FINAL CONCEPT DESIGN REPORT
UNIVERSITY DRIVE DRAINAGE IMPROVEMENTS

In. to cancel 26th July

FCD 92-12

10:00 am 27th min Consult.

sla

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In - house 26th Jan
10 am 27th meeting Consult.

FCD 92-12

Prepared For:

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Registered Professional Engineer (Civil) CERTIFICATE NO. 24767 ROBERT A. EICHINGER DATE SIGNED March 11, 1993 ARIZONA, U.S.A.

MARCH, 1992

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EXECUTIVE SUMMARY

An engineering alternatives analyses was conducted to recommend a level of protection for flood control improvements for University Drive between Higley Road and Power Road. The engineering alternatives analyses examined flood control improvements for storm events having return intervals of 2, 5, 10, and 25-years.

The results and conclusions of the alternatives analyses were presented in the report titled "Concept Design Report University Drive Drainage Improvements," by Simons, Li & Associates, Inc. (9). The report presented the methodology used to evaluate the drainage alternatives, provided a cost estimate for each alternative, and recommended a preferred flood control alternative.

The concept report recommended the 10-year return interval as the level of protection desired for flood control at University Drive. The recommendation was based on cost effectiveness, degree of protection, and consistency with the drainage design for other drainage systems in the project area.

This final report examines the recommended flood control alternative in a more detailed approach. The hydrologic model developed in the concept report is further refined in the final analyses to compute side street flows along University Drive and to incorporate elements that improve the level of detail of the model.

The hydrologic model incorporates two plans, Plan 1 and Plan 2, which depicts the existing conditions of the watershed and the proposed drainage improvements along University Drive, respectively. The two plan approach provides for a direct comparison of the proposed improvements with the existing conditions.

- Report need to provide plan to show the parcels
  discused here.
- you need to provide Final plan to show these
  Information.

Comments provided by the Flood Control District on the concept report have been incorporated or addressed in this final report. In addition, modifications to the hydrologic model have been included in this report.

A detailed hydraulic analysis was conducted for the recommended flood control alternative. The computed proposed University Drive drain hydraulic grade line was compared with proposed gutter and roadway grade line profiles to ensure that proposed improvements remain within project constraints and criteria.

plan

Project improvements will include a new storm drain from Higley Road to 62nd Street. The improvements also include a new detention basin located within the SRP easement between 62nd and 64th Streets. The primary function of the proposed improvements are to mitigate the roadway and neighborhood flooding experienced during the 10-year rainfall/runoff event.

Utility conflicts along the entire length of the project are minimal. All utility lines crossing the University Drive storm drain are high enough in elevation that the storm drain mainline runs beneath them. The 12-inch sanitary sewer at Recker Road with 8-feet of cover is above the storm drain. The somewhat deep location of the storm drain will facilitate future crossing utilities (water and sewer lines; see Appendix A1 through A6 for profile location of crossing utilities).

Right-of-way requirements have also been minimized by detailed analysis and design. Additional right-of-way along University Drive is not needed since the storm drain centerline is located 5-feet south of the construction centerline.

plan

With the enlargement of the pond east of 62nd Street, the seven (7) parcels along the south side of Cicero Street and west of 62nd Street are not required. However, the three parcels east of 62nd Street at Cicero Street will be needed to adequately grade Pond 'A'. Overlay easements for detention in the area of the pond between 62nd Street and 64th Street are required. There will be no need for channel right-of-way east of 64th Street since the use of a channel through the SRP easement area has been abandoned.

I. INTRODUCTION

A. Authorization and Purpose

This final concept design and report has been authorized and prepared for Entranco. Entranco is the prime consultant for the University Drive Drainage Improvement Project. The project is a multi-agency undertaking involving the Flood Control District of Maricopa County (FCDMC), the Maricopa County Department of Transportation (MCDOT), and the City of Mesa (COM). The FCDMC is acting as the local agency and administrator of the contract.

The FCDMC and COM are responsible for the development and review of flood control improvements. MCDOT is responsible for road improvements and drainage issues related to the road improvements. The contract study number is FCD 92-12, and the MCDOT work order No. is 68868.

Initially, a concept design report was prepared to present the engineering alternatives analysis conducted and to recommend a preferred level of flood protection for the University Drive Drainage Improvement Project. The purpose of this final concept design report is to document the detailed analyses of the recommended level of flood protection for University Drive.

B. Scope of Work

The project scope was formulated to identify off-site drainage improvements associated with the level of protection required for events having the return frequency of 2, 5, 10, and 25-years. The project improvements include the section of University Drive located in a county island within Mesa, from Higley Road to Power Road. The concept design report incorporates a construction cost estimate for each level of protection. This final report presents a construction cost estimate for the 10-year level of protection.

C. Problem Statement

The University Drive Drainage Improvements Project is being undertaken to improve the drainage and flood control for University Drive. Areas south of University Drive are subjected to flooding from stormwater runoff which cross over University Drive. The existing drainage paths are oriented to flow from northeast to southeast. SW Flows collected on University Drive (currently an inverted crown street) during storm events cross University east of local high points which currently prevent the flows from continuing west. The local high points divert the flows south to the downstream subdivisions. You need to use Ref. Map.

II. PROJECT DESCRIPTION

A. Project Location

The University Drive Drainage Improvements project is located within a county island within the City of Mesa at University Drive from Higley Road to Power Road (Bush Highway). Figure 1 provides a vicinity map showing the location of the project within the Phoenix metropolitan area.

The portion of University Drive studied is located in a county island within the City of Mesa. Figure 2 provides a location map depicting the specific limits of the University Drive Drainage Improvement project.

B. Watershed Description

The watershed or drainage basin contributing storm flows to the University Drive Drainage Improvements is 5.2 square miles in area. The drainage basin for this project is bounded by Higley Road on the west, University Drive on the south, Power Road on the east, and McKellips Road on the north. A portion of the basin extends east of Power Road and north of McKellips. Figure 3 illustrates the contributing watershed.

1. Land Use

The University Drive watershed is almost completely developed for residential and commercial land uses. The predominant land use is for residential purposes. According to City of Mesa zoning maps a large proportion of the watershed is zoned single residence and planned area developments (P.A.D.S). Approximately 25 percent of the drainage area is related to golf courses and associated developments. Figure 3 shows the zoning for the project watershed. The base map for Figure 3 was provided by the City of Mesa.

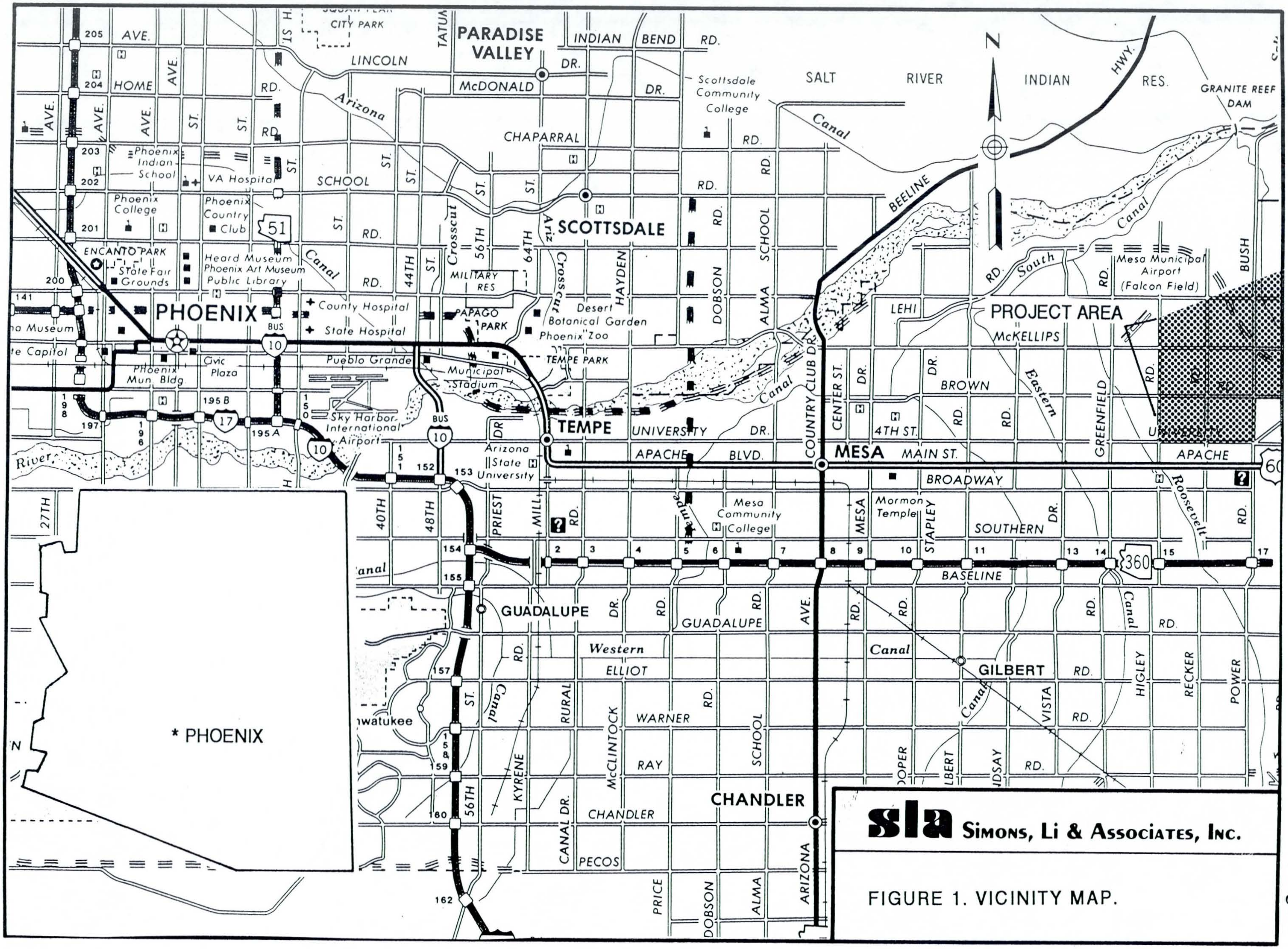

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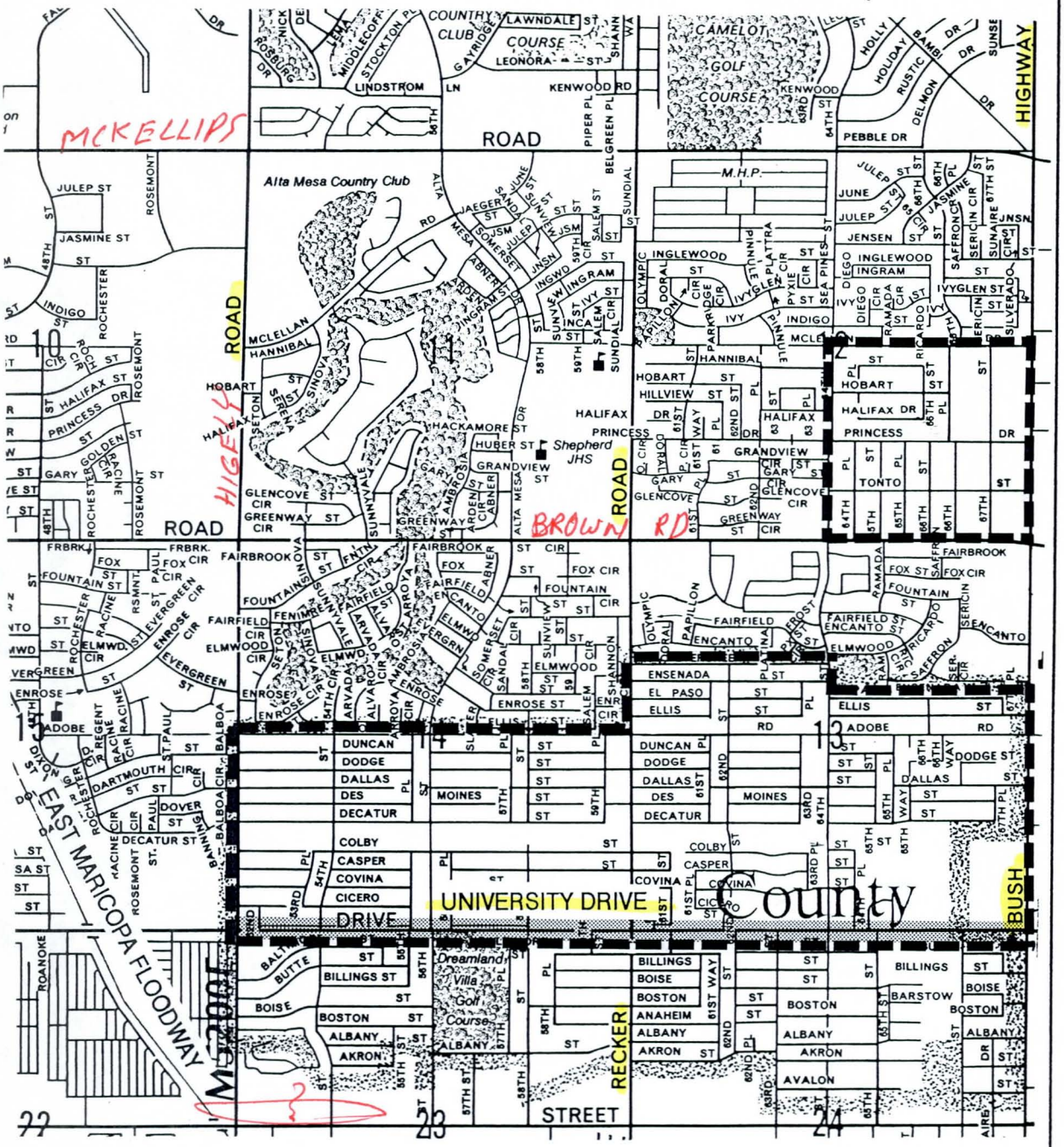
FIGURE 1. VICINITY MAP.



UNIVERSITY DRIVE PROJECT LIMITS

COUNTY ISLAND BOUNDARY

N

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FIGURE 2. LOCATION MAP.

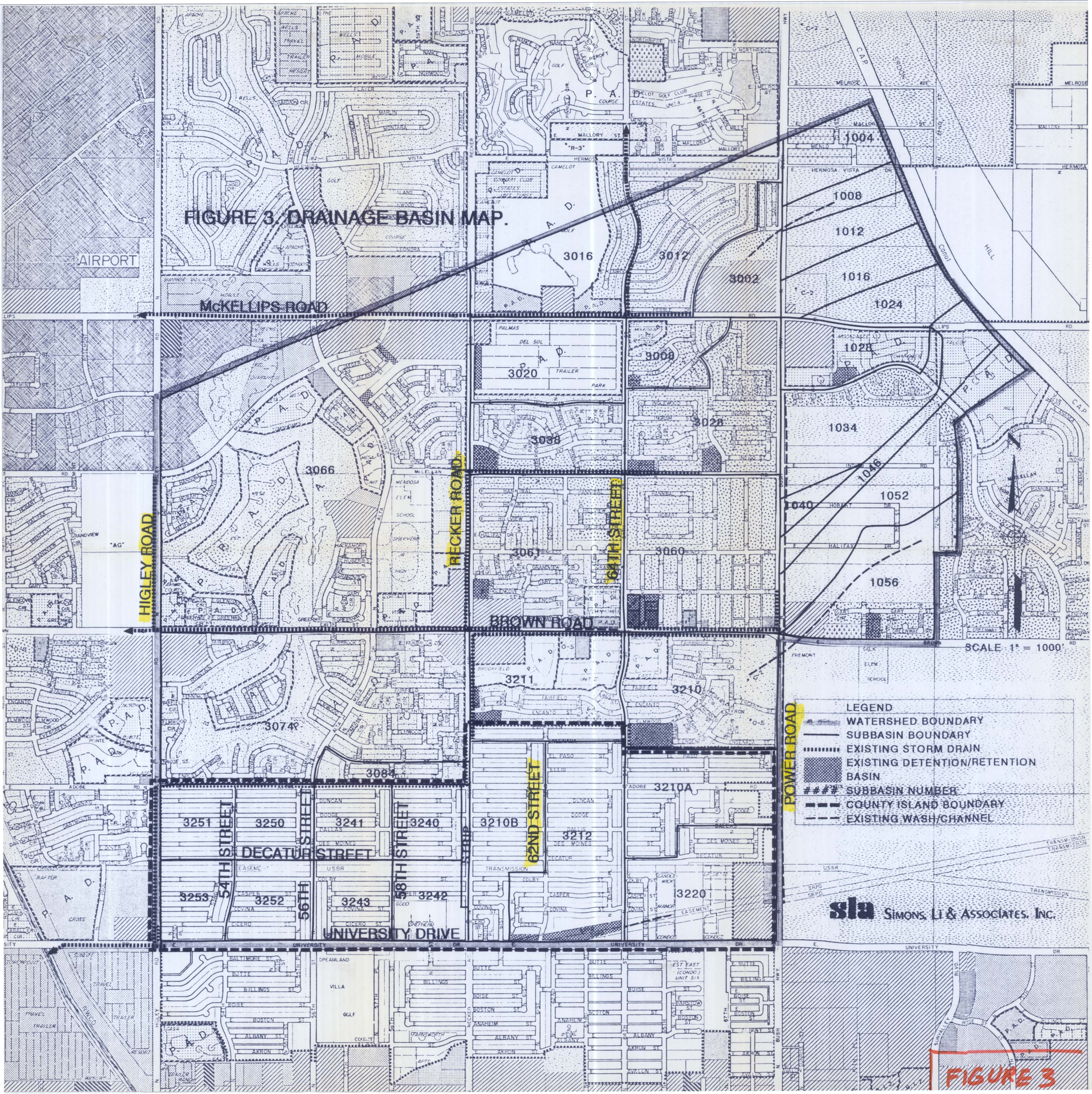


FIGURE 3. DRAINAGE BASIN MAP.
AIRPORT
McKELLIPS ROAD
HIGLEY ROAD
RECKER ROAD
6TH ST
BROWN ROAD
POWER ROAD
DECATUR STREET
UNIVERSITY DRIVE
54TH STREET
56TH STREET
58TH STREET
62ND STREET
3016
3012
3002
3020
3008
3028
3038
3066
3061
3060
3211
3210
3074
3084
3210A
3210B
3212
3220
3251
3250
3241
3240
3253
3252
3243
3242
1004
1008
1012
1016
1024
1028
1034
1040
1046
1052
1056
LEGEND
WATERSHED BOUNDARY
SUBBASIN BOUNDARY
EXISTING STORM DRAIN
EXISTING DETENTION/RETENTION BASIN
SUBBASIN NUMBER
COUNTY ISLAND BOUNDARY
EXISTING WASH/CHANNEL
SCALE 1" = 1000'
SIMONS, LI & ASSOCIATES, INC.
FIGURE 3

2. Transportation Corridors

The major transportation elements within the project watershed include the following north-south arterials: Higley Road, Recker Road, and Power Road; and the following east-west arterials: McKellips Road, Brown Road, and University Drive. The orientation and location of these major streets define a transportation grid with a framework based on one mile intervals. Figure 3 shows the location of major streets.

3. Existing Drainage Facilities

The existing drainage facilities located within the project watershed are comprised of drainage elements found in typical urban basins. These drainage elements consist of various sizes of detention/retention basin systems, open channels (and inverted crown streets), storm drains, catch basins, collector pipes, and a stormwater pumping station. Table 1 provides a summary of the pertinent existing drainage facilities within the drainage basin.

The overall existing drainage system utilizes inverted crown streets to convey stormwater flows. The inverted crown streets are primarily located in the southern portion of the drainage area (south and along Adobe Road). Sixty-fourth street is an inverted crown street and conveys stormwater flows into a retention basin system located within the Salt River Project (SRP) power easement.

Located throughout the project watershed are numerous detention and retention basins (See Figure 3). The major retention basins include the golf course lakes and basins at the Alta Mesa Golf Course. Detention basin systems are generally located in the southwest quadrant of their respective catchment areas. The detention basins typically utilize small diameter pipe (12 inches) as bleed-off lines (low level outlets) to meter out stormwater stored within the basins. This type of detention basin management typically delays and reduces peak stormwater runoff discharges.

Open channels found within the project watershed consist of natural and manmade channels. Very few natural, desert washes exist within the watershed. Natural channels are typically located in the northeast portion of the study area in relatively undeveloped areas.

TABLE 1. SUMMARY OF MAJOR EXISTING DRAINAGE FACILITIES.

ELEMENT	LOCATION	DESCRIPTION
Detention/ Retention Basins	64th Street & Ensenada	Brookfield East II detention basin. 7.66 AF storage 12" bleed-off line routed to Brookfield West II at Recker and Evergreen.
	Evergreen/Recker	Brookfield West II detention basins. Two basins with total capacity of 8.98 AF of storage. Storm water pumping station with 6 cfs discharge capacity to 48-inch storm drain in Brown.
	64th Street/Brown	City of Mesa retention basin. Storage capacity 23.48 AF. 15-inch bleed-off line discharges to open channel along northside of Brown.
	Glencove/Recker	Manor View detention basin storage capacity of 2.7 AF. Two smaller basins (Golden West Unit 4 and Golden West 5) provide additional capacity of 2.28 AF. Hydrologic model indicates reservoir MANOR with 5.0 AF capacity.
	McClellan/Recker	Sonata detention basin. Total storage capacity 8.6 AF.
	Recker/North of Inglewood	Palma del Sol Trailer Park retention basin. Estimated capacity 7 AF.
	McClellan between 64th & Power	Two Maplewood basins with total storage capacity of 9 AF.
	East Jensen Rd. South of McKellips	Falcon Hill #1 retention basin. Total storage capacity 3.2 AF.
	East Jensen Rd. East of Power	Moondance Unit I. Four basins that have combined storage capacity of 7 AF.
	East Brown & North 70th St.	Stoneybrook III. Total storage capacity of 4.1 AF. 12" bleed-off line to open channel adjacent to Fremont Jr. High.
	North of Brown between Higley and Alta Mesa Drive	Alta Mesa Golf Course. Total retention capacity estimated at 33.3 AF.
	South of Brown between Higley and Alta Mesa Drive	Alta Mesa Golf Course. Total retention capacity estimated at 25 AF.
Storm Drains	Brown Rd. West of Recker	48" RGRCP S=0.0086 ft/ft. n=0.012 Estimated capacity = 160 cfs. Takes flows all the way to EMF.

TABLE 1. (Con't)		
Storm Drains	Brown Road between Power and Recker	30-inch CIPP. Slope = 0.0059 ft/ft. Length = 6,200 ft. N = 0.012 Outfalls onto Recker Road south of Evergreen.
	Brown Road between Recker and Power	48-inch CIPP. Slope = 0.0059 ft/ft. n = 0.012 Length = 3900 ft. Estimated capacity = 130 cfs. Outfalls to City of Mesa detention basin at 64th/Brown.
	McKellips Road West of 68th Street	36-inch CIPP. Slope = 0.01315 ft/ft. Estimated capacity = 90 cfs. Discharges to 42-inch CIPP in McKellips west of Recker then out of drainage basin.
	Higley Road; Adobe to University	Storm drain ranges in size from 30- to 66-inch in diameter from Adobe to University Drive. Length = 2640 ft. Flows discharge to 84-inch outfall pipe to EMF.
Open Channels	North Side of El Paso from Power to 64th	Shotcrete lined channel located along north side of El Paso Street from Power Road to 64th Street. Estimated capacity = 90 cfs. Trapezoidal cross section, S=0.0089 ft/ft, n = 0.022, length = 2640 ft.
	East Side of Power Road	Earth-lined trapezoidal shaped roadside channel. Estimated capacity = 130 cfs, n = 0.025. Slope = 0.0085 ft/ft.

Man-made channels include earth-lined roadside ditches and channels, gunite and concrete-lined open channels, as well as grass lined channels. An earth-lined roadside channel exists on the east side of Power Road which conveys a bank full discharge of 130 cfs. Some portion of the flows in this roadside channel cross Power Road and enter the project watershed while the remaining flows continue south on Power Road and out of the project watershed.

An existing gunite-lined open channel is located just south of the Power Road/Ensenada intersection and continues west to 64th Street. The channel captures stormwater flow from Power Road and discharges onto 64th Street along the southern boundary of the Ensenada Park detention basin. The channel has an estimated bank-full capacity of 90 cfs.

Major trunk storm drain pipes are located in Higley and Brown Roads. A 48-inch diameter pipe is located in Brown Road from just east of Recker Road and continues west to the East Maricopa Floodway (EMF). The 48-inch pipe conveys stormwater not only from Brown Road, but also from flows conveyed by pipe and surface flows from Recker Road. The estimated capacity of this pipe is 160 cfs.

A storm drain pipe ranging in size from 30-inches to 66-inches is located in Higley Road from Adobe Road to University Drive. The storm pipe conveys stormwater that is captured from the inverted crown streets east of Higley and south of Adobe Road to the 84-inch pipe located at the intersection of University Drive and Higley Road. The 84-inch pipe then continues west to discharge to the EMF.

An easterly 60-inch stub-out pipe located at the intersection of Higley Road and University Drive will be replaced with a 72-inch storm drain extending east on University Drive. The 60-inch pipe has an approximate invert of 1340.75 feet which is 16.7 feet below the street surface.

C. Design Criteria

The design criteria for this project are presented in the Flood Control District of Maricopa County's (FCDMC) two volume drainage design manual. Volume 1 - Hydrology, of the "Drainage Design Manual for Maricopa County," dated June, 1992, provides technical procedures for estimating stormwater runoff to assist engineers in the design of storm drainage facilities. Volume 2 - Hydraulics, of the "Drainage Design Manual for Maricopa County," dated September, 1992, provides criteria and design guidance for storm drainage facilities in Maricopa County.

The University Drive Drainage Improvements project shall intercept and convey stormwater from the recommended design frequency (10-year event) to the EMF. The design frequencies investigated as part of the concept study were the 2-, 5-, 10-, and 25-year events.

III. HYDROLOGIC MODEL

A. Model Selection

The U.S. Army Corps of Engineers HEC-1 rainfall/runoff simulation model was selected to model the hydrologic responses of the University Drive project watershed. The HEC-1 model is designed to simulate the surface runoff response of a basin to precipitation by representing the basin as an interconnected system of hydrologic and hydraulic components. Each component models an aspect of the precipitation-runoff process within a portion of the basin, commonly referred to as a subbasin. A component may represent a surface runoff entity, a stream channel, or a reservoir. Representation of a component requires a set of parameters which specify the particular characteristics of the component and mathematical relations which describe the physical processes. The result of the modeling process is the computation of hydrographs at desired locations in the basin (1).

The HEC-1 program was developed under several assumptions and limitations. The assumption was made that the hydrologic processes can be represented by model parameters which reflect average conditions within a subarea. If such averages are inappropriate for a subarea then it would be necessary to consider smaller subareas within which the average parameters do apply.

Simulations are limited to a single storm due to the fact that provision is not made for soil moisture recovery during periods of no precipitation. The model results are based in terms of discharge and not stage, although stages can be printed out by the program based on a user specified rating curve. Streamflow routings are performed by hydrologic routing methods and do not reflect the full St. Venant equations. Reservoir routings are based on the Modified Puls technique.

The Flood Control District of Maricopa County developed a HEC-1 model depicting the existing hydrologic conditions for the University Drive project watershed. The FCDMC accomplished

this task by modifying the HEC-1 model which had been developed for the East Maricopa County Area Master Drainage Study. The FCDMC model for the University Drive project simulates the return periods for the 2, 5, 10, 25, 50 and 100-year frequencies.

As part of the project scope of work Simons, Li & Associates, Inc. (SLA) was to review and update the FCDMC HEC-1 model. The hydrologic parameters and assumptions employed in the HEC-1 model were reviewed to assure that the parameters were current, technically acceptable, and that sufficient detail was incorporated within the model for the design of this project.

The Flood Control District of Maricopa County model reflecting existing conditions of the project watershed was modified, if and as required, to provide up-to-date hydrologic parameters and characteristics of the watershed. Information collected from field reconnaissance and engineering records for existing facilities was incorporated into the FCDMC existing conditions model.

A HEC-1 model was developed to simulate the existing conditions (Plan 1) and the proposed drainage improvements (Plan 2) within the same working model. The HEC-1 program incorporates a multi-plan option that allows for alternatives to be compared to a base condition.

B. Sub-Basin Delineation

One of the first steps in developing a rainfall/runoff model is to define the boundaries of the basin and to subdivide the basin (watershed) into a number of smaller subbasins. The basis for the subbasin delineation depends on the study objectives and other factors.

Subdivision of the area of a large basin is necessary because of the size and complexity of the system, including the heterogeneity of basin characteristics and storms. A basin with a diversity of topography and land uses should be broken down into smaller components to fit the constraints and assumptions in the model. Subdivision is often necessary to obtain desired information needed in terms of level of detail and location (2).

Subbasins were delineated on the basis of land use, subbasin shape, and hydrologic integrity. Figure 3 presents a map of the watershed for University Drive. Subbasin delineation allows the computation of required hydrographs and peak discharges at selected locations in the watershed. Of particular interest are the peak discharges and hydrographs representing existing conditions and the peak discharges and hydrographs representing improved (or alternative) conditions along University Drive.

C. Hydrologic Parameters and Assumptions

1. Design Storm

The FCDMC selected to investigate alternative levels of protection for return intervals having frequencies of 2, 5, 10 and 25-years. The design storm for each of these frequencies has a 6-hour duration. The distribution pattern selected for simulation was a weighted distribution pattern developed between the FCDMC's pattern 2 and pattern 3 (pattern 2.4) as provided in Volume 1 of the "Drainage Design Manual for Maricopa County."

Basin rainfall depths for each return interval were obtained from the FCDMC Hydrology Manual. These rainfall depths were not really reduced over the basin. The precipitation depths for each return interval are:

TABLE 2. RAINFALL DEPTHS.

Return Interval (yrs)	Precipitation Depth (in)
2	1.15
5	1.60
10	1.90
25	2.35

2. Rainfall Losses

Not all the precipitation which falls onto a watershed contributes to stormwater runoff. Rainfall which does not contribute to runoff can be considered a "rainfall loss" (2). Rainfall losses take the form of interception, infiltration, and depression storage. Of the three forms of rainfall losses, infiltration (the movement of water into the ground), is generally the most significant loss during flood events.

The FCDMC's HEC-1 computer model developed for this project utilized the Soil Conservation Service (SCS) runoff curve number method to simulate rainfall losses. The curve number is a function of land use, soil classification, hydrologic conditions, and antecedent moisture conditions.

The variation in infiltration rates of different soils is incorporated in curve number selection using the standard SCS hydrologic soil group classification system. The SCS system is based on four hydrologic soil groups, A through D. Soils in group A have very low runoff potential (i.e; high infiltration rate), those in group B have moderately low runoff potential, those in group C have moderately high runoff potential, and those in group D have high runoff potential (i.e; very slow infiltration rate).

Each subbasin was examined on the basis of soil group and antecedent moisture condition by previous investigations. An SCS curve number was then assigned to each subbasin to represent the average subbasin land use, cover, soil group, and antecedent moisture.

3. Detention/Retention Reservoirs

As stated previously, the University Drive project watershed has numerous urban detention/retention basins. These basins serve to: (1) attenuate the peak discharge of inflow hydrographs, and (2) translate the hydrograph in time.

The concept of stormwater detention involves the temporary storage of runoff for subsequent release, at controlled rates, into downstream conveyance systems. Retention, however, consists of the on-site storage of runoff which is not subsequently discharged into a downstream watercourse; but rather may be consumed by evapo-transpiration, or drained into the subsurface by infiltration facilities. Some detention/retention facilities are merely single purpose (i.e; for flood control uses only). However, it is much more favorable, from both a social and economic standpoint, to provide multiple use facilities.

It is assumed for the purposes of this study that all City of Mesa subdivision detention/ retention basins were designed and constructed to comply with the City's subdivision storm drainage policy. The policy states for retention volume that "all subdivisions must provide retention of the storm runoff generated by a 100-year 2-hour storm" (5). The policy goes on to state that there "....shall be some method of draining all retention areas in a 36-hour period. Retained storm water shall be pumped or drained through a gravity bleedoff system to an existing storm drain or drainage channel" (5).

Several FCDMC delineated subbasins were further sub-divided into smaller subunits to provide more detail and reflect the hydrologic conditions/system of the watershed. The FCDMC subbasins were further subdivided on the basis of the drainage areas of their respective detention/retention basin systems. This resulted in modifying the FCDMC model to refine the detention/retention responses. Modifications to the model are provided in Appendix D.

The FCDMC utilized the divert option of HEC-1 to model all the detention/retention basins within the project watershed. The City of Mesa made available to the FCDMC as-built drawings and basin certifications to quantify the available storage in the basins. SLA revised the divert option for several existing basins by developing the necessary parameters for detention basin hydrologic routing. These parameters included basin area-elevation curves, low level outlet variables, and parameters that describe emergency spillways.

4. Split Flows

It is not uncommon in urbanized areas for runoff being conveyed in streets to be either augmented or diminished in quantity by flows entering or departing at street intersections. This statement is true for many of the interverted crown street intersections south of Adobe Road. Adobe Road from Recker Road to Higley Road is an inverted crown street and is a major stormwater drainage element for that particular area of the drainage basin.

Split flows occur on both Adobe Road and Decatur Street between Recker Road and Higley Road. Split flows occur on these streets with their intersection of north-south streets. Split flows occur on Adobe Road with it's intersection with 56th Street and Recker Roads. The FCDMC model had a split flow occurring at the intersection of Adobe with Higley. The split was assumed to be 50 percent of the flows going south on Higley, and 50 percent of the flows continuing west on Adobe. A detailed survey of the Adobe/Higley intersection and street carrying capacity analysis indicates that flows on Adobe are diverted south on Higley, and no flows bypass the intersection and continue west. This is because a local street crest (high point) on Adobe on the west side of the intersection prevents flows from continuing west (for the return intervals investigated in this study).

Split flows occur on Decatur where the street intersects with 56th and 54th Streets. Detailed surveys of these intersections were not conducted. The rating (diversion) curves for these intersections were developed based on as-built longitudinal slopes and assumed pavement cross sections.

Split flows were determined using Mannings equation to develop a depth/discharge relationship for the major street. In most cases the "major" street in question has an inverted crown. At several intersections, flow in the "major" street continues downstream until the depth of flow in the street is deep enough to spill onto the side street. In some cases the side streets have crests on the down gradient side of the intersection. The rating curve was completed by computing side street diversion using a weir equation. Split flow computations are provided in Appendix B. Table 3 provides a summary of the split flow/rating curve analysis.

TABLE 3. SUMMARY OF SPLIT FLOWS.

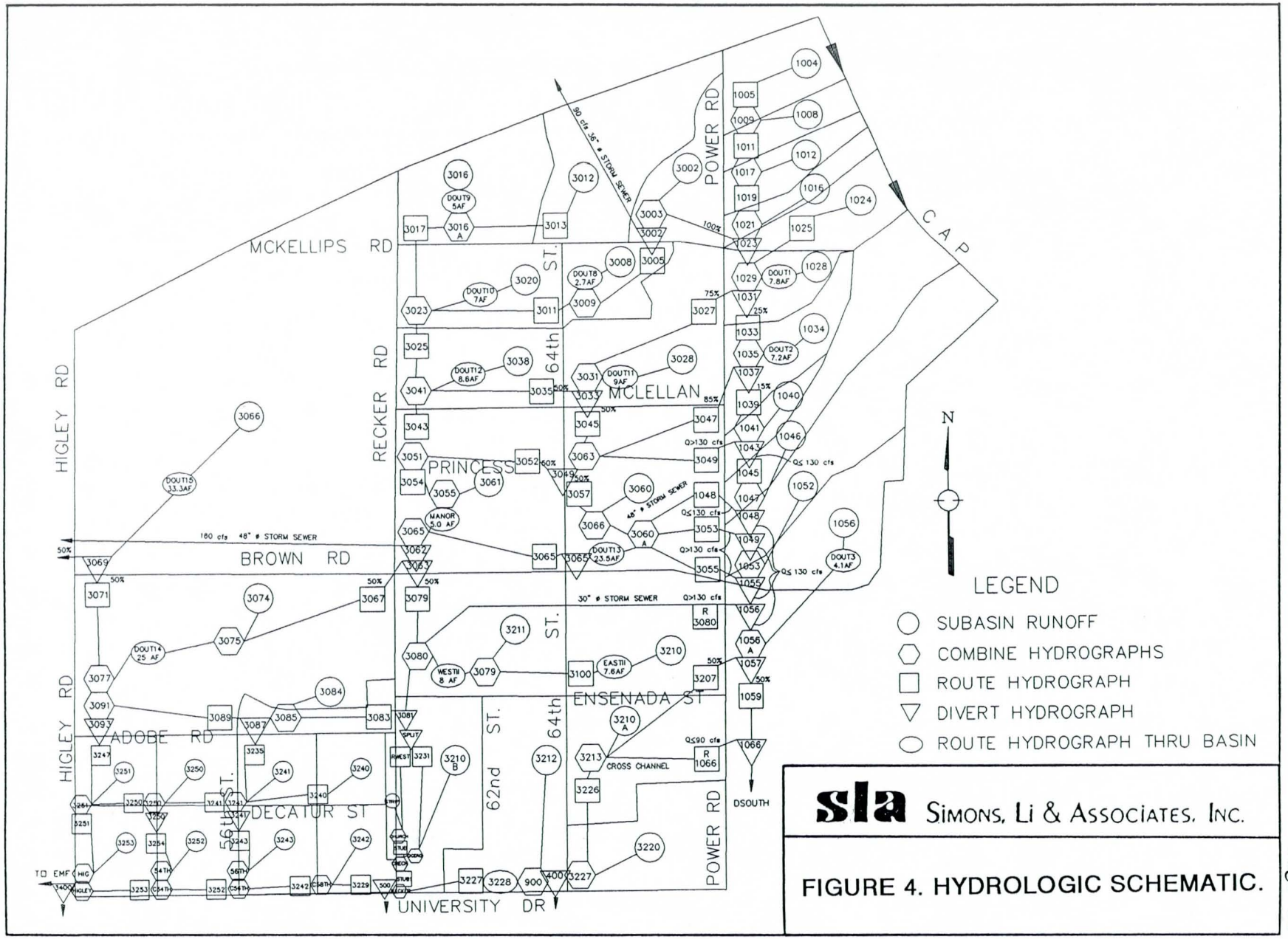
ID	Intersection	Rating Curve				
D3083	Adobe @ 56th Street	DI	0	24.6	49.9	145.3
		DQ	0	13.6	22 0	48.4
D3087	Adobe @ Recker Road	DI	0	71	107.6	270.5
		DQ	0	0	21.8	71.1
D3093	Adobe @ Higley Road	DI	0	10	100	1000
		DQ	0	10	100	1000
D 3241	Decatur @ 54th Street	DI	0	83.3	233	
		DQ	0	35.5	95.8	
D 3250	Decatur @ 56th Street	DI	0	83.3	233	
		DQ	0	43.5	123	

5. Hydrologic Schematic

Figure 4 presents a hydrologic schematic diagram representing the interrelationships of the drainage elements for the project watershed. The schematic illustrates in pictorial form the drainage network of the basins as well as the construction of the hydrologic model.

The schematic represents both existing conditions on the watershed, and proposed improvements for flood control along University Drive. The proposed improvements are not shown specifically on the schematic but are found in plan 2 of the hydrologic model. The representation of the proposed improvements are the same as existing conditions for the particular drainage element. For example the symbol represented by an oval at University Drive east of 62nd Street represents existing conditions for plan 1, and represents a proposed detention basin in plan 2.

The triangles along University Drive at Higley, Recker, and 64th Streets represents flow diversions crossing University under existing conditions in plan 1. However, in plan 2 the diversions are nonexistent as plan 2 provides for flood control improvements.



sla Simons, Li & Associates, Inc.

FIGURE 4. HYDROLOGIC SCHEMATIC.

6. Kinematic-Wave Rainfall/Runoff Modeling

The kinematic-wave method is an alternative to the unit hydrograph approach to rainfall-runoff modeling. The parameters of this model are developed from physical characteristics of the basin, and equations of motion are used to simulate the movement of water through the system. Parameters such as catchment length and area, roughness, slope, and channel geometry are used to define the flow of water conceptually over basin surfaces, into stream channels, and through the channel network. The method is particularly useful in urban studies because the effects of urbanization can be accounted for by changing the measurable physical parameters of slope, catchment length, surface roughness, and area (2).

A typical urban drainage system is shown in Figure 5. Rain falls on two general types of surfaces: (1) those that are essentially impervious, such as roofs, driveways, parking lots, and other paved areas; and (2) pervious areas, most of which are covered with vegetation and have numerous small depressions which produce local storage of rainfall. It is assumed in the model that water initially travels over these surfaces as sheet flow; however, in a relatively short distance the water begins to collect in small streams or rivulets and the process of stream or channel flow begins.

There are certain weaknesses inherent in the kinematic wave routing approach. These include: (1) the theory does not provide for attenuation of the flood wave; (2) surcharging of storm drains frequently occurs during major storm events; no explicit provision for surcharging is provided by this method; and (3) ponding and local storage of water during major events is not accounted for.

The runoff process in kinematic -wave rainfall-runoff modeling utilizes three basic elements: (1) one or two typical overland flow elements; (2) a typical collector channel element, and (3) a main channel element. Schematic drawings of these elements are shown in Figure 6. This figure illustrates the relationships of the various types of elements to each other. The elements are specified to represent typical features of the basin, and thus the parameters chosen for the individual elements should be representative of the entire subbasin.

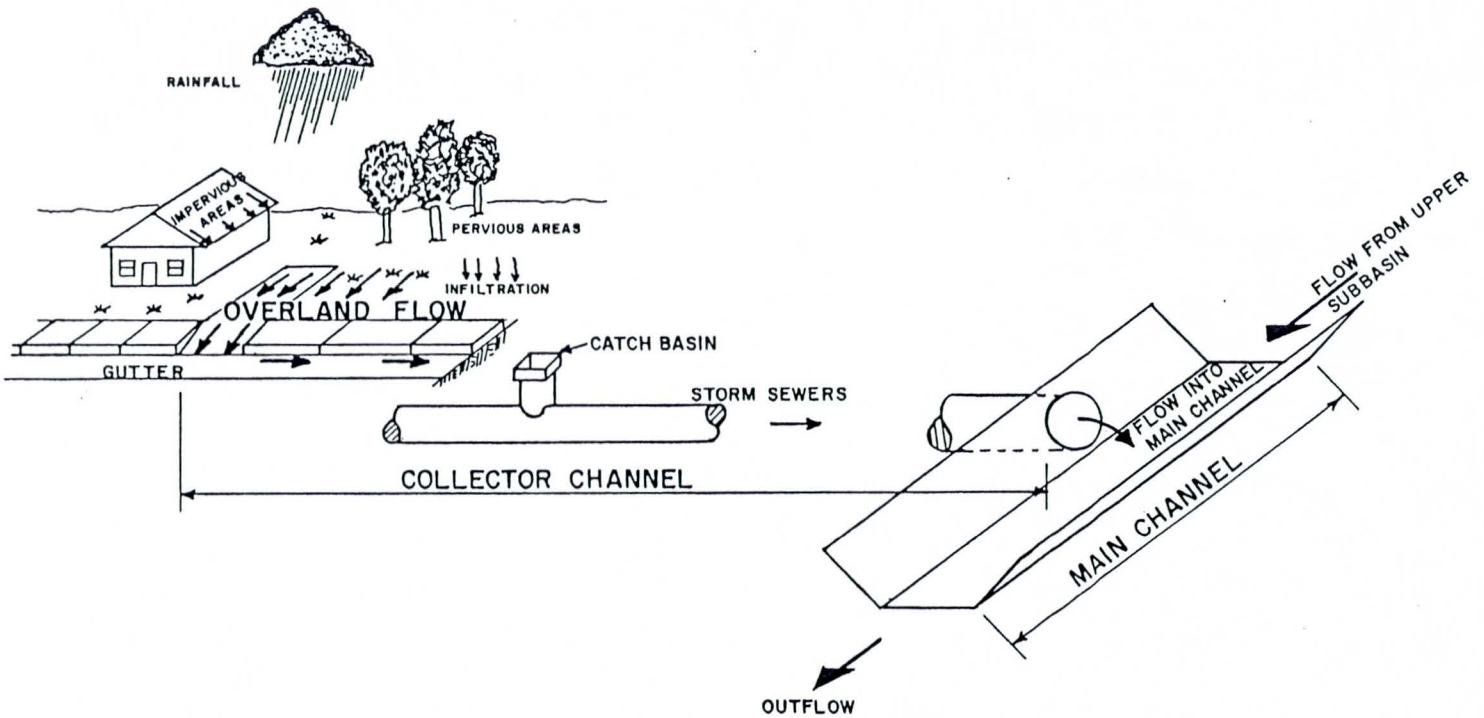


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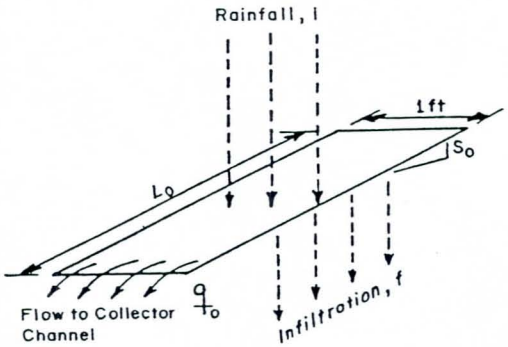
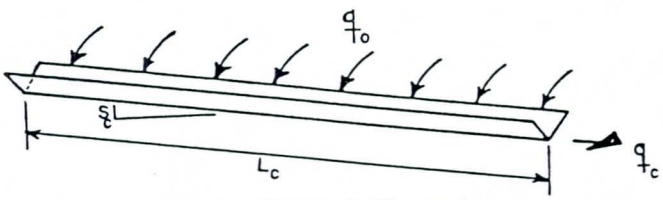
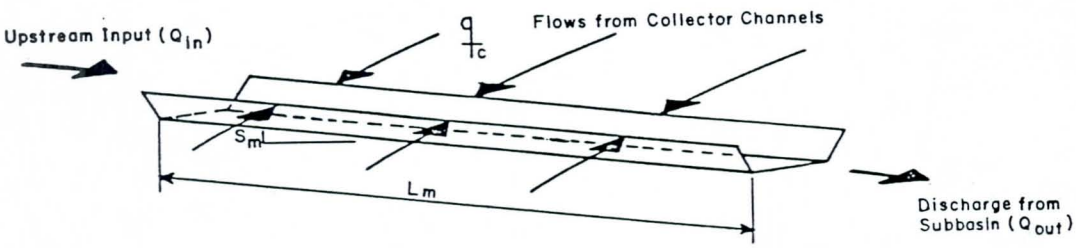
FIGURE 5. TYPICAL URBAN DRAINAGE SYSTEM.



Overland Flow Element



Collector Channel Element



Main Channel Element

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FIGURE 6. KINEMATIC WAVE ELEMENTS.

6.1 Overland Flow Elements

The basic flow element is a rectangular plane of unit width. It is simply a sloping rectangular plane surface upon which the rain falls. Some of the rainfall is lost by infiltration, the remainder runs off the lower edge of the plane into a channel. Infiltration losses may vary with time or be constant, and a different loss rate can be specified for each flow strip. The fraction of the element that is impervious can also be specified.

The following data are needed for each overland flow strip:

- Typical overland flow length, L_o
- Representative slope, S_o
- Roughness coefficient, n
- Percentage of subbasin area this element represents
- Infiltration and loss rate parameters

6.2 Collector Channel

The collector channel element is used to model the flow in its path from the point where it first becomes channel flow to the point where it enters the main channel. The inflow into the collector channel is taken as a uniformly distributed flow along the entire length of the channel. This represents flow running off from overland flow elements and approximates flows from individual catch basins and tributary pipes distributed along the collector channel.

The following data are needed as input to describe the collector channel system:

- Surface area drained by a single representative collector channel
- Length, L_c
- Channel slope, S
- Manning's roughness coefficient, n
- Channel shape
- Pipe diameter or the trapezoid bottom width and side slopes, if appropriate

6.3 Main Channel

The main channel can carry both inflows from upstream subbasins as well as flows supplied by the collector channels within the subbasin. The inflow from the collector channel is taken to be uniformly distributed along the length of the main channel. This is assumed to reasonably approximate the actual situation where the flow enters the channel from the various collectors at a number of discrete points at various spacings.

The upstream subbasin inflow is normally combined with the local subbasin inflows in the kinematic wave computations. As an alternative, these can be computed separately and combined at the subbasin outlet.

The following input data is required for the main channel element:

- Channel or stream length, L_m
- Slope, S_m
- Manning's roughness coefficient, n
- Area of subbasins, A
- Channel shape
- Channel dimensions
- The upstream hydrograph to be routed through the reach, if desired

The University Drive Drainage Improvements project watershed is highly urbanized with a high percentage of impervious areas. The basin is basically laid out on a 1-mile grid making subbasins highly geometric and homogeneous, and very conducive to the kinematic wave modeling approach.

D. Hydrologic Model Results

The existing hydrologic conditions HEC-1 model was developed as described previously and peak discharges computed at selected points of interest (concentration). The existing conditions model assumed that runoff generated from the watershed eventually contributes to the peak discharge at the intersection of University Drive and Higley Road. Existing field conditions show that

stormwater crosses University Drive at several locations into the subdivisions located south of the project. The existing conditions model allows for stormflows to leave the watershed to the south. The HEC-1 input and output files are provided on disk as a supplement to this report.

Table 4 below provides a summary of the results of existing peak discharges for the 10-year design (Plan 1). The peak discharges are given from downstream to upstream at selected points of concentration along University Drive.

Need to Provid Discharges for 2, 5, & 25

TABLE 4. EXISTING PEAK DISCHARGES ALONG UNIVERSITY DRIVE.

Return Interval (yrs)	Higley Road (cfs)	56th Street (cfs)	Recker Road (cfs)	62nd Street (cfs)	64th Street (cfs)
10	672	500	357	235	158

Higly C56th CRec

where is this in Page 3

The results of the hydrologic model allowed the identification and estimation of side street peak discharges into University Drive. Side street discharges will be used to determine the number, size, and location of inlets to capture side street flows. The inlets will be sized in the construction documents to capture 100 percent of the 10-year flows. Side streets where inlets should be provided include 54th Street, 56th Street, 58th Street, Recker Road, 62nd Street, and 64th Street. Table 5 provides a summary of the estimated side street flows discharging to University Drive for the preferred flood control alternative.

All side streets, except Higley Road, do not have an existing stormwater collection system. Therefore, it may be concluded that the estimated discharges for side street flows can be assumed to all be surface drainage (street flows) and must be captured in order to maintain the 10-year roadway drainage criteria for MCDOT requirements.

for CATCH Basin

TABLE 5. ESTIMATED SIDE STREET FLOWS

Level of Protection	Side Street Flows (cfs)						
	Higley	54th	56th	58th	Recker	62nd	64th
10	149	104	94	55	117	85	82

Need 2, 5, 25

The existing hydrologic model was further refined to simulate field conditions for storm flows discharging onto Recker Road from Adobe Road. A new strip subbasin was delineated whose boundaries extend from Adobe Road down the centerline of Recker Road to Covina Street, west 150 feet on the extended Covina Street, then north along an extended lot line defining a local high point (ridge) to Adobe (See Appendix D).

As discussed previously, a split flow occurs at the intersection of Adobe Road and Recker Road. Flows continuing south on Recker are then split again 50-50; 50 percent continuing south on the west side of Recker and 50 percent continuing south on the east side of Recker.

The flows routed south on the west side of Recker and south of Adobe are combined with the discharge produced by the new strip subbasin at a point 650 feet north of University on the west side of Recker Road. Located at this point is the entrance to a perimeter open channel on the church property at Covina and Recker.

An inlet and connector pipe are proposed to be constructed at the entrance to the open channel to capture the flows on the west side of Recker. The captured flows will be routed to the new University Drive storm drain.

Other inlets and connector pipes will be located on the east side of Recker Road along the frontage road. These inlets will capture storm flows continuing south on Recker and south of Adobe. The captured storm flow will be combined with the captured flows from the west side of Recker Road and discharged to the University Drive storm drain.

Drainage area 3220 (see Figure 3, Drainage Basin Map) will either drain south to University Drive or west to minor washes or channels, and eventually into the detention pond west of 64th Street. Originally it was envisioned that a channel along the SRPD easement would drain the area north of the easement to the pond. After detailed field reconnaisance it became clear that the west half of this area naturally drains that way now, through washes, channels, and existing grading. The east half has a mini-storage facility and an empty parcel with retention or existing ponding which minimizes runoff.

With only the smaller area south of the easement draining directly to University Drive, a HEC-1 model was constructed to identify the peak flows on the roadway (See HEC-1 output in Appendix H). University Drive has a minimum gutter slope of 0.008 feet-per-foot in this area of the project. The capacity of the gutter is approximately 15 cfs. With this capacity the additional off-site runoff from area 3220 will not exceed the allowable spread for the 10-year event. The cumulative (peak) flow at 64th Street is approximately 12 cfs which is less than the capacity of the 24-inch storm drain (20 cfs) used for roadway drainage. See the project cost estimate for catch basins and connector pipe cost including the 1,084 linear feet of 24-inch storm drain from 64th Street to 700 feet west of Power Road, 31 catch basins (MAG 533-1 L=10 estimated), 1050 linear feet of 18-inch connector pipe, and the one special catch basin.

IV. FLOOD CONTROL ALTERNATIVES

A. Protection Levels

The primary objective of this study is to recommend a level of protection for flood control of stormwater discharges impacting the University Drive Drainage Improvements Project. Level of protection may be defined as those combinations of drainage elements (detention basins, storm drains) which function to provide an adequate drainage protection for the return interval specified.

The levels of protection identified for evaluation were selected by the Flood Control District and the Maricopa County Department of Transportation (MCDOT) prior to the initiation of this study. The levels of protection correspond to the return intervals of 2, 5, 10, and 25-year storm events.

The levels of protection or flood control alternatives were examined and evaluated on the basis of hydrologic and hydraulic impact, and economics (9). Each alternative was ranked according to the above criteria and a recommended alternative selected.

B. Components of Protection

Drainage elements that comprise the components of a flood control protection system are constrained by the project site considerations and right-of-way or existing easements. The FCDMC has identified an existing SRP power easement that will be utilized as the location of a detention basin. The major storm drain trunkline recommended for this project will be located beneath University Drive starting from Higley Road and extending approximately east of 62nd Street.

The recommended drainage components consist of a detention basin system located within the SRP easement and a large storm drain trunkline in University Drive. Other elements include catch basins at roadway intersections, particularly at those existing intersections that discharge stormwater onto University Drive from the north.

The concept report (9) identified for each alternative the detention basin size required according to the available site area and the inflow hydrograph to the basin. The concept report proposed to use 12-inch low level outlets for all alternatives unless a larger pipe size was required for hydrologic impacts and economic benefits.

Three factors impacted basin geometry for the alternatives studied in the concept report. The Salt River Project requires an access pad for towers and poles elevated above the water surface elevation for the ponds. The pad is to be 100-foot square centered on each transmission tower and be accessible by vehicles. The second factor impacting basin configuration is a proposed 20-foot wide pedestrian walkway/maintenance road. The walkway would be located along the north perimeter of the basins. The third factor is the location of several subdivided parcels located adjacent to the detention basin area.

MESA The City of Mesa drainage policies allow for the use of cast-in-place pipe (CIPP) for long runs of storm trunklines. Their policy, however, requires that the hydraulic grade line remain inside the pipe. If the hydraulic grade line is elevated above the crown of the pipe, the City requires rubber-gasket reinforced concrete pipe (RGRCP)(5).

C. Detailed Investigation

The concept report identified a flood control drainage system based on a detention basin/storm drain configuration for each level of protection. An iterative process was utilized to size detention basins and storm drain pipe sizes. This final report conducted a more detailed study for the preferred alternative for flood control improvements at University Drive.

The concept report provided a summary of detention basin components for each level of protection. This final report provides a more detailed evaluation of the required detention basin volume for the preferred level of protection (10-year frequency). The required basin volume was determined for the preferred level of protection by relaxing the drain time criteria of 36 hours, providing for one foot of freeboard, and allowing a deeper basin to detain a greater volume of stormwater.

The detailed analysis for the proposed detention basin indicates that only one basin will be required to detain storm flows. The concept report identified that two basins would be required (Pond A and Pond B). The detailed analysis formulated a configuration whereby Pond A would not be required for the proposed improvements. However, Pond A should still remain in it's present condition to retain minor street flows directed to it by a swale at the west end. Pond A would drain by the use of existing dry wells. The existing lots on the north side of Pond A would not be required for purchase by the FCDMC.

A 6-foot deep (5-foot depth plus 1-foot freeboard) basin with 4:1 (H:V) side slopes located at the Pond B site is recommended. Storm flows from 62nd Street and 64th Street can be directed to the basin with the use of inlets and connector pipes. The outlet pipe would be 12-inches in diameter and bleed-off computations indicate that the basin would drain in 4.3 days. The three lots on the east end of the detention basin and adjacent to 62nd Street will be required. Basin sizing computations are provided in Appendix C.

Time to Drain

Storm flows generated from the improved University Drive east of 64th Street will be discharged into the detention basin. This approach will ensure utilization of the detention basin function for as much of stormwater volume capture as possible.

The concept report provided peak discharges at selected points of concentration for all four levels of protection. The results of the detailed hydrologic analysis for the preferred alternative are given in Table 6. The discharges given in Table 6 are for specific concentration points along University and illustrate the discharge requirements for the recommended storm pipe system.

TABLE 6. DISCHARGE REQUIREMENTS FOR STORM PIPE SYSTEM.

Level of Protection (yrs)	Higley Road (cfs)	54th Street (cfs)	56th Street (cfs)	58th Street (cfs)	Recker Road (cfs)	62nd Street (cfs)
10	482	358	256	163	117	7

The hydraulic computer model "THYSYS" (Version 2.4, 1990), developed for the Texas Department of Highways and Public Transportation was used to evaluate the hydraulics of the recommended storm drain system. The model input includes pipe lengths, Manning's roughness coefficient for pipe, discharges, pipe diameters, and soffit elevations. For the hydraulic analysis, pipe slopes for new pipe was started at 0.007 feet/foot. Table 7 summarizes the components of the recommended University Drive storm drain.

this Table need more Inf. it is ~~ter~~ difficult to understand

TABLE 7. SUMMARY OF UNIVERSITY DRIVE STORM DRAIN COMPONENTS

EMF - Higley Rd	Higley Rd - 54th Street (in x lf)	54th Street 56th Street (in x lf)	56th Street 58th Street (in x lf)	58th Street Recker Rd (in x lf)	Recker - 62nd St. (in x lf)
	72	72	54	54	24
Existing 84-Inch	1152	1480	1330	1300	1250

Table 8 presents a summary of the required inlets and connector pipes to capture side street flows. Storm flows conveyed by the side streets on the north side of University Drive will be captured by inlets and directed by pipe to the proposed University Drive storm drain. All side streets along University Drive examined in this study are inverted crown streets except for Recker Road.

TABLE 8. CATCH BASIN/INLET SUMMARY FOR FLOOD PROTECTION.

University Drive Station	Side Street	Inlet Type	Length (feet)	Flow Captured (cfs)	Side Street Pipe Dia. (inches)	Side Street Pipe Slope (ft/ft)
111 + 40	54th Street	Street Grate	36	104	48	0.0030
126 + 20	56th Street	Street Grate	47	94	42	0.0060
139 + 50	58th Street	Street Grate	37	55	36	0.0040
152 + 50	Recker* Rd.			117	42	0.0076
165 + 00	62nd* Street	Street Grate		85		
179 + 00	64th* Street	Street Grate		82		

*To be finalized at the 70 percent submittal.

The drainage conveyed by the inverted crown streets will be captured by specially designed catch basins. The specially designed catch basins are required because neither the FCDMC Drainage Design Manual or the FHWA HEC-12 "Drainage of Highway Pavements" address or present a methodology or approach for analyzing and designing catch basins/inlets for inverted crown streets. The storm flows estimated to be conveyed along the side streets were previously presented in Table 4.

The concept for side street flows is to capture the estimated 10-year flow before the curb returns at University Drive with each street. The 100 percent capture will be accomplished through the use of a "street grate" system which essentially is a series of grates side-by-side from curb-to-curb. The street grate will be bicycle safe and will span a channel trough that also extends from curb-to-curb. The channel trough then empties directly into a connector pipe which discharges into a storm drain pipe. The analysis of the side street-street grates and an illustrative concept drawing of the grate system may be found in Appendix F. Special "street grate" inlets will utilize MAG 540-1 frames and 'EF' type grates.

The complete hydraulic analyses is included as part of this final report as Appendix E. Hardcopies of both the THYSYS model input and output are included as well as a computer disk with hydrology and hydraulic files.

The hydraulic analysis output from the THYSYS model was checked and compared by hand calculations using the FCDMC methods presented in Volume II of the Drainage Design Manual. The hand computations are included in Appendix E as well. The hydraulic grade line, pipe profile, and plan are shown on the 100 scale plan sheets in Appendix A.

D. Preferred Alternative

The concept report (9) provided an in-depth evaluation of alternatives or levels of protection based on hydrologic, hydraulic, and economic impacts. This final report specifically focuses on the preferred alternative as selected and recommended in the concept report.

1. Hydrologic Impact

The hydrologic impact from the 10-year level of protection will be to discontinue stormwater flows from crossing University at Higley, Recker, and 64th Streets. Flows that previously crossed University Drive will be captured by upstream inlets and directed to the new University Drive storm drain. Subdivisions located south of University Drive will be afforded a 10-year-plus level of protection from stormflows originating from north of University.

The recommended detention basin concept will eliminate the need to upgrade the existing retention basin to the west of 62nd Street within the SRP easement. The existing retention basin is recommended to remain in-place as it functions to retain minor stormwater inflow generated from adjacent street paving. The retention basin utilizes two dry wells to inject captured stormwater into the subsurface.

The recommended detention basin concept is a basin 6-feet deep (5-foot storage plus 1-foot freeboard) with 4:1 (H:V) side slopes. Appendix A-5 shows a basin with an 8-foot depth (7-foot storage plus 1-foot freeboard for extra protection). The length of the basin extends from 64th

Street to 62nd Street within the SRP easement. The basin will capture stormflows generated from upstream subbasins and the outlet structure will release the detained stormwater to the new University Drive drain. University Drive pavement drainage from approximately 62nd Street to Power Road will be routed to the detention basin. It will take approximately 4 days to drain the detention basin. Appendix C provides detailed computations for detention basin sizing and bleed-off time.

Discharges to the EMF from the 84-inch outfall will increase under the recommended level of flood control protection for University Drive. The full flow capacity of the 84-inch outfall is approximately 246 cfs. Under the recommended concept, the EMF discharge will increase to an estimated 482 cfs. The increase in discharge accounts for the capability of the proposed level of protection system to collect, direct, and discharge at a greater design flow. The increase at the 84-inch pipe also accounts for the addition of more subbasins to the original watershed delineated for the analyses of the Higley Road storm drain.

The 100-year 6-hour storm was input into the hydrologic model to examine the impact on the existing conditions and proposed improvements for University Drive. The results provided in Table 9, indicate a substantial increase in flows with the proposed improvements.

The proposed detention basin will be severely overtaxed under the 100-year event. The basin will spill out onto University Drive and follow historical drainage paths to the south. Since the proposed storm drain system was designed under pressurized conditions for the 10-year storm, no additional flows can be admitted to the storm drain for flows greater than designed.

TABLE 9. 100-YEAR DISCHARGES ALONG UNIVERSITY DRIVE.

Condition 100-Year	Higley Road (cfs)	54th Street (cfs)	56th Street (cfs)	58th Street (cfs)	Recker Road (cfs)	62nd Street (cfs)	64th Street (cfs)
Existing*	407	446	263	94	0	218	60
Proposed	1183	717	531	360	290	37	299

*Remaining flows after diversions cross University under existing conditions.

The 100-year event will produce side street flows exceeding those estimated for the 10-year event. The 100-year side street flows will, at this time, be conveyed south to intersect with University Drive. Since the level of protection to be provided is the 10-year frequency, the 100-year side street flows will inundate the north half of the new University Drive. The 100-year stormwater will generally flow west until flows reach low points at Recker, 64th, and Higley and then will cross over University and follow historical flow paths.

What is Exist. Cross and what is proposed Cross, to see what is the effect of this Project.

2. Hydraulic Impact

The proposed drainage improvements for University Drive will provide protection for the 10-year return interval. The proposed and recommended detention basin/storm drain system was analyzed and sized to safely convey discharges produced by such an event level.

The University Drive storm drain was designed to flow under pressure conditions. This concept was approved by the Flood Control District and the City of Mesa to eliminate the need for an additional outfall to the East Maricopa Floodway. The hydraulic grade line begins at the 84-inch outfall at the EMF at critical depth for the pipe.

The existing 60-inch stubout located at University Drive and Higley Road will be removed and replaced upstream with a 72-inch storm drain. A larger size pipe was required to lower the hydraulic grade line in order not to exceed the catch basin inlet elevations minus 6-inches.

3. Cost Estimate

A construction cost estimate for the preferred alternative was developed based on available ADOT bid tabulations and a 5-year construction cost averaging conducted by the City of Phoenix. The construction cost estimate included side street laterals but not the transmission tower pads required by SRP or pavement drainage improvements for University Drive itself.

The construction cost estimate for flood control improvements to provide a 10-year level of protection is $ 1,744,000.00. The development of the cost estimate is provided in Appendix G.

V. CONCLUSION AND SUMMARY

This final report examined in greater detail the recommended level of protection for flood control improvements along University Drive. The recommended level of protection was identified in the concept report (9).

The recommended storm drain system begins at Higley Road by tying into an existing 84-inch storm drain that outfalls to the East Maricopa Floodway. Pipe sizes range from 72-inch, 54-inch, and 24-inch for the mainline storm drain. Side street laterals range from 48-inches to 24-inches in diameter. The storm drain mainline ends at the proposed detention basin.

Implementation of the concept and final recommendations will provide a 10-year level of protection for flood control improvements for University Drive. Flows generated north of University Drive for the 10-year return interval will be intercepted prior to University and conveyed to outfall to the EMF.

