Del Webb's Sun City West—Expansion Area

MASTER DRAINAGE REPORT

FOR

SUN CITY WEST EXPANSION AREA

Prepared For

DEL E. WEBB DEVELOPMENT CO. L.P.,
a Delaware Limited Partnership,
Developer

DEL WEBB HOME CONSTRUCTION, INC.
an Arizona Corporation,
Owner

Prepared By

STANLEY CONSULTANTS INC.
3117 North 16th Street
Phoenix, Arizona 85016
(602) 279-0901

Prepared: July, 1992

Revised: August 11, 1992

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14393
RICHARD B.
HOPPE
8-13-92

Prepared: July, 1992

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PREFACE

This report supersedes the Conceptual Master Drainage Report for the proposed Sun City West Expansion Area. The conceptual report was initially submitted to Maricopa County in January 1992. It was revised according to review comments from the Flood Control District in March 1992 and accepted by the District in a memo to the County Department of Planning and Development dated April 9, 1992.

As its title implied, the conceptual report encompassed preliminary land use and layout and proposed methods of analysis based on the County's Hydrologic Design Manual. A conceptual HEC-1 model of the study area and proposed development was also presented. This new report is an extension of the conceptual one. It will utilize much of the same narrative, approach, methods and basic modeling techniques and parameters from the conceptual report. It will drop the "conceptual" term in the title and address the actual hydrologic and hydraulic design of proposed grading, drainage and golf course improvement plans.

In addition, it will address some interim aspects of drainage that will be employed until the development is completed and permanent drainage improvements are in place. This includes grading and drainage design intended to reduce or eliminate sources of soil loss associated with construction grading. Additional drainage submittals will be made with each future subdivision unit that address drainage of roadways, storm drains and drainage channels specifically associated with that unit.

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INTRODUCTION

This report has been prepared at the direction of Del E. Webb Development Co., L.P., a Delaware limited partnership (hereinafter, Del Webb) for submittal to the Flood Control District of Maricopa County. It was prepared in support of Del Webb's proposed Sun City West Expansion Area.

The Development Master Plan titled "Sun City West Expansion" is to govern 884.7 acres situated immediately north of Sun City West and is planned as an expansion of the existing Sun City West active-adult community. Development plans consist primarily of single family lots, casitas, an 18-hole regulation golf course, a multi-purpose community recreation center and a small commercial parcel. See Figure 1 for Vicinity Map.

Residential portions of the Expansion Area consist primarily of single family units on lots averaging 6,000 to 8,000 square feet. Multi-family casitas are planned on three parcels near the center of the master plan. The golf course is a "target" course where about half is turf and the other half is decomposed granite or similar ground cover with low water use landscaping. Open space parcels are located throughout the master plan incorporating portions of the golf course with entry features including several permanent lakes.

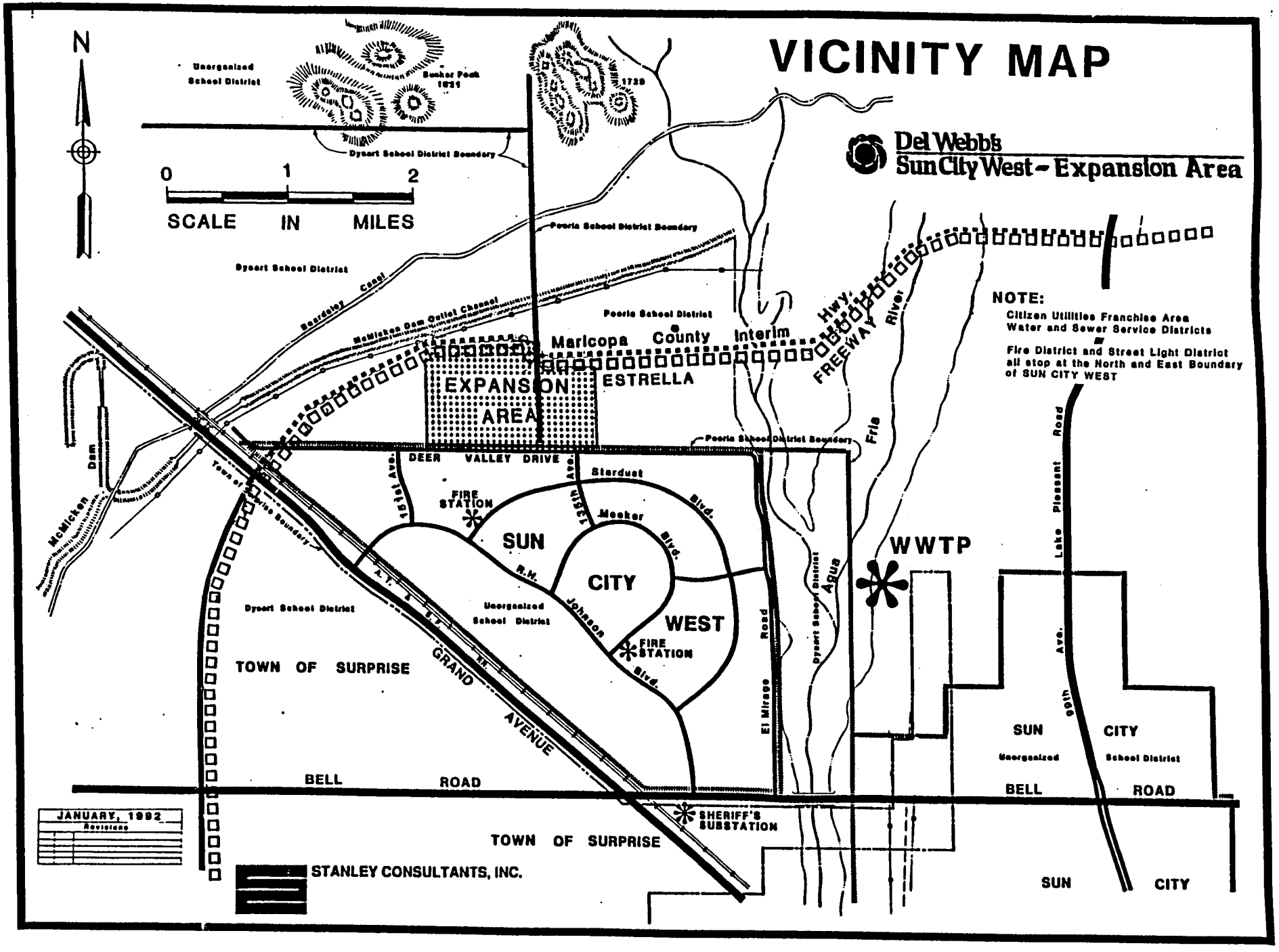

VICINITY MAP
Del Webb's
Sun City West - Expansion Area
N
0 1 2
SCALE IN MILES
Unorganized School District
Bunker Peak 1821
1729
Dysart School District Boundary
Peoria School District Boundary
Dysart School District
Beardsley Canal
McMicken Dam Outlet Channel
Peoria School District
Maricopa County Interim Hwy.
FREEWAY
River
Fris
EXPANSION AREA
ESTRELLA
Peoria School District Boundary
DEER VALLEY DRIVE
151st Ave.
136th Ave.
Stardust Blvd.
Meeker Blvd.
FIRE STATION
SUN CITY WEST
R.H. Johnson Blvd.
FIRE STATION
Unorganized School District
Dysart School District
TOWN OF SURPRISE
A.T. & S.F.
GRAND AVENUE
El Mirage Road
Dysart School District
Agua
WWTP
Lake Pleasant Road
99th Ave.
SUN CITY
Unorganized School District
BELL ROAD
SHERIFF'S SUBSTATION
TOWN OF SURPRISE
SUN CITY
McMicken Dam
Town of Surprise Boundary
NOTE:
Citizen Utilities Franchise Area
Water and Sewer Service Districts
Fire District and Street Light District all stop at the North and East Boundary of SUN CITY WEST
JANUARY, 1992
Revisions
STANLEY CONSULTANTS, INC.

FIGURE 1

The existing property is undeveloped desert with a light to moderate cover of brush, trees and some cacti and a seasonal cover of grass. Soils are primarily fine textured alluviums ranging from sandy loam to clay loam with surface gravels present in some areas. There is an existing livestock water tank in the south-central portion of the property. The overall slope is from northwest to southeast at about 2/3 percent and the terrain is relatively flat and uniform. There are a number of existing washes that cross the parcel.

To the south is Deer Valley Drive which is an existing 2-lane paved roadway. South of Deer Valley Drive is the existing Sun City West development. To the west and north is existing undeveloped desert similar to the onsite area. The proposed Estrella Freeway will pass across the northern edge of the property. It is not due for construction for several years but approximately 50 acres of right-of-way from the Expansion Area property will be set aside for it at this time. Maricopa County proposes an interim highway along the freeway's north right-of-way limit. To the east of the site is an existing citrus orchard.

Drainage in the area is generally from northwest to southeast. The upper limit of offsite contributing area is the existing McMicken Dam Outlet Channel which passes just north of the property. This is a combination open channel and levee that conveys the discharge from McMicken Dam, which is located west of Sun City, east toward the Agua Fria River. The outlet Channel discharges to an existing wash near the alignment of 123rd Avenue, which, in turn, conveys the flow south to the Agua Fria River. The Outlet Channel has sufficient capacity to carry both the 100-year McMicken discharge and the concurrent local 100-year flows that it intercepts along its path.

Drainage from the area south of the McMicken Dam Outlet Channel, including the Expansion Area property, moves southeasterly as both shallow overland flow and shallow concentrated flow in existing washes. Typically, washes are on the order of 1 to 3 feet in depth and 5 to 25 feet in width. This drainage collects along the north side of Deer Valley Drive in an existing drainageway which extends from Grand Avenue east to about 123rd Avenue where it joins the same wash that receives the McMicken Dam Outlet Channel discharge.

This drainageway, from Grand Avenue to the eastern boundary of the subject property, is shallow and overgrown with trees and brush. To the east of the property, this drainageway becomes a formal channel with a clean uniform trapezoidal cross section. This channel was constructed by Del Webb. The drainage system along Deer Valley Drive protects the existing Sun City West from offsite flows. The Deer Valley drainageway is classed as a major drain under the Uniform Drainage Policies and Standards for Maricopa County because of the size of its contributing area.

A second drainageway exists running north to south along the west side of the existing citrus orchard. This is a shallow, more or less continuous channel that is overgrown with trees and brush. It provides a degree of drainage protection for the citrus orchard by directing shallow flows south to the drainageway along Deer Valley Drive. All the area, then, north of Deer Valley Drive, east of Grand Avenue, south of the McMicken Dam Outlet Channel and west of the citrus orchard drains toward the southeast corner of the proposed expansion property where it enters the improved Deer Valley Drive channel.

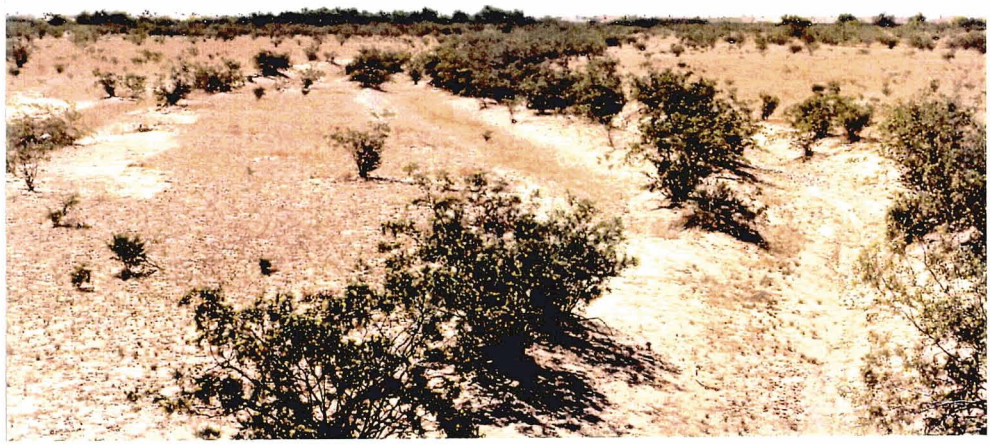


PLATE 1 TYPICAL ONSITE EXISTING DESERT. PHOTOGRAPH TAKEN NEAR CENTER OF PROPERTY LOOKING SOUTHEAST.

PLATE 2 TYPICAL WASH ONSITE. BOTTOM WIDTH IS ABOUT 2 TO 3 FEET. PHOTOGRAPH TAKEN LOOKING SOUTHEAST NEAR CENTER OF PROPERTY.

PLATE 3 TYPICAL REACH OF McMICKEN DAM OUTLET CHANNEL LOOKING EAST (DOWNSTREAM) NEAR NORTHWEST CORNER OF PROPERTY.

PLATE 4 DRAINAGEWAY ALONG EAST SIDE OF PROPERTY LOOKING SOUTH (DOWNSTREAM). EXISTING CITRUS ORCHARD TO EAST.

PLATE 5 EXISTING DRAINAGE CHANNEL ALONG DEER VALLEY DRIVE LOOKING EAST (DOWNSTREAM) FROM ABOUT 135TH AVENUE.

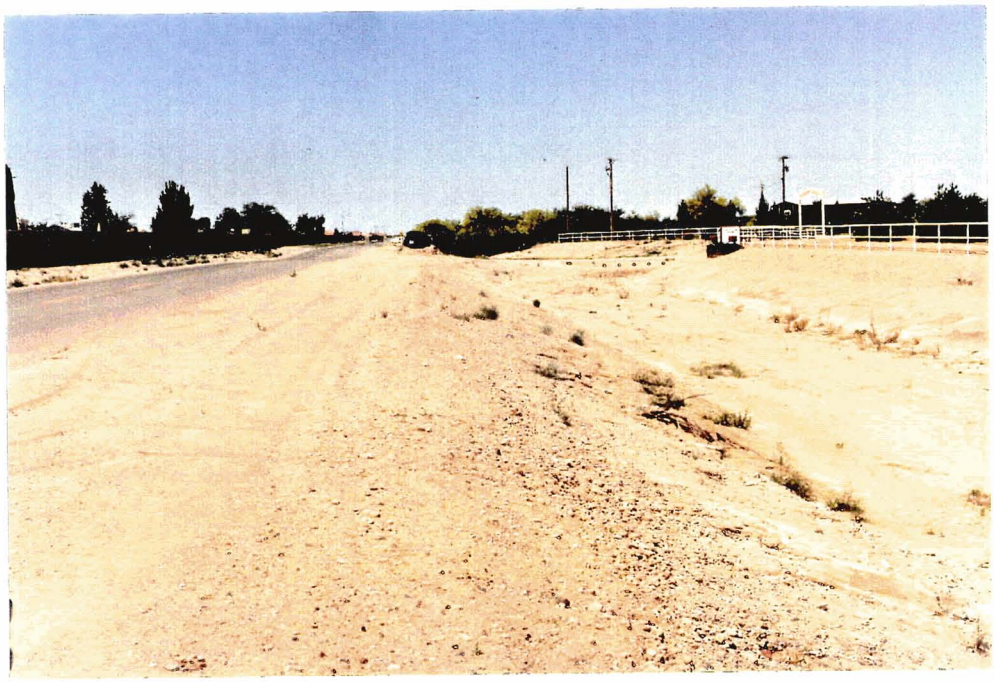


PLATE 6 EXISTING CHANNEL ALONG DEER VALLEY DRIVE LOOKING WEST (UPSTREAM) NEAR 135TH AVENUE.

According to the Flood Insurance Rate Map for Maricopa County, Arizona and Incorporated Area, the proposed expansion property falls on map panel numbers 04013C1135E, 1145E, 1155E and 1165F (See Figure 2). These four map panels all carry the revision date of September 4, 1991. The property is designated on these maps as being within flood insurance Zone X. This zone is defined as follows:

> Zone X-Areas of 500-year flood; areas of 100 year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

This appears to be a fairly accurate assessment of the general flood potential of the property and surrounding area for insurance purposes. There is no federal mandatory requirement for flood insurance on structures in Zone X.

The proposed expansion property is not located within any formal basin-wide master drainage plan or Area Drainage Master Study (ADMS). The property was included as offsite contributing area to Sun City West in a previous master drainage report prepared by HDR Engineers in 1977. That report estimated peak flows contributing at various points to the drainageway along Deer Valley Drive. Hydrology was based on the Soil Conservation Service TR-20 computer watershed model.

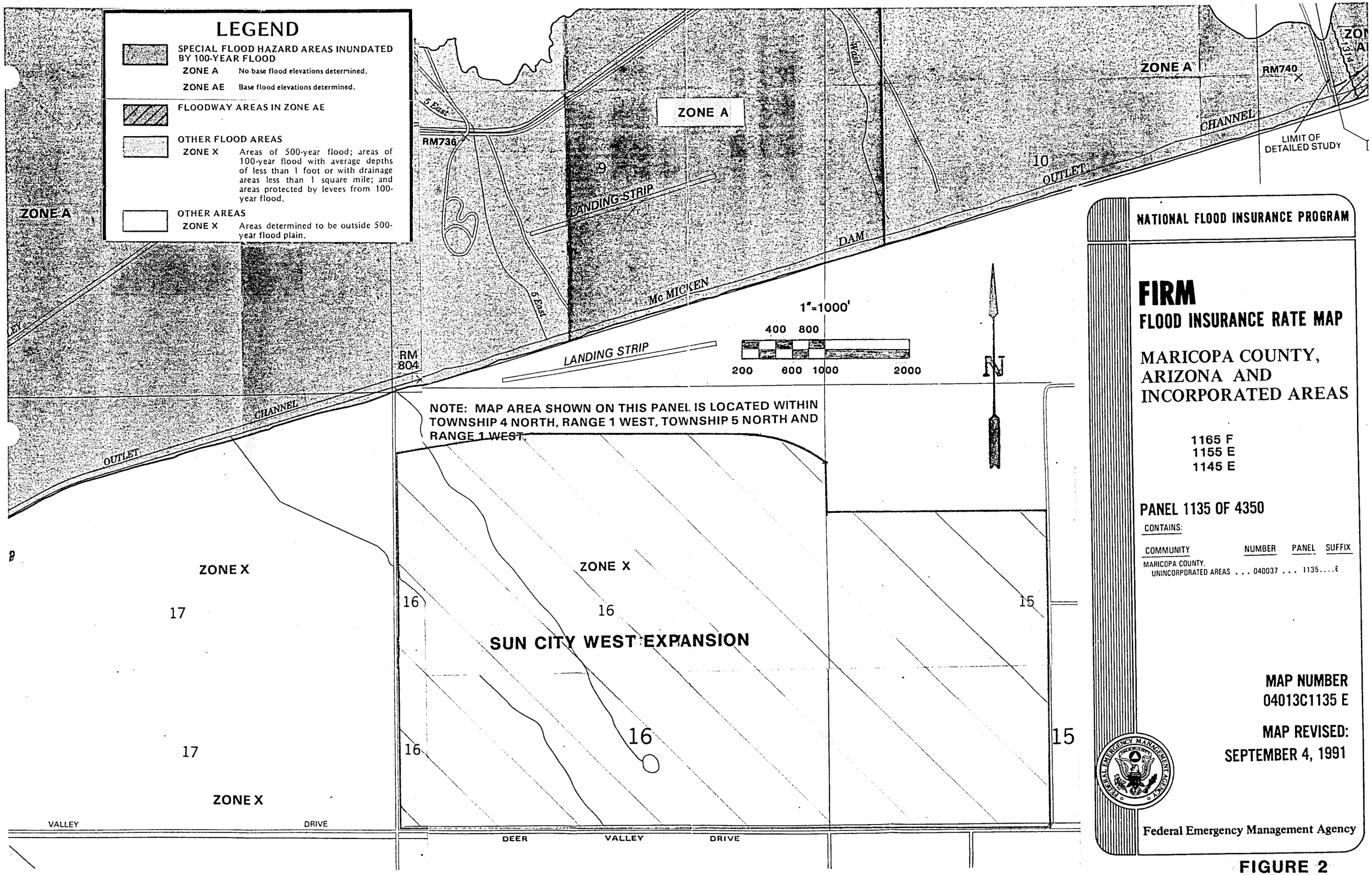

LEGEND
SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD
ZONE A No base flood elevations determined.
ZONE AE Base flood elevations determined.
FLOODWAY AREAS IN ZONE AE
OTHER FLOOD AREAS
ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.
OTHER AREAS
ZONE X Areas determined to be outside 500-year flood plain.
ZONE A
ZONE A
ZONE A
RM736
RM740
RM 804
5 East
9
10
LANDING STRIP
LANDING STRIP
DAM
Mc MICKEN
OUTLET
CHANNEL
LIMIT OF DETAILED STUDY
1"=1000'
400 800
200 600 1000 2000
N
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 4 NORTH, RANGE 1 WEST, TOWNSHIP 5 NORTH AND RANGE 1 WEST.
ZONE X
ZONE X
ZONE X
17
17
16
16
16
16
15
15
SUN CITY WEST EXPANSION
VALLEY DRIVE
DEER VALLEY DRIVE
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS
1165 F
1155 E
1145 E
PANEL 1135 OF 4350
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS . . . 040037 . . . 1135. . . . E
MAP NUMBER
04013C1135 E
MAP REVISED:
SEPTEMBER 4, 1991
Federal Emergency Management Agency

FIGURE 2

BASIC DESIGN CRITERIA

The basic design criteria for this report can be found in four primary documents from the Flood Control District of Maricopa County. The first is the Uniform Drainage Policies and Standards for Maricopa County, Arizona dated February 25, 1987. It is intended to standardize drainage requirements for Maricopa County including incorporated areas.

The second document is the Drainage Regulation for the Unincorporated Area of Maricopa County, Arizona, published October 5, 1988. It's purpose is to implement and enforce drainage standards in unincorporated areas through the requirement for drainage clearances and submittal of plans and reports.

The third document is the Hydrologic Design Manual for Maricopa County (hereafter referred to as the Hydrology Manual) dated September 1, 1990. This manual outlines methods to be used in the study of hydrology in Maricopa County. Its development was the direct result and one of the primary objectives of the Uniform Drainage Policies and Standards. The Manual is currently under revision. All HEC-1 hydrology models in this report are based on the MCUHP1 loader program dated revised December 16, 1991.

The fourth document is the Draft Drainage Design Manual for Maricopa County, Volume II, Hydraulics (subsequently referred to as the Hydraulics Manual). It is dated November 1991 and is currently under review by the Flood Control District and the hydrologic and engineering community in general. It is not known at this time when this document will be officially adopted. Its use in this report will generally be as a technical reference and guideline.

The basic design storm for this project will be the 100-year, 2-hour storm. This applies to the design of both stormwater conveyance systems and detention basins. In addition to the 100-year storm, frequencies of 2, 10 and 50 years have been considered in the design of channels, golf course drainage and culvert design. Discharges from the property under developed conditions will be as close as possible in location to existing conditions with depth and velocity no greater than existing conditions. The peak discharge after development will not exceed existing conditions.

The hydrologic model in this report will use the Clark unit hydrograph method with Green-Ampt rainfall losses based on the Hydrologic Design Manual. The Clark Unitgraph method will also be used for any future updates, master plan revisions or drainage design where hydrograph routing is involved. The Rational Method will be used for subsequent design of individual subdivision units, and commercial and recreation center parcels where hydrographs and hydrograph routing are not required.

Stormwater detention basins will be designed for the peak 100-year 2-hour runoff volume from the overall developed site. Detention basins will be designed to discharge their entire volume within a 36-hour period. Drainageways will be designed to convey 100-year peak discharges with freeboard. Hydraulics for this report are based on a variety of different analyses including normal depth, standard step backwater, weir, orifice and standard culvert hydraulics.

Streets will be designed to carry flows in accordance with Maricopa County criteria. The 10-year flow must be conveyed within the street section without going over the curb and the 50-year flow must not exceed 0.30 feet above the curb. The maximum allowable flow rate and

velocity in any street are 100 cfs and 10 ft/sec respectively. Storm drains or channels will be provided where necessary to limit the amount of flow carried in the streets. Culverts will be designed so that there is no more than 6" of flow going over the roadway in a 100-year event and no flow over the roadway in a 50-year event. Finished floors will be above the maximum 100-year high water elevation.

PROPOSED DRAINAGE SYSTEM

Drainage from offsite areas will be intercepted by a perimeter channel system and conveyed to locations where it can enter the proposed development. Along the west boundary, there will be a concrete lined trapezoidal channel. Along the north side, a channel is proposed in conjunction with the landscaped buffer area adjacent to the proposed Estrella Freeway. Preliminary design for the north channel has been done on the basis of both an earth channel concept and a gunite lined channel. The north channel will receive flow from future Estrella Freeway drainage culverts. This north channel does not currently fall entirely within the expansion property boundary (See Figure 3, Appendix A). This discontinuity will be corrected through proposed land trades involving the acquisition of right-of-way for the Estrella Freeway. If the missing parcel cannot be acquired, the channel will be routed just inside the current boundary as illustrated on Figure 3. Preliminary channel grades and hydraulics have been done for both alignments.

Offsite flows will enter the property at two locations along the west boundary and one location along the north boundary (See Figures 3, 4 and 5 in Appendices A and B). This drainage will be conveyed from the point of entry to the proposed golf course/open space area via concrete lined trapezoidal channel. Trapezoidal channels, where used, will generally have a bottom width ranging from 10 to 20 feet and side slopes of 0.5 horizontal to 1.0 vertical. Offsite flows will then be conveyed through the development via the golf/open space areas to the southeast corner of the property.

Conveyance within the golf/open space area is primarily by means of open channels. These channels generally have a non-uniform cross-section and a combination of turf, stone or bare soil ground surface. Vegetation, from a hydraulic standpoint, will generally be designed to minimize obstruction. The golf/open space conveyance system includes a series of detention basins and localized depressed areas which maintain minimum design slopes in turfed areas. Incorporated with these basins and depressed areas is a system of 12" to 24" diameter drainpipe interconnecting them to a downstream outfall. This outfall generally consists of either the next depression or detention basin downstream or an open golf course channel or one of the permanent lakes. Flow velocities will generally be kept to non-erosive values although short duration velocities of erosive potential are found in some localized areas. Conversely, minimum flow velocities have also been considered to maintain transport of sediment loads through the project from offsite areas.

Onsite developed areas will be designed to surface drain via streets to localized outfalls within the golf/open space area. Streets will range in size from residential 32 feet wide and 4 inch roll curb to major arterial 68 feet wide and 6 inch vertical curb. No inverted crown streets are proposed at this time. Contributing sub-basins will be kept as small as reasonably possible in final design to minimize the amount of flow carried in the streets. Storm drain and catch basin systems or open channels will be provided where street capacities exceed allowable criteria.

Culverts will be provided under roadways at various locations in conjunction with the golf course/open space channels. Culvert sizes range from single 36-inch diameter pipe to multiple barrel box culverts. Golf cart underpasses will be provided at three locations where the golf

course intersects the proposed Deer Valley Road alignment. These underpasses will generally consist of an 8' x 8' concrete box culvert. Underpass culverts will be hydraulically separate from low flows but may carry some of the higher flows, thus acting as a safety valve. Their potential capacity is not considered in sizing the primary conveyance culverts.

Detention basins for onsite development will be provided in the golf/open space area. These basins cover a wide range of configurations and volumes. Some are no more than minor depressions 1 or 2 feet deep. Others are 5 to 6 feet deep and capable of holding over 30 acre feet.

The smallest basins are too numerous and insignificant to model individually but in many instances, their volumes have been included within a single larger basin. Many of the smaller depressions are not modeled at all in HEC-1 as detention basins. All of the detention basins that incorporate permanent lake features do not include any volume below the normal lake water surface in the HEC-1 elevation-volume relationship.

There are a total of 18 detention basins modelled in HEC-1. Half of these basins receive runoff from onsite contributing areas only. The other half will receive both onsite and offsite drainage. Collectively, their maximum stage volumes will just exceed the total excess rainfall generated by the onsite area for the design storm.

Detention basin outlets generally consist of either a small diameter pipe (such as the 12" to 24" interconnecting drainpipe mentioned previously) used in combination with a weir for overflow or they will consist of a roadway culvert. Culverts range in size from 36" diameter pipe to

multi-barrel boxes. The lower-most detention basin at the southeast corner of the Expansion Area will discharge flow to the existing channel along Deer Valley Drive using a short section of open channel.

Onsite grading of future subdivisions will differ significantly from the typical grading scheme in Sun City West south of Deer Valley Drive. Instead of the lots being mass graded and sharing a common rear yard drainage swale, they will typically be graded to outfall individually to the street in front of the lot. This will eliminate the need for rear and side yard drainage easements and the potential drainage conflict with future fencing and landscaping. Rear yards which adjoin golf course or open space areas will typically drain out the back to those areas.

HYDROLOGIC ASSUMPTIONS AND METHODS

The Corps of Engineers HEC-1 computer hydrograph program, version 4.0 dated September 1990 was used in this report to generate and route synthetic hydrographs. This version contains Green-Ampt loss rate functions, which, along with the Clark Unitgraph option are required by the Flood Control District's Hydrologic Design Manual for contributing areas greater than 160 acres. Clark Unitgraph hydrology will be used as the basis of design for storm water detention, offsite and major onsite drainage channels, golf course conveyance, storm drain trunklines and other major drainage features on an overall master plan basis.

A version of the Rational Runoff Method is also presented in the Hydrology Manual. It will not be used for design in this report but may be used to estimate peak flows for drainage design of future individual parcels within the Expansion Master Plan. Generally, its use would be limited to those applications where only volume and peak flow estimates are needed and hydrograph routing is not involved. For example, it might be used as the basis for checking street flow capacity, design of minor drainage channels and swales, catch basin inlets and minor storm drain laterals.

A similar combination of methods was used with the existing Sun City West development south of Deer Valley Drive. The SCS TR-20 method was used for hydrograph routing and design of major drainage features while the Rational Runoff Method is used for individual subdivisions. Certain adjustments have been made to Rational Method parameters in Sun City West so that flow rates are comparable to those from TR-20.

Since there will be circumstances in the future where either the Clark Unitgraph or Rational Method are applicable, a brief evaluation of comparative results will be presented in this report for three selected onsite sub-basins. These comparative calculations will be made using the same basic area, length, slope, resistance coefficient and rainfall data. Calculations and results will be discussed in the conclusion section of this report.

Rainfall data for this report is taken from the Hydrology Manual. The 100-year 2-hour rainfall amount for use with the Clark Unitgraph method is estimated at 2.77 inches. This storm total was used in conjunction with the 2-hour distribution from Table 2.2 of the Hydrology Manual. No aerial reduction was assumed for the HEC-1 model. Future Rational Method calculations will use the rainfall intensity-duration-frequency relation of Figure 3.2 of the Hydrology Manual. No location adjustment was made for rational rainfall intensity in the comparisons to the Clark Unitgraph contained in this report.

Drainage sub-basins for the HEC-1 models are shown on Figures 3, 6, and 7 in Appendices A and B. Their areas were estimated through the use of a digital planimeter. Right-of-way for the proposed Estrella Freeway was considered as offsite area, existing desert. Areas are estimated to the nearest 0.001 square mile. The HEC-1 program uses this level of accuracy in its computations but rounds off the output data to the nearest 0.01 square miles. Rational method will use area in acres.

Times of concentration are estimated using essentially the same methodology for both the Clark Unitgraph and Rational Methods. Both methods use the same basic equation (equation

3.2/5.5 of the Hydrology Manual) to estimate floodwave travel time as a function of watershed length, resistance, slope and rainfall intensity. This equation is:

$$Tc = 11.4L^{0.5}\, Kb^{0.52}\, S^{-0.31}\, i^{-0.38}$$

The only difference in application is that Clark Unitgraph uses the intensity of rainfall excess and the Rational Method uses direct rainfall intensity. Slopes and lengths have been estimated for the HEC-1 model based on preliminary street layout and mass grading plans.

The watershed resistance coefficient, Kb, in the time of concentration equation is estimated using the following equation from the Hydrology Manual:

$$Kb = m \log A + b$$

where A is the contributing area in acres and m and b are equation parameters taken from Table 3.1/5.1 of the Hydrology Manual. For contributing areas with more than one land use, m and b parameters are area-weighted. Table 1 summarizes the basic parameters used in the HEC-1 model. In relative terms, residential and commercial land use has the least resistance, golf course and open space has the greatest resistance and existing desert falls mid-range between the two.

TABLE 1 RESISTANCE COEFFICIENT PARAMETERS

	m	b
Residential, Commercial, Rec. Center	-0.00625	0.04
Existing Desert	-0.016	0.10
Golf Course/Open Space	-0.025	0.15

Watershed storage coefficient, R, is a function of time of concentration, area and length based on equation 5.6 of the Hydrology Manual. This equation is:

$$R = 0.37\ Tc^{1.11}\ A^{-0.57}\ L^{0.80}$$

Test runs indicate that Tc and R are particularly sensitive to selection of m and b parameters used in estimating Kb. Tc and R for Clark Unitgraph are calculated using the MCUHP1 program dated revised December 16, 1991. MCUHP1 is used in conjunction with a Lotus 123 spreadsheet developed by Stanley Consultants which processes raw data, assembles the results and redirects them as a batch file through MCUHP1. Rational Method Tc is calculated by hand.

The time-area relationship for urban watersheds from Table 5.2 of the Hydrology Manual was used for all onsite developed sub-basins. All offsite sub-basins and the existing condition onsite area use the natural watershed time-area relationship from Table 5.2. The HEC-1 computation time interval was chosen at 5 minutes.

Green Ampt rainfall loss rates for all offsite sub-basins and the onsite existing condition sub-basin are area-weighted values based on soil texture classifications and the parameters in Table 4.2 of the Hydrology Manual. All soils found in the study area are classified in hydrologic soil group B. DTHETA is based on the dry value and XKSAT is adjusted assuming a vegetation cover of 25%. Initial surface retention loss, IA, for existing conditions was assumed to be 0.35 inches and impervious area was assumed to be 1 percent. The existing surface cover of gravel which occurs in parts of the study area was assumed to not affect rainfall losses.

Procedures for estimating Green and Ampt loss rates and percent impervious for urbanized areas are not directly presented in the Hydrology Manual so a number of interpretations and assumptions have been made. Contributing area is assumed to consist of either impervious or pervious land use. The impervious land use is further broken into connected and non-connected area.

Connected impervious is considered separately in HEC-1. It consists of such things as roofs, driveways, sidewalks, streets and parking lots which are directly connected to a means of runoff conveyance such as a street or drainage channel. Estimates of connected impervious are entered in HEC-1 as percent of total area. This area produces 100 percent runoff. Estimates range from 1 percent for golf course and existing desert to 25 percent for residential to 80 percent for commercial and recreation center land use.

A non-connected impervious area is not directly connected to a means of runoff conveyance. Its runoff must flow over adjacent landscaped or other pervious surfaces where infiltration may occur. Non-connected impervious area is included with pervious area and loss rates for both are assumed to be reflected by soil parameters DTHETA, PSIF and XKSAT.

Basic soil parameters for the developed condition were assumed to be the same as the weighted parameters for the onsite existing condition. This presumes no change due to grading and earthwork. DTHETA assumes the dry condition except for the golf course and open space areas which assume half dry and half normal conditions. XKSAT is modified assuming 25 percent vegetative cover (same as existing condition) except in the golf course/open space area where half is assumed to have 100 percent cover and the other half is assumed at 25 percent.

In addition to the connected impervious and Green-Ampt soil loss considerations, HEC-1 also considers an initial rainfall abstraction or surface retention loss. In HEC-1, this loss only applies to pervious and non-connected impervious land use. Estimates of surface retention loss are estimated from Table 4.1 of the Hydrology Manual and range from 0.10 inches for commercial and recreation center to 0.15 inches for residential land use to 0.35 inches for existing desert or proposed golf and open space.

Rainfall losses for the Rational Method are estimated by a single runoff coefficient parameter. This coefficient varies according to land use. Coefficients were selected based on Table 3.2 of the Hydrology Manual. A 100-year frequency factor of 1.25 is applied to runoff coefficients in anticipation of the next revision of the Hydrology Manual.

In general, all loss rate parameters for onsite developed conditions are area-weighted for sub-basins consisting of multiple land use. A summary of Green and Ampt loss rate parameters, initial abstract and percent impervious as well as Rational runoff coefficients and associated rainfall excess is presented in Table 2.

Hydrograph routing in HEC-1 for this report is performed using kinematic wave and modified Puls options. Kinematic wave routing applies only to concrete lined trapezoidal channels and roadways. Modified Puls routing applies to both channel and detention basin routing in the golf/open space areas. Cross sections for routing purposes are derived from grading and golf course plans. No infiltration/percolation losses are assumed for any modified Puls routing. Longitudinal channel slopes are estimated based on grading and golf course plans. The

TABLE 2

RAINFALL LOSSES FOR ONSITE AREAS

(Rainfall Excess Based on 100-Year, 2-Hour Storm of 2.77 Inches)

CLARK UNITGRAPH LOSS RATES

Land Use	Initial Loss (Inches)	DTHETA	PSIF (Inches)	XKSAT (In/Hr)	RTIMP (Percent)	Rainfall Excess (Inches)
Single Family Residential & Casita	0.15	0.35	5.05	0.23	25	1.87
Golf/Open Space	0.35	0.30	5.05	0.23	1	1.39
Commercial & Recreation Center	0.10	0.35	5.05	0.30	80	2.53
Exist. Onsite Desert	0.35	0.35	5.05	0.23	1	1.46

RATIONAL METHOD RUNOFF COEFFICIENTS

Land Use	Base Runoff Coefficient C	Frequency Factor	Adjusted Runoff Coefficient C	Rainfall Excess (Inches)
Single Family Residential & Casita	0.50	1.25	0.63	1.75
Golf/Open Space	0.28*	1.25	0.35	0.97
Commercial & Recreation Center	0.70	1.25	0.88	2.43

* Composite C based on half turf @ C = 0.20 and the other half desert @ C = 0.35

number of routing steps is one (1) for reservoir routing. For channel routing, it is estimated based on reach length divided by an assumed average flow velocity of 5 feet/second divided by the computation time interval of 5 minutes (or 300 seconds).

Detention basin volumes are estimated by HEC-1 on the basis of elevation-area input. Areas are estimated with the use of a digital planimeter. As mentioned previously, many detention basins reflect the sum of several sub-detention basins within them. The maximum possible depth of any detention basin is 6 feet measured from the lowest ground surface to the highest possible water surface stage. The hydraulics of detention basin outlets is discussed in the Hydraulic Assumptions and Methods section of this report.

HYDROLOGIC MODELS

There are three HEC-1 models presented in this report. Model 11389A1 considers the entire contributing area to the southeast corner of the proposed expansion as one basin, existing conditions. Model 11389A2 takes the same existing condition basin in 11389A1 and breaks it into sub-basins according to onsite and offsite areas. Model 11389B takes the onsite sub-basin in 11389A2 and breaks it into developed condition sub-basins with channel and detention basin routing. In addition to these HEC-1 models, this report will present a comparison of peak flows and volumes from the Rational Method to those from Clark Unitgraph for three selected onsite developed sub-basins.

HEC-1 models 11389A1 and 11389A2 are intended to provide an existing condition peak discharge for comparison to the previous estimate by HDR and to the proposed developed condition. These two models also compare, between each other, the effects of breaking the total area into smaller sub-basins. Offsite flows in model 11389A2 are routed through the onsite area in hypothetical channels. An abbreviated output of HEC-1 model 11389B is included in Appendix C. Full input files of all HEC-1 models are provided on diskette in Appendix A.

HYDRAULIC ASSUMPTIONS AND METHODS

Hydraulic analysis in this report encompasses a variety of items ranging from flow in streets to flow in open channels to discharge through detention basin outlets. Hydraulic methods are taken from a number of sources including the County's Draft Drainage Design Manual, Volume II, Hydraulics. Analysis and calculations are found primarily in Appendix D of this report. References to the applicable source and summaries of major assumptions are generally found with the particular analysis.

An analysis of flow conveyance in streets is included in Appendix D. It is intended primarily as a standardized design aid for future subdivision units although it was also used along with estimated discharges, to locate approximately where storm drains will be required in order to stay within established street conveyance criteria. The street conveyance analysis is based on Manning normal depth.

Approximate storm drain locations are illustrated on Figure 4. No pipe sizing or line grades have been set at this time. In general, storm drain design will be done along with the necessary hydraulic analysis as part of the associated roadway or subdivision improvement plans. Hydrology will be based on a 10-year return frequency in conjunction with 10-year roadway conveyance criteria.

Hydraulic analysis of the open channel system which will intercept flows from offsite areas in the completely developed scenario is based on Manning normal depth. Preliminary grades and channel sections are presented in Appendix D for the channel proposed along the northern boundary of the project. Hydraulics for gunite lined channels along the west boundary and for

those channels which convey offsite flows into the golf course open space area in the completely developed scenario have been addressed on a typical section basis only. These channels will be designed and built at that point in time when they are required to protect adjacent subdivision units.

Hydraulic analysis of detention basin outlets falls into three categories. Hydraulics for basins with outlets consisting of small diameter pipe and overflow weirs is analyzed directly in HEC-1 with basic input provided on SL and SS records. Basic assumptions are listed in HEC-1 input. Detention basin outlets consisting of roadway culverts are analyzed hydraulically using the Hydraulic Engineering Circular No. 5 approach presented in the Hydraulics Manual. Assumptions and basic data are presented in Appendix D. Results are input to HEC-1 via SE and SQ records. Generally, culvert analysis assumes no clogging and no safety grates or associated losses. Outlet flow velocities for all culverts have been estimated based on a Manning analysis assuming no backwater effects. Excessive velocities occur at some culverts. This will be addressed in detail with each future specific culvert design.

Detention basin 330 at the southeast corner of the Expansion Area is unique. Its outlet is neither a weir nor a culvert but a short section of transition channel between the basin and the existing channel along Deer Valley Drive. Detention within basin 330 is created primarily by the restrictive backwater influence of the existing Deer Valley channel. The elevation - discharge relationship for detention basin 330 is based on a short HEC-2 backwater analysis that begins about 300 feet downstream of the Expansion Area's eastern property line. The HEC-2 analysis is presented in Appendix D of this report.

The limits of flooding and ponding within the golf course and open space areas have been delineated on the grading and drainage plans for the Expansion Area which accompanies this report. These limits are approximated on the following basis. Conveyance reaches are analyzed as open channel by either normal depth or standard step backwater. Backwater analysis was run on the southernmost golf course channel due to its size and magnitude of flow. HEC-2 model SCWEH2C is presented in Appendix D for this reach. Flooding limits are based on computed water surface elevations.

Flooding limits on all other conveyance reaches are estimated on the basis of normal depth hydraulics utilizing the routing reach cross sections from HEC-1 model 11389B. Also utilized from HEC-1 to delineate potential ponding limits are the maximum stage elevations for each of the detention basins. In cases where more than one approach was possible, the highest water surface was used to delineate flooding/ponding limits. Because of the generally insignificant capacity of the small diameter golf course drainpipe, it was not considered in any of the conveyance analysis or conveyance flooding limits.

INTERIM DRAINAGE FACILITIES AND FIRST CONSTRUCTION PHASE

The first phase of construction in the Expansion Area involves grading of the entire golf course and three parcels of land which lie in Section 15. These areas will be graded to the contours presented on the grading and drainage plans which accompany the Master Drainage Report. Nearly all of the major drainage and stormwater detention features associated with the golf course as described earlier will be constructed with the first phase of improvements.

Deer Valley Drive culverts associated with concentration points DET190 and DET220 and the Williams Drive culvert associated with concentration point DET270 will be constructed with the first phase of improvements. Their specific design will be included with roadway and subdivision improvement plans for the three parcels in Section 15 which will follow shortly after the grading and drainage plans.

At this time, it is anticipated that all other culverts will be constructed with later phases of development. Proposed detention volumes associated with culverts at concentration points DET40, DET100 and DET150 as modeled in HEC-1 run 11389B will not be provided initially.

Interim drainage which approaches the up-slope side of the golf course will be diverted by temporary ditches and grading along the golf course perimeter. This will direct flows to concentration points anticipated in ultimate design. Temporary silting basins will be provided at these points of inflow to allow some of the heavier sediment to drop out before entering the golf course. Rock-lined spillways and stilling basins will be provided at the golf course inflow points.

CONCLUSIONS

The existing condition peak discharge at the southeast corner of the Expansion Property is estimated at 2,300 cfs for the 100-year 2-hour storm using the Flood Control District's Hydrology Manual. The 1977 report by HDR does not identify this particular location as a concentration point. Based on HDR concentration point 59 which is just downstream from the Expansion Property's southeast corner, the estimated peak discharge is about 1800 cfs. HDR used a 100-year 24-hour storm and the SCS TR-20 watershed model.

The capacity of the existing improved channel along Deer Valley Drive downstream from the expansion property is about 1400 cfs at the top of the south bank. The south bank is about 5.5 feet above the channel bottom. At a depth of 6.5 feet, the capacity is about 2000 cfs. Flow velocities in the channel are on the order of 6 feet per second at bank-full depths.

Hydraulics of the Deer Valley Road channel are based on the HEC-2 backwater analysis in Appendix D which covers the area immediately downstream of the Expansion Area. Based on field inspection and measurement, it appears that the channel has been constructed substantially close to original design and has functioned adequately since constructed in about 1983. Using the estimated existing condition 100-year peak flow of 2300 cfs from this report, there is a potential for overflow indicated on both sides of the channel.

With the proposed expansion of Sun City West, there will be a significant amount of stormwater detention provided on a significant portion of the overall contributing area. Using current drainage criteria, the estimated peak discharge after development will be about 1600

cfs. This would be a net reduction of 700 cfs and would correspond to a depth of just under 6 feet in the channel along Deer Valley Drive.

The proposed Expansion Area comprises almost half of the total area contributing to the channel along Deer Valley Drive at the downstream limit of the proposed expansion. Runoff from slightly more than half of the onsite area is detained in basins that are separate from offsite flow. Detention basins for the remaining area handle both onsite and offsite flows. Collectively, onsite detention basins provide enough volume at their peak stages to just exceed the total 100-year 2-hour detention requirement. Table 3 contains a summary of the onsite areas, their peak flows and their volumes. Table 4 contains a summary of basic detention basin data, peak stages and corresponding volumes. The maximum drawdown time on any of the proposed detention basins is about 10 hours. The average is less than 5 hours and the maximum allowable is 36 hours under County criteria.

Three onsite sub-basins were selected for comparison between the Rational Method and Clark Unitgraph. Sub-basin 210 represents one of the smaller, primarily golf course sub-basins. Sub-basins 290 and 130 represent typical smaller and larger (respectively) primarily residential sub-basins. As mentioned previously, this comparison is made using the same basic watershed area, length, slope, resistance coefficient and rainfall data. Rational Method peak flows were about 15% higher than corresponding Clark Unitgraph peaks for residential basins 130 and 290. This is fair agreement in a hydrologic sense. On the other hand, the Clark Unitgraph peak for golf course basin 210 is about 40% higher than the Rational Method Peak. In general,

Green-Ampt loss rates used with Clark Unitgraph produce about 10% more runoff volume than with corresponding Rational runoff coefficients.

7-20-92

TABLE 4

PEAK FLOWS AND RUNOFF VOLUMES FOR ONSITE SUB-BASINS
100-YEAR, 2-HOUR STORM; HEC-1 MODEL 11389B

SUB-BASIN NUMBER	PEAK DISCHARGE (cfs)	RUNOFF VOLUME (ac-ft)
5	65	3
10	8	1
15	23	1
20	28	1
25	19	1
30	56	3
35	60	2
40	26	1
45	28	1
50	19	1
55	28	1
60	59	3
65	22	1
70	28	1
75	22	1
80	25	1
85	24	1
90	25	2
95	25	1
100	42	2
105	27	1
110	71	2
115	69	3
120	49	2
125	26	1
130	66	3
135	56	2
140	65	4
145	25	1
150	36	1
155	56	2
160	53	2
165	70	3
170	35	1
175	27	2
180	52	2
185	52	3
190	67	2
195	27	1
196	52	4
200	29	1
205	22	1
210	28	1
215	71	3
220	22	1
225	64	2
230	57	4
235	12	1
240	81	4
245	17	1
250	42	2
255	6	1
260	32	1
270	24	1
280	61	3
290	33	1
295	24	1
300	28	1
305	49	2
310	40	2
315	25	1
320	43	3
325	58	3
330	62	4
335	86	3

Total Detention Volume Required 119 ac-ft

TABLE 4 7-16-92

SUMMARY OF DETENTION BASIN CHARACTERISTICS
HEC-1 MODEL 11389B

DET BASIN #	# OF BARRELS	BARREL SIZE	WIER CREST ELEV	WIER LENGTH (ft)	Qin (cfs)	Qout (cfs)	MIN BASIN ELEV	MAX STAGE	LOWEST ADJAC REAR YD	MAX DEPTH (ft)	FREEBRD (ft)	VOLUME @ MAX STAGE (ac-ft)	STORAGE @ WIER CREST (ac-ft)
* 40	2	10'X3'	NA	NA	395	371	1295	1297.9	1300.0	2.9	2.1	1.6	NA
* 45	1	24"	1292.0	190	368	365	1288	1292.8	1296.0	4.8	3.2	3.1	2.0
145	1	24"	1300.5	150	25	14	1296	1297.9	1302.5	1.9	4.6	0.3	3.7
150	2	36"	NA	NA	247	102	1294	1298.8	1300.0	4.8	1.2	5.5	NA
175	1	24"	1293.0	50	135	98	1292	1293.7	1296.0	1.7	2.3	5.5	3.9
185	1	24"	1295.0	30	52	19	1288	1293.8	1296.0	5.8	2.2	1.2	2.3
190	2	36"	NA	NA	149	72	1281	1285.0	1288.0	4.0	3.0	9.6	NA
200	2	24"	1278.0	70	156	65	1273	1278.2	NA	5.2	NA	8.9	8.0
125	2	24"	1273.5	60	295	258	1269	1274.7	1282.0	5.7	7.3	4.3	2.6
* 100	4	12'X4'	NA	NA	1338	1297	1268	1272.8	1275.0	4.8	2.2	7.3	NA
* 220	4	12'X4'	NA	NA	1305	1186	1265	1269.6	1271.0	4.6	1.4	21.0	NA
235	1	12"	1295.5	80	12	3	1293	1293.5	1296.0	0.5	2.5	0.3	1.0
245	2	24"	1292.0	50	157	134	1289	1292.8	1295.0	3.8	2.2	2.4	1.6
* 250	2	24"	1284.5	60	680	610	1281	1286.8	1288.5	5.8	1.7	7.8	2.0
* 270	3	12'X3'	NA	NA	638	614	1281	1284.7	1286.0	3.7	1.3	2.4	NA
* 295	2	24"	1279.0	80	609	599	1276	1280.9	1282.0	4.9	1.1	4.2	1.1
* 300	1	24"	1274.5	140	624	618	1271	1275.9	1279.0	4.9	3.1	5.7	2.9
* 330	TRANS	CHANNEL	NA	NA	1737	1608	1264	1269.4	1272.0	5.4	2.6	32.9	13.7

TOTAL ONSITE DETENTION 124.0 AC-FT

* Detention basin receives combined onsite and offsite flows. All other basins receive only onsite flows.

BIBLIOGRAPHY

1. Uniform Drainage Policies and Standards for Maricopa County, Arizona; February 25, 1987.

2. Drainage Regulations for the Unincorporated Area of Maricopa County, Arizona; October 5, 1988.

3. Hydrological Design Manual for Maricopa County, Arizona; September 1, 1990 with MCUHP1 program dated revised December 16, 1991.

4. Draft Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics; November 1991.

5. Corps of Engineers HEC-1 Computer Hydrograph Package, Version 4.0, September 1990.

6. Corps of Engineers HEC-2 Computer Backwater Program, Version August 1985.

7. Sun City West Drainage Master Plan, HDR Engineers, 1977.

8. Flood Insurance Rate Map for Maricopa County, Panels 04013C1135E, 1145E, 1155E, 1165F, September 4, 1991.

9. United States Geological Survey 7.5 Minute Quadrangles Calderwood Butte and McMicken Dam.

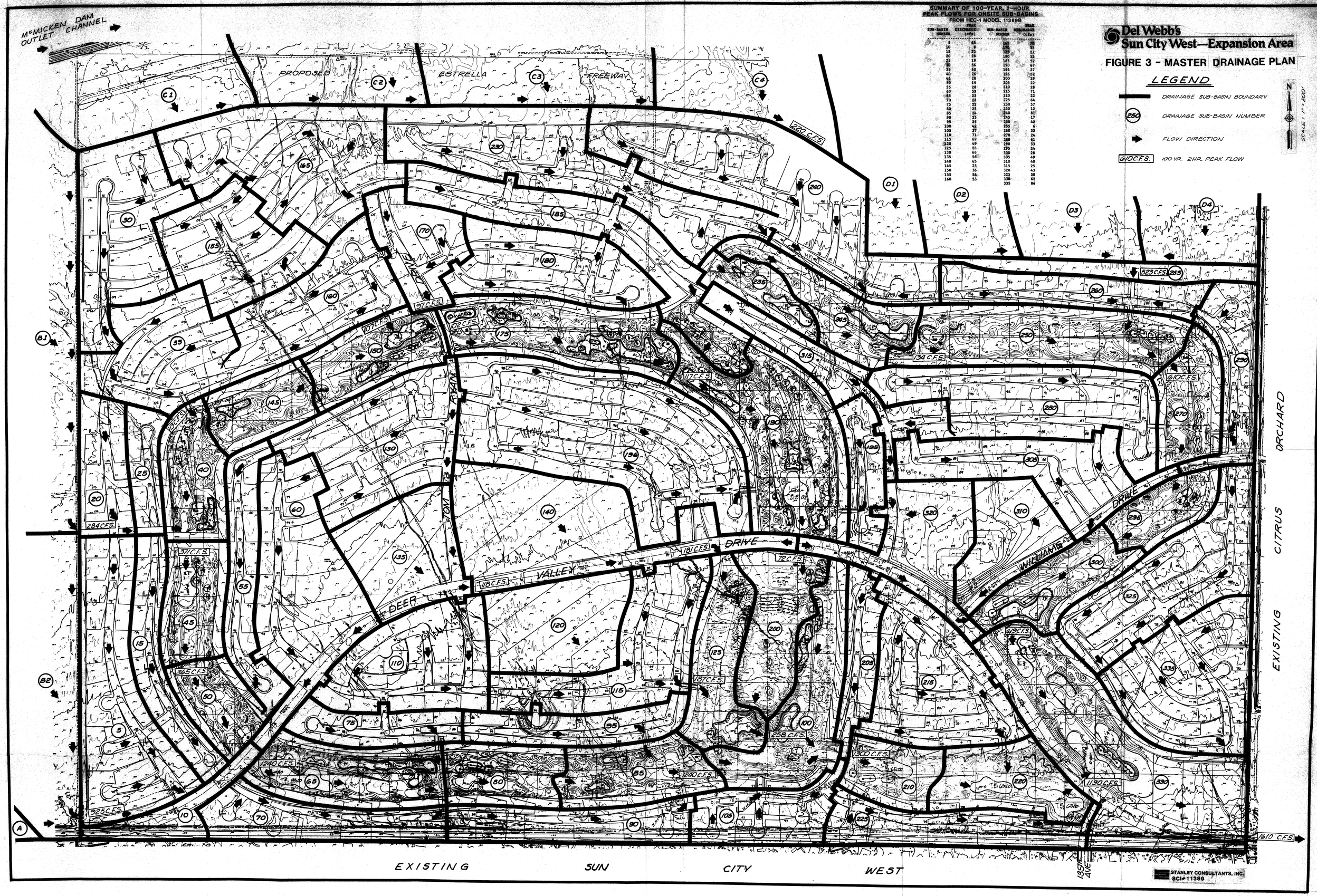
10. Onsite Topography, 1 ft. Contour Interval, Prepared by Kenney Aerial, Dated December 1990.

11. Soil Survey of Maricopa County, Central Part, Soil Conservation Service, September 1977.

GSB/tlb:AUG028

Del Webb's
Sun City West—Expansion Area

FIGURE 3 - MASTER DRAINAGE PLAN

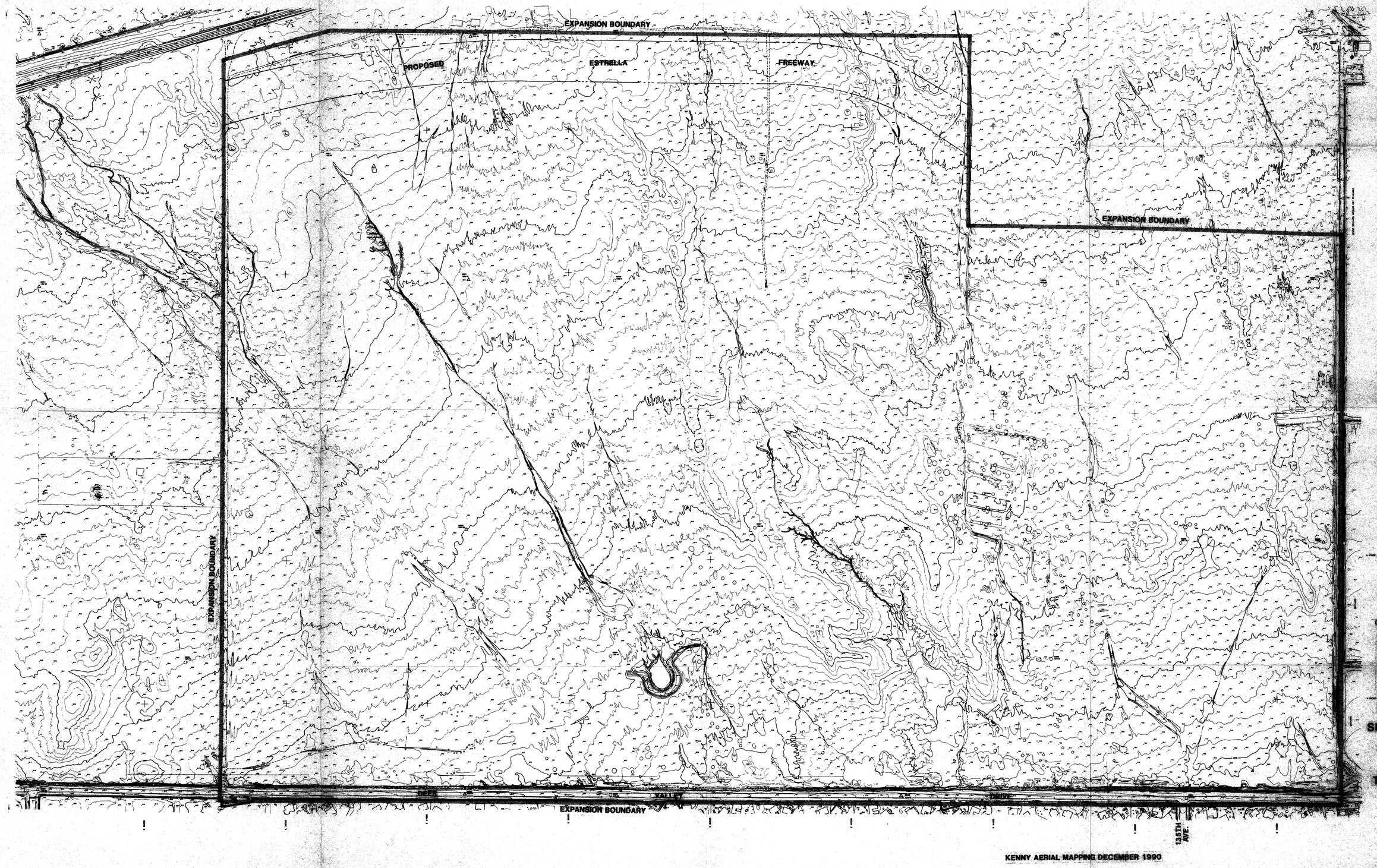


LEGEND

- DRAINAGE SUB-BASIN BOUNDARY
- (250) DRAINAGE SUB-BASIN NUMBER
- FLOW DIRECTION
- 610 C.F.S. 100 YR. 2HR. PEAK FLOW

SUMMARY OF 100-YEAR, 2-HOUR PEAK FLOWS FOR ONSITE SUB-BASINS FROM HEC-1 MODEL 11369B

SUB-BASIN NUMBER	PEAK DISCHARGE (cfs)	SUB-BASIN NUMBER	PEAK DISCHARGE (cfs)
5	65	165	28
10	8	170	55
15	23	175	27
20	28	180	52
25	19	185	52
30	56	190	67
35	60	195	27
40	26	196	52
45	28	200	29
50	19	205	22
55	28	210	28
60	59	215	71
65	22	220	22
70	28	225	64
75	22	230	57
80	25	235	18
85	34	240	81
90	23	245	17
95	25	250	42
100	48	255	6
105	27	260	32
110	71	270	24
115	69	280	61
120	49	290	53
125	26	295	24
130	46	300	28
135	56	305	49
140	65	310	40
145	25	315	25
150	36	320	43
155	56	325	28
160	53	330	62
		335	86



CONTOUR INTERVAL: 1 FT.

N

SCALE 1"=300'

SUN CITY WEST EXPANSION ONSITE TOPOGRAPHY

FIGURE 5

STANLEY CONSULTANTS, INC.
SCI # 11026

APPENDIX B
HYDROLOGY AND SUPPORTING HEC-1 DATA

STANLEY

JOB SUN CITY WEST EXPANSION

SHEET NO. 1 OF 4

CALCULATED BY GSB DATE

CHECKED BY DATE

SCALE

PRECIPITATION: (REFER TO HYDROLOGY MANUAL, CHAPTER 2)

DURATION

FREQUENCY	6-HOUR	24-HOUR
2 YEAR	1.2"	1.5"
5 YEAR	1.7"	2.1"
10 YEAR	2.1"	2.6"
25 YEAR	2.6"	3.2"
50 YEAR	2.9"	3.6"
100 YEAR	3.3"	4.1"

FIGURES 2.2 THRU 2.13

FOR 1-HOUR DURATION:

2 YEAR = $-0.011 + 0.942(1.2)(1.2/1.5) = 0.89$

100 YEAR = $0.494 + 0.755(3.3)(3.3/4.1) = 2.50$

5 " = 1.25"

10 " = 1.55"

25 " = 1.9"

50 " = 2.2"

FIGURE 2.14

FOR 2-HOUR DURATION

2 YEAR = $0.341(1.2) + 0.659(0.89) = 1.00$

100 YEAR = $0.341(3.3) + 0.659(2.5) = 2.77$

FOR 3-HOUR DURATION:

2 YEAR = $0.569(1.2) + 0.431(0.89) = 1.07$

100 YEAR = $0.569(3.3) + 0.431(2.5) = 2.96$

FOR 12 HOUR DURATION REFER TO FIG. 2.15

FOR LESS THAN 1 HR DURATION:

	2YR	5YR	10YR	25YR	50YR	100YR
5MIN	0.30	0.43	0.53	0.65	0.75	0.85
10MIN	0.45	0.64	0.79	0.97	1.12	1.28
15MIN	0.55	0.78	0.96	1.18	1.36	1.55
30MIN	0.60	1.03	1.27	1.56	1.80	2.05

PRODUCT 205-1 NEBS Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380

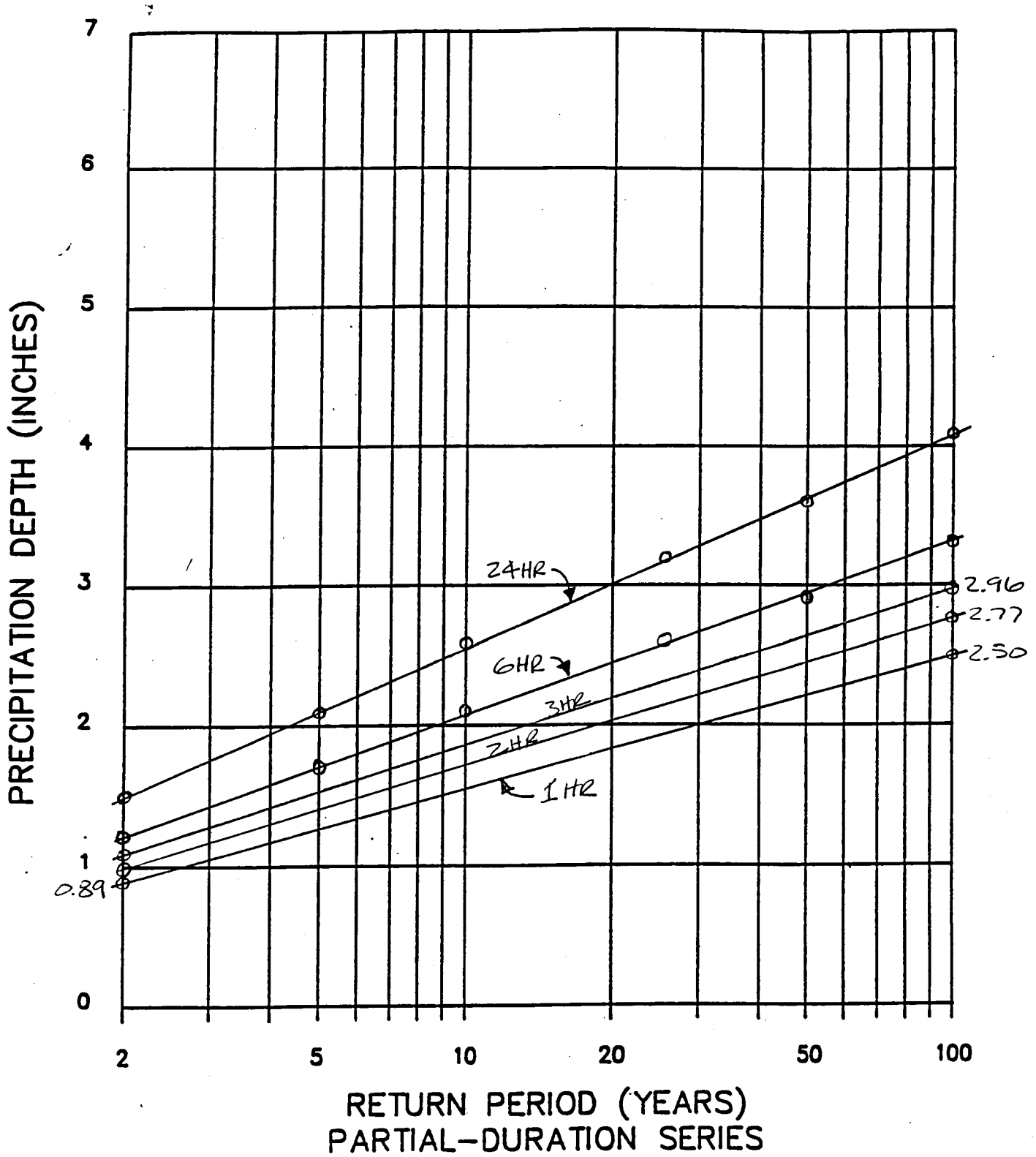


Figure 2.14
Precipitation Depth versus Return Period for Partial-Duration Series

3 of 4

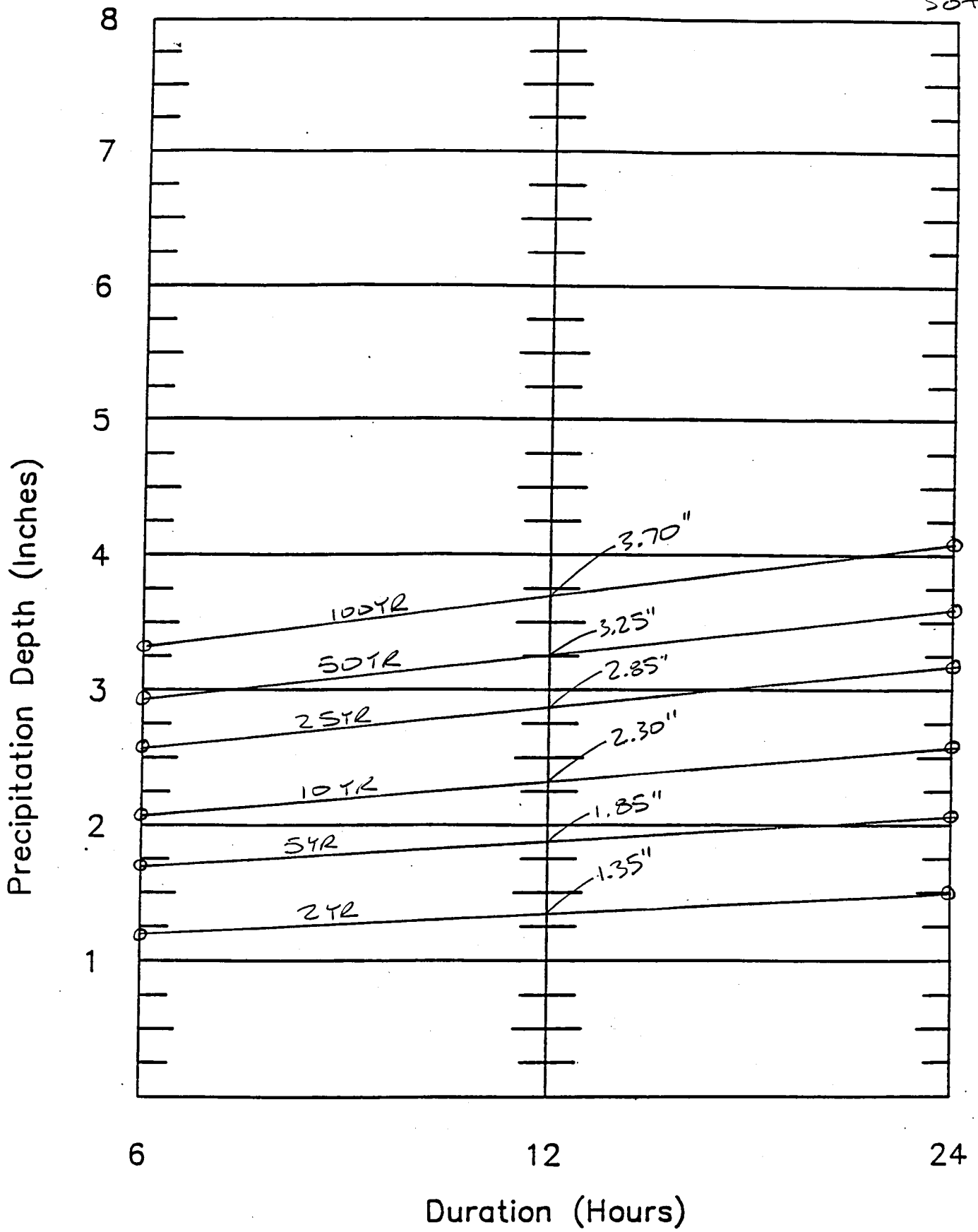


Figure 2.15
Precipitation Depth-Duration Diagram (6 to 24 hour)

STANLEY

JOB SUN CITY WEST EXPANSION

SHEET NO. 4 OF 4

CALCULATED BY GSB DATE

CHECKED BY DATE

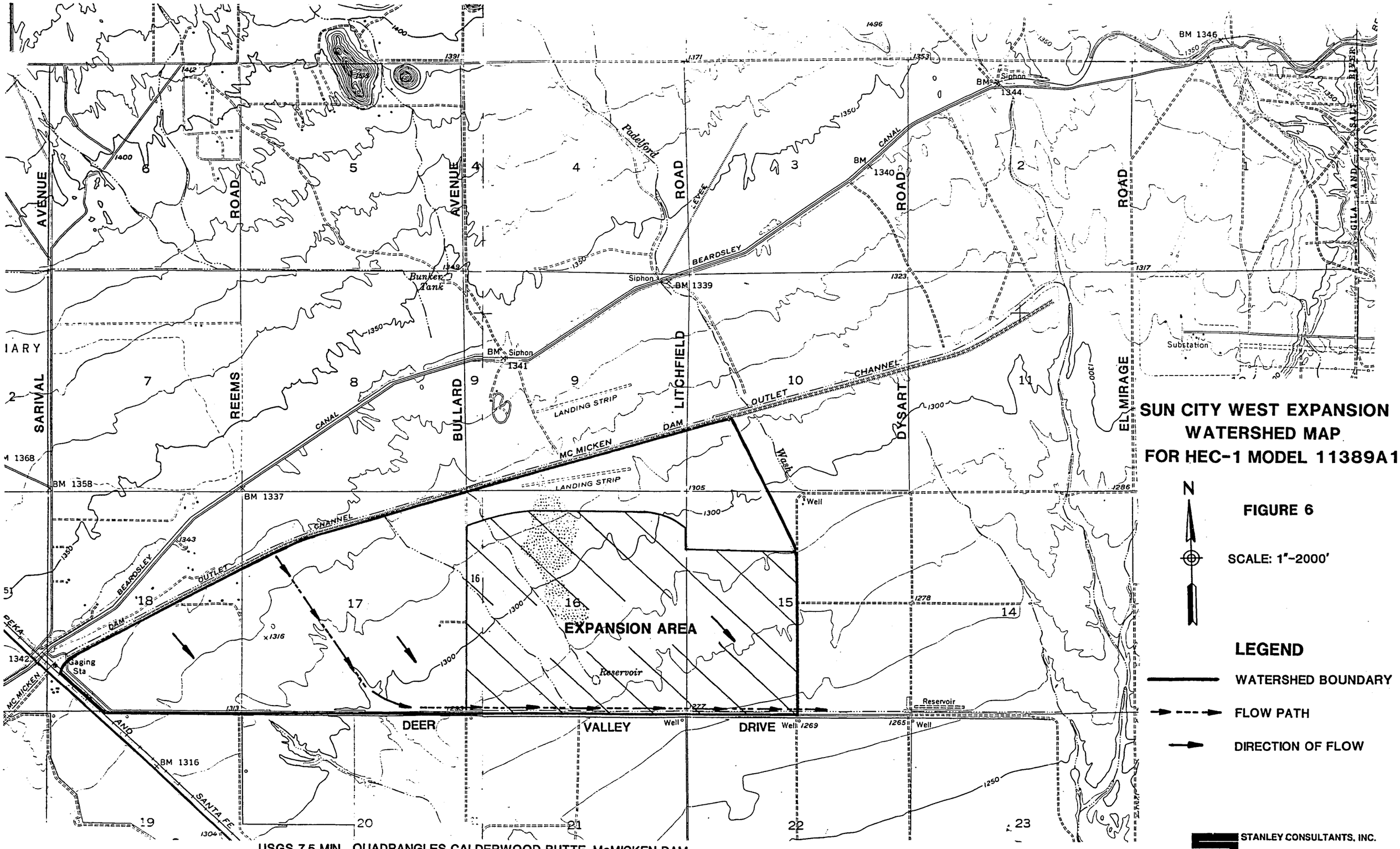
SCALE

DEPTH DURATION FREQUENCY TABLE
FOR SUN CITY WEST EXPANSION:

FREQUENCY

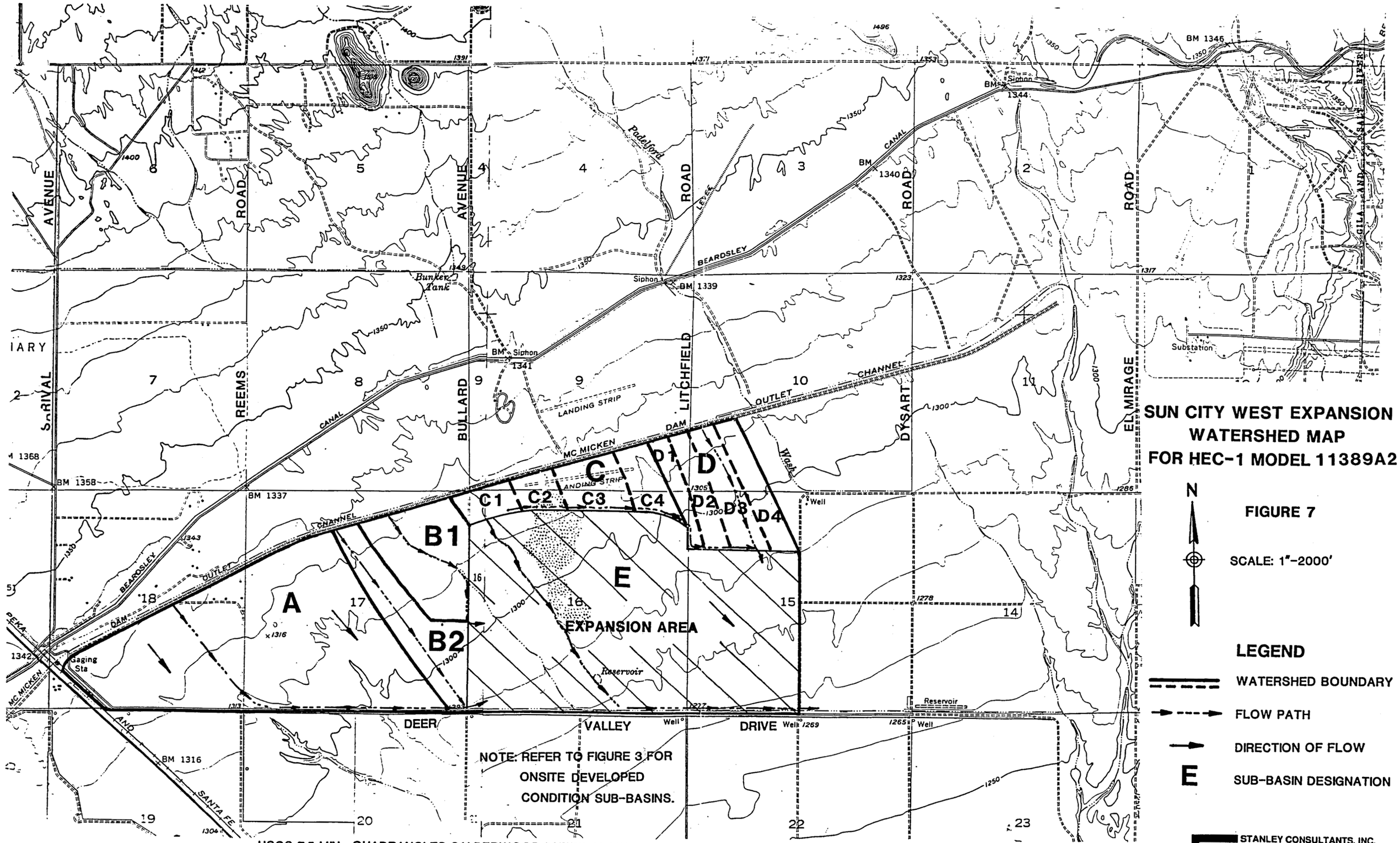
DURATION	2YR	5YR	10YR	25YR	50YR	100YR
5 MIN	0.30	0.43	0.53	0.65	0.75	0.85
10 MIN	0.45	0.64	0.79	0.97	1.12	1.28
15 MIN	0.55	0.78	0.96	1.18	1.36	1.55
30 MIN	0.60	1.03	1.27	1.56	1.80	2.05
1 HR	0.89	1.25	1.55	1.90	2.20	2.50
2 HR	1.00	1.40	1.70	2.15	2.45	2.77
3 HR	1.07	1.50	1.85	2.30	2.65	2.96
6 HR	1.20	1.70	2.10	2.60	2.90	3.30
12 HR	1.35	1.85	2.30	2.85	3.25	3.70
24 HR	1.50	2.10	2.60	3.20	3.60	4.10

PRODUCT 205-1 NEBS Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380



USGS 7.5 MIN. QUADRANGLES CALDERWOOD BUTTE, McMICKEN DAM

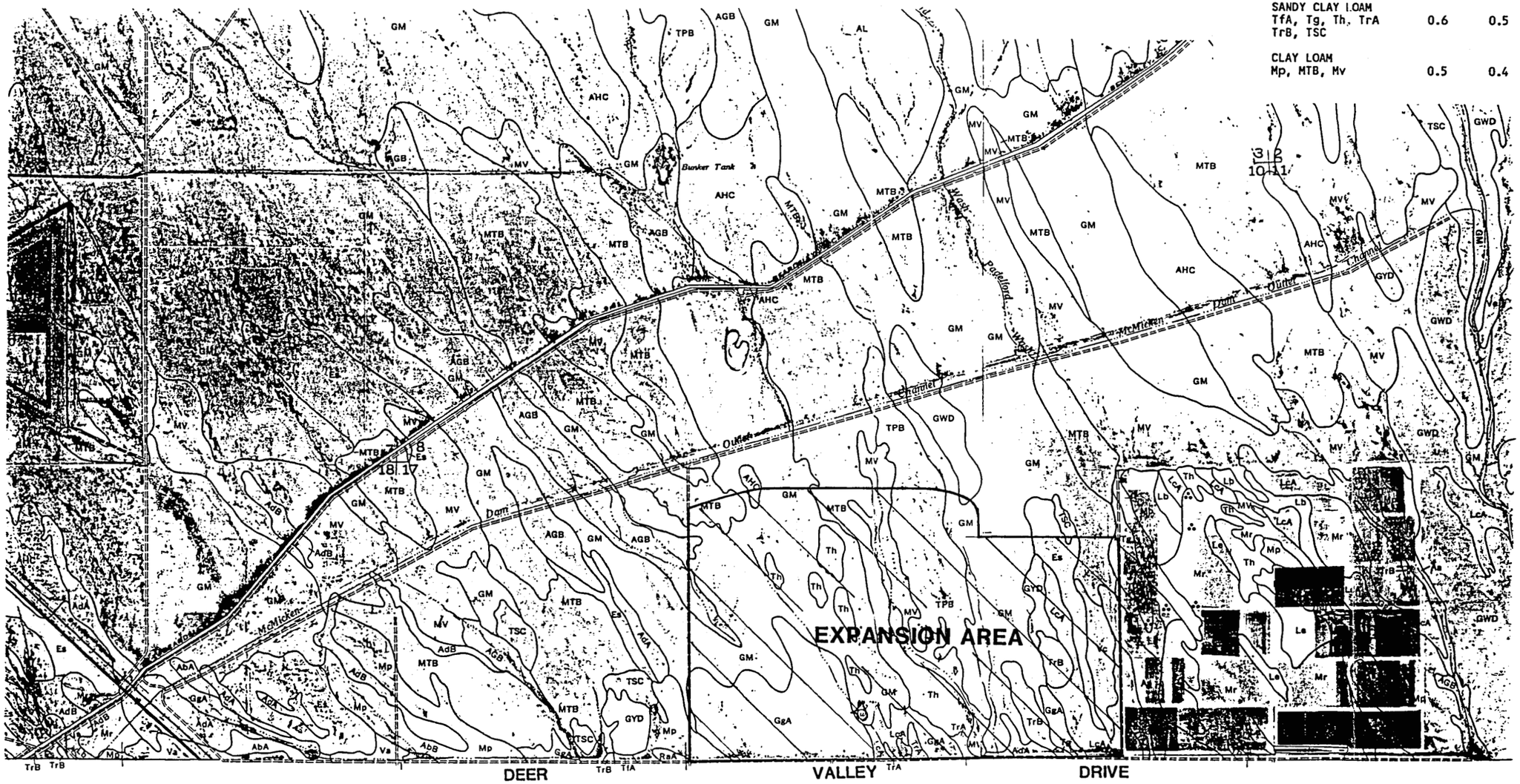
STANLEY CONSULTANTS, INC.
SCI# 11389


SUN CITY WEST EXPANSION
WATERSHED MAP
FOR HEC-1 MODEL 11389A2
FIGURE 7
SCALE: 1"-2000'
N
LEGEND
WATERSHED BOUNDARY
FLOW PATH
DIRECTION OF FLOW
E SUB-BASIN DESIGNATION
STANLEY CONSULTANTS, INC.
SCI# 11389
A
B1
B2
C
C1
C2
C3
C4
D
D1
D2
D3
D4
E
EXPANSION AREA
NOTE: REFER TO FIGURE 3 FOR ONSITE DEVELOPED CONDITION SUB-BASINS.
USGS 7.5 MIN. QUADRANGLES CALDERWOOD BUTTE, McMICKEN DAM
BEARDSLEY CANAL
CHANNEL
OUTLET
DAM
LANDING STRIP
MC MICKEN
DEER VALLEY DRIVE
BULLARD AVENUE
LITCHFIELD ROAD
DYSART ROAD
EL MIRAGE ROAD
REEMS ROAD
SARIVAL AVENUE
Padelford
Bunker Tank
Siphon
Gaging Sta
Reservoir
Substation
Well
SANTA FE
PEKA
GILA RIVER
BM 1346
BM 1344
BM 1340
BM 1339
BM 1341
BM 1358
BM 1337
BM 1316

NOTE: THIS MAP REPRODUCED FROM SOIL SURVEY OF MARICOPA COUNTY, ARIZONA - CENTRAL PART, SOIL CONSERVATION SERVICE, SEPTEMBER 1977, SHEETS 2 & 3. REFER TO THAT SURVEY FOR DESCRIPTION OF SOILS.

