC DESIGN

1. Peak Rates of Runoff

   Reference ADOT Manuals and data sheets included in manuals.

a) For Urban areas

(1) Use Rational Method for urban area under 0.1 square miles (64 acres) and pavement and median drainage.

(2) Use TR-20 or TR-55 method as developed by the Soil Conservation Service or HEC-1 Flood Hydrograph Package as developed by the U.S. Army Corps of Engineers for urban areas greater than 0.1 square miles.

b) Non-Urban Areas

(1) Use Soil Conservation Service Method, Part I, for areas up to 10 square miles. Reference ADOT Manuals.

(2) Use Soil Conservation Service Method, Part II for areas greater than 10 square miles. Reference ADOT Manuals.

c) Design should consider land development expected in the area for 20 years in the future.

2. Frequencies

a) The following frequencies are applicable:

Type of Structure	Type of Project Interstate	Primary	Secondary
Bridge	50 yr.**	50 yr.**	50 yr.*
Culvert	50 yr.**	50 yr.**	25 yr.
Storm Sewer	10 yr.	10 yr.	10 yr.
Storm Sewer for Depressed Section	50 yr.	25 yr.***	10 yr.***
Pavement Drainage	10 yr.	10 yr.	10 yr.

* A lesser value may be used when conditions warrant. Justification shall be included in the report.

** The flood of record should be used if greater than the 50 year event.

*** A higher value may be used where conditions warrant. Justification shall be included in the report.

b) In cases where the highway encroaches into a regulatory floodway, the 100 year design frequency shall be used.

c) The design frequencies shall be reviewed to assure compliance with Federal Highway Program Manual, Volume 6, Chapter 7, Section 3, Subsection 2.

102.3 PAVEMENT DESIGN

This section is limited to the drainage of pavements where an underground sewer system is not required and where pavement runoff must be concentrated at the roadway shoulder to prevent erosion of the embankment face.

1. Storm frequency shall be in accordance with criteria in Section 1.2, Design Frequency, ADOT Manual I, pages 1 and 2.

2. Storm runoff shall be calculated by the Rational Method.

3. Allowable ponding widths shall be as follows:

Roadway Type	Maximum Spread	Frequency
Rural 4-lane divided	Lt. shoulder width Rt. shoulder width plus 1/2 adjacent traffic lane width	10 years
Urban 4 or 6 lane divided by raised median	Lt. gutter width plus any shoulder width Rt. shoulder, parking or distress lane width plus 1/2 adjacent traffic lane width	10 years
4 or 6-lane undivided	Shoulder, parking or distress lane width plus 1/2 adjacent traffic lane width	10 years
2-lane undivided	Gutter and/or shoulder parking or distress lane width	10 years
22′ or 24′ ramps (Incl. accel. & decel. lane)	Left 2′ Right 8′	10 years

4. Embankment curb shall be used at the edge of paved roadways on fills where storm water cannot be permitted to run down and erode the embankment face.

5. Hydraulic Capacity Charts have been developed for standard ADOT embankment inlets and shall be used in the design. Reference ADOT Standards C-04.10 (Formerly C-4.01) and C-04.20 (Formerly C-4.02).

The hydraulic capacity charts for these standards have the clogging factors incorporated into them and no additional reduction should be made.

6. Inlets on grade

   Portion of flow permitted to by-pass inlet and be picked up at succeeding inlets downstream.

7. Inlets at Sag

   Inlets must be sized to intercept all of the flow. No flow will be permitted to overtop the curb. If the inlet capacity in the sag is less than the approach flow, then additional inlets shall be placed upstream to reduce the flow at the sag.

8. Spillways and Downdrains:

   a) Use between inlets and toe of slope and in accordance with ADOT Standards C-04.10 (formerly C-4.01), C-04.20 (Formerly C-4.02) and C-04.40.

   b) The curb opening inlets on grade and in sags shall be spaced such that curbs are not overtopped and the pavement spread remains within the specified limits.

   c) If possible, space the curb opening limits to eliminate water by-passing. This is not required, but is preferable.

   d) Downdrains will be used where embankment slopes are steeper than 4:1 and where spillways will be visible from the main roadway.

   e) Spillways will be used where embankment slopes are 4:1 or flatter.

9. All computations to be performed on ADOT Pavement Drainage Design Sheets contained in ADOT Manuals.

102.4 MEDIAN DRAINAGE

1. The storm runoff from medians will be removed by median inlets or standard culverts.

2. Storm frequency shall be in accordance with criteria in Section 1.2, Design Frequency, ADOT Manual I, pages 1 and 2.

3. Storm runoff shall be calculated by the Rational Method.

4. The maximum allowable ponding depth in the median shall not exceed the elevation of the top of the subgrade at the edge of pavement.

5. Median dykes will be required at the downstream side of all median drains except where the inlet is located in a sag. The top of the median dyke should be at least 0.5 feet higher than the design highwater elevation of the inlet.

6. Pave median when velocity is excessive and erosion is a problem.

7. Hydraulic capacity charts have been developed for standard ADOT median inlets and shall be used in the design. Reference ADOT Standards C-15.30 (Formerly C-15.08), C-15.80 (Formerly C-15.09) and C-15.90 (Formerly C-15.10).

   The hydraulic capacity charts for these standards have the clogging factors incorporated into them and no additional reduction should be made.

8. All computations are to be performed on ADOT Median Drainage Design Sheets contained in the ADOT Manuals.

102.5 STORM SEWER SYSTEM

1. The storm sewer system shall consist of a system of inlets, conduits and other appurtenances which are designed to collect and convey storm runoff from the roadways and adjacent contributory drainage areas to an outlet.

2. Storm frequency shall be in accordance with criteria in Section 1.2, Design Frequency, ADOT Manual I, pages 1 and 2, with the exception of underpasses or other depressed roadways where ponded water can be removed only through a storm sewer system. For this exception, the storm frequency shall be 50 years.

3. Storm runoff shall be calculated by the Rational Method.

4. The allowable ponding width shall be in accordance with criteria in Section 2.2, Pavement Design, Item 3 of part 102.3 of this section.

5. Hydraulic capacities of the standard ADOT inlets shall be determined utilizing the general equations.

6. The following factors shall be applied to grate, curb opening and combination inlets due to clogging:

   a) Grates

(1) Sump Conditions

(a) Orifice Flow - actual area = 2.0 x required area

(b) Weir Flow - actual Perimeter = 2.0 x required perimeter

(2) Continuous Grade Conditions - actual length of opening = 2.0 x required length or greater

b) Curb Opening Inlets

(1) Sump Conditions - actual length of opening = 1.25 x required length or greater

(2) Continuous Grade Conditions - actual length of opening = 1.25 x required length or greater

c) Combination Grate and Curb Opening - ADOT Standard C-15.10 Catch Basin, Type 1 and 2

(1) Sump Conditions

(a) Orifice Flow - actual area = 1.0 x required area of grate only

(b) Weir Flow - actual perimeter = 1.0 x required perimeter of grate only

(2) Continuous Grade Conditions - actual length of opening = 1.0 x required length of grate only

d) Standard C-15.40 Catch Basin, Type 5

(1) Sump Conditions

(a) Orifice Flow - actual area = 1.0 x required area of grate only

(b) Weir Flow - actual perimeter = 1.0 x required perimeter of grate only

(2) Continuous Grade Conditions - actual curb opening length upstream from grate = 1.25 x required length

e) Slotted Drains

(1) Sump Conditions - actual length of opening = 2.0 x required length

(2) Continuous Grade Conditions - actual length of opening = 1.25 x required length

7. Hydraulic profile of the storm sewer system shall be required to assure the system will perform as designed.

8. Catch Basins

   a) All catch basins and grates shall conform with ADOT Standards, C-15.10 thru C-15.90.

   b) Catch basins shall be spaced such that curbs are not overtopped and the pavement spread remains within the specified limits.

9. All computations shall be shown on ADOT standard design forms contained in ADOT Manuals.

   a) Runoff Calculation Sheet - all design data and hydrologic calculations

   b) Inlet Calculations Sheet - all inlet design data and calculations

   c) Storm Sewer Calculation Sheet - all storm sewer design data and calculations

10. Depressed Roadways

   a) Design the storm sewer for a 50-year frequency.

   b) Determine the elevation of the 50-year hydraulic grade line (HGL) and check to see that the HGL is below the low steel at all roadway inlets.

   c) If the 50-year HGL elevation is less than six inches below the elevation of the low steel of any roadway inlet grate, adjust the conduit sizes or flow line elevations as necessary to lower the HGL elevation at that point.

   d) If revisions have been made, recheck the 50-year HGL to determine the effect on the remainder of the system.

   e) If the storm sewer terminates at a pump station, the 50-year HGL must consider the water surface elevation in the pump station.

   f) The 50-year HGL shall be shown on the final profiles.

102.6 CROSSROAD CULVERTS

1. Storm frequency shall be in accordance with criteria in Section 1.2, Design Frequency, ADOT Manual I, pages 1 and 2.

2. Storm water runoff shall be calculated utilizing the correct method for the conditions as stipulated in Section 1.2, Design Frequency, ADOT Manual I, pages 1 and 2.

3. Calculate size and type of structure in accordance with HEC No. 5. The maximum allowable headwater shall not exceed the elevation of the top of subgrade at the edge of pavement.

4. The culvert inlet shall be as close as possible to the natural stream bed. Any culvert having an invert elevation more than six inches below the natural stream profile shall be assumed to have only the waterway opening above the stream bed profile for hydraulic capacity calculations.

5. Outlet Protection

   a) Structures in range and desert areas, with drainage areas less than 0.1 square miles, will not require outlet protection unless specifically requested at the field review.

   b) Structures in urban areas, with drainage areas less than 0.1 square miles, will be analyzed for potential scour and protection designed accordingly.

   c) All structures in areas with drainage areas greater than 0.1 square miles shall be designed with outlet protection. The following parameters are suggested for determining the type of outlet protection required. The Consultant shall be responsible for the design and type of material used.

Ratio of Outlet Velocity to Natural Stream Velocity	Outlet Protection
1.0 to 1.5	No protection required
1.5 to 2.0 with outlet velocity less than 10 fps	Dump rock riprap
1.5 to 2.5 with outlet velocity greater than 10 fps	Wired tied rock riprap
Greater than 2.5	Concrete energy dissipater or consider larger culvert

Use rock density of 140 lb/cu. ft. in the design of graded riprap. The dumped rock riprap shall be designed in accordance with HEC No. 15.

d) For outlet flow velocities greater than either 2.5 times the natural stream velocity or 16 feet per second, an energy dissipator should be considered. The design shall be in accordance with HEC No. 14.

6. The 100-year event shall be analyzed for potential damage to upstream property, roadway, and channel erosion for all crossroad culverts.

102.7 CHANNEL AND DITCH

1. Hydraulic design shall be in accordance with ADOT manuals, Hydraulic Engineering Circulars prepared by the Federal Highway Administration, and sound engineering practice.

2. The suggested minimum freeboard for improved channels shall be as follows:

   a) Supercritical Flow - 0.25 x water depth

   b) Subcritical Flow - 0.20 x (depth + $V^2/2q$)

   c) No freeboard less than 1.0 foot

3. Paving shall be used where necessary for erosion protection.

102.8 EROSION CONTROL

1. Temporary erosion control methods shall be employed during construction to control erosion and sediment until the permanent protection is provided. The types of protection are generally as follows:

   a) Direct Protection of Ground Surface - ground cover, soil stabilization or riprap

   b) Control of Runoff Pattern - diversion ditches, shoulder berms or slope drains

   c) Removal of Sediment from Water - silt fences, check dams or sediment basins

2. The NCHRP publication entitled "Erosion Control During Highway Construction" and the AASHTO Guideline "Erosion and Sediment Control in Highway Construction" may be used as guides for evaluation of measures.

3. Permanent erosion control due to erosive velocities shall be in accordance with criteria set forth in the Hydraulic Engineering Circular No. 15.

102.9 SCOUR AND BANK PROTECTION

1. Bank protection shall be provided to direct flows and protect banks, channels and roadway embankments from scour. Bank protection shall not be used to protect new bridge foundations. Remedial bank protection may be necessary at existing bridges.

2. The bank protection shall accommodate the design flow for the following conditions:

   a) Scour and velocity shall be computed for conditions which can cause the largest value of each considering the site conditions.

   b) The bank protection shall extend below the channel thalweg sufficient to be stable for the anticipated scour.

3. Methods of bank protection shall be in accordance with HEC No. 15. Due to the more recent information utilized to develop HEC No. 15, the use of HEC No. 11 for design of bank protection is discouraged.

102.10 SUBSURFACE DRAINAGE

1. Use perforated metal pipe.

2. Install in a narrow trench backfilled with a filter material.

3. Obtain design data from "Handbook of Steel Drainage and Highway Construction Products", American Iron and Steel Institute, latest edition.

4. Due to the involvement of geology and soil mechanics, it is suggested that the design consultant cooperate with ADOT Materials Services and Drainage Design Services.

102.11 CATTLE AND/OR VEHICLE PASSES

1. The use of a cattle and/or vehicle pass for a drainage structure is permissible.

2. When the design is a multi-barrel structure and is used for drainage purposes, at least one barrel must meet the requirement of a passageway as follows:

TYPE	SIZE
Stock pass	Min. 120" dia. structural plate or min. 10′ x 8" box culvert
Vehicle pass	Min. 144" dia. structural plate or min. 10′ x 10′ box culvert

3. The desirable maximum length for a stock pass is 250 feet.

4. Bridge design should incorporate the same requirements.

5. Design and details shall be in accordance with ADOT Standards.

APPENDIX J

HEC OUTPUTS

1. EXISTING POWER-IRONWOOD
2. PROPOSED POWER-IRONWOOD
3. EXISTING IRONWOOD-US 60
4. PROPOSED IRONWOOD-US 60

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

  1           ID       SUPERSTITION FREEWAY  -  OFFSITE DRAINAGE ANALYSIS    <SUPWST>
  2           ID       EXISTING CONDITION  -  IRONWOOD TO POWER ROAD
  3           ID       FEBRUARY 1987   -  100-YEAR RAINFALL
              *DIAGRAM
  4           IT     15                    120
  5           ID      6
  6           PG      1    3.65
  7           PG     10
  8           IN     30                     48
  9           PI  0.019   0.020   0.020   0.022   0.022   0.023   0.025   0.025   0.026   0.028
 10           PI  0.029   0.031   0.033   0.035   0.038   0.042   0.046   0.051   0.057   0.067
 11           PI  0.085   0.113   0.176   1.387   0.262   0.136   0.097   0.076   0.067   0.058
 12           PI  0.050   0.046   0.041   0.038   0.035   0.033   0.031   0.029   0.027   0.027
 13           PI  0.025   0.024   0.023   0.022   0.022   0.020   0.020   0.019
              *      DRAINAGE AREA BETWEEN N. DIVERSION DAM AND POWER ROAD

 14           KK  SUB200
 15           KM       LOCAL RUNOFF AT IRONWOOD AND FREEWAY
 16           PR     10
 17           PW      1
 18           PT      1
 19           PW      1
 20           BA   0.06
 21           UK    650  0.0175    0.20     100
 22           RK   1000   0.010   0.040   0.008    TRAP     2.0     4.0
 23           RK   1500  0.0040   0.016           TRAP     3.5     1.5

 24           KK  DIV200
 25           KM       STORE HYDROGRAPH IN D200
 26           DT   D200
 27           DI      0    1000   10000
 28           DQ      0    1000   10000

 29           KK  SUB202
 30           KM       LOCAL RUNOFF TO 2100 FEET WEST OF IRONWOOD
 31           PR     10
 32           PW      1
 33           PT      1
 34           PW      1
 35           BA   0.24
 36           LS           85.7
 37           UK    650  0.0175   0.200     100
 38           RK   3600   0.010   0.040    0.04    TRAP     2.0     4.0
 39           RK   2100  0.0040   0.016           TRAP     3.5     1.5

 40           KK  DIV202
 41           KM       STORE HYDROGRAPH IN D202
 42           DT   D202
 43           DI      0    1000   10000
 44           DQ      0    1000   10000
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  45          KK  SUB204
  46          KM       LOCAL RUNOFF TO IRRIGATION DAM (ASSUME NO ATTENUATION)
  47          PR      10
  48          PW       1
  49          PT       1
  50          PW       1
  51          BA    0.70
  52          LS              84
  53          UK     650  0.0175   0.200     100
  54          RK    6000  0.0083   0.040   0.043    TRAP     2.0     4.0
  55          RK    2500  0.0048   0.035           TRAP    10.0     3.0

  56          KK  DIV204
  57          KM       STORE HYDROGRAPH IN D204
  58          DT    D204
  59          DI       0   10000
  60          DQ       0   10000

  61          KK  SUB206
  62          KM       LOCAL RUNOFF TO MERIDIAN DRIVE
  63          PR      10
  64          PW       1
  65          PT       1
  66          PW       1
  67          BA    0.05
  68          LS              83
  69          UK     500   0.023   0.200     100
  70          RK    1600   0.013   0.040   0.043    TRAP     2.0     4.0
  71          RK    1835   0.040   0.016           TRAP     9.3     1.5

  72          KK  DIV206
  73          KM       STORE HYDROGRAPH IN D206
  74          DT    D206
  75          DI       0   10000
  76          DQ       0   10000

  77          KK       1
  78          KM       COMBINE HYDROGRAPHS TO REDUCE # IN STACK
  79          HC       4

  80          KK  SUB208
  81          KM       LOCAL RUNOFF TO C.A.P. OVERCHUTE (STA 574+50)
  82          PR      10
  83          PW       1
  84          PT       1
  85          PW       1
  86          BA    0.06
  87          LS              83
  88          UK     500   0.023    0.20     100
  89          RK    1900   0.010   0.040    0.03    TRAP     2.0     4.0
  90          RK     885   0.004   0.016           TRAP     9.3     1.5
```

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

  91          KK   RO208
  92          KM        ROUTE FLOWS FROM C.A.P. OVERCHUTE TO FREEWAY
  93          RK    1000  0.0086   0.040           TRAP     2.0     4.0     YES

  94          KK  SUB210
  95          KM        RUNOFF FROM SUBBASIN 210
  96          PR      10
  97          PW       1
  98          PT       1
  99          PW       1
 100          BA    0.07
 101          LS              83
 102          UK     250   0.008   0.200     100
 103          RK    1200  0.0086   0.040    0.05    TRAP     2.0     4.0
 104          RK     975  0.0033   0.016            TRAP     4.7     1.5

 105          KK   CO210
 106          KM        COMBINE FLOWS AT 2000 FEET WEST OF C.A.P. AT FREEWAY
 107          HC       2
              *       THIS IS NOT ALL THE FLOW AT THE FREEWAY
              *       FLOWS THROUGH C.A.P. OVERCHUTE (563+50) ALSO WILL CONTRIBUTE

 108          KK   WEEKES
 109          KM        BREAKOUT FLOW FROM WEEKES WASH
 110          BA     4.8
 111          IN      30                     48
 112          QI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 113          QI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 114          QI    25.0    60.0   114.0   586.0  1731.0  3864.0  2703.0  1668.0  1103.0   802.0
 115          QI   648.0   524.0   435.0   373.0   328.0   296.0   271.0   250.0   240.0   233.0
 116          QI   221.0   208.0   199.0   189.0   178.0   166.0   158.0   147.0

 117          KK  ROWEEK
 118          KM        ROUTE WEEKES WASH BREAKOUT FLOWS TO US60
 119          RK    6500    0.01   0.065            TRAP      25      30

 120          KK   SUB74
 121          KM        LOCAL RUNOFF TO APACHE TRAIL
 122          PR      10
 123          PW       1
 124          PT       1
 125          PW       1
 126          BA    2.78
 127          LS              85
 128          UK    1500   0.015   0.200     100
 129          RK    5000   0.013   0.040   0.009    TRAP     2.0     4.0
 130          RK    8400   0.009   0.035            TRAP    15.0     3.0

 131          KK    CO74
 132          KM        COMBINE LOCAL WITH WEEKES WASH BREAKOUT
 133          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  134         KK   RO74
  135         KM       ROUTE FLOWS FROM APACHE TRAIL TO C.A.P. (SUB76)
  136         RK   14400   0.010   0.035           TRAP    15.0     3.0     YES

  137         KK   SUB76
  138         KM       LOCAL RUNOFF TO C.A.P.
  139         PR      10
  140         PW       1
  141         PT       1
  142         PW       1
  143         BA    2.13
  144         LS              84
  145         UK    1250   0.013   0.200     100
  146         RK    7000   0.010   0.040   0.176    TRAP     2.0     4.0
  147         RK   14400   0.010   0.035           TRAP    15.0     3.0

  148         KK   CO76
  149         KM       COMBINE FLOWS AT C.A.P. TO BOTH OVERCHUTES (STA 563+50 & 552+50)
  150         HC       2

  151         KK  DIV76A
  152         KM       DIVERT FLOW IN EXCESS OF OVERCHUTE CAPACITY TO NORTHWEST
  153         DT   DCAP1
  154         DI       0    2300    2400    5000    7000
  155         DQ       0       0     100    1700    3700

  156         KK   DIV76
  157         KM       DIVERT 50% OF FLOWS TO EACH OVERCHUTE
  158         DT     D76
  159         DI       0     100    1000   10000
  160         DQ       0      50     500    5000

  161         KK   RO76
  162         KM       ROUTE FLOWS FROM C.A.P. OVERCHUTE TO FREEWAY 2000' WEST OF C.A.P.
  163         RK    1750  0.0086   0.040           TRAP     2.0     4.0     YES

  164         KK   CO211
  165         KM       COMBINE FLOWS IN FREEWAY 2000 FEET WEST OF C.A.P.
  166         HC       2

  167         KK  DIV211
  168         KM       STORE HYDROGRAPH IN D211
  169         DT    D211
  170         DI       0   10000
  171         DQ       0   10000

  172         KK   SUB70
  173         KM       LOCAL RUNOFF TO APACHE TRAIL
  174         PR      10
  175         PW       1
  176         PT       1
  177         PW       1
  178         BA    1.35
  179         LS              85
```

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

 180          UK    1000   0.011   0.200     100
 181          RK    3500   0.012   0.040  0.0502    TRAP     2.0     4.0
 182          RK   11200   0.011   0.035            TRAP    10.0     3.0

 183          KK    R070
 184          KM        ROUTE FLOWS FROM APACHE TRAIL TO C.A.P.
 185          RK    8800  0.0090   0.035            TRAP    10.0     3.0     YES

 186          KK   SUB72
 187          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTES (STA 542+50 & 529+50)
 188          PR      10
 189          PW       1
 190          PT       1
 191          PW       1
 192          BA    1.38
 193          LS              85
 194          UK    1250   0.011   0.200     100
 195          RK    2500   0.009   0.040  0.0359    TRAP     2.0     4.0
 196          RK    8800   0.009   0.035            TRAP    10.0     3.0

 197          KK   CO72A
 198          KM        COMBINE FLOWS AT C.A.P. OVERCHUTES
 199          HC       2

 200          KK    RE72
 201          KM        RETRIEVE DIVERTED FLOWS FROM D/S CAP OVERCHUTES
 202          DR   DCAP1

 203          KK    CO72
 204          KM        COMBINE FLOWS AT C.A.P. OVERCHUTES (INCLUDING DIVERTED)
 205          HC       2

 206          KK  DIV72A
 207          KM        DIVERT FLOWS IN EXCESS OF OVERCHUTE CAPACITIES
 208          DT   DCAP2
 209          DI       0    3550    3600    4050    6050
 210          DQ       0       0      50     500    2500

 211          KK   DIV72
 212          KM        DIVERT 50% OF FLOW TO EACH OVERCHUTE
 213          DT     D72
 214          DI       0     100    1000   10000
 215          DQ       0      50     500    5000

 216          KK   RED76
 217          KM        RETRIEVE DIVERTED HYDROGRAPH FROM SUB76
 218          DR     D76

 219          KK    CO73
 220          KM        COMBINE OVERCHUTE FLOWS (STA 542+50 AND 552+50)
 221          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 222          KK    RO73
 223          KM        ROUTE OVERCHUTE FLOWS TO FREEWAY AT SIGNAL BUTTE
 224          RK    3750  0.0100   0.040           TRAP     2.0     4.0     YES

 225          KK  SUB212
 226          KM        LOCAL RUNOFF AT SIGNAL BUTTE AND FREEWAY
 227          PR      10
 228          PW       1
 229          PT       1
 230          PW       1
 231          BA    0.17
 232          LS              83
 233          UK     500   0.010    0.20     100
 234          RK    2000   0.010   0.040    0.26    TRAP     2.0     4.0
 235          RK    2000  0.0100   0.035           TRAP    25.0     2.0

 236          KK   CO212
 237          KM        COMBINE LOCAL AND OVERCHUTE FLOWS AT SIGNAL BUTTE
 238          HC       2

 239          KK   RED72
 240          KM        RETRIEVE DIVERTED HYDROGRAPH FROM SUB72
 241          DR     D72

 242          KK    RO73
 243          KM        ROUTE FLOWS FROM C.A.P. OVERCHUTE (STA 529+50) TO FREEWAY
 244          RK    4200   0.010   0.040           TRAP     2.0     4.0     YES

 245          KK  SUB214
 246          KM        LOCAL RUNOFF TO SIGNAL BUTTE
 247          PR      10
 248          PW       1
 249          PT       1
 250          PW       1
 251          BA    0.25
 252          LS              83
 253          UK     500   0.010    0.20     100
 254          RK    4000   0.009    0.04   0.063    TRAP    25.0     2.0
 255          RK    2900  0.0070   0.035           TRAP    35.0     3.0

 256          KK   CO214
 257          KM        COMBINE FLOWS 1400 FEET WEST OF SIGNAL BUTTE
 258          HC       2

 259          KK   SUB38
 260          KM        LOCAL RUNOFF TO APACHE TRAIL
 261          PR      10
 262          PW       1
 263          PT       1
 264          PW       1
 265          BA    0.99
 266          LS              84
 267          UK     500  0.0125   0.200     100
 268          RK    4000  0.0125   0.040  0.0574    TRAP     2.0     4.0
```

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

 269        RK   14000  0.0090   0.035           TRAP    10.0     3.0

 270        KK    RO38
 271        KM       ROUTE FLOWS FROM APACHE TRAIL TO C.A.P.
 272        RK    6000  0.0120   0.035           TRAP    10.0     3.0     YES

 273        KK   SUB40
 274        KM       LOCAL RUNOFF TO C.A.P. OVERCHUTES (STA 504+25 & 479+00)
 275        PR      10
 276        PW       1
 277        PT       1
 278        PW       1
 279        BA    0.45
 280        LS             84
 281        UK     350  0.0180   0.200     100
 282        RK    2500  0.0100   0.040  0.0448    TRAP     2.0     4.0
 283        RK    6000  0.0120   0.035           TRAP    10.0     3.0

 284        KK    CO40
 285        KM       COMBINE FLOWS AT C.A.P. OVERCHUTES (STA 504+25 & 479+00)
 286        HC       2

 287        KK   DIV40
 288        KM       DIVERT 50% OF FLOW TO EACH OVERCHUTE
 289        DT     D40
 290        DI       0     100    1000   10000
 291        DQ       0      50     500    5000

 292        KK    RO40
 293        KM       ROUTE C.A.P. OVERCHUTE (STA 504+25) FLOWS TO FREEWAY
 294        RK    6000  0.0083   0.040           TRAP     2.0     4.0     YES

 295        KK  SUB216
 296        KM       LOCAL RUNOFF TO CRISMON
 297        BA    0.55
 298        LS           85.5
 299        UK     500   0.010   0.200     100
 300        RK    6000  0.0083   0.040    0.11    TRAP    25.0     2.0
 301        RK    2500  0.0070   0.035           TRAP    35.0     3.0

 302        KK   CO216
 303        KM       COMBINE FLOWS AT SUPERSTITION FREEWAY
 304        HC       2

 305        KK    CO41
 306        KM       COMBINE TOTAL FLOW IN FREEWAY AT CRISMON
 307        HC       2

 308        KK   RED40
 309        KM       RETRIEVE DIVERTED HYDROGRAPH FROM SUB40
 310        DR     D40
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 311          KK   R041
 312          KM       ROUTE C.A.P. OVERCHUTE (STA 479+00) FLOWS TO FREEWAY 3000 FEET W. OF CRI
 313          RK   9500   0.008   0.035           TRAP    10.0     3.0     YES

 314          KK  SUB34
 315          KM       LOCAL RUNOFF TO APACHE TRAIL
 316          PR     10
 317          PW      1
 318          PT      1
 319          PW      1
 320          BA   1.84
 321          LS            84
 322          UK   1000  0.0100   0.200     100
 323          RK   5000  0.0111   0.040   0.090    TRAP     2.0     4.0
 324          RK  13700  0.0102   0.035           TRAP    10.0     3.0

 325          KK   R034
 326          KM       ROUTE FLOWS FROM APACHE TRAIL TO C.A.P.
 327          RK   3200  0.0093   0.035           TRAP    20.0     3.0     YES

 328          KK  SUB36
 329          KM       LOCAL RUNOFF TO C.A.P. OVERCHUTES (STA 471+03 & 456+50)
 330          PR     10
 331          PW      1
 332          PT      1
 333          PW      1
 334          BA   0.33
 335          LS            84
 336          UK    250  0.0067   0.200     100
 337          RK   1500  0.0167   0.040  0.0269    TRAP     2.0     4.0
 338          RK   3200  0.0093   0.035           TRAP    20.0     3.0

 339          KK   C036
 340          KM       COMBINE FLOWS AT C.A.P. OVERCHUTES (STA 471+03 & 456+50)
 341          HC      2

 342          KK   R036
 343          KM       ROUTE C.A.P. OVERCHUTE (STA 471+03 AND 456+50) FLOWS TO 2600' W. OF CRIS
 344          RK   9500   0.008   0.035           TRAP    10.0     3.0     YES

 345          KK   C037
 346          KM       COMBINE OVERCHUTE AND FREEWAY FLOW 2600' W. OF CRISMON
              *      THIS IS NOT THE TOTAL FLOW IN FREEWAY AT CRISMON
 347          HC      2

 348          KK  SUB218
 349          KM       LOCAL RUNOFF TO 2600 FEET WEST OF CRISMON AT THE FREEWAY
 350          PR     10
 351          PW      1
 352          PT      1
 353          PW      1
 354          BA   1.21
 355          LS          83.3
 356          UK    500   0.010    0.20     100
```