VI. REFERENCES

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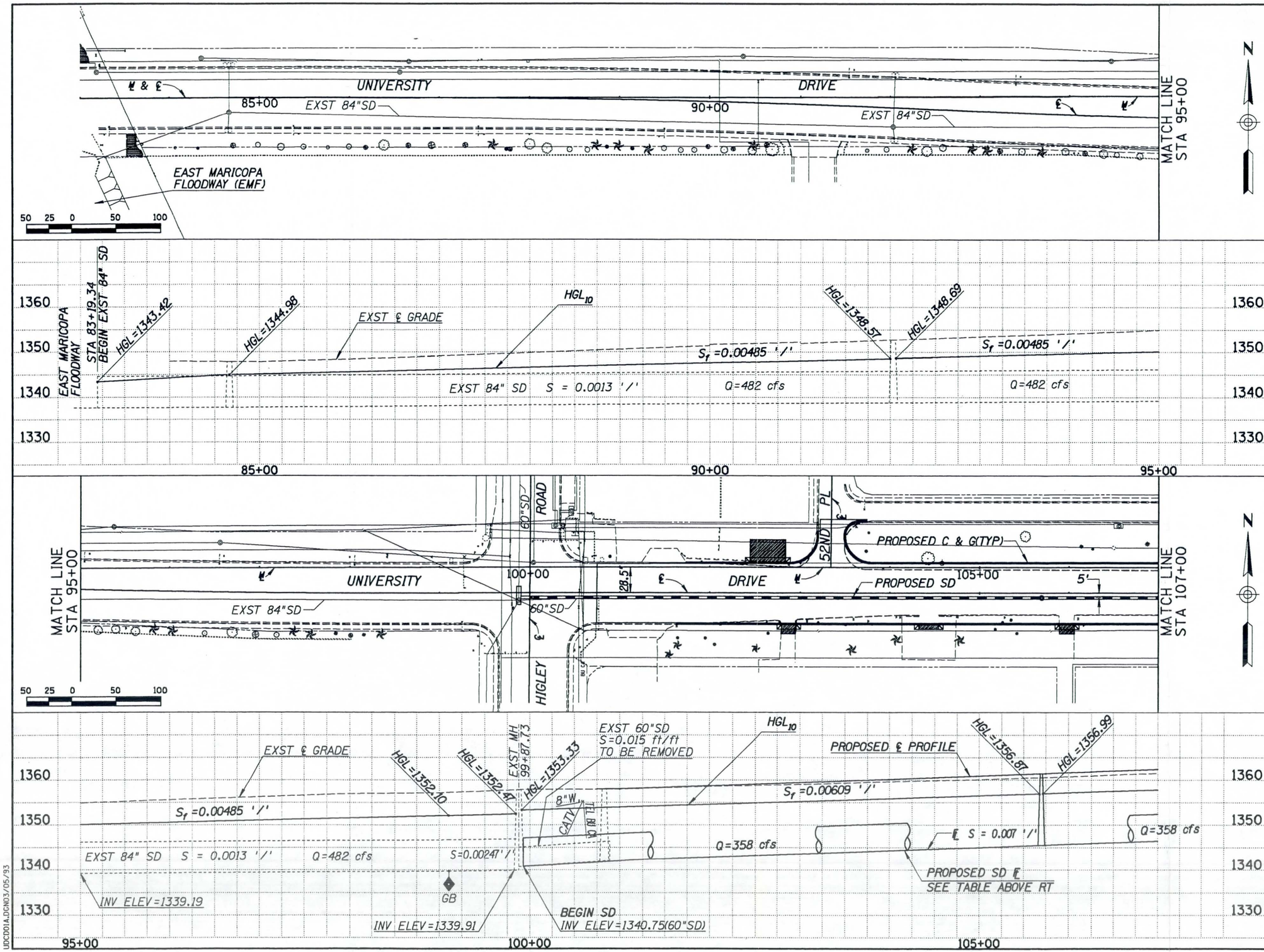
9. Simons, Li & Associates, Inc., "Concept Design Report University Drive Drainage Improvements". Prepared for ENTRANCO. Flood Control District 92-12. December, 1992.

APPENDIX A: CONCEPT PLAN EXHIBITS (100 SCALE)

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.				



UDCD01A.DGN03/05/93

UNIVERSITY DRIVE STORM DRAIN

ALTERNATE	EVENT	HIGLEY TO 56TH ST
(1)	10 YR	72"Φ

(1) RECOMMENDED ALTERNATE

Two working days before you dig.
CALL FOR THE BLUE STAKES
1-800-782-5348
Blue Stake Center

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

UNIVERSITY DRIVE
EAST MARICOPA FLOODWAY TO POWER ROAD
PROJECT NO. 92003

SCHEMATIC NOT FOR CONSTRUCTION USE

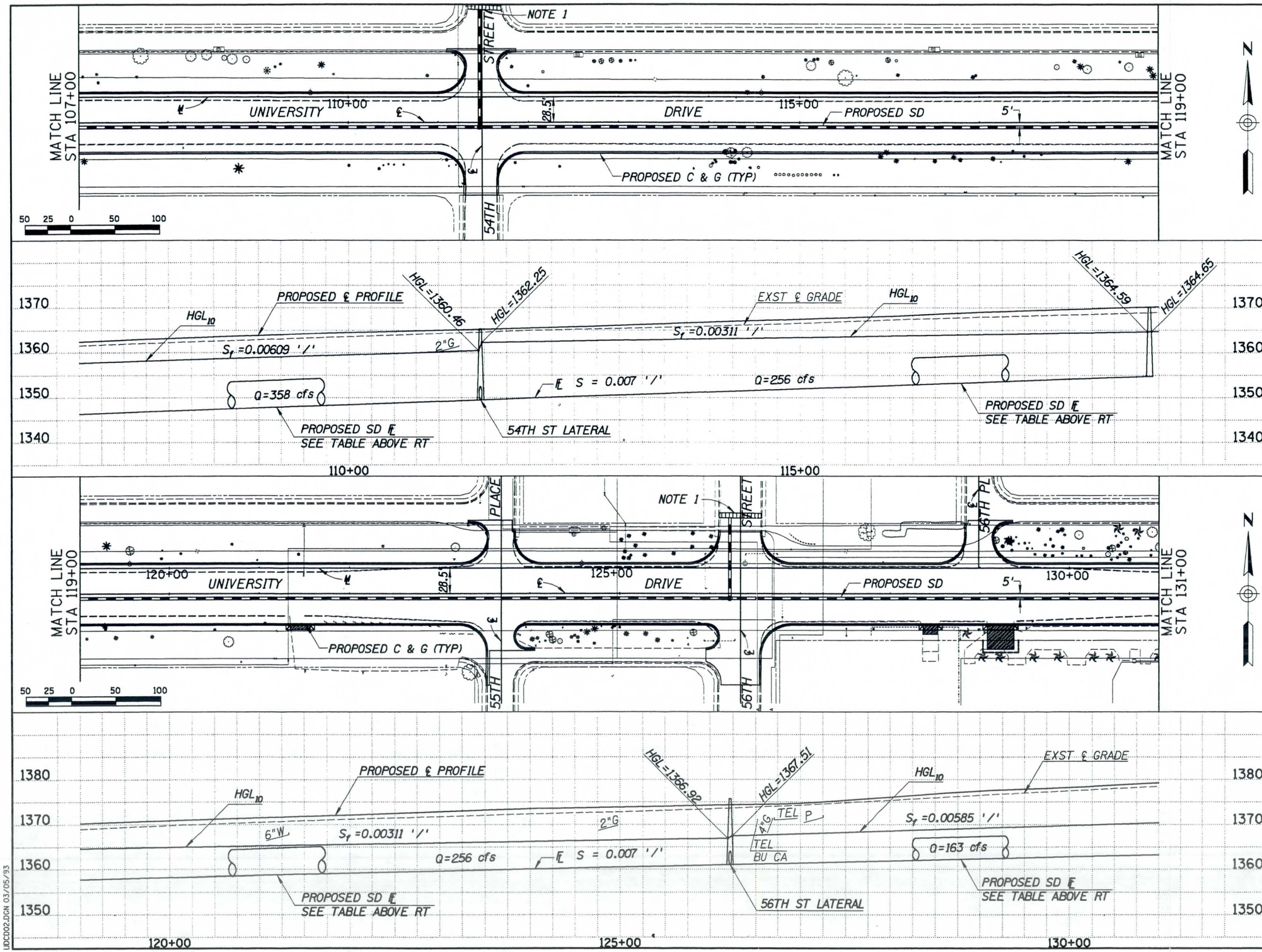
	BY	DATE
DESIGNED	WSK	10/26/92
DRAWN	JPG/TST	10/26/92
CHECKED	GEF	10/26/92

ENTRANCO
ENGINEERS • PLANNERS • SURVEYORS
ARIZONA • WASHINGTON • CALIFORNIA
2400 N. DUNLAP AVENUE, SUITE 100
PHOENIX, ARIZONA 85021
(602) 264-1336

CONCEPT DRAINAGE PLAN/PROFILE
STA. 83+00.00 TO STA. 107+00.00

SHEET OF
- -

APPENDIX A-1



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.				

UNIVERSITY DRIVE STORM DRAIN

ALTERNATE	EVENT	HIGLEY TO 56TH ST	56TH ST TO RECKER
(1)	10 YR	72"Φ	54"Φ

(1) RECOMMENDED ALTERNATE

NOTE 1:

SIDE STREET CATCH BASINS TO INTERCEPT 100% OF FLOWS

USE: SPECIAL CB-MODIFIED COP DET NO. P-1572 W/MAG STD DET 540-2 FRAME AND EF GRATES (BICYCLE SAFE)

Two working days before you dig. CALL FOR THE BLUE STAKES 1-800-782-5348 Blue Stake Center

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

UNIVERSITY DRIVE
EAST MARICOPA FLOODWAY TO POWER ROAD
PROJECT NO. 92003

SCHEMATIC NOT FOR CONSTRUCTION USE

	BY	DATE
DESIGNED	WSK	10/26/92
DRAWN	JPG/TST	10/26/92
CHECKED	GEF	10/26/92

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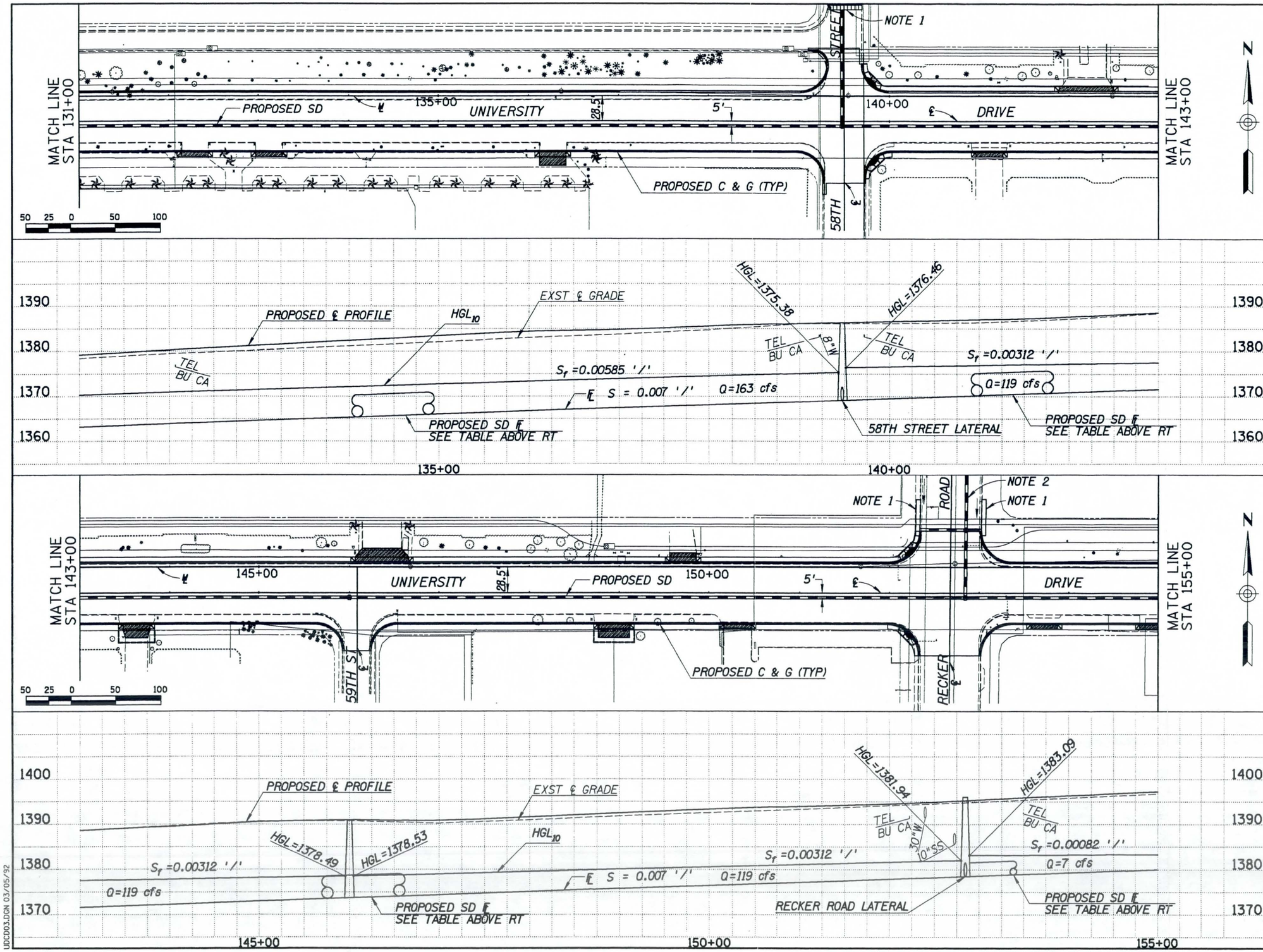
2400 N. DUNLAP AVENUE, SUITE 100 PHOENIX, ARIZONA 85021 (602) 264-1228

CONCEPT DRAINAGE PLAN/PROFILE
STA. 107+00.00 TO STA. 131+00.00

SHEET OF - -

UDCD02.DGN 03/05/93

APPENDIX A-2



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.				

UNIVERSITY DRIVE STORM DRAIN

ALTERNATE EVENT		56TH ST TO RECKER	RECKER RD TO 62ND ST
(1)	10 YR	54"Φ	24"Φ

(1) RECOMMENDED ALTERNATE

NOTE 1:

SIDE STREET CATCH BASINS TO INTERCEPT 100% OF FLOWS

USE: SPECIAL MODIFIED COP DET NO. P-1572 W/MAG STD DET 540-2 FRAME AND EF GRATES (BICYCLE SAFE)

NOTE 2:

RECKER ROAD LATERAL EXTENDS 650'± NORTH AND CAPTURES 100% OF THE Q_{10} ON RECKER ROAD

Two working days before you dig. CALL FOR THE BLUE STAKES 1-800-782-5348 Blue Stake Center

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

UNIVERSITY DRIVE
EAST MARICOPA FLOODWAY TO POWER ROAD
PROJECT NO. 92003

SCHEMATIC NOT FOR CONSTRUCTION USE

	BY	DATE
DESIGNED	WSK	10/26/92
DRAWN	JPG/TST	10/26/92
CHECKED	GEF	10/26/92

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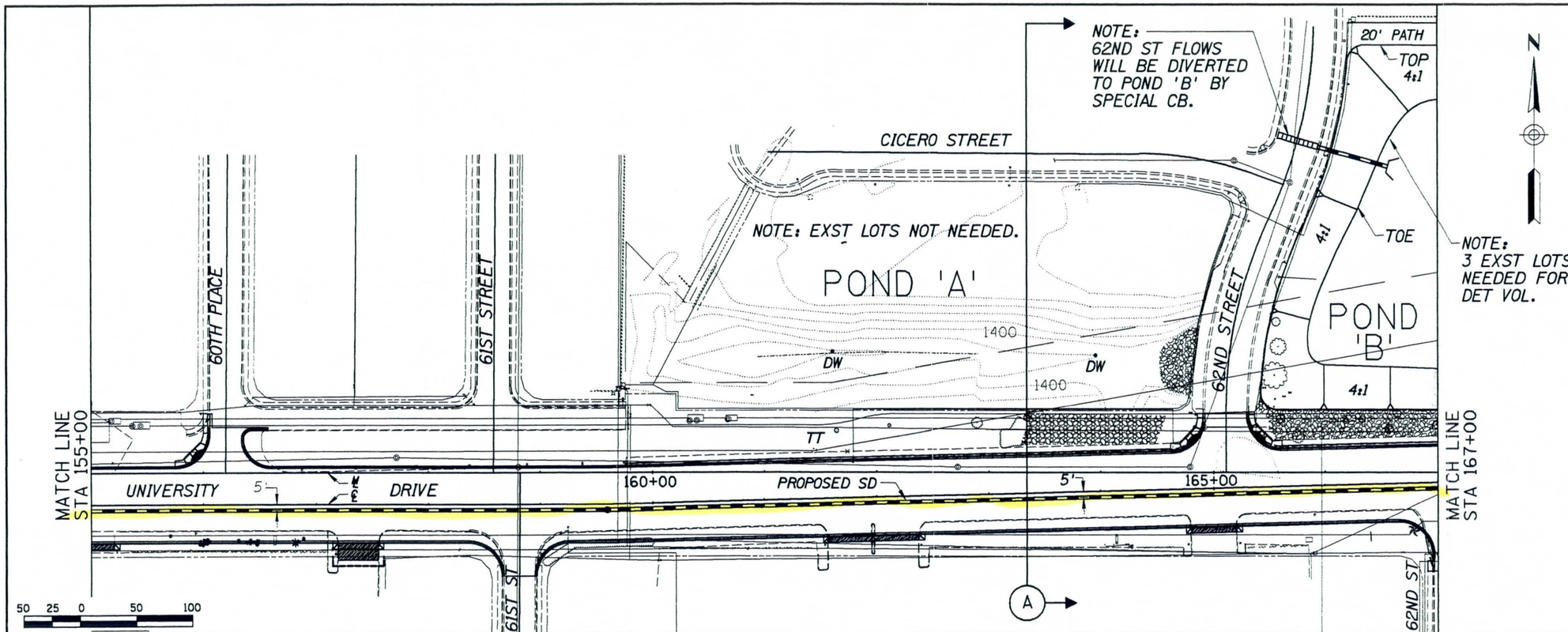
CONCEPT DRAINAGE PLAN/PROFILE
STA. 131+00.00 TO STA. 155+00.00

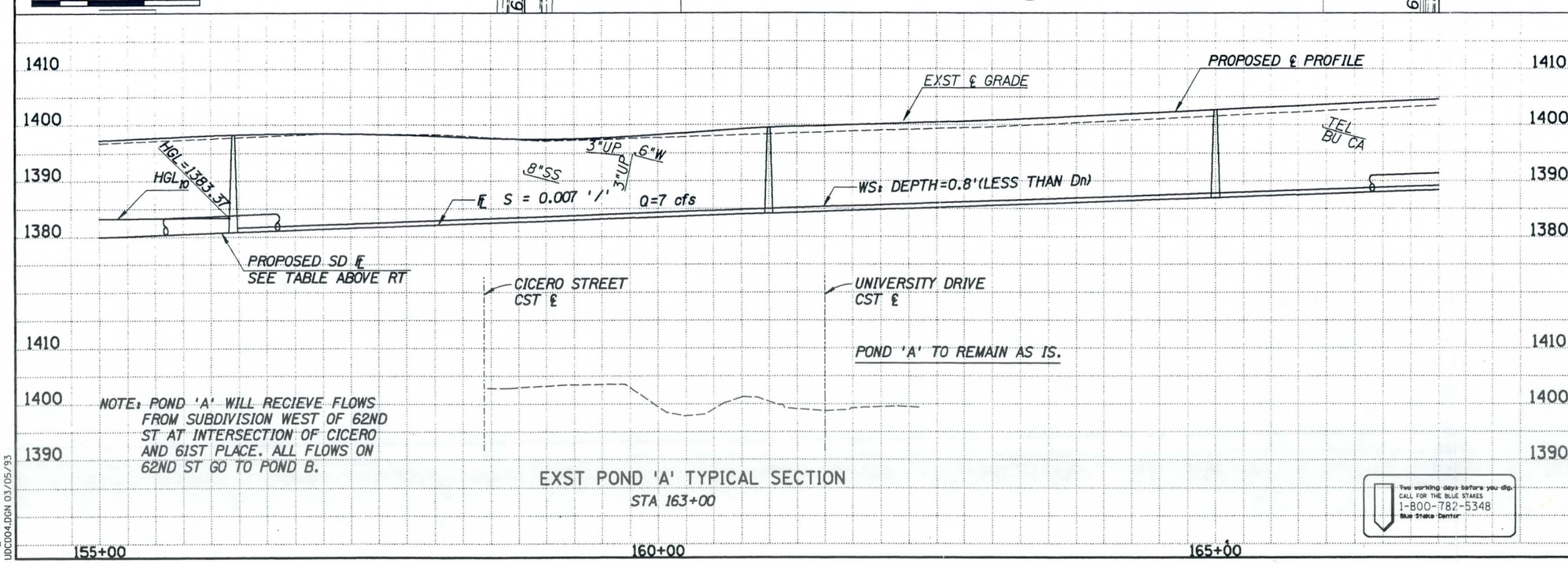
SHEET OF - -

UDCD03.DGN 03/05/92

APPENDIX A-3

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.				





EXST POND 'A' TYPICAL SECTION
STA 163+00

Two working days before you dig CALL FOR THE BLUE STAKES 1-800-782-5348 Blue Stake Center

LEGEND:

TT TRANSMISSION TOWER
PP POWER POLE
DW EXST DRY WELL
▼ 1' MAX WATER SURFACE

POND DATA (POND 'B' ONLY)

EXCAVATION = 105,000 CY
DETENSION VOL = 24 AC
= $1.08 \times 10^6 FT^3$
PEAK RUNOFF = $1.05 \times 10^6 FT^3$

UNIVERSITY DRIVE STORM DRAIN

ALTERNATE	EVENT	STA 155+00 TO 167+00
(1)	10 YR	24"Φ

(1) RECOMMENDED ALTERNATE

USE: SPECIAL CB-MODIFIED COP DET NO. P-1572 W/MAG STD DET 540-2 FRAME AND EF GRATES (BICYCLE SAFE)

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

UNIVERSITY DRIVE
EAST MARICOPA FLOODWAY TO POWER ROAD
PROJECT NO. 92003

SCHEMATIC NOT FOR CONSTRUCTION USE

	BY	DATE
DESIGNED	WSK	11/17/92
DRAWN	JPG/TST	11/17/92
CHECKED	GEF	11/17/92

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PHOENIX, ARIZONA 85021 (602) 254-1228

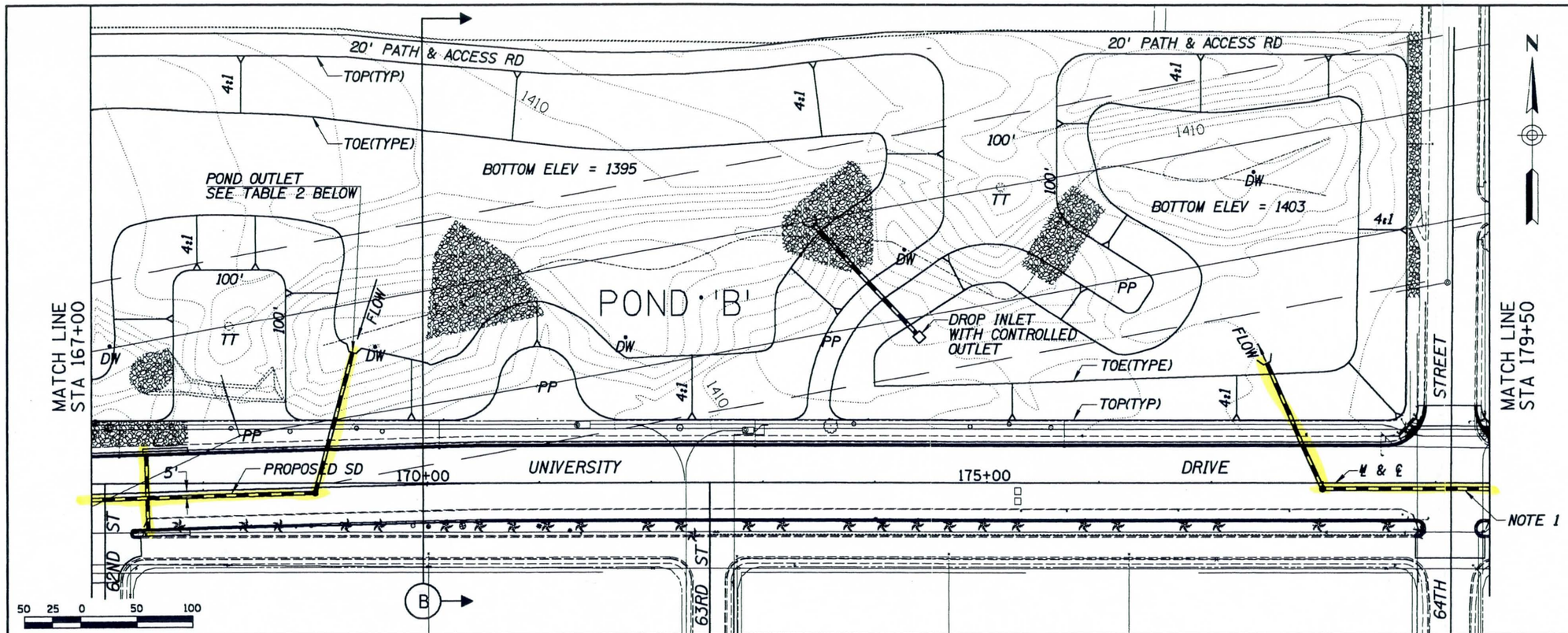
CONCEPT DRAINAGE PLAN/PROFILE
STA. 155+00.00 TO STA. 167+00.00

SHEET OF - -

UDCD04.DGN 03/05/93

APPENDIX A-4

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.				



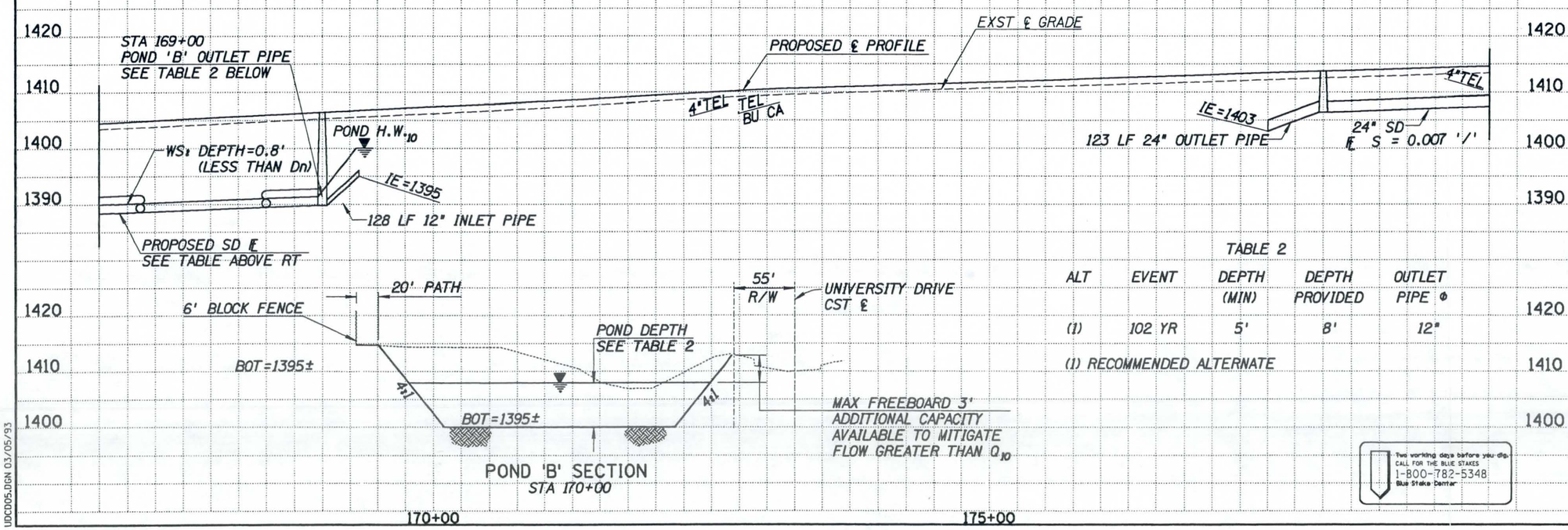


TABLE 2

ALT	EVENT	DEPTH (MIN)	DEPTH PROVIDED	OUTLET PIPE Φ
(1)	102 YR	5'	8'	12"

(1) RECOMMENDED ALTERNATE

Two working days before you dig, CALL FOR THE BLUE STAKES 1-800-782-5348 Blue Stake Center

LEGEND:

TT TRANSMISSION TOWER
PP POWER POLE
DW EXST DRY WELL
▼ 1' MAX WATER SURFACE

UNIVERSITY DRIVE STORM DRAIN
STA 167+00 TO 169+00

ALTERNATE	EVENT	MAIN
(1)	10 YR	24"Φ

(1) RECOMMENDED ALTERNATE

NOTES:

SD BEYOND 177+00 IS PROVIDED FOR PAVEMENT DRAINAGE

DRYWELLS TO BE ABANDONED

NOTE 1:

24" SD AND CURB OPENING INLETS ARE FOR PAVEMENT DRAINAGE. HGL IS BELOW CROWN OF SD.

CATCH BASIN CONNECTOR PIPE DESIGN WILL BE COMPLETED FOR 60% PLAN SUBMITTAL.

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

UNIVERSITY DRIVE
EAST MARICOPA FLOODWAY TO POWER ROAD
PROJECT NO. 92003

SCHEMATIC NOT FOR CONSTRUCTION USE

	BY	DATE
DESIGNED	WSK	11/17/92
DRAWN	JPG/TST	11/17/92
CHECKED	GEF	11/17/92

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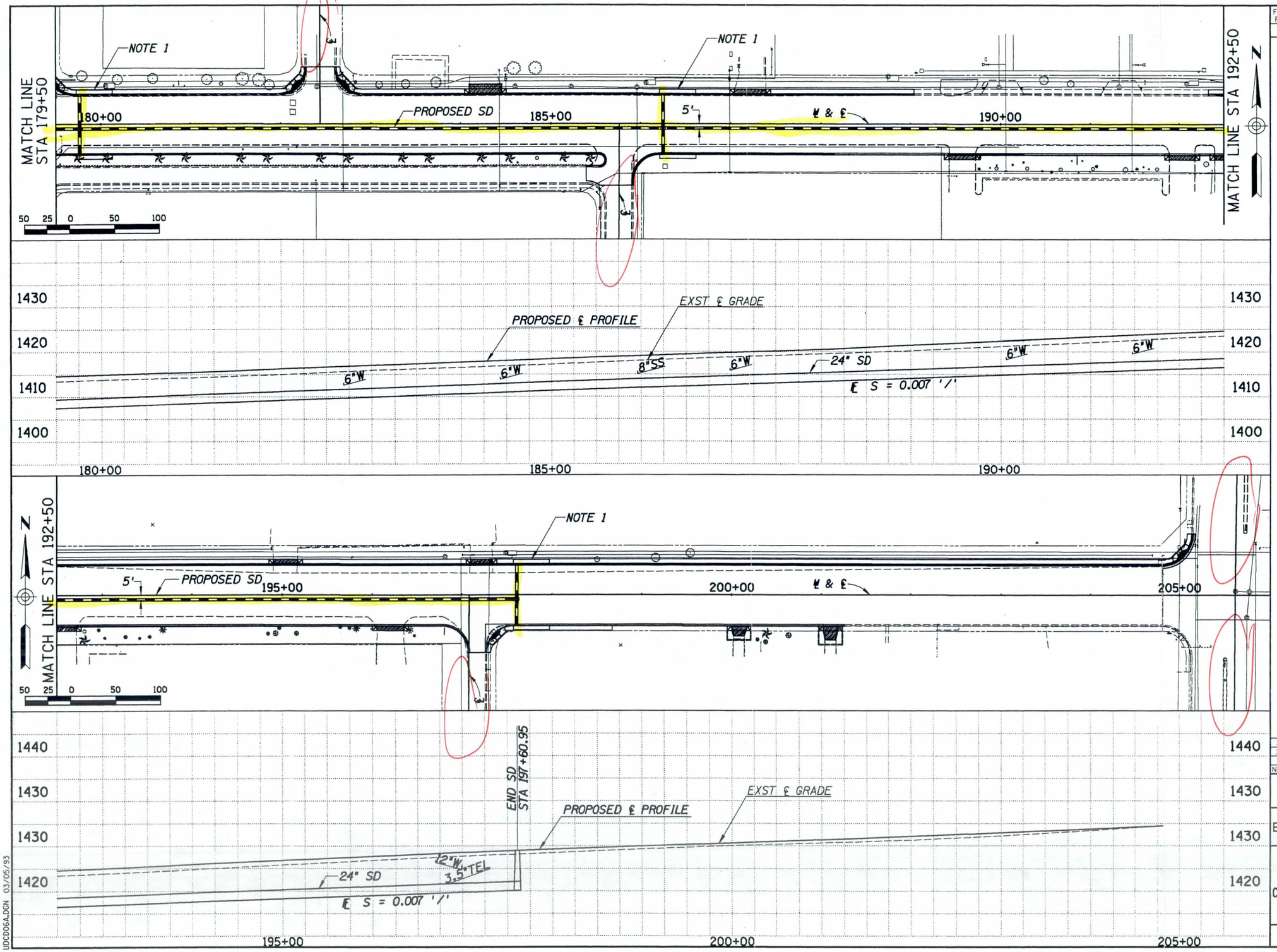
CONCEPT DRAINAGE PLAN/PROFILE
STA. 167+00.00 TO STA. 179+00.00

SHEET OF
- -

UDCD05.DGN 03/05/93



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.				

NOTE 1:

24" SD AND CURB OPENING INLETS ARE FOR PAVEMENT DRAINAGE. HGL IS BELOW CROWN OF SD.

CATCH BASIN CONNECTOR PIPE DESIGN WILL BE COMPLETED FOR 60% PLAN SUBMITTAL.

Two working days before you dig.
CALL FOR THE BLUE STAKES
1-800-782-5348
Blue Stake Center

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

UNIVERSITY DRIVE
EAST MARICOPA FLOODWAY TO POWER ROAD
PROJECT NO. 92003

SCHEMATIC NOT FOR CONSTRUCTION USE

	BY	DATE
DESIGNED	WSK	10/26/92
DRAWN	JPG/TST	10/26/92
CHECKED	GEF	10/26/92

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CONCEPT DRAINAGE PLAN/PROFILE
STA. 179+00.00 TO STA. 213+00.00

SHEET OF
- -

UDCD06A.DGN 03/05/93

APPENDIX A-6

APPENDIX B: DIVERSION COMPUTATIONS

sla
SIMONS, LI & ASSOCIATES, INC.

CLIENT _____ JOB NO. _____ PAGE _____
PROJECT _____ DATE CHECKED _____ DATE _____
DETAIL _____ CHECKED BY _____ COMPUTED BY _____

DIVERSION COMPUTATIONS
(SPLIT FLOWS AT INTERSECTIONS)

sla
SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTMAN CO
PROJECT UNIVERSITY
DETAIL DIVERSION COMPUTATIONS
JOB NO. A2-EE-02
DATE CHECKED 2/8/93
CHECKED BY JRM
PAGE 1A/
DATE 1/25/93
COMPUTED BY KAE

ROADWAY LONGITUDINAL SLOPES FOR DIVERSION COMPUTATIONS
(DATA FURNISHED BY BILL KANTOR WHO EXAMINED COUNTY HIGHWAY RECORDS JAN. 19, 1993)

	ADOBE @ HIGLEY		
S=	0.0071 ft/ft	0.0042 ft/ft	← SLOPE (ft/ft)
	47 FT	68 FT	← STREET WIDTH (ft)

ADOBE @ 56TH ST	
0.0075 ft/ft	0.0056 ft/ft
47'	47'

ADOBE @ RECKER	
0.009 ft/ft	0.005 ft/ft
47'	68'

DECATUR @ 54TH	
0.007 ft/ft	0.0069 ft/ft
28'	36'

DECATUR @ 56th	
0.007 ft/ft	0.0035 ft/ft
28'	47'

FOR INVERTED CROWN ST ASSUME 0.01 ft/ft CROSS SLOPE

sla
SIMONS, li & ASSOCIATES, INC.

CLIENT: ENTRANCO
PROJECT: UNIVERSITY
DETAIL: RATING CURVES

JOB NO. A2-EE-02
DATE CHECKED:
CHECKED BY:

PAGE 1B
DATE 1/27/93
COMPUTED BY RAE

RATING CURVES FOR DI/DQ RECORDS

HEC-1 KK GROUP

ADOBE @ 56TH ST — DV3087

DI	0	24.6	49.9	145.3
DQ	0	13.6	22.0	48.4

✓

ADOBE @ PECKER — DV3081

DI	0	~~71~~	107.6	270.5
DQ	0	0	21.8	71.1

? ✓

ADOBE @ HIGLEY — DV3093

DI	0	10	100	1000
DQ	0	10	100	1000

✓

DECATUR @ 54TH ST — DV 3250

DI	0	83.3	233
DQ	0	35.5	95.8

✓

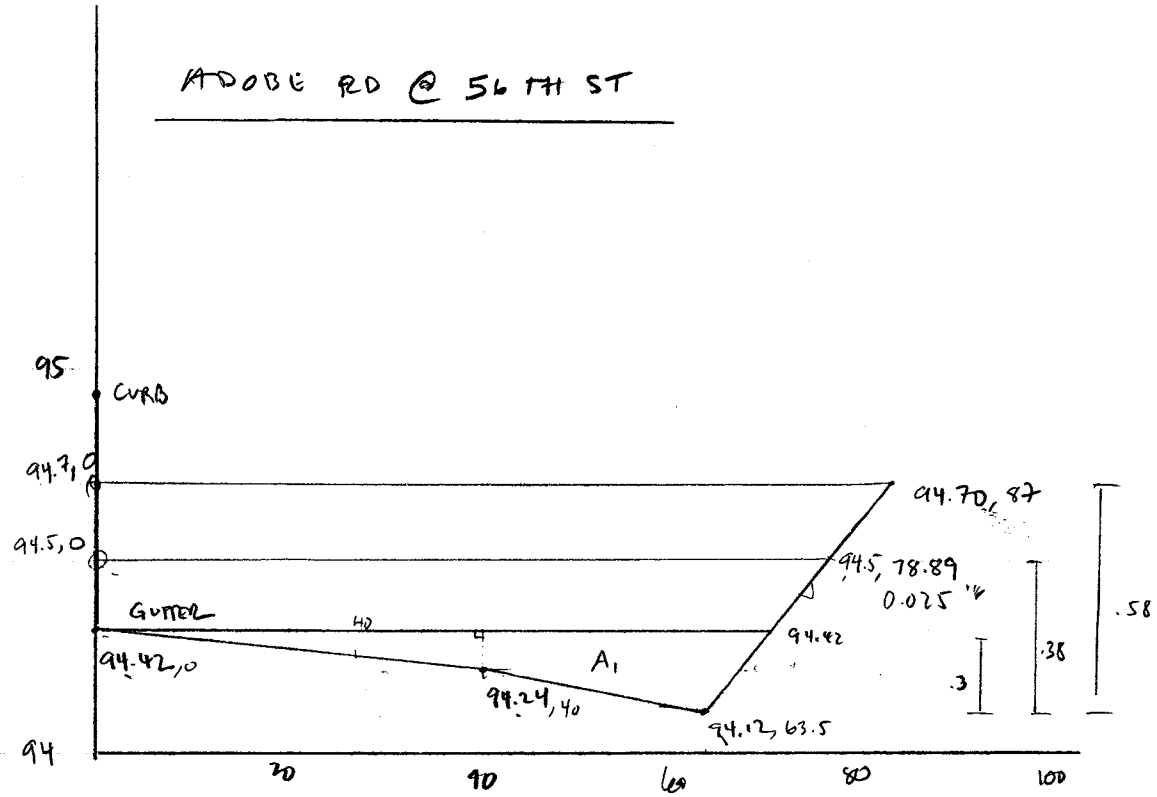
DECATUR @ 56TH ST — DV3241 ✓

DI	0	83.3	233
DQ	0	43.5	123

sla
SIMONS, li & ASSOCIATES, INC.

CLIENT: ENTMAN LD
PROJECT: UNIVERSITY RATING CURVES
DETAIL:
JOB NO. A2-EE-02
DATE CHECKED: 2/8/93
CHECKED BY: JRM
PAGE: 1
DATE: 1/25/93
COMPUTED BY: RAE

ADOBE RD @ 56TH ST



$n = 0.016$

$A_1 = 10.22\ ft^2$

$S = 0.0075\ \%$

$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$

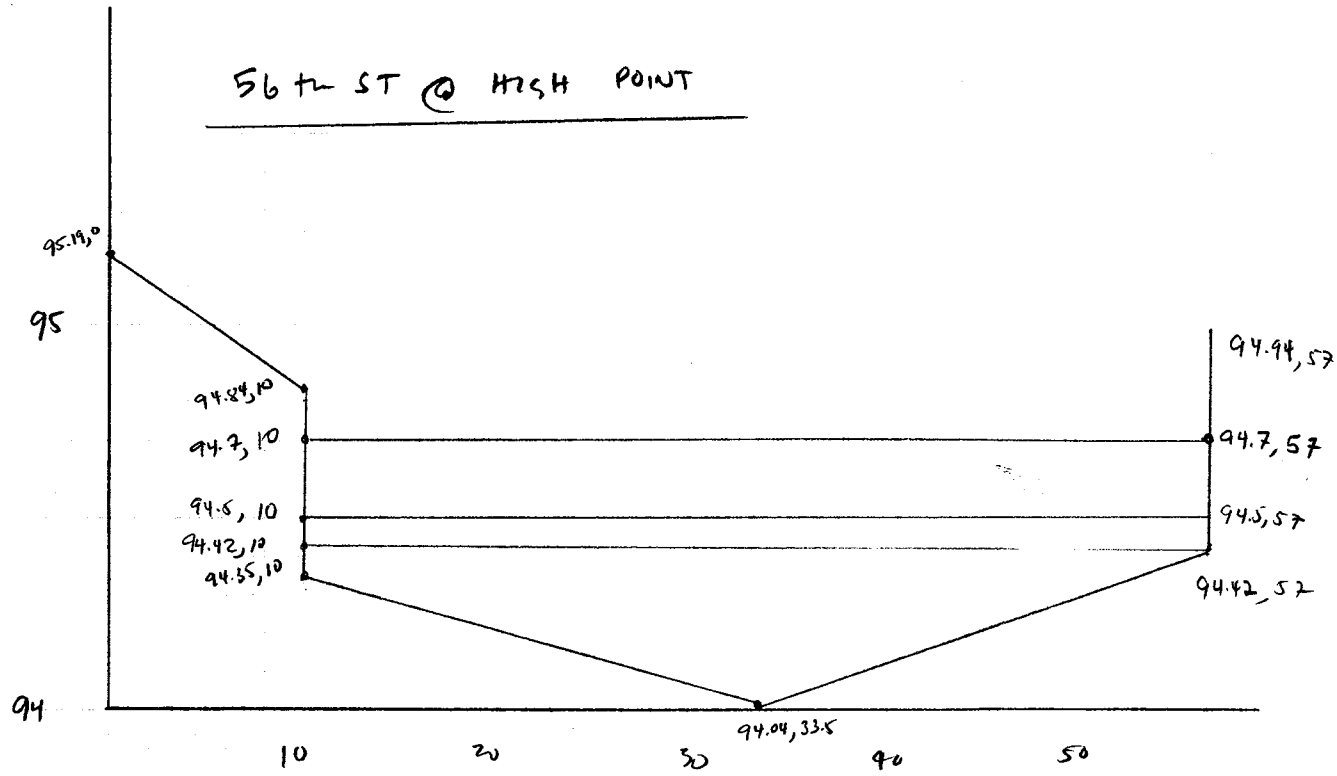
$Q = 8.043\ A R^{2/3}$

d	A	P	R	$R^{2/3}$	Q
0.30	11.06	76	0.15	0.28	24.6
.38	17.24	79	0.22	0.36	49.9
0.58	33.84	87	0.39	0.53	145.3

sla
SIMONS, li & ASSOCIATES, INC.

CLIENT: ENTMANLO
PROJECT: UNIVERSITY
DETAIL: PATTING CURVES
JOB NO: M-EE-02
DATE CHECKED: 2/8/93
CHECKED BY: JRM
PAGE: 2
DATE: 1/25/93
COMPUTED BY: RAE

56th ST @ HIGH POINT



Use weir equation $Q = CLd^{1.5}$ $C = 3.0$ L = length of weir = 47 ft

d	A	T	HYDRAULIC DEPTH (A/T)	$(A/T)^{1.5}$	Q
.3	9.75	47	0.21	0.1	13.57
.38	13.51	47	0.29	0.16	22.0
.58	22.91	47	0.49	0.34	48.4

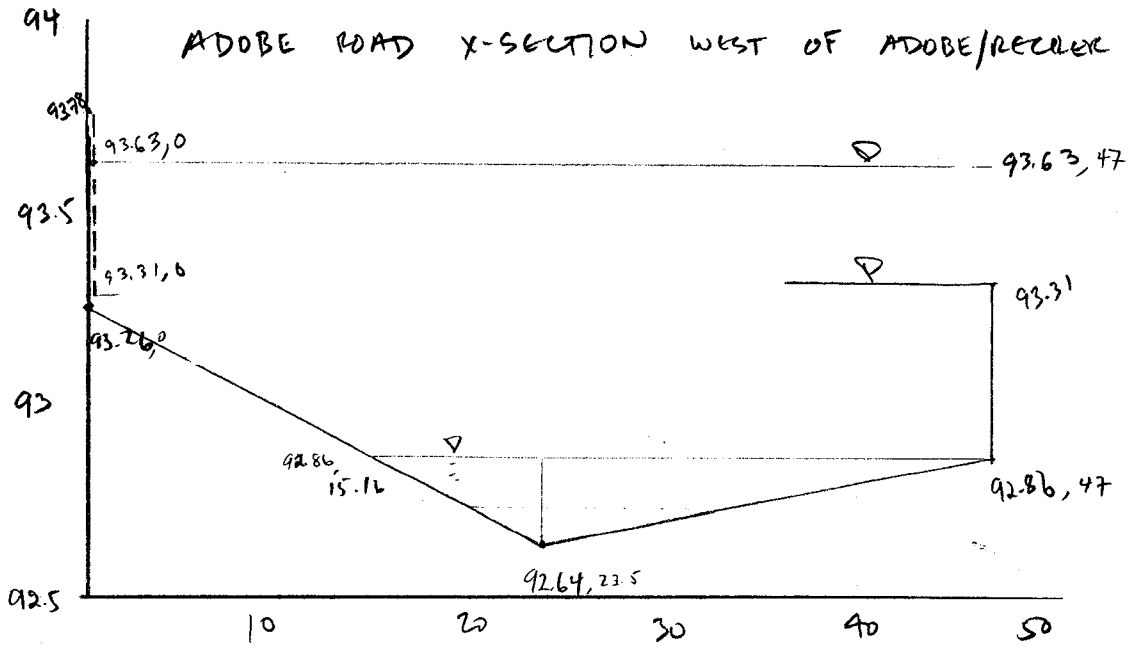
SPLIT @ ADOBE + 56th ST

DI	0	24.6	49.9	145.3
DQ	0	13.6	22.0	48.4

sla
SIMONS, li & ASSOCIATES, INC.

CLIENT: ENTRANCO
PROJECT: UNIVERSITY
DETAIL: DIVERSION – SPLIT FLOW
JOB NO.: A2-EE-01
DATE CHECKED:
CHECKED BY:
PAGE: 3+4
DATE: 2/19/93
COMPUTED BY: RAE

ADOBE ROAD X-SECTION WEST OF ADOBE/RECKER INT.



d	A	P	R	$R^{2/3}$	Q
0.22	3.5	31.84	0.11	0.23	7.1
0.67	21.03	47.5	0.44	0.58	107.6
0.99	36.66	47.82	0.77	0.84	270.5

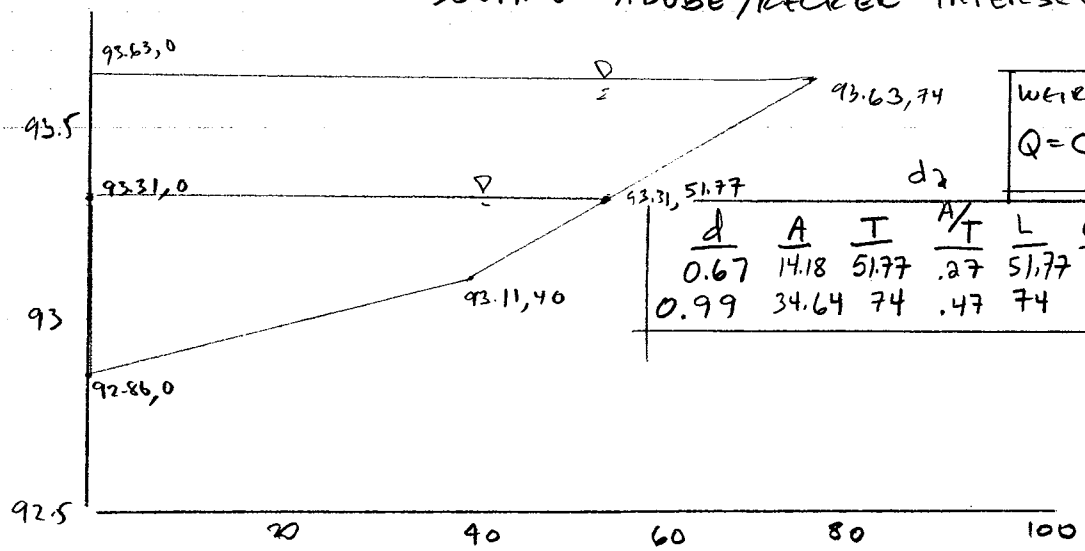
DI	7.1	107.6	270.5
DQ	0	21.8	71.1

$n = 0.016$
$S = 0.009$

$$Q = \frac{1.486}{0.016} A R^{2/3} (0.009)^{1/2}$$

$$Q \sim 8.81 A R^{2/3}$$

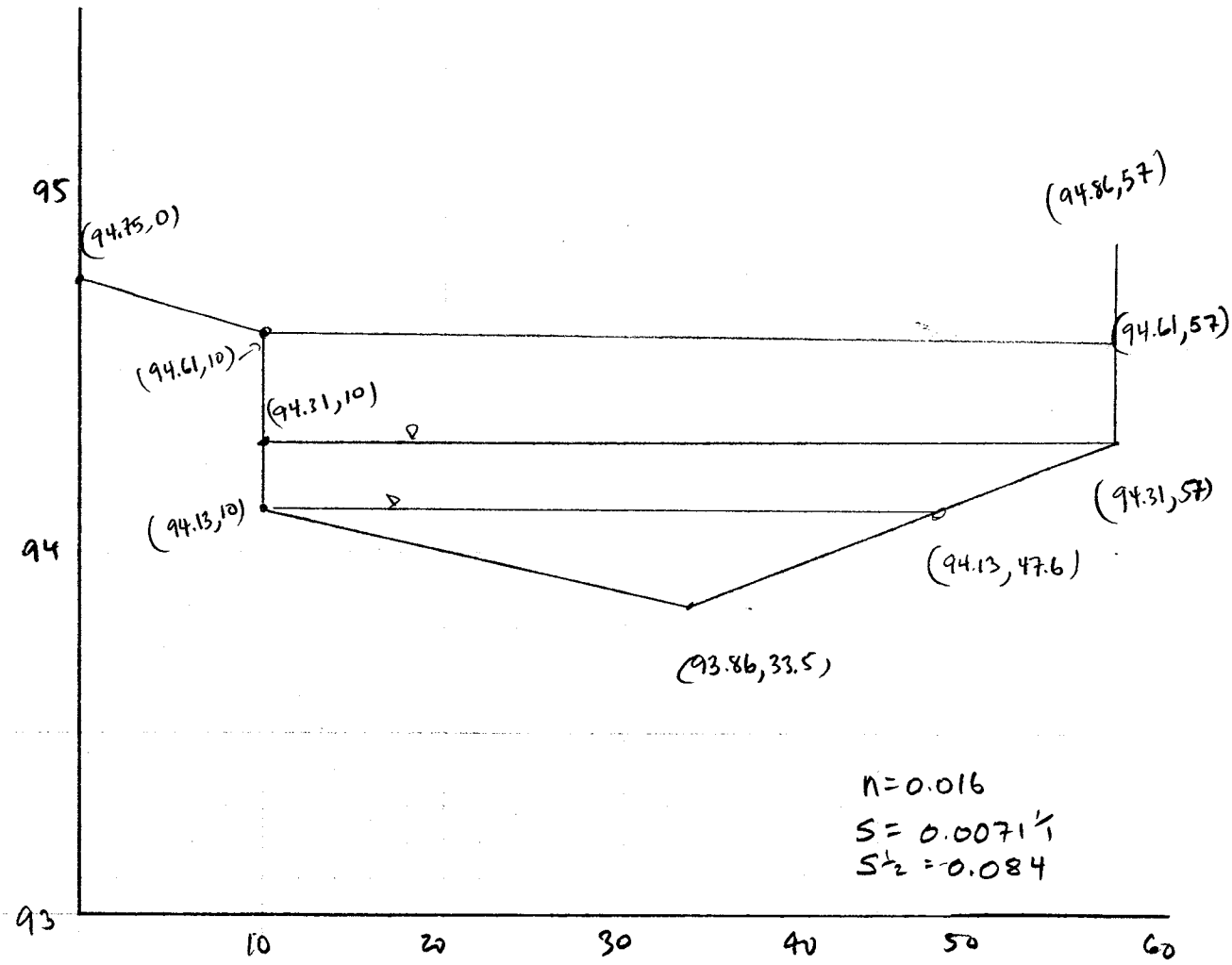
X-SECTION RECKER @ CREST (HIGH POINT)
SOUTH OF ADOBE/RECKER INTERSECTION



WEIR EQN
$Q = C L d^{1.5}$
$C = 3.0$

d	A	T	A/T	L	Q
0.67	14.18	51.77	.27	51.77	21.79
0.99	34.64	74	.47	74	71.1

ADOBE RD EAST OF HIGLEY



d	A	P	R	$R^{2/3}$	Q (cfs)
0.27	5.1	37.6	0.14	0.26	10.4
0.45	12.7	47.5	0.27	0.42	41.22
0.75	26.7	49.0	0.54	0.67	139.3

$Q = 7.82 A R^{2/3}$

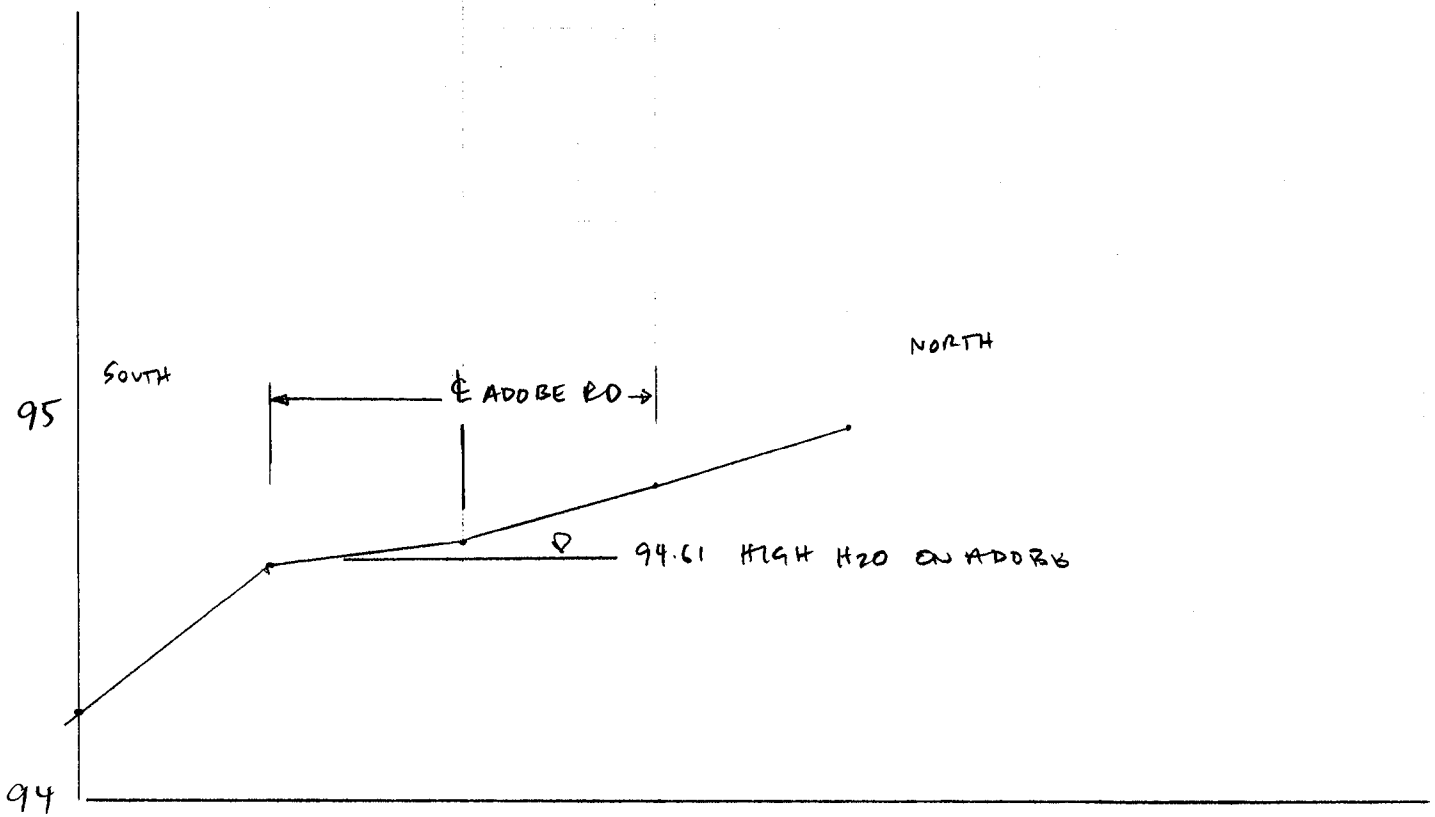
SIMONS, LI & ASSOCIATES, INC.

CLIENT EATTMAN LO
PROJECT
DETAIL

JOB NO. A2-EE-02
DATE CHECKED 2/5/93
CHECKED BY JRM

PAGE 6
DATE 1/26/93
COMPUTED BY RAC

PROFILE HIGLEY ROAD THRU HIGLEY/ADOBE INTERSECTION



@ H_2O ELEV 94.61 Q = 137.3 cfs NO OVERTOPPING OF HIGLEY PROFILE GRADE LINE - FLOWS FROM ADOBE FOR 10 YEAR EVENT FLOW WEST TO INTERSECTION THEN TURN SOUTH DOWN HIGLEY AS ASSUMED IN HEC-1 MODEL.

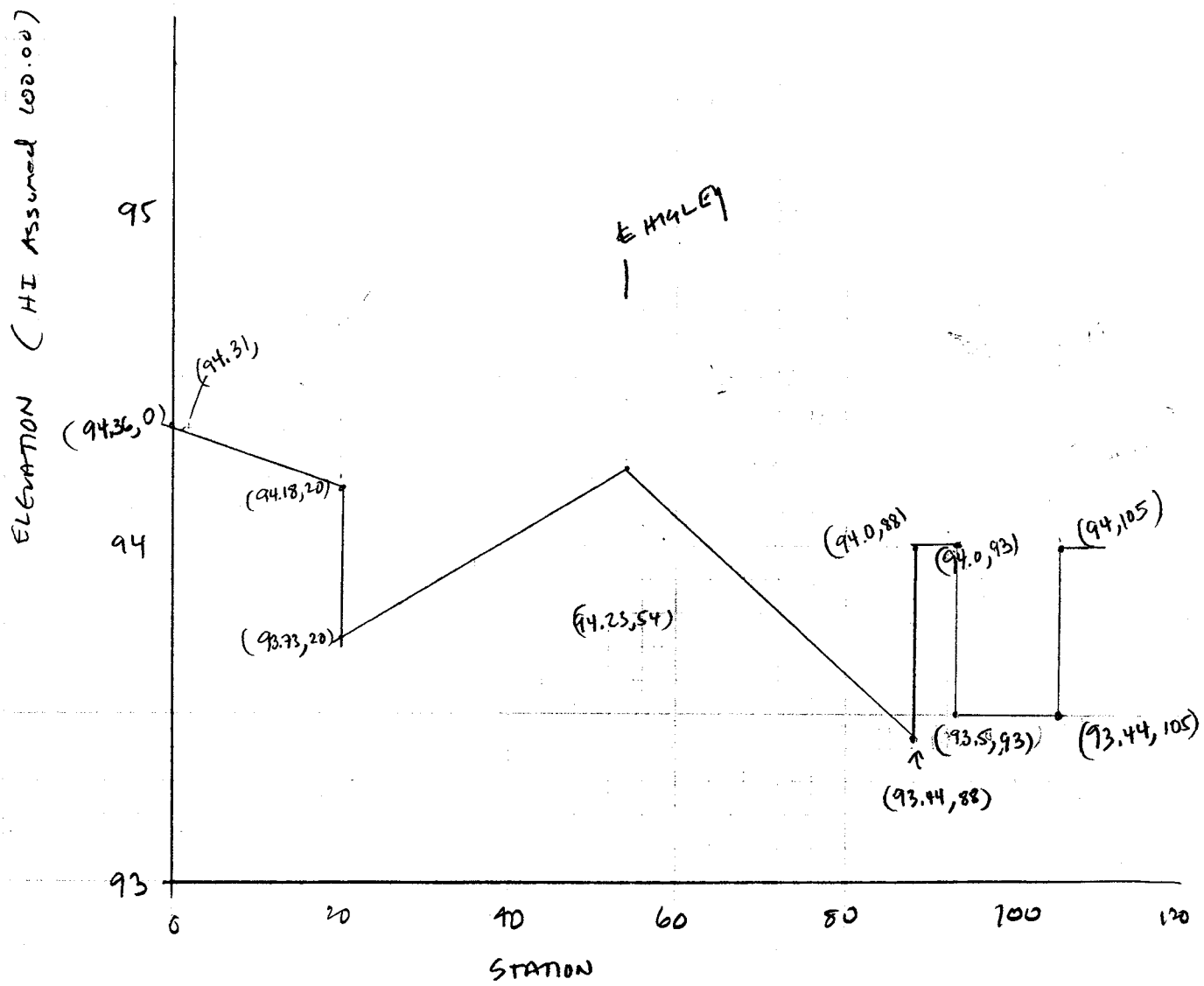
sla
SIMONS, LI & ASSOCIATES, INC.