GREEN AND AMPT RAINFALL LOSS PARAMETERS BY SCS SOIL TYPE

SCS SOIL TYPE	IA (dry)	IA (norm)	DTHETA (dry)	DTHETA (norm)	PSIF	XKSAT
SANDY LOAM AbA, AdA, AdB AGB, AHC, GYD GWD, RaA, Vc, Va	0.7	0.6	0.35	0.25	4.3	0.4
LOAM Es, GgA, GM, LcA	0.6	0.5	0.35	0.25	3.5	0.25
SANDY CLAY LOAM TfA, Tg, Th, TrA TrB, TSC	0.6	0.5	0.25	0.15	8.6	0.06
CLAY LOAM Mp, MTB, Mv	0.5	0.4	0.25	0.15	8.2	0.04



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SCALE: 1"-2000'

FIGURE 8

SUN CITY WEST EXPANSION SOILS MAP - EXISTING CONDITIONS

STANLEY CONSULTANTS, INC.
SCI# 11389

DESIGNED BY GJB DATE 3-13-92 SHEET NO. PAGE NO.
CHECKED BY DATE OF JOB NO.
REVIEWED BY DATE SUBJECT: SUN CITY WEST EXPANSION
APPROVED BY DATE SOIL CLASS BREAKDOWN

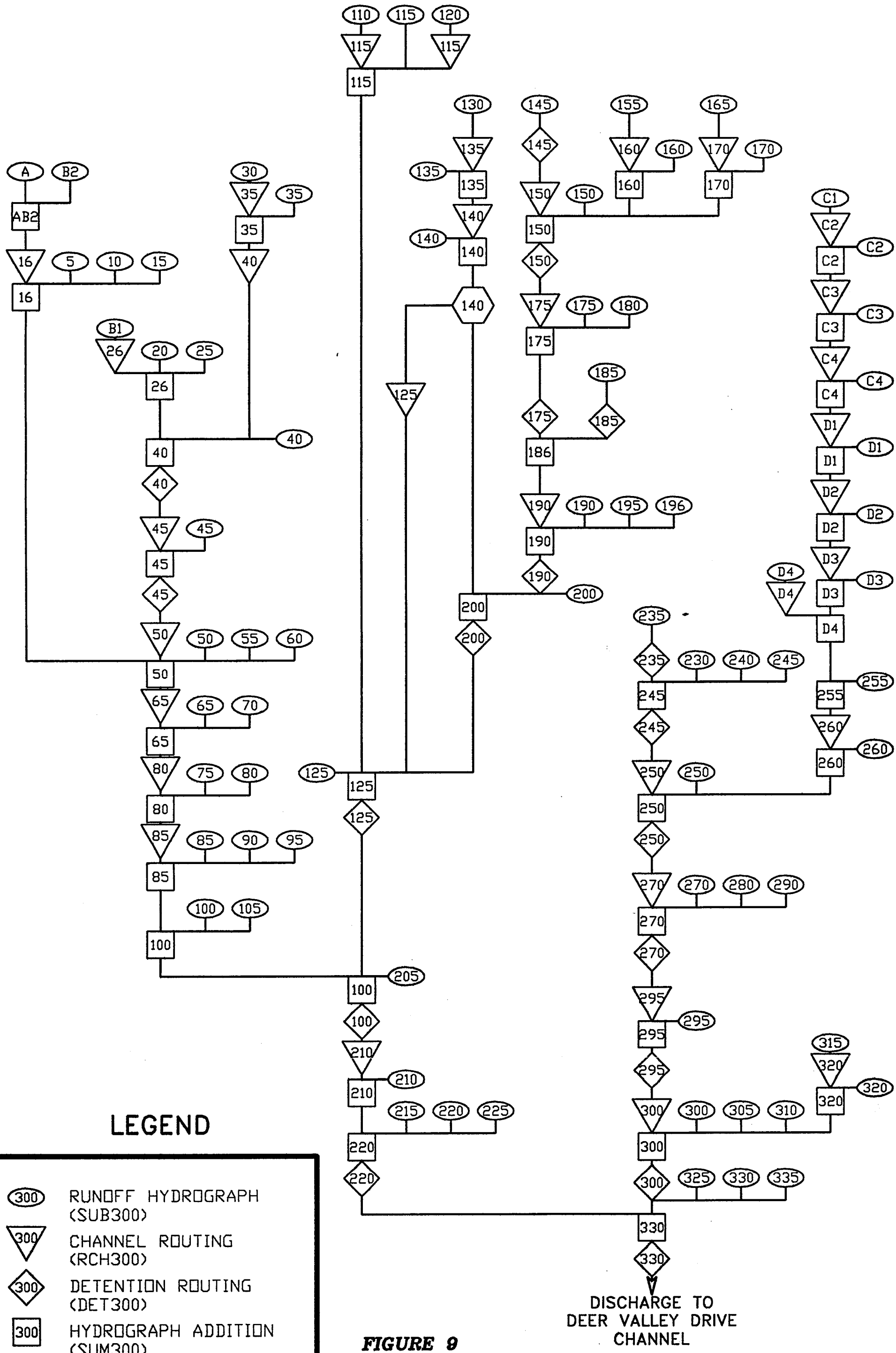
EXISTING CONDITION SOILS

AREA	% SL	% L	% SCL	% CL	TOTAL AREA (ACRES)
A	24.3	23.8	4.4	47.5	555
B	30.7	41.1	4.3	23.9	223
C	16.3	33.7	17.4	32.6	125
D	6.4	77.0	2.8	13.8	145
E	3.4	61.7	19.0	10.9	330

PROCEDURE FOR WEIGHTING GREEN & AMPT LOSS RATE PARAMETERS IS FROM CHAPTER 4 OF HYDROLOGY MANUAL. BASIC PARAMETERS ARE FROM TABLE 4.2. DTHETA ASSUMES DRY CONDITION FOR EXIST SUB-BASINS. XKSAT IS MODIFIED BY CK ASSUMING 25% VEGETATIVE COVER. ALL PARAMETERS ARE AREA-WEIGHTED.

SC 3020

ROUT389B.DWG
8/11/92



LEGEND

- (300) RUNOFF HYDROGRAPH (SUB300)
- ▽300 CHANNEL ROUTING (RCH300)
- ◇300 DETENTION ROUTING (DET300)
- □300 HYDROGRAPH ADDITION (SUM300)
- ⬡140 DIVERT HYDROGRAPH (DVT140)

FIGURE 9

SUN CITY WEST EXPANSION

HEC 1 ROUTING SCHEMATIC FOR MODEL 11389B

BASIC SUB-BASIN PARAMETERS 7-15-92

RESIST COEFF PARAMETERS

m(res, comm) =	-0.00625
m(desert) =	-0.01600
m(golf, o.s.) =	-0.02500
b(res, comm) =	0.04000
b(desert) =	0.10000
b(golf, o.s.) =	0.15000

LAND USE	IA	DTHETA	PSIF	XKSAT	RTIMP
Res SF	0.150	0.350	5.050	0.230	25.000
Res CAS	0.150	0.350	5.050	0.230	25.000
Golf/O.S.	0.350	0.300	5.050	0.300	1.000
Comm	0.100	0.350	5.050	0.230	80.000
Exst des	0.350	**	**	**	1.000

SPECIFIC SUB-BASIN DATA (MCUHP1 input file) WEIGHTED GREEN / AMPT PARAMETERS

Sub-Basin #	Area (mi^2)	Length (mi)	Resist. Coeff, Kb	Slope (ft/mi)	IA	DTHETA	PSIF	XKSAT	RTIMP (%)	Tc (hr)	R (hr)
OFFSITE											
A	0.867	1.515	0.056	26.4	0.350	0.350	6.150	0.210	1.0	0.996	0.557
B1	0.188	0.568	0.067	29.9	0.350	0.350	5.090	0.280	1.0	0.508	0.288
B2	0.161	1.000	0.068	38.0	0.350	0.350	5.090	0.280	1.0	0.717	0.724
C1	0.028	0.256	0.080	11.7	0.350	0.350	6.050	0.200	1.0	0.479	0.422
C2	0.027	0.303	0.080	13.2	0.350	0.350	6.050	0.200	1.0	0.512	0.531
C3	0.064	0.398	0.074	20.1	0.350	0.350	6.050	0.200	1.0	0.488	0.382
C4	0.058	0.455	0.075	26.4	0.350	0.350	6.050	0.200	1.0	0.479	0.441
D1	0.033	0.398	0.079	32.7	0.350	0.350	4.340	0.260	1.0	0.408	0.458
D2	0.055	0.492	0.075	30.5	0.350	0.350	4.340	0.260	1.0	0.475	0.480
D3	0.081	0.587	0.073	30.7	0.350	0.350	4.340	0.260	1.0	0.533	0.504
D4	0.089	0.587	0.072	32.4	0.350	0.350	4.340	0.260	1.0	0.512	0.457
E	1.297	1.840	0.053	26.1	0.350	0.350	5.050	0.230	1.0	1.104	0.580
TOTAL	2.930	2.650	0.048	23.0	0.350	0.350	5.550	0.220	1.0	1.504	0.688
ONSITE											
5	0.031	0.375	0.032	22.667	0.150	0.350	5.050	0.230	25.000	0.233	0.243
10	0.008	0.239	0.084	8.381	0.225	0.325	5.050	0.265	40.500	0.504	0.863
15	0.013	0.337	0.034	26.697	0.150	0.350	5.050	0.230	25.000	0.213	0.330
20	0.012	0.218	0.034	20.661	0.150	0.350	5.050	0.230	25.000	0.179	0.202
25	0.008	0.172	0.036	17.407	0.150	0.350	5.050	0.230	25.000	0.175	0.205
30	0.026	0.295	0.041	23.692	0.170	0.345	5.050	0.237	22.600	0.233	0.222
35	0.023	0.254	0.033	25.612	0.150	0.350	5.050	0.230	25.000	0.179	0.157
40	0.014	0.178	0.108	44.936	0.310	0.310	5.050	0.286	5.800	0.254	0.232
45	0.011	0.110	0.110	54.621	0.310	0.310	5.050	0.286	5.800	0.179	0.123
50	0.010	0.155	0.111	48.293	0.310	0.310	5.050	0.286	5.800	0.229	0.224
55	0.015	0.352	0.034	28.387	0.150	0.350	5.050	0.230	25.000	0.213	0.315
60	0.031	0.417	0.032	19.200	0.150	0.350	5.050	0.230	25.000	0.262	0.302
65	0.017	0.227	0.106	22.000	0.310	0.310	5.050	0.286	5.800	0.404	0.422
70	0.015	0.295	0.034	15.231	0.150	0.350	5.050	0.230	25.000	0.242	0.316
75	0.009	0.210	0.035	21.405	0.150	0.350	5.050	0.230	25.000	0.179	0.231
80	0.013	0.153	0.109	29.333	0.310	0.310	5.050	0.286	5.800	0.275	0.234
85	0.014	0.180	0.108	30.568	0.310	0.310	5.050	0.286	5.800	0.300	0.281
90	0.016	0.352	0.034	13.626	0.150	0.350	5.050	0.230	25.000	0.283	0.418
95	0.012	0.252	0.034	18.659	0.150	0.350	5.050	0.230	25.000	0.183	0.262
100	0.024	0.288	0.094	55.579	0.290	0.315	5.050	0.279	8.200	0.287	0.287

Sub-Basin #	Area (mi^2)	Length (mi)	Resist. Coeff, Kb	Slope (ft/mi)	IA	DTHETA	PSIF	XKSAT	RTIMP (%)	Tc (hr)	R (hr)
105	0.013	0.220	0.034	11.379	0.150	0.350	5.050	0.230	25.000	0.225	0.250
110	0.025	0.210	0.033	22.357	0.150	0.350	5.050	0.230	25.000	0.171	0.122
115	0.026	0.256	0.032	22.684	0.150	0.350	5.050	0.230	25.000	0.183	0.152
120	0.020	0.259	0.033	23.124	0.150	0.350	5.050	0.230	25.000	0.188	0.182
125	0.019	0.303	0.105	56.100	0.310	0.310	5.050	0.286	5.800	0.321	0.386
130	0.030	0.352	0.032	22.710	0.150	0.350	5.050	0.230	25.000	0.225	0.226
135	0.021	0.246	0.033	28.431	0.145	0.350	5.050	0.230	30.500	0.171	0.153
140	0.037	0.496	0.031	16.525	0.140	0.350	5.050	0.230	36.000	0.300	0.363
145	0.011	0.140	0.110	64.216	0.310	0.310	5.050	0.286	5.800	0.196	0.164
150	0.014	0.121	0.108	53.625	0.310	0.310	5.050	0.286	5.800	0.188	0.121
155	0.022	0.250	0.033	22.000	0.150	0.350	5.050	0.230	25.000	0.188	0.168
160	0.021	0.250	0.033	22.000	0.150	0.350	5.050	0.230	25.000	0.188	0.172
165	0.036	0.386	0.040	23.294	0.170	0.345	5.050	0.237	22.600	0.271	0.270
170	0.013	0.170	0.034	17.600	0.150	0.350	5.050	0.230	25.000	0.167	0.146
175	0.022	0.294	0.103	28.955	0.310	0.310	5.050	0.286	5.800	0.421	0.468
180	0.022	0.277	0.033	21.699	0.150	0.350	5.050	0.230	25.000	0.200	0.196
185	0.029	0.498	0.032	30.114	0.150	0.350	5.050	0.230	25.000	0.250	0.342
190	0.031	0.225	0.109	70.992	0.330	0.305	5.050	0.293	3.400	0.250	0.174
195	0.009	0.136	0.035	22.000	0.150	0.350	5.050	0.230	25.000	0.133	0.117
196	0.056	0.436	0.103	24.104	0.330	0.305	5.050	0.293	3.400	0.637	0.597
200	0.014	0.210	0.098	61.838	0.275	0.315	5.050	0.279	24.700	0.229	0.236
205	0.009	0.218	0.035	32.139	0.150	0.350	5.050	0.230	25.000	0.154	0.201
210	0.009	0.076	0.112	52.800	0.310	0.310	5.050	0.286	5.800	0.146	0.081
215	0.029	0.324	0.032	28.407	0.150	0.350	5.050	0.230	25.000	0.196	0.185
220	0.015	0.167	0.107	15.000	0.310	0.310	5.050	0.286	5.800	0.383	0.334
225	0.016	0.095	0.034	31.680	0.150	0.350	5.050	0.230	25.000	0.092	0.042
230	0.038	0.509	0.040	20.610	0.170	0.345	5.050	0.237	22.600	0.338	0.416
235	0.007	0.155	0.114	45.073	0.310	0.310	5.050	0.286	5.800	0.242	0.291
240	0.045	0.455	0.039	19.800	0.170	0.345	5.050	0.237	22.600	0.313	0.317
245	0.014	0.275	0.099	32.772	0.290	0.315	5.050	0.279	8.200	0.363	0.487
250	0.027	0.284	0.102	44.000	0.310	0.310	5.050	0.286	5.800	0.338	0.317
255	0.008	0.246	0.132	28.431	0.350	0.300	5.050	0.300	1.000	0.463	0.803
260	0.015	0.294	0.034	28.955	0.150	0.350	5.050	0.230	25.000	0.192	0.243
270	0.012	0.142	0.109	31.680	0.310	0.310	5.050	0.286	5.800	0.254	0.211
280	0.031	0.398	0.032	20.114	0.150	0.350	5.050	0.230	25.000	0.254	0.280
290	0.013	0.218	0.034	29.843	0.150	0.350	5.050	0.230	25.000	0.158	0.168
295	0.010	0.104	0.121	38.400	0.330	0.305	5.050	0.293	3.400	0.208	0.146
300	0.013	0.155	0.118	61.171	0.330	0.305	5.050	0.293	3.400	0.221	0.185
305	0.023	0.318	0.033	20.429	0.150	0.350	5.050	0.230	25.000	0.221	0.238
310	0.015	0.256	0.034	23.467	0.100	0.350	5.050	0.230	80.000	0.183	0.207
315	0.014	0.369	0.034	29.785	0.150	0.350	5.050	0.230	25.000	0.217	0.348
320	0.019	0.358	0.033	22.908	0.100	0.350	5.050	0.230	80.000	0.221	0.291
325	0.028	0.360	0.032	20.842	0.150	0.350	5.050	0.230	25.000	0.233	0.249
330	0.047	0.386	0.088	24.588	0.280	0.315	5.050	0.279	19.200	0.479	0.436
335	0.028	0.227	0.032	33.000	0.150	0.350	5.050	0.230	25.000	0.150	0.106
TOTAL ONSITE AREA	1.298 SQ.MI.										

** GREEN AND AMPT RAINFALL LOSS PARAMETERS FOR EXISTING DESERT ARE WEIGHTED BY AREA OF INDIVIDUAL SOIL TYPES WITHIN EACH SUB-BASIN.

NOTE: GREEN AND AMPT RAINFALL LOSS PARAMETERS FOR ONSITE DEVELOPED AREAS ARE BASED ON EXISTING CONDITION ONSITE AREA WEIGHTED VALUES FROM SUB-BASIN "E".

RAT100YR 7-15-92

RATIONAL METHOD FOLLOWS THE PROCEDURE OUTLINED IN THE FCDMC HYDROLOGIC DESIGN MANU

TIME OF CONCENTRATION (100-YR STORM)

The following equation is used in conjunction with Fig. 3.2 in Hydro Manual.

Tc = 11.4*L^(.5)*Kb^(.52)*S^(-.31)*i^(-.38)

Tc is the Time of Concentration (hours)
L is the length of the longest flow path in the sub-basin (miles)
Kb is the watershed resistance coefficient (weighted by land use)
S is the slope of the watercourse (feet/mile)
i is the rainfall intensity (inches/hour)

RESISTANCE COEFFICIENT PARAMETERS

m(residential) = -0.00625 Kb = m * logA + b
m(golf/open sp) = -0.025
b(residential) = 0.04
b(golf/open sp) = 0.15

SPECIFIC SUB-BASIN DATA

Sub-Basin #	Area (acres)	Length (ft)	Length (mi)	Slope (ft/mi)	Resist. Coeff Kb	Land Use (percent)	
130	19.105	1860	0.352	22.7	0.032	SF/100	
210	5.806	400	0.076	52.8	0.112	SF/20	GOL/80
290	8.366	1150	0.218	29.8	0.034	SF/100	

CALCULATION OF Tc

SUB-BASIN 130	assume initial value for i:	6.00 in/hr			
Tc =	0.22 hours	so the new i is:	6.50 in/hr	recalc Tc	
Tc =	0.21 hours	so ..... i is:	6.50 in/hr	<< USE THIS	
SUB-BASIN 210	assume initial value for i:	7.50 in/hr			
Tc =	0.14 hours	so the new i is:	7.40 in/hr	recalc Tc	
Tc =	0.14 hours	so ..... i is:	7.40 in/hr	<< USE THIS	
SUB-BASIN 290	assume initial value for i:	7.00 in/hr			
Tc =	0.15 hours	so the new i is:	7.20 in/hr	recalc Tc	
Tc =	0.15 hours	so ..... i is:	7.20 in/hr	<< USE THIS	

COEFFICIENTS OF RUNOFF
C-factors are weighted by area of different land uses within the sub-basin.

	Raw C-value	Frequency Factor	Adjusted C-value
SFR	0.5	1.25	0.63
CAS	0.5	1.25	0.63
GOLF	0.28	1.25	0.35
COMM	0.7	1.25	0.88

SUB-BASIN 130 SFR = 100 %
Weighted C = 0.63

SUB-BASIN 210 SFR = 20 % GOLF = 80 %
Weighted C = 0.41

SUB-BASIN 290 SFR = 100 %
Weighted C = 0.63

CALCULATION OF RUNOFF (100-YR STORM)

SUB-BASIN #	C	i (in/hr)	A (acres)	Q (cfs)
SUB130	0.63	6.50	19.11	77.61
SUB210	0.41	7.40	5.81	17.40
SUB290	0.63	7.20	8.37	37.65

RATION10 8-13-92

RATIONAL METHOD FOLLOWS THE PROCEDURE OUTLINED IN THE FCDMC HYDROLOGIC DESIGN MANU

TIME OF CONCENTRATION

The following equation is used in conjunction with Fig. 3.2 in Hydro Manual.

Tc = 11.4*L^(.5)*Kb^(.52)*S^(-.31)*i^(-.38)

Tc is the Time of Concentration (hours)
L is the length of the longest flow path in the sub-basin (miles)
Kb is the watershed resistance coefficient (weighted by land use)
S is the slope of the watercourse (feet/mile)
i is the rainfall intensity (inches/hour)

RESISTANCE COEFFICIENT PARAMETERS

m(residential) = -0.00625 Kb = m * logA + b
m(golf/open sp) = -0.025
b(residential) = 0.04
b(golf/open sp) = 0.15

SPECIFIC SUB-BASIN DATA

Sub-Basin #	Area (acres)	Length (ft)	Length (mi)	Slope (ft/mi)	Resist. Coeff Kb	Land Use (percent)	
130	19.105	1860	0.352	22.7	0.032	SF/100	
210	5.806	400	0.076	52.8	0.112	SF/20	GOL/80
290	8.366	1150	0.218	29.8	0.034	SF/100	

CALCULATION OF Tc

SUB-BASIN 130	assume initial value for i:	3.50 in/hr			
Tc =	0.2666 hours	so the new i is:	3.60 in/hr	recalc Tc	
Tc =	0.2638 hours	so ..... i is:	3.60 in/hr	<< USE THIS	
SUB-BASIN 210	assume initial value for i:	4.00 in/hr			
Tc =	0.17 hours	so the new i is:	4.50 in/hr	recalc Tc	
Tc =	0.17 hours	so ..... i is:	4.50 in/hr	<< USE THIS	
SUB-BASIN 290	assume initial value for i:	4.00 in/hr			
Tc =	0.19 hours	so the new i is:	4.20 in/hr	recalc Tc	
Tc =	0.19 hours	so ..... i is:	4.20 in/hr	<< USE THIS	

COEFFICIENTS OF RUNOFF
C-factors are weighted by area of different land uses within the sub-basin.

	Raw C-value	Frequency Factor	Adjusted C-value
SFR	0.5	1	0.50
CAS	0.5	1	0.50
GOLF	0.28	1	0.28
COMM	0.7	1	0.70

SUB-BASIN 130 SFR = 100 %
Weighted C = 0.50

SUB-BASIN 210 SFR = 20 % GOLF = 80 %
Weighted C = 0.32

SUB-BASIN 290 SFR = 100 %
Weighted C = 0.50

CALCULATION OF RUNOFF (10-YR STORM)

SUB-BASIN #	C	i (in/hr)	A (acres)	Q (cfs)
SUB130	0.50	3.60	19.11	34.39
SUB210	0.32	4.50	5.81	8.47
SUB290	0.50	4.20	8.37	17.57

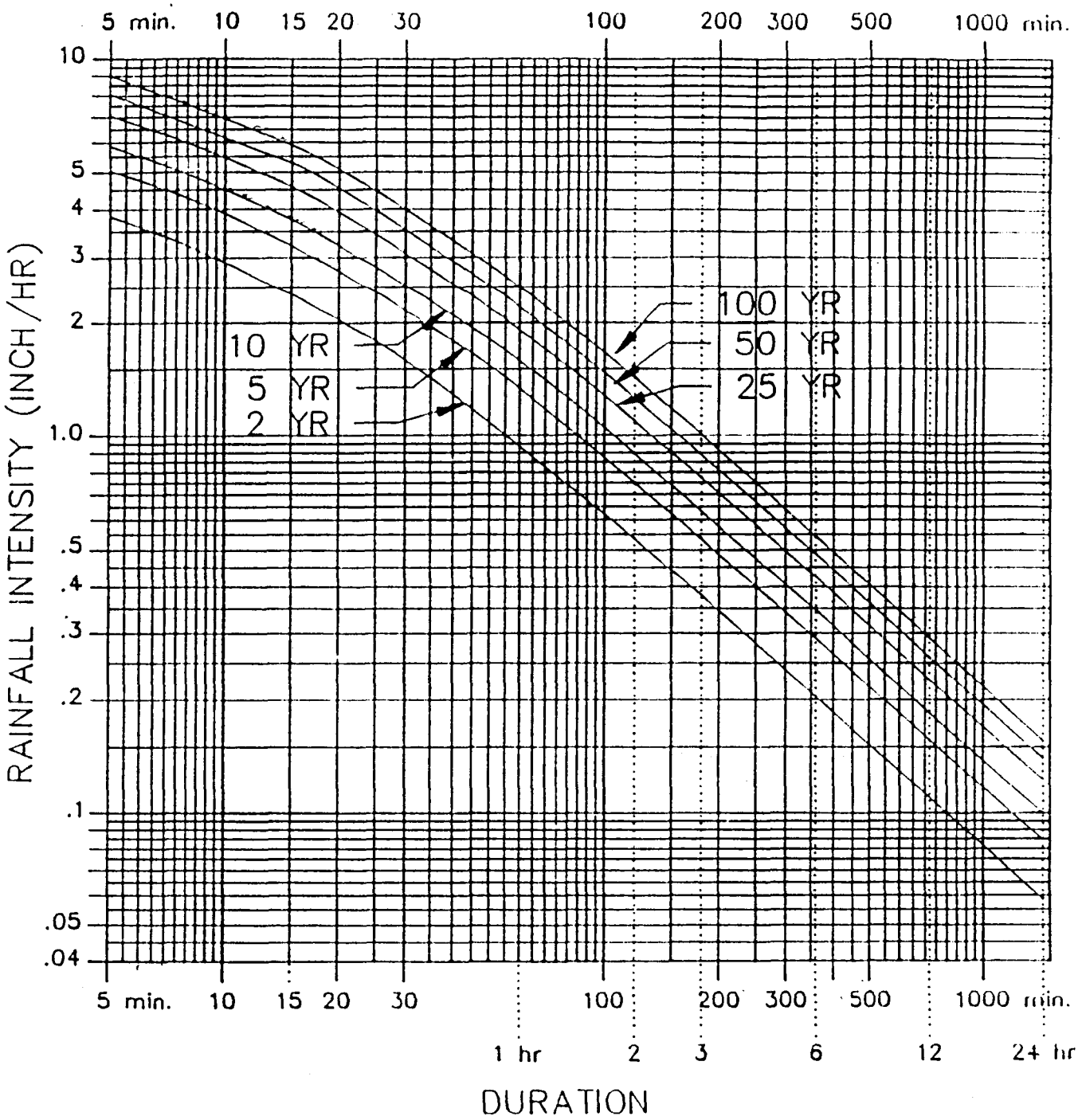


Figure 3.2
Rainfall Intensity-Duration-Frequency Relation
(Phoenix Metro Area)

BASIC SUB-BASIN PARAMETERS 7-15-92

RESIST COEFF PARAMETERS	
m(res, comm) =	-0.00625
m(desert) =	-0.01600
m(golf, o.s.) =	-0.02500
b(res, comm) =	0.04000
b(desert) =	0.10000
b(golf, o.s.) =	0.15000

LAND USE	IA	DTHETA	PSIF	XKSAT	RTIMP
Res SF	0.150	0.350	5.050	0.230	25.000
Res CAS	0.150	0.350	5.050	0.230	25.000
Golf/O.S.	0.350	0.300	5.050	0.300	1.000
Comm	0.100	0.350	5.050	0.230	80.000
Exst des	0.350	**	**	**	1.000

SPECIFIC SUB-BASIN DATA (MCUHP1 input file)

Sub-Basin #	Area (ac)	Area (mi^2)	Length (mi)	Resist. Coeff, Kb	Slope (ft/mi)	WEIGHTED GREEN / AMPT PARAMETERS IA	DTHETA	PSIF	XKSAT	RTIMP (%)
OFFSITE										
C2	17.000	0.027	0.303	0.080	13.2	0.350	0.350	6.050	0.200	1.0
D4	57.000	0.089	0.587	0.072	32.4	0.350	0.350	4.340	0.260	1.0
ONSITE										
130	19.105	0.030	0.352	0.032	22.710	0.150	0.350	5.050	0.230	25.000
210	5.806	0.009	0.076	0.112	52.800	0.310	0.310	5.050	0.286	5.800
290	8.366	0.013	0.218	0.034	29.843	0.150	0.350	5.050	0.230	25.000

RESULTS OF MCUHP1

	100-YR STORM		50-YR STORM		10-YR STORM		2-YR STORM	
	Tc	R	Tc	R	Tc	R	Tc	R
C2	0.512	0.531	0.583	0.613	0.900	0.992	1.000	1.116
D4	0.512	0.457	0.483	0.527	0.892	0.845	1.000	0.959
130	0.225	0.226	0.237	0.240	0.300	0.311	0.517	0.569
210	0.146	0.081	0.158	0.089	0.204	0.118	0.625	0.410
290	0.158	0.168	0.171	0.183	0.208	0.228	0.338	0.389

FLOWPCNT 8-13-92

COMPARES FLOWS OF 2, 10 AND 50 YEAR STORMS WITH 100 YEAR FLOW.
FLOWS CALCULATED USING MCUHP1 AND HEC-1

SUBAREA	100 yr	50 yr	RATIO 50 yr/ 100 yr	10 yr	RATIO 10 yr/ 100 yr	2 yr	RATIO 2 yr/ 100 yr
PRECIP	2.77	2.45	0.88	1.70	0.61	1.00	0.36
SUBC2	30	22	0.73	7	0.23	1	0.03
SUBD4	109	82	0.75	27	0.25	2	0.02
SUB130	66	54	0.82	28	0.42	7	0.11
SUB210	28	22	0.79	10	0.36	1	0.04
SUB290	33	28	0.85	15	0.45	4	0.12
AVERAGE			0.79		0.34		0.06

COMPARES FLOWS OF 10 YEAR STORM WITH 100 YEAR FLOW.
FLOWS CALCULATED USING RATIONAL METHOD (COUNTY HYDROLOGIC MANUAL)

SUBAREA	100 yr	10 yr	RATIO 10 yr/ 100 yr
PRECIP	2.77	1.70	0.61
SUB130	78	34	0.44
SUB210	17	8	0.49
SUB290	38	18	0.47
AVERAGE			0.47

APPENDIX C
HEC-1 PRINTOUT

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
*  RUN DATE  07/16/1992  TIME  20:09:15 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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

  1           ID
  2           ID        SUN CITY WEST EXPANSION MASTER DRAINAGE
  3           ID        STANLEY CONSULTANTS JOB # 11389   DATE: 16 JUL 92
  4           ID        HEC-1 MODEL 11389A1  (EXISTING CONDITIONS; SINGLE BASIN)
  5           ID
  6           ID        CLARK UNIT HYDROGRAPH
  7           ID
  8           ID        2-HR STORM DISTRIBUTION (TABLE 2.2) P100 = 2.77"
  9           ID        NO AREAL REDUCTION FACTOR
 10           ID
 11           ID        GREEN-AMPT LOSS RATES FOR EXISTING CONDITIONS BASED ON
 12           ID              AREA-WEIGHTED VALUES OF EXISTING SOILS ASSUMING DTHETA DRY
 13           ID              AND VEGETATIVE COVER 25 PERCENT.
 14           ID              IA ASSUMED TO BE 0.35 INCHES AND PERCENT IMPERVIOUS ASSUMED
 15           ID              TO BE 1 PERCENT.
 16           ID
 17           ID        Kb BASED ON m = -0.016 and b = 0.10
 18           ID
 19           ID        TIME OF CONCENTRATION AND STORAGE COEFFICIENT R
 20           ID              BASED ON RESULTS FROM MCUHP1 (REVISED 12-16-91)
 21           ID
 22           ID        TIME-AREA RELATION FROM TABLE 5.2, USE NATURAL
 23           ID              TIME-AREA UA RECORD
 24           ID
              *DIAGRAM
 25           IT       5                    150
 26           IO       3

 27           KK  SUBTOT
 28           KM           SUB-BASIN TOTAL - OFFSITE AREAS A, B1, B2, C AND D AND ONSITE AREA E
 29           KM           CONCENTRATION POINT IS AT SOUTH EAST CORNER OF THE EXPANSION AREA
 30           BA   2.930
 31           IN       5
 32           PB   2.770
 33           PC    .000    .011    .018    .023    .028    .032    .046    .071    .100    .137
 34           PC    .176    .232    .327    .601    .743    .863    .901    .930    .954    .962
 35           PC    .970    .979    .982    .992   1.000
 36           LG    .350    .350   5.55     .22       1
 37           UC   1.504    .688
 38           UA       0       3       5       8      12      20      43      75      90      96
 39           UA     100
 40           ZZ
```

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

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

    27      SUBTOT

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS       *
*            SEPTEMBER 1990            *                    *   HYDROLOGIC ENGINEERING CENTER      *
*             VERSION 4.0              *                    *         609 SECOND STREET            *
*                                      *                    *      DAVIS, CALIFORNIA 95616         *
*  RUN DATE  07/16/1992  TIME  20:09:15 *                    *          (916) 756-1104              *
*                                      *                    *                                      *
****************************************                    ****************************************


                              SUN CITY WEST EXPANSION MASTER DRAINAGE
                              STANLEY CONSULTANTS JOB # 11389   DATE: 16 JUL 92
                              HEC-1 MODEL 11389A1  (EXISTING CONDITIONS; SINGLE BASIN)

                              CLARK UNIT HYDROGRAPH

                              2-HR STORM DISTRIBUTION (TABLE 2.2) P100 = 2.77"
                              NO AREAL REDUCTION FACTOR

                              GREEN-AMPT LOSS RATES FOR EXISTING CONDITIONS BASED ON
                                    AREA-WEIGHTED VALUES OF EXISTING SOILS ASSUMING DTHETA DRY
                                    AND VEGETATIVE COVER 25 PERCENT.
                                    IA ASSUMED TO BE 0.35 INCHES AND PERCENT IMPERVIOUS ASSUMED
                                    TO BE 1 PERCENT.

                              Kb BASED ON m = -0.016 and b = 0.10

                              TIME OF CONCENTRATION AND STORAGE COEFFICIENT R
                                    BASED ON RESULTS FROM MCUHP1 (REVISED 12-16-91)

                              TIME-AREA RELATION FROM TABLE 5.2, USE NATURAL
                                    TIME-AREA UA RECORD


  26 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        150  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      1    0  ENDING DATE
                      NDTIME       1225  ENDING TIME
                       ICENT         19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   12.42 HOURS

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


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
                **************
                *            *
27 KK           *   SUBTOT   *
                *            *
                **************
                                    SUB-BASIN TOTAL - OFFSITE AREAS A, B1, B2, C AND D AND ONSITE AREA E
                                    CONCENTRATION POINT IS AT SOUTH EAST CORNER OF THE EXPANSION AREA

31 IN             TIME DATA FOR INPUT TIME SERIES
                       JXMIN          5  TIME INTERVAL IN MINUTES
                      JXDATE      1   0  STARTING DATE
                      JXTIME          0  STARTING TIME

                SUBBASIN RUNOFF DATA

30 BA             SUBBASIN CHARACTERISTICS
                       TAREA       2.93  SUBBASIN AREA

                  PRECIPITATION DATA

32 PB                  STORM       2.77  BASIN TOTAL PRECIPITATION

33 PI               INCREMENTAL PRECIPITATION PATTERN
                      .01       .01       .01       .01       .00       .01       .03       .03       .04       .04
                      .06       .09       .27       .14       .12       .04       .03       .02       .01       .01
                      .01       .00       .01       .01

36 LG             GREEN AND AMPT LOSS RATE
                      STRTL        .35  STARTING LOSS
                        DTH        .35  MOISTURE DEFICIT
                       PSIF       5.55  WETTING FRONT SUCTION
                      XKSAT        .22  HYDRAULIC CONDUCTIVITY
                      RTIMP       1.00  PERCENT IMPERVIOUS AREA

37 UC             CLARK UNITGRAPH
                         TC       1.50  TIME OF CONCENTRATION
                          R        .69  STORAGE COEFFICIENT

38 UA             ACCUMULATED-AREA VS. TIME,  11 ORDINATES
                        .0       3.0       5.0       8.0      12.0      20.0      43.0      75.0      90.0      96.0
                     100.0

                                                          ***

                                                   UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=  1.50 HR,       R=   .69 HR
                                         SNYDER   TP=  1.20 HR,      CP=   .95

                                                     UNIT HYDROGRAPH
                                                 56 END-OF-PERIOD ORDINATES
                 22.       61.       88.      110.      136.      168.      203.      260.      339.      520.
                799.     1114.     1401.     1534.     1538.     1477.     1383.     1286.     1169.     1037.
                919.      814.      721.      639.      566.      501.      444.      393.      348.      308.
                273.      242.      214.      190.      168.      149.      132.      117.      104.       92.
                 81.       72.       64.       56.       50.       44.       39.       35.       31.       27.
                 24.       21.       19.       17.       15.       13.

     ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION   SUBTOT

     TOTAL RAINFALL =    2.77, TOTAL LOSS =    1.32, TOTAL EXCESS =    1.45

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR     12.42-HR
+   (CFS)       (HR)
                          (CFS)
+    2139.      2.25                  453.        219.        219.        219.
                        (INCHES)    1.439       1.439       1.439       1.439
                         (AC-FT)      225.        225.        225.        225.

                        CUMULATIVE AREA =    2.93 SQ MI

1
                                                   RUNOFF SUMMARY
                                             FLOW IN CUBIC FEET PER SECOND
                                           TIME IN HOURS,  AREA IN SQUARE MILES

                                      PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
        OPERATION       STATION       FLOW    PEAK                                          AREA      STAGE     MAX STAGE
```

```
+                                                  6-HOUR     24-HOUR     72-HOUR
        HYDROGRAPH AT
+                       SUBTOT     2139.    2.25       453.        219.        219.       2.93

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

```
1****************************************                    ****************************************
*                                      *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS       *
*            SEPTEMBER 1990            *                    *   HYDROLOGIC ENGINEERING CENTER      *
*             VERSION 4.0              *                    *         609 SECOND STREET            *
*                                      *                    *      DAVIS, CALIFORNIA 95616         *
*  RUN DATE  07/16/1992  TIME  20:09:43 *                    *          (916) 756-1104              *
*                                      *                    *                                      *
****************************************                    ****************************************

                                    X     X  XXXXXXX   XXXXX          X
                                    X     X  X        X     X        XX
                                    X     X  X        X               X
                                    XXXXXXX  XXXX     X        XXXXX  X
                                    X     X  X        X               X
                                    X     X  X        X     X         X
                                    X     X  XXXXXXX   XXXXX         XXX

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                          HEC-1 INPUT                                          PAGE  1

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

        1           ID
        2           ID        SUN CITY WEST EXPANSION MASTER DRAINAGE
        3           ID        STANLEY CONSULTANTS JOB # 11389   DATE: 16 JUL 92
        4           ID        HEC-1 MODEL 11389A2  (EXISTING CONDITION; MULTI SUB-BASIN)
        5           ID
        6           ID        CLARK UNIT HYDROGRAPH
        7           ID
        8           ID        2-HR STORM DISTRIBUTION (TABLE 2.2) P100 = 2.77"
        9           ID        NO AREAL REDUCTION FACTOR
       10           ID
       11           ID        GREEN-AMPT LOSS RATES FOR EXISTING CONDITIONS BASED ON
       12           ID              AREA-WEIGHTED VALUES OF EXISTING SOILS ASSUMING DTHETA DRY
       13           ID              AND VEGETATIVE COVER 25 PERCENT.
       14           ID              IA ASSUMED TO BE 0.35 INCHES AND PERCENT IMPERVIOUS ASSUMED
       15           ID              TO BE 1 PERCENT.
       16           ID
       17           ID        Kb BASED ON m = -0.016 and b = 0.10
       18           ID
       19           ID        TIME OF CONCENTRATION AND STORAGE COEFFICIENT R
       20           ID              BASED ON RESULTS FROM MCUHP1 (REVISED 12-16-91)
       21           ID
       22           ID        TIME-AREA RELATION FROM TABLE 5.2, ALL AREAS USE A NATURAL
       23           ID              TIME-AREA UA RECORD
       24           ID
       25           ID        OFFSITE FLOWS ARE ROUTED THROUGH HYPOTHETICAL ONSITE CHANNELS
       26           ID              USING MODIFIED PULS ROUTING.  CHANNELS REFLECT EXISTING
       27           ID              CROSS-SECTIONS AND EXISTING ROUGHNESS.
       28           ID
       29           ID
                    *DIAGRAM
       30           IT       5                    150
       31           IO       3

       32           KK   SUBB1        RUNOFF HYDROGRAPH FROM SUB-BASIN B1
       33           BA    .188
       34           IN       5
       35           PB   2.770
       36           PC    .000    .011    .018    .023    .028    .032    .046    .071    .100    .137
       37           PC    .176    .232    .327    .601    .743    .863    .901    .930    .954    .962
       38           PC    .970    .979    .982    .992   1.000
       39           LG    .350    .350   5.09     .28       1
       40           UC    .508    .288
```

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 41          UA       0       3       5       8      12      20      43      75      90      96
 42          UA     100

 43          KK   RCHAB        ROUTE HYDROGRAPH SUBB1 THRU REACH AB; HYPOTHETICAL CHANNEL
 44          RS       2    FLOW      -1
 45          RC    .050    .035    .050    2800    .005
 46          RX     500     500     513     525     530     542     550     550
 47          RY     100     100      97      95      95      97     100     100
1                                        HEC-1 INPUT                                          PAGE  2

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


 48          KK    SUBA        RUNOFF HYDROGRAPH FROM SUB-BASIN A
 49          BA    .867
 50          LG     .35     .35    6.15     .21       1
 51          UC    .996    .557
 52          UA       0       3       5       8      12      20      43      75      90      96
 53          UA     100

 54          KK   SUBB2        RUNOFF HYDROGRAPH FROM SUB-BASIN B2
 55          BA    .161
 56          LG     .35     .35    5.09     .28       1
 57          UC    .717    .724
 58          UA       0       3       5       8      12      20      43      75      90      96
 59          UA     100

 60          KK   SUMAB        COMBINE HYDROGRAPH FROM RCHAB, SUBA & SUBB2
 61          HC       3

 62          KK  RCHSUM        ROUTE HYDROGRAPH SUMAB THRU REACH SUM; HYPOTHETICAL CHANNEL
 63          RS       6    FLOW      -1
 64          RC    .035    .050    .050    8670    .004
 65          RX     500     500     560     560     580     580     600     600
 66          RY     100     100      93      93      93      93     100     100

 67          KK    SUBC        RUNOFF HYDROGRAPH FROM SUB-BASIN C
 68          BA    .195
 69          LG     .35     .35    6.05      .2       1
 70          UC    .683    .494
 71          UA       0       3       5       8      12      20      43      75      90      96
 72          UA     100

 73          KK   RCHCD        ROUTE HYDROGRAPH SUBC THRU REACH CD; HYPOTHETICAL CHANNEL
 74          RS       1    FLOW      -1
 75          RC    .050    .035    .050    2020    .004
 76          RX     500     500     513     525     530     542     550     550
 77          RY     100     100      97      95      95      97     100     100

 78          KK    SUBD        RUNOFF HYDROGRAPH FROM SUB-BASIN D
 79          BA    .227
 80          LG     .35     .35    4.34     .26       1
 81          UC    .596    .397
 82          UA       0       3       5       8      12      20      43      75      90      96
 83          UA     100

 84          KK   SUMCD        COMBINE HYDROGRAPH FROM SUBC & SUBD
 85          HC       2

 86          KK  RCHSUM        ROUTE HYDROGRAPH SUMCD THRU REACH SUM; HYPOTHETICAL CHANNEL
 87          RS       4    FLOW      -1
 88          RC    .050    .035    .050    5520    .005
 89          RX     500     500     513     525     530     542     550     550
 90          RY     100     100      97      95      95      97     100     100
1                                        HEC-1 INPUT                                          PAGE  3

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


 91          KK    SUBE        RUNOFF HYDROGRAPH FROM SUB-BASIN E
 92          BA   1.297
 93          LG     .35     .35    5.05     .23       1
 94          UC   1.104    .580
 95          UA       0       3       5       8      12      20      43      75      90      96
 96          UA     100

 97          KK  SUMTOT        COMBINE HYDROGRAPH FROM RCHSUM (WEST & NORTH)
 98          HC       3
 99          ZZ
1
```

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

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

   32       SUBB1
                V
                V
   43       RCHAB
                .
                .
   48           .        SUBA
                .           .
                .           .
   54           .           .       SUBB2
                .           .           .
                .           .           .
   60       SUMAB.......................
                V
                V
   62      RCHSUM
                .
                .
   67           .        SUBC
                .           V
                .           V
   73           .       RCHCD
                .           .
                .           .
   78           .           .        SUBD
                .           .           .
                .           .           .
   84           .       SUMCD............
                .           V
                .           V
   86           .      RCHSUM
                .           .
                .           .
   91           .           .        SUBE
                .           .           .
                .           .           .
   97      SUMTOT......................

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
*  RUN DATE  07/16/1992  TIME  20:09:43 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

SUN CITY WEST EXPANSION MASTER DRAINAGE
STANLEY CONSULTANTS JOB # 11389 DATE: 16 JUL 92
HEC-1 MODEL 11389A2 (EXISTING CONDITION; MULTI SUB-BASIN)

CLARK UNIT HYDROGRAPH

2-HR STORM DISTRIBUTION (TABLE 2.2) P100 = 2.77"
NO AREAL REDUCTION FACTOR

GREEN-AMPT LOSS RATES FOR EXISTING CONDITIONS BASED ON
AREA-WEIGHTED VALUES OF EXISTING SOILS ASSUMING DTHETA DRY
AND VEGETATIVE COVER 25 PERCENT.
IA ASSUMED TO BE 0.35 INCHES AND PERCENT IMPERVIOUS ASSUMED
TO BE 1 PERCENT.

Kb BASED ON m = -0.016 and b = 0.10

TIME OF CONCENTRATION AND STORAGE COEFFICIENT R
BASED ON RESULTS FROM MCUHP1 (REVISED 12-16-91)

```
                    TIME-AREA RELATION FROM TABLE 5.2, ALL AREAS USE A NATURAL
                          TIME-AREA UA RECORD

                    OFFSITE FLOWS ARE ROUTED THROUGH HYPOTHETICAL ONSITE CHANNELS
                          USING MODIFIED PULS ROUTING.  CHANNELS REFLECT EXISTING
                          CROSS-SECTIONS AND EXISTING ROUGHNESS.


 31 IO        OUTPUT CONTROL VARIABLES
                    IPRNT          3  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT        HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1   0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        150  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      1   0  ENDING DATE
                   NDTIME       1225  ENDING TIME
                    ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL     .08 HOURS
                     TOTAL TIME BASE   12.42 HOURS

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


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 32 KK      *    SUBB1   *          RUNOFF HYDROGRAPH FROM SUB-BASIN B1
            *            *
            **************

 34 IN        TIME DATA FOR INPUT TIME SERIES
                    JXMIN          5  TIME INTERVAL IN MINUTES
                   JXDATE      1   0  STARTING DATE
                   JXTIME          0  STARTING TIME

              SUBBASIN RUNOFF DATA

 33 BA        SUBBASIN CHARACTERISTICS
                    TAREA        .19  SUBBASIN AREA

              PRECIPITATION DATA

 35 PB              STORM       2.77  BASIN TOTAL PRECIPITATION

 36 PI          INCREMENTAL PRECIPITATION PATTERN
                    .01       .01       .01       .01       .00       .01       .03       .03       .04       .04
                    .06       .09       .27       .14       .12       .04       .03       .02       .01       .01
                    .01       .00       .01       .01

 39 LG        GREEN AND AMPT LOSS RATE
                   STRTL        .35  STARTING LOSS
                     DTH        .35  MOISTURE DEFICIT
                    PSIF       5.09  WETTING FRONT SUCTION
                   XKSAT        .28  HYDRAULIC CONDUCTIVITY
                   RTIMP       1.00  PERCENT IMPERVIOUS AREA

 40 UC        CLARK UNITGRAPH
                      TC        .51  TIME OF CONCENTRATION
                       R        .29  STORAGE COEFFICIENT

 41 UA        ACCUMULATED-AREA VS. TIME,  11 ORDINATES
                      .0       3.0       5.0       8.0      12.0      20.0      43.0      75.0      90.0      96.0
                   100.0
```

```
                                                  ***

                                                UNIT HYDROGRAPH PARAMETERS
                                         CLARK   TC=   .51 HR,       R=   .29 HR
                                        SNYDER   TP=   .43 HR,      CP=   .85

                                                UNIT HYDROGRAPH
                                            23 END-OF-PERIOD ORDINATES
                8.      23.      45.     129.     228.     241.     197.     148.     111.      83.
               62.      46.      34.      26.      19.      14.      11.       8.       6.       4.
                3.       3.       2.

     ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION    SUBB1

    TOTAL RAINFALL =    2.77, TOTAL LOSS =    1.40, TOTAL EXCESS =    1.37

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     12.42-HR
+   (CFS)       (HR)
                          (CFS)
+     284.      1.50                  28.         13.         13.         13.
                        (INCHES)    1.365       1.365       1.365       1.365
                         (AC-FT)     14.         14.         14.         14.

                        CUMULATIVE AREA =     .19 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
  43 KK    *     RCHAB  *            ROUTE HYDROGRAPH SUBB1 THRU REACH AB; HYPOTHETICAL CHANNEL
           *            *
           **************

              HYDROGRAPH ROUTING DATA

  44 RS          STORAGE ROUTING
                      NSTPS          2  NUMBER OF SUBREACHES
                       ITYP       FLOW  TYPE OF INITIAL CONDITION
                      RSVRIC      -1.00  INITIAL CONDITION
                           X        .00 WORKING R AND D COEFFICIENT

  45 RC          NORMAL DEPTH CHANNEL
                        ANL       .050  LEFT OVERBANK N-VALUE
                       ANCH       .035  MAIN CHANNEL N-VALUE
                        ANR       .050  RIGHT OVERBANK N-VALUE
                      RLNTH      2800.  REACH LENGTH
                        SEL      .0050  ENERGY SLOPE
                      ELMAX         .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                     CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
  47 RY       ELEVATION    100.00    100.00     97.00     95.00     95.00     97.00    100.00    100.00
  46 RX       DISTANCE     500.00    500.00    513.00    525.00    530.00    542.00    550.00    550.00

                                                  ***

                                     COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE        .00       .11       .28       .49       .77      1.09      1.47      1.90      2.38      2.90
          OUTFLOW        .00      1.85      6.74     15.09     27.43     44.30     66.20     93.64    130.36    178.41
        ELEVATION      95.00     95.26     95.53     95.79     96.05     96.32     96.58     96.84     97.11     97.37

          STORAGE       3.45      4.03      4.65      5.29      5.96      6.67      7.41      8.17      8.97      9.80
          OUTFLOW     232.95    293.99    361.56    435.70    516.44    603.85    698.00    798.95    906.78   1021.56
        ELEVATION      97.63     97.89     98.16     98.42     98.68     98.95     99.21     99.47     99.74    100.00

     ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION    RCHAB

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     12.42-HR
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+   (CFS)       (HR)
                          (CFS)
+     262.      1.67                28.        13.        13.        13.
                        (INCHES)    1.365      1.365      1.365      1.365
                        (AC-FT)     14.        14.        14.        14.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR      72-HR     12.42-HR
+  (AC-FT)      (HR)
       2.       1.67                 0.         0.         0.         0.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR      72-HR     12.42-HR
+   (FEET)      (HR)
    97.76       1.67               95.53      95.26      95.26      95.26

                        CUMULATIVE AREA =     .19 SQ MI


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            *            *
  48 KK     *     SUBA   *            RUNOFF HYDROGRAPH FROM SUB-BASIN A
            *            *
            **************

              SUBBASIN RUNOFF DATA

  49 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .87  SUBBASIN AREA

                PRECIPITATION DATA

  35 PB               STORM        2.77  BASIN TOTAL PRECIPITATION

  36 PI           INCREMENTAL PRECIPITATION PATTERN
                     .01       .01       .01       .01       .00       .01       .03       .03       .04       .04
                     .06       .09       .27       .14       .12       .04       .03       .02       .01       .01
                     .01       .00       .01       .01

  50 LG         GREEN AND AMPT LOSS RATE
                      STRTL         .35  STARTING LOSS
                        DTH         .35  MOISTURE DEFICIT
                       PSIF        6.15  WETTING FRONT SUCTION
                      XKSAT         .21  HYDRAULIC CONDUCTIVITY
                      RTIMP        1.00  PERCENT IMPERVIOUS AREA

  51 UC         CLARK UNITGRAPH
                         TC        1.00  TIME OF CONCENTRATION
                          R         .56  STORAGE COEFFICIENT

  52 UA         ACCUMULATED-AREA VS. TIME,  11 ORDINATES
                       .0       3.0       5.0       8.0      12.0      20.0      43.0      75.0      90.0      96.0
                    100.0

                                                    ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=  1.00 HR,       R=   .56 HR
                                         SNYDER   TP=   .83 HR,      CP=   .88

                                                    UNIT HYDROGRAPH
                                                43 END-OF-PERIOD ORDINATES
              12.       30.       45.       62.       86.      126.      231.      408.      553.      602.
             583.      539.      478.      412.      355.      305.      263.      226.      195.      168.
             144.      124.      107.       92.       79.       68.       59.       51.       43.       37.
              32.       28.       24.       21.       18.       15.       13.       11.       10.        8.
               7.        6.        5.

    ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION     SUBA

   TOTAL RAINFALL =    2.77, TOTAL LOSS =    1.34, TOTAL EXCESS =    1.43

 PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
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                                        6-HR        24-HR        72-HR      12.42-HR
+   (CFS)       (HR)
                              (CFS)
+    811.       1.92                    133.         64.          64.          64.
                         (INCHES)     1.424        1.424        1.424        1.424
                          (AC-FT)      66.          66.          66.          66.

                         CUMULATIVE AREA =     .87 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


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            *            *
  54 KK     *     SUBB2  *            RUNOFF HYDROGRAPH FROM SUB-BASIN B2
            *            *
            **************

              SUBBASIN RUNOFF DATA

  55 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .16  SUBBASIN AREA

                PRECIPITATION DATA

  35 PB               STORM        2.77  BASIN TOTAL PRECIPITATION

  36 PI           INCREMENTAL PRECIPITATION PATTERN
                     .01       .01       .01       .01       .00       .01       .03       .03       .04       .04
                     .06       .09       .27       .14       .12       .04       .03       .02       .01       .01
                     .01       .00       .01       .01

  56 LG         GREEN AND AMPT LOSS RATE
                      STRTL         .35  STARTING LOSS
                        DTH         .35  MOISTURE DEFICIT
                       PSIF        5.09  WETTING FRONT SUCTION
                      XKSAT         .28  HYDRAULIC CONDUCTIVITY
                      RTIMP        1.00  PERCENT IMPERVIOUS AREA

  57 UC         CLARK UNITGRAPH
                         TC         .72  TIME OF CONCENTRATION
                          R         .72  STORAGE COEFFICIENT

  58 UA         ACCUMULATED-AREA VS. TIME,  11 ORDINATES
                        .0       3.0       5.0       8.0      12.0      20.0      43.0      75.0      90.0      96.0
                     100.0

                                                    ***

                                                UNIT HYDROGRAPH PARAMETERS
                                         CLARK   TC=   .72 HR,       R=   .72 HR
                                        SNYDER   TP=   .63 HR,      CP=   .62

                                                  UNIT HYDROGRAPH
                                            52 END-OF-PERIOD ORDINATES
                 2.        6.       10.       16.       34.       69.       97.      102.       97.       88.
                79.       70.       63.       56.       50.       44.       39.       35.       31.       28.
                25.       22.       20.       18.       16.       14.       12.       11.       10.        9.
                 8.        7.        6.        6.        5.        4.        4.        4.        3.        3.
                 2.        2.        2.        2.        2.        1.        1.        1.        1.        1.
                 1.        1.

     ***            ***            ***            ***            ***

                         HYDROGRAPH AT STATION    SUBB2

    TOTAL RAINFALL =    2.77, TOTAL LOSS =    1.40, TOTAL EXCESS =    1.37

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR        24-HR        72-HR      12.42-HR
+   (CFS)       (HR)
                              (CFS)
+    132.       1.75                     24.          11.          11.          11.
                         (INCHES)     1.364        1.364        1.364        1.364
                          (AC-FT)      12.          12.          12.          12.

                         CUMULATIVE AREA =     .16 SQ MI
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          *            *
  60 KK   *    SUMAB   *            COMBINE HYDROGRAPH FROM RCHAB, SUBA & SUBB2
          *            *
          **************

  61 HC         HYDROGRAPH COMBINATION
                     ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

     ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION    SUMAB

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR       24-HR       72-HR     12.42-HR
+  (CFS)       (HR)
                          (CFS)
+   1100.      1.83                184.        89.         89.         89.
                         (INCHES)   1.407      1.407       1.407       1.407
                          (AC-FT)    91.        91.         91.         91.

                         CUMULATIVE AREA =    1.22 SQ MI


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          *            *
  62 KK   *    RCHSUM  *            ROUTE HYDROGRAPH SUMAB THRU REACH SUM; HYPOTHETICAL CHANNEL
          *            *
          **************

             HYDROGRAPH ROUTING DATA

  63 RS         STORAGE ROUTING
                     NSTPS           6  NUMBER OF SUBREACHES
                      ITYP        FLOW  TYPE OF INITIAL CONDITION
                    RSVRIC       -1.00  INITIAL CONDITION
                         X         .00 WORKING R AND D COEFFICIENT

  64 RC         NORMAL DEPTH CHANNEL
                       ANL        .035  LEFT OVERBANK N-VALUE
                      ANCH        .050  MAIN CHANNEL N-VALUE
                       ANR        .050  RIGHT OVERBANK N-VALUE
                     RLNTH       8670.  REACH LENGTH
                       SEL       .0040  ENERGY SLOPE
                     ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                        --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
  66 RY       ELEVATION   100.00    100.00     93.00     93.00     93.00     93.00    100.00    100.00
  65 RX       DISTANCE    500.00    500.00    560.00    560.00    580.00    580.00    600.00    600.00

                                                          ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE        .00      1.62      3.55      5.79      8.34     11.19     14.36     17.83     21.61     25.70
          OUTFLOW        .00      7.76     26.59     56.12     96.88    149.57    214.94    293.75    386.76    494.74
        ELEVATION      93.00     93.37     93.74     94.11     94.47     94.84     95.21     95.58     95.95     96.32

          STORAGE      30.10     34.81     39.83     45.16     50.79     56.73     62.99     69.55     76.42     83.60
          OUTFLOW     618.43    758.55    915.85   1091.02   1284.76   1497.76   1730.70   1984.24   2259.05   2555.77
        ELEVATION      96.68     97.05     97.42     97.79     98.16     98.53     98.89     99.26     99.63    100.00

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                    HYDROGRAPH AT STATION   RCHSUM

 PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR     12.42-HR
+   (CFS)      (HR)
                            (CFS)
+     969.     2.33                184.         89.         89.         89.
                         (INCHES)  1.403       1.407       1.407       1.407
                          (AC-FT)   91.         91.         91.         91.

 PEAK STORAGE  TIME                        MAXIMUM AVERAGE STORAGE
                                   6-HR       24-HR       72-HR     12.42-HR
+  (AC-FT)     (HR)
       7.      2.33                  2.          1.          1.          1.

 PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                   6-HR       24-HR       72-HR     12.42-HR
+   (FEET)     (HR)
    97.53      2.33               94.48       93.73       93.73       93.73

                         CUMULATIVE AREA =    1.22 SQ MI


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          *            *
 67 KK    *     SUBC   *          RUNOFF HYDROGRAPH FROM SUB-BASIN C
          *            *
          **************

            SUBBASIN RUNOFF DATA

 68 BA        SUBBASIN CHARACTERISTICS
                   TAREA         .19  SUBBASIN AREA

              PRECIPITATION DATA

 35 PB             STORM        2.77  BASIN TOTAL PRECIPITATION

 36 PI          INCREMENTAL PRECIPITATION PATTERN
                   .01       .01       .01       .01       .00       .01       .03       .03       .04       .04
                   .06       .09       .27       .14       .12       .04       .03       .02       .01       .01
                   .01       .00       .01       .01

 69 LG        GREEN AND AMPT LOSS RATE
                  STRTL         .35  STARTING LOSS
                    DTH         .35  MOISTURE DEFICIT
                   PSIF        6.05  WETTING FRONT SUCTION
                  XKSAT         .20  HYDRAULIC CONDUCTIVITY
                  RTIMP        1.00  PERCENT IMPERVIOUS AREA

 70 UC        CLARK UNITGRAPH
                     TC         .68  TIME OF CONCENTRATION
                      R         .49  STORAGE COEFFICIENT

 71 UA        ACCUMULATED-AREA VS. TIME,  11 ORDINATES
                     .0       3.0       5.0       8.0      12.0      20.0      43.0      75.0      90.0      96.0
                  100.0

                                                   ***

                                          UNIT HYDROGRAPH PARAMETERS
                                   CLARK   TC=   .68 HR,       R=   .49 HR
                                  SNYDER   TP=   .59 HR,      CP=   .75

                                          UNIT HYDROGRAPH
                                     37 END-OF-PERIOD ORDINATES
              4.       11.       18.       30.       67.      128.      163.      160.      143.      122.
            103.       87.       74.       62.       52.       44.       37.       32.       27.       23.
             19.       16.       14.       11.       10.        8.        7.        6.        5.        4.
              4.        3.        3.        2.        2.        2.        1.

    ***            ***            ***            ***            ***

                    HYDROGRAPH AT STATION     SUBC
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    TOTAL RAINFALL =    2.77, TOTAL LOSS =    1.31, TOTAL EXCESS =    1.46

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     12.42-HR
+   (CFS)       (HR)
                          (CFS)
+     216.      1.67                30.         15.         15.         15.
                        (INCHES)    1.451       1.451       1.451       1.451
                         (AC-FT)    15.         15.         15.         15.

                        CUMULATIVE AREA =     .19 SQ MI


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            *            *
   73 KK    *    RCHCD   *          ROUTE HYDROGRAPH SUBC THRU REACH CD; HYPOTHETICAL CHANNEL
            *            *
            **************

               HYDROGRAPH ROUTING DATA

   74 RS         STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       FLOW  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

   75 RC         NORMAL DEPTH CHANNEL
                        ANL       .050  LEFT OVERBANK N-VALUE
                       ANCH       .035  MAIN CHANNEL N-VALUE
                        ANR       .050  RIGHT OVERBANK N-VALUE
                      RLNTH      2020.  REACH LENGTH
                        SEL      .0040  ENERGY SLOPE
                      ELMAX         .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
   77 RY       ELEVATION   100.00    100.00     97.00     95.00     95.00     97.00    100.00    100.00
   76 RX       DISTANCE    500.00    500.00    513.00    525.00    530.00    542.00    550.00    550.00

                                                   ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

            STORAGE       .00       .08       .20       .36       .55       .79      1.06      1.37      1.72      2.09
            OUTFLOW       .00      1.65      6.03     13.49     24.53     39.62     59.21     83.75    116.59    159.58
          ELEVATION     95.00     95.26     95.53     95.79     96.05     96.32     96.58     96.84     97.11     97.37

            STORAGE      2.49      2.91      3.35      3.82      4.30      4.81      5.34      5.90      6.47      7.07
            OUTFLOW    208.36    262.96    323.39    389.70    461.92    540.10    624.31    714.60    811.05    913.71
          ELEVATION     97.63     97.89     98.16     98.42     98.68     98.95     99.21     99.47     99.74    100.00

      ***           ***           ***           ***           ***

                        HYDROGRAPH AT STATION    RCHCD

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     12.42-HR
+   (CFS)       (HR)
                          (CFS)
+     199.      1.83                30.         15.         15.         15.
                        (INCHES)    1.451       1.451       1.451       1.451
                         (AC-FT)    15.         15.         15.         15.

 PEAK STORAGE   TIME                          MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     12.42-HR
+  (AC-FT)      (HR)
       2.       1.83                 0.          0.          0.          0.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     12.42-HR
+   (FEET)      (HR)
    97.58       1.83               95.71       95.34       95.34       95.34
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                    CUMULATIVE AREA =     .19 SQ MI

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  78 KK   *     SUBD   *            RUNOFF HYDROGRAPH FROM SUB-BASIN D
          *            *
          **************

             SUBBASIN RUNOFF DATA

  79 BA        SUBBASIN CHARACTERISTICS
                     TAREA         .23  SUBBASIN AREA

               PRECIPITATION DATA

  35 PB              STORM        2.77  BASIN TOTAL PRECIPITATION

  36 PI          INCREMENTAL PRECIPITATION PATTERN
                    .01       .01       .01       .01       .00       .01       .03       .03       .04       .04
                    .06       .09       .27       .14       .12       .04       .03       .02       .01       .01
                    .01       .00       .01       .01

  80 LG        GREEN AND AMPT LOSS RATE
                     STRTL         .35  STARTING LOSS
                       DTH         .35  MOISTURE DEFICIT
                      PSIF        4.34  WETTING FRONT SUCTION
                     XKSAT         .26  HYDRAULIC CONDUCTIVITY
                     RTIMP        1.00  PERCENT IMPERVIOUS AREA

  81 UC        CLARK UNITGRAPH
                        TC         .60  TIME OF CONCENTRATION
                         R         .40  STORAGE COEFFICIENT

  82 UA        ACCUMULATED-AREA VS. TIME,  11 ORDINATES
                      .0       3.0       5.0       8.0      12.0      20.0      43.0      75.0      90.0      96.0
                   100.0

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                         CLARK   TC=   .60 HR,       R=   .40 HR
                                        SNYDER   TP=   .50 HR,      CP=   .77

                                                   UNIT HYDROGRAPH
                                              30 END-OF-PERIOD ORDINATES
                 6.       17.       30.       68.      158.      226.      224.      194.      159.      128.
               104.       84.       68.       55.       45.       36.       29.       24.       19.       16.
                13.       10.        8.        7.        5.        4.        4.        3.        2.        2.

     ***            ***            ***            ***            ***

                        HYDROGRAPH AT STATION     SUBD

    TOTAL RAINFALL =    2.77, TOTAL LOSS =    1.32, TOTAL EXCESS =    1.45

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     12.42-HR
+   (CFS)       (HR)
                             (CFS)
+    293.       1.58                35.         17.         17.         17.
                          (INCHES)  1.446       1.446       1.446       1.446
                           (AC-FT)   18.         18.         18.         18.

                        CUMULATIVE AREA =     .23 SQ MI

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          *            *
  84 KK   *     SUMCD  *            COMBINE HYDROGRAPH FROM SUBC & SUBD
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          *            *
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 85 HC          HYDROGRAPH COMBINATION
                     ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

     ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION    SUMCD

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     12.42-HR
+   (CFS)       (HR)
                          (CFS)
+     449.      1.67                 66.         32.         32.         32.
                        (INCHES)    1.448       1.448       1.448       1.448
                         (AC-FT)     33.         33.         33.         33.

                        CUMULATIVE AREA =     .42 SQ MI


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          *            *
 86 KK    *    RCHSUM  *            ROUTE HYDROGRAPH SUMCD THRU REACH SUM; HYPOTHETICAL CHANNEL
          *            *
          **************

             HYDROGRAPH ROUTING DATA

 87 RS          STORAGE ROUTING
                      NSTPS           4  NUMBER OF SUBREACHES
                       ITYP        FLOW  TYPE OF INITIAL CONDITION
                     RSVRIC       -1.00  INITIAL CONDITION
                          X         .00 WORKING R AND D COEFFICIENT

 88 RC          NORMAL DEPTH CHANNEL
                        ANL        .050  LEFT OVERBANK N-VALUE
                       ANCH        .035  MAIN CHANNEL N-VALUE
                        ANR        .050  RIGHT OVERBANK N-VALUE
                      RLNTH       5520.  REACH LENGTH
                        SEL       .0050  ENERGY SLOPE
                      ELMAX          .0  MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

                                   CROSS-SECTION DATA
                          --- LEFT OVERBANK --- + ------ MAIN CHANNEL ------- + --- RIGHT OVERBANK ---
 90 RY       ELEVATION    100.00    100.00     97.00     95.00     95.00     97.00    100.00    100.00
 89 RX       DISTANCE     500.00    500.00    513.00    525.00    530.00    542.00    550.00    550.00

                                                          ***

                                   COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       .00       .22       .54       .97      1.51      2.15      2.90      3.75      4.70      5.72
          OUTFLOW       .00      1.85      6.74     15.09     27.43     44.30     66.20     93.64    130.36    178.41
        ELEVATION     95.00     95.26     95.53     95.79     96.05     96.32     96.58     96.84     97.11     97.37

          STORAGE      6.81      7.95      9.16     10.43     11.76     13.15     14.60     16.11     17.69     19.33
          OUTFLOW    232.95    293.99    361.56    435.70    516.44    603.85    698.00    798.95    906.78   1021.56
        ELEVATION     97.63     97.89     98.16     98.42     98.68     98.95     99.21     99.47     99.74    100.00

     ***            ***            ***            ***            ***

                       HYDROGRAPH AT STATION   RCHSUM

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     12.42-HR
+   (CFS)       (HR)
                          (CFS)
+     420.      1.92                 66.         32.         32.         32.
                        (INCHES)    1.447       1.448       1.448       1.448
                         (AC-FT)     33.         33.         33.         33.
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 PEAK STORAGE   TIME                          MAXIMUM AVERAGE STORAGE
                                        6-HR       24-HR       72-HR     12.42-HR
+  (AC-FT)      (HR)
       3.       1.92                     1.          0.          0.          0.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                        6-HR       24-HR       72-HR     12.42-HR
+   (FEET)      (HR)
    98.37       1.92                    96.01      95.49       95.49       95.49

                          CUMULATIVE AREA =     .42 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  91 KK     *     SUBE   *            RUNOFF HYDROGRAPH FROM SUB-BASIN E
            *            *
            **************

               SUBBASIN RUNOFF DATA

  92 BA          SUBBASIN CHARACTERISTICS
                      TAREA        1.30  SUBBASIN AREA

                 PRECIPITATION DATA

  35 PB               STORM        2.77  BASIN TOTAL PRECIPITATION

  36 PI            INCREMENTAL PRECIPITATION PATTERN
                      .01       .01       .01       .01       .00       .01       .03       .03       .04       .04
                      .06       .09       .27       .14       .12       .04       .03       .02       .01       .01
                      .01       .00       .01       .01

  93 LG          GREEN AND AMPT LOSS RATE
                      STRTL         .35  STARTING LOSS
                        DTH         .35  MOISTURE DEFICIT
                       PSIF        5.05  WETTING FRONT SUCTION
                      XKSAT         .23  HYDRAULIC CONDUCTIVITY
                      RTIMP        1.00  PERCENT IMPERVIOUS AREA

  94 UC          CLARK UNITGRAPH
                         TC        1.10  TIME OF CONCENTRATION
                          R         .58  STORAGE COEFFICIENT

  95 UA          ACCUMULATED-AREA VS. TIME,  11 ORDINATES
                        .0       3.0       5.0       8.0      12.0      20.0      43.0      75.0      90.0      96.0
                     100.0

                                                          ***

                                                UNIT HYDROGRAPH PARAMETERS
                                          CLARK   TC=  1.10 HR,       R=   .58 HR
                                         SNYDER   TP=   .92 HR,      CP=   .91

                                                   UNIT HYDROGRAPH
                                              46 END-OF-PERIOD ORDINATES
                 15.       40.       59.       78.      103.      144.      229.      387.      617.      797.
                847.      821.      761.      685.      598.      518.      448.      388.      336.      291.
                252.      218.      189.      164.      142.      123.      106.       92.       80.       69.
                 60.       52.       45.       39.       34.       29.       25.       22.       19.       16.
                 14.       12.       11.        9.        8.        7.

     ***            ***            ***            ***            ***

                         HYDROGRAPH AT STATION     SUBE

    TOTAL RAINFALL =    2.77, TOTAL LOSS =    1.31, TOTAL EXCESS =    1.46

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR       24-HR       72-HR     12.42-HR
+   (CFS)       (HR)
                          (CFS)
+    1167.      2.00                   202.        98.         98.         98.
                        (INCHES)     1.451      1.451       1.451       1.451
                         (AC-FT)     100.        100.        100.        100.
```

CUMULATIVE AREA = 1.30 SQ MI

*** ***

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          **************
          *            *
 97 KK    *   SUMTOT   *          COMBINE HYDROGRAPH FROM RCHSUM (WEST & NORTH)
          *            *
          **************

 98 HC        HYDROGRAPH COMBINATION
                   ICOMP          3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***

    ***          ***          ***          ***          ***
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HYDROGRAPH AT STATION SUMTOT

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	12.42-HR
2275.	2.17	(CFS)	451.	218.	218.	218.
		(INCHES)	1.429	1.432	1.432	1.432
		(AC-FT)	224.	224.	224.	224.