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

 357          RK    7000   0.008   0.040    0.20    TRAP    25.0     2.0
 358          RK    2600  0.0070   0.035            TRAP    35.0     3.0

 359          KK   CO218
 360          KM        COMBINE TOTAL FLOW IN FREEWAY 2600 FEET WEST OF CRISMON
 361          HC       2

 362          KK   CO219
 363          KM        COMBINE FLOW AT 0.5 MI EAST OF ELLSWORTH IN SR360
 364          KO       1
 365          HC       2

 366          KK  SUB220
 367          KM        LOCAL RUNOFF AT ELLSWORTH AND FREEWAY
 368          PR      10
 369          PW       1
 370          PT       1
 371          PW       1
 372          BA    0.84
 373          LS            85.7
 374          UK    1250   0.010   0.200     100
 375          RK    3500   0.010   0.040   0.128    TRAP     2.0     4.0
 376          RK    3550   0.006   0.035            TRAP    10.0     3.0

 377          KK   CO220
 378          KM        COMBINE FLOW INTO PONDING AREA
 379          KO       1
 380          HC       2

 381          KK  DIV220
 382          KM        DIVERT FLOW OVER WEIR AT BASELINE AND ELLSWORTH
 383          KO       1
 384          DT    WEIR
 385          DI       0     870    1086    1976    3033    4465
 386          DQ       0       0     181    1031    2505    3445

 387          KK   RO221
 388          KM        ROUTE FLOWS FROM PONDING AREA WEST ALONG S. ROW CHANNEL
 389          RK    2600   0.007   0.035            TRAP    15.0     2.0

 390          KK  SUB222
 391          KM        LOCAL FLOWS TO 2700 FEET WEST OF ELLSWORTH
 392          PR      10
 393          PW       1
 394          PT       1
 395          PW       1
 396          BA    0.21
 397          LS              86
 398          UK    1250   0.005   0.200     100
 399          RK    2000   0.007   0.040    0.03    TRAP     2.0     4.0
 400          RK    2700  0.0060   0.035            TRAP    20.0     3.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 401          KK   CD222
 402          KM        COMBINE FLOWS IN SOUTH ROW CHANNEL
 403          HC       2

 404          KK   RD220
 405          KM        ROUTE FLOWS TO HAWES ROAD IN S. ROW CHANNEL
 406          RK    2600   0.007   0.035           TRAP    15.0     2.0

 407          KK  SUB224
 408          KM        LOCAL FLOW TO HAWES ROAD
 409          PR      10
 410          PW       1
 411          PT       1
 412          PW       1
 413          BA    0.30
 414          LS            85.4
 415          UK     500   0.010    0.20     100
 416          RK    4500   0.009   0.040    0.25    TRAP    10.0     3.0
 417          RK    2500  0.0028   0.016           TRAP    12.0     1.5

 418          KK   CD224
 419          KM        COMBINE FLOW AT ELLSWORTH AND FREEWAY
 420          HC       2

 421          KK   SUB16
 422          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTE (STA 396+00)
 423          PR      10
 424          PW       1
 425          PT       1
 426          PW       1
 427          BA    0.71
 428          LS             84
 429          UK     500  0.0133   0.200     100
 430          RK    8800  0.0148   0.040   0.158    TRAP     2.0     4.0
 431          RK    1700  0.0055   0.035           TRAP     8.0     1.5

 432          KK   SUB18
 433          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTES (STA 427+15 & 429+20)
 434          PR      10
 435          PW       1
 436          PT       1
 437          PW       1
 438          BA    1.50
 439          LS             83
 440          UK    1000  0.0150   0.200     100
 441          RK    4800  0.0115   0.040  0.1033    TRAP     2.0     4.0
 442          RK   10000  0.0102   0.035           TRAP    10.0     3.0

 443          KK    CD18
 444          KM        COMBINE FLOWS AT C.A.P. FROM SUB16 AND SUB18
 445          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 446          KK    RO18
 447          KM        ROUTE FLOWS FROM C.A.P. TO BROADWAY
 448          RK    8300  0.0102   0.035           TRAP     5.0     2.0     YES

 449          KK   SUB20
 450          KM        LOCAL RUNOFF TO BROADWAY ROAD
 451          PR      10
 452          PW       1
 453          PT       1
 454          PW       1
 455          BA    1.05
 456          LS              85
 457          UK      90   0.005   0.200     100
 458          RK    5250  0.0075   0.050   0.043    TRAP    20.0    0.01
 459          RK    8300  0.0102   0.035           TRAP     5.0     2.0

 460          KK    CO20
 461          KM        COMBINE RUNOFF 2600 FEET WEST OF ELLSWORTH ON BROADWAY
 462          HC       2

 463          KK   DIV20
 464          KM        DIVERT EXCESS FLOW SOUTH ACCROSS BROADWAY
 465          DT     D20
 466          DI       0    1200    2400    4800   11200
 467          DQ       0       0    1200    3600   10000

 468          KK    RO20
 469          KM        ROUTE FLOWS TO HAWES AND BROADWAY
 470          RK    2600  0.0054   0.035           TRAP     5.0     2.0     YES

 471          KK   SUB10
 472          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTE (STA 345+30)
 473          PR      10
 474          PW       1
 475          PT       1
 476          PW       1
 477          BA    0.33
 478          LS              83
 479          UK     500  0.0230   0.200     100
 480          RK    3000  0.0167   0.040  0.0646    TRAP     2.0     4.0
 481          RK    1480  0.0042   0.035           TRAP     8.0     1.5

 482          KK   SUB12
 483          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTE (STA 374+00)
 484          PR      10
 485          PW       1
 486          PT       1
 487          PW       1
 488          BA    0.75
 489          LS              84
 490          UK     500  0.0180   0.200     100
 491          RK    6600  0.0174   0.040   0.071    TRAP     2.0     4.0
 492          RK    1060  0.0056   0.035           TRAP     8.0     1.5
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 493          KK    CO12
 494          KM        COMBINE RUNOFF FROM OVERCHUTES (STA 345+30 AND 374+00)
 495          HC       2

 496          KK    RO12
 497          KM        ROUTE FLOWS FROM OVERCHUTES TO HAWES AND BROADWAY
 498          RK   10400  0.0098   0.035           TRAP     5.0     3.0    YES

 499          KK   SUB14
 500          KM        LOCAL RUNOFF TO HAWES AND BROADWAY
 501          PR      10
 502          PW       1
 503          PT       1
 504          PW       1
 505          BA    1.17
 506          LS              86
 507          UK      85   0.005   0.200     100
 508          RK    8500  0.0067  0.0500   0.036    TRAP    20.0    0.01
 509          RK    2600  0.0075   0.040           TRAP    32.0     6.0

 510          KK    CO14
 511          KM        COMBINE LOCAL AND OVERCHUTE FLOWS
 512          HC       2

 513          KK    CO21
 514          KM        COMBINE FLOWS IN BROADWAY ROAD AT HAWES (TOTAL)
 515          HC       2

 516          KK  DIV21A
 517          KM        DIVERT EXCESS FLOWS ACCROSS BROADWAY
 518          DT   DT21A
 519          DI       0    1200    2400    4800   11200
 520          DQ       0       0    1200    3600   10000

 521          KK   DIV21
 522          KM        DIVERT FLOWS CONTINUING WEST ON BROADWAY
 523          DT   DT21B
 524          DI       0     800    1000    1250    2000    3000
 525          DQ       0       0     200     300     500    1000

 526          KK    RO21
 527          KM        ROUTE FLOWS SOUTH TO FREEWAY AT HAWES ROAD
 528          RK    2000  0.0068   0.025           TRAP    60.0     4.0     YES

 529          KK   RET20
 530          KM        RETRIEVE DIVERTED FLOWS FROM BROADWAY
 531          DR     D20

 532          KK   RO20D
 533          KM        ROUTE DIVERTED FLOWS FROM BROADWAY TO HAWES ROAD
 534          RK    2900  0.0067   0.035           TRAP    10.0     4.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 535          KK  RET21A
 536          KM       RETRIEVE DIVERTED FLOWS FROM BROADWAY
 537          DR   DT21A

 538          KK   CO21A
 539          KM       COMBINE DIVERTED FLOWS AT HAWES
 540          HC      2

 541          KK   CO21B
 542          KM       COMBINE FLOW IN HAWES ROAD CHANNEL 2900 FEET SOUTH OF BROADWAY
 543          HC      2

 544          KK   RO21B
 545          KM       ROUTE HAWES ROAD CHANNEL FLOWS TO FREEWAY
 546          RK    5500  0.0068   0.025           TRAP    60.0     4.0

 547          KK    CO22
 548          KM       COMBINE FLOWS IN FREEWAY AT HAWES ROAD (EXCEPT LOCAL RUNOFF)
 549          HC      2

 550          KK  SUB226
 551          KM       LOCAL RUNOFF TO HAWES ROAD AT THE FREEWAY
 552          PR     10
 553          PW      1
 554          PT      1
 555          PW      1
 556          BA   1.17
 557          LS           84.4
 558          UK    1250   0.010   0.200     100
 559          RK    6500   0.009   0.040   0.117   TRAP     2.0     4.0
 560          RK    6000   0.004   0.035           TRAP    30.0     2.0

 561          KK   CO226
 562          KM       COMBINE FLOWS IN FREEWAY AT HAWES ROAD (TOTAL)
 563          HC      2

 564          KK   RO226
 565          KM       ROUTE FLOWS FROM HAWES ROAD TO SOSSAMAN CHANNEL
 566          RK    4000  0.0066   0.035           TRAP    25.0     4.0

 567          KK  SUB228
 568          KM       LOCAL RUNOFF AT SOSSAMAN CHANNEL
 569          PR     10
 570          PW      1
 571          PT      1
 572          PW      1
 573          BA   0.31
 574          LS           86.5
 575          UK     110   0.005   0.200     100
 576          RK    2600  0.0038   0.016    0.05   TRAP    40.0    0.01
 577          RK    4200  0.0026   0.016           TRAP    16.6     1.5
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

578           KK  SUB230
579           KM       LOCAL RUNOFF AT SOSSAMAN CHANNEL AND SOUTHERN AVE
580           PR     10
581           PW      1
582           PT      1
583           PW      1
584           BA   0.42
585           LS            65
              *      RUNOFF CURVE NUMBER REDUCED FROM 85 FOR 50-YEAR RETENTION (75%)
586           UK    150   0.005   0.200     100
587           RK   3100  0.0061   0.061   0.035    TRAP    40.0    0.01
588           RK   4350  0.0062   0.016           TRAP    10.0     1.5

589           KK   RO230
590           KM       ROUTE FLOWS IN SOSSAMAN CHANNEL FROM SOUTHERN TO FREEWAY
591           RK   2200   0.006   0.035           TRAP    20.0     2.0     YES

592           KK   CO230
593           KM       COMBINE FLOWS IN SOSSAMAN CHANNEL AT FREEWAY
594           HC      2

595           KK   CO231
596           KM       COMBINE FLOW IN SOSSAMAN CHANNEL AT FREEWAY
597           HC      2

598           KK   RET23
599           KM       RETRIEVE FLOWS DIVERTED AT HAWES AND BROADWAY
600           DR   DT21B

601           KK   ROD21
602           KM       ROUTE DIVERTED FLOWS TO FREEWAY
603           RK   9600  0.0038   0.035           TRAP    30.0    4.00

604           KK   SUB24
605           KM       RUNOFF FROM EMCMDS SUB24
606           BA   2.11
607           LS            86
608           UK    100  0.0050    0.20     100
609           RK   7000  0.0070   0.045    0.01    TRAP    20.0    0.01
610           RK   9600  0.0038   0.035           TRAP    30.0     4.0

611           KK   CO24
612           KM       COMBINE FLOWS AT FREEWAY
613           HC      2

614           KK  SUB26A
615           KM       LOCAL RUNOFF FROM EMCMDS SUBAREA 26 (EAST PORTION)
616           BA   1.92
617           LS          84.3
618           UK   1250  0.0050   0.200     100
619           RK   3500   0.006   0.050    0.14    TRAP    20.0    0.01
620           RK   9000  0.0064   0.025           TRAP    12.0     2.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 621          KK   CO26A
 622          KM        COMBINE FLOW IN FREEWAY AT 0.5 MI WEST OF SOSSAMAN ROAD
 623          HC       2

 624          KK   RO26A
 625          KM        ROUTE FLOWS TO POWER ROAD
 626          RK    2800  0.0053   0.016           TRAP    12.0     2.0

 627          KK  SUB26B
 628          KM        LOCAL FLOWS TO POWER ROAD
 629          BA    0.60
 630          LS              84
 631          UK     100  0.0050   0.200     100
 632          RK    7800   0.006   0.050    0.15   TRAP    40.0    0.01
 633          RK    2800  0.0053   0.016           TRAP    12.0     2.0

 634          KK    CO27
 635          KM        COMBINE FLOWS AT POWER ROAD IN FREEWAY CHANNEL
 636          KO       1
 637          HC       2

 638          KK  SUB26C
 639          KM        LOCAL RUNOFF FROM POWER ROAD TO R.W.C.D.
 640          BA    0.44
 641          LS            77.3
 642          UK    1250   0.005    0.20     100
 643          RK    2600  0.0038   0.035           TRAP    10.0     3.0
 644          RK    5200  0.0015   0.016           TRAP    12.0     2.0

 645          KK   CO26C
 646          KM        COMBINE TOTAL FLOW IN FREEWAY CHANNEL AT R.W.C.D.
 647          KO       1
 648          HC       2
 649          ZZ
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100-YR
EXISTING

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB200	79.	12.25	16.	6.	5.	.06		
DIVERSION TO	D200	79.	.25	16.	6.	5.	.06		
HYDROGRAPH AT	DIV200	0.	.25	0.	0.	0.	.06		
HYDROGRAPH AT	SUB202	171.	12.50	43.	14.	11.	.24		
DIVERSION TO	D202	171.	.25	43.	14.	11.	.24		
HYDROGRAPH AT	DIV202	0.	.25	0.	0.	0.	.24		
HYDROGRAPH AT	SUB204	395.	12.50	113.	36.	29.	.70		
DIVERSION TO	D204	395.	.25	113.	36.	29.	.70		
HYDROGRAPH AT	DIV204	0.	.25	0.	0.	0.	.70		
HYDROGRAPH AT	SUB206	38.	12.25	8.	3.	2.	.05		
DIVERSION TO	D206	38.	.25	8.	3.	2.	.05		
HYDROGRAPH AT	DIV206	0.	.25	0.	0.	0.	.05		
4 COMBINED AT	1	0.	.25	0.	0.	0.	1.05		
HYDROGRAPH AT	SUB208	45.	12.50	10.	3.	2.	.06		
ROUTED TO	RO208	45.	12.50	10.	3.	3.	.06		
HYDROGRAPH AT	SUB210	60.	12.25	12.	4.	3.	.07		
2 COMBINED AT	CO210	102.	12.50	21.	7.	5.	.13		
HYDROGRAPH AT	WEEKE	3864.	12.50	1225.	406.	327.	4.80		
ROUTED TO	ROWEEK	3595.	12.75	1214.	401.	323.	4.80		
HYDROGRAPH AT	SUB74	1055.	13.00	445.	148.	119.	2.78		
2 COMBINED AT	CO74	4502.	12.75	1652.	548.	442.	7.58		
ROUTED TO	RO74	4329.	13.00	1639.	543.	438.	7.58		
HYDROGRAPH AT	SUB76	876.	13.00	334.	110.	88.	2.13		
2 COMBINED AT	CO76	5205.	13.00	1972.	653.	526.	9.71		
DIVERSION TO	DCAP1	1905.	13.00	320.	80.	65.	9.71		
HYDROGRAPH AT	DIV76A	3300.	13.00	1652.	573.	462.	9.71		

DIVERSION TO	D76	1650.	13.00	826.	286.	231.	9.71
HYDROGRAPH AT	DIV76	1650.	13.00	826.	286.	231.	9.71
ROUTED TO	RO76	1642.	13.00	824.	286.	231.	9.71
2 COMBINED AT	CO211	1675.	13.00	845.	293.	236.	9.84
DIVERSION TO	D211	1675.	.25	845.	293.	236.	9.84
HYDROGRAPH AT	DIV211	0.	.25	0.	0.	0.	9.84
HYDROGRAPH AT	SUB70	626.	12.75	228.	74.	59.	1.35
ROUTED TO	RO70	624.	13.00	228.	74.	59.	1.35
HYDROGRAPH AT	SUB72	572.	13.00	232.	76.	61.	1.38
2 COMBINED AT	CO72A	1197.	13.00	458.	149.	120.	2.73
HYDROGRAPH AT	RE72	1905.	13.00	320.	80.	65.	.00
2 COMBINED AT	CO72	3101.	13.00	778.	229.	185.	2.73
DIVERSION TO	DCAP2	0.	13.00	0.	0.	0.	2.73
HYDROGRAPH AT	DIV72A	3101.	13.00	778.	229.	185.	2.73
DIVERSION TO	D72	1551.	13.00	389.	115.	93.	2.73
HYDROGRAPH AT	DIV72	1551.	13.00	389.	115.	93.	2.73
HYDROGRAPH AT	RED76	1650.	13.00	826.	286.	231.	.00
2 COMBINED AT	CO73	3201.	13.00	1215.	401.	323.	2.73
ROUTED TO	RO73	3125.	13.00	1209.	400.	322.	2.73
HYDROGRAPH AT	SUB212	101.	12.50	27.	9.	7.	.17
2 COMBINED AT	CO212	3181.	13.00	1236.	408.	329.	2.90
HYDROGRAPH AT	RED72	1551.	13.00	389.	115.	93.	.00
ROUTED TO	RO73	1466.	13.00	388.	114.	92.	.00
HYDROGRAPH AT	SUB214	140.	12.50	39.	13.	10.	.25
2 COMBINED AT	CO214	1561.	13.00	426.	127.	102.	.25
HYDROGRAPH AT	SUB38	639.	12.50	164.	52.	42.	.99
ROUTED TO	RO38	612.	12.75	165.	52.	42.	.99
HYDROGRAPH AT	SUB40	384.	12.50	77.	24.	19.	.45
2 COMBINED AT	CO40	913.	12.50	240.	76.	62.	1.44
DIVERSION TO	D40	457.	12.50	120.	38.	31.	1.44

HYDROGRAPH AT	DIV40	457.	12.50	120.	38.	31.	1.44
ROUTED TO	RO40	451.	12.75	124.	39.	32.	1.44
HYDROGRAPH AT	SUB216	372.	12.50	95.	30.	25.	.55
2 COMBINED AT	CO216	770.	12.75	219.	70.	56.	1.99
2 COMBINED AT	CO41	2188.	13.00	645.	197.	159.	2.24
HYDROGRAPH AT	RED40	457.	12.50	120.	38.	31.	.00
ROUTED TO	RO41	419.	12.75	118.	38.	31.	.00
HYDROGRAPH AT	SUB34	754.	12.75	291.	95.	77.	1.84
ROUTED TO	RO34	747.	13.00	291.	95.	77.	1.84
HYDROGRAPH AT	SUB36	284.	12.50	57.	18.	14.	.33
2 COMBINED AT	CO36	824.	13.00	346.	113.	91.	2.17
ROUTED TO	RO36	824.	13.25	343.	113.	91.	2.17
2 COMBINED AT	CO37	1214.	12.75	461.	150.	121.	2.17
HYDROGRAPH AT	SUB218	710.	12.50	191.	62.	50.	1.21
2 COMBINED AT	CO218	1843.	12.75	649.	212.	171.	3.38
2 COMBINED AT	CO219	3847.	13.00	1294.	409.	330.	5.62
HYDROGRAPH AT	SUB220	352.	13.00	146.	48.	38.	.84
2 COMBINED AT	CO220	4200.	13.00	1439.	456.	368.	6.46
DIVERSION TO	WEIR	3271.	14.00	744.	186.	150.	6.46
HYDROGRAPH AT	DIV220	937.	14.00	695.	270.	218.	6.46
ROUTED TO	RO221	925.	14.25	692.	270.	218.	6.46
HYDROGRAPH AT	SUB222	71.	13.25	36.	12.	10.	.21
2 COMBINED AT	CO222	990.	13.00	727.	282.	228.	6.67
ROUTED TO	RO220	967.	14.25	727.	282.	227.	6.67
HYDROGRAPH AT	SUB224	206.	12.50	53.	17.	14.	.30
2 COMBINED AT	CO224	1069.	13.00	776.	299.	241.	6.97
HYDROGRAPH AT	SUB16	494.	12.50	118.	37.	30.	.71
HYDROGRAPH AT	SUB18	678.	12.75	236.	76.	61.	1.50
2 COMBINED AT	CO18	1080.	12.50	353.	113.	91.	2.21
ROUTED TO	RO18	1067.	12.75	348.	112.	91.	2.21

HYDROGRAPH AT	SUB20	961.	12.50	187.	58.	47.	1.05
2 COMBINED AT	CO20	1841.	12.50	534.	171.	138.	3.26
DIVERSION TO	D20	641.	12.50	49.	12.	10.	3.26
HYDROGRAPH AT	DIV20	1200.	12.50	485.	158.	128.	3.26
ROUTED TO	RO20	1200.	12.75	484.	158.	128.	3.26
HYDROGRAPH AT	SUB10	248.	12.50	54.	17.	14.	.33
HYDROGRAPH AT	SUB12	594.	12.50	128.	40.	32.	.75
2 COMBINED AT	CO12	842.	12.50	182.	57.	46.	1.08
ROUTED TO	RO12	742.	12.50	179.	57.	46.	1.08
HYDROGRAPH AT	SUB14	614.	12.75	207.	67.	54.	1.17
2 COMBINED AT	CO14	1315.	12.75	385.	123.	99.	2.25
2 COMBINED AT	CO21	2515.	12.75	870.	282.	227.	5.51
DIVERSION TO	DT21A	1315.	12.25	184.	46.	37.	5.51
HYDROGRAPH AT	DIV21A	1200.	12.25	686.	236.	190.	5.51
DIVERSION TO	DT21B	280.	12.25	90.	22.	18.	5.51
HYDROGRAPH AT	DIV21	920.	12.25	596.	213.	172.	5.51
ROUTED TO	RO21	920.	12.50	596.	213.	172.	5.51
HYDROGRAPH AT	RET20	641.	12.50	49.	12.	10.	.00
ROUTED TO	RO20D	520.	12.75	53.	13.	11.	.00
HYDROGRAPH AT	RET21A	1315.	12.75	184.	46.	37.	.00
2 COMBINED AT	CO21A	1835.	12.75	237.	59.	48.	.00
2 COMBINED AT	CO21B	2755.	12.75	833.	273.	220.	5.51
ROUTED TO	RO21B	2704.	12.75	825.	272.	219.	5.51
2 COMBINED AT	CO22	3681.	12.75	1601.	570.	460.	12.48
HYDROGRAPH AT	SUB226	447.	13.00	186.	61.	49.	1.17
2 COMBINED AT	CO226	4084.	12.75	1787.	631.	509.	13.65
ROUTED TO	RO226	3952.	13.00	1784.	630.	509.	13.65
HYDROGRAPH AT	SUB228	340.	12.25	60.	19.	15.	.31
HYDROGRAPH AT	SUB230	50.	13.25	24.	9.	7.	.42
ROUTED TO	RO230	48.	13.25	24.	9.	7.	.42

2 COMBINED AT	CO230	340.	12.25	82.	27.	22.	.73
2 COMBINED AT	CO231	4080.	13.00	1856.	658.	531.	14.38
HYDROGRAPH AT	RET23	280.	12.25	90.	22.	18.	.00
ROUTED TO	RO021	277.	13.75	89.	22.	18.	.00
HYDROGRAPH AT	SUB24	860.	13.00	352.	117.	94.	2.11
2 COMBINED AT	CO24	1091.	13.00	441.	139.	112.	2.11
HYDROGRAPH AT	SUB26A	576.	13.25	297.	100.	81.	1.92
2 COMBINED AT	CO26A	1638.	13.00	738.	239.	193.	4.03
ROUTED TO	RO26A	1631.	13.25	738.	240.	193.	4.03
HYDROGRAPH AT	SUB26B	379.	12.50	98.	31.	25.	.60
2 COMBINED AT	CO27	1836.	13.00	833.	271.	219.	4.63
HYDROGRAPH AT	SUB26C	80.	13.75	48.	17.	14.	.44
2 COMBINED AT	CO26C	1904.	13.00	881.	288.	233.	5.07

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

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

50-YR
EXISTING

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB200	68.	12.25	14.	5.	4.	.06		
DIVERSION TO	D200	68.	.25	14.	5.	4.	.06		
HYDROGRAPH AT	DIV200	0.	.25	0.	0.	0.	.06		
HYDROGRAPH AT	SUB202	127.	12.50	35.	11.	9.	.24		
DIVERSION TO	D202	127.	.25	35.	11.	9.	.24		
HYDROGRAPH AT	DIV202	0.	.25	0.	0.	0.	.24		
HYDROGRAPH AT	SUB204	275.	12.75	90.	29.	24.	.70		
DIVERSION TO	D204	275.	.25	90.	29.	24.	.70		
HYDROGRAPH AT	DIV204	0.	.25	0.	0.	0.	.70		
HYDROGRAPH AT	SUB206	27.	12.25	7.	2.	2.	.05		
DIVERSION TO	D206	27.	.25	7.	2.	2.	.05		
HYDROGRAPH AT	DIV206	0.	.25	0.	0.	0.	.05		
4 COMBINED AT	1	0.	.25	0.	0.	0.	1.05		
HYDROGRAPH AT	SUB208	33.	12.50	8.	3.	2.	.06		
ROUTED TO	RO208	33.	12.50	8.	3.	2.	.06		
HYDROGRAPH AT	SUB210	43.	12.25	9.	3.	2.	.07		
2 COMBINED AT	CO210	75.	12.50	17.	5.	4.	.13		
HYDROGRAPH AT	WEEKE	3538.	12.50	1061.	348.	281.	4.80		
ROUTED TO	ROWEEK	3247.	12.75	1052.	343.	277.	4.80		
HYDROGRAPH AT	SUB74	756.	13.25	355.	120.	97.	2.78		
2 COMBINED AT	CO74	3815.	12.75	1397.	463.	374.	7.58		
ROUTED TO	RO74	3675.	13.00	1387.	459.	370.	7.58		
HYDROGRAPH AT	SUB76	617.	13.25	262.	88.	71.	2.13		
2 COMBINED AT	CO76	4291.	13.00	1649.	547.	441.	9.71		
DIVERSION TO	DCAP1	1264.	13.00	191.	48.	38.	9.71		
HYDROGRAPH AT	DIV76A	3027.	13.00	1458.	499.	403.	9.71		