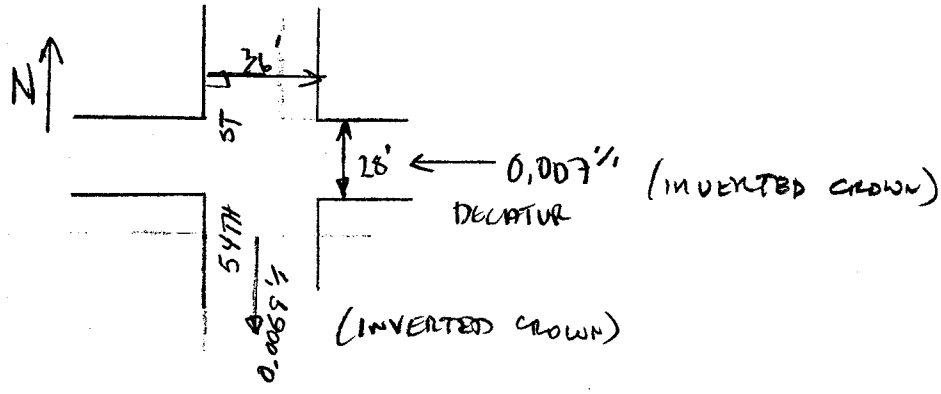
CLIENT ENTRANGO
PROJECT
DETAIL

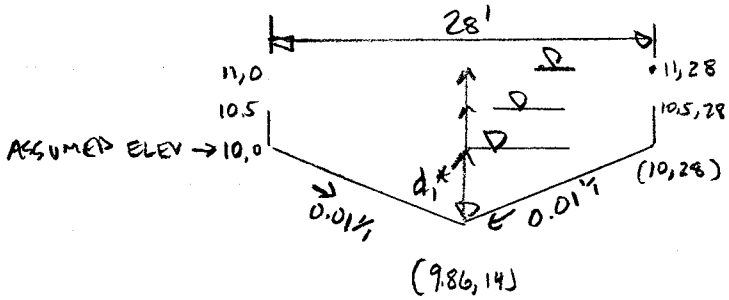
JOB NO. AZ-EE-02
DATE CHECKED 2/8/93
CHECKED BY JRM

PAGE 7
DATE 1/26/93
COMPUTED BY RAE

HIGLEY ROAD SOUTH OF ADOBE (LOOKING NORTH)



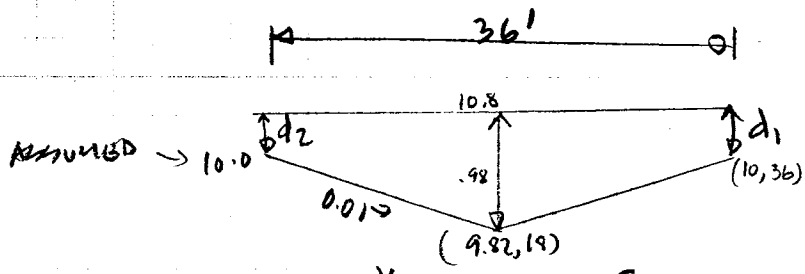




ASSUMED
1. CROSS SLOPE = 0.01 ft/ft
2. FLOW CONTAINED WITHIN X-SECTION
3. 0.5' VERTICAL CURBS

X-SECTION DECATUR

USED CURB	d_1	d_1^*	A	P	R	$R^{2/3}$	Q
10	0	0.14	1.96	28.7	0.07	0.17	2.6
10.5	.5	0.64	15.96	29	0.55	0.67	83.3
11	1.0	1.14	29.96	30	1.00	1.00	233



WEIR EQN
$Q = Cld^{1.5}$
$C = 3.0$

X-SECTION 59TH ST

A. let $d_1 = 1.0$ $d_2 = 0.6$

$Q_D = 233 - 113.24 = 119.76$ CFS

$Q_D = 3(18)\left(\frac{.6+.98}{2}\right)^{1.5} + 3(18)\left(\frac{.98+1}{2}\right)^{1.5}$

$Q_D = 37.9 + 53.2 = 91.1 \neq 119.8$

.5	83.3
.6	? = 113.24
1.0	233

$\frac{.4}{.5} = \frac{x}{149.7}$

$x = 119.76$

B. $d_1 = 1$ $d_2 = 0.68'$

.5	83.3		
.68	? 137.2	$\frac{.32}{.5} = \frac{x}{149.7}$	
1	233		

$Q_D = 233 - 137.2 = 95.8$ CFS

$10.68 + \frac{.32}{2} = 10.84$

$10.84 - 9.82 = 1.02$

$Q_D = 3(18)\left(\frac{.68 + 1.02}{2}\right)^{1.5} + 3(18)\left(\frac{1.02 + 1}{2}\right)^{1.5}$

$= 42.3 + 54.8 = 97.1 \approx 95.8$ CLOSE ENOUGH

c. let $d_1 = 0.5$ $d_2 = 0.3$

0	2.6		
.3	? 51.02	$\frac{.2}{.5} = \frac{x}{80.7}$	
.5	83.3		

$Q_D = 83.3 - 51.0 = 32.3$ CFS

$10.3 + \frac{.2}{2} = 10.4$

$10.4 - 9.82 = .58$

$Q_D = 3(18)\left(\frac{.3 + .58}{2}\right)^{1.5} + 3(18)\left(\frac{.58 + .5}{2}\right)^{1.5}$

$= 15.8 + 21.4 = 37.2$

d. let $d_1 = 0.5$ $d_2 = 0.28$

0	2.6		
.28	? 47.8	$\frac{.22}{.5} = \frac{x}{80.7}$	
.5	83.3		

$Q_D = 83.3 - 47.8 = 35.5$ CFS

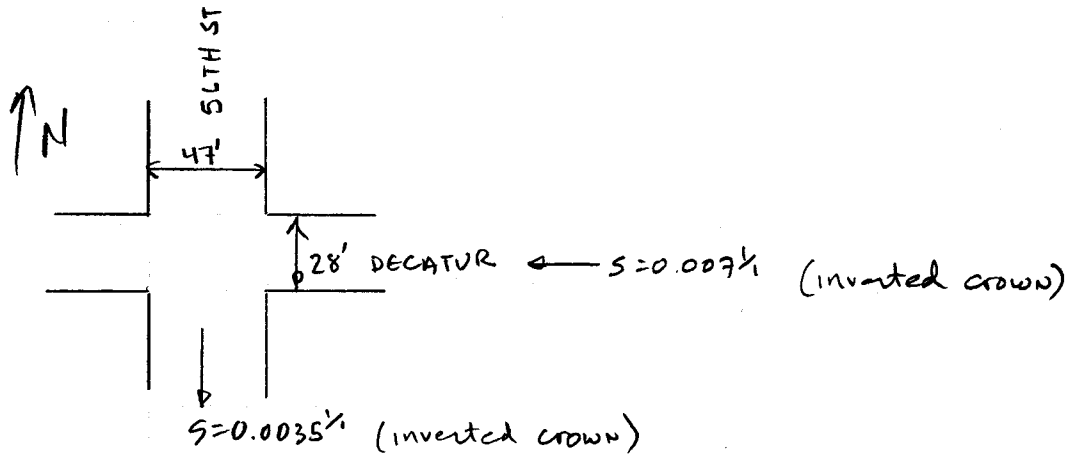
$10.28 + \frac{.22}{2} = 10.39$

$10.39 - 9.82 = .57$

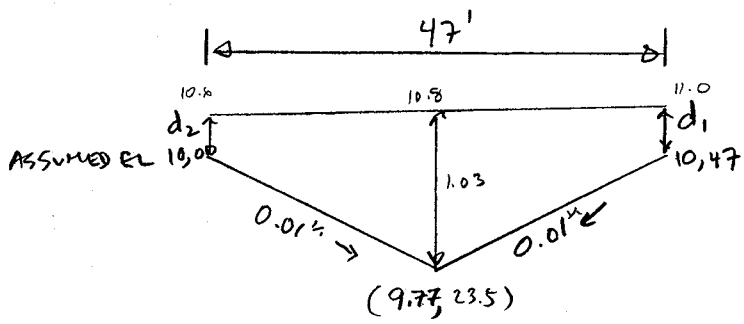
$Q_D = 3(18)\left(\frac{.28 + .57}{2}\right)^{1.5} + 3(18)\left(\frac{.57 + .5}{2}\right)^{1.5}$

$= 15 + 21.1 = 36.1 \cong 35.$ OK CLOSE ENOUGH

DI	0	83.3	233
DQ	0	35.5	95.8



DECATUR @ 56th ST HAS SAME RATING CURVE AS AT 54TH ST (SEE SHEET 8)



ASSUMED
1. CROSS SLOPE = 0.01%
2. FLOW CONTAINED WITHIN X-SECTION
3. 0.5' VERT CURB

56TH ST X-SECTION

let $d_1 = 1.0'$ $d_2 = 0.6$

$Q_D = 233 - 113.24 = 119.76$ (see sheet 8)

$$Q_D = 3(23.5)\left(\frac{0.6 + 1.03}{2}\right)^{1.5} + 3(23.5)\left(\frac{1.03 + 1}{2}\right)^{1.5}$$

$$= 51.9 + 72.1 = 124$$

let $d_1 = 1.0'$ $d_2 = 0.59$

$Q_D = 233 - 110.3 = 122.8$ cfs

.5 83.3
.59 ? =
1.0 233

$$\frac{.41}{.5} = \frac{x}{149.7}$$

10.59 10.795 11.0
1.025

$$Q_D = 3(23.5)\left(\frac{.59 + 1.025}{2}\right)^{1.5} + 3(23.5)\left(\frac{1.025 + 1}{2}\right)^{1.5}$$

$$Q_D = 51.2 + 71.82 = 123.0 \cong 122.8 \text{ OK}$$

233/123

---

let $d_1 = 0.5$ $d_2 = .3$

10.3 10.4 10.5
6.63
9.77

$$Q_D = 83.3 - 51.0 = 32.3 \text{ cfs}$$

$$Q_D = 3(23.5)\left(\frac{0.3 + 0.63}{2}\right)^{1.5} + 3(23.5)\left(\frac{.63 + .5}{2}\right)^{1.5}$$

$$Q_D = 22.4 + 30 = 52.4 >> 32.3 \text{ X}$$

let $d_1 = 0.5$ $d_2 = 0.25$

0 2.6
.25 ?42.95
.5 83.3

$$\frac{.25}{.5} = \frac{X}{80.7}$$

$$Q_D = 83.3 - 42.9 = 40.35$$

$$Q_D = 3(23.5)\left(\frac{.25 + 0.605}{2}\right)^{1.5} + 3(23.5)\left(\frac{.605 + 0.5}{2}\right)^{1.5}$$

10.25 10.375 10.5
0.605
9.77

$$Q_D = 19.7 + 28.9 = 48.6 \neq 40.35$$

let $d_1 = 0.5$ $d_2 = 0.23$

0 2.6
.23 ?
.5 83.3

$$\frac{.27}{.5} = \frac{X}{80.7}$$

$$Q_D = 83.3 - 39.72 = 43.6$$

$$Q_D = 3(23.5)\left(\frac{.23 + .595}{2}\right)^{1.5} + 3(23.5)\left(\frac{.595 + .5}{2}\right)^{1.5}$$

10.23 10.365 10.5
.595
9.77

$$Q_D = 18.7 + 28.5 = 47.26 \simeq 43.6$$

close enough

83.3/

DI	0	83.3	233
DQ	0	43.5	123

ADOBE RD. @ 56th ST
(ADOBE56.DAT)

X-COORD.	Y-COORD.	'n'
0.00	95.00	0.0160
0.00	94.42	0.0160
40.00	94.24	0.0160
63.50	94.12	0.0160
87.00	94.70	0.0160

STAGE ELEVATION = 94.420 , SLOPE OF SECTION = 0.007500

SECT	AREA	WET PER	HYD RAD	CONVEY	DISCHARGE	VELOCITY
2	3.60	40.00	0.0900	67.27	5.83	1.62
3	5.64	23.50	0.2400	202.74	17.56	3.11
4	1.82	12.16	0.1500	47.89	4.15	2.27
SUM	11.06	75.66		317.91	27.53	

TOTALS AREA 11.06, CONVEYANCE 317.91, DISCHARGE 27.53
TOPWIDTH 75.66, HYDRAULIC DEPTH (A/Tw) 0.15
AVERAGE SECTION VELOCITY 2.49 fps
****
****

STAGE ELEVATION = 94.500 , SLOPE OF SECTION = 0.007500

SECT	AREA	WET PER	HYD RAD	CONVEY	DISCHARGE	VELOCITY
1	0.00	0.08	0.0000	0.00	0.00	0.00
2	6.80	40.00	0.1700	194.22	16.82	2.47
3	7.52	23.50	0.3200	327.50	28.36	3.77
4	2.93	15.40	0.1899	89.97	7.79	2.66
SUM	17.25	78.98		611.69	52.97	

TOTALS AREA 17.25, CONVEYANCE 611.69, DISCHARGE 52.97
TOPWIDTH 78.90, HYDRAULIC DEPTH (A/Tw) 0.22
AVERAGE SECTION VELOCITY 3.07 fps
****
****

STAGE ELEVATION = 94.700 , SLOPE OF SECTION = 0.007500

SECT	AREA	WET PER	HYD RAD	CONVEY	DISCHARGE	VELOCITY
1	0.00	0.28	0.0000	0.00	0.00	0.00
2	14.80	40.00	0.3700	710.09	61.50	4.16
3	12.22	23.50	0.5200	735.70	63.71	5.21
4	6.81	23.51	0.2899	277.88	24.07	3.53
SUM	33.83	87.29		1723.67	149.27	

TOTALS AREA 33.83, CONVEYANCE 1723.67, DISCHARGE 149.27
TOPWIDTH 87.00, HYDRAULIC DEPTH (A/Tw) 0.39
AVERAGE SECTION VELOCITY 4.41 fps
****
****

56th STREET @ HIGH PT.
(56THST.DAT)

X-COORD.	Y-COORD.	'n'
0.00	95.19	0.0160
10.00	94.84	0.0160
10.00	94.35	0.0160
33.50	94.04	0.0160
57.00	94.42	0.0160
57.00	94.94	0.0160

STAGE ELEVATION = 94.420 , SLOPE OF SECTION = 0.000000

SECT	AREA	WET PER	HYD RAD	CONVEY	DISCHARGE	VELOCITY
2	0.00	0.07	0.0000	0.00	0.00	0.00
3	5.29	23.50	0.2250	182.05	0.00	0.00
4	4.46	23.50	0.1900	137.33	0.00	0.00
SUM	9.75	47.08		319.38	0.00	

TOTALS AREA 9.75, CONVEYANCE 319.38, DISCHARGE 0.00
TOPWIDTH 47.00, HYDRAULIC DEPTH (A/Tw) 0.21
AVERAGE SECTION VELOCITY 0.00 fps
****
****

STAGE ELEVATION = 94.500 , SLOPE OF SECTION = 0.000000

SECT	AREA	WET PER	HYD RAD	CONVEY	DISCHARGE	VELOCITY
2	0.00	0.15	0.0000	0.00	0.00	0.00
3	7.17	23.50	0.3050	302.30	0.00	0.00
4	6.35	23.50	0.2700	246.71	0.00	0.00
5	0.00	0.08	0.0000	0.00	0.00	0.00
SUM	13.51	47.24		549.01	0.00	

TOTALS AREA 13.51, CONVEYANCE 549.01, DISCHARGE 0.00
TOPWIDTH 47.00, HYDRAULIC DEPTH (A/Tw) 0.29
AVERAGE SECTION VELOCITY 0.00 fps
****
****

STAGE ELEVATION = 94.700 , SLOPE OF SECTION = 0.000000

SECT	AREA	WET PER	HYD RAD	CONVEY	DISCHARGE	VELOCITY
2	0.00	0.35	0.0000	0.00	0.00	0.00
3	11.87	23.50	0.5050	700.63	0.00	0.00
4	11.04	23.50	0.4699	621.55	0.00	0.00
5	0.00	0.28	0.0000	0.00	0.00	0.00
SUM	22.91	47.64		1322.19	0.00	

TOTALS AREA 22.91, CONVEYANCE 1322.19, DISCHARGE 0.00
TOPWIDTH 47.00, HYDRAULIC DEPTH (A/Tw) 0.49
AVERAGE SECTION VELOCITY 0.00 fps
****
****

ADOBE RD. EAST OF HIGLEY
(ADHIG.DAT)

X-COORD.	Y-COORD.	'n'
10.00	94.61	0.0160
10.00	94.13	0.0160
33.50	93.86	0.0160
57.00	94.31	0.0160
57.00	94.86	0.0160

STAGE ELEVATION = 94.130 , SLOPE OF SECTION = 0.007100

SECT	AREA	WET PER	HYD RAD	CONVEY	DISCHARGE	VELOCITY
2	3.17	23.50	0.1350	77.69	6.55	2.06
3	1.90	14.10	0.1350	46.61	3.93	2.06
SUM	5.08	37.60		124.30	10.47	

TOTALS AREA 5.08, CONVEYANCE 124.30, DISCHARGE 10.47
TOPWIDTH 37.60, HYDRAULIC DEPTH (A/Tw) 0.13
AVERAGE SECTION VELOCITY 2.06 fps
****
****

STAGE ELEVATION = 94.310 , SLOPE OF SECTION = 0.007100

SECT	AREA	WET PER	HYD RAD	CONVEY	DISCHARGE	VELOCITY
1	0.00	0.18	0.0000	0.00	0.00	0.00
2	7.40	23.50	0.3150	319.00	26.88	3.63
3	5.29	23.50	0.2250	182.04	15.34	2.90
SUM	12.69	47.19		501.04	42.22	

TOTALS AREA 12.69, CONVEYANCE 501.04, DISCHARGE 42.22
TOPWIDTH 47.00, HYDRAULIC DEPTH (A/Tw) 0.27
AVERAGE SECTION VELOCITY 3.33 fps
****
****

STAGE ELEVATION = 94.610 , SLOPE OF SECTION = 0.007100

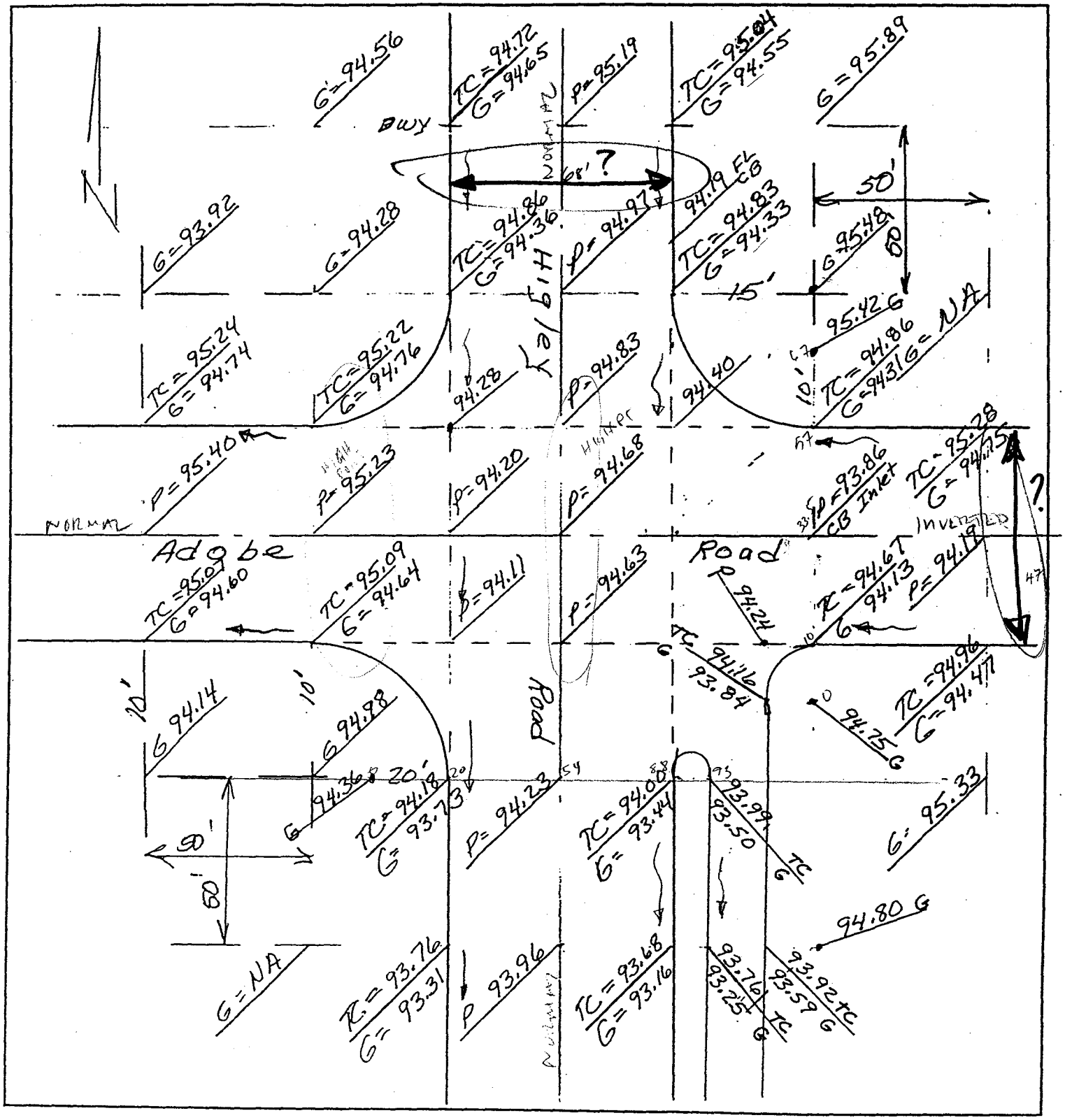
SECT	AREA	WET PER	HYD RAD	CONVEY	DISCHARGE	VELOCITY
1	0.00	0.48	0.0000	0.00	0.00	0.00
2	14.45	23.50	0.6150	973.13	82.00	5.67
3	12.34	23.50	0.5249	747.46	62.98	5.10
4	0.00	0.30	0.0000	0.00	0.00	0.00
SUM	26.79	47.79		1720.59	144.98	

TOTALS AREA 26.79, CONVEYANCE 1720.59, DISCHARGE 144.98
TOPWIDTH 47.00, HYDRAULIC DEPTH (A/Tw) 0.57
AVERAGE SECTION VELOCITY 5.41 fps
****
****

ENTRANCO

SHEET NO 1 OF
PROJECT NO 92003-10

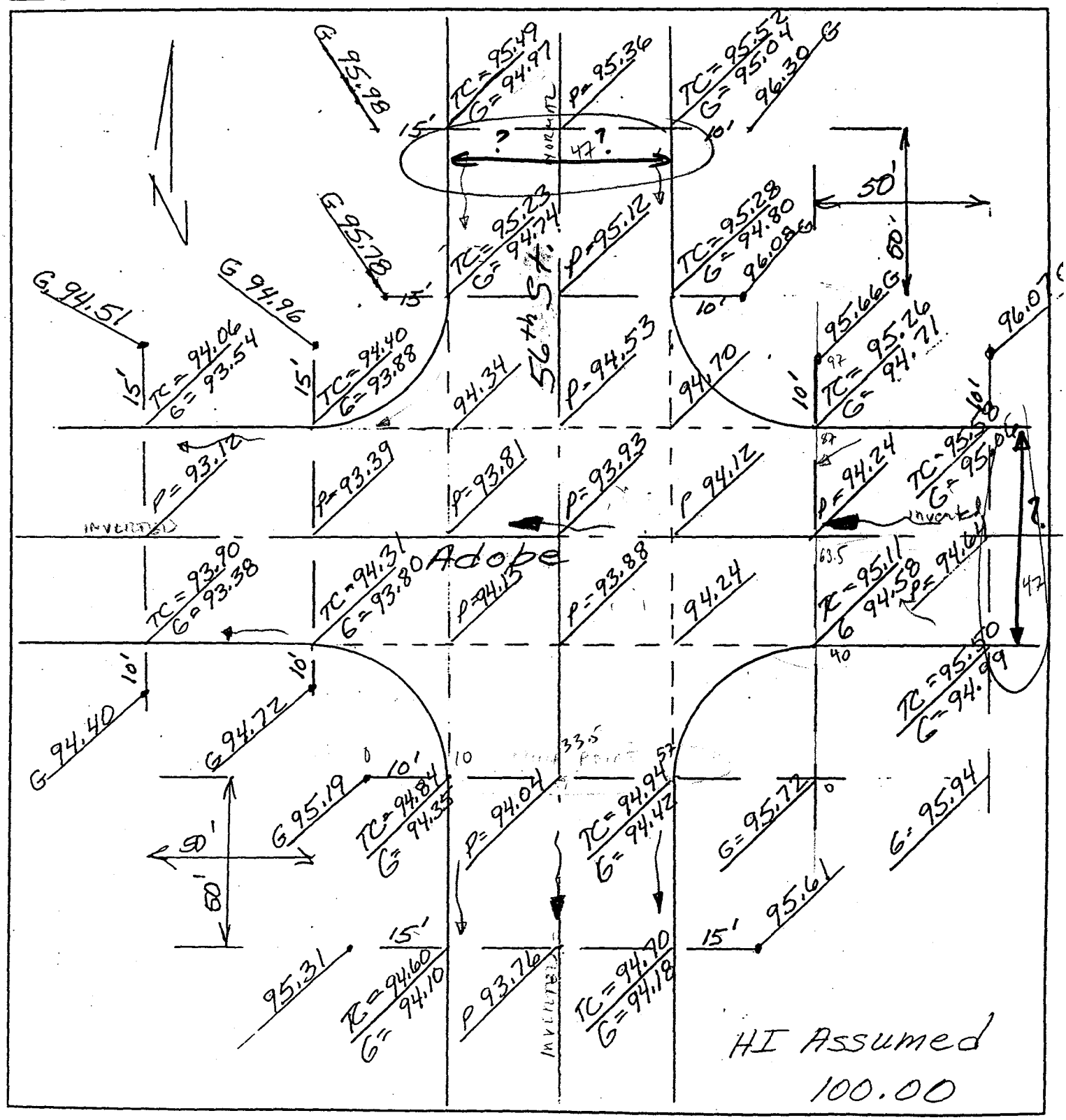
PROJECT University Drive
SUBJECT Adobe & Higley HI Assumed 100.00
MADE BY VR / PRS DATE 10/26/92 CHECKED BY DATE
REVISED BY PRS DATE 10/30/92 RECHECKED BY DATE



ENTRANCO

SHEET NO 2 OF
PROJECT NO 92003-10

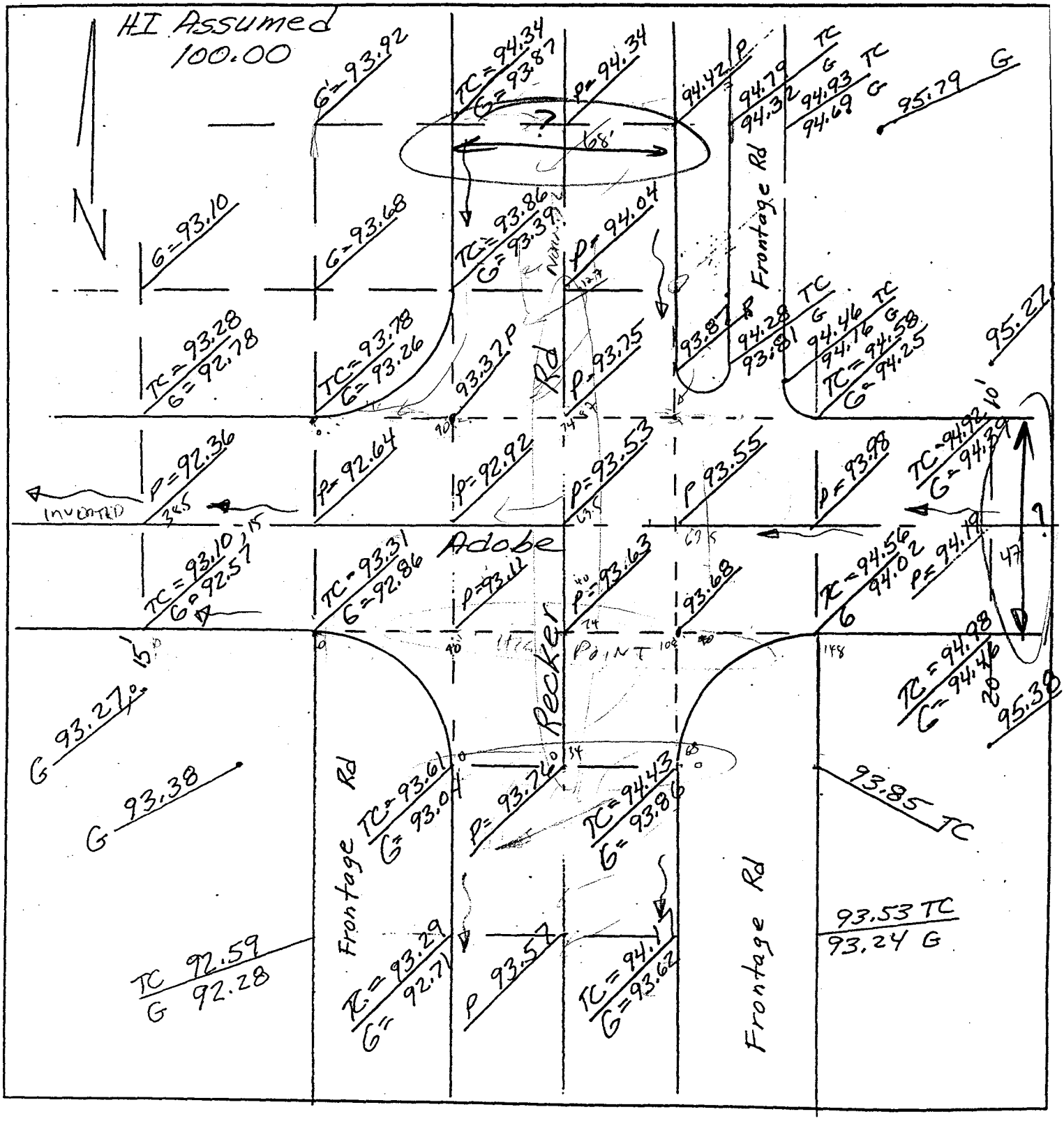
PROJECT University Drive
SUBJECT Adobe & 56th St
MADE BY VA/PRS DATE 10/26/92 CHECKED BY DATE
REVISED BY PRS DATE 10/30/92 RECHECKED BY DATE



ENTRANCO

SHEET NO 3 OF
PROJECT NO 92003-10

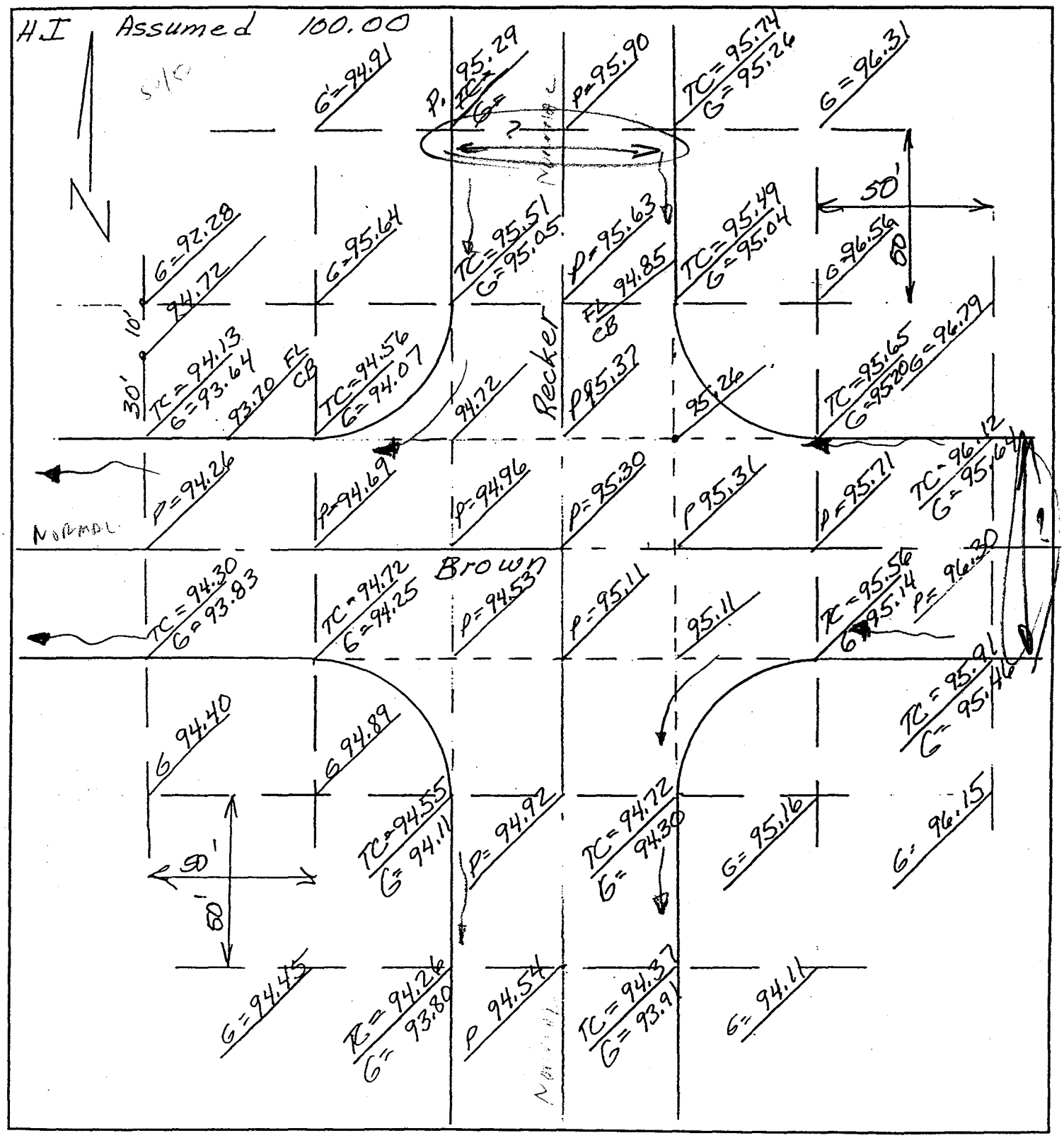
PROJECT University Drive
SUBJECT Adobe & Recker Rd
MADE BY VA/PRS DATE 10/26/92 CHECKED BY DATE
REVISED BY PRS DATE 10/30/92 RECHECKED BY DATE



ENTRANCO

SHEET NO 4 OF
PROJECT NO 92003-10

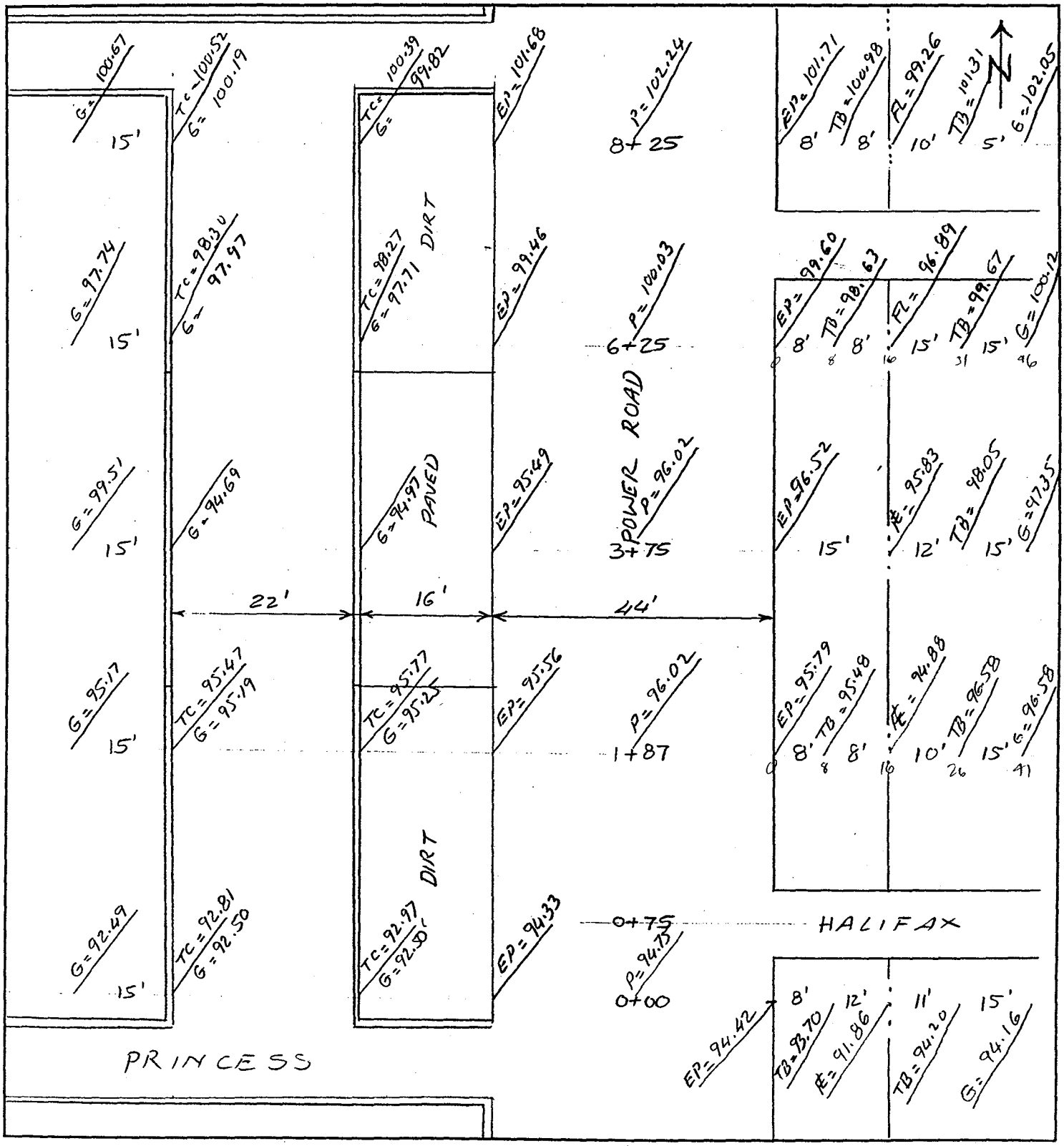
PROJECT University Drive
SUBJECT Brown & Recker
MADE BY VA/PRS DATE 10/26/92 CHECKED BY DATE
REVISED BY PRS DATE 10/29/92 RECHECKED BY DATE



ENTRANCO

SHEET NO 5 OF ____
PROJECT NO 92003-10-

PROJECT UNIVERSITY DRIVE
SUBJECT POWER ROAD X-SEC'S
MADE BY VA/PRS DATE 10-26-92 CHECKED BY PRS DATE 10/28/92
REVISED BY ____ DATE ____ RECHECKED BY ____ DATE ____



11-12-1992 08:21:27

POWER ROAD ROADSIDE CHANNEL; AZ-EE-02; TASK 3

Shape of Channel is triangle
Left side slope = 5.4 ; right side slope = 5.9 and average side slope = 5.65
Flow rate = 130 cfs
Manning n-value is .022 6+25
Normal depth = 2.184451
Critical slope = 7.153003E-03
Velocity = 4.821813 ft/sec
Top Width = 24.6843 ft
Area = 26.96082 sq ft

Shape of Channel is triangle
Left side slope = 5.8 ; right side slope = 17.5 and average side slope = 11.65
Normal depth = 1.660891
Critical slope = 7.767371E-03
Velocity = 4.045156 ft/sec 1+87
Top Width = 38.69875 ft
Area = 32.1372 sq ft
Critical Depth = 1.505504

Shape of Channel is triangle
Left side slope = 5.8 ; right side slope = 17.5 and average side slope = 11.65
Flow rate = 100 cfs
Normal depth = 1.505263 1+87
Critical slope = .0080439

Shape of Channel is triangle
Left side slope = 5.8 ; right side slope = 17.5 and average side slope = 11.65
Flow rate = 75 cfs
Normal depth = 1.351327 1+87
Critical slope = 8.358438E-03

Shape of Channel is triangle
Left side slope = 5.8 ; right side slope = 17.5 and average side slope = 11.65
Flow rate = 25 cfs
Normal depth = .8950347 1+87
Critical slope = 9.677011E-03

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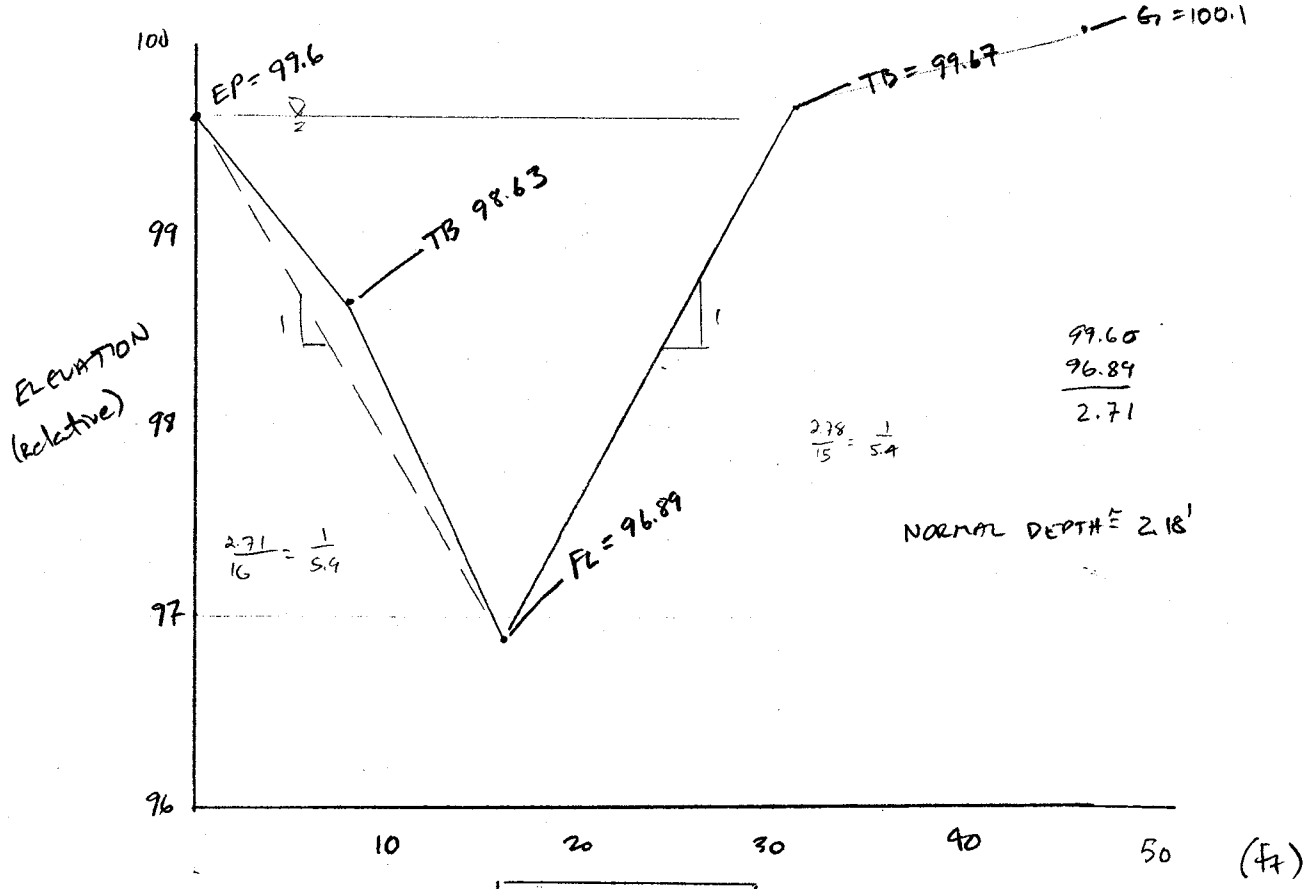
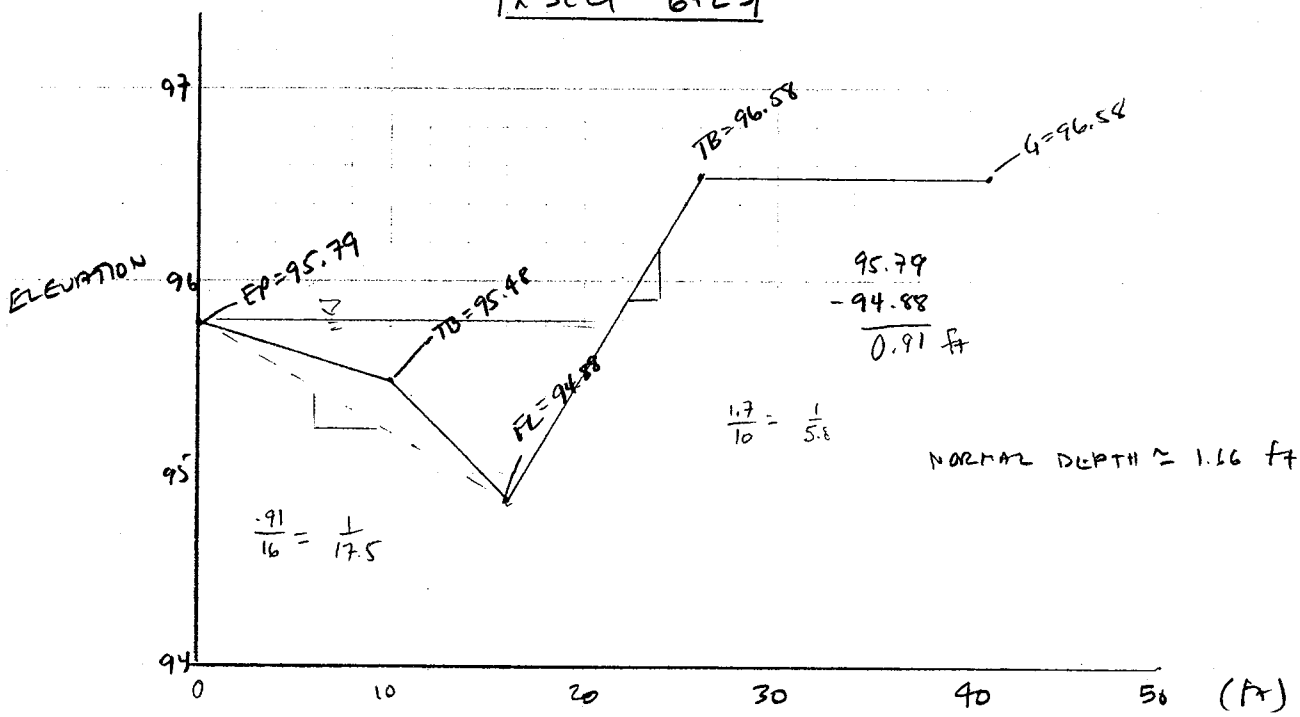
CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL POWER RD ROADSIDE CHANNEL

JOB NO. A2-EE-02
DATE CHECKED
CHECKED BY

PAGE
DATE 11/11/92
COMPUTED BY RAG



X-SECT 6+25



X-SECT 1+87

CHANNEL LENGTH = 625 - 187 = 438 FT

Δ ft = 96.89 - 94.88 = 2.01 FT

AVE. CHANNEL SLOPE = $\frac{2.01}{438}$ = 0.0046 ft/ft

* ROADSIDE CHANNEL CONSTRUCTED OF EARTH BOTTOM AND CLEAN EARTH STRAIGHT SIDES.

MANNING'S n-VALUE = 0.022 (FCD "HYDRAULICS" MANUAL p. 257)

APPENDIX C: DETENTION BASIN COMPUTATIONS

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CLIENT _____ JOB NO. _____ PAGE _____
PROJECT _____ DATE CHECKED _____ DATE _____
DETAIL _____ CHECKED BY _____ COMPUTED BY _____

DETENTION BASIN SIZING +

BLEEDOFF CALCULATIONS.

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CLIENT ENTRANCO
PROJECT UNIVERSITY
DETAIL POND SIZING

JOB NO. A2-EE-02
DATE CHECKED
CHECKED BY

PAGE
DATE
COMPUTED BY RAB

BASIN SIZES 10-YEAR FREQUENCY

1' FB BASIN LENGTH ≈ 1130' ±
4:1 H:V

MODEL	BASIN DEPTH	12" ϕ LOW LEVEL EL	PEAK FLOW	PEAK STAGE	REMARKS
E	7	1405	6	1407.5	LOW LEVEL OUTLET 2' ABOVE BASIN BOTTOM
F	7	1403	7	1406.5	LOW LEVEL OUTLET = BASIN BOTTOM EL
G	6	1404	7	1407.5	LOW LEVEL OUTLET = BASIN BOTTOM EL
H	5	1405	7	1408.4	LOW LEVEL OUTLET = BASIN BOTTOM EL

* MODEL RESULTS INDICATE 24 AF ATME REQUIRED WITH A 12" ϕ BLEEDOFF PIPE FOR 10-YEAR FREQUENCY. MODELS F, G, + H ALL PROVIDE REQUIRED STORAGE (24 AF) BUT MODEL H REQUIRES LESS EXCAVATION. RECOMMEND 5 FOOT DEEP BASIN, 4:1 SIDE SLOPES, LENGTH 1130± DEPENDING ON VOLUME TAKEN BY SRP TRANSMISSION TOWERS.

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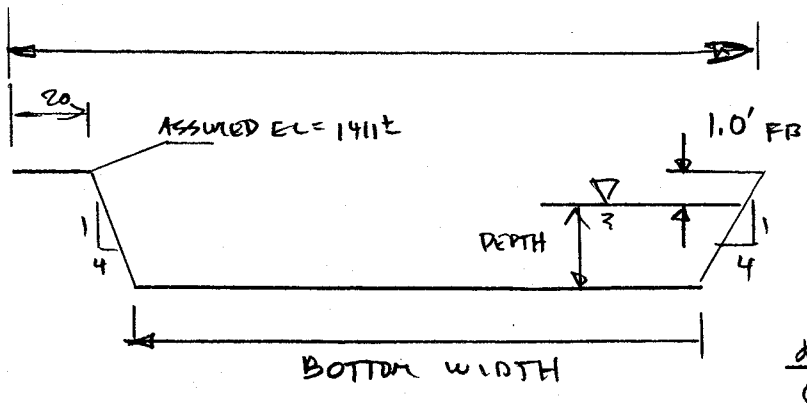
CLIENT ENTRAN CO
PROJECT UNIVERSITY
DETAIL TRIAL BASIN SIZES
JOB NO. 12-EE-02
DATE CHECKED
CHECKED BY
PAGE
DATE 3/4/93
COMPUTED BY MAB

MODEL G



depth	vol	El
0	0	1404
1	6.7	5
2	13.6	6
3	20.7	7
4	28.0	8
5	35.5	9
6	43.3	1410
7	—	1411

ASSUME d = 6 FT BASIN LENGTH ≅ 1130'
TOTAL depth = 6+1 = 7 FT
BASIN WIDTH = 330 − 20 − 28 − 28 = 254'

MODEL H

ASSUME d = 5 FT BASIN LENGTH ≅ 1130'
TOTAL DEPTH = 5+1 = 6'
BASIN WIDTH = 330 − 20 − 24 − 24 = 262
BOTT EL = 1411 − 6 = 1405

depth	vol	El
0	0	1405
1	6.9	6
2	14.1	7
3	21.3	8
4	28.8	9
5	36.5	10
6	—	11

VOL = (d=5') $1130\left(\frac{5}{2}\right)(262 + 262 + 20 + 20) = 1{,}593{,}300$
(= 36.5 AF)

sla
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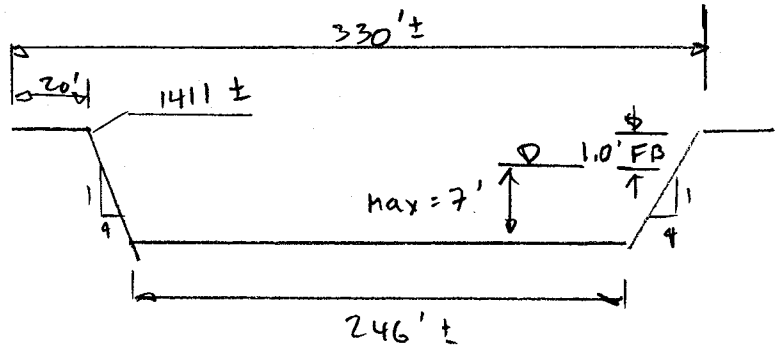
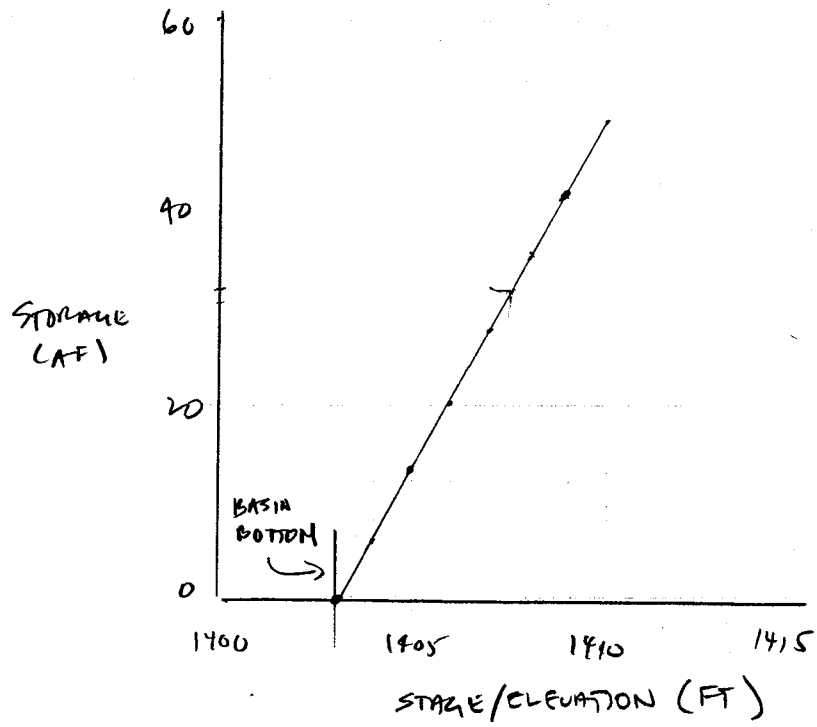
CLIENT ENTRANCO | JOB NO. A2-EE-02 | PAGE
PROJECT UNIVERSITY | DATE CHECKED | DATE RAE
DETAIL POND B STAGE/STORAGE | CHECKED BY | COMPUTED BY 1/20/93

POND B STAGE/STORAGE INCOPORATING APPROXIMATE ELEVATIONS

FREQUENCY = 10 YR 7 FT WATER DEPTH (8 FT + 1 FT FB)



d	ELEV	VOLUME (AF)
20	1403	0
31	1404	6.5
92	1405	13.2
53	1406	20.1
64	1407	27.2
75	1408	34.5
86	1409	42.0
99 7	1410	49.8
100 8	1411	—



ASSUME: 12" ϕ OUTLET
ELEVATION = 1405

PRELIMINARY
ALTIOE.DAT RESULTS

PEAK DISCHARGE = 6 CFS
PEAK STORAGE =
PEAK STAGE = 1407.

12" OUTLET 2-ft above basin bottom. require 13.2 AF retention before basin starts to spill (drain).

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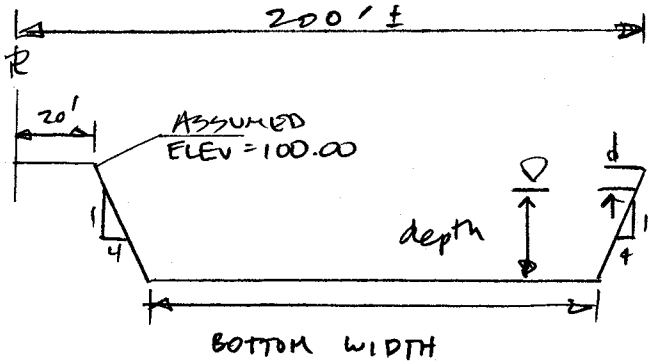
CLIENT ENTMANCO | JOB NO. A2-EE-02 | PAGE 1/5
PROJECT UNIVERSITY | DATE CHECKED | DATE JAN. 14 1993
DETAIL POND A SIZING | CHECKED BY | COMPUTED BY RAE



ROUTE RECKER FLOWS TO POND A

DETENTION POND A SECTION (NOT TO SCALE)

TRIAL SIZE FOR 10-YR

ASSUMPTIONS

A. OPTIMIZE STORAGE
B. DRAIN TIME NOT UNDER CONSIDERATION
C. 1 FT FREEBOARD
D. 4:1 (H:V) SIDESLOPES
E. ASSUME POND LENGTH = 350 FT
F. POND ASSUMES CAPTURE OF FLOWS FROM RECKER ROAD ≈ 44 CFS

1. ASSUME DEPTH = 7 FT
(TOTAL DEPTH = 7+1 = 8 FT)

BOTTOM WIDTH =
200 − 20 − 32 − 32 = 116 FT

BASIN VOLUME = $350\left(\frac{7}{2}\right)(116 + 116 + 28 + 28) = 352{,}800\ FT^3$
$= 8.1\ AF$

d	ELEV	VOLUME (AF)
0	92	0
1	93	0.96
2	94	2.00
3	95	3.1
4	96	4.2
5	97	5.5
6	98	6.7
7	99	8.1

$VOL = L\left(\frac{d}{2}\right)\left(232 + 2(4)(d)\right)$

ALT10B.DAT RESULTS

PEAK OUTFLOW = 46 CFS
PEAK STORAGE = AF
PEAK STAGE = FT

TRY 12" OUTLET @ ELEV = 93

TRY ANOTHER BASIN SIZE OR DOWNSIZE FLOWS FROM RECKER TO POND A

2. TRY DEPTH = 10 FT (TOTAL DEPTH = 11 FT) BOTTOM WIDTH = 200 - 20 - 44 - 44 = 92 FT

VOLUME = $350\left(\frac{10}{2}\right)(92 + 92 + 40 + 40) = 10.6$ AF

d	ELEV	VOL (AF)
0	89	0
1	90	0.77
2	91	1.61
3	92	2.5
4	93	3.5
5	94	4.5
6	95	5.6
7	96	6.8
8	97	7.9
9	98	9.3
10	99	10.6

$VOL = L\left(\frac{d}{2}\right)(184 + 8(d))$
$175(d)(184 + 8(d))$

12" ϕ OUTLET @ ELEV = 92 FT

ALT10B.DAT RESULTS

PEAK OUTFLOW = 16 FT^3/S
PEAK STORAGE = 11 AF
PEAK STAGE = 99 FT

3. DISCARD CONCEPT OF DIVERTING RECKER FLOWS TO POND A
RESIZE BASIN

TRY DEPTH = 7 FT BOTTOM WIDTH = 200 - 20 - 32 - 32 = 116 FT

see #1 for BASIN VOLUME + STAGE/STORAGE CURVE

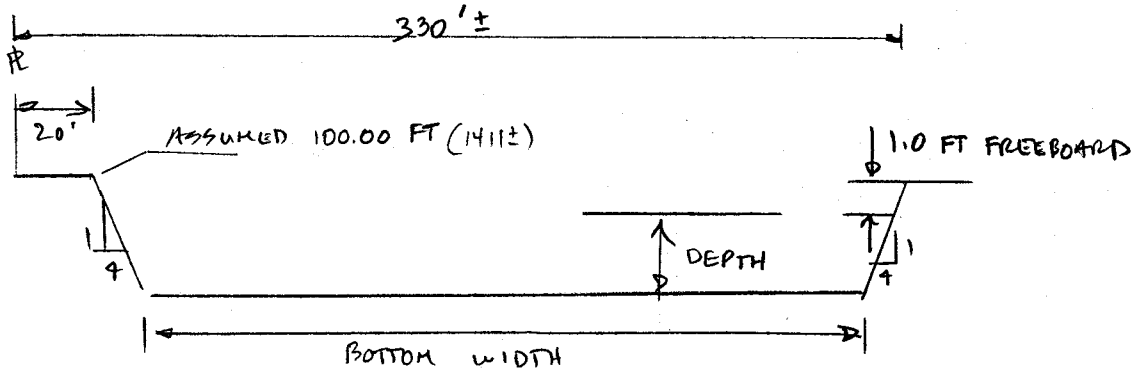
12" ϕ OUTLET @ ELEV = 93

ALT10B.DAT RESULTS w/o RECKER FLOWS

PEAK OUTFLOW	=	9	CFS
PEAK STORAGE	=	7	AF
PEAK STAGE	=	98.5	FT

@ RECKER/UNIVERSITY PEAK FLOW = 157 CFS DESIGN (240 CFS existing)

DETENTION BASIN POND B SECTION A-A (NOT TO SCALE)



TRIAL BASIN SIZE FOR 10-YEAR FREQUENCY

1. ASSUME DEPTH = 7 FT BOTTOM WIDTH = 330 - 20 - 32 - 32 = 246 ft
(8)(4) (8)(4)
(TOTAL DEPTH = 7+1 = 8 FT)

BASIN LENGTH ≅ 1,130 FT

BASIN VOLUME ≈ $1130\left(\frac{7}{2}\right)(246+246+28+28)$ = 2,167,340 FT^3
(d = 7 ft) = 49.8 AF

ELEV BOTTOM 100 - 8 = 92

d	ELEV	VOLUME (AF)	
0	92	0	1403
1	93	6.5	4
2	94	13.2	5
3	95	20.1	6
4	96	27.2	7
5	97	34.5	08
6	98	42.0	09
7	99	49.8	10
8	100	—	1411

VOLUME = $L\left(\frac{d}{2}\right)\left(246+246+2(d)(4)\right)$

ASSUME
OUTLET ELEVATION = 94 FT
DISCHARGE COEFF = 0.6 (BRATER + KING)
EXPONENT = 0.5

try 12" ϕ OUTLET AREA = 0.79 FT^2
(18" 1.77 ft^2)
(24" 3.14 ft^2)

ALT10B.DAT RESULTS

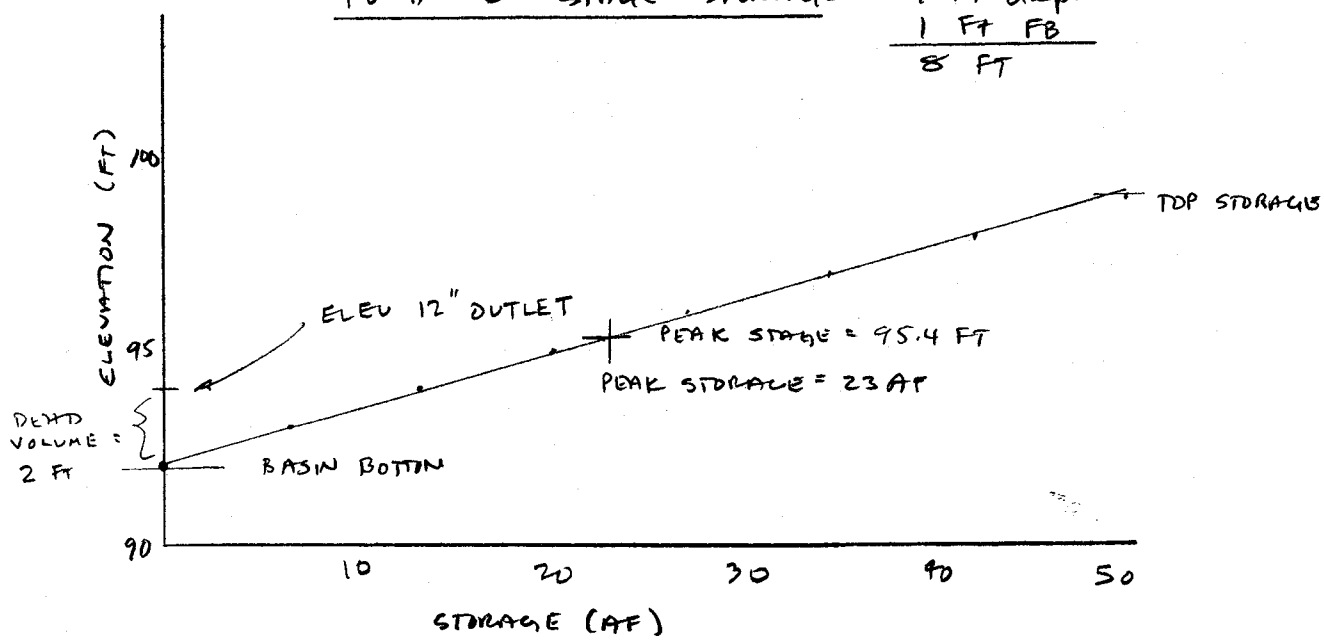
PEAK OUTFLOW = 14 CFS
PEAK STORAGE = 23 AF
PEAK STAGE = 95.4 FT

sla
SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTRANCO | JOB NO. A2-EE-02 | PAGE 4/5
PROJECT UNIVERSITY DRIVE | DATE CHECKED | DATE JAN. 14 1993
DETAIL POND B STAGE STORAGE | CHECKED BY | COMPUTED BY RAS

POND B STAGE - STORAGE

7 FT depth
1 FT FB
8 FT



2. ASSUME DEPTH = 5 FT BOTTOM WIDTH = 330 - 20 - (6)(4) - (6)(4) = 262 FT
TOTAL DEPTH = 5 + 1 = 6 FT

BASIN VOLUME $\cong$ $1130\left(\frac{5}{2}\right)(262+262+20+20) = 1{,}593{,}300\ FT^3 = 36.6\ AF$

ELEV BOTTOM = 100 - 6 = 94

d	ELEV	VOLUME
0	94	0
1	95	6.9
2	96	14.0
3	97	21.3
4	98	28.9
5	99	36.6

$VOL = L\left(\frac{d}{2}\right)(524 + 2(4)(d))$

OUTLET ELEV = 94
TRY 12" OUTLET

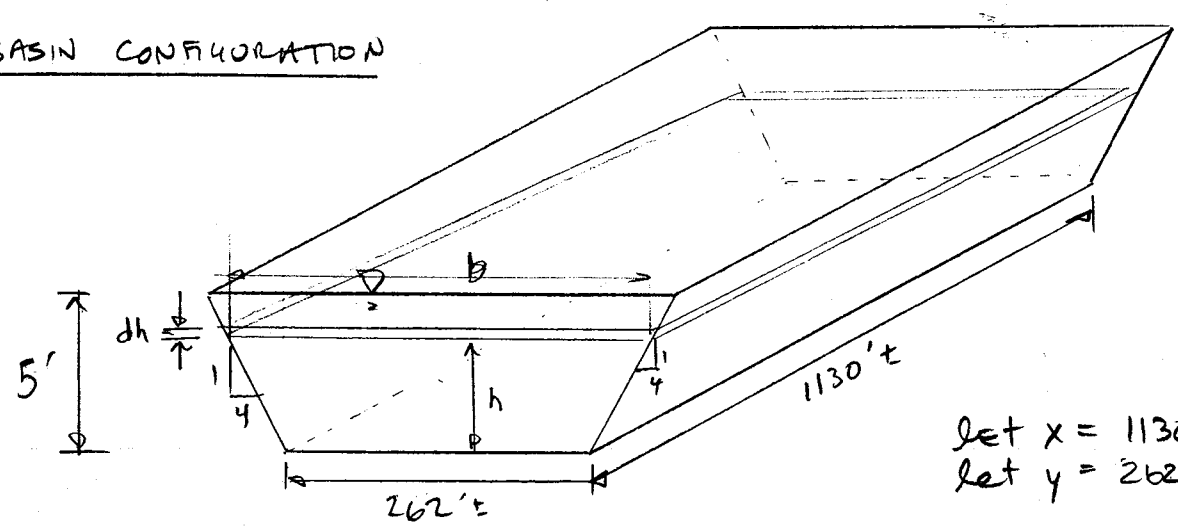
ALTIOB.DAT RESULTS
PEAK OUTFLOW = 6 CFS
PEAK STORAGE = 16 AF
PEAK STAGE = 96.74 FT

ESTIMATE BASIN BLEED OFF TIME

ASSUMPTIONS

1. 12" DIAMETER LOW LEVEL OUTLET; $C_d = 0.6$ (BRATER + KING)
2. LOW LEVEL OUTLET LOCATED AT BASIN BOTTOM
3. MAXIMUM STAGE IN BASIN (7ft)
4. ORIFICE EQUATION $Q = C_d A \sqrt{2gh}$
5. BASIN LENGTH ≈ 1130 FT
6. VERTICAL ENDS; 4:1 SIDE SLOPES
7. BOTTOM LENGTH ≈ 262 FT (basin depth TOTAL = 5' + 1' FB = 6 FT)

BASIN CONFIGURATION



let x = 1130'
let y = 262'

TIME NEEDED TO DRAIN DOWN AN INCREMENT OF DEPTH dh IS EQUAL TO THE VOLUME Ar dh DIVIDED BY THE DISCHARGE Q. INTEGRATING BETWEEN WATER DEPTHS h_1 AND h_2

$$t = \int_0^t dt = -\int_{h_1}^{h_2} \left(\frac{Ar}{Q}\right) dh$$

(minus sign indicates decreasing (dropping) water level)

$$Ar = f(h) = xb = x(y + 2(4)h) = xy + 8xh$$

substitute orifice equation for Q

$$t = -\frac{1}{C_d A \sqrt{2g}} \int_0^5 \frac{xy + 8xh}{\sqrt{h}}\, dh$$

$$= -\frac{1}{C_d A\sqrt{2g}}\left[xy\int_0^5 \frac{dh}{\sqrt{h}} + 8x\int_0^5 \sqrt{h}\,dh\right]$$

$$= -\frac{1}{C_d A\sqrt{2g}}\left[xy\left\{2h^{0.5}\right|_0^5 + 8x\left\{\frac{2}{3}h^{3/2}\right|_0^5\right]$$

$$-\frac{1}{C_d A\sqrt{2g}}\left[4.47\,xy + 7.45(8x)\right]$$

substitute $x = 1130$ $y = 262$ $C_d = 0.6$ $A = 0.79\ ft^2$ $g = 32.2\ ft/s^2$

$$t = -\frac{1}{0.6(0.79)\sqrt{64.4}}\left[1{,}324{,}020 + 67{,}380\right] = 365{,}789\ sec$$

$= 6{,}096$ min

$= 101$ hrs

$t = 4.23$ days

University Drive Drainage Improvements

Estimation of detention basin bleedoff time

DEPTH (ft)	AVERAGE DEPTH (ft)	AREA @ AVERAGE DEPTH (ft^2)	DISCHARGE OF ORIFICE (ft^3/s)	TIME INCREMENT (seconds)
5				
	4.5	336,740	8.08	41,667
4				
	3.5	327,700	7.13	45,978
3				
	2.5	318,660	6.02	52,901
2				
	2	309,620	4.67	66,357
1				
	0.5	300,580	2.69	111,578
0				
		TOTAL TIME IN SECONDS =		318481.6
		TOTAL TIME IN MINUTES =		5308.0
		TOTAL TIME IN HOURS =		88.5
		TOTAL TIME IN DAYS =		3.7

Low level outlet is 12-inch diameter pipe
Discharge coefficent = 0.6

E1

MODEL E

ALT10 E.DAT
7' deep 1'FB
Low Level = 1405

```
699        RK    1200    0.01   0.045    0.02    TRAP       5       5
700        RK    3100    0.01   0.025            TRAP       3       5

701        KK    C900
702        KM    COMBINE SUBBASIN S3212 AND DV400
703        HC       2

704        KK   R3228
705        KO       3       1
706        KM          ROUTE TO RECKER
707        RK    1320   0.006   0.025            TRAP       3      20     YES
           *  ******************PROPOSED DETENTION BASIN************************
708        KP       2
709        RS       1    STOR      -1       0
710        SL    1405    0.79     0.6     0.5
711        SS  1409.9      60     2.6     1.5
712        SV       0     6.5    13.2    20.1    27.2    34.5      42    49.8
713        SE    1403    1404    1405    1406    1407    1408    1409    1410

714        KK   R3227
715        RN
           *  *************************DUMMY ROUTING ROUTINE********************
716        KP       2
```

*** ***

```
          **************
          *            *
704 KK    *     R3228  *
          *            *
          **************

705 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           1  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                                 ROUTE TO RECKER

             HYDROGRAPH ROUTING DATA

707 RK          KINEMATIC WAVE STREAM ROUTING
                         L       1320.  CHANNEL LENGTH
                         S      0.0060  SLOPE
                         N       0.025  CHANNEL ROUGHNESS COEFFICIENT
                        CA        0.00  CONTRIBUTING AREA
                     SHAPE        TRAP  CHANNEL SHAPE
                        WD        3.00  BOTTOM WIDTH OR DIAMETER
                         Z       20.00  SIDE SLOPE
                    NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                                 COMPUTED KINEMATIC PARAMETERS
                                      VARIABLE TIME STEP
                                   (DT SHOWN IS A MINIMUM)

                ELEMENT    ALPHA       M        DT        DX      PEAK    TIME TO     VOLUME    MAXIMUM
                                                                            PEAK                  CELERITY
                                                (MIN)      (FT)     (CFS)    (MIN)      (IN)      (FPS)
```

E2

```
                MAIN          1.06      1.33      1.74    440.00    113.92    255.21      0.51      4.58

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1247E+02  EXCESS=0.0000E+00 OUTFLOW=0.1248E+02 BASIN STORAGE=0.2272E-03 PERCENT ERROR=   0.0

                                    INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                MAIN          1.06      1.33      3.00              113.80    255.00      0.51

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

                    HYDROGRAPH AT STATION    R3228
                     FOR PLAN 1, RATIO = 1.00

 PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                  6-HR       24-HR       72-HR     35.95-HR
+  (CFS)       (HR)
                        (CFS)
+    114.      4.25                24.         6.          4.          4.
                      (INCHES)    0.498       0.513       0.513       0.513
                       (AC-FT)     12.         12.         12.         12.

                      CUMULATIVE AREA =    0.46 SQ MI


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

 708 KP        PLAN  2 FOR STATION    R3228

               HYDROGRAPH ROUTING DATA

 709 RS          STORAGE ROUTING
                      NSTPS           1  NUMBER OF SUBREACHES
                       ITYP        STOR  TYPE OF INITIAL CONDITION
                     RSVRIC       -1.00  INITIAL CONDITION
                          X        0.00 WORKING R AND D COEFFICIENT

 712 SV            STORAGE         0.0       6.5      13.2      20.1      27.2      34.5      42.0      49.8

 713 SE          ELEVATION     1403.00   1404.00   1405.00   1406.00   1407.00   1408.00   1409.00   1410.00

 710 SL          LOW-LEVEL OUTLET
                      ELEVL     1405.00  ELEVATION AT CENTER OF OUTLET
                      CAREA        0.79  CROSS-SECTIONAL AREA
                       COQL        0.60  COEFFICIENT
                       EXPL        0.50  EXPONENT OF HEAD

 711 SS          SPILLWAY
                       CREL     1409.90  SPILLWAY CREST ELEVATION
                      SPWID       60.00  SPILLWAY WIDTH
                       COQW        2.60  WEIR COEFFICIENT
                       EXPW        1.50  EXPONENT OF HEAD

                                                  ***

                                   COMPUTED OUTFLOW-ELEVATION DATA
```

OUTFLOW	0.00	0.00	2.71	3.01	3.37	3.83	4.43	5.26	6.47	8.41
ELEVATION	1403.00	1405.00	1405.51	1405.63	1405.78	1406.01	1406.36	1406.91	1407.90	1409.90
OUTFLOW	8.42	8.46	8.57	8.76	9.08	9.54	10.17	11.02	12.09	13.43
ELEVATION	1409.90	1409.90	1409.91	1409.92	1409.93	1409.94	1409.95	1409.96	1409.98	1410.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	6.50	13.20	16.72	17.51	18.61	20.10	20.19	22.64	26.59
OUTFLOW	0.00	0.00	0.00	2.71	3.01	3.37	3.80	3.83	4.43	5.26
ELEVATION	1403.00	1404.00	1405.00	1405.51	1405.63	1405.78	1406.00	1406.01	1406.36	1406.91
STORAGE	27.20	33.77	34.50	42.00	49.02	49.15	49.30	49.41	49.52	49.65
OUTFLOW	5.38	6.47	6.58	7.60	8.41	8.76	9.53	10.17	11.02	12.09
ELEVATION	1407.00	1407.90	1408.00	1409.00	1409.90	1409.92	1409.94	1409.95	1409.96	1409.98
STORAGE	49.80									
OUTFLOW	13.43									
ELEVATION	1410.00									

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

HYDROGRAPH AT STATION R3228
FOR PLAN 2, RATIO = 1.00

PEAK FLOW	TIME
+ (CFS)	(HR)
+ 6.	7.50

	MAXIMUM AVERAGE FLOW			
	6-HR	24-HR	72-HR	35.95-HR
(CFS)	6.	5.	4.	4.
(INCHES)	0.121	0.435	0.543	0.543
(AC-FT)	3.	11.	13.	13.