CUMULATIVE AREA = 2.93 SQ MI

1

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SUBB1	284.	1.50	28.	13.	13.	.19		
ROUTED TO	RCHAB	262.	1.67	28.	13.	13.	.19	97.76	1.67
HYDROGRAPH AT	SUBA	811.	1.92	133.	64.	64.	.87		
HYDROGRAPH AT	SUBB2	132.	1.75	24.	11.	11.	.16		
3 COMBINED AT	SUMAB	1100.	1.83	184.	89.	89.	1.22		
ROUTED TO	RCHSUM	969.	2.33	184.	89.	89.	1.22	97.53	2.33
HYDROGRAPH AT	SUBC	216.	1.67	30.	15.	15.	.19		
ROUTED TO	RCHCD	199.	1.83	30.	15.	15.	.19	97.58	1.83
HYDROGRAPH AT	SUBD	293.	1.58	35.	17.	17.	.23		
2 COMBINED AT	SUMCD	449.	1.67	66.	32.	32.	.42		
ROUTED TO	RCHSUM	420.	1.92	66.	32.	32.	.42	98.37	1.92

	HYDROGRAPH AT							
+		SUBE	1167.	2.00	202.	98.	98.	1.30
	3 COMBINED AT							
+		SUMTOT	2275.	2.17	451.	218.	218.	2.93

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

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS        *
 *          SEPTEMBER 1990               *                    *   HYDROLOGIC ENGINEERING CENTER       *
 *           VERSION 4.0                 *                    *         609 SECOND STREET             *
 *                                       *                    *      DAVIS, CALIFORNIA 95616          *
 * RUN DATE  08/11/1992  TIME  11:32:43  *                    *          (916) 756-1104               *
 *                                       *                    *                                       *
 *****************************************                    *****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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

  1           ID
  2           ID
  3           ID        SUN CITY WEST EXPANSION AREA MASTER DRAINAGE
  4           ID        STANLEY CONSULTANTS JOB # 11389   DATE: 11 AUG 92
  5           ID        HEC-1 MODEL 11389B (EXIST COND OFFSITE; DEVELOPED COND ONSITE)
  6           ID
  7           ID        CLARK UNIT HYDROGRAPH
  8           ID
  9           ID        2-HR STORM DISTRIBUTION (FCDMC HYDROLOGIC DESIGN MANUAL; TABLE 2.2)
 10           ID             P100 = 2.77"  - -  NO AERIAL REDUCTION
 11           ID
 12           ID        COMPUTATION TIME INTERVAL 5 MINUTES
 13           ID
 14           ID        GREEN-AMPT LOSS RATES FOR OFFSITE EXISTING CONDITIONS BASED ON
 15           ID             AREA-WEIGHTED VALUES OF EXISTING SOILS ASSUMING DTHETA DRY
 16           ID             AND VEGETATIVE COVER 25 PERCENT.
 17           ID             IA ASSUMED TO BE 0.35 INCHES AND PERCENT IMPERVIOUS ASSUMED
 18           ID             TO BE 1 PERCENT.
 19           ID
 20           ID        GREEN-AMPT LOSS RATES FOR ONSITE DEVELOPED CONDITIONS ARE AREA-WEIGHTED.
 21           ID          RAINFALL LOSSES FOR ONSITE DEVELOPED SOILS ASSUME SAME BASE DTHETA,
 22           ID          PSIF & XKSAT FROM WEIGHTED ONSITE EXISTING SOILS. INITIAL ABSTRACT
 23           ID          AND PERCENT IMPERV AS FOLLOWS:
 24           ID                                          IA         RTIMP
 25           ID                       RES SF AND CAS    0.15         25
 26           ID                       GOLF/OPEN SP      0.35          1
 27           ID                       COMMERCIAL        0.10         80
 28           ID
 29           ID        TIME OF CONCENTRATION, TC, AND STORAGE COEFFICIENT, R, ARE BASED ON
 30           ID          MCUHP1 (REVISED 12-16-91) WITH LENGTHS AND SLOPES ESTIMATED
 31           ID          FROM PRELIMINARY LOT LAYOUTS AND GRADING. Kb BASED ON m AND b
 32           ID          PARAMETERS FROM TABLE 5.1 OF HYDROLOGY MANUAL. ONSITE VALUES
 33           ID          ARE AREA-WEIGHTED FOR COMPOSITE LAND USE BASED ON:
 34           ID                                           m          b
 35           ID                       SF RES, CAS & COMM  -0.00625   0.040
 36           ID                       GOLF/OPEN SP        -0.0250    0.015
 37           ID                       EXIST DESERT        -0.0160    0.100
 38           ID
 39           ID        TIME-AREA RELATION FROM TABLE 5.2:
 40           ID          OFFSITE AREAS USE A NATURAL TIME-AREA UA RECORD
 41           ID          ONSITE AREAS USE AN URBAN TIME-AREA UA RECORD
 42           ID
```

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 43          ID        HYDROGRAPH ROUTING THRU STREET REACH USES KENEMATIC WAVE AND ASSUMES:
 44          ID          TRAPEZOID CHANNEL, Wbase=32',40' OR 68'; SIDE SLOPE 1V:0.0001H;
 45          ID              "n" = 0.015; SLOPE S = 0.005 (ft/ft)
 46          ID
 47          ID        HYDROGRAPH ROUTING THRU GUNITE CHANNEL USES KINEMATIC WAVE AND ASSUMES:
 48          ID          TRAPEZOID CHANNEL, Wbase=10'(MIN),20'(MAX); SIDE SLOPE 1V:0.5H;
 49          ID              "n" = 0.016; SLOPE S = 0.005 (ft/ft)
 50          ID
 51          ID        HYDROGRAPH ROUTING THRU GOLF COURSE CHANNEL USES MOD PULS AND ASSUMES:
 52          ID          CROSS SECTIONS BASED ON GOLF COURSE GRADING PLANS;
 53          ID          LOW FLOW "n" = 0.025; OVERBANK "n" = 0.030;
 54          ID          CHANNEL SLOPE BASED ON ESTIMATED HYDRAULIC GRADIENT;
 55          ID          SLOPE S = DELTA ELEVATION / LENGTH OF FLOWPATH
1                                        HEC-1 INPUT                                          PAGE  2

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

 56          ID          ELEVATION CHANGE IS UPSTREAM FLOWLINE TO DOWNSTREAM FLOWLINE
 57          ID          (or to water surface of detention basin assuming 3' ponding depth).
 58          ID          NSTPS (RS RECORD) = LENGTH/(VEL*300 SEC) -- VEL ASSUMED @ 5 FPS
 59          ID
 60          ID        HYDROGRAPH ROUTING THRU DET BASINS USES MOD PULS LEVEL POOL.
 61          ID          ELEVATION VS STORAGE DATA IS BASED ON GOLF COURSE PLANS.
 62          ID          BASIN OUTLETS CONSISTING OF PIPE AND WIER IN COMBO ASSUMES:
 63          ID                PIPE SIZE RANGES FROM SINGLE 12" TO MULTI - 24"
 64          ID                LOW-FLOWS ASSUME ORIFICE EQUATION:
 65          ID                  Q = C * A(pipe) * H(above FL)^0.5
 66          ID                (ORIFICE COEF, C, ESTIMATED AT 0.40 TO GIVE RESULTS
 67          ID                  SIMILAR TO HEC-5 FOR CIRC RCP W/ INLET CONTROL)
 68          ID                WIERS ARE ASSUMED TO BE BROAD, HORIZ CREST WITH VERT SIDES,
 69          ID                    WIER COEFF = 2.6
 70          ID          BASIN OUTLETS CONSISTING OF ROADWAY CULVERTS ASSUME
 71          ID                HEC-5 ELEV-DISCHARGE.
 72          ID          DET BASIN 330 ELEV-DISCHARGE BASED ON BACKWATER FROM HEC-2 SCWEH2C
 73          ID
             *DIAGRAM
 74          IT       5                    200
 75          IO       5

 76          KK    SUBA        RUNOFF HYDROGRAPH FROM OFFSITE SUB-BASIN A
 77          BA    .867
 78          IN       5
 79          PB   2.770
 80          PC    .000    .011    .018    .023    .028    .032    .046    .071    .100    .137
 81          PC    .176    .232    .327    .601    .743    .863    .901    .930    .954    .962
 82          PC    .970    .979    .982    .992   1.000
 83          LG     .35     .35    6.15     .21       1
 84          UC    .996    .557
 85          UA       0       3       5       8      12      20      43      75      90      96
 86          UA     100

 87          KK   SUBB2        RUNOFF HYDROGRAPH FROM OFFSITE SUB-BASIN B2
 88          BA    .161
 89          LG     .35     .35    5.09     .28       1
 90          UC    .717    .724
 91          UA       0       3       5       8      12      20      43      75      90      96
 92          UA     100

 93          KK  SUMAB2        COMBINE HYDROGRAPH FROM SUBA AND SUBB2
 94          HC       2

 95          KK   RCH16        ROUTE HYDROGRAPH SUMAB2 THRU REACH 16; GUNITE CHANNEL
 96          RK    1280    .005    .016            TRAP      20      .5

 97          KK   SUB05        RUNOFF HYDROGRAPH FROM SUB-BASIN 5
 98          BA    .031
 99          LG    .150    .350   5.050    .230  25.000
100          UC    .233    .243
101          UA       0       5      16      30      65      77      84      90      94      97
102          UA     100
1                                        HEC-1 INPUT                                          PAGE  3

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

103          KK   SUB10        RUNOFF HYDROGRAPH FROM SUB-BASIN 10
104          BA    .008
105          LG    .225    .325   5.050    .265  40.500
106          UC    .504    .863
107          UA       0       5      16      30      65      77      84      90      94      97
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108          UA     100

109          KK   SUB15        RUNOFF HYDROGRAPH FROM SUB-BASIN 15
110          BA    .013
111          LG    .150    .350   5.050    .230  25.000
112          UC    .213    .330
113          UA       0       5      16      30      65      77      84      90      94      97
114          UA     100

115          KK   SUM16        COMBINE HYDROGRAPH FROM RCH16, SUB05, SUB10 & SUB15
116          HC       4

117          KK   SUBB1        RUNOFF HYDROGRAPH FROM SUB-BASIN B1
118          KM          ***** BEGIN NEW BRANCH *****
119          BA    .188
120          LG    .350    .350    5.09     .28       1
121          UC    .508    .288
122          UA       0       3       5       8      12      20      43      75      90      96
123          UA     100

124          KK   RCH26        ROUTE HYDROGRAPH SUBB1 THRU REACH 26; GUNITE CHANNEL
125          RK     650    .005    .016            TRAP      20      .5

126          KK   SUB20        RUNOFF HYDROGRAPH FROM SUB-BASIN 20
127          BA    .012
128          LG    .150    .350   5.050    .230  25.000
129          UC    .179    .202
130          UA       0       5      16      30      65      77      84      90      94      97
131          UA     100

132          KK   SUB25        RUNOFF HYDROGRAPH FROM SUB-BASIN 25
133          BA    .008
134          LG    .150    .350   5.050    .230  25.000
135          UC    .175    .205
136          UA       0       5      16      30      65      77      84      90      94      97
137          UA     100

138          KK   SUM26        COMBINE HYDROGRAPH FROM RCH26, SUB20 & SUB25
139          HC       3

140          KK   SUB30        RUNOFF HYDROGRAPH FROM SUB-BASIN 30
141          BA    .026
142          LG    .170    .345   5.050    .237  22.600
143          UC    .233    .222
144          UA       0       5      16      30      65      77      84      90      94      97
145          UA     100
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

146          KK   RCH35        ROUTE HYDROGRAPH SUB30 THRU REACH 35; 40' STREET
147          RK     840    .005    .015            TRAP      40   .0001

148          KK   SUB35        RUNOFF HYDROGRAPH FROM SUB-BASIN 35
149          BA    .023
150          LG    .150    .350   5.050    .230  25.000
151          UC    .179    .157
152          UA       0       5      16      30      65      77      84      90      94      97
153          UA     100

154          KK   SUM35        COMBINE HYDROGRAPH FROM RCH35 & SUB35
155          HC       2

156          KK   RCH40        ROUTE HYDROGRAPH SUM35 THRU REACH 40
157          RS       1    FLOW      -1
158          RC     .03    .025     .03     820    .004
159          RX       0      20      60      65     130     135     195     210
160          RY    1302    1301    1297  1296.5  1296.5    1297    1302    1303

161          KK   SUB40        RUNOFF HYDROGRAPH FROM SUB-BASIN 40
162          BA    .014
163          LG    .310    .310   5.050    .286   5.800
164          UC    .254    .232
165          UA       0       5      16      30      65      77      84      90      94      97
166          UA     100

167          KK   SUM40        COMBINE HYDROGRAPH FROM SUM26, RCH40 & SUB40
168          KM                INFLOW INTO DETENTION BASIN 40
169          HC       3
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170          KK   DET40        ROUTE HYDROGRAPH SUM40 THRU DET BASIN 40;
171          KM                HIGH WIER; 2-10'X3' CBC
172          KO       1
173          RS       1    STOR      -1
174          SA       0     .11     .36     .67    1.21    3.10
175          SE    1294    1295    1296    1297    1298    1299
176          SQ       0      50     145     260     385     485

177          KK   RCH45        ROUTE HYDROGRAPH DET40 THRU REACH 45
178          RS       1    FLOW      -1
179          RC     .03    .025     .03     600    .003
180          RX       0      20      60      70     110     120     155     190
181          RY    1293    1291  1290.5    1290    1290  1290.5    1292    1293

182          KK   SUB45        RUNOFF HYDROGRAPH FROM SUB-BASIN 45
183          BA    .011
184          LG    .310    .310   5.050    .286   5.800
185          UC    .179    .123
186          UA       0       5      16      30      65      77      84      90      94      97
187          UA     100
1                                      HEC-1 INPUT                                          PAGE  5

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


188          KK   SUM45        COMBINE HYDROGRAPH FROM RCH45 & SUB45
189          KM                INFLOW INTO DETENTION BASIN 45
190          HC       2

191          KK   DET45        ROUTE HYDROGRAPH SUM45 THRU DET BASIN 45;
192          KM                190-FOOT WIER USED FOR HIGH FLOWS AND 1-24" RCP
193          KO       1
194          RS       1    STOR      -1
195          SA       0     .01     .14     .51     .78    1.12    1.40    2.73    3.27
196          SE    1287    1288    1289    1290    1291    1292  1292.5    1293    1294
197          SL    1287     3.1      .4      .5
198          SS    1292     190     2.6     1.5

199          KK   RCH50        ROUTE HYDROGRAPH DET45 THRU REACH 50
200          RS       1    FLOW      -1
201          RC     .03    .025     .03     820    .009
202          RX       0      20      55      60      90     100     115     140
203          RY    1291    1288    1287  1286.5  1286.5    1287    1289    1291

204          KK   SUB50        RUNOFF HYDROGRAPH FROM SUB-BASIN 50
205          BA    .010
206          LG    .310    .310   5.050    .286   5.800
207          UC    .229    .224
208          UA       0       5      16      30      65      77      84      90      94      97
209          UA     100

210          KK   SUB55        RUNOFF HYDROGRAPH FROM SUB-BASIN 55
211          BA    .015
212          LG    .150    .350   5.050    .230  25.000
213          UC    .213    .315
214          UA       0       5      16      30      65      77      84      90      94      97
215          UA     100

216          KK   SUB60        RUNOFF HYDROGRAPH FROM SUB-BASIN 60
217          BA    .031
218          LG    .150    .350   5.050    .230  25.000
219          UC    .262    .302
220          UA       0       5      16      30      65      77      84      90      94      97
221          UA     100

222          KK   SUM50        COMBINE HYDROGRAPH FROM RCH50, SUB50, SUB55 & SUB60
223          HC       5

224          KK   RCH65        ROUTE HYDROGRAPH SUM50 THRU REACH 65
225          RS       1    FLOW      -1
226          RC     .03    .025     .03    1300    .003
227          RX       0      30      45      50     140     145     180     200
228          RY    1285    1283  1282.5    1282    1282  1282.5    1285    1286
1                                      HEC-1 INPUT                                          PAGE  6

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


229          KK   SUB65        RUNOFF HYDROGRAPH FROM SUB-BASIN 65
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230          BA    .017
231          LG    .310    .310   5.050    .286   5.800
232          UC    .404    .422
233          UA       0       5      16      30      65      77      84      90      94      97
234          UA     100

235          KK   SUB70        RUNOFF HYDROGRAPH FROM SUB-BASIN 70
236          BA    .015
237          LG    .150    .350   5.050    .230  25.000
238          UC    .242    .316
239          UA       0       5      16      30      65      77      84      90      94      97
240          UA     100

241          KK   SUM65        COMBINE HYDROGRAPH FROM RCH65, SUB65 & SUB70
242          HC       3

243          KK   RCH80        ROUTE HYDROGRAPH SUM65 THRU REACH 80
244          RS       1    FLOW      -1
245          RC     .03    .025     .03    1160    .003
246          RX       0      20      50      95     145     150     170     185
247          RY    1281    1280    1277    1276    1276    1277    1280    1281

248          KK   SUB75        RUNOFF HYDROGRAPH FROM SUB-BASIN 75
249          BA    .011
250          LG    .150    .350   5.050    .230  25.000
251          UC    .204    .268
252          UA       0       5      16      30      65      77      84      90      94      97
253          UA     100

254          KK   SUB80        RUNOFF HYDROGRAPH FROM SUB-BASIN 80
255          BA    .013
256          LG    .310    .310   5.050    .286   5.800
257          UC    .275    .234
258          UA       0       5      16      30      65      77      84      90      94      97
259          UA     100

260          KK   SUM80        COMBINE HYDROGRAPH FROM RCH80, SUB75 & SUB80
261          HC       3

262          KK   RCH85        ROUTE HYDROGRAPH SUM80 THRU REACH 85
263          RS       1    FLOW      -1
264          RC     .03    .025     .03     620    .003
265          RX       0      50      90     115     165     190     220     230
266          RY    1279    1277    1275    1274    1274    1275    1278    1279

267          KK   SUB85        RUNOFF HYDROGRAPH FROM SUB-BASIN 85
268          BA    .014
269          LG    .310    .310   5.050    .286   5.800
270          UC    .300    .281
271          UA       0       5      16      30      65      77      84      90      94      97
272          UA     100
```



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

273          KK   SUB90        RUNOFF HYDROGRAPH FROM SUB-BASIN 90
274          BA    .016
275          LG    .150    .350   5.050    .230  25.000
276          UC    .283    .418
277          UA       0       5      16      30      65      77      84      90      94      97
278          UA     100

279          KK   SUB95        RUNOFF HYDROGRAPH FROM SUB-BASIN 95
280          BA    .011
281          LG    .150    .350   5.050    .230  25.000
282          UC    .183    .218
283          UA       0       5      16      30      65      77      84      90      94      97
284          UA     100

285          KK   SUM85        COMBINE HYDROGRAPH FROM RCH85, SUB85, SUB90 & SUB95
286          HC       4

287          KK  SUB100        RUNOFF HYDROGRAPH FROM SUB-BASIN 100
288          BA    .024
289          LG    .290    .315   5.050    .279    8.20
290          UC    .287    .287
291          UA       0       5      16      30      65      77      84      90      94      97
292          UA     100
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293          KK  SUB105        RUNOFF HYDROGRAPH FROM SUB-BASIN 105
294          BA    .013
295          LG    .150    .350   5.050    .230  25.000
296          UC    .225    .250
297          UA       0       5      16      30      65      77      84      90      94      97
298          UA     100

299          KK  SUM100        COMBINE HYDROGRAPH FROM SUM85, SUB100 & SUB105
300          HC       3

301          KK  SUB110        RUNOFF HYDROGRAPH FROM SUB-BASIN 110
302          KM           ***** BEGIN NEW BRANCH *****
303          BA    .025
304          LG    .150    .350   5.050    .230  25.000
305          UC    .171    .122
306          UA       0       5      16      30      65      77      84      90      94      97
307          UA     100

308          KK  RCH115        ROUTE HYDROGRAPH SUB110 THRU REACH 115; 32' STREET
309          RK    1360    .005    .015            TRAP      32   .0001

310          KK  SUB115        RUNOFF HYDROGRAPH FROM SUB-BASIN 115
311          BA    .026
312          LG    .150    .350   5.050    .230  25.000
313          UC    .183    .152
314          UA       0       5      16      30      65      77      84      90      94      97
315          UA     100
1                                          HEC-1 INPUT                                          PAGE  8

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

316          KK  SUB120        RUNOFF HYDROGRAPH FROM SUB-BASIN 120
317          BA    .020
318          LG    .150    .350   5.050    .230  25.000
319          UC    .188    .182
320          UA       0       5      16      30      65      77      84      90      94      97
321          UA     100

322          KK  RCH115        ROUTE HYDROGRAPH SUB120 THRU REACH 115; 32' STREET
323          RK     600    .005    .015            TRAP      32   .0001

324          KK  SUM115        COMBINE HYDROGRAPH FROM RCH115 (both) & SUB115
325          HC       3

326          KK  SUB125        RUNOFF HYDROGRAPH FROM SUB-BASIN 125
327          BA   .0187
328          LG    .310    .310   5.050    .286    5.80
329          UC    .321    .386
330          UA       0       5      16      30      65      77      84      90      94      97
331          UA     100

332          KK  SUB130        RUNOFF HYDROGRAPH FROM SUB-BASIN 130
333          KM           ***** BEGIN NEW BRANCH *****
334          BA    .030
335          LG    .150    .350   5.050    .230  25.000
336          UC    .225    .226
337          UA       0       5      16      30      65      77      84      90      94      97
338          UA     100

339          KK  RCH135        ROUTE HYDROGRAPH SUB130 THRU REACH 135; 40' STREET
340          RK     800    .005    .015            TRAP      40   .0001

341          KK  SUB135        RUNOFF HYDROGRAPH FROM SUB-BASIN 135
342          BA    .021
343          LG    .145    .350   5.050    .230  30.500
344          UC    .171    .153
345          UA       0       5      16      30      65      77      84      90      94      97
346          UA     100

347          KK  SUM135        COMBINE HYDROGRAPH FROM RCH135 & SUB135
348          HC       2

349          KK  RCH140        ROUTE HYDROGRAPH SUM135 THRU REACH 140; 68' STREET
350          RK    1800    .005    .015            TRAP      68   .0001

351          KK  SUB140        RUNOFF HYDROGRAPH FROM SUB-BASIN 140
352          BA    .037
353          LG    .140    .350   5.050    .230  36.000
354          UC    .300    .363
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355          UA       0       5      16      30      65      77      84      90      94      97
356          UA     100
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

357          KK  SUM140        COMBINE HYDROGRAPH FROM RCH140 & SUB140
358          HC       2

359          KK  DVT140        SPLIT HYDROGRAPH SUM140 50\50
360          DT  DVT141
361          DI       0      50     100     200     300     400
362          DQ       0      25      50     100     200     300

363          KK  RCH125        ROUTE HYDROGRAPH DVT140 THRU REACH 125
364          RS       1    FLOW      -1
365          RC     .03    .025     .03    1500    .011
366          RX       0      10      45      50     100     110     150     170
367          RY    1281    1280  1279.5    1279    1279  1279.5    1280    1281

368          KK  SUM125        COMBINE HYDROGRAPH FROM SUM115, SUB125 & RCH125
369          HC       3

370          KK  SUB145        RUNOFF HYDROGRAPH FROM SUB-BASIN 145
371          KM           ***** BEGIN NEW BRANCH *****
372          BA    .011
373          LG    .310    .310   5.050    .286   5.800
374          UC    .196    .164
375          UA       0       5      16      30      65      77      84      90      94      97

376          KK  DET145        ROUTE HYDROGRAPH SUB145 THRU DET BASIN 145;
377          KM                150-FOOT WIER USED FOR HIGH FLOWS AND 1-24" RCP
378          KO       1
379          RS       1    STOR      -1
380          SA       0     .12     .43    1.07    1.94    2.75    3.37
381          SE    1296    1297    1298    1299    1300    1301    1302
382          SL    1296     3.1      .4      .5
383          SS  1300.5     150     2.6     1.5

384          KK  RCH150        ROUTE HYDROGRAPH DET145 THRU REACH 150
385          RS       1    FLOW      -1
386          RC     .03    .025     .03     620    .006
387          RX       0      10      45      50     100     110     150     170
388          RY    1301    1300    1297  1296.5  1296.5    1297    1298    1301

389          KK  SUB150        RUNOFF HYDROGRAPH FROM SUB-BASIN 150
390          BA    .014
391          LG    .310    .310   5.050    .286   5.800
392          UC    .188    .121
393          UA       0       5      16      30      65      77      84      90      94      97
394          UA     100

395          KK  SUB155        RUNOFF HYDROGRAPH FROM SUB-BASIN 155
396          BA    .022
397          LG    .150    .350   5.050    .230  25.000
398          UC    .188    .168
399          UA       0       5      16      30      65      77      84      90      94      97
400          UA     100
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

401          KK  RCH160        ROUTE HYDROGRAPH SUB155 THRU REACH 160; 32' STREET
402          RK     950    .005    .015            TRAP      32   .0001

403          KK  SUB160        RUNOFF HYDROGRAPH FROM SUB-BASIN 160
404          BA    .021
405          LG    .150    .350   5.050    .230  25.000
406          UC    .188    .172
407          UA       0       5      16      30      65      77      84      90      94      97
408          UA     100

409          KK  SUM160        COMBINE HYDROGRAPH FROM RCH160 & SUB160
410          HC       2

411          KK  SUB165        RUNOFF HYDROGRAPH FROM SUB-BASIN 165
412          BA    .036
413          LG    .174    .348   5.101    .240  22.610
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414          UC    .275    .274
415          UA       0       5      16      30      65      77      84      90      94      97
416          UA     100

417          KK  RCH170        ROUTE HYDROGRAPH SUB165 THRU REACH 170; 40' STREET
418          RK     900    .005    .015            TRAP      40   .0001

419          KK  SUB170        RUNOFF HYDROGRAPH FROM SUB-BASIN 170
420          BA    .013
421          LG    .150    .350   5.050    .230  25.000
422          UC    .167    .146
423          UA       0       5      16      30      65      77      84      90      94      97
424          UA     100

425          KK  SUM170        COMBINE HYDROGRAPH FROM RCH170 & SUB170
426          HC       2

427          KK  SUM150        COMBINE HYDROGRAPH FROM RCH150, SUB150, SUM160 & SUM170
428          KM                INFLOW INTO DETENTION BASIN 150
429          HC       4

430          KK  DET150        ROUTE HYDROGRAPH SUM150 THRU DET BASIN 150;
431          KM                HIGH WIER & 2-36" RCP
432          KO       1
433          RS       1    STOR      -1
434          SA       0     .30     .78    1.34    2.10    3.02
435          SE    1294    1295    1296    1297    1298    1299
436          SQ       0   .0001      12      40      75     108

437          KK  RCH175        ROUTE HYDROGRAPH DET150 THRU REACH 175
438          RS       1    FLOW      -1
439          RC     .03    .025     .03    1550    .004
440          RX       0      60      95     100     145     150     175     200
441          RY    1297    1296    1295  1294.5  1294.5    1295    1297    1299
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

442          KK  SUB175        RUNOFF HYDROGRAPH FROM SUB-BASIN 175
443          BA    .022
444          LG    .310    .310   5.050    .286   5.800
445          UC    .421    .468
446          UA       0       5      16      30      65      77      84      90      94      97
447          UA     100

448          KK  SUB180        RUNOFF HYDROGRAPH FROM SUB-BASIN 180
449          BA    .022
450          LG    .150    .350   5.050    .230  25.000
451          UC    .200    .196
452          UA       0       5      16      30      65      77      84      90      94      97
453          UA     100

454          KK  SUM175        COMBINE HYDROGRAPH FROM RCH175, SUB175 & SUB180
455          KM                INFLOW INTO DETENTION BASIN 175
456          HC       3

457          KK  DET175        ROUTE HYDROGRAPH SUM175 THRU DET BASIN 175;
458          KM                50-FOOT WIER USED FOR HIGH FLOWS AND 1-24" RCP
459          KO       1
460          RS       1    STOR      -1
461          SA       0     .08     .37     .89    1.54    2.10    2.94
462          SE    1288    1289    1290    1291    1292    1293    1294
463          SL    1288     3.1      .4      .5
464          SS    1293      50     2.6     1.5

465          KK  SUB185        RUNOFF HYDROGRAPH FROM SUB-BASIN 185
466          BA    .029
467          LG    .150    .350   5.050    .230  25.000
468          UC    .250    .342
469          UA       0       5      16      30      65      77      84      90      94      97
470          UA     100

471          KK  DET185        ROUTE HYDROGRAPH SUB185 THRU DET BASIN 185
472          KM                30-FOOT WIER USED FOR HIGH FLOWS AND 1-24" RCP
473          KO       1
474          RS       1    STOR      -1
475          SA       0     .14     .35     .55     .76    1.12    1.80
476          SE    1290    1291    1292    1293    1294    1295    1296
477          SL    1290     3.1      .4      .5
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478          SS    1295      30     2.6     1.5

479          KK  SUM186        COMBINE HYDROGRAPH FROM DET175 & DET185
480          HC       2

481          KK  RCH190        ROUTE HYDROGRAPH SUM186 THRU REACH 190
482          RS       1    FLOW      -1
483          RC     .03    .025     .03    1200    .008
484          RX       0      35      45      50     110     125     145     150
485          RY    1294    1292    1291    1290    1290    1291    1293    1294
1                                         HEC-1 INPUT                                                          PAGE 12

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


486          KK  SUB190        RUNOFF HYDROGRAPH FROM SUB-BASIN 190
487          BA    .031
488          LG    .330    .305   5.050    .293   3.400
489          UC    .250    .174
490          UA       0       5      16      30      65      77      84      90      94      97
491          UA     100

492          KK  SUB195        RUNOFF HYDROGRAPH FROM SUB-BASIN 195
493          BA    .009
494          LG    .150    .350   5.050    .230  25.000
495          UC    .133    .117
496          UA       0       5      16      30      65      77      84      90      94      97
497          UA     100

498          KK  SUB196        RUNOFF HYDROGRAPH FROM SUB-BASIN 196
499          BA    .056
500          LG    .330    .305   5.050    .293   3.400
501          UC    .637    .597
502          UA       0       5      16      30      65      77      84      90      94      97
503          UA     100

504          KK  SUM190        COMBINE HYDROGRAPH FROM RCH190, SUB190, SUB195 & SUB196
505          KM                INFLOW INTO DETENTION BASIN 190
506          HC       4

507          KK  DET190        ROUTE HYDROGRAPH SUM190 THRU DET BASIN 190;
508          KM                HIGH WIER & 2-36" RCP
509          KO       1
510          RS       1    STOR      -1
511          SA       0    1.38    2.34    3.63    5.03    6.57
512          SE    1281    1282    1283    1284    1285    1286
513          SQ       0      13      38      58      72      92

514          KK  SUB200        RUNOFF HYDROGRAPH FROM SUB-BASIN 200
515          BA   .0143
516          LG    .275    .315   5.050    .279    24.7
517          UC    .229    .236
518          UA       0       5      16      30      65      77      84      90      94      97
519          UA     100

520          KK  DVT141        RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUM140
521          DR  DVT141

522          KK  SUM200        COMBINE HYDROGRAPH FROM DVT141, DET190 & SUB200
523          KM                INFLOW INTO DETENTION BASIN 200
524          HC       3

525          KK  DET200        ROUTE HYDROGRAPH SUM200 THRU DET BASIN 200;
526          KM                70-FOOT WIER USED FOR HIGH FLOWS AND 2 - 24" RCP
527          KO       1
528          RS       1    STOR      -1
529          SA       0     .07     .77    2.21    3.09    3.96    4.60
530          SE    1273    1274    1275    1276    1277    1278    1279
531          SL    1273     6.2      .4      .5
1                                         HEC-1 INPUT                                                          PAGE 13

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

532          SS    1278      70     2.6     1.5

533          KK  SUM125        COMBINE HYDROGRAPH FROM SUM125 & DET200
534          KM                INFLOW INTO DETENTION BASIN 125
535          HC       2

536          KK  DET125        ROUTE HYDROGRAPH SUM125 THRU DET BASIN 125;
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537          KM                 60-FOOT WIER USED FOR HIGH FLOWS AND 2-24" RCP
538          KO       1
539          RS       1    STOR      -1
540          SA       0     .16     .51     .86    1.05    1.39    1.68    2.34
541          SE    1269    1270    1271    1272    1273    1274    1275    1276
542          SL    1269     6.2      .4      .5
543          SS  1273.5      60     2.6     1.5

544          KK  SUB205         RUNOFF HYDROGRAPH FROM SUB-BASIN 205
545          BA    .009
546          LG    .150    .350   5.050    .230  25.000
547          UC    .154    .201
548          UA       0       5      16      30      65      77      84      90      94      97
549          UA     100

550          KK  SUM100         COMBINE HYDROGRAPH FROM SUM100, DET125 & SUB205
551          KM                 INFLOW INTO DETENTION BASIN 100
552          HC       3

553          KK  DET100         ROUTE HYDROGRAPH SUM100 THRU DET BASIN 100;
554          KM                 HIGH WIER AND 4 - 12'X4' CONCRETE BOX CULVERTS
555          KO       1
556          RS       1    STOR      -1
557          SA       0     .24    1.15    2.03    2.80    3.46    4.08
558          SE    1268    1269    1270    1271    1272    1273    1274
559          SQ       0     130     330     620     970    1360    1650

560          KK  RCH210         ROUTE HYDROGRAPH DET100 THRU REACH 210
561          RS       1    FLOW      -1
562          RC     .03    .025     .03     750    .003
563          RX       0      20      40      45     130     135     175     200
564          RY    1274    1270    1267  1266.5  1266.5    1267    1269    1271

565          KK  SUB210         RUNOFF HYDROGRAPH FROM SUB-BASIN 210
566          BA    .009
567          LG    .310    .310   5.050    .286   5.800
568          UC    .146    .081
569          UA       0       5      16      30      65      77      84      90      94      97
570          UA     100

571          KK  SUM210         COMBINE HYDROGRAPH FROM DET100 & SUB210
572          HC       2
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

573          KK  SUB215         RUNOFF HYDROGRAPH FROM SUB-BASIN 215
574          BA    .029
575          LG    .150    .350   5.050    .230  25.000
576          UC    .196    .185
577          UA       0       5      16      30      65      77      84      90      94      97
578          UA     100

579          KK  SUB220         RUNOFF HYDROGRAPH FROM SUB-BASIN 220
580          BA    .015
581          LG    .310    .310   5.050    .286   5.800
582          UC    .383    .334
583          UA       0       5      16      30      65      77      84      90      94      97
584          UA     100

585          KK  SUB225         RUNOFF HYDROGRAPH FROM SUB-BASIN 225
586          BA    .016
587          LG    .150    .350   5.050    .230  25.000
588          UC    .092    .042
589          UA       0       5      16      30      65      77      84      90      94      97
590          UA     100

591          KK  SUM220         COMBINE HYDROGRAPH FROM SUM210, SUB215, SUB220 & SUB225
592          KM                 INFLOW INTO DETENTION BASIN 220
593          HC       4

594          KK  DET220         ROUTE HYDROGRAPH SUM220 THRU DET BASIN 220;
595          KM                 HIGH WIER AND 4 - 12' X 4' CONCRETE BOX CULVERTS
596          KO       1
597          RS       1    STOR      -1
598          SA       0    3.71    4.76    5.90    6.70    7.36    8.33
599          SE    1265    1266    1267    1268    1269    1270    1271
600          SQ       0     130     330     620     970    1360    1650
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601          KK  SUB230        RUNOFF HYDROGRAPH FROM SUB-BASIN 230
602          KM           ***** BEGIN NEW BRANCH *****
603          BA    .038
604          LG    .170    .345   5.050    .237  22.600
605          UC    .338    .416
606          UA       0       5      16      30      65      77      84      90      94      97
607          UA     100

608          KK  SUB235        RUNOFF HYDROGRAPH FROM SUB-BASIN 235
609          BA    .007
610          LG    .310    .310   5.050    .286   5.800
611          UC    .242    .291
612          UA       0       5      16      30      65      77      84      90      94      97
613          UA     100

614          KK  DET235        ROUTE HYDROGRAPH SUB235 THRU DET BASIN 235;
615          KM                80-FOOT WIER USED FOR HIGH FLOWS AND 1-12" RCP
616          KO       1
617          RS       1    STOR      -1
618          SA       0     .28     .69     .92    1.18
619          SE    1292    1293    1294    1295    1296
1                                        HEC-1 INPUT                                          PAGE 15

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

620          SL    1292      .8      .4      .5
621          SS  1294.5      80     2.6     1.5

622          KK  SUB240        RUNOFF HYDROGRAPH FROM SUB-BASIN 240
623          BA    .045
624          LG    .170    .345   5.050    .237  22.600
625          UC    .313    .317
626          UA       0       5      16      30      65      77      84      90      94      97
627          UA     100

628          KK  SUB245        RUNOFF HYDROGRAPH FROM SUB-BASIN 245
629          BA    .014
630          LG    .290    .315   5.050    .279   8.200
631          UC    .363    .487
632          UA       0       5      16      30      65      77      84      90      94      97
633          UA     100

634          KK  SUM245        COMBINE HYDROGRAPH FROM SUB230, DET235, SUB240 & SUB245
635          KM                INFLOW INTO DETENTION BASIN 245
636          HC       4

637          KK  DET245        ROUTE HYDROGRAPH SUM245 THRU DET BASIN 245;
638          KM                50-FOOT WIER USED FOR HIGH FLOWS AND 2-24" RCP
639          KO       1
640          RS       1    STOR      -1
641          SA       0     .36     .78    1.00    1.20    2.03    3.04
642          SE    1289    1290    1291    1292    1293    1294    1295
643          SL    1289     6.2      .4      .5
644          SS    1292      50     2.6     1.5

645          KK  RCH250        ROUTE HYDROGRAPH DET245 THRU REACH 250
646          RS       1    FLOW      -1
647          RC     .03    .025     .03    1500    .007    1290
648          RX       0      25      45      55     110     120     140     170
649          RY    1290    1288    1287  1286.5  1286.5    1287    1288    1290

650          KK  SUB250        RUNOFF HYDROGRAPH FROM SUB-BASIN 250
651          BA    .027
652          LG    .310    .310   5.050    .286   5.800
653          UC    .338    .317
654          UA       0       5      16      30      65      77      84      90      94      97
655          UA     100

656          KK   SUBC1        RUNOFF HYDROGRAPH FROM OFFSITE AREA SUBC1
657          KM           ***** BEGIN NEW BRANCH *****
658          BA    .028
659          LG     .35     .35    6.05     .20       1
660          UC    .479    .422
661          UA       0       3       5       8      12      20      43      75      90      96
662          UA     100
1                                        HEC-1 INPUT                                          PAGE 16

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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663          KK   RCHC2        ROUTE HYDROGRAPH SUBC1 THRU REACH C2; GUNITE CHANNEL
664          RK    1400    .005    .016            TRAP      10      .5

665          KK   SUBC2        RUNOFF HYDROGRAPH FROM OFFSITE AREA SUBC2
666          BA    .027
667          LG     .35     .35    6.05     .20       1
668          UC    .512    .531
669          UA       0       3       5       8      12      20      43      75      90      96
670          UA     100

671          KK   SUMC2        COMBINE HYDROGRAPHS RCHC2 AND SUBC2
672          HC       2

673          KK   RCHC3        ROUTE HYDROGRAPH SUMC2 THRU REACH C3; GUNITE CHANNEL
674          RK    1600    .005    .016            TRAP      10      .5

675          KK   SUBC3        RUNOFF HYDROGRAPH FROM OFFSITE AREA SUBC3
676          BA    .064
677          LG     .35     .35    6.05     .20       1
678          UC    .488    .382
679          UA       0       3       5       8      12      20      43      75      90      96
680          UA     100

681          KK   SUMC3        COMBINE HYDROGRAPHS RCHC3 AND SUBC3
682          HC       2

683          KK   RCHC4        ROUTE HYDROGRAPH SUMC3 THRU REACH C4; GUNITE CHANNEL
684          RK    1400    .005    .016            TRAP      10      .5

685          KK   SUBC4        RUNOFF HYDROGRAPH FROM OFFSITE AREA SUBC4
686          BA    .058
687          LG     .35     .35    6.05     .20       1
688          UC    .479    .441
689          UA       0       3       5       8      12      20      43      75      90      96
690          UA     100

691          KK   SUMC4        COMBINE HYDROGRAPHS RCHC4 AND SUBC4
692          HC       2

693          KK   RCHD1        ROUTE HYDROGRAPH SUMC4 THRU REACH D1; GUNITE CHANNEL
694          RK     600    .005    .016            TRAP      10      .5

695          KK   SUBD1        RUNOFF HYDROGRAPH FROM OFFSITE AREA SUBD1
696          BA    .033
697          LG     .35     .35    4.34     .26       1
698          UC    .408    .458
699          UA       0       3       5       8      12      20      43      75      90      96
700          UA     100
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

701          KK   SUMD1        COMBINE HYDROGRAPHS RCHD1 AND SUBD1
702          HC       2

703          KK   RCHD2        ROUTE HYDROGRAPH SUMD1 THRU REACH D2; GUNITE CHANNEL
704          RK     900    .005    .016            TRAP      10      .5

705          KK   SUBD2        RUNOFF HYDROGRAPH FROM OFFSITE AREA SUBD2
706          BA    .055
707          LG     .35     .35    4.34     .26       1
708          UC    .475    .480
709          UA       0       3       5       8      12      20      43      75      90      96
710          UA     100

711          KK   SUMD2        COMBINE HYDROGRAPHS RCHD2 AND SUBD2
712          HC       2

713          KK   RCHD3        ROUTE HYDROGRAPH SUMD2 THRU REACH D3; GUNITE CHANNEL
714          RK     850    .005    .016            TRAP      10      .5

715          KK   SUBD3        RUNOFF HYDROGRAPH FROM OFFSITE AREA SUBD3
716          BA    .081
717          LG     .35     .35    4.34     .26       1
718          UC    .533    .504
719          UA       0       3       5       8      12      20      43      75      90      96
720          UA     100

721          KK   SUMD3        COMBINE HYDROGRAPHS RCHD3 AND SUBD3
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722          HC       2

723          KK   SUBD4        RUNOFF HYDROGRAPH FROM OFFSITE AREA SUBD4
724          BA    .089
725          LG     .35     .35    4.34     .26       1
726          UC    .512    .457
727          UA       0       3       5       8      12      20      43      75      90      96
728          UA     100

729          KK   RCHD4        ROUTE HYDROGRAPH SUBD4 THRU REACH D4; GUNITE CHANNEL
730          RK     850    .005    .016            TRAP      10      .5

731          KK   SUMD4        COMBINE HYDROGRAPHS RCHD4 AND SUMD3
732          HC       2

733          KK  SUB255        RUNOFF HYDROGRAPH FROM SUB-BASIN 255
734          BA    .008
735          LG    .350    .300   5.050    .300   1.000
736          UC    .463    .803
737          UA       0       5      16      30      65      77      84      90      94      97
738          UA     100
1                                          HEC-1 INPUT                                          PAGE 18

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

739          KK  SUM255        COMBINE HYDROGRAPH FROM SUMD4 & SUB255
740          HC       2

741          KK  RCH260        ROUTE HYDROGRAPH SUM255 THRU REACH 260; GUNITE CHANNEL
742          RK     300    .005    .016            TRAP      10      .5

743          KK  SUB260        RUNOFF HYDROGRAPH FROM SUB-BASIN 260
744          BA    .015
745          LG    .150    .350   5.050    .230  25.000
746          UC    .192    .243
747          UA       0       5      16      30      65      77      84      90      94      97
748          UA     100

749          KK  SUM260        COMBINE HYDROGRAPH FROM RCH260 & SUB260
750          HC       2

751          KK  SUM250        COMBINE HYDROGRAPH FROM RCH250, SUB 250 & SUM260
752          KM                INFLOW INTO DETENTION BASIN 250
753          HC       3

754          KK  DET250        ROUTE HYDROGRAPH SUM250 THRU DET BASIN 250;
755          KM                60-FOOT WIER USED FOR HIGH FLOWS AND 2-24" RCP
756          KO       1
757          RS       1    STOR      -1
758          SA       0     .20     .59    1.08    2.08    2.72    3.39
759          SE    1281    1282    1283    1284    1285    1286    1287
760          SL    1281     6.2      .4      .5
761          SS  1284.5      60     2.6     1.5

762          KK  RCH270        ROUTE HYDROGRAPH DET250 THRU REACH 270
763          RS       1    FLOW      -1
764          RC     .03    .025     .03     750    .002
765          RX       0      30      50      55     115     120     130     145
766          RY  1288.5    1286    1283  1282.5  1282.5    1283    1285    1286

767          KK  SUB270        RUNOFF HYDROGAPH FROM SUB-BASIN 270
768          BA    .012
769          LG    .310    .310   5.050    .286   5.800
770          UC    .254    .211
771          UA       0       5      16      30      65      77      84      90      94      97
772          UA     100

773          KK  SUB280        RUNOFF HYDROGRAPH FROM SUB-BASIN 280
774          BA    .031
775          LG    .150    .350   5.050    .230  25.000
776          UC    .254    .280
777          UA       0       5      16      30      65      77      84      90      94      97
778          UA     100
1                                          HEC-1 INPUT                                          PAGE 19

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

779          KK  SUB290        RUNOFF HYDROGRAPH FROM SUB-BASIN 290
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780          BA    .013
781          LG    .150    .350   5.050    .230  25.000
782          UC    .158    .168
783          UA       0       5      16      30      65      77      84      90      94      97
784          UA     100

785          KK  SUM270        COMBINE HYDROGRAPH FROM RCH270, SUB270, SUB280 & SUB290
786          HC       4

787          KK  DET270        ROUTE HYDROGRAPH SUM270 THRU DET BASIN 270;
788          KM                HIGH WIER AND 3 - 12' X 3' CONCRETE BOX CULVERTS
789          KO       1
790          RS       1    STOR      -1
791          SA       0     .27     .72    1.08    1.71    2.27
792          SE    1281    1282    1283    1284    1285    1286
793          SQ       0      90     260     475     685     870

794          KK  RCH295        ROUTE HYDROGRAPH DET270 THRU REACH 295
795          RS       1    FLOW      -1
796          RC     .03    .025     .03     550    .002
797          RX       0      15      30      50      80     100     120     155
798          RY    1282    1280    1279    1278    1278    1279    1280    1281

799          KK  SUB295        RUNOFF HYDROGRAPH FROM SUB-BASIN 295
800          BA    .010
801          LG    .330    .305   5.050    .293   3.400
802          UC    .208    .146
803          UA       0       5      16      30      65      77      84      90      94      97
804          UA     100

805          KK  SUM295        COMBINE HYDROGRAPH FROM RCH295 & SUB295
806          KM                INFLOW INTO DETENTION BASIN 295
807          HC       2

808          KK  DET295        ROUTE HYDROGRAPH SUM295 THRU DET BASIN 295;
809          KM                80-FOOT WIER USED FOR HIGH FLOWS AND 2 - 24" RCP
810          KO       1
811          RS       1    STOR      -1
812          SA       0     .15     .51    1.02    1.63    2.39    2.90
813          SE    1276    1277    1278    1279    1280    1281    1282
814          SL    1276     6.2      .4      .5
815          SS    1279      80     2.6     1.5

816          KK  RCH300        ROUTE HYDROGRAPH DET295 THRU REACH 300
817          RS       1    FLOW      -1
818          RC     .03    .025     .03     850    .008
819          RX       0      20      25      30      80      85     110     140
820          RY    1278    1276    1275  1274.5  1274.5    1275    1277    1280
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

821          KK  SUB300        RUNOFF HYDROGRAPH FROM SUB-BASIN 300
822          BA    .013
823          LG    .330    .305   5.050    .293   3.400
824          UC    .221    .185
825          UA       0       5      16      30      65      77      84      90      94      97
826          UA     100

827          KK  SUB305        RUNOFF HYDROGRAPH FROM SUB-BASIN 305
828          BA    .023
829          LG    .150    .350   5.050    .230  25.000
830          UC    .221    .238
831          UA       0       5      16      30      65      77      84      90      94      97
832          UA     100

833          KK  SUB310        RUNOFF HYDROGRAPH FROM SUB-BASIN 310
834          BA    .015
835          LG    .100    .350   5.050    .230  80.000
836          UC    .183    .207
837          UA       0       5      16      30      65      77      84      90      94      97
838          UA     100

839          KK  SUB315        RUNOFF HYDROGRAPH FROM SUB-BASIN 315
840          BA    .014
841          LG    .150    .350   5.050    .230  25.000
842          UC    .217    .348
843          UA       0       5      16      30      65      77      84      90      94      97
844          UA     100
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845          KK  RCH320        ROUTE HYDROGRAPH SUB315 THRU REACH 320; 68' STREET
846          RK    1400    .005    .015            TRAP      68   .0001

847          KK  SUB320        RUNOFF HYDROGRAPH FROM SUB-BASIN 320
848          BA    .019
849          LG    .100    .350    5.05    .230  80.000
850          UC    .221    .291
851          UA       0       5      16      30      65      77      84      90      94      97
852          UA     100

853          KK  SUM320        COMBINE HYDROGRAPH FROM RCH320 & SUB320
854          HC       2

855          KK  SUM300        COMBINE HYDROGRAPH FROM RCH300, SUB300, SUB305, SUB310 & SUM320
856          KM                INFLOW INTO DETENTION BASIN 300
857          HC       5

858          KK  DET300        ROUTE HYDROGRAPH SUM300 THRU DET BASIN 300;
859          KM                140-FOOT WIER USED FOR HIGH FLOWS AND 1-24" RCP
860          KO       1
861          RS       1    STOR      -1
862          SA       0     .66     .88    1.30    2.03    2.61    3.55
863          SE    1271    1272    1273    1274    1275    1276    1277
864          SL    1271     3.1      .4      .5
865          SS  1274.5     140     2.6     1.5
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

866          KK  SUB325        RUNOFF HYDROGRAPH FROM SUB-BASIN 325
867          BA    .028
868          LG    .150    .350   5.050    .230  25.000
869          UC    .233    .249
870          UA       0       5      16      30      65      77      84      90      94      97
871          UA     100

872          KK  SUB330        RUNOFF HYDROGRAPH FROM SUB-BASIN 330
873          BA    .047
874          LG    .280    .315   5.050    .279  19.200
875          UC    .479    .436
876          UA       0       5      16      30      65      77      84      90      94      97
877          UA     100

878          KK  SUB335        RUNOFF HYDROGRAPH FROM SUB-BASIN 335
879          BA    .028
880          LG    .150    .350   5.050    .230  25.000
881          UC    .150    .106
882          UA       0       5      16      30      65      77      84      90      94      97
883          UA     100

884          KK  SUM330        COMBINE HYDROGRAPH FROM DET220, DET300, SUB325, SUB330 & SUB335
885          KM                INFLOW INTO DETENTION BASIN 330
886          HC       5

887          KK  DET330        ROUTE HYDROGRAPH SUM330 THRU DET BASIN 330;
888          KM                OUTLET CONSISTS OF TRANS CHANNEL FROM DET BASIN 330 TO EXIST
889          KM                CHANNEL ALONG DEER VALLEY DR. SEE HEC-2 RUN SCWEH2C FOR ELEV
890          KM                VS DISCHARGE BASED ON BACKWATER.
891          KO       1
892          RS       1    STOR      -1
893          SA       0    1.19    4.04    8.68    9.69   10.30   10.89
894          SE    1264    1265    1266    1267    1268    1269    1270
895          SQ       0      80     220     450     830    1300    2000
896          ZZ
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1

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

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

    76       SUBA
                .
                .
    87          .       SUBB2
                .          .
                .          .
    93      SUMAB2............
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            V
            V
 95      RCH16
            .
            .
 97         .      SUB05
            .          .
            .          .
103         .          .      SUB10
            .          .          .
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109         .          .          .      SUB15
            .          .          .          .
            .          .          .          .
115     SUM16.................................
            .
            .
117         .      SUBB1
            .          V
            .          V
124         .      RCH26
            .          .
            .          .
126         .          .      SUB20
            .          .          .
            .          .          .
132         .          .          .      SUB25
            .          .          .          .
            .          .          .          .
138         .      SUM26......................
            .          .
            .          .
140         .          .      SUB30
            .          .          V
            .          .          V
146         .          .      RCH35
            .          .          .
            .          .          .
148         .          .          .      SUB35
            .          .          .          .
            .          .          .          .
154         .          .      SUM35............
            .          .          V
            .          .          V
156         .          .      RCH40
            .          .          .
            .          .          .
161         .          .          .      SUB40
            .          .          .          .
            .          .          .          .
167         .      SUM40......................
            .          V
            .          V
170         .      DET40
            .          V
            .          V
177         .      RCH45
            .          .
            .          .
182         .          .      SUB45
            .          .          .
            .          .          .
188         .      SUM45............
            .          V
            .          V
191         .      DET45
            .          V
            .          V
199         .      RCH50
            .          .
            .          .
204         .          .      SUB50
            .          .          .
            .          .          .
210         .          .          .      SUB55
            .          .          .          .
            .          .          .          .
216         .          .          .          .      SUB60
            .          .          .          .          .
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222     SUM50.............................................
            V
            V
224     RCH65
            .
            .
229         .       SUB65
            .           .
            .           .
235         .           .       SUB70
            .           .           .
            .           .           .
241     SUM65.......................
            V
            V
243     RCH80
            .
            .
248         .       SUB75
            .           .
            .           .
254         .           .       SUB80
            .           .           .
            .           .           .
260     SUM80.......................
            V
            V
262     RCH85
            .
            .
267         .       SUB85
            .           .
            .           .
273         .           .       SUB90
            .           .           .
            .           .           .
279         .           .           .       SUB95
            .           .           .           .
            .           .           .           .
285     SUM85...................................
            .
            .
287         .      SUB100
            .           .
            .           .
293         .           .      SUB105
            .           .           .
            .           .           .
299    SUM100.......................
            .
            .
301         .      SUB110
            .           V
            .           V
308         .      RCH115
            .           .
            .           .
310         .           .      SUB115
            .           .           .
            .           .           .
316         .           .           .      SUB120
            .           .           .           V
            .           .           .           V
322         .           .           .      RCH115
            .           .           .           .
            .           .           .           .
324         .      SUM115.......................
            .           .
            .           .
326         .           .      SUB125
            .           .           .
            .           .           .
332         .           .           .      SUB130
            .           .           .           V
            .           .           .           V
339         .           .           .      RCH135
            .           .           .           .
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341         .           .           .           .      SUB135
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347                 SUM135............
                         V
                         V
349                 RCH140
                         .
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351                 .        SUB140
                         .          .
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357                 SUM140............
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                         .
360                 .-------> DVT141
359                 DVT140
                         V
                         V
363                 RCH125
                         .
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368          SUM125........................
                 .
                 .
370              .   SUB145
                 .       V
                 .       V
376              .   DET145
                 .       V
                 .       V
384              .   RCH150
                 .       .
                 .       .
389              .   SUB150
                 .       .
                 .       .
395              .   .        SUB155
                 .   .            V
                 .   .            V
401              .   .        RCH160
                 .   .            .
                 .   .            .
403              .   .        .        SUB160
                 .   .        .            .
                 .   .        .            .
409              .   .        SUM160............
                 .   .            .
                 .   .            .
411              .   .        .        SUB165
                 .   .        .            V
                 .   .        .            V
417              .   .        .        RCH170
                 .   .        .            .
                 .   .        .            .
419              .   .        .            .        SUB170
                 .   .        .            .            .
                 .   .        .            .            .
425              .   .        .        SUM170............
                 .   .        .            .
                 .   .        .            .
427              .   SUM150.................................
                 .       V
                 .       V
430              .   DET150
                 .       V
                 .       V
437              .   RCH175
                 .       .
                 .       .
442              .   .        SUB175
                 .   .        .
                 .   .        .
448              .   .        .        SUB180
                 .   .        .            .
                 .   .        .            .
454              .   SUM175........................
                 .       V
                 .       V
457              .   DET175
                 .       .
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465          .           .           .      SUB185
             .           .           .          V
             .           .           .          V
471          .           .           .      DET185
             .           .           .          .
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479          .           .      SUM186.............
             .           .           V
             .           .           V
481          .           .      RCH190
             .           .           .
             .           .           .
486          .           .           .      SUB190
             .           .           .          .
             .           .           .          .
492          .           .           .          .      SUB195
             .           .           .          .          .
             .           .           .          .          .
498          .           .           .          .          .      SUB196
             .           .           .          .          .          .
             .           .           .          .          .          .
504          .           .      SUM190.................................
             .           .           V
             .           .           V
507          .           .      DET190
             .           .           .
             .           .           .
514          .           .           .      SUB200
             .           .           .          .
             .           .           .          .
521          .           .           .          .          .<-------  DVT141
520          .           .           .          .      DVT141
             .           .           .          .          .
             .           .           .          .          .
522          .           .      SUM200........................
             .           .           V
             .           .           V
525          .           .      DET200
             .           .           .
             .           .           .
533          .      SUM125.............
             .           V
             .           V
536          .      DET125
             .           .
             .           .
544          .           .      SUB205
             .           .           .
             .           .           .
550     SUM100........................
             V
             V
553     DET100
             V
             V
560     RCH210
             .
             .
565          .      SUB210
             .           .
             .           .
571     SUM210............
             .
             .
573          .      SUB215
             .           .
             .           .
579          .           .      SUB220
             .           .           .
             .           .           .
585          .           .           .      SUB225
             .           .           .          .
             .           .           .          .
591     SUM220.................................
             V
             V
594     DET220
             .
             .
601          .      SUB230
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                .         .
                .         .
608             .         .     SUB235
                .         .         V
                .         .         V
614             .         .     DET235
                .         .         .
                .         .         .
622             .         .         .     SUB240
                .         .         .         .
                .         .         .         .
628             .         .         .         .     SUB245
                .         .         .         .         .
                .         .         .         .         .
634             .     SUM245.......................................
                .         V
                .         V
637             .     DET245
                .         V
                .         V
645             .     RCH250
                .         .
                .         .
650             .         .     SUB250
                .         .         .
                .         .         .
656             .         .         .     SUBC1
                .         .         .         V
                .         .         .         V
663             .         .         .     RCHC2
                .         .         .         .
                .         .         .         .
665             .         .         .         .     SUBC2
                .         .         .         .         .
                .         .         .         .         .
671             .         .         .     SUMC2............
                .         .         .         V
                .         .         .         V
673             .         .         .     RCHC3
                .         .         .         .
                .         .         .         .
675             .         .         .         .     SUBC3
                .         .         .         .         .
                .         .         .         .         .
681             .         .         .     SUMC3............
                .         .         .         V
                .         .         .         V
683             .         .         .     RCHC4
                .         .         .         .
                .         .         .         .
685             .         .         .         .     SUBC4
                .         .         .         .         .
                .         .         .         .         .
691             .         .         .     SUMC4............
                .         .         .         V
                .         .         .         V
693             .         .         .     RCHD1
                .         .         .         .
                .         .         .         .
695             .         .         .         .     SUBD1
                .         .         .         .         .
                .         .         .         .         .
701             .         .         .     SUMD1............
                .         .         .         V
                .         .         .         V
703             .         .         .     RCHD2
                .         .         .         .
                .         .         .         .
705             .         .         .         .     SUBD2
                .         .         .         .         .
                .         .         .         .         .
711             .         .         .     SUMD2............
                .         .         .         V
                .         .         .         V
713             .         .         .     RCHD3
                .         .         .         .
                .         .         .         .
715             .         .         .         .     SUBD3
                .         .         .         .         .
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721   .         .         .      SUMD3............
      .         .         .         .
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723   .         .         .         .      SUBD4
      .         .         .         .          V
      .         .         .         .          V
729   .         .         .         .      RCHD4
      .         .         .         .          .
      .         .         .         .          .
731   .         .         .      SUMD4............
      .         .         .         .
      .         .         .         .
733   .         .         .         .     SUB255
      .         .         .         .          .
      .         .         .         .          .
739   .         .         .     SUM255............
      .         .         .         V
      .         .         .         V
741   .         .         .     RCH260
      .         .         .         .
      .         .         .         .
743   .         .         .         .     SUB260
      .         .         .         .          .
      .         .         .         .          .
749   .         .         .     SUM260............
      .         .         .         .
      .         .         .         .
751   .     SUM250........................
      .         V
      .         V
754   .     DET250
      .         V
      .         V
762   .     RCH270
      .         .
      .         .
767   .         .     SUB270
      .         .         .
      .         .         .
773   .         .         .     SUB280
      .         .         .         .
      .         .         .         .
779   .         .         .         .     SUB290
      .         .         .         .          .
      .         .         .         .          .
785   .     SUM270.................................
      .         V
      .         V
787   .     DET270
      .         V
      .         V
794   .     RCH295
      .         .
      .         .
799   .         .     SUB295
      .         .         .
      .         .         .
805   .     SUM295............
      .         V
      .         V
808   .     DET295
      .         V
      .         V
816   .     RCH300
      .         .
      .         .
821   .         .     SUB300
      .         .         .
      .         .         .
827   .         .         .     SUB305
      .         .         .         .
      .         .         .         .
833   .         .         .         .     SUB310
      .         .         .         .          .
      .         .         .         .          .
839   .         .         .         .          .     SUB315
      .         .         .         .          .          V
      .         .         .         .          .          V
845   .         .         .         .          .     RCH320
      .         .         .         .          .          .
```

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847                                                  SUB320
853                                          SUM320.............
855                 SUM300.............................................
                        V
                        V
858                 DET300
866                         SUB325
872                                 SUB330
878                                         SUB335
884             SUM330.............................................
                    V
                    V
887             DET330
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*           SEPTEMBER 1990             *
*            VERSION 4.0               *
*                                      *
*  RUN DATE  08/11/1992  TIME  11:32:43 *
*                                      *
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****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
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SUN CITY WEST EXPANSION AREA MASTER DRAINAGE
STANLEY CONSULTANTS JOB # 11389 DATE: 11 AUG 92
HEC-1 MODEL 11389B (EXIST COND OFFSITE; DEVELOPED COND ONSITE)

CLARK UNIT HYDROGRAPH

2-HR STORM DISTRIBUTION (FCDMC HYDROLOGIC DESIGN MANUAL; TABLE 2.2)
P100 = 2.77" - - NO AERIAL REDUCTION

COMPUTATION TIME INTERVAL 5 MINUTES

GREEN-AMPT LOSS RATES FOR OFFSITE EXISTING CONDITIONS BASED ON
AREA-WEIGHTED VALUES OF EXISTING SOILS ASSUMING DTHETA DRY
AND VEGETATIVE COVER 25 PERCENT.
IA ASSUMED TO BE 0.35 INCHES AND PERCENT IMPERVIOUS ASSUMED
TO BE 1 PERCENT.

GREEN-AMPT LOSS RATES FOR ONSITE DEVELOPED CONDITIONS ARE AREA-WEIGHTED.
RAINFALL LOSSES FOR ONSITE DEVELOPED SOILS ASSUME SAME BASE DTHETA,
PSIF & XKSAT FROM WEIGHTED ONSITE EXISTING SOILS. INITIAL ABSTRACT
AND PERCENT IMPERV AS FOLLOWS:

	IA	RTIMP
RES SF AND CAS	0.15	25
GOLF/OPEN SP	0.35	1
COMMERCIAL	0.10	80

TIME OF CONCENTRATION, TC, AND STORAGE COEFFICIENT, R, ARE BASED ON
MCUHP1 (REVISED 12-16-91) WITH LENGTHS AND SLOPES ESTIMATED
FROM PRELIMINARY LOT LAYOUTS AND GRADING. Kb BASED ON m AND b
PARAMETERS FROM TABLE 5.1 OF HYDROLOGY MANUAL. ONSITE VALUES
ARE AREA-WEIGHTED FOR COMPOSITE LAND USE BASED ON:

	m	b
SF RES, CAS & COMM	-0.00625	0.040
GOLF/OPEN SP	-0.0250	0.015
EXIST DESERT	-0.0160	0.100

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                    TIME-AREA RELATION FROM TABLE 5.2:
                      OFFSITE AREAS USE A NATURAL TIME-AREA UA RECORD
                      ONSITE AREAS USE AN URBAN TIME-AREA UA RECORD

                    HYDROGRAPH ROUTING THRU STREET REACH USES KENEMATIC WAVE AND ASSUMES:
                      TRAPEZOID CHANNEL, Wbase=32',40' OR 68'; SIDE SLOPE 1V:0.0001H;
                          "n" = 0.015; SLOPE S = 0.005 (ft/ft)

                    HYDROGRAPH ROUTING THRU GUNITE CHANNEL USES KINEMATIC WAVE AND ASSUMES:
                      TRAPEZOID CHANNEL, Wbase=10'(MIN),20'(MAX); SIDE SLOPE 1V:0.5H;
                          "n" = 0.016; SLOPE S = 0.005 (ft/ft)

                    HYDROGRAPH ROUTING THRU GOLF COURSE CHANNEL USES MOD PULS AND ASSUMES:
                      CROSS SECTIONS BASED ON GOLF COURSE GRADING PLANS;
                      LOW FLOW "n" = 0.025; OVERBANK "n" = 0.030;
                      CHANNEL SLOPE BASED ON ESTIMATED HYDRAULIC GRADIENT;
                      SLOPE S = DELTA ELEVATION / LENGTH OF FLOWPATH
                      ELEVATION CHANGE IS UPSTREAM FLOWLINE TO DOWNSTREAM FLOWLINE
                      (or to water surface of detention basin assuming 3' ponding depth).
                      NSTPS (RS RECORD) = LENGTH/(VEL*300 SEC) -- VEL ASSUMED @ 5 FPS

                    HYDROGRAPH ROUTING THRU DET BASINS USES MOD PULS LEVEL POOL.
                      ELEVATION VS STORAGE DATA IS BASED ON GOLF COURSE PLANS.
                      BASIN OUTLETS CONSISTING OF PIPE AND WIER IN COMBO ASSUMES:
                             PIPE SIZE RANGES FROM SINGLE 12" TO MULTI - 24"
                             LOW-FLOWS ASSUME ORIFICE EQUATION:
                               Q = C * A(pipe) * H(above FL)^0.5
                             (ORIFICE COEF, C, ESTIMATED AT 0.40 TO GIVE RESULTS
                               SIMILAR TO HEC-5 FOR CIRC RCP W/ INLET CONTROL)
                             WIERS ARE ASSUMED TO BE BROAD, HORIZ CREST WITH VERT SIDES,
                                 WIER COEFF = 2.6
                      BASIN OUTLETS CONSISTING OF ROADWAY CULVERTS ASSUME
                             HEC-5 ELEV-DISCHARGE.
                      DET BASIN 330 ELEV-DISCHARGE BASED ON BACKWATER FROM HEC-2 SCWEH2C


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

    IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ         200  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      1    0  ENDING DATE
                     NDTIME        1635  ENDING TIME
                     ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   16.58 HOURS

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


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
170 KK      *     DET40  *            ROUTE HYDROGRAPH SUM40 THRU DET BASIN 40;
            *            *
            **************

172 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA
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173 RS          STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       STOR  TYPE OF INITIAL CONDITION
                    RSVRIC      -1.00  INITIAL CONDITION
                         X        .00 WORKING R AND D COEFFICIENT

174 SA               AREA         .0       .1       .4       .7      1.2      3.1

175 SE          ELEVATION     1294.00  1295.00  1296.00  1297.00  1298.00  1299.00

176 SQ          DISCHARGE         0.      50.     145.     260.     385.     485.
                                                          ***

                                          COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00      .04      .26      .77     1.69     3.78
        ELEVATION    1294.00  1295.00  1296.00  1297.00  1298.00  1299.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN        0. TO      145.
                THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
                THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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                                          HYDROGRAPH AT STATION    DET40

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1294.0	*	1		0535	68	0.	.0	1294.0	*	1		1110	135	0.	.0	1294.0
1		0005	2	0.	.0	1294.0	*	1		0540	69	0.	.0	1294.0	*	1		1115	136	0.	.0	1294.0
1		0010	3	1.	.0	1294.0	*	1		0545	70	0.	.0	1294.0	*	1		1120	137	0.	.0	1294.0
1		0015	4	1.	.0	1294.0	*	1		0550	71	0.	.0	1294.0	*	1		1125	138	0.	.0	1294.0
1		0020	5	1.	.0	1294.0	*	1		0555	72	0.	.0	1294.0	*	1		1130	139	0.	.0	1294.0
1		0025	6	1.	.0	1294.0	*	1		0600	73	0.	.0	1294.0	*	1		1135	140	0.	.0	1294.0
1		0030	7	2.	.0	1294.0	*	1		0605	74	0.	.0	1294.0	*	1		1140	141	0.	.0	1294.0
1		0035	8	2.	.0	1294.0	*	1		0610	75	0.	.0	1294.0	*	1		1145	142	0.	.0	1294.0
1		0040	9	4.	.0	1294.1	*	1		0615	76	0.	.0	1294.0	*	1		1150	143	0.	.0	1294.0
1		0045	10	5.	.0	1294.1	*	1		0620	77	0.	.0	1294.0	*	1		1155	144	0.	.0	1294.0
1		0050	11	7.	.0	1294.1	*	1		0625	78	0.	.0	1294.0	*	1		1200	145	0.	.0	1294.0
1		0055	12	10.	.0	1294.2	*	1		0630	79	0.	.0	1294.0	*	1		1205	146	0.	.0	1294.0
1		0100	13	18.	.0	1294.4	*	1		0635	80	0.	.0	1294.0	*	1		1210	147	0.	.0	1294.0
1		0105	14	52.	.0	1295.0	*	1		0640	81	0.	.0	1294.0	*	1		1215	148	0.	.0	1294.0
1		0110	15	102.	.2	1295.5	*	1		0645	82	0.	.0	1294.0	*	1		1220	149	0.	.0	1294.0
1		0115	16	174.	.4	1296.3	*	1		0650	83	0.	.0	1294.0	*	1		1225	150	0.	.0	1294.0
1		0120	17	245.	.7	1296.9	*	1		0655	84	0.	.0	1294.0	*	1		1230	151	0.	.0	1294.0
1		0125	18	305.	1.1	1297.4	*	1		0700	85	0.	.0	1294.0	*	1		1235	152	0.	.0	1294.0
1		0130	19	354.	1.5	1297.8	*	1		0705	86	0.	.0	1294.0	*	1		1240	153	0.	.0	1294.0
1		0135	20	371.	1.6	1297.9	*	1		0710	87	0.	.0	1294.0	*	1		1245	154	0.	.0	1294.0
1		0140	21	348.	1.4	1297.7	*	1		0715	88	0.	.0	1294.0	*	1		1250	155	0.	.0	1294.0
1		0145	22	299.	1.1	1297.3	*	1		0720	89	0.	.0	1294.0	*	1		1255	156	0.	.0	1294.0
1		0150	23	236.	.7	1296.8	*	1		0725	90	0.	.0	1294.0	*	1		1300	157	0.	.0	1294.0
1		0155	24	168.	.4	1296.2	*	1		0730	91	0.	.0	1294.0	*	1		1305	158	0.	.0	1294.0
1		0200	25	118.	.2	1295.7	*	1		0735	92	0.	.0	1294.0	*	1		1310	159	0.	.0	1294.0
1		0205	26	83.	.1	1295.4	*	1		0740	93	0.	.0	1294.0	*	1		1315	160	0.	.0	1294.0
1		0210	27	63.	.1	1295.1	*	1		0745	94	0.	.0	1294.0	*	1		1320	161	0.	.0	1294.0
1		0215	28	46.	.0	1294.9	*	1		0750	95	0.	.0	1294.0	*	1		1325	162	0.	.0	1294.0
1		0220	29	31.	.0	1294.6	*	1		0755	96	0.	.0	1294.0	*	1		1330	163	0.	.0	1294.0
1		0225	30	25.	.0	1294.5	*	1		0800	97	0.	.0	1294.0	*	1		1335	164	0.	.0	1294.0
1		0230	31	17.	.0	1294.3	*	1		0805	98	0.	.0	1294.0	*	1		1340	165	0.	.0	1294.0
1		0235	32	14.	.0	1294.3	*	1		0810	99	0.	.0	1294.0	*	1		1345	166	0.	.0	1294.0
1		0240	33	10.	.0	1294.2	*	1		0815	100	0.	.0	1294.0	*	1		1350	167	0.	.0	1294.0
1		0245	34	8.	.0	1294.2	*	1		0820	101	0.	.0	1294.0	*	1		1355	168	0.	.0	1294.0
1		0250	35	6.	.0	1294.1	*	1		0825	102	0.	.0	1294.0	*	1		1400	169	0.	.0	1294.0
1		0255	36	4.	.0	1294.1	*	1		0830	103	0.	.0	1294.0	*	1		1405	170	0.	.0	1294.0
1		0300	37	3.	.0	1294.1	*	1		0835	104	0.	.0	1294.0	*	1		1410	171	0.	.0	1294.0
1		0305	38	2.	.0	1294.0	*	1		0840	105	0.	.0	1294.0	*	1		1415	172	0.	.0	1294.0
1		0310	39	1.	.0	1294.0	*	1		0845	106	0.	.0	1294.0	*	1		1420	173	0.	.0	1294.0
1		0315	40	0.	.0	1294.0	*	1		0850	107	0.	.0	1294.0	*	1		1425	174	0.	.0	1294.0
1		0320	41	0.	.0	1294.0	*	1		0855	108	0.	.0	1294.0	*	1		1430	175	0.	.0	1294.0
1		0325	42	0.	.0	1294.0	*	1		0900	109	0.	.0	1294.0	*	1		1435	176	0.	.0	1294.0
1		0330	43	0.	.0	1294.0	*	1		0905	110	0.	.0	1294.0	*	1		1440	177	0.	.0	1294.0
1		0335	44	0.	.0	1294.0	*	1		0910	111	0.	.0	1294.0	*	1		1445	178	0.	.0	1294.0
1		0340	45	0.	.0	1294.0	*	1		0915	112	0.	.0	1294.0	*	1		1450	179	0.	.0	1294.0
1		0345	46	0.	.0	1294.0	*	1		0920	113	0.	.0	1294.0	*	1		1455	180	0.	.0	1294.0
1		0350	47	0.	.0	1294.0	*	1		0925	114	0.	.0	1294.0	*	1		1500	181	0.	.0	1294.0
1		0355	48	0.	.0	1294.0	*	1		0930	115	0.	.0	1294.0	*	1		1505	182	0.	.0	1294.0
1		0400	49	0.	.0	1294.0	*	1		0935	116	0.	.0	1294.0	*	1		1510	183	0.	.0	1294.0

```
 1    0405  50      0.      .0  1294.0 *  1    0940 117      0.      .0  1294.0 *  1    1515 184      0.      .0  1294.0
 1    0410  51      0.      .0  1294.0 *  1    0945 118      0.      .0  1294.0 *  1    1520 185      0.      .0  1294.0
 1    0415  52      0.      .0  1294.0 *  1    0950 119      0.      .0  1294.0 *  1    1525 186      0.      .0  1294.0
 1    0420  53      0.      .0  1294.0 *  1    0955 120      0.      .0  1294.0 *  1    1530 187      0.      .0  1294.0
 1    0425  54      0.      .0  1294.0 *  1    1000 121      0.      .0  1294.0 *  1    1535 188      0.      .0  1294.0
 1    0430  55      0.      .0  1294.0 *  1    1005 122      0.      .0  1294.0 *  1    1540 189      0.      .0  1294.0
 1    0435  56      0.      .0  1294.0 *  1    1010 123      0.      .0  1294.0 *  1    1545 190      0.      .0  1294.0
 1    0440  57      0.      .0  1294.0 *  1    1015 124      0.      .0  1294.0 *  1    1550 191      0.      .0  1294.0
 1    0445  58      0.      .0  1294.0 *  1    1020 125      0.      .0  1294.0 *  1    1555 192      0.      .0  1294.0
 1    0450  59      0.      .0  1294.0 *  1    1025 126      0.      .0  1294.0 *  1    1600 193      0.      .0  1294.0
 1    0455  60      0.      .0  1294.0 *  1    1030 127      0.      .0  1294.0 *  1    1605 194      0.      .0  1294.0
 1    0500  61      0.      .0  1294.0 *  1    1035 128      0.      .0  1294.0 *  1    1610 195      0.      .0  1294.0
 1    0505  62      0.      .0  1294.0 *  1    1040 129      0.      .0  1294.0 *  1    1615 196      0.      .0  1294.0
 1    0510  63      0.      .0  1294.0 *  1    1045 130      0.      .0  1294.0 *  1    1620 197      0.      .0  1294.0
 1    0515  64      0.      .0  1294.0 *  1    1050 131      0.      .0  1294.0 *  1    1625 198      0.      .0  1294.0
 1    0520  65      0.      .0  1294.0 *  1    1055 132      0.      .0  1294.0 *  1    1630 199      0.      .0  1294.0
 1    0525  66      0.      .0  1294.0 *  1    1100 133      0.      .0  1294.0 *  1    1635 200      0.      .0  1294.0
 1    0530  67      0.      .0  1294.0 *  1    1105 134      0.      .0  1294.0 *
                                         *                                        *
*****************************************************************************************************************************

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     16.58-HR
+   (CFS)      (HR)
                            (CFS)
+    371.      1.58                 44.         16.         16.         16.
                          (INCHES)  1.495       1.495       1.495       1.495
                           (AC-FT)  22.         22.         22.         22.

 PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+  (AC-FT)     (HR)
       2.      1.58                  0.          0.          0.          0.

 PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+   (FEET)     (HR)
   1297.89     1.58             1294.55     1294.20     1294.20     1294.20

                        CUMULATIVE AREA =     .27 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 191 KK     *    DET45   *          ROUTE HYDROGRAPH SUM45 THRU DET BASIN 45;
            *            *
            **************

 193 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

 194 RS         STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

 195 SA              AREA         .0        .0        .1        .5        .8       1.1       1.4       2.7       3.3

 196 SE         ELEVATION    1287.00   1288.00   1289.00   1290.00   1291.00   1292.00   1292.50   1293.00   1294.00

 197 SL         LOW-LEVEL OUTLET
                      ELEVL    1287.00  ELEVATION AT CENTER OF OUTLET
                      CAREA       3.10  CROSS-SECTIONAL AREA
                       COQL        .40  COEFFICIENT
                       EXPL        .50  EXPONENT OF HEAD

 198 SS         SPILLWAY
                       CREL    1292.00  SPILLWAY CREST ELEVATION
                      SPWID     190.00  SPILLWAY WIDTH
                       COQW       2.60  WEIR COEFFICIENT
```

EXPW 1.50 EXPONENT OF HEAD

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.00	.07	.37	1.01	1.96	2.59	3.60	6.60
ELEVATION	1287.00	1288.00	1289.00	1290.00	1291.00	1292.00	1292.50	1293.00	1294.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	9.75	10.49	11.35	12.35	13.56	15.03	16.85	19.17	22.24
ELEVATION	1287.00	1287.96	1288.11	1288.30	1288.54	1288.86	1289.28	1289.87	1290.72	1292.00
OUTFLOW	23.76	33.89	60.92	113.21	199.07	326.88	504.91	741.46	1044.86	1423.55
ELEVATION	1292.02	1292.08	1292.18	1292.32	1292.50	1292.72	1292.98	1293.28	1293.62	1294.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.00	.00	.00	.01	.02	.05	.07	.12	.31
OUTFLOW	.00	9.75	9.94	10.49	11.35	12.35	13.56	14.06	15.03	16.85
ELEVATION	1287.00	1287.96	1288.00	1288.11	1288.30	1288.54	1288.86	1289.00	1289.28	1289.87
STORAGE	.37	.80	1.01	1.96	1.98	2.05	2.17	2.35	2.59	2.95
OUTFLOW	17.22	19.17	19.89	22.24	23.76	33.89	60.92	113.21	197.98	326.88
ELEVATION	1290.00	1290.72	1291.00	1292.00	1292.02	1292.08	1292.18	1292.32	1292.50	1292.72
STORAGE	3.55	3.60	4.39	5.40	6.60					
OUTFLOW	504.91	518.36	741.46	1044.86	1423.55					
ELEVATION	1292.98	1293.00	1293.28	1293.62	1294.00					

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 1424.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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HYDROGRAPH AT STATION DET45

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1287.0	1		0535	68	0.	.0	1287.0	1		1110	135	0.	.0	1287.0
1		0005	2	0.	.0	1287.0	1		0540	69	0.	.0	1287.0	1		1115	136	0.	.0	1287.0
1		0010	3	0.	.0	1287.0	1		0545	70	0.	.0	1287.0	1		1120	137	0.	.0	1287.0
1		0015	4	0.	.0	1287.0	1		0550	71	0.	.0	1287.0	1		1125	138	0.	.0	1287.0
1		0020	5	1.	.0	1287.1	1		0555	72	0.	.0	1287.0	1		1130	139	0.	.0	1287.0
1		0025	6	1.	.0	1287.1	1		0600	73	0.	.0	1287.0	1		1135	140	0.	.0	1287.0
1		0030	7	1.	.0	1287.1	1		0605	74	0.	.0	1287.0	1		1140	141	0.	.0	1287.0
1		0035	8	2.	.0	1287.2	1		0610	75	0.	.0	1287.0	1		1145	142	0.	.0	1287.0
1		0040	9	2.	.0	1287.2	1		0615	76	0.	.0	1287.0	1		1150	143	0.	.0	1287.0
1		0045	10	3.	.0	1287.3	1		0620	77	0.	.0	1287.0	1		1155	144	0.	.0	1287.0
1		0050	11	4.	.0	1287.4	1		0625	78	0.	.0	1287.0	1		1200	145	0.	.0	1287.0
1		0055	12	6.	.0	1287.6	1		0630	79	0.	.0	1287.0	1		1205	146	0.	.0	1287.0
1		0100	13	11.	.0	1288.3	1		0635	80	0.	.0	1287.0	1		1210	147	0.	.0	1287.0
1		0105	14	15.	.1	1289.3	1		0640	81	0.	.0	1287.0	1		1215	148	0.	.0	1287.0
1		0110	15	18.	.5	1290.2	1		0645	82	0.	.0	1287.0	1		1220	149	0.	.0	1287.0
1		0115	16	20.	1.2	1291.2	1		0650	83	0.	.0	1287.0	1		1225	150	0.	.0	1287.0
1		0120	17	73.	2.2	1292.2	1		0655	84	0.	.0	1287.0	1		1230	151	0.	.0	1287.0
1		0125	18	271.	2.8	1292.6	1		0700	85	0.	.0	1287.0	1		1235	152	0.	.0	1287.0
1		0130	19	317.	2.9	1292.7	1		0705	86	0.	.0	1287.0	1		1240	153	0.	.0	1287.0
1		0135	20	355.	3.0	1292.8	1		0710	87	0.	.0	1287.0	1		1245	154	0.	.0	1287.0
1		0140	21	365.	3.1	1292.8	1		0715	88	0.	.0	1287.0	1		1250	155	0.	.0	1287.0
1		0145	22	341.	3.0	1292.7	1		0720	89	0.	.0	1287.0	1		1255	156	0.	.0	1287.0
1		0150	23	291.	2.9	1292.7	1		0725	90	0.	.0	1287.0	1		1300	157	0.	.0	1287.0
1		0155	24	230.	2.7	1292.6	1		0730	91	0.	.0	1287.0	1		1305	158	0.	.0	1287.0
1		0200	25	170.	2.5	1292.4	1		0735	92	0.	.0	1287.0	1		1310	159	0.	.0	1287.0
1		0205	26	122.	2.4	1292.3	1		0740	93	0.	.0	1287.0	1		1315	160	0.	.0	1287.0
1		0210	27	90.	2.3	1292.3	1		0745	94	0.	.0	1287.0	1		1320	161	0.	.0	1287.0
1		0215	28	67.	2.2	1292.2	1		0750	95	0.	.0	1287.0	1		1325	162	0.	.0	1287.0
1		0220	29	51.	2.1	1292.1	1		0755	96	0.	.0	1287.0	1		1330	163	0.	.0	1287.0
1		0225	30	38.	2.1	1292.1	1		0800	97	0.	.0	1287.0	1		1335	164	0.	.0	1287.0
1		0230	31	30.	2.0	1292.1	1		0805	98	0.	.0	1287.0	1		1340	165	0.	.0	1287.0
1		0235	32	24.	2.0	1292.0	1		0810	99	0.	.0	1287.0	1		1345	166	0.	.0	1287.0
1		0240	33	22.	1.9	1292.0	1		0815	100	0.	.0	1287.0	1		1350	167	0.	.0	1287.0
1		0245	34	22.	1.9	1291.9	1		0820	101	0.	.0	1287.0	1		1355	168	0.	.0	1287.0
1		0250	35	22.	1.8	1291.8	1		0825	102	0.	.0	1287.0	1		1400	169	0.	.0	1287.0
1		0255	36	22.	1.7	1291.7	1		0830	103	0.	.0	1287.0	1		1405	170	0.	.0	1287.0

1	0300	37	21.	1.6	1291.6	*	1	0835	104	0.	.0	1287.0	*	1	1410	171	0.	.0	1287.0
1	0305	38	21.	1.5	1291.5	*	1	0840	105	0.	.0	1287.0	*	1	1415	172	0.	.0	1287.0
1	0310	39	21.	1.3	1291.3	*	1	0845	106	0.	.0	1287.0	*	1	1420	173	0.	.0	1287.0
1	0315	40	20.	1.2	1291.2	*	1	0850	107	0.	.0	1287.0	*	1	1425	174	0.	.0	1287.0
1	0320	41	20.	1.1	1291.1	*	1	0855	108	0.	.0	1287.0	*	1	1430	175	0.	.0	1287.0
1	0325	42	20.	1.0	1290.9	*	1	0900	109	0.	.0	1287.0	*	1	1435	176	0.	.0	1287.0
1	0330	43	19.	.8	1290.8	*	1	0905	110	0.	.0	1287.0	*	1	1440	177	0.	.0	1287.0
1	0335	44	19.	.7	1290.6	*	1	0910	111	0.	.0	1287.0	*	1	1445	178	0.	.0	1287.0
1	0340	45	18.	.6	1290.3	*	1	0915	112	0.	.0	1287.0	*	1	1450	179	0.	.0	1287.0
1	0345	46	18.	.5	1290.1	*	1	0920	113	0.	.0	1287.0	*	1	1455	180	0.	.0	1287.0
1	0350	47	17.	.3	1289.9	*	1	0925	114	0.	.0	1287.0	*	1	1500	181	0.	.0	1287.0
1	0355	48	16.	.2	1289.6	*	1	0930	115	0.	.0	1287.0	*	1	1505	182	0.	.0	1287.0
1	0400	49	15.	.1	1289.3	*	1	0935	116	0.	.0	1287.0	*	1	1510	183	0.	.0	1287.0
1	0405	50	13.	.0	1288.6	*	1	0940	117	0.	.0	1287.0	*	1	1515	184	0.	.0	1287.0
1	0410	51	0.	.0	1287.0	*	1	0945	118	0.	.0	1287.0	*	1	1520	185	0.	.0	1287.0
1	0415	52	0.	.0	1287.0	*	1	0950	119	0.	.0	1287.0	*	1	1525	186	0.	.0	1287.0
1	0420	53	0.	.0	1287.0	*	1	0955	120	0.	.0	1287.0	*	1	1530	187	0.	.0	1287.0
1	0425	54	0.	.0	1287.0	*	1	1000	121	0.	.0	1287.0	*	1	1535	188	0.	.0	1287.0
1	0430	55	0.	.0	1287.0	*	1	1005	122	0.	.0	1287.0	*	1	1540	189	0.	.0	1287.0
1	0435	56	0.	.0	1287.0	*	1	1010	123	0.	.0	1287.0	*	1	1545	190	0.	.0	1287.0
1	0440	57	0.	.0	1287.0	*	1	1015	124	0.	.0	1287.0	*	1	1550	191	0.	.0	1287.0
1	0445	58	0.	.0	1287.0	*	1	1020	125	0.	.0	1287.0	*	1	1555	192	0.	.0	1287.0
1	0450	59	0.	.0	1287.0	*	1	1025	126	0.	.0	1287.0	*	1	1600	193	0.	.0	1287.0
1	0455	60	0.	.0	1287.0	*	1	1030	127	0.	.0	1287.0	*	1	1605	194	0.	.0	1287.0
1	0500	61	0.	.0	1287.0	*	1	1035	128	0.	.0	1287.0	*	1	1610	195	0.	.0	1287.0
1	0505	62	0.	.0	1287.0	*	1	1040	129	0.	.0	1287.0	*	1	1615	196	0.	.0	1287.0
1	0510	63	0.	.0	1287.0	*	1	1045	130	0.	.0	1287.0	*	1	1620	197	0.	.0	1287.0
1	0515	64	0.	.0	1287.0	*	1	1050	131	0.	.0	1287.0	*	1	1625	198	0.	.0	1287.0
1	0520	65	0.	.0	1287.0	*	1	1055	132	0.	.0	1287.0	*	1	1630	199	0.	.0	1287.0
1	0525	66	0.	.0	1287.0	*	1	1100	133	0.	.0	1287.0	*	1	1635	200	0.	.0	1287.0
1	0530	67	0.	.0	1287.0	*	1	1105	134	0.	.0	1287.0	*						
						*							*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	16.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 365.	1.67		45.	16.	16.	16.
		(INCHES)	1.496	1.496	1.496	1.496
		(AC-FT)	22.	22.	22.	22.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (AC-FT)	(HR)				
3.	1.67	1.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (FEET)	(HR)				
1292.78	1.67	1289.33	1287.84	1287.84	1287.84

CUMULATIVE AREA = .28 SQ MI

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          *            *
376 KK    *   DET145   *          ROUTE HYDROGRAPH SUB145 THRU DET BASIN 145;
          *            *
          **************

378 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          1  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

            HYDROGRAPH ROUTING DATA

379 RS        STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       STOR  TYPE OF INITIAL CONDITION
                    RSVRIC     -1.00  INITIAL CONDITION
                         X       .00 WORKING R AND D COEFFICIENT

380 SA            AREA        .0      .1      .4      1.1     1.9     2.8     3.4
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381 SE          ELEVATION     1296.00   1297.00   1298.00   1299.00   1300.00   1301.00   1302.00

382 SL          LOW-LEVEL OUTLET
                      ELEVL     1296.00  ELEVATION AT CENTER OF OUTLET
                      CAREA        3.10  CROSS-SECTIONAL AREA
                       COQL         .40  COEFFICIENT
                       EXPL         .50  EXPONENT OF HEAD

383 SS          SPILLWAY
                       CREL     1300.50  SPILLWAY CREST ELEVATION
                      SPWID      150.00  SPILLWAY WIDTH
                       COQW        2.60  WEIR COEFFICIENT
                       EXPW        1.50  EXPONENT OF HEAD
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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.04	.30	1.03	2.51	4.84	7.90
ELEVATION	1296.00	1297.00	1298.00	1299.00	1300.00	1301.00	1302.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	9.73	10.43	11.24	12.19	13.32	14.67	16.33	18.41	21.10
ELEVATION	1296.00	1296.96	1297.10	1297.28	1297.50	1297.79	1298.18	1298.70	1299.43	1300.50
OUTFLOW	21.91	27.19	41.21	68.17	112.40	178.10	269.54	390.96	546.69	740.84
ELEVATION	1300.52	1300.56	1300.64	1300.74	1300.88	1301.04	1301.24	1301.46	1301.72	1302.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.04	.04	.05	.08	.13	.22	.30	.38	.73
OUTFLOW	.00	9.73	9.94	10.43	11.24	12.19	13.32	14.06	14.67	16.33
ELEVATION	1296.00	1296.96	1297.00	1297.10	1297.28	1297.50	1297.79	1298.00	1298.18	1298.70
STORAGE	1.03	1.55	2.51	3.57	3.61	3.72	3.90	4.16	4.51	4.84
OUTFLOW	17.22	18.41	19.89	21.10	21.91	27.19	41.21	68.17	112.40	160.12
ELEVATION	1299.00	1299.43	1300.00	1300.50	1300.52	1300.56	1300.64	1300.74	1300.88	1301.00
STORAGE	4.96	5.51	6.17	6.97	7.90					
OUTFLOW	178.10	269.54	390.96	546.69	740.84					
ELEVATION	1301.04	1301.24	1301.46	1301.72	1302.00					

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HYDROGRAPH AT STATION DET145

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1296.0	*	1		0535	68	0.	.0	1296.0	*	1		1110	135	0.	.0	1296.0
1		0005	2	0.	.0	1296.0	*	1		0540	69	0.	.0	1296.0	*	1		1115	136	0.	.0	1296.0
1		0010	3	0.	.0	1296.0	*	1		0545	70	0.	.0	1296.0	*	1		1120	137	0.	.0	1296.0
1		0015	4	0.	.0	1296.0	*	1		0550	71	0.	.0	1296.0	*	1		1125	138	0.	.0	1296.0
1		0020	5	0.	.0	1296.0	*	1		0555	72	0.	.0	1296.0	*	1		1130	139	0.	.0	1296.0
1		0025	6	0.	.0	1296.0	*	1		0600	73	0.	.0	1296.0	*	1		1135	140	0.	.0	1296.0
1		0030	7	0.	.0	1296.0	*	1		0605	74	0.	.0	1296.0	*	1		1140	141	0.	.0	1296.0
1		0035	8	0.	.0	1296.0	*	1		0610	75	0.	.0	1296.0	*	1		1145	142	0.	.0	1296.0
1		0040	9	0.	.0	1296.0	*	1		0615	76	0.	.0	1296.0	*	1		1150	143	0.	.0	1296.0
1		0045	10	0.	.0	1296.0	*	1		0620	77	0.	.0	1296.0	*	1		1155	144	0.	.0	1296.0
1		0050	11	0.	.0	1296.0	*	1		0625	78	0.	.0	1296.0	*	1		1200	145	0.	.0	1296.0
1		0055	12	0.	.0	1296.0	*	1		0630	79	0.	.0	1296.0	*	1		1205	146	0.	.0	1296.0
1		0100	13	1.	.0	1296.1	*	1		0635	80	0.	.0	1296.0	*	1		1210	147	0.	.0	1296.0
1		0105	14	6.	.0	1296.6	*	1		0640	81	0.	.0	1296.0	*	1		1215	148	0.	.0	1296.0
1		0110	15	11.	.1	1297.2	*	1		0645	82	0.	.0	1296.0	*	1		1220	149	0.	.0	1296.0
1		0115	16	13.	.2	1297.6	*	1		0650	83	0.	.0	1296.0	*	1		1225	150	0.	.0	1296.0
1		0120	17	13.	.2	1297.8	*	1		0655	84	0.	.0	1296.0	*	1		1230	151	0.	.0	1296.0
1		0125	18	14.	.3	1297.9	*	1		0700	85	0.	.0	1296.0	*	1		1235	152	0.	.0	1296.0
1		0130	19	14.	.3	1297.9	*	1		0705	86	0.	.0	1296.0	*	1		1240	153	0.	.0	1296.0
1		0135	20	13.	.2	1297.8	*	1		0710	87	0.	.0	1296.0	*	1		1245	154	0.	.0	1296.0
1		0140	21	13.	.2	1297.6	*	1		0715	88	0.	.0	1296.0	*	1		1250	155	0.	.0	1296.0
1		0145	22	12.	.1	1297.4	*	1		0720	89	0.	.0	1296.0	*	1		1255	156	0.	.0	1296.0
1		0150	23	10.	.0	1297.1	*	1		0725	90	0.	.0	1296.0	*	1		1300	157	0.	.0	1296.0
1		0155	24	3.	.0	1296.3	*	1		0730	91	0.	.0	1296.0	*	1		1305	158	0.	.0	1296.0
1		0200	25	1.	.0	1296.1	*	1		0735	92	0.	.0	1296.0	*	1		1310	159	0.	.0	1296.0
1		0205	26	0.	.0	1296.0	*	1		0740	93	0.	.0	1296.0	*	1		1315	160	0.	.0	1296.0
1		0210	27	0.	.0	1296.0	*	1		0745	94	0.	.0	1296.0	*	1		1320	161	0.	.0	1296.0

1	0215	28	0.	.0	1296.0	*	1	0750	95	0.	.0	1296.0	*	1	1325	162	0.	.0	1296.0
1	0220	29	0.	.0	1296.0	*	1	0755	96	0.	.0	1296.0	*	1	1330	163	0.	.0	1296.0
1	0225	30	0.	.0	1296.0	*	1	0800	97	0.	.0	1296.0	*	1	1335	164	0.	.0	1296.0
1	0230	31	0.	.0	1296.0	*	1	0805	98	0.	.0	1296.0	*	1	1340	165	0.	.0	1296.0
1	0235	32	0.	.0	1296.0	*	1	0810	99	0.	.0	1296.0	*	1	1345	166	0.	.0	1296.0
1	0240	33	0.	.0	1296.0	*	1	0815	100	0.	.0	1296.0	*	1	1350	167	0.	.0	1296.0
1	0245	34	0.	.0	1296.0	*	1	0820	101	0.	.0	1296.0	*	1	1355	168	0.	.0	1296.0
1	0250	35	0.	.0	1296.0	*	1	0825	102	0.	.0	1296.0	*	1	1400	169	0.	.0	1296.0
1	0255	36	0.	.0	1296.0	*	1	0830	103	0.	.0	1296.0	*	1	1405	170	0.	.0	1296.0
1	0300	37	0.	.0	1296.0	*	1	0835	104	0.	.0	1296.0	*	1	1410	171	0.	.0	1296.0
1	0305	38	0.	.0	1296.0	*	1	0840	105	0.	.0	1296.0	*	1	1415	172	0.	.0	1296.0
1	0310	39	0.	.0	1296.0	*	1	0845	106	0.	.0	1296.0	*	1	1420	173	0.	.0	1296.0
1	0315	40	0.	.0	1296.0	*	1	0850	107	0.	.0	1296.0	*	1	1425	174	0.	.0	1296.0
1	0320	41	0.	.0	1296.0	*	1	0855	108	0.	.0	1296.0	*	1	1430	175	0.	.0	1296.0
1	0325	42	0.	.0	1296.0	*	1	0900	109	0.	.0	1296.0	*	1	1435	176	0.	.0	1296.0
1	0330	43	0.	.0	1296.0	*	1	0905	110	0.	.0	1296.0	*	1	1440	177	0.	.0	1296.0
1	0335	44	0.	.0	1296.0	*	1	0910	111	0.	.0	1296.0	*	1	1445	178	0.	.0	1296.0
1	0340	45	0.	.0	1296.0	*	1	0915	112	0.	.0	1296.0	*	1	1450	179	0.	.0	1296.0
1	0345	46	0.	.0	1296.0	*	1	0920	113	0.	.0	1296.0	*	1	1455	180	0.	.0	1296.0
1	0350	47	0.	.0	1296.0	*	1	0925	114	0.	.0	1296.0	*	1	1500	181	0.	.0	1296.0
1	0355	48	0.	.0	1296.0	*	1	0930	115	0.	.0	1296.0	*	1	1505	182	0.	.0	1296.0
1	0400	49	0.	.0	1296.0	*	1	0935	116	0.	.0	1296.0	*	1	1510	183	0.	.0	1296.0
1	0405	50	0.	.0	1296.0	*	1	0940	117	0.	.0	1296.0	*	1	1515	184	0.	.0	1296.0
1	0410	51	0.	.0	1296.0	*	1	0945	118	0.	.0	1296.0	*	1	1520	185	0.	.0	1296.0
1	0415	52	0.	.0	1296.0	*	1	0950	119	0.	.0	1296.0	*	1	1525	186	0.	.0	1296.0
1	0420	53	0.	.0	1296.0	*	1	0955	120	0.	.0	1296.0	*	1	1530	187	0.	.0	1296.0
1	0425	54	0.	.0	1296.0	*	1	1000	121	0.	.0	1296.0	*	1	1535	188	0.	.0	1296.0
1	0430	55	0.	.0	1296.0	*	1	1005	122	0.	.0	1296.0	*	1	1540	189	0.	.0	1296.0
1	0435	56	0.	.0	1296.0	*	1	1010	123	0.	.0	1296.0	*	1	1545	190	0.	.0	1296.0
1	0440	57	0.	.0	1296.0	*	1	1015	124	0.	.0	1296.0	*	1	1550	191	0.	.0	1296.0
1	0445	58	0.	.0	1296.0	*	1	1020	125	0.	.0	1296.0	*	1	1555	192	0.	.0	1296.0
1	0450	59	0.	.0	1296.0	*	1	1025	126	0.	.0	1296.0	*	1	1600	193	0.	.0	1296.0
1	0455	60	0.	.0	1296.0	*	1	1030	127	0.	.0	1296.0	*	1	1605	194	0.	.0	1296.0
1	0500	61	0.	.0	1296.0	*	1	1035	128	0.	.0	1296.0	*	1	1610	195	0.	.0	1296.0
1	0505	62	0.	.0	1296.0	*	1	1040	129	0.	.0	1296.0	*	1	1615	196	0.	.0	1296.0
1	0510	63	0.	.0	1296.0	*	1	1045	130	0.	.0	1296.0	*	1	1620	197	0.	.0	1296.0
1	0515	64	0.	.0	1296.0	*	1	1050	131	0.	.0	1296.0	*	1	1625	198	0.	.0	1296.0
1	0520	65	0.	.0	1296.0	*	1	1055	132	0.	.0	1296.0	*	1	1630	199	0.	.0	1296.0
1	0525	66	0.	.0	1296.0	*	1	1100	133	0.	.0	1296.0	*	1	1635	200	0.	.0	1296.0
1	0530	67	0.	.0	1296.0	*	1	1105	134	0.	.0	1296.0	*						
						*							*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	16.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 14.	1.42		2.	1.	1.	1.
		(INCHES)	1.484	1.484	1.484	1.484
		(AC-FT)	1.	1.	1.	1.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (AC-FT)	(HR)				
0.	1.42	0.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (FEET)	(HR)				
1297.92	1.42	1296.22	1296.08	1296.08	1296.08

CUMULATIVE AREA = .01 SQ MI

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              **************
              *            *
430 KK        *   DET150   *          ROUTE HYDROGRAPH SUM150 THRU DET BASIN 150;
              *            *
              **************

432 KO            OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
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HYDROGRAPH ROUTING DATA

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433 RS          STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                         X        .00 WORKING R AND D COEFFICIENT

434 SA              AREA          .0        .3        .8       1.3       2.1       3.0

435 SE         ELEVATION     1294.00   1295.00   1296.00   1297.00   1298.00   1299.00

436 SQ         DISCHARGE          0.        0.       12.       40.       75.      108.
                                                          ***
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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.10	.62	1.67	3.37	5.92
ELEVATION	1294.00	1295.00	1296.00	1297.00	1298.00	1299.00

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HYDROGRAPH AT STATION DET150

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1294.0	1		0535	68	0.	.1	1295.0	1		1110	135	0.	.1	1295.0
1		0005	2	0.	.0	1294.0	1		0540	69	0.	.1	1295.0	1		1115	136	0.	.1	1295.0
1		0010	3	0.	.0	1294.1	1		0545	70	0.	.1	1295.0	1		1120	137	0.	.1	1295.0
1		0015	4	0.	.0	1294.1	1		0550	71	0.	.1	1295.0	1		1125	138	0.	.1	1295.0
1		0020	5	0.	.0	1294.2	1		0555	72	0.	.1	1295.0	1		1130	139	0.	.1	1295.0
1		0025	6	0.	.0	1294.3	1		0600	73	0.	.1	1295.0	1		1135	140	0.	.1	1295.0
1		0030	7	0.	.0	1294.5	1		0605	74	0.	.1	1295.0	1		1140	141	0.	.1	1295.0
1		0035	8	0.	.1	1294.7	1		0610	75	0.	.1	1295.0	1		1145	142	0.	.1	1295.0
1		0040	9	0.	.1	1295.0	1		0615	76	0.	.1	1295.0	1		1150	143	0.	.1	1295.0
1		0045	10	1.	.1	1295.1	1		0620	77	0.	.1	1295.0	1		1155	144	0.	.1	1295.0
1		0050	11	2.	.2	1295.2	1		0625	78	0.	.1	1295.0	1		1200	145	0.	.1	1295.0
1		0055	12	4.	.3	1295.3	1		0630	79	0.	.1	1295.0	1		1205	146	0.	.1	1295.0
1		0100	13	7.	.4	1295.6	1		0635	80	0.	.1	1295.0	1		1210	147	0.	.1	1295.0
1		0105	14	16.	.8	1296.2	1		0640	81	0.	.1	1295.0	1		1215	148	0.	.1	1295.0
1		0110	15	40.	1.7	1297.0	1		0645	82	0.	.1	1295.0	1		1220	149	0.	.1	1295.0
1		0115	16	64.	2.8	1297.7	1		0650	83	0.	.1	1295.0	1		1225	150	0.	.1	1295.0
1		0120	17	83.	4.0	1298.2	1		0655	84	0.	.1	1295.0	1		1230	151	0.	.1	1295.0
1		0125	18	94.	4.8	1298.6	1		0700	85	0.	.1	1295.0	1		1235	152	0.	.1	1295.0
1		0130	19	100.	5.3	1298.8	1		0705	86	0.	.1	1295.0	1		1240	153	0.	.1	1295.0
1		0135	20	102.	5.5	1298.8	1		0710	87	0.	.1	1295.0	1		1245	154	0.	.1	1295.0
1		0140	21	101.	5.4	1298.8	1		0715	88	0.	.1	1295.0	1		1250	155	0.	.1	1295.0
1		0145	22	98.	5.2	1298.7	1		0720	89	0.	.1	1295.0	1		1255	156	0.	.1	1295.0
1		0150	23	94.	4.9	1298.6	1		0725	90	0.	.1	1295.0	1		1300	157	0.	.1	1295.0
1		0155	24	90.	4.5	1298.4	1		0730	91	0.	.1	1295.0	1		1305	158	0.	.1	1295.0
1		0200	25	84.	4.1	1298.3	1		0735	92	0.	.1	1295.0	1		1310	159	0.	.1	1295.0
1		0205	26	79.	3.7	1298.1	1		0740	93	0.	.1	1295.0	1		1315	160	0.	.1	1295.0
1		0210	27	72.	3.2	1297.9	1		0745	94	0.	.1	1295.0	1		1320	161	0.	.1	1295.0
1		0215	28	64.	2.8	1297.7	1		0750	95	0.	.1	1295.0	1		1325	162	0.	.1	1295.0
1		0220	29	56.	2.5	1297.5	1		0755	96	0.	.1	1295.0	1		1330	163	0.	.1	1295.0
1		0225	30	49.	2.1	1297.3	1		0800	97	0.	.1	1295.0	1		1335	164	0.	.1	1295.0
1		0230	31	43.	1.8	1297.1	1		0805	98	0.	.1	1295.0	1		1340	165	0.	.1	1295.0
1		0235	32	37.	1.6	1296.9	1		0810	99	0.	.1	1295.0	1		1345	166	0.	.1	1295.0
1		0240	33	31.	1.3	1296.7	1		0815	100	0.	.1	1295.0	1		1350	167	0.	.1	1295.0
1		0245	34	26.	1.2	1296.5	1		0820	101	0.	.1	1295.0	1		1355	168	0.	.1	1295.0
1		0250	35	22.	1.0	1296.4	1		0825	102	0.	.1	1295.0	1		1400	169	0.	.1	1295.0
1		0255	36	18.	.9	1296.2	1		0830	103	0.	.1	1295.0	1		1405	170	0.	.1	1295.0
1		0300	37	15.	.7	1296.1	1		0835	104	0.	.1	1295.0	1		1410	171	0.	.1	1295.0
1		0305	38	13.	.7	1296.0	1		0840	105	0.	.1	1295.0	1		1415	172	0.	.1	1295.0
1		0310	39	11.	.6	1295.9	1		0845	106	0.	.1	1295.0	1		1420	173	0.	.1	1295.0
1		0315	40	9.	.5	1295.8	1		0850	107	0.	.1	1295.0	1		1425	174	0.	.1	1295.0
1		0320	41	8.	.4	1295.7	1		0855	108	0.	.1	1295.0	1		1430	175	0.	.1	1295.0
1		0325	42	7.	.4	1295.6	1		0900	109	0.	.1	1295.0	1		1435	176	0.	.1	1295.0
1		0330	43	6.	.4	1295.5	1		0905	110	0.	.1	1295.0	1		1440	177	0.	.1	1295.0
1		0335	44	5.	.3	1295.4	1		0910	111	0.	.1	1295.0	1		1445	178	0.	.1	1295.0
1		0340	45	4.	.3	1295.4	1		0915	112	0.	.1	1295.0	1		1450	179	0.	.1	1295.0
1		0345	46	4.	.3	1295.3	1		0920	113	0.	.1	1295.0	1		1455	180	0.	.1	1295.0
1		0350	47	3.	.2	1295.3	1		0925	114	0.	.1	1295.0	1		1500	181	0.	.1	1295.0
1		0355	48	3.	.2	1295.2	1		0930	115	0.	.1	1295.0	1		1505	182	0.	.1	1295.0
1		0400	49	2.	.2	1295.2	1		0935	116	0.	.1	1295.0	1		1510	183	0.	.1	1295.0
1		0405	50	2.	.2	1295.2	1		0940	117	0.	.1	1295.0	1		1515	184	0.	.1	1295.0
1		0410	51	2.	.2	1295.1	1		0945	118	0.	.1	1295.0	1		1520	185	0.	.1	1295.0

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  1    0415  52      1.      .2  1295.1 *  1    0950 119      0.      .1  1295.0 *  1    1525 186      0.      .1  1295.0
  1    0420  53      1.      .2  1295.1 *  1    0955 120      0.      .1  1295.0 *  1    1530 187      0.      .1  1295.0
  1    0425  54      1.      .1  1295.1 *  1    1000 121      0.      .1  1295.0 *  1    1535 188      0.      .1  1295.0
  1    0430  55      1.      .1  1295.1 *  1    1005 122      0.      .1  1295.0 *  1    1540 189      0.      .1  1295.0
  1    0435  56      1.      .1  1295.1 *  1    1010 123      0.      .1  1295.0 *  1    1545 190      0.      .1  1295.0
  1    0440  57      1.      .1  1295.1 *  1    1015 124      0.      .1  1295.0 *  1    1550 191      0.      .1  1295.0
  1    0445  58      1.      .1  1295.0 *  1    1020 125      0.      .1  1295.0 *  1    1555 192      0.      .1  1295.0
  1    0450  59      0.      .1  1295.0 *  1    1025 126      0.      .1  1295.0 *  1    1600 193      0.      .1  1295.0
  1    0455  60      0.      .1  1295.0 *  1    1030 127      0.      .1  1295.0 *  1    1605 194      0.      .1  1295.0
  1    0500  61      0.      .1  1295.0 *  1    1035 128      0.      .1  1295.0 *  1    1610 195      0.      .1  1295.0
  1    0505  62      0.      .1  1295.0 *  1    1040 129      0.      .1  1295.0 *  1    1615 196      0.      .1  1295.0
  1    0510  63      0.      .1  1295.0 *  1    1045 130      0.      .1  1295.0 *  1    1620 197      0.      .1  1295.0
  1    0515  64      0.      .1  1295.0 *  1    1050 131      0.      .1  1295.0 *  1    1625 198      0.      .1  1295.0
  1    0520  65      0.      .1  1295.0 *  1    1055 132      0.      .1  1295.0 *  1    1630 199      0.      .1  1295.0
  1    0525  66      0.      .1  1295.0 *  1    1100 133      0.      .1  1295.0 *  1    1635 200      0.      .1  1295.0
  1    0530  67      0.      .1  1295.0 *  1    1105 134      0.      .1  1295.0 *
                                         *                                         *
*****************************************************************************************************************************

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     16.58-HR
+   (CFS)      (HR)
                          (CFS)
+     102.     1.58                  22.         8.          8.          8.
                        (INCHES)   1.747       1.747       1.747       1.747
                         (AC-FT)     11.         11.         11.         11.

 PEAK STORAGE  TIME                         MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+  (AC-FT)     (HR)
       5.      1.58                   1.         0.          0.          0.

 PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+   (FEET)     (HR)
   1298.82     1.58               1295.98    1295.33     1295.33     1295.33

                        CUMULATIVE AREA =     .12 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 457 KK     *   DET175   *          ROUTE HYDROGRAPH SUM175 THRU DET BASIN 175;
            *            *
            **************

 459 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

 460 RS         STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

 461 SA              AREA         .0        .1        .4        .9       1.5       2.1       2.9

 462 SE         ELEVATION     1288.00   1289.00   1290.00   1291.00   1292.00   1293.00   1294.00

 463 SL         LOW-LEVEL OUTLET
                      ELEVL     1288.00  ELEVATION AT CENTER OF OUTLET
                      CAREA        3.10  CROSS-SECTIONAL AREA
                       COQL         .40  COEFFICIENT
                       EXPL         .50  EXPONENT OF HEAD

 464 SS         SPILLWAY
                       CREL     1293.00  SPILLWAY CREST ELEVATION
                      SPWID       50.00  SPILLWAY WIDTH
                       COQW        2.60  WEIR COEFFICIENT
                       EXPW        1.50  EXPONENT OF HEAD
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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.03	.23	.85	2.05	3.86	6.37
ELEVATION	1288.00	1289.00	1290.00	1291.00	1292.00	1293.00	1294.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	9.75	10.49	11.35	12.35	13.56	15.03	16.85	19.17	22.24
ELEVATION	1288.00	1288.96	1289.11	1289.30	1289.54	1289.86	1290.28	1290.87	1291.72	1293.00
OUTFLOW	22.44	23.52	26.24	31.36	39.61	51.76	68.55	90.76	119.10	154.36
ELEVATION	1293.01	1293.04	1293.09	1293.17	1293.26	1293.37	1293.49	1293.64	1293.81	1294.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.02	.03	.04	.06	.10	.19	.23	.36	.73
OUTFLOW	.00	9.75	9.94	10.49	11.35	12.35	13.56	14.06	15.03	16.85
ELEVATION	1288.00	1288.96	1289.00	1289.11	1289.30	1289.54	1289.86	1290.00	1290.28	1290.87
STORAGE	.85	1.64	2.05	3.86	3.88	3.95	4.06	4.22	4.42	4.68
OUTFLOW	17.22	19.17	19.89	22.24	22.44	23.52	26.24	31.36	39.61	51.76
ELEVATION	1291.00	1291.72	1292.00	1293.00	1293.01	1293.04	1293.09	1293.17	1293.26	1293.37
STORAGE	4.99	5.38	5.83	6.37						
OUTFLOW	68.55	90.76	119.10	154.36						
ELEVATION	1293.49	1293.64	1293.81	1294.00						

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 10.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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HYDROGRAPH AT STATION DET175

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1288.0	*	1		0535	68	17.	.9	1291.0	*	1		1110	135	0.	.0	1288.0
1		0005	2	0.	.0	1288.0	*	1		0540	69	17.	.8	1290.9	*	1		1115	136	0.	.0	1288.0
1		0010	3	0.	.0	1288.0	*	1		0545	70	16.	.7	1290.8	*	1		1120	137	0.	.0	1288.0
1		0015	4	1.	.0	1288.1	*	1		0550	71	16.	.6	1290.6	*	1		1125	138	0.	.0	1288.0
1		0020	5	1.	.0	1288.1	*	1		0555	72	15.	.4	1290.4	*	1		1130	139	0.	.0	1288.0
1		0025	6	1.	.0	1288.1	*	1		0600	73	15.	.3	1290.2	*	1		1135	140	0.	.0	1288.0
1		0030	7	1.	.0	1288.1	*	1		0605	74	14.	.2	1290.0	*	1		1140	141	0.	.0	1288.0
1		0035	8	1.	.0	1288.1	*	1		0610	75	13.	.1	1289.7	*	1		1145	142	0.	.0	1288.0
1		0040	9	2.	.0	1288.2	*	1		0615	76	11.	.1	1289.3	*	1		1150	143	0.	.0	1288.0
1		0045	10	2.	.0	1288.2	*	1		0620	77	4.	.0	1288.4	*	1		1155	144	0.	.0	1288.0
1		0050	11	3.	.0	1288.3	*	1		0625	78	0.	.0	1288.0	*	1		1200	145	0.	.0	1288.0
1		0055	12	5.	.0	1288.5	*	1		0630	79	0.	.0	1288.0	*	1		1205	146	0.	.0	1288.0
1		0100	13	10.	.0	1289.0	*	1		0635	80	0.	.0	1288.0	*	1		1210	147	0.	.0	1288.0
1		0105	14	12.	.1	1289.6	*	1		0640	81	0.	.0	1288.0	*	1		1215	148	0.	.0	1288.0
1		0110	15	15.	.4	1290.3	*	1		0645	82	0.	.0	1288.0	*	1		1220	149	0.	.0	1288.0
1		0115	16	17.	.8	1291.0	*	1		0650	83	0.	.0	1288.0	*	1		1225	150	0.	.0	1288.0
1		0120	17	19.	1.4	1291.5	*	1		0655	84	0.	.0	1288.0	*	1		1230	151	0.	.0	1288.0
1		0125	18	20.	2.1	1292.1	*	1		0700	85	0.	.0	1288.0	*	1		1235	152	0.	.0	1288.0
1		0130	19	21.	2.9	1292.5	*	1		0705	86	0.	.0	1288.0	*	1		1240	153	0.	.0	1288.0
1		0135	20	22.	3.7	1292.9	*	1		0710	87	0.	.0	1288.0	*	1		1245	154	0.	.0	1288.0
1		0140	21	38.	4.4	1293.2	*	1		0715	88	0.	.0	1288.0	*	1		1250	155	0.	.0	1288.0
1		0145	22	64.	4.9	1293.5	*	1		0720	89	0.	.0	1288.0	*	1		1255	156	0.	.0	1288.0
1		0150	23	82.	5.2	1293.6	*	1		0725	90	0.	.0	1288.0	*	1		1300	157	0.	.0	1288.0
1		0155	24	93.	5.4	1293.7	*	1		0730	91	0.	.0	1288.0	*	1		1305	158	0.	.0	1288.0
1		0200	25	98.	5.5	1293.7	*	1		0735	92	0.	.0	1288.0	*	1		1310	159	0.	.0	1288.0
1		0205	26	98.	5.5	1293.7	*	1		0740	93	0.	.0	1288.0	*	1		1315	160	0.	.0	1288.0
1		0210	27	96.	5.5	1293.7	*	1		0745	94	0.	.0	1288.0	*	1		1320	161	0.	.0	1288.0
1		0215	28	92.	5.4	1293.6	*	1		0750	95	0.	.0	1288.0	*	1		1325	162	0.	.0	1288.0
1		0220	29	86.	5.3	1293.6	*	1		0755	96	0.	.0	1288.0	*	1		1330	163	0.	.0	1288.0
1		0225	30	80.	5.2	1293.6	*	1		0800	97	0.	.0	1288.0	*	1		1335	164	0.	.0	1288.0
1		0230	31	73.	5.1	1293.5	*	1		0805	98	0.	.0	1288.0	*	1		1340	165	0.	.0	1288.0
1		0235	32	66.	4.9	1293.5	*	1		0810	99	0.	.0	1288.0	*	1		1345	166	0.	.0	1288.0
1		0240	33	60.	4.8	1293.4	*	1		0815	100	0.	.0	1288.0	*	1		1350	167	0.	.0	1288.0
1		0245	34	54.	4.7	1293.4	*	1		0820	101	0.	.0	1288.0	*	1		1355	168	0.	.0	1288.0
1		0250	35	49.	4.6	1293.3	*	1		0825	102	0.	.0	1288.0	*	1		1400	169	0.	.0	1288.0
1		0255	36	43.	4.5	1293.3	*	1		0830	103	0.	.0	1288.0	*	1		1405	170	0.	.0	1288.0
1		0300	37	39.	4.4	1293.2	*	1		0835	104	0.	.0	1288.0	*	1		1410	171	0.	.0	1288.0
1		0305	38	34.	4.3	1293.2	*	1		0840	105	0.	.0	1288.0	*	1		1415	172	0.	.0	1288.0

1	0310	39	31.	4.2	1293.2 *	1	0845	106	0.	.0	1288.0 *	1	1420	173	0.	.0	1288.0
1	0315	40	28.	4.1	1293.1 *	1	0850	107	0.	.0	1288.0 *	1	1425	174	0.	.0	1288.0
1	0320	41	25.	4.0	1293.1 *	1	0855	108	0.	.0	1288.0 *	1	1430	175	0.	.0	1288.0
1	0325	42	23.	3.9	1293.0 *	1	0900	109	0.	.0	1288.0 *	1	1435	176	0.	.0	1288.0
1	0330	43	22.	3.9	1293.0 *	1	0905	110	0.	.0	1288.0 *	1	1440	177	0.	.0	1288.0
1	0335	44	22.	3.8	1293.0 *	1	0910	111	0.	.0	1288.0 *	1	1445	178	0.	.0	1288.0
1	0340	45	22.	3.7	1292.9 *	1	0915	112	0.	.0	1288.0 *	1	1450	179	0.	.0	1288.0
1	0345	46	22.	3.6	1292.9 *	1	0920	113	0.	.0	1288.0 *	1	1455	180	0.	.0	1288.0
1	0350	47	22.	3.5	1292.8 *	1	0925	114	0.	.0	1288.0 *	1	1500	181	0.	.0	1288.0
1	0355	48	22.	3.4	1292.7 *	1	0930	115	0.	.0	1288.0 *	1	1505	182	0.	.0	1288.0
1	0400	49	21.	3.3	1292.7 *	1	0935	116	0.	.0	1288.0 *	1	1510	183	0.	.0	1288.0
1	0405	50	21.	3.1	1292.6 *	1	0940	117	0.	.0	1288.0 *	1	1515	184	0.	.0	1288.0
1	0410	51	21.	3.0	1292.5 *	1	0945	118	0.	.0	1288.0 *	1	1520	185	0.	.0	1288.0
1	0415	52	21.	2.9	1292.5 *	1	0950	119	0.	.0	1288.0 *	1	1525	186	0.	.0	1288.0
1	0420	53	21.	2.8	1292.4 *	1	0955	120	0.	.0	1288.0 *	1	1530	187	0.	.0	1288.0
1	0425	54	21.	2.7	1292.3 *	1	1000	121	0.	.0	1288.0 *	1	1535	188	0.	.0	1288.0
1	0430	55	21.	2.5	1292.3 *	1	1005	122	0.	.0	1288.0 *	1	1540	189	0.	.0	1288.0
1	0435	56	20.	2.4	1292.2 *	1	1010	123	0.	.0	1288.0 *	1	1545	190	0.	.0	1288.0
1	0440	57	20.	2.3	1292.1 *	1	1015	124	0.	.0	1288.0 *	1	1550	191	0.	.0	1288.0
1	0445	58	20.	2.1	1292.1 *	1	1020	125	0.	.0	1288.0 *	1	1555	192	0.	.0	1288.0
1	0450	59	20.	2.0	1292.0 *	1	1025	126	0.	.0	1288.0 *	1	1600	193	0.	.0	1288.0
1	0455	60	20.	1.9	1291.9 *	1	1030	127	0.	.0	1288.0 *	1	1605	194	0.	.0	1288.0
1	0500	61	19.	1.8	1291.8 *	1	1035	128	0.	.0	1288.0 *	1	1610	195	0.	.0	1288.0
1	0505	62	19.	1.6	1291.7 *	1	1040	129	0.	.0	1288.0 *	1	1615	196	0.	.0	1288.0
1	0510	63	19.	1.5	1291.6 *	1	1045	130	0.	.0	1288.0 *	1	1620	197	0.	.0	1288.0
1	0515	64	19.	1.4	1291.5 *	1	1050	131	0.	.0	1288.0 *	1	1625	198	0.	.0	1288.0
1	0520	65	18.	1.3	1291.4 *	1	1055	132	0.	.0	1288.0 *	1	1630	199	0.	.0	1288.0
1	0525	66	18.	1.1	1291.3 *	1	1100	133	0.	.0	1288.0 *	1	1635	200	0.	.0	1288.0
1	0530	67	18.	1.0	1291.1 *	1	1105	134	0.	.0	1288.0 *						
					*						*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	16.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 98.	2.08		30.	11.	11.	11.
		(INCHES)	1.725	1.726	1.726	1.726
		(AC-FT)	15.	15.	15.	15.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (AC-FT)	(HR)				
5.	2.08	3.	1.	1.	1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (FEET)	(HR)				
1293.69	2.08	1291.78	1289.37	1289.37	1289.37

CUMULATIVE AREA = .16 SQ MI

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              *            *
471 KK        *   DET185   *          ROUTE HYDROGRAPH SUB185 THRU DET BASIN 185
              *            *
              **************

473 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

                HYDROGRAPH ROUTING DATA

474 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

475 SA              AREA          .0       .1       .3       .6       .8      1.1      1.8

476 SE          ELEVATION     1290.00  1291.00  1292.00  1293.00  1294.00  1295.00  1296.00
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477 SL          LOW-LEVEL OUTLET
                     ELEVL     1290.00  ELEVATION AT CENTER OF OUTLET
                     CAREA        3.10  CROSS-SECTIONAL AREA
                      COQL         .40  COEFFICIENT
                      EXPL         .50  EXPONENT OF HEAD

478 SS          SPILLWAY
                      CREL     1295.00  SPILLWAY CREST ELEVATION
                     SPWID       30.00  SPILLWAY WIDTH
                      COQW        2.60  WEIR COEFFICIENT
                      EXPW        1.50  EXPONENT OF HEAD
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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.05	.28	.73	1.38	2.32	3.76
ELEVATION	1290.00	1291.00	1292.00	1293.00	1294.00	1295.00	1296.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	9.75	10.49	11.35	12.35	13.56	15.03	16.85	19.17	22.24
ELEVATION	1290.00	1290.96	1291.11	1291.30	1291.54	1291.86	1292.28	1292.87	1293.72	1295.00
OUTFLOW	22.39	23.12	24.85	28.04	33.13	40.54	50.73	64.14	81.21	102.36
ELEVATION	1295.01	1295.05	1295.10	1295.17	1295.26	1295.37	1295.50	1295.65	1295.81	1296.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.04	.05	.06	.10	.15	.24	.28	.39	.66
OUTFLOW	.00	9.75	9.94	10.49	11.35	12.35	13.56	14.06	15.03	16.85
ELEVATION	1290.00	1290.96	1291.00	1291.11	1291.30	1291.54	1291.86	1292.00	1292.28	1292.87
STORAGE	.73	1.18	1.38	2.32	2.33	2.37	2.43	2.51	2.63	2.77
OUTFLOW	17.22	19.17	19.89	22.24	22.39	23.12	24.85	28.04	33.13	40.54
ELEVATION	1293.00	1293.72	1294.00	1295.00	1295.01	1295.05	1295.10	1295.17	1295.26	1295.37
STORAGE	2.95	3.17	3.44	3.76						
OUTFLOW	50.73	64.14	81.21	102.36						
ELEVATION	1295.50	1295.65	1295.81	1296.00						

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HYDROGRAPH AT STATION DET185

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1290.0	*	1		0535	68	0.	.0	1290.0	*	1		1110	135	0.	.0	1290.0
1		0005	2	0.	.0	1290.0	*	1		0540	69	0.	.0	1290.0	*	1		1115	136	0.	.0	1290.0
1		0010	3	0.	.0	1290.0	*	1		0545	70	0.	.0	1290.0	*	1		1120	137	0.	.0	1290.0
1		0015	4	0.	.0	1290.0	*	1		0550	71	0.	.0	1290.0	*	1		1125	138	0.	.0	1290.0
1		0020	5	0.	.0	1290.0	*	1		0555	72	0.	.0	1290.0	*	1		1130	139	0.	.0	1290.0
1		0025	6	1.	.0	1290.1	*	1		0600	73	0.	.0	1290.0	*	1		1135	140	0.	.0	1290.0
1		0030	7	1.	.0	1290.1	*	1		0605	74	0.	.0	1290.0	*	1		1140	141	0.	.0	1290.0
1		0035	8	1.	.0	1290.1	*	1		0610	75	0.	.0	1290.0	*	1		1145	142	0.	.0	1290.0
1		0040	9	1.	.0	1290.1	*	1		0615	76	0.	.0	1290.0	*	1		1150	143	0.	.0	1290.0
1		0045	10	2.	.0	1290.2	*	1		0620	77	0.	.0	1290.0	*	1		1155	144	0.	.0	1290.0
1		0050	11	2.	.0	1290.2	*	1		0625	78	0.	.0	1290.0	*	1		1200	145	0.	.0	1290.0
1		0055	12	3.	.0	1290.3	*	1		0630	79	0.	.0	1290.0	*	1		1205	146	0.	.0	1290.0
1		0100	13	5.	.0	1290.5	*	1		0635	80	0.	.0	1290.0	*	1		1210	147	0.	.0	1290.0
1		0105	14	10.	.1	1291.1	*	1		0640	81	0.	.0	1290.0	*	1		1215	148	0.	.0	1290.0
1		0110	15	13.	.2	1291.6	*	1		0645	82	0.	.0	1290.0	*	1		1220	149	0.	.0	1290.0
1		0115	16	15.	.4	1292.2	*	1		0650	83	0.	.0	1290.0	*	1		1225	150	0.	.0	1290.0
1		0120	17	16.	.6	1292.7	*	1		0655	84	0.	.0	1290.0	*	1		1230	151	0.	.0	1290.0
1		0125	18	18.	.8	1293.1	*	1		0700	85	0.	.0	1290.0	*	1		1235	152	0.	.0	1290.0
1		0130	19	18.	1.0	1293.4	*	1		0705	86	0.	.0	1290.0	*	1		1240	153	0.	.0	1290.0
1		0135	20	19.	1.1	1293.6	*	1		0710	87	0.	.0	1290.0	*	1		1245	154	0.	.0	1290.0
1		0140	21	19.	1.2	1293.7	*	1		0715	88	0.	.0	1290.0	*	1		1250	155	0.	.0	1290.0
1		0145	22	19.	1.2	1293.8	*	1		0720	89	0.	.0	1290.0	*	1		1255	156	0.	.0	1290.0
1		0150	23	19.	1.2	1293.8	*	1		0725	90	0.	.0	1290.0	*	1		1300	157	0.	.0	1290.0
1		0155	24	19.	1.2	1293.7	*	1		0730	91	0.	.0	1290.0	*	1		1305	158	0.	.0	1290.0
1		0200	25	19.	1.1	1293.6	*	1		0735	92	0.	.0	1290.0	*	1		1310	159	0.	.0	1290.0
1		0205	26	19.	1.1	1293.5	*	1		0740	93	0.	.0	1290.0	*	1		1315	160	0.	.0	1290.0
1		0210	27	18.	1.0	1293.4	*	1		0745	94	0.	.0	1290.0	*	1		1320	161	0.	.0	1290.0
1		0215	28	18.	.9	1293.3	*	1		0750	95	0.	.0	1290.0	*	1		1325	162	0.	.0	1290.0
1		0220	29	18.	.8	1293.1	*	1		0755	96	0.	.0	1290.0	*	1		1330	163	0.	.0	1290.0

1	0225	30	17.	.7	1293.0	*	1	0800	97	0.	.0	1290.0	*	1	1335	164	0.	.0	1290.0
1	0230	31	17.	.6	1292.8	*	1	0805	98	0.	.0	1290.0	*	1	1340	165	0.	.0	1290.0
1	0235	32	16.	.5	1292.6	*	1	0810	99	0.	.0	1290.0	*	1	1345	166	0.	.0	1290.0
1	0240	33	15.	.4	1292.4	*	1	0815	100	0.	.0	1290.0	*	1	1350	167	0.	.0	1290.0
1	0245	34	14.	.3	1292.1	*	1	0820	101	0.	.0	1290.0	*	1	1355	168	0.	.0	1290.0
1	0250	35	14.	.2	1291.9	*	1	0825	102	0.	.0	1290.0	*	1	1400	169	0.	.0	1290.0
1	0255	36	12.	.2	1291.6	*	1	0830	103	0.	.0	1290.0	*	1	1405	170	0.	.0	1290.0
1	0300	37	11.	.1	1291.2	*	1	0835	104	0.	.0	1290.0	*	1	1410	171	0.	.0	1290.0
1	0305	38	6.	.0	1290.6	*	1	0840	105	0.	.0	1290.0	*	1	1415	172	0.	.0	1290.0
1	0310	39	1.	.0	1290.1	*	1	0845	106	0.	.0	1290.0	*	1	1420	173	0.	.0	1290.0
1	0315	40	0.	.0	1290.0	*	1	0850	107	0.	.0	1290.0	*	1	1425	174	0.	.0	1290.0
1	0320	41	0.	.0	1290.0	*	1	0855	108	0.	.0	1290.0	*	1	1430	175	0.	.0	1290.0
1	0325	42	0.	.0	1290.0	*	1	0900	109	0.	.0	1290.0	*	1	1435	176	0.	.0	1290.0
1	0330	43	0.	.0	1290.0	*	1	0905	110	0.	.0	1290.0	*	1	1440	177	0.	.0	1290.0
1	0335	44	0.	.0	1290.0	*	1	0910	111	0.	.0	1290.0	*	1	1445	178	0.	.0	1290.0
1	0340	45	0.	.0	1290.0	*	1	0915	112	0.	.0	1290.0	*	1	1450	179	0.	.0	1290.0
1	0345	46	0.	.0	1290.0	*	1	0920	113	0.	.0	1290.0	*	1	1455	180	0.	.0	1290.0
1	0350	47	0.	.0	1290.0	*	1	0925	114	0.	.0	1290.0	*	1	1500	181	0.	.0	1290.0
1	0355	48	0.	.0	1290.0	*	1	0930	115	0.	.0	1290.0	*	1	1505	182	0.	.0	1290.0
1	0400	49	0.	.0	1290.0	*	1	0935	116	0.	.0	1290.0	*	1	1510	183	0.	.0	1290.0
1	0405	50	0.	.0	1290.0	*	1	0940	117	0.	.0	1290.0	*	1	1515	184	0.	.0	1290.0
1	0410	51	0.	.0	1290.0	*	1	0945	118	0.	.0	1290.0	*	1	1520	185	0.	.0	1290.0
1	0415	52	0.	.0	1290.0	*	1	0950	119	0.	.0	1290.0	*	1	1525	186	0.	.0	1290.0
1	0420	53	0.	.0	1290.0	*	1	0955	120	0.	.0	1290.0	*	1	1530	187	0.	.0	1290.0
1	0425	54	0.	.0	1290.0	*	1	1000	121	0.	.0	1290.0	*	1	1535	188	0.	.0	1290.0
1	0430	55	0.	.0	1290.0	*	1	1005	122	0.	.0	1290.0	*	1	1540	189	0.	.0	1290.0
1	0435	56	0.	.0	1290.0	*	1	1010	123	0.	.0	1290.0	*	1	1545	190	0.	.0	1290.0
1	0440	57	0.	.0	1290.0	*	1	1015	124	0.	.0	1290.0	*	1	1550	191	0.	.0	1290.0
1	0445	58	0.	.0	1290.0	*	1	1020	125	0.	.0	1290.0	*	1	1555	192	0.	.0	1290.0
1	0450	59	0.	.0	1290.0	*	1	1025	126	0.	.0	1290.0	*	1	1600	193	0.	.0	1290.0
1	0455	60	0.	.0	1290.0	*	1	1030	127	0.	.0	1290.0	*	1	1605	194	0.	.0	1290.0
1	0500	61	0.	.0	1290.0	*	1	1035	128	0.	.0	1290.0	*	1	1610	195	0.	.0	1290.0
1	0505	62	0.	.0	1290.0	*	1	1040	129	0.	.0	1290.0	*	1	1615	196	0.	.0	1290.0
1	0510	63	0.	.0	1290.0	*	1	1045	130	0.	.0	1290.0	*	1	1620	197	0.	.0	1290.0
1	0515	64	0.	.0	1290.0	*	1	1050	131	0.	.0	1290.0	*	1	1625	198	0.	.0	1290.0
1	0520	65	0.	.0	1290.0	*	1	1055	132	0.	.0	1290.0	*	1	1630	199	0.	.0	1290.0
1	0525	66	0.	.0	1290.0	*	1	1100	133	0.	.0	1290.0	*	1	1635	200	0.	.0	1290.0
1	0530	67	0.	.0	1290.0	*	1	1105	134	0.	.0	1290.0	*						
						*							*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	16.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 19.	1.75		6.	2.	2.	2.
		(INCHES)	1.857	1.857	1.857	1.857
		(AC-FT)	3.	3.	3.	3.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (AC-FT)	(HR)				
1.	1.75	0.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (FEET)	(HR)				
1293.76	1.75	1290.96	1290.35	1290.35	1290.35

CUMULATIVE AREA = .03 SQ MI

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          **************
          *            *
507 KK    *   DET190   *          ROUTE HYDROGRAPH SUM190 THRU DET BASIN 190;
          *            *
          **************

509 KO         OUTPUT CONTROL VARIABLES
                     IPRNT          1  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA
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510 RS          STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       STOR  TYPE OF INITIAL CONDITION
                    RSVRIC      -1.00  INITIAL CONDITION
                         X        .00 WORKING R AND D COEFFICIENT

511 SA               AREA         .0       1.4       2.3       3.6       5.0       6.6

512 SE          ELEVATION    1281.00   1282.00   1283.00   1284.00   1285.00   1286.00

513 SQ          DISCHARGE         0.       13.       38.       58.       72.       92.
                                                          ***
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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.46	2.30	5.26	9.57	15.35
ELEVATION	1281.00	1282.00	1283.00	1284.00	1285.00	1286.00

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HYDROGRAPH AT STATION DET190

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1281.0	*	1		0535	68	40.	2.6	1283.1	*	1		1110	135	0.	.0	1281.0
1		0005	2	0.	.0	1281.0	*	1		0540	69	39.	2.4	1283.0	*	1		1115	136	0.	.0	1281.0
1		0010	3	0.	.0	1281.0	*	1		0545	70	38.	2.3	1283.0	*	1		1120	137	0.	.0	1281.0
1		0015	4	0.	.0	1281.0	*	1		0550	71	36.	2.1	1282.9	*	1		1125	138	0.	.0	1281.0
1		0020	5	0.	.0	1281.0	*	1		0555	72	34.	2.0	1282.8	*	1		1130	139	0.	.0	1281.0
1		0025	6	0.	.0	1281.0	*	1		0600	73	32.	1.9	1282.8	*	1		1135	140	0.	.0	1281.0
1		0030	7	1.	.0	1281.0	*	1		0605	74	31.	1.8	1282.7	*	1		1140	141	0.	.0	1281.0
1		0035	8	1.	.0	1281.1	*	1		0610	75	30.	1.7	1282.7	*	1		1145	142	0.	.0	1281.0
1		0040	9	1.	.0	1281.1	*	1		0615	76	28.	1.6	1282.6	*	1		1150	143	0.	.0	1281.0
1		0045	10	2.	.1	1281.1	*	1		0620	77	27.	1.5	1282.6	*	1		1155	144	0.	.0	1281.0
1		0050	11	2.	.1	1281.2	*	1		0625	78	25.	1.4	1282.5	*	1		1200	145	0.	.0	1281.0
1		0055	12	3.	.1	1281.2	*	1		0630	79	24.	1.2	1282.4	*	1		1205	146	0.	.0	1281.0
1		0100	13	5.	.2	1281.4	*	1		0635	80	22.	1.1	1282.4	*	1		1210	147	0.	.0	1281.0
1		0105	14	10.	.4	1281.8	*	1		0640	81	20.	1.0	1282.3	*	1		1215	148	0.	.0	1281.0
1		0110	15	18.	.8	1282.2	*	1		0645	82	18.	.9	1282.2	*	1		1220	149	0.	.0	1281.0
1		0115	16	27.	1.5	1282.6	*	1		0650	83	17.	.7	1282.2	*	1		1225	150	0.	.0	1281.0
1		0120	17	37.	2.3	1283.0	*	1		0655	84	15.	.6	1282.1	*	1		1230	151	0.	.0	1281.0
1		0125	18	43.	3.0	1283.2	*	1		0700	85	14.	.5	1282.0	*	1		1235	152	0.	.0	1281.0
1		0130	19	47.	3.6	1283.4	*	1		0705	86	13.	.5	1282.0	*	1		1240	153	0.	.0	1281.0
1		0135	20	50.	4.1	1283.6	*	1		0710	87	11.	.4	1281.8	*	1		1245	154	0.	.0	1281.0
1		0140	21	53.	4.5	1283.7	*	1		0715	88	9.	.3	1281.7	*	1		1250	155	0.	.0	1281.0
1		0145	22	56.	4.9	1283.9	*	1		0720	89	7.	.3	1281.6	*	1		1255	156	0.	.0	1281.0
1		0150	23	58.	5.4	1284.0	*	1		0725	90	6.	.2	1281.5	*	1		1300	157	0.	.0	1281.0
1		0155	24	60.	5.9	1284.1	*	1		0730	91	5.	.2	1281.4	*	1		1305	158	0.	.0	1281.0
1		0200	25	62.	6.4	1284.3	*	1		0735	92	4.	.1	1281.3	*	1		1310	159	0.	.0	1281.0
1		0205	26	64.	7.0	1284.4	*	1		0740	93	3.	.1	1281.3	*	1		1315	160	0.	.0	1281.0
1		0210	27	65.	7.5	1284.5	*	1		0745	94	3.	.1	1281.2	*	1		1320	161	0.	.0	1281.0
1		0215	28	67.	8.0	1284.6	*	1		0750	95	2.	.1	1281.2	*	1		1325	162	0.	.0	1281.0
1		0220	29	68.	8.4	1284.7	*	1		0755	96	2.	.1	1281.1	*	1		1330	163	0.	.0	1281.0
1		0225	30	69.	8.8	1284.8	*	1		0800	97	2.	.1	1281.1	*	1		1335	164	0.	.0	1281.0
1		0230	31	70.	9.1	1284.9	*	1		0805	98	1.	.0	1281.1	*	1		1340	165	0.	.0	1281.0
1		0235	32	71.	9.3	1284.9	*	1		0810	99	1.	.0	1281.1	*	1		1345	166	0.	.0	1281.0
1		0240	33	72.	9.4	1285.0	*	1		0815	100	1.	.0	1281.1	*	1		1350	167	0.	.0	1281.0
1		0245	34	72.	9.5	1285.0	*	1		0820	101	1.	.0	1281.1	*	1		1355	168	0.	.0	1281.0
1		0250	35	72.	9.6	1285.0	*	1		0825	102	1.	.0	1281.0	*	1		1400	169	0.	.0	1281.0
1		0255	36	72.	9.6	1285.0	*	1		0830	103	0.	.0	1281.0	*	1		1405	170	0.	.0	1281.0
1		0300	37	72.	9.5	1285.0	*	1		0835	104	0.	.0	1281.0	*	1		1410	171	0.	.0	1281.0
1		0305	38	72.	9.5	1285.0	*	1		0840	105	0.	.0	1281.0	*	1		1415	172	0.	.0	1281.0
1		0310	39	71.	9.3	1284.9	*	1		0845	106	0.	.0	1281.0	*	1		1420	173	0.	.0	1281.0
1		0315	40	70.	9.1	1284.9	*	1		0850	107	0.	.0	1281.0	*	1		1425	174	0.	.0	1281.0
1		0320	41	70.	8.8	1284.8	*	1		0855	108	0.	.0	1281.0	*	1		1430	175	0.	.0	1281.0
1		0325	42	69.	8.6	1284.8	*	1		0900	109	0.	.0	1281.0	*	1		1435	176	0.	.0	1281.0
1		0330	43	68.	8.3	1284.7	*	1		0905	110	0.	.0	1281.0	*	1		1440	177	0.	.0	1281.0
1		0335	44	67.	8.0	1284.6	*	1		0910	111	0.	.0	1281.0	*	1		1445	178	0.	.0	1281.0
1		0340	45	66.	7.7	1284.6	*	1		0915	112	0.	.0	1281.0	*	1		1450	179	0.	.0	1281.0
1		0345	46	65.	7.4	1284.5	*	1		0920	113	0.	.0	1281.0	*	1		1455	180	0.	.0	1281.0
1		0350	47	64.	7.2	1284.4	*	1		0925	114	0.	.0	1281.0	*	1		1500	181	0.	.0	1281.0
1		0355	48	63.	6.9	1284.4	*	1		0930	115	0.	.0	1281.0	*	1		1505	182	0.	.0	1281.0
1		0400	49	62.	6.6	1284.3	*	1		0935	116	0.	.0	1281.0	*	1		1510	183	0.	.0	1281.0
1		0405	50	62.	6.3	1284.3	*	1		0940	117	0.	.0	1281.0	*	1		1515	184	0.	.0	1281.0
1		0410	51	61.	6.1	1284.2	*	1		0945	118	0.	.0	1281.0	*	1		1520	185	0.	.0	1281.0
1		0415	52	60.	5.8	1284.1	*	1		0950	119	0.	.0	1281.0	*	1		1525	186	0.	.0	1281.0
1		0420	53	59.	5.6	1284.1	*	1		0955	120	0.	.0	1281.0	*	1		1530	187	0.	.0	1281.0

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 1    0425  54    58.    5.3  1284.0 *  1    1000 121    0.     .0  1281.0 *  1    1535 188    0.     .0  1281.0
 1    0430  55    57.    5.1  1283.9 *  1    1005 122    0.     .0  1281.0 *  1    1540 189    0.     .0  1281.0
 1    0435  56    55.    4.8  1283.8 *  1    1010 123    0.     .0  1281.0 *  1    1545 190    0.     .0  1281.0
 1    0440  57    53.    4.6  1283.8 *  1    1015 124    0.     .0  1281.0 *  1    1550 191    0.     .0  1281.0
 1    0445  58    52.    4.4  1283.7 *  1    1020 125    0.     .0  1281.0 *  1    1555 192    0.     .0  1281.0
 1    0450  59    51.    4.2  1283.6 *  1    1025 126    0.     .0  1281.0 *  1    1600 193    0.     .0  1281.0
 1    0455  60    49.    3.9  1283.6 *  1    1030 127    0.     .0  1281.0 *  1    1605 194    0.     .0  1281.0
 1    0500  61    48.    3.7  1283.5 *  1    1035 128    0.     .0  1281.0 *  1    1610 195    0.     .0  1281.0
 1    0505  62    47.    3.6  1283.4 *  1    1040 129    0.     .0  1281.0 *  1    1615 196    0.     .0  1281.0
 1    0510  63    45.    3.4  1283.4 *  1    1045 130    0.     .0  1281.0 *  1    1620 197    0.     .0  1281.0
 1    0515  64    44.    3.2  1283.3 *  1    1050 131    0.     .0  1281.0 *  1    1625 198    0.     .0  1281.0
 1    0520  65    43.    3.0  1283.2 *  1    1055 132    0.     .0  1281.0 *  1    1630 199    0.     .0  1281.0
 1    0525  66    42.    2.9  1283.2 *  1    1100 133    0.     .0  1281.0 *  1    1635 200    0.     .0  1281.0
 1    0530  67    41.    2.7  1283.1 *  1    1105 134    0.     .0  1281.0 *
                                      *                                     *
*****************************************************************************************************************

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     16.58-HR
+   (CFS)      (HR)
                          (CFS)
+     72.      2.92                 50.         18.         18.         18.
                        (INCHES)   1.616       1.655       1.655       1.655
                         (AC-FT)    25.         25.         25.         25.

 PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+  (AC-FT)     (HR)
      10.      2.92                  5.          2.          2.          2.

 PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+   (FEET)     (HR)
  1285.00      2.92              1283.70     1282.01     1282.01     1282.01

                        CUMULATIVE AREA =     .29 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 525 KK     *   DET200   *          ROUTE HYDROGRAPH SUM200 THRU DET BASIN 200;
            *            *
            **************

 527 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

              HYDROGRAPH ROUTING DATA

 528 RS         STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

 529 SA               AREA         .0        .1        .8       2.2       3.1       4.0       4.6

 530 SE         ELEVATION     1273.00   1274.00   1275.00   1276.00   1277.00   1278.00   1279.00

 531 SL         LOW-LEVEL OUTLET
                      ELEVL     1273.00  ELEVATION AT CENTER OF OUTLET
                      CAREA        6.20  CROSS-SECTIONAL AREA
                       COQL         .40  COEFFICIENT
                       EXPL         .50  EXPONENT OF HEAD

 532 SS         SPILLWAY
                       CREL     1278.00  SPILLWAY CREST ELEVATION
                      SPWID       70.00  SPILLWAY WIDTH
                       COQW        2.60  WEIR COEFFICIENT
                       EXPW        1.50  EXPONENT OF HEAD

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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.02	.38	1.81	4.45	7.96	12.24
ELEVATION	1273.00	1274.00	1275.00	1276.00	1277.00	1278.00	1279.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	22.99	24.46	26.14	28.07	30.31	32.93	36.05	39.82	44.47
ELEVATION	1273.00	1274.34	1274.51	1274.73	1274.99	1275.32	1275.74	1276.29	1277.01	1278.00
OUTFLOW	44.81	46.44	50.40	57.74	69.48	86.70	110.37	141.59	181.37	230.72
ELEVATION	1278.01	1278.05	1278.10	1278.17	1278.26	1278.37	1278.50	1278.65	1278.81	1279.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.02	.07	.12	.21	.37	.69	1.30	1.81	2.47
OUTFLOW	.00	19.89	22.99	24.46	26.14	28.07	30.31	32.93	34.45	36.05
ELEVATION	1273.00	1274.00	1274.34	1274.51	1274.73	1274.99	1275.32	1275.74	1276.00	1276.29
STORAGE	4.45	7.96	8.01	8.14	8.35	8.64	9.01	9.46	10.01	10.65
OUTFLOW	39.78	44.47	44.81	46.44	50.40	57.74	69.48	86.70	110.37	141.59
ELEVATION	1277.00	1278.00	1278.01	1278.05	1278.10	1278.17	1278.26	1278.37	1278.50	1278.65
STORAGE	11.39	12.24								
OUTFLOW	181.37	230.72								
ELEVATION	1278.81	1279.00								

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 20.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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HYDROGRAPH AT STATION DET200

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1273.0	*	1		0535	68	47.	8.2	1278.1	*	1		1110	135	0.	.0	1273.0
1		0005	2	0.	.0	1273.0	*	1		0540	69	46.	8.1	1278.0	*	1		1115	136	0.	.0	1273.0
1		0010	3	0.	.0	1273.0	*	1		0545	70	46.	8.1	1278.0	*	1		1120	137	0.	.0	1273.0
1		0015	4	1.	.0	1273.0	*	1		0550	71	45.	8.0	1278.0	*	1		1125	138	0.	.0	1273.0
1		0020	5	1.	.0	1273.1	*	1		0555	72	44.	7.9	1278.0	*	1		1130	139	0.	.0	1273.0
1		0025	6	1.	.0	1273.1	*	1		0600	73	44.	7.9	1278.0	*	1		1135	140	0.	.0	1273.0
1		0030	7	2.	.0	1273.1	*	1		0605	74	44.	7.8	1277.9	*	1		1140	141	0.	.0	1273.0
1		0035	8	2.	.0	1273.1	*	1		0610	75	44.	7.7	1277.9	*	1		1145	142	0.	.0	1273.0
1		0040	9	3.	.0	1273.2	*	1		0615	76	44.	7.6	1277.9	*	1		1150	143	0.	.0	1273.0
1		0045	10	5.	.0	1273.2	*	1		0620	77	44.	7.5	1277.9	*	1		1155	144	0.	.0	1273.0
1		0050	11	7.	.0	1273.4	*	1		0625	78	44.	7.3	1277.8	*	1		1200	145	0.	.0	1273.0
1		0055	12	10.	.0	1273.5	*	1		0630	79	43.	7.2	1277.8	*	1		1205	146	0.	.0	1273.0
1		0100	13	16.	.0	1273.8	*	1		0635	80	43.	7.1	1277.7	*	1		1210	147	0.	.0	1273.0
1		0105	14	23.	.1	1274.4	*	1		0640	81	43.	6.9	1277.7	*	1		1215	148	0.	.0	1273.0
1		0110	15	28.	.4	1275.0	*	1		0645	82	43.	6.8	1277.7	*	1		1220	149	0.	.0	1273.0
1		0115	16	31.	1.0	1275.5	*	1		0650	83	43.	6.6	1277.6	*	1		1225	150	0.	.0	1273.0
1		0120	17	34.	1.7	1276.0	*	1		0655	84	42.	6.4	1277.6	*	1		1230	151	0.	.0	1273.0
1		0125	18	36.	2.6	1276.3	*	1		0700	85	42.	6.2	1277.5	*	1		1235	152	0.	.0	1273.0
1		0130	19	38.	3.3	1276.6	*	1		0705	86	42.	6.0	1277.4	*	1		1240	153	0.	.0	1273.0
1		0135	20	39.	3.9	1276.8	*	1		0710	87	42.	5.8	1277.4	*	1		1245	154	0.	.0	1273.0
1		0140	21	40.	4.4	1277.0	*	1		0715	88	41.	5.6	1277.3	*	1		1250	155	0.	.0	1273.0
1		0145	22	40.	4.8	1277.1	*	1		0720	89	41.	5.4	1277.3	*	1		1255	156	0.	.0	1273.0
1		0150	23	41.	5.1	1277.2	*	1		0725	90	41.	5.1	1277.2	*	1		1300	157	0.	.0	1273.0
1		0155	24	41.	5.4	1277.3	*	1		0730	91	40.	4.9	1277.1	*	1		1305	158	0.	.0	1273.0
1		0200	25	41.	5.7	1277.4	*	1		0735	92	40.	4.6	1277.1	*	1		1310	159	0.	.0	1273.0
1		0205	26	42.	5.9	1277.4	*	1		0740	93	40.	4.4	1277.0	*	1		1315	160	0.	.0	1273.0
1		0210	27	42.	6.2	1277.5	*	1		0745	94	39.	4.1	1276.9	*	1		1320	161	0.	.0	1273.0
1		0215	28	42.	6.4	1277.6	*	1		0750	95	39.	3.9	1276.8	*	1		1325	162	0.	.0	1273.0
1		0220	29	43.	6.6	1277.6	*	1		0755	96	38.	3.6	1276.7	*	1		1330	163	0.	.0	1273.0
1		0225	30	43.	6.9	1277.7	*	1		0800	97	38.	3.4	1276.6	*	1		1335	164	0.	.0	1273.0
1		0230	31	43.	7.1	1277.7	*	1		0805	98	37.	3.1	1276.5	*	1		1340	165	0.	.0	1273.0
1		0235	32	44.	7.3	1277.8	*	1		0810	99	37.	2.9	1276.4	*	1		1345	166	0.	.0	1273.0
1		0240	33	44.	7.5	1277.9	*	1		0815	100	36.	2.6	1276.3	*	1		1350	167	0.	.0	1273.0
1		0245	34	44.	7.7	1277.9	*	1		0820	101	36.	2.4	1276.3	*	1		1355	168	0.	.0	1273.0
1		0250	35	44.	7.9	1278.0	*	1		0825	102	35.	2.2	1276.2	*	1		1400	169	0.	.0	1273.0
1		0255	36	46.	8.1	1278.0	*	1		0830	103	35.	1.9	1276.0	*	1		1405	170	0.	.0	1273.0
1		0300	37	49.	8.3	1278.1	*	1		0835	104	34.	1.7	1275.9	*	1		1410	171	0.	.0	1273.0
1		0305	38	52.	8.4	1278.1	*	1		0840	105	33.	1.5	1275.8	*	1		1415	172	0.	.0	1273.0
1		0310	39	55.	8.5	1278.1	*	1		0845	106	33.	1.2	1275.7	*	1		1420	173	0.	.0	1273.0
1		0315	40	58.	8.6	1278.2	*	1		0850	107	32.	1.0	1275.5	*	1		1425	174	0.	.0	1273.0

1	0320	41	61.	8.7	1278.2	*	1	0855	108	31.	.8	1275.4	*	1	1430	175	0.	.0	1273.0
1	0325	42	62.	8.8	1278.2	*	1	0900	109	30.	.6	1275.2	*	1	1435	176	0.	.0	1273.0
1	0330	43	63.	8.8	1278.2	*	1	0905	110	28.	.4	1275.0	*	1	1440	177	0.	.0	1273.0
1	0335	44	64.	8.8	1278.2	*	1	0910	111	26.	.2	1274.7	*	1	1445	178	0.	.0	1273.0
1	0340	45	65.	8.9	1278.2	*	1	0915	112	21.	.0	1274.2	*	1	1450	179	0.	.0	1273.0
1	0345	46	65.	8.9	1278.2	*	1	0920	113	0.	.0	1273.0	*	1	1455	180	0.	.0	1273.0
1	0350	47	65.	8.9	1278.2	*	1	0925	114	0.	.0	1273.0	*	1	1500	181	0.	.0	1273.0
1	0355	48	65.	8.9	1278.2	*	1	0930	115	0.	.0	1273.0	*	1	1505	182	0.	.0	1273.0
1	0400	49	64.	8.8	1278.2	*	1	0935	116	0.	.0	1273.0	*	1	1510	183	0.	.0	1273.0
1	0405	50	64.	8.8	1278.2	*	1	0940	117	0.	.0	1273.0	*	1	1515	184	0.	.0	1273.0
1	0410	51	63.	8.8	1278.2	*	1	0945	118	0.	.0	1273.0	*	1	1520	185	0.	.0	1273.0
1	0415	52	63.	8.8	1278.2	*	1	0950	119	0.	.0	1273.0	*	1	1525	186	0.	.0	1273.0
1	0420	53	62.	8.8	1278.2	*	1	0955	120	0.	.0	1273.0	*	1	1530	187	0.	.0	1273.0
1	0425	54	61.	8.8	1278.2	*	1	1000	121	0.	.0	1273.0	*	1	1535	188	0.	.0	1273.0
1	0430	55	61.	8.7	1278.2	*	1	1005	122	0.	.0	1273.0	*	1	1540	189	0.	.0	1273.0
1	0435	56	60.	8.7	1278.2	*	1	1010	123	0.	.0	1273.0	*	1	1545	190	0.	.0	1273.0
1	0440	57	59.	8.7	1278.2	*	1	1015	124	0.	.0	1273.0	*	1	1550	191	0.	.0	1273.0
1	0445	58	57.	8.6	1278.2	*	1	1020	125	0.	.0	1273.0	*	1	1555	192	0.	.0	1273.0
1	0450	59	56.	8.6	1278.2	*	1	1025	126	0.	.0	1273.0	*	1	1600	193	0.	.0	1273.0
1	0455	60	55.	8.5	1278.1	*	1	1030	127	0.	.0	1273.0	*	1	1605	194	0.	.0	1273.0
1	0500	61	54.	8.5	1278.1	*	1	1035	128	0.	.0	1273.0	*	1	1610	195	0.	.0	1273.0
1	0505	62	53.	8.5	1278.1	*	1	1040	129	0.	.0	1273.0	*	1	1615	196	0.	.0	1273.0
1	0510	63	52.	8.4	1278.1	*	1	1045	130	0.	.0	1273.0	*	1	1620	197	0.	.0	1273.0
1	0515	64	51.	8.4	1278.1	*	1	1050	131	0.	.0	1273.0	*	1	1625	198	0.	.0	1273.0
1	0520	65	50.	8.3	1278.1	*	1	1055	132	0.	.0	1273.0	*	1	1630	199	0.	.0	1273.0
1	0525	66	49.	8.3	1278.1	*	1	1100	133	0.	.0	1273.0	*	1	1635	200	0.	.0	1273.0
1	0530	67	48.	8.2	1278.1	*	1	1105	134	0.	.0	1273.0	*						
						*							*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	16.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 65.	3.75		50.	23.	23.	23.
		(INCHES)	1.533	1.945	1.945	1.945
		(AC-FT)	25.	31.	31.	31.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (AC-FT)	(HR)				
9.	3.75	8.	3.	3.	3.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (FEET)	(HR)				
1278.22	3.75	1277.86	1275.17	1275.17	1275.17

CUMULATIVE AREA = .30 SQ MI

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          *            *
536 KK    *   DET125   *          ROUTE HYDROGRAPH SUM125 THRU DET BASIN 125;
          *            *
          **************

538 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          1  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

            HYDROGRAPH ROUTING DATA

539 RS        STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       STOR  TYPE OF INITIAL CONDITION
                   RSVRIC      -1.00  INITIAL CONDITION
                        X        .00 WORKING R AND D COEFFICIENT

540 SA              AREA         .0       .2       .5       .9      1.0      1.4      1.7      2.3

541 SE        ELEVATION     1269.00  1270.00  1271.00  1272.00  1273.00  1274.00  1275.00  1276.00

542 SL        LOW-LEVEL OUTLET
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ELEVL	1269.00	ELEVATION AT CENTER OF OUTLET
CAREA	6.20	CROSS-SECTIONAL AREA
COQL	.40	COEFFICIENT
EXPL	.50	EXPONENT OF HEAD

543 SS SPILLWAY

CREL	1273.50	SPILLWAY CREST ELEVATION
SPWID	60.00	SPILLWAY WIDTH
COQW	2.60	WEIR COEFFICIENT
EXPW	1.50	EXPONENT OF HEAD

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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.05	.37	1.05	2.00	3.22	4.75	6.75
ELEVATION	1269.00	1270.00	1271.00	1272.00	1273.00	1274.00	1275.00	1276.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	22.91	24.30	25.87	27.65	29.70	32.07	34.86	38.18	42.19
ELEVATION	1269.00	1270.33	1270.49	1270.69	1270.93	1271.23	1271.60	1272.07	1272.68	1273.50
OUTFLOW	43.19	48.43	61.47	85.86	125.15	182.89	262.60	367.88	502.28	669.27
ELEVATION	1273.53	1273.61	1273.74	1273.92	1274.14	1274.42	1274.74	1275.11	1275.53	1276.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.05	.12	.17	.23	.34	.37	.50	.74	1.05
OUTFLOW	.00	19.89	22.91	24.30	25.87	27.65	28.13	29.70	32.07	34.45
ELEVATION	1269.00	1270.00	1270.33	1270.49	1270.69	1270.93	1271.00	1271.23	1271.60	1272.00
STORAGE	1.11	1.68	2.00	2.57	2.61	2.70	2.87	3.10	3.22	3.42
OUTFLOW	34.86	38.18	39.78	42.19	43.19	48.43	61.47	85.86	99.63	125.15
ELEVATION	1272.07	1272.68	1273.00	1273.50	1273.53	1273.61	1273.74	1273.92	1274.00	1274.14
STORAGE	3.82	4.32	4.75	4.94	5.73	6.75				
OUTFLOW	182.89	262.60	335.31	367.88	502.28	669.27				
ELEVATION	1274.42	1274.74	1275.00	1275.11	1275.53	1276.00				

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 20.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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HYDROGRAPH AT STATION DET125

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1269.0	*	1		0535	68	49.	2.7	1273.6	*	1		1110	135	0.	.0	1269.0
1		0005	2	0.	.0	1269.0	*	1		0540	69	48.	2.7	1273.6	*	1		1115	136	0.	.0	1269.0
1		0010	3	1.	.0	1269.0	*	1		0545	70	47.	2.7	1273.6	*	1		1120	137	0.	.0	1269.0
1		0015	4	2.	.0	1269.1	*	1		0550	71	47.	2.7	1273.6	*	1		1125	138	0.	.0	1269.0
1		0020	5	2.	.0	1269.1	*	1		0555	72	46.	2.7	1273.6	*	1		1130	139	0.	.0	1269.0
1		0025	6	3.	.0	1269.2	*	1		0600	73	46.	2.6	1273.6	*	1		1135	140	0.	.0	1269.0
1		0030	7	4.	.0	1269.2	*	1		0605	74	45.	2.6	1273.6	*	1		1140	141	0.	.0	1269.0
1		0035	8	5.	.0	1269.3	*	1		0610	75	45.	2.6	1273.6	*	1		1145	142	0.	.0	1269.0
1		0040	9	7.	.0	1269.4	*	1		0615	76	45.	2.6	1273.6	*	1		1150	143	0.	.0	1269.0
1		0045	10	11.	.0	1269.6	*	1		0620	77	44.	2.6	1273.5	*	1		1155	144	0.	.0	1269.0
1		0050	11	16.	.0	1269.8	*	1		0625	78	44.	2.6	1273.5	*	1		1200	145	0.	.0	1269.0
1		0055	12	21.	.1	1270.1	*	1		0630	79	44.	2.6	1273.5	*	1		1205	146	0.	.0	1269.0
1		0100	13	24.	.2	1270.5	*	1		0635	80	44.	2.6	1273.5	*	1		1210	147	0.	.0	1269.0
1		0105	14	30.	.6	1271.3	*	1		0640	81	44.	2.6	1273.5	*	1		1215	148	0.	.0	1269.0
1		0110	15	37.	1.5	1272.5	*	1		0645	82	43.	2.6	1273.5	*	1		1220	149	0.	.0	1269.0
1		0115	16	64.	2.9	1273.8	*	1		0650	83	43.	2.6	1273.5	*	1		1225	150	0.	.0	1269.0
1		0120	17	205.	4.0	1274.5	*	1		0655	84	43.	2.6	1273.5	*	1		1230	151	0.	.0	1269.0
1		0125	18	258.	4.3	1274.7	*	1		0700	85	43.	2.6	1273.5	*	1		1235	152	0.	.0	1269.0
1		0130	19	246.	4.2	1274.7	*	1		0705	86	43.	2.6	1273.5	*	1		1240	153	0.	.0	1269.0
1		0135	20	211.	4.0	1274.5	*	1		0710	87	43.	2.6	1273.5	*	1		1245	154	0.	.0	1269.0
1		0140	21	175.	3.8	1274.4	*	1		0715	88	42.	2.6	1273.5	*	1		1250	155	0.	.0	1269.0
1		0145	22	145.	3.6	1274.2	*	1		0720	89	42.	2.6	1273.5	*	1		1255	156	0.	.0	1269.0
1		0150	23	121.	3.4	1274.1	*	1		0725	90	42.	2.6	1273.5	*	1		1300	157	0.	.0	1269.0
1		0155	24	104.	3.3	1274.0	*	1		0730	91	42.	2.5	1273.5	*	1		1305	158	0.	.0	1269.0
1		0200	25	91.	3.1	1273.9	*	1		0735	92	42.	2.5	1273.5	*	1		1310	159	0.	.0	1269.0
1		0205	26	81.	3.1	1273.9	*	1		0740	93	42.	2.5	1273.5	*	1		1315	160	0.	.0	1269.0
1		0210	27	74.	3.0	1273.8	*	1		0745	94	42.	2.5	1273.4	*	1		1320	161	0.	.0	1269.0

1	0215	28	68.	2.9	1273.8	*	1	0750	95	42.	2.5	1273.4	*	1	1325	162	0.	.0	1269.0
1	0220	29	63.	2.9	1273.7	*	1	0755	96	42.	2.5	1273.4	*	1	1330	163	0.	.0	1269.0
1	0225	30	59.	2.8	1273.7	*	1	0800	97	42.	2.4	1273.4	*	1	1335	164	0.	.0	1269.0
1	0230	31	57.	2.8	1273.7	*	1	0805	98	42.	2.4	1273.4	*	1	1340	165	0.	.0	1269.0
1	0235	32	55.	2.8	1273.7	*	1	0810	99	41.	2.4	1273.3	*	1	1345	166	0.	.0	1269.0
1	0240	33	53.	2.8	1273.7	*	1	0815	100	41.	2.3	1273.3	*	1	1350	167	0.	.0	1269.0
1	0245	34	52.	2.7	1273.6	*	1	0820	101	41.	2.3	1273.3	*	1	1355	168	0.	.0	1269.0
1	0250	35	51.	2.7	1273.6	*	1	0825	102	41.	2.3	1273.2	*	1	1400	169	0.	.0	1269.0
1	0255	36	50.	2.7	1273.6	*	1	0830	103	41.	2.2	1273.2	*	1	1405	170	0.	.0	1269.0
1	0300	37	50.	2.7	1273.6	*	1	0835	104	41.	2.2	1273.2	*	1	1410	171	0.	.0	1269.0
1	0305	38	52.	2.7	1273.6	*	1	0840	105	40.	2.1	1273.1	*	1	1415	172	0.	.0	1269.0
1	0310	39	54.	2.8	1273.7	*	1	0845	106	40.	2.1	1273.1	*	1	1420	173	0.	.0	1269.0
1	0315	40	56.	2.8	1273.7	*	1	0850	107	40.	2.0	1273.0	*	1	1425	174	0.	.0	1269.0
1	0320	41	58.	2.8	1273.7	*	1	0855	108	40.	2.0	1273.0	*	1	1430	175	0.	.0	1269.0
1	0325	42	60.	2.8	1273.7	*	1	0900	109	39.	1.9	1272.9	*	1	1435	176	0.	.0	1269.0
1	0330	43	62.	2.9	1273.7	*	1	0905	110	39.	1.8	1272.8	*	1	1440	177	0.	.0	1269.0
1	0335	44	63.	2.9	1273.8	*	1	0910	111	39.	1.8	1272.8	*	1	1445	178	0.	.0	1269.0
1	0340	45	64.	2.9	1273.8	*	1	0915	112	38.	1.7	1272.7	*	1	1450	179	0.	.0	1269.0
1	0345	46	65.	2.9	1273.8	*	1	0920	113	37.	1.5	1272.5	*	1	1455	180	0.	.0	1269.0
1	0350	47	65.	2.9	1273.8	*	1	0925	114	36.	1.2	1272.2	*	1	1500	181	0.	.0	1269.0
1	0355	48	65.	2.9	1273.8	*	1	0930	115	34.	1.0	1271.9	*	1	1505	182	0.	.0	1269.0
1	0400	49	65.	2.9	1273.8	*	1	0935	116	32.	.8	1271.6	*	1	1510	183	0.	.0	1269.0
1	0405	50	65.	2.9	1273.8	*	1	0940	117	30.	.5	1271.3	*	1	1515	184	0.	.0	1269.0
1	0410	51	64.	2.9	1273.8	*	1	0945	118	28.	.3	1271.0	*	1	1520	185	0.	.0	1269.0
1	0415	52	64.	2.9	1273.8	*	1	0950	119	24.	.2	1270.5	*	1	1525	186	0.	.0	1269.0
1	0420	53	63.	2.9	1273.7	*	1	0955	120	14.	.0	1269.7	*	1	1530	187	0.	.0	1269.0
1	0425	54	62.	2.9	1273.7	*	1	1000	121	0.	.0	1269.0	*	1	1535	188	0.	.0	1269.0
1	0430	55	62.	2.9	1273.7	*	1	1005	122	0.	.0	1269.0	*	1	1540	189	0.	.0	1269.0
1	0435	56	61.	2.9	1273.7	*	1	1010	123	0.	.0	1269.0	*	1	1545	190	0.	.0	1269.0
1	0440	57	60.	2.9	1273.7	*	1	1015	124	0.	.0	1269.0	*	1	1550	191	0.	.0	1269.0
1	0445	58	59.	2.8	1273.7	*	1	1020	125	0.	.0	1269.0	*	1	1555	192	0.	.0	1269.0
1	0450	59	58.	2.8	1273.7	*	1	1025	126	0.	.0	1269.0	*	1	1600	193	0.	.0	1269.0
1	0455	60	57.	2.8	1273.7	*	1	1030	127	0.	.0	1269.0	*	1	1605	194	0.	.0	1269.0
1	0500	61	56.	2.8	1273.7	*	1	1035	128	0.	.0	1269.0	*	1	1610	195	0.	.0	1269.0
1	0505	62	55.	2.8	1273.7	*	1	1040	129	0.	.0	1269.0	*	1	1615	196	0.	.0	1269.0
1	0510	63	54.	2.8	1273.7	*	1	1045	130	0.	.0	1269.0	*	1	1620	197	0.	.0	1269.0
1	0515	64	53.	2.8	1273.7	*	1	1050	131	0.	.0	1269.0	*	1	1625	198	0.	.0	1269.0
1	0520	65	52.	2.7	1273.6	*	1	1055	132	0.	.0	1269.0	*	1	1630	199	0.	.0	1269.0
1	0525	66	51.	2.7	1273.6	*	1	1100	133	0.	.0	1269.0	*	1	1635	200	0.	.0	1269.0
1	0530	67	50.	2.7	1273.6	*	1	1105	134	0.	.0	1269.0	*						
						*							*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	16.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 258.	1.42		69.	32.	32.	32.
		(INCHES)	1.351	1.735	1.735	1.735
		(AC-FT)	34.	44.	44.	44.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (AC-FT)	(HR)				
4.	1.42	3.	1.	1.	1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (FEET)	(HR)				
1274.72	1.42	1273.75	1271.40	1271.40	1271.40

CUMULATIVE AREA = .48 SQ MI

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          **************
          *            *
553 KK    *   DET100   *          ROUTE HYDROGRAPH SUM100 THRU DET BASIN 100;
          *            *
          **************

555 KO         OUTPUT CONTROL VARIABLES
                    IPRNT          1  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE
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HYDROGRAPH ROUTING DATA

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556 RS        STORAGE ROUTING
                   NSTPS          1  NUMBER OF SUBREACHES
                    ITYP       STOR  TYPE OF INITIAL CONDITION
                  RSVRIC      -1.00  INITIAL CONDITION
                       X        .00 WORKING R AND D COEFFICIENT

557 SA            AREA          .0       .2       1.1       2.0       2.8       3.5       4.1

558 SE       ELEVATION     1268.00  1269.00  1270.00  1271.00  1272.00  1273.00  1274.00

559 SQ       DISCHARGE          0.      130.      330.      620.      970.     1360.     1650.
                                                          ***
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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.08	.72	2.29	4.69	7.82	11.58
ELEVATION	1268.00	1269.00	1270.00	1271.00	1272.00	1273.00	1274.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 330.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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HYDROGRAPH AT STATION DET100

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1268.0	1		0535	68	56.	.0	1268.4	1		1110	135	0.	.0	1268.0
1		0005	2	0.	.0	1268.0	1		0540	69	54.	.0	1268.4	1		1115	136	0.	.0	1268.0
1		0010	3	2.	.0	1268.0	1		0545	70	53.	.0	1268.4	1		1120	137	0.	.0	1268.0
1		0015	4	3.	.0	1268.0	1		0550	71	51.	.0	1268.4	1		1125	138	0.	.0	1268.0
1		0020	5	4.	.0	1268.0	1		0555	72	50.	.0	1268.4	1		1130	139	0.	.0	1268.0
1		0025	6	5.	.0	1268.0	1		0600	73	49.	.0	1268.4	1		1135	140	0.	.0	1268.0
1		0030	7	6.	.0	1268.0	1		0605	74	48.	.0	1268.4	1		1140	141	0.	.0	1268.0
1		0035	8	8.	.0	1268.1	1		0610	75	47.	.0	1268.4	1		1145	142	0.	.0	1268.0
1		0040	9	12.	.0	1268.1	1		0615	76	46.	.0	1268.4	1		1150	143	0.	.0	1268.0
1		0045	10	18.	.0	1268.1	1		0620	77	46.	.0	1268.4	1		1155	144	0.	.0	1268.0
1		0050	11	26.	.0	1268.2	1		0625	78	45.	.0	1268.3	1		1200	145	0.	.0	1268.0
1		0055	12	35.	.0	1268.3	1		0630	79	45.	.0	1268.3	1		1205	146	0.	.0	1268.0
1		0100	13	50.	.0	1268.4	1		0635	80	45.	.0	1268.3	1		1210	147	0.	.0	1268.0
1		0105	14	97.	.1	1268.7	1		0640	81	44.	.0	1268.3	1		1215	148	0.	.0	1268.0
1		0110	15	164.	.2	1269.2	1		0645	82	44.	.0	1268.3	1		1220	149	0.	.0	1268.0
1		0115	16	259.	.5	1269.6	1		0650	83	44.	.0	1268.3	1		1225	150	0.	.0	1268.0
1		0120	17	413.	1.2	1270.3	1		0655	84	43.	.0	1268.3	1		1230	151	0.	.0	1268.0
1		0125	18	578.	2.1	1270.9	1		0700	85	43.	.0	1268.3	1		1235	152	0.	.0	1268.0
1		0130	19	694.	2.8	1271.2	1		0705	86	43.	.0	1268.3	1		1240	153	0.	.0	1268.0
1		0135	20	787.	3.4	1271.5	1		0710	87	43.	.0	1268.3	1		1245	154	0.	.0	1268.0
1		0140	21	886.	4.1	1271.8	1		0715	88	43.	.0	1268.3	1		1250	155	0.	.0	1268.0
1		0145	22	998.	4.9	1272.1	1		0720	89	42.	.0	1268.3	1		1255	156	0.	.0	1268.0
1		0150	23	1114.	5.8	1272.4	1		0725	90	42.	.0	1268.3	1		1300	157	0.	.0	1268.0
1		0155	24	1224.	6.7	1272.7	1		0730	91	42.	.0	1268.3	1		1305	158	0.	.0	1268.0
1		0200	25	1293.	7.3	1272.8	1		0735	92	42.	.0	1268.3	1		1310	159	0.	.0	1268.0
1		0205	26	1297.	7.3	1272.8	1		0740	93	42.	.0	1268.3	1		1315	160	0.	.0	1268.0
1		0210	27	1241.	6.9	1272.7	1		0745	94	42.	.0	1268.3	1		1320	161	0.	.0	1268.0
1		0215	28	1144.	6.1	1272.4	1		0750	95	42.	.0	1268.3	1		1325	162	0.	.0	1268.0
1		0220	29	1028.	5.2	1272.1	1		0755	96	42.	.0	1268.3	1		1330	163	0.	.0	1268.0
1		0225	30	903.	4.2	1271.8	1		0800	97	42.	.0	1268.3	1		1335	164	0.	.0	1268.0
1		0230	31	784.	3.4	1271.5	1		0805	98	42.	.0	1268.3	1		1340	165	0.	.0	1268.0
1		0235	32	683.	2.7	1271.2	1		0810	99	41.	.0	1268.3	1		1345	166	0.	.0	1268.0
1		0240	33	593.	2.1	1270.9	1		0815	100	41.	.0	1268.3	1		1350	167	0.	.0	1268.0
1		0245	34	511.	1.7	1270.6	1		0820	101	41.	.0	1268.3	1		1355	168	0.	.0	1268.0
1		0250	35	448.	1.4	1270.4	1		0825	102	41.	.0	1268.3	1		1400	169	0.	.0	1268.0
1		0255	36	398.	1.1	1270.2	1		0830	103	41.	.0	1268.3	1		1405	170	0.	.0	1268.0
1		0300	37	356.	.9	1270.1	1		0835	104	41.	.0	1268.3	1		1410	171	0.	.0	1268.0
1		0305	38	316.	.7	1269.9	1		0840	105	40.	.0	1268.3	1		1415	172	0.	.0	1268.0
1		0310	39	280.	.6	1269.8	1		0845	106	40.	.0	1268.3	1		1420	173	0.	.0	1268.0
1		0315	40	260.	.5	1269.6	1		0850	107	40.	.0	1268.3	1		1425	174	0.	.0	1268.0
1		0320	41	241.	.4	1269.6	1		0855	108	40.	.0	1268.3	1		1430	175	0.	.0	1268.0
1		0325	42	222.	.4	1269.5	1		0900	109	39.	.0	1268.3	1		1435	176	0.	.0	1268.0
1		0330	43	206.	.3	1269.4	1		0905	110	39.	.0	1268.3	1		1440	177	0.	.0	1268.0
1		0335	44	193.	.3	1269.3	1		0910	111	39.	.0	1268.3	1		1445	178	0.	.0	1268.0
1		0340	45	182.	.2	1269.3	1		0915	112	38.	.0	1268.3	1		1450	179	0.	.0	1268.0
1		0345	46	171.	.2	1269.2	1		0920	113	37.	.0	1268.3	1		1455	180	0.	.0	1268.0
1		0350	47	161.	.2	1269.2	1		0925	114	36.	.0	1268.3	1		1500	181	0.	.0	1268.0

1	0355	48	151.	.1	1269.1	*	1	0930	115	34.	.0	1268.3	*	1	1505	182	0.	.0	1268.0
1	0400	49	142.	.1	1269.1	*	1	0935	116	32.	.0	1268.2	*	1	1510	183	0.	.0	1268.0
1	0405	50	134.	.1	1269.0	*	1	0940	117	30.	.0	1268.2	*	1	1515	184	0.	.0	1268.0
1	0410	51	126.	.1	1269.0	*	1	0945	118	28.	.0	1268.2	*	1	1520	185	0.	.0	1268.0
1	0415	52	119.	.1	1268.9	*	1	0950	119	25.	.0	1268.2	*	1	1525	186	0.	.0	1268.0
1	0420	53	114.	.1	1268.9	*	1	0955	120	15.	.0	1268.1	*	1	1530	187	0.	.0	1268.0
1	0425	54	106.	.1	1268.8	*	1	1000	121	1.	.0	1268.0	*	1	1535	188	0.	.0	1268.0
1	0430	55	100.	.1	1268.8	*	1	1005	122	0.	.0	1268.0	*	1	1540	189	0.	.0	1268.0
1	0435	56	93.	.1	1268.7	*	1	1010	123	0.	.0	1268.0	*	1	1545	190	0.	.0	1268.0
1	0440	57	88.	.1	1268.7	*	1	1015	124	0.	.0	1268.0	*	1	1550	191	0.	.0	1268.0
1	0445	58	83.	.1	1268.6	*	1	1020	125	0.	.0	1268.0	*	1	1555	192	0.	.0	1268.0
1	0450	59	79.	.0	1268.6	*	1	1025	126	0.	.0	1268.0	*	1	1600	193	0.	.0	1268.0
1	0455	60	76.	.0	1268.6	*	1	1030	127	0.	.0	1268.0	*	1	1605	194	0.	.0	1268.0
1	0500	61	74.	.0	1268.6	*	1	1035	128	0.	.0	1268.0	*	1	1610	195	0.	.0	1268.0
1	0505	62	71.	.0	1268.5	*	1	1040	129	0.	.0	1268.0	*	1	1615	196	0.	.0	1268.0
1	0510	63	68.	.0	1268.5	*	1	1045	130	0.	.0	1268.0	*	1	1620	197	0.	.0	1268.0
1	0515	64	66.	.0	1268.5	*	1	1050	131	0.	.0	1268.0	*	1	1625	198	0.	.0	1268.0
1	0520	65	63.	.0	1268.5	*	1	1055	132	0.	.0	1268.0	*	1	1630	199	0.	.0	1268.0
1	0525	66	60.	.0	1268.5	*	1	1100	133	0.	.0	1268.0	*	1	1635	200	0.	.0	1268.0
1	0530	67	58.	.0	1268.4	*	1	1105	134	0.	.0	1268.0	*						
						*							*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	16.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1297.	2.08		317.	122.	122.	122.
		(INCHES)	1.447	1.543	1.543	1.543
		(AC-FT)	157.	168.	168.	168.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (AC-FT)	(HR)				
7.	2.08	1.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (FEET)	(HR)				
1272.84	2.08	1269.58	1268.63	1268.63	1268.63

CUMULATIVE AREA = 2.04 SQ MI

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              **************
              *            *
594 KK        *   DET220   *          ROUTE HYDROGRAPH SUM220 THRU DET BASIN 220;
              *            *
              **************

596 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

                HYDROGRAPH ROUTING DATA

597 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

598 SA               AREA         .0      3.7      4.8      5.9      6.7      7.4      8.3

599 SE          ELEVATION     1265.00  1266.00  1267.00  1268.00  1269.00  1270.00  1271.00

600 SQ          DISCHARGE         0.      130.     330.     620.     970.    1360.    1650.
                                                                  ***

                                                COMPUTED STORAGE-ELEVATION DATA

            STORAGE        .00     1.24     5.46    10.78    17.08    24.10    31.94
          ELEVATION    1265.00  1266.00  1267.00  1268.00  1269.00  1270.00  1271.00
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HYDROGRAPH AT STATION DET220

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1265.0	1		0535	68	61.	.6	1265.5	1		1110	135	0.	.0	1265.0
1		0005	2	0.	.0	1265.0	1		0540	69	59.	.6	1265.5	1		1115	136	0.	.0	1265.0
1		0010	3	1.	.0	1265.0	1		0545	70	57.	.5	1265.4	1		1120	137	0.	.0	1265.0
1		0015	4	2.	.0	1265.0	1		0550	71	56.	.5	1265.4	1		1125	138	0.	.0	1265.0
1		0020	5	2.	.0	1265.0	1		0555	72	54.	.5	1265.4	1		1130	139	0.	.0	1265.0
1		0025	6	3.	.0	1265.0	1		0600	73	53.	.5	1265.4	1		1135	140	0.	.0	1265.0
1		0030	7	5.	.0	1265.0	1		0605	74	51.	.5	1265.4	1		1140	141	0.	.0	1265.0
1		0035	8	6.	.1	1265.0	1		0610	75	50.	.5	1265.4	1		1145	142	0.	.0	1265.0
1		0040	9	9.	.1	1265.1	1		0615	76	49.	.5	1265.4	1		1150	143	0.	.0	1265.0
1		0045	10	13.	.1	1265.1	1		0620	77	48.	.5	1265.4	1		1155	144	0.	.0	1265.0
1		0050	11	18.	.2	1265.1	1		0625	78	47.	.4	1265.4	1		1200	145	0.	.0	1265.0
1		0055	12	25.	.2	1265.2	1		0630	79	46.	.4	1265.4	1		1205	146	0.	.0	1265.0
1		0100	13	39.	.4	1265.3	1		0635	80	46.	.4	1265.4	1		1210	147	0.	.0	1265.0
1		0105	14	80.	.8	1265.6	1		0640	81	45.	.4	1265.3	1		1215	148	0.	.0	1265.0
1		0110	15	144.	1.5	1266.1	1		0645	82	45.	.4	1265.3	1		1220	149	0.	.0	1265.0
1		0115	16	191.	2.5	1266.3	1		0650	83	45.	.4	1265.3	1		1225	150	0.	.0	1265.0
1		0120	17	251.	3.8	1266.6	1		0655	84	44.	.4	1265.3	1		1230	151	0.	.0	1265.0
1		0125	18	326.	5.4	1267.0	1		0700	85	44.	.4	1265.3	1		1235	152	0.	.0	1265.0
1		0130	19	426.	7.2	1267.3	1		0705	86	44.	.4	1265.3	1		1240	153	0.	.0	1265.0
1		0135	20	528.	9.1	1267.7	1		0710	87	43.	.4	1265.3	1		1245	154	0.	.0	1265.0
1		0140	21	625.	10.9	1268.0	1		0715	88	43.	.4	1265.3	1		1250	155	0.	.0	1265.0
1		0145	22	722.	12.6	1268.3	1		0720	89	43.	.4	1265.3	1		1255	156	0.	.0	1265.0
1		0150	23	821.	14.4	1268.6	1		0725	90	43.	.4	1265.3	1		1300	157	0.	.0	1265.0
1		0155	24	925.	16.3	1268.9	1		0730	91	43.	.4	1265.3	1		1305	158	0.	.0	1265.0
1		0200	25	1026.	18.1	1269.1	1		0735	92	42.	.4	1265.3	1		1310	159	0.	.0	1265.0
1		0205	26	1111.	19.6	1269.4	1		0740	93	42.	.4	1265.3	1		1315	160	0.	.0	1265.0
1		0210	27	1168.	20.6	1269.5	1		0745	94	42.	.4	1265.3	1		1320	161	0.	.0	1265.0
1		0215	28	1186.	21.0	1269.6	1		0750	95	42.	.4	1265.3	1		1325	162	0.	.0	1265.0
1		0220	29	1167.	20.6	1269.5	1		0755	96	42.	.4	1265.3	1		1330	163	0.	.0	1265.0
1		0225	30	1117.	19.7	1269.4	1		0800	97	42.	.4	1265.3	1		1335	164	0.	.0	1265.0
1		0230	31	1045.	18.4	1269.2	1		0805	98	42.	.4	1265.3	1		1340	165	0.	.0	1265.0
1		0235	32	959.	16.9	1269.0	1		0810	99	42.	.4	1265.3	1		1345	166	0.	.0	1265.0
1		0240	33	868.	15.2	1268.7	1		0815	100	42.	.4	1265.3	1		1350	167	0.	.0	1265.0
1		0245	34	778.	13.6	1268.5	1		0820	101	41.	.4	1265.3	1		1355	168	0.	.0	1265.0
1		0250	35	692.	12.1	1268.2	1		0825	102	41.	.4	1265.3	1		1400	169	0.	.0	1265.0
1		0255	36	614.	10.7	1268.0	1		0830	103	41.	.4	1265.3	1		1405	170	0.	.0	1265.0
1		0300	37	546.	9.4	1267.7	1		0835	104	41.	.4	1265.3	1		1410	171	0.	.0	1265.0
1		0305	38	486.	8.3	1267.5	1		0840	105	41.	.4	1265.3	1		1415	172	0.	.0	1265.0
1		0310	39	433.	7.3	1267.4	1		0845	106	41.	.4	1265.3	1		1420	173	0.	.0	1265.0
1		0315	40	386.	6.5	1267.2	1		0850	107	41.	.4	1265.3	1		1425	174	0.	.0	1265.0
1		0320	41	346.	5.8	1267.1	1		0855	108	40.	.4	1265.3	1		1430	175	0.	.0	1265.0
1		0325	42	315.	5.1	1266.9	1		0900	109	40.	.4	1265.3	1		1435	176	0.	.0	1265.0
1		0330	43	289.	4.6	1266.8	1		0905	110	40.	.4	1265.3	1		1440	177	0.	.0	1265.0
1		0335	44	266.	4.1	1266.7	1		0910	111	40.	.4	1265.3	1		1445	178	0.	.0	1265.0
1		0340	45	246.	3.7	1266.6	1		0915	112	39.	.4	1265.3	1		1450	179	0.	.0	1265.0
1		0345	46	229.	3.3	1266.5	1		0920	113	39.	.4	1265.3	1		1455	180	0.	.0	1265.0
1		0350	47	213.	3.0	1266.4	1		0925	114	38.	.4	1265.3	1		1500	181	0.	.0	1265.0
1		0355	48	199.	2.7	1266.3	1		0930	115	37.	.4	1265.3	1		1505	182	0.	.0	1265.0
1		0400	49	186.	2.4	1266.3	1		0935	116	36.	.3	1265.3	1		1510	183	0.	.0	1265.0
1		0405	50	174.	2.2	1266.2	1		0940	117	35.	.3	1265.3	1		1515	184	0.	.0	1265.0
1		0410	51	163.	1.9	1266.2	1		0945	118	33.	.3	1265.3	1		1520	185	0.	.0	1265.0
1		0415	52	154.	1.7	1266.1	1		0950	119	32.	.3	1265.2	1		1525	186	0.	.0	1265.0
1		0420	53	144.	1.5	1266.1	1		0955	120	29.	.3	1265.2	1		1530	187	0.	.0	1265.0
1		0425	54	136.	1.4	1266.0	1		1000	121	24.	.2	1265.2	1		1535	188	0.	.0	1265.0
1		0430	55	126.	1.2	1266.0	1		1005	122	18.	.2	1265.1	1		1540	189	0.	.0	1265.0
1		0435	56	113.	1.1	1265.9	1		1010	123	12.	.1	1265.1	1		1545	190	0.	.0	1265.0
1		0440	57	103.	1.0	1265.8	1		1015	124	7.	.1	1265.1	1		1550	191	0.	.0	1265.0
1		0445	58	96.	.9	1265.7	1		1020	125	4.	.0	1265.0	1		1555	192	0.	.0	1265.0
1		0450	59	89.	.9	1265.7	1		1025	126	2.	.0	1265.0	1		1600	193	0.	.0	1265.0
1		0455	60	84.	.8	1265.6	1		1030	127	1.	.0	1265.0	1		1605	194	0.	.0	1265.0
1		0500	61	80.	.8	1265.6	1		1035	128	1.	.0	1265.0	1		1610	195	0.	.0	1265.0
1		0505	62	77.	.7	1265.6	1		1040	129	0.	.0	1265.0	1		1615	196	0.	.0	1265.0
1		0510	63	74.	.7	1265.6	1		1045	130	0.	.0	1265.0	1		1620	197	0.	.0	1265.0
1		0515	64	71.	.7	1265.5	1		1050	131	0.	.0	1265.0	1		1625	198	0.	.0	1265.0
1		0520	65	69.	.7	1265.5	1		1055	132	0.	.0	1265.0	1		1630	199	0.	.0	1265.0
1		0525	66	66.	.6	1265.5	1		1100	133	0.	.0	1265.0	1		1635	200	0.	.0	1265.0
1		0530	67	63.	.6	1265.5	1		1105	134	0.	.0	1265.0							

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