DIVERSION TO	D76	1514.	13.00	729.	249.	201.	9.71
HYDROGRAPH AT	DIV76	1514.	13.00	729.	249.	201.	9.71
ROUTED TO	RO76	1487.	13.00	729.	249.	201.	9.71
2 COMBINED AT	CO211	1518.	13.00	744.	255.	206.	9.84
DIVERSION TO	D211	1518.	.25	744.	255.	206.	9.84
HYDROGRAPH AT	DIV211	0.	.25	0.	0.	0.	9.84
HYDROGRAPH AT	SUB70	481.	13.00	185.	60.	49.	1.35
ROUTED TO	RO70	469.	13.00	182.	60.	48.	1.35
HYDROGRAPH AT	SUB72	413.	13.00	185.	61.	50.	1.38
2 COMBINED AT	CO72A	882.	13.00	367.	121.	98.	2.73
HYDROGRAPH AT	RE72	1264.	13.00	191.	48.	38.	.00
2 COMBINED AT	CO72	2146.	13.00	557.	169.	136.	2.73
DIVERSION TO	DCAP2	0.	13.00	0.	0.	0.	2.73
HYDROGRAPH AT	DIV72A	2146.	13.00	557.	169.	136.	2.73
DIVERSION TO	D72	1073.	13.00	279.	85.	68.	2.73
HYDROGRAPH AT	DIV72	1073.	13.00	279.	85.	68.	2.73
HYDROGRAPH AT	RED76	1514.	13.00	729.	249.	201.	.00
2 COMBINED AT	CO73	2587.	13.00	1008.	334.	269.	2.73
ROUTED TO	RO73	2482.	13.25	1007.	334.	269.	2.73
HYDROGRAPH AT	SUB212	72.	12.50	22.	7.	6.	.17
2 COMBINED AT	CO212	2519.	13.25	1028.	341.	275.	2.90
HYDROGRAPH AT	RED72	1073.	13.00	279.	85.	68.	.00
ROUTED TO	RO73	1019.	13.25	278.	85.	68.	.00
HYDROGRAPH AT	SUB214	98.	12.75	31.	10.	8.	.25
2 COMBINED AT	CO214	1081.	13.25	309.	95.	76.	.25
HYDROGRAPH AT	SUB38	448.	12.75	129.	42.	33.	.99
ROUTED TO	RO38	426.	12.75	129.	42.	34.	.99
HYDROGRAPH AT	SUB40	313.	12.50	63.	20.	16.	.45
2 COMBINED AT	CO40	609.	12.75	190.	61.	49.	1.44
DIVERSION TO	D40	305.	12.75	95.	31.	25.	1.44

HYDROGRAPH AT	DIV40	305.	12.75	95.	31.	25.	1.44
ROUTED TO	RO40	304.	13.00	96.	31.	25.	1.44
HYDROGRAPH AT	SUB216	249.	12.75	76.	25.	20.	.55
2 COMBINED AT	CO216	549.	12.75	172.	56.	45.	1.99
2 COMBINED AT	CO41	1520.	13.00	480.	150.	121.	2.24
HYDROGRAPH AT	RED40	305.	12.75	95.	31.	25.	.00
ROUTED TO	RO41	286.	13.00	93.	30.	25.	.00
HYDROGRAPH AT	SUB34	581.	13.00	234.	77.	62.	1.84
ROUTED TO	RO34	565.	13.25	234.	77.	62.	1.84
HYDROGRAPH AT	SUB36	211.	12.50	46.	14.	12.	.33
2 COMBINED AT	CO36	641.	13.00	277.	92.	74.	2.17
ROUTED TO	RO36	633.	13.25	273.	91.	74.	2.17
2 COMBINED AT	CO37	887.	13.00	366.	122.	98.	2.17
HYDROGRAPH AT	SUB218	477.	12.75	150.	49.	40.	1.21
2 COMBINED AT	CO218	1274.	13.00	514.	171.	138.	3.38
2 COMBINED AT	CO219	2793.	13.00	994.	321.	259.	5.62
HYDROGRAPH AT	SUB220	257.	13.00	117.	39.	31.	.84
2 COMBINED AT	CO220	3051.	13.00	1110.	360.	291.	6.46
DIVERSION TO	WEIR	2517.	13.75	474.	118.	96.	6.46
HYDROGRAPH AT	DIV220	943.	13.75	636.	242.	195.	6.46
ROUTED TO	RO221	930.	14.00	636.	241.	195.	6.46
HYDROGRAPH AT	SUB222	52.	13.25	28.	10.	8.	.21
2 COMBINED AT	CO222	974.	14.00	664.	251.	203.	6.67
ROUTED TO	RO220	967.	14.00	664.	252.	203.	6.67
HYDROGRAPH AT	SUB224	153.	12.50	43.	14.	11.	.30
2 COMBINED AT	CO224	1008.	14.00	704.	265.	214.	6.97
HYDROGRAPH AT	SUB16	358.	12.50	94.	30.	24.	.71
HYDROGRAPH AT	SUB18	473.	12.75	186.	61.	49.	1.50
2 COMBINED AT	CO18	781.	12.75	280.	91.	74.	2.21
ROUTED TO	RO18	760.	12.75	277.	91.	73.	2.21

HYDROGRAPH AT	SUB20	655.	12.50	148.	47.	38.	1.05
2 COMBINED AT	CO20	1246.	12.75	423.	138.	111.	3.26
DIVERSION TO	D20	46.	12.75	2.	0.	0.	3.26
HYDROGRAPH AT	DIV20	1200.	12.75	422.	137.	111.	3.26
ROUTED TO	RO20	1190.	12.75	420.	137.	110.	3.26
HYDROGRAPH AT	SUB10	182.	12.50	43.	14.	11.	.33
HYDROGRAPH AT	SUB12	424.	12.50	101.	32.	26.	.75
2 COMBINED AT	CO12	606.	12.50	145.	46.	37.	1.08
ROUTED TO	RO12	536.	12.75	142.	46.	37.	1.08
HYDROGRAPH AT	SUB14	450.	12.75	167.	55.	44.	1.17
2 COMBINED AT	CO14	986.	12.75	309.	100.	81.	2.25
2 COMBINED AT	CO21	2175.	12.75	729.	237.	191.	5.51
DIVERSION TO	DT21A	975.	12.50	113.	28.	23.	5.51
HYDROGRAPH AT	DIV21A	1200.	12.50	616.	209.	169.	5.51
DIVERSION TO	DT21B	280.	12.50	70.	17.	14.	5.51
HYDROGRAPH AT	DIV21	920.	12.50	547.	191.	154.	5.51
ROUTED TO	RO21	920.	12.75	545.	191.	154.	5.51
HYDROGRAPH AT	RET20	46.	12.75	2.	0.	0.	.00
ROUTED TO	RO20D	23.	13.00	2.	0.	0.	.00
HYDROGRAPH AT	RET21A	975.	12.75	113.	28.	23.	.00
2 COMBINED AT	CO21A	984.	12.75	115.	29.	23.	.00
2 COMBINED AT	CO21B	1904.	12.75	660.	220.	178.	5.51
ROUTED TO	RO21B	1769.	13.00	659.	220.	178.	5.51
2 COMBINED AT	CO22	2636.	12.75	1363.	485.	391.	12.48
HYDROGRAPH AT	SUB226	319.	13.25	146.	49.	40.	1.17
2 COMBINED AT	CO226	2893.	12.75	1509.	535.	431.	13.65
ROUTED TO	RO226	2850.	13.00	1510.	535.	432.	13.65
HYDROGRAPH AT	SUB228	269.	12.25	50.	15.	12.	.31
HYDROGRAPH AT	SUB230	30.	13.50	16.	6.	5.	.42
ROUTED TO	RO230	30.	13.75	16.	6.	5.	.42

2 COMBINED AT	CO230	269.	12.25	64.	21.	17.	.73
2 COMBINED AT	CO231	2937.	13.00	1566.	557.	449.	14.38
HYDROGRAPH AT	RET23	280.	12.50	70.	17.	14.	.00
ROUTED TO	RO021	267.	13.75	69.	17.	14.	.00
HYDROGRAPH AT	SUB24	661.	13.25	286.	96.	77.	2.11
2 COMBINED AT	CO24	892.	13.25	355.	113.	91.	2.11
HYDROGRAPH AT	SUB26A	413.	13.50	233.	81.	65.	1.92
2 COMBINED AT	CO26A	1295.	13.25	588.	194.	156.	4.03
ROUTED TO	RO26A	1279.	13.25	587.	194.	156.	4.03
HYDROGRAPH AT	SUB26B	267.	12.50	79.	26.	21.	.60
2 COMBINED AT	CO27	1420.	13.25	663.	220.	177.	4.63
HYDROGRAPH AT	SUB26C	54.	14.00	36.	13.	11.	.44
2 COMBINED AT	CO26C	1467.	13.25	699.	233.	188.	5.07

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

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

  1           ID       SUPERSTITION FREEWAY  -  OFFSITE DRAINAGE ANALYSIS     <SUPROW>
  2           ID       PROPOSED CONDITION  -  IRONWOOD TO POWER ROAD
  3           ID       FEBRUARY 1987   -  100-YEAR RAINFALL
              *DIAGRAM
  4           IT     15                    120
  5           IO      5
  6           PG      1    3.65
  7           PG     10
  8           IN     30                     48
  9           PI   0.019   0.020   0.020   0.022   0.022   0.023   0.025   0.025   0.026   0.028
 10           PI   0.029   0.031   0.033   0.035   0.038   0.042   0.046   0.051   0.057   0.067
 11           PI   0.085   0.113   0.176   1.387   0.262   0.136   0.097   0.076   0.067   0.058
 12           PI   0.050   0.046   0.041   0.038   0.035   0.033   0.031   0.029   0.027   0.027
 13           PI   0.025   0.024   0.023   0.022   0.022   0.020   0.020   0.019
              *       DRAINAGE AREA BETWEEN N. DIVERSION DAM AND POWER ROAD

 14           KK  SUB200
 15           KM       LOCAL RUNOFF AT IRONWOOD AND FREEWAY
 16           PR     10
 17           PW      1
 18           PT      1
 19           PW      1
 20           BA   0.06
 21           UK    650  0.0175    0.20     100
 22           RK   1000   0.010   0.040   0.008    TRAP     2.0     4.0
 23           RK   1500  0.0040   0.016           TRAP     3.5     1.5

 24           KK  DIV200
 25           KM       STORE HYDROGRAPH IN D200
 26           DT   D200
 27           DI      0    1000   10000
 28           DQ      0    1000   10000

 29           KK  SUB202
 30           KM       LOCAL RUNOFF TO 2100 FEET WEST OF IRONWOOD
 31           PR     10
 32           PW      1
 33           PT      1
 34           PW      1
 35           BA   0.24
 36           LS           85.7
 37           UK    650  0.0175   0.200     100
 38           RK   3600   0.010   0.040    0.04    TRAP     2.0     4.0
 39           RK   2100  0.0040   0.016           TRAP     3.5     1.5

 40           KK  SUB204
 41           KM       LOCAL RUNOFF TO IRRIGATION DAM (ASSUME NO ATTENUATION)
 42           PR     10
 43           PW      1
 44           PT      1
 45           PW      1
 46           BA   0.70
 47           LS             84
 48           UK    650  0.0175   0.200     100
 49           RK   6000  0.0083   0.040   0.043    TRAP     2.0     4.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  50          RK    2500  0.0048   0.035           TRAP    10.0     3.0

  51          KK   CO204
  52          KM        COMBINE FLOWS ALONG SR360 AT IRRIGATION EMBANKMENT
  53          KO       1
  54          HC       2

  55          KK  DIV204
  56          KM        STORE HYDROGRAPH IN D204
  57          DT    D204
  58          DI       0   10000
  59          DQ       0   10000

  60          KK  SUB206
  61          KM        LOCAL RUNOFF TO MERIDIAN DRIVE
  62          PR      10
  63          PW       1
  64          PT       1
  65          PW       1
  66          BA    0.05
  67          LS              83
  68          UK     500   0.023   0.200     100
  69          RK    1600   0.013   0.040   0.043    TRAP     2.0     4.0
  70          RK    1835   0.040   0.016           TRAP     9.3     1.5

  71          KK  DIV206
  72          KM        STORE HYDROGRAPH IN D206
  73          DT    D206
  74          DI       0   10000
  75          DQ       0   10000

  76          KK       1
  77          KM        COMBINE HYDROGRAPHS TO REDUCE # IN STACK
  78          HC       3

  79          KK  SUB208
  80          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTE (STA 574+50)
  81          PR      10
  82          PW       1
  83          PT       1
  84          PW       1
  85          BA    0.06
  86          LS              83
  87          UK     500   0.023    0.20     100
  88          RK    1900   0.010   0.040    0.03    TRAP     2.0     4.0
  89          RK     885   0.004   0.016           TRAP     9.3     1.5

  90          KK   WEEKES
  91          KM        BREAKOUT FLOW FROM WEEKES WASH
  92          BA     4.8
  93          IN      30                     48
  94          QI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0 1
  95          QI     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0 2
  96          QI    25.0    60.0   114.0   586.0  1731.0  3864.0  2703.0  1668.0  1103.0   802.0 3
  97          QI   648.0   524.0   435.0   373.0   328.0   296.0   271.0   250.0   240.0   233.0 4
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BKS WASH

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

  98          QI   221.0   208.0   199.0   189.0   178.0   166.0   158.0   147.0

  99          KK  ROWEEK
 100          KM       ROUTE WEEKES WASH BREAKOUT FLOWS TO US60
 101          RK    6500    0.01   0.065           TRAP      25      30

 102          KK   SUB74
 103          KM       LOCAL RUNOFF TO APACHE TRAIL
 104          PR      10
 105          PW       1
 106          PT       1
 107          PW       1
 108          BA    2.78
 109          LS             85
 110          UK    1500   0.015   0.200     100
 111          RK    5000   0.013   0.040   0.009    TRAP     2.0     4.0
 112          RK    8400   0.009   0.035           TRAP    15.0     3.0

 113          KK    CO74
 114          KM       COMBINE LOCAL WITH WEEKES WASH BREAKOUT
 115          HC       2

 116          KK    RO74
 117          KM       ROUTE FLOWS FROM APACHE TRAIL TO C.A.P. (SUB76)
 118          RK   14400   0.010   0.035           TRAP    15.0     3.0

 119          KK   SUB76
 120          KM       LOCAL RUNOFF TO C.A.P.
 121          PR      10
 122          PW       1
 123          PT       1
 124          PW       1
 125          BA    2.13
 126          LS             84
 127          UK    1250   0.013   0.200     100
 128          RK    7000   0.010   0.040   0.176    TRAP     2.0     4.0
 129          RK   14400   0.010   0.035           TRAP    15.0     3.0

 130          KK    CO76
 131          KM       COMBINE FLOWS AT C.A.P. TO BOTH OVERCHUTES (STA 563+50 & 552+50)
 132          HC       2

 133          KK  DIV76A
 134          KM       DIVERT FLOW IN EXCESS OF OVERCHUTE CAPACITY TO NORTHWEST
 135          DT   DCAP1
 136          DI       0    2425    2975    3920    5525    6675
 137          DQ       0       0     125     745    2050    3000

 138          KK  SUBAS1
 139          KM       RUNOFF ONTO SUBBASIN 1 AREA
 140          BA    0.11
 141          LS             95
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 142          KK  BASIN1
 143          KM       COMBINE FLOWS INTO SUBBASIN 1
 144          KO      1
 145          HC      2

 146          KK  COBAS1
 147          KM       COMBINE FLOWS FROM SUB208
 148          HC      2

 149          KK  ROBAS1
 150          KM       ROUTE FLOWS THROUGH SUBBASIN 1
 151          KO      1
 152          RS    1.0    ELEV    51.5
 153          SV      0      94     159     224     291     359     428     499     571
 154          SE   51.5      53      54      55      56      57      58      59      60
 155          SQ      0     150     360     585     855    1125    1395    1650    1890

 156          KK  BASOT1
 157          KM       ROUTE OUTFLOW FROM BASIN 1 TO BASIN 2
 158          RK   1550  0.0052    0.03           TRAP      30     3.0

 159          KK   SUB70
 160          KM       LOCAL RUNOFF TO APACHE TRAIL
 161          PR     10
 162          PW      1
 163          PT      1
 164          PW      1
 165          BA   1.35
 166          LS             85
 167          UK   1000   0.011   0.200     100
 168          RK   3500   0.012   0.040  0.0502    TRAP     2.0     4.0
 169          RK  11200   0.011   0.035           TRAP    10.0     3.0

 170          KK   RO70
 171          KM       ROUTE FLOWS FROM APACHE TRAIL TO C.A.P.
 172          RK   8800  0.0090   0.035           TRAP    10.0     3.0

 173          KK   SUB72
 174          KM       LOCAL RUNOFF TO C.A.P. OVERCHUTES (STA 542+50 & 529+50)
 175          PR     10
 176          PW      1
 177          PT      1
 178          PW      1
 179          BA   1.38
 180          LS             85
 181          UK   1250   0.011   0.200     100
 182          RK   2500   0.009   0.040  0.0359    TRAP     2.0     4.0
 183          RK   8800   0.009   0.035           TRAP    10.0     3.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 184          KK   CO72A
 185          KM        COMBINE FLOWS AT C.A.P. OVERCHUTES
 186          HC       2

 187          KK  SUB212
 188          KM        LOCAL RUNOFF BELOW C.A.P. ABOVE SOUTHERN AVE.
 189          BA    0.07
 190          LS              83
 191          UK     250   0.010   0.200     100
 192          RK    1000   0.010   0.040    0.02    TRAP     2.0     4.0
 193          RK    1500   0.007   0.035            TRAP    25.0     2.0

 194          KK   CO212
 195          KM        COMBINE FLOW OVER DIP SECTION ALONG SOUTHERN AVE.
 196          HC       2

 197          KK    RE72
 198          KM        RETRIEVE DIVERTED FLOWS FROM D/S CAP OVERCHUTES
 199          DR   DCAP1

 200          KK    CO72
 201          KM        COMBINE FLOWS AT C.A.P. OVERCHUTES (INCLUDING DIVERTED)
 202          HC       2

 203          KK  SUBAS2
 204          KM        RUNOFF INTO RETENTION BASIN 2
 205          BA    0.11
 206          LS              90

 207          KK  BASIN2
 208          KM        COMBINE FLOWS INTO WEST BASIN (#2)
 209          KO       1
 210          HC       2

 211          KK  ROBAS2
 212          KM        ROUTE FLOWS THROUGH WEST BASIN (#2)
 213          KO       1
 214          RS       1    ELEV      45
 215          SV       0     168     286     345     466
 216          SE      42      45      47      48      50
 217          SQ       0     155     340     430     600

 218          KK  COBAS2
 219          KM        COMBINE OUTFLOWS FROM BOTH C.A.P. BASINS
 220          KO       1
 221          HC       2

 222          KK  SUB214
 223          KM        LOCAL RUNOFF AT SIGNAL BUTTE AND SR360
 224          BA    0.09
 225          LS              83
 226          UK     250   0.010   0.200     100
 227          RK    1000   0.009    0.04    0.03    TRAP     2.0     4.0
 228          RK    2450  0.0066   0.025            TRAP    10.0     2.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 229          KK   RO214
 230          KM        ROUTE SUB214 FLOWS TO CRISMON ROAD
 231          RK    3400  0.0056   0.016            TRAP     0.1     3.0

 232          KK   SUB38
 233          KM        LOCAL RUNOFF TO APACHE TRAIL
 234          PR      10
 235          PW       1
 236          PT       1
 237          PW       1
 238          BA    0.99
 239          LS              84
 240          UK     500  0.0125   0.200     100
 241          RK    4000  0.0125   0.040  0.0574    TRAP     2.0     4.0
 242          RK   14000  0.0090   0.035            TRAP    10.0     3.0

 243          KK    RO38
 244          KM        ROUTE FLOWS FROM APACHE TRAIL TO C.A.P.
 245          RK    6000  0.0120   0.035            TRAP    10.0     3.0

 246          KK   SUB40
 247          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTES (STA 504+25 & 479+00)
 248          PR      10
 249          PW       1
 250          PT       1
 251          PW       1
 252          BA    0.45
 253          LS              84
 254          UK     350  0.0180   0.200     100
 255          RK    2500  0.0100   0.040  0.0448    TRAP     2.0     4.0
 256          RK    6000  0.0120   0.035            TRAP    10.0     3.0

 257          KK    CO40
 258          KM        COMBINE FLOWS AT C.A.P. OVERCHUTES (STA 504+25 & 479+00)
 259          HC       2

 260          KK   DIV40
 261          KM        DIVERT 50% OF FLOW TO EACH OVERCHUTE
 262          DT     D40
 263          DI       0     100    1000   10000
 264          DQ       0      50     500    5000

 265          KK    RO40
 266          KM        ROUTE C.A.P. OVERCHUTE (STA 504+25) FLOWS TO FREEWAY
 267          RK    6000  0.0083   0.040            TRAP     2.0     4.0

 268          KK  SUB216
 269          KM        LOCAL RUNOFF TO CRISMON
 270          KO       1
 271          BA    0.55
 272          LS            85.5
 273          UK     500   0.010   0.200     100
 274          RK    6000  0.0083   0.040    0.11    TRAP    25.0     2.0
 275          RK    2500  0.0070   0.035            TRAP    35.0     3.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 276          KK   CO216
 277          KM        COMBINE.FLOWS AT SUPERSTITION FREEWAY
 278          KO       1
 279          HC       2

 280          KK   CO217
 281          KM        COMBINE FLOWS NEAR CRISMON
 282          HC       2

 283          KK   RO217
 284          KM        ROUTE FLOWS FROM CRISMON TO 1200 ' EAST OF ELLSWORTH ROAD
              *       DROP STRUCTURES REQUIRED TO REDUCE LONGITUDINAL SLOPE
 285          RK    4000  0.0033   0.016            TRAP     7.5     3.0

 286          KK   RED40
 287          KM        RETRIEVE DIVERTED HYDROGRAPH FROM SUB40
 288          DR     D40

 289          KK    RO41
 290          KM        ROUTE C.A.P. OVERCHUTE (STA 479+00) FLOWS TO SR360 3000' W. OF CRISMON
 291          RK    9500   0.008   0.035            TRAP    10.0     3.0

 292          KK   SUB34
 293          KM        LOCAL RUNOFF TO APACHE TRAIL
 294          PR      10
 295          PW       1
 296          PT       1
 297          PW       1
 298          BA    1.84
 299          LS              84
 300          UK    1000  0.0100   0.200     100
 301          RK    5000  0.0111   0.040   0.090    TRAP     2.0     4.0
 302          RK   13700  0.0102   0.035            TRAP    10.0     3.0

 303          KK    RO34
 304          KM        ROUTE FLOWS FROM APACHE TRAIL TO C.A.P.
 305          RK    3200  0.0093   0.035            TRAP    20.0     3.0

 306          KK   SUB36
 307          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTES (STA 471+03 & 456+50)
 308          PR      10
 309          PW       1
 310          PT       1
 311          PW       1
 312          BA    0.33
 313          LS              84
 314          UK     250  0.0067   0.200     100
 315          RK    1500  0.0167   0.040  0.0269    TRAP     2.0     4.0
 316          RK    3200  0.0093   0.035            TRAP    20.0     3.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 317          KK   CO36
 318          KM       COMBINE FLOWS AT C.A.P. OVERCHUTES (STA 471+03 & 456+50)
 319          HC      2

 320          KK   RO36
 321          KM       ROUTE C.A.P. OVERCHUTE (STA 471+03 AND 456+50) FLOWS TO 2600' W. OF CRIS
 322          RK   9500   0.008   0.035           TRAP    10.0     3.0

 323          KK   CO37
 324          KM       COMBINE OVERCHUTE AND FREEWAY FLOW 2600' W. OF CRISMON
 325          KO      1
 326          HC      2

 327          KK  SUB218
 328          KM       LOCAL RUNOFF TO 2600 FEET WEST OF CRISMON AT THE FREEWAY
 329          PR     10
 330          PW      1
 331          PT      1
 332          PW      1
 333          BA   1.21
 334          LS           83.3
 335          UK    500   0.010    0.20     100
 336          RK   7000   0.008   0.040    0.20    TRAP    25.0     2.0
 337          RK   2600  0.0070   0.035           TRAP    35.0     3.0

 338          KK   CO218
 339          KM       COMBINE TOTAL FLOW IN FREEWAY 2600 FEET WEST OF CRISMON
 340          KO      1
 341          HC      2

 342          KK   CO219
 343          KM       COMBINE FLOWS AT 2600 FEET WEST OF CRISMON
 344          KO      1
 345          HC      2

 346          KK   RO219
 347          KM       ROUTE FLOWS TO ELLSWORTH REGIONAL DETENTION BASIN
              *      DROP STRUCTURES REQUIRED TO REDUCE LONGITUDINAL SLOPE
 348          RK   1000  0.0023   0.016           TRAP    27.0     3.0

 349          KK  SUB220
 350          KM       LOCAL RUNOFF AT ELLSWORTH AND FREEWAY
 351          PR     10
 352          PW      1
 353          PT      1
 354          PW      1
 355          BA   0.84
 356          LS           85.7
 357          UK   1250   0.010   0.200     100
 358          RK   3500   0.010   0.040   0.128    TRAP     2.0     4.0
 359          RK   3550   0.006   0.035           TRAP    10.0     3.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 360          KK   CO220
 361          KM        COMBINED FLOW INTO RETENTION BASIN NO. OF SR360
 362          KO       1
 363          HC       2

 364          KK    ROUT
 365          KM        ROUTE FLOW THROUGH BASIN NO. OF SR360
 366          KO       1
 367          RS       1    ELEV      64
 368          SV       0    81.2   264.2   386.2   447.2   508.2   525.2   538.7   569.2
 369          SE      64      68      74      78      80      82    82.5      83      84
 370          SQ       0       0       0       0       0       0     186     526    1488

 371          KK  SUB222
 372          KM        LOCAL FLOWS TO 2700 FEET WEST OF ELLSWORTH
 373          PR      10
 374          PW       1
 375          PT       1
 376          PW       1
 377          BA    0.21
 378          LS             86
 379          UK    1250   0.005   0.200     100
 380          RK    2000   0.007   0.040    0.03    TRAP     2.0     4.0
 381          RK    2700  0.0060   0.035            TRAP    20.0     3.0

 382          KK   RO222
 383          KM        ROUTE CO222 FLOWS TO HAWES ROAD
              *       DROP STRUCTURES REQUIRED TO REDUCE LONGITUDINAL SLOPE
 384          RK    5000  0.0034   0.016            TRAP     1.0     3.0

 385          KK  SUB224
 386          KM        LOCAL FLOW TO HAWES ROAD
 387          PR      10
 388          PW       1
 389          PT       1
 390          PW       1
 391          BA    0.30
 392          LS           85.4
 393          UK     500   0.010    0.20     100
 394          RK    4500   0.009   0.040    0.25    TRAP    10.0     3.0
 395          RK    2500  0.0028   0.016            TRAP    12.0     1.5

 396          KK   CO224
 397          KM        COMBINE FLOW AT HAWES AND FREEWAY
 398          HC       2

 399          KK   SUB16
 400          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTE (STA 396+00)
 401          PR      10
 402          PW       1
 403          PT       1
 404          PW       1
 405          BA    0.71
 406          LS             84
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 407          UK     500  0.0133   0.200     100
 408          RK    8800  0.0148   0.040   0.158    TRAP     2.0     4.0
 409          RK    1700  0.0055   0.035            TRAP     8.0     1.5

 410          KK   SUB18
 411          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTES (STA 427+15 & 429+20)
 412          PR      10
 413          PW       1
 414          PT       1
 415          PW       1
 416          BA    1.50
 417          LS             83
 418          UK    1000  0.0150   0.200     100
 419          RK    4800  0.0115   0.040  0.1033    TRAP     2.0     4.0
 420          RK   10000  0.0102   0.035            TRAP    10.0     3.0

 421          KK    CO18
 422          KM        COMBINE FLOWS AT C.A.P. FROM SUB16 AND SUB18
 423          HC       2

 424          KK    RO18
 425          KM        ROUTE FLOWS FROM C.A.P. TO BROADWAY
 426          RK    8300  0.0102   0.035            TRAP     5.0     2.0

 427          KK   SUB20
 428          KM        LOCAL RUNOFF TO BROADWAY ROAD
 429          PR      10
 430          PW       1
 431          PT       1
 432          PW       1
 433          BA    1.05
 434          LS             85
 435          UK      90   0.005   0.200     100
 436          RK    5250  0.0075   0.050   0.043    TRAP    20.0    0.01
 437          RK    8300  0.0102   0.035            TRAP     5.0     2.0