PEAK STORAGE	TIME
+ (AC-FT)	(HR)
31.	7.55

	MAXIMUM AVERAGE STORAGE			
	6-HR	24-HR	72-HR	35.95-HR
	31.	27.	24.	24.

PEAK STAGE	TIME
+ (FEET)	(HR)
1407.53	7.60

	MAXIMUM AVERAGE STAGE			
	6-HR	24-HR	72-HR	35.95-HR
	1407.46	1407.00	1406.49	1406.49

CUMULATIVE AREA = 0.46 SQ MI

low level = 1405
basin bot = 1403

2' dead stage ≅ 13 AF

F1

```
699          RK    1200    0.01    0.045    0.02    TRAP      5      5
700          RK    3100    0.01    0.025            TRAP      3      5

701          KK    C900
702          KM    COMBINE SUBBASIN S3212 AND DV400
703          HC       2

704          KK   R3228
705          KO       3       1
706          KM          ROUTE TO RECKER
707          RK    1320   0.006   0.025            TRAP      3     20    YES
             *  ******************PROPOSED DETENTION BASIN***********************
708          KP       2
709          RS       1    STOR      -1       0
710          SL    1403    0.79     0.6     0.5
711          SS  1409.9      60     2.6     1.5
712          SV       0     6.5    13.2    20.1    27.2    34.5      42    49.8
713          SE    1403    1404    1405    1406    1407    1408    1409    1410

714          KK   R3227
715          RN
             *  *************************DUMMY ROUTING ROUTINE********************
716          KP       2
```

MODEL F

ALT10F.DAT

7' deep 1' FB

low level el = basin bot = 1403

*** ***

```
          **************
          *            *
704 KK    *     R3228  *
          *            *
          **************

705 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          1  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
                                 ROUTE TO RECKER

             HYDROGRAPH ROUTING DATA

707 RK          KINEMATIC WAVE STREAM ROUTING
                         L      1320.  CHANNEL LENGTH
                         S     0.0060  SLOPE
                         N      0.025  CHANNEL ROUGHNESS COEFFICIENT
                        CA       0.00  CONTRIBUTING AREA
                     SHAPE       TRAP  CHANNEL SHAPE
                        WD       3.00  BOTTOM WIDTH OR DIAMETER
                         Z      20.00  SIDE SLOPE
                    NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                                 COMPUTED KINEMATIC PARAMETERS
                                      VARIABLE TIME STEP
                                    (DT SHOWN IS A MINIMUM)

                ELEMENT    ALPHA       M        DT       DX      PEAK    TIME TO     VOLUME    MAXIMUM
                                                                          PEAK                  CELERITY
                                                (MIN)     (FT)    (CFS)    (MIN)      (IN)      (FPS)
```

F2

```
                MAIN          1.06      1.33       1.74    440.00    113.92    255.21      0.51      4.58

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1247E+02  EXCESS=0.0000E+00 OUTFLOW=0.1248E+02 BASIN STORAGE=0.2272E-03 PERCENT ERROR=   0.0

                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                MAIN          1.06      1.33       3.00              113.80    255.00      0.51

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

                    HYDROGRAPH AT STATION    R3228
                      FOR PLAN 1, RATIO = 1.00

 PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                  6-HR       24-HR       72-HR     35.95-HR
+  (CFS)       (HR)
                        (CFS)
+    114.      4.25                24.         6.          4.          4.
                      (INCHES)    0.498       0.513       0.513       0.513
                       (AC-FT)     12.         12.         12.         12.

                      CUMULATIVE AREA =    0.46 SQ MI


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

 708 KP        PLAN  2 FOR STATION    R3228

               HYDROGRAPH ROUTING DATA

 709 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X       0.00 WORKING R AND D COEFFICIENT

 712 SV            STORAGE        0.0       6.5      13.2      20.1      27.2      34.5      42.0      49.8

 713 SE          ELEVATION    1403.00   1404.00   1405.00   1406.00   1407.00   1408.00   1409.00   1410.00

 710 SL          LOW-LEVEL OUTLET
                      ELEVL    1403.00  ELEVATION AT CENTER OF OUTLET
                      CAREA       0.79  CROSS-SECTIONAL AREA
                       COQL       0.60  COEFFICIENT
                       EXPL       0.50  EXPONENT OF HEAD

 711 SS          SPILLWAY
                       CREL    1409.90  SPILLWAY CREST ELEVATION
                      SPWID      60.00  SPILLWAY WIDTH
                       COQW       2.60  WEIR COEFFICIENT
                       EXPW       1.50  EXPONENT OF HEAD

                                                  ***

                                        COMPUTED OUTFLOW-ELEVATION DATA
```

OUTFLOW	0.00	2.70	2.97	3.30	3.72	4.25	4.96	5.96	7.47	9.99
ELEVATION	1403.00	1403.50	1403.61	1403.76	1403.96	1404.25	1404.71	1405.46	1406.86	1409.90
OUTFLOW	9.99	10.03	10.13	10.33	10.64	11.10	11.73	12.58	13.65	14.99
ELEVATION	1409.90	1409.90	1409.91	1409.92	1409.93	1409.94	1409.95	1409.96	1409.98	1410.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	3.28	3.97	4.91	6.22	6.50	8.18	11.23	13.20	16.38
OUTFLOW	0.00	2.70	2.97	3.30	3.72	3.80	4.25	4.96	5.38	5.96
ELEVATION	1403.00	1403.50	1403.61	1403.76	1403.96	1404.00	1404.25	1404.71	1405.00	1405.46
STORAGE	20.10	26.20	27.20	34.50	42.00	49.02	49.15	49.30	49.41	49.52
OUTFLOW	6.58	7.47	7.60	8.50	9.31	9.99	10.33	11.10	11.74	12.58
ELEVATION	1406.00	1406.86	1407.00	1408.00	1409.00	1409.90	1409.92	1409.94	1409.95	1409.96
STORAGE	49.65	49.80								
OUTFLOW	13.65	14.99								
ELEVATION	1409.98	1410.00								

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

HYDROGRAPH AT STATION R3228
FOR PLAN 2, RATIO = 1.00

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	35.95-HR
+ (CFS)	(HR)					
		(CFS)				
+ 7.	7.30		7.	6.	5.	5.
		(INCHES)	0.144	0.524	0.670	0.670
		(AC-FT)	3.	13.	16.	16.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	35.95-HR
+ (AC-FT)	(HR)				
24.	7.40	23.	19.	16.	16.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	35.95-HR
+ (FEET)	(HR)				
1406.55	7.40	1406.45	1405.88	1405.34	1405.34

CUMULATIVE AREA = 0.46 SQ MI

MODEL G

ALT10G.DAT

6' deep 1' FB

```
699          RK    1200    0.01   0.045    0.02    TRAP       5       5
700          RK    3100    0.01   0.025            TRAP       3       5

701          KK    C900
702          KM    COMBINE SUBBASIN S3212 AND DV400
703          HC       2

704          KK   R3228
705          KO       3       1
706          KM          ROUTE TO RECKER
707          RK    1320   0.006   0.025            TRAP       3      20     YES
             *  ******************PROPOSED DETENTION BASIN************************
708          KP       2
709          RS       1    STOR      -1       0
710          SL    1404    0.79     0.6     0.5
711          SS  1409.9      60     2.6     1.5
712          SV       0     6.7    13.6    20.7    28.0    35.5    43.3
713          SE    1404    1405    1406    1407    1408    1409    1410

714          KK   R3227
715          RN
             *  *************************DUMMY ROUTING ROUTINE********************
716          KP       2
717          RK    1200   0.007   0.013            CIRC     1.5            YES
             *  ********************************************************************

718          KK   D3081
719          KM          RETRIEVE DIVERTED HYDROGRAPH D3081
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*** ***

```
          **************
          *            *
704 KK    *     R3228  *
          *            *
          **************

705 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           1  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                                 ROUTE TO RECKER

            HYDROGRAPH ROUTING DATA

707 RK          KINEMATIC WAVE STREAM ROUTING
                         L       1320.  CHANNEL LENGTH
                         S      0.0060  SLOPE
                         N       0.025  CHANNEL ROUGHNESS COEFFICIENT
                        CA        0.00  CONTRIBUTING AREA
                     SHAPE        TRAP  CHANNEL SHAPE
                        WD        3.00  BOTTOM WIDTH OR DIAMETER
                         Z       20.00  SIDE SLOPE
                    NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                                 COMPUTED KINEMATIC PARAMETERS
```

VARIABLE TIME STEP
(DT SHOWN IS A MINIMUM)

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN	1.06	1.33	1.74	440.00	113.92	255.21	0.51	4.58

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1247E+02 EXCESS=0.0000E+00 OUTFLOW=0.1248E+02 BASIN STORAGE=0.2272E-03 PERCENT ERROR= 0.0

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN	1.06	1.33	3.00	113.80	255.00	0.51

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

HYDROGRAPH AT STATION R3228
FOR PLAN 1, RATIO = 1.00

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	35.95-HR
+ 114.	4.25	(CFS)	24.	6.	4.	4.
		(INCHES)	0.498	0.513	0.513	0.513
		(AC-FT)	12.	12.	12.	12.

CUMULATIVE AREA = 0.46 SQ MI

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

708 KP PLAN 2 FOR STATION R3228

HYDROGRAPH ROUTING DATA

709 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

712 SV	STORAGE	0.0	6.7	13.6	20.7	28.0	35.5	43.3
713 SE	ELEVATION	1404.00	1405.00	1406.00	1407.00	1408.00	1409.00	1410.00

710 SL LOW-LEVEL OUTLET

ELEVL	1404.00	ELEVATION AT CENTER OF OUTLET
CAREA	0.79	CROSS-SECTIONAL AREA
COQL	0.60	COEFFICIENT
EXPL	0.50	EXPONENT OF HEAD

711 SS SPILLWAY

CREL	1409.90	SPILLWAY CREST ELEVATION
SPWID	60.00	SPILLWAY WIDTH

G3

COQW	2.60	WEIR COEFFICIENT
EXPW	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	0.00	2.69	2.96	3.27	3.67	4.17	4.83	5.75	7.08	9.23
ELEVATION	1404.00	1404.50	1404.60	1404.74	1404.93	1405.20	1405.62	1406.29	1407.47	1409.90
OUTFLOW	9.24	9.28	9.38	9.58	9.89	10.35	10.99	11.83	12.90	14.24
ELEVATION	1409.90	1409.90	1409.91	1409.92	1409.93	1409.94	1409.95	1409.96	1409.98	1410.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	3.37	4.05	4.97	6.24	6.70	8.11	10.96	13.60	15.63
OUTFLOW	0.00	2.69	2.96	3.27	3.67	3.80	4.17	4.83	5.38	5.75
ELEVATION	1404.00	1404.50	1404.60	1404.74	1404.93	1405.00	1405.20	1405.62	1406.00	1406.29
STORAGE	20.70	24.15	28.00	35.50	42.52	42.65	42.80	42.91	43.02	43.15
OUTFLOW	6.58	7.08	7.60	8.50	9.23	9.58	10.35	10.99	11.83	12.91
ELEVATION	1407.00	1407.47	1408.00	1409.00	1409.90	1409.92	1409.94	1409.95	1409.96	1409.98
STORAGE	43.30									
OUTFLOW	14.24									
ELEVATION	1410.00									

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

HYDROGRAPH AT STATION R3228
FOR PLAN 2, RATIO = 1.00

6' deep 1' FB

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	35.95-HR
+ (CFS)	(HR)					
		(CFS)				
+ 7.	7.30		7.	6.	5.	5.
		(INCHES)	0.142	0.518	0.663	0.663
		(AC-FT)	3.	13.	16.	16.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	35.95-HR
+ (AC-FT)	(HR)				
24.	7.40	23.	19.	16.	16.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	35.95-HR
+ (FEET)	(HR)				
1407.45	7.40	1407.36	1406.81	1406.28	1406.28

CUMULATIVE AREA = 0.46 SQ MI

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION= 1

*** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

H1

```
699          RK    1200    0.01   0.045    0.02    TRAP       5       5
700          RK    3100    0.01   0.025            TRAP       3       5

701          KK    C900
702          KM    COMBINE SUBBASIN S3212 AND DV400
703          HC       2

704          KK   R3228
705          KO       3       1
706          KM          ROUTE TO RECKER
707          RK    1320   0.006   0.025            TRAP       3      20     YES
             *  ******************PROPOSED DETENTION BASIN***********************
708          KP       2
709          RS       1    STOR      -1       0
710          SL    1405    0.79     0.6     0.5
711          SS  1409.9      60     2.6     1.5
712          SV       0     6.9    14.0    21.3    28.8    36.5
713          SE    1405    1406    1407    1408    1409    1410

714          KK   R3227
715          RN
             *  *************************DUMMY ROUTING ROUTINE********************
716          KP       2
```

MODEL H

ALT10H.DAT

5' deep 1' FB

*** ***

```
          **************
          *            *
704 KK    *     R3228  *
          *            *
          **************

705 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           1  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                                 ROUTE TO RECKER

             HYDROGRAPH ROUTING DATA

707 RK          KINEMATIC WAVE STREAM ROUTING
                         L       1320.  CHANNEL LENGTH
                         S      0.0060  SLOPE
                         N       0.025  CHANNEL ROUGHNESS COEFFICIENT
                        CA        0.00  CONTRIBUTING AREA
                     SHAPE        TRAP  CHANNEL SHAPE
                        WD        3.00  BOTTOM WIDTH OR DIAMETER
                         Z       20.00  SIDE SLOPE
                    NDXMIN           2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                                 COMPUTED KINEMATIC PARAMETERS
                                      VARIABLE TIME STEP
                                   (DT SHOWN IS A MINIMUM)

                ELEMENT    ALPHA       M        DT        DX      PEAK   TIME TO    VOLUME   MAXIMUM
                                                                          PEAK               CELERITY
                                                (MIN)      (FT)    (CFS)   (MIN)      (IN)     (FPS)
```

H

```
                MAIN          1.06      1.33      1.74    440.00    113.92    255.21      0.51      4.58

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1247E+02  EXCESS=0.0000E+00 OUTFLOW=0.1248E+02 BASIN STORAGE=0.2272E-03 PERCENT ERROR=   0.0

                                        INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

                MAIN          1.06      1.33      3.00              113.80    255.00      0.51

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

                     HYDROGRAPH AT STATION    R3228
                       FOR PLAN 1, RATIO = 1.00

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                   6-HR       24-HR       72-HR     35.95-HR
+  (CFS)       (HR)
                         (CFS)
+    114.      4.25                24.         6.          4.          4.
                       (INCHES)   0.498       0.513       0.513       0.513
                        (AC-FT)    12.         12.         12.         12.

                        CUMULATIVE AREA =    0.46 SQ MI


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

 708 KP        PLAN  2 FOR STATION    R3228

               HYDROGRAPH ROUTING DATA

 709 RS          STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X       0.00 WORKING R AND D COEFFICIENT

 712 SV            STORAGE        0.0       6.9      14.0      21.3      28.8      36.5

 713 SE          ELEVATION     1405.00   1406.00   1407.00   1408.00   1409.00   1410.00

 710 SL          LOW-LEVEL OUTLET
                      ELEVL     1405.00  ELEVATION AT CENTER OF OUTLET
                      CAREA        0.79  CROSS-SECTIONAL AREA
                       COQL        0.60  COEFFICIENT
                       EXPL        0.50  EXPONENT OF HEAD

 711 SS          SPILLWAY
                       CREL     1409.90  SPILLWAY CREST ELEVATION
                      SPWID       60.00  SPILLWAY WIDTH
                       COQW        2.60  WEIR COEFFICIENT
                       EXPW        1.50  EXPONENT OF HEAD

                                                  ***

                                        COMPUTED OUTFLOW-ELEVATION DATA
```

OUTFLOW	0.00	2.69	2.94	3.24	3.61	4.07	4.68	5.49	6.64	8.41
ELEVATION	1405.00	1405.50	1405.60	1405.72	1405.90	1406.15	1406.51	1407.08	1408.05	1409.90
OUTFLOW	8.42	8.46	8.57	8.76	9.08	9.54	10.17	11.02	12.09	13.43
ELEVATION	1409.90	1409.90	1409.91	1409.92	1409.93	1409.94	1409.95	1409.96	1409.98	1410.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	3.44	4.12	5.00	6.21	6.90	7.95	10.54	14.00	14.62
OUTFLOW	0.00	2.69	2.94	3.24	3.61	3.80	4.07	4.68	5.38	5.49
ELEVATION	1405.00	1405.50	1405.60	1405.72	1405.90	1406.00	1406.15	1406.51	1407.00	1407.08
STORAGE	21.30	21.71	28.80	35.73	35.86	36.01	36.11	36.23	36.36	36.50
OUTFLOW	6.58	6.64	7.60	8.41	8.76	9.53	10.17	11.02	12.09	13.43
ELEVATION	1408.00	1408.05	1409.00	1409.90	1409.92	1409.94	1409.95	1409.96	1409.98	1410.00

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

HYDROGRAPH AT STATION R3228
FOR PLAN 2, RATIO = 1.00

PEAK FLOW	TIME
+ (CFS)	(HR)
+ 7.	7.30

	MAXIMUM AVERAGE FLOW			
	6-HR	24-HR	72-HR	35.95-HR
(CFS)	7.	6.	5.	5.
(INCHES)	0.140	0.511	0.655	0.655
(AC-FT)	3.	12.	16.	16.

ACTIOH.DAT

PEAK STORAGE	TIME
+ (AC-FT)	(HR)
24.	7.40

	MAXIMUM AVERAGE STORAGE			
	6-HR	24-HR	72-HR	35.95-HR
	23.	19.	16.	16.

PEAK STAGE	TIME
+ (FEET)	(HR)
1408.37	7.40

	MAXIMUM AVERAGE STAGE			
	6-HR	24-HR	72-HR	35.95-HR
	1408.28	1407.75	1407.23	1407.23

CUMULATIVE AREA = 0.46 SQ MI

APPENDIX D: DOCUMENTATION FOR HYDROLOGIC MODEL

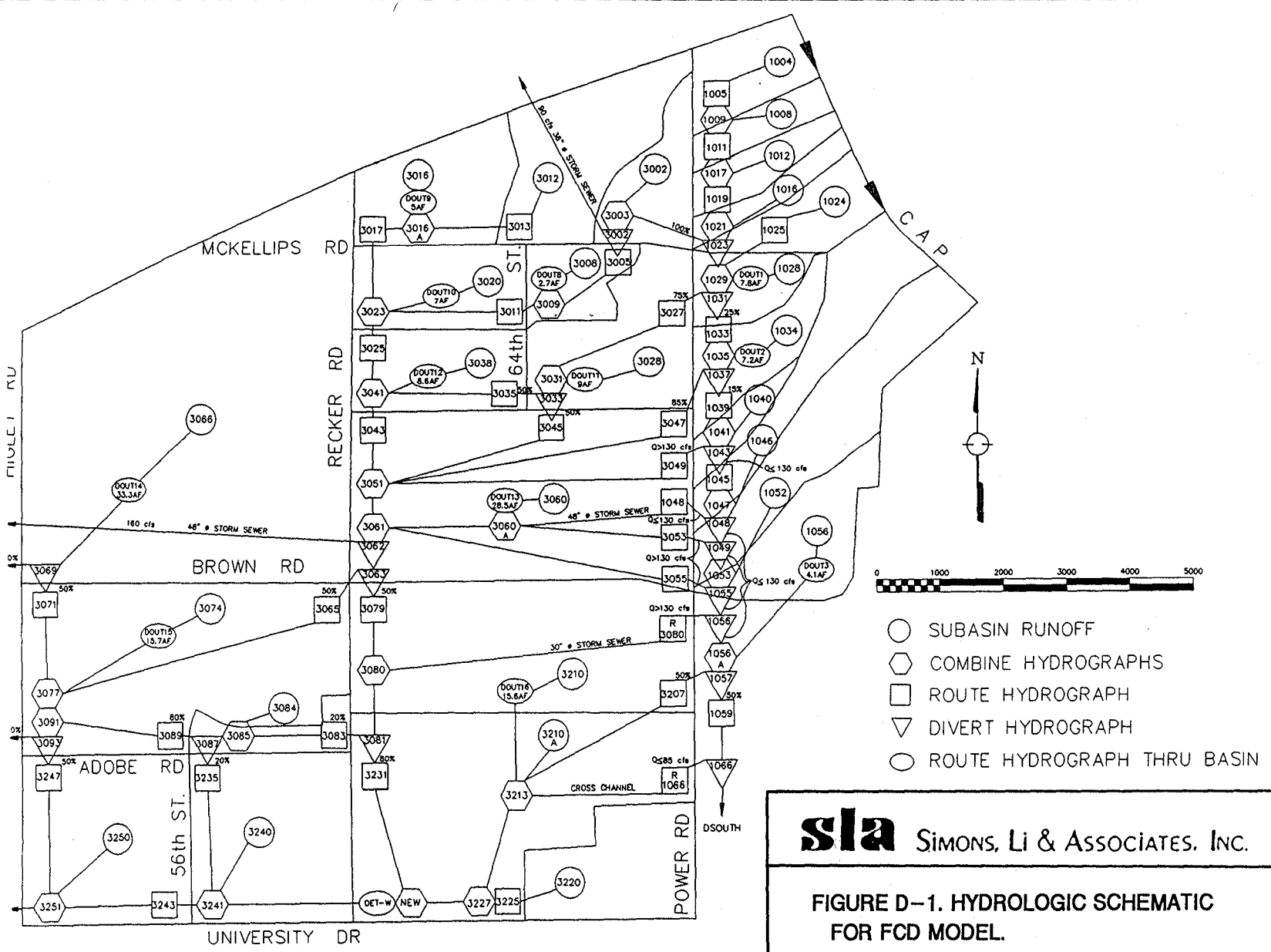
APPENDIX D

This appendix provides documentation of the changes made to the Flood Control District University Drive hydrologic model. The changes were conducted by Simons, Li & Associates, Inc., to provide a higher degree of detail for simulating the watershed field conditions. The changes were made as a result of an evaluation of as-built plans of detention/retention basins, storm drains, and open channels; discussions with the City of Mesa and the Flood Control District; and field trips to the project watershed. Some as-built plans for detention basins, storm drains, and open channels were furnished to SLA by the FCD.

Most of the modifications to the FCD model were focused on the watershed south of Brown Road with one exception. That exception is the area bounded by McLellan Road on the north, Recker Road on the west, Power Road on the east, and Brown Road on the south. These subbasins or areas were modified to reflect in greater detail the hydrologic characteristics within those basins. Focus was placed on these areas as they were believed to have a relatively higher impact on the objectives of the University Drive hydrologic study.

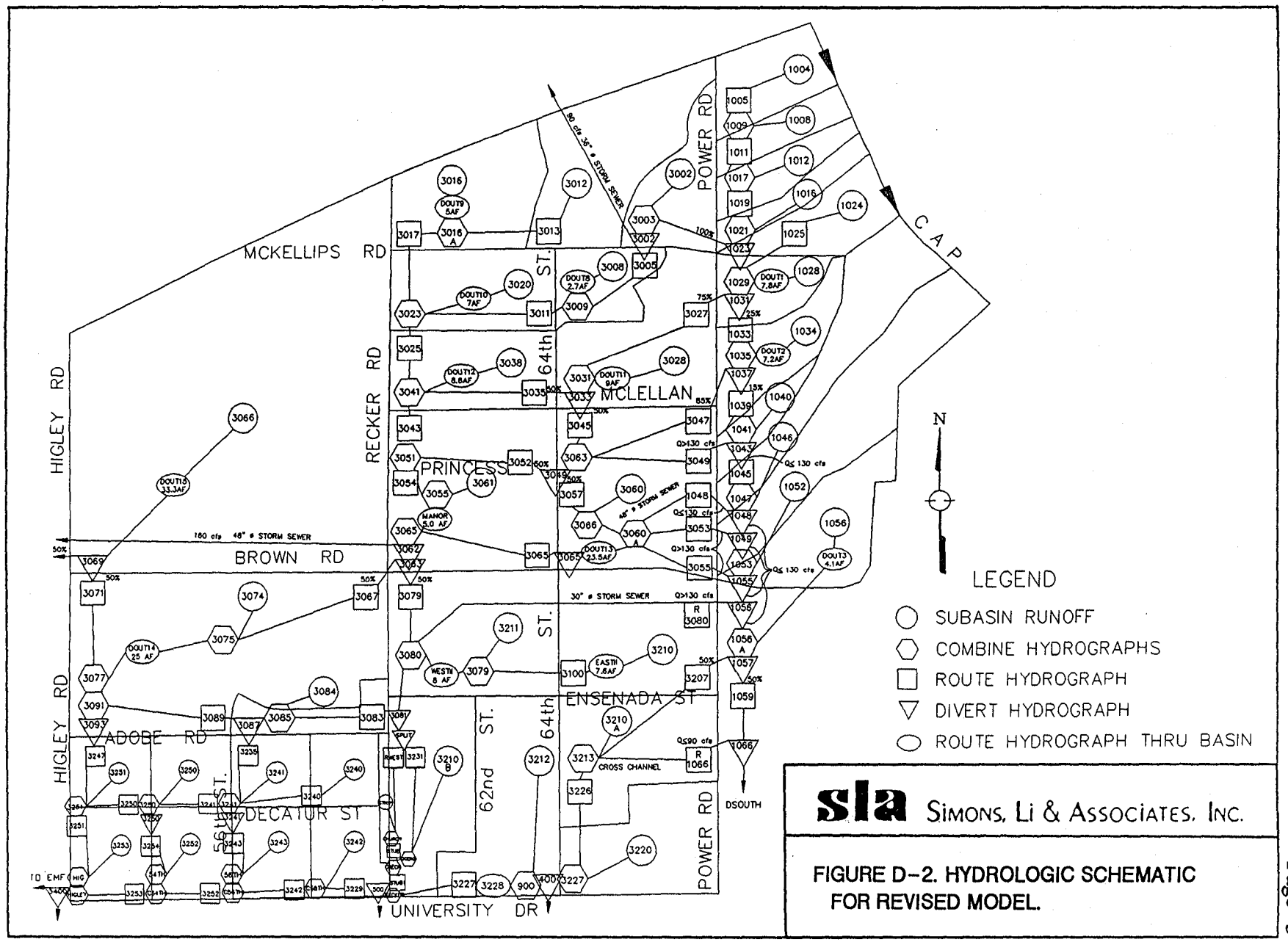
Figure D-1 presents a schematic of the existing hydrologic model developed by the Flood Control District. The FCD model was extracted from a much larger model developed for the East Maricopa Area Master Drainage Study (EMAMDS). The FCD depicts the University Drive watershed existing conditions without modification. That modification incorporated all flows on University Drive directed toward the west. The FCD later provided diversion rating curves for three locations where storm flows cross University Drive with Higley Road, Recker Road, and 64th Street. These diversions are also included in the SLA modified FCD model.

Figure D-2 presents a schematic of the hydrologic model of the project watershed developed by SLA using the FCD model as a base. One of the objectives of the study was to quantify side street flows onto University Drive at each of the eighth-mile streets. With that in mind, concentration points were placed at Higley Road, 54th Street, 56th Street, 58th Street, and Recker Road to aid in the quantification.



sla Simons, Li & Associates, Inc.

FIGURE D-1. HYDROLOGIC SCHEMATIC FOR FCD MODEL.



sla Simons, Li & Associates, Inc.

FIGURE D-2. HYDROLOGIC SCHEMATIC FOR REVISED MODEL.

As-built plans of several detention and retention basins were examined and basin volumes cross-checked between the plans and the FCD model. One basin volume change was made for the portion of the Alta Mesa Golf Course located south of Brown Road. The retention basin capacity was changed from 15.7 AF to 25 AF from examination of FCD furnished documentation, field reconnaissance, and from discussions with the City of Mesa.

A minor modification to how stormwater was routed in subbasin 3074 was made. Both Figures D-1 and D-2 show a diversion (split) at the intersection of Brown and Recker Roads. Diversion 3063 splits storm flows 50 percent to subbasin 3074 and 50 percent continues south on Recker. The 50 percent that splits to subbasin 3074 is routed to a new combination point 3075 and combined with the runoff from subbasin 3074. The combined hydrograph is then routed through the retention basins of the Alta Mesa Golf Course. This change was made after examination of storm drain plans that showed the location of the drain outlets. The street storm drains are configured to outlet to the Alta Mesa Golf Course retention basins. This is true not only in subbasin 3074 but also in subbasin 3066 (the north half of the Alta Mesa Golf Course).

The FCD subbasin 3060 was restructured and split into two subbasins in the SLA model - subbasins 3060 and 3061 (see Figure D-2). The two new basins are half in size of the original subbasin but retain the similiar hydrologic characteristics. The collector and main channel lengths were reduced from 2000 feet and 5000 feet to 1000 feet and 2640 feet, respectively.

The basic change in the SLA model for subbasins 3060 and 3061 is how the stormwater is routed, combined, and stored through these basins. In subbasin 3060 routed hydrographs 3047, 3049, and 3045 are combined at combination point 3063. The combined hydrograph is split 50/50 at diversion point 3049. Fifty percent of the combined hydrograph is routed west along Princess Drive and the remaining 50 percent is routed south on 64th Street to combination point 3066. At combination point 3066 hydrographs from subbasin 3060 and routed hydrograph 3057 are combined.

Diverted hydrographs 1048, 1049, and 1055, are retrieved and routed to combination point 3060A. Diverted hydrograph 1048 is routed through a 48-inch storm drain (capacity 174 cfs) originating at Power and Brown Roads. The 48-inch pipe outlets to a City of Mesa detention reservoir located at the northeast corner of Brown and 64th Street. The detention reservoir has a capacity of 23.5 acre-feet and is provided with a 15-inch diameter bleed-off line. This detention basin provides regional detention capacity for subbasin 3060 as well as for flows diverted into the subbasin. The routing lengths of the retrieved diversions were changed where appropriate to reduce the lengths to one-half mile.

After combined hydrograph 3060A is routed through the City of Mesa detention reservoir a diversion was provided (D3065) to accommodate the possibility of diverting detention outlet flows south along 64th Street. This capacity remains although is not used.

In subbasin 3061 the diverted hydrograph 3045 is retrieved and routed along Princess Drive to combination point 3051. Subbasin runoff is combined with the routed flows coming south along Recker at combination point 3055. These combined flows are then routed through a small detention basin (manor) with a capacity of 5 acre-feet. The outflow hydrograph from this basin is combined with the routed hydrograph 3065 from subbasin 3060 (routed along Brown Road). The combined hydrograph 3065 is then split diverting a maximum of 160 cfs into a 48-inch storm drain in Brown Road. The 48-inch storm drain conveys flow west and out of the drainage area (and discharges to the East Maricopa Floodway).

The FCD model provided one combined detention basin for the area bounded by Brown Road, McLellan Road, Power Road, and Recker Road. This combined basin has a capacity of 28.5 acre-feet. The SLA model modified the FCD model by splitting the combined capacity into two semi-regional detention basins. These two detention basins were discussed above and serve subbasins 3060 and 3061.

Diverted hydrographs 1048, 1049, and 1055, are retrieved and routed to combination point 3060A. Diverted hydrograph 1048 is routed through a 48-inch storm drain (capacity 174 cfs) originating at Power and Brown Roads. The 48-inch pipe outlets to a City of Mesa detention reservoir located at the northeast corner of Brown and 64th Street. The detention reservoir has a capacity of 23.5 acre-feet and is provided with a 15-inch diameter bleed-off line. This detention basin provides regional detention capacity for subbasin 3060 as well as for flows diverted into the subbasin. The routing lengths of the retrieved diversions were changed where appropriate to reduce the lengths to one-half mile.

After combined hydrograph 3060A is routed through the City of Mesa detention reservoir a diversion was provided (D3065) to accommodate the possibility of diverting detention outlet flows south along 64th Street. This capacity remains although is not used.

In subbasin 3061 the diverted hydrograph 3045 is retrieved and routed along Princess Drive to combination point 3051. Subbasin runoff is combined with the routed flows coming south along Recker at combination point 3055. These combined flows are then routed through a small detention basin (manor) with a capacity of 5 acre-feet. The outflow hydrograph from this basin is combined with the routed hydrograph 3065 from subbasin 3060 (routed along Brown Road). The combined hydrograph 3065 is then split diverting a maximum of 160 cfs into a 48-inch storm drain in Brown Road. The 48-inch storm drain conveys flow west and out of the drainage area (and discharges to the East Maricopa Floodway).

The FCD model provided one combined detention basin for the area bounded by Brown Road, McLellan Road, Power Road, and Recker Road. This combined basin has a capacity of 28.5 acre-feet. The SLA model modified the FCD model by splitting the combined capacity into two semi-regional detention basins. These two detention basins were discussed above and serve subbasins 3060 and 3061.

Subbasin 3210 in the FCD furnished model encompassed an area of 0.35 square miles and incorporated a combined retention capacity of 15.6 acre-feet. The SLA model split subbasin 3210 into two subbasins, 3210 and 3211, with basin areas of 0.18 square miles each. The two new subbasins retained the hydrologic parameters of the original except for basin area, and the lengths of the collector and main channels. The collection and main channels were reduced from 1400 feet and 3800 feet to 700 feet and 1900 feet, respectively.

A reservoir routine was developed for the detention basins EAST II. This basins as-built certified capacity is 7.6 acre-feet. A pond area vs. elevation curve was constructed by planimetering the basin grading plan. The reservoir routine was completed by adding input data regarding EAST II's outlet structure. The low-level outlet for EAST II is a 12-inch pipe that discharges to the detention basin in subbasin 3211.

The 30-inch storm drain that originates at the intersection of Brown Road and Power Road outfalls into the street on Recker south of Brown. This hydrograph is combined at combination point 3080 with the outflow from the detention basin WEST II and routing reach 3079. The combined flows are then split at the intersection of Adobe Road and Recker Road.

The FCD subbasin 3210 incorporated a detention capacity of 15.6 acre-feet as stated above. The 15.6 acre-feet is a combined total that was split into the basins EAST II and WEST II. Examination of as-built plans showed that basin EAST II discharges to WEST II and that no flows (except emergency overflow) proceed south on 64th Street as depicted in the FCD model (see Figure D-1).

The FCD subbasin 3210A encompasses an area of 0.98 square miles and has no detention capacity. This subbasin was divided into three subbasins in the SLA revised model. These subbasins are 3210A, 3212, and 3210B with areas of 0.16, 0.15, and 0.21 square miles respectively. Figure D-2 illustrates the boundaries of each of the three new subbasins.

A shotcrete-lined open channel originates at Power Road north of El Paso Street. The open channel conveys captured storm runoff from Power Road and discharges onto 64th Street south of the EAST II basin. The open channel has an approximate capacity of 90 cfs.

The resulting hydrograph routed through the open channel combines with the hydrograph for subbasin 3210A and routed hydrograph 3207 at combination point 3213. The combined hydrograph is routed south on 64th Street (inverted crown) to University Drive.

Subbasin 3220 remained unchanged between the FCD furnished model and the SLA revised model. Subbasin 3220 is combined at combination point 3227 in both models. Both models incorporated a diversion routine at the intersection of 64th Street and University Drive. The routine accounts for stormflows that cross University at or in the vicinity of 64th Street. Under existing conditions up to 80 percent of combination point 3227 flows can cross University and continue south out of the study area.

The FCD model and the SLA model provide under existing conditions along University Drive two other diversion routines to account for flows crossing University to the south. These diversions are located at Recker Road and at Higley Road. Under existing conditions all flows at Recker Road are diverted south across University. At Higley Road, 60 percent of the combined flows are diverted south across University. The diversions are illustrated in Figure D-2 as triangles with flow arrows pointing southward.

The remaining undiverted flow at 64th Street is combined with the runoff hydrograph for subbasin 3212 at combination point 900. In the existing conditions model the resulting hydrograph is routed west along University Drive to Recker Road. These flows are combined at Recker Road with runoff from subbasin 3210B and routing reach 3231. The combined flows under existing conditions are then diverted across University Drive to the south with diversion routine 500.

Subbasins 3240 and 3250 in the FCD model comprising the area south of Adobe Road between Higley and Recker Roads and north of University Drive has been subdivided into eight subbasins in the revised hydrologic model. The purpose of breaking down the larger subbasins into smaller units was to quantify side streets flows from 54th, 56th, and 58th Streets onto University Drive. The eight subbasins, 3240, 3241, 3242, 3243, 3250, 3251, 3252, and 3253 are fully developed and incorporate diversion routines at the intersections of 54th and 56th Streets with Decatur Street.

Proposed Drainage Elements

The revised hydrologic model is a multiplan model that examines both existing and proposed hydrologic conditions for University Drive. The revised model incorporates a HEC-1 option for evaluating proposed drainage improvements by utilizing the multiplan routine. The proposed drainage improvements are called PLAN2 in the SLA model.

The proposed drainage improvements include the provision of a detention basin between 64th and 62nd Streets and a major trunkline storm drain from the detention basin to approximately Higley Road along University Drive.

The proposed detention basin is modelled as basin routine 3228 in Figure D-2 at University Drive. The proposed storm drains are modelled in PLAN2 as routing reaches 3227, 3229, 3242, 3252, and 3253. The pipe slopes for the hydrologic investigation were input at 0.007 feet per foot to match the approximate ground slope along University Drive.

A complete data input listing for the preferred alternative is given in Appendix H. Appendix H also provides a complete output listing for the preferred alternative. Complete diversion (split flow) computations with assumptions are provided in Appendix B. Detention basin size computations and bleed-off calculations are provided in Appendix C.

sla
SIMONS, li & ASSOCIATES, INC.

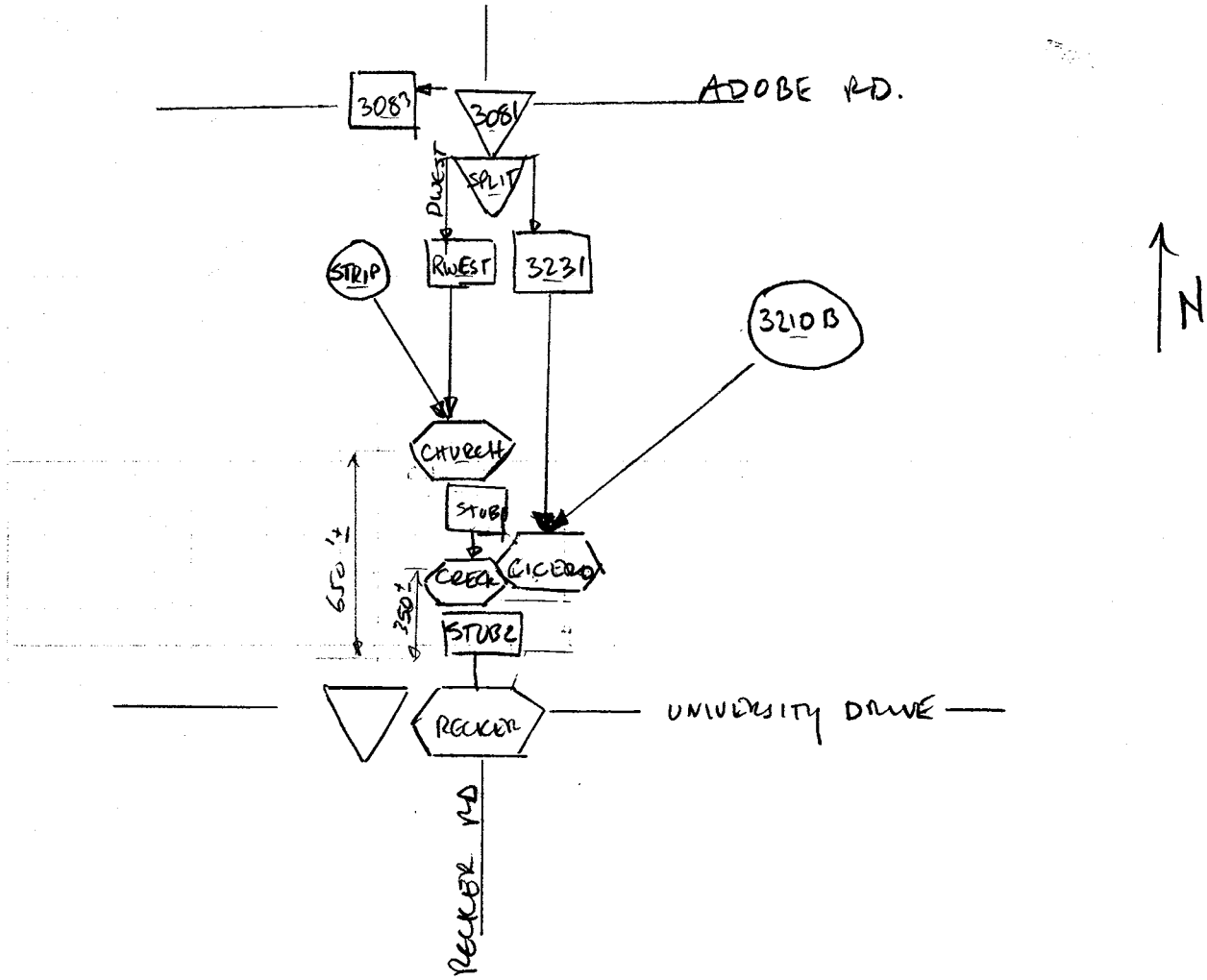
CLIENT _____ JOB NO. _____ PAGE _____
PROJECT _____ DATE CHECKED _____ DATE _____
DETAIL _____ CHECKED BY _____ COMPUTED BY _____

REVISED DRAINAGE AREAS FOR S3240 + S3242

D.A S3240 = 0.063 − 0.0062 = 0.056 sq mi

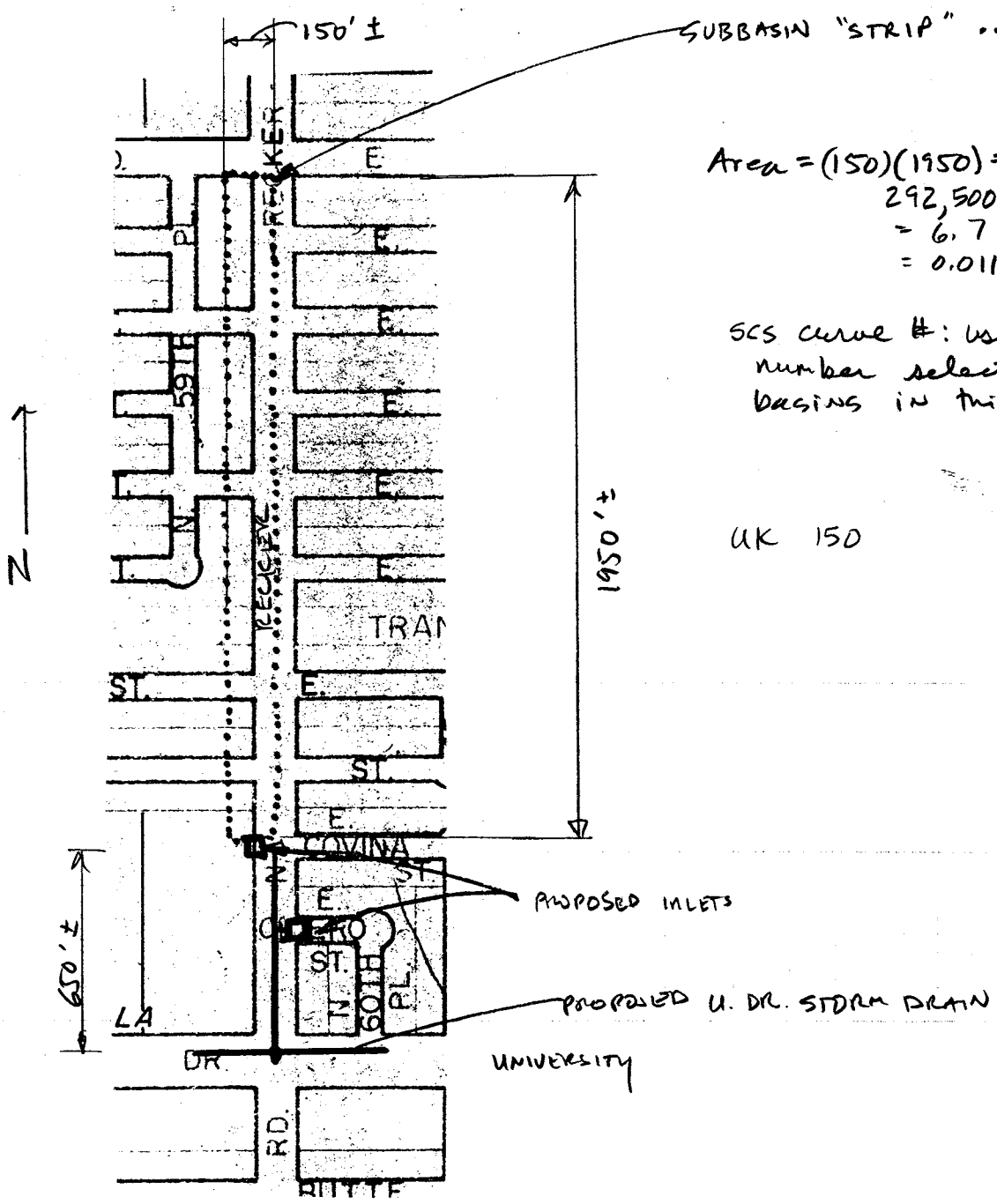
D.A S3242 = 0.071 − 0.0043 = 0.0067 sq mi

NEW SCHEMATIC TO INCORPORATE EAST + WEST FLOWS DOWN RECKER PLUS NEW SUBBASIN "STRIP"



sla
SIMONS, LI & ASSOCIATES, INC.

CLIENT: ERTMAN LO
PROJECT: UNIVERSITY
DETAIL: SUBBASIN "STRIP"
JOB NO.: A2-EE-02
DATE CHECKED:
CHECKED BY:
PAGE:
DATE: 2/26/93
COMPUTED BY: RAE



Area = (150)(1950) =
292,500 ft²
= 6.7 AC
= 0.011 mi²

SCS curve #: use FCD number selected for basins in this area

UK 150

500 SCALE

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*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
*  RUN DATE  03/09/1993  TIME  13:59:32 *
*                                      *
****************************************
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****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X       XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
```

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::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
:::                                      :::
:::  Full Microcomputer Implementation   :::
:::                 by                   :::
:::        Haestad Methods, Inc.         :::
:::                                      :::
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

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

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

  1           ID        FLOOD CONTROL DISTRICT OF MARICOPA COUNTY HEC-1 MODEL OF
  2           ID        EAST MARICOPA COUNTY ADMS MODIFIED FOR THE UNIVERSITY DRIVE
  3           ID        IMPROVEMENT PROJECT--
  4           ID        6-HR,    RAINFALL
  5           ID        MODIFIED SEPT.28, 1992 WITH RETENTION VOLUMES FROM CITY OF MESA FILES
  6           ID        FOR ALL OF THE SUBDIVISIONS IN THE STUDY AREA
  7           ID
  8           ID        ENTRANCO                    PROJECT MANAGER: BILL KANTOR, P.E.
  9           ID        2400 WEST DUNLAP AVENUE
 10           ID        PHOENIX ARIZONA  85021      PROJECT ENGINEER: VAHID AMENIAN, P.E.
 11           ID        (602) 264-1228
 12           ID
 13           ID  ***********************************************************************
 14           ID
 15           ID  ******************RUNOFF MODEL FOR AREA EAST OF 64TH STREET******************
 16           ID
 17           ID  ***************FLOWS INCLUDED IN SLA HEC-1 MODEL FOR E MC ADMS***************
 18           ID
 19           ID  ****THIS MODEL DEVELOPS FLOWS ON UNIV. DR. ROADWAY INCL. OFFSITE RUNOFFS*****
 20           ID
 21           ID  ***********************************************************************
 22           ID
              *DIAGRAM
 23           IT      3                    121
 24           ID      5

 25           KK    DA-1
 26           KM        RUNOFF FROM SUBBASIN NW CORNER OF POWER AND UNIVERSITY
 27           PB    1.83
 28           IN      15
 29           PC       0    .012    .018   .0275    .041   .0525   .0635   .0745    .086   .0975
 30           PC    .111    .126   .1475   .1925    .278   .4615    .637   .8165    .884    .325
 31           PC    .348   .3615    .374   .3875     1.0
 32           BA    .024
 33           LS              77
 34           UK    1250   .0095   0.200     100
 35           RD     800   .0090    .016
 36           RC    .016    .016    .016     800   .0090     100
 37           RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 38           RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00

 39           KK   R/W-1
 40           KM        RUNOFF FROM 800' OF UNIV. DR. R/W E OF POWER RD; N OF CENTERLINE
 41           BA   .0016
 42           LS              95
 43           UK      34     .02     .10     100
 44           RD     800   .0090    .016
 45           RC    .016    .016    .016     800   .0090     100
 46           RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 47           RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00
```

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

 48           KK   R/W-2
 49           KM        RUNOFF FROM 800' OF UNIV. DR. R/W E OF POWER RD; S OF CENTERLINE
 50           BA   .0016
 51           LS             95
 52           UK     34     .02     .10     100
 53           RD    800   .0090    .016
 54           RC   .016    .016    .016     800   .0090     100
 55           RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 56           RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00

 57           KK   CH-1
 58           KM        COMBINE DA-1, R/W-1 AND R/W-2
 59           HC       3

 60           KK   RT-1
 61           KM        ROUTE COMB. FLOWS IN 24" SD IN UNIV. DR. 600' WEST
 62           RD    600    .007    .012            CIRC       2

 63           KK   DA-2
 64           KM        RUNOFF FROM SUBBASIN 800' to 1300' WEST OF POWER
 65           BA   .013
 66           LS             80
 67           UK    750   .0095   0.200     100
 68           RD    500   .0090    .016
 69           RC   .016    .016    .016     500   .0090     100
 70           RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 71           RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00

 72           KK   R/W-3
 73           KM        RUNOFF FROM UNIV. DR. R/W 800' to 1300' E OF POWER RD; N OF CENTERLINE
 74           BA   .0010
 75           LS             95
 76           UK     34     .02     .10     100
 77           RD    500   .0090    .016
 78           RC   .016    .016    .016     500   .0090     100
 79           RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 80           RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00

 81           KK   R/W-4
 82           KM        RUNOFF FROM UNIV. DR. R/W 800' to 1300' E OF POWER RD; S OF CENTERLINE
 83           BA   .0010
 84           LS             95
 85           UK     34     .02     .10     100
 86           RD    500   .0090    .016
 87           RC   .016    .016    .016     500   .0090     100
 88           RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 89           RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00

 90           KK   CH-2
 91           KM        COMBINE DA-2, R/W-3 AND R/W-4 WITH PREVIOUS PIPE FLOW
 92           HC       4
```

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

  93          KK    RT-2
  94          KM        ROUTE COMB. FLOWS IN 24" SD IN UNIV. DR. 1300' WEST OF POWER RD
  95          RD     600    .007    .012            CIRC       2

  96          KK    DA-3
  97          KM        RUNOFF FROM SUBBASIN 1300' to 1900' WEST OF POWER
  98          BA    .033
  99          LS              77
 100          UK    1250   .0035   0.200     100
 101          RD     600   .0090    .016
 102          RC    .016    .016    .016     600   .0090     100
 103          RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 104          RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00

 105          KK   R/W-5
 106          KM        RUNOFF FROM UNIV. DR. R/W 1300' TO 1900' E OF POWER RD; N OF CENTERLINE
 107          BA   .0012
 108          LS              95
 109          UK      34     .02     .10     100
 110          RD     600   .0090    .016
 111          RC    .016    .016    .016     600   .0090     100
 112          RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 113          RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00

 114          KK   R/W-6
 115          KM        RUNOFF FROM UNIV. DR. R/W 1300' TO 1900' E OF POWER RD; S OF CENTERLINE
 116          BA   .0012
 117          LS              95
 118          UK      34     .02     .10     100
 119          RD     600   .0090    .016
 120          RC    .016    .016    .016     600   .0090     100
 121          RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 122          RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00

 123          KK    CH-3
 124          KM        COMBINE DA-3, R/W-5 AND R/W-6 WITH PREVIOUS PIPE FLOW
 125          HC       4

 126          KK    RT-3
 127          KM        ROUTE COMB. FLOWS IN 24" SD IN UNIV. DR. 600' WEST
 128          RD     500    .007    .012            CIRC       2

 129          KK    DA-4
 130          KM        RUNOFF FROM SUBBASIN 1900' to 2600' WEST OF POWER
 131          BA   .0072
 132          LS              85
 133          UK     250   .0035   0.200     100
 134          RD     700   .0090    .016
 135          RC    .016    .016    .016     700   .0090     100
 136          RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 137          RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00
```

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

 138          KK   R/W-7
 139          KM        RUNOFF FROM UNIV. DR. R/W 1900' TO 2600' E OF POWER RD; N OF CENTERLINE
 140          BA   .0012
 141          LS             95
 142          UK     34     .02     .10     100
 143          RD    700   .0090    .016
 144          RC   .016    .016    .016     700   .0090     100
 145          RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 146          RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00

 147          KK   R/W-8
 148          KM        RUNOFF FROM UNIV. DR. R/W 1900' TO 2600' E OF POWER RD; S OF CENTERLINE
 149          BA   .0012
 150          LS             95
 151          UK     34     .02     .10     100
 152          RD    700   .0090    .016
 153          RC   .016    .016    .016     700   .0090     100
 154          RX  100.00  100.08  101.50  134.08  134.09  166.67  168.08  168.16
 155          RY  100.00   99.50   99.58  100.23  100.23   99.58   99.50  100.00

 156          KK    CH-3
 157          KM        COMBINE DA-4, R/W-7 AND R/W-8 WITH PREVIOUS PIPE FLOW
 158          HC       4

 159          KK    RT-3
 160          KM        ROUTE COMB. FLOWS IN 24" SD IN UNIV. DR. 123 INTO POND "B"
 161          RD    123    .007    .012           CIRC      2
 162          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   25      DA-1
              .
              .
   39         .       R/W-1
              .          .
              .          .
   48         .          .      R/W-2
              .          .         .
              .          .         .
   57      CH-1.......................
              V
              V
   60      RT-1
              .
              .
   63         .       DA-2
              .          .
              .          .
   72         .          .      R/W-3
              .          .         .
              .          .         .
   81         .          .         .      R/W-4
              .          .         .         .
              .          .         .         .
   90      CH-2.................................
              V
              V
   93      RT-2
              .
              .
   96         .       DA-3
              .          .
              .          .
  105         .          .      R/W-5
              .          .         .
              .          .         .
  114         .          .         .      R/W-6
              .          .         .         .
              .          .         .         .
  123      CH-3.................................
              V
              V
  126      RT-3
              .
              .
  129         .       DA-4
              .          .
              .          .
  138         .          .      R/W-7
              .          .         .
              .          .         .
  147         .          .         .      R/W-8
              .          .         .         .
              .          .         .         .
  156      CH-3.................................
              V
              V
  159      RT-3
```

```
****************************************                    ****************************************
*                                      *                    *                                      *
*  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  03/09/1993  TIME  13:59:32 *                    *         (916) 756-1104               *
*                                      *                    *                                      *
****************************************                    ****************************************
```

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY HEC-1 MODEL OF
EAST MARICOPA COUNTY ADMS MODIFIED FOR THE UNIVERSITY DRIVE
IMPROVEMENT PROJECT--
6-HR, RAINFALL
MODIFIED SEPT.28, 1992 WITH RETENTION VOLUMES FROM CITY OF MESA FILES
FOR ALL OF THE SUBDIVISIONS IN THE STUDY AREA

ENTRANCO PROJECT MANAGER: BILL KANTOR, P.E.
2400 WEST DUNLAP AVENUE
PHOENIX ARIZONA 85021 PROJECT ENGINEER: VAHID AMENIAN, P.E.
(602) 254-1228