```
                                        6-HR        24-HR        72-HR      16.58-HR
+   (CFS)       (HR)
                            (CFS)
+    1186.      2.25                    329.         127.         127.         127.
                         (INCHES)     1.451        1.549        1.549        1.549
                          (AC-FT)      163.         174.         174.         174.

 PEAK STORAGE   TIME                          MAXIMUM AVERAGE STORAGE
                                        6-HR        24-HR        72-HR      16.58-HR
+  (AC-FT)      (HR)
      21.       2.25                      5.           2.           2.           2.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                        6-HR        24-HR        72-HR      16.58-HR
+   (FEET)      (HR)
   1269.55      2.25                 1266.65      1265.66      1265.66      1265.66

                         CUMULATIVE AREA =    2.11 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 614 KK     *   DET235   *          ROUTE HYDROGRAPH SUB235 THRU DET BASIN 235;
            *            *
            **************

 616 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           1  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

 617 RS          STORAGE ROUTING
                      NSTPS           1  NUMBER OF SUBREACHES
                       ITYP        STOR  TYPE OF INITIAL CONDITION
                      RSVRIC      -1.00  INITIAL CONDITION
                           X        .00 WORKING R AND D COEFFICIENT

 618 SA               AREA          .0        .3        .7        .9       1.2

 619 SE          ELEVATION     1292.00   1293.00   1294.00   1295.00   1296.00

 620 SL          LOW-LEVEL OUTLET
                      ELEVL     1292.00  ELEVATION AT CENTER OF OUTLET
                      CAREA         .80  CROSS-SECTIONAL AREA
                       COQL         .40  COEFFICIENT
                       EXPL         .50  EXPONENT OF HEAD

 621 SS          SPILLWAY
                       CREL     1294.50  SPILLWAY CREST ELEVATION
                      SPWID       80.00  SPILLWAY WIDTH
                       COQW        2.60  WEIR COEFFICIENT
                       EXPW        1.50  EXPONENT OF HEAD

                                                          ***

                                          COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00       .09       .56      1.37      2.41
        ELEVATION    1292.00   1293.00   1294.00   1295.00   1296.00

                                          COMPUTED OUTFLOW-ELEVATION DATA

          OUTFLOW        .00      1.79      1.93      2.08      2.27      2.49      2.75      3.08      3.50      4.06
        ELEVATION    1292.00   1292.49   1292.56   1292.66   1292.78   1292.94   1293.15   1293.44   1293.86   1294.50

          OUTFLOW       4.48      7.24     14.64     28.95     52.42     87.36    136.04    200.74    283.71    387.25
        ELEVATION    1294.52   1294.56   1294.64   1294.74   1294.88   1295.04   1295.24   1295.46   1295.72   1296.00


                                       COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE        .00       .01       .02       .03       .04       .08       .09       .14       .25       .47
          OUTFLOW        .00      1.79      1.93      2.08      2.27      2.49      2.57      2.75      3.08      3.50
```

ELEVATION	1292.00	1292.49	1292.56	1292.66	1292.78	1292.94	1293.00	1293.15	1293.44	1293.86
STORAGE	.56	.94	.95	.98	1.05	1.14	1.25	1.37	1.40	1.59
OUTFLOW	3.63	4.06	4.48	7.24	14.64	28.95	52.42	77.98	87.36	136.04
ELEVATION	1294.00	1294.50	1294.52	1294.56	1294.64	1294.74	1294.88	1295.00	1295.04	1295.24
STORAGE	1.82	2.09	2.41							
OUTFLOW	200.74	283.71	387.25							
ELEVATION	1295.46	1295.72	1296.00							

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 201. TO 387.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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HYDROGRAPH AT STATION DET235

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1292.0	*	1		0535	68	0.	.0	1292.0	*	1		1110	135	0.	.0	1292.0
1		0005	2	0.	.0	1292.0	*	1		0540	69	0.	.0	1292.0	*	1		1115	136	0.	.0	1292.0
1		0010	3	0.	.0	1292.0	*	1		0545	70	0.	.0	1292.0	*	1		1120	137	0.	.0	1292.0
1		0015	4	0.	.0	1292.0	*	1		0550	71	0.	.0	1292.0	*	1		1125	138	0.	.0	1292.0
1		0020	5	0.	.0	1292.0	*	1		0555	72	0.	.0	1292.0	*	1		1130	139	0.	.0	1292.0
1		0025	6	0.	.0	1292.0	*	1		0600	73	0.	.0	1292.0	*	1		1135	140	0.	.0	1292.0
1		0030	7	0.	.0	1292.0	*	1		0605	74	0.	.0	1292.0	*	1		1140	141	0.	.0	1292.0
1		0035	8	0.	.0	1292.0	*	1		0610	75	0.	.0	1292.0	*	1		1145	142	0.	.0	1292.0
1		0040	9	0.	.0	1292.0	*	1		0615	76	0.	.0	1292.0	*	1		1150	143	0.	.0	1292.0
1		0045	10	0.	.0	1292.0	*	1		0620	77	0.	.0	1292.0	*	1		1155	144	0.	.0	1292.0
1		0050	11	0.	.0	1292.0	*	1		0625	78	0.	.0	1292.0	*	1		1200	145	0.	.0	1292.0
1		0055	12	0.	.0	1292.1	*	1		0630	79	0.	.0	1292.0	*	1		1205	146	0.	.0	1292.0
1		0100	13	0.	.0	1292.1	*	1		0635	80	0.	.0	1292.0	*	1		1210	147	0.	.0	1292.0
1		0105	14	2.	.0	1292.5	*	1		0640	81	0.	.0	1292.0	*	1		1215	148	0.	.0	1292.0
1		0110	15	2.	.0	1292.7	*	1		0645	82	0.	.0	1292.0	*	1		1220	149	0.	.0	1292.0
1		0115	16	3.	.1	1293.0	*	1		0650	83	0.	.0	1292.0	*	1		1225	150	0.	.0	1292.0
1		0120	17	3.	.2	1293.2	*	1		0655	84	0.	.0	1292.0	*	1		1230	151	0.	.0	1292.0
1		0125	18	3.	.2	1293.3	*	1		0700	85	0.	.0	1292.0	*	1		1235	152	0.	.0	1292.0
1		0130	19	3.	.3	1293.4	*	1		0705	86	0.	.0	1292.0	*	1		1240	153	0.	.0	1292.0
1		0135	20	3.	.3	1293.5	*	1		0710	87	0.	.0	1292.0	*	1		1245	154	0.	.0	1292.0
1		0140	21	3.	.3	1293.5	*	1		0715	88	0.	.0	1292.0	*	1		1250	155	0.	.0	1292.0
1		0145	22	3.	.3	1293.5	*	1		0720	89	0.	.0	1292.0	*	1		1255	156	0.	.0	1292.0
1		0150	23	3.	.3	1293.5	*	1		0725	90	0.	.0	1292.0	*	1		1300	157	0.	.0	1292.0
1		0155	24	3.	.3	1293.5	*	1		0730	91	0.	.0	1292.0	*	1		1305	158	0.	.0	1292.0
1		0200	25	3.	.3	1293.5	*	1		0735	92	0.	.0	1292.0	*	1		1310	159	0.	.0	1292.0
1		0205	26	3.	.3	1293.5	*	1		0740	93	0.	.0	1292.0	*	1		1315	160	0.	.0	1292.0
1		0210	27	3.	.3	1293.5	*	1		0745	94	0.	.0	1292.0	*	1		1320	161	0.	.0	1292.0
1		0215	28	3.	.2	1293.4	*	1		0750	95	0.	.0	1292.0	*	1		1325	162	0.	.0	1292.0
1		0220	29	3.	.2	1293.4	*	1		0755	96	0.	.0	1292.0	*	1		1330	163	0.	.0	1292.0
1		0225	30	3.	.2	1293.3	*	1		0800	97	0.	.0	1292.0	*	1		1335	164	0.	.0	1292.0
1		0230	31	3.	.2	1293.3	*	1		0805	98	0.	.0	1292.0	*	1		1340	165	0.	.0	1292.0
1		0235	32	3.	.2	1293.2	*	1		0810	99	0.	.0	1292.0	*	1		1345	166	0.	.0	1292.0
1		0240	33	3.	.2	1293.2	*	1		0815	100	0.	.0	1292.0	*	1		1350	167	0.	.0	1292.0
1		0245	34	3.	.1	1293.1	*	1		0820	101	0.	.0	1292.0	*	1		1355	168	0.	.0	1292.0
1		0250	35	3.	.1	1293.1	*	1		0825	102	0.	.0	1292.0	*	1		1400	169	0.	.0	1292.0
1		0255	36	3.	.1	1293.0	*	1		0830	103	0.	.0	1292.0	*	1		1405	170	0.	.0	1292.0
1		0300	37	3.	.1	1293.0	*	1		0835	104	0.	.0	1292.0	*	1		1410	171	0.	.0	1292.0
1		0305	38	2.	.1	1292.9	*	1		0840	105	0.	.0	1292.0	*	1		1415	172	0.	.0	1292.0
1		0310	39	2.	.0	1292.8	*	1		0845	106	0.	.0	1292.0	*	1		1420	173	0.	.0	1292.0
1		0315	40	2.	.0	1292.7	*	1		0850	107	0.	.0	1292.0	*	1		1425	174	0.	.0	1292.0
1		0320	41	2.	.0	1292.6	*	1		0855	108	0.	.0	1292.0	*	1		1430	175	0.	.0	1292.0
1		0325	42	1.	.0	1292.4	*	1		0900	109	0.	.0	1292.0	*	1		1435	176	0.	.0	1292.0
1		0330	43	0.	.0	1292.1	*	1		0905	110	0.	.0	1292.0	*	1		1440	177	0.	.0	1292.0
1		0335	44	0.	.0	1292.0	*	1		0910	111	0.	.0	1292.0	*	1		1445	178	0.	.0	1292.0
1		0340	45	0.	.0	1292.0	*	1		0915	112	0.	.0	1292.0	*	1		1450	179	0.	.0	1292.0
1		0345	46	0.	.0	1292.0	*	1		0920	113	0.	.0	1292.0	*	1		1455	180	0.	.0	1292.0
1		0350	47	0.	.0	1292.0	*	1		0925	114	0.	.0	1292.0	*	1		1500	181	0.	.0	1292.0
1		0355	48	0.	.0	1292.0	*	1		0930	115	0.	.0	1292.0	*	1		1505	182	0.	.0	1292.0
1		0400	49	0.	.0	1292.0	*	1		0935	116	0.	.0	1292.0	*	1		1510	183	0.	.0	1292.0
1		0405	50	0.	.0	1292.0	*	1		0940	117	0.	.0	1292.0	*	1		1515	184	0.	.0	1292.0
1		0410	51	0.	.0	1292.0	*	1		0945	118	0.	.0	1292.0	*	1		1520	185	0.	.0	1292.0
1		0415	52	0.	.0	1292.0	*	1		0950	119	0.	.0	1292.0	*	1		1525	186	0.	.0	1292.0
1		0420	53	0.	.0	1292.0	*	1		0955	120	0.	.0	1292.0	*	1		1530	187	0.	.0	1292.0
1		0425	54	0.	.0	1292.0	*	1		1000	121	0.	.0	1292.0	*	1		1535	188	0.	.0	1292.0
1		0430	55	0.	.0	1292.0	*	1		1005	122	0.	.0	1292.0	*	1		1540	189	0.	.0	1292.0
1		0435	56	0.	.0	1292.0	*	1		1010	123	0.	.0	1292.0	*	1		1545	190	0.	.0	1292.0
1		0440	57	0.	.0	1292.0	*	1		1015	124	0.	.0	1292.0	*	1		1550	191	0.	.0	1292.0
1		0445	58	0.	.0	1292.0	*	1		1020	125	0.	.0	1292.0	*	1		1555	192	0.	.0	1292.0

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 1    0450  59     0.      .0  1292.0 *  1    1025 126     0.      .0  1292.0 *  1    1600 193     0.      .0  1292.0
 1    0455  60     0.      .0  1292.0 *  1    1030 127     0.      .0  1292.0 *  1    1605 194     0.      .0  1292.0
 1    0500  61     0.      .0  1292.0 *  1    1035 128     0.      .0  1292.0 *  1    1610 195     0.      .0  1292.0
 1    0505  62     0.      .0  1292.0 *  1    1040 129     0.      .0  1292.0 *  1    1615 196     0.      .0  1292.0
 1    0510  63     0.      .0  1292.0 *  1    1045 130     0.      .0  1292.0 *  1    1620 197     0.      .0  1292.0
 1    0515  64     0.      .0  1292.0 *  1    1050 131     0.      .0  1292.0 *  1    1625 198     0.      .0  1292.0
 1    0520  65     0.      .0  1292.0 *  1    1055 132     0.      .0  1292.0 *  1    1630 199     0.      .0  1292.0
 1    0525  66     0.      .0  1292.0 *  1    1100 133     0.      .0  1292.0 *  1    1635 200     0.      .0  1292.0
 1    0530  67     0.      .0  1292.0 *  1    1105 134     0.      .0  1292.0 *
                                        *                                       *
*****************************************************************************************************************

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     16.58-HR
+   (CFS)      (HR)
                          (CFS)
+      3.      1.75                   1.          0.          0.          0.
                        (INCHES)    1.482       1.482       1.482       1.482
                         (AC-FT)      1.          1.          1.          1.

 PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+  (AC-FT)     (HR)
       0.      1.75                   0.          0.          0.          0.

 PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+   (FEET)     (HR)
   1293.54     1.75              1292.47     1292.17     1292.17     1292.17

                        CUMULATIVE AREA =     .01 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
 637 KK   *   DET245   *          ROUTE HYDROGRAPH SUM245 THRU DET BASIN 245;
          *            *
          **************

 639 KO        OUTPUT CONTROL VARIABLES
                     IPRNT          1  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

            HYDROGRAPH ROUTING DATA

 640 RS        STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       STOR  TYPE OF INITIAL CONDITION
                    RSVRIC      -1.00  INITIAL CONDITION
                         X        .00 WORKING R AND D COEFFICIENT

 641 SA             AREA         .0        .4        .8       1.0       1.2       2.0       3.0

 642 SE        ELEVATION     1289.00   1290.00   1291.00   1292.00   1293.00   1294.00   1295.00

 643 SL        LOW-LEVEL OUTLET
                     ELEVL     1289.00  ELEVATION AT CENTER OF OUTLET
                     CAREA        6.20  CROSS-SECTIONAL AREA
                      COQL         .40  COEFFICIENT
                      EXPL         .50  EXPONENT OF HEAD

 644 SS        SPILLWAY
                      CREL     1292.00  SPILLWAY CREST ELEVATION
                     SPWID       50.00  SPILLWAY WIDTH
                      COQW        2.60  WEIR COEFFICIENT
                      EXPW        1.50  EXPONENT OF HEAD

                                                    ***

                                        COMPUTED STORAGE-ELEVATION DATA

          STORAGE        .00       .12       .68      1.56      2.66      4.26      6.78
        ELEVATION    1289.00   1290.00   1291.00   1292.00   1293.00   1294.00   1295.00
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COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	22.61	23.62	24.73	25.95	27.30	28.79	30.46	32.33	34.45
ELEVATION	1289.00	1290.29	1290.41	1290.55	1290.70	1290.88	1291.10	1291.35	1291.64	1292.00
OUTFLOW	35.71	41.81	56.59	83.86	127.47	191.22	278.94	394.49	541.63	724.22
ELEVATION	1292.04	1292.14	1292.29	1292.50	1292.78	1293.10	1293.49	1293.94	1294.44	1295.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.12	.24	.30	.37	.47	.59	.68	.75	.96
OUTFLOW	.00	19.89	22.61	23.62	24.73	25.95	27.30	28.13	28.79	30.46
ELEVATION	1289.00	1290.00	1290.29	1290.41	1290.55	1290.70	1290.88	1291.00	1291.10	1291.35
STORAGE	1.22	1.56	1.60	1.70	1.86	2.09	2.40	2.66	2.79	3.34
OUTFLOW	32.33	34.45	35.71	41.81	56.59	83.86	127.47	169.78	191.22	278.94
ELEVATION	1291.64	1292.00	1292.04	1292.14	1292.29	1292.50	1292.78	1293.00	1293.10	1293.49
STORAGE	4.13	4.26	5.24	6.78						
OUTFLOW	394.49	412.17	541.63	724.22						
ELEVATION	1293.94	1294.00	1294.44	1295.00						

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HYDROGRAPH AT STATION DET245

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1289.0	*	1		0535	68	0.	.0	1289.0	*	1		1110	135	0.	.0	1289.0
1		0005	2	0.	.0	1289.0	*	1		0540	69	0.	.0	1289.0	*	1		1115	136	0.	.0	1289.0
1		0010	3	0.	.0	1289.0	*	1		0545	70	0.	.0	1289.0	*	1		1120	137	0.	.0	1289.0
1		0015	4	1.	.0	1289.0	*	1		0550	71	0.	.0	1289.0	*	1		1125	138	0.	.0	1289.0
1		0020	5	1.	.0	1289.1	*	1		0555	72	0.	.0	1289.0	*	1		1130	139	0.	.0	1289.0
1		0025	6	1.	.0	1289.1	*	1		0600	73	0.	.0	1289.0	*	1		1135	140	0.	.0	1289.0
1		0030	7	2.	.0	1289.1	*	1		0605	74	0.	.0	1289.0	*	1		1140	141	0.	.0	1289.0
1		0035	8	2.	.0	1289.1	*	1		0610	75	0.	.0	1289.0	*	1		1145	142	0.	.0	1289.0
1		0040	9	3.	.0	1289.1	*	1		0615	76	0.	.0	1289.0	*	1		1150	143	0.	.0	1289.0
1		0045	10	4.	.0	1289.2	*	1		0620	77	0.	.0	1289.0	*	1		1155	144	0.	.0	1289.0
1		0050	11	5.	.0	1289.3	*	1		0625	78	0.	.0	1289.0	*	1		1200	145	0.	.0	1289.0
1		0055	12	7.	.0	1289.4	*	1		0630	79	0.	.0	1289.0	*	1		1205	146	0.	.0	1289.0
1		0100	13	12.	.1	1289.6	*	1		0635	80	0.	.0	1289.0	*	1		1210	147	0.	.0	1289.0
1		0105	14	21.	.2	1290.1	*	1		0640	81	0.	.0	1289.0	*	1		1215	148	0.	.0	1289.0
1		0110	15	26.	.5	1290.7	*	1		0645	82	0.	.0	1289.0	*	1		1220	149	0.	.0	1289.0
1		0115	16	31.	1.1	1291.4	*	1		0650	83	0.	.0	1289.0	*	1		1225	150	0.	.0	1289.0
1		0120	17	50.	1.8	1292.2	*	1		0655	84	0.	.0	1289.0	*	1		1230	151	0.	.0	1289.0
1		0125	18	113.	2.3	1292.7	*	1		0700	85	0.	.0	1289.0	*	1		1235	152	0.	.0	1289.0
1		0130	19	134.	2.4	1292.8	*	1		0705	86	0.	.0	1289.0	*	1		1240	153	0.	.0	1289.0
1		0135	20	127.	2.4	1292.8	*	1		0710	87	0.	.0	1289.0	*	1		1245	154	0.	.0	1289.0
1		0140	21	111.	2.3	1292.7	*	1		0715	88	0.	.0	1289.0	*	1		1250	155	0.	.0	1289.0
1		0145	22	94.	2.2	1292.6	*	1		0720	89	0.	.0	1289.0	*	1		1255	156	0.	.0	1289.0
1		0150	23	78.	2.0	1292.5	*	1		0725	90	0.	.0	1289.0	*	1		1300	157	0.	.0	1289.0
1		0155	24	66.	1.9	1292.4	*	1		0730	91	0.	.0	1289.0	*	1		1305	158	0.	.0	1289.0
1		0200	25	55.	1.8	1292.3	*	1		0735	92	0.	.0	1289.0	*	1		1310	159	0.	.0	1289.0
1		0205	26	47.	1.8	1292.2	*	1		0740	93	0.	.0	1289.0	*	1		1315	160	0.	.0	1289.0
1		0210	27	40.	1.7	1292.1	*	1		0745	94	0.	.0	1289.0	*	1		1320	161	0.	.0	1289.0
1		0215	28	36.	1.6	1292.0	*	1		0750	95	0.	.0	1289.0	*	1		1325	162	0.	.0	1289.0
1		0220	29	34.	1.5	1291.9	*	1		0755	96	0.	.0	1289.0	*	1		1330	163	0.	.0	1289.0
1		0225	30	33.	1.4	1291.8	*	1		0800	97	0.	.0	1289.0	*	1		1335	164	0.	.0	1289.0
1		0230	31	33.	1.3	1291.7	*	1		0805	98	0.	.0	1289.0	*	1		1340	165	0.	.0	1289.0
1		0235	32	32.	1.1	1291.6	*	1		0810	99	0.	.0	1289.0	*	1		1345	166	0.	.0	1289.0
1		0240	33	31.	1.0	1291.4	*	1		0815	100	0.	.0	1289.0	*	1		1350	167	0.	.0	1289.0
1		0245	34	30.	.9	1291.2	*	1		0820	101	0.	.0	1289.0	*	1		1355	168	0.	.0	1289.0
1		0250	35	28.	.7	1291.0	*	1		0825	102	0.	.0	1289.0	*	1		1400	169	0.	.0	1289.0
1		0255	36	27.	.6	1290.9	*	1		0830	103	0.	.0	1289.0	*	1		1405	170	0.	.0	1289.0
1		0300	37	25.	.4	1290.6	*	1		0835	104	0.	.0	1289.0	*	1		1410	171	0.	.0	1289.0
1		0305	38	24.	.3	1290.4	*	1		0840	105	0.	.0	1289.0	*	1		1415	172	0.	.0	1289.0
1		0310	39	21.	.2	1290.1	*	1		0845	106	0.	.0	1289.0	*	1		1420	173	0.	.0	1289.0
1		0315	40	13.	.1	1289.6	*	1		0850	107	0.	.0	1289.0	*	1		1425	174	0.	.0	1289.0
1		0320	41	6.	.0	1289.3	*	1		0855	108	0.	.0	1289.0	*	1		1430	175	0.	.0	1289.0
1		0325	42	4.	.0	1289.2	*	1		0900	109	0.	.0	1289.0	*	1		1435	176	0.	.0	1289.0
1		0330	43	2.	.0	1289.1	*	1		0905	110	0.	.0	1289.0	*	1		1440	177	0.	.0	1289.0
1		0335	44	1.	.0	1289.1	*	1		0910	111	0.	.0	1289.0	*	1		1445	178	0.	.0	1289.0
1		0340	45	1.	.0	1289.0	*	1		0915	112	0.	.0	1289.0	*	1		1450	179	0.	.0	1289.0
1		0345	46	0.	.0	1289.0	*	1		0920	113	0.	.0	1289.0	*	1		1455	180	0.	.0	1289.0
1		0350	47	0.	.0	1289.0	*	1		0925	114	0.	.0	1289.0	*	1		1500	181	0.	.0	1289.0
1		0355	48	0.	.0	1289.0	*	1		0930	115	0.	.0	1289.0	*	1		1505	182	0.	.0	1289.0
1		0400	49	0.	.0	1289.0	*	1		0935	116	0.	.0	1289.0	*	1		1510	183	0.	.0	1289.0

```
 1    0405  50     0.     .0  1289.0 *  1    0940 117     0.     .0  1289.0 *  1    1515 184     0.     .0  1289.0
 1    0410  51     0.     .0  1289.0 *  1    0945 118     0.     .0  1289.0 *  1    1520 185     0.     .0  1289.0
 1    0415  52     0.     .0  1289.0 *  1    0950 119     0.     .0  1289.0 *  1    1525 186     0.     .0  1289.0
 1    0420  53     0.     .0  1289.0 *  1    0955 120     0.     .0  1289.0 *  1    1530 187     0.     .0  1289.0
 1    0425  54     0.     .0  1289.0 *  1    1000 121     0.     .0  1289.0 *  1    1535 188     0.     .0  1289.0
 1    0430  55     0.     .0  1289.0 *  1    1005 122     0.     .0  1289.0 *  1    1540 189     0.     .0  1289.0
 1    0435  56     0.     .0  1289.0 *  1    1010 123     0.     .0  1289.0 *  1    1545 190     0.     .0  1289.0
 1    0440  57     0.     .0  1289.0 *  1    1015 124     0.     .0  1289.0 *  1    1550 191     0.     .0  1289.0
 1    0445  58     0.     .0  1289.0 *  1    1020 125     0.     .0  1289.0 *  1    1555 192     0.     .0  1289.0
 1    0450  59     0.     .0  1289.0 *  1    1025 126     0.     .0  1289.0 *  1    1600 193     0.     .0  1289.0
 1    0455  60     0.     .0  1289.0 *  1    1030 127     0.     .0  1289.0 *  1    1605 194     0.     .0  1289.0
 1    0500  61     0.     .0  1289.0 *  1    1035 128     0.     .0  1289.0 *  1    1610 195     0.     .0  1289.0
 1    0505  62     0.     .0  1289.0 *  1    1040 129     0.     .0  1289.0 *  1    1615 196     0.     .0  1289.0
 1    0510  63     0.     .0  1289.0 *  1    1045 130     0.     .0  1289.0 *  1    1620 197     0.     .0  1289.0
 1    0515  64     0.     .0  1289.0 *  1    1050 131     0.     .0  1289.0 *  1    1625 198     0.     .0  1289.0
 1    0520  65     0.     .0  1289.0 *  1    1055 132     0.     .0  1289.0 *  1    1630 199     0.     .0  1289.0
 1    0525  66     0.     .0  1289.0 *  1    1100 133     0.     .0  1289.0 *  1    1635 200     0.     .0  1289.0
 1    0530  67     0.     .0  1289.0 *  1    1105 134     0.     .0  1289.0 *
                                      *                                      *
*****************************************************************************************************************

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     16.58-HR
+   (CFS)      (HR)
                            (CFS)
+     134.     1.50                20.          7.          7.          7.
                         (INCHES)  1.754       1.754       1.754       1.754
                          (AC-FT)  10.         10.         10.         10.

 PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+  (AC-FT)     (HR)
       2.      1.50                 0.          0.          0.          0.

 PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+   (FEET)     (HR)
   1292.81     1.50             1290.02     1289.37     1289.37     1289.37

                        CUMULATIVE AREA =     .10 SQ MI


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          **************
          *            *
754 KK    *   DET250   *          ROUTE HYDROGRAPH SUM250 THRU DET BASIN 250;
          *            *
          **************

756 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          1  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

            HYDROGRAPH ROUTING DATA

757 RS        STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       STOR  TYPE OF INITIAL CONDITION
                   RSVRIC      -1.00  INITIAL CONDITION
                        X        .00 WORKING R AND D COEFFICIENT

758 SA              AREA         .0        .2        .6       1.1       2.1       2.7       3.4

759 SE        ELEVATION     1281.00   1282.00   1283.00   1284.00   1285.00   1286.00   1287.00

760 SL        LOW-LEVEL OUTLET
                    ELEVL     1281.00  ELEVATION AT CENTER OF OUTLET
                    CAREA        6.20  CROSS-SECTIONAL AREA
                     COQL         .40  COEFFICIENT
                     EXPL         .50  EXPONENT OF HEAD

761 SS        SPILLWAY
                     CREL     1284.50  SPILLWAY CREST ELEVATION
                    SPWID       60.00  SPILLWAY WIDTH
                     COQW        2.60  WEIR COEFFICIENT
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EXPW 1.50 EXPONENT OF HEAD

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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.07	.44	1.27	2.82	5.21	8.26
ELEVATION	1281.00	1282.00	1283.00	1284.00	1285.00	1286.00	1287.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	22.73	23.89	25.18	26.61	28.22	30.04	32.10	34.47	37.21
ELEVATION	1281.00	1282.31	1282.44	1282.60	1282.79	1283.01	1283.28	1283.60	1284.00	1284.50
OUTFLOW	38.27	43.63	56.85	81.45	120.93	178.87	258.74	364.12	498.48	665.36
ELEVATION	1284.53	1284.61	1284.74	1284.92	1285.14	1285.42	1285.74	1286.11	1286.53	1287.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.07	.14	.19	.25	.33	.44	.45	.63	.88
OUTFLOW	.00	19.89	22.73	23.89	25.18	26.61	28.13	28.22	30.04	32.10
ELEVATION	1281.00	1282.00	1282.31	1282.44	1282.60	1282.79	1283.00	1283.01	1283.28	1283.60
STORAGE	1.27	1.92	1.97	2.10	2.32	2.65	2.82	3.12	3.74	4.53
OUTFLOW	34.45	37.21	38.27	43.63	56.85	81.45	94.93	120.93	178.87	258.74
ELEVATION	1284.00	1284.50	1284.53	1284.61	1284.74	1284.92	1285.00	1285.14	1285.42	1285.74
STORAGE	5.21	5.52	6.75	8.26						
OUTFLOW	331.06	364.12	498.48	665.36						
ELEVATION	1286.00	1286.11	1286.53	1287.00						

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 20.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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HYDROGRAPH AT STATION DET250

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1281.0	*	1		0535	68	0.	.0	1281.0	*	1		1110	135	0.	.0	1281.0
1		0005	2	0.	.0	1281.0	*	1		0540	69	0.	.0	1281.0	*	1		1115	136	0.	.0	1281.0
1		0010	3	0.	.0	1281.0	*	1		0545	70	0.	.0	1281.0	*	1		1120	137	0.	.0	1281.0
1		0015	4	0.	.0	1281.0	*	1		0550	71	0.	.0	1281.0	*	1		1125	138	0.	.0	1281.0
1		0020	5	1.	.0	1281.0	*	1		0555	72	0.	.0	1281.0	*	1		1130	139	0.	.0	1281.0
1		0025	6	1.	.0	1281.0	*	1		0600	73	0.	.0	1281.0	*	1		1135	140	0.	.0	1281.0
1		0030	7	1.	.0	1281.1	*	1		0605	74	0.	.0	1281.0	*	1		1140	141	0.	.0	1281.0
1		0035	8	2.	.0	1281.1	*	1		0610	75	0.	.0	1281.0	*	1		1145	142	0.	.0	1281.0
1		0040	9	2.	.0	1281.1	*	1		0615	76	0.	.0	1281.0	*	1		1150	143	0.	.0	1281.0
1		0045	10	3.	.0	1281.2	*	1		0620	77	0.	.0	1281.0	*	1		1155	144	0.	.0	1281.0
1		0050	11	5.	.0	1281.2	*	1		0625	78	0.	.0	1281.0	*	1		1200	145	0.	.0	1281.0
1		0055	12	6.	.0	1281.3	*	1		0630	79	0.	.0	1281.0	*	1		1205	146	0.	.0	1281.0
1		0100	13	11.	.0	1281.5	*	1		0635	80	0.	.0	1281.0	*	1		1210	147	0.	.0	1281.0
1		0105	14	21.	.1	1282.1	*	1		0640	81	0.	.0	1281.0	*	1		1215	148	0.	.0	1281.0
1		0110	15	27.	.3	1282.8	*	1		0645	82	0.	.0	1281.0	*	1		1220	149	0.	.0	1281.0
1		0115	16	32.	.9	1283.7	*	1		0650	83	0.	.0	1281.0	*	1		1225	150	0.	.0	1281.0
1		0120	17	47.	2.2	1284.6	*	1		0655	84	0.	.0	1281.0	*	1		1230	151	0.	.0	1281.0
1		0125	18	192.	3.9	1285.5	*	1		0700	85	0.	.0	1281.0	*	1		1235	152	0.	.0	1281.0
1		0130	19	375.	5.6	1286.1	*	1		0705	86	0.	.0	1281.0	*	1		1240	153	0.	.0	1281.0
1		0135	20	525.	7.0	1286.6	*	1		0710	87	0.	.0	1281.0	*	1		1245	154	0.	.0	1281.0
1		0140	21	603.	7.7	1286.8	*	1		0715	88	0.	.0	1281.0	*	1		1250	155	0.	.0	1281.0
1		0145	22	610.	7.8	1286.8	*	1		0720	89	0.	.0	1281.0	*	1		1255	156	0.	.0	1281.0
1		0150	23	571.	7.4	1286.7	*	1		0725	90	0.	.0	1281.0	*	1		1300	157	0.	.0	1281.0
1		0155	24	510.	6.9	1286.6	*	1		0730	91	0.	.0	1281.0	*	1		1305	158	0.	.0	1281.0
1		0200	25	443.	6.2	1286.4	*	1		0735	92	0.	.0	1281.0	*	1		1310	159	0.	.0	1281.0
1		0205	26	379.	5.7	1286.2	*	1		0740	93	0.	.0	1281.0	*	1		1315	160	0.	.0	1281.0
1		0210	27	322.	5.1	1286.0	*	1		0745	94	0.	.0	1281.0	*	1		1320	161	0.	.0	1281.0
1		0215	28	273.	4.7	1285.8	*	1		0750	95	0.	.0	1281.0	*	1		1325	162	0.	.0	1281.0
1		0220	29	233.	4.3	1285.6	*	1		0755	96	0.	.0	1281.0	*	1		1330	163	0.	.0	1281.0
1		0225	30	199.	3.9	1285.5	*	1		0800	97	0.	.0	1281.0	*	1		1335	164	0.	.0	1281.0
1		0230	31	171.	3.7	1285.4	*	1		0805	98	0.	.0	1281.0	*	1		1340	165	0.	.0	1281.0
1		0235	32	149.	3.4	1285.3	*	1		0810	99	0.	.0	1281.0	*	1		1345	166	0.	.0	1281.0
1		0240	33	129.	3.2	1285.2	*	1		0815	100	0.	.0	1281.0	*	1		1350	167	0.	.0	1281.0
1		0245	34	114.	3.0	1285.1	*	1		0820	101	0.	.0	1281.0	*	1		1355	168	0.	.0	1281.0
1		0250	35	101.	2.9	1285.0	*	1		0825	102	0.	.0	1281.0	*	1		1400	169	0.	.0	1281.0
1		0255	36	89.	2.7	1285.0	*	1		0830	103	0.	.0	1281.0	*	1		1405	170	0.	.0	1281.0

1	0300	37	80.	2.6	1284.9	*	1	0835	104	0.	.0	1281.0	*	1	1410	171	0.	.0	1281.0
1	0305	38	71.	2.5	1284.8	*	1	0840	105	0.	.0	1281.0	*	1	1415	172	0.	.0	1281.0
1	0310	39	64.	2.4	1284.8	*	1	0845	106	0.	.0	1281.0	*	1	1420	173	0.	.0	1281.0
1	0315	40	56.	2.3	1284.7	*	1	0850	107	0.	.0	1281.0	*	1	1425	174	0.	.0	1281.0
1	0320	41	50.	2.2	1284.7	*	1	0855	108	0.	.0	1281.0	*	1	1430	175	0.	.0	1281.0
1	0325	42	44.	2.1	1284.6	*	1	0900	109	0.	.0	1281.0	*	1	1435	176	0.	.0	1281.0
1	0330	43	39.	2.0	1284.5	*	1	0905	110	0.	.0	1281.0	*	1	1440	177	0.	.0	1281.0
1	0335	44	37.	1.9	1284.5	*	1	0910	111	0.	.0	1281.0	*	1	1445	178	0.	.0	1281.0
1	0340	45	36.	1.7	1284.4	*	1	0915	112	0.	.0	1281.0	*	1	1450	179	0.	.0	1281.0
1	0345	46	36.	1.6	1284.2	*	1	0920	113	0.	.0	1281.0	*	1	1455	180	0.	.0	1281.0
1	0350	47	35.	1.4	1284.1	*	1	0925	114	0.	.0	1281.0	*	1	1500	181	0.	.0	1281.0
1	0355	48	34.	1.2	1284.0	*	1	0930	115	0.	.0	1281.0	*	1	1505	182	0.	.0	1281.0
1	0400	49	33.	1.0	1283.8	*	1	0935	116	0.	.0	1281.0	*	1	1510	183	0.	.0	1281.0
1	0405	50	32.	.9	1283.6	*	1	0940	117	0.	.0	1281.0	*	1	1515	184	0.	.0	1281.0
1	0410	51	30.	.7	1283.3	*	1	0945	118	0.	.0	1281.0	*	1	1520	185	0.	.0	1281.0
1	0415	52	28.	.5	1283.0	*	1	0950	119	0.	.0	1281.0	*	1	1525	186	0.	.0	1281.0
1	0420	53	26.	.3	1282.7	*	1	0955	120	0.	.0	1281.0	*	1	1530	187	0.	.0	1281.0
1	0425	54	23.	.1	1282.3	*	1	1000	121	0.	.0	1281.0	*	1	1535	188	0.	.0	1281.0
1	0430	55	11.	.0	1281.5	*	1	1005	122	0.	.0	1281.0	*	1	1540	189	0.	.0	1281.0
1	0435	56	1.	.0	1281.0	*	1	1010	123	0.	.0	1281.0	*	1	1545	190	0.	.0	1281.0
1	0440	57	1.	.0	1281.0	*	1	1015	124	0.	.0	1281.0	*	1	1550	191	0.	.0	1281.0
1	0445	58	1.	.0	1281.0	*	1	1020	125	0.	.0	1281.0	*	1	1555	192	0.	.0	1281.0
1	0450	59	1.	.0	1281.0	*	1	1025	126	0.	.0	1281.0	*	1	1600	193	0.	.0	1281.0
1	0455	60	0.	.0	1281.0	*	1	1030	127	0.	.0	1281.0	*	1	1605	194	0.	.0	1281.0
1	0500	61	0.	.0	1281.0	*	1	1035	128	0.	.0	1281.0	*	1	1610	195	0.	.0	1281.0
1	0505	62	0.	.0	1281.0	*	1	1040	129	0.	.0	1281.0	*	1	1615	196	0.	.0	1281.0
1	0510	63	0.	.0	1281.0	*	1	1045	130	0.	.0	1281.0	*	1	1620	197	0.	.0	1281.0
1	0515	64	0.	.0	1281.0	*	1	1050	131	0.	.0	1281.0	*	1	1625	198	0.	.0	1281.0
1	0520	65	0.	.0	1281.0	*	1	1055	132	0.	.0	1281.0	*	1	1630	199	0.	.0	1281.0
1	0525	66	0.	.0	1281.0	*	1	1100	133	0.	.0	1281.0	*	1	1635	200	0.	.0	1281.0
1	0530	67	0.	.0	1281.0	*	1	1105	134	0.	.0	1281.0	*						
						*							*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	16.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 610.	1.75		96.	35.	35.	35.
		(INCHES)	1.517	1.517	1.517	1.517
		(AC-FT)	48.	48.	48.	48.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (AC-FT)	(HR)				
8.	1.75	2.	1.	1.	1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (FEET)	(HR)				
1286.85	1.75	1283.21	1281.80	1281.80	1281.80

CUMULATIVE AREA = .59 SQ MI

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          **************
          *            *
787 KK    *   DET270   *          ROUTE HYDROGRAPH SUM270 THRU DET BASIN 270;
          *            *
          **************

789 KO        OUTPUT CONTROL VARIABLES
                    IPRNT          1  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

            HYDROGRAPH ROUTING DATA

790 RS        STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       STOR  TYPE OF INITIAL CONDITION
                   RSVRIC      -1.00  INITIAL CONDITION
                        X        .00 WORKING R AND D COEFFICIENT

791 SA              AREA         .0       .3       .7      1.1      1.7      2.3
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792 SE	ELEVATION	1281.00	1282.00	1283.00	1284.00	1285.00	1286.00
793 SQ	DISCHARGE	0.	90.	260.	475.	685.	870.

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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.09	.57	1.46	2.84	4.83
ELEVATION	1281.00	1282.00	1283.00	1284.00	1285.00	1286.00

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 260.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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HYDROGRAPH AT STATION DET270

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1281.0	*	1		0535	68	0.	.0	1281.0	*	1		1110	135	0.	.0	1281.0
1		0005	2	0.	.0	1281.0	*	1		0540	69	0.	.0	1281.0	*	1		1115	136	0.	.0	1281.0
1		0010	3	1.	.0	1281.0	*	1		0545	70	0.	.0	1281.0	*	1		1120	137	0.	.0	1281.0
1		0015	4	1.	.0	1281.0	*	1		0550	71	0.	.0	1281.0	*	1		1125	138	0.	.0	1281.0
1		0020	5	1.	.0	1281.0	*	1		0555	72	0.	.0	1281.0	*	1		1130	139	0.	.0	1281.0
1		0025	6	2.	.0	1281.0	*	1		0600	73	0.	.0	1281.0	*	1		1135	140	0.	.0	1281.0
1		0030	7	2.	.0	1281.0	*	1		0605	74	0.	.0	1281.0	*	1		1140	141	0.	.0	1281.0
1		0035	8	3.	.0	1281.0	*	1		0610	75	0.	.0	1281.0	*	1		1145	142	0.	.0	1281.0
1		0040	9	4.	.0	1281.0	*	1		0615	76	0.	.0	1281.0	*	1		1150	143	0.	.0	1281.0
1		0045	10	6.	.0	1281.1	*	1		0620	77	0.	.0	1281.0	*	1		1155	144	0.	.0	1281.0
1		0050	11	8.	.0	1281.1	*	1		0625	78	0.	.0	1281.0	*	1		1200	145	0.	.0	1281.0
1		0055	12	11.	.0	1281.1	*	1		0630	79	0.	.0	1281.0	*	1		1205	146	0.	.0	1281.0
1		0100	13	20.	.0	1281.2	*	1		0635	80	0.	.0	1281.0	*	1		1210	147	0.	.0	1281.0
1		0105	14	51.	.1	1281.6	*	1		0640	81	0.	.0	1281.0	*	1		1215	148	0.	.0	1281.0
1		0110	15	97.	.1	1282.0	*	1		0645	82	0.	.0	1281.0	*	1		1220	149	0.	.0	1281.0
1		0115	16	124.	.2	1282.2	*	1		0650	83	0.	.0	1281.0	*	1		1225	150	0.	.0	1281.0
1		0120	17	142.	.2	1282.3	*	1		0655	84	0.	.0	1281.0	*	1		1230	151	0.	.0	1281.0
1		0125	18	167.	.3	1282.5	*	1		0700	85	0.	.0	1281.0	*	1		1235	152	0.	.0	1281.0
1		0130	19	267.	.6	1283.0	*	1		0705	86	0.	.0	1281.0	*	1		1240	153	0.	.0	1281.0
1		0135	20	405.	1.2	1283.7	*	1		0710	87	0.	.0	1281.0	*	1		1245	154	0.	.0	1281.0
1		0140	21	527.	1.8	1284.2	*	1		0715	88	0.	.0	1281.0	*	1		1250	155	0.	.0	1281.0
1		0145	22	593.	2.2	1284.6	*	1		0720	89	0.	.0	1281.0	*	1		1255	156	0.	.0	1281.0
1		0150	23	614.	2.4	1284.7	*	1		0725	90	0.	.0	1281.0	*	1		1300	157	0.	.0	1281.0
1		0155	24	591.	2.2	1284.6	*	1		0730	91	0.	.0	1281.0	*	1		1305	158	0.	.0	1281.0
1		0200	25	541.	1.9	1284.3	*	1		0735	92	0.	.0	1281.0	*	1		1310	159	0.	.0	1281.0
1		0205	26	478.	1.5	1284.0	*	1		0740	93	0.	.0	1281.0	*	1		1315	160	0.	.0	1281.0
1		0210	27	395.	1.1	1283.6	*	1		0745	94	0.	.0	1281.0	*	1		1320	161	0.	.0	1281.0
1		0215	28	335.	.9	1283.3	*	1		0750	95	0.	.0	1281.0	*	1		1325	162	0.	.0	1281.0
1		0220	29	285.	.7	1283.1	*	1		0755	96	0.	.0	1281.0	*	1		1330	163	0.	.0	1281.0
1		0225	30	240.	.5	1282.9	*	1		0800	97	0.	.0	1281.0	*	1		1335	164	0.	.0	1281.0
1		0230	31	201.	.4	1282.7	*	1		0805	98	0.	.0	1281.0	*	1		1340	165	0.	.0	1281.0
1		0235	32	173.	.3	1282.5	*	1		0810	99	0.	.0	1281.0	*	1		1345	166	0.	.0	1281.0
1		0240	33	151.	.3	1282.4	*	1		0815	100	0.	.0	1281.0	*	1		1350	167	0.	.0	1281.0
1		0245	34	133.	.2	1282.3	*	1		0820	101	0.	.0	1281.0	*	1		1355	168	0.	.0	1281.0
1		0250	35	116.	.2	1282.2	*	1		0825	102	0.	.0	1281.0	*	1		1400	169	0.	.0	1281.0
1		0255	36	103.	.1	1282.1	*	1		0830	103	0.	.0	1281.0	*	1		1405	170	0.	.0	1281.0
1		0300	37	91.	.1	1282.0	*	1		0835	104	0.	.0	1281.0	*	1		1410	171	0.	.0	1281.0
1		0305	38	78.	.1	1281.9	*	1		0840	105	0.	.0	1281.0	*	1		1415	172	0.	.0	1281.0
1		0310	39	72.	.1	1281.8	*	1		0845	106	0.	.0	1281.0	*	1		1420	173	0.	.0	1281.0
1		0315	40	64.	.1	1281.7	*	1		0850	107	0.	.0	1281.0	*	1		1425	174	0.	.0	1281.0
1		0320	41	58.	.1	1281.6	*	1		0855	108	0.	.0	1281.0	*	1		1430	175	0.	.0	1281.0
1		0325	42	51.	.1	1281.6	*	1		0900	109	0.	.0	1281.0	*	1		1435	176	0.	.0	1281.0
1		0330	43	45.	.0	1281.5	*	1		0905	110	0.	.0	1281.0	*	1		1440	177	0.	.0	1281.0
1		0335	44	41.	.0	1281.5	*	1		0910	111	0.	.0	1281.0	*	1		1445	178	0.	.0	1281.0
1		0340	45	38.	.0	1281.4	*	1		0915	112	0.	.0	1281.0	*	1		1450	179	0.	.0	1281.0
1		0345	46	37.	.0	1281.4	*	1		0920	113	0.	.0	1281.0	*	1		1455	180	0.	.0	1281.0
1		0350	47	36.	.0	1281.4	*	1		0925	114	0.	.0	1281.0	*	1		1500	181	0.	.0	1281.0
1		0355	48	35.	.0	1281.4	*	1		0930	115	0.	.0	1281.0	*	1		1505	182	0.	.0	1281.0
1		0400	49	34.	.0	1281.4	*	1		0935	116	0.	.0	1281.0	*	1		1510	183	0.	.0	1281.0
1		0405	50	33.	.0	1281.4	*	1		0940	117	0.	.0	1281.0	*	1		1515	184	0.	.0	1281.0
1		0410	51	32.	.0	1281.4	*	1		0945	118	0.	.0	1281.0	*	1		1520	185	0.	.0	1281.0
1		0415	52	30.	.0	1281.3	*	1		0950	119	0.	.0	1281.0	*	1		1525	186	0.	.0	1281.0
1		0420	53	29.	.0	1281.3	*	1		0955	120	0.	.0	1281.0	*	1		1530	187	0.	.0	1281.0
1		0425	54	26.	.0	1281.3	*	1		1000	121	0.	.0	1281.0	*	1		1535	188	0.	.0	1281.0
1		0430	55	22.	.0	1281.2	*	1		1005	122	0.	.0	1281.0	*	1		1540	189	0.	.0	1281.0
1		0435	56	16.	.0	1281.2	*	1		1010	123	0.	.0	1281.0	*	1		1545	190	0.	.0	1281.0

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  1    0440  57     10.      .0  1281.1 *  1    1015 124     0.      .0  1281.0 *  1    1550 191     0.      .0  1281.0
  1    0445  58      7.      .0  1281.1 *  1    1020 125     0.      .0  1281.0 *  1    1555 192     0.      .0  1281.0
  1    0450  59      4.      .0  1281.0 *  1    1025 126     0.      .0  1281.0 *  1    1600 193     0.      .0  1281.0
  1    0455  60      3.      .0  1281.0 *  1    1030 127     0.      .0  1281.0 *  1    1605 194     0.      .0  1281.0
  1    0500  61      2.      .0  1281.0 *  1    1035 128     0.      .0  1281.0 *  1    1610 195     0.      .0  1281.0
  1    0505  62      1.      .0  1281.0 *  1    1040 129     0.      .0  1281.0 *  1    1615 196     0.      .0  1281.0
  1    0510  63      1.      .0  1281.0 *  1    1045 130     0.      .0  1281.0 *  1    1620 197     0.      .0  1281.0
  1    0515  64      1.      .0  1281.0 *  1    1050 131     0.      .0  1281.0 *  1    1625 198     0.      .0  1281.0
  1    0520  65      1.      .0  1281.0 *  1    1055 132     0.      .0  1281.0 *  1    1630 199     0.      .0  1281.0
  1    0525  66      0.      .0  1281.0 *  1    1100 133     0.      .0  1281.0 *  1    1635 200     0.      .0  1281.0
  1    0530  67      0.      .0  1281.0 *  1    1105 134     0.      .0  1281.0 *
                                         *                                       *
*****************************************************************************************************************************

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     16.58-HR
+   (CFS)      (HR)
                          (CFS)
+     614.     1.83                 107.         39.         39.         39.
                         (INCHES)  1.540       1.540       1.540       1.540
                          (AC-FT)   53.         53.         53.         53.

 PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+  (AC-FT)     (HR)
       2.      1.83                   0.          0.          0.          0.

 PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     16.58-HR
+   (FEET)     (HR)
   1284.66     1.83              1281.81     1281.29     1281.29     1281.29

                        CUMULATIVE AREA =     .64 SQ MI


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            *            *
 808 KK     *   DET295   *          ROUTE HYDROGRAPH SUM295 THRU DET BASIN 295;
            *            *
            **************

 810 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

 811 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

 812 SA               AREA         .0        .2        .5       1.0       1.6       2.4       2.9

 813 SE          ELEVATION    1276.00   1277.00   1278.00   1279.00   1280.00   1281.00   1282.00

 814 SL          LOW-LEVEL OUTLET
                      ELEVL    1276.00  ELEVATION AT CENTER OF OUTLET
                      CAREA       6.20  CROSS-SECTIONAL AREA
                       COQL        .40  COEFFICIENT
                       EXPL        .50  EXPONENT OF HEAD

 815 SS          SPILLWAY
                       CREL    1279.00  SPILLWAY CREST ELEVATION
                      SPWID      80.00  SPILLWAY WIDTH
                       COQW       2.60  WEIR COEFFICIENT
                       EXPW       1.50  EXPONENT OF HEAD

                                                    ***

                                          COMPUTED STORAGE-ELEVATION DATA

            STORAGE        .00       .05       .36      1.11      2.43      4.42      7.06
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ELEVATION	1276.00	1277.00	1278.00	1279.00	1280.00	1281.00	1282.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	22.61	23.62	24.73	25.95	27.30	28.79	30.46	32.33	34.45
ELEVATION	1276.00	1277.29	1277.41	1277.55	1277.70	1277.88	1278.10	1278.35	1278.64	1279.00
OUTFLOW	36.08	44.98	67.45	109.70	178.04	278.69	417.91	601.94	837.09	1129.52
ELEVATION	1279.04	1279.13	1279.28	1279.50	1279.77	1280.10	1280.48	1280.93	1281.44	1282.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.05	.11	.14	.18	.23	.31	.36	.41	.56
OUTFLOW	.00	19.89	22.61	23.62	24.73	25.95	27.30	28.13	28.79	30.46
ELEVATION	1276.00	1277.00	1277.29	1277.41	1277.55	1277.70	1277.88	1278.00	1278.10	1278.35
STORAGE	.78	1.11	1.15	1.25	1.42	1.69	2.06	2.43	2.58	3.30
OUTFLOW	32.33	34.45	36.08	44.98	67.45	109.70	178.04	247.78	278.69	417.91
ELEVATION	1278.64	1279.00	1279.04	1279.13	1279.28	1279.50	1279.77	1280.00	1280.10	1280.48
STORAGE	4.26	4.42	5.51	7.06						
OUTFLOW	601.94	632.79	837.09	1129.52						
ELEVATION	1280.93	1281.00	1281.44	1282.00						

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 20.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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HYDROGRAPH AT STATION DET295

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1276.0	*	1		0535	68	1.	.0	1276.0	*	1		1110	135	0.	.0	1276.0
1		0005	2	0.	.0	1276.0	*	1		0540	69	0.	.0	1276.0	*	1		1115	136	0.	.0	1276.0
1		0010	3	0.	.0	1276.0	*	1		0545	70	0.	.0	1276.0	*	1		1120	137	0.	.0	1276.0
1		0015	4	0.	.0	1276.0	*	1		0550	71	0.	.0	1276.0	*	1		1125	138	0.	.0	1276.0
1		0020	5	1.	.0	1276.0	*	1		0555	72	0.	.0	1276.0	*	1		1130	139	0.	.0	1276.0
1		0025	6	1.	.0	1276.0	*	1		0600	73	0.	.0	1276.0	*	1		1135	140	0.	.0	1276.0
1		0030	7	1.	.0	1276.1	*	1		0605	74	0.	.0	1276.0	*	1		1140	141	0.	.0	1276.0
1		0035	8	2.	.0	1276.1	*	1		0610	75	0.	.0	1276.0	*	1		1145	142	0.	.0	1276.0
1		0040	9	2.	.0	1276.1	*	1		0615	76	0.	.0	1276.0	*	1		1150	143	0.	.0	1276.0
1		0045	10	3.	.0	1276.2	*	1		0620	77	0.	.0	1276.0	*	1		1155	144	0.	.0	1276.0
1		0050	11	5.	.0	1276.2	*	1		0625	78	0.	.0	1276.0	*	1		1200	145	0.	.0	1276.0
1		0055	12	6.	.0	1276.3	*	1		0630	79	0.	.0	1276.0	*	1		1205	146	0.	.0	1276.0
1		0100	13	12.	.0	1276.6	*	1		0635	80	0.	.0	1276.0	*	1		1210	147	0.	.0	1276.0
1		0105	14	22.	.1	1277.2	*	1		0640	81	0.	.0	1276.0	*	1		1215	148	0.	.0	1276.0
1		0110	15	28.	.3	1278.0	*	1		0645	82	0.	.0	1276.0	*	1		1220	149	0.	.0	1276.0
1		0115	16	33.	.9	1278.7	*	1		0650	83	0.	.0	1276.0	*	1		1225	150	0.	.0	1276.0
1		0120	17	75.	1.5	1279.3	*	1		0655	84	0.	.0	1276.0	*	1		1230	151	0.	.0	1276.0
1		0125	18	138.	1.8	1279.6	*	1		0700	85	0.	.0	1276.0	*	1		1235	152	0.	.0	1276.0
1		0130	19	185.	2.1	1279.8	*	1		0705	86	0.	.0	1276.0	*	1		1240	153	0.	.0	1276.0
1		0135	20	268.	2.5	1280.1	*	1		0710	87	0.	.0	1276.0	*	1		1245	154	0.	.0	1276.0
1		0140	21	388.	3.1	1280.4	*	1		0715	88	0.	.0	1276.0	*	1		1250	155	0.	.0	1276.0
1		0145	22	500.	3.7	1280.7	*	1		0720	89	0.	.0	1276.0	*	1		1255	156	0.	.0	1276.0
1		0150	23	572.	4.1	1280.9	*	1		0725	90	0.	.0	1276.0	*	1		1300	157	0.	.0	1276.0
1		0155	24	599.	4.2	1280.9	*	1		0730	91	0.	.0	1276.0	*	1		1305	158	0.	.0	1276.0
1		0200	25	585.	4.2	1280.9	*	1		0735	92	0.	.0	1276.0	*	1		1310	159	0.	.0	1276.0
1		0205	26	542.	3.9	1280.8	*	1		0740	93	0.	.0	1276.0	*	1		1315	160	0.	.0	1276.0
1		0210	27	481.	3.6	1280.6	*	1		0745	94	0.	.0	1276.0	*	1		1320	161	0.	.0	1276.0
1		0215	28	411.	3.3	1280.5	*	1		0750	95	0.	.0	1276.0	*	1		1325	162	0.	.0	1276.0
1		0220	29	347.	2.9	1280.3	*	1		0755	96	0.	.0	1276.0	*	1		1330	163	0.	.0	1276.0
1		0225	30	294.	2.7	1280.1	*	1		0800	97	0.	.0	1276.0	*	1		1335	164	0.	.0	1276.0
1		0230	31	249.	2.4	1280.0	*	1		0805	98	0.	.0	1276.0	*	1		1340	165	0.	.0	1276.0
1		0235	32	211.	2.2	1279.9	*	1		0810	99	0.	.0	1276.0	*	1		1345	166	0.	.0	1276.0
1		0240	33	181.	2.1	1279.8	*	1		0815	100	0.	.0	1276.0	*	1		1350	167	0.	.0	1276.0
1		0245	34	158.	2.0	1279.7	*	1		0820	101	0.	.0	1276.0	*	1		1355	168	0.	.0	1276.0
1		0250	35	139.	1.8	1279.6	*	1		0825	102	0.	.0	1276.0	*	1		1400	169	0.	.0	1276.0
1		0255	36	122.	1.8	1279.5	*	1		0830	103	0.	.0	1276.0	*	1		1405	170	0.	.0	1276.0
1		0300	37	109.	1.7	1279.5	*	1		0835	104	0.	.0	1276.0	*	1		1410	171	0.	.0	1276.0
1		0305	38	97.	1.6	1279.4	*	1		0840	105	0.	.0	1276.0	*	1		1415	172	0.	.0	1276.0
1		0310	39	85.	1.5	1279.4	*	1		0845	106	0.	.0	1276.0	*	1		1420	173	0.	.0	1276.0
1		0315	40	77.	1.5	1279.3	*	1		0850	107	0.	.0	1276.0	*	1		1425	174	0.	.0	1276.0
1		0320	41	69.	1.4	1279.3	*	1		0855	108	0.	.0	1276.0	*	1		1430	175	0.	.0	1276.0
1		0325	42	63.	1.4	1279.3	*	1		0900	109	0.	.0	1276.0	*	1		1435	176	0.	.0	1276.0
1		0330	43	57.	1.3	1279.2	*	1		0905	110	0.	.0	1276.0	*	1		1440	177	0.	.0	1276.0

1	0335	44	51.	1.3	1279.2	*	1	0910	111	0.	.0	1276.0	*	1	1445	178	0.	.0	1276.0
1	0340	45	45.	1.3	1279.1	*	1	0915	112	0.	.0	1276.0	*	1	1450	179	0.	.0	1276.0
1	0345	46	43.	1.2	1279.1	*	1	0920	113	0.	.0	1276.0	*	1	1455	180	0.	.0	1276.0
1	0350	47	40.	1.2	1279.1	*	1	0925	114	0.	.0	1276.0	*	1	1500	181	0.	.0	1276.0
1	0355	48	38.	1.2	1279.1	*	1	0930	115	0.	.0	1276.0	*	1	1505	182	0.	.0	1276.0
1	0400	49	37.	1.2	1279.0	*	1	0935	116	0.	.0	1276.0	*	1	1510	183	0.	.0	1276.0
1	0405	50	36.	1.1	1279.0	*	1	0940	117	0.	.0	1276.0	*	1	1515	184	0.	.0	1276.0
1	0410	51	35.	1.1	1279.0	*	1	0945	118	0.	.0	1276.0	*	1	1520	185	0.	.0	1276.0
1	0415	52	35.	1.1	1279.0	*	1	0950	119	0.	.0	1276.0	*	1	1525	186	0.	.0	1276.0
1	0420	53	34.	1.1	1279.0	*	1	0955	120	0.	.0	1276.0	*	1	1530	187	0.	.0	1276.0
1	0425	54	34.	1.1	1278.9	*	1	1000	121	0.	.0	1276.0	*	1	1535	188	0.	.0	1276.0
1	0430	55	34.	1.0	1278.9	*	1	1005	122	0.	.0	1276.0	*	1	1540	189	0.	.0	1276.0
1	0435	56	33.	.9	1278.8	*	1	1010	123	0.	.0	1276.0	*	1	1545	190	0.	.0	1276.0
1	0440	57	33.	.8	1278.7	*	1	1015	124	0.	.0	1276.0	*	1	1550	191	0.	.0	1276.0
1	0445	58	32.	.7	1278.5	*	1	1020	125	0.	.0	1276.0	*	1	1555	192	0.	.0	1276.0
1	0450	59	30.	.6	1278.3	*	1	1025	126	0.	.0	1276.0	*	1	1600	193	0.	.0	1276.0
1	0455	60	29.	.4	1278.1	*	1	1030	127	0.	.0	1276.0	*	1	1605	194	0.	.0	1276.0
1	0500	61	26.	.2	1277.7	*	1	1035	128	0.	.0	1276.0	*	1	1610	195	0.	.0	1276.0
1	0505	62	23.	.1	1277.3	*	1	1040	129	0.	.0	1276.0	*	1	1615	196	0.	.0	1276.0
1	0510	63	8.	.0	1276.4	*	1	1045	130	0.	.0	1276.0	*	1	1620	197	0.	.0	1276.0
1	0515	64	1.	.0	1276.1	*	1	1050	131	0.	.0	1276.0	*	1	1625	198	0.	.0	1276.0
1	0520	65	2.	.0	1276.1	*	1	1055	132	0.	.0	1276.0	*	1	1630	199	0.	.0	1276.0
1	0525	66	1.	.0	1276.1	*	1	1100	133	0.	.0	1276.0	*	1	1635	200	0.	.0	1276.0
1	0530	67	1.	.0	1276.0	*	1	1105	134	0.	.0	1276.0	*						
						*							*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	16.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 599.	1.92		108.	39.	39.	39.
		(INCHES)	1.538	1.538	1.538	1.538
		(AC-FT)	54.	54.	54.	54.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (AC-FT)	(HR)				
4.	1.92	1.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (FEET)	(HR)				
1280.92	1.92	1278.32	1276.84	1276.84	1276.84

CUMULATIVE AREA = .65 SQ MI

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              *            *
858 KK        *   DET300   *          ROUTE HYDROGRAPH SUM300 THRU DET BASIN 300;
              *            *
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860 KO            OUTPUT CONTROL VARIABLES
                        IPRNT          1  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE

                HYDROGRAPH ROUTING DATA

861 RS            STORAGE ROUTING
                        NSTPS          1  NUMBER OF SUBREACHES
                         ITYP       STOR  TYPE OF INITIAL CONDITION
                        RSVRIC      -1.00  INITIAL CONDITION
                             X        .00 WORKING R AND D COEFFICIENT

862 SA                  AREA         .0       .7       .9      1.3      2.0      2.6      3.5

863 SE            ELEVATION     1271.00  1272.00  1273.00  1274.00  1275.00  1276.00  1277.00

864 SL            LOW-LEVEL OUTLET
                        ELEVL     1271.00  ELEVATION AT CENTER OF OUTLET
                        CAREA        3.10  CROSS-SECTIONAL AREA
                         COQL         .40  COEFFICIENT
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                    EXPL        .50  EXPONENT OF HEAD

865 SS        SPILLWAY
                    CREL    1274.50  SPILLWAY CREST ELEVATION
                   SPWID     140.00  SPILLWAY WIDTH
                    COQW       2.60  WEIR COEFFICIENT
                    EXPW       1.50  EXPONENT OF HEAD
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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.22	.99	2.07	3.72	6.04	9.10
ELEVATION	1271.00	1272.00	1273.00	1274.00	1275.00	1276.00	1277.00

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	9.66	10.28	10.98	11.79	12.72	13.81	15.11	16.68	18.61
ELEVATION	1271.00	1271.94	1272.07	1272.22	1272.40	1272.64	1272.93	1273.31	1273.81	1274.50
OUTFLOW	20.23	30.83	58.90	113.01	201.75	333.57	517.12	760.82	1073.35	1463.20
ELEVATION	1274.53	1274.60	1274.73	1274.90	1275.13	1275.40	1275.73	1276.10	1276.53	1277.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.18	.22	.27	.37	.50	.68	.93	.99	1.28
OUTFLOW	.00	9.66	9.94	10.28	10.98	11.79	12.72	13.81	14.06	15.11
ELEVATION	1271.00	1271.94	1272.00	1272.07	1272.22	1272.40	1272.64	1272.93	1273.00	1273.31
STORAGE	1.83	2.07	2.81	2.85	2.98	3.20	3.53	3.72	3.99	4.59
OUTFLOW	16.68	17.22	18.61	20.23	30.83	58.90	113.01	148.58	201.75	333.57
ELEVATION	1273.81	1274.00	1274.50	1274.53	1274.60	1274.73	1274.90	1275.00	1275.13	1275.40
STORAGE	5.35	6.04	6.31	7.53	9.10					
OUTFLOW	517.12	690.95	760.82	1073.35	1463.20					
ELEVATION	1275.73	1276.00	1276.10	1276.53	1277.00					

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HYDROGRAPH AT STATION DET300