 438          KK    CO20
 439          KM        COMBINE RUNOFF 2600 FEET WEST OF ELLSWORTH ON BROADWAY
 440          HC       2

 441          KK   DIV20
 442          KM        DIVERT EXCESS FLOW SOUTH ACCROSS BROADWAY
 443          DT     D20
 444          DI       0    1200    2400    4800   11200
 445          DQ       0       0    1200    3600   10000

 446          KK    RO20
 447          KM        ROUTE FLOWS TO HAWES AND BROADWAY
 448          RK    2600  0.0054   0.035            TRAP     5.0     2.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 449          KK   SUB10
 450          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTE (STA 345+30)
 451          PR      10
 452          PW       1
 453          PT       1
 454          PW       1
 455          BA    0.33
 456          LS              83
 457          UK     500  0.0230   0.200     100
 458          RK    3000  0.0167   0.040  0.0646    TRAP     2.0     4.0
 459          RK    1480  0.0042   0.035            TRAP     8.0     1.5

 460          KK   SUB12
 461          KM        LOCAL RUNOFF TO C.A.P. OVERCHUTE (STA 374+00)
 462          PR      10
 463          PW       1
 464          PT       1
 465          PW       1
 466          BA    0.75
 467          LS              84
 468          UK     500  0.0180   0.200     100
 469          RK    6600  0.0174   0.040   0.071    TRAP     2.0     4.0
 470          RK    1060  0.0056   0.035            TRAP     8.0     1.5

 471          KK    CO12
 472          KM        COMBINE RUNOFF FROM OVERCHUTES (STA 345+30 AND 374+00)
 473          HC       2

 474          KK    RO12
 475          KM        ROUTE FLOWS FROM OVERCHUTES TO HAWES AND BROADWAY
 476          RK   10400  0.0098   0.035            TRAP     5.0     3.0

 477          KK   SUB14
 478          KM        LOCAL RUNOFF TO HAWES AND BROADWAY
 479          PR      10
 480          PW       1
 481          PT       1
 482          PW       1
 483          BA    1.17
 484          LS              86
 485          UK      85   0.005   0.200     100
 486          RK    8500  0.0067  0.0500   0.036    TRAP    20.0    0.01
 487          RK    2600  0.0075   0.040            TRAP    32.0     6.0

 488          KK    CO14
 489          KM        COMBINE LOCAL AND OVERCHUTE FLOWS
 490          HC       2

 491          KK    CO21
 492          KM        COMBINE FLOWS IN BROADWAY ROAD AT HAWES (TOTAL)
 493          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

494           KK  DIV21A
495           KM        DIVERT EXCESS FLOWS ACCROSS BROADWAY
496           KO       1
497           DT   DT21A
498           DI       0    1200    2400    4800   11200
499           DQ       0       0    1200    3600   10000

500           KK   DIV21
501           KM        DIVERT FLOWS CONTINUING WEST ON BROADWAY
502           DT   DT21B
503           DI       0     800    1000    1250    2000    3000
504           DQ       0       0     200     300     500    1000

505           KK    RO21
506           KM        ROUTE FLOWS SOUTH TO FREEWAY AT HAWES ROAD
507           RK    2000  0.0068   0.025            TRAP    60.0     4.0

508           KK   RET20
509           KM        RETRIEVE DIVERTED FLOWS FROM BROADWAY
510           DR     D20

511           KK   RO20D
512           KM        ROUTE DIVERTED FLOWS FROM BROADWAY TO HAWES ROAD
513           RK    2900  0.0067   0.035            TRAP    10.0     4.0

514           KK  RET21A
515           KM        RETRIEVE DIVERTED FLOWS FROM BROADWAY
516           DR   DT21A

517           KK   CO21A
518           KM        COMBINE DIVERTED FLOWS AT HAWES
519           HC       2

520           KK   CO21B
521           KM        COMBINE FLOW IN HAWES ROAD CHANNEL 2900 FEET SOUTH OF BROADWAY
522           HC       2

523           KK   RO21B
524           KM        ROUTE HAWES ROAD CHANNEL FLOWS TO FREEWAY
525           RK    5500  0.0068   0.025            TRAP    60.0     4.0

526           KK  SUB226
527           KM        LOCAL RUNOFF TO HAWES ROAD AT THE FREEWAY
528           PR      10
529           PW       1
530           PT       1
531           PW       1
532           BA    1.17
533           LS           84.4
534           UK    1250   0.010   0.200     100
535           RK    6500   0.009   0.040   0.117    TRAP     2.0     4.0
536           RK    6000   0.004   0.035            TRAP    30.0     2.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  537         KK   CO226
  538         KM        COMBINE FLOWS ALONG HAWES ROAD
  539         HC       2

  540         KK    CO22
  541         KM        COMBINE FLOWS IN FREEWAY AT HAWES ROAD
  542         HC       2

  543         KK   RO226
  544         KM        ROUTE FLOW TO SOSSAMAN CHANNEL
  545         RK    4000  0.0066   0.035           TRAP    25.0     4.0

  546         KK  SUB22B
  547         KM        LOCAL RUNOFF AT SOSSAMAN CHANNEL
  548         PR      10
  549         PW       1
  550         PT       1
  551         PW       1
  552         BA    0.31
  553         LS           86.5
  554         UK     110   0.005   0.200     100
  555         RK    2600  0.0038   0.016    0.05    TRAP    40.0    0.01
  556         RK    4200  0.0026   0.016            TRAP    16.6     1.5

  557         KK  SUB230
  558         KM        LOCAL RUNOFF AT SOSSAMAN CHANNEL AND SOUTHERN AVE
  559         PR      10
  560         PW       1
  561         PT       1
  562         PW       1
  563         BA    0.42
  564         LS             65
              *       RUNOFF CURVE NUMBER REDUCED FROM 85 FOR 50-YEAR RETENTION (75%)
  565         UK     150   0.005   0.200     100
  566         RK    3100  0.0061   0.061   0.035    TRAP    40.0    0.01
  567         RK    4350  0.0062   0.016            TRAP    10.0     1.5

  568         KK   RO230
  569         KM        ROUTE FLOWS IN SOSSAMAN CHANNEL FROM SOUTHERN TO FREEWAY
  570         RK    2200   0.006   0.035            TRAP    20.0     2.0

  571         KK   CO230
  572         KM        COMBINE FLOWS IN SOSSAMAN CHANNEL AT FREEWAY
  573         HC       2

  574         KK   CO231
  575         KM        COMBINE FLOW IN SOSSAMAN CHANNEL AT FREEWAY
  576         HC       2
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BNGHE/CMCHE8/


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

 577          KK   RET23
 578          KM        RETRIEVE FLOWS DIVERTED AT HAWES AND BROADWAY
 579          DR   DT21B

 580          KK   ROD21
 581          KM        ROUTE DIVERTED FLOWS TO FREEWAY
 582          RK    9600  0.0038   0.035           TRAP    30.0    4.00

 583          KK   SUB24
 584          KM        RUNOFF FROM EMCMDS SUB24
 585          BA    2.11
 586          LS              86
 587          UK     100  0.0050    0.20     100
 588          RK    7000  0.0070   0.045    0.01    TRAP    20.0    0.01
 589          RK    9600  0.0038   0.035           TRAP    30.0     4.0

 590          KK    CO24
 591          KM        COMBINE FLOWS AT FREEWAY
 592          KO       1
 593          HC       2

 594          KK   DIV24
 595          KM        DIVERT FLOWS TO OFFCHANNEL STORAGE (Q>890)
 596          DT   DBAS1
 597          DI       0     890    1090
 598          DQ       0       0     200

 599          KK  SUB26A
 600          KM        LOCAL RUNOFF FROM EMCMDS SUBAREA 26 (EAST PORTION)
 601          BA    1.92
 602          LS            84.3
 603          UK    1250  0.0050   0.200     100
 604          RK    3500   0.006   0.050    0.14    TRAP    20.0    0.01
 605          RK    9000  0.0064   0.025           TRAP    12.0     2.0

 606          KK   CO26A
 607          KM        COMBINE FLOW IN FREEWAY AT 0.5 MI WEST OF SOSSAMAN ROAD
 608          HC       2

 609          KK  DIV26A
 610          KM        DIVERT FLOWS TO OFFCHANNEL STORAGE (Q>1265)
 611          DT   DBAS2
 612          DI       0    1265    1500
 613          DQ       0       0     235

 614          KK  SUB26B
 615          KM        LOCAL FLOWS TO POWER ROAD
 616          BA    0.60
 617          LS              84
 618          UK     100  0.0050   0.200     100
 619          RK    7800   0.006   0.050    0.15    TRAP    40.0    0.01
 620          RK    2800  0.0053   0.016           TRAP    12.0     2.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 621          KK   CD27
 622          KM       COMBINE FLOWS AT POWER ROAD IN FREEWAY CHANNEL
 623          KO      1
 624          HC      2

 625          KK  RO26B1
 626          KM       ROUTE FLOWS TO POWER ROAD (WEIR LENGTH = 150 ')
 627          KO      1
 628          RS    1.0    ELEV    1360
 629          SV      0    7.48   13.20   24.32   40.45   43.67
 630          SE   1360  1362.4    1364  1366.7    1370  1370.6
 631          SQ      0     250     500    1000    1500    1575

 632          KK  RO26B2
 633          KM       ROUTE FLOW FROM POWER TO WEST FOR 500 FEET
 634          RK    500  0.0053   0.016           TRAP    12.0     2.0

 635          KK  RO26B3
 636          KM       ROUTE FLOW TO 2000 FEET WEST OF POWER ROAD
 637          RK   1500   0.015   0.016           TRAP    12.0     2.0

 638          KK  RO26B4
 639          KM       ROUTE FLOW TO RWCD, 5175 FEET WEST OF POWER ROAD
 640          RK   3175 0.00157   0.016           TRAP    12.0     2.0

 641          KK  SUB26C
 642          KM       LOCAL RUNOFF FROM POWER ROAD TO R.W.C.D.
 643          BA   0.44
 644          LS        77.3
 645          UK   1250   0.005    0.20     100
 646          RK   2600  0.0038   0.035           TRAP    10.0     3.0
 647          RK   5200  0.0015   0.016           TRAP    12.0     2.0

 648          KK   CD26C
 649          KM       COMBINE TOTAL FLOW IN FREEWAY CHANNEL AT R.W.C.D.
 650          KO      1
 651          HC      2
 652          ZZ
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

100-YR
PROPOSED

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB200	79.	12.25	16.	6.	5.	.06		
DIVERSION TO	D200	79.	.25	16.	6.	5.	.06		
HYDROGRAPH AT	DIV200	0.	.25	0.	0.	0.	.06		
HYDROGRAPH AT	SUB202	171.	12.50	43.	14.	11.	.24		
HYDROGRAPH AT	SUB204	395.	12.50	113.	36.	29.	.70		
2 COMBINED AT	CO204	566.	12.50	156.	50.	40.	.94		
DIVERSION TO	D204	566.	.25	156.	50.	40.	.94		
HYDROGRAPH AT	DIV204	0.	.25	0.	0.	0.	.94		
HYDROGRAPH AT	SUB206	38.	12.25	8.	3.	2.	.05		
DIVERSION TO	D206	38.	.25	8.	3.	2.	.05		
HYDROGRAPH AT	DIV206	0.	.25	0.	0.	0.	.05		
3 COMBINED AT	1	0.	.25	0.	0.	0.	1.05		
HYDROGRAPH AT	SUB208	45.	12.50	10.	3.	2.	.06		
HYDROGRAPH AT	WEEKE	3864.	12.50	1225.	406.	327.	4.80		
ROUTED TO	ROWEEK	3595.	12.75	1214.	401.	323.	4.80		
HYDROGRAPH AT	SUB74	1055.	13.00	445.	148.	119.	2.78		
2 COMBINED AT	CO74	4502.	12.75	1652.	548.	442.	7.58		
ROUTED TO	RO74	4329.	13.00	1639.	543.	438.	7.58		
HYDROGRAPH AT	SUB76	876.	13.00	334.	110.	88.	2.13		
2 COMBINED AT	CO76	5205.	13.00	1972.	653.	526.	9.71		
DIVERSION TO	DCAP1	1789.	13.00	254.	63.	51.	9.71		
HYDROGRAPH AT	DIV76A	3415.	13.00	1719.	589.	475.	9.71		
HYDROGRAPH AT	SUBAS1	60.	13.00	25.	8.	7.	.11		
2 COMBINED AT	BASIN1	3475.	13.00	1744.	597.	482.	9.82		
2 COMBINED AT	COBAS1	3491.	13.00	1753.	601.	484.	9.88		
ROUTED TO	ROBAS1	1449.	15.25	1219.	534.	431.	9.88	58.21	15.25

ROUTED TO	BASOT1	1449.	13.25	1219.	533.	430.	7.88		
HYDROGRAPH AT	SUB70	626.	12.75	228.	74.	59.	1.35		
ROUTED TO	RO70	624.	13.00	228.	74.	59.	1.35		
HYDROGRAPH AT	SUB72	572.	13.00	232.	76.	61.	1.38		
2 COMBINED AT	CO72A	1197.	13.00	458.	149.	120.	2.73		
HYDROGRAPH AT	SUB212	60.	12.25	12.	4.	3.	.07		
2 COMBINED AT	CO212	1211.	13.00	469.	153.	123.	2.80		
HYDROGRAPH AT	RE72	1789.	13.00	254.	63.	51.	.00		
2 COMBINED AT	CO72	3001.	13.00	723.	216.	175.	2.80		
HYDROGRAPH AT	SUBAS2	145.	12.25	24.	8.	6.	.11		
2 COMBINED AT	BASIN2	3030.	13.00	745.	224.	181.	2.91		
ROUTED TO	ROBAS2	387.	15.00	356.	206.	191.	2.91	47.53	15.00
2 COMBINED AT	COBAS2	1835.	15.25	1575.	740.	621.	12.79		
HYDROGRAPH AT	SUB214	77.	12.25	15.	5.	4.	.09		
ROUTED TO	RO214	74.	12.50	15.	5.	4.	.09		
HYDROGRAPH AT	SUB38	639.	12.50	164.	52.	42.	.99		
ROUTED TO	RO38	612.	12.75	165.	52.	42.	.99		
HYDROGRAPH AT	SUB40	384.	12.50	77.	24.	19.	.45		
2 COMBINED AT	CO40	913.	12.50	240.	76.	62.	1.44		
DIVERSION TO	D40	457.	12.50	120.	38.	31.	1.44		
HYDROGRAPH AT	DIV40	457.	12.50	120.	38.	31.	1.44		
ROUTED TO	RO40	451.	12.75	124.	39.	32.	1.44		
HYDROGRAPH AT	SUB216	372.	12.50	95.	30.	25.	.55		
2 COMBINED AT	CO216	770.	12.75	219.	70.	56.	1.99		
2 COMBINED AT	CO217	820.	12.75	234.	74.	60.	2.08		
ROUTED TO	RO217	813.	12.75	234.	74.	60.	2.08		
HYDROGRAPH AT	RED40	457.	12.50	120.	38.	31.	.00		
ROUTED TO	RO41	419.	12.75	118.	38.	31.	.00		
HYDROGRAPH AT	SUB34	754.	12.75	291.	95.	77.	1.84		
ROUTED TO	RO34	747.	13.00	291.	95.	77.	1.84		

HYDROGRAPH AT	SUB36	284.	12.50	57.	18.	14.	.33		
2 COMBINED AT	CO36	824.	13.00	346.	113.	91.	2.17		
ROUTED TO	RO36	824.	13.25	343.	113.	91.	2.17		
2 COMBINED AT	CO37	1214.	12.75	461.	150.	121.	2.17		
HYDROGRAPH AT	SUB218	710.	12.50	191.	62.	50.	1.21		
2 COMBINED AT	CO218	1843.	12.75	649.	212.	171.	3.38		
2 COMBINED AT	CO219	2656.	12.75	882.	286.	231.	5.46		
ROUTED TO	RO219	2614.	12.75	882.	287.	231.	5.46		
HYDROGRAPH AT	SUB220	352.	13.00	146.	48.	38.	.84		
2 COMBINED AT	CO220	2961.	12.75	1028.	334.	270.	6.30		
ROUTED TO	ROUT	241.	19.75	201.	76.	61.	6.30	82.58	19.75
HYDROGRAPH AT	SUB222	71.	13.25	36.	12.	10.	.21		
ROUTED TO	RO222	71.	13.25	35.	12.	10.	.21		
HYDROGRAPH AT	SUB224	206.	12.50	53.	17.	14.	.30		
2 COMBINED AT	CO224	247.	12.50	88.	29.	23.	.51		
HYDROGRAPH AT	SUB16	494.	12.50	118.	37.	30.	.71		
HYDROGRAPH AT	SUB18	678.	12.75	236.	76.	61.	1.50		
2 COMBINED AT	CO18	1080.	12.50	353.	113.	91.	2.21		
ROUTED TO	RO18	1067.	12.75	348.	112.	91.	2.21		
HYDROGRAPH AT	SUB20	961.	12.50	187.	58.	47.	1.05		
2 COMBINED AT	CO20	1841.	12.50	534.	171.	138.	3.26		
DIVERSION TO	D20	641.	12.50	49.	12.	10.	3.26		
HYDROGRAPH AT	DIV20	1200.	12.50	485.	158.	128.	3.26		
ROUTED TO	RO20	1200.	12.75	484.	158.	128.	3.26		
HYDROGRAPH AT	SUB10	248.	12.50	54.	17.	14.	.33		
HYDROGRAPH AT	SUB12	594.	12.50	128.	40.	32.	.75		
2 COMBINED AT	CO12	842.	12.50	182.	57.	46.	1.08		
ROUTED TO	RO12	742.	12.50	179.	57.	46.	1.08		
HYDROGRAPH AT	SUB14	614.	12.75	207.	67.	54.	1.17		
2 COMBINED AT	CO14	1315.	12.75	385.	123.	99.	2.25		

2 COMBINED AT	CO21	2515.	12.75	870.	282.	227.	5.51
DIVERSION TO	DT21A	1315.	12.25	184.	46.	37.	5.51
HYDROGRAPH AT	DIV21A	1200.	12.25	686.	236.	190.	5.51
DIVERSION TO	DT21B	280.	12.25	90.	22.	18.	5.51
HYDROGRAPH AT	DIV21	920.	12.25	596.	213.	172.	5.51
ROUTED TO	RO21	920.	12.50	596.	213.	172.	5.51
HYDROGRAPH AT	RET20	641.	12.50	49.	12.	10.	.00
ROUTED TO	RO20D	520.	12.75	53.	13.	11.	.00
HYDROGRAPH AT	RET21A	1315.	12.75	184.	46.	37.	.00
2 COMBINED AT	CO21A	1835.	12.75	237.	59.	48.	.00
2 COMBINED AT	CO21B	2755.	12.75	833.	273.	220.	5.51
ROUTED TO	RO21B	2704.	12.75	825.	272.	219.	5.51
HYDROGRAPH AT	SUB226	447.	13.00	186.	61.	49.	1.17
2 COMBINED AT	CO226	3106.	12.75	1011.	333.	268.	6.68
2 COMBINED AT	CO22	3320.	12.75	1097.	361.	292.	7.19
ROUTED TO	RO226	3105.	13.00	1104.	363.	293.	7.19
HYDROGRAPH AT	SUB228	340.	12.25	60.	19.	15.	.31
HYDROGRAPH AT	SUB230	50.	13.25	24.	9.	7.	.42
ROUTED TO	RO230	48.	13.25	24.	9.	7.	.42
2 COMBINED AT	CO230	340.	12.25	82.	27.	22.	.73
2 COMBINED AT	CO231	3234.	13.00	1178.	390.	315.	7.92
HYDROGRAPH AT	RET23	280.	12.25	90.	22.	18.	.00
ROUTED TO	ROD21	277.	13.75	89.	22.	18.	.00
HYDROGRAPH AT	SUB24	860.	13.00	352.	117.	94.	2.11
2 COMBINED AT	CO24	1091.	13.00	441.	139.	112.	2.11
DIVERSION TO	DBAS1	201.	12.75	22.	6.	4.	2.11
HYDROGRAPH AT	DIV24	890.	12.75	419.	133.	108.	2.11
HYDROGRAPH AT	SUB26A	576.	13.25	297.	100.	81.	1.92
2 COMBINED AT	CO26A	1466.	13.25	715.	234.	189.	4.03
DIVERSION TO	DBAS2	201.	12.75	33.	8.	7.	4.03

HYDROGRAPH AT	DIV26A	1265.	12.75	682.	226.	182.	4.03		
HYDROGRAPH AT	SUB26B	379.	12.50	98.	31.	25.	.60		
2 COMBINED AT	CO27	1567.	12.75	779.	257.	207.	4.63		
ROUTED TO	RO26B1	1401.	13.50	771.	256.	207.	4.63	1369.35	13.50
ROUTED TO	RO26B2	1401.	13.50	771.	256.	207.	4.63		
ROUTED TO	RO26B3	1400.	13.50	771.	256.	207.	4.63		
ROUTED TO	RO26B4	1397.	13.50	768.	256.	207.	4.63		
HYDROGRAPH AT	SUB26C	80.	13.75	48.	17.	14.	.44		
2 COMBINED AT	CO26C	1475.	13.50	816.	273.	220.	5.07		

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

50-YR
PROPOSED

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB200	68.	12.25	14.	5.	4.	.06		
DIVERSION TO	D200	68.	.25	14.	5.	4.	.06		
HYDROGRAPH AT	DIV200	0.	.25	0.	0.	0.	.06		
HYDROGRAPH AT	SUB202	127.	12.50	35.	11.	9.	.24		
HYDROGRAPH AT	SUB204	275.	12.75	90.	29.	24.	.70		
2 COMBINED AT	CO204	384.	12.50	125.	40.	33.	.94		
DIVERSION TO	D204	384.	.25	125.	40.	33.	.94		
HYDROGRAPH AT	DIV204	0.	.25	0.	0.	0.	.94		
HYDROGRAPH AT	SUB206	27.	12.25	7.	2.	2.	.05		
DIVERSION TO	D206	27.	.25	7.	2.	2.	.05		
HYDROGRAPH AT	DIV206	0.	.25	0.	0.	0.	.05		
3 COMBINED AT	1	0.	.25	0.	0.	0.	1.05		
HYDROGRAPH AT	SUB208	33.	12.50	8.	3.	2.	.06		
HYDROGRAPH AT	WEEKE	3538.	12.50	1061.	348.	281.	4.80		
ROUTED TO	ROWEEK	3247.	12.75	1052.	343.	277.	4.80		
HYDROGRAPH AT	SUB74	756.	13.25	355.	120.	97.	2.78		
2 COMBINED AT	CO74	3815.	12.75	1397.	463.	374.	7.58		
ROUTED TO	RO74	3675.	13.00	1387.	459.	370.	7.58		
HYDROGRAPH AT	SUB76	617.	13.25	262.	88.	71.	2.13		
2 COMBINED AT	CO76	4291.	13.00	1649.	547.	441.	9.71		
DIVERSION TO	DCAP1	1047.	13.00	125.	31.	25.	9.71		
HYDROGRAPH AT	DIV76A	3244.	13.00	1524.	515.	416.	9.71		
HYDROGRAPH AT	SUBAS1	50.	13.25	22.	7.	6.	.11		
2 COMBINED AT	BASIN1	3294.	13.00	1546.	523.	422.	9.82		
2 COMBINED AT	COBAS1	3308.	13.00	1553.	525.	424.	9.88		
ROUTED TO	ROBAS1	1276.	15.25	1067.	465.	375.	9.88	57.56	15.25

ROUTED TO	BASOT1	1275.	15.25	1066.	464.	374.	9.88		
HYDROGRAPH AT	SUB70	481.	13.00	185.	60.	49.	1.35		
ROUTED TO	RO70	469.	13.00	182.	60.	48.	1.35		
HYDROGRAPH AT	SUB72	413.	13.00	185.	61.	50.	1.38		
2 COMBINED AT	CO72A	882.	13.00	367.	121.	98.	2.73		
HYDROGRAPH AT	SUB212	47.	12.50	9.	3.	2.	.07		
2 COMBINED AT	CO212	895.	13.00	375.	124.	100.	2.80		
HYDROGRAPH AT	RE72	1047.	13.00	125.	31.	25.	.00		
2 COMBINED AT	CO72	1942.	13.00	500.	155.	125.	2.80		
HYDROGRAPH AT	SUBAS2	120.	12.25	20.	6.	5.	.11		
2 COMBINED AT	BASIN2	1965.	13.00	518.	162.	130.	2.91		
ROUTED TO	ROBAS2	259.	15.50	243.	155.	149.	2.91	46.12	15.50
2 COMBINED AT	COBAS2	1534.	15.25	1308.	619.	523.	12.79		
HYDROGRAPH AT	SUB214	60.	12.50	12.	4.	3.	.09		
ROUTED TO	RO214	58.	12.50	12.	4.	3.	.09		
HYDROGRAPH AT	SUB38	448.	12.75	129.	42.	33.	.99		
ROUTED TO	RO38	426.	12.75	129.	42.	34.	.99		
HYDROGRAPH AT	SUB40	313.	12.50	63.	20.	16.	.45		
2 COMBINED AT	CO40	609.	12.75	190.	61.	49.	1.44		
DIVERSION TO	D40	305.	12.75	95.	31.	25.	1.44		
HYDROGRAPH AT	DIV40	305.	12.75	95.	31.	25.	1.44		
ROUTED TO	RO40	304.	13.00	96.	31.	25.	1.44		
HYDROGRAPH AT	SUB216	249.	12.75	76.	25.	20.	.55		
2 COMBINED AT	CO216	549.	12.75	172.	56.	45.	1.99		
2 COMBINED AT	CO217	593.	12.75	184.	60.	48.	2.08		
ROUTED TO	RO217	552.	12.75	184.	60.	48.	2.08		
HYDROGRAPH AT	RED40	305.	12.75	95.	31.	25.	.00		
ROUTED TO	RO41	286.	13.00	93.	30.	25.	.00		
HYDROGRAPH AT	SUB34	581.	13.00	234.	77.	62.	1.84		
ROUTED TO	RO34	565.	13.25	234.	77.	62.	1.84		

HYDROGRAPH AT	SUB36	211.	12.50	46.	14.	12.	.33		
2 COMBINED AT	CO36	641.	13.00	277.	92.	74.	2.17		
ROUTED TO	RO36	633.	13.25	273.	91.	74.	2.17		
2 COMBINED AT	CO37	887.	13.00	366.	122.	98.	2.17		
HYDROGRAPH AT	SUB218	477.	12.75	150.	49.	40.	1.21		
2 COMBINED AT	CO218	1274.	13.00	514.	171.	138.	3.38		
2 COMBINED AT	CO219	1820.	13.00	698.	231.	186.	5.46		
ROUTED TO	RO219	1817.	13.00	698.	231.	186.	5.46		
HYDROGRAPH AT	SUB220	257.	13.00	117.	39.	31.	.84		
2 COMBINED AT	CO220	2074.	13.00	814.	270.	218.	6.30		
ROUTED TO	ROUT	74.	27.00	46.	11.	9.	6.30	82.20	27.00
HYDROGRAPH AT	SUB222	52.	13.25	28.	10.	8.	.21		
ROUTED TO	RO222	51.	13.50	28.	10.	8.	.21		
HYDROGRAPH AT	SUB224	153.	12.50	43.	14.	11.	.30		
2 COMBINED AT	CO224	177.	12.50	71.	23.	19.	.51		
HYDROGRAPH AT	SUB16	358.	12.50	94.	30.	24.	.71		
HYDROGRAPH AT	SUB18	473.	12.75	186.	61.	49.	1.50		
2 COMBINED AT	CO18	781.	12.75	280.	91.	74.	2.21		
ROUTED TO	RO18	760.	12.75	277.	91.	73.	2.21		
HYDROGRAPH AT	SUB20	655.	12.50	148.	47.	38.	1.05		
2 COMBINED AT	CO20	1246.	12.75	423.	138.	111.	3.26		
DIVERSION TO	D20	46.	12.75	2.	0.	0.	3.26		
HYDROGRAPH AT	DIV20	1200.	12.75	422.	137.	111.	3.26		
ROUTED TO	RO20	1190.	12.75	420.	137.	110.	3.26		
HYDROGRAPH AT	SUB10	182.	12.50	43.	14.	11.	.33		
HYDROGRAPH AT	SUB12	424.	12.50	101.	32.	26.	.75		
2 COMBINED AT	CO12	606.	12.50	145.	46.	37.	1.08		
ROUTED TO	RO12	536.	12.75	142.	46.	37.	1.08		
HYDROGRAPH AT	SUB14	450.	12.75	167.	55.	44.	1.17		
2 COMBINED AT	CO14	986.	12.75	309.	100.	81.	2.25		