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

******************RUNOFF MODEL FOR AREA EAST OF 64TH STREET******************

***************FLOWS INCLUDED IN SLA HEC-1 MODEL FOR E MC ADMS***************

****THIS MODEL DEVELOPS FLOWS ON UNIV. DR. ROADWAY INCL. OFFSITE RUNOFFS*****

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

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

    IT        HYDROGRAPH TIME DATA
                    NMIN          3  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1    0  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        121  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      1    0  ENDING DATE
                  NDTIME       0600  ENDING TIME
                   ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL     .05 HOURS
                   TOTAL TIME BASE    6.00 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
```

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	DA-1	1.	6.00	0.	0.	0.	.02		
HYDROGRAPH AT	R/W-1	2.	3.95	0.	0.	0.	.00		
HYDROGRAPH AT	R/W-2	2.	3.95	0.	0.	0.	.00		
3 COMBINED AT	CH-1	3.	4.00	1.	1.	1.	.03		
ROUTED TO	RT-1	3.	4.00	1.	1.	1.	.03		
HYDROGRAPH AT	DA-2	2.	5.50	0.	0.	0.	.01		
HYDROGRAPH AT	R/W-3	1.	3.95	0.	0.	0.	.00		
HYDROGRAPH AT	R/W-4	1.	3.95	0.	0.	0.	.00		
4 COMBINED AT	CH-2	6.	4.00	1.	1.	1.	.04		
ROUTED TO	RT-2	6.	4.00	1.	1.	1.	.04		
HYDROGRAPH AT	DA-3	2.	6.00	0.	0.	0.	.03		
HYDROGRAPH AT	R/W-5	1.	3.95	0.	0.	0.	.00		
HYDROGRAPH AT	R/W-6	1.	3.95	0.	0.	0.	.00		
4 COMBINED AT	CH-3	8.	4.00	2.	2.	2.	.08		
ROUTED TO	RT-3	8.	4.00	2.	2.	2.	.08		
HYDROGRAPH AT	DA-4	3.	4.35	0.	0.	0.	.01		
HYDROGRAPH AT	R/W-7	1.	3.95	0.	0.	0.	.00		
HYDROGRAPH AT	R/W-8	1.	3.95	0.	0.	0.	.00		
4 COMBINED AT	CH-3	12.	4.00	3.	3.	3.	.09		
ROUTED TO	RT-3	12.	4.00	3.	3.	3.	.09		

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
DA-1	MANE	3.00	1.28	360.00	.12	3.00	1.28	360.00	.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4997E+00 OUTFLOW= .1506E+00 BASIN STORAGE= .0000E+00 PERCENT ERROR= 69.9

R/W-1	MANE	3.00	1.63	237.00	1.35	3.00	1.63	237.00	1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1176E+00 OUTFLOW= .1152E+00 BASIN STORAGE= .0000E+00 PERCENT ERROR= 2.1

R/W-2	MANE	3.00	1.63	237.00	1.35	3.00	1.63	237.00	1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1176E+00 OUTFLOW= .1152E+00 BASIN STORAGE= .0000E+00 PERCENT ERROR= 2.1

RT-1	MANE	1.65	3.37	239.87	.26	3.00	3.37	240.00	.26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3814E+00 EXCESS= .0000E+00 OUTFLOW= .3771E+00 BASIN STORAGE= .4266E-02 PERCENT ERROR= .0

DA-2	MANE	3.00	1.56	330.00	.29	3.00	1.56	330.00	.29

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3443E+00 OUTFLOW= .2026E+00 BASIN STORAGE= .0000E+00 PERCENT ERROR= 41.2

R/W-3	MANE	3.00	1.02	237.00	1.35	3.00	1.02	237.00	1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7350E-01 OUTFLOW= .7215E-01 BASIN STORAGE= .0000E+00 PERCENT ERROR= 1.8

R/W-4	MANE	3.00	1.02	237.00	1.35	3.00	1.02	237.00	1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7350E-01 OUTFLOW= .7215E-01 BASIN STORAGE= .0000E+00 PERCENT ERROR= 1.8

RT-2	MANE	1.49	5.66	241.24	.32	3.00	5.64	240.00	.32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7236E+00 EXCESS= .0000E+00 OUTFLOW= .7167E+00 BASIN STORAGE= .7046E-02 PERCENT ERROR= .0

DA-3	MANE	3.00	1.76	360.00	.12	3.00	1.76	360.00	.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6871E+00 OUTFLOW= .2102E+00 BASIN STORAGE= .0000E+00 PERCENT ERROR= 69.4

R/W-5	MANE	3.00	1.22	237.00	1.35	3.00	1.22	237.00	1.35

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8820E-01 OUTFLOW= .8650E-01 BASIN STORAGE= .0000E+00 PERCENT ERROR=   1.9

          R/W-6  MANE        3.00      1.22    237.00      1.35      3.00      1.22    237.00        1.36

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8820E-01 OUTFLOW= .8650E-01 BASIN STORAGE= .0000E+00 PERCENT ERROR=   1.9

           RT-3  MANE        1.15      8.24    240.64       .26      3.00      8.20    240.00         .26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1101E+01 EXCESS= .0000E+00 OUTFLOW= .1092E+01 BASIN STORAGE= .8976E-02 PERCENT ERROR=    .0

           DA-4  MANE        3.00      2.79    261.00       .62      3.00      2.79    261.00         .62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2748E+00 OUTFLOW= .2381E+00 BASIN STORAGE= .0000E+00 PERCENT ERROR=  13.3

          R/W-7  MANE        3.00      1.23    237.00      1.35      3.00      1.23    237.00        1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8820E-01 OUTFLOW= .8633E-01 BASIN STORAGE= .0000E+00 PERCENT ERROR=   2.1

          R/W-8  MANE        3.00      1.23    237.00      1.35      3.00      1.23    237.00        1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8820E-01 OUTFLOW= .8633E-01 BASIN STORAGE= .0000E+00 PERCENT ERROR=   2.1

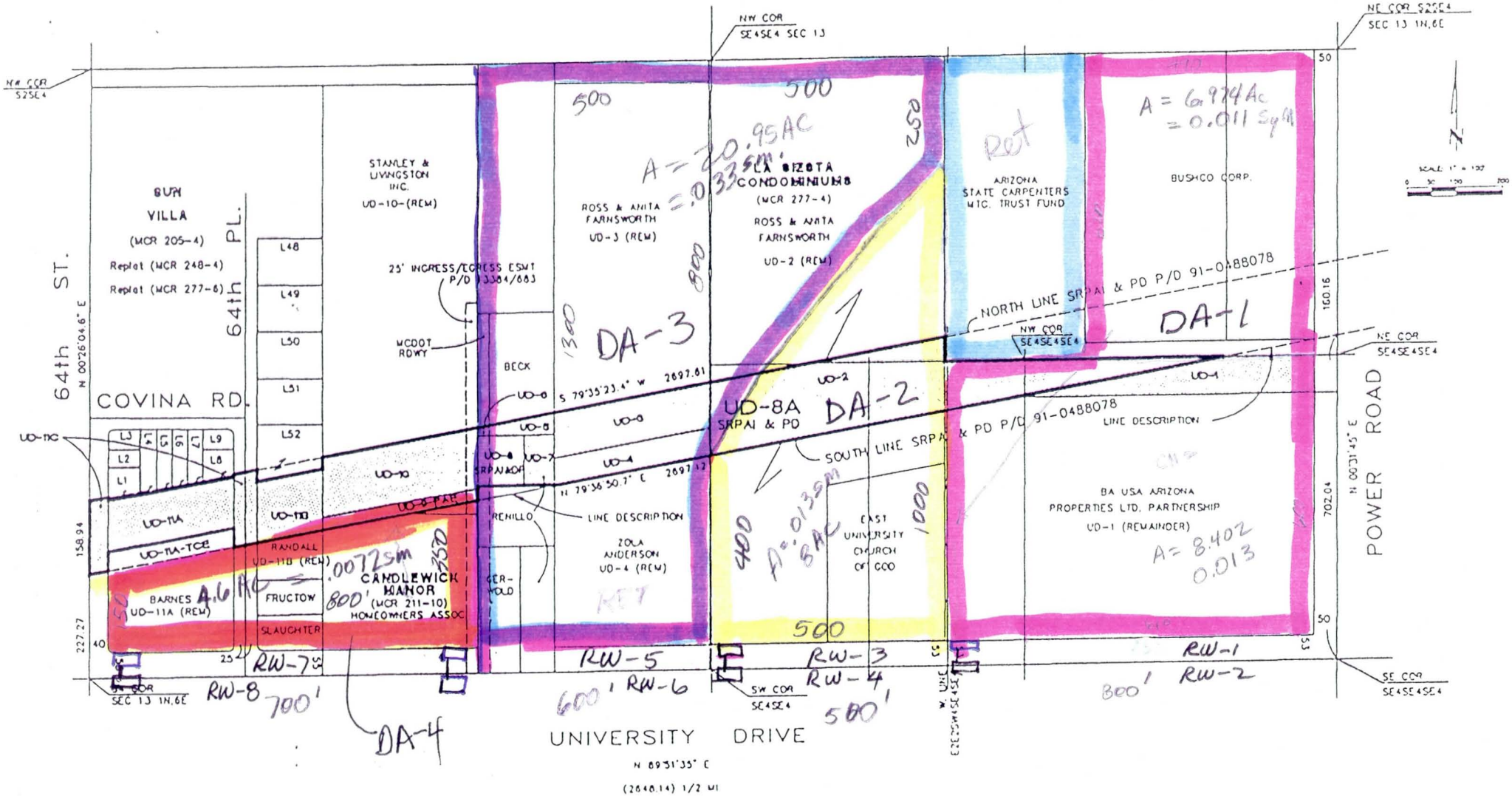
           RT-3  MANE         .26     11.91    240.26       .32      3.00     11.88    240.00         .32

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1504E+01 EXCESS= .0000E+00 OUTFLOW= .1502E+01 BASIN STORAGE= .2417E-02 PERCENT ERROR=    .0


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

DRAINAGE AREA EAST OF 64TH STREET

HEC-1 BASIN 3220



APPENDIX E: STORM DRAIN HYDRAULICS (THYSYS)

sla
SIMONS, LI & ASSOCIATES, INC.

CLIENT _____ JOB NO. _____ PAGE _____
PROJECT _____ DATE CHECKED _____ DATE _____
DETAIL _____ CHECKED BY _____ COMPUTED BY _____

STORM DRAIN HYDRAULICS
a. OUTFALL DRAWDOWN CURVE
b. THYSYS INPUT + OUTPUT
c. FCD METHOD CHECK OF THYSYS

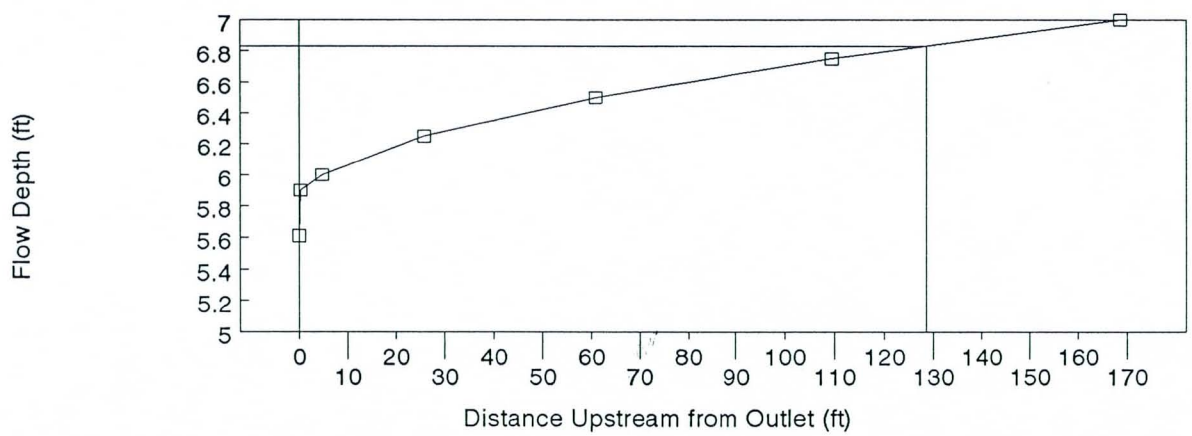
University Drive Drainage Improvements FDC 92–12
AZ–EE–02

Diameter = 7 ft
Flowrate = 482 cfs
Critical = 5.61

n = 0.012
SLOPE= 0.00125

Y ft	A ft^2	P ft	R ft	V fps	V^2/2 ft	E ft	Delta E ft	Vm fps	Rm ft	Slope ft/ft	Delta X
5.61	33.06	15.53	2.130	14.58	3.30	8.91					
							0.0008	14.25	2.127	0.00484	0.22
5.90	34.61	16.28	2.125	13.93	3.01	8.91					
							0.0149	13.83	2.123	0.00457	4.48
6.00	35.11	16.56	2.120	13.73	2.93	8.93					
							0.0664	13.51	2.107	0.00441	21.04
6.25	36.27	17.32	2.094	13.29	2.74	8.99					
							0.1054	13.11	2.070	0.00425	35.13
6.50	37.26	18.20	2.047	12.93	2.60	9.10					
							0.2494	12.80	2.008	0.00422	48.52
6.75	38.05	19.33	1.968	12.67	2.49	9.24					
							0.3379	12.60	1.859	0.00453	59.17
7.00	38.48	21.99	1.750	12.52	2.44	9.44				SUM =	168.57

DRAWDOWN CURVE FOR EMF OUTFALL



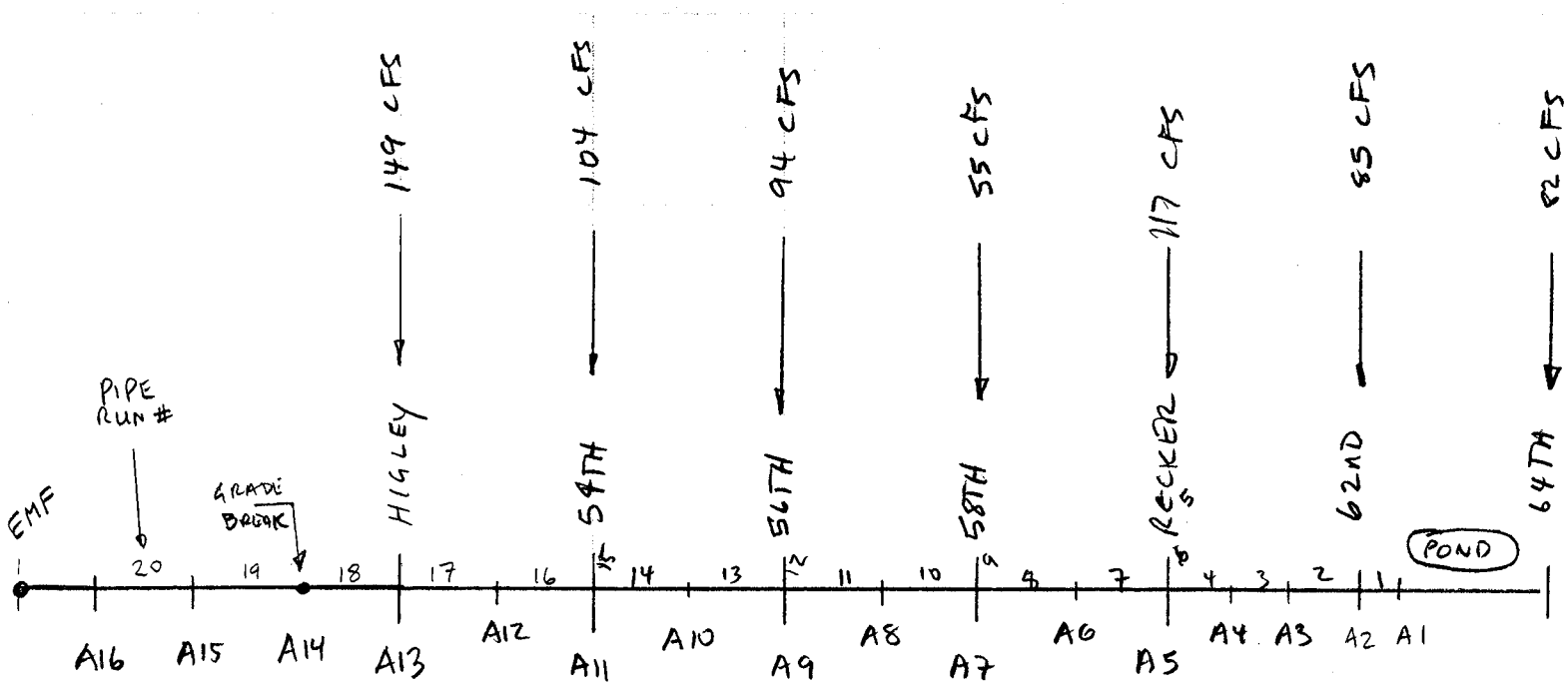
SIMONS, LI & ASSOCIATES, INC.

SLA
SIMONS, LI & ASSOCIATES, INC.

CLIENT Eatmando
PROJECT Lawyers LTD
DETAIL PIPE PLAN SCHEMATIC

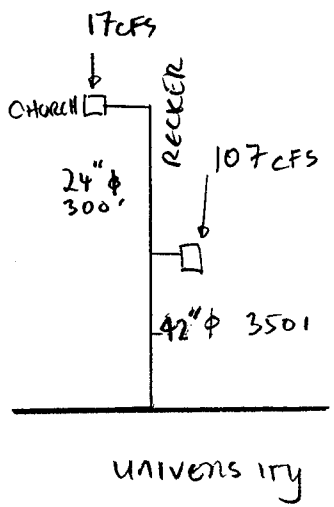
JOB NO. A2-EE-02
DATE CHECKED
CHECKED BY

PAGE
DATE 3/4/93
COMPUTED BY PAE



LEGEND

= PIPE RUN
A# = NODE #
→ = SIDESTREET Q_{10}
+ = JUNCTION/MH



```
*******************************
*                             *
*          THYSYS             *
*                             *
*   TEXAS HYDRAULICS SYSTEM   *
*                             *
*******************************
```

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$       STORM SEWER HYDRAULIC ANALYSYS FOR UNIVERSITY DRIVE
$       SIMONS, LI & ASSOCIATES, INC. - TEMPE, ARIZONA
$       10-YEAR EVENT USING HEC-1 FOR RUNOFF AND ROUTING
SEWER              ANALYSIS                    SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
DA A  1                                                  12       6     7
SEW0023--NO SUBAREA TC DATA GIVEN.  ASSUME MINIMUM.
DA B  1                                                                17
SEW0023--NO SUBAREA TC DATA GIVEN.  ASSUME MINIMUM.
DA B  2                                                               100
SEW0023--NO SUBAREA TC DATA GIVEN.  ASSUME MINIMUM.
DA A  5                                                                -5
SEW0023--NO SUBAREA TC DATA GIVEN.  ASSUME MINIMUM.
DA C  1                                                                55
SEW0023--NO SUBAREA TC DATA GIVEN.  ASSUME MINIMUM.
DA A  7                                                               -11
SEW0023--NO SUBAREA TC DATA GIVEN.  ASSUME MINIMUM.
DA D  1                                                                94
SEW0023--NO SUBAREA TC DATA GIVEN.  ASSUME MINIMUM.
DA A  9                                                                -1
SEW0023--NO SUBAREA TC DATA GIVEN.  ASSUME MINIMUM.
DA E  1                                                               104
SEW0023--NO SUBAREA TC DATA GIVEN.  ASSUME MINIMUM.
DA A 11                                                                -2
SEW0023--NO SUBAREA TC DATA GIVEN.  ASSUME MINIMUM.
DA A 13                                                               124
SEW0023--NO SUBAREA TC DATA GIVEN.  ASSUME MINIMUM.
$  STARTING WATER SURFACE ELEVATION ASSUMES CRITICAL DEPTH DRAWDOWN
$  AT THE EMF OUTFALL.  PRESSURE FLOW STARTS AT THE UPSTREAM SIDE OF
$  THE FIRST MANHOLE UPSTREAM OF THE EMF OUTFALL.
OUTLET    STATIONING  8469.00 T.W. ELEV  1344.98   A 16
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
DSGN   1  A  1 A  2 US1395.29 DS1392.49  400          0.012       24 CIRC
DSGN   2  A  2 A  3 US1392.49 DS1389.69  400          0.012       24 CIRC
DSGN   3  A  3 A  4 US1389.69 DS1386.33  480          0.012       24 CIRC
DSGN   4  A  4 A  5 US1386.33 DS1383.74  370          0.012       24 CIRC
DSGN   5  B  1 B  2 US1388.68 DS1386.40  300          0.012       24 CIRC
DSGN   6  B  2 A  5 US1386.40 DS1383.74  350          0.012       42 CIRC
DSGN   7  A  5 A  6 US1383.74 DS1379.19  650          0.012       54 CIRC
DSGN   8  A  6 A  7 US1379.19 DS1374.64  650          0.012       54 CIRC
DSGN   9  C  1 A  7 US1374.84 DS1374.64   50          0.012       36 CIRC
DSGN  10  A  7 A  8 US1374.64 DS1369.95  670          0.012       54 CIRC
DSGN  11  A  8 A  9 US1369.95 DS1365.33  660          0.012       54 CIRC
DSGN  12  D  1 A  9 US1365.63 DS1365.33   50          0.012       42 CIRC
DSGN  13  A  9 A 10 US1365.33 DS1360.22  730          0.012       72 CIRC
DSGN  14  A 10 A 11 US1360.22 DS1354.97  750          0.012       72 CIRC
DSGN  15  E  1 A 11 US1355.12 DS1354.97   50          0.012       48 CIRC
DSGN  16  A 11 A 12 US1354.97 DS1350.98  570          0.012       72 CIRC
DSGN  17  A 12 A 13 US1350.98 DS1346.91  582          0.012       72 CIRC
DSGN  18  A 13 A 14 US1346.91 DS1346.72   77          0.012       84 CIRC
DSGN  19  A 14 A 15 US1346.72 DS1345.82  702          0.012       84 CIRC
DSGN  20  A 15 A 16 US1345.82 DS1344.83  740          0.012       84 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
```

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$          L IN L IN  NO.                LOSS
ANAL   1   A  1 A  2          24
ANAL   2   A  2 A  3          24          0.50
ANAL   3   A  3 A  4          24          0.01
ANAL   4   A  4 A  5          24          0.50
ANAL   5   B  1 B  2          24
ANAL   6   B  2 A  5          42
ANAL   7   A  5 A  6          54          1.15
ANAL   8   A  6 A  7          54          0.04
ANAL   9   C  1 A  7          36
ANAL  10   A  7 A  8          54          1.08
ANAL  11   A  8 A  9          54          0.08
ANAL  12   D  1 A  9          42
ANAL  13   A  9 A 10          72          0.59
ANAL  14   A 10 A 11          72          0.06
ANAL  15   E  1 A 11          48
ANAL  16   A 11 A 12          72          1.79
ANAL  17   A 12 A 13          72          0.12
ANAL  18   A 13 A 14          84          0.86
ANAL  19   A 14 A 15          84          0.00
ANAL  20   A 15 A 16          84          0.12
ENDATA
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SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
1	A 1	A 2	.00	.00	.00	.00	.00	.00	.00	7.00
2	A 2	A 3	.00	.00	.00	.00	1.12	.00	.00	7.00
3	A 3	A 4	.00	.00	.00	.00	2.24	.00	.00	7.00
4	A 4	A 5	.00	.00	.00	.00	3.58	.00	.00	7.00
5	B 1	B 2	.00	.00	.00	.00	.00	.00	.00	17.00
6	B 2	A 5	.00	.00	.00	.00	.66	.00	.00	117.00
7	A 5	A 6	.00	.00	.00	.00	4.61	.00	.00	119.00
8	A 6	A 7	.00	.00	.00	.00	5.52	.00	.00	119.00
9	C 1	A 7	.00	.00	.00	.00	.00	.00	.00	55.00
10	A 7	A 8	.00	.00	.00	.00	6.42	.00	.00	163.00
11	A 8	A 9	.00	.00	.00	.00	7.30	.00	.00	163.00
12	D 1	A 9	.00	.00	.00	.00	.00	.00	.00	94.00
13	A 9	A10	.00	.00	.00	.00	8.16	.00	.00	256.00
14	A10	A11	.00	.00	.00	.00	9.01	.00	.00	256.00
15	E 1	A11	.00	.00	.00	.00	.00	.00	.00	104.00
16	A11	A12	.00	.00	.00	.00	9.87	.00	.00	358.00
17	A12	A13	.00	.00	.00	.00	10.49	.00	.00	358.00
18	A13	A14	.00	.00	.00	.00	11.12	.00	.00	482.00
19	A14	A15	.00	.00	.00	.00	11.23	.00	.00	482.00
20	A15	A16	.00	.00	.00	.00	12.16	.00	.00	482.00

TEXAS DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION
TEXAS HYDRAULIC SYSTEM - 221108
THYSYS

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
1	A 1	A 2	1393.29	1390.49	400	.00700	1	24	24	CIRC
2	A 2	A 3	1390.49	1387.69	400	.00700	1	24	24	CIRC
3	A 3	A 4	1387.69	1384.33	480	.00700	1	24	24	CIRC
4	A 4	A 5	1384.33	1381.74	370	.00700	1	24	24	CIRC
5	B 1	B 2	1386.68	1384.40	300	.00760	1	24	24	CIRC
6	B 2	A 5	1382.90	1380.24	350	.00760	1	42	42	CIRC
7	A 5	A 6	1379.24	1374.69	650	.00700	1	54	54	CIRC
8	A 6	A 7	1374.69	1370.14	650	.00700	1	54	54	CIRC
9	C 1	A 7	1371.84	1371.64	50	.00400	1	36	36	CIRC
10	A 7	A 8	1370.14	1365.45	670	.00700	1	54	54	CIRC
11	A 8	A 9	1365.45	1360.83	660	.00700	1	54	54	CIRC
12	D 1	A 9	1362.13	1361.83	50	.00600	1	42	42	CIRC
13	A 9	A10	1359.33	1354.22	730	.00700	1	72	72	CIRC
14	A10	A11	1354.22	1348.97	750	.00700	1	72	72	CIRC
15	E 1	A11	1351.12	1350.97	50	.00300	1	48	48	CIRC
16	A11	A12	1348.97	1344.98	570	.00700	1	72	72	CIRC
17	A12	A13	1344.98	1340.91	582	.00699	1	72	72	CIRC
18	A13	A14	1339.91	1339.72	77	.00247	1	84	84	CIRC
19	A14	A15	1339.72	1338.82	702	.00128	1	84	84	CIRC
20	A15	A16	1338.82	1337.83	740	.00134	1	84	84	CIRC

TEXAS DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION
TEXAS HYDRAULIC SYSTEM - 221108
THYSYS

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
1	A 1	A 2	.012	.00	7.00	1394.09	1391.79	.00082	.40	3.2*	20.5
2	A 2	A 3	.012	.50	7.00	1391.79	1388.50	.00082	.40	5.9*	20.5
3	A 3	A 4	.012	.01	7.00	1388.50	1385.63	.00082	.40	3.2*	20.5
4	A 4	A 5	.012	.50	7.00	1385.63	1383.09	.00082	.40	3.1*	20.5
5	B 1	B 2	.012	.00	17.00	1389.22	1387.77	.00481	.67	5.4**	21.4
6	B 2	A 5	.012	.00	117.00	1387.77	1383.74	.01152	1.00	12.2	95.0***
7	A 5	A 6	.012	1.15	119.00	1383.09	1378.53	.00312	.60	8.2*	178.2
8	A 6	A 7	.012	.04	119.00	1378.53	1376.46	.00312	.60	7.5**	178.2
9	C 1	A 7	.012	.00	55.00	1376.75	1376.46	.00579	1.00	7.8	45.7***
10	A 7	A 8	.012	1.08	163.00	1376.46	1371.46	.00585	.75	10.2**	178.2
11	A 8	A 9	.012	.08	163.00	1371.46	1367.51	.00585	.75	10.2**	178.2
12	D 1	A 9	.012	.00	94.00	1367.88	1367.51	.00744	1.00	9.8	84.4***
13	A 9	A10	.012	.59	256.00	1367.51	1364.65	.00311	.60	9.1**	383.9
14	A10	A11	.012	.06	256.00	1364.65	1362.25	.00311	.60	9.1**	383.9
15	E 1	A11	.012	.00	104.00	1362.48	1362.25	.00447	1.00	8.3	85.2***
16	A11	A12	.012	1.79	358.00	1362.25	1356.99	.00609	.77	12.7**	383.9
17	A12	A13	.012	.12	358.00	1356.99	1353.33	.00609	.77	12.7**	383.7
18	A13	A14	.012	.86	482.00	1353.33	1352.10	.00485	1.00	12.5	343.8***
19	A14	A15	.012	.00	482.00	1352.10	1348.69	.00485	1.00	12.5	247.8***
20	A15	A16	.012	.12	482.00	1348.69	1344.98	.00485	1.00	12.5	253.1***

SEW0069--**PIPE FLOWING FULL DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON FULL FLOW.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

SEW0071--*PIPE FLOW DEPTH > NORMAL DEPTH DUE TO DOWNSTREAM CONTROL, NOT INSUFFICIENT CAPACITY- VELOCITY IS BASED ON ELEVATION OF HYDRAULIC GRADE LINE AT DOWNSTREAM ELEVATION.
JUNCTION LOSSES MAY NEED TO BE CONSIDERED AT SUBMERGED JUNCTIONS

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SEW0008--CAPACITY OF RUN  6 IS EXCEEDED.
SEW0008--CAPACITY OF RUN  9 IS EXCEEDED.
SEW0008--CAPACITY OF RUN 12 IS EXCEEDED.
SEW0008--CAPACITY OF RUN 15 IS EXCEEDED.
SEW0008--CAPACITY OF RUN 18 IS EXCEEDED.
SEW0008--CAPACITY OF RUN 19 IS EXCEEDED.
SEW0008--CAPACITY OF RUN 20 IS EXCEEDED.
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STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
1	A 1	16900
2	A 2	16500
3	A 3	16100
4	A 4	15620
5	B 1	15900
6	B 2	15600
7	A 5	15250
8	A 6	14600
9	C 1	14000
10	A 7	13950
11	A 8	13280
12	D 1	12670
13	A 9	12620
14	A10	11890
15	E 1	11190
16	A11	11140
17	A12	10570
18	A13	9988
19	A14	9911
20	A15	9209

OUTFALL HGL	43.42248
Do	7
Qo	482
Dc	5.612488
Vc	14.58
(Vc^2)/2g	3.300875

CRITICAL DEPTH
AT THE
OUTFALL. HYDRAULICS
CONTINUED UPSTREAM
USING DRAWDOWN
CURVE TO FIRST
MANHOLE.

MANHOLE	(THRU MANHOLE)		
U.S.		D.S.	
Qu	482	Qo	482
Du	7	Do	7
Vu	12.52451	Dn	6.8
(Vu ^ 2)/2g	2.435770	Vn	13.02
		(Vn ^ 2)/2g	2.632304
Du/Do	1		
Qu/Qo	1		
Kb (Fig. 4.16)	0.12		
Ku (Fig. 4.8)			
Hb	0.315876		
HGL	44.98587	HGL	44.67
INVERT	37.83		
	7.155876		
7*0.8=	5.6	PRESSURE FLOW	

MANHOLE	(THRU MANHOLE)		
U.S.		D.S.	
Qu	482	Qo	482
Du	7	Do	7
Vu	12.52451960	Vo	12.52451
(Vu ^ 2)/2g	2.435770051	(Vo ^ 2)/2g	2.435770
		n	0.012
Du/Do	1	Lo	740
Qu/Qo	1	Sf	0.004827
Kb (Fig. 4.16)			
Ku (Fig. 4.8)	0.05		
Hu	0.121788502	Hf	3.572454
U.S. HGL	48.68011956	D.S. HGL	48.55833
INVERT	38.82		
	9.860119566		
		PRESSURE FLOW	

UNIVERSITY @ HIGLEY

MANHOLE (THRU WITH 9O DEGREE LATERAL)

U.S.		D.S. (rounded outfall)		LATERAL	
Qu	358	Qo	482	Ql	104
Du	6	Do	7	Dl	5.5
Vu	12.6616599	Vo	12.5245196	Vl	4.377418
(Vu ^ 2)/2g	2.48940422	(Vo ^ 2)/2g	2.43577005	Do/Du	1.166666
		n	0.012	Dl/Do	0.785714
Ku* (Fig 4.14)	1.7	Length	779	B/Do	1
Reduction	0.2	Sf	0.00482764	Qu/Qo	0.742738
Ku*	1.36	Hf	3.76073255	Qu/Qo*Do/Du	0.866528
Mu	0.26	D.S. HGL	52.4408521	Kl* (Fig 4.13)	1.14
Ku	0.3536			Reduction	0.2
Hu	0.86128829			Kl*	0.912
U.S. HGL	53.3021404			Ml (Fig 4.13)	0.32
INVERT	39.91			Kl	0.29184
	13.3921404	PRESSURE FLOW		Hl	0.710855
				LAT HGL	53.15170

MH BETWEEN HIGLEY/54TH

MANHOLE	(THRU MANHOLE)		
U.S.		D.S. (rounded outfall)	
Qu	358	Qo	358
Du	6	Do	6
Vu	12.66165	Vo	12.66165
(Vu^2)/2g	2.489404	(Vo^2)/2g	2.489404
A/Du	1	n	0.012
Du/Do	1	Lo	582
Qu/Qo	1	Sf	0.006059
Kb (Fig. 4.16)			
Ku (Fig. 4.8)	0.05		
Hu	0.124470	Hf	3.526607
U.S. HGL	56.95321	D.S.HGL	56.82874
	44.98		
	11.97321	PRSSURE FLOW	

UNIVERSITY @54TH

MANHOLE (THRU WITH 9O DEGREE LATERAL)

U.S.		D.S. (rounded outfall)		LATERAL	
Qu	256	Qo	358	Ql	104
Du	6	Do	6	Dl	4
Vu	9.054147	Vo	12.66165	Vl	8.276057
(Vu ^ 2)/2g	1.272944	(Vo ^ 2)/2g	2.489404	Do/Du	1
		n	0.012	Dl/Do	0.666666
Ku* (Fig 4.14)	1.8	Length	570	B/Do	1
Reduction	0.2	Sf	0.006059	Qu/Qo	0.715083
Ku*	1.44	Hf	3.453894	Qu/Qo*Do/Du	0.715083
Mu	0.5	D.S. HGL	60.40711	Kl* (Fig 4.13)	0.95
Ku	0.72			Reduction	0.3
Hu	1.792371			Kl*	0.665
U.S. HGL	62.19948			Ml (Fig 4.13)	0.63
INVERT	48.97			Kl	0.41895
	13.22948	PRESSURE FLOW		Hl	1.042935
6*0.8=	4.8			LAT HGL	61.45004

MH BETWEEN 54TH/56TH

MANHOLE	(THRU MANHOLE)		
U.S.		D.S. (rounded outfall)	
Qu	256	Qo	256
Du	6	Do	6
Vu	9.054147	Vo	9.054147
(Vu ^ 2)/2g	1.272944	(Vo ^ 2)/2g	1.272944
A/Du	1	n	0.012
Du/Do	1	Lo	750
Qu/Qo	1	Sf	0.003098
		So	0.007
Kb (Fig. 4.16)			
Ku (Fig. 4.8)	0.05		
Hu	0.063647	Hf	2.323856
U.S. HGL	64.58698	D.S.HGL	64.52334
INVERT	54.22		
	10.36698	PRESSURE FLOW	

UNIVERSITY @56TH

MANHOLE (THRU WITH 9O DEGREE LATERAL)

U.S.		D.S. (rounded outfall)		LATERAL	
Qu	163	Qo	256	Ql	94
Du	4.5	Do	6	Dl	3.5
Vu	10.24879	Vo	9.0541478	Vl	9.770164
(Vu ^ 2)/2g	1.631020	(Vo ^ 2)/2g	1.2729440	Do/Du	1.333333
		n	0.012	Dl/Do	0.583333
Ku* (Fig 4.14)	1.94	Length	730	B/Do	1
Reduction	0.2	Sf	0.0030984	Qu/Qo	0.636718
Ku*	1.552	Hf	2.2618871	Qu/Qo*Do/Du	0.848958
Mu	0.3	D.S. HGL	66.848875	Kl* (Fig 4.13)	0.9
Ku	0.4656			Reduction	0.3
Hu	0.592682			Kl*	0.63
U.S. HGL	67.44155			Ml (Fig 4.13)	0.44
INVERT	59.83			Kl	0.2772
	7.611557	PRESSURE FLOW		Hl	0.352860
				LAT HGL	67.20173

MH BETWEEN 56TH/58TH

MANHOLE	(THRU MANHOLE)		
U.S.		D.S. (rounded outfall)	
Qu	163	Qo	163
Du	4.5	Do	4.5
Vu	10.24879	Vo	10.24879
(Vu ^ 2)/2g	1.631020	(Vo ^ 2)/2g	1.631020
A/Du	1	n	0.012
Du/Do	1	Lo	660
Qu/Qo	1	Sf	0.005825
		So	0.007
Kb (Fig. 4.16)			
Ku (Fig. 4.8)	0.05		
Hu	0.081551	Hf	3.844904
U.S. HGL	71.36801	D.S.HGL	71.28646
INVERT	65.45		
	5.918013	PRESSURE FLOW	

UNIVERSITY @58TH

MANHOLE (THRU WITH 9O DEGREE LATERAL)

U.S.		D.S. (rounded outfall)		LATERAL	
Qu	119	Qo	163	Ql	55
Du	4.5	Do	4.5	Dl	3
Vu	7.482247	Vo	10.24879	Vl	7.780908
(Vu^2)/2g	0.869317	(Vo^2)/2g	1.631020	Do/Du	1
		n	0.012	Dl/Do	0.666666
Ku* (Fig 4.14)	1.8	Length	670	B/Do	1
Reduction	0.2	Sf	0.005825	Qu/Qo	0.730061
Ku*	1.44	Hf	3.903160	Qu/Qo*Do/Du	0.730061
Mu	0.46	D.S. HGL	75.27117	Kl* (Fig 4.13)	1
Ku	0.6624			Reduction	0.3
Hu	1.080388			Kl*	0.7
U.S. HGL	76.35156			Ml (Fig 4.13)	0.6
INVERT	70.14			Kl	0.42
	6.211562	PRESSURE FLOW		Hl	0.685028
				LAT HGL	75.95620

MH BETWEEN 58TH/RECKER

MANHOLE	(THRU MANHOLE)		
U.S.		D.S. (rounded outfall)	
Qu	119	Qo	119
Du	4.5	Do	4.5
Vu	7.482247	Vo	7.482247
(Vu ^ 2)/2g	0.869317	(Vo ^ 2)/2g	0.869317
A/Du	1	n	0.012
Du/Do	1	Lo	650
Qu/Qo	1	Sf	0.003104
		So	0.007
Kb (Fig. 4.16)			
Ku (Fig. 4.8)	0.05		
Hu	0.043465	Hf	2.018244
U.S. HGL	78.41327	D.S.HGL	78.36980
INVERT	74.69		
	3.723272	PRESSURE FLOW	
4.5*0.8=	3.6		

UNIVERSITY @RECKER

MANHOLE (THRU WITH 90 DEGREE LATERAL)

U.S.		D.S. (rounded outfall)		LATERAL	
Qu	7	Qo	119	Ql	117
Du	2	Do	4.5	Dl	3.5
Vu	2.228169	Vo	7.482247	Vl	12.16073
(Vu ^ 2)/2g	0.077092	(Vo ^ 2)/2g	0.869317	Do/Du	2.25
		n	0.012	Dl/Do	0.777777
Ku* (Fig 4.14)	1.7	Length	650	B/Do	1
Reduction	0.2	Sf	0.003104	Qu/Qo	0.058823
Ku*	1.36	Hf	2.018244	Qu/Qo*Do/Du	0.132352
Mu	0.98	D.S. HGL	80.43151	Kl* (Fig 4.13)	1
Ku (Fig 4.15)	1.3328			Reduction	0.2
Hu	1.158625			Kl*	0.8
U.S. HGL	81.59014			Ml (Fig 4.13)	0.98
INVERT	79.24			Kl(Fig. 4.15)	0.784
	2.350142	OPEN CHANNEL		Hl	0.681544
4.5*0.8=	3.68	FLOW		LAT HGL	81.11306

MH BETWEEN RECKER/DETENTION POND

MANHOLE (THRU MANHOLE)

U.S.		D.S. (rounded outfall)	
Qu	7	Qo	7
Du	2	Do	2
Vu	2.228169	Vo	2.228169
(Vu ^ 2)/2g	0.077092	(Vo ^ 2)/2g	0.077092
A/Du	1	n	0.012
Du/Do	1	Lo	370
Qu/Qo	1	Sf	0.000811
		So	0.007
Kb (Fig. 4.1(			
Ku (Fig. 4.8)	0.05		
Hu	0.003854	Hf	0.300298
U.S. HGL	81.41721	D.S.HGL	81.41336

OPEN CHANNEL FLOW

UNIVERSITY DRIVE HYDRAULIC GRADE LINE

03-Mar-93

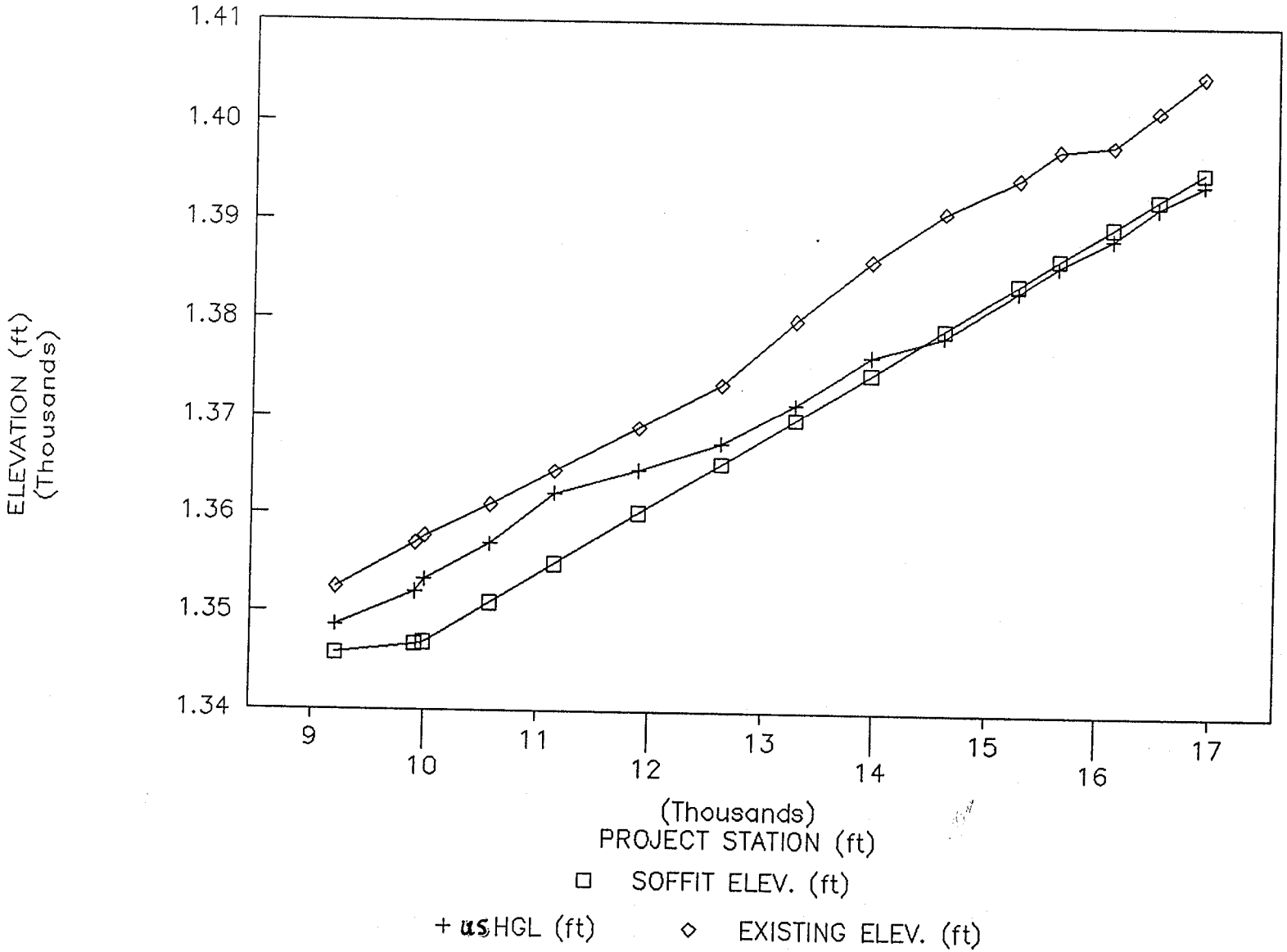
RUN NO.	NODE NO.	* PROJECT STATION	* UPSTREAM HEAD	DOWNSTREAM HEAD	U/S SOFFIT ELEV (ft)	D/S SOFFIT ELEV (ft)	* UPSTREAM EXISTING ELEV (ft)	LOCATION
20	15	9209	1348.69	1344.98	1345.82	1344.83	1352.50	M.H. U/S OF EMF
19	14	9911	1352.10	1348.69	1346.72	1345.82	1357.00	GRADE BREAK
18	13	9988	1353.33	1352.10	1346.91	1346.72	1357.75	HIGLEY @ UNIVERSITY
17	12	10570	1356.99	1353.33	1350.98	1346.91	1361.00	M.H.
16	11	11140	1362.25	1356.99	1354.97	1350.98	1364.50	54TH STREET
14	10	11890	1364.65	1362.25	1360.22	1354.97	1369.00	M.H.
13	9	12620	1367.51	1364.65	1365.33	1360.22	1373.50	56TH STREET
11	8	13280	1371.46	1367.51	1369.95	1365.33	1380.00	M.H.
10	7	13950	1376.46	1371.46	1374.64	1369.95	1386.00	58TH STREET
8	6	14600	1378.53	1376.46	1379.19	1374.64	1391.00	59TH STREET
7	5	15250	1383.09	1378.53	1383.74	1379.19	1394.50	RECKER ROAD
4	4	15620	1385.63	1383.09	1386.33	1383.74	1397.50	60TH PLACE
3	3	16100	1388.50	1385.63	1389.69	1386.33	1398.00	M.H.
2	2	16500	1391.79	1388.50	1392.49	1389.69	1401.50	62ND STREET
1	1	16900	1394.09	1391.79	1395.29	1392.49	1405.00	M.H. END TRUNK LINE

* = PLOT

SLA, INC.

UNIVERSITY DRIVE STORM DRAIN PROFILES

EMF TO POND "B"



APPENDIX F: SIDE STREET INLET ANALYSIS

GIVEN: $Q = 104$ cfs (HEC-1 HYDROLOGIC MODEL)

1. INSTALL BANK OF BICYCLE SAFE GRATES ACROSS THE FULL WIDTH OF THE ROADWAY APPROX. 100 FT. NORTH OF THE CURB RETURN @ UNIVERSITY.

NORMAL DEPTH CALCS: (HEC-2 @ STA. 1+00)

APPROACH ROADWAY WIDTH INTERCEPTED BY PROPOSED GRATES = 36 ft.

$V = 4.0$ fps
$A = 23.5$ ft^2
} ASSUME 94 cfs IS THE TOTAL FRONTAL FLOW AT GRATES

$d = 0.7'$ (MAXIMUM)

$$Y_h = \frac{A}{W} = \frac{23.5}{36} = 0.65 \text{ ft}$$

GRATE CAPACITY ANALYSIS:

$$E_0 = \frac{Q_w}{Q} = 1-(1-W/T)^{2.67} \quad \text{(HEC-12, EQN. 7)}$$

E_0 = RATIO OF FRONTAL FLOW TO TOTAL GUTTER FLOW

$$E_0 = \frac{94}{104} = 0.90$$

ASSUME: NO SIDE FLOW INTERCEPTION ALONG CURB

$$R_f = 1-0.09(V-V_0) \quad \text{(HEC-12, EQN. 9)}$$

V_0 = SPLASH OVER VELOCITY
V = GUTTER FLOW VELOCITY
R_f = RATIO OF FRONTAL FLOW INTERCEPTED TO TOTAL FRONTAL FLOW

TO ASSURE TOTAL INTERCEPTION OF FRONTAL FLOW, APPLY A 60% REDUCTION FACTOR TO THE LENGTH OF THE PROPOSED GRATES PER FCDMC TABLE 3.2.

ASSUME: MAG. STD. DETAIL 540-2, GRATE EF-1

$W \simeq 2$ ft; $L = 3'4''$

$L_e = 3.3(0.6) = 2$ ft

$V_0 = 4$ fps (HEC-12, CHART 7)

THEREFORE: $R_f = 1$

$E = R_f E_0 + R_s(1 - E_0)$ (HEC-12, EQN. 11)

SINCE IT IS ASSUMED THAT NO SIDE FLOW WILL BE INTERCEPTED, E BECOMES:

$E = R_f E_0 = 0.9(1)$

$E = 0.9$

$Q_i = EQ = 0.9(104) = \underline{\underline{94 \text{ cfs}}}$

BY PASS FLOW $= Q_b = Q - Q_i = 104 - 94$

$\underline{\underline{Q_b = 10 \text{ cfs}}}$

CHECK W/ ADOT EQN:

$$L = \frac{V}{2}(d + d_b)^{1/2}$$

V = APPROACH VELOCITY, fps
d = DEPTH OF APPROACH FLOW, ft
d_b = DEPTH OF BARS IN GRATE, ft
L = EFFECTIVE LENGTH OF GRATE, ft

$$L_e = \frac{4}{2}(0.65 + 0.29)^{1/2}$$

$L_e = 1.94$ ft

$L = \frac{1.94}{0.6} = 3.2 \text{ ft} < 3'4''$ OK ✓

GIVEN:

$Q = 10$ cfs
$B = 36.4$
$W = 2$ ft; $L = 3'4''$
$n = 0.016$
$Z = 6$
$S = 0.0030$ ft/ft
USE A LW-1 GRATE (MAG. STD. 540-2)

NORMAL DEPTH CALCS: (HEC-2 @ STA 0+50)

$d = 0.2$ ft
$V = 1.6$ ft/sec

$$E_0 = \frac{W}{B + dZ}$$ (HEC-12, CHART 17)

$$= \frac{2}{36.4 + 0.2(6)}$$

$$E_0 = 0.053$$

$$R_f = 1 - 0.09(V - V_0)$$ (HEC-12, EQN 9)

FROM CHART 7 — $V_0 = 6$ ft/s

$$R_f = 1 - 0.09(1.6 - 6) = 1$$

$$R_S = \frac{1}{\left(1 + \frac{0.15\,V^{1.8}}{S_x\,L^{2.3}}\right)}$$ (HEC-12, EQN 10)

$$R_S = \frac{1}{\left(1 + \frac{0.15(1.6)^{1.8}}{0.01(3.3)^{2.3}}\right)} = 0.31$$

$S_x = 0.01$ — MINIMUM VALUE ON CHART 8 (per SECTION 10)

$E = R_f E_0 + R_s (1 - E_0)$ (HEC-12, EQN 11)

$E = 1(0.053) + 0.31(1 - 0.053)$

$E = 0.35$

$Q_i = EQ = 0.35(10) = 3.5$ cfs

$Q_b = Q - 0.75(Q_i) = 10 - 2.6 = 7.4$

NORMAL DEPTH CALCS: (HEC-2 @ STA. 0+00)

$d = 0.18$ ft
$V = 1.3$ fps

$E_0 = 0.053$
$R_f = 1$
$R_s = 0.39$

$E = 0.42$

$Q_i = 0.42(7.4) = 3.1$

$Q_b = Q - 0.75(Q_i) = 7.4 - 2.3 = 5.1$

NORMAL DEPTH CALCS: (HEC-2 @ STA. 0+00)

$d = 0.15$ ft
$V = 1.1$ fps

$E_0 = 0.053$
$R_f = 1$
$R_s = 0.47$

$E = 0.50$

$Q_i = 0.5(5.1) = 2.6$

$Q_b = 5.1 - 0.75(2.6) = 3.2$ cfs

STA. 0+00:

$$Q_i = 3.0\,P\,d^{3/2}$$

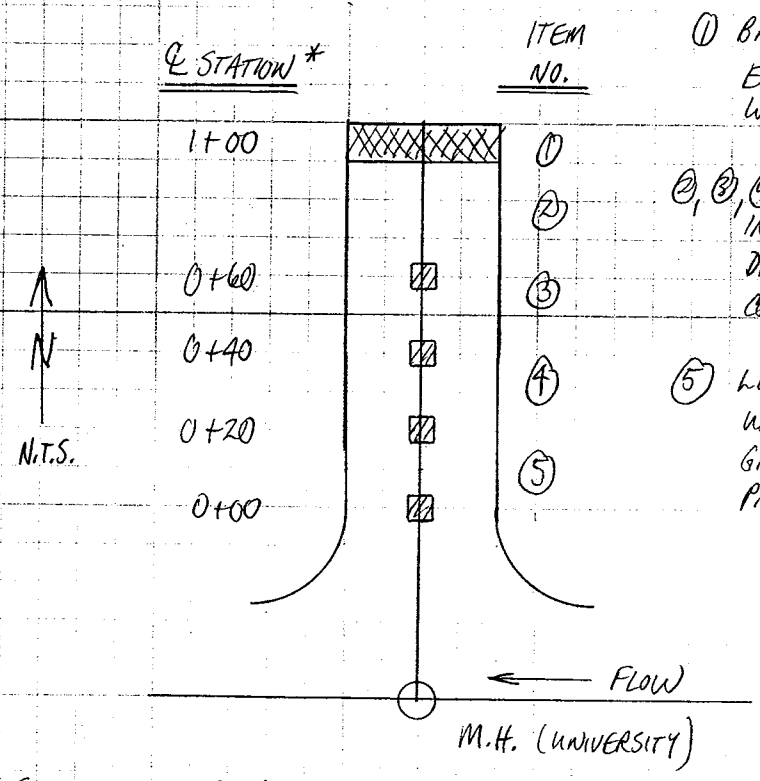
$$d = \left(\frac{Q_i}{3P}\right)^{2/3}$$

TO ACCOUNT FOR CLOGGING, ASSUME $Q_i = 2Q_b$, WHICH IS EQUIVALENT TO A 50% REDUCTION FACTOR. DETERMINE THE SUMP DEPTH REQUIRED TO CAPTURE REMAINING FLOW.

$$d = \left[\frac{2(3.2)}{3(10.6)}\right]^{2/3}$$

$$d = \underline{0.34\,ft}$$

DESIGN SKETCH:



CATCH BASIN DESCRIPTION

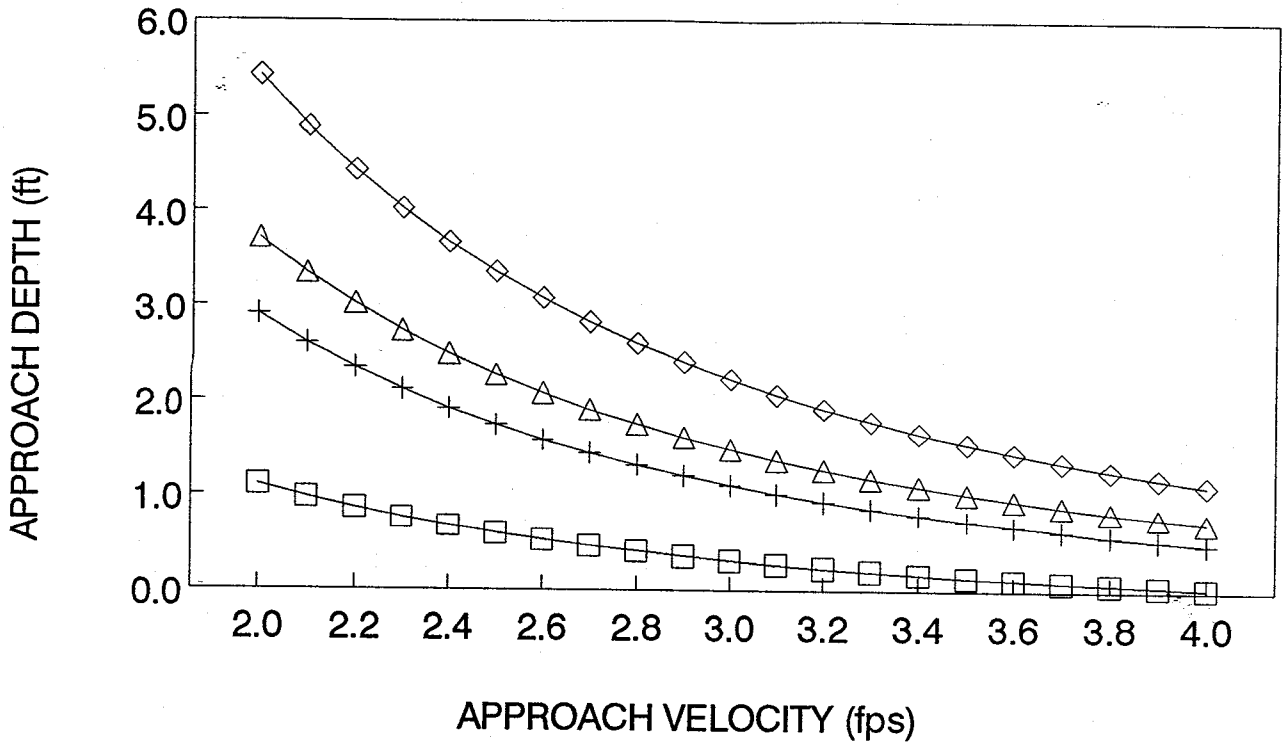
① BANK OF MAG. STD. DET. 540-2 EF-1 GRATES FOR FULL WIDTH OF ROADWAY

②, ③, ④ LW-1.0 GRATE DROP INLETS USING MAG. STD. DETAIL 538. INLETS CONSTRUCTED ON GRADE

⑤ LW-1.0 GRATE DROP INLET USING MAG. STD DETAIL 538. GRADE INTERSECTION TO PROVIDE 0.34' DEEP SUMP.

* STA. 0+00 IS @ BACK OF 54th STREET CURB RETURN

GRATE CAPACITY CHART ON GRADE
(Includes a 40% Clogging Factor)



□ 2 ft Reticuline + 3 ft Reticuline ◇ 4 ft Reticuline △ Std. MAG Grate

REDUCTION FACTOR = 0.6 (FCDMC TABLE 3.2)

GRATE TYPE	RETICULINE			MAG
LENGTH OF GRATE (ft) =	2	3	4	3.33
Db (ft) =	0.33	0.33	0.33	0.29

VELOCITY ft/sec	CALCULATED ALLOWABLE DEPTH (ft)			
2.0	1.11	2.91	5.43	3.71
2.1	0.97	2.61	4.89	3.34
2.2	0.86	2.34	4.43	3.01
2.3	0.76	2.12	4.02	2.73
2.4	0.67	1.92	3.67	2.49
2.5	0.59	1.74	3.35	2.27
2.6	0.52	1.58	3.07	2.08
2.7	0.46	1.44	2.83	1.90
2.8	0.40	1.32	2.61	1.75
2.9	0.35	1.21	2.41	1.61
3.0	0.31	1.11	2.23	1.49
3.1	0.27	1.02	2.06	1.37
3.2	0.23	0.93	1.92	1.27
3.3	0.20	0.86	1.78	1.18
3.4	0.16	0.79	1.66	1.09
3.5	0.14	0.72	1.55	1.01
3.6	0.11	0.67	1.44	0.94
3.7	0.09	0.61	1.35	0.88
3.8	0.07	0.56	1.26	0.82
3.9	0.05	0.52	1.18	0.76
4.0	0.03	0.48	1.11	0.71

GIVEN: $Q = 94$ cfs (HEC-1 HYDROLOGIC MODEL)

1. INSTALL BANK OF BICYCLE SAFE GRATES ACROSS THE FULL WIDTH OF THE ROADWAY APPROX. AT THE CURB RETURN AT UNIVERSITY DRIVE.

NORMAL DEPTH CALCS: (HEC-2 @ STA. 0+00)

APPROACH ROADWAY WIDTH INTERCEPTED BY PROPOSED GRATES = 47 ft

$V = 4$ fps
$A = 23.5$ ft^2
} ASSUME 94 cfs IS THE TOTAL FRONTAL FLOW AT GRATES

$d = 0.66'$ (MAXIMUM)

$$y_n = \frac{A}{W} = \frac{23.5}{47} = 0.50 \text{ ft}$$

GRATE CAPACITY ANALYSIS:

$$E_0 = \frac{Q_w}{Q} = 1-(1-W/T)^{2.67} \quad \text{(HEC-12, EQN. 7)}$$

E_0 = RATIO OF FRONTAL FLOW TO TOTAL FLOW

$$E_0 = \frac{94}{94} = 1.0$$

ASSUME: ALL FLOW IS FRONTAL FLOW CONTAINED BETWEEN THE CURBS.

$$R_f = 1-0.09(V-V_0) \quad \text{(HEC-12, EQN. 9)}$$

R_f = RATIO OF FRONTAL FLOW INTERCEPTED TO TOTAL FRONTAL FLOW
V = APPROACH VELOCITY
V_0 = SPLASH OVER VELOCITY

TO ASSURE TOTAL INTERCEPTION OF FRONTAL FLOW, APPLY A 60% REDUCTION FACTOR TO THE LENGTH OF THE PROPOSED GRATES PER FCDMC TABLE 3.2.

ASSUME: MAG. STD. DETAIL 540-2, GRATE EF-1

$W \simeq 2'$; $L = 3'4''$

$L_e = 3.3(0.6) = 2$ ft

$V_0 = 4$ fps (HEC-12, CHART 7)

THEREFORE: $R_f = 1$

$E = R_f E_0 + R_s (1 - E_0)$ (HEC-12, EQN. 11)

SINCE THE DESIGN FLOW IS ONLY 65% OF THE STREET CAPACITY AND THAT ALL THE FLOW IS FRONTAL FLOW, E BECOMES:

$E = R_f E_0 = 1$

$Q_i = EQ = 1(94) = \underline{94 \text{ cfs}}$

SINCE THE CLOGGING / REDUCTION FACTOR WAS APPLIED TO THE GRATE LENGTH, NO FLOW PAST THE GRATES IS ANTICIPATED.

CHECK W/ ADOT EQN:

$$L = \frac{V}{2}\left(d + d_b\right)^{1/2}$$

$$L_e = \frac{4}{2}\left(0.50 + 0.29\right)^{1/2}$$

$$L_e = 1.78 \text{ ft}$$

$$L = \frac{1.78}{0.6} = 2.9 \simeq 3.0 \text{ ft} < 3'4'' \quad \underline{OK} \checkmark$$

```
*********************************************
*  HEC-2 WATER SURFACE PROFILES             *
*                                           *
*  Version   4.6.2;  May 1991               *
*                                           *
*  RUN DATE    07MAR93    TIME    13:12:12  *
*********************************************
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****************************************
*  U.S. ARMY CORPS OF ENGINEERS        *
*  HYDROLOGIC ENGINEERING CENTER       *
*  609 SECOND STREET, SUITE D          *
*  DAVIS, CALIFORNIA 95616-4687        *
*        (916) 756-1104                *
****************************************
```

```
X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X         XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX             XXXXXXX
```

THIS RUN EXECUTED 07MAR93 13:12:13

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************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
************************************
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```
T1      SIMONS, LI & ASSOCIATES, INC. - TEMPE, AZ
T2      56th STREET CROSS SECTION 0+00
T3      56TH000.DAT

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        0        0        0     .0060       0        0       94      74.5      0

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      1        0       -1        0        0       0       -1        0        0       15


NC                                      0.1      0.3
NH       3      .013        4     .016       51     .013       55
X1       0        7        3       52
X3      10
GR   75.29        0    75.21        3    74.7        4    74.41     27.5    74.79      51
GR   75.23       52    75.17       55
```

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

```
*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO  .000
3720 CRITICAL DEPTH ASSUMED

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       75.21 ELREA=       75.23

     .000      .66    75.07    75.07    74.50    75.32      .25      .00      .00    75.21
    94.0       .0     94.0       .0       .0     23.5       .0       .0       .0    75.23
     .00      .00     4.00      .00     .000     .016     .000     .000    74.41     3.27
  .004814       0.       0.       0.        0       35        8      .00    48.37    51.64

FLOW DISTRIBUTION FOR SECNO=       .00          CWSEL=     75.07

STA=       3.      52.
  PER Q=    100.0
   AREA=     23.5
    VEL=      4.0
  DEPTH=       .5
```

THIS RUN EXECUTED 07MAR93 13:12:16

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HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

56TH000.DAT

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	.000	.00	.00	.00	74.41	94.00	75.07	75.07	75.32	48.14	4.00	23.51	13.55

56TH000.DAT

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	.000	94.00	75.07	.00	.00	.57	48.37	.00

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= .000 PROFILE= 1 CRITICAL DEPTH ASSUMED

GIVEN: Q = 55 cfs (HEC-1 HYDROLOGIC MODEL)

1. INSTALL BANK OF BICYCLE SAFE GRATES ACROSS THE FULL WIDTH OF THE ROADWAY APPROX. 50 ft NORTH OF THE CURB RETURN @ UNIVERSITY.

NORMAL DEPTH CALCS: (HEC-2 @ STA. 0+50)

APPROACH ROADWAY WIDTH INTERCEPTED BY PROPOSED GRATES = 37 ft

$V = 3.6$ fps, $A = 15.2$ ft^2 } ASSUME 54.7 cfs IS THE TOTAL FRONTAL FLOW @ GRATES

$d = 0.51$ ft (MAXIMUM)

$$y_n = \frac{15.2}{37} = 0.41 \text{ ft}$$

GRATE CAPACITY ANALYSIS:

$$E_o = \frac{54.7}{55} = 0.994$$

ASSUME: NO SIDE FLOW INTERCEPTION ALONG CURB

TO ASSURE TOTAL INTERCEPTION OF FRONTAL FLOW, APPLY A 60% CLOGGING FACTOR TO THE LENGTH OF THE PROPOSED GRATES PER FCDMC TABLE 3.2.

ASSUME: MAG STD. DETAIL 590-2, GRATE EF-1

$W = 2$ ft ; $L = 3'4''$

$L_e = 0.6(3.3) = 2$ ft

$V_o = 4$ fps (HEC-12, CHART 7)

THEREFORE: $R_f = 1$

SINCE IT IS ASSUMED THAT NO SIDE FLOW WILL BE INTERCEPTED, E BECOMES:

$$E = R_f E_0 = 1(0.994) = 0.994$$

$$Q_i = EQ = 0.994(55) = \underline{54.7 \text{ cfs}}$$

$$\text{BY PASS FLOW} = Q_b = Q - Q_i = 55 - 54.7 = 0.3 \text{ cfs}$$

$$Q_b = \underline{0.3 \text{ cfs}}$$

CHECK W/ ADOT EQN:

$$L_e = \frac{V}{2}(d + d_b)^{1/2}$$

$$L_e = \frac{3.6}{2}(0.41 + 0.29)^{1/2}$$

$$L_e = 1.51 \text{ ft}$$

$$L_T = \frac{1.51}{0.6} = 2.51 \text{ ft} < 3'4'' \quad \underline{OK} \checkmark$$

NOTE: IT WOULD NOT BE ECONOMICAL TO INSTALL ADDITIONAL CATCH BASINS TO CAPTURE THE BY PASS FLOW OF 0.3 cfs. THIS CONCLUSION IS BASED UPON:

1. MILD (0.0036 ft/ft) LONGITUDINAL SLOPE.
2. FLAT (0.0011 ft/ft) CROSS SLOPE OF THE ROADWAY GEOMETRY.

```
*******************************************
*  HEC-2 WATER SURFACE PROFILES           *
*                                         *
*  Version   4.6.2;  May 1991             *
*                                         *
*  RUN DATE    07MAR93    TIME    14:13:12 *
*******************************************
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****************************************
*  U.S. ARMY CORPS OF ENGINEERS        *
*  HYDROLOGIC ENGINEERING CENTER       *
*  609 SECOND STREET, SUITE D          *
*  DAVIS, CALIFORNIA 95616-4687        *
*        (916) 756-1104                *
****************************************
```

```
X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X         XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX              XXXXXXX
```

THIS RUN EXECUTED 07MAR93 14:13:12

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************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
************************************


T1      SIMONS, LI & ASSOCIATES, INC. - TEMPE, AZ
T2      58th STREET CROSS SECTION 0+50
T3      58TH050.DAT

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        0        0        0     .0054       0        0       55       87       0

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      1        0       -1        0        0       0       -1        0        0       15


NC                                      0.1      0.3
NH       3     .013      3.5     .016     40.5     .013       41
X1      50        6      3.5     40.5
X3      10
GR    87.1        0    87.04        3    86.67      3.5    86.57       22    86.87     40.5
GR   87.24       41
```

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

```
*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV=     .100 CEHV=     .300
1490 NH CARD USED
*SECNO 50.000
3720 CRITICAL DEPTH ASSUMED
    50.000       .51     87.08     87.08     87.00     87.28       .20       .00       .00     86.67
      55.0        .3      54.7        .0        .2      15.2        .0        .0        .0     86.87
       .00      1.89      3.59       .08      .013      .016      .013      .000     86.57       .93
   .004897        0.        0.        0.         0        11         5       .00     39.85     40.79


FLOW DISTRIBUTION FOR SECNO=     50.00         CWSEL=     87.08

STA=       1.       4.      41.      41.
  PER Q=       .5     99.5       .0
   AREA=       .2     15.2       .0
    VEL=      1.9      3.6       .1
  DEPTH=       .1       .4       .1
```

THIS RUN EXECUTED 07MAR93 14:13:14

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

58TH050.DAT

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	50.000	.00	.00	.00	86.57	55.00	87.08	87.08	87.28	48.97	3.59	15.41	7.86

58TH050.DAT

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	50.000	55.00	87.08	.00	.00	.08	39.85	.00

SUMMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= 50.000 PROFILE= 1 CRITICAL DEPTH ASSUMED

SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL STREET CAPACITY SUMMARY

JOB NO. AZ-EE-02
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LOCATION	INVERTED CROWN CAPACITY (cfs)	NORMAL CROWN EAST MIN. (cfs)	NORMAL CROWN WEST MIN. (cfs)	NORMAL CROWN EAST AVG. (cfs)	NORMAL CROWN WEST AVG. (cfs)	NORMAL CROWN TOTAL AVG. (cfs)	AVERAGE SLOPE (ft/ft)
52nd PLACE	38.7						0.0038
54th STREET	30.3						0.0029
55th PLACE	56.2						0.0017
56th STREET	145.9						0.0060
56th PLACE	45.4			4.9	4.2	7.1	0.0047
58th STREET	31.8						0.0040
RECKER		1.0	17.5	9.1	22.8	31.8	0.0076
60th PLACE	13.4	3.6	2.9	3.9	3.2	7.0	0.0046
61st STREET	27.9	2.8	3.8	4.0	4.9	8.9	0.0084

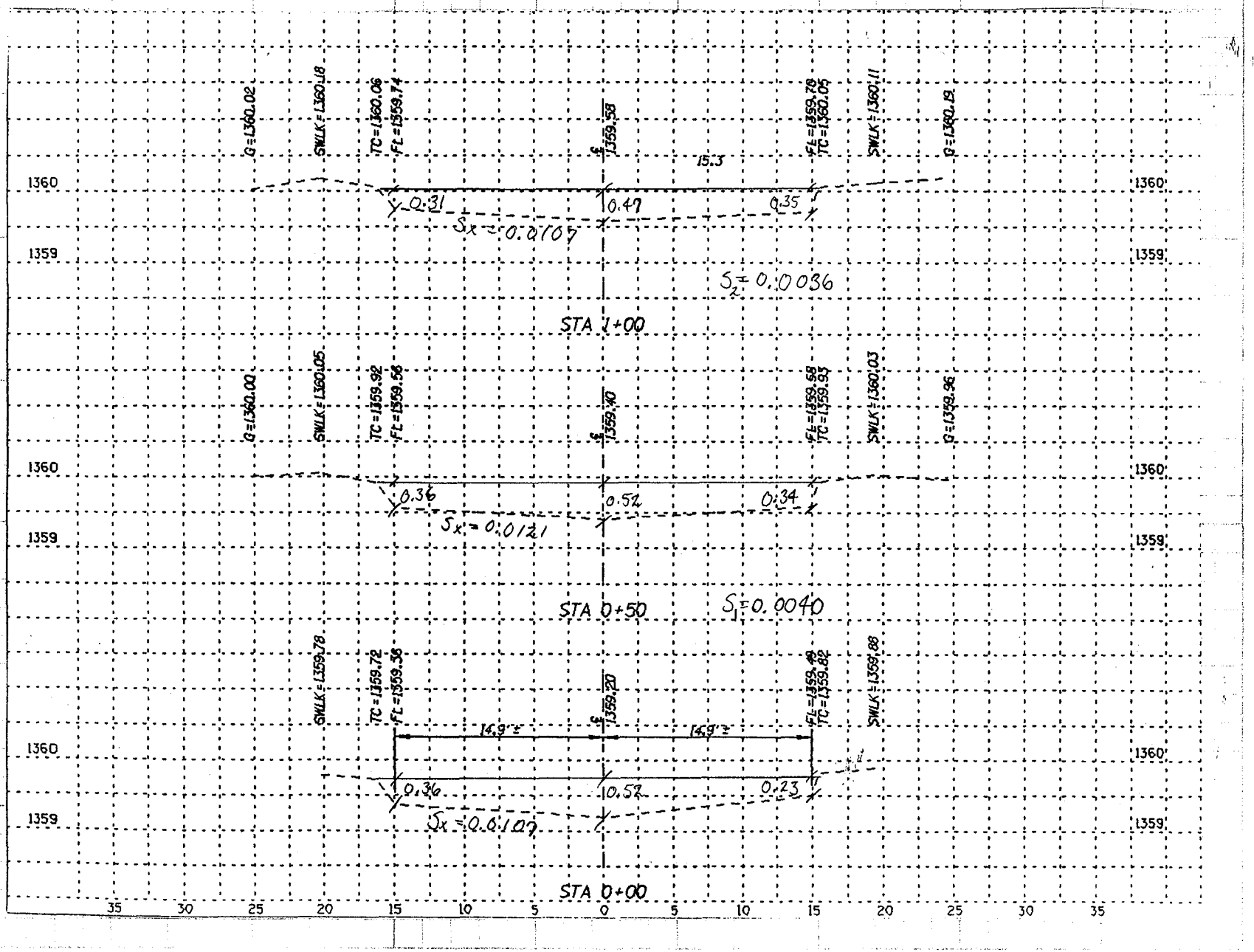
NOTE: STREETS W/ BOTH NORMAL & INVERTED CROWN CAPACITIES INDICATE TYPICALLY INVERTED CROWN STREETS AT UNIVERSITY DRIVE W/ NORMAL CROWNS NORTH OF UNIVERSITY DRIVE.

SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL 52nd PLACE CROSS-SECTIONS

JOB NO. AZ-EE-02
DATE CHECKED [illegible]
CHECKED BY 3/8/93

PAGE
DATE 2/25/93
COMPUTED BY VRM



$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

STA. 0+00:

$$A = \left(\frac{0.36+0.52}{2}\right)(14.9) + \left(\frac{0.52+0.23}{2}\right)(14.9) = 12.14$$

$$W_p = 0.36 + 0.23 + 2(14.9) = 30.39$$

STA. 0+50:

$$A = \left(\frac{0.36+0.52}{2}\right)(14.9) + \left(\frac{0.52+0.34}{2}\right)(14.9) = 12.96$$

$$W_p = 0.36 + 0.34 + 2(14.9) = 30.50$$

STA. 1+00:

$$A = \left(\frac{0.31+0.47}{2}\right)(14.9) + \left(\frac{0.47+0.35}{2}\right)(14.9) = 11.92$$

$$W_p = 0.31 + 0.35 + 2(14.9) = 30.46$$

AVERAGE:

$$A = (12.14 + 12.96 + 11.92)/3 = 12.34$$
$$W_p = (30.39 + 30.50 + 30.46)/3 = 30.45$$
$$S = 0.0038$$

CAPACITY:

$$Q = \frac{1.486}{0.016}(12.34)\left(\frac{12.34}{30.45}\right)^{2/3}(0.0038)^{1/2}$$

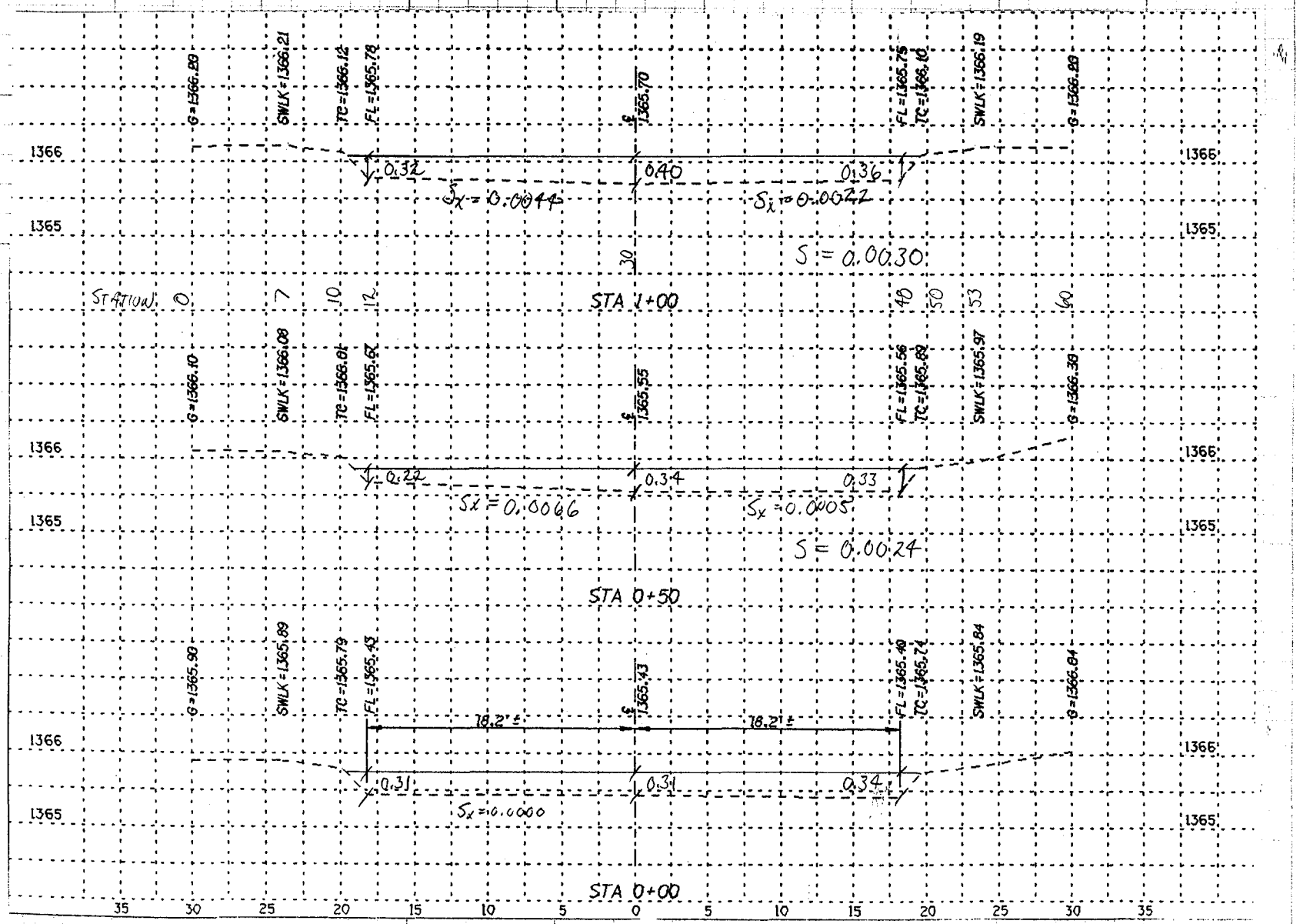
$$\underline{\underline{Q = 38.7 \text{ cfs}}}$$

SIMONS, LI & ASSOCIATES, INC.

CLIENT _____ PROJECT ENTRANCO UNIVERSITY DRIVE DETAIL 54th STREET CROSS-SECTIONS

JOB NO. AZ-EE-02 DATE CHECKED 3/8/93 CHECKED BY RMC

PAGE _____ DATE 2/25/93 COMPUTED BY VRM



SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL 54th STREET CROSS-SECTIONS

JOB NO. AZ-EE-02
DATE CHECKED 2/25/93
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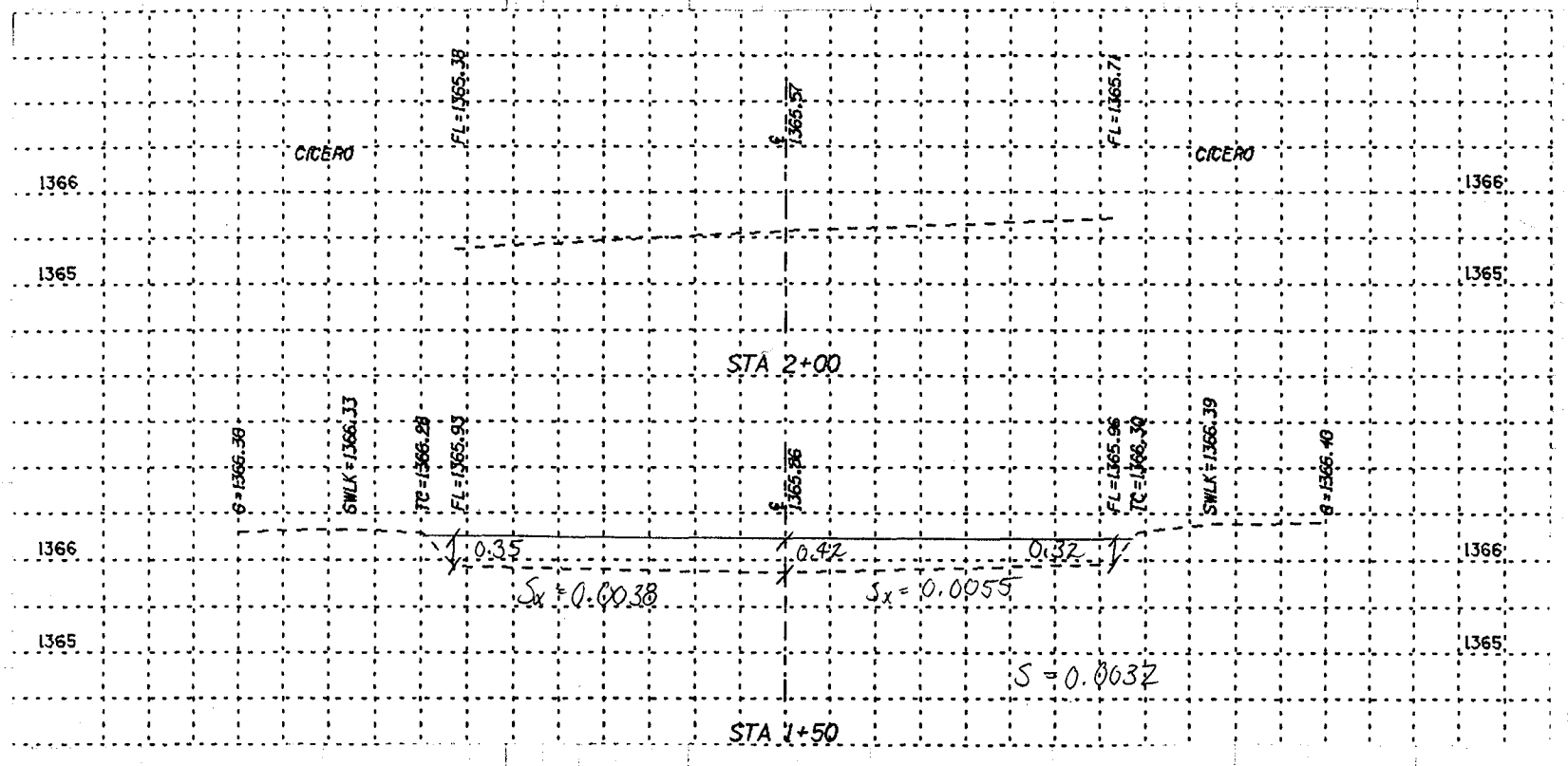
DATE 2/25/93
COMPUTED BY JRM



STA. 0+00:

$$A = 0.31(18.2) + \left(\frac{0.31+0.34}{2}\right)(18.2) = 11.56$$

$$W_p = 0.31 + 0.34 + 2(18.2) = 37.05$$

STA. 0+50:

$$A = \left(\frac{0.22+0.34}{2}\right)(18.2) + \left(\frac{0.34+0.33}{2}\right)(18.2) = 11.19$$

$$W_p = 0.22 + 0.33 + 2(18.2) = 36.95$$

STA. 1+00:

$$A = \left(\frac{0.32+0.40}{2}\right)(18.2) + \left(\frac{0.40+0.36}{2}\right)(18.2) = 13.47$$

$$W_p = 0.32 + 0.36 + 2(18.2) = 37.08$$

STA. 1+50:

$$A = \left(\frac{0.35+0.42}{2}\right)(18.2) + \left(\frac{0.42+0.32}{2}\right)(18.2) = 13.74$$

$$W_p = 0.35 + 0.32 + 2(18.2) = 37.07$$

AVERAGE:

$$A = (11.56 + 11.19 + 13.47 + 13.74)/4 = 12.49$$

$$W_p = (37.05 + 36.95 + 37.08 + 37.07)/4 = 37.04$$

$$S = 0.0029$$

CAPACITY:

$$Q = \frac{1.486}{0.016}\, 12.49 \left(\frac{12.49}{37.04}\right)^{2/3} (0.0029)^{1/2}$$

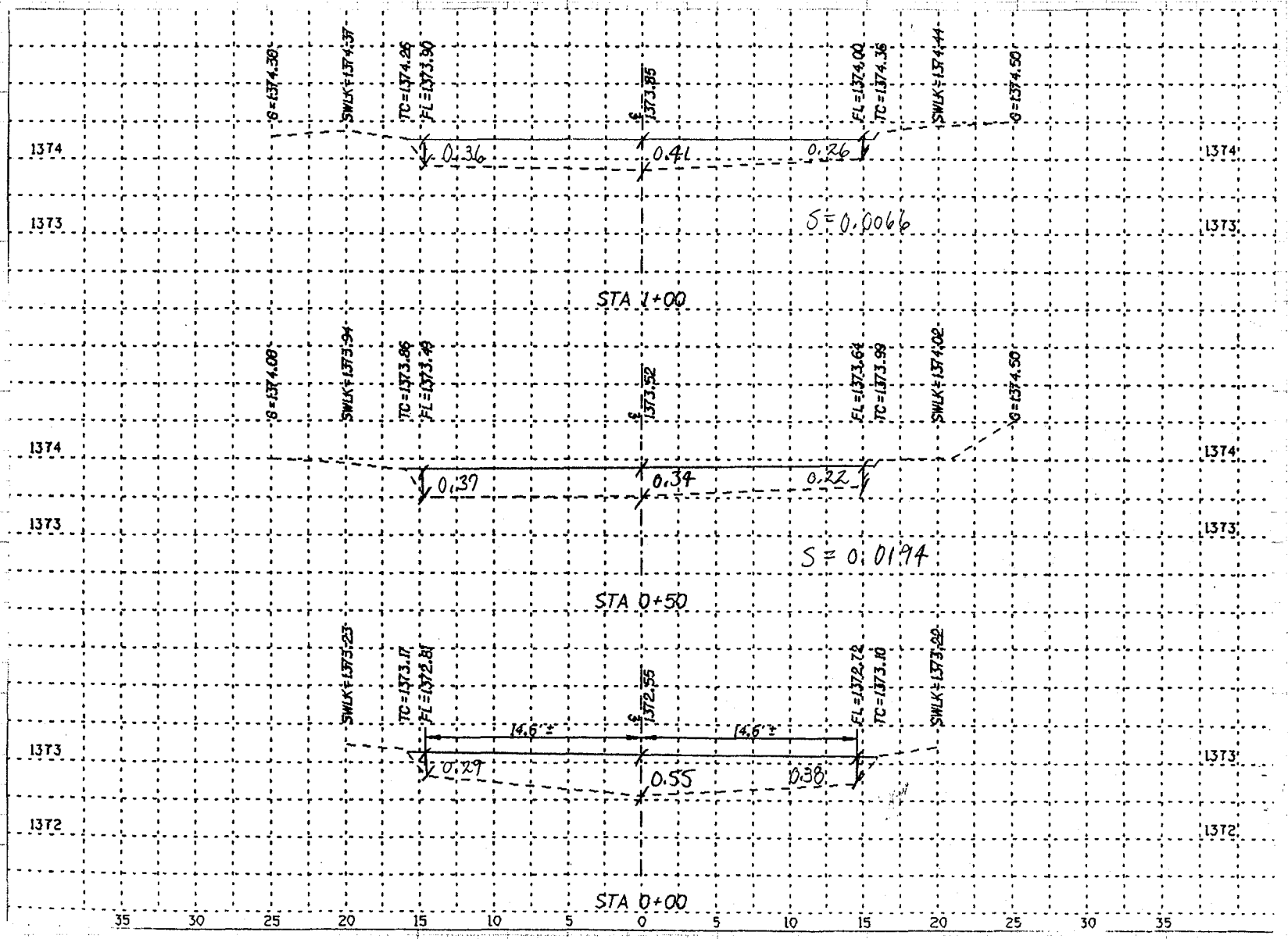
$$\underline{\underline{Q = 30.3 \text{ cfs}}}$$

SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL 55th PLACE CROSS-SECTIONS

JOB NO. AB-EE-02
DATE CHECKED 3/9/93
CHECKED BY RAB

PAGE
DATE 2/25/93
COMPUTED BY JRM



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SIMONS, Li & ASSOCIATES, INC.

CLIENT: ENTRANCO
PROJECT: UNIVERSITY DRIVE
DETAIL: 55th PLACE CROSS-SECTIONS

JOB NO.: AZ-EE-02
DATE CHECKED: 3/8/93
CHECKED BY: RME

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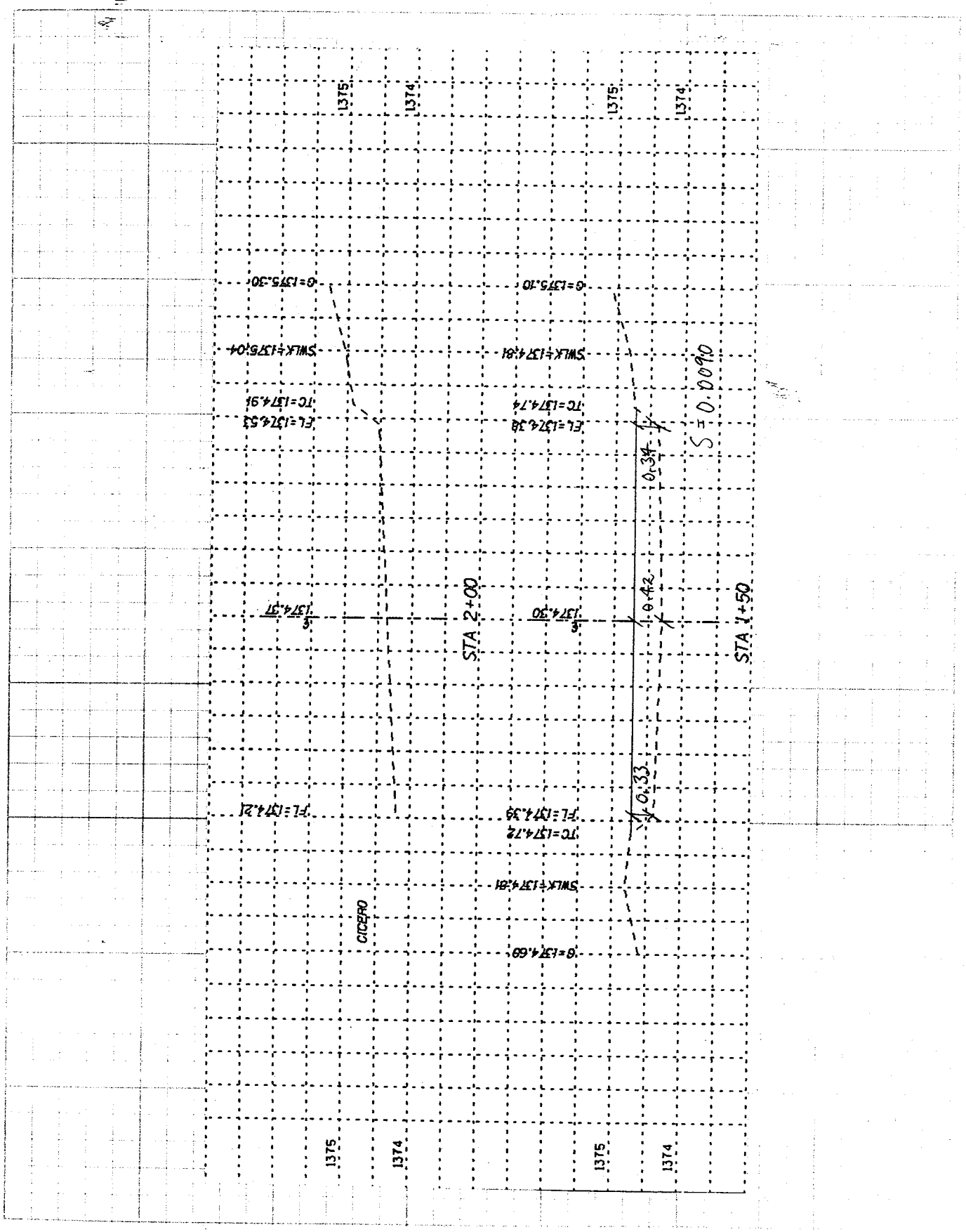
DATE: 2/23/93
COMPUTED BY: JRM



STA. 0+00:

$$A = \left(\frac{0.29+0.55}{2}\right)(14.6) + \left(\frac{0.55+0.38}{2}\right)(14.6) = 12.92$$

$$W_p = 0.29+0.38+2(14.6) = 29.87$$

STA. 0+50:

$$A = \left(\frac{0.37+0.34}{2}\right)(14.6) + \left(\frac{0.34+0.22}{2}\right)(14.6) = 9.27$$

$$W_p = 0.37+0.22+2(14.6) = 29.79$$

STA. 1+00:

$$A = \left(\frac{0.36+0.41}{2}\right)(14.6) + \left(\frac{0.41+0.26}{2}\right)(14.6) = 10.51$$

$$W_p = 0.36+0.26+2(14.6) = 29.82$$

STA. 1+50:

$$A = \left(\frac{0.33+0.42}{2}\right)(14.6) + \left(\frac{0.42+0.34}{2}\right)(14.6) = 11.02$$

$$W_p = 0.33+0.34+2(14.6) = 29.87$$

AVERAGE:

$$A = (12.92+9.27+10.51+11.02)/4 = 10.93$$

$$W_p = (29.87+29.79+29.82+29.87)/4 = 29.84$$

$$S = 0.0117$$

CAPACITY:

$$Q = \frac{1.486}{0.016}(0.93)\left(\frac{10.93}{29.84}\right)^{2/3}(0.0117)^{1/2}$$

$$\underline{\underline{Q = 56.2 \text{ cfs}}}$$

SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL 56th STREET CROSS-SECTIONS

JOB NO. AZ-EE-02
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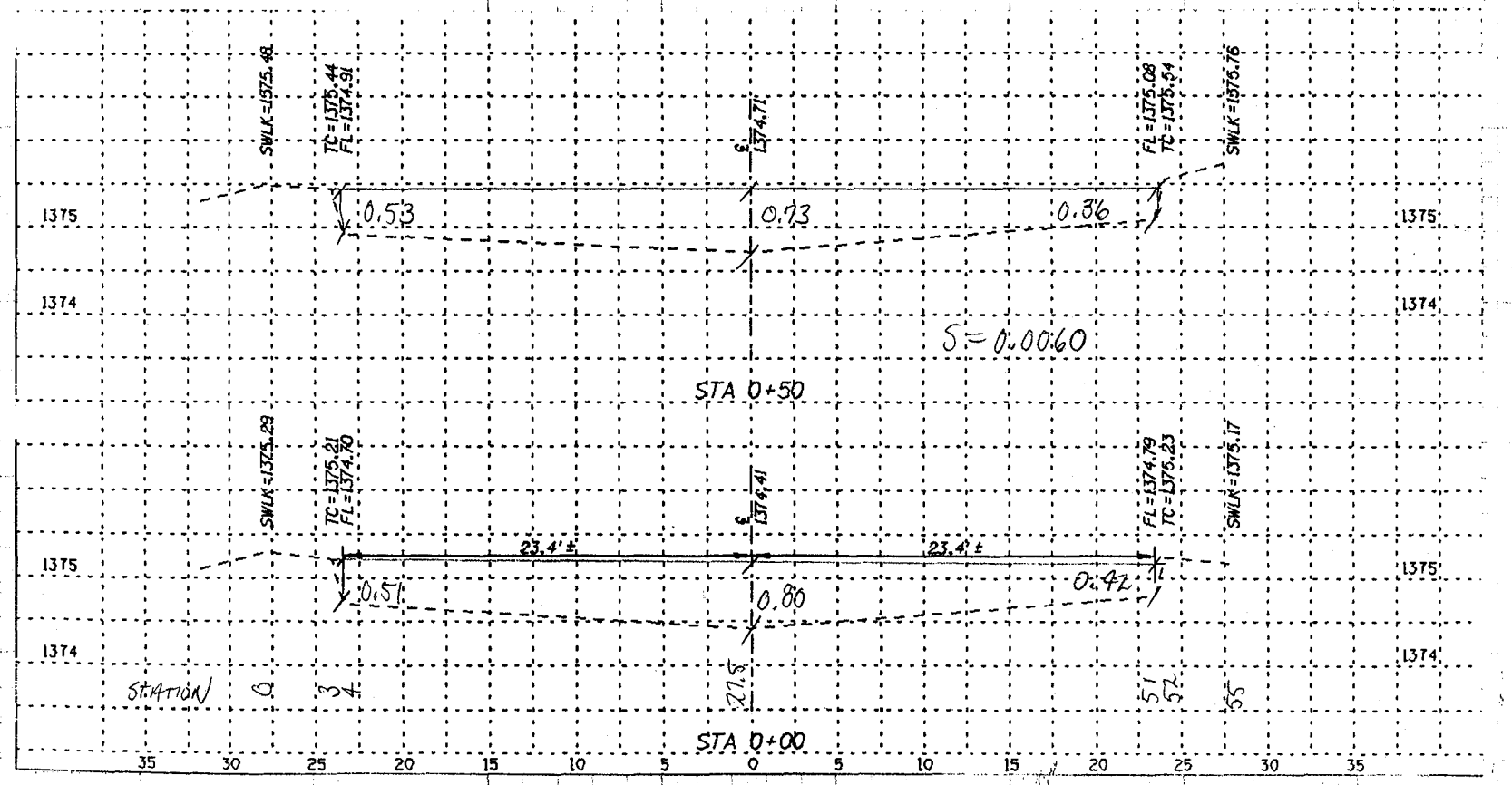
PAGE
DATE 2/26/93
COMPUTED BY SKM



STA. 0+00:

$$A = \left(\frac{0.51+0.80}{2}\right)(23.4) + \left(\frac{0.80+0.42}{2}\right)(23.4) = 29.60$$

$$W_p = 0.51+0.42+2(23.4) = 47.73$$

STA. 0+50:

$$A = \left(\frac{0.53+0.73}{2}\right)(23.4) + \left(\frac{0.73+0.36}{2}\right)(23.4) = 27.50$$

$$W_p = 0.53+0.36+2(23.4) = 47.69$$

AVERAGE:

$$A = (29.60+27.50)/2 = 28.55$$

$$W_p = (47.73+47.69)/2 = 47.71$$

$$S = 0.0060$$

CAPACITY:

$$Q = \frac{1.486}{0.016}(28.55)\left(\frac{28.55}{47.71}\right)^{2/3}(0.0060)^{1/2}$$

$$Q = 145.9 \text{ cfs}$$

SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL 56th PLACE CROSS-SECTIONS

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CHECKED BY RMB

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DATE 3/1/93
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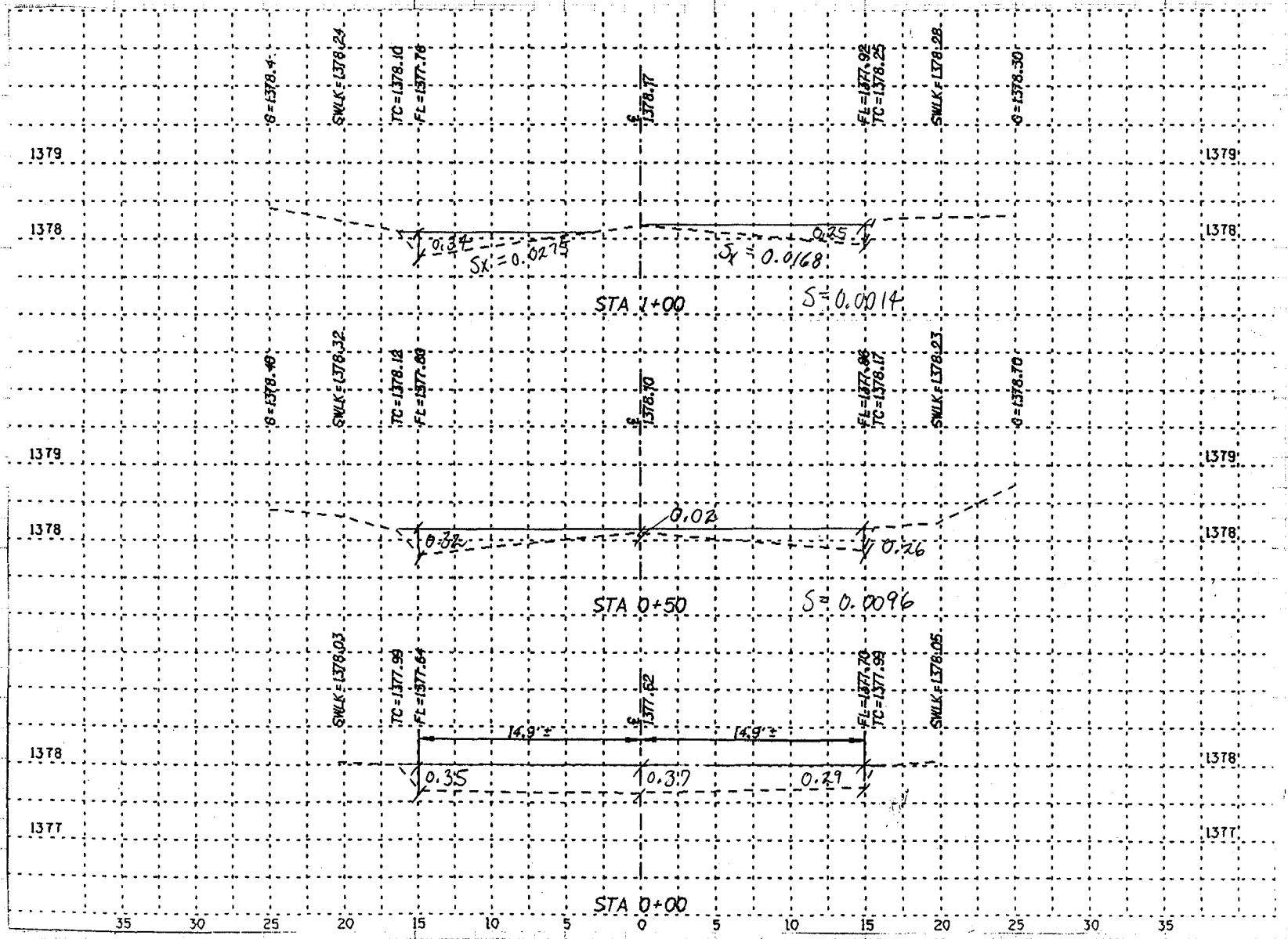

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CLIENT ENTRANCO

PROJECT UNIVERSITY DRIVE

DETAIL 56th PLACE CROSS-SECTIONS

JOB NO. A2-EE-02

DATE CHECKED 3/8/93

CHECKED BY RMR

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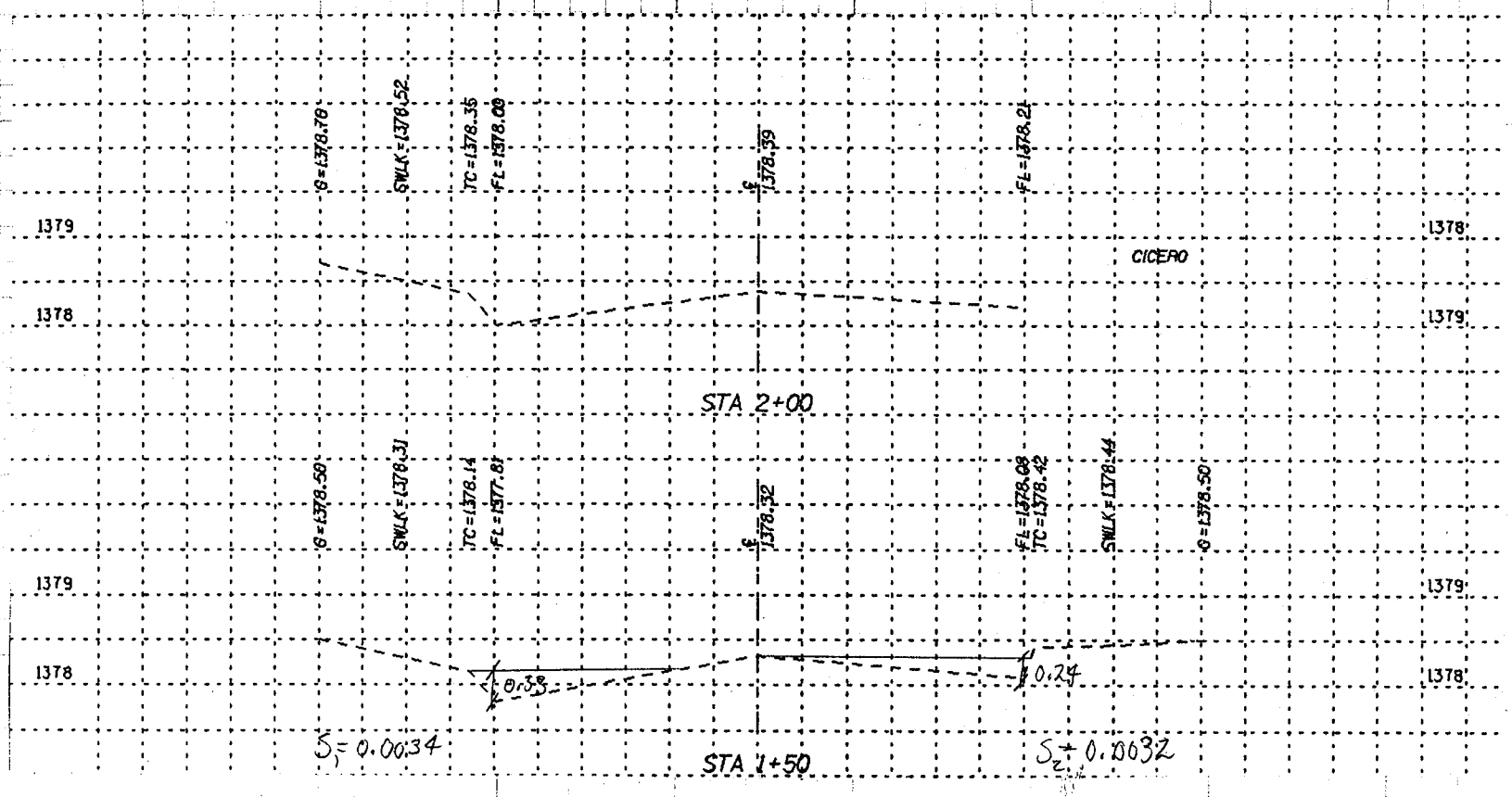
COMPUTED BY JRM



STA. 0+00:

$$A = \left(\frac{0.35+0.37}{2}\right)(14.9) + \left(\frac{0.37+0.29}{2}\right)(14.9) = 10.28$$

$$W_p = 0.35+0.29+2(14.9) = 30.44$$

$$Q = \frac{1.486}{0.016}(10.28)\left(\frac{10.28}{30.44}\right)^{2/3}(0.0096)^{1/2}$$

$$Q = 45.4 \text{ cfs}$$

STA. 0+50:

$$A = \left(\frac{0.32+0.02}{2}\right)(14.9) + \left(\frac{0.02+0.26}{2}\right)(14.9) = 4.62$$

$$W_p = 0.32+0.26+2(14.9) = 30.38$$

$$Q = \frac{1.486}{0.016}(4.62)\left(\frac{4.62}{30.38}\right)^{2/3}(0.0014)^{1/2}$$

$$Q = 4.6 \text{ cfs}$$

STA. 1+00:

$$Q_L = \left(\frac{0.56}{0.016}\right)(0.0275)^{1.67}(0.0034)^{0.5}(12.4)^{2.67}$$

$$Q_L = 4.2 \text{ cfs}$$

$$Q_R = \left(\frac{0.56}{0.016}\right)(0.0168)^{1.67}(0.0032)^{0.5}(14.9)^{2.67}$$

$$Q_R = 2.9 \text{ cfs}$$

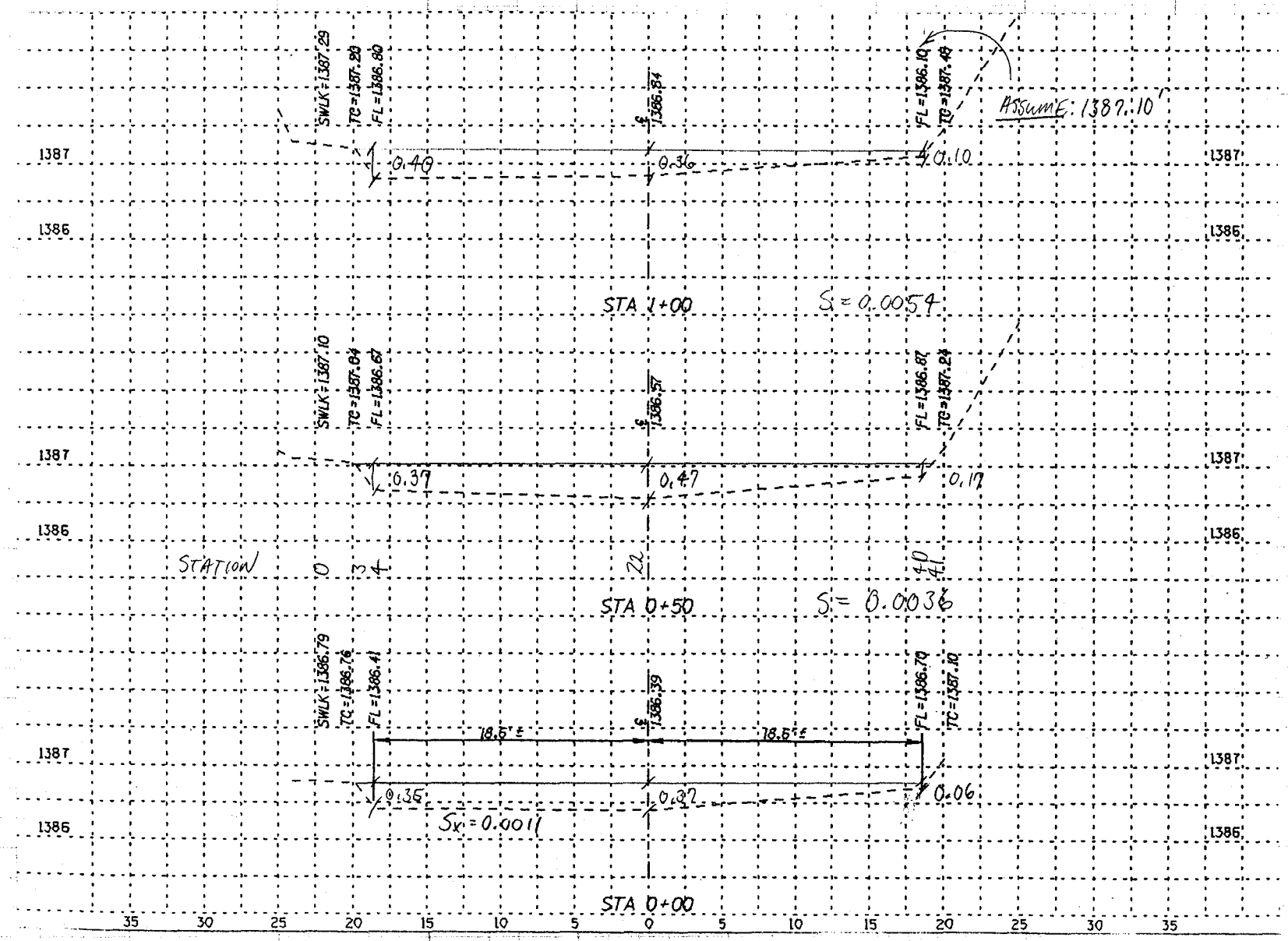
$$Q_T = 4.2+2.9 = 7.1 \text{ cfs}$$

SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL 58th STREET CROSS-SECTIONS

JOB NO. AZ-EE-02
DATE CHECKED 3/6/93
CHECKED BY RMC

PAGE
DATE 3/1/93
COMPUTED BY VCM



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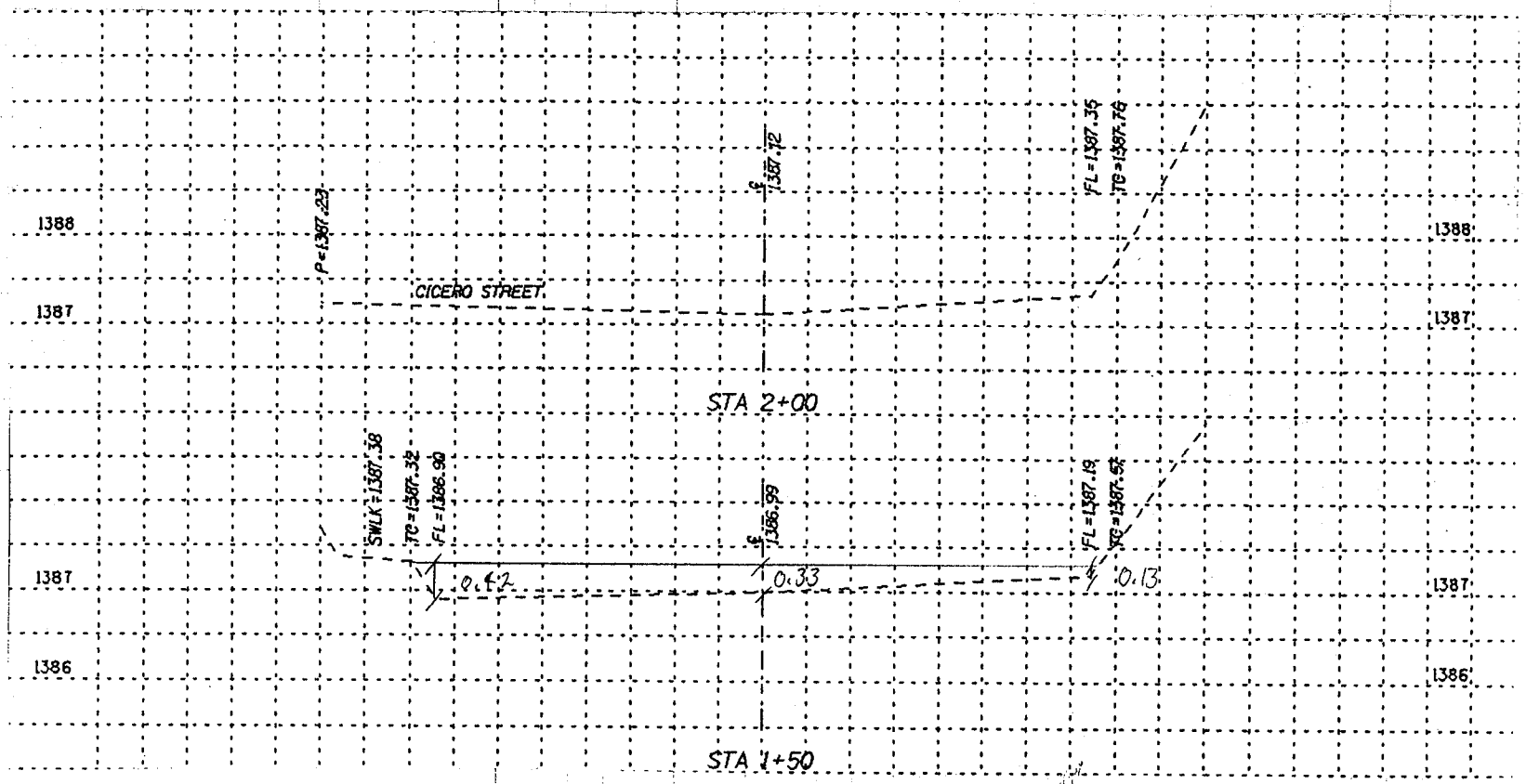
SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL 58 ℄ STREET CROSS-SECTION

JOB NO. AZ-EE-02
DATE CHECKED 3/8/93
CHECKED BY RMB

PAGE
DATE 3/1/93
COMPUTED BY JRM



STA. 0+00:

$$A = \left(\frac{0.35+0.37}{2}\right)(18.6) + \left(\frac{0.37+0.06}{2}\right)(18.6) = 10.70$$

$$W_p = 0.35+0.06+2(18.6) = 37.61$$

STA. 0+50:

$$A = \left(\frac{0.37+0.47}{2}\right)(18.6) + \left(\frac{0.47+0.17}{2}\right)(18.6) = 13.76$$

$$W_p = 0.37+0.17+2(18.6) = 37.74$$

STA. 1+00:

$$A = \left(\frac{0.40+0.36}{2}\right)(18.6) + \left(\frac{0.36+0.10}{2}\right)(18.6) = 11.35$$

$$W_p = 0.40+0.10+2(18.6) = 37.70$$

STA. 1+50:

$$A = \left(\frac{0.42+0.33}{2}\right)(18.6) + \left(\frac{0.33+0.13}{2}\right)(18.6) = 11.25$$

$$W_p = 0.42+0.13+2(18.6) = 37.75$$

AVERAGE:

$$A = (10.70+13.76+11.35+11.25)/4 = 11.77$$

$$W_p = (37.61+37.74+37.70+37.75)/4 = 37.70$$

$$S = 0.0040$$

CAPACITY:

$$Q = \frac{1.486}{0.016}(11.77)\left(\frac{11.77}{37.70}\right)^{2/3}(0.0040)^{1/2}$$

$$\underline{\underline{Q = 31.8 \text{ cfs}}}$$

SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL 60th PLACE CROSS-SECTIONS

JOB NO. A2-EE-02
DATE CHECKED 3/8/92
CHECKED BY RAK

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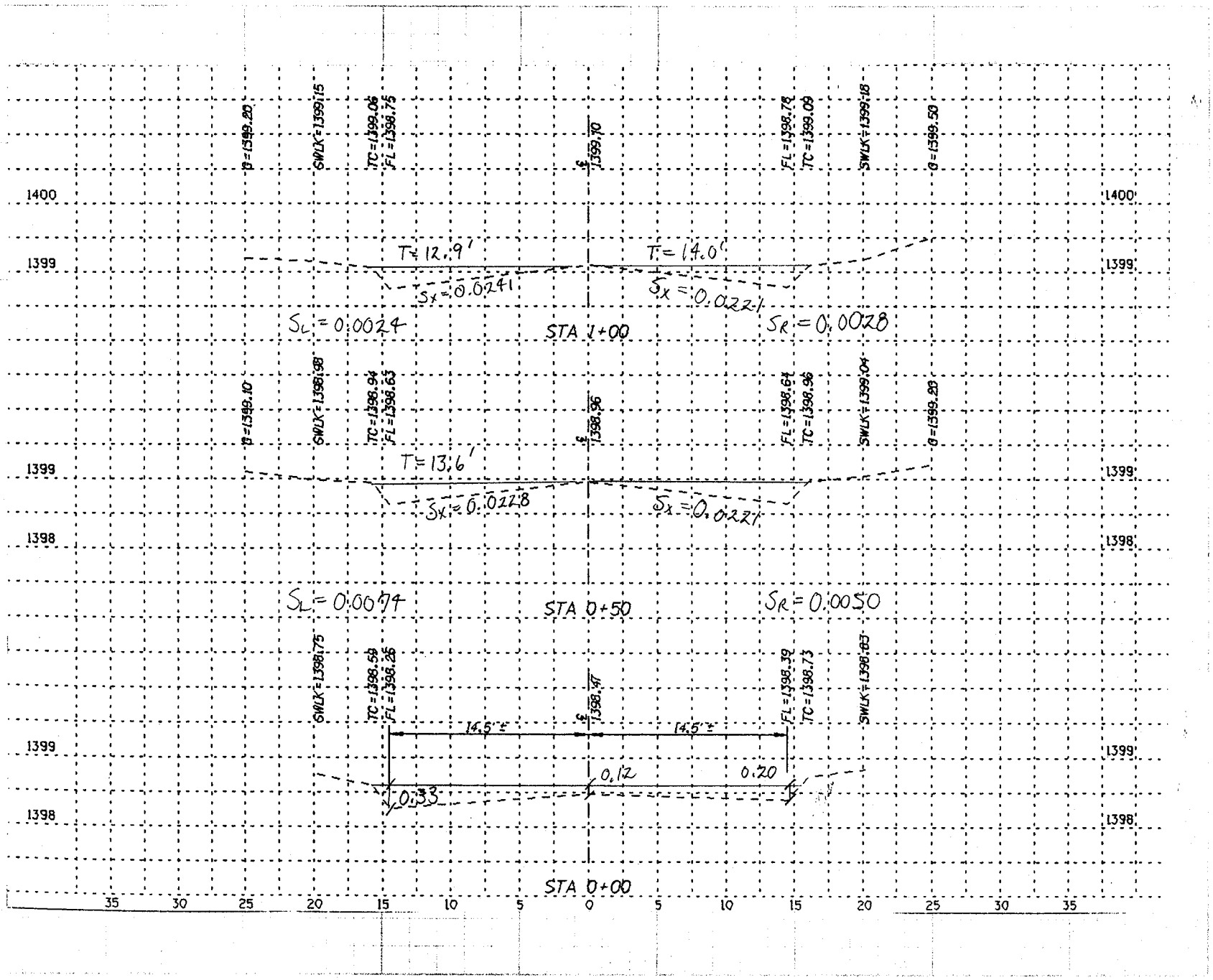
DATE 3/1/93
COMPUTED BY JRM



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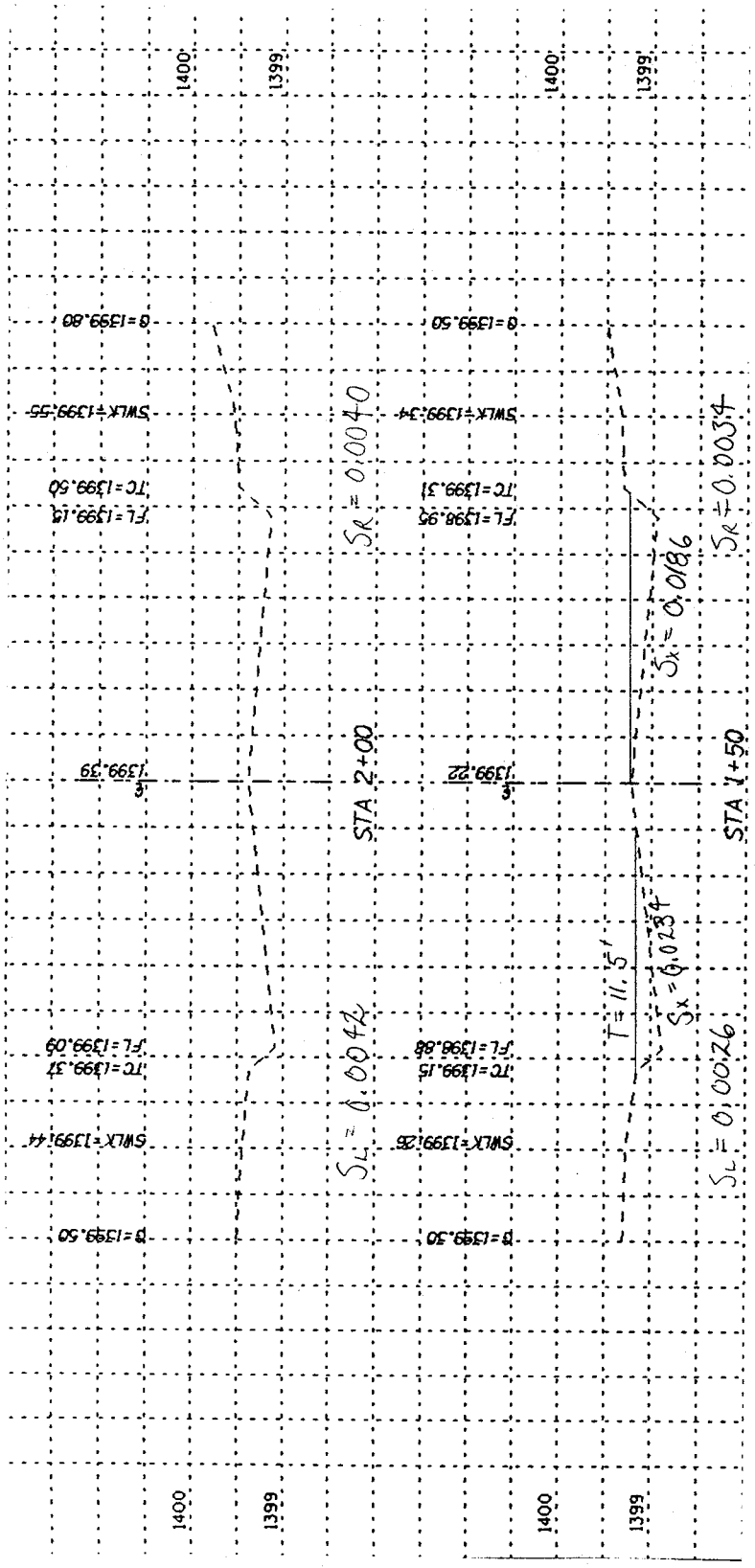
CLIENT	ENTRANCO	JOB NO.	A2-EE-02	PAGE	
PROJECT	UNIVERSITY DRIVE	DATE CHECKED	3/8/93	DATE	3/1/93
DETAIL	60th PLACE CROSS-SECTIONS	CHECKED BY	RMC	COMPUTED BY	VRM



STA. 0+00:

$$A = \left(\frac{0.33+0.12}{2}\right)(14.5) + \left(\frac{0.12+0.20}{2}\right)(14.5) = 5.58$$

$$W_p = 0.33 + 0.20 + 2(14.5) = 29.53$$

$$Q = \frac{1.486}{0.016}(5.58)\left(\frac{5.58}{29.53}\right)^{2/3}(0.0062)^{1/2}$$

$$\underline{Q = 13.4 \text{ cfs}}$$

STA. 0+50:

$$Q_L = \left(\frac{0.56}{0.016}\right)(0.0228)^{1.67}(0.0024)^{0.5}(13.6)^{2.67}$$

$$Q_L = 3.3 \text{ cfs}$$

$$Q_R = \left(\frac{0.56}{0.016}\right)(0.0221)^{1.67}(0.0028)^{0.5}(14.5)^{2.67}$$

$$Q_R = 4.0 \text{ cfs}$$

$$Q_T = Q_L + Q_R = \underline{7.3 \text{ cfs}}$$

STA. 1+00:

$$Q_L = \left(\frac{0.56}{0.016}\right)(0.0241)^{1.67}(0.0026)^{0.5}(12.9)^{2.67}$$

$$Q_L = 3.3 \text{ cfs}$$

$$Q_R = \left(\frac{0.56}{0.016}\right)(0.0221)^{1.67}(0.0034)^{0.5}(14.0)^{2.67}$$

$$Q_L = 4.0 \text{ cfs}$$

$$Q_T = Q_L + Q_R = \underline{7.3 \text{ cfs}}$$

STA. 1+50:

$$Q_L = \left(\frac{0.56}{0.016}\right)(0.0234)^{1.67}(0.0042)^{0.5}(11.5)^{2.67}$$

$$Q_L = 2.9 \text{ cfs}$$

$$Q_R = \left(\frac{0.56}{0.016}\right)(0.0186)^{1.67}(0.0040)^{0.5}(14.5)^{2.67}$$

$$Q_R = 3.6 \text{ cfs}$$

$$Q_T = Q_L + Q_R = \underline{6.5 \text{ cfs}}$$

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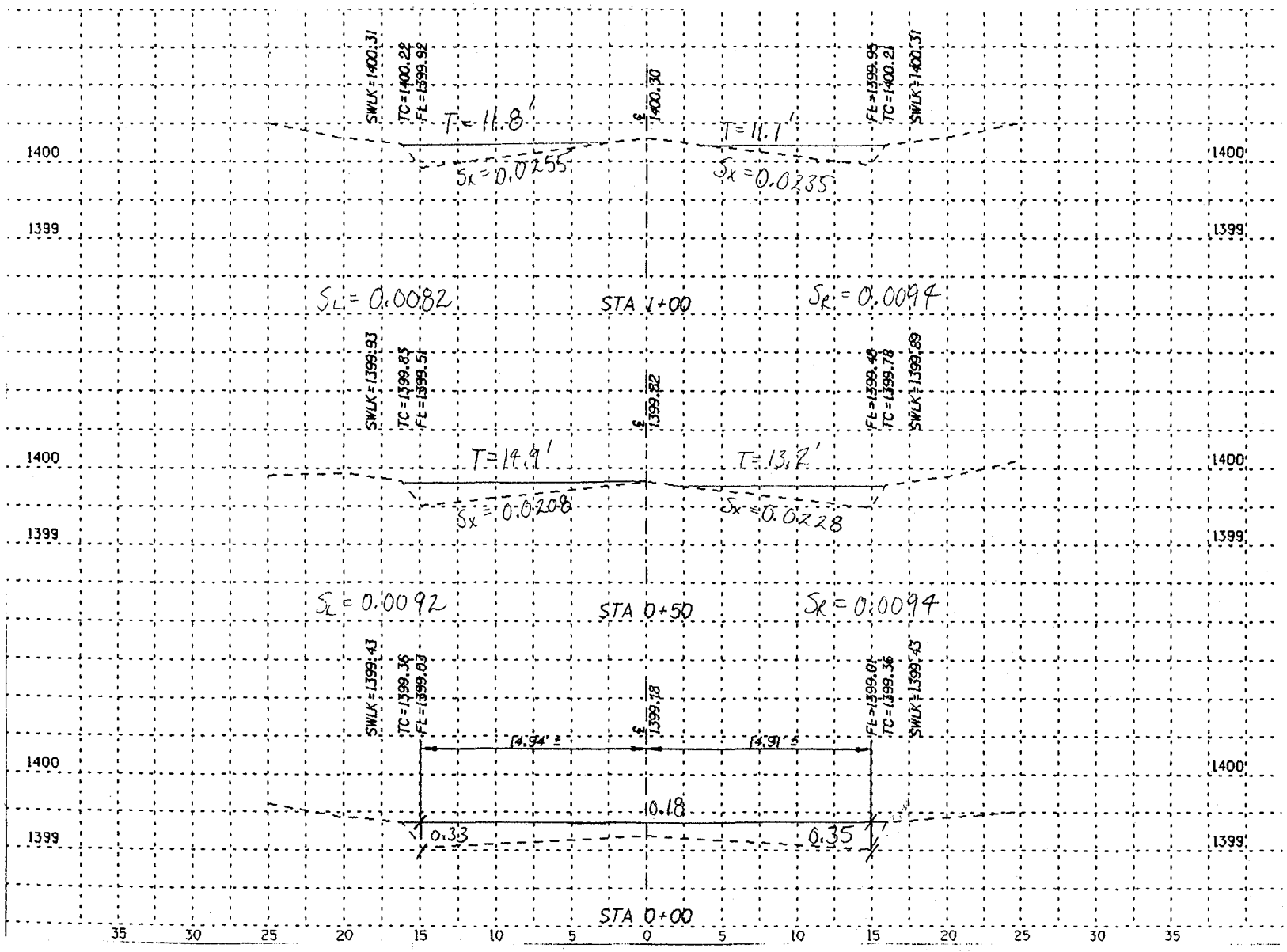
CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL 61st STREET CROSS-SECTIONS
JOB NO. AZ-EE-02
DATE CHECKED 3/5/93
CHECKED BY RPR
PAGE
DATE 3/1/93
COMPUTED BY JKM



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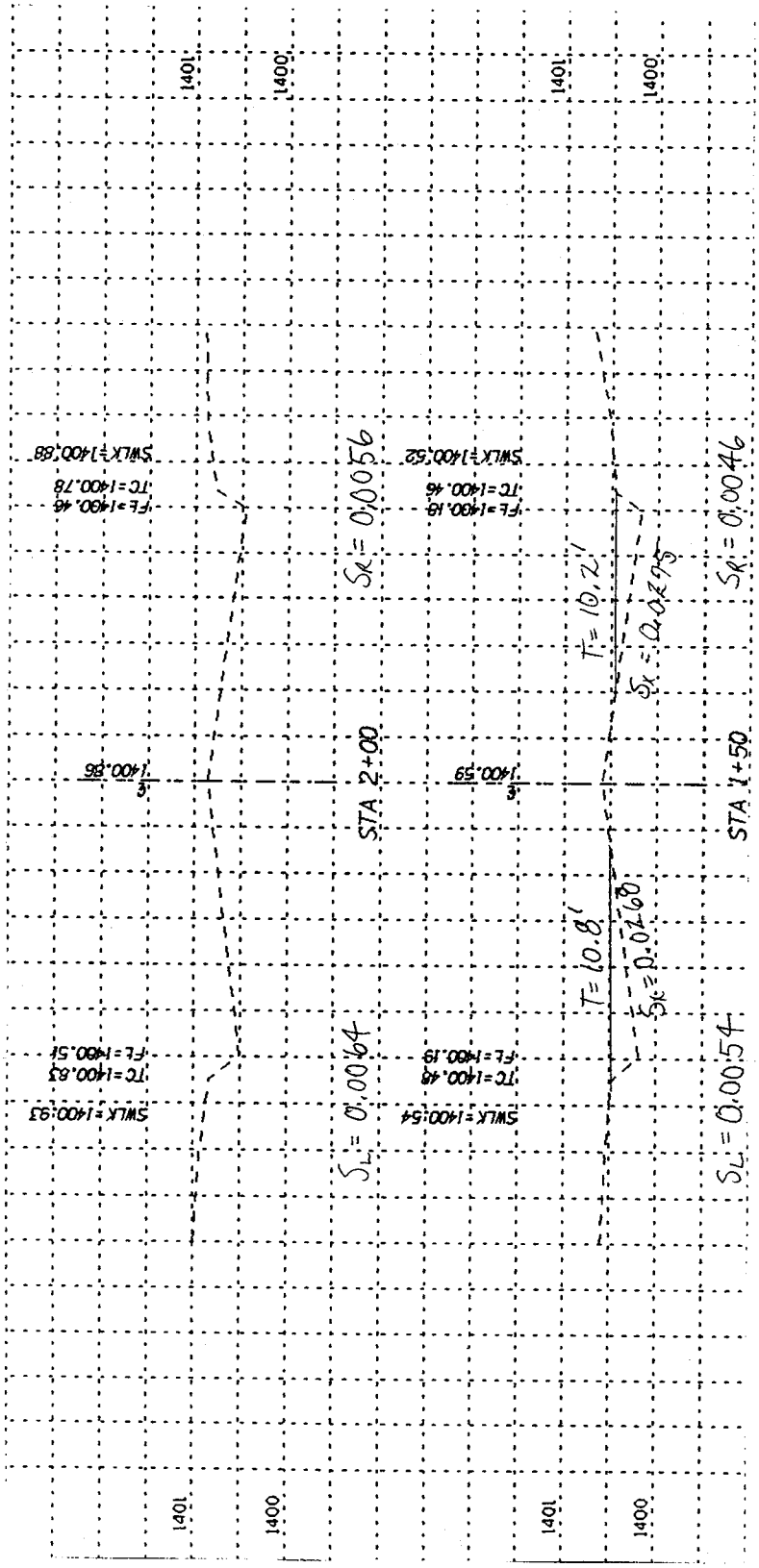
CLIENT: ENTRANCO	JOB NO. AZ-EE-02	PAGE	
PROJECT: UNIVERSITY DRIVE	DATE CHECKED 3/6/94	DATE 3/1/93	
DETAIL: 61st STREET CROSS-SECTIONS	CHECKED BY DAE	COMPUTED BY JRM	



STA. 0+00:

$$A = \left(\frac{0.33+0.18}{2}\right)(14.9) + \left(\frac{0.18+0.35}{2}\right)(14.9) = 7.75$$

$$W_p = 0.33 + 0.35 + 2(14.9) = 30.48$$

$$Q = \frac{1.486}{0.016}(7.75)\left(\frac{7.75}{30.48}\right)^{2/3}(0.0093)^{1/2}$$

$$Q = 27.9 \text{ cfs}$$

STA. 0+50:

$$Q_L = \left(\frac{0.56}{0.016}\right)(0.0208)^{1.67}(0.0082)^{0.5}(14.9)^{2.67}$$

$$Q_L = 6.7 \text{ cfs}$$

$$Q_R = \left(\frac{0.56}{0.016}\right)(0.0228)^{1.67}(0.0094)^{0.5}(13.2)^{2.67}$$

$$Q_R = 6.0 \text{ cfs}$$

$$Q_T = Q_L + Q_R = 12.7 \text{ cfs}$$

STA. 1+00:

$$Q_L = \left(\frac{0.56}{0.016}\right)(0.0255)^{1.67}(0.0054)^{0.5}(11.8)^{2.67}$$

$$Q_L = 4.1 \text{ cfs}$$

$$Q_R = \left(\frac{0.56}{0.016}\right)(0.0235)^{1.67}(0.0046)^{0.5}(11.1)^{2.67}$$

$$Q_R = 2.8 \text{ cfs}$$

$$Q_T = Q_L + Q_R = 6.9 \text{ cfs}$$

STA. 1+50:

$$Q_L = \left(\frac{0.56}{0.016}\right)(0.0268)^{1.67}(0.0064)^{0.5}(10.8)^{2.67}$$

$$Q_L = 3.8 \text{ cfs}$$

$$Q_R = \left(\frac{0.56}{0.016}\right)(0.0275)^{1.67}(0.0056)^{0.5}(10.2)^{2.67}$$

$$Q_R = 3.2 \text{ cfs}$$

$$Q_T = Q_L + Q_R = \underline{7.0 \text{ cfs}}$$

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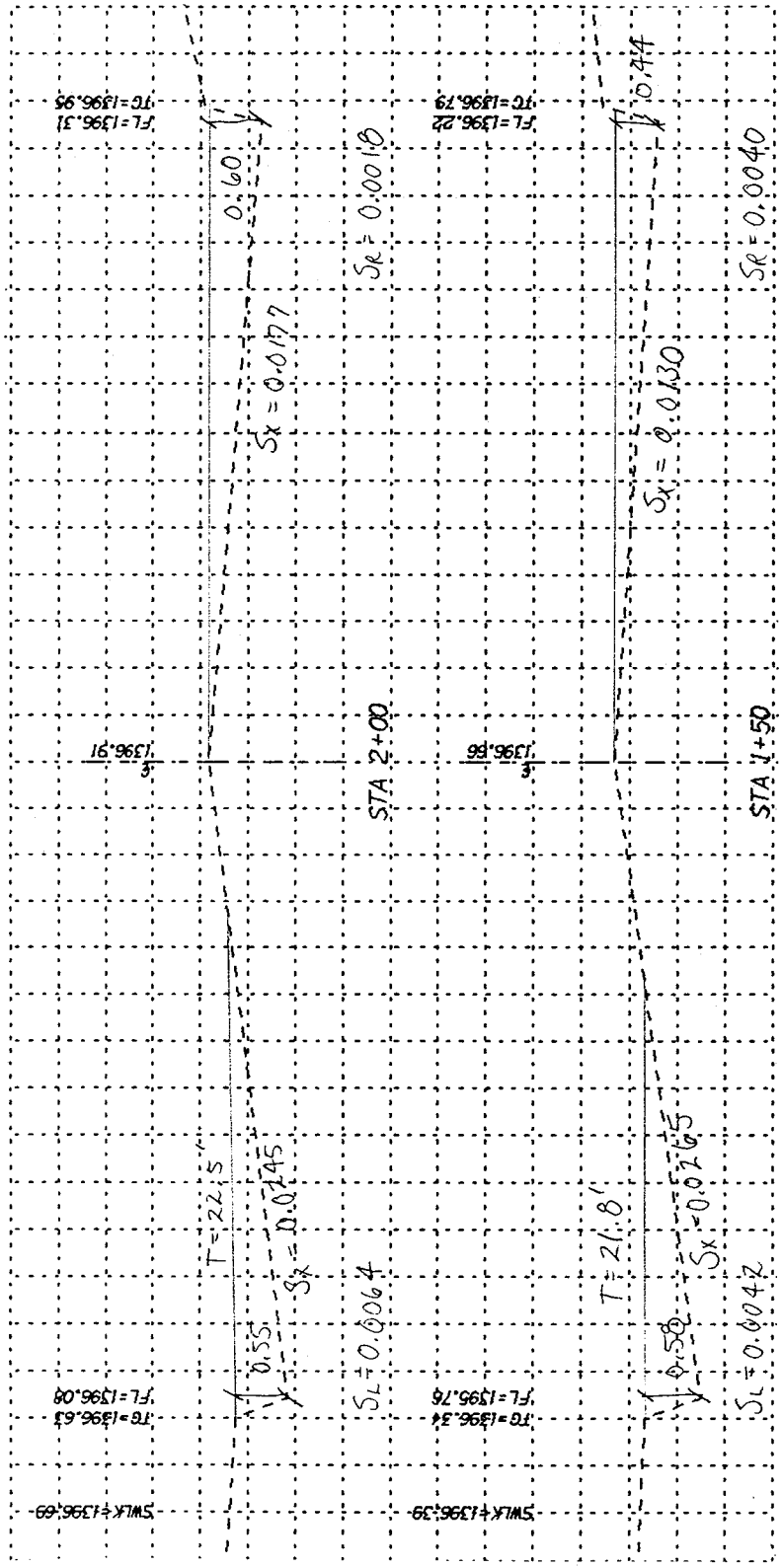
SIMONS, li & ASSOCIATES, INC.

CLIENT	ENTRANCO	JOB NO.	AZ-EE-02	PAGE	
PROJECT	UNIVERSITY DRIVE	DATE CHECKED	3/8/93	DATE	3/1/93
DETAIL	RECKER RD. CROSS-SECTIONS	CHECKED BY	RAE	COMPUTED BY	URM



SIMONS, LI & ASSOCIATES, INC.