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1271.0	*	1		0535	68	18.	2.5	1274.3	*	1		1110	135	0.	.0	1271.0
1		0005	2	0.	.0	1271.0	*	1		0540	69	18.	2.4	1274.2	*	1		1115	136	0.	.0	1271.0
1		0010	3	1.	.0	1271.0	*	1		0545	70	18.	2.2	1274.1	*	1		1120	137	0.	.0	1271.0
1		0015	4	1.	.0	1271.1	*	1		0550	71	17.	2.1	1274.0	*	1		1125	138	0.	.0	1271.0
1		0020	5	2.	.0	1271.2	*	1		0555	72	17.	2.0	1273.9	*	1		1130	139	0.	.0	1271.0
1		0025	6	2.	.0	1271.2	*	1		0600	73	17.	1.9	1273.9	*	1		1135	140	0.	.0	1271.0
1		0030	7	3.	.1	1271.3	*	1		0605	74	17.	1.8	1273.8	*	1		1140	141	0.	.0	1271.0
1		0035	8	4.	.1	1271.4	*	1		0610	75	16.	1.7	1273.7	*	1		1145	142	0.	.0	1271.0
1		0040	9	5.	.1	1271.5	*	1		0615	76	16.	1.6	1273.6	*	1		1150	143	0.	.0	1271.0
1		0045	10	8.	.1	1271.8	*	1		0620	77	16.	1.4	1273.5	*	1		1155	144	0.	.0	1271.0
1		0050	11	10.	.2	1272.0	*	1		0625	78	15.	1.3	1273.4	*	1		1200	145	0.	.0	1271.0
1		0055	12	10.	.3	1272.1	*	1		0630	79	15.	1.2	1273.3	*	1		1205	146	0.	.0	1271.0
1		0100	13	12.	.5	1272.3	*	1		0635	80	15.	1.1	1273.2	*	1		1210	147	0.	.0	1271.0
1		0105	14	13.	.8	1272.8	*	1		0640	81	14.	1.0	1273.1	*	1		1215	148	0.	.0	1271.0
1		0110	15	16.	1.6	1273.6	*	1		0645	82	14.	.9	1272.9	*	1		1220	149	0.	.0	1271.0
1		0115	16	19.	2.8	1274.5	*	1		0650	83	13.	.8	1272.8	*	1		1225	150	0.	.0	1271.0
1		0120	17	140.	3.7	1275.0	*	1		0655	84	13.	.8	1272.7	*	1		1230	151	0.	.0	1271.0
1		0125	18	219.	4.1	1275.2	*	1		0700	85	13.	.7	1272.6	*	1		1235	152	0.	.0	1271.0
1		0130	19	259.	4.2	1275.2	*	1		0705	86	12.	.6	1272.5	*	1		1240	153	0.	.0	1271.0
1		0135	20	295.	4.4	1275.3	*	1		0710	87	12.	.5	1272.4	*	1		1245	154	0.	.0	1271.0
1		0140	21	358.	4.7	1275.4	*	1		0715	88	11.	.4	1272.3	*	1		1250	155	0.	.0	1271.0
1		0145	22	454.	5.1	1275.6	*	1		0720	89	11.	.3	1272.2	*	1		1255	156	0.	.0	1271.0
1		0150	23	545.	5.5	1275.8	*	1		0725	90	10.	.3	1272.1	*	1		1300	157	0.	.0	1271.0
1		0155	24	604.	5.7	1275.9	*	1		0730	91	10.	.2	1272.0	*	1		1305	158	0.	.0	1271.0
1		0200	25	619.	5.7	1275.9	*	1		0735	92	8.	.1	1271.7	*	1		1310	159	0.	.0	1271.0
1		0205	26	597.	5.7	1275.9	*	1		0740	93	5.	.1	1271.5	*	1		1315	160	0.	.0	1271.0
1		0210	27	549.	5.5	1275.8	*	1		0745	94	4.	.1	1271.4	*	1		1320	161	0.	.0	1271.0
1		0215	28	486.	5.2	1275.7	*	1		0750	95	3.	.0	1271.2	*	1		1325	162	0.	.0	1271.0
1		0220	29	417.	4.9	1275.6	*	1		0755	96	2.	.0	1271.2	*	1		1330	163	0.	.0	1271.0
1		0225	30	354.	4.7	1275.4	*	1		0800	97	1.	.0	1271.1	*	1		1335	164	0.	.0	1271.0
1		0230	31	301.	4.4	1275.3	*	1		0805	98	1.	.0	1271.1	*	1		1340	165	0.	.0	1271.0
1		0235	32	256.	4.2	1275.2	*	1		0810	99	1.	.0	1271.1	*	1		1345	166	0.	.0	1271.0
1		0240	33	219.	4.1	1275.2	*	1		0815	100	0.	.0	1271.0	*	1		1350	167	0.	.0	1271.0
1		0245	34	189.	3.9	1275.1	*	1		0820	101	0.	.0	1271.0	*	1		1355	168	0.	.0	1271.0

```
  1    0250  35    165.    3.8  1275.0 *  1    0825 102    0.     .0  1271.0 *  1    1400 169    0.     .0  1271.0
  1    0255  36    144.    3.7  1275.0 *  1    0830 103    0.     .0  1271.0 *  1    1405 170    0.     .0  1271.0
  1    0300  37    128.    3.6  1274.9 *  1    0835 104    0.     .0  1271.0 *  1    1410 171    0.     .0  1271.0
  1    0305  38    114.    3.5  1274.9 *  1    0840 105    0.     .0  1271.0 *  1    1415 172    0.     .0  1271.0
  1    0310  39    103.    3.5  1274.9 *  1    0845 106    0.     .0  1271.0 *  1    1420 173    0.     .0  1271.0
  1    0315  40     92.    3.4  1274.8 *  1    0850 107    0.     .0  1271.0 *  1    1425 174    0.     .0  1271.0
  1    0320  41     82.    3.3  1274.8 *  1    0855 108    0.     .0  1271.0 *  1    1430 175    0.     .0  1271.0
  1    0325  42     74.    3.3  1274.8 *  1    0900 109    0.     .0  1271.0 *  1    1435 176    0.     .0  1271.0
  1    0330  43     67.    3.2  1274.8 *  1    0905 110    0.     .0  1271.0 *  1    1440 177    0.     .0  1271.0
  1    0335  44     60.    3.2  1274.7 *  1    0910 111    0.     .0  1271.0 *  1    1445 178    0.     .0  1271.0
  1    0340  45     55.    3.2  1274.7 *  1    0915 112    0.     .0  1271.0 *  1    1450 179    0.     .0  1271.0
  1    0345  46     50.    3.1  1274.7 *  1    0920 113    0.     .0  1271.0 *  1    1455 180    0.     .0  1271.0
  1    0350  47     46.    3.1  1274.7 *  1    0925 114    0.     .0  1271.0 *  1    1500 181    0.     .0  1271.0
  1    0355  48     43.    3.1  1274.7 *  1    0930 115    0.     .0  1271.0 *  1    1505 182    0.     .0  1271.0
  1    0400  49     40.    3.1  1274.6 *  1    0935 116    0.     .0  1271.0 *  1    1510 183    0.     .0  1271.0
  1    0405  50     39.    3.0  1274.6 *  1    0940 117    0.     .0  1271.0 *  1    1515 184    0.     .0  1271.0
  1    0410  51     37.    3.0  1274.6 *  1    0945 118    0.     .0  1271.0 *  1    1520 185    0.     .0  1271.0
  1    0415  52     36.    3.0  1274.6 *  1    0950 119    0.     .0  1271.0 *  1    1525 186    0.     .0  1271.0
  1    0420  53     35.    3.0  1274.6 *  1    0955 120    0.     .0  1271.0 *  1    1530 187    0.     .0  1271.0
  1    0425  54     35.    3.0  1274.6 *  1    1000 121    0.     .0  1271.0 *  1    1535 188    0.     .0  1271.0
  1    0430  55     34.    3.0  1274.6 *  1    1005 122    0.     .0  1271.0 *  1    1540 189    0.     .0  1271.0
  1    0435  56     34.    3.0  1274.6 *  1    1010 123    0.     .0  1271.0 *  1    1545 190    0.     .0  1271.0
  1    0440  57     34.    3.0  1274.6 *  1    1015 124    0.     .0  1271.0 *  1    1550 191    0.     .0  1271.0
  1    0445  58     33.    3.0  1274.6 *  1    1020 125    0.     .0  1271.0 *  1    1555 192    0.     .0  1271.0
  1    0450  59     33.    3.0  1274.6 *  1    1025 126    0.     .0  1271.0 *  1    1600 193    0.     .0  1271.0
  1    0455  60     32.    3.0  1274.6 *  1    1030 127    0.     .0  1271.0 *  1    1605 194    0.     .0  1271.0
  1    0500  61     31.    3.0  1274.6 *  1    1035 128    0.     .0  1271.0 *  1    1610 195    0.     .0  1271.0
  1    0505  62     29.    3.0  1274.6 *  1    1040 129    0.     .0  1271.0 *  1    1615 196    0.     .0  1271.0
  1    0510  63     27.    2.9  1274.6 *  1    1045 130    0.     .0  1271.0 *  1    1620 197    0.     .0  1271.0
  1    0515  64     22.    2.9  1274.5 *  1    1050 131    0.     .0  1271.0 *  1    1625 198    0.     .0  1271.0
  1    0520  65     19.    2.8  1274.5 *  1    1055 132    0.     .0  1271.0 *  1    1630 199    0.     .0  1271.0
  1    0525  66     18.    2.7  1274.4 *  1    1100 133    0.     .0  1271.0 *  1    1635 200    0.     .0  1271.0
  1    0530  67     18.    2.6  1274.3 *  1    1105 134    0.     .0  1271.0 *
                                         *                                    *
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 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     16.58-HR
+  (CFS)       (HR)
                          (CFS)
+    619.      2.00                  125.        46.         46.         46.
                        (INCHES)    1.572       1.598       1.598       1.598
                         (AC-FT)     62.         63.         63.         63.

 PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                      6-HR       24-HR       72-HR     16.58-HR
+ (AC-FT)      (HR)
      6.       2.00                    3.          1.          1.          1.

 PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                      6-HR       24-HR       72-HR     16.58-HR
+  (FEET)      (HR)
  1275.89      2.00                1274.53     1272.36     1272.36     1272.36

                        CUMULATIVE AREA =     .74 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


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          *            *
887 KK    *    DET330  *          ROUTE HYDROGRAPH SUM330 THRU DET BASIN 330;
          *            *
          **************

891 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          1  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

                HYDROGRAPH ROUTING DATA

892 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT
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893 SA	AREA	.0	1.2	4.0	8.7	9.7	10.3	10.9
894 SE	ELEVATION	1264.00	1265.00	1266.00	1267.00	1268.00	1269.00	1270.00
895 SQ	DISCHARGE	0.	80.	220.	450.	830.	1300.	2000.

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COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	.40	2.87	9.08	18.27	28.26	38.85
ELEVATION	1264.00	1265.00	1266.00	1267.00	1268.00	1269.00	1270.00

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HYDROGRAPH AT STATION DET330

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DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	.0	1264.0	1		0535	68	89.	.6	1265.1	1		1110	135	0.	.0	1264.0
1		0005	2	0.	.0	1264.0	1		0540	69	85.	.5	1265.0	1		1115	136	0.	.0	1264.0
1		0010	3	2.	.0	1264.0	1		0545	70	82.	.4	1265.0	1		1120	137	0.	.0	1264.0
1		0015	4	3.	.0	1264.0	1		0550	71	79.	.4	1265.0	1		1125	138	0.	.0	1264.0
1		0020	5	5.	.0	1264.1	1		0555	72	73.	.4	1264.9	1		1130	139	0.	.0	1264.0
1		0025	6	7.	.0	1264.1	1		0600	73	71.	.4	1264.9	1		1135	140	0.	.0	1264.0
1		0030	7	9.	.0	1264.1	1		0605	74	69.	.3	1264.9	1		1140	141	0.	.0	1264.0
1		0035	8	11.	.1	1264.1	1		0610	75	67.	.3	1264.8	1		1145	142	0.	.0	1264.0
1		0040	9	16.	.1	1264.2	1		0615	76	66.	.3	1264.8	1		1150	143	0.	.0	1264.0
1		0045	10	23.	.1	1264.3	1		0620	77	64.	.3	1264.8	1		1155	144	0.	.0	1264.0
1		0050	11	31.	.2	1264.4	1		0625	78	63.	.3	1264.8	1		1200	145	0.	.0	1264.0
1		0055	12	42.	.2	1264.5	1		0630	79	62.	.3	1264.8	1		1205	146	0.	.0	1264.0
1		0100	13	62.	.3	1264.8	1		0635	80	61.	.3	1264.8	1		1210	147	0.	.0	1264.0
1		0105	14	96.	.7	1265.1	1		0640	81	60.	.3	1264.8	1		1215	148	0.	.0	1264.0
1		0110	15	146.	1.6	1265.5	1		0645	82	59.	.3	1264.7	1		1220	149	0.	.0	1264.0
1		0115	16	214.	2.8	1266.0	1		0650	83	59.	.3	1264.7	1		1225	150	0.	.0	1264.0
1		0120	17	275.	4.4	1266.2	1		0655	84	58.	.3	1264.7	1		1230	151	0.	.0	1264.0
1		0125	18	355.	6.5	1266.6	1		0700	85	57.	.3	1264.7	1		1235	152	0.	.0	1264.0
1		0130	19	443.	8.9	1267.0	1		0705	86	56.	.3	1264.7	1		1240	153	0.	.0	1264.0
1		0135	20	546.	11.4	1267.3	1		0710	87	56.	.3	1264.7	1		1245	154	0.	.0	1264.0
1		0140	21	656.	14.1	1267.5	1		0715	88	55.	.3	1264.7	1		1250	155	0.	.0	1264.0
1		0145	22	778.	17.0	1267.9	1		0720	89	54.	.3	1264.7	1		1255	156	0.	.0	1264.0
1		0150	23	924.	20.3	1268.2	1		0725	90	54.	.3	1264.7	1		1300	157	0.	.0	1264.0
1		0155	24	1082.	23.6	1268.5	1		0730	91	53.	.3	1264.7	1		1305	158	0.	.0	1264.0
1		0200	25	1232.	26.8	1268.9	1		0735	92	51.	.3	1264.6	1		1310	159	0.	.0	1264.0
1		0205	26	1385.	29.5	1269.1	1		0740	93	49.	.2	1264.6	1		1315	160	0.	.0	1264.0
1		0210	27	1515.	31.5	1269.3	1		0745	94	47.	.2	1264.6	1		1320	161	0.	.0	1264.0
1		0215	28	1588.	32.6	1269.4	1		0750	95	46.	.2	1264.6	1		1325	162	0.	.0	1264.0
1		0220	29	1608.	32.9	1269.4	1		0755	96	44.	.2	1264.6	1		1330	163	0.	.0	1264.0
1		0225	30	1583.	32.5	1269.4	1		0800	97	44.	.2	1264.5	1		1335	164	0.	.0	1264.0
1		0230	31	1522.	31.6	1269.3	1		0805	98	43.	.2	1264.5	1		1340	165	0.	.0	1264.0
1		0235	32	1435.	30.3	1269.2	1		0810	99	43.	.2	1264.5	1		1345	166	0.	.0	1264.0
1		0240	33	1332.	28.7	1269.0	1		0815	100	42.	.2	1264.5	1		1350	167	0.	.0	1264.0
1		0245	34	1240.	27.0	1268.9	1		0820	101	42.	.2	1264.5	1		1355	168	0.	.0	1264.0
1		0250	35	1150.	25.1	1268.7	1		0825	102	42.	.2	1264.5	1		1400	169	0.	.0	1264.0
1		0255	36	1055.	23.1	1268.5	1		0830	103	42.	.2	1264.5	1		1405	170	0.	.0	1264.0
1		0300	37	961.	21.1	1268.3	1		0835	104	41.	.2	1264.5	1		1410	171	0.	.0	1264.0
1		0305	38	871.	19.1	1268.1	1		0840	105	41.	.2	1264.5	1		1415	172	0.	.0	1264.0
1		0310	39	792.	17.3	1267.9	1		0845	106	41.	.2	1264.5	1		1420	173	0.	.0	1264.0
1		0315	40	721.	15.6	1267.7	1		0850	107	41.	.2	1264.5	1		1425	174	0.	.0	1264.0
1		0320	41	654.	14.0	1267.5	1		0855	108	41.	.2	1264.5	1		1430	175	0.	.0	1264.0
1		0325	42	593.	12.5	1267.4	1		0900	109	40.	.2	1264.5	1		1435	176	0.	.0	1264.0
1		0330	43	538.	11.2	1267.2	1		0905	110	40.	.2	1264.5	1		1440	177	0.	.0	1264.0
1		0335	44	489.	10.0	1267.1	1		0910	111	40.	.2	1264.5	1		1445	178	0.	.0	1264.0
1		0340	45	446.	9.0	1267.0	1		0915	112	39.	.2	1264.5	1		1450	179	0.	.0	1264.0
1		0345	46	411.	8.0	1266.8	1		0920	113	39.	.2	1264.5	1		1455	180	0.	.0	1264.0
1		0350	47	379.	7.2	1266.7	1		0925	114	39.	.2	1264.5	1		1500	181	0.	.0	1264.0
1		0355	48	350.	6.4	1266.6	1		0930	115	38.	.2	1264.5	1		1505	182	0.	.0	1264.0
1		0400	49	324.	5.7	1266.5	1		0935	116	37.	.2	1264.5	1		1510	183	0.	.0	1264.0
1		0405	50	300.	5.0	1266.3	1		0940	117	36.	.2	1264.4	1		1515	184	0.	.0	1264.0
1		0410	51	279.	4.5	1266.3	1		0945	118	35.	.2	1264.4	1		1520	185	0.	.0	1264.0
1		0415	52	260.	4.0	1266.2	1		0950	119	33.	.2	1264.4	1		1525	186	0.	.0	1264.0
1		0420	53	243.	3.5	1266.1	1		0955	120	31.	.2	1264.4	1		1530	187	0.	.0	1264.0
1		0425	54	228.	3.1	1266.0	1		1000	121	27.	.1	1264.3	1		1535	188	0.	.0	1264.0
1		0430	55	211.	2.7	1265.9	1		1005	122	22.	.1	1264.3	1		1540	189	0.	.0	1264.0
1		0435	56	192.	2.4	1265.8	1		1010	123	16.	.1	1264.2	1		1545	190	0.	.0	1264.0
1		0440	57	176.	2.1	1265.7	1		1015	124	11.	.1	1264.1	1		1550	191	0.	.0	1264.0
1		0445	58	162.	1.8	1265.6	1		1020	125	6.	.0	1264.1	1		1555	192	0.	.0	1264.0

1	0450	59	150.	1.6	1265.5	*	1	1025	126	4.	.0	1264.0	*	1	1600	193	0.	.0	1264.0
1	0455	60	140.	1.5	1265.4	*	1	1030	127	2.	.0	1264.0	*	1	1605	194	0.	.0	1264.0
1	0500	61	131.	1.3	1265.4	*	1	1035	128	1.	.0	1264.0	*	1	1610	195	0.	.0	1264.0
1	0505	62	124.	1.2	1265.3	*	1	1040	129	1.	.0	1264.0	*	1	1615	196	0.	.0	1264.0
1	0510	63	117.	1.1	1265.3	*	1	1045	130	0.	.0	1264.0	*	1	1620	197	0.	.0	1264.0
1	0515	64	111.	.9	1265.2	*	1	1050	131	0.	.0	1264.0	*	1	1625	198	0.	.0	1264.0
1	0520	65	104.	.8	1265.2	*	1	1055	132	0.	.0	1264.0	*	1	1630	199	0.	.0	1264.0
1	0525	66	98.	.7	1265.1	*	1	1100	133	0.	.0	1264.0	*	1	1635	200	0.	.0	1264.0
1	0530	67	93.	.6	1265.1	*	1	1105	134	0.	.0	1264.0	*						
						*							*						

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	16.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1608.	2.33		473.	180.	180.	180.
		(INCHES)	1.490	1.569	1.569	1.569
		(AC-FT)	234.	247.	247.	247.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (AC-FT)	(HR)				
33.	2.33	9.	3.	3.	3.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	16.58-HR
+ (FEET)	(HR)				
1269.44	2.33	1266.50	1265.02	1265.02	1265.02

CUMULATIVE AREA = 2.95 SQ MI

1

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	SUBA	811.	1.92	133.	48.	48.	.87		
+	HYDROGRAPH AT	SUBB2	132.	1.75	24.	9.	9.	.16		
+	2 COMBINED AT	SUMAB2	925.	1.92	156.	57.	57.	1.03		
+	ROUTED TO	RCH16	921.	1.92	157.	57.	57.	1.03		
+	HYDROGRAPH AT	SUB05	65.	1.25	6.	2.	2.	.03		
+	HYDROGRAPH AT	SUB10	8.	1.50	2.	1.	1.	.01		
+	HYDROGRAPH AT	SUB15	23.	1.33	3.	1.	1.	.01		
+	4 COMBINED AT	SUM16	941.	1.92	167.	60.	60.	1.08		
+	HYDROGRAPH AT	SUBB1	284.	1.50	28.	10.	10.	.19		
+	ROUTED TO	RCH26	281.	1.58	28.	10.	10.	.19		
+	HYDROGRAPH AT	SUB20	28.	1.25	2.	1.	1.	.01		
+	HYDROGRAPH AT	SUB25	19.	1.25	2.	1.	1.	.01		
+	3 COMBINED AT	SUM26	301.	1.50	32.	11.	11.	.21		

	HYDROGRAPH AT								
+		SUB30	56.	1.25	5.	2.	2.	.03	
	ROUTED TO								
+		RCH35	55.	1.33	5.	2.	2.	.03	
	HYDROGRAPH AT								
+		SUB35	60.	1.25	5.	2.	2.	.02	
	2 COMBINED AT								
+		SUM35	113.	1.25	10.	4.	4.	.05	
	ROUTED TO								
+		RCH40	106.	1.33	10.	4.	4.	.05	
+									1297.07 1.33
	HYDROGRAPH AT								
+		SUB40	26.	1.33	2.	1.	1.	.01	
	3 COMBINED AT								
+		SUM40	395.	1.50	44.	16.	16.	.27	
	ROUTED TO								
+		DET40	371.	1.58	44.	16.	16.	.27	
+									1297.89 1.58
	ROUTED TO								
+		RCH45	364.	1.58	44.	16.	16.	.27	
+									1291.38 1.58
	HYDROGRAPH AT								
+		SUB45	28.	1.25	2.	1.	1.	.01	
	2 COMBINED AT								
+		SUM45	368.	1.58	45.	16.	16.	.28	
	ROUTED TO								
+		DET45	365.	1.67	45.	16.	16.	.28	
+									1292.78 1.67
	ROUTED TO								
+		RCH50	363.	1.67	45.	16.	16.	.28	
+									1287.75 1.67
	HYDROGRAPH AT								
+		SUB50	19.	1.25	2.	1.	1.	.01	
	HYDROGRAPH AT								
+		SUB55	28.	1.33	3.	1.	1.	.01	
	HYDROGRAPH AT								
+		SUB60	59.	1.33	6.	2.	2.	.03	
	5 COMBINED AT								
+		SUM50	1239.	1.83	223.	81.	81.	1.42	
	ROUTED TO								
+		RCH65	1222.	1.92	223.	81.	81.	1.42	
+									1284.10 1.92
	HYDROGRAPH AT								
+		SUB65	22.	1.42	3.	1.	1.	.02	
	HYDROGRAPH AT								
+		SUB70	28.	1.33	3.	1.	1.	.01	
	3 COMBINED AT								
+		SUM65	1236.	1.92	229.	83.	83.	1.45	
	ROUTED TO								
+		RCH80	1219.	1.92	229.	83.	83.	1.45	
+									1278.41 1.92
	HYDROGRAPH AT								
+		SUB75	22.	1.25	2.	1.	1.	.01	
	HYDROGRAPH AT								
+		SUB80	25.	1.33	2.	1.	1.	.01	
	3 COMBINED AT								

+		SUM80	1225.	1.92	233.	84.	84.	1.47	
	ROUTED TO								
+		RCH85	1224.	2.00	233.	84.	84.	1.47	
+									1276.39 2.00
	HYDROGRAPH AT								
+		SUB85	24.	1.33	2.	1.	1.	.01	
	HYDROGRAPH AT								
+		SUB90	25.	1.33	3.	1.	1.	.02	
	HYDROGRAPH AT								
+		SUB95	25.	1.25	2.	1.	1.	.01	
	4 COMBINED AT								
+		SUM85	1237.	2.00	241.	87.	87.	1.51	
	HYDROGRAPH AT								
+		SUB100	42.	1.33	4.	1.	1.	.02	
	HYDROGRAPH AT								
+		SUB105	27.	1.25	3.	1.	1.	.01	
	3 COMBINED AT								
+		SUM100	1245.	2.00	247.	90.	90.	1.55	
	HYDROGRAPH AT								
+		SUB110	71.	1.17	5.	2.	2.	.03	
	ROUTED TO								
+		RCH115	71.	1.25	5.	2.	2.	.03	
	HYDROGRAPH AT								
+		SUB115	69.	1.25	5.	2.	2.	.03	
	HYDROGRAPH AT								
+		SUB120	49.	1.25	4.	1.	1.	.02	
	ROUTED TO								
+		RCH115	48.	1.25	4.	1.	1.	.02	
	3 COMBINED AT								
+		SUM115	187.	1.25	14.	5.	5.	.07	
	HYDROGRAPH AT								
+		SUB125	26.	1.33	3.	1.	1.	.02	
	HYDROGRAPH AT								
+		SUB130	66.	1.25	6.	2.	2.	.03	
	ROUTED TO								
+		RCH135	64.	1.33	6.	2.	2.	.03	
	HYDROGRAPH AT								
+		SUB135	56.	1.25	4.	2.	2.	.02	
	2 COMBINED AT								
+		SUM135	118.	1.25	10.	4.	4.	.05	
	ROUTED TO								
+		RCH140	116.	1.33	10.	4.	4.	.05	
	HYDROGRAPH AT								
+		SUB140	65.	1.33	8.	3.	3.	.04	
	2 COMBINED AT								
+		SUM140	181.	1.33	18.	7.	7.	.09	
	DIVERSION TO								
+		DVT141	90.	1.33	9.	3.	3.	.09	
	HYDROGRAPH AT								
+		DVT140	90.	1.33	9.	3.	3.	.09	
	ROUTED TO								
+		RCH125	81.	1.42	9.	3.	3.	.09	
+									1279.43 1.42
	3 COMBINED AT								

+		SUM125	261.	1.33	26.	10.	10.	.18		
	HYDROGRAPH AT									
+		SUB145	25.	1.25	2.	1.	1.	.01		
	ROUTED TO									
+		DET145	14.	1.42	2.	1.	1.	.01		
+									1297.92	1.42
	ROUTED TO									
+		RCH150	13.	1.58	2.	1.	1.	.01		
+									1296.65	1.58
	HYDROGRAPH AT									
+		SUB150	36.	1.25	2.	1.	1.	.01		
	HYDROGRAPH AT									
+		SUB155	56.	1.25	4.	2.	2.	.02		
	ROUTED TO									
+		RCH160	54.	1.25	4.	2.	2.	.02		
	HYDROGRAPH AT									
+		SUB160	53.	1.25	4.	2.	2.	.02		
	2 COMBINED AT									
+		SUM160	107.	1.25	9.	3.	3.	.04		
	HYDROGRAPH AT									
+		SUB165	70.	1.33	7.	3.	3.	.04		
	ROUTED TO									
+		RCH170	69.	1.33	7.	3.	3.	.04		
	HYDROGRAPH AT									
+		SUB170	35.	1.25	3.	1.	1.	.01		
	2 COMBINED AT									
+		SUM170	97.	1.33	10.	3.	3.	.05		
	4 COMBINED AT									
+		SUM150	247.	1.25	22.	8.	8.	.12		
	ROUTED TO									
+		DET150	102.	1.58	22.	8.	8.	.12		
+									1298.82	1.58
	ROUTED TO									
+		RCH175	99.	1.75	22.	8.	8.	.12		
+									1295.18	1.75
	HYDROGRAPH AT									
+		SUB175	27.	1.42	4.	1.	1.	.02		
	HYDROGRAPH AT									
+		SUB180	52.	1.25	4.	2.	2.	.02		
	3 COMBINED AT									
+		SUM175	135.	1.50	30.	11.	11.	.16		
	ROUTED TO									
+		DET175	98.	2.08	30.	11.	11.	.16		
+									1293.69	2.08
	HYDROGRAPH AT									
+		SUB185	52.	1.33	6.	2.	2.	.03		
	ROUTED TO									
+		DET185	19.	1.75	6.	2.	2.	.03		
+									1293.76	1.75
	2 COMBINED AT									
+		SUM186	117.	2.08	36.	13.	13.	.19		
	ROUTED TO									
+		RCH190	115.	2.08	36.	13.	13.	.19		
+									1290.52	2.08
	HYDROGRAPH AT									
+		SUB190	67.	1.25	5.	2.	2.	.03		

	HYDROGRAPH AT								
+		SUB195	27.	1.17	2.	1.	1.	.01	
	HYDROGRAPH AT								
+		SUB196	52.	1.50	9.	3.	3.	.06	
	4 COMBINED AT								
+		SUM190	149.	1.33	51.	18.	18.	.29	
	ROUTED TO								
+		DET190	72.	2.92	50.	18.	18.	.29	
+									1285.00 2.92
	HYDROGRAPH AT								
+		SUB200	29.	1.25	3.	1.	1.	.01	
	HYDROGRAPH AT								
+		DVT141	90.	1.33	9.	3.	3.	.00	
	3 COMBINED AT								
+		SUM200	156.	1.33	61.	23.	23.	.30	
	ROUTED TO								
+		DET200	65.	3.75	50.	23.	23.	.30	
+									1278.22 3.75
	2 COMBINED AT								
+		SUM125	295.	1.33	74.	32.	32.	.48	
	ROUTED TO								
+		DET125	258.	1.42	69.	32.	32.	.48	
+									1274.72 1.42
	HYDROGRAPH AT								
+		SUB205	22.	1.25	2.	1.	1.	.01	
	3 COMBINED AT								
+		SUM100	1338.	1.92	317.	122.	122.	2.04	
	ROUTED TO								
+		DET100	1297.	2.08	317.	122.	122.	2.04	
+									1272.84 2.08
	ROUTED TO								
+		RCH210	1299.	2.08	317.	122.	122.	2.04	
+									1268.77 2.08
	HYDROGRAPH AT								
+		SUB210	28.	1.17	1.	1.	1.	.01	
	2 COMBINED AT								
+		SUM210	1299.	2.08	319.	123.	123.	2.05	
	HYDROGRAPH AT								
+		SUB215	71.	1.25	6.	2.	2.	.03	
	HYDROGRAPH AT								
+		SUB220	22.	1.42	2.	1.	1.	.01	
	HYDROGRAPH AT								
+		SUB225	64.	1.17	3.	1.	1.	.02	
	4 COMBINED AT								
+		SUM220	1305.	2.08	329.	127.	127.	2.11	
	ROUTED TO								
+		DET220	1186.	2.25	329.	127.	127.	2.11	
+									1269.55 2.25
	HYDROGRAPH AT								
+		SUB230	57.	1.33	7.	3.	3.	.04	
	HYDROGRAPH AT								
+		SUB235	12.	1.33	1.	0.	0.	.01	
	ROUTED TO								
+		DET235	3.	1.75	1.	0.	0.	.01	
+									1293.54 1.75

	HYDROGRAPH AT									
+		SUB240	81.	1.33	9.	3.	3.	.05		
	HYDROGRAPH AT									
+		SUB245	17.	1.42	2.	1.	1.	.01		
	4 COMBINED AT									
+		SUM245	157.	1.33	20.	7.	7.	.10		
	ROUTED TO									
+		DET245	134.	1.50	20.	7.	7.	.10		
+									1292.81	1.50
	ROUTED TO									
+		RCH250	119.	1.67	20.	7.	7.	.10		
+									1287.07	1.67
	HYDROGRAPH AT									
+		SUB250	42.	1.33	4.	2.	2.	.03		
	HYDROGRAPH AT									
+		SUBC1	36.	1.50	4.	2.	2.	.03		
	ROUTED TO									
+		RCHC2	36.	1.58	4.	2.	2.	.03		
	HYDROGRAPH AT									
+		SUBC2	30.	1.58	4.	2.	2.	.03		
	2 COMBINED AT									
+		SUMC2	66.	1.58	9.	3.	3.	.05		
	ROUTED TO									
+		RCHC3	64.	1.58	9.	3.	3.	.05		
	HYDROGRAPH AT									
+		SUBC3	87.	1.58	10.	4.	4.	.06		
	2 COMBINED AT									
+		SUMC3	151.	1.58	19.	7.	7.	.12		
	ROUTED TO									
+		RCHC4	148.	1.58	19.	7.	7.	.12		
	HYDROGRAPH AT									
+		SUBC4	72.	1.58	9.	3.	3.	.06		
	2 COMBINED AT									
+		SUMC4	220.	1.58	28.	10.	10.	.18		
	ROUTED TO									
+		RCHD1	219.	1.58	28.	10.	10.	.18		
	HYDROGRAPH AT									
+		SUBD1	41.	1.50	5.	2.	2.	.03		
	2 COMBINED AT									
+		SUMD1	258.	1.58	33.	12.	12.	.21		
	ROUTED TO									
+		RCHD2	255.	1.58	33.	12.	12.	.21		
	HYDROGRAPH AT									
+		SUBD2	65.	1.58	9.	3.	3.	.05		
	2 COMBINED AT									
+		SUMD2	320.	1.58	41.	15.	15.	.27		
	ROUTED TO									
+		RCHD3	317.	1.58	41.	15.	15.	.27		
	HYDROGRAPH AT									
+		SUBD3	93.	1.58	13.	5.	5.	.08		
	2 COMBINED AT									
+		SUMD3	409.	1.58	54.	20.	20.	.35		
	HYDROGRAPH AT									
+		SUBD4	109.	1.58	14.	5.	5.	.09		

	ROUTED TO								
+		RCHD4	108.	1.58	14.	5.	5.	.09	
	2 COMBINED AT								
+		SUMD4	517.	1.58	68.	25.	25.	.44	
	HYDROGRAPH AT								
+		SUB255	6.	1.50	1.	0.	0.	.01	
	2 COMBINED AT								
+		SUM255	523.	1.58	69.	25.	25.	.44	
	ROUTED TO								
+		RCH260	521.	1.58	69.	25.	25.	.44	
	HYDROGRAPH AT								
+		SUB260	32.	1.25	3.	1.	1.	.01	
	2 COMBINED AT								
+		SUM260	535.	1.58	72.	26.	26.	.46	
	3 COMBINED AT								
+		SUM250	680.	1.58	96.	35.	35.	.59	
	ROUTED TO								
+		DET250	610.	1.75	96.	35.	35.	.59	
+									1286.85 1.75
	ROUTED TO								
+		RCH270	610.	1.75	96.	35.	35.	.59	
+									1284.52 1.75
	HYDROGRAPH AT								
+		SUB270	24.	1.33	2.	1.	1.	.01	
	HYDROGRAPH AT								
+		SUB280	61.	1.33	6.	2.	2.	.03	
	HYDROGRAPH AT								
+		SUB290	33.	1.25	3.	1.	1.	.01	
	4 COMBINED AT								
+		SUM270	638.	1.75	107.	39.	39.	.64	
	ROUTED TO								
+		DET270	614.	1.83	107.	39.	39.	.64	
+									1284.66 1.83
	ROUTED TO								
+		RCH295	609.	1.83	107.	39.	39.	.64	
+									1280.23 1.83
	HYDROGRAPH AT								
+		SUB295	24.	1.25	2.	1.	1.	.01	
	2 COMBINED AT								
+		SUM295	610.	1.83	108.	39.	39.	.65	
	ROUTED TO								
+		DET295	599.	1.92	108.	39.	39.	.65	
+									1280.92 1.92
	ROUTED TO								
+		RCH300	594.	1.92	108.	39.	39.	.65	
+									1275.96 1.92
	HYDROGRAPH AT								
+		SUB300	28.	1.25	2.	1.	1.	.01	
	HYDROGRAPH AT								
+		SUB305	49.	1.25	5.	2.	2.	.02	
	HYDROGRAPH AT								
+		SUB310	40.	1.25	4.	1.	1.	.01	
	HYDROGRAPH AT								
+		SUB315	25.	1.33	3.	1.	1.	.01	
	ROUTED TO								
+		RCH320	24.	1.42	3.	1.	1.	.01	

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          HYDROGRAPH AT
+                        SUB320       43.    1.25          5.         2.         2.       .02
          2 COMBINED AT
+                        SUM320       66.    1.33          8.         3.         3.       .03
          5 COMBINED AT
+                        SUM300      624.    1.92        127.        46.        46.       .74
          ROUTED TO
+                        DET300      619.    2.00        125.        46.        46.       .74
+                                                                                     1275.89        2.00
          HYDROGRAPH AT
+                        SUB325       58.    1.25          6.         2.         2.       .03
          HYDROGRAPH AT
+                        SUB330       62.    1.42          9.         3.         3.       .05
          HYDROGRAPH AT
+                        SUB335       86.    1.17          6.         2.         2.       .03
          5 COMBINED AT
+                        SUM330     1737.    2.17        473.       180.       180.      2.95
          ROUTED TO
+                        DET330     1608.    2.33        473.       180.       180.      2.95
+                                                                                     1269.44        2.33
1
                                   SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                      (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                          INTERPOLATED TO
                                                                       COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

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

             RCH16   MANE         .44    923.84    115.64      1.42     5.00    920.86    115.00      1.42

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7757E+02 EXCESS= .0000E+00 OUTFLOW= .7758E+02 BASIN STORAGE= .1445E-04 PERCENT ERROR=    .0

             RCH26   MANE         .44    283.89     91.23      1.37     5.00    280.55     95.00      1.37

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1368E+02 EXCESS= .0000E+00 OUTFLOW= .1369E+02 BASIN STORAGE= .1735E-05 PERCENT ERROR=    .0

             RCH35   MANE         .94     56.27     77.05      1.82     5.00     55.40     80.00      1.82

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2517E+01 EXCESS= .0000E+00 OUTFLOW= .2522E+01 BASIN STORAGE= .1294E-04 PERCENT ERROR=   -.2

            RCH115   MANE        1.21     70.71     72.62      1.87     5.00     70.54     75.00      1.87

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2480E+01 EXCESS= .0000E+00 OUTFLOW= .2500E+01 BASIN STORAGE= .2395E-04 PERCENT ERROR=   -.8

            RCH115   MANE         .58     49.02     75.86      1.86     5.00     48.25     75.00      1.87

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1983E+01 EXCESS= .0000E+00 OUTFLOW= .1987E+01 BASIN STORAGE= .2981E-05 PERCENT ERROR=   -.2

            RCH135   MANE         .86     65.46     76.85      1.86     5.00     64.05     80.00      1.86

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2974E+01 EXCESS= .0000E+00 OUTFLOW= .2979E+01 BASIN STORAGE= .9742E-05 PERCENT ERROR=   -.2

            RCH140   MANE        1.57    116.97     77.75      1.90     5.00    115.57     80.00      1.89

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5141E+01 EXCESS= .0000E+00 OUTFLOW= .5156E+01 BASIN STORAGE= .2584E-03 PERCENT ERROR=   -.3
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RCH160  MANE        .90    55.64    76.58     1.87     5.00    54.37    75.00       1.86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2181E+01 EXCESS= .0000E+00 OUTFLOW= .2188E+01 BASIN STORAGE= .1061E-04 PERCENT ERROR=   -.3

RCH170  MANE        .90    69.59    81.94     1.81     5.00    68.80    80.00       1.81

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3461E+01 EXCESS= .0000E+00 OUTFLOW= .3466E+01 BASIN STORAGE= .1404E-04 PERCENT ERROR=   -.2

RCHC2  MANE        1.15    35.78    92.76     1.45     5.00    35.77    95.00       1.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2167E+01 EXCESS= .0000E+00 OUTFLOW= .2167E+01 BASIN STORAGE= .2242E-05 PERCENT ERROR=    .0

RCHC3  MANE        1.13    65.71    97.29     1.45     5.00    64.04    95.00       1.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4254E+01 EXCESS= .0000E+00 OUTFLOW= .4257E+01 BASIN STORAGE= .1050E-04 PERCENT ERROR=   -.1

RCHC4  MANE         .79   150.17    96.55     1.45     5.00   148.12    95.00       1.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9205E+01 EXCESS= .0000E+00 OUTFLOW= .9207E+01 BASIN STORAGE= .1878E-04 PERCENT ERROR=    .0

RCHD1  MANE         .30   220.05    95.51     1.45     5.00   218.66    95.00       1.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1370E+02 EXCESS= .0000E+00 OUTFLOW= .1370E+02 BASIN STORAGE= .1048E-04 PERCENT ERROR=    .0

RCHD2  MANE         .49   256.63    95.76     1.45     5.00   254.78    95.00       1.46

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1627E+02 EXCESS= .0000E+00 OUTFLOW= .1627E+02 BASIN STORAGE= .2003E-04 PERCENT ERROR=    .0

RCHD3  MANE         .35   319.62    95.67     1.45     5.00   316.63    95.00       1.46

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2054E+02 EXCESS= .0000E+00 OUTFLOW= .2054E+02 BASIN STORAGE= .2333E-04 PERCENT ERROR=    .0

RCHD4  MANE         .56   108.66    96.17     1.45     5.00   108.08    95.00       1.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6861E+01 EXCESS= .0000E+00 OUTFLOW= .6863E+01 BASIN STORAGE= .7600E-06 PERCENT ERROR=    .0

RCH260  MANE         .16   522.71    95.25     1.45     5.00   521.35    95.00       1.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3428E+02 EXCESS= .0000E+00 OUTFLOW= .3428E+02 BASIN STORAGE= .9800E-05 PERCENT ERROR=    .0

RCH320  MANE        2.28    24.32    82.52     1.86     5.00    24.21    85.00       1.87

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1388E+01 EXCESS= .0000E+00 OUTFLOW= .1390E+01 BASIN STORAGE= .1010E-03 PERCENT ERROR=   -.1


*** NORMAL END OF HEC-1 ***
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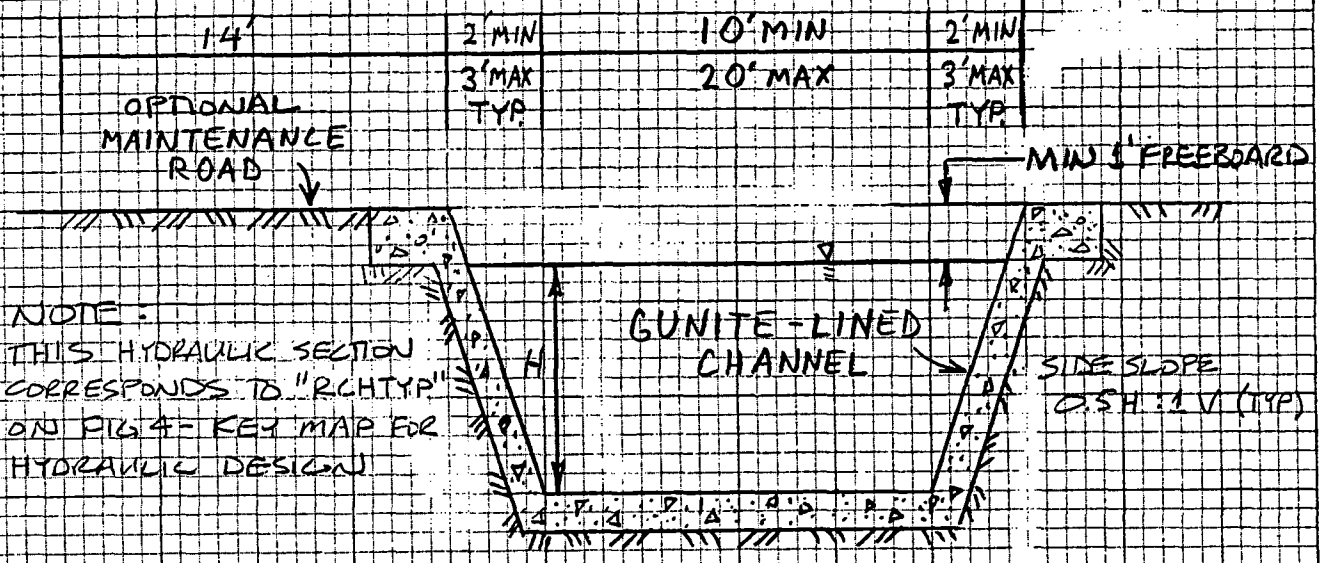
APPENDIX D
HYDRAULIC ANALYSES

DESIGNED BY D. STOUGH DATE 1-3-92 SHEET NO. PAGE NO.
CHECKED BY CAB DATE OF JOB NO.
REVIEWED BY DATE SUBJECT: TYPICAL GUNITE CHANNEL
APPROVED BY DATE X-SECTION

TYPICAL GUNITE LINED CHANNEL



NOTE:
THIS HYDRAULIC SECTION CORRESPONDS TO "RCHTYP" ON FIG 4 - KEY MAP FOR HYDRAULIC DESIGN

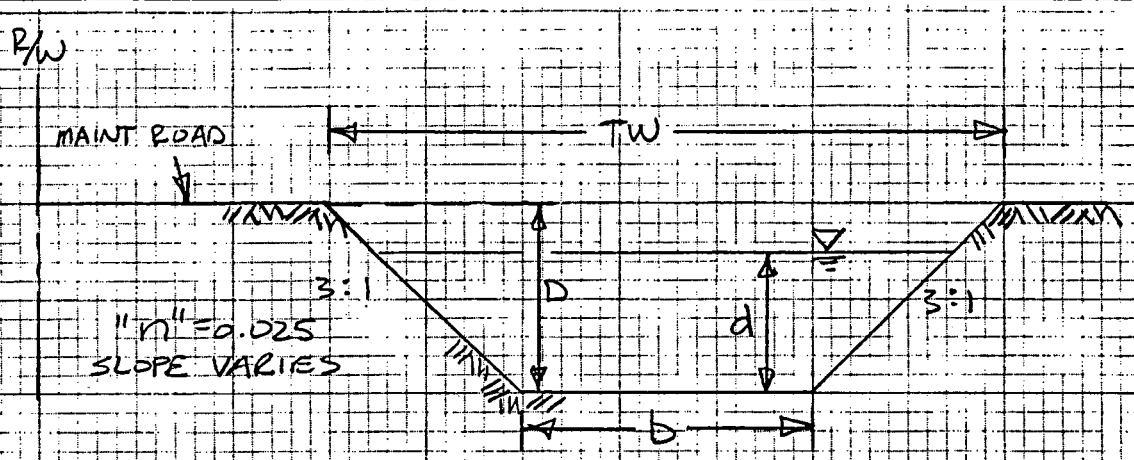
CAPACITY DETERMINED USING MANNINGS EQUATION
ASSUME NORMAL DEPTH; NO BACKWATER EFFECT

$$\text{CAPACITY} = \frac{1.486}{n} * \left(\frac{A}{WP}\right)^{2/3} * S^{1/2} * A$$

S IS THE AVERAGE SLOPE OF THE CHANNEL BED
ASSUME S = .003 '/FT MIN.
n FOR GUNITE-LINED CHANNEL IS ASSUMED TO BE
n = 0.016 (MANNINGS n-VALUE)
A AND WP VARY WITH H

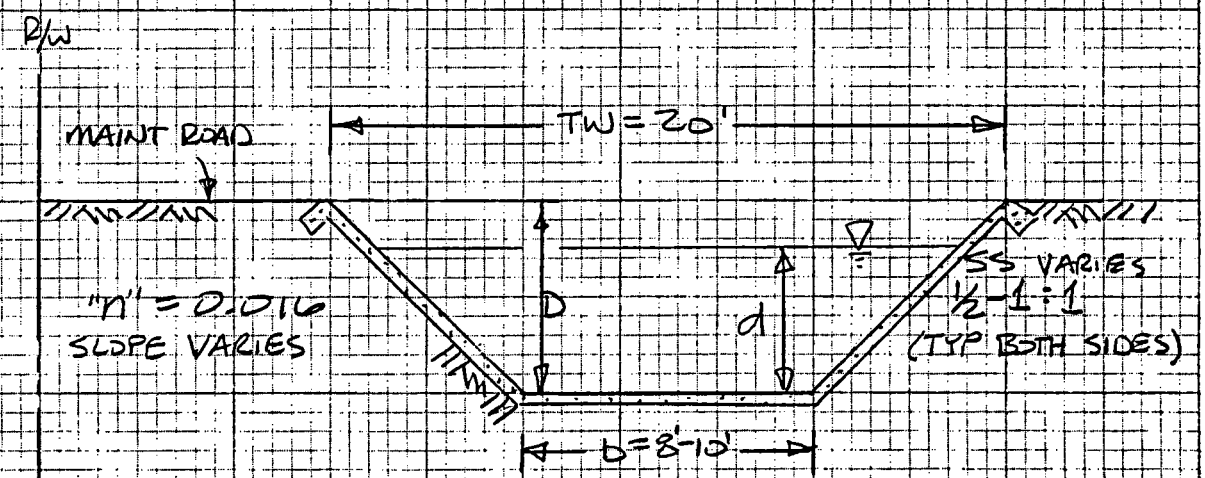
	10' BOTTOM WIDTH			20' BOTTOM WIDTH		
H(FT)	A(SQ.FT)	V(FPS)	Q(CFS)	A(SQ.FT.)	V(FPS)	Q(CFS)
1	10.5	4.9	51.4	20.5	5.0	102.2
2	22.0	7.5	165.5	42.0	7.8	326.5
3	34.5	9.6	330.4	64.5	10.0	645.9
4	48.0	11.3	543.0	88.0	11.9	1050.7
5	62.5	12.8	802.3	112.5	13.7	1535.8
6	78.0	14.2	1108.3	138.0	15.2	2098.1

DESIGNED BY GSB DATE 7-1-92 SHEET NO. 1 PAGE NO.
CHECKED BY DATE OF 2 JOB NO. 11389
REVIEWED BY DATE SUBJECT: SUN CITY WEST EXPANSION
APPROVED BY DATE NORTH CHANNEL TYP SECTIONS



TYPICAL EARTH CHANNEL

SEE SUMMARY TABLE ON SHT 2 OF 2
FOR SLOPE, D, d, b, TW



TYPICAL GUNITE CHANNEL

SEE SUMMARY TABLE ON SHT 2 OF 2
FOR SLOPE, D AND d.

SC 3020

DESIGNED BY GSB DATE 7-1-92 SHEET NO. 2 PAGE NO.
CHECKED BY DATE OF 2 JOB NO. 11339
REVIEWED BY DATE SUBJECT: SUN CITY WEST EXPANSION
APPROVED BY DATE NORTH CHANNEL HYDRAULICS

					GUNITE CHANNEL			EARTH CHANNEL				
REACH	LENGTH	SLOPE	DEPTH D	Q_2 Q_{100}	FLOW DEPTH	AVG VEL	FROUDE #	FLOW DEPTH	BOTTOM WIDTH b	TOP WIDTH TW	AVG VEL	FROUDE #
RCH C2	1430 FT	0.30%	3.0-5.0 FT	13 CFS	0.5 FT	3.1 FT/SEC	0.76	0.8	5 FT	23-35 FT	2.3 FT/SEC	0.52
				36 CFS	1.0 FT	4.4 FT/SEC	0.81	1.5	"	"	3.0 FT/SEC	0.55
RCH C3	1570	0.30	5.0	24	0.7	3.6	0.79	1.1	5	35	2.7	0.54
				66	1.2	5.1	0.84	1.8	"	"	3.6	0.58
RCH C4	1380	0.30	4.0-9.0	54	1.1	4.8	0.85	1.6	5	29-39	3.4	0.57
				151	2.0	6.8	0.88	2.7	"	"	4.4	0.61
RCH D1	620	0.40	4.0-5.0	79	1.2	6.0	0.98	1.8	5	29-35	4.1	0.67
				220	2.3	8.4	1.02	2.9	"	"	5.4	0.71
RCH D2	930	0.40	5.5	93	1.4	6.3	0.98	1.6	10	43	4.1	0.67
				258	2.6	8.9	1.02	2.6	"	"	5.5	0.72
RCH D3	850	0.45	5.5-6.0	115	1.5	7.1	1.05	1.7	10	43-46	4.6	0.72
				320	2.9	9.9	1.09	2.8	"	"	6.1	0.77
RCH D4	850	0.30	4.0-5.0	39	0.9	4.3	0.82	1.4	5	29-35	3.1	0.56
				109	1.7	6.1	0.86	2.3	"	"	4.1	0.59

NOTES:
→ ALL HYDRAULIC DATA BASED ON MANNING NORMAL DEPTH
→ Q_2 IS ESTIMATED BASED ON $P_2/P_{100} \times Q_{100}$

SC 3020

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Culvert Design Form

PROJECT: SCW EXPANSION MASTER DRAINAGE	STATION: DET 40 SHEET 1 OF 2	CULVERT DESIGN FORM DESIGNER / DATE: D.STOUGH / 7-12-92 REVIEWER / DATE: D.STOUGH / 8-12-92

HYDROLOGICAL DATA

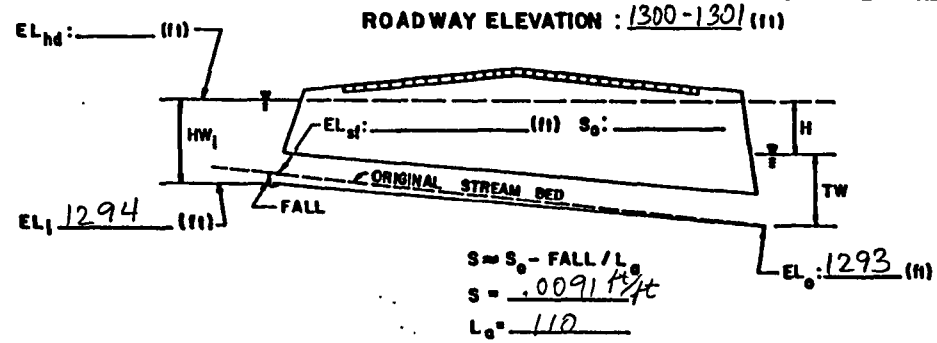
SEE ADD'L. SHTS.

- ☐ METHOD: HEC 1, CLARK, GRN/AMPT
- ☐ DRAINAGE AREA: _____ ☐ STREAM SLOPE: _____
- ☐ CHANNEL SHAPE: _____
- ☐ ROUTING: MOD PULS ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)

ROADWAY ELEVATION: 1300-1301 (ft)



CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	OUTLET CONTROL TW (5)	d_c	(d_c+D)/2	h_o (6)	k_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
2 - 10' X 3'	60	3	.38	1.14	/	95.14	OFF SCALE							95.14	5.7	INLET CONTROL
	100	5	.53	1.59	/	95.59	OFF SCALE							95.59	6.9	" "
	200	10	.83	2.49	/	96.49	OFF SCALE							96.49	8.9	" "
	300	15	1.10	3.30	/	97.30	1.1	1.9	2.45	2.45	0.2	0.60	96.05	97.30	10.3	INLET CONTROL
	400	20	1.38	4.14	/	98.14	1.4	2.4	2.70	2.70	0.2	1.05	96.75	98.14	11.3	" "

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

- a. APPROXIMATE
- f. CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho. HEADWATER IN OUTLET CONTROL
- i. INLET CONTROL SECTION
- o. OUTLET
- sf. STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION:

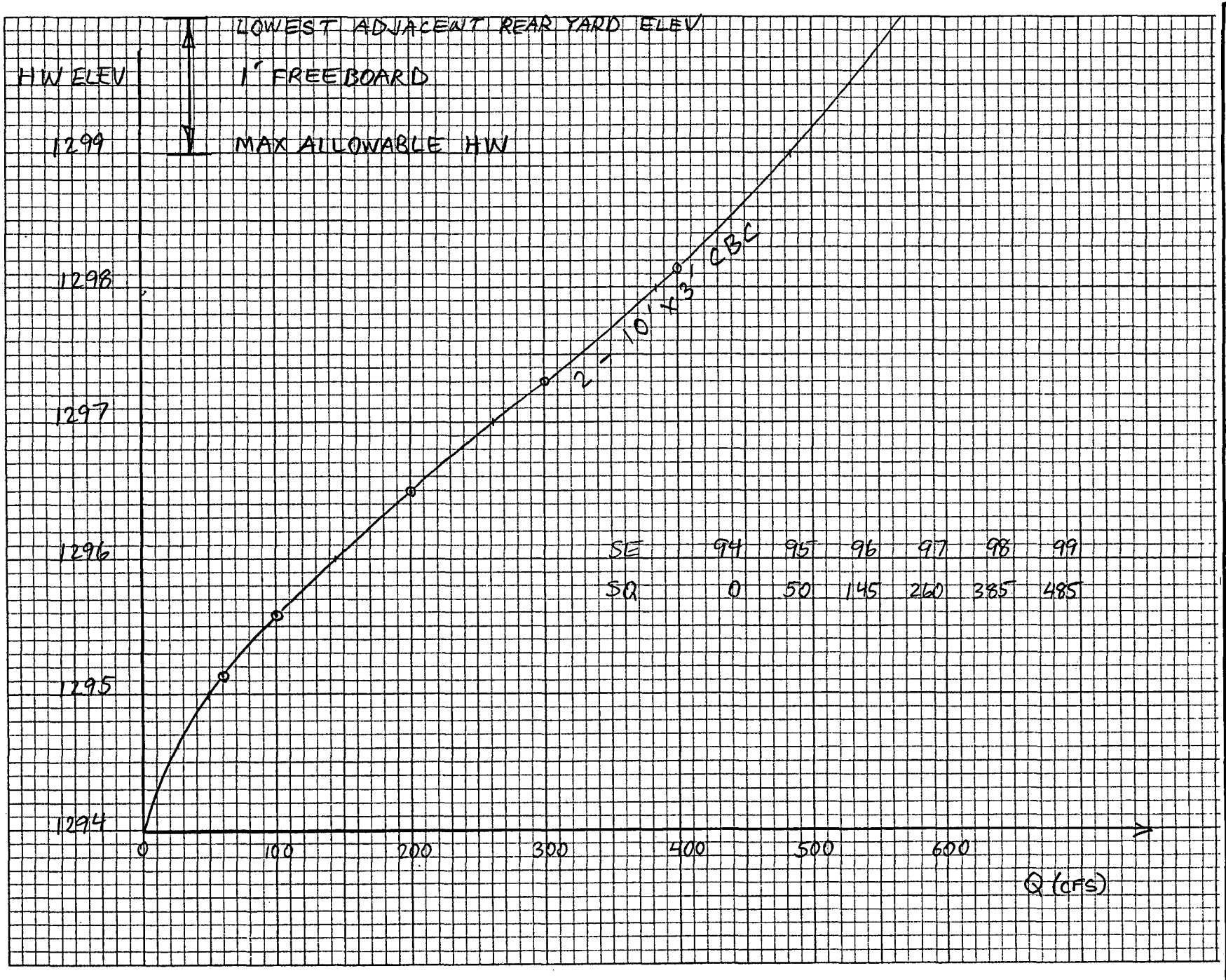
STRAIGHT HEADWALL, 90° TO FLOW
ROUNDED EDGES @ INLET & OUTLET
MAX ALLOWABLE HW = 1299.0

OUTLET VEL. BASED ON MANNING ANALYSIS; NO BACKWTR.

CULVERT BARREL SELECTED:

SIZE: _____
SHAPE: _____
MATERIAL: _____
ENTRANCE: _____

DESIGNED BY D.STOUGH DATE 7-13-92 SHEET NO. 2 PAGE NO.
CHECKED BY DATE OF 2 JOB NO.
REVIEWED BY DATE SUBJECT: D.E.T. 40
APPROVED BY DATE



SE	94	95	96	97	98	99
SQ	0	50	145	260	385	485

SC 3020

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Culvert Design Form

PROJECT: SCW EXPANSION MASTER DRAINAGE	STATION: SUM 50 SHEET 1 OF 1	CULVERT DESIGN FORM DESIGNER / DATE: D.STOUGH / 7-12-92 REVIEWER / DATE: D.STOUGH / 8-12-92

HYDROLOGICAL DATA

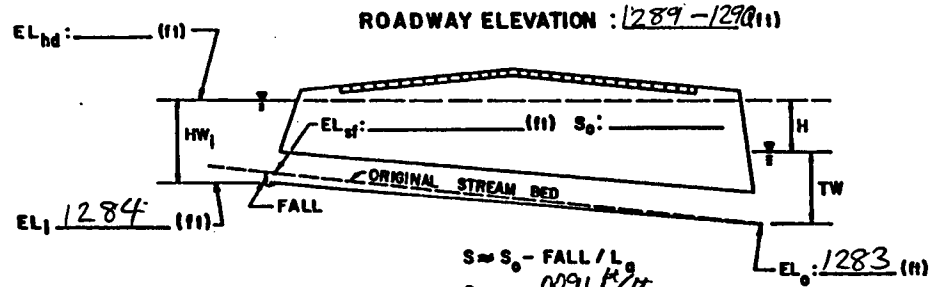
SEE ADD'L. SHTS.

- ☐ METHOD: HEC-1, CLARK, GRN/AMPT
- ☐ DRAINAGE AREA: _____ ☐ STREAM SLOPE: _____
- ☐ CHANNEL SHAPE: _____
- ☐ ROUTING: MOD PULS ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)

ROADWAY ELEVATION: 1289 – 1290 (ft)



$S \approx S_o - FALL / L_o$

$S = .0091$ ft/ft

$L_o = 110'$

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	OUTLET CONTROL TW (5)	d_c	(d_c+D)/2	h_o (6)	k_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
4-10' x 4'	400	10	0.63	2.52	/	86.52								86.52	8.9	INLET CONTROL
	600	15	0.82	3.28	/	87.28								87.28	10.3	" "
	800	20	0.99	3.96	/	87.96	1.20	2.40	3.20	3.20	.2	0.58	86.78	87.96	11.3	" "
	1200	30	1.32	5.28	/	89.28	1.							89.28	12.9	" "
	1600	40	1.78	7.12	/	91.12	2.10	3.70	3.85	3.85	.2	2.40	89.25	91.12	14.0	INLET CONTROL

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_t/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

- a. APPROXIMATE
- f. CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho. HEADWATER IN OUTLET CONTROL
- i. INLET CONTROL SECTION
- o. OUTLET
- sf. STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION:

STRAIGHT HEADWALL; 90° TO FLOW
ROUNDED EDGES @ INLET & OUTLET
MAX ALLOWABLE HW = 1290
OUTLET VEL. BASED ON MANNING ANALYSIS; NO BACKWTR.

CULVERT BARREL SELECTED:

SIZE: _____
SHAPE: _____
MATERIAL: _____
ENTRANCE: _____

THIS CULVERT IS ASSUMED TO NOT EFFECT HYDROGRAPH ROUTING IN HEC-1 MODEL 11389 B

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Culvert Design Form

PROJECT: SCW MASTER DRAINAGE	STATION: DET 100 SHEET 1 OF 2	CULVERT DESIGN FORM DESIGNER / DATE: D.STOUGH / 7-14-92 REVIEWER / DATE: D.STOUGH / 8-12-92

HYDROLOGICAL DATA

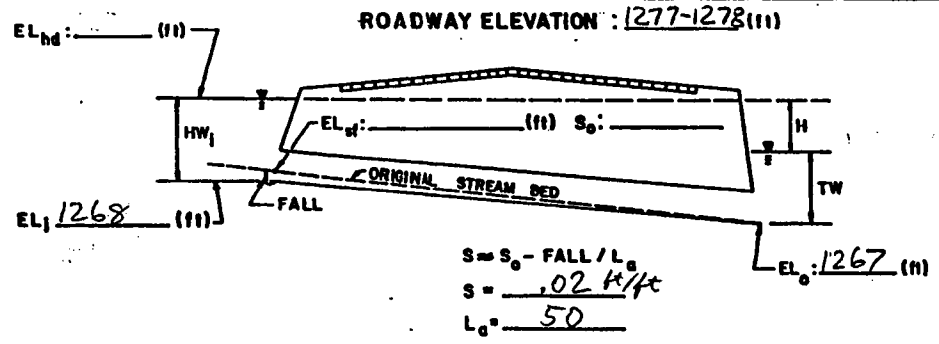
SEE ADD'L. SHTS.

- ☐ METHOD: HEC 1, CLARK U.H., GRN/AMPT
- ☐ DRAINAGE AREA: _____ ☐ STREAM SLOPE: _____
- ☐ CHANNEL SHAPE: _____
- ☐ ROUTING: _____ ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)

ROADWAY ELEVATION: 1277-1278 (ft)



CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	OUTLET CONTROL TW (5)	d_c	(d_c+D)/2	h_o (6)	k_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
4-12'X4' CBC	480	10	0.63	2.52	/	70.52								70.52	12.3	INLET CNTRL
	720	15	0.82	3.28	/	71.28								71.28	14.1	" "
	960	20	0.99	3.96	/	71.96	2.6	2.4	3.20	3.2	.2	.5	70.70	71.96	15.6	" "
	1440	30	1.32	5.28	/	73.28								73.29	17.8	" "
	1920	40	1.78	7.12	/	75.12	3.0	3.7	3.85	3.85	.2	1.4	72.25	75.12	19.5	INLET CONTROL

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

a. APPROXIMATE
f. CULVERT FACE
hd. DESIGN HEADWATER
hi. HEADWATER IN INLET CONTROL
ho. HEADWATER IN OUTLET CONTROL
i. INLET CONTROL SECTION
o. OUTLET
sf. STREAMBED AT CULVERT FACE
tw. TAILWATER

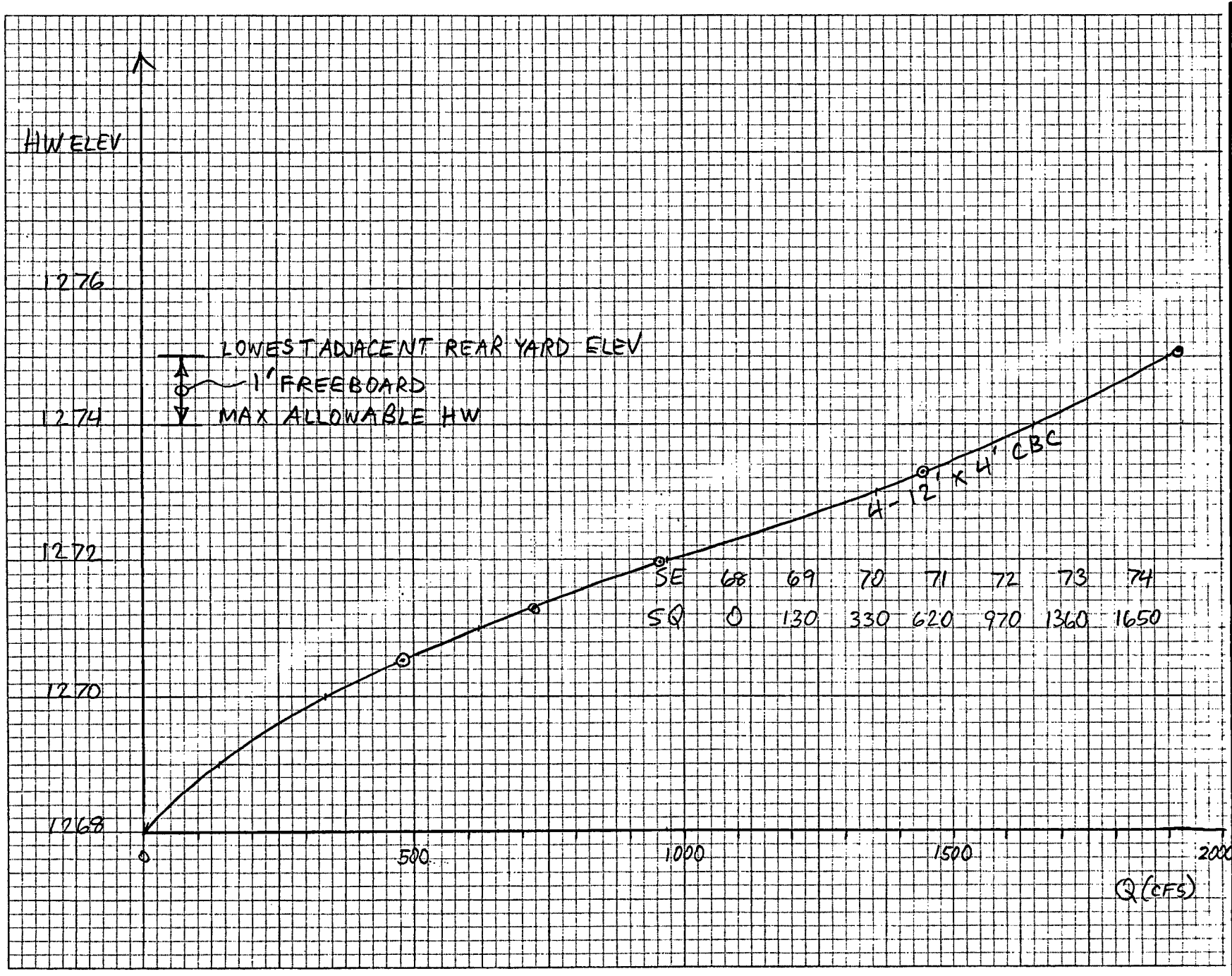
COMMENTS / DISCUSSION:

STRAIGHT HEADWALLS, 90° TO FLOW
ROUNDED EDGES @ INLET & OUTLET
MAX ALLOWABLE HW = 1274
OUTLET VEL. BASED ON MANNING ANALYSIS, NO BACKWTR.

CULVERT BARREL SELECTED:

SIZE: _____
SHAPE: _____
MATERIAL: _____
ENTRANCE: _____

DESIGNED BY D.STOUGH DATE 7-14-92 SHEET NO. 2 PAGE NO.
CHECKED BY DATE OF 2 JOB NO.
REVIEWED BY DATE SUBJECT: DET 100
APPROVED BY DATE



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Culvert Design Form

PROJECT: SCW EXPANSION MASTER DRAINAGE

STATION: DET 150

SHEET 1 **OF** 2

CULVERT DESIGN FORM

DESIGNER / DATE: D.STOUGH / 7-12-92

REVIEWER / DATE: D.STOUGH / 8-12-92

HYDROLOGICAL DATA

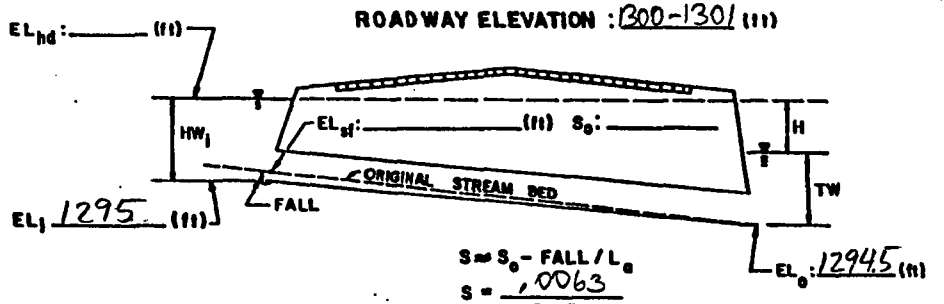
SEE ADD'L. SHTS.

- ☐ METHOD: HEC1, CLARK, GRN/AMPT
- ☐ DRAINAGE AREA: _____ ☐ STREAM SLOPE: _____
- ☐ CHANNEL SHAPE: _____
- ☐ ROUTING: MOD. PULS ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)

ROADWAY ELEVATION: 1300-1301 (ft)



$S = S_o - FALL / L_o$

$S =$ .0063

$L_o =$ 80

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	OUTLET CONTROL TW (5)	d_c	(d_c+D)/2	h_o (6)	k_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
2 - 36" RCP	20	10	.45	1.35	/	96.35	OFF SCALE							96.35	5.2	INLET CONTROL
	30	15	.58	1.74	/	96.74	"	"						96.74	5.8	" "
	40	20	.67	2.01	/	97.01	"	"						97.01	6.3	" "
	60	30	.85	2.55	/	97.55	"	1.80	2.40	2.40	0.2	.46	97.36	97.55	6.9	" "
	80	40	1.04	3.12	/	98.12	.6	2.10	2.55	2.55	0.2	0.8	97.85	98.12	7.3	" "

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) $h_o = TW$ or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

- a. APPROXIMATE
- f. CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho. HEADWATER IN OUTLET CONTROL
- i. INLET CONTROL SECTION
- o. OUTLET
- sf. STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION:

STRAIGHT HEADWALL; 90° TO FLOW
ROUNDED EDGES @ INLET & OUTLET
MAX ALLOWABLE HW = 1299.0
OUTLET VEL. BASED ON MANNING ANALYSIS; NO BACKWTR

CULVERT BARREL SELECTED:

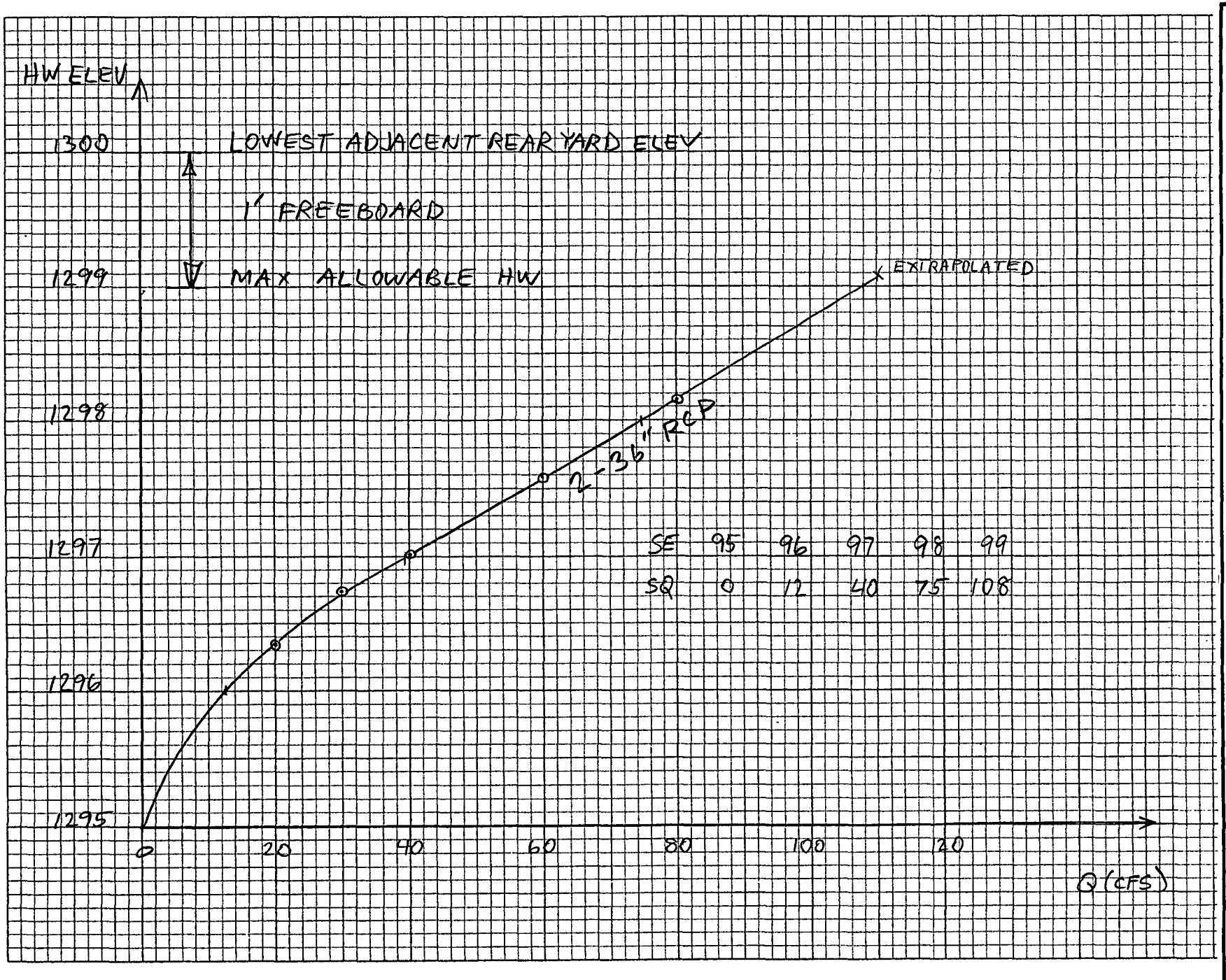
SIZE: _____

SHAPE: _____

MATERIAL: _____ n _____

ENTRANCE: _____

DESIGNED BY D.STOUGH DATE 7-13-92 SHEET NO. 2 PAGE NO.
CHECKED BY DATE OF 2 JOB NO.
REVIEWED BY DATE SUBJECT: DET 150
APPROVED BY DATE



SE	95	96	97	98	99
SQ	0	12	40	75	108

SC 3020

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Culvert Design Form

PROJECT: SCW EXPANSION MASTER DRAINAGE

STATION: DET 190

SHEET 1 **OF** 2

CULVERT DESIGN FORM

DESIGNER / DATE: D. STOUGH / 7-12-92

REVIEWER / DATE: D. STOUGH / 8-12-92

HYDROLOGICAL DATA

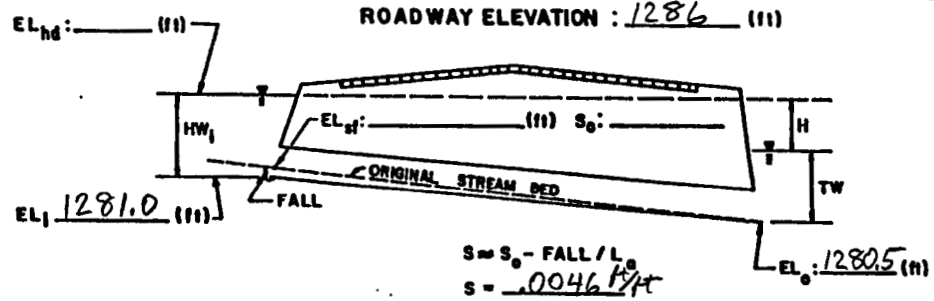
SEE ADD'L. SHTS.

- ☐ METHOD: HEC 1, CLARK, GRN/AMPT
- ☐ DRAINAGE AREA: _____ ☐ STREAM SLOPE: _____
- ☐ CHANNEL SHAPE: _____
- ☐ ROUTING: MOD. PULS ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)

ROADWAY ELEVATION: 1286 (ft)



$S = S_o - FALL / L_o$

$S = .0046$ ft/ft

$L_o = 110$

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	OUTLET CONTROL TW (5)	d_c	(d_c+D)/2	h_o (6)	k_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
2 - 36" RCP	30	15	0.58	1.74	/	82.74	OFF		SCALE					82.74	5.2	INLET CONTROL
	40	20	.67	2.01	/	83.01	OFF		SCALE					83.01	5.6	" "
	60	30	.85	2.55	/	83.55	0.5	1.75	2.38	2.38	0.2	.55	83.43	83.55	6.1	INLET CONTROL
	80	40	1.04	3.12	/	84.12								84.12	6.3	" "
	120	60	1.48	4.44	/	85.44	1.0	2.50	2.75	2.75	0.2	2.20	85.45	85.44	8.5	ASSUME PIPE FULL

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) $h_o = TW$ or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29 n^2 L) / R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

- a. APPROXIMATE
- f. CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho. HEADWATER IN OUTLET CONTROL
- i. INLET CONTROL SECTION
- o. OUTLET
- sf. STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION:

STRAIGHT HEADWALL; 90° TO FLOW
ROUNDED EDGES @ INLET & OUTLET
MAX. ALLOWABLE HW = 1285
OUTLET VEL. BASED ON MANNING ANALYSIS; NO BACKWTR.

CULVERT BARREL SELECTED:

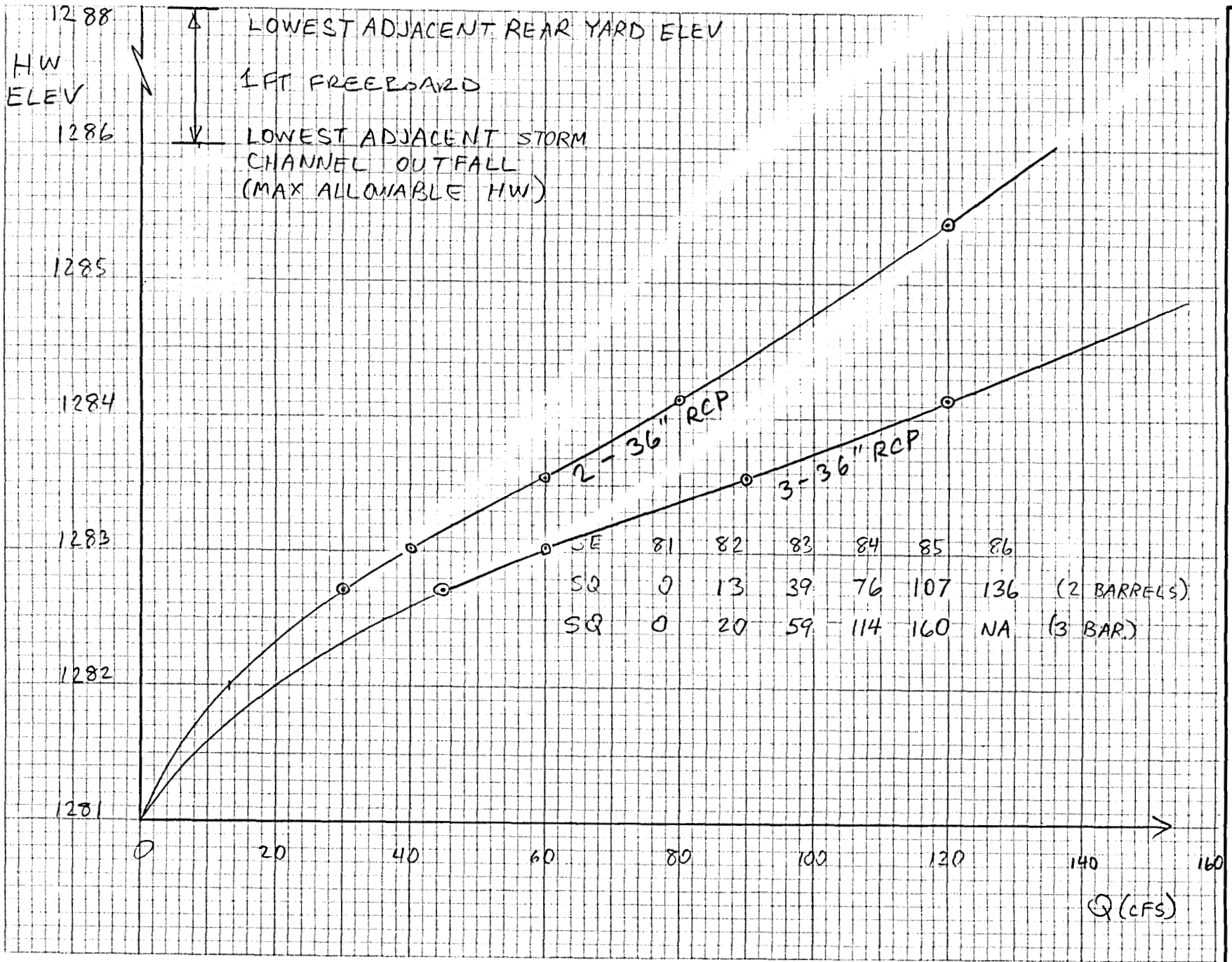
SIZE: _____

SHAPE: _____

MATERIAL: _____

ENTRANCE: _____

DESIGNED BY D.S. TOUGH DATE 7-13-92 SHEET NO. 2 OF 2 PAGE NO.
CHECKED BY DATE JOB NO.
REVIEWED BY DATE SUBJECT: DET. 190
APPROVED BY DATE



SE	81	82	83	84	85	86	
SQ	0	13	39	76	107	136	(2 BARRELS)
SQ	0	20	59	114	160	NA	(3 BAR.)

SC 3020

e 4.42
Culvert Design Form

PROJECT: SCW EXPANSION MASTER DRAINAGE	STATION: DET 220 SHEET 1 OF 2	CULVERT DESIGN FORM DESIGNER / DATE: D. STOUGH, 7-10-92 REVIEWER / DATE: D. STOUGH, 8-12-92

HYDROLOGICAL DATA

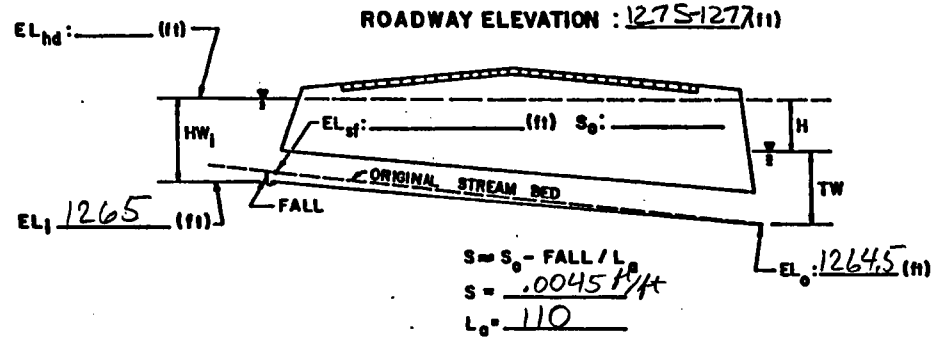
SEE ADD'L SHTS.

- ☐ METHOD: HEC 1, CLARK, GRN/AMPT
- ☐ DRAINAGE AREA: _____ ☐ STREAM SLOPE: _____
- ☐ CHANNEL SHAPE: _____
- ☐ ROUTING: MOD. PULS ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)

ROADWAY ELEVATION: 1275-1277 (ft)



$S = S_o - FALL / L_o$

$S = .0045$ ft/ft

$L_o = 110$

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	OUTLET CONTROL TW (5)	d_c	(d_c+D)/2	h_o (6)	k_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
4 - 12'x4' CBC	240	5	.40	1.60	/	66.60								66.60	5.6	"
	480	10	.62	2.52	/	67.52								67.52	7.2	"
	720	15	.82	3.28	/	68.28								68.28	8.3	"
	960	20	1.00	4.00	/	69.00	3.50	2.30	3.15	4.40	.2	0.57	68.57	69.00	9.1	INLET CONTROL
	1920	40	1.69	6.76	/	71.76	4.90	3.70	3.85	4.90	.2	2.30	71.70	71.76	11.3	ASSUME CULVERT FULL

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

- a. APPROXIMATE
- f. CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho. HEADWATER IN OUTLET CONTROL
- i. INLET CONTROL SECTION
- o. OUTLET
- sf. STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION:

STRAIGHT HEADWALL; 90° TO FLOW
ROUNDED EDGES @ INLET & OUTLET
MAX ALLOWABLE HW = 1270.0
OUTLET VEL. BASED ON MANNING ANALYSIS;
NO BACKWATER

CULVERT BARREL SELECTED:

SIZE: _____
SHAPE: _____
MATERIAL: _____
ENTRANCE: _____

DESIGNED BY D.STOUGH DATE 7-16-92 SHEET NO. 2 PAGE NO.
CHECKED BY DATE OF 2 JOB NO.
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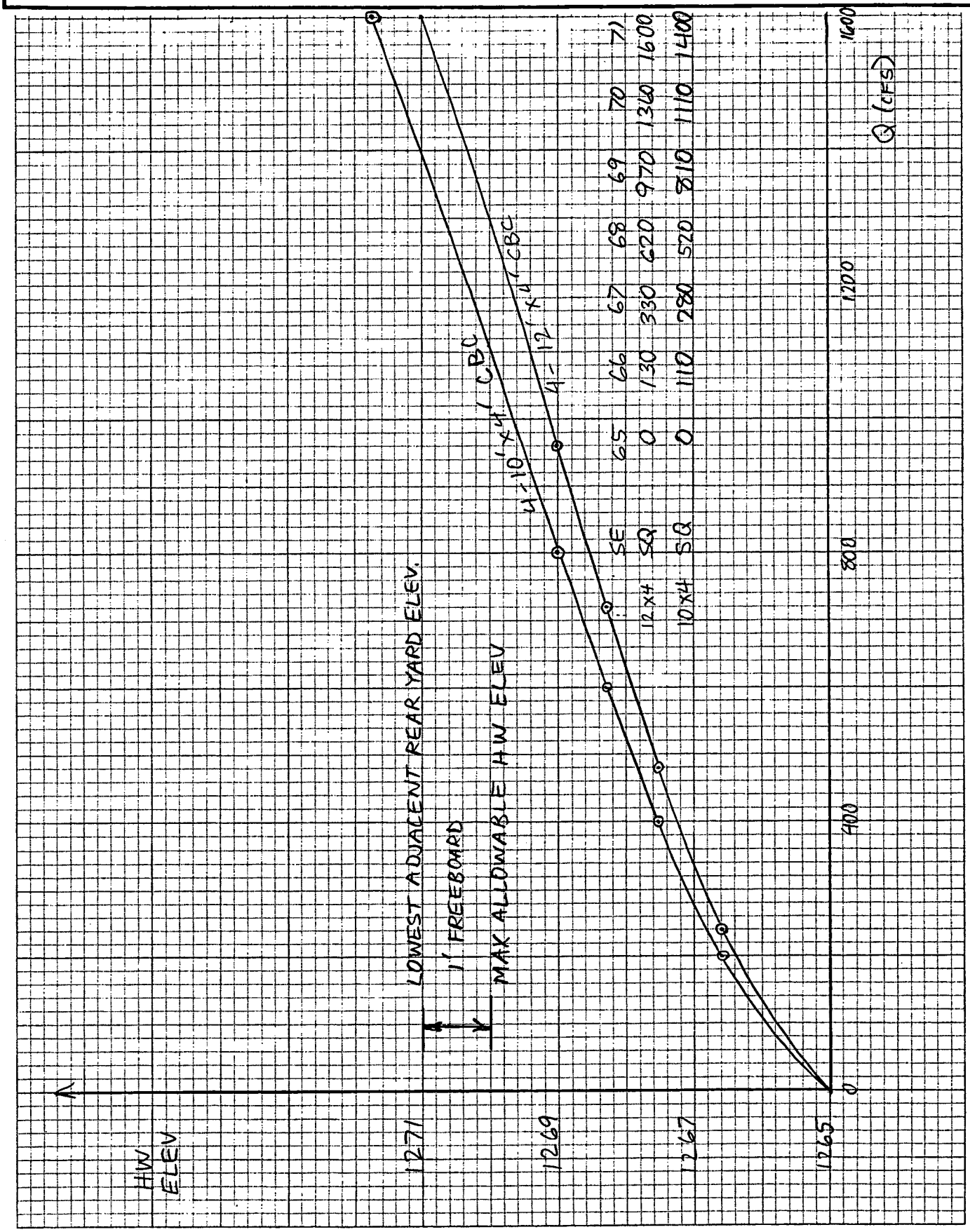


SC 3020

ure 4.42
Culvert Design Form

PROJECT: SCW EXPANSION
MASTER DRAINAGE

STATION: DET 270
SHEET 1 **OF** 2

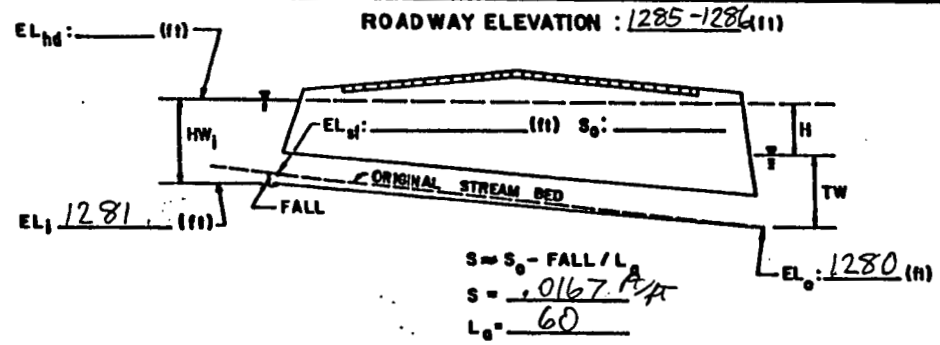
CULVERT DESIGN FORM
DESIGNER / DATE: D.STOUGH, 7-12-92
REVIEWER / DATE: D.STOUGH, 8-12-92

HYDROLOGICAL DATA

SEE ADD'L SHTS.
- ☐ METHOD: HEC-1, CLARK, GRN/AMPT
- ☐ DRAINAGE AREA: _____ ☐ STREAM SLOPE: _____
- ☐ CHANNEL SHAPE: _____
- ☐ ROUTING: MOD. PULS ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)



CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	OUTLET CONTROL TW (5)	d_c	(d_c+D)/2	h_o (6)	k_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
3- 12'x 3'	72	2	.86*	.86	/	81.86	OFF SCALE							81.86	6.0	INLET CONTROL
	180	5	.53	1.59	/	82.59	"		"					82.59	8.5	" "
	360	10	.82	2.46	/	83.46	"		"					83.46	11.0	" "
	540	15	1.10	3.30	/	84.30	1.3	1.90	2.45	2.45	.2	.50	82.95	84.30	12.7	INLET CONTROL
	720	20	1.39	4.17	/	85.17	1.5	2.40	2.70	2.70	.2	.88	83.58	85.17	14.0	" "

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:
- o. APPROXIMATE
- f. CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho. HEADWATER IN OUTLET CONTROL
- i. INLET CONTROL SECTION
- o. OUTLET
- sf. STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION:
* HW/D OFF SCALE USING H=4'; 1 FT. BOX HEIGHT USED FOR LOWER FLOWS
STRAIGHT HEADWALL; 90° TO FLOW
ROUNDED EDGES @ INLET & OUTLET
MAX ALLOWABLE HW= 1285

CULVERT BARREL SELECTED:
SIZE: _____
SHAPE: _____
MATERIAL: _____
ENTRANCE: _____

OUTLET VEL. BASED ON MANNING ANALYSIS; NO BACKWTR.

DESIGNED BY D.A.TOUGH DATE 7-13-92 SHEET NO. 2 OF 2 PAGE NO.
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REVIEWED BY DATE SUBJECT: DET 270
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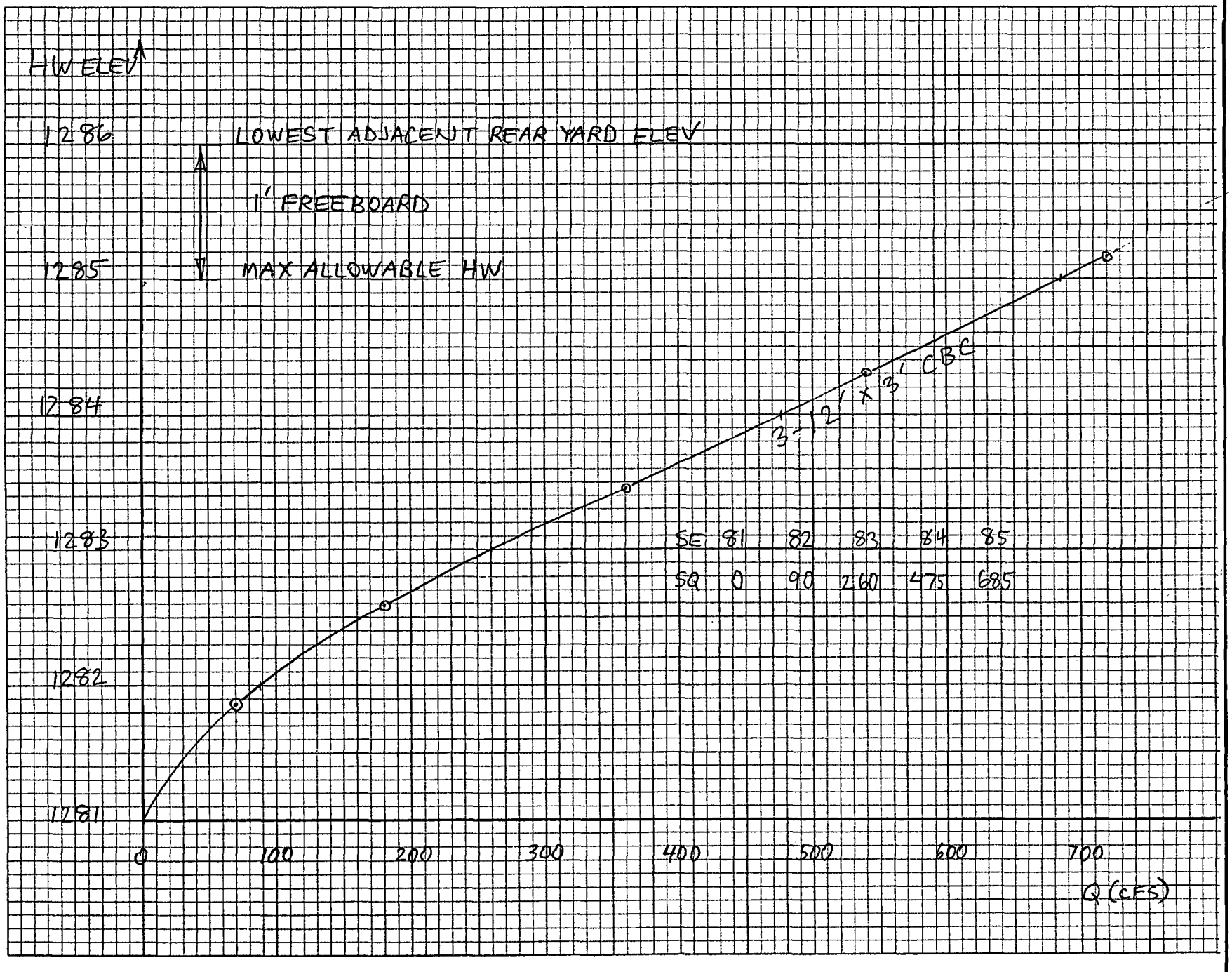


SC 3020

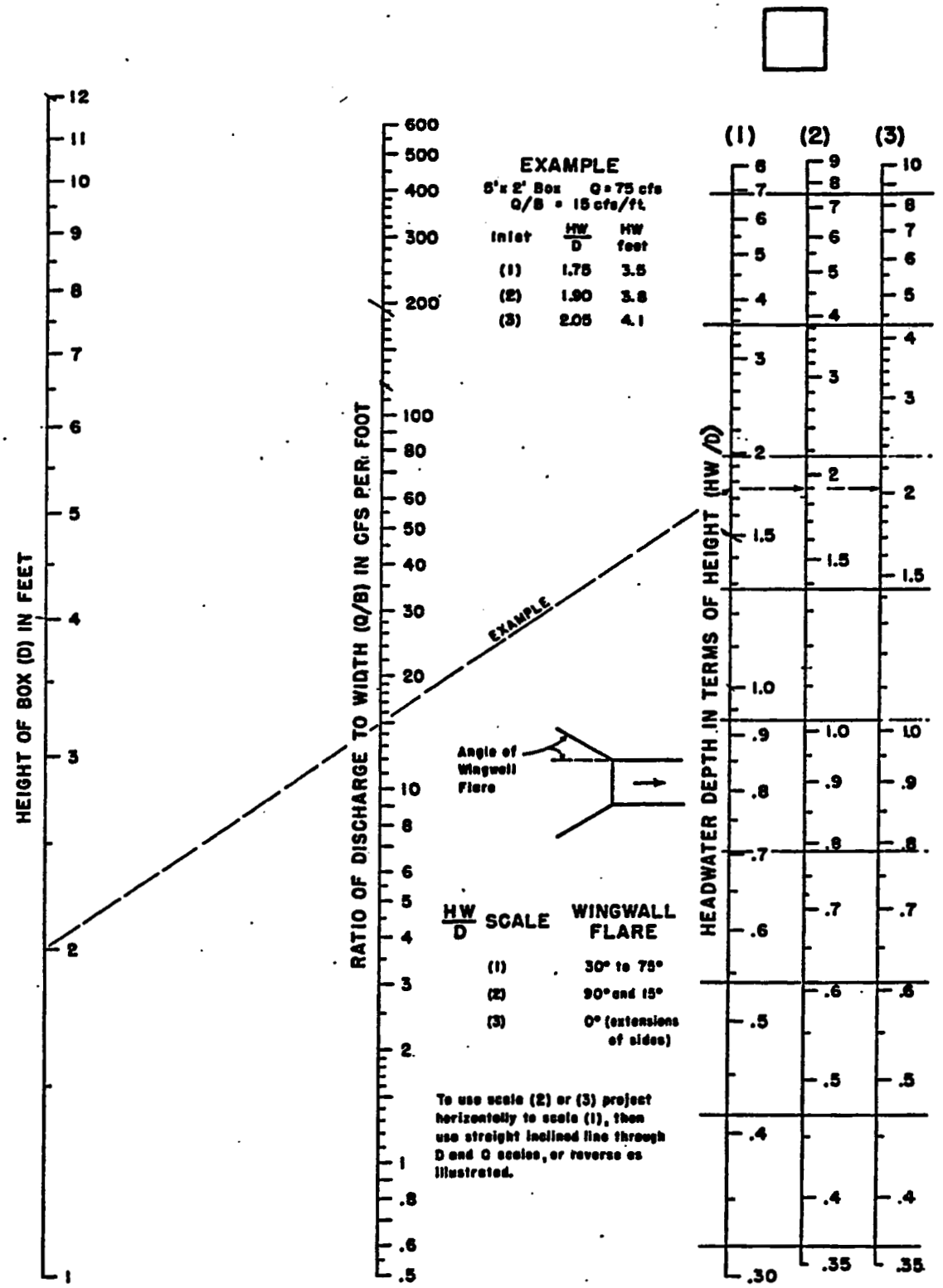


Figure 4.59
Headwater Depth for Box Culverts with Inlet Control

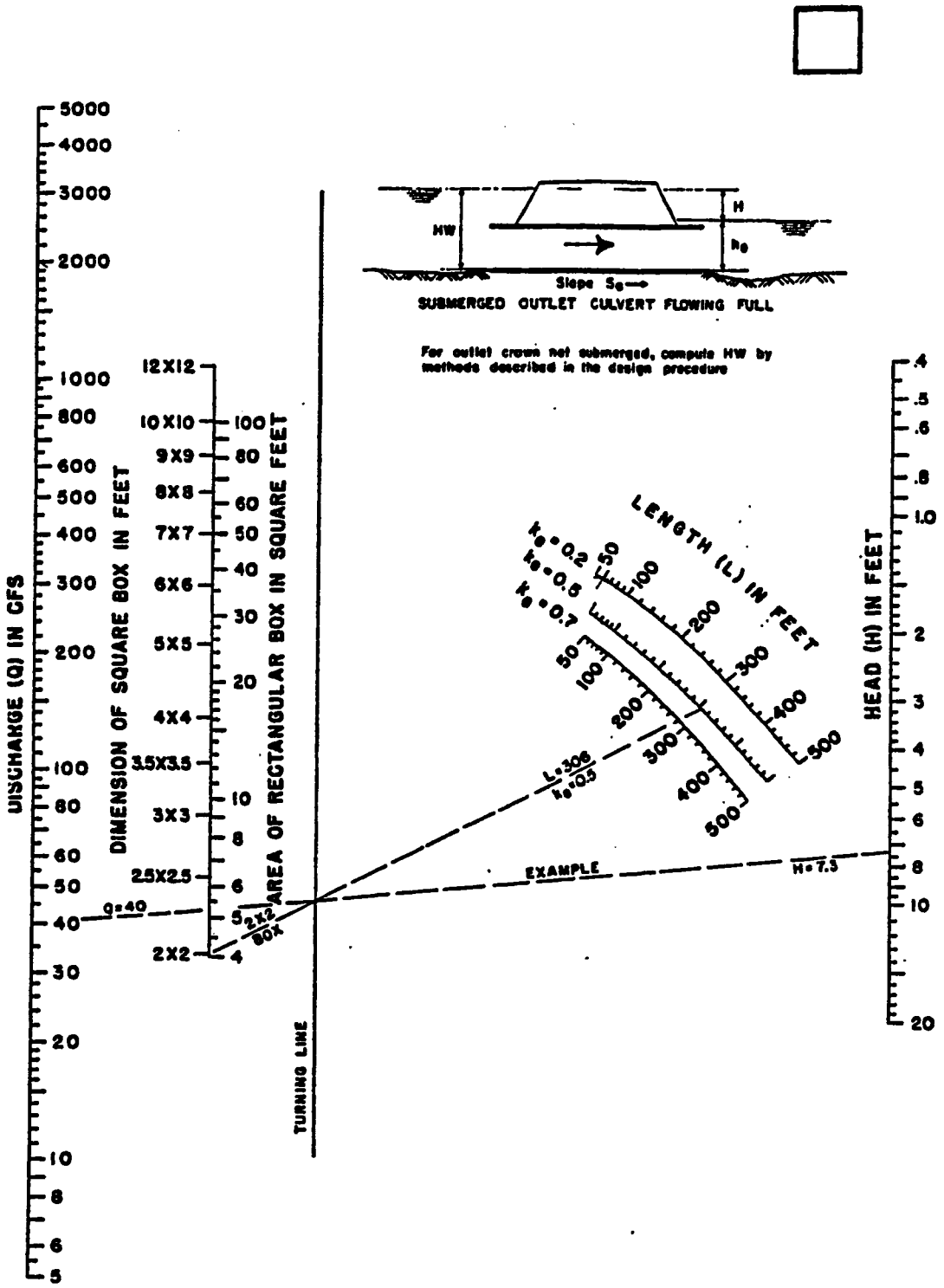
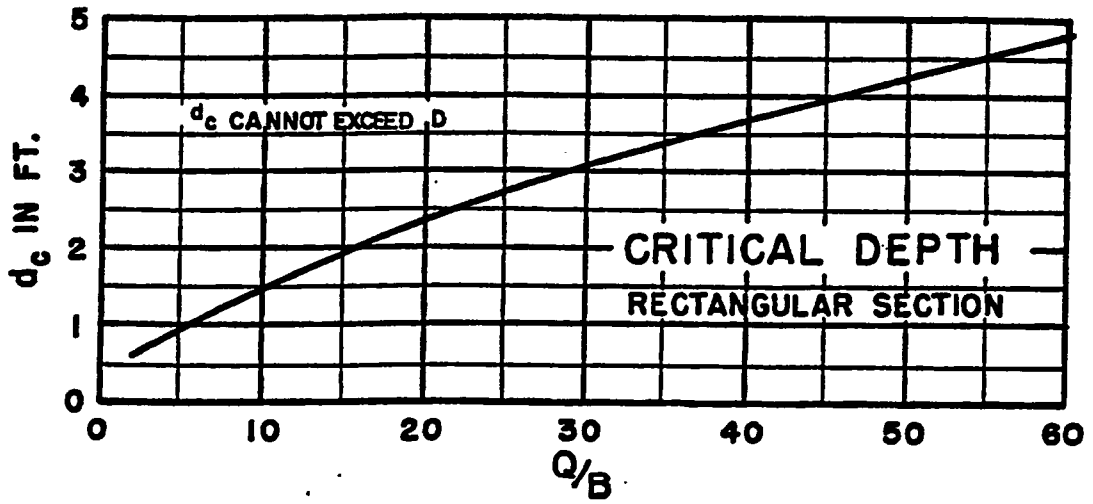


Figure 4.63
Head for Concrete Box Culverts Flowing Full
n = 0.012



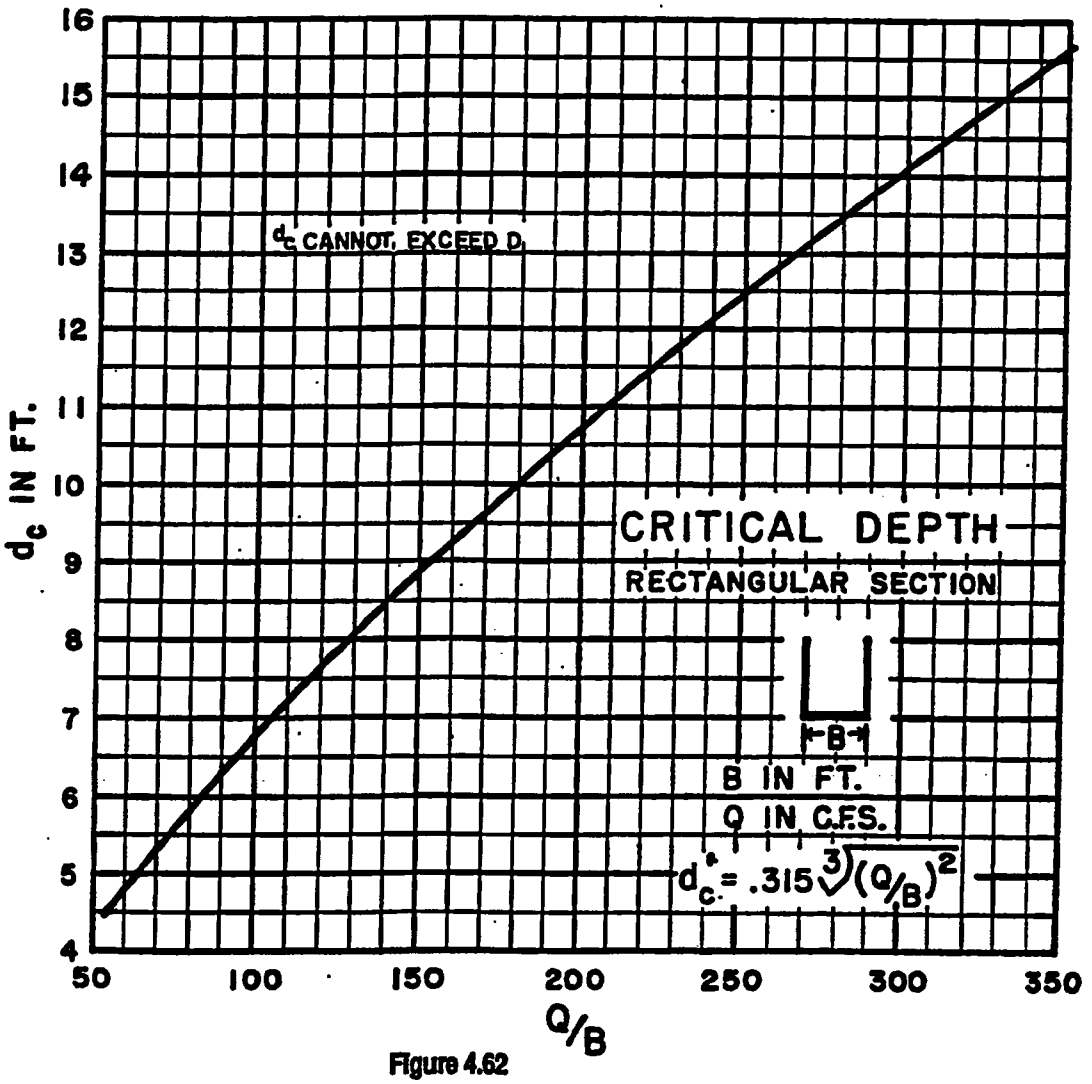


Figure 4.62
Critical Depth Rectangular Section

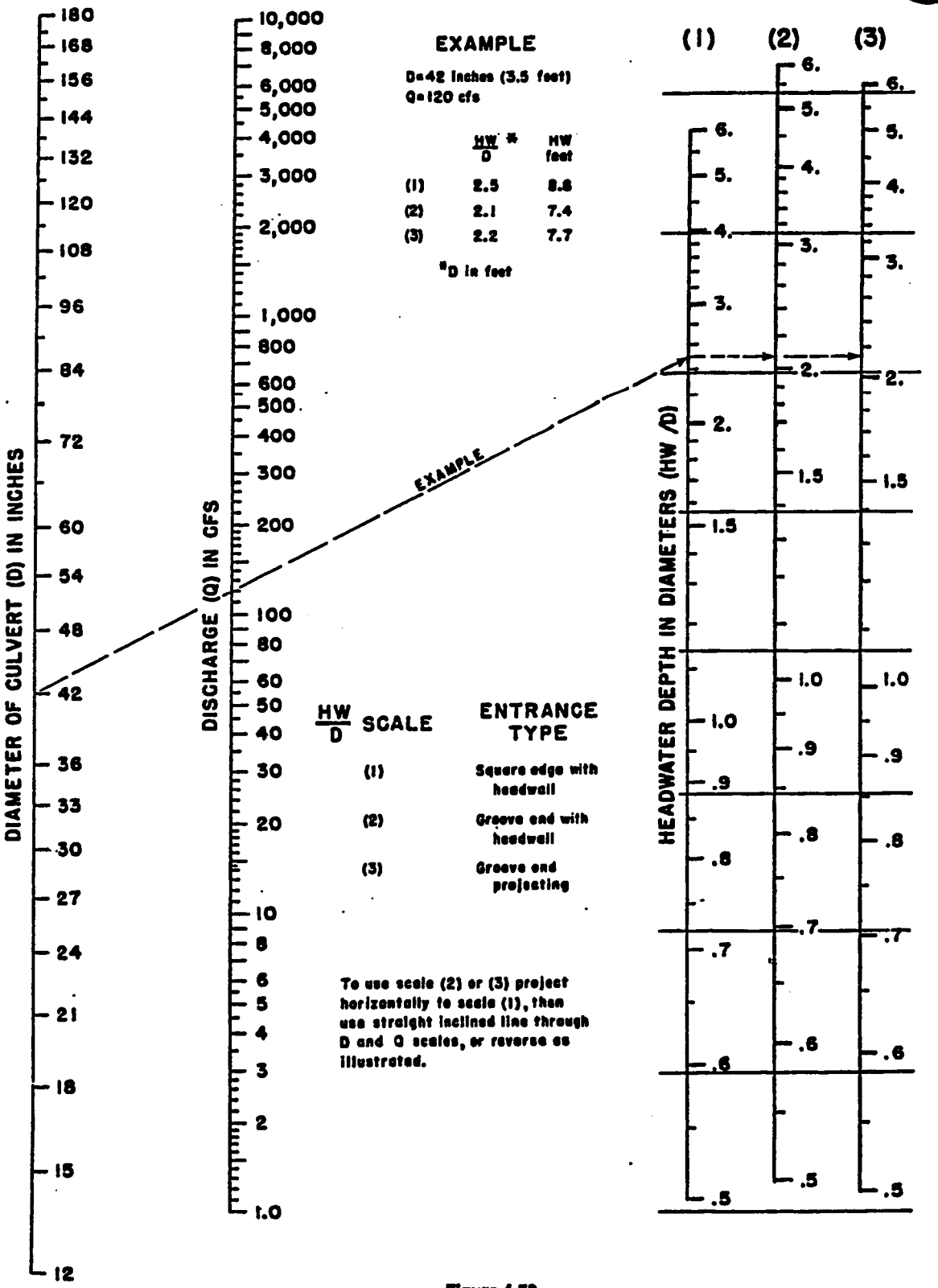


Figure 4.53
Headwater Depth for Concrete Pipe Culverts with Inlet Control

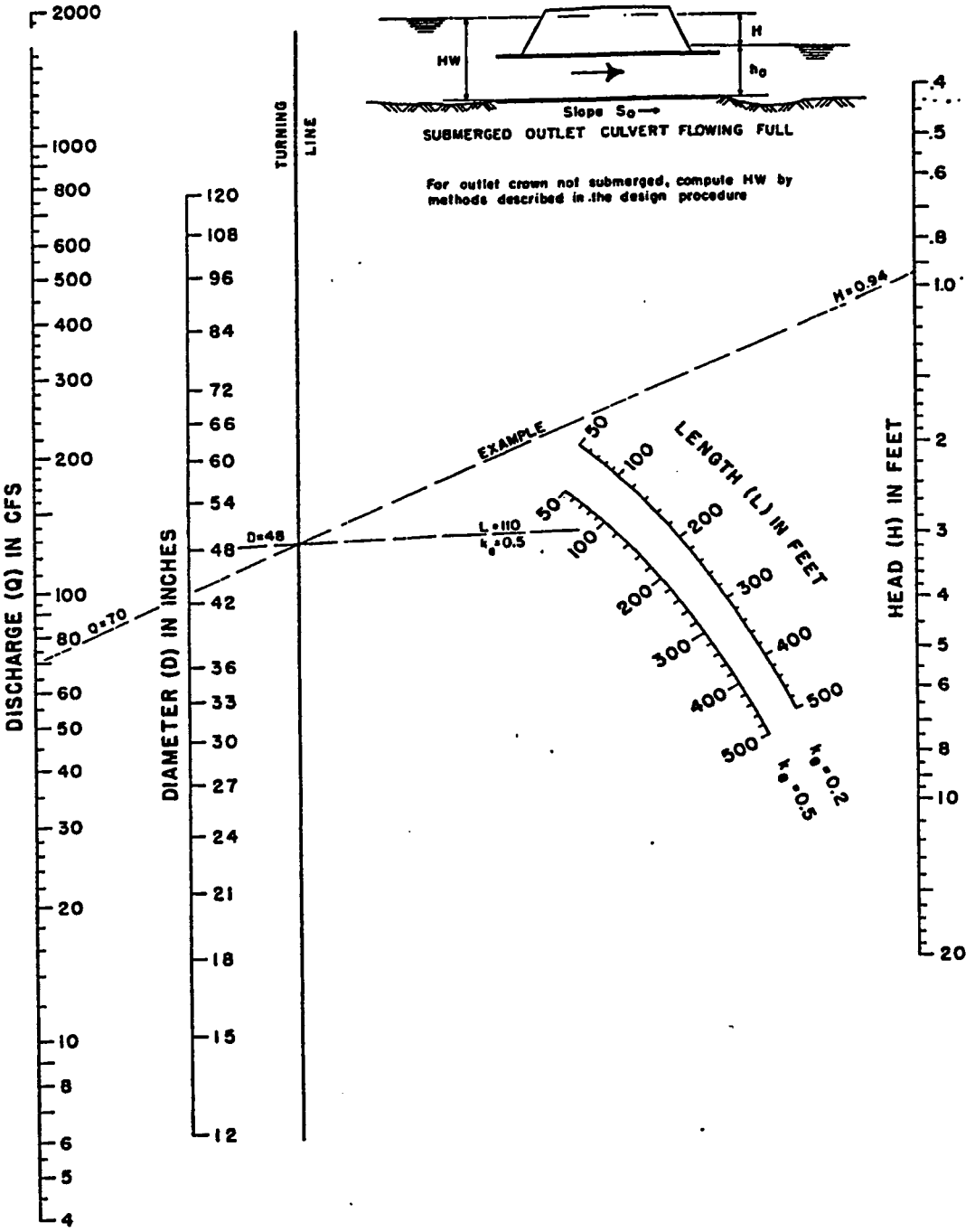


Figure 4.57
Head for Concrete Pipe Culverts Flowing Full

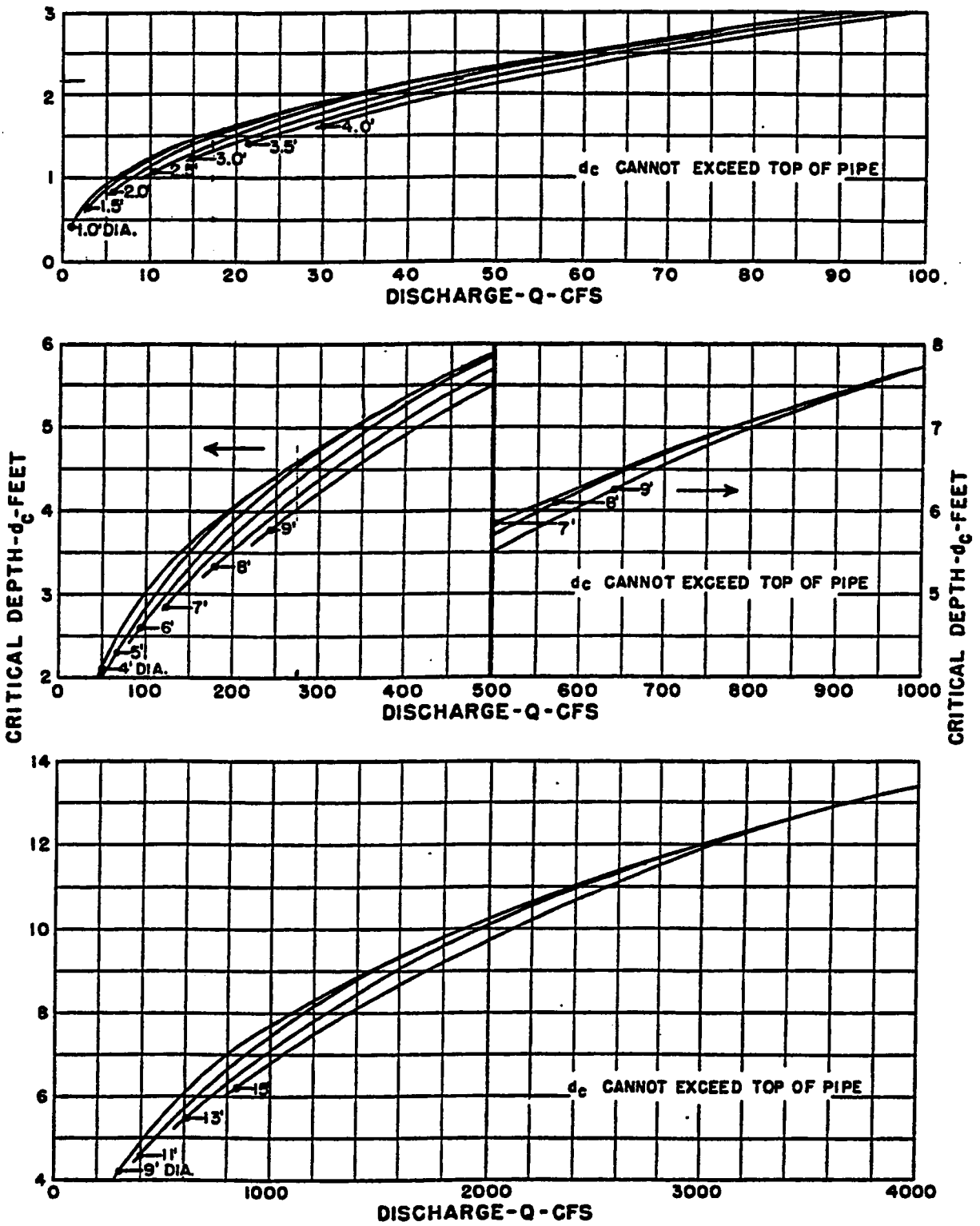


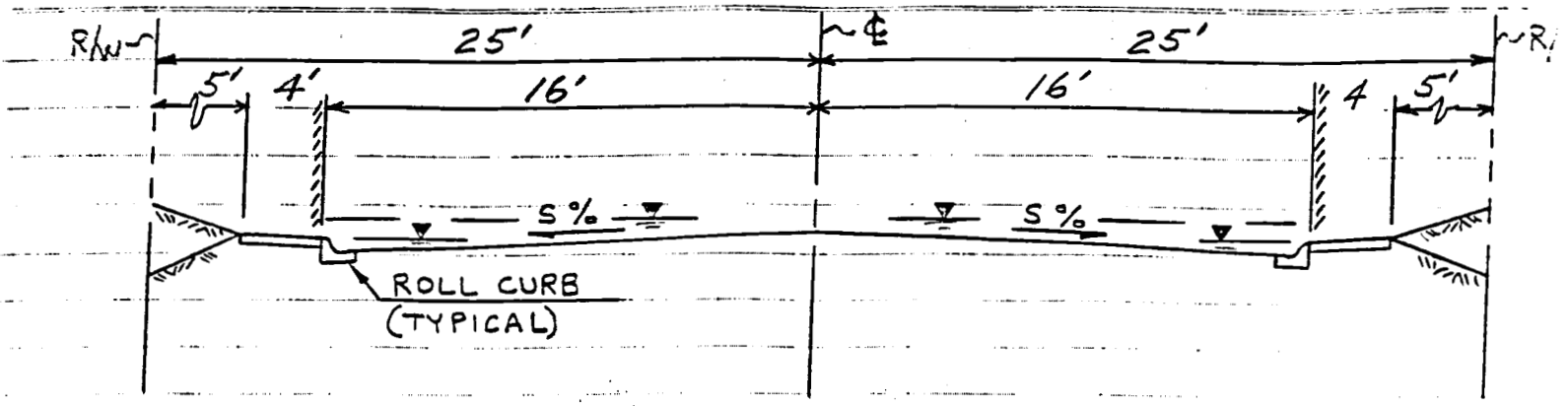
Figure 4.56
Critical Depth for Circular Pipe

Job No. 1389-3-300 Page No.

Computed by ARE Date 7/92
Checked by WHH Date 19 JULY 92
Reviewed by Date
Approved by Date

Subject SUN CITY WEST EXPANSION
STORM DRAINAGE - STREET CAPACITY

Sheet No. of



MANNINGS: $Q = AV$, $V = \frac{1.486}{n} R^{2/3} S^{1/2}$ $n = 0.016$ $R = A/W_p$

1 % ROADWAY CROSS-SLOPE														
DEPTH OF FLOW	AREA	W_p	LONGITUDINAL SLOPE OF ROADWAY											
			0.2 %		0.4 %		0.6 %		0.8 %		1.0 %		1.2 %	
			Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
0.33	8	32.2	13	1.6	19	2.3	23	2.8	26	3.3	29	3.7	32	4.0
0.63	17.6	32.2	49	2.8	69	3.9	85	4.8	98	5.6	109	6.2	—	—

2 % ROADWAY CROSS-SLOPE														
DEPTH OF FLOW	AREA	W_p	LONGITUDINAL SLOPE OF ROADWAY											
			0.2 %		0.4 %		0.6 %		0.8 %		1.0 %		1.2 %	
			Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
0.33	5.4	32.2	6.8	1.3	9.6	1.8	12	2.2	14	2.5	15	2.8	17	3.1
0.63	15.0	32.2	38	2.5	53	3.5	65	4.3	75	5.0	84	5.6	92	6.1

AREA FROM B/C TO R/W NOT INCLUDED HYDRAULICALLY.

W.S. @ 0.3' ABOVE T.C. USE MANNING'S EQUATION

Q IN CFS, V IN FPS, AREA IN FT^2, W_P IN FT, DEPTH IN FT

Job No. 1389-3-300 Page No.

Computed by ARE Date 7/92

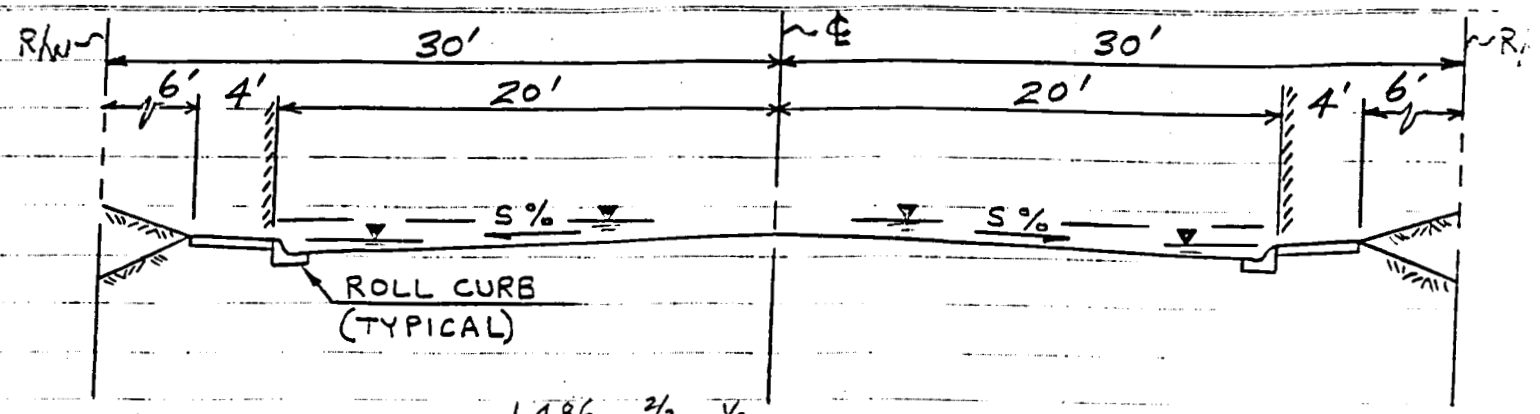
Checked by WHH Date 19 JUL 92

Reviewed by ARE Date 7/20/92

Approved by Date

Subject SUN CITY WEST EXPANSION
STORM DRAINAGE - STREET CAPACITY

Sheet No. of



MANNING'S EQ: $V = \frac{1.486}{n} R^{2/3} S^{1/2}$ $n = 0.016$

$R = A/W_p$

1 % ROADWAY CROSS-SLOPE														
DEPTH OF FLOW	AREA	W_p	LONGITUDINAL SLOPE OF ROADWAY											
			0.2 %		0.4 %		0.6 %		0.8 %		1.0 %		1.2 %	
			Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
0.33	9.2	40.2	14	1.6	20	2.2	25	2.7	29	3.1	32	3.5	35	3.8
0.63	21.2	40.2	58	2.7	81	3.8	99	4.7	115	5.4	—	—	—	—

2 % ROADWAY CROSS-SLOPE														
DEPTH OF FLOW	AREA	W_p	LONGITUDINAL SLOPE OF ROADWAY											
			0.2 %		0.4 %		0.6 %		0.8 %		1.0 %		1.2 %	
			Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
0.33	5.4	34	6.6	1.2	9.3	1.7	11	2.1	13	2.4	15	2.7	16	3.0
0.63	17.2	40.2	40	2.3	55	3.2	67	3.9	77	4.5	86	5.0	95	5.5

AREA FROM B/C TO R/W NOT INCLUDED HYDRAULICALLY.

W.S. @ 0.3' ABOVE T.C. USE MANNING'S EQUATION

Q IN CFS, V IN FPS, AREA IN FT^2, W_P IN FT, DEPTH IN FT

Job No. 11389-3-300 Page No.

Computed by ARE Date 7/92
Checked by WHH Date 20 July 92
Reviewed by Date
Approved by Date

Subject SUN CITY WEST EXPANSION
STORM DRAINAGE - STREET CAPACITY

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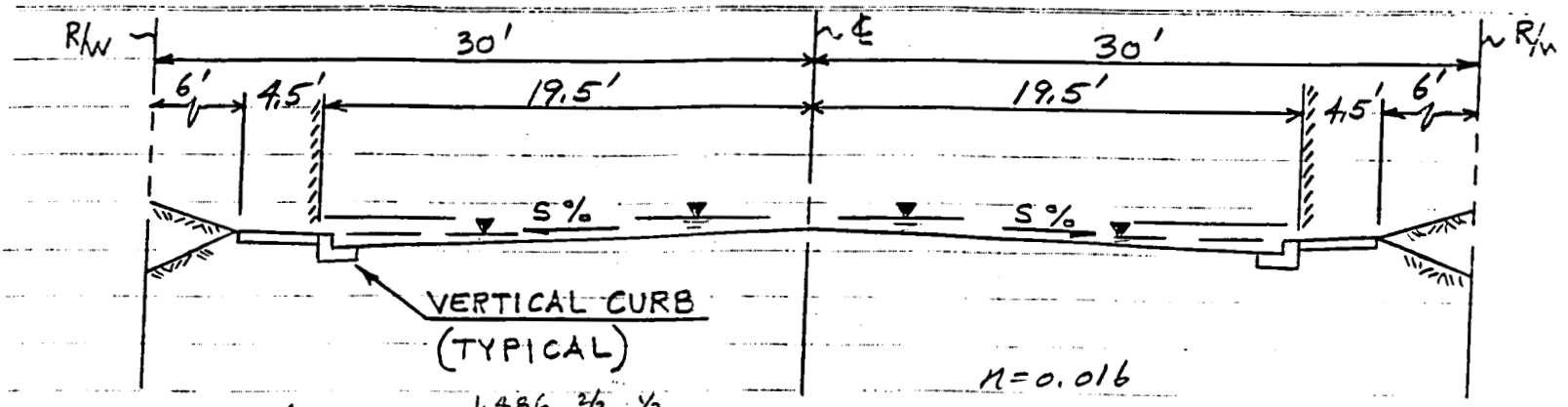


MANNING'S EQ: $V = \frac{1.486}{n} R^{2/3} S^{1/2}$

$R = A/W_P$

1 % ROADWAY CROSS-SLOPE														
DEPTH OF FLOW	AREA	W_P	LONGITUDINAL SLOPE OF ROADWAY											
			0.2 %		0.4 %		0.6 %		0.8 %		1.0 %		1.2 %	
			Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
0.5	15.7	40	35	2.2	50	3.2	61	3.9	70	4.5	78	5.0	86	5.5
0.8	27.4	40	88	3.2	125	4.6	—	—	—	—	—	—	—	—

2 % ROADWAY CROSS-SLOPE														
DEPTH OF FLOW	AREA	W_P	LONGITUDINAL SLOPE OF ROADWAY											
			0.2 %		0.4 %		0.6 %		0.8 %		1.0 %		1.2 %	
			Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
0.5	11.9	40	22	1.9	31	2.6	38	3.2	44	3.7	49	4.1	54	4.5
0.8	23.6	40	69	2.9	98	4.1	119	5.1	—	—	—	—	—	—

AREA FROM B/C TO R/W NOT INCLUDED HYDRAULICALLY.

W.S. @ 0.3' ABOVE T.C. USE MANNING'S EQUATION

Q IN CFS, V IN FPS, AREA IN FT^2, W_P IN FT, DEPTH IN FT

Job No. 1389-3-300 Page No.

Computed by ARE Date 7/92

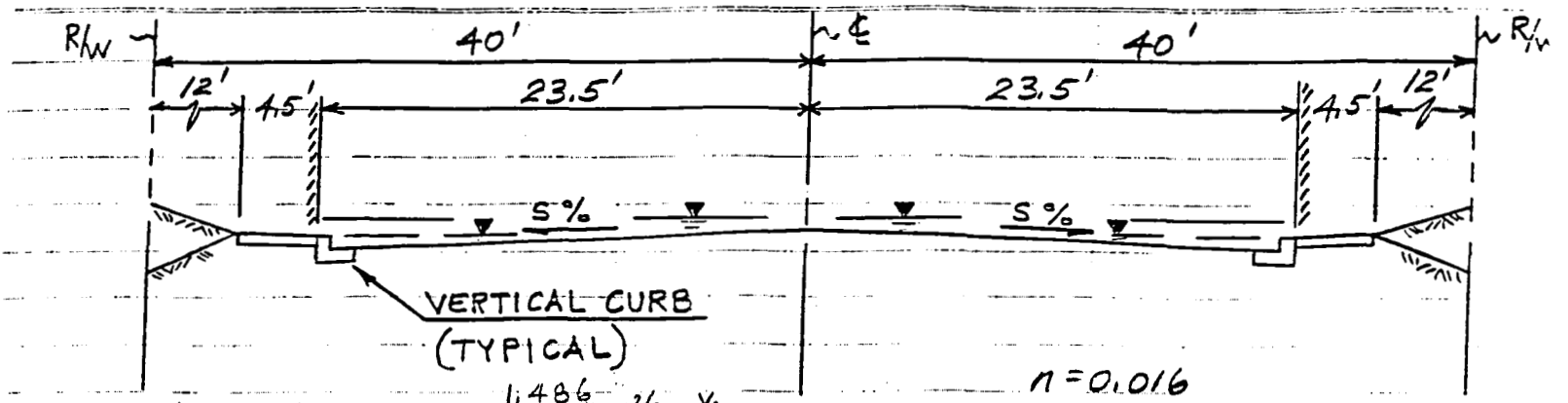
Checked by WHH Date 20 July 92

Reviewed by Date

Approved by Date

Subject SUN CITY WEST EXPANSION
STORM DRAINAGE - STREET CAPACITY

Sheet No. of



MANNING'S EQ: $V = \frac{1.486}{n} R^{2/3} S^{1/2}$

$R = A/W_p$

1 % ROADWAY CROSS-SLOPE														
DEPTH OF FLOW	AREA	W_p	LONGITUDINAL SLOPE OF ROADWAY											
			0.2 %		0.4 %		0.6 %		0.8 %		1.0 %		1.2 %	
			Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
0.5	18.0	43	39	2.2	55	3.1	67	3.7	78	4.3	87	4.8	95	5.3
0.8	32.1	43	102	3.2	–	–	–	–	–	–	–	–	–	–

2 % ROADWAY CROSS-SLOPE														
DEPTH OF FLOW	AREA	W_p	LONGITUDINAL SLOPE OF ROADWAY											
			0.2 %		0.4 %		0.6 %		0.8 %		1.0 %		1.2 %	
			Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
0.5	12.5	43	21	1.7	30	2.4	37	2.9	42	3.4	47	3.8	52	4.1
0.8	26.6	43	75	2.8	105	3.9	–	–	–	–	–	–	–	–

AREA FROM B/C TO R/W NOT INCLUDED HYDRAULICALLY.

W.S. @ 0.3' ABOVE T.C. USE MANNING'S EQUATION

Q IN CFS, V IN FPS, AREA IN FT^2, W_P IN FT, DEPTH IN FT

Job No. 11389-3-300 Page No.

Computed by ARE Date 7/92

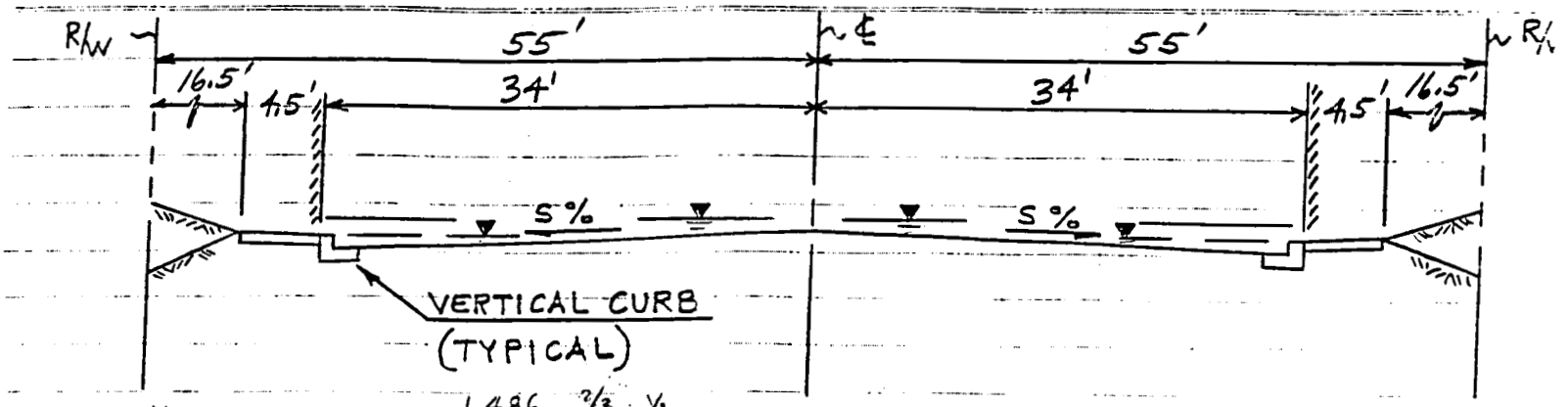
Checked by WHH Date 19 JULY 1992

Reviewed by Date

Approved by Date

Subject SUN CITY WEST EXPANSION
STORM DRAINAGE - STREET CAPACITY

Sheet No. of



MANNING'S EQ: $V = \frac{1.486}{n} R^{2/3} S^{1/2}$ $n = 0.016$

$R = A/W_p$

1 % ROADWAY CROSS-SLOPE														
DEPTH OF FLOW	AREA	W_p	LONGITUDINAL SLOPE OF ROADWAY											
			0.2 %		0.4 %		0.6 %		0.8 %		1.0 %		1.2 %	
			Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
0.22	4.8	45	4.5	0.9	6.3	1.3	7.8	1.6	9	1.9	10	2.1	11	2.3
0.5	22.4	69	44	1.9	62	2.8	76	3.4	88	3.9	98	4.4	108	4.8
0.8	42.8	69	129	3	—	—	—	—	—	—	—	—	—	—

2 % ROADWAY CROSS-SLOPE														
DEPTH OF FLOW	AREA	W_p	LONGITUDINAL SLOPE OF ROADWAY											
			0.2 %		0.4 %		0.6 %		0.8 %		1.0 %		1.2 %	
			Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
0.44	9.7	45	15	1.5	21	2.1	25	2.6	29	3	32	3.3	36	3.7
0.5	12.5	51	20	1.6	29	2.3	35	2.8	41	3.3	46	3.6	50	4
0.8	31.3	69	100	3.2	—	—	—	—	—	—	—	—	—	—

AREA FROM B/C TO R/W NOT INCLUDED HYDRAULICALLY.

W.S. @ 0.3' ABOVE T.C. USE MANNING'S EQUATION

Q IN CFS, V IN FPS, AREA IN FT^2, W_P IN FT, DEPTH IN FT

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1*****************************************************
 *  WATER SURFACE PROFILES                           *
 *  VERSION OF NOVEMBER 1976                         *
 *  UPDATED MAY 1984                                 *
 *  IBM-PC-XT VERSION AUGUST 1985                    *
 *  RUN DATE  07-18-92   TIME  13:48:15              *
 *****************************************************
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****************************************
 *  U.S. ARMY CORPS OF ENGINEERS        *
 *  THE HYDROLOGIC ENGINEERING CENTER   *
 *  609 SECOND STREET, SUITE D          *
 *  DAVIS, CALIFORNIA 95616             *
   *  (916) 440-2105 (FTS) 448-2105
****************************************
```

```
X     X  XXXXXXX   XXXXX            XXXXX
X     X  X       X     X           X     X
X     X  X       X                       X
XXXXXXX  XXXX    X          XXXXX   XXXXX
X     X  X       X                 X
X     X  X       X     X           X
X     X  XXXXXXX   XXXXX            XXXXXXX
```