2 COMBINED AT	CO21	2175.	12.75	729.	237.	191.	5.51
DIVERSION TO	DT21A	975.	12.50	113.	28.	23.	5.51
HYDROGRAPH AT	DIV21A	1200.	12.50	616.	209.	169.	5.51
DIVERSION TO	DT21B	280.	12.50	70.	17.	14.	5.51
HYDROGRAPH AT	DIV21	920.	12.50	547.	191.	154.	5.51
ROUTED TO	RO21	920.	12.75	545.	191.	154.	5.51
HYDROGRAPH AT	RET20	46.	12.75	2.	0.	0.	.00
ROUTED TO	RO20D	23.	13.00	2.	0.	0.	.00
HYDROGRAPH AT	RET21A	975.	12.75	113.	28.	23.	.00
2 COMBINED AT	CO21A	984.	12.75	115.	29.	23.	.00
2 COMBINED AT	CO21B	1904.	12.75	660.	220.	178.	5.51
ROUTED TO	RO21B	1769.	13.00	659.	220.	178.	5.51
HYDROGRAPH AT	SUB226	319.	13.25	146.	49.	40.	1.17
2 COMBINED AT	CO226	2077.	13.00	805.	269.	217.	6.68
2 COMBINED AT	CO22	2219.	13.00	873.	293.	236.	7.19
ROUTED TO	RO226	2191.	13.00	872.	293.	236.	7.19
HYDROGRAPH AT	SUB228	269.	12.25	50.	15.	12.	.31
HYDROGRAPH AT	SUB230	30.	13.50	16.	6.	5.	.42
ROUTED TO	RO230	30.	13.75	16.	6.	5.	.42
2 COMBINED AT	CO230	269.	12.25	64.	21.	17.	.73
2 COMBINED AT	CO231	2277.	13.00	928.	314.	253.	7.92
HYDROGRAPH AT	RET23	280.	12.50	70.	17.	14.	.00
ROUTED TO	ROD21	267.	13.75	69.	17.	14.	.00
HYDROGRAPH AT	SUB24	661.	13.25	286.	96.	77.	2.11
2 COMBINED AT	CO24	892.	13.25	355.	113.	91.	2.11
DIVERSION TO	DBAS1	2.	13.25	0.	0.	0.	2.11
HYDROGRAPH AT	DIV24	890.	13.25	355.	113.	91.	2.11
HYDROGRAPH AT	SUB26A	413.	13.50	233.	81.	65.	1.92
2 COMBINED AT	CO26A	1292.	13.25	587.	194.	156.	4.03
DIVERSION TO	DBAS2	27.	13.25	2.	0.	0.	4.03

HYDROGRAPH AT	DIV26A	1265.	13.25	586.	194.	156.	4.03		
HYDROGRAPH AT	SUB26B	267.	12.50	79.	26.	21.	.60		
2 COMBINED AT	CO27	1407.	13.25	662.	219.	177.	4.63		
ROUTED TO	RO26B1	1316.	13.75	654.	219.	176.	4.63	1368.79	13.75
ROUTED TO	RO26B2	1316.	13.75	654.	219.	176.	4.63		
ROUTED TO	RO26B3	1315.	13.75	654.	219.	176.	4.63		
ROUTED TO	RO26B4	1310.	13.75	654.	218.	176.	4.63		
HYDROGRAPH AT	SUB26C	54.	14.00	36.	13.	11.	.44		
2 COMBINED AT	CO26C	1363.	13.75	690.	232.	187.	5.07		

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

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

  1           ID       SUPERSTITION FREEWAY DRAINAGE                <SUPEXT>
  2           ID       EXISTING CONDITIONS - US60 TO NORTH DIVERSION DAM (IRONWOOD ROAD)
  3           ID       FEBRUARY 1987   100-YEAR 24-HOUR
              *DIAGRAM
  4           IT     3.0                    300
  5           IO       5
  6           PG      10
  7           IN      30                     48
  8           PI   0.021   0.022   0.023   0.024   0.025   0.025   0.027   0.028   0.029   0.031
  9           PI   0.032   0.034   0.036   0.039   0.042   0.046   0.050   0.056   0.064   0.074
 10           PI   0.094   0.125   0.194   1.531   0.290   0.150   0.107   0.084   0.074   0.064
 11           PI   0.056   0.050   0.046   0.042   0.039   0.037   0.034   0.032   0.030   0.029
 12           PI   0.028   0.026   0.026   0.024   0.024   0.023   0.022   0.021

 13           KK   SUB02
 14           KM       RUNOFF AT SR360 AND NORTH DIVERSION DAM
 15           PR      10
 16           PW       1
 17           PT      10
 18           PW       1
 19           BA    0.88
 20           LS             83
 21           UD     0.4

 22           KK   SUB04
 23           KM       RUNOFF AT SR360 EAST OF IDAHO ROAD
 24           BA    0.46
 25           LS             83
 26           UD     0.3

 27           KK    CO04
 28           KO       1
 29           HC       2

 30           KK  SUB04E
 31           KM       EAST PORTION OF OLD SUB04
 32           BA    0.15
 33           LS             83
 34           UD    0.27

 35           KK   SUB05
 36           KM       RUNOFF IN ROYAL PALM STREET
 37           BA    0.10
 38           LS             83
 39           UD    0.15

 40           KK   CO105
 41           KM       COMBINE FLOWS 0.25 MI EAST OF IDAHO
 42           HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  43          KK   SUB06
  44          KM        RUNOFF FROM UNDEVELOPED UPPER WEEKES WASH
  45          BA    1.86
  46          LS              87
  47          UD     0.2

  48          KK    R007
  49          KM        ROUTE RUNOFF TO CONFLUENCE WITH SUBAREA 08
  50          RS       1    ELEV     1.0
  51          RC   0.085   0.040   0.085    2200  0.0182     9.0
  52          RX     100     115     225     231     261     267     377     392
  53          RY     9.0     4.5     4.0     1.0     1.0     4.0     4.5     9.0

  54          KK   SUB08
  55          KM        RUNOFF ALONG APACHE TRAIL NORTH OF PINAL COUNTY LINE
  56          BA    1.19
  57          LS            86.5
  58          UD    0.17

  59          KK   CO108
  60          KM        WEEKES WASH FLOW AT NORTH OF PINAL COUNTY LINE
  61          HC       2

  62          KK    R009
  63          KM        ROUTE RUNOFF TO SOUTH OF PINAL COUNTY LINE
  64          RS     2.0    ELEV     1.0
  65          RC   0.085   0.040   0.085    4500  0.0133     9.0
  66          RX     100     115     225     231     261     267     377     392
  67          RY     9.0     4.5     4.0     1.0     1.0     4.0     4.5     9.0

  68          KK   SUB10
  69          KM        RUNOFF FROM EAST OF APACHE TRAIL AT PINAL COUNTY LINE
  70          BA    2.27
  71          LS            88.5
  72          UD    0.36

  73          KK   CO110
  74          KM        COMBINE WEEKES WASH FLOWS AT LOST DUTCHMAN PARK
  75          HC       2

  76          KK    R011
  77          KM        ROUTE WEEKES WASH FLOWS TO EAST 1/4 SECTION 2
  78          RS     1.0    ELEV     1.0
  79          RC   0.085   0.040   0.085    3000  0.0133     9.0
  80          RX     100     115     225     231     266     272     383     397
  81          RY     9.0     5.0     4.0     1.0     1.0     4.0     5.0     9.0

  82          KK   SUB12
  83          KM        RUNOFF FROM NORTH OF PINAL COUNTY LINE
  84          BA    1.37
  85          LS              90
  86          UD    0.17
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 87           KK   CO112
 88           KM        COMBINE FLOWS IN WEEKES WASH AT EAST 1/4 SECTION 2
 89           HC       2

 90           KK    RO13
 91           KM        ROUTE WEEKES WASH FLOWS TO U/S OF PROPOSED WEEKES DAM
 92           RS     1.0    ELEV     1.0
 93           RC   0.085   0.040   0.085    2700  0.0148     9.0
 94           RX     100     115     225     231     266     272     383     397
 95           RY     9.0     5.0     4.0     1.0     1.0     4.0     5.0     9.0

 96           KK   SUB14
 97           KM        RUNOFF FROM NORTH OF PROPOSED WEEKES WASH DAM
 98           BA    1.39
 99           LS              92
100           UD    0.30

101           KK   CO114
102           KM        COMBINE WEEKES WASH FLOWS U/S OF PROPOSED WEEKES DAM
103           HC       2

104           KK   SUB16
105           KM        RUNOFF FROM EAST OF PROPOSED WEEKES WASH DAM
106           BA    0.90
107           LS              87
108           UD     0.3

109           KK   CO116
110           KM        COMBINE FLOWS INTO EAST SIDE OF PROPOSED WEEKES DAM
111           HC       2

112           KK    RO17
113           KM        ROUTE TO FLOWS TO BREAKOUT AREA
114           RS     2.0    ELEV     1.0
115           RC   0.085   0.040   0.085    2600  0.0077     9.0
116           RX     100     115     225     231     266     272     383     397
117           RY     9.0     5.0     4.0     1.0     1.0     4.0     5.0     9.0

118           KK   SUB18
119           KM        RUNOFF FROM NORTH OF PROPOSED WEEKES WASH DAM
120           BA     0.8
121           LS              91
122           UD     0.3

123           KK   CO118
124           KM        TOTAL INFLOW TO PROPOSED WEEKES DAM AND BREAKOUT AREA
125           HC       2

126           KK    RO19
127           KM        ROUTE WEEKES WASH FLOWS TO SUPERSTITION BLVD.
128           RS     6.0    ELEV     1.0
129           RC   0.085   0.085   0.085   12200  0.0111    12.0
130           RX     100     130     150     170     800     820     900     905
131           RY     9.0     7.0     7.0     1.0     1.0     7.0    12.0    12.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 132          KK   SUB20
 133          KM        LOCAL RUNOFF BETWEEN PROPOSED WEEKES DAM AND SUPERSTITION BLVD.
 134          BA    0.95
 135          LS              82
 136          UD    0.35

 137          KK   CD120
 138          KM        COMBINE FLOWS IN WEEKES WASH AT SUPERSTITION BLVD.
 139          HC       2

 140          KK  BRKOUT
 141          KM        DIVERT BREAKOUT FLOWS TO WEST
 142          KO       1
 143          DT    D120
 144          DI       0     100    1065    7500   10000   12500
 145          DQ       0       0     580    3750    4000    5000

 146          KK    RO21
 147          KM        ROUTE FLOWS TO US 60
 148          RS     3.0    ELEV    1744
 149          RC   0.085   0.040   0.085    6000   0.011    1750
 150          RX     100     250     530     550     600     620     625     630
 151          RY    1750    1745    1745    1744    1744    1745    1745    1750

 152          KK   SUB22
 153          KM        LOCAL BETWEEN SUPERSTITION BLVD. AND US 60
 154          BA    0.30
 155          LS            82.5
 156          UD    0.25

 157          KK   CD122
 158          KM        COMBINE FLOWS IN WEEKES WASH AT US 60
 159          HC       2

 160          KK  DVUS60
 161          KM        DIVERT FLOWS TO SOUTHEAST ALONG US60
 162          DT   DUS60
 163          DI       0     680    1908    4397    9024
 164          DQ       0       0     164     930    2563

 165          KK    RO23
 166          KM        ROUTE WEEKES WASH FLOWS TO SR360 NORTH R.O.W.
 167          RS     3.0    ELEV     1.0
 168          RC   0.045   0.040   0.045    6700  0.0104    12.0
 169          RX     100     110     126     127     142     143     159     169
 170          RY    12.0     2.0     2.0     1.0     1.0     2.0     2.0    12.0

 171          KK   SUB24
 172          KM        LOCAL RUNOFF BETWEEN US 60 AND US 360
 173          BA    0.42
 174          LS              83
 175          UD     0.3
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  176         KK   CO124
  177         KM        TOTAL WEEKES WASH FLOW AT US 360 NORTH R.O.W.
  178         KO       1
  179         HC       2

  180         KK   CO205
  181         KM        COMBINE FLOWS IN SR360 BASIN EAST OF WEEKES WITH WEEKES
  182         HC       2

  183         KK   SUB26
  184         KM        RUNOFF IN SUB EAST OF WEEKES WASH
  185         BA    0.38
  186         LS            85.2
  187         UD    0.12

  188         KK  REUS60
  189         KM        RETRIEVE WEEKES WASH BREAKOUT FLOWS
  190         DR   DUS60

  191         KK  ROUS60
  192         KM        ROUTE DIVERTED FLOWS TO FREEWAY R.O.W.
  193         RK    3360  0.0125    0.04            TRAP    10.0    12.0

  194         KK    CO26
  195         KM        COMBINE FLOWS IN SUB 26
  196         KO       1
  197         HC       2

  198         KK    CO27
  199         KM        COMBINE TOTAL FLOW AT WEEKES WASH AND FREEWAY - IDAHO TO TOMAHAWK
  200         KO       1
  201         HC       2

  202         KK   SUB28
  203         KM        RUNOFF FROM SUBAREA 28
  204         BA    0.17
  205         LS            87.4
  206         UD    0.17

  207         KK   SUB30
  208         KM        RUNOFF FROM SUBAREA 30 U/S OF US60
  209         BA    0.65
  210         LS            88.3
  211         UD    0.26

  212         KK   CO130
  213         KM        COMBINE FLOWS AT US60
  214         HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 215          KK   SUB32
 216          KM        RUNOFF FROM SUBAREA 32 U/S OF US60
 217          BA    0.11
 218          LS            89.5
 219          UD    0.13

 220          KK   CO132
 221          KM        COMBINE FLOWS AT US60
 222          HC       2

 223          KK   SUB36
 224          KM        RUNOFF FROM SUBAREA 36 U/S OF US60
 225          BA    1.12
 226          LS            87.3
 227          UD    0.33

 228          KK   CO136
 229          KM        COMBINE FLOWS ABOVE US60
 230          HC       2

 231          KK    RO37
 232          KM        ROUTE COMBINE FLOWS TO SR360
 233          RS       2    ELEV     1.0
 234          RC   0.085   0.040   0.085    4200  0.0126     5.0
 235          RX     100     103     186     190     210     214     297     300
 236          RY       5       4       3       1       1       3       4       5

 237          KK   SUB38
 238          KM        LOCAL RUNOFF FROM BELOW US 60 AT SR360
 239          BA    0.33
 240          LS              84
 241          UD    0.13

 242          KK   CO138
 243          KM        COMBINE FLOWS AT SR360
 244          HC       2

 245          KK   SUB40
 246          KM        RUNOFF FROM SUBAREA ABOVE US60
 247          BA    0.13
 248          LS            88.5
 249          UD    0.19

 250          KK    RO40
 251          KM        ROUTE FLOWS TO SR360
 252          RS       2    ELEV     1.0
 253          RC   0.085   0.040   0.085    3400  0.0103     5.0
 254          RX     100     104     134     138     153     157     187     191
 255          RY     5.0     3.5     3.0     1.0     1.0     3.0     3.5     5.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 256          KK   SUB42
 257          KM        LOCAL RUNOFF BETWEEN US60 AND SR360
 258          BA    0.17
 259          LS            84.2
 260          UD    0.10

 261          KK   CO142
 262          KM        COMBINE FLOWS AT SR360
 263          HC       2

 264          KK   CO143
 265          KM        COMBINE FLOWS AT NORTH R.O.W. OF SR360
 266          KO       1
 267          HC       2

 268          KK   SUB50
 269          KM        RUNOFF FROM SUB50 AT SR360
 270          BA    0.17
 271          LS            88.4
 272          UD    0.17

 273          KK   SUB54
 274          KM        RUNOFF FROM SUB54 AT SR360
 275          BA    0.29
 276          LS              87
 277          UD    0.22
 278          ZZ
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

100-YR
EXISTING

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB02	859.	12.25	165.	66.	66.	.88		
HYDROGRAPH AT	SUB04	513.	12.15	87.	35.	35.	.46		
2 COMBINED AT	CO04	1355.	12.20	251.	101.	101.	1.34		
HYDROGRAPH AT	SUB04E	174.	12.10	28.	11.	11.	.15		
HYDROGRAPH AT	SUB05	134.	12.05	19.	8.	8.	.10		
2 COMBINED AT	CO105	302.	12.05	47.	19.	19.	.25		
HYDROGRAPH AT	SUB06	2694.	12.05	411.	168.	168.	1.86		
ROUTED TO	RO07	2498.	12.15	409.	167.	167.	1.86	5.27	12.15
HYDROGRAPH AT	SUB08	1752.	12.05	259.	106.	106.	1.19		
2 COMBINED AT	CO108	4140.	12.10	668.	272.	272.	3.05		
ROUTED TO	RO09	3650.	12.25	662.	269.	269.	3.05	6.15	12.25
HYDROGRAPH AT	SUB10	2819.	12.20	524.	215.	215.	2.27		
2 COMBINED AT	CO110	6429.	12.20	1186.	484.	484.	5.32		
ROUTED TO	RO11	6021.	12.30	1180.	480.	480.	5.32	7.18	12.30
HYDROGRAPH AT	SUB12	2220.	12.05	336.	140.	140.	1.37		
2 COMBINED AT	CO112	6972.	12.25	1516.	619.	619.	6.69		
ROUTED TO	RO13	6780.	12.35	1509.	615.	615.	6.69	7.34	12.35
HYDROGRAPH AT	SUB14	2050.	12.10	361.	151.	151.	1.39		
2 COMBINED AT	CO114	8379.	12.25	1870.	767.	767.	8.08		
HYDROGRAPH AT	SUB16	1149.	12.15	198.	81.	81.	.90		
2 COMBINED AT	CO116	9405.	12.25	2068.	847.	847.	8.98		
ROUTED TO	RO17	9239.	12.35	2059.	841.	841.	8.98	9.24	12.35
HYDROGRAPH AT	SUB18	1149.	12.10	201.	84.	84.	.80		
2 COMBINED AT	CO118	10101.	12.30	2260.	925.	925.	9.78		
ROUTED TO	RO19	8345.	12.90	1951.	785.	785.	9.78	4.24	12.90
HYDROGRAPH AT	SUB20	954.	12.20	171.	69.	69.	.95		

2 COMBINED AT	CO120	8611.	12.90	2122.	854.	854.	10.73		
DIVERSION TO	D120	3861.	12.90	1036.	416.	416.	10.73		
HYDROGRAPH AT	BRKOUT	4750.	12.90	1086.	438.	438.	10.73		
ROUTED TO	RO21	4206.	13.20	1000.	402.	402.	10.73	1747.20	13.20
HYDROGRAPH AT	SUB22	351.	12.10	56.	22.	22.	.30		
2 COMBINED AT	CO122	4252.	13.20	1056.	425.	425.	11.03		
DIVERSION TO	DUS60	885.	13.20	138.	55.	55.	11.03		
HYDROGRAPH AT	DVUS60	3366.	13.20	918.	369.	369.	11.03		
ROUTED TO	RO23	3310.	13.35	872.	350.	350.	11.03	7.56	13.35
HYDROGRAPH AT	SUB24	468.	12.15	79.	32.	32.	.42		
2 COMBINED AT	CO124	3371.	13.35	951.	382.	382.	11.45		
2 COMBINED AT	CO205	3403.	13.35	998.	401.	401.	11.70		
HYDROGRAPH AT	SUB26	566.	12.00	79.	32.	32.	.38		
HYDROGRAPH AT	REUS60	885.	13.20	138.	55.	55.	.00		
ROUTED TO	ROUS60	860.	13.30	135.	54.	54.	.00		
2 COMBINED AT	CO26	906.	13.30	214.	86.	86.	.38		
2 COMBINED AT	CO27	4303.	13.35	1212.	488.	488.	12.08		
HYDROGRAPH AT	SUB28	257.	12.05	38.	16.	16.	.17		
HYDROGRAPH AT	SUB30	911.	12.10	150.	62.	62.	.65		
2 COMBINED AT	CO130	1153.	12.10	188.	77.	77.	.82		
HYDROGRAPH AT	SUB32	183.	12.00	27.	11.	11.	.11		
2 COMBINED AT	CO132	1330.	12.05	215.	88.	88.	.93		
HYDROGRAPH AT	SUB36	1394.	12.15	248.	101.	101.	1.12		
2 COMBINED AT	CO136	2669.	12.10	463.	190.	190.	2.05		
ROUTED TO	RO37	2327.	12.30	459.	187.	187.	2.05	5.59	12.30
HYDROGRAPH AT	SUB38	468.	12.00	65.	27.	27.	.33		
2 COMBINED AT	CO138	2475.	12.25	525.	214.	214.	2.38		
HYDROGRAPH AT	SUB40	199.	12.05	30.	12.	12.	.13		
ROUTED TO	RO40	186.	12.15	30.	12.	12.	.13	2.94	12.15
HYDROGRAPH AT	SUB42	250.	12.00	34.	14.	14.	.17		

2 COMBINED AT	CD142	407.	12.05	64.	26.	26.	.30
2 COMBINED AT	CD143	2715.	12.25	588.	239.	239.	2.68
HYDROGRAPH AT	SUB50	264.	12.05	40.	16.	16.	.17
HYDROGRAPH AT	SUB54	409.	12.05	64.	26.	26.	.29

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

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

50-YEAR
EXISTING

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB02	717.	12.25	136.	55.	55.	.83		
HYDROGRAPH AT	SUB04	429.	12.15	72.	29.	29.	.46		
2 COMBINED AT	CO04	1131.	12.20	208.	84.	84.	1.34		
HYDROGRAPH AT	SUB04E	145.	12.10	24.	9.	9.	.15		
HYDROGRAPH AT	SUB05	113.	12.05	16.	6.	6.	.10		
2 COMBINED AT	CO105	252.	12.05	39.	16.	16.	.25		
HYDROGRAPH AT	SUB06	2299.	12.05	348.	142.	142.	1.86		
ROUTED TO	R007	2116.	12.15	346.	141.	141.	1.86	5.04	12.15
HYDROGRAPH AT	SUB08	1495.	12.05	219.	89.	89.	1.19		
2 COMBINED AT	CO108	3509.	12.10	565.	229.	229.	3.05		
ROUTED TO	R009	3051.	12.25	559.	226.	226.	3.05	5.83	12.25
HYDROGRAPH AT	SUB10	2417.	12.20	447.	182.	182.	2.27		
2 COMBINED AT	CO110	5399.	12.20	1006.	408.	408.	5.32		
ROUTED TO	R011	5033.	12.35	999.	405.	405.	5.32	6.77	12.35
HYDROGRAPH AT	SUB12	1922.	12.05	289.	119.	119.	1.37		
2 COMBINED AT	CO112	5807.	12.25	1288.	524.	524.	6.69		
ROUTED TO	R013	5658.	12.35	1282.	520.	520.	6.69	6.91	12.35
HYDROGRAPH AT	SUB14	1783.	12.10	313.	130.	130.	1.39		
2 COMBINED AT	CO114	7001.	12.30	1595.	650.	650.	8.08		
HYDROGRAPH AT	SUB16	980.	12.15	168.	68.	68.	.90		
2 COMBINED AT	CO116	7877.	12.25	1762.	718.	718.	8.98		
ROUTED TO	R017	7746.	12.35	1753.	713.	713.	8.98	8.64	12.35
HYDROGRAPH AT	SUB18	995.	12.15	174.	72.	72.	.80		
2 COMBINED AT	CO118	8478.	12.30	1927.	785.	785.	9.78		
ROUTED TO	R019	6874.	13.00	1630.	656.	656.	9.78	3.90	13.00
HYDROGRAPH AT	SUB20	793.	12.20	141.	57.	57.	.95		

2 COMBINED AT	CD120	7070.	12.95	1771.	712.	712.	10.73		
DIVERSION TO	D120	3538.	12.95	884.	355.	355.	10.73		
HYDROGRAPH AT	BRKOUT	3532.	12.95	887.	357.	357.	10.73		
ROUTED TO	RO21	3220.	13.35	806.	324.	324.	10.73	1746.83	13.35
HYDROGRAPH AT	SUB22	293.	12.10	46.	19.	19.	.30		
2 COMBINED AT	CD122	3253.	13.35	852.	342.	342.	11.03		
DIVERSION TO	DUS60	578.	13.35	92.	37.	37.	11.03		
HYDROGRAPH AT	DVUS60	2675.	13.35	760.	305.	305.	11.03		
ROUTED TO	RO23	2643.	13.50	715.	287.	287.	11.03	6.82	13.50
HYDROGRAPH AT	SUB24	391.	12.15	66.	26.	26.	.42		
2 COMBINED AT	CD124	2689.	13.45	781.	314.	314.	11.45		
2 COMBINED AT	CD205	2715.	13.45	820.	329.	329.	11.70		
HYDROGRAPH AT	SUB26	481.	12.00	66.	27.	27.	.38		
HYDROGRAPH AT	REUS60	578.	13.35	92.	37.	37.	.00		
ROUTED TO	ROUS60	572.	13.45	89.	36.	36.	.00		
2 COMBINED AT	CD26	611.	13.45	156.	63.	63.	.38		
2 COMBINED AT	CD27	3325.	13.45	976.	392.	392.	12.08		
HYDROGRAPH AT	SUB28	220.	12.05	32.	13.	13.	.17		
HYDROGRAPH AT	SUB30	781.	12.10	128.	52.	52.	.65		
2 COMBINED AT	CD130	989.	12.10	160.	65.	65.	.82		
HYDROGRAPH AT	SUB32	158.	12.00	23.	9.	9.	.11		
2 COMBINED AT	CD132	1140.	12.05	183.	75.	75.	.93		
HYDROGRAPH AT	SUB36	1188.	12.15	211.	86.	86.	1.12		
2 COMBINED AT	CD136	2280.	12.10	394.	160.	160.	2.05		
ROUTED TO	RO37	1975.	12.30	390.	158.	158.	2.05	5.28	12.30
HYDROGRAPH AT	SUB38	395.	12.00	55.	22.	22.	.33		
2 COMBINED AT	CD138	2097.	12.30	444.	180.	180.	2.38		
HYDROGRAPH AT	SUB40	171.	12.05	26.	11.	11.	.13		
ROUTED TO	RO40	159.	12.15	25.	10.	10.	.13	2.77	12.15
HYDROGRAPH AT	SUB42	212.	12.00	28.	11.	11.	.17		

2 COMBINED AT	CO142	344.	12.05	54.	22.	22.	.30
2 COMBINED AT	CO143	2299.	12.25	498.	202.	202.	2.68
HYDROGRAPH AT	SUB50	227.	12.05	34.	14.	14.	.17
HYDROGRAPH AT	SUB54	348.	12.05	54.	22.	22.	.29

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

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

  1           ID       SUPERSTITION FREEWAY - OFFSITE DRAINAGE ANALYSIS     (SUPROE)
  2           ID       PROPOSED CONDITION - US60 TO NO. DIVERSION DAM (IRONWOOD)
  3           ID       FEBRUARY 1987   100-YEAR 24-HOUR
              $DIAGRAM
  4           IT     3.0                    300
  5           IO       5
  6           PG      10
  7           IN      30                    48
  8           PI   0.021   0.022   0.023   0.024   0.025   0.025   0.027   0.028   0.029   0.031
  9           PI   0.032   0.034   0.036   0.039   0.042   0.046   0.050   0.056   0.064   0.074
 10           PI   0.094   0.125   0.194   1.531   0.290   0.150   0.107   0.084   0.074   0.064
 11           PI   0.056   0.050   0.046   0.042   0.039   0.037   0.034   0.032   0.030   0.029
 12           PI   0.028   0.026   0.026   0.024   0.024   0.023   0.022   0.021

 13           KK   SUB02
 14           KM       RUNOFF AT SR360 AND NORTH DIVERSION DAM
 15           KO       1
 16           PR      10
 17           PW       1
 18           PT      10
 19           PW       1
 20           BA    0.88
 21           LS             83
 22           UD     0.4

 23           KK   SUB04
 24           KM       RUNOFF AT SR360 EAST OF IDAHO ROAD
 25           BA    0.46
 26           LS             83
 27           UD     0.3

 28           KK   RESRT
 29           KM       ROUTE FLOWS THROUGH BASIN IN R.O.W.
 30           KO       1
 31           RS       1    ELEV    28.0
 32           SV       0     8.5    18.1    28.4    40.0    52.7
 33           SE      28      30      32      34      36      38
 34           SQ       0       0       0       0      33      65