CLIENT ENTRANCO
PROJECT UNIVERSITY DRIVE
DETAIL RECKER RD. CROSS-SECTIONS

JOB NO. A2-EE-02
DATE CHECKED 3/8/93
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DATE 3/1/93
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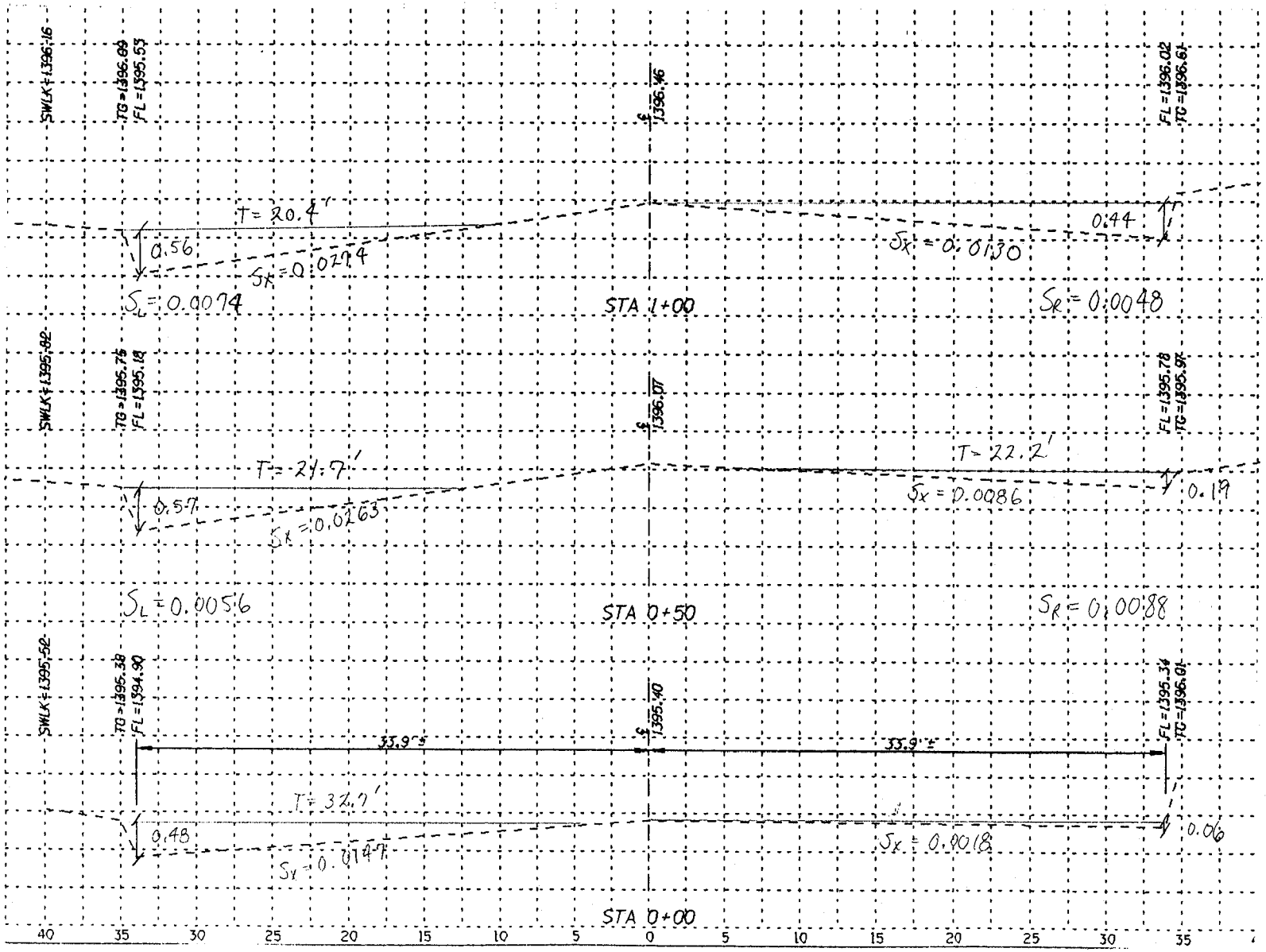


STA. 0+00:

$$Q_L = \left(\frac{0.56}{0.016}\right)(0.0147)^{1.67}(0.0056)^{0.5}(32.7)^{2.67}$$
$$Q_L = 25.2 \text{ cfs}$$

$$Q_R = \left(\frac{0.56}{0.016}\right)(0.0018)^{1.67}(0.0088)^{0.5}(33.9)^{2.67}$$
$$Q_R = 1.0 \text{ cfs}$$

$$Q_T = Q_L + Q_R = \underline{\underline{26.2 \text{ cfs}}}$$

STA. 0+50:

$$Q_L = \left(\frac{0.56}{0.016}\right)(0.0263)^{1.67}(0.0074)^{0.5}(20.4)^{2.67}$$
$$Q_L = 21.7 \text{ cfs}$$

$$Q_R = \left(\frac{0.56}{0.016}\right)(0.0086)^{1.67}(0.0048)^{0.5}(22.2)^{2.67}$$
$$Q_R = 3.4 \text{ cfs}$$

$$Q_T = Q_L + Q_R = \underline{\underline{25.1 \text{ cfs}}}$$

STA. 1+00

$$Q_L = \left(\frac{0.56}{0.016}\right)(0.0274)^{1.67}(0.0042)^{0.5}(20.4)^{2.67}$$
$$Q_L = 17.5 \text{ cfs}$$

$$Q_R = \left(\frac{0.56}{0.016}\right)(0.0130)^{1.67}(0.0040)^{0.5}(33.9)^{2.67}$$
$$Q_R = 19.1 \text{ cfs}$$

$$Q_T = Q_L + Q_R = \underline{\underline{36.6 \text{ cfs}}}$$

sla
SIMONS, LI & ASSOCIATES, INC.

CLIENT: ENTRANCO
PROJECT: UNIVERSITY DRIVE
DETAIL: RECKER ROAD STREET CAPACITY
JOB NO.: AZ-EE-02
DATE CHECKED: 3/8/93
CHECKED BY: [illegible]
PAGE:
DATE: 3/1/93
COMPUTED BY: JRM

STA. 1+50:

$$Q_L = \left(\frac{0.56}{0.016}\right)(0.0265)^{1.67}(0.0064)^{0.5}(22.5)^{2.67}$$

$$Q_L = 26.6 \text{ cfs}$$

$$Q_R = \left(\frac{0.56}{0.016}\right)(0.0130)^{1.67}(0.0018)^{0.5}(33.9)^{2.67}$$

$$Q_R = 12.8 \text{ cfs}$$

$$Q_T = Q_R + Q_L = \underline{\underline{39.4 \text{ cfs}}}$$

sla
SIMONS, li & ASSOCIATES, INC.

CLIENT ENTRANCO | JOB NO. A2-EE-01 | PAGE
PROJECT UNIVERSITY DRIVE | DATE CHECKED 3 | DATE 3/5/92
DETAIL INLET FOR CHURCH CHANNEL | CHECKED BY | COMPUTED BY RAG

HEC-1 MODEL INDICATES 17 CFS COMING SOUTH ON WEST SIDE OF RECKER. NEED TO INTERCEPT 17 CFS AT MOUTH OF CHANNEL. DESIGN CATCH BASIN/INLET TO CAPTURE 17 CFS.

USE GRATED CATCH BASIN OPERATING AS WEIR IN A SUMP CONDITION

FROM FIG 3-44 WITH $Q = 17$ cfs $d = 0.6$ ft $P = 12$ ft

$P = 2(W+L)$ let $W = L$ $P = 2(L+L) = 2(2L) = 4L$

$12 = 4L$

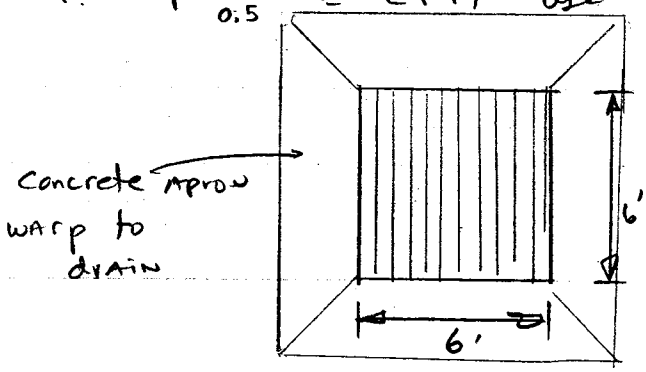
$L = 3$ $W = 3$

check $Q_i = C_w P d^{1.5} = 3.0(12)(0.6)^{1.5} = 16.7$ ok

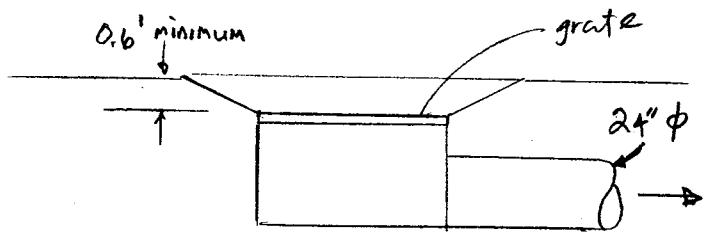
Reduction factor from drainage manual hydraulics table 3.2 grate in sump $= 0.5$

with 50% clogging need to increase perimeter of grate in sump to 24 ft

$\therefore P = \frac{12}{0.5} = 24$ ft use 6'x6' grate



$P = 4(6) = 24$ ft



ELEVATIONS TO BE SET AT 40% PLAN SUBMITTAL

APPENDIX G: CONSTRUCTION COST ESTIMATE

10-YEAR FREQUENCY SYSTEM (FLOOD CONTROL DISTRICT)

ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT $$
REMOVE 60-INCH STORM DRAIN	L.F.	91	12.00	1,092
REMOVE MANHOLE	E.A.	1	300.00	300
24-INCH STORM SEWER PIPE	L.F.	1,950	48.00	93,600
36-INCH STORM SEWER PIPE	L.F.	100	68.75	6,875
42-INCH STORM SEWER PIPE	L.F.	450	78.00	35,100
48-INCH STORM SEWER PIPE	L.F.	150	115.00	17,250
54-INCH STORM SEWER PIPE	L.F.	2,630	100.00	263,000
72-INCH STORM SEWER PIPE	L.F.	2,640	192.50	508,200
12-INCH LOW LEVEL OUTLET PIPE	L.F.	125	32.00	4,000
12-INCH HEADWALL (502-2) MODIFIED	E.A.	1	1,200.00	1,200
DETENTION BASIN EXCAVATION	C.Y.	105,000	5.00	525,000
STORM SEWER MANHOLE (520 & 522)	E.A.	4	1,790.00	7,160
STORM SEWER MANHOLE (521 & 522)	E.A.	8	2,360.00	18,880
STREET GRATE CATCH BASINS	E.A.	3	10,000.00	30,000
GRATED CATCH BASINS (538, 540-2)	E.A.	4	1,125.00	4,500
		SUB-TOTAL		$1,516,157
		15% CONTINGENCY		$227,424
		TOTAL		$1,744,000

10-YEAR FREQUENCY SYSTEM (MARICOPA COUNTY DEPT OF TRANSPORTATION)

ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT $$
18-INCH CATCH BASIN CONNECTOR PIPE	L.F.	1,054	58.00	61,132
24-INCH STORM SEWER PIPE	L.F.	1,083	48.00	51,984
CATCH BASIN (533-1, L=10')	E.A.	31	1,770.00	54,870
CATCH BASIN (SPECIAL SUMP @ CHANNEL	E.A.	1	4,000.00	4,000
		SUB-TOTAL		$171,986
		15% CONTINGENCY		$25,798
		TOTAL		$198,000

APPENDIX H: HEC-1 10-YEAR HYDROLOGIC MODEL INPUT/OUTPUT

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*            VERSION 4.0.1E            *
*                                      *
*  RUN DATE  03/04/93  TIME  12:38:10  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 551-1748              *
*                                      *
****************************************
```

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

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

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

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

  1           ID        FLOOD CONTROL DISTRICT OF MARICOPA COUNTY HEC-1 MODEL OF
  2           ID        EAST MARICOPA COUNTY ADMS MODIFIED FOR THE UNIVERSITY DRIVE
  3           ID        IMPROVEMENT PROJECT--
  4           ID        6-HR,    RAINFALL
  5           ID        MODIFIED SEPT.28, 1992 WITH RETENTION VOLUMES FROM CITY OF MESA FILES
  6           ID        FOR ALL OF THE SUBDIVISIONS IN THE STUDY AREA
  7           ID        RETURN PERIODS OF 2, 5, 10, 25, 50 AND 100 YEARS ARE SIMULATED
  8           ID        BY USE OF THE "JR" CARD
  9           ID
 10           ID        THIS MODEL REQUIRES THE EXTENDED ARRAY VERSION OF HEC-1
 11           ID        IN ORDER TO RUN.  THE NUMBER OF HYDROGRAPH ORDINATES ARE GREATER
 12           ID        THAN 300 (RECORD IT, FIELD 4).
 13           ID
 14           ID
 15           ID        SIMONS, LI & ASSOCIATES                  FILE = 10-YEAR.DAT
 16           ID        4600 SOUTH MILL AVENUE, SUITE 200
 17           ID        TEMPE ARIZONA  85282
 18           ID        (602) 491-1393
 19           ID
 20           ID  ******************************************************************************
 21           ID  ****************ALTERNATIVE 3 = FLOOD PROTECTION FOR 10-YEAR FREQUENCY*******
 22           ID  ******************************************************************************
 23           ID
              *DIAGRAM
 24           IT      3                    720
 25           IO      5
 26           IN     15
 27           JP      2

 28           KK   S1004
 29           KM      RUNOFF FROM SUBBASIN S1004 HERMOSA VISTA DR. & MENLO ST.
 30           PB    1.89
 31           PC      0    .012    .018   .0275    .041   .0525   .0635   .0745    .086   .0975
 32           PC    .111    .126   .1475   .1925    .278   .4615    .697   .8165    .884    .925
 33           PC    .948   .9615    .974   .9875     1.0
 34           BA   0.062
 35           LS             83
 36           UK    250   .0095   0.200     100
 37           RK   1400  0.0139   0.040           TRAP     3.0     2.0

 38           KK   R1005
 39           KM        ROUTE FLOWS FROM S1004 TO C1009  (NATURAL  CHANNEL)
 40           RK   1200  0.0057   0.025           TRAP     3.0     2.0     YES

 41           KK   S1008
 42           KM        RUNOFF FROM SUBBASIN S1008    RIO SALADO COMMUNITY COLLEGE
 43           BA   0.048
 44           LS             83
 45           UK    600  0.0095   0.200     100
 46           RK   1700  0.0139   0.040           TRAP     3.0     2.0
```

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

  47          KK   C1009
  48          KM        COMBINE FLOWS FROM S1008 AND R1005  EAST OF POWER ROAD
  49          HC       2

  50          KK   R1011
  51          KM        ROUTE FLOWS FROM C1009 TO C1021 SOUTH ALONG EAST SIDE OF POWER ROAD
  52          RK    1600  0.0095   0.025            TRAP     5.0     2.0     YES

  53          KK   S1012
  54          KM        RUNOFF FROM SUBBASIN S1012  DESERT (UNDEVELOPED)
  55          BA   0.062
  56          LS             77
  57          UK     600  0.0096   0.200     100
  58          RK    1800  0.0139   0.040            TRAP     3.0     2.0

  59          KK   R1013
  60          KM        ROUTE FLOWS FROM S1012 TO C1017 NATURAL CHANNEL
  61          RK    1300  0.0057   0.025            TRAP     3.0     2.0     YES

  62          KK   S1016
  63          KM        RUNOFF FROM SUBBASIN S1016    DESERT (UNDEVELOPED)
  64          BA    .036
  65          LS             77
  66          UK     600   .0095    .200     100
  67          RK    2400   .0139    .040            TRAP       3       2

  68          KK   C1017
  69          KM        COMBINE FLOWS FROM R1013 AND S1016
  70          HC       2

  71          KK   R1019
  72          KM        ROUTE FLOWS FROM C1017 TO C1021 SOUTH ALONG EAST SIDE OF POWER ROAD
  73          RK    1400   .0057    .025            TRAP       5       2     YES

  74          KK   C1021
  75          KM        COMBINE FLOWS FROM R1019 AND R1011 AT BUSH HWY. & MCKELLIPS, C1021
  76          HC       2

  77          KK  DV1023
  78          KM        DIVERT 100% OF FLOWS WEST ACROSS POWER RD IN MCKELLIPS RD. TO C3003
  79          DT   D1023
  80          DI       0     100     200     300     400     500    1000
  81          DQ       0     100     200     300     400     500    1000

  82          KK   S1024
  83          KM        RUNOFF FROM SUBBASIN S1024  UNDEVELOPED DESERT LAND
  84          BA    .093
  85          LS             77
  86          UK     600   .0095    .200     100
  87          RK    2000   .0139    .040            TRAP       3       2
```

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

 88           KK   R1025
 89           KM        ROUTE FLOWS FROM S1024 ACROSS McKELLIPS RD TO C1029
 90           RK    1000   .0057    .025            TRAP       5       2     YES

 91           KK   S1028
 92           KM        RUNOFF FROM SUBBASIN S1028 MOONDANCE TOWNHOMES
 93           BA    .065
 94           LS              83
 95           UK     600   .0095    .100     100
 96           RK    1300   .0139    .040            TRAP       5       3
 97           KM   B1028

 98           KK   DOUT1
 99           KM   RETENTION BASIN N. OF JENSEN, OPP. EDGEWATER CIRCLE ** NEW TO UDIP**
100           KM    RETENTION VOLUME: 7.8 AF (SOURCE: "AS BUILT" PLANS)
101           DT   DOUT1     7.8
102           DI       0       1      10     100    2000
103           DQ       0     .99     9.9    99.5    1999

104           KK   C1029
105           KM        COMBINE FLOWS FROM S1028 AND R1025 AT BUSH HWY S. OF McKELLIPS
106           HC       3

107           KK  DV1031
108           KM        DIVERT 75% OF FLOWS WEST ACROSS BUSH HWY. TO R3027
109           KM     25 % OF FLOW CONTINUES SOUTH ALONG POWER ROAD
110           DT   D1031
111           DI       0     100     200     300     400     500
112           DQ       0      75     150     225     300     375

113           KK   R1033
114           KM        ROUTE FLOWS FROM DV1031 TO C1035
115           RK    1600   .0144    .025            TRAP       5       2     YES

116           KK   S1034
117           KM        RUNOFF FROM SUBBASIN S1034 MIXED RESIDENTIAL & DESERT
118           BA    .065
119           LS              85
120           UK     200   .0095    .150     100
121           RK    2200   .0139    .040            TRAP       5       3
122           KM    B1034
123           KM     TWO RETENTION BASINS:  1. FALCON HILL #1, 3.2 AF (CITY OF MESA)
124           KM      2.  MOONDANCE #2  EST 4 AF CAPACITY (TOTAL RETENTION VOLUME
125           KM       FOR S1028 (7.8) AND S1034 (4) ARE 11.8 AF AS PER DRAINAGE REPORTS

126           KK   DOUT2
127           DT   DOUT2    15.0
128           DI       0       1     100    2000
129           DQ       0     .99    99.9    1999
```

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

 130          KK   C1035
 131          KM        COMBINE FLOWS FROM S1034 AND R1033 AT BUSH HWY.
 132          HC       2

 133          KK  DV1037
 134          KM        DIVERT 85% OF FLOWS ACROSS BUSH HWY TO R3047
 135          KM      THE REMAINING 15% OF FLOW CONTINUES SOUTH ALONG POWER ROAD
 136          DT   D1037
 137          DI       0     100     200     300     500    1000
 138          DQ       0      85     170     255     425     850

 139          KK   R1039
 140          KM        ROUTE FLOWS FROM DV1037 TO C1041 (15% RETAINED FROM THE NORTH)
 141          RK     800  0.0122    .025            TRAP       5       2     YES

 142          KK   S1040
 143          KM        RUNOFF FROM SUBBASIN S1040, A SMALL, MOSTLY DESERT SUBBASIN
 144          BA    .043
 145          LS              77
 146          UK     600   .0096    .200     100
 147          RK    1700   .0139    .040            TRAP       5       3

 148          KK   C1041
 149          KM        COMBINE FLOWS FROM S1040 AND R1039 ON EAST SIDE OF POWER RD.
 150          HC       2

 151          KK  DV1043
 152          KM        DIVERT FLOWS ACROSS BUSH HWY. TO R3049, CAPACITY SOUTH = 130 CFS
 153          DT   D1043
 154          DI       0     100     130     200     300     400     600    1000
 155          DQ       0     .01      .1      70     170     270     470     870

 156          KK   R1045
 157          KM        ROUTE FLOWS FROM DV1043 TO C1047
 158          RK     800   .0085    .025            TRAP       5       2     YES

 159          KK   S1046
 160          KM        RUNOFF FROM SUBBASIN S1046, LONG & NARROW, MOSTLY DESERT
 161          BA    .115
 162          LS              80
 163          UK     700   .0095    .200     100
 164          RK    3700   .0139     .04            TRAP       5       3

 165          KK   C1047
 166          KM        COMBINE FLOWS FROM S1046 AND R1045 ALONG POWER ROAD
 167          HC       2

 168          KK  DV1048
 169          KM   48-IN. STORM SEWER AT S=.0059 FT/FT, CAPACITY ESTIMATED AT 130 CFS
 170          KM      THIS STORM SEWER DISCHARGES TO THE RETENTION BASIN BETWEEN
 171          KM       64TH AND 65TH STREETS, NORTH OF BROWN ROAD  **NEW FOR UDIP**
 172          DT   D1048             175
 173          DI       0     100     130     200    1000
 174          DQ       0      95     120     130     130
```

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

 175          KK  DV1049
 176          KM        DIVERT FLOWS ACROSS BUSH HWY TO R3053,UP TO 130 CFS GOES SOUTH
 177          DT   D1049
 178          DI       0       1     100     130     200    2000
 179          DQ       0      .1      .5       1      70    1870

 180          KK   R1051
 181          KM        ROUTE FLOWS FROM D1049 TO C1053 ALONG EAST SIDE OF POWER RD
 182          RK     800   .0085    .025            TRAP       5       2     YES

 183          KK   S1052
 184          KM        RUNOFF FROM SUBBASIN S1052, LONG,NARROW MOSTLY DESERT SUBBASIN
 185          BA     .21
 186          LS              80
 187          UK     700   .0095    .200     100
 188          RK    4200   .0139     .04            TRAP       5       3

 189          KK   C1053
 190          KM        COMBINE FLOWS FROM S1052 AND R1051  NEAR BROWN/POWER RD INTERSECTION
 191          HC       2

 192          KK  DV1055
 193          KM    DIVERT ALL BUT 130 CFS OF RUNOFF WEST ALONG BROWN RD, 130 CFS GOES SOUTH
 194          DT   D1055             130
 195          DI       0       1     100     130     200    2000
 196          DQ       0      .9      99     129     130     130

 197          KK   S1056
 198          KM        RUNOFF FROM SUBBASIN S1056, PARTLY DEVELOPED IN SOUTH
 199          KM     CN CHANGED FROM 77 IN EADMS14 TO 79 FOR UDIP
 200          BA     .12
 201          LS              79
 202          UK     700   .0095    .150     100
 203          RK    3400   .0139     .04            TRAP       5       3
 204          KM   B1056
 205          KM    RETENTION BASIN SE CORNER OF GARY STREET AND N. 70TH STREET.
 206          KM    VOLUME IS 4.1 ACC'D TO STONEYBROOK 3 DRAINAGE REPORT (CITY OF MESA)

 207          KK   DOUT3
 208          DT   DOUT3     4.1
 209          DI       0       1      10    1000    2000
 210          DQ       0      .8      9.     990    1900

 211          KK  C1056A
 212          KM    COMBINE THE UNDIVERTED FLOW CONTINUTING SOUTH ALONG EAST SIDE OF
 213          KM    POWER ROAD WITH THE RUNOFF FROM SUBBASIN 1056
 214          HC       2

 215          KK  DV1056
 216          KM      DIVERT FLOW INTO THE 30" STORM SEWER WEST OUT BROWN RD.
 217          KM       THIS STORM SEWER DISCHARGES TO THE RETENTION BASINS AT THE
 218          KM       NE CORNER OF RECKER RD AND EVERGREEN STREET, CAPACITY = 30 CFS
 219          DT   D1056              30
 220          DI       0       1      30    1000
```

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

 221          DQ       0      .9    29.8      30

 222          KK  DV1057
 223          KM        DIVERT 50% OF THE REMAINING FLOW  ACROSS BUSH HWY. TO R3207
 224          DT   D1057
 225          DI       0      10  100000
 226          DQ       0       5   50000

 227          KK   R1059
 228          KM        ROUTE FLOWS FROM DV1057 TO C1065
 229          RK    3000   .0094    .025            TRAP       5       2     YES

 230          KK  DV1066
 231          KM     DIVERT FLOW INTO THE BROOKFIELD EAST 2 & 3  DRAINAGE CHANNEL
 232          KM     WEST ALONG THE NORTH SIDE OF EL PASO ST. 64TH STREET AT ENSENADA PARK
 233          KM    THE CAPACITY OF THE CHANNEL IS ESTIMATED TO BE 85 CFS, ref a-33786a
 234          DT   D1066              85
 235          DI       0       1     140     200     300     400    1000
 236          DQ       0     .99      85      85      85      85      85
 237          KM     MOVE BACK UP NORTH OF McKELLIPS

 238          KK  DSOUTH
 239          KM    FLOWS CONTINUING SOUTH ON THE EAST SIDE OF POWER ROAD ARE CAPTURED
 240          KM     IN THE TRAPEZOIDAL CHANNEL AND TRANSPORTED OUT OF THE STUDY AREA
 241          DT  DSOUTH
 242          DI       0   10000
 243          DQ       0   10000

 244          KK   D1023
 245          KM   RETRIEVE HYDROGRAPH FROM THE EAST OF BUSH HWY
 246          DR   D1023

 247          KK   S3002
 248          KM          RUNOFF FROM SUBBASIN S3002 MOSTLY DESERT INSIDE E. DELMON DRIVE
 249          KM   CN CHANGED FROM 80 TO 79 FOR UDIP
 250          BA   0.094
 251          LS              79       0
 252          UK     200  0.0131   0.200     100
 253          RK    1000   0.005   0.035    0.01    TRAP       1      10

 254          KK   C3003
 255          KM          COMBINE FLOWS FROM D1023 AND S3002
 256          HC       2

 257          KK  DV3002
 258          KM     STORM SEWER RUNS WEST TO RECKER RD. & CAN CARRY ESTIMATED 90 CFS
 259          KM    THE FLOW IS ROUTED TO R3017
 260          DT   D3002
 261          DI       0      85      90      95     200     500
 262          DQ       0    84.9    89.9      90      90      90
```

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

 263          KK   R3005
 264          KM          ROUTE C3003 TO C3009
 265          RK    1200   0.010   0.020            TRAP       8     1.5     YES

 266          KK   S3008
 267          KM   RUNOFF FROM SUBBASIN S3008  A FULLY-DEVELOPED RESIDENTIAL AREA
 268          KM     POMEROY ESTATES II         HAVE  RETENTION BASIN SOUTH OF JENSEN
 269          BA   0.070
 270          LS              82      38
 271          UK     100   0.005   0.100     100
 272          RK    1800  0.0127   0.025            TRAP      20      20
 273          KM   B3008
 274          KM   RETENTION BASIN EAST OF 64TH ST. BETWEEN JENSEN AND E. JULEP
 275          KM     POMEROY ESTATE II- RETENTION VOLUME IS 2.69 AF AS PER "AS BUILT" PLANS

 276          KK   DOUT8
 277          DT   DOUT8    2.69
 278          DI       0       1     100    2000
 279          DQ       0     .99    99.9    1999

 280          KK   C3009
 281          KM          COMBINE FLOWS FROM R3005 AND B3008
 282          HC       2

 283          KK   R3011
 284          KM          ROUTE C3009 TO C3023
 285          RK    3500  0.0127   0.030            TRAP       8     1.5     YES

 286          KK   S3012
 287          KM          RUNOFF FROM SUBBASIN S3012    FULLY DEVELOPED RESIDENTIAL
 288          BA    0.19
 289          LS              79      38
 290          UK     200   0.005   0.200     100
 291          RK    5600  0.0133    0.04            TRAP       3      10

 292          KK   R3013
 293          KM          ROUTE S3012 HYDROGRAPH TO C3016A
 294          RK    1400  0.0070   0.035            TRAP       2      15     YES
 295          RK    2500  0.0091   0.025            TRAP       8     1.5

 296          KK   S3016
 297          KM          RUNOFF FROM SUBBASIN S3016 CAMELOT GOLF COURSE
 298          BA   0.147
 299          LS              65       0
 300          UK     200  0.0140   0.200     100
 301          RK    3600  0.0133   0.045            TRAP      10      30
 302          KM   B3016
 303          KM   RETENTION STORAGE WITHIN THE LAKES IN CAMELOT GOLF COURSE
 304          KM     IS ESTIMATED AT A NOMINAL 5 AF  UNTIL BETTER DATA BECOME AVAILABLE
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 305          KK   DOUT9
 306          DT   DOUT9       5
 307          DI       0       1     100    2000
 308          DQ       0     .99    99.9    1999

 309          KK  C3016A
 310          KM     COMBINE RUNOFF FROM S3012 WITH RUNOFF FROM S3016
 311          HC       2

 312          KK   R3017
 313          KM          ROUTE S3016 HYDROGRAPH PLUS STORM SEWER OUTFLOW TO C3023
 314          RK    1400  0.0049   0.025            TRAP       3      50     YES

 315          KK   S3020
 316          KM          RUNOFF FROM SUBBASIN S3020  PALMAS DEL SOL TRAILER PARK
 317          BA    0.13
 318          LS              85      38
 319          UK     200   0.010   0.100     100
 320          RK    1400  0.0070   0.035    0.02    TRAP       2      15
 321          RK    2500  0.0091   0.025            TRAP       8     1.5
 322          KM   B3021
 323          KM          THE RETENTION BASIN VOLUME ESTIMATED  6 AC. FT.
 324          KM   THIS BASIN IS LOCATED ALONG RECKER RD. IN THE PALMAS DEL SOL LOT

 325          KK  DOUT10
 326          DT  DOUT10       6
 327          DI       0       1     100    2000
 328          DQ       0     .99    99.9    1999

 329          KK   C3023
 330          KM          COMBINE HYDROGRAPHS S3020, R3017,  AND R3011
 331          HC       3

 332          KK   R3025
 333          KM          ROUTE C3023 HYDROGRAPH TO C3041
 334          RK    1300  0.0049   0.025            TRAP       3      50     YES

 335          KK   D1031
 336          KM          RETRIEVE DIVERTED HYDROGRAPH D1031 FROM E. OF BUSH HWY.
 337          DR   D1031

 338          KK   R3027
 339          KM          ROUTE RETRIEVED HYDROGRAPH TO C3031
 340          RK    4000   0.007   0.025            TRAP       3      20     YES

 341          KK   S3028
 342          KM          RUNOFF FROM SUBBASIN S3028 FULLY-DEVELOPED SUBBASIN
 343          KM           MAPLEWOOD I AND II SUBDIVISIONS
 344          BA    0.27
 345          LS              82      38
 346          UK     250   0.010   0.100     100
 347          RK    4000   0.007   0.025            TRAP       3      20
 348          KM   B3029
 349          KM          ROUTE HYDROGRAPH S3028 THROUGH RETENTION AREAS V=9.035 AC. FT.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 350          KM       MAPLEWOOD DEVELOPMENT   DRAINAGE REPORT GIVES 9.035 AF OF STORAGE

 351          KK  DOUT11
 352          DT  DOUT11   9.035
 353          DI       0       1     100    2000
 354          DQ       0     .99    99.9    1999

 355          KK   C3031
 356          KM          COMBINE HYDROGRAPHS B3029 AND R3027
 357          HC       2

 358          KK  DV3033
 359          KM          DIVERT 50% OF REMAINING FLOW SOUTH ON 64TH ST.  TO 3045
 360          DT   D3033
 361          DI       0      10   10000
 362          DQ       0       5    5000

 363          KK   R3035
 364          KM          ROUTE DV3033 ALONG McCLELLAN RD. TO C3041
 365          RK    2640   0.014   0.025            TRAP      25       2     YES

 366          KK   S3038
 367          KM          RUNOFF FROM SUBBASIN S3038 FULLY URBANIZED, SINGLE FAMILY
 368          BA    0.13
 369          LS              79      38
 370          UK     250   0.010   0.200     100
 371          RK    2500   0.007   0.025            TRAP       3      20
 372          KM   B3039
 373          KM          ROUTE HYDROGRAPH S3038 THROUGH RETENTION BASIN V=8.85 AF
 374          KM     THIS RETENTION BASIN IS ON THE NE CORNER OF RECKER AND McCLELLAN
 375          KM               SONATA SUBDIVISION

 376          KK  DOUT12
 377          DT  DOUT12    8.85
 378          DI       0       1     100    2000
 379          DQ       0     .99    99.9    1999

 380          KK   C3041
 381          KM          COMBINE RUNOFF FROM B3039, R3035, AND R3025
 382          HC       3

 383          KK   R3043
 384          KM          ROUTE HYDROGRAPH TO C3051
 385          RK    2640  0.0049   0.025            TRAP       3      50     YES

 386          KK   D3033
 387          KM          RETRIEVE DIVERTED HYDROGRAPH D3033
 388          DR   D3033

 389          KK   R3045
 390          KM          ROUTE DIVERTED HYDROGRAPH D3033 TO C3063
 391          RK    2640  0.0049   0.025            TRAP       3      50
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 392          KK   D1037
 393          KM          RETRIEVE DIVERTED HYDROGRAPH D1037
 394          DR   D1037

 395          KK   R3047
 396          KM          ROUTE RETRIEVED HYDROGRAPH D1037 TO C3063
 397          RK    1000  0.0090   0.050            TRAP       3      10
 398          RK    2640  0.0091   0.025            TRAP       3      30

 399          KK   D1043
 400          KM          RETRIEVE DIVERTED HYDROGRAPH D1043
 401          DR   D1043

 402          KK   R3049
 403          KM          ROUTE RETRIEVED HYDROGRAPH D1043 TO C3063
 404          RK    1000  0.0090   0.050            TRAP       3      10
 405          RK    2640  0.0091   0.025            TRAP       3      30

 406          KK   C3063
 407          KM          COMBINE HYDROGRAPHS R3049, R3047, R3045
 408          HC       3

 409          KK  DV3049
 410          KM          DIVERT 50% FLOWS DOWN 64TH STREET AND 50% FLOW WEST ON PRINCESS
 411          DT   D3049
 412          DI       0     100     500    1000    2000
 413          DQ       0      50     250     500    1000

 414          KK   R3052
 415          KM          ROUTE TO C3051
 416          RK    2640  0.0091   0.025            TRAP       3      30

 417          KK   C3051
 418          KM          COMBINE R3043, R3052
 419          HC       2

 420          KK   R3054
 421          KM          ROUTE COMBINED HYDROGRAPH C3051 TO C3055
 422          RK    2640  0.0049   0.025            TRAP       3      50

 423          KK   S3061
 424          KM          RUNOFF FROM SUBBASIN S3061
 425          BA    0.30
 426          LS              75      38
 427          UK     250  0.0085   0.200     100
 428          RK    1000  0.0090   0.050            TRAP       3      10
 429          RK    2640  0.0091   0.025            TRAP       3      50

 430          KK   C3055
 431          KM          COMBINE S3061,R3054
 432          HC       2
 433          KM          B3061A
 434          KM          RETENTION BASIN AT CORNER OF BROWN/RECKER
 435          KM          APPROXIMATE CAPACITY OF 5 AF.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 436          KK   MANOR
 437          DT   MANOR       5
 438          DI       0       1     100    2000
 439          DQ       0    0.99    99.9    1999

 440          KK   D3049
 441          KM          RETRIEVE DIVERTED FLOW D3049
 442          DR   D3049

 443          KK   R3057
 444          KM          ROUTE DIVERT  FLOW TO C3066
 445          RK    2640  0.0049   0.025            TRAP       3      50

 446          KK   S3060
 447          KM          RUNOFF FROM SUBBASIN S3060
 448          BA    0.30
 449          LS              75      38
 450          UK     250  0.0085   0.200     100
 451          RK    1000  0.0090   0.050            TRAP       3      10
 452          RK    2640  0.0091   0.025            TRAP       3      50

 453          KK   C3066
 454          KM          COMBINE SUBBASIN 3060 WITH R3057
 455          HC       2

 456          KK   D1048
 457          KM     RETRIEVE THE FLOW (UP TO 175 CFS) DIVERTED INTO THE 48" STORM SEWER
 458          KM      COMING FROM POWER RD. & BROWN RD.
 459          DR   D1048

 460          KK   R1048
 461          KM    ROUTE THE RETRIEVED SEWER FLOW THRU 3900 FT OF 48" DIA. CIPP
 462          RK    3900    .013    .012            CIRC     4.0

 463          KK   D1049
 464          KM          RETRIEVE DIVERTED HYDROGRAPH D1049
 465          DR   D1049

 466          KK   R3053
 467          KM          ROUTE RETRIEVED HYDROGRAPH D1049 TO C3060A
 468          RK     600  0.0080   0.050            TRAP       3      10
 469          RK    2640  0.0091   0.025            TRAP       3      50

 470          KK   D1055
 471          KM          RETRIEVE DIVERTED HYDROGRAPH D1055
 472          DR   D1055

 473          KK   R3055
 474          KM          ROUTE RETRIEVED HYDROGRAPH D1055 TO C3060A
 475          RK     600  0.0080   0.050            TRAP       3      10
 476          RK    2640  0.0091   0.025            TRAP       3      50
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

477           KK  C3060A
478           KM          COMBINE ROUTED HYDROGRAPHS R3055,R3053,R1048, AND C3066
479           HC       4
480           KM   B3060
481           KM    1.  NE CORNER OF BROWN RD & 64TH STREET: 23.48 AF

482           KK  DOUT13
483           DT  DOUT13    23.5
484           DI       0       1     100    2000
485           DQ       0     .99    99.9    1999

486           KK  DV3065
487           KM           DIVERT 100% TO R3056
488           DT   D3065
489           DI       0      10    1000
490           DQ       0       0       0

491           KK   R3065
492           KM          ROUTE  HYDROGRAPH DV3065 TO C3065
493           RK    2640  0.0091   0.025            TRAP       4     1.5

494           KK   C3065
495           KM          COMBINE R3065, MANOR
496           HC       2

497           KK  DV3062
498           KM     48"  STORM SEWER TAKES RUNOFF FROM THE CORNER OF BROWN RD & 66TH ST
499           KM    ALL THE WAY TO THE EMF; THE ESTIMATED CAPACITY IS 160 CFS
500           DT   D3062             160
501           DI       0     150     160     170     200     300     500    1000
502           DQ       0     149     159     160     160     160     160     160

503           KK  DV3063
504           KM          DIVERT 50% OF RUNOFF S. THROUGH RECKER RD. SOUTH TO R3079
505           DT   D3063
506           DI       0      10   10000
507           DQ       0       5    5000

508           KK   R3067
              *         RE-ROUTED DV3063 TO NEW COMBINATION POINT C3075
509           KM          ROUTE HYDROGRAPH DV3063 TO C3075
510           RK    1400   0.007   0.025            TRAP       3      30     YES
511           RK    2200   0.009   0.045            TRAP       3      50

512           KK   S3074
513           KM          RUNOFF FROM SUBBASIN S3074 MOSTLY RESIDENTIAL W/ GOLF COURSE
514           BA    0.46
515           LS              82      10
516           UK     250   0.006   0.200     100
517           RK    5000   0.007   0.025    0.20    TRAP       3      30
518           RK    2800   0.009   0.045            TRAP       3      50
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 519          KK   C3075
 520          KM          COMBINE FLOWS FROM R3067 AND S3074
 521          KO       5
 522          HC       2
 523          KM   B3075
 524          KM          ROUTE S3074 HYDROGRAPH THROUGH RETENTION BASIN V=25 AC. FT.
 525          KM    THIS APPARENTLY REPRESENTS THE LAKE IN THE GOLF COURSE; UPDATE VOLUME

 526          KK  DOUT14
 527          KO       5
 528          DT  DOUT14      25
 529          DI       0       1     100    1000    2000
 530          DQ       0     .99    99.9   999.5    1999

 531          KK   S3066
 532          KM          RUNOFF FROM SUBBASIN S3066 ALTA MESA GOLF COURSE
 533          BA   0.104
 534          LS              80       0
 535          UK     250   0.005   0.200     100
 536          RK    6200  0.0095   0.025            TRAP       3      30
 537          KM   B3067
 538          KM          ROUTE S3066 THROUGH RETENTION BASIN V=30 AC. FT.
 539          KM    THIS IS APPARENTLY THE GOLF COURSE LAKES STORAGE
 540          KM    THE VOLUME SHOULD BE UPDATED WHEN BETTER DATA BECOMES AVAILABLE

 541          KK  DOUT15
 542          DT  DOUT15      30
 543          DI       0       1     100    2000
 544          DQ       0     .99    99.9    1999

 545          KK  DV3069
 546          KM          DIVERT 50% OF OVERFLOW W. TO BROWN & HIGLEY (R3097)
 547          KM       50% OF THE FLOW CROSSES HIGLEY AND DOES NOT CONTRIBUTE AT UNIV. DRIVE
 548          DT  D3069
 549          DI       0      10   10000
 550          DQ       0       5    5000

 551          KK   R3071
 552          KM          ROUTE 50% OF THE OVERFLOW DV3069 FROM B3067 TO C3077
 553          KM    THIS FLOW IS GOING SOUTH DOWN HIGLEY RD TO ADOBE ROAD
 554          RK    3000  0.0090   0.045            TRAP       3      50     YES

 555          KK   C3077
 556          KM          COMBINE FLOWS FROM R3071  AND B3075
 557          HC       2

 558          KK   S3210
 559          KM          RUNOFF FROM SUBBASIN S3210  FULLY DEVELOPED,
 560          KM          SUBBASIN S3210 MODIFIED FROM FCD HEC-1 MODEL
 561          KM
 562          BA    0.18
 563          KO       5
 564          LS              85      50
 565          UK     250   0.008   0.100     100
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 566          RK     700   0.010   0.045   0.125    TRAP       5      30
 567          RK    1900   0.010   0.025            TRAP       3      20
 568          KM          B3211
 569          KM          RETENTION BASIN BROOKFIELD EAST II
 570          KM          VOLUME = 7.6 AF FROM AS-BUILT CERTIFICATION
 571          KM          PLANIMETERED AS-BUILT TO DEVELOP AREA/ELEVATION CURVE

 572          KK  EASTII
 573          KO       5
 574          RS       1    ELEV      26
 575          SA    0.64    1.08    1.63    2.10    2.55    2.88    3.22    3.58    3.98    4.33
 576          SE    29.5      30      31      32      33      34      35      36      37      38
 577          SL      26    0.78     0.6     0.5
 578          SS      37     120     2.7     1.5

 579          KK   R3100
 580          KO       5
 581          RK    2640  0.0058   0.035            CIRC    0.78

 582          KK   S3211
 583          KM          NEW SUBBASIN SPLIT OUT FROM S3210
 584          BA    0.18
 585          LS              85      50
 586          UK     250   0.008     0.1     100
 587          RK     700    0.01   0.045   0.125    TRAP       5      30
 588          RK    1800    0.01   0.025            TRAP       3      20

 589          KK   C3079
 590          KO       5
 591          KM          COMBINE S3211,R3100
 592          HC       2
 593          KM           RETENTION BASIN WESTII

 594          KK  WESTII
 595          KO       5
 596          DT  WESTII       8
 597          DI       0      10     100    1000
 598          DQ       0     9.9      99     998

 599          KK   D3063
 600          KM          RETRIEVE DIVERTED HYDROGRAPH D3063
 601          DR   D3063

 602          KK   R3079
 603          KM          ROUTE RETRIEVED HYDROGRAPH (D3063) S. DOWN RECKER RD. TO DV3081
 604          RK    2640  0.0049   0.025            TRAP       2      50

 605          KK   D1056
 606          KM    RETRIEVE FLOW FROM THE 30" STORM SEWER COMING FROM THE INTERSECTION
 607          KM    OF BROWN RD AND POWER RD.   *****NEW FOR UDIP****
 608          DR   D1056
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

609           KK   R3080
610           KM    ROUTE FLOW IN STORM SEWER (D1056) TO ITS OUTFALL IN RECKER RD.
611           RK    6200   .0105    .012            CIRC     2.5
612           KM    COMBINE THE HYDROGRAPHS FROM R3079 AND R3080  **NEW FOR UDIP**
613           KM    AND FROM WESTII

614           KK   C3080
615           HC       3    2.54

616           KK  DV3081
617           KM        (*DIVERT 50% OF FLOW S. TO R3231)
618           KM    NEW DIVERSION RATING CURVE DEVEOPED FROM FIELD DATA
619           DT   D3081
620           DI       0     7.1   107.6   270.5
621           DQ       0       0    21.8    71.1

622           KK   R3083
623           KM          ROUTE DV3081 TO C3085 ALONG ADOBE RD.
624           KM     LENGTH CHANGED FROM 1300 TO 2600 FOR UDIP
625           RK    2600 0.0080   0.025            TRAP       25       1

626           KK   S3084
627           KM          RUNOFF FROM SUBBASIN S3084   SMALL, FULLY-DEVELOPED
628           BA   0.061
629           LS              82      38
630           UK     250  0.0049   0.100     100
631           RK    3400  0.0080   0.025            TRAP       3      30

632           KK   C3085
633           KM          COMBINE HYDROGRAPHS FROM S3084 AND R3083
634           HC       2

635           KK  DV3087
636           KO       5
637           KM          DIVERT 20% OF FLOW SOUTH DOWN 56TH ST. TO R3235
638           KM      NEW DIVERSION RATING CURVE DEVELOPED FROM FIELD SURVEY
639           DT   D3087
640           DI       0    24.6    49.9   145.3
641           DQ       0    13.6      22    48.4

642           KK   R3089
643           KM          ROUTE 80% OF THE HYDROGRAPH WEST ALONG ADOBE RD TO C3091
644           RK    2600 0.0115   0.025            TRAP       25       1     YES

645           KK   C3091
646           KM          COMBINE FLOWS FROM R3089 AND C3077
647           HC       2

648           KK  DV3093
649           KM          DIVERT  0% OF FLOW WEST ACROSS HIGLEY AND OUT OF THE STUDY AREA
650           DT   D3093
651           DI       0      10   10000
652           DQ       0      10   10000
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 653          KK   D1057
 654          KM      LEAVE THIS HYDROGRAPH GOING DOWN HIGLEY HANGING FOR NOW
 655          KM          RETRIEVE DIVERTED HYDROGRAPH D1057
 656          DR   D1057

 657          KK   R3207
 658          KM          ROUTE RETRIEVED HYDROGRAPH THROUGH C3213
 659          RK    8680   0.010   0.025            TRAP       8       2

 660          KK   D1066
 661          KM    RETRIEVE THE FLOW FROM POWER RD. IN THE CHANNEL ALONG EL PASO ST.
 662          DR   D1066

 663          KK   R1066
 664          KM          ROUTE THE CHANNEL FLOW FROM POWER ROAD TO 64TH STREET
 665          RK    2600  0.0089    .019            TRAP      11       2

 666          KK  S3210A
 667          KM    THIS IS THE SOUTHERN PART OF SUBBASIN S3210, WHICH DOES NOT
 668          KM      BENEFIT FROM THE RETENTION BASINS
 669          BA    0.16
 670          LS              75      50
 671          UK     250    .008      .2     100
 672          RK     700     .01    .045    .125    TRAP       5       5
 673          RK    2640     .01    .025            TRAP       3       5

 674          KK   C3213
 675          KM          COMBINE FLOWS FROM S3210A AND R3207 AND R1066
 676          HC       3

 677          KK   R3326
 678          KM          ROUTE C3213 DOWN 64TH STREET TO C3227
 679          RK    2640  0.0063   0.025            TRAP       3      50

 680          KK   S3220
 681          KM          RUNOFF FROM SUBBASIN S3220  MOSTLY DEVELOPED
 682          BA   0.146
 683          LS              74      50
 684          UK     250   0.006   0.100     100
 685          RK    1600   0.009   0.025            TRAP       3      20
 686          RK    1600   0.010   0.050            TRAP       3       2

 687          KK   C3227
 688          KM          COMBINE RUNOFF FROM R3226 AND S3220
 689          HC       2

 690          KK   DV400
 691          KM          DIVERT 80% OF COMBINED FLOWS SOUTH ON 64TH - PLAN 1
 692          DT    D400
 693          DI       0      10   10000
 694          DQ       0       8    8000
              *  ******************** NO DIVERSION - PLAN 2 ****************
 695          KP       2
 696          DT    D400
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 697          DI       0      10   10000
 698          DQ       0       0       0

 699          KK   S3212
 700          KM              NEW SUBBASIN S3212 SPLIT OUR FROM 3210B
 701          BA    0.15
 702          LS             75      50
 703          UK     150   0.008      .2     100
 704          RK    1200    0.01   0.045    0.02    TRAP       5       5
 705          RK    3100    0.01   0.025            TRAP       3       5

 706          KK    C900
 707          KM    COMBINE SUBBASIN S3212 AND DV400
 708          HC       2

 709          KK   R3228
 710          KO       2       1
 711          KM          ROUTE TO RECKER
 712          RK    1320   0.006   0.025            TRAP       3      20     YES
              *  ******************PROPOSED DETENTION BASIN**********************
 713          KP       2
 714          RS       1    STOR      -1       0
 715          SL    1405    0.79     0.6     0.5
 716          SS  1409.9      60     2.6     1.5
 717          SV       0     6.9    14.0    21.3    28.8    36.5
 718          SE    1405    1406    1407    1408    1409    1410

 719          KK   R3227
 720          RN
              *  *************************DUMMY ROUTING ROUTINE*******************
 721          KP       2
 722          RK    1200   0.007   0.013            CIRC     1.5             YES
              *  ******************************************************************

 723          KK   D3081
 724          KM          RETRIEVE DIVERTED HYDROGRAPH D3081
 725          DR   D3081

 726          KK   SPLIT
 727          KM    SPLIT D3081 50/50 DOWN WEST & EAST SIDES OF RECKER
 728          DT   DWEST
 729          DI       0      10     100    1000
 730          DQ       0       5      50     500

 731          KK   R3231
 732          KM   ROUTE RETRIEVED HYDROGRAPH D3081 TO UNIVERSITY & RECKER
 733          RK    2000   .0063    .025            TRAP       3      50

 734          KK  S3210B
 735          KM          NEW SUBBASIN SPLIT OFF ORIGINAL 3210A
 736          BA    0.21
 737          LS             75      50
 738          UK     250   0.008     0.2     100
 739          RK    1200    0.01   0.045   0.125    TRAP       5       5
 740          RK    3100    0.01   0.025            TRAP       3       5
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 741          KK  CICERO
 742          KM    COMBINE HYDROGRAPHS S3210B AND R3231 TO OBTAIN SIDE STREET FLOW ON RECKER
 743          HC      2

 744          KK   DWEST
 745          KM     RETRIEVE DIVERTED HYDROGRAPH DWEST
 746          DR   DWEST

 747          KK   RWEST
 748          KM     ROUTE DWEST SOUTH ALONG WEST SIDE OF RECKER TO 600 FT NORTH OF UNIVERSITY
 749          RK    1950  0.0063   0.025            TRAP       3      50

 750          KK   STRIP
 751          KM     NEW SUBBASIN STRIP DISCHARGES TO WEST SIDE OF RECKER, SOUTH OF ADOBE TO
 752          KM     650 FT NORTH OF UNIVERSITY.
 753          BA   0.011
 754          LS              87      65
 755          UK     150   0.008     0.1     100
 756          RK    1950  0.0063   0.025            TRAP       3      50

 757          KK  CHURCH
              * ***************************************************************************
 758          KM    COMBINE SUBBASIN STRIP AND RWEST  650 FT NORTH OF UNIVERSITY, WEST SIDE OF
 759          KM    RECKER.  LOCATION OF PROPOSED INLET FOR PLAN 2.
 760          HC      2

 761          KK    STUB
 762          KM     ROUTE COMBINED HYDROGRAPH TO CICERO
 763          RK     300  0.0063   0.025            TRAP       3      50
              * ****************************PLAN 2 - INSTALL STORM DRAIN******************
 764          KP      2
 765          KM     CAPTURE FLOWS OF WEST SIDE OF RECKER AND ROUTE TO UNIVERSITY IN PIPE
 766          RK     300   0.006   0.013            CIRC     2.0
              * ****************************************************************************

 767          KK   CRECK
 768          KM      COMBINE STUB AND CICERO
 769          HC      2

 770          KK   STUB2
 771          KM    ROUTE COMBINED CHURCH FLOWS (STUB) AND CICERO TO UNIVERSITY DRAIN AT
 772          KM    RECKER
 773          RK     350  0.0063   0.025            TRAP       3      50
              * ****************************PLAN 2 - INSTALL STORM DRAIN **************
 774          KP      2
 775          RK     350   0.006   0.013            CIRC     3.5
              * ***************************************************************************

 776          KK  RECKER
 777          KM     COMBINE STUB2, R3227
 778          HC      2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 779          KK   DV500
 780          KM     DIVERT 100% OF COMBINED FLOWS SOUTH ON RECKER - PLAN 1
 781          DT    D500
 782          DI       0      10   10000
 783          DQ       0    9.99    9999
              *   ************** NO DIVERSION - PLAN 2 *********************
 784          KP       2
 785          DT    D500
 786          DI       0      10   10000
 787          DQ       0       0       0

 788          KK   R3229
 789          KO       5
 790          KM          ROUTE RECKER TO C58TH
 791          RK    1320   0.006   0.025           TRAP       3      20     YES
              *  **********************INSTALL STORM DRAIN PLAN 2*****************
 792          KP       2
 793          RK    1320   0.007   0.013           CIRC     4.8             YES
              *  ******************************************************************

 794          KK   S3242
 795          KM     RUNOFF FROM S3242 FULLY DELVELOPED
 796          BA   0.067
 797          LS             87      50
 798          UK     200   0.008    0.10     100
 799          RK    1500   0.006   0.025           TRAP       3      20

 800          KK   C58TH
 801          KM      COMBINE R3229 AND S3242
 802          HC       2

 803          KK   R3242
 804          KM    ROUTE 58TH WEST
 805          RK    1320   0.006   0.025           TRAP       3      20     YES
              *   **********************PLAN 2 - INSTALL STORM DRAIN ********
 806          KP       2
 807          RK    1320   0.007   0.013           CIRC     4.8             YES
              *    ******************************************************************

 808          KK   S3243
 809          KM      RUNOFF FROM S3243 FULLY DELVEOPED
 810          BA   0.071
 811          LS             87      50
 812          UK     200   0.008     0.1     100
 813          RK    1500   0.006   0.025           TRAP       2      20

 814          KK   S3240
 815          KM     RUNOFF FROM S3240 FULLY DEVELOPED
 816          BA   0.056
 817          LS             87      50
 818          UK     200   0.008     0.1     100
 819          RK    1320   0.006   0.025           TRAP       3      20
```

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

 820          KK   R3240
 821          KM     ROUTE S3240 WEST ON DECATUR
 822          RK    1320   0.006   0.025            TRAP       3      20

 823          KK   D3087
 824          KM     RETRIEVE DIVERTED HYDROGRAPH D3087
 825          DR   D3087

 826          KK   R3235
 827          KM    ROUTE DIVERTED HYDROGRAPH D3087 TO C3241
 828          RK    1140   0.006   0.025            TRAP       2      20

 829          KK   S3241
 830          KM    RUNOFF FROM S3241 FULLY DEVELOPED
 831          BA   0.054
 832          LS              87      50
 833          UK     200   0.008     0.1     100
 834          RK    1320   0.006   0.025            TRAP       3      20

 835          KK   C3241
 836          KM    COMBINE R3240, R3235, AND S3241
 837          HC       3

 838          KK  DV3241
 839          KM    (SPLIT C3241 70% WEST AND 30% SOUTH)
 840          KM     NEW DIVERSION RATING CURVE DEVELOPED FROM FIELD SURVEY
 841          DT   D3241
 842          DI       0    83.3     233
 843          DQ       0    43.5     123

 844          KK   R3243
 845          KM       ROUTE DV3241 SOUTH TO C56TH
 846          RK    1500  0.0051    0.04            TRAP       3      50

 847          KK    56TH
 848          KM     COMBINE S3243 AND R3242 TO GET SIDE STREET FLOW ON 56TH AT UNIVERSITY
 849          HC       2

 850          KK   C56TH
 851          KM      COMBINE 56TH SIDE STREET FLOW AND R3242
 852          HC       2

 853          KK   R3252
 854          KM       ROUTE C56TH WEST TO 54TH ST
 855          RK    1500   0.006   0.025            TRAP       3      20     YES
              * ****************** PLAN 2 - INSTALL STORM DRAIN *************
 856          KP       2
 857          RK    1500   0.007   0.013            CIRC       6             YES
              * ************************************************************
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 858          KK   S3252
 859          KM    RUNOFF FROM S3252 FULLY DEVELOPED
 860          BA   0.071
 861          LS              87      50
 862          UK     200   0.008     0.1     100
 863          RK    1320   0.008   0.025   0.031    TRAP       3      20
 864          RK    1500  0.0051    0.04            TRAP       3      50

 865          KK   D3241
 866          KM     RETRIEVE DIVERTED HYDROGRAPH D3241
 867          DR   D3241

 868          KK   R3241
 869          KM     ROUTE D3241 TO C3250
 870          RK    1320   0.006   0.025            TRAP       3      20

 871          KK   S3250
 872          KM     RUNOFF FROM S3250 FULLY DEVELOPED
 873          BA   0.054
 874          LS              87      50
 875          UK     200   0.008     0.1     100
 876          RK    1320   0.008   0.025   0.031    TRAP       3      20
 877          RK    1140  0.0051    0.04            TRAP       3      50

 878          KK   C3250
 879          KM     COMBINE S3250 AND R3241
 880          HC       2

 881          KK  DV3250
 882          KM     (SPLIT C3250 70% WEST AND 30% SOUTH)
 883          KM      NEW DIVERSION RATING CURVE DEVELOPED FROM FIELD SURVEY
 884          DT   D3250
 885          DI       0    83.3     233
 886          DQ       0    35.5    95.8

 887          KK   R3254
 888          KM      ROUTE DIVERTED HYDROGRAPH DV3250 TO C54TH
 889          RK    1500  0.0051    0.04            TRAP       3      50

 890          KK    54TH
 891          KM      COMBINE R3254 AND S3252 TO GET SIDE STREET FLOWS ON 54TH AT UNIVERSITY
 892          HC       2

 893          KK   C54TH
 894          KM     COMBINE 54TH AND R3252
 895          HC       2

 896          KK   R3253
 897          KM     ROUTE C54TH TO UNIVERSITY AND HIGLEY
 898          RK    1140   0.006   0.025            TRAP       3      20     YES
              * *************** PLAN 2 - INSTALL STORM DRAIN *******************
 899          KP       2
 900          RK    1140   0.007   0.013            CIRC       6
              * ****************************************************************
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 901          KK   S3253
 902          KM       RUNOFF FROM S3253 FULLY DEVELOPED
 903          BA   0.071
 904          LS              87      50
 905          UK     200   0.008     0.1     100
 906          RK    1320   0.008   0.025   0.031    TRAP       3      20
 907          RK    1500  0.0051    0.04            TRAP       3      50

 908          KK   D3250
 909          KM     RETRIEVE DIVERTED HYDROGRAPH D3250
 910          DR   D3250

 911          KK   R3250
 912          KM     ROUTE D3250 TO C3251
 913          RK    1320  0.0051    0.04            TRAP       3      50

 914          KK   S3251
 915          KM      RUNOFF FROM S3251 FULLY DEVELOPED
 916          BA   0.054
 917          LS              87      50
 918          UK     200   0.008     0.1     100
 919          RK    1140   0.008   0.025   0.031    TRAP       3      20
 920          RK    1320   0.008    0.04            TRAP       3      50

 921          KK   D3093
 922          KM     RETRIEVE DIVERTED HYDROGRAPH D3093
 923          DR   D3093

 924          KK   R3247
 925          KM     ROUTE RETRIEVED HYDROGRAPH D3093 TO C3251
 926          RK    1140  0.0051    0.04            TRAP       3      50

 927          KK   C3251
 928          KM    COMBINE R3247, S3251, AND R3250
 929          HC       3

 930          KK   R3251
 931          KM    ROUTE C3251 TO UNIVERSITY AND HIGLEY (TO C-HIG)
 932          RK    1500  0.0051    0.04            TRAP       3      50

 933          KK     HIG
 934          KM    COMBINE R3251 AND S3253 TO OBTAIN SIDE STREET FLOW ON HIGLEY
 935          HC       2

 936          KK  HIGLEY
 937          KM      COMBINE R3253 AND HIG (SIDE STREET FLOW)
 938          HC       2

 939          KK  DV3400
 940          KM          DIVERT 60% OF COMBINED FLOWS
 941          DT   D3400
 942          DI       0      10   10000
 943          DQ       0       6    6000
              *    ***************** NO DIVERSION - PLAN 2 ***************
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 944          KP       2
 945          DT   D3400
 946          DI       0      10   10000
 947          DQ       0       0       0

 948          KK   EMF-3
 949          KO       5
 950          KM          ROUTE IN 84-INCH RCP AT UNIVERSITY/HIGLEY TO EMF
 951          RK    1685  0.0013   0.013           CIRC       7
 952          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   28      S1004
               V
               V
   38      R1005
               .
               .
   41          .       S1008
               .           .
               .           .
   47      C1009............
               V
               V
   50      R1011
               .
               .
   53          .       S1012
               .           V
               .           V
   59          .       R1013
               .           .
               .           .
   62          .           .       S1016
               .           .           .
               .           .           .
   68          .       C1017............
               .           V
               .           V
   71          .       R1019
               .           .
               .           .
   74      C1021............
               .
               .
   79          .------->   D1023
   77     DV1023
               .
               .
   82          .       S1024
               .           V
               .           V
   88          .       R1025
               .           .
               .           .
   91          .           .       S1028
               .           .           .
               .           .           .
  101          .           .           .------->   DOUT1
   98          .           .       DOUT1
               .           .           .
               .           .           .
  104      C1029........................
               .
               .
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110          .------->   D1031
107     DV1031
             V
             V
113      R1033
             .
             .
116          .       S1034
             .           .
             .           .
127          .           .------->   DOUT2
126          .       DOUT2
             .           .
             .           .
130      C1035............
             .
             .
136          .------->   D1037
133     DV1037
             V
             V
139      R1039
             .
             .
142          .       S1040
             .           .
             .           .
148      C1041............
             .
             .
153          .------->   D1043
151     DV1043
             V
             V
156      R1045
             .
             .
159          .       S1046
             .           .
             .           .
165      C1047............
             .
             .
172          .------->   D1048
168     DV1048
             .
             .
177          .------->   D1049
175     DV1049
             V
             V
180      R1051
             .
             .
183          .       S1052
             .           .
             .           .
189      C1053............
             .
             .
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194          .-------->   D1055
192     DV1055
             .
             .
197          .       S1056
             .           .
             .           .
208          .           .-------->   DOUT3
207          .       DOUT3
             .           .
             .           .
211     C1056A............
             .
             .
219          .-------->   D1056
215     DV1056
             .
             .
224          .-------->   D1057
222     DV1057
            V
            V
227      R1059
             .
             .
234          .-------->   D1066
230     DV1066
             .
             .
241          .-------->  DSOUTH
238     DSOUTH
             .
             .
246          .           .<--------   D1023
244          .       D1023
             .           .
             .           .
247          .           .       S3002
             .           .           .
             .           .           .
254          .       C3003............
             .           .
             .           .
260          .           .-------->   D3002
257          .      DV3002
             .           V
             .           V
263          .       R3005
             .           .
             .           .
266          .           .       S3008
             .           .           .
             .           .           .
277          .           .           .-------->   DOUT8
276          .           .       DOUT8
             .           .           .
             .           .           .
280          .       C3009............
             .           V
             .           V
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283          .      R3011
             .         .
             .         .
286          .         .      S3012
             .         .         V
             .         .         V
292          .         .      R3013
             .         .         .
             .         .         .
296          .         .         .      S3016
             .         .         .         .
             .         .         .         .
306          .         .         .         .-------->   DOUT9
305          .         .         .      DOUT9
             .         .         .         .
             .         .         .         .
309          .         .      C3016A............
             .         .         V
             .         .         V
312          .         .      R3017
             .         .         .
             .         .         .
315          .         .         .      S3020
             .         .         .         .
             .         .         .         .
326          .         .         .         .-------->  DOUT10
325          .         .         .     DOUT10
             .         .         .         .
             .         .         .         .
329          .      C3023........................
             .         V
             .         V
332          .      R3025
             .         .
             .         .
337          .         .         .<-------   D1031
335          .         .      D1031
             .         .         V
             .         .         V
338          .         .      R3027
             .         .         .
             .         .         .
341          .         .         .      S3028
             .         .         .         .
             .         .         .         .
352          .         .         .         .-------->  DOUT11
351          .         .         .     DOUT11
             .         .         .         .
             .         .         .         .
355          .         .      C3031............
             .         .         .
             .         .         .
360          .         .         .-------->   D3033
358          .         .     DV3033
             .         .         V
             .         .         V
363          .         .      R3035
             .         .         .
             .         .         .
366          .         .         .      S3038
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            .          .          .          .
            .          .          .          .
377         .          .          .          .-------> DOUT12
376         .          .          .     DOUT12
            .          .          .          .
            .          .          .          .
380         .      C3041.......................
            .          V
            .          V
383         .      R3043
            .          .
            .          .
388         .          .          .<-------  D3033
386         .          .     D3033
            .          .          V
            .          .          V
389         .          .     R3045
            .          .          .
            .          .          .
394         .          .          .          .<-------  D1037
392         .          .          .     D1037
            .          .          .          V
            .          .          .          V
395         .          .          .     R3047
            .          .          .          .
            .          .          .          .
401         .          .          .          .          .<-------  D1043
399         .          .          .          .     D1043
            .          .          .          .          V
            .          .          .          .          V
402         .          .          .          .     R3049
            .          .          .          .          .
            .          .          .          .          .
406         .          .     C3063........................
            .          .          .
            .          .          .
411         .          .          .-------> D3049
409         .          .    DV3049
            .          .          V
            .          .          V
414         .          .     R3052
            .          .          .
            .          .          .
417         .      C3051............
            .          V
            .          V
420         .      R3054
            .          .
            .          .
423         .          .     S3061
            .          .          .
            .          .          .
430         .      C3055............
            .          .
            .          .
437         .          .-------> MANOR
436         .      MANOR
            .          .
            .          .
442         .          .          .<-------  D3049
```