1

07-18-92 13:48:15 PAGE 1

THIS RUN EXECUTED 07-18-92

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*************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION AUGUST 1985
*************************************************
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C
T1      SUN CITY WEST EXPANSION MASTER DRAINAGE REPORT      STANLEY CONSULTANTS
T2      DEER VLLY RD CHANNEL AND RATING CURVE FOR DET BASIN 330 OUTLET
T3      DET330 OUTLET/DEER VLLY CHANNEL       FILENAME: SCWEH2C   DATE: 7-19-92

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      0.       2.        0.        0.   .001500       .00        .0        0.  1264.500      .000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     1.000      .000    -1.000      .000      .000      .000      .000      .000      .000    15.000


NC      .035      .020      .025      .100      .300      .000      .000      .000      .000      .000
QT     5.000   250.000   500.000  1000.000  1500.000  2000.000      .000      .000      .000      .000

          CROSS SECTIONS ORIENTED LEFT TO RIGHT LOOKING DOWNSTREAM

          ZERO POINT FOR CROSS SECTION GR STATIONING CORRESPONDS TO LEFT
             END OF CROSS SECTION LINE

          STARTING WATER SURFACE ELEVATION BASED ON SLOPE-AREA METHOD
             USING ESTIMATED SLOPE OF 0.0015 FT/FT

X1      7.000     8.000    37.000   102.000      .000      .000      .000      .000      .000      .000
GR   1268.900      .000  1268.400    37.000  1262.400    57.000  1262.400    82.000  1267.900   102.000
GR   1268.200   112.000  1268.600   140.000  1270.900   150.000      .000      .000      .000      .000

X1      7.500     8.000    37.000   102.000    50.000    50.000    50.000      .000      .000      .000
GR   1269.000      .000  1268.500    37.000  1262.500    57.000  1262.500    82.000  1268.000   102.000
GR   1268.300   112.000  1268.700   140.000  1271.000   150.000      .000      .000      .000      .000


          XSECTN 8+75 IS AT EXISTING DRIVEWAY INTO BODINE ORCHARD.
          SMALL DIAM CULVERTS UNDER DRIVEWAY ASSUMED HYDRAUCILLY INEFFECTIVE

X1      8.750     8.000    57.000   132.000   125.000   125.000   125.000      .000      .000      .000
GR   1269.500      .000  1268.600    57.000  1264.000    87.000  1264.000   112.000  1268.100   132.000
GR   1268.400   162.000  1268.800   190.000  1271.000   200.000      .000      .000      .000      .000
```

1

07-18-92 13:48:15 PAGE 2

XSECTN 10+00 IS EAST PROPERTY LINE OF EXPANSION AREA

X1	10.000	8.000	75.000	142.000	110.000	135.000	125.000	.000	.000	.000
GR	1270.500	.000	1269.000	75.000	1263.000	100.000	1263.000	130.000	1269.000	142.000
GR	1270.000	158.000	1270.500	185.000	1273.000	200.000	.000	.000	.000	.000

OUTLET AT DET BASIN 330 CONSISTS OF SHORT TRAPEZOIDAL CHANNEL
SECTION. BOTTOM WIDTH RANGES FROM 35FT AT XSECTN 11+30 TO 50FT
AT XSECTN 11+80. SIDE SLOPES ARE 3H : 1V.

X1	11.300	8.000	155.000	230.000	100.000	150.000	130.000	.000	.000	.000
GR	1270.500	.000	1271.000	45.000	1270.000	155.000	1263.800	175.000	1263.800	210.000
GR	1270.000	230.000	1271.000	375.000	1271.100	415.000	.000	.000	.000	.000
X1	11.800	6.000	170.000	270.000	55.000	45.000	50.000	.000	.000	.000
GR	1272.000	50.000	1272.000	170.000	1264.000	195.000	1264.000	245.000	1272.000	270.000
GR	1272.000	400.000	.000	.000	.000	.000	.000	.000	.000	.000
NC	.000	.000	.000	.300	.500	.000	.000	.000	.000	.000
X1	12.300	4.000	45.000	440.000	45.000	55.000	50.000	.000	.000	.000
GR	1272.000	45.000	1264.000	120.000	1264.000	375.000	1272.000	440.000	.000	.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

THIS RUN EXECUTED 07-18-92

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION AUGUST 1985
**************************************************
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

DET330 OUTLET/DEER VLLY

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
	7.000	.00	.00	.00	1262.40	250.00	1264.64	.00	1264.82	15.28	3.41	73.30	63.96
	7.000	.00	.00	.00	1262.40	500.00	1265.67	.00	1265.95	15.15	4.20	119.10	128.46
	7.000	.00	.00	.00	1262.40	1000.00	1267.11	.00	1267.52	15.13	5.12	195.15	257.05
	7.000	.00	.00	.00	1262.40	1500.00	1268.15	.00	1268.67	15.26	5.79	259.96	383.95
	7.000	.00	.00	.00	1262.40	2000.00	1268.88	.00	1269.50	15.01	6.37	336.74	516.30
	7.500	50.00	.00	.00	1262.50	250.00	1264.71	.00	1264.90	15.87	3.46	72.35	62.76
	7.500	50.00	.00	.00	1262.50	500.00	1265.74	.00	1266.02	15.58	4.24	117.94	126.69
	7.500	50.00	.00	.00	1262.50	1000.00	1267.18	.00	1267.60	15.44	5.16	193.75	254.48
	7.500	50.00	.00	.00	1262.50	1500.00	1268.22	.00	1268.75	15.54	5.83	258.25	380.48
	7.500	50.00	.00	.00	1262.50	2000.00	1268.95	.00	1269.57	15.33	6.41	333.28	510.89
*	8.750	125.00	.00	.00	1264.00	250.00	1265.31	1265.31	1265.85	91.33	5.89	42.42	26.16
*	8.750	125.00	.00	.00	1264.00	500.00	1265.97	1265.97	1266.73	81.34	7.00	71.39	55.44
	8.750	125.00	.00	.00	1264.00	1000.00	1267.24	.00	1268.02	48.03	7.09	141.14	144.30
	8.750	125.00	.00	.00	1264.00	1500.00	1268.34	.00	1269.09	32.65	6.93	218.91	262.51
	8.750	125.00	.00	.00	1264.00	2000.00	1269.15	.00	1269.82	23.27	6.78	326.72	414.60
	10.000	125.00	.00	.00	1263.00	250.00	1265.96	.00	1266.04	4.22	2.16	115.82	121.66
	10.000	125.00	.00	.00	1263.00	500.00	1266.84	.00	1266.99	6.56	3.11	160.75	195.21
	10.000	125.00	.00	.00	1263.00	1000.00	1268.00	.00	1268.30	9.81	4.40	227.37	319.22
	10.000	125.00	.00	.00	1263.00	1500.00	1268.92	.00	1269.35	11.63	5.25	285.79	439.77
	10.000	125.00	.00	.00	1263.00	2000.00	1269.46	.00	1270.05	14.02	6.20	328.56	534.20
	11.300	130.00	.00	.00	1263.80	250.00	1266.01	.00	1266.12	8.83	2.68	93.31	84.12
	11.300	130.00	.00	.00	1263.80	500.00	1266.92	.00	1267.11	10.58	3.56	140.28	153.73
	11.300	130.00	.00	.00	1263.80	1000.00	1268.11	.00	1268.46	12.96	4.74	211.16	277.74
	11.300	130.00	.00	.00	1263.80	1500.00	1269.06	.00	1269.53	14.02	5.49	273.18	400.57
	11.300	130.00	.00	.00	1263.80	2000.00	1269.63	.00	1270.26	16.85	6.37	313.92	487.25

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
11.800	50.00	.00	.00	1264.00	250.00	1266.09	.00	1266.16	5.52	2.11	118.41	106.36
11.800	50.00	.00	.00	1264.00	500.00	1267.04	.00	1267.16	6.08	2.76	181.01	202.78
11.800	50.00	.00	.00	1264.00	1000.00	1268.32	.00	1268.52	7.09	3.65	274.14	375.62
11.800	50.00	.00	.00	1264.00	1500.00	1269.32	.00	1269.59	7.56	4.24	354.19	545.65
11.800	50.00	.00	.00	1264.00	2000.00	1269.98	.00	1270.35	8.75	4.87	411.02	676.22
12.300	50.00	.00	.00	1264.00	250.00	1266.18	.00	1266.19	.19	.42	598.43	572.03
12.300	50.00	.00	.00	1264.00	500.00	1267.19	.00	1267.20	.21	.55	903.35	1092.58
12.300	50.00	.00	.00	1264.00	1000.00	1268.58	.00	1268.59	.24	.74	1350.82	2031.62
12.300	50.00	.00	.00	1264.00	1500.00	1269.67	.00	1269.68	.26	.87	1726.00	2945.56
12.300	50.00	.00	.00	1264.00	2000.00	1270.44	.00	1270.46	.29	1.00	2006.19	3690.69

1

DET330 OUTLET/DEER VLLY

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	7.000	250.00	1264.64	.00	.00	.14	40.58	.00
	7.000	500.00	1265.67	1.04	.00	.17	47.80	.00
	7.000	1000.00	1267.11	1.44	.00	.11	57.84	.00
	7.000	1500.00	1268.15	1.04	.00	.15	72.53	.00
	7.000	2000.00	1268.88	.73	.00	-.12	139.79	.00
	7.500	250.00	1264.71	.00	.07	.00	40.42	50.00
	7.500	500.00	1265.74	1.03	.07	.00	47.63	50.00
	7.500	1000.00	1267.18	1.44	.07	.00	57.67	50.00
	7.500	1500.00	1268.22	1.04	.07	.00	71.66	50.00
	7.500	2000.00	1268.95	.73	.07	.00	137.84	50.00
*	8.750	250.00	1265.31	.00	.60	.00	39.90	125.00
*	8.750	500.00	1265.97	.66	.23	.00	47.46	125.00
	8.750	1000.00	1267.24	1.27	.06	.00	61.99	125.00
	8.750	1500.00	1268.34	1.10	.12	.00	97.64	125.00
	8.750	2000.00	1269.15	.80	.20	.00	168.71	125.00
	10.000	250.00	1265.96	.00	.66	.00	48.25	125.00
	10.000	500.00	1266.84	.88	.87	.00	53.69	125.00
	10.000	1000.00	1268.00	1.16	.76	.00	60.86	125.00
	10.000	1500.00	1268.92	.92	.58	.00	66.52	125.00
	10.000	2000.00	1269.46	.54	.31	.00	97.20	125.00
	11.300	250.00	1266.01	.00	.05	.00	49.28	130.00
	11.300	500.00	1266.92	.90	.07	.00	55.09	130.00
	11.300	1000.00	1268.11	1.20	.11	.00	62.85	130.00
	11.300	1500.00	1269.06	.94	.14	.00	68.92	130.00
	11.300	2000.00	1269.63	.58	.18	.00	72.63	130.00
	11.800	250.00	1266.09	.00	.08	.00	63.09	50.00
	11.800	500.00	1267.04	.95	.13	.00	69.01	50.00
	11.800	1000.00	1268.32	1.28	.20	.00	76.99	50.00
	11.800	1500.00	1269.32	1.00	.26	.00	83.23	50.00
	11.800	2000.00	1269.98	.66	.35	.00	87.39	50.00
	12.300	250.00	1266.18	.00	.09	.00	293.21	50.00
	12.300	500.00	1267.19	1.01	.15	.00	310.87	50.00
	12.300	1000.00	1268.58	1.39	.26	.00	335.12	50.00
	12.300	1500.00	1269.67	1.09	.35	.00	354.17	50.00
	12.300	2000.00	1270.44	.78	.46	.00	367.75	50.00

1

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= 8.750 PROFILE= 1 CRITICAL DEPTH ASSUMED

```
CAUTION  SECNO=     8.750  PROFILE= 1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION  SECNO=     8.750  PROFILE= 1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION  SECNO=     8.750  PROFILE= 2  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=     8.750  PROFILE= 2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION  SECNO=     8.750  PROFILE= 2  20 TRIALS ATTEMPTED TO BALANCE WSEL

1
 07-18-92     13:48:34                                                                    PAGE    1


                                                                    THIS RUN EXECUTED 07-18-92
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  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION AUGUST 1985
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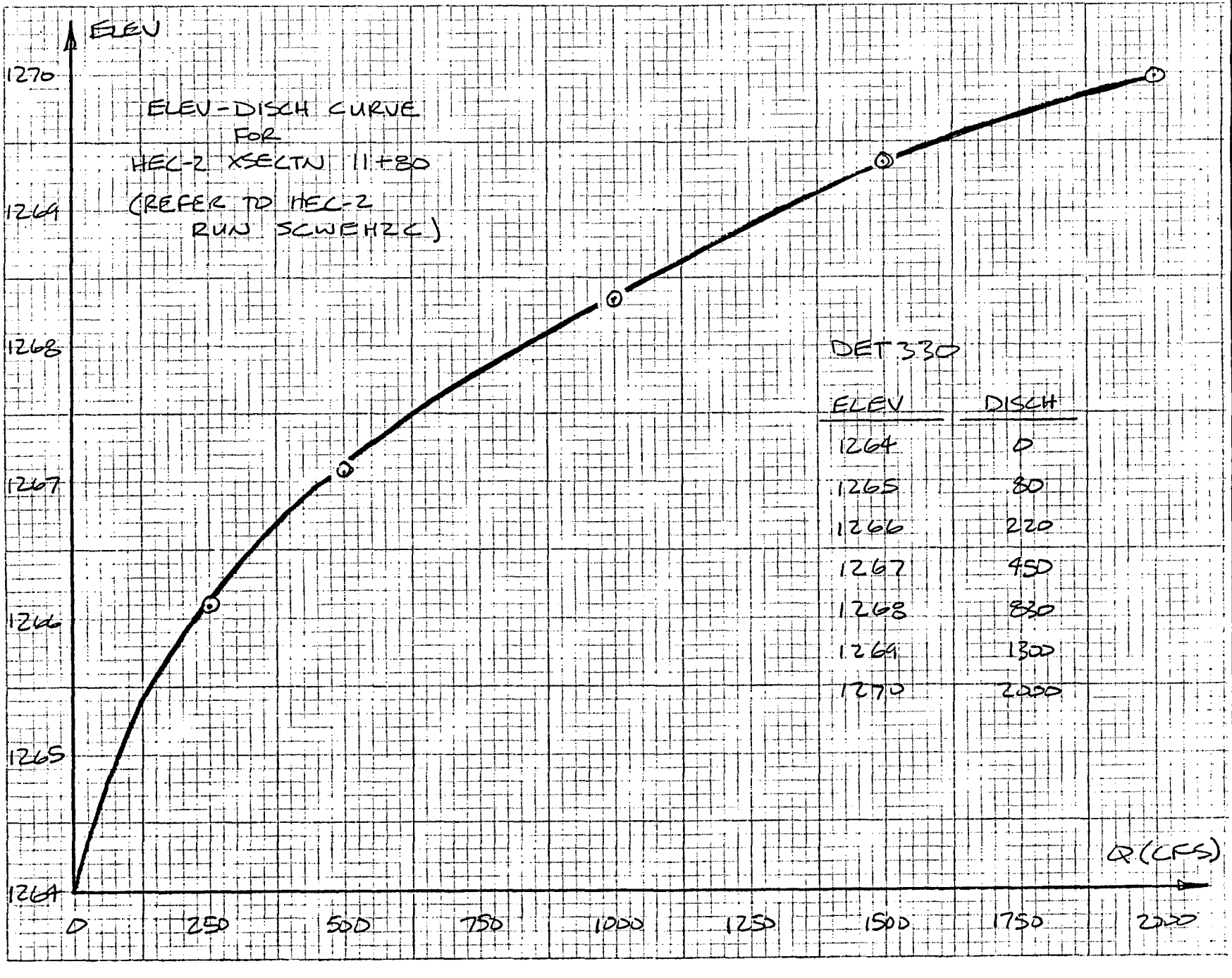
DESIGNED BY G.S.R. DATE 7-19-93 SHEET NO. PAGE NO.
CHECKED BY DATE OF JOB NO. 11.3001
REVIEWED BY DATE SUBJECT: SUN VALLEY WEST EXP
APPROVED BY DATE ELEV-DISCH @ DET 330



DET 330

ELEV	DISCH
1264	0
1265	80
1266	220
1267	450
1268	830
1269	1300
1270	2000

```
1*****************************************************
*  WATER SURFACE PROFILES                            *
*  VERSION OF NOVEMBER 1976                          *
*  UPDATED MAY 1984                                  *
*  IBM-PC-XT VERSION AUGUST 1985                     *
*  RUN DATE  07-16-92   TIME  18:54:59               *
*****************************************************
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****************************************
*  U.S. ARMY CORPS OF ENGINEERS        *
*  THE HYDROLOGIC ENGINEERING CENTER   *
*  609 SECOND STREET, SUITE D          *
*  DAVIS, CALIFORNIA 95616             *
*  (916) 440-2105 (FTS) 448-2105       *
****************************************
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X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X          XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX             XXXXXXX
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1

07-16-92 18:54:59 PAGE 1

THIS RUN EXECUTED 07-16-92

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION AUGUST 1985
**************************************************
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C
T1      SUN CITY WEST EXPANSION MASTER DRAINAGE REPORT      STANLEY CONSULTANTS
T2      BACKWATER ANALYSIS FOR SOUTHERN-MOST GOLF COURSE CHANNEL
T3      SOUTHERN GOLF CHANNEL            FILENAME: SCWEH2D        DATE: 7-16-92

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      0.       2.        0.        0.   .000000       .00        .0        0.  1269.550      .000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

    -1.000     .000    -1.000      .000      .000      .000      .000      .000      .000    15.000

NC      .030      .030      .025      .100      .300      .000      .000      .000      .000      .000
QT     1.000   1400.000      .000      .000      .000      .000      .000      .000      .000      .000

          CROSS SECTIONS ORIENTED LEFT TO RIGHT LOOKING DOWNSTREAM

          ZERO POINT FOR CROSS SECTION GR STATIONING CORRESPONDS TO LEFT
          END OF CROSS SECTION LINE (GENERALLY THE NORTH EDGE OF GOLF COURSE)

          CHANNEL CROSS SECTION STATIONING BEGINS AT 10+00 CORRESPONDING TO
          THE PROPOSED CENTERLINE OF DEER VALLEY DRIVE (REALIGNED)

          STARTING WATER SURFACE ELEVATION AT CROSS SECTION 10+65 IS BASED
          ON MAXIMUM STAGE AT DET220 FROM HEC-1 RUN 11389B

X1     10.650     6.000   340.000   500.000      .000      .000      .000      .000      .000      .000
GR   1278.000      .000  1278.000   340.000  1265.000   360.000  1265.000   455.000  1276.000   500.000
GR   1275.000   575.000      .000      .000      .000      .000      .000      .000      .000      .000

X1     14.500     9.000   170.000   320.000   375.000   395.000   385.000      .000      .000      .000
GR   1276.000      .000  1273.000    25.000  1273.000    50.000  1271.000    80.000  1270.000   170.000
GR   1266.000   195.000  1266.000   290.000  1270.000   320.000  1271.500   350.000      .000      .000

X1     19.850     9.000    35.000   278.000   535.000   535.000   535.000      .000      .000      .000
GR   1277.000      .000  1271.000    35.000  1269.000    65.000  1268.000   100.000  1267.500   155.000
GR   1268.000   210.000  1269.000   245.000  1271.000   278.000  1273.500   310.000      .000      .000

X1     26.100     8.000      .000   210.000   625.000   625.000   625.000      .000      .000      .000
GR   1278.000      .000  1269.000    70.000  1268.000   100.000  1269.000   135.000  1271.000   160.000
GR   1272.000   180.000  1274.000   210.000  1276.000   250.000      .000      .000      .000      .000
1
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WATER SURFACE AT XSECTN 27+10 IS BASED ON MAXIMUM STAGE AT DET100
FROM HEC-1 RUN 11389B

```
X1     27.100      9.000     30.000    150.000    100.000    100.000    100.000       .000       .000       .000
X5      1.000   1272.840       .000       .000       .000       .000       .000       .000       .000       .000
GR   1278.000       .000   1274.000     30.000   1273.000     70.000   1270.000     80.000   1269.000    105.000
GR   1270.000    140.000   1274.000    150.000   1275.000    200.000   1276.000    220.000       .000       .000

X1     32.350      7.000     55.000    140.000    540.000    520.000    525.000       .000       .000       .000
GR   1276.000       .000   1275.000     55.000   1271.000     80.000   1270.000    100.000   1271.000    120.000
GR   1274.000    140.000   1276.000    155.000       .000       .000       .000       .000       .000       .000

X1     35.750      6.000     35.000    130.000    350.000    335.000    340.000       .000       .000       .000
GR   1276.000       .000   1275.000     35.000   1270.000     65.000   1270.000    100.000   1276.000    130.000
GR   1277.000    200.000       .000       .000       .000       .000       .000       .000       .000       .000

QT      1.000   1300.000       .000       .000       .000       .000       .000       .000       .000       .000
X1     40.550      9.000     70.000    270.000    480.000    480.000    480.000       .000       .000       .000
GR   1281.000       .000   1279.000     20.000   1279.000     60.000   1278.000     70.000   1275.000    130.000
GR   1274.500    175.000   1275.000    240.000   1278.000    270.000   1278.500    300.000       .000       .000

X1     47.500      4.000       .000    270.000    695.000    695.000    695.000       .000       .000       .000
GR   1283.000       .000   1277.000     80.000   1277.000    210.000   1281.000    270.000       .000       .000

X1     52.750      9.000    125.000    300.000    525.000    525.000    525.000       .000       .000       .000
GR   1285.500       .000   1286.500     20.000   1282.000     65.000   1281.000     83.000   1282.500    115.000
GR   1282.000    125.000   1278.000    155.000   1278.000    265.000   1283.000    300.000       .000       .000

X1     57.550     10.000    205.000    300.000    480.000    480.000    480.000       .000       .000       .000
GR   1287.000       .000   1282.000     45.000   1282.000     80.000   1283.500    100.000   1284.000    120.000
GR   1285.000    205.000   1281.000    230.000   1280.300    250.000   1281.000    280.000   1285.000    300.000

X1     63.200      6.000     15.000    300.000    565.000    565.000    565.000       .000       .000       .000
GR   1289.000       .000   1290.000     15.000   1284.000     75.000   1283.000    190.000   1284.000    265.000
GR   1288.000    300.000       .000       .000       .000       .000       .000       .000       .000       .000

X1     68.900      8.000    125.000    300.000    560.000    580.000    570.000       .000       .000       .000
GR   1291.000       .000   1291.000    125.000   1287.000    170.000   1286.000    190.000   1284.000    210.000
GR   1283.700    235.000   1284.000    260.000   1290.000    300.000       .000       .000       .000       .000
EJ       .000       .000       .000       .000       .000       .000       .000       .000       .000       .000
1
```



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

*PROF 1

CCHV=    .100 CEHV=    .300
*SECNO 10.650
```

CROSS SECTIONS ORIENTED LEFT TO RIGHT LOOKING DOWNSTREAM

ZERO POINT FOR CROSS SECTION GR STATIONING CORRESPONDS TO LEFT
END OF CROSS SECTION LINE (GENERALLY THE NORTH EDGE OF GOLF COURSE)

CHANNEL CROSS SECTION STATIONING BEGINS AT 10+00 CORRESPONDING TO
THE PROPOSED CENTERLINE OF DEER VALLEY DRIVE (REALIGNED)

STARTING WATER SURFACE ELEVATION AT CROSS SECTION 10+65 IS BASED
ON MAXIMUM STAGE AT DET220 FROM HEC-1 RUN 11389B

```
    10.65     4.55  1269.55      .00  1269.55  1269.68      .13      .00      .00  1278.00
    1400.       0.    1400.       0.       0.     491.       0.       0.       0.  1276.00
      .00      .00     2.85      .00     .030     .025     .030     .000  1265.00   353.00
  .000363       0.       0.       0.        0        0        0      .00   120.61   473.61
0
 FLOW DISTRIBUTION FOR SECNO=     10.65          CWSEL=   1269.55

 STA=     353.     500.
   PER Q=    100.0
```

```
   AREA=    490.5
    VEL=      2.9

 *SECNO 14.500
     14.50     3.71  1269.71      .00      .00  1269.86      .15      .18      .01  1270.00
     1400.       0.    1400.       0.       0.     447.       0.       4.       1.  1270.00
       .03      .00     3.13      .00     .030     .025     .030     .000  1266.00   171.80
   .000626     375.     385.     395.        2        0        0      .00   146.04   317.84
0
 FLOW DISTRIBUTION FOR SECNO=     14.50          CWSEL=   1269.71

 STA=     172.     320.
   PER Q=    100.0
    AREA=    447.4
     VEL=      3.1

1
  07-16-92     18:54:59                                                                                PAGE    4

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


 *SECNO 19.850
     19.85     2.68  1270.18      .00      .00  1270.36      .18      .49      .01  1271.00
     1400.       0.    1400.       0.       0.     407.       0.       9.       3.  1271.00
       .08      .00     3.44      .00     .030     .025     .030     .000  1267.50    47.32
   .001455     535.     535.     535.        2        0        0      .00   217.13   264.45
0
 FLOW DISTRIBUTION FOR SECNO=     19.85          CWSEL=   1270.18

 STA=      47.     278.
   PER Q=    100.0
    AREA=    406.6
     VEL=      3.4

 *SECNO 26.100
     26.10     3.31  1271.31      .00      .00  1271.85      .54     1.38      .11  1278.00
     1400.       0.    1400.       0.       0.     237.       0.      14.       6.  1274.00
       .11      .00     5.91      .00     .030     .025     .030     .000  1268.00    52.05
   .003745     625.     625.     625.        3        0        0      .00   114.11   166.16
0
 FLOW DISTRIBUTION FOR SECNO=     26.10          CWSEL=   1271.31

 STA=      52.     210.
   PER Q=    100.0
    AREA=    236.9
     VEL=      5.9

 *SECNO 27.100
  WATER EL=X5 CARD=  1272.840

            WATER SURFACE AT XSECTN 27+10 IS BASED ON MAXIMUM STAGE AT DET100
            FROM HEC-1 RUN 11389B

     27.10     3.84  1272.84      .00      .00  1273.45      .61      .32      .02  1274.00
     1400.       0.    1400.       0.       0.     224.       0.      15.       6.  1274.00
       .11      .00     6.25      .00     .030     .025     .030     .000  1269.00    70.53
   .002691     100.     100.     100.        0        0        0      .00    76.57   147.10
0
 FLOW DISTRIBUTION FOR SECNO=     27.10          CWSEL=   1272.84

 STA=      71.     150.
   PER Q=    100.0
    AREA=    223.9
     VEL=      6.3

1
  07-16-92     18:54:59                                                                                PAGE    5

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

```
*SECNO 32.350
    32.35     4.31  1274.31      .00      .00  1274.92      .62     1.47      .00  1275.00
    1400.       0.    1400.       0.       0.     222.       0.      17.       7.   1274.00
      .13      .00     6.30      .76     .030     .025     .030     .000  1270.00    59.35
  .002927     540.     525.     520.        2        0        0      .00    82.93   142.28
0
 FLOW DISTRIBUTION FOR SECNO=     32.35          CWSEL=   1274.31

 STA=      59.     140.     142.
   PER Q=    100.0       .0
    AREA=    222.3       .3
     VEL=      6.3       .8

 *SECNO 35.750
    35.75     5.19  1275.19      .00      .00  1275.47      .28      .52      .03  1275.00
    1400.       0.    1400.       0.       1.     330.       0.      19.       8.   1276.00
      .16      .32     4.24      .00     .030     .025     .030     .000  1270.00    28.27
  .000927     350.     340.     335.        2        0        0      .00    97.70   125.96
0
 FLOW DISTRIBUTION FOR SECNO=     35.75          CWSEL=   1275.19

 STA=      28.      35.     130.
   PER Q=       .0    100.0
    AREA=       .6    329.9
     VEL=       .3      4.2

 *SECNO 40.550
 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
    40.55     1.81  1276.31  1276.31      .00  1276.98      .67      .97      .12  1278.00
    1300.       0.    1300.       0.       0.     197.       0.      22.       9.   1278.00
      .18      .00     6.58      .00     .030     .025     .030     .000  1274.50   103.78
  .008458     480.     480.     480.       20       22        0      .00   149.33   253.11
0
 FLOW DISTRIBUTION FOR SECNO=     40.55          CWSEL=   1276.31

 STA=     104.     270.
   PER Q=    100.0
    AREA=    197.5
     VEL=      6.6

1
  07-16-92     18:54:59                                                                    PAGE    6

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

 *SECNO 47.500
    47.50     2.16  1279.16      .00      .00  1279.38      .22     2.35      .05  1283.00
    1300.       0.    1300.       0.       0.     346.       0.      27.      12.   1281.00
      .23      .00     3.75      .00     .030     .025     .030     .000  1277.00    51.25
  .001808     695.     695.     695.        5        0        0      .00   191.10   242.35
0
 FLOW DISTRIBUTION FOR SECNO=     47.50          CWSEL=   1279.16

 STA=      51.     270.
   PER Q=    100.0
    AREA=    346.2
     VEL=      3.8

 *SECNO 52.750
    52.75     2.19  1280.19      .00      .00  1280.54      .34     1.12      .04  1282.00
    1300.       0.    1300.       0.       0.     277.       0.      30.      14.   1283.00
      .26      .00     4.68      .00     .030     .025     .030     .000  1278.00   138.48
  .002549     525.     525.     525.        3        0        0      .00   141.94   280.42
0
 FLOW DISTRIBUTION FOR SECNO=     52.75          CWSEL=   1280.19

 STA=     138.     300.
   PER Q=    100.0
    AREA=    277.5
     VEL=      4.7

 *SECNO 57.550
```

```
3265 DIVIDED FLOW

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    57.55      2.82  1283.12  1283.12      .00  1283.87      .76      1.81      .12  1285.00
    1300.      200.   1100.       0.      53.     148.       0.       33.      15.   1285.00
      .28      3.78     7.41      .00     .030     .025     .030      .000  1280.30    34.96
  .006170      480.     480.     480.       20       11        0       .00   133.70   290.58
0
 FLOW DISTRIBUTION FOR SECNO=     57.55          CWSEL=   1283.12

 STA=      35.       45.       80.       95.      300.
   PER Q=      1.1      12.6       1.7      84.6
    AREA=      5.6      39.0       8.3     148.4
     VEL=      2.6       4.2       2.6       7.4

1
  07-16-92     18:54:59                                                                                    PAGE    7

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

 *SECNO 63.200

 3301 HV CHANGED MORE THAN HVINS

    63.20      2.37  1285.37      .00       .00  1285.55      .19      1.63      .06  1290.00
    1300.        0.    1300.       0.        0.     373.       0.       37.      18.   1288.00
      .32       .00     3.49      .00      .030     .025     .030      .000  1283.00    61.30
  .001659      565.     565.     565.        3        0        0       .00   215.69   276.99
0
 FLOW DISTRIBUTION FOR SECNO=     63.20          CWSEL=   1285.37

 STA=      61.      300.
   PER Q=    100.0
    AREA=    372.9
     VEL=      3.5

 *SECNO 68.900

 3301 HV CHANGED MORE THAN HVINS

    68.90      2.86  1286.56      .00       .00  1287.27      .71      1.56      .16  1291.00
    1300.        0.    1300.       0.        0.     192.       0.       40.      20.   1290.00
      .35       .00     6.78      .00      .030     .025     .030      .000  1283.70   178.79
  .005361      560.     570.     580.        3        0        0       .00    98.28   277.07
0
 FLOW DISTRIBUTION FOR SECNO=     68.90          CWSEL=   1286.56

 STA=     179.      300.
   PER Q=    100.0
    AREA=    191.7
     VEL=      6.8

1
  07-16-92     18:54:59                                                                                    PAGE    8


                                                                                THIS RUN EXECUTED 07-16-92
 ***************************************************
   HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
   ERROR CORR -  01,02,03,04,05,06
   MODIFICATION -  50,51,52,53,54,55,56
   IBM-PC-XT VERSION AUGUST 1985
 ***************************************************

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

 SOUTHERN GOLF CHANNEL

 SUMMARY PRINTOUT TABLE  150
```

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
	10.650	.00	.00	.00	1265.00	1400.00	1269.55	.00	1269.68	3.63	2.85	490.53	735.23
	14.500	385.00	.00	.00	1266.00	1400.00	1269.71	.00	1269.86	6.26	3.13	447.38	559.54
	19.850	535.00	.00	.00	1267.50	1400.00	1270.18	.00	1270.36	14.55	3.44	406.55	366.99
	26.100	625.00	.00	.00	1268.00	1400.00	1271.31	.00	1271.85	37.45	5.91	236.87	228.76
*	27.100	100.00	.00	.00	1269.00	1400.00	1272.84	.00	1273.45	26.91	6.25	223.92	269.87
	32.350	525.00	.00	.00	1270.00	1400.00	1274.31	.00	1274.92	29.27	6.30	222.69	258.75
	35.750	340.00	.00	.00	1270.00	1400.00	1275.19	.00	1275.47	9.27	4.24	330.55	459.87
*	40.550	480.00	.00	.00	1274.50	1300.00	1276.31	1276.31	1276.98	84.58	6.58	197.48	141.36
	47.500	695.00	.00	.00	1277.00	1300.00	1279.16	.00	1279.38	18.08	3.75	346.25	305.72
	52.750	525.00	.00	.00	1278.00	1300.00	1280.19	.00	1280.54	25.49	4.68	277.48	257.51
*	57.550	480.00	.00	.00	1280.30	1300.00	1283.12	1283.12	1283.87	61.70	7.41	201.33	165.50
	63.200	565.00	.00	.00	1283.00	1300.00	1285.37	.00	1285.55	16.59	3.49	372.92	319.17
	68.900	570.00	.00	.00	1283.70	1300.00	1286.56	.00	1287.27	53.61	6.78	191.72	177.56

SOUTHERN GOLF CHANNEL

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	10.650	1400.00	1269.55	.00	.00	.00	120.61	.00
	14.500	1400.00	1269.71	.00	.16	.00	146.04	385.00
	19.850	1400.00	1270.18	.00	.47	.00	217.13	535.00
	26.100	1400.00	1271.31	.00	1.13	.00	114.11	625.00
*	27.100	1400.00	1272.84	.00	1.53	.00	76.57	100.00
	32.350	1400.00	1274.31	.00	1.47	.00	82.93	525.00
	35.750	1400.00	1275.19	.00	.89	.00	97.70	340.00
*	40.550	1300.00	1276.31	.00	1.12	.00	149.33	480.00
	47.500	1300.00	1279.16	.00	2.85	.00	191.10	695.00
	52.750	1300.00	1280.19	.00	1.03	.00	141.94	525.00
*	57.550	1300.00	1283.12	.00	2.92	.00	133.70	480.00
	63.200	1300.00	1285.37	.00	2.25	.00	215.69	565.00
	68.900	1300.00	1286.56	.00	1.19	.00	98.28	570.00

SUMMARY OF ERRORS AND SPECIAL NOTES

NOTE SECNO= 27.100 PROFILE= 1 WSEL BASED ON X5 CARD

CAUTION SECNO= 40.550 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 40.550 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY

```
CAUTION  SECNO=    40.550  PROFILE= 1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION  SECNO=    57.550  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=    57.550  PROFILE= 1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION  SECNO=    57.550  PROFILE= 1  20 TRIALS ATTEMPTED TO BALANCE WSEL

1
 07-16-92     18:55:09                                                                    PAGE    1


                                                                    THIS RUN EXECUTED 07-16-92
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  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
  IBM-PC-XT VERSION AUGUST 1985
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APPENDIX E
1977 SUN CITY WEST MASTER DRAINAGE

Section H
INTRODUCTION TO DRAINAGE MASTER PLAN

Section H
INTRODUCTION TO DRAINAGE MASTER PLAN

Drainage analysis has been conducted for the purposes of evaluating the existing conditions on and adjacent to the Sun City West Phase I site and the future conditions relating to the proposed development of the project site for the control of periodic flooding conditions which result from a 100 year Frequency Storm.

From this analysis a Master Drainage Plan has been developed consisting of roadways, roadways with center channels and lined drainage channels to carry the design Frequency Storm away from the proposed development. Once implemented, this Plan will insure that housing construction is above flood levels for design frequency storms.

The study area contains approximately 5,687 acres of land within Township 4 North, Range 1 West. This land is owned by the Del E. Webb Development Company and is currently being farmed by several different parties, primarily Boswell Farms, Inc. and a cattle feeding yard (Lizard Acres) operated as Circle One Ranch. The total acreage is not under cultivation but varies in useage from raw desert to fallow to agricultural with the latter being the primary useage.

1. NATURAL FEATURES

The study area lies within the portion of the state designated as the upper Sonoran Desert and has all of the general terrain features usually associated with a typical southwestern desert region. This consists of creosote bushes and Saguaro Cactus as the predominate plants on the flats, with Palo Verde and Ironwood trees lining the washes including Mesquite bushes which generally form very dense thickets at ends of washes.

The topography consists of flat desert plain sloping southeast with the White Tank Mountains to the west and the Wickenburg and Hieroglyphic Mountains to the north. The Beardsley Canal and proposed Central Arizona Project Canal

lie north of the project site. In 1956 the Army Corps of Engineers completed construction of a Detention Basin known as the McMicken Dam to protect Luke Air Force Base from flooding by Trilby Wash. The outlet for this basin is an earth lined channel (McMicken Dam Outlet Channel) varying in width from 20' to 50' along the north side of the project site.

The area is drained by many arroyos and washes which discharge into the Detention Basin or Outlet Channel and ultimately discharge into the Agua Fria River located along the east side of the project site. This river along with the other rivers in the Phoenix area are dry and have no permanent flow. In the vicinity of the project site the Agua Fria River banks are reasonably well defined as a water course and are capable of carrying sizeable flows resulting from high intensity summer storms prevalent to this area.

The climate of the area is typical of the arid Sonoran Desert. Temperatures vary from highs near 120° F in summer to lows below 20° F. in winter. Long range temperature approximates 70° F.

Rainfall in the area is usually concentrated in the months of December-March and July-September. Winter storms are normally the result of the easterly movement of storm fronts arising in the Northern Pacific. These fronts pass across the state in cycles during the winter months and usually exert their maximum influence in the higher elevations and along the Mogollon Rim Country; however, they are frequently of several days' duration and may result in significant precipitation within the watershed being studied.

Summer storms more often result from the movement of wet air masses northward from the Gulf of Mexico traveling generally from southwest to northeast across the state. These storms are frequently of high intensity and may produce cyclonic activity as well as large amounts of precipitation. Local thunderstorms are also frequently observed during the summer and fall. These generally do not cover large areas, but may result in severe localized flooding due to their high intensity. Floods may, of course, result from any of the types of storms discussed, depending on duration and location of high intensity rainfall.

2. HYDROLOGY

Storm runoff has been estimated by the Soil Conservation Service Method using precipitation maps prepared by the U. S. Weather Bureau for the Soil Conservation Service. Values of precipitation were selected from these maps for the study area for 6 hour and 24 hour duration storms of 100 year frequency. These values were then converted to 12, 3, 2 & 1 hour railfalls by use of equations relating 6 hour and 24 hour durations. Storm runoff quantities were then computed by the TR-20

Hydrology Program in the study area for 100 year Frequency Storms of 24, 12, 6, 3, 2 & 1 hour duration, utilizing the appropriate curve numbers of the contributing drainage areas.

3. DESIGN CRITERIA

FROM: Arizona Highway Department - Bridge Division
"Hydrologic Design for Highway Drainage in Arizona"

PRECIPITATION (Inches)

DURATION (Hours)	10 yr. Freq.	25 yr. Freq.	50 yr. Freq.	100 yr. Freq.
6	2.1	2.6	2.9	3.3
24	2.5	3.2	3.6	4.20
2*	1.79*	2.14*	2.36*	2.61
1	1.5	2.0	2.2	2.40

* Interpolated values equating 6 hour and 24 hour rainfalls
($P_{2\,hr.} = 1.77\,P_6 - 0.77\,P_{24}$)

Peak runoff estimate based on 100 Year Frequency Storm of 24 hour duration.

Runoff Quantities have been calculated using computer application of the TR-20 Hydrology Program based on Soil Conservation Unit hydrograph equation for estimating peak rate of runoff:

$$Q_p = \frac{484\ AQ}{T_p}$$

WHERE:

Q_p = peak discharge is cfs

A = Drainage Area in square miles

Q = Runoff volume of the watershed in inches

T_p = Time to peak in hours

484 = is a constant for the units used

Time to peak is based on the following

$$T_p = \frac{D}{2} + 0.6T_c$$

Where:

T_p = time to peak in hours

D = Duration of storm in hours

T_c = time of concentration in hours

The Runoff volume Q is a function of the storm rainfall and a curve number (CN) which is based on a vegetative cover type and density and a hydrologic soil group. The hydrologic soil group within Sun City West and the surrounding area is constant as group C (slow infiltration rate). The cover type and density within Sun City West will vary considerably for each drainage area; thus the CN will be based on a weighted CN corresponding to the type of development using the following values:

CN	Type of Development
91	Commercial Areas
87	Single Family Housing Area
83	Apartment Complex Area
83	Duplex Areas
80	Undeveloped Desert Areas
74	Golf Course Areas

Section I
HYDROLOGICAL ANALYSIS

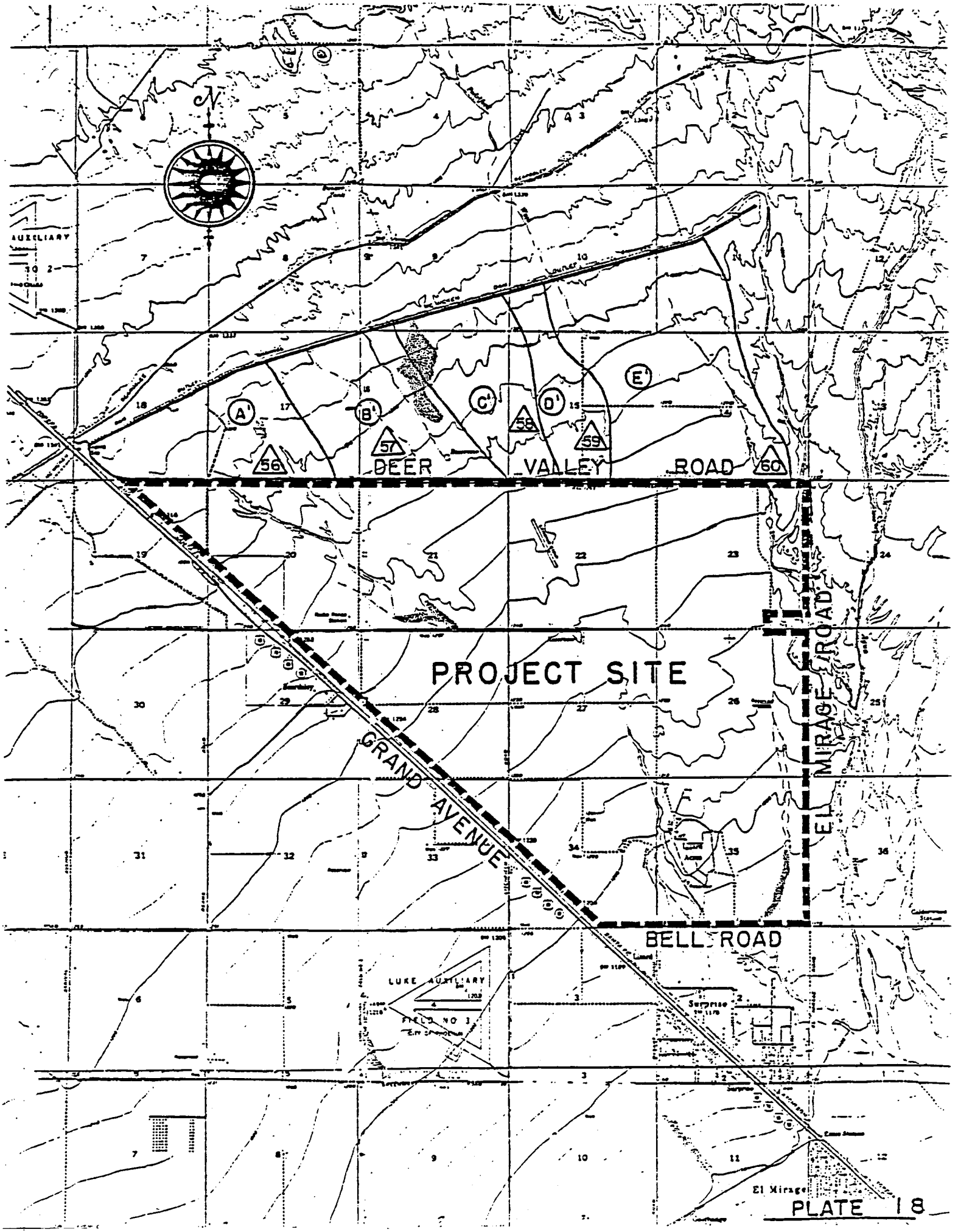

N
A'
B'
C'
D'
E'
56
57
58
59
60
DEER VALLEY ROAD
PROJECT SITE
GRAND AVENUE
EL MIRAGE ROAD
BELL ROAD
LUKE AUXILIARY
FIELD NO 3
Surprise
El Mirage

PLATE 18

Runoff Quantities and Concentration Points

Storm runoff contributions have been estimated for each Offsite Drainage Area (as shown on Plate 18) for a 100 year Frequency Storm of 24 hour duration. Runoff quantities for each Drainage Area are presented in Table 6. TR-20 Program routed storm runoff quantities, at indicated concentration points, are presented in Table 7.

Runoff calculations were based on the land within the drainage area remaining undeveloped or in agricultural useage. If offsite land use changes, it will be the responsibility of the owner(s) of said land to increase the channel size associated with the proposed Deer Valley Road improvement if runoff quantities are sufficiently increased or cause any flood of Sun City West.

2. ONSITE DRAINAGE

Onsite Drainage Area Description

As shown by Plate 19, the drainage area of the project site extends from Bell Road to Deer Valley Road and from Grand Avenue to El Mirage Road, containing approximately 9 square miles of area. This land is currently in varying stages of useage ranging from Desert to fallow to agricultural. The surface runoff south of Deer Valley Road now is a combination of surface sheet flow and defined washes conveyed in a southeasterly direction. Upon reaching Bell Road, surface runoff is conveyed under the road in a system of pipe culverts and reinforced concrete box culverts.

The overall drainage pattern is in a southeasterly direction on an average slope of a 0.5' drop per 100 feet horizontal run. The elevations within the study area range from 1322 in the northwest corner to 1176 in the southeast corner, which gives a fall of 146 feet over the area.

The existing cover type varies from Desert Brush to agricultural crop with a density ranging from "poor" to "good" and having a hydrologic soil group in Category "C". Proposed development of the study area will include single family housing, apartments, golf courses, cemetery, shopping centers, recreation centers and other commercial uses resulting in varying curve numbers.

The central core designated by Drainage Area AA on Plate 19 contains model housing, apartments, a recreation center and a golf course. The unique feature of this core is that it will contribute no surface runoff as all the runoff will be stored on the golf course or it's lakes for use in irrigation of the golf course.

The surface runoff, with improvements, of the other drainage areas will be in the southeasterly direction. It is proposed that the drainage handling system for the project will use the roadway system network, grass or lined channels and a combination of roadways with median channels to transport the runoff to a discharge point. Once this runoff reaches Bell Road it will be conveyed under the roadway in box culverts and collected on the south side in a large channel to be conveyed east for discharge into the Agua Fria River channel.

Section I
HYDROLOGICAL ANALYSIS

The Master Drainage Plan is based on the quantities and characteristics of runoff, both within the proposed developed new community and from the surrounding area. Presented below is a description of the onsite and offsite drainage areas and their associated runoff quantities and points of storm water discharge concentration.

1. OFFSITE DRAINAGE

Offsite Drainage Area Description

As shown by Plate 18 the offsite drainage area of this study encompasses Sections 14, 15 and 16 and parts of Sections 9, 10, 11, 17 and 18 of Township 4 North, Range 1 West up to the outlet channel of McMicken Dam. This study area is mostly undeveloped desert land with a small mix of agricultural row crop useage by Bodine Produce Company in Sections 14 and 15. The type of cover in this area is considered to be Desert Brush with density rating of "poor" and a Hydrologic Soil Group C, all as described in Arizona Highway Department Hydrologic Design Manual.

In addition to the aforementioned sections, the offsite drainage includes overflow from McMicken Dam outlet channel ranging between 4450 cfs and 14,000 cfs, including side inflows from adjacent drainage areas. This flow comes down an existing wash along the east boundary of Sections 11, 14, 23 and 26 before being intercepted by Agua Fria River Channel.

There presently exists along the north side of Deer Valley Road an earth channel of varying depth and width between Reams Road and El Mirage Road. This ditch will divert storm water runoff from the north in an easterly direction to its intersection with El Mirage Road Channel Section for conveyance to the Agua Fria River. The existing ditch section increases in width and depth as it proceeds east.

The existing design capacity of this ditch is not known at this time as no field data was taken north of Deer Valley Road. This ditch will intercept runoff from two defined washes in the area with the remainder being interception of sheet flow off desert land and agricultural land.

The entire project site is above the delineated Flood Plain of the Agua Fria River as shown on Flood Plain Maps prepared by the Maricopa County Flood Control District.

Runoff Quantities and Concentration Points

Storm runoff quantities have been estimated for each Onsite Drainage Area (as shown on Plate 19) for a 100 year Frequency Storm of 24 hour duration. Runoff quantities for each Drainage Area are presented in Table 8. The TR-20 Program routed storm runoff quantities, at indicated concentration points, are presented in Table 9.

TABLE 6

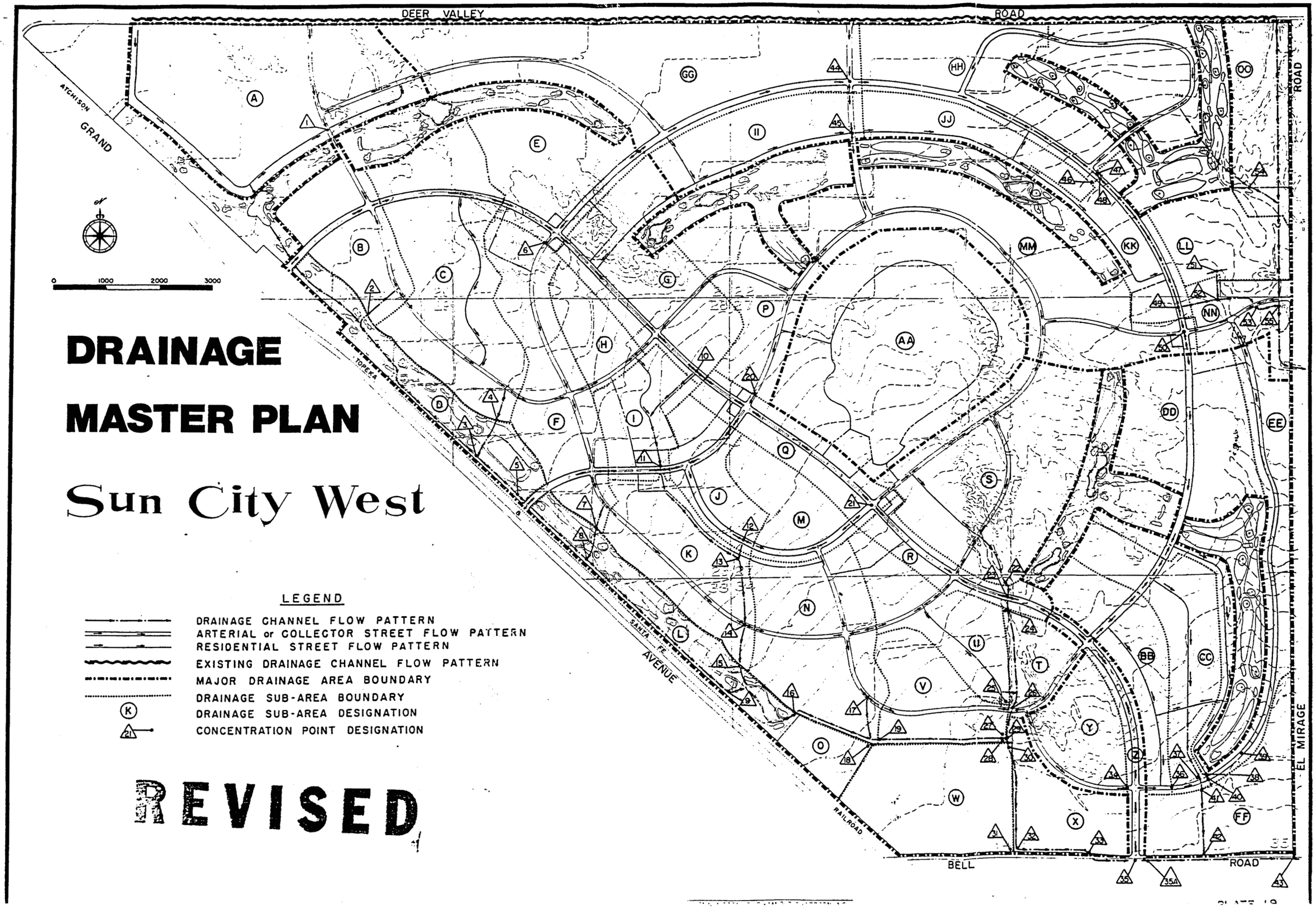
OFF-SITE STORM RUNOFF

SYMBOL	DRAINAGE AREA (Acres)	CURVE NUMBER	T_c (Min)	ESTIMATED PEAK (cfs)
A'	550	80	41.5	718
B'	595	80	58	637
C'	467	80	52.5	535
D'	301	80	54.5	338
E'	1101	80	78.5	958

TABLE 7

OFF-SITE ROUTED STORM RUNOFF

CONCENTRATION POINT	DRAINAGE AREA (Acres)	TIME TO PEAK (Hours)	ESTIMATED PEAK RUNOFF (cfs)	REMARKS
56	550	12.26	718	D.A. A'
57	1145	12.50	1315	D.A. A'&B'
58	1612	12.78	1583	D.A. A',B'&C'
59	1913	12.81	1794	D.A. A',B',C'&D'
60	3014	13.21	2381	D.A. A',B',C',D'&E'



DRAINAGE MASTER PLAN

Sun City West

REVISED