 35           KK   CO04
 36           KO       1
 37           HC       2

 38           KK  NDROUT
 39           KM       ROUTE COMBINED FLOW THROUGH 3 BBL. 6X8 BOX CULVERT
 40           KO       1
 41           RS       1    ELEV    23.0
 42           SV       0    0.42    0.86    1.35    1.88    2.45    3.06    3.37    3.71
 43           SE    23.0    24.0    25.0    26.0    27.0    28.0    29.0    29.5    30.0
 44           SQ       0      75     175     312     480     696    1163    1491    1848
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  45          KK  SUB04E
  46          KM       EAST PORTION OF OLD SUB04
  47          BA   0.15
  48          LS            83
  49          UD   0.27

  50          KK  SUB05
  51          KM       RUNOFF IN ROYAL PALM STREET
  52          BA   0.10
  53          LS            83
  54          UD   0.15

  55          KK  CO105
  56          KM       COMBINE FLOWS 0.25 MI EAST OF IDAHO
  57          HC      2

  58          KK  SUB06
  59          KM       RUNOFF FROM UNDEVELOPED UPPER WEEKES WASH
  60          KO      1
  61          BA   1.86
  62          LS            87
  63          UD    0.2

  64          KK   RO07
  65          KM       ROUTE RUNOFF TO CONFLUENCE WITH SUBAREA 08
  66          RS      1   ELEV    1.0
  67          RC  0.085  0.040  0.085   2200  0.0182    9.0
  68          RX    100    115    225    231    261    267    377    392
  69          RY    9.0    4.5    4.0    1.0    1.0    4.0    4.5    9.0

  70          KK  SUB08
  71          KM       RUNOFF ALONG APACHE TRAIL NORTH OF PINAL COUNTY LINE
  72          BA   1.19
  73          LS          86.5
  74          UD   0.17

  75          KK  CO108
  76          KM       WEEKES WASH FLOW AT NORTH OF PINAL COUNTY LINE
  77          HC      2

  78          KK   RO09
  79          KM       ROUTE RUNOFF TO SOUTH OF PINAL COUNTY LINE
  80          RS    2.0   ELEV    1.0
  81          RC  0.085  0.040  0.085   4500  0.0133    9.0
  82          RX    100    115    225    231    261    267    377    392
  83          RY    9.0    4.5    4.0    1.0    1.0    4.0    4.5    9.0

  84          KK  SUB10
  85          KM       RUNOFF FROM EAST OF APACHE TRAIL AT PINAL COUNTY LINE
  86          BA   2.27
  87          LS          88.5
  88          UD   0.36
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 89           KK   CO110
 90           KM        COMBINE WEEKES WASH FLOWS AT LOST DUTCHMAN PARK
 91           HC       2

 92           KK    RO11
 93           KM        ROUTE WEEKES WASH FLOWS TO EAST 1/4 SECTION 2
 94           RS     1.0    ELEV     1.0
 95           RC   0.085   0.040   0.085    3000  0.0133     9.0
 96           RX     100     115     225     231     266     272     383     397
 97           RY     9.0     5.0     4.0     1.0     1.0     4.0     5.0     9.0

 98           KK   SUB12
 99           KM        RUNOFF FROM NORTH OF PINAL COUNTY LINE
100           BA    1.37
101           LS              90
102           UD    0.17

103           KK   CO112
104           KM        COMBINE FLOWS IN WEEKES WASH AT EAST 1/4 SECTION 2
105           HC       2

106           KK    RO13
107           KM        ROUTE WEEKES WASH FLOWS TO U/S OF PROPOSED WEEKES DAM
108           RS     1.0    ELEV     1.0
109           RC   0.085   0.040   0.085    2700  0.0148     9.0
110           RX     100     115     225     231     266     272     383     397
111           RY     9.0     5.0     4.0     1.0     1.0     4.0     5.0     9.0

112           KK   SUB14
113           KM        RUNOFF FROM NORTH OF PROPOSED WEEKES WASH DAM
114           BA    1.39
115           LS              92
116           UD    0.30

117           KK   CO114
118           KM        COMBINE WEEKES WASH FLOWS U/S OF PROPOSED WEEKES DAM
119           HC       2

120           KK   SUB16
121           KM        RUNOFF FROM EAST OF PROPOSED WEEKES WASH DAM
122           BA    0.90
123           LS              87
124           UD     0.3

125           KK   CO116
126           KM        COMBINE FLOWS INTO EAST SIDE OF PROPOSED WEEKES DAM
127           HC       2

128           KK    RO17
129           KM        ROUTE TO FLOWS TO BREAKOUT AREA
130           RS     2.0    ELEV     1.0
131           RC   0.085   0.040   0.085    2600  0.0077     9.0
132           RX     100     115     225     231     266     272     383     397
133           RY     9.0     5.0     4.0     1.0     1.0     4.0     5.0     9.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 134          KK   SUB18
 135          KM        RUNOFF FROM NORTH OF PROPOSED WEEKES WASH DAM
 136          BA     0.8
 137          LS              91
 138          UD     0.3

 139          KK   CO118
 140          KM        TOTAL INFLOW TO PROPOSED WEEKES DAM AND BREAKOUT AREA
 141          KO       1
 142          HC       2

 143          KK    RO19
 144          KM        ROUTE WEEKES WASH FLOWS TO SUPERSTITION BLVD.
 145          RS     6.0    ELEV     1.0
 146          RC   0.085   0.085   0.085   12200  0.0111    12.0
 147          RX     100     130     150     170     800     820     900     905
 148          RY     9.0     7.0     7.0     1.0     1.0     7.0    12.0    12.0

 149          KK   SUB20
 150          KM        LOCAL RUNOFF BETWEEN PROPOSED WEEKES DAM AND SUPERSTITION BLVD.
 151          BA    0.95
 152          LS              82
 153          UD    0.35

 154          KK   CO120
 155          KM        COMBINE FLOWS IN WEEKES WASH AT SUPERSTITION BLVD.
 156          HC       2

 157          KK  BRKOUT
 158          KM        DIVERT BREAKOUT FLOWS TO WEST
 159          KO       1
 160          DT    D120
 161          DI       0     100    1065    7500   10000   12500
 162          DQ       0       0     580    3750    4000    5000

 163          KK    RO21
 164          KM        ROUTE FLOWS TO US 60
 165          RS     3.0    ELEV    1744
 166          RC   0.085   0.040   0.085    6000   0.011    1750
 167          RX     100     250     530     550     600     620     625     630
 168          RY    1750    1745    1745    1744    1744    1745    1745    1750

 169          KK   SUB22
 170          KM        LOCAL BETWEEN SUPERSTITION BLVD. AND US 60
 171          BA    0.30
 172          LS            82.5
 173          UD    0.25

 174          KK   CO122
 175          KM        COMBINE FLOWS IN WEEKES WASH AT US 60
 176          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 177          KK  DVUS60
 178          KM       DIVERT FLOWS TO SOUTHEAST ALONG US60
 179          DT   DUS60
 180          DI      0     680    1908    4397    9024
 181          DQ      0       0     164     930    2563

 182          KK    RO23
 183          KM       ROUTE WEEKES WASH FLOWS TO SR360 NORTH R.O.W.
 184          RS    3.0    ELEV     1.0
 185          RC  0.045   0.040   0.045    6700  0.0104    12.0
 186          RX    100     110     126     127     142     143     159     169
 187          RY   12.0     2.0     2.0     1.0     1.0     2.0     2.0    12.0

 188          KK   SUB24
 189          KM       LOCAL RUNOFF BETWEEN US 60 AND US 360
 190          BA   0.42
 191          LS             83
 192          UD    0.3

 193          KK   CO124
 194          KM       TOTAL WEEKES WASH FLOW AT US 360 NORTH R.O.W.
 195          KO      1
 196          HC      2

 197          KK   CO205
 198          KM       COMBINE FLOWS IN SR360 BASIN EAST OF WEEKES WITH WEEKES
 199          HC      2

 200          KK   SUB26
 201          KM       RUNOFF IN SUB EAST OF WEEKES WASH
 202          BA   0.38
 203          LS          85.2
 204          UD   0.12

 205          KK  REUS60
 206          KM       RETRIEVE WEEKES WASH BREAKOUT FLOWS
 207          DR   DUS60

 208          KK  ROUS60
 209          KM       ROUTE DIVERTED FLOWS TO FREEWAY R.O.W.
 210          RK   3360  0.0125    0.04           TRAP    10.0    12.0

 211          KK    CO26
 212          KM       COMBINE FLOWS IN SUB 26
 213          KO      1
 214          HC      2

 215          KK    CO27
 216          KM       COMBINE TOTAL FLOW AT WEEKES WASH AND FREEWAY - IDAHO TO TOMAHAWK
 217          KO      1
 218          HC      2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 219          KK   ROUT
 220          KM       ROUTE FLOWS THROUGH 28 FOOT WIDE SINGLE SPAN BRIDGE
 221          RS    1.0    STOR   10.96
 222          SV      0    13.0    41.1    72.1   107.6   147.5   190.5   236.5   273.3
 223          SE     35      36      38      40      42      44      46      48    49.5
 224          SQ      0      74     383     823    1364    1988    2687    3452    3857

 225          KK   SUB28
 226          KM       RUNOFF FROM SUBAREA 28
 227          BA   0.17
 228          LS           87.4
 229          UD   0.17

 230          KK   SUB30
 231          KM       RUNOFF FROM SUBAREA 30 U/S OF US60
 232          BA   0.65
 233          LS           88.3
 234          UD   0.26

 235          KK   CO130
 236          KM       COMBINE FLOWS AT US60
 237          HC      2

 238          KK   SUB32
 239          KM       RUNOFF FROM SUBAREA 32 U/S OF US60
 240          BA   0.11
 241          LS           89.5
 242          UD   0.13

 243          KK   CO132
 244          KM       COMBINE FLOWS AT US60
 245          HC      2

 246          KK   SUB36
 247          KM       RUNOFF FROM SUBAREA 36 U/S OF US60
 248          BA   1.12
 249          LS           87.3
 250          UD   0.33

 251          KK   CO136
 252          KM       COMBINE FLOWS ABOVE US60
 253          HC      2

 254          KK   RO37
 255          KM       ROUTE COMBINE FLOWS TO SR360
 256          RS      2    ELEV     1.0
 257          RC  0.085   0.040   0.085    4200  0.0126     5.0
 258          RX    100     103     186     190     210     214     297     300
 259          RY      5       4       3       1       1       3       4       5
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 260          KK   SUB38
 261          KM        LOCAL RUNOFF FROM BELOW US 60 AT SR360
 262          BA    0.33
 263          LS              84
 264          UD    0.13

 265          KK   CO138
 266          KM        COMBINE FLOWS AT SR360
 267          HC       2

 268          KK   SUB40
 269          KM        RUNOFF FROM SUBAREA ABOVE US60
 270          BA    0.13
 271          LS            88.5
 272          UD    0.19

 273          KK    RO40
 274          KM        ROUTE FLOWS TO SR360
 275          RS       2   ELEV     1.0
 276          RC   0.085   0.040   0.085    3400  0.0103     5.0
 277          RX     100     104     134     138     153     157     187     191
 278          RY     5.0     3.5     3.0     1.0     1.0     3.0     3.5     5.0

 279          KK   SUB42
 280          KM        LOCAL RUNOFF BETWEEN US60 AND SR360
 281          BA    0.17
 282          LS            84.2
 283          UD    0.10

 284          KK   CO142
 285          KM        COMBINE FLOWS AT SR360
 286          HC       2

 287          KK   CO143
 288          KM        COMBINE FLOWS AT NORTH R.O.W. OF SR360
 289          KO       1
 290          HC       2

 291          KK     ROUT
 292          KM         ROUTE INFLOW HYDROGRAPH THROUGH CULVERTS
 293          RS     1.0   ELEV      65
 294          SV     0.0    0.15     0.6     1.5     3.1     5.6     9.1    13.7   19.45   26.35
 295          SE      65    65.5      66    66.5      67    67.5      68    68.5      69    69.5
 296          SQ     0.0     119     375     688    1063    1462    1938    2375    2875    3375

 297          KK   SUB50
 298          KM        RUNOFF FROM SUB50 AT SR360
 299          BA    0.17
 300          LS            88.4
 301          UD    0.17
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 302          KK   SUB54
 303          KM        RUNOFF FROM SUB54 AT SR360
 304          BA    0.29
 305          LS              87
 306          UD    0.22
 307          ZZ
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

100-YR
PROPOSED

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB02	859.	12.25	165.	66.	66.	.88		
HYDROGRAPH AT	SUB04	513.	12.15	87.	35.	35.	.46		
ROUTED TO	RESRT	29.	14.95	9.	4.	4.	.46	35.76	14.95
2 COMBINED AT	CO04	859.	12.25	174.	70.	70.	1.34		
ROUTED TO	NDROUT	861.	12.25	173.	70.	70.	1.34	28.35	12.25
HYDROGRAPH AT	SUB04E	174.	12.10	28.	11.	11.	.15		
HYDROGRAPH AT	SUB05	134.	12.05	19.	8.	8.	.10		
2 COMBINED AT	CO105	302.	12.05	47.	19.	19.	.25		
HYDROGRAPH AT	SUB06	2694.	12.05	411.	168.	168.	1.86		
ROUTED TO	RO07	2498.	12.15	409.	167.	167.	1.86	5.27	12.15
HYDROGRAPH AT	SUB08	1752.	12.05	259.	106.	106.	1.19		
2 COMBINED AT	CO108	4140.	12.10	668.	272.	272.	3.05		
ROUTED TO	RO09	3650.	12.25	662.	269.	269.	3.05	6.15	12.25
HYDROGRAPH AT	SUB10	2819.	12.20	524.	215.	215.	2.27		
2 COMBINED AT	CO110	6429.	12.20	1186.	484.	484.	5.32		
ROUTED TO	RO11	6021.	12.30	1180.	480.	480.	5.32	7.18	12.30
HYDROGRAPH AT	SUB12	2220.	12.05	336.	140.	140.	1.37		
2 COMBINED AT	CO112	6972.	12.25	1516.	619.	619.	6.69		
ROUTED TO	RO13	6780.	12.35	1509.	615.	615.	6.69	7.34	12.35
HYDROGRAPH AT	SUB14	2050.	12.10	361.	151.	151.	1.39		
2 COMBINED AT	CO114	8379.	12.25	1870.	767.	767.	8.08		
HYDROGRAPH AT	SUB16	1149.	12.15	198.	81.	81.	.90		
2 COMBINED AT	CO116	9405.	12.25	2068.	847.	847.	8.98		
ROUTED TO	RO17	9239.	12.35	2059.	841.	841.	8.98	9.24	12.35
HYDROGRAPH AT	SUB18	1149.	12.10	201.	84.	84.	.80		
2 COMBINED AT	CO118	10101.	12.30	2260.	925.	925.	9.78		

ROUTED TO	RO19	8345.	12.90	1951.	785.	785.	9.78	4.24	12.90
HYDROGRAPH AT	SUB20	954.	12.20	171.	69.	69.	.95		
2 COMBINED AT	CO120	8611.	12.90	2122.	854.	854.	10.73		
DIVERSION TO	D120	3861.	12.90	1036.	416.	416.	10.73		
HYDROGRAPH AT	BRKOUT	4750.	12.90	1086.	438.	438.	10.73		
ROUTED TO	RO21	4206.	13.20	1000.	402.	402.	10.73	1747.20	13.20
HYDROGRAPH AT	SUB22	351.	12.10	56.	22.	22.	.30		
2 COMBINED AT	CO122	4252.	13.20	1056.	425.	425.	11.03		
DIVERSION TO	DUS60	885.	13.20	138.	55.	55.	11.03		
HYDROGRAPH AT	DVUS60	3366.	13.20	918.	369.	369.	11.03		
ROUTED TO	RO23	3310.	13.35	872.	350.	350.	11.03	7.56	13.35
HYDROGRAPH AT	SUB24	468.	12.15	79.	32.	32.	.42		
2 COMBINED AT	CO124	3371.	13.35	951.	382.	382.	11.45		
2 COMBINED AT	CO205	3403.	13.35	998.	401.	401.	11.70		
HYDROGRAPH AT	SUB26	566.	12.00	79.	32.	32.	.38		
HYDROGRAPH AT	REUS60	885.	13.20	138.	55.	55.	.00		
ROUTED TO	ROUS60	860.	13.30	135.	54.	54.	.00		
2 COMBINED AT	CO26	906.	13.30	214.	86.	86.	.38		
2 COMBINED AT	CO27	4303.	13.35	1212.	488.	488.	12.08		
ROUTED TO	ROUT	2811.	13.95	912.	375.	375.	12.08	46.32	13.95
HYDROGRAPH AT	SUB28	257.	12.05	38.	16.	16.	.17		
HYDROGRAPH AT	SUB30	911.	12.10	150.	62.	62.	.65		
2 COMBINED AT	CO130	1153.	12.10	188.	77.	77.	.82		
HYDROGRAPH AT	SUB32	183.	12.00	27.	11.	11.	.11		
2 COMBINED AT	CO132	1330.	12.05	215.	88.	88.	.93		
HYDROGRAPH AT	SUB36	1394.	12.15	248.	101.	101.	1.12		
2 COMBINED AT	CO136	2669.	12.10	463.	190.	190.	2.05		
ROUTED TO	RO37	2327.	12.30	459.	187.	187.	2.05	5.59	12.30
HYDROGRAPH AT	SUB38	468.	12.00	65.	27.	27.	.33		
2 COMBINED AT	CO138	2475.	12.25	525.	214.	214.	2.38		

HYDROGRAPH AT	SUB40	199.	12.05	30.	12.	12.	.13		
ROUTED TO	RO40	186.	12.15	30.	12.	12.	.13	2.94	12.15
HYDROGRAPH AT	SUB42	250.	12.00	34.	14.	14.	.17		
2 COMBINED AT	CO142	407.	12.05	64.	26.	26.	.30		
2 COMBINED AT	CO143	2715.	12.25	588.	239.	239.	2.68		
ROUTED TO	ROU	2582.	12.35	588.	239.	239.	2.68	68.71	12.35
HYDROGRAPH AT	SUB50	264.	12.05	40.	16.	16.	.17		
HYDROGRAPH AT	SUB54	409.	12.05	64.	26.	26.	.29		

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

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

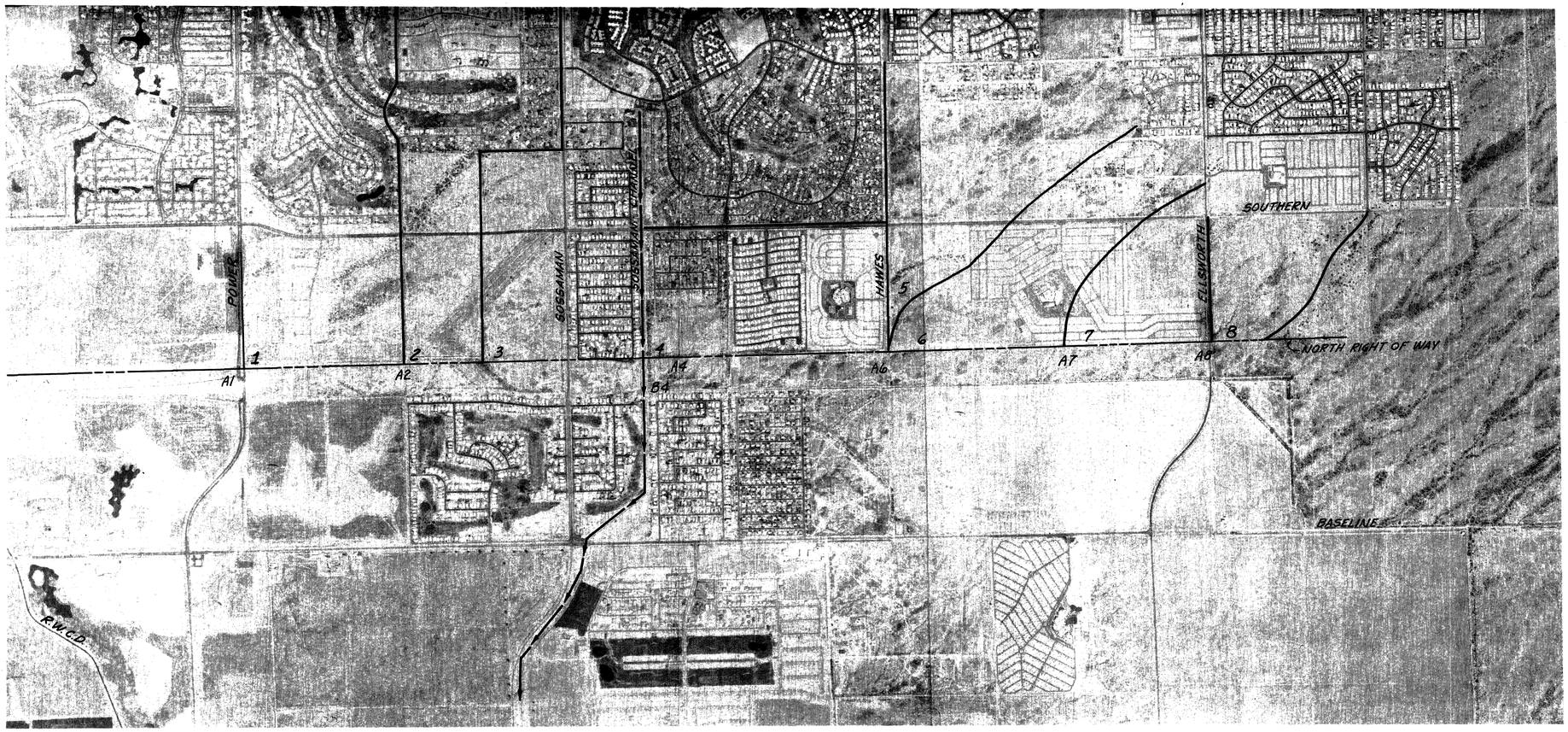
50-YR
PROPOSED

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUB02	717.	12.25	136.	55.	55.	.88		
HYDROGRAPH AT	SUB04	429.	12.15	72.	29.	29.	.46		
ROUTED TO	RESRT	16.	14.95	3.	1.	1.	.46	34.97	14.95
2 COMBINED AT	CO04	717.	12.25	140.	56.	56.	1.34		
ROUTED TO	NDROUT	720.	12.25	139.	56.	56.	1.34	28.05	12.25
HYDROGRAPH AT	SUB04E	145.	12.10	24.	9.	9.	.15		
HYDROGRAPH AT	SUB05	113.	12.05	16.	6.	6.	.10		
2 COMBINED AT	CO105	252.	12.05	39.	16.	16.	.25		
HYDROGRAPH AT	SUB06	2299.	12.05	348.	142.	142.	1.86		
ROUTED TO	RD07	2116.	12.15	346.	141.	141.	1.86	5.04	12.15
HYDROGRAPH AT	SUB08	1495.	12.05	219.	89.	89.	1.19		
2 COMBINED AT	CO108	3509.	12.10	565.	229.	229.	3.05		
ROUTED TO	RD09	3051.	12.25	559.	226.	226.	3.05	5.83	12.25
HYDROGRAPH AT	SUB10	2417.	12.20	447.	182.	182.	2.27		
2 COMBINED AT	CO110	5399.	12.20	1006.	408.	408.	5.32		
ROUTED TO	RD11	5033.	12.35	999.	405.	405.	5.32	6.77	12.35
HYDROGRAPH AT	SUB12	1922.	12.05	289.	119.	119.	1.37		
2 COMBINED AT	CO112	5807.	12.25	1288.	524.	524.	6.69		
ROUTED TO	RD13	5658.	12.35	1282.	520.	520.	6.69	6.91	12.35
HYDROGRAPH AT	SUB14	1783.	12.10	313.	130.	130.	1.39		
2 COMBINED AT	CO114	7001.	12.30	1595.	650.	650.	8.08		
HYDROGRAPH AT	SUB16	980.	12.15	168.	68.	68.	.90		
2 COMBINED AT	CO116	7877.	12.25	1762.	718.	718.	8.98		
ROUTED TO	RD17	7746.	12.35	1753.	713.	713.	8.98	8.64	12.35
HYDROGRAPH AT	SUB18	995.	12.15	174.	72.	72.	.80		
2 COMBINED AT	CO118	8478.	12.30	1927.	785.	785.	9.78		

ROUTED TO	RO19	6874.	13.00	1630.	656.	656.	9.78	3.90	13.00
HYDROGRAPH AT	SUB20	793.	12.20	141.	57.	57.	.95		
2 COMBINED AT	CO120	7070.	12.95	1771.	712.	712.	10.73		
DIVERSION TO	D120	3538.	12.95	884.	355.	355.	10.73		
HYDROGRAPH AT	BRKOUT	3532.	12.95	887.	357.	357.	10.73		
ROUTED TO	RO21	3220.	13.35	806.	324.	324.	10.73	1746.83	13.35
HYDROGRAPH AT	SUB22	293.	12.10	46.	19.	19.	.30		
2 COMBINED AT	CO122	3253.	13.35	852.	342.	342.	11.03		
DIVERSION TO	DUS60	578.	13.35	92.	37.	37.	11.03		
HYDROGRAPH AT	DVUS60	2675.	13.35	760.	305.	305.	11.03		
ROUTED TO	RO23	2643.	13.50	715.	287.	287.	11.03	6.82	13.50
HYDROGRAPH AT	SUB24	391.	12.15	66.	26.	26.	.42		
2 COMBINED AT	CO124	2689.	13.45	781.	314.	314.	11.45		
2 COMBINED AT	CO205	2715.	13.45	820.	329.	329.	11.70		
HYDROGRAPH AT	SUB26	481.	12.00	66.	27.	27.	.38		
HYDROGRAPH AT	REUS60	578.	13.35	92.	37.	37.	.00		
ROUTED TO	ROUS60	572.	13.45	89.	36.	36.	.00		
2 COMBINED AT	CO26	611.	13.45	156.	63.	63.	.38		
2 COMBINED AT	CO27	3325.	13.45	976.	392.	392.	12.08		
ROUTED TO	ROUT	2250.	14.10	707.	293.	293.	12.08	44.75	14.10
HYDROGRAPH AT	SUB28	220.	12.05	32.	13.	13.	.17		
HYDROGRAPH AT	SUB30	781.	12.10	128.	52.	52.	.65		
2 COMBINED AT	CO130	989.	12.10	160.	65.	65.	.82		
HYDROGRAPH AT	SUB32	158.	12.00	23.	9.	9.	.11		
2 COMBINED AT	CO132	1140.	12.05	183.	75.	75.	.93		
HYDROGRAPH AT	SUB36	1188.	12.15	211.	86.	86.	1.12		
2 COMBINED AT	CO136	2280.	12.10	394.	160.	160.	2.05		
ROUTED TO	RO37	1975.	12.30	390.	158.	158.	2.05	5.28	12.30
HYDROGRAPH AT	SUB38	395.	12.00	55.	22.	22.	.33		
2 COMBINED AT	CO138	2097.	12.30	444.	180.	180.	2.38		

HYDROGRAPH AT	SUB40	171.	12.05	26.	11.	11.	.13		
ROUTED TO	RD40	159.	12.15	25.	10.	10.	.13	2.77	12.15
HYDROGRAPH AT	SUB42	212.	12.00	28.	11.	11.	.17		
2 COMBINED AT	CO142	344.	12.05	54.	22.	22.	.30		
2 COMBINED AT	CO143	2299.	12.25	498.	202.	202.	2.68		
ROUTED TO	ROU	2202.	12.35	498.	202.	202.	2.68	68.30	12.35
HYDROGRAPH AT	SUB50	227.	12.05	34.	14.	14.	.17		
HYDROGRAPH AT	SUB54	348.	12.05	54.	22.	22.	.29		

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



LEGEND

—— Drainage Boundary

26 Concentration Point Number

EXISTING CONDITION

CONCENTRATION POINT NO.	HEC-1 SUBAREA NO.	DISCHARGE 100-YR.	50-YR.	2-YR.
1	SUB26B	378	266	10
2	SUB26A	575	412	19
3	CO24	1098	891	34
4	SUB228	339	269	18
5	CO226	3435	2374	90
6	SUB224	292	208	12
7	SUB222	71	51	3
8	SUB220	264	192	10

RECOMMENDED ALTERNATIVE

CONCENTRATION POINT NO.	HEC-1 SUBAREA NO.	DISCHARGE 100-YR.	50-YR.
1	SUB26B	378	266
A1	RO26B	1564	1232
2	SUB26A	575	412
A2	CO26A	1635	1292
3	CO24	1090	891
4	SUB228	339	269
A4	RO226	2914	2035
B4	CO231	3042	2121
5	CO226	3099	2074
6	SUB224	292	208
A6	CO22	3099	2074
7	SUB222	71	51
A7	ROUT5	237	51
8	SUB220	264	192
A8	ROUT	228	59

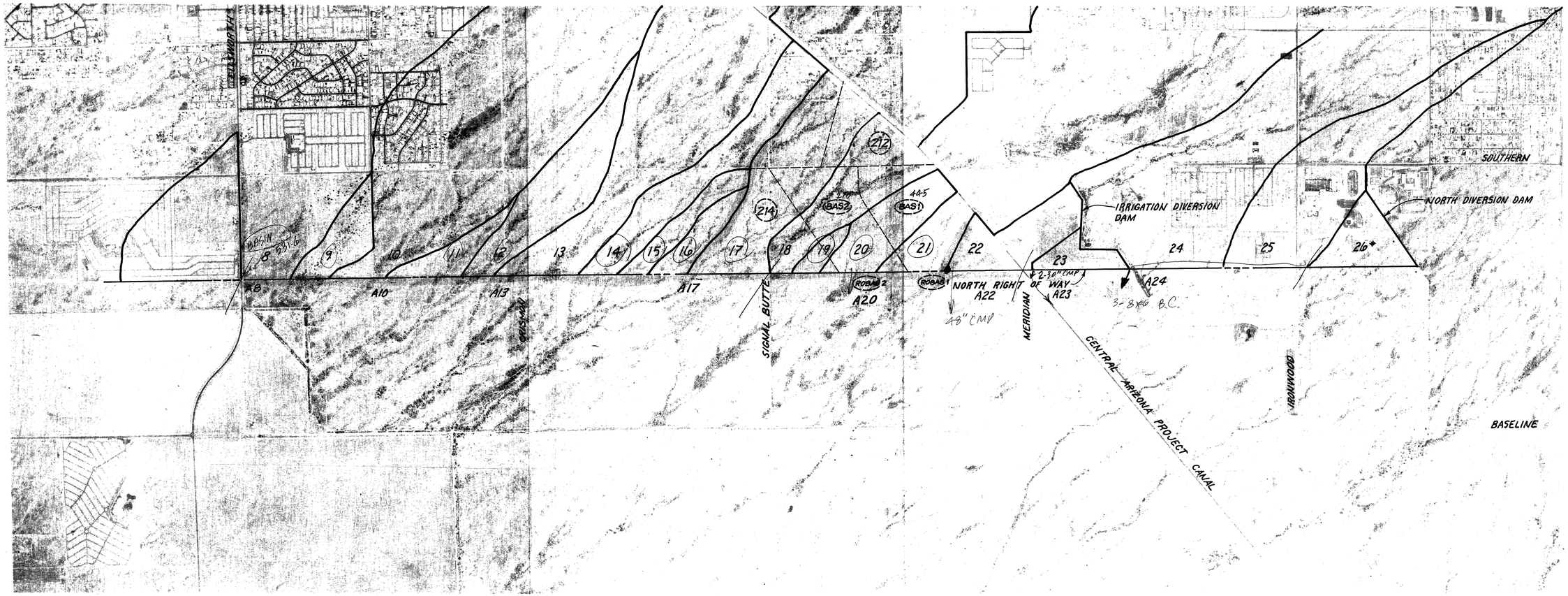
PRELIMINARY

SUPERSTITION FREEWAY
OFFSITE DRAINAGE
POWER TO ELLSWORTH

DESIGN L.G.M.	SCALE	JOB NO.	DATE	SHEET
DRAWN L.J.C.	HORZ. 1" = 1000'	7005	9/23/86	1 OF 3
CHECK R.L.M.	VERT.			

AN WEST INC.
Consulting Engineers
PHOENIX, ARIZONA

FIGURE 3



LEGEND

—— Drainage Boundary

26 Concentration Point Number

---- Future Drainage Boundary

EXISTING CONDITION

CONCENTRATION POINT NO.	HEC-1 SUBAREA NO.	DISCHARGE 100-YR.	DISCHARGE 50-YR.	DISCHARGE 2-YR.
8	SUB220	352	257	10
9		93	74	12
10	CO218	1843	1274	52
11		44	35	6
12		105	83	13
13	CO216	770	549	23
14		97	77	12
15		52	42	7
16		50	40	6
17	CO214	1561	1081	23
18	CO212	3181	2519	330
19		40	33	5
20		120	95	16
21	RO76	1642	1487	321
22	RO208	45	33	1
23	SUB206	38	27	1
24	SUB204	395	275	13
25	SUB202	171	127	6
26*	SUB200	79	68	17

RECOMMENDED ALTERNATIVE

CONCENTRATION POINT NO.	HEC-1 SUBAREA NO.	DISCHARGE 100-YR.	DISCHARGE 50-YR.
8	SUB220	352	257
A8	ROUT	241	74
9		93	74
A10	CO219	2656	1820
10	CO218	1843	1274
11		44	35
12		105	83
A13	CO217	820	593
13	CO216	770	549
14		97	77
15		52	42
16		50	40
A17	SUB214	77	60
17		154	122
18		57	46
19		45	37
A20	ROBAS2	387	259
20		0	0
21		0	0
A22	ROBAS1	1449	1276
22		0	0
A23	SUB206	38	27
23	SUB206	38	27
A24	CO204	566	384
24	SUB204	395	275
25	SUB202	171	127
26	SUB200*	79	68

* Reach III Subarea Presented For Continuity

PRELIMINARY

SUPERSTITION FREEWAY
OFFSITE DRAINAGE
ELLSWORTH TO IRONWOOD

DESIGN LSM	SCALE	JOB NO.	DATE	SHEET
DRAWN KTM	HORZ. 1"=1000'	7005	9/23/86	2 OF 3
CHECK RLM	VERT.			

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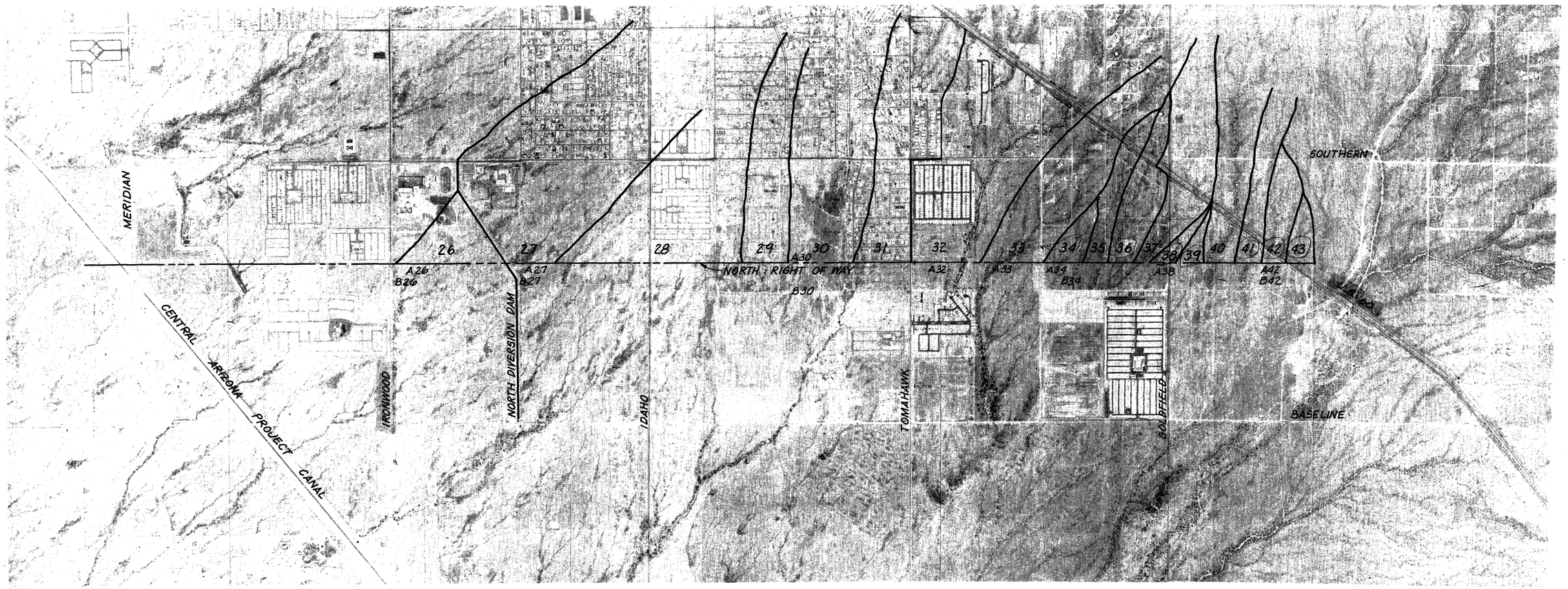
FIG. 3

PHOENIX, ARIZONA

FIGURE 3



LEGEND

—— Drainage Boundary

26 Concentration Point Number

(34) SCS method was used.

EXISTING-CONDITION

CONCENTRATION POINT NO.	HEC-1 SUBAREA NO.	DISCHARGE 100-YR.	50-YR.	2-YR.
26	SUB200	79	68	17
27	SUB02	859	717	126
28	SUB04	513	429	102
29	SUB05	134	113	22
30	C0124	3371	2689	491
31	C026	906	611	109
32	C0138	2475	2097	487
33	C0142	407	344	67
34		102	83	15
35		67	55	11
36		84	69	14
37	SUB50	264	227	60
38		31	25	5
39		68	56	6
40	SUB54	409	348	84
41		53	43	8
42		54	44	8
43		34	28	5

RECOMMENDED ALTERNATIVE

CONCENTRATION POINT NO.	HEC-1 SUBAREA NO.	DISCHARGE 100-YR.	50-YR.
26	SUB200	79	68
A26		56	53
B26		23	12
27	SUB02	1859	717
A27	C004	1859	717
B27		869	844
28	SUB04	513	429
29	SUB05	134	113
30	C0124	3371	2689
A30	C027	4303	3325
B30	ROUT	2811	2250
31	C026	906	611
32	C0138	2475	2097
A32		750	675
33	C0142	407	344
A33		2625	2206
34		102	83
A34		13	11
B34		89	72
35		67	55
36		84	69
37	SUB50	264	227
38		31	25
A38		31	25
39		68	56
40	SUB54	409	348
41		53	43
42		54	44
A42		27	22
B42		27	22
43		34	28

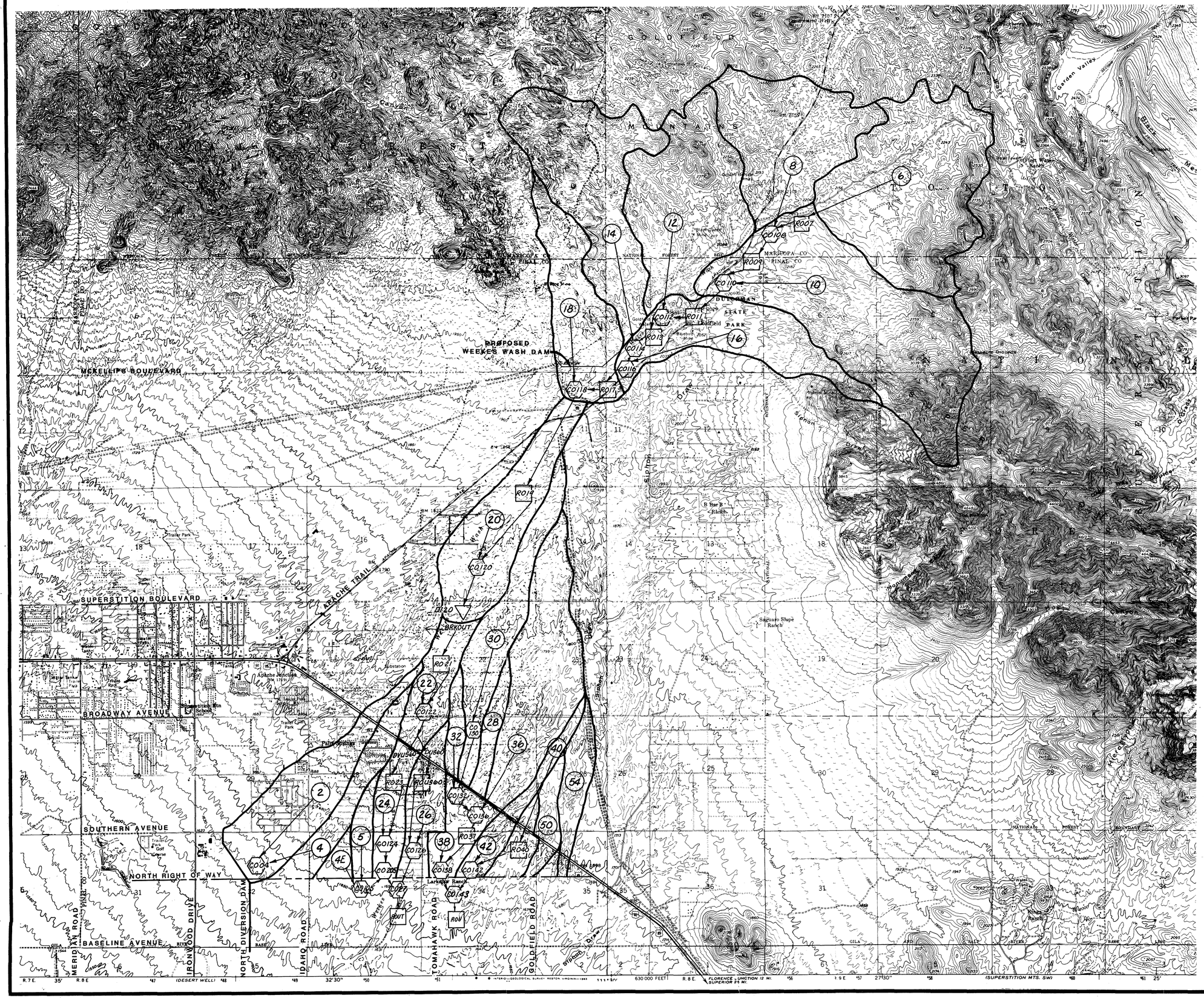
PRELIMINARY

SUPERSTITION FREEWAY
OFFSITE DRAINAGE
IRONWOOD TO U.S.60

DESIGN L.S.M.	SCALE	JOB NO.	DATE	SHEET
DRAWN R.D.G.	HORZ. 1" = 1000'	7005	9/23/86	3 OF 3
CHECK R.L.M.	VERT. —			

AN WEST INC.
Consulting Engineers
PHOENIX, ARIZONA

FIGURE 3



LEGEND

(4)	SUBAREA CALCULATION
(CO)	COMBINED HYDROGRAPH
RO	ROUTE HYDROGRAPH
△	DIVERT HYDROGRAPH

N

PROPOSED CONDITION

SUPERSTITION FREEWAY OFFSITE DRAINAGE HEC-1 SCHEMATIC IRONWOOD TO US 60

DESIGN L.B.M.	SCALE	JOB NO.	DATE	SHEET
DRAWN R.D.B.	HORZ. 1" = 2000'	7005	9-25-86	2 OF 2
CHECK R.L.M	VERT.			

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PRELIMINARY
APPENDIX J
PHOENIX, ARIZONA

FIGURE 6

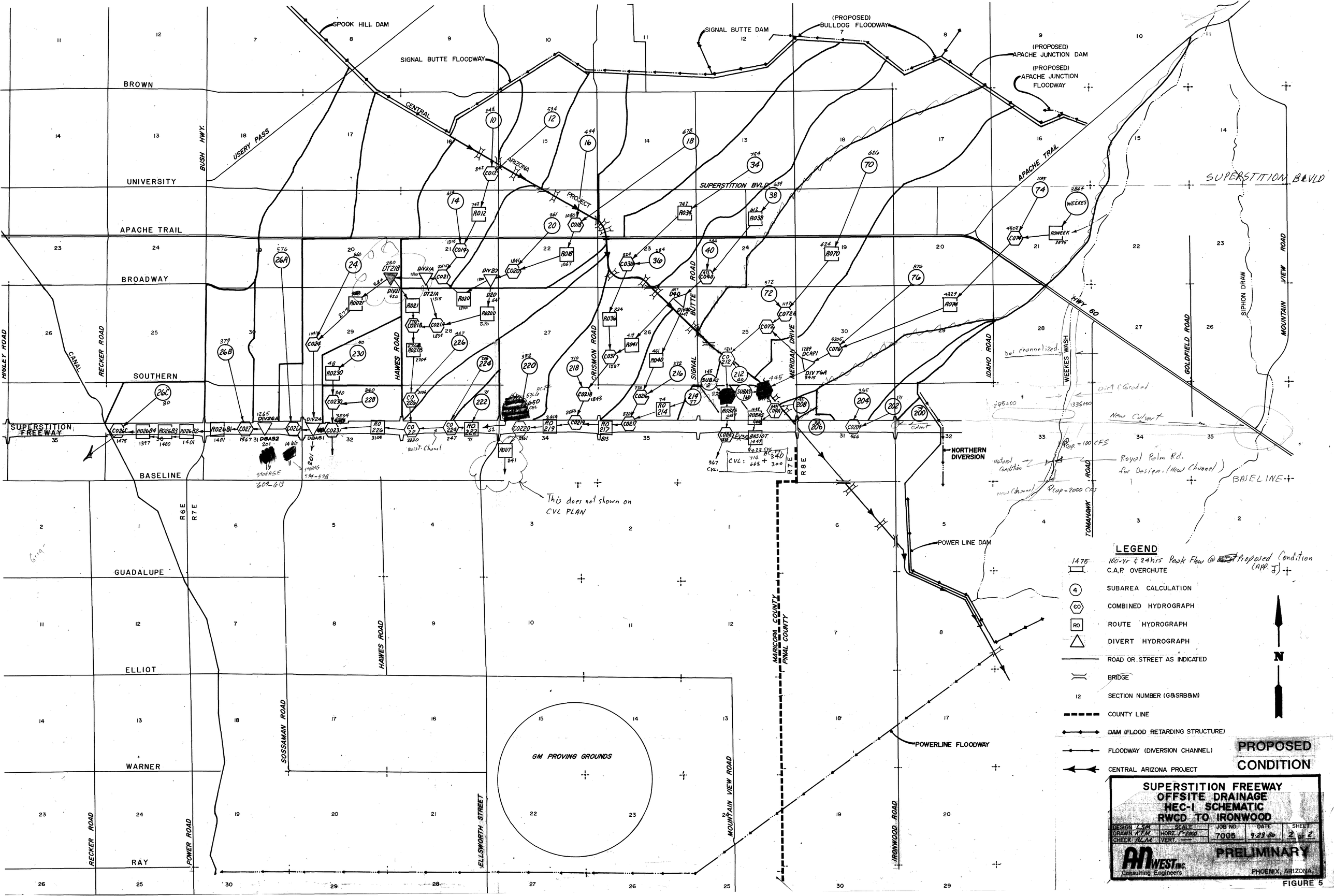
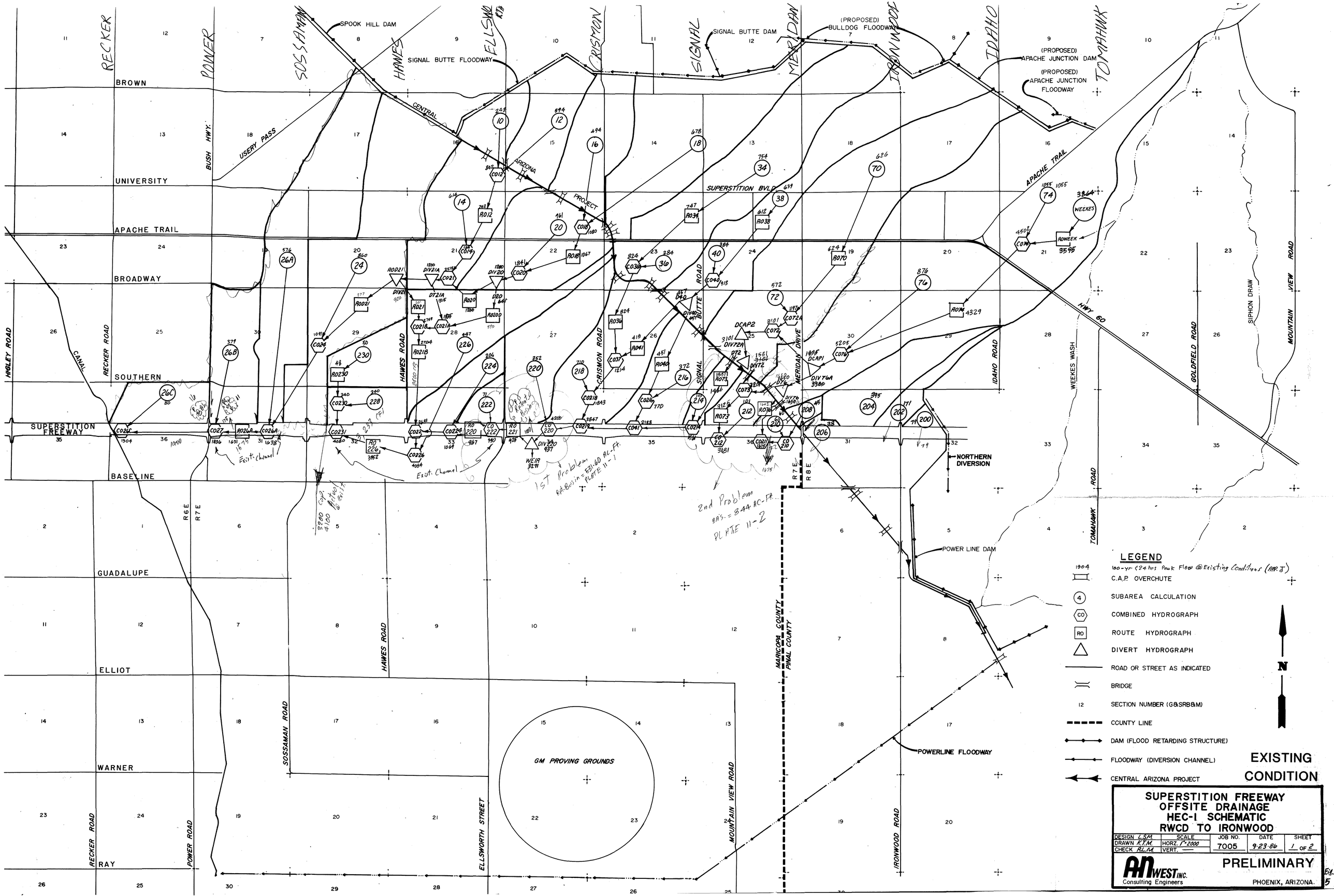
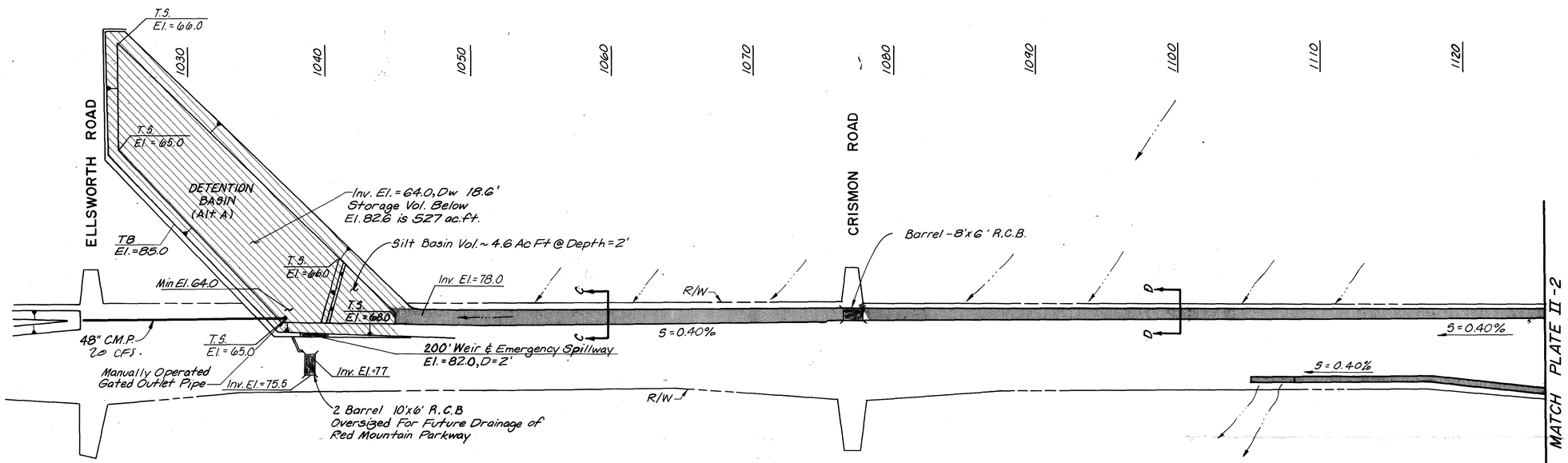
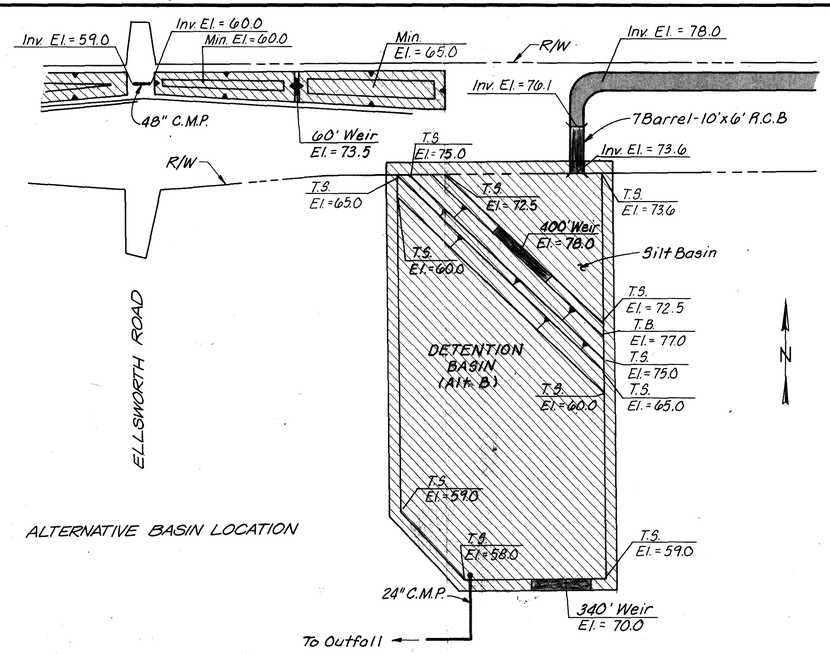

SPOOK HILL DAM
SIGNAL BUTTE FLOODWAY
SIGNAL BUTTE DAM
(PROPOSED) BULLDOG FLOODWAY
(PROPOSED) APACHE JUNCTION DAM
(PROPOSED) APACHE JUNCTION FLOODWAY
CENTRAL
ARIZONA
PROJECT
BROWN
UNIVERSITY
APACHE TRAIL
BROADWAY
SOUTHERN
BASELINE
GUADALUPE
ELLIOT
WARNER
RAY
SUPERSTITION FREEWAY
SUPERSTITION BVLD
SUPERSTITION BLVD
BUSH HWY.
USERY PASS
HIGLEY ROAD
CANAL
RECKER ROAD
HAWES ROAD
CRISMON ROAD
SIGNAL BUTTE ROAD
MERIDIAN DRIVE
IDAHO ROAD
WEEKES WASH
GOLDFIELD ROAD
SIPHON DRAW
MOUNTAIN VIEW ROAD
HWY 60
TOMAHAWK ROAD
POWER ROAD
SOSSAMAN ROAD
ELLSWORTH STREET
IRONWOOD ROAD
MARICOPA COUNTY
PINAL COUNTY
R6E
R7E
GM PROVING GROUNDS
NORTHERN DIVERSION
POWER LINE DAM
POWERLINE FLOODWAY
STORAGE 609-613
This does not shown on CVL PLAN
Not channelized
Dirt & Graded
New Culvert
Royal Palm Rd. for Design. (New Channel)
Natural Condition
New Channel
Qcap = 100 CFS
Qcap = 2000 CFS
LEGEND
100-yr & 24hrs Peak Flow @ Proposed Condition (APP. J)
C.A.P. OVERCHUTE
SUBAREA CALCULATION
COMBINED HYDROGRAPH
ROUTE HYDROGRAPH
DIVERT HYDROGRAPH
ROAD OR STREET AS INDICATED
BRIDGE
SECTION NUMBER (G&SRB&M)
COUNTY LINE
DAM (FLOOD RETARDING STRUCTURE)
FLOODWAY (DIVERSION CHANNEL)
CENTRAL ARIZONA PROJECT
N
PROPOSED CONDITION
SUPERSTITION FREEWAY
OFFSITE DRAINAGE
HEC-I SCHEMATIC
RWCD TO IRONWOOD
DESIGN L.S.M.
DRAWN K.T.M.
CHECK R.L.M.
SCALE
HORZ. 1"=2000
VERT. —
JOB NO. 7005
DATE 9-23-86
SHEET 2 OF 2
PRELIMINARY
AMWEST INC.
Consulting Engineers
PHOENIX, ARIZONA

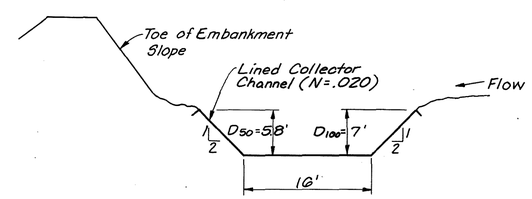
FIGURE 5


SPOOK HILL DAM
SIGNAL BUTTE DAM
(PROPOSED) BULLDOG FLOODWAY
(PROPOSED) APACHE JUNCTION DAM
(PROPOSED) APACHE JUNCTION FLOODWAY
SIGNAL BUTTE FLOODWAY
CENTRAL ARIZONA PROJECT
USERY PASS
APACHE TRAIL
SUPERSTITION BVLD
HWY 60
BROWN
UNIVERSITY
BROADWAY
SOUTHERN
SUPERSTITION FREEWAY
BASELINE
GUADALUPE
ELLIOT
WARNER
RAY
RECKER
POWER
SOSSAMAN
HAWES
ELLSWORTH
CRISMON
SIGNAL BUTTE ROAD
MERIDIAN DRIVE
IRONWOOD
IDAHO
TOMAHAWK
HOBLEY ROAD
CANAL
RECKER ROAD
BUSH HWY.
POWER ROAD
HAWES ROAD
SOSSAMAN ROAD
ELLSWORTH STREET
MOUNTAIN VIEW ROAD
IRONWOOD ROAD
IDAHO ROAD
WEEKES WASH
GOLDFIELD ROAD
SIPHON DRAW
MOUNTAIN VIEW ROAD
TOMAHAWK ROAD
R6E
R7E
R8E
MARICOPA COUNTY
PINAL COUNTY
GM PROVING GROUNDS
NORTHERN DIVERSION
POWER LINE DAM
POWERLINE FLOODWAY
Exist. Channel
1st Problem
Ret. Basin = 531.60 AC-Ft.
PLATE 11-1
2nd Problem
BAS. = 844 AC-Ft.
PLATE 11-2
LEGEND
100-yr 6 24 hrs Peak Flow @ Existing Conditions (AMJ)
C.A.P. OVERCHUTE
SUBAREA CALCULATION
COMBINED HYDROGRAPH
ROUTE HYDROGRAPH
DIVERT HYDROGRAPH
ROAD OR STREET AS INDICATED
BRIDGE
SECTION NUMBER (G&SRB&M)
COUNTY LINE
DAM (FLOOD RETARDING STRUCTURE)
FLOODWAY (DIVERSION CHANNEL)
CENTRAL ARIZONA PROJECT
N
EXISTING CONDITION
SUPERSTITION FREEWAY
OFFSITE DRAINAGE
HEC-I SCHEMATIC
RWCD TO IRONWOOD
DESIGN L.S.M.
DRAWN K.T.M.
CHECK R.L.M.
SCALE
HORZ. 1"=2000
VERT. —
JOB NO. 7005
DATE 9-23-86
SHEET 1 OF 2
AMWEST INC.
Consulting Engineers
PRELIMINARY
PHOENIX, ARIZONA.

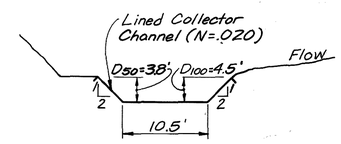




ALTERNATIVE BASIN LOCATION



SECTION C-C
N.T.S.



SECTION D-D
N.T.S.

LEGEND

- Wash Flowline
- Right of Way (R/W)
- Box Culvert (R.C.B.)
- Pipe Culvert (R.C.P. or C.M.P.)
- Open Channel
- Basin Area
- Side Slope
- T.S. Toe of Slope
- T.B. Top of Bank

PLATE II-1
PROPOSED DRAINAGE CONCEPT

REACH II
ELLSWORTH TO IRONWOOD

DESIGN	SCALE	JOB NO.	DATE	SHEET
DRAWN A.C.B. HORZ. 1"=400'		7005-01	11-19-86	1 of 2
CHECK A.C.B. VERT. —				

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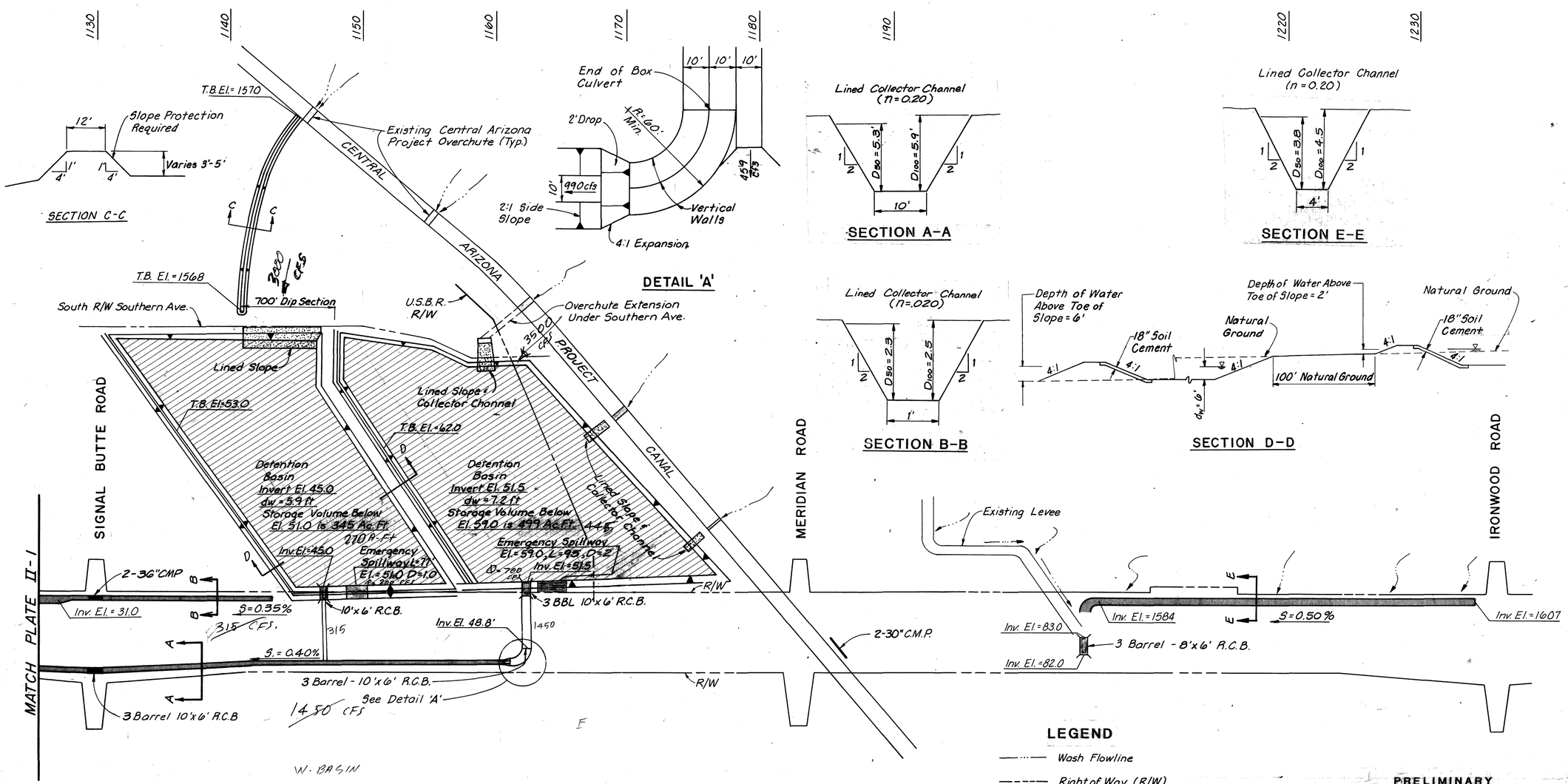
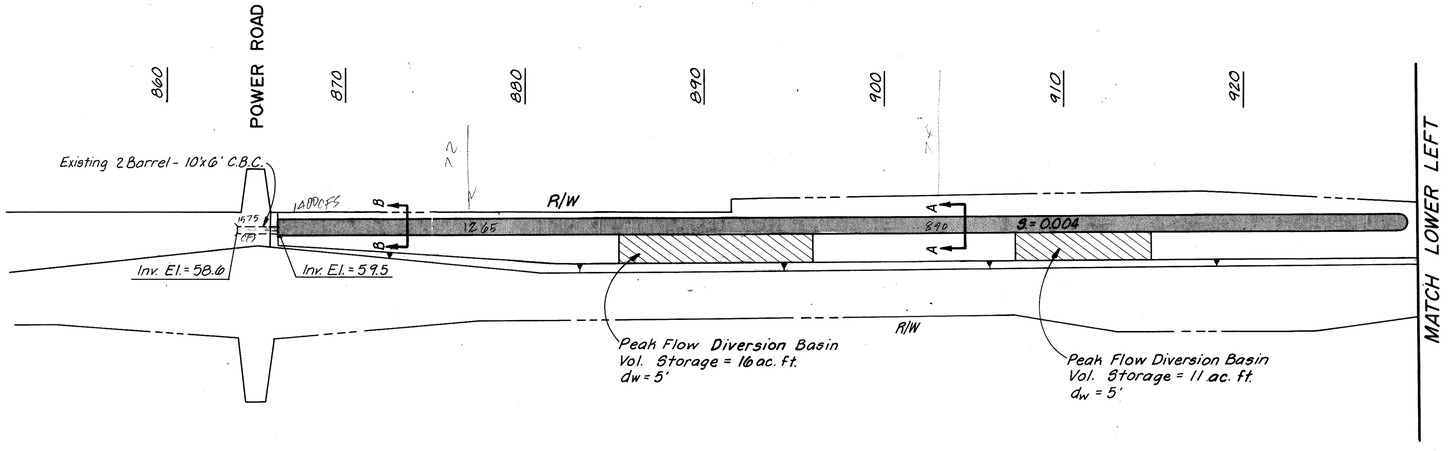
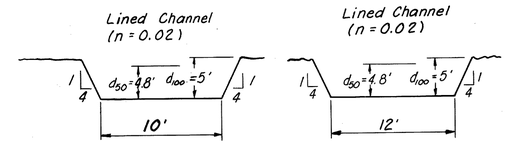
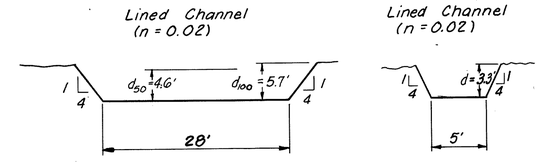

1130
1140
1150
1160
1170
1180
1190
1220
1230
T.B.El.=1570
Slope Protection Required
12'
1'
4'
Varies 3'-5'
SECTION C-C
Existing Central Arizona Project Overchute (Typ.)
CENTRAL
ARIZONA
PROJECT
CANAL
T.B. El.=1568
700' Dip Section
3300 cfs
South R/W Southern Ave.
U.S.B.R. R/W
Overchute Extension Under Southern Ave.
3500 cfs
Lined Slope
T.B. El.=53.0
Lined Slope & Collector Channel
T.B. El.=62.0
Detention Basin
Invert El. 45.0
dw=5.9 ft
Storage Volume Below El. 51.0 is 345 Ac.Ft.
270 A.Ft
Inv.El.=45.0
Emergency Spillway=71'
El.=51.0 D=1.0
Detention Basin
Invert El. 51.5
dw=7.2 ft
Storage Volume Below El. 59.0 is 499 Ac.Ft.
446
Emergency Spillway
El.=59.0, L=95, D=2
Inv. El.=51.5
Q=700 cfs
Lined Slope & Collector Channel
SIGNAL BUTTE ROAD
MERIDIAN ROAD
IRONWOOD ROAD
MATCH PLATE II-1
2-36"CMP
Inv. El.=31.0
S=0.35%
315 CFS.
10'x6' R.C.B.
3 BBL 10'x6' R.C.B.
Inv. El. 48.8'
1450
S.=0.40%
3 Barrel - 10'x6' R.C.B.
See Detail 'A'
3 Barrel 10'x6' R.C.B
1450 CFS
R/W
2-30"C.M.P.
Existing Levee
Inv. El.=83.0
Inv. El.=82.0
3 Barrel - 8'x6' R.C.B.
Inv. El.=1584
S=0.50%
Inv. El.=1607
W. BASIN
End of Box Culvert
10'
10'
10'
2' Drop
R=60' Min.
10'
990 cfs
2:1 Side Slope
Vertical Walls
4:1 Expansion
459 cfs
DETAIL 'A'
Lined Collector Channel (n=0.20)
Dso=5.3'
D100=5.9'
10'
SECTION A-A
Lined Collector Channel (n=0.20)
Dso=3.8
D100=4.5
4'
SECTION E-E
Lined Collector Channel (n=.020)
Dso=2.3
D100=2.5
1'
SECTION B-B
Depth of Water Above Toe of Slope=6'
18" Soil Cement
Natural Ground
dw=6'
100' Natural Ground
Depth of Water Above Toe of Slope=2'
Natural Ground
18" Soil Cement
SECTION D-D
LEGEND
Wash Flowline
Right of Way (R/W)
Box Culvert (R.C.B.)
Pipe Culvert (R.C.P. or C.M.P.)
Open Channel
Basin Area
Side Slope
T.S. Toe of Slope
T.B. Top of Bank
N
PRELIMINARY
PLATE II-2 PROPOSED
DRAINAGE CONCEPT
REACH II
ELLSWORTH TO IRONWOOD
DESIGN L.E.M.
DRAWN B.D.B.
CHECK R.L.M.
SCALE
HORZ 1"=400'
VERT —
JOB NO. 7005-01
DATE 11-19-86
SHEET 2 of 2
ANWEST INC.
Consulting Engineers
PHOENIX, ARIZONA







LEGEND

- Wash Flowline
- Right of Way (R/W)
- Box Culvert (R.C.B.)
- Pipe Culvert (R.C.P. or C.M.P.)
- Open Channel
- Basin Area
- Side Slope
- T.S. Toe of Slope
- T.B. Top of Bank

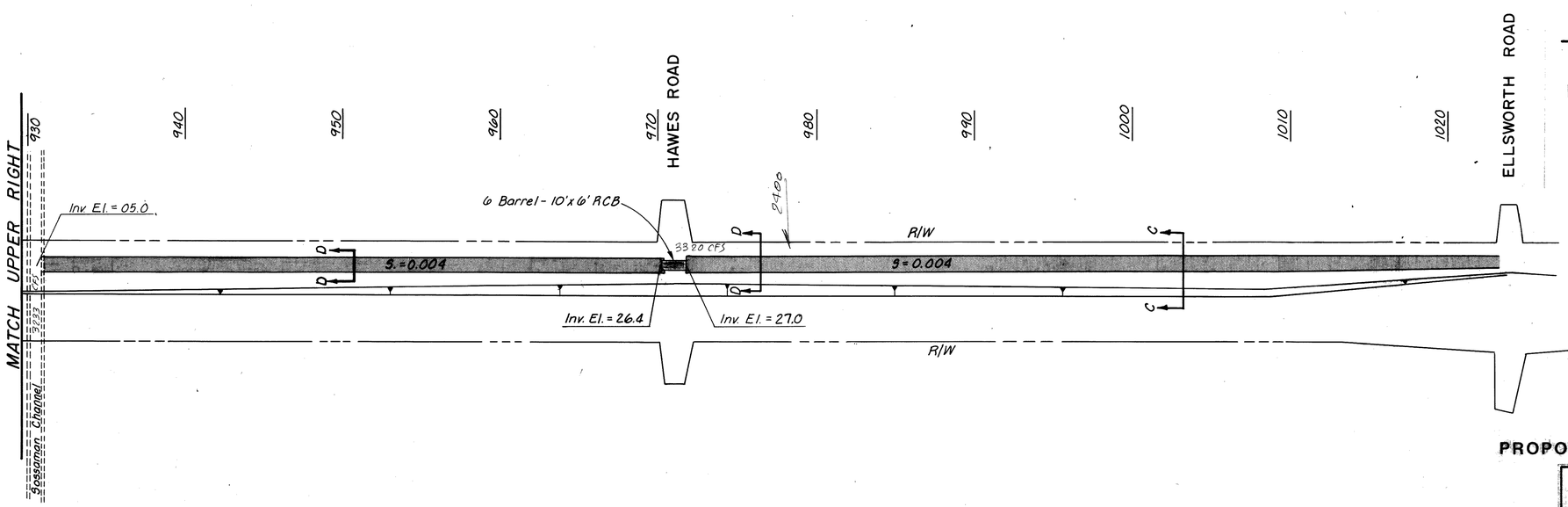


PLATE 1
PROPOSED DRAINAGE CONCEPT

REACH I
POWER TO ELLSWORTH

DESIGN	SCALE	JOB NO.	DATE	SHEET
DRAWN H.D.B.	HORZ. 1"=400'	7005-01	11-19-86	1 of 1
CHECK H.L.M.	VERT. —			

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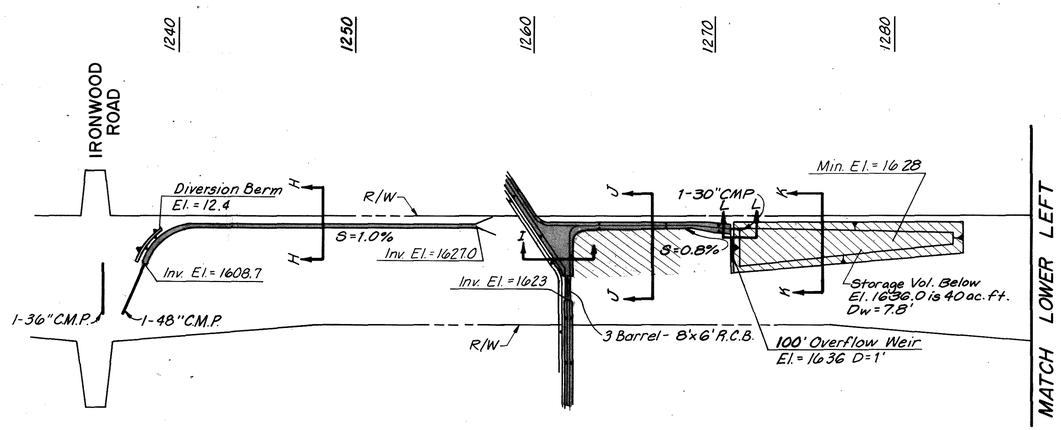
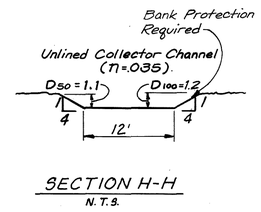
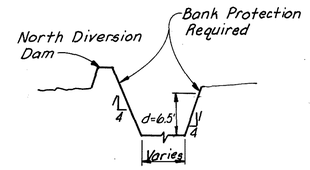
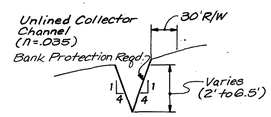




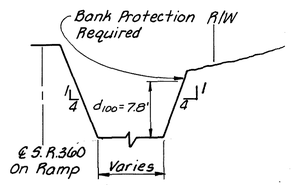
SECTION H-H
N.T.S.



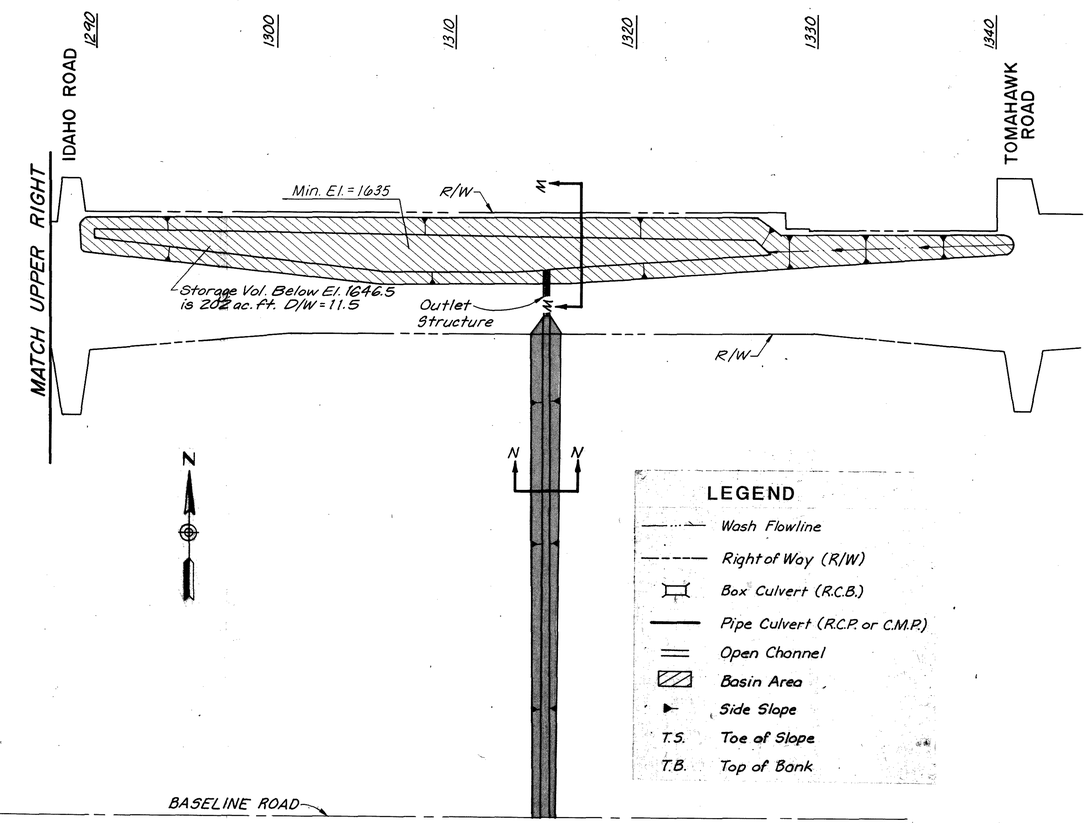
SECTION I-I
N.T.S.

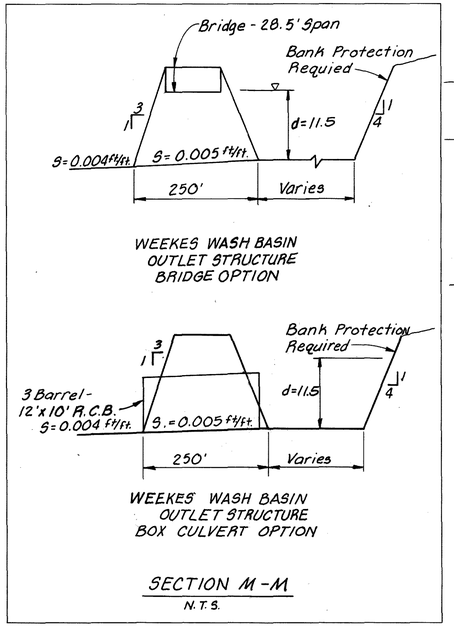


SECTION J-J
N.T.S.

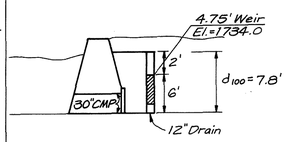


SECTION K-K
N.T.S.

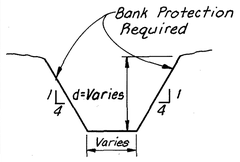




SECTION M-M
N.T.S.



SECTION L-L
N.T.S.



SECTION N-N
N.T.S.

PLATE III-1 PROPOSED DRAINAGE CONCEPT

REACH III			
IRONWOOD TO U.S. 60			
DESIGN L.S.M. / DRAWN R.D.G. / CHECK R.L.M.	SCALE HORZ. 1"=400' VERT.	JOB NO. 1005-01	DATE 11-18-96 / SHEET 1 OF 2

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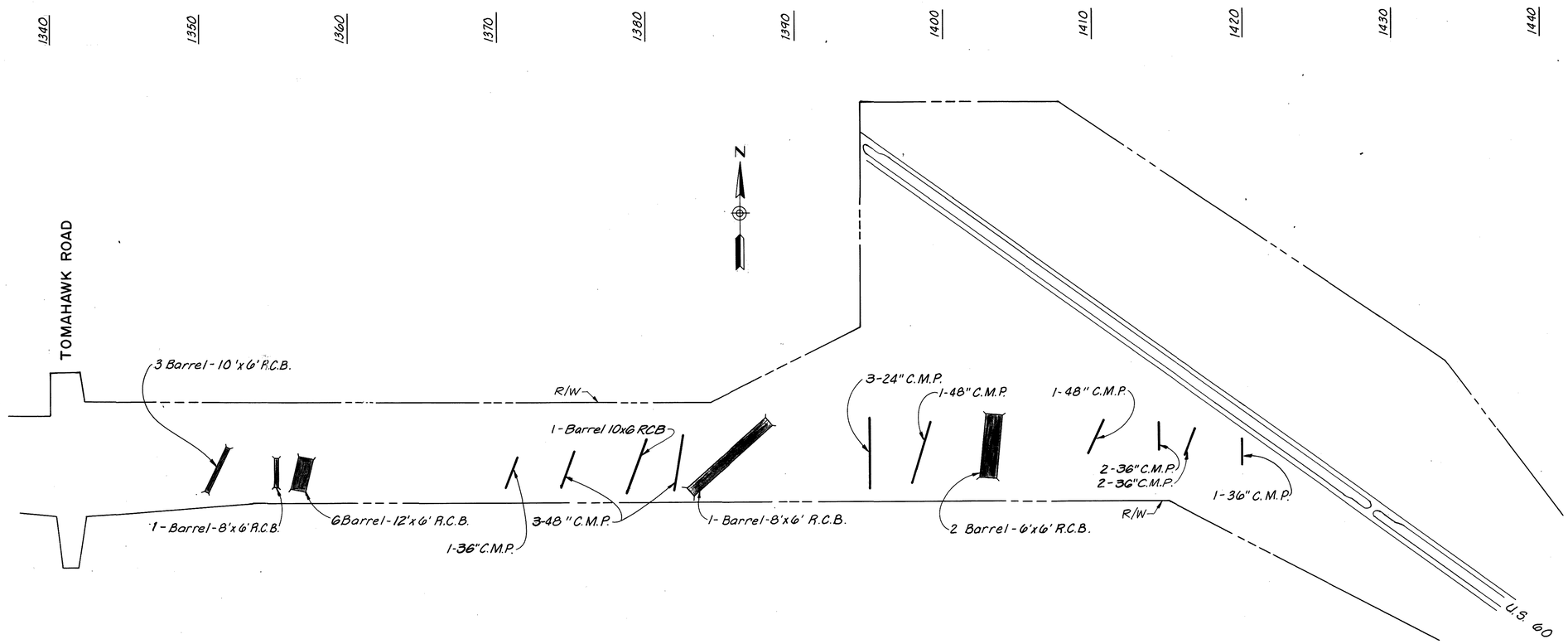

LEGEND

—·····—	Wash Flowline
— — — —	Right of Way (R/W)
	Box Culvert (R.C.B.)
———	Pipe Culvert (R.C.P. or C.M.P.)
═══	Open Channel
	Basin Area
►	Side Slope
T.S.	Toe of Slope
T.B.	Top of Bank

PLATE III-2
PROPOSED DRAINAGE CONCEPT

REACH III
IRONWOOD TO U.S.60

DESIGN G.A.M.	SCALE	JOB NO.	DATE	SHEET
DRAWN R.E.B.	HORZ. 1"=400'	7009-01	11-19-86	2 OF 2
CHECK R.E.M.	VERT.			

AN WEST INC.
Consulting Engineers
PHOENIX, ARIZONA