```
440     .       .     D3049
        .       .       V
        .       .       V
443     .       .     R3057
        .       .       .
        .       .       .
446     .       .       .     S3060
        .       .       .       .
        .       .       .       .
453     .       .     C3066............
        .       .       .
        .       .       .
459     .       .       .       .<-------   D1048
456     .       .       .     D1048
        .       .       .       V
        .       .       .       V
460     .       .       .     R1048
        .       .       .       .
        .       .       .       .
465     .       .       .       .         .<-------   D1049
463     .       .       .       .     D1049
        .       .       .       .         V
        .       .       .       .         V
466     .       .       .       .     R3053
        .       .       .       .         .
        .       .       .       .         .
472     .       .       .       .         .         .<-------   D1055
470     .       .       .       .         .     D1055
        .       .       .       .         .         V
        .       .       .       .         .         V
473     .       .       .       .         .     R3055
        .       .       .       .         .         .
        .       .       .       .         .         .
477     .       .     C3060A..................................
        .       .       .
        .       .       .
483     .       .       .-------> DOUT13
482     .       .     DOUT13
        .       .       .
        .       .       .
488     .       .       .------->   D3065
486     .       .     DV3065
        .       .       V
        .       .       V
491     .       .     R3065
        .       .       .
        .       .       .
494     .     C3065............
        .       .
        .       .
500     .       .------->   D3062
497     .     DV3062
        .       .
        .       .
505     .       .------->   D3063
503     .     DV3063
        .       V
        .       V
508     .     R3067
        .       .
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            .           .
512         .           .       S3074
            .           .           .
            .           .           .
519         .       C3075............
            .           .
            .           .
528         .           .-------> DOUT14
526         .      DOUT14
            .           .
            .           .
531         .           .       S3066
            .           .           .
            .           .           .
542         .           .           .-------> DOUT15
541         .           .      DOUT15
            .           .           .
            .           .           .
548         .           .           .------->  D3069
545         .           .      DV3069
            .           .           V
            .           .           V
551         .           .       R3071
            .           .           .
            .           .           .
555         .       C3077............
            .           .
            .           .
558         .           .       S3210
            .           .           V
            .           .           V
572         .           .      EASTII
            .           .           V
            .           .           V
579         .           .       R3100
            .           .           .
            .           .           .
582         .           .           .       S3211
            .           .           .           .
            .           .           .           .
589         .           .       C3079............
            .           .           .
            .           .           .
596         .           .           .-------> WESTII
594         .           .      WESTII
            .           .           .
            .           .           .
601         .           .           .           .<-------   D3063
599         .           .           .       D3063
            .           .           .           V
            .           .           .           V
602         .           .           .       R3079
            .           .           .           .
            .           .           .           .
608         .           .           .           .           .<-------   D1056
605         .           .           .           .       D1056
            .           .           .           .           V
            .           .           .           .           V
609         .           .           .           .       R3080
            .           .           .           .           .
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                .         .         .         .         .
614             .         .     C3080.......................
                .         .         .
                .         .         .
619             .         .         .-------> D3081
616             .         .    DV3081
                .         .         V
                .         .         V
622             .         .     R3083
                .         .         .
                .         .         .
626             .         .         .      S3084
                .         .         .         .
                .         .         .         .
632             .         .     C3085............
                .         .         .
                .         .         .
639             .         .         .-------> D3087
635             .         .    DV3087
                .         .         V
                .         .         V
642             .         .     R3089
                .         .         .
                .         .         .
645             .     C3091............
                .         .
                .         .
650             .         .-------> D3093
648             .    DV3093
                .         .
                .         .
656             .         .         .<-------  D1057
653             .         .    D1057
                .         .         V
                .         .         V
657             .         .    R3207
                .         .         .
                .         .         .
662             .         .         .         .<-------  D1066
660             .         .         .      D1066
                .         .         .         V
                .         .         .         V
663             .         .         .      R1066
                .         .         .         .
                .         .         .         .
666             .         .         .         .     S3210A
                .         .         .         .         .
                .         .         .         .         .
674             .         .    C3213.......................
                .         .         V
                .         .         V
677             .         .    R3326
                .         .         .
                .         .         .
680             .         .         .      S3220
                .         .         .         .
                .         .         .         .
687             .         .    C3227............
                .         .         .
                .         .         .
```

```
692     .       .       .------->   D400
690     .       .   DV400
        .       .       .
        .       .       .
699     .       .       .     S3212
        .       .       .        .
        .       .       .        .
706     .       .    C900............
        .       .       V
        .       .       V
709     .       .   R3228
        .       .       V
        .       .       V
719     .       .   R3227
        .       .       .
        .       .       .
725     .       .       .        .<-------   D3081
723     .       .       .     D3081
        .       .       .        .
        .       .       .        .
728     .       .       .        .------->   DWEST
726     .       .       .     SPLIT
        .       .       .        V
        .       .       .        V
731     .       .       .     R3231
        .       .       .        .
        .       .       .        .
734     .       .       .        .     S3210B
        .       .       .        .        .
        .       .       .        .        .
741     .       .       .   CICERO............
        .       .       .        .
        .       .       .        .
746     .       .       .        .        .<-------   DWEST
744     .       .       .        .     DWEST
        .       .       .        .        V
        .       .       .        .        V
747     .       .       .        .     RWEST
        .       .       .        .        .
        .       .       .        .        .
750     .       .       .        .        .     STRIP
        .       .       .        .        .        .
        .       .       .        .        .        .
757     .       .       .        .     CHURCH............
        .       .       .        .        V
        .       .       .        .        V
761     .       .       .        .      STUB
        .       .       .        .        .
        .       .       .        .        .
767     .       .       .     CRECK............
        .       .       .        V
        .       .       .        V
770     .       .       .     STUB2
        .       .       .        .
        .       .       .        .
776     .       .   RECKER............
        .       .       .
        .       .       .
781     .       .       .------->   D500
779     .       .   DV500
```

```
                .         .         V
                .         .         V
788             .         .      R3229
                .         .         .
                .         .         .
794             .         .         .      S3242
                .         .         .         .
                .         .         .         .
800             .         .      C58TH............
                .         .         V
                .         .         V
803             .         .      R3242
                .         .         .
                .         .         .
808             .         .         .      S3243
                .         .         .         .
                .         .         .         .
814             .         .         .         .      S3240
                .         .         .         .         V
                .         .         .         .         V
820             .         .         .         .      R3240
                .         .         .         .         .
                .         .         .         .         .
825             .         .         .         .         .          .<-------   D3087
823             .         .         .         .         .      D3087
                .         .         .         .         .          V
                .         .         .         .         .          V
826             .         .         .         .         .      R3235
                .         .         .         .         .          .
                .         .         .         .         .          .
829             .         .         .         .         .          .      S3241
                .         .         .         .         .          .          .
                .         .         .         .         .          .          .
835             .         .         .         .      C3241........................
                .         .         .         .         .
                .         .         .         .         .
841             .         .         .         .         .-------->   D3241
838             .         .         .         .     DV3241
                .         .         .         .         V
                .         .         .         .         V
844             .         .         .         .      R3243
                .         .         .         .         .
                .         .         .         .         .
847             .         .         .        56TH............
                .         .         .         .
                .         .         .         .
850             .         .      C56TH............
                .         .         V
                .         .         V
853             .         .      R3252
                .         .         .
                .         .         .
858             .         .         .      S3252
                .         .         .         .
                .         .         .         .
867             .         .         .         .         .<-------   D3241
865             .         .         .         .      D3241
                .         .         .         .         V
                .         .         .         .         V
868             .         .         .         .      R3241
```

```
                .         .         .         .         .
                .         .         .         .         .
871             .         .         .         .         .      S3250
                .         .         .         .         .          .
                .         .         .         .         .          .
878             .         .         .         .      C3250............
                .         .         .         .         .
                .         .         .         .         .
884             .         .         .         .         .-------> D3250
881             .         .         .         .     DV3250
                .         .         .         .         V
                .         .         .         .         V
887             .         .         .         .      R3254
                .         .         .         .         .
                .         .         .         .         .
890             .         .         .       54TH............
                .         .         .         .
                .         .         .         .
893             .         .     C54TH............
                .         .         V
                .         .         V
896             .         .     R3253
                .         .         .
                .         .         .
901             .         .         .      S3253
                .         .         .         .
                .         .         .         .
910             .         .         .         .         .<------- D3250
908             .         .         .         .      D3250
                .         .         .         .         V
                .         .         .         .         V
911             .         .         .         .      R3250
                .         .         .         .         .
                .         .         .         .         .
914             .         .         .         .         .      S3251
                .         .         .         .         .          .
                .         .         .         .         .          .
923             .         .         .         .         .          .         .<------- D3093
921             .         .         .         .         .          .     D3093
                .         .         .         .         .          .         V
                .         .         .         .         .          .         V
924             .         .         .         .         .          .     R3247
                .         .         .         .         .          .         .
                .         .         .         .         .          .         .
927             .         .         .         .      C3251......................
                .         .         .         .         V
                .         .         .         .         V
930             .         .         .         .      R3251
                .         .         .         .         .
                .         .         .         .         .
933             .         .         .       HIG............
                .         .         .         .
                .         .         .         .
936             .         .     HIGLEY............
                .         .         .
                .         .         .
941             .         .         .-------> D3400
939             .         .     DV3400
                .         .         V
                .         .         V
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              MAY   1991              *
*           VERSION 4.0.1E             *
*                                      *
*  RUN DATE  03/04/93  TIME  12:38:10  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748             *
*                                      *
****************************************
```

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY HEC-1 MODEL OF
EAST MARICOPA COUNTY ADMS MODIFIED FOR THE UNIVERSITY DRIVE
IMPROVEMENT PROJECT--
6-HR, RAINFALL
MODIFIED SEPT.28, 1992 WITH RETENTION VOLUMES FROM CITY OF MESA FILES
FOR ALL OF THE SUBDIVISIONS IN THE STUDY AREA
RETURN PERIODS OF 2, 5, 10, 25, 50 AND 100 YEARS ARE SIMULATED
BY USE OF THE "JR" CARD

THIS MODEL REQUIRES THE EXTENDED ARRAY VERSION OF HEC-1
IN ORDER TO RUN. THE NUMBER OF HYDROGRAPH ORDINATES ARE GREATER
THAN 300 (RECORD IT, FIELD 4).

SIMONS, LI & ASSOCIATES FILE = ALT10H.DAT
4600 SOUTH MILL AVENUE, SUITE 200
TEMPE ARIZONA 85282
(602) 491-1393

```
*****************************************************************************
****************ALTERNATIVE 3 = FLOOD PROTECTION FOR 10-YEAR FREQUENCY*******
*****************************************************************************
```

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

   IT          HYDROGRAPH TIME DATA
                      NMIN          3  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1   0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        720  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      2   0  ENDING DATE
                    NDTIME       1157  ENDING TIME
                     ICENT         19  CENTURY MARK

               COMPUTATION INTERVAL    0.05 HOURS
                    TOTAL TIME BASE   35.95 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

JP        MULTI-PLAN OPTION
              NPLAN           2  NUMBER OF PLANS

JR        MULTI-RATIO OPTION
            RATIOS OF RUNOFF
           1.00

   *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

   *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

   *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

   *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

   *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

   *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

   *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

   *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

   *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1
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*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

*** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

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*** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

521 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

527 KO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1
```

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

573 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

580 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

590 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

595 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

        *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

        *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

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        *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

636 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

        *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1
```

```
*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1


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


          **************
          *            *
709 KK    *     R3228  *
          *            *
          **************

710 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          2  PRINT CONTROL
                     IPLOT          1  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                               ROUTE TO RECKER

             HYDROGRAPH ROUTING DATA

712 RK          KINEMATIC WAVE STREAM ROUTING
                         L      1320.  CHANNEL LENGTH
                         S     0.0060  SLOPE
                         N      0.025  CHANNEL ROUGHNESS COEFFICIENT
                        CA       0.00  CONTRIBUTING AREA
                     SHAPE       TRAP  CHANNEL SHAPE
                        WD       3.00  BOTTOM WIDTH OR DIAMETER
                         Z      20.00  SIDE SLOPE
                    NDXMIN          2  MINIMUM NUMBER OF DX INTERVALS

                                                  ***
                                 COMPUTED KINEMATIC PARAMETERS
                                      VARIABLE TIME STEP
                                    (DT SHOWN IS A MINIMUM)

                 ELEMENT    ALPHA       M        DT        DX       PEAK    TIME TO     VOLUME    MAXIMUM
                                                                              PEAK                CELERITY
                                                (MIN)      (FT)     (CFS)    (MIN)       (IN)      (FPS)

                 MAIN         1.06      1.33      1.74    440.00    113.92   255.21       0.51      4.58


CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1247E+02  EXCESS=0.0000E+00 OUTFLOW=0.1248E+02 BASIN STORAGE=0.2272E-03 PERCENT ERROR=   0.0


                                 INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL


                 MAIN         1.06      1.33      3.00              113.80   255.00       0.51
*****************************************************************************************************************************************

                                          HYDROGRAPH AT STATION    R3228
                                             PLAN 1,   RATIO =  1.00
```

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0900	181	1.	1		1800	361	0.	2		0300	541	0.
1		0003	2	0.	1		0903	182	1.	1		1803	362	0.	2		0303	542	0.
1		0006	3	0.	1		0906	183	1.	1		1806	363	0.	2		0306	543	0.
1		0009	4	0.	1		0909	184	1.	1		1809	364	0.	2		0309	544	0.
1		0012	5	0.	1		0912	185	1.	1		1812	365	0.	2		0312	545	0.
1		0015	6	0.	1		0915	186	1.	1		1815	366	0.	2		0315	546	0.
1		0018	7	0.	1		0918	187	1.	1		1818	367	0.	2		0318	547	0.
1		0021	8	0.	1		0921	188	1.	1		1821	368	0.	2		0321	548	0.
1		0024	9	0.	1		0924	189	1.	1		1824	369	0.	2		0324	549	0.
1		0027	10	0.	1		0927	190	1.	1		1827	370	0.	2		0327	550	0.
1		0030	11	0.	1		0930	191	1.	1		1830	371	0.	2		0330	551	0.
1		0033	12	0.	1		0933	192	1.	1		1833	372	0.	2		0333	552	0.
1		0036	13	0.	1		0936	193	1.	1		1836	373	0.	2		0336	553	0.
1		0039	14	0.	1		0939	194	1.	1		1839	374	0.	2		0339	554	0.
1		0042	15	0.	1		0942	195	1.	1		1842	375	0.	2		0342	555	0.
1		0045	16	0.	1		0945	196	1.	1		1845	376	0.	2		0345	556	0.
1		0048	17	0.	1		0948	197	1.	1		1848	377	0.	2		0348	557	0.
1		0051	18	0.	1		0951	198	1.	1		1851	378	0.	2		0351	558	0.
1		0054	19	0.	1		0954	199	0.	1		1854	379	0.	2		0354	559	0.
1		0057	20	0.	1		0957	200	0.	1		1857	380	0.	2		0357	560	0.
1		0100	21	0.	1		1000	201	0.	1		1900	381	0.	2		0400	561	0.
1		0103	22	0.	1		1003	202	0.	1		1903	382	0.	2		0403	562	0.
1		0106	23	0.	1		1006	203	0.	1		1906	383	0.	2		0406	563	0.
1		0109	24	0.	1		1009	204	0.	1		1909	384	0.	2		0409	564	0.
1		0112	25	0.	1		1012	205	0.	1		1912	385	0.	2		0412	565	0.
1		0115	26	0.	1		1015	206	0.	1		1915	386	0.	2		0415	566	0.
1		0118	27	1.	1		1018	207	0.	1		1918	387	0.	2		0418	567	0.
1		0121	28	1.	1		1021	208	0.	1		1921	388	0.	2		0421	568	0.
1		0124	29	1.	1		1024	209	0.	1		1924	389	0.	2		0424	569	0.
1		0127	30	1.	1		1027	210	0.	1		1927	390	0.	2		0427	570	0.
1		0130	31	1.	1		1030	211	0.	1		1930	391	0.	2		0430	571	0.
1		0133	32	2.	1		1033	212	0.	1		1933	392	0.	2		0433	572	0.
1		0136	33	2.	1		1036	213	0.	1		1936	393	0.	2		0436	573	0.
1		0139	34	2.	1		1039	214	0.	1		1939	394	0.	2		0439	574	0.
1		0142	35	2.	1		1042	215	0.	1		1942	395	0.	2		0442	575	0.
1		0145	36	2.	1		1045	216	0.	1		1945	396	0.	2		0445	576	0.
1		0148	37	3.	1		1048	217	0.	1		1948	397	0.	2		0448	577	0.
1		0151	38	3.	1		1051	218	0.	1		1951	398	0.	2		0451	578	0.
1		0154	39	3.	1		1054	219	0.	1		1954	399	0.	2		0454	579	0.
1		0157	40	3.	1		1057	220	0.	1		1957	400	0.	2		0457	580	0.
1		0200	41	4.	1		1100	221	0.	1		2000	401	0.	2		0500	581	0.
1		0203	42	4.	1		1103	222	0.	1		2003	402	0.	2		0503	582	0.
1		0206	43	4.	1		1106	223	0.	1		2006	403	0.	2		0506	583	0.
1		0209	44	4.	1		1109	224	0.	1		2009	404	0.	2		0509	584	0.
1		0212	45	4.	1		1112	225	0.	1		2012	405	0.	2		0512	585	0.
1		0215	46	5.	1		1115	226	0.	1		2015	406	0.	2		0515	586	0.
1		0218	47	5.	1		1118	227	0.	1		2018	407	0.	2		0518	587	0.
1		0221	48	5.	1		1121	228	0.	1		2021	408	0.	2		0521	588	0.
1		0224	49	5.	1		1124	229	0.	1		2024	409	0.	2		0524	589	0.
1		0227	50	5.	1		1127	230	0.	1		2027	410	0.	2		0527	590	0.
1		0230	51	5.	1		1130	231	0.	1		2030	411	0.	2		0530	591	0.
1		0233	52	5.	1		1133	232	0.	1		2033	412	0.	2		0533	592	0.
1		0236	53	5.	1		1136	233	0.	1		2036	413	0.	2		0536	593	0.
1		0239	54	6.	1		1139	234	0.	1		2039	414	0.	2		0539	594	0.
1		0242	55	6.	1		1142	235	0.	1		2042	415	0.	2		0542	595	0.

1	0245	56	6.	*	1	1145	236	0.	*	1	2045	416	0.	*	2	0545	596	0.
1	0248	57	6.	*	1	1148	237	0.	*	1	2048	417	0.	*	2	0548	597	0.
1	0251	58	6.	*	1	1151	238	0.	*	1	2051	418	0.	*	2	0551	598	0.
1	0254	59	6.	*	1	1154	239	0.	*	1	2054	419	0.	*	2	0554	599	0.
1	0257	60	6.	*	1	1157	240	0.	*	1	2057	420	0.	*	2	0557	600	0.
1	0300	61	6.	*	1	1200	241	0.	*	1	2100	421	0.	*	2	0600	601	0.
1	0303	62	6.	*	1	1203	242	0.	*	1	2103	422	0.	*	2	0603	602	0.
1	0306	63	6.	*	1	1206	243	0.	*	1	2106	423	0.	*	2	0606	603	0.
1	0309	64	7.	*	1	1209	244	0.	*	1	2109	424	0.	*	2	0609	604	0.
1	0312	65	7.	*	1	1212	245	0.	*	1	2112	425	0.	*	2	0612	605	0.
1	0315	66	7.	*	1	1215	246	0.	*	1	2115	426	0.	*	2	0615	606	0.
1	0318	67	8.	*	1	1218	247	0.	*	1	2118	427	0.	*	2	0618	607	0.
1	0321	68	8.	*	1	1221	248	0.	*	1	2121	428	0.	*	2	0621	608	0.
1	0324	69	9.	*	1	1224	249	0.	*	1	2124	429	0.	*	2	0624	609	0.
1	0327	70	10.	*	1	1227	250	0.	*	1	2127	430	0.	*	2	0627	610	0.
1	0330	71	11.	*	1	1230	251	0.	*	1	2130	431	0.	*	2	0630	611	0.
1	0333	72	12.	*	1	1233	252	0.	*	1	2133	432	0.	*	2	0633	612	0.
1	0336	73	14.	*	1	1236	253	0.	*	1	2136	433	0.	*	2	0636	613	0.
1	0339	74	16.	*	1	1239	254	0.	*	1	2139	434	0.	*	2	0639	614	0.
1	0342	75	19.	*	1	1242	255	0.	*	1	2142	435	0.	*	2	0642	615	0.
1	0345	76	24.	*	1	1245	256	0.	*	1	2145	436	0.	*	2	0645	616	0.
1	0348	77	29.	*	1	1248	257	0.	*	1	2148	437	0.	*	2	0648	617	0.
1	0351	78	37.	*	1	1251	258	0.	*	1	2151	438	0.	*	2	0651	618	0.
1	0354	79	46.	*	1	1254	259	0.	*	1	2154	439	0.	*	2	0654	619	0.
1	0357	80	57.	*	1	1257	260	0.	*	1	2157	440	0.	*	2	0657	620	0.
1	0400	81	68.	*	1	1300	261	0.	*	1	2200	441	0.	*	2	0700	621	0.
1	0403	82	82.	*	1	1303	262	0.	*	1	2203	442	0.	*	2	0703	622	0.
1	0406	83	94.	*	1	1306	263	0.	*	1	2206	443	0.	*	2	0706	623	0.
1	0409	84	105.	*	1	1309	264	0.	*	1	2209	444	0.	*	2	0709	624	0.
1	0412	85	111.	*	1	1312	265	0.	*	1	2212	445	0.	*	2	0712	625	0.
1	0415	86	114.	*	1	1315	266	0.	*	1	2215	446	0.	*	2	0715	626	0.
1	0418	87	113.	*	1	1318	267	0.	*	1	2218	447	0.	*	2	0718	627	0.
1	0421	88	110.	*	1	1321	268	0.	*	1	2221	448	0.	*	2	0721	628	0.
1	0424	89	106.	*	1	1324	269	0.	*	1	2224	449	0.	*	2	0724	629	0.
1	0427	90	100.	*	1	1327	270	0.	*	1	2227	450	0.	*	2	0727	630	0.
1	0430	91	95.	*	1	1330	271	0.	*	1	2230	451	0.	*	2	0730	631	0.
1	0433	92	88.	*	1	1333	272	0.	*	1	2233	452	0.	*	2	0733	632	0.
1	0436	93	83.	*	1	1336	273	0.	*	1	2236	453	0.	*	2	0736	633	0.
1	0439	94	77.	*	1	1339	274	0.	*	1	2239	454	0.	*	2	0739	634	0.
1	0442	95	72.	*	1	1342	275	0.	*	1	2242	455	0.	*	2	0742	635	0.
1	0445	96	66.	*	1	1345	276	0.	*	1	2245	456	0.	*	2	0745	636	0.
1	0448	97	62.	*	1	1348	277	0.	*	1	2248	457	0.	*	2	0748	637	0.
1	0451	98	57.	*	1	1351	278	0.	*	1	2251	458	0.	*	2	0751	638	0.
1	0454	99	53.	*	1	1354	279	0.	*	1	2254	459	0.	*	2	0754	639	0.
1	0457	100	50.	*	1	1357	280	0.	*	1	2257	460	0.	*	2	0757	640	0.
1	0500	101	46.	*	1	1400	281	0.	*	1	2300	461	0.	*	2	0800	641	0.
1	0503	102	43.	*	1	1403	282	0.	*	1	2303	462	0.	*	2	0803	642	0.
1	0506	103	40.	*	1	1406	283	0.	*	1	2306	463	0.	*	2	0806	643	0.
1	0509	104	37.	*	1	1409	284	0.	*	1	2309	464	0.	*	2	0809	644	0.
1	0512	105	35.	*	1	1412	285	0.	*	1	2312	465	0.	*	2	0812	645	0.
1	0515	106	32.	*	1	1415	286	0.	*	1	2315	466	0.	*	2	0815	646	0.
1	0518	107	30.	*	1	1418	287	0.	*	1	2318	467	0.	*	2	0818	647	0.
1	0521	108	28.	*	1	1421	288	0.	*	1	2321	468	0.	*	2	0821	648	0.
1	0524	109	26.	*	1	1424	289	0.	*	1	2324	469	0.	*	2	0824	649	0.
1	0527	110	25.	*	1	1427	290	0.	*	1	2327	470	0.	*	2	0827	650	0.
1	0530	111	23.	*	1	1430	291	0.	*	1	2330	471	0.	*	2	0830	651	0.
1	0533	112	22.	*	1	1433	292	0.	*	1	2333	472	0.	*	2	0833	652	0.
1	0536	113	20.	*	1	1436	293	0.	*	1	2336	473	0.	*	2	0836	653	0.
1	0539	114	19.	*	1	1439	294	0.	*	1	2339	474	0.	*	2	0839	654	0.
1	0542	115	18.	*	1	1442	295	0.	*	1	2342	475	0.	*	2	0842	655	0.

1	0545	116	17.	*	1	1445	296	0.	*	1	2345	476	0.	*	2	0845	656	0.
1	0548	117	16.	*	1	1448	297	0.	*	1	2348	477	0.	*	2	0848	657	0.
1	0551	118	16.	*	1	1451	298	0.	*	1	2351	478	0.	*	2	0851	658	0.
1	0554	119	15.	*	1	1454	299	0.	*	1	2354	479	0.	*	2	0854	659	0.
1	0557	120	14.	*	1	1457	300	0.	*	1	2357	480	0.	*	2	0857	660	0.
1	0600	121	14.	*	1	1500	301	0.	*	2	0000	481	0.	*	2	0900	661	0.
1	0603	122	13.	*	1	1503	302	0.	*	2	0003	482	0.	*	2	0903	662	0.
1	0606	123	13.	*	1	1506	303	0.	*	2	0006	483	0.	*	2	0906	663	0.
1	0609	124	12.	*	1	1509	304	0.	*	2	0009	484	0.	*	2	0909	664	0.
1	0612	125	12.	*	1	1512	305	0.	*	2	0012	485	0.	*	2	0912	665	0.
1	0615	126	12.	*	1	1515	306	0.	*	2	0015	486	0.	*	2	0915	666	0.
1	0618	127	11.	*	1	1518	307	0.	*	2	0018	487	0.	*	2	0918	667	0.
1	0621	128	11.	*	1	1521	308	0.	*	2	0021	488	0.	*	2	0921	668	0.
1	0624	129	10.	*	1	1524	309	0.	*	2	0024	489	0.	*	2	0924	669	0.
1	0627	130	10.	*	1	1527	310	0.	*	2	0027	490	0.	*	2	0927	670	0.
1	0630	131	9.	*	1	1530	311	0.	*	2	0030	491	0.	*	2	0930	671	0.
1	0633	132	9.	*	1	1533	312	0.	*	2	0033	492	0.	*	2	0933	672	0.
1	0636	133	8.	*	1	1536	313	0.	*	2	0036	493	0.	*	2	0936	673	0.
1	0639	134	8.	*	1	1539	314	0.	*	2	0039	494	0.	*	2	0939	674	0.
1	0642	135	8.	*	1	1542	315	0.	*	2	0042	495	0.	*	2	0942	675	0.
1	0645	136	7.	*	1	1545	316	0.	*	2	0045	496	0.	*	2	0945	676	0.
1	0648	137	7.	*	1	1548	317	0.	*	2	0048	497	0.	*	2	0948	677	0.
1	0651	138	6.	*	1	1551	318	0.	*	2	0051	498	0.	*	2	0951	678	0.
1	0654	139	6.	*	1	1554	319	0.	*	2	0054	499	0.	*	2	0954	679	0.
1	0657	140	6.	*	1	1557	320	0.	*	2	0057	500	0.	*	2	0957	680	0.
1	0700	141	5.	*	1	1600	321	0.	*	2	0100	501	0.	*	2	1000	681	0.
1	0703	142	5.	*	1	1603	322	0.	*	2	0103	502	0.	*	2	1003	682	0.
1	0706	143	5.	*	1	1606	323	0.	*	2	0106	503	0.	*	2	1006	683	0.
1	0709	144	5.	*	1	1609	324	0.	*	2	0109	504	0.	*	2	1009	684	0.
1	0712	145	4.	*	1	1612	325	0.	*	2	0112	505	0.	*	2	1012	685	0.
1	0715	146	4.	*	1	1615	326	0.	*	2	0115	506	0.	*	2	1015	686	0.
1	0718	147	4.	*	1	1618	327	0.	*	2	0118	507	0.	*	2	1018	687	0.
1	0721	148	4.	*	1	1621	328	0.	*	2	0121	508	0.	*	2	1021	688	0.
1	0724	149	4.	*	1	1624	329	0.	*	2	0124	509	0.	*	2	1024	689	0.
1	0727	150	3.	*	1	1627	330	0.	*	2	0127	510	0.	*	2	1027	690	0.
1	0730	151	3.	*	1	1630	331	0.	*	2	0130	511	0.	*	2	1030	691	0.
1	0733	152	3.	*	1	1633	332	0.	*	2	0133	512	0.	*	2	1033	692	0.
1	0736	153	3.	*	1	1636	333	0.	*	2	0136	513	0.	*	2	1036	693	0.
1	0739	154	3.	*	1	1639	334	0.	*	2	0139	514	0.	*	2	1039	694	0.
1	0742	155	3.	*	1	1642	335	0.	*	2	0142	515	0.	*	2	1042	695	0.
1	0745	156	2.	*	1	1645	336	0.	*	2	0145	516	0.	*	2	1045	696	0.
1	0748	157	2.	*	1	1648	337	0.	*	2	0148	517	0.	*	2	1048	697	0.
1	0751	158	2.	*	1	1651	338	0.	*	2	0151	518	0.	*	2	1051	698	0.
1	0754	159	2.	*	1	1654	339	0.	*	2	0154	519	0.	*	2	1054	699	0.
1	0757	160	2.	*	1	1657	340	0.	*	2	0157	520	0.	*	2	1057	700	0.
1	0800	161	2.	*	1	1700	341	0.	*	2	0200	521	0.	*	2	1100	701	0.
1	0803	162	2.	*	1	1703	342	0.	*	2	0203	522	0.	*	2	1103	702	0.
1	0806	163	2.	*	1	1706	343	0.	*	2	0206	523	0.	*	2	1106	703	0.
1	0809	164	2.	*	1	1709	344	0.	*	2	0209	524	0.	*	2	1109	704	0.
1	0812	165	2.	*	1	1712	345	0.	*	2	0212	525	0.	*	2	1112	705	0.
1	0815	166	2.	*	1	1715	346	0.	*	2	0215	526	0.	*	2	1115	706	0.
1	0818	167	1.	*	1	1718	347	0.	*	2	0218	527	0.	*	2	1118	707	0.
1	0821	168	1.	*	1	1721	348	0.	*	2	0221	528	0.	*	2	1121	708	0.
1	0824	169	1.	*	1	1724	349	0.	*	2	0224	529	0.	*	2	1124	709	0.
1	0827	170	1.	*	1	1727	350	0.	*	2	0227	530	0.	*	2	1127	710	0.
1	0830	171	1.	*	1	1730	351	0.	*	2	0230	531	0.	*	2	1130	711	0.
1	0833	172	1.	*	1	1733	352	0.	*	2	0233	532	0.	*	2	1133	712	0.
1	0836	173	1.	*	1	1736	353	0.	*	2	0236	533	0.	*	2	1136	713	0.
1	0839	174	1.	*	1	1739	354	0.	*	2	0239	534	0.	*	2	1139	714	0.
1	0842	175	1.	*	1	1742	355	0.	*	2	0242	535	0.	*	2	1142	715	0.

1	0845	176	1.	*	1	1745	356	0.	*	2	0245	536	0.	*	2	1145	716	0.
1	0848	177	1.	*	1	1748	357	0.	*	2	0248	537	0.	*	2	1148	717	0.
1	0851	178	1.	*	1	1751	358	0.	*	2	0251	538	0.	*	2	1151	718	0.
1	0854	179	1.	*	1	1754	359	0.	*	2	0254	539	0.	*	2	1154	719	0.
1	0857	180	1.	*	1	1757	360	0.	*	2	0257	540	0.	*	2	1157	720	0.
				*					*					*				

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	35.95-HR
114.	4.25	(CFS)	24.	6.	4.	4.
		(INCHES)	0.498	0.513	0.513	0.513
		(AC-FT)	12.	12.	12.	12.

CUMULATIVE AREA = 0.46 SQ MI

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713 KP PLAN 2 FOR STATION R3228

HYDROGRAPH ROUTING DATA

714 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

717 SV STORAGE	0.0	6.9	14.0	21.3	28.8	36.5
718 SE ELEVATION	1405.00	1406.00	1407.00	1408.00	1409.00	1410.00

715 SL LOW-LEVEL OUTLET

ELEVL	1405.00	ELEVATION AT CENTER OF OUTLET
CAREA	0.79	CROSS-SECTIONAL AREA
COQL	0.60	COEFFICIENT
EXPL	0.50	EXPONENT OF HEAD

716 SS SPILLWAY

CREL	1409.90	SPILLWAY CREST ELEVATION
SPWID	60.00	SPILLWAY WIDTH
COQW	2.60	WEIR COEFFICIENT
EXPW	1.50	EXPONENT OF HEAD

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COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	0.00	2.69	2.94	3.24	3.61	4.07	4.68	5.49	6.64	8.41
ELEVATION	1405.00	1405.50	1405.60	1405.72	1405.90	1406.15	1406.51	1407.08	1408.05	1409.90
OUTFLOW	8.42	8.46	8.57	8.76	9.08	9.54	10.17	11.02	12.09	13.43
ELEVATION	1409.90	1409.90	1409.91	1409.92	1409.93	1409.94	1409.95	1409.96	1409.98	1410.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	3.44	4.12	5.00	6.21	6.90	7.95	10.54	14.00	14.62

OUTFLOW	0.00	2.69	2.94	3.24	3.61	3.80	4.07	4.68	5.38	5.49
ELEVATION	1405.00	1405.50	1405.60	1405.72	1405.90	1406.00	1406.15	1406.51	1407.00	1407.08
STORAGE	21.30	21.71	28.80	35.73	35.86	36.01	36.11	36.23	36.36	36.50
OUTFLOW	6.58	6.64	7.60	8.41	8.76	9.53	10.17	11.02	12.09	13.43
ELEVATION	1408.00	1408.05	1409.00	1409.90	1409.92	1409.94	1409.95	1409.96	1409.98	1410.00

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HYDROGRAPH AT STATION R3228
PLAN 2, RATIO = 1.00

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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.	0.0	1405.0	*	1		1200	241	7.	22.2	1408.1	*	2		0000	481	6.	16.1	1407.3
1		0003	2	0.	0.0	1405.0	*	1		1203	242	7.	22.2	1408.1	*	2		0003	482	6.	16.1	1407.3
1		0006	3	0.	0.0	1405.0	*	1		1206	243	7.	22.1	1408.1	*	2		0006	483	6.	16.1	1407.3
1		0009	4	0.	0.0	1405.0	*	1		1209	244	7.	22.1	1408.1	*	2		0009	484	6.	16.1	1407.3
1		0012	5	0.	0.0	1405.0	*	1		1212	245	7.	22.1	1408.1	*	2		0012	485	6.	16.0	1407.3
1		0015	6	0.	0.0	1405.0	*	1		1215	246	7.	22.1	1408.1	*	2		0015	486	6.	16.0	1407.3
1		0018	7	0.	0.0	1405.0	*	1		1218	247	7.	22.0	1408.1	*	2		0018	487	6.	16.0	1407.3
1		0021	8	0.	0.0	1405.0	*	1		1221	248	7.	22.0	1408.1	*	2		0021	488	6.	16.0	1407.3
1		0024	9	0.	0.0	1405.0	*	1		1224	249	7.	22.0	1408.1	*	2		0024	489	6.	15.9	1407.3
1		0027	10	0.	0.0	1405.0	*	1		1227	250	7.	21.9	1408.1	*	2		0027	490	6.	15.9	1407.3
1		0030	11	0.	0.0	1405.0	*	1		1230	251	7.	21.9	1408.1	*	2		0030	491	6.	15.9	1407.3
1		0033	12	0.	0.0	1405.0	*	1		1233	252	7.	21.9	1408.1	*	2		0033	492	6.	15.9	1407.3
1		0036	13	0.	0.0	1405.0	*	1		1236	253	7.	21.9	1408.1	*	2		0036	493	6.	15.9	1407.3
1		0039	14	0.	0.0	1405.0	*	1		1239	254	7.	21.8	1408.1	*	2		0039	494	6.	15.8	1407.3
1		0042	15	0.	0.0	1405.0	*	1		1242	255	7.	21.8	1408.1	*	2		0042	495	6.	15.8	1407.2
1		0045	16	0.	0.0	1405.0	*	1		1245	256	7.	21.8	1408.1	*	2		0045	496	6.	15.8	1407.2
1		0048	17	0.	0.0	1405.0	*	1		1248	257	7.	21.8	1408.1	*	2		0048	497	6.	15.8	1407.2
1		0051	18	0.	0.0	1405.0	*	1		1251	258	7.	21.7	1408.1	*	2		0051	498	6.	15.7	1407.2
1		0054	19	0.	0.0	1405.0	*	1		1254	259	7.	21.7	1408.1	*	2		0054	499	6.	15.7	1407.2
1		0057	20	0.	0.0	1405.0	*	1		1257	260	7.	21.7	1408.1	*	2		0057	500	6.	15.7	1407.2
1		0100	21	0.	0.0	1405.0	*	1		1300	261	7.	21.7	1408.0	*	2		0100	501	6.	15.7	1407.2
1		0103	22	0.	0.0	1405.0	*	1		1303	262	7.	21.6	1408.0	*	2		0103	502	6.	15.6	1407.2
1		0106	23	0.	0.0	1405.0	*	1		1306	263	7.	21.6	1408.0	*	2		0106	503	6.	15.6	1407.2
1		0109	24	0.	0.0	1405.0	*	1		1309	264	7.	21.6	1408.0	*	2		0109	504	6.	15.6	1407.2
1		0112	25	0.	0.0	1405.0	*	1		1312	265	7.	21.6	1408.0	*	2		0112	505	6.	15.6	1407.2
1		0115	26	0.	0.0	1405.0	*	1		1315	266	7.	21.5	1408.0	*	2		0115	506	6.	15.5	1407.2
1		0118	27	0.	0.0	1405.0	*	1		1318	267	7.	21.5	1408.0	*	2		0118	507	6.	15.5	1407.2
1		0121	28	0.	0.1	1405.0	*	1		1321	268	7.	21.5	1408.0	*	2		0121	508	6.	15.5	1407.2
1		0124	29	0.	0.1	1405.0	*	1		1324	269	7.	21.5	1408.0	*	2		0124	509	6.	15.5	1407.2
1		0127	30	0.	0.1	1405.0	*	1		1327	270	7.	21.4	1408.0	*	2		0127	510	6.	15.5	1407.2
1		0130	31	0.	0.1	1405.0	*	1		1330	271	7.	21.4	1408.0	*	2		0130	511	6.	15.4	1407.2
1		0133	32	0.	0.1	1405.0	*	1		1333	272	7.	21.4	1408.0	*	2		0133	512	6.	15.4	1407.2
1		0136	33	0.	0.1	1405.0	*	1		1336	273	7.	21.3	1408.0	*	2		0136	513	6.	15.4	1407.2
1		0139	34	0.	0.1	1405.0	*	1		1339	274	7.	21.3	1408.0	*	2		0139	514	6.	15.4	1407.2
1		0142	35	0.	0.2	1405.0	*	1		1342	275	7.	21.3	1408.0	*	2		0142	515	6.	15.3	1407.2
1		0145	36	0.	0.2	1405.0	*	1		1345	276	7.	21.3	1408.0	*	2		0145	516	6.	15.3	1407.2
1		0148	37	0.	0.2	1405.0	*	1		1348	277	7.	21.2	1408.0	*	2		0148	517	6.	15.3	1407.2
1		0151	38	0.	0.2	1405.0	*	1		1351	278	7.	21.2	1408.0	*	2		0151	518	6.	15.3	1407.2
1		0154	39	0.	0.3	1405.0	*	1		1354	279	7.	21.2	1408.0	*	2		0154	519	6.	15.2	1407.2
1		0157	40	0.	0.3	1405.0	*	1		1357	280	7.	21.2	1408.0	*	2		0157	520	6.	15.2	1407.2
1		0200	41	0.	0.3	1405.0	*	1		1400	281	7.	21.1	1408.0	*	2		0200	521	6.	15.2	1407.2
1		0203	42	0.	0.4	1405.1	*	1		1403	282	7.	21.1	1408.0	*	2		0203	522	6.	15.2	1407.2
1		0206	43	0.	0.4	1405.1	*	1		1406	283	7.	21.1	1408.0	*	2		0206	523	6.	15.2	1407.2

1	0209	44	0.	0.4	1405.1	*	1	1409	284	7.	21.1	1408.0	*	2	0209	524	6.	15.1	1407.2
1	0212	45	0.	0.5	1405.1	*	1	1412	285	7.	21.0	1408.0	*	2	0212	525	6.	15.1	1407.2
1	0215	46	0.	0.5	1405.1	*	1	1415	286	7.	21.0	1408.0	*	2	0215	526	6.	15.1	1407.1
1	0218	47	0.	0.5	1405.1	*	1	1418	287	7.	21.0	1408.0	*	2	0218	527	6.	15.1	1407.1
1	0221	48	0.	0.6	1405.1	*	1	1421	288	7.	21.0	1408.0	*	2	0221	528	6.	15.0	1407.1
1	0224	49	0.	0.6	1405.1	*	1	1424	289	7.	20.9	1407.9	*	2	0224	529	6.	15.0	1407.1
1	0227	50	1.	0.7	1405.1	*	1	1427	290	7.	20.9	1407.9	*	2	0227	530	6.	15.0	1407.1
1	0230	51	1.	0.7	1405.1	*	1	1430	291	7.	20.9	1407.9	*	2	0230	531	6.	15.0	1407.1
1	0233	52	1.	0.7	1405.1	*	1	1433	292	7.	20.8	1407.9	*	2	0233	532	6.	15.0	1407.1
1	0236	53	1.	0.8	1405.1	*	1	1436	293	7.	20.8	1407.9	*	2	0236	533	6.	14.9	1407.1
1	0239	54	1.	0.8	1405.1	*	1	1439	294	7.	20.8	1407.9	*	2	0239	534	6.	14.9	1407.1
1	0242	55	1.	0.9	1405.1	*	1	1442	295	6.	20.8	1407.9	*	2	0242	535	6.	14.9	1407.1
1	0245	56	1.	0.9	1405.1	*	1	1445	296	6.	20.7	1407.9	*	2	0245	536	6.	14.9	1407.1
1	0248	57	1.	1.0	1405.1	*	1	1448	297	6.	20.7	1407.9	*	2	0248	537	6.	14.8	1407.1
1	0251	58	1.	1.0	1405.1	*	1	1451	298	6.	20.7	1407.9	*	2	0251	538	6.	14.8	1407.1
1	0254	59	1.	1.1	1405.2	*	1	1454	299	6.	20.7	1407.9	*	2	0254	539	6.	14.8	1407.1
1	0257	60	1.	1.1	1405.2	*	1	1457	300	6.	20.6	1407.9	*	2	0257	540	6.	14.8	1407.1
1	0300	61	1.	1.2	1405.2	*	1	1500	301	6.	20.6	1407.9	*	2	0300	541	6.	14.7	1407.1
1	0303	62	1.	1.2	1405.2	*	1	1503	302	6.	20.6	1407.9	*	2	0303	542	6.	14.7	1407.1
1	0306	63	1.	1.3	1405.2	*	1	1506	303	6.	20.6	1407.9	*	2	0306	543	6.	14.7	1407.1
1	0309	64	1.	1.3	1405.2	*	1	1509	304	6.	20.5	1407.9	*	2	0309	544	5.	14.7	1407.1
1	0312	65	1.	1.4	1405.2	*	1	1512	305	6.	20.5	1407.9	*	2	0312	545	5.	14.7	1407.1
1	0315	66	1.	1.5	1405.2	*	1	1515	306	6.	20.5	1407.9	*	2	0315	546	5.	14.6	1407.1
1	0318	67	1.	1.5	1405.2	*	1	1518	307	6.	20.5	1407.9	*	2	0318	547	5.	14.6	1407.1
1	0321	68	1.	1.6	1405.2	*	1	1521	308	6.	20.4	1407.9	*	2	0321	548	5.	14.6	1407.1
1	0324	69	1.	1.7	1405.2	*	1	1524	309	6.	20.4	1407.9	*	2	0324	549	5.	14.6	1407.1
1	0327	70	1.	1.8	1405.3	*	1	1527	310	6.	20.4	1407.9	*	2	0327	550	5.	14.5	1407.1
1	0330	71	1.	1.9	1405.3	*	1	1530	311	6.	20.4	1407.9	*	2	0330	551	5.	14.5	1407.1
1	0333	72	2.	2.0	1405.3	*	1	1533	312	6.	20.3	1407.9	*	2	0333	552	5.	14.5	1407.1
1	0336	73	2.	2.1	1405.3	*	1	1536	313	6.	20.3	1407.9	*	2	0336	553	5.	14.5	1407.1
1	0339	74	2.	2.3	1405.3	*	1	1539	314	6.	20.3	1407.9	*	2	0339	554	5.	14.5	1407.1
1	0342	75	2.	2.5	1405.4	*	1	1542	315	6.	20.3	1407.9	*	2	0342	555	5.	14.4	1407.1
1	0345	76	2.	2.7	1405.4	*	1	1545	316	6.	20.2	1407.9	*	2	0345	556	5.	14.4	1407.1
1	0348	77	2.	3.0	1405.4	*	1	1548	317	6.	20.2	1407.8	*	2	0348	557	5.	14.4	1407.1
1	0351	78	3.	3.3	1405.5	*	1	1551	318	6.	20.2	1407.8	*	2	0351	558	5.	14.4	1407.0
1	0354	79	3.	3.8	1405.5	*	1	1554	319	6.	20.1	1407.8	*	2	0354	559	5.	14.3	1407.0
1	0357	80	3.	4.3	1405.6	*	1	1557	320	6.	20.1	1407.8	*	2	0357	560	5.	14.3	1407.0
1	0400	81	3.	4.9	1405.7	*	1	1600	321	6.	20.1	1407.8	*	2	0400	561	5.	14.3	1407.0
1	0403	82	3.	5.6	1405.8	*	1	1603	322	6.	20.1	1407.8	*	2	0403	562	5.	14.3	1407.0
1	0406	83	4.	6.4	1405.9	*	1	1606	323	6.	20.0	1407.8	*	2	0406	563	5.	14.3	1407.0
1	0409	84	4.	7.3	1406.1	*	1	1609	324	6.	20.0	1407.8	*	2	0409	564	5.	14.2	1407.0
1	0412	85	4.	8.2	1406.2	*	1	1612	325	6.	20.0	1407.8	*	2	0412	565	5.	14.2	1407.0
1	0415	86	4.	9.1	1406.3	*	1	1615	326	6.	20.0	1407.8	*	2	0415	566	5.	14.2	1407.0
1	0418	87	5.	10.1	1406.4	*	1	1618	327	6.	19.9	1407.8	*	2	0418	567	5.	14.2	1407.0
1	0421	88	5.	11.0	1406.6	*	1	1621	328	6.	19.9	1407.8	*	2	0421	568	5.	14.1	1407.0
1	0424	89	5.	11.9	1406.7	*	1	1624	329	6.	19.9	1407.8	*	2	0424	569	5.	14.1	1407.0
1	0427	90	5.	12.8	1406.8	*	1	1627	330	6.	19.9	1407.8	*	2	0427	570	5.	14.1	1407.0
1	0430	91	5.	13.6	1406.9	*	1	1630	331	6.	19.8	1407.8	*	2	0430	571	5.	14.1	1407.0
1	0433	92	5.	14.3	1407.0	*	1	1633	332	6.	19.8	1407.8	*	2	0433	572	5.	14.0	1407.0
1	0436	93	6.	15.0	1407.1	*	1	1636	333	6.	19.8	1407.8	*	2	0436	573	5.	14.0	1407.0
1	0439	94	6.	15.7	1407.2	*	1	1639	334	6.	19.8	1407.8	*	2	0439	574	5.	14.0	1407.0
1	0442	95	6.	16.3	1407.3	*	1	1642	335	6.	19.7	1407.8	*	2	0442	575	5.	14.0	1407.0
1	0445	96	6.	16.9	1407.4	*	1	1645	336	6.	19.7	1407.8	*	2	0445	576	5.	14.0	1407.0
1	0448	97	6.	17.4	1407.5	*	1	1648	337	6.	19.7	1407.8	*	2	0448	577	5.	13.9	1407.0
1	0451	98	6.	17.9	1407.5	*	1	1651	338	6.	19.7	1407.8	*	2	0451	578	5.	13.9	1407.0
1	0454	99	6.	18.3	1407.6	*	1	1654	339	6.	19.6	1407.8	*	2	0454	579	5.	13.9	1407.0
1	0457	100	6.	18.7	1407.6	*	1	1657	340	6.	19.6	1407.8	*	2	0457	580	5.	13.9	1407.0
1	0500	101	6.	19.1	1407.7	*	1	1700	341	6.	19.6	1407.8	*	2	0500	581	5.	13.9	1407.0
1	0503	102	6.	19.5	1407.7	*	1	1703	342	6.	19.6	1407.8	*	2	0503	582	5.	13.8	1407.0
1	0506	103	6.	19.8	1407.8	*	1	1706	343	6.	19.5	1407.8	*	2	0506	583	5.	13.8	1407.0

1	0509	104	6.	20.1	1407.8	*	1	1709	344	6.	19.5	1407.8	*	2	0509	584	5.	13.8	1407.0
1	0512	105	6.	20.4	1407.9	*	1	1712	345	6.	19.5	1407.8	*	2	0512	585	5.	13.8	1407.0
1	0515	106	6.	20.6	1407.9	*	1	1715	346	6.	19.5	1407.7	*	2	0515	586	5.	13.7	1407.0
1	0518	107	7.	20.9	1407.9	*	1	1718	347	6.	19.4	1407.7	*	2	0518	587	5.	13.7	1407.0
1	0521	108	7.	21.1	1408.0	*	1	1721	348	6.	19.4	1407.7	*	2	0521	588	5.	13.7	1407.0
1	0524	109	7.	21.3	1408.0	*	1	1724	349	6.	19.4	1407.7	*	2	0524	589	5.	13.7	1407.0
1	0527	110	7.	21.5	1408.0	*	1	1727	350	6.	19.4	1407.7	*	2	0527	590	5.	13.7	1407.0
1	0530	111	7.	21.7	1408.0	*	1	1730	351	6.	19.3	1407.7	*	2	0530	591	5.	13.6	1406.9
1	0533	112	7.	21.8	1408.1	*	1	1733	352	6.	19.3	1407.7	*	2	0533	592	5.	13.6	1406.9
1	0536	113	7.	22.0	1408.1	*	1	1736	353	6.	19.3	1407.7	*	2	0536	593	5.	13.6	1406.9
1	0539	114	7.	22.1	1408.1	*	1	1739	354	6.	19.2	1407.7	*	2	0539	594	5.	13.6	1406.9
1	0542	115	7.	22.3	1408.1	*	1	1742	355	6.	19.2	1407.7	*	2	0542	595	5.	13.5	1406.9
1	0545	116	7.	22.4	1408.1	*	1	1745	356	6.	19.2	1407.7	*	2	0545	596	5.	13.5	1406.9
1	0548	117	7.	22.5	1408.2	*	1	1748	357	6.	19.2	1407.7	*	2	0548	597	5.	13.5	1406.9
1	0551	118	7.	22.6	1408.2	*	1	1751	358	6.	19.1	1407.7	*	2	0551	598	5.	13.5	1406.9
1	0554	119	7.	22.7	1408.2	*	1	1754	359	6.	19.1	1407.7	*	2	0554	599	5.	13.5	1406.9
1	0557	120	7.	22.8	1408.2	*	1	1757	360	6.	19.1	1407.7	*	2	0557	600	5.	13.4	1406.9
1	0600	121	7.	22.9	1408.2	*	1	1800	361	6.	19.1	1407.7	*	2	0600	601	5.	13.4	1406.9
1	0603	122	7.	23.0	1408.2	*	1	1803	362	6.	19.0	1407.7	*	2	0603	602	5.	13.4	1406.9
1	0606	123	7.	23.1	1408.2	*	1	1806	363	6.	19.0	1407.7	*	2	0606	603	5.	13.4	1406.9
1	0609	124	7.	23.2	1408.3	*	1	1809	364	6.	19.0	1407.7	*	2	0609	604	5.	13.3	1406.9
1	0612	125	7.	23.3	1408.3	*	1	1812	365	6.	19.0	1407.7	*	2	0612	605	5.	13.3	1406.9
1	0615	126	7.	23.3	1408.3	*	1	1815	366	6.	18.9	1407.7	*	2	0615	606	5.	13.3	1406.9
1	0618	127	7.	23.4	1408.3	*	1	1818	367	6.	18.9	1407.7	*	2	0618	607	5.	13.3	1406.9
1	0621	128	7.	23.5	1408.3	*	1	1821	368	6.	18.9	1407.7	*	2	0621	608	5.	13.3	1406.9
1	0624	129	7.	23.5	1408.3	*	1	1824	369	6.	18.9	1407.7	*	2	0624	609	5.	13.2	1406.9
1	0627	130	7.	23.6	1408.3	*	1	1827	370	6.	18.8	1407.7	*	2	0627	610	5.	13.2	1406.9
1	0630	131	7.	23.6	1408.3	*	1	1830	371	6.	18.8	1407.7	*	2	0630	611	5.	13.2	1406.9
1	0633	132	7.	23.7	1408.3	*	1	1833	372	6.	18.8	1407.7	*	2	0633	612	5.	13.2	1406.9
1	0636	133	7.	23.7	1408.3	*	1	1836	373	6.	18.8	1407.7	*	2	0636	613	5.	13.2	1406.9
1	0639	134	7.	23.8	1408.3	*	1	1839	374	6.	18.7	1407.6	*	2	0639	614	5.	13.1	1406.9
1	0642	135	7.	23.8	1408.3	*	1	1842	375	6.	18.7	1407.6	*	2	0642	615	5.	13.1	1406.9
1	0645	136	7.	23.9	1408.3	*	1	1845	376	6.	18.7	1407.6	*	2	0645	616	5.	13.1	1406.9
1	0648	137	7.	23.9	1408.3	*	1	1848	377	6.	18.7	1407.6	*	2	0648	617	5.	13.1	1406.9
1	0651	138	7.	23.9	1408.3	*	1	1851	378	6.	18.6	1407.6	*	2	0651	618	5.	13.0	1406.9
1	0654	139	7.	23.9	1408.4	*	1	1854	379	6.	18.6	1407.6	*	2	0654	619	5.	13.0	1406.9
1	0657	140	7.	24.0	1408.4	*	1	1857	380	6.	18.6	1407.6	*	2	0657	620	5.	13.0	1406.9
1	0700	141	7.	24.0	1408.4	*	1	1900	381	6.	18.6	1407.6	*	2	0700	621	5.	13.0	1406.9
1	0703	142	7.	24.0	1408.4	*	1	1903	382	6.	18.5	1407.6	*	2	0703	622	5.	13.0	1406.9
1	0706	143	7.	24.0	1408.4	*	1	1906	383	6.	18.5	1407.6	*	2	0706	623	5.	12.9	1406.9
1	0709	144	7.	24.0	1408.4	*	1	1909	384	6.	18.5	1407.6	*	2	0709	624	5.	12.9	1406.8
1	0712	145	7.	24.0	1408.4	*	1	1912	385	6.	18.5	1407.6	*	2	0712	625	5.	12.9	1406.8
1	0715	146	7.	24.0	1408.4	*	1	1915	386	6.	18.4	1407.6	*	2	0715	626	5.	12.9	1406.8
1	0718	147	7.	24.0	1408.4	*	1	1918	387	6.	18.4	1407.6	*	2	0718	627	5.	12.9	1406.8
1	0721	148	7.	24.0	1408.4	*	1	1921	388	6.	18.4	1407.6	*	2	0721	628	5.	12.8	1406.8
1	0724	149	7.	24.0	1408.4	*	1	1924	389	6.	18.4	1407.6	*	2	0724	629	5.	12.8	1406.8
1	0727	150	7.	24.0	1408.4	*	1	1927	390	6.	18.3	1407.6	*	2	0727	630	5.	12.8	1406.8
1	0730	151	7.	24.0	1408.4	*	1	1930	391	6.	18.3	1407.6	*	2	0730	631	5.	12.8	1406.8
1	0733	152	7.	24.0	1408.4	*	1	1933	392	6.	18.3	1407.6	*	2	0733	632	5.	12.8	1406.8
1	0736	153	7.	24.0	1408.4	*	1	1936	393	6.	18.3	1407.6	*	2	0736	633	5.	12.7	1406.8
1	0739	154	7.	24.0	1408.4	*	1	1939	394	6.	18.2	1407.6	*	2	0739	634	5.	12.7	1406.8
1	0742	155	7.	24.0	1408.4	*	1	1942	395	6.	18.2	1407.6	*	2	0742	635	5.	12.7	1406.8
1	0745	156	7.	24.0	1408.4	*	1	1945	396	6.	18.2	1407.6	*	2	0745	636	5.	12.7	1406.8
1	0748	157	7.	24.0	1408.4	*	1	1948	397	6.	18.2	1407.6	*	2	0748	637	5.	12.6	1406.8
1	0751	158	7.	24.0	1408.4	*	1	1951	398	6.	18.1	1407.6	*	2	0751	638	5.	12.6	1406.8
1	0754	159	7.	24.0	1408.4	*	1	1954	399	6.	18.1	1407.6	*	2	0754	639	5.	12.6	1406.8
1	0757	160	7.	24.0	1408.4	*	1	1957	400	6.	18.1	1407.6	*	2	0757	640	5.	12.6	1406.8
1	0800	161	7.	24.0	1408.4	*	1	2000	401	6.	18.1	1407.6	*	2	0800	641	5.	12.6	1406.8
1	0803	162	7.	24.0	1408.4	*	1	2003	402	6.	18.0	1407.6	*	2	0803	642	5.	12.5	1406.8
1	0806	163	7.	23.9	1408.4	*	1	2006	403	6.	18.0	1407.6	*	2	0806	643	5.	12.5	1406.8

1	0809	164	7.	23.9	1408.4	*	1	2009	404	6.	18.0	1407.5	*	2	0809	644	5.	12.5	1406.8
1	0812	165	7.	23.9	1408.3	*	1	2012	405	6.	18.0	1407.5	*	2	0812	645	5.	12.5	1406.8
1	0815	166	7.	23.9	1408.3	*	1	2015	406	6.	17.9	1407.5	*	2	0815	646	5.	12.5	1406.8
1	0818	167	7.	23.9	1408.3	*	1	2018	407	6.	17.9	1407.5	*	2	0818	647	5.	12.4	1406.8
1	0821	168	7.	23.9	1408.3	*	1	2021	408	6.	17.9	1407.5	*	2	0821	648	5.	12.4	1406.8
1	0824	169	7.	23.9	1408.3	*	1	2024	409	6.	17.9	1407.5	*	2	0824	649	5.	12.4	1406.8
1	0827	170	7.	23.8	1408.3	*	1	2027	410	6.	17.8	1407.5	*	2	0827	650	5.	12.4	1406.8
1	0830	171	7.	23.8	1408.3	*	1	2030	411	6.	17.8	1407.5	*	2	0830	651	5.	12.4	1406.8
1	0833	172	7.	23.8	1408.3	*	1	2033	412	6.	17.8	1407.5	*	2	0833	652	5.	12.3	1406.8
1	0836	173	7.	23.8	1408.3	*	1	2036	413	6.	17.8	1407.5	*	2	0836	653	5.	12.3	1406.8
1	0839	174	7.	23.8	1408.3	*	1	2039	414	6.	17.7	1407.5	*	2	0839	654	5.	12.3	1406.8
1	0842	175	7.	23.8	1408.3	*	1	2042	415	6.	17.7	1407.5	*	2	0842	655	5.	12.3	1406.8
1	0845	176	7.	23.7	1408.3	*	1	2045	416	6.	17.7	1407.5	*	2	0845	656	5.	12.2	1406.8
1	0848	177	7.	23.7	1408.3	*	1	2048	417	6.	17.7	1407.5	*	2	0848	657	5.	12.2	1406.8
1	0851	178	7.	23.7	1408.3	*	1	2051	418	6.	17.6	1407.5	*	2	0851	658	5.	12.2	1406.7
1	0854	179	7.	23.7	1408.3	*	1	2054	419	6.	17.6	1407.5	*	2	0854	659	5.	12.2	1406.7
1	0857	180	7.	23.7	1408.3	*	1	2057	420	6.	17.6	1407.5	*	2	0857	660	5.	12.2	1406.7
1	0900	181	7.	23.6	1408.3	*	1	2100	421	6.	17.6	1407.5	*	2	0900	661	5.	12.1	1406.7
1	0903	182	7.	23.6	1408.3	*	1	2103	422	6.	17.6	1407.5	*	2	0903	662	5.	12.1	1406.7
1	0906	183	7.	23.6	1408.3	*	1	2106	423	6.	17.5	1407.5	*	2	0906	663	5.	12.1	1406.7
1	0909	184	7.	23.6	1408.3	*	1	2109	424	6.	17.5	1407.5	*	2	0909	664	5.	12.1	1406.7
1	0912	185	7.	23.6	1408.3	*	1	2112	425	6.	17.5	1407.5	*	2	0912	665	5.	12.1	1406.7
1	0915	186	7.	23.5	1408.3	*	1	2115	426	6.	17.5	1407.5	*	2	0915	666	5.	12.0	1406.7
1	0918	187	7.	23.5	1408.3	*	1	2118	427	6.	17.4	1407.5	*	2	0918	667	5.	12.0	1406.7
1	0921	188	7.	23.5	1408.3	*	1	2121	428	6.	17.4	1407.5	*	2	0921	668	5.	12.0	1406.7
1	0924	189	7.	23.5	1408.3	*	1	2124	429	6.	17.4	1407.5	*	2	0924	669	5.	12.0	1406.7
1	0927	190	7.	23.4	1408.3	*	1	2127	430	6.	17.4	1407.5	*	2	0927	670	5.	12.0	1406.7
1	0930	191	7.	23.4	1408.3	*	1	2130	431	6.	17.3	1407.5	*	2	0930	671	5.	11.9	1406.7
1	0933	192	7.	23.4	1408.3	*	1	2133	432	6.	17.3	1407.5	*	2	0933	672	5.	11.9	1406.7
1	0936	193	7.	23.4	1408.3	*	1	2136	433	6.	17.3	1407.4	*	2	0936	673	5.	11.9	1406.7
1	0939	194	7.	23.4	1408.3	*	1	2139	434	6.	17.3	1407.4	*	2	0939	674	5.	11.9	1406.7
1	0942	195	7.	23.3	1408.3	*	1	2142	435	6.	17.2	1407.4	*	2	0942	675	5.	11.9	1406.7
1	0945	196	7.	23.3	1408.3	*	1	2145	436	6.	17.2	1407.4	*	2	0945	676	5.	11.8	1406.7
1	0948	197	7.	23.3	1408.3	*	1	2148	437	6.	17.2	1407.4	*	2	0948	677	5.	11.8	1406.7
1	0951	198	7.	23.3	1408.3	*	1	2151	438	6.	17.2	1407.4	*	2	0951	678	5.	11.8	1406.7
1	0954	199	7.	23.2	1408.3	*	1	2154	439	6.	17.1	1407.4	*	2	0954	679	5.	11.8	1406.7
1	0957	200	7.	23.2	1408.3	*	1	2157	440	6.	17.1	1407.4	*	2	0957	680	5.	11.8	1406.7
1	1000	201	7.	23.2	1408.3	*	1	2200	441	6.	17.1	1407.4	*	2	1000	681	5.	11.7	1406.7
1	1003	202	7.	23.2	1408.2	*	1	2203	442	6.	17.1	1407.4	*	2	1003	682	5.	11.7	1406.7
1	1006	203	7.	23.1	1408.2	*	1	2206	443	6.	17.0	1407.4	*	2	1006	683	5.	11.7	1406.7
1	1009	204	7.	23.1	1408.2	*	1	2209	444	6.	17.0	1407.4	*	2	1009	684	5.	11.7	1406.7
1	1012	205	7.	23.1	1408.2	*	1	2212	445	6.	17.0	1407.4	*	2	1012	685	5.	11.7	1406.7
1	1015	206	7.	23.1	1408.2	*	1	2215	446	6.	17.0	1407.4	*	2	1015	686	5.	11.6	1406.7
1	1018	207	7.	23.0	1408.2	*	1	2218	447	6.	16.9	1407.4	*	2	1018	687	5.	11.6	1406.7
1	1021	208	7.	23.0	1408.2	*	1	2221	448	6.	16.9	1407.4	*	2	1021	688	5.	11.6	1406.7
1	1024	209	7.	23.0	1408.2	*	1	2224	449	6.	16.9	1407.4	*	2	1024	689	5.	11.6	1406.7
1	1027	210	7.	23.0	1408.2	*	1	2227	450	6.	16.9	1407.4	*	2	1027	690	5.	11.6	1406.7
1	1030	211	7.	22.9	1408.2	*	1	2230	451	6.	16.8	1407.4	*	2	1030	691	5.	11.5	1406.7
1	1033	212	7.	22.9	1408.2	*	1	2233	452	6.	16.8	1407.4	*	2	1033	692	5.	11.5	1406.6
1	1036	213	7.	22.9	1408.2	*	1	2236	453	6.	16.8	1407.4	*	2	1036	693	5.	11.5	1406.6
1	1039	214	7.	22.9	1408.2	*	1	2239	454	6.	16.8	1407.4	*	2	1039	694	5.	11.5	1406.6
1	1042	215	7.	22.8	1408.2	*	1	2242	455	6.	16.8	1407.4	*	2	1042	695	5.	11.5	1406.6
1	1045	216	7.	22.8	1408.2	*	1	2245	456	6.	16.7	1407.4	*	2	1045	696	5.	11.4	1406.6
1	1048	217	7.	22.8	1408.2	*	1	2248	457	6.	16.7	1407.4	*	2	1048	697	5.	11.4	1406.6
1	1051	218	7.	22.8	1408.2	*	1	2251	458	6.	16.7	1407.4	*	2	1051	698	5.	11.4	1406.6
1	1054	219	7.	22.7	1408.2	*	1	2254	459	6.	16.7	1407.4	*	2	1054	699	5.	11.4	1406.6
1	1057	220	7.	22.7	1408.2	*	1	2257	460	6.	16.6	1407.4	*	2	1057	700	5.	11.4	1406.6
1	1100	221	7.	22.7	1408.2	*	1	2300	461	6.	16.6	1407.4	*	2	1100	701	5.	11.3	1406.6
1	1103	222	7.	22.7	1408.2	*	1	2303	462	6.	16.6	1407.4	*	2	1103	702	5.	11.3	1406.6
1	1106	223	7.	22.6	1408.2	*	1	2306	463	6.	16.6	1407.4	*	2	1106	703	5.	11.3	1406.6

1	1109	224	7.	22.6	1408.2	*	1	2309	464	6.	16.5	1407.3	*	2	1109	704	5.	11.3	1406.6
1	1112	225	7.	22.6	1408.2	*	1	2312	465	6.	16.5	1407.3	*	2	1112	705	5.	11.3	1406.6
1	1115	226	7.	22.6	1408.2	*	1	2315	466	6.	16.5	1407.3	*	2	1115	706	5.	11.2	1406.6
1	1118	227	7.	22.5	1408.2	*	1	2318	467	6.	16.5	1407.3	*	2	1118	707	5.	11.2	1406.6
1	1121	228	7.	22.5	1408.2	*	1	2321	468	6.	16.4	1407.3	*	2	1121	708	5.	11.2	1406.6
1	1124	229	7.	22.5	1408.2	*	1	2324	469	6.	16.4	1407.3	*	2	1124	709	5.	11.2	1406.6
1	1127	230	7.	22.5	1408.2	*	1	2327	470	6.	16.4	1407.3	*	2	1127	710	5.	11.2	1406.6
1	1130	231	7.	22.4	1408.2	*	1	2330	471	6.	16.4	1407.3	*	2	1130	711	5.	11.1	1406.6
1	1133	232	7.	22.4	1408.1	*	1	2333	472	6.	16.3	1407.3	*	2	1133	712	5.	11.1	1406.6
1	1136	233	7.	22.4	1408.1	*	1	2336	473	6.	16.3	1407.3	*	2	1136	713	5.	11.1	1406.6
1	1139	234	7.	22.4	1408.1	*	1	2339	474	6.	16.3	1407.3	*	2	1139	714	5.	11.1	1406.6
1	1142	235	7.	22.3	1408.1	*	1	2342	475	6.	16.3	1407.3	*	2	1142	715	5.	11.1	1406.6
1	1145	236	7.	22.3	1408.1	*	1	2345	476	6.	16.3	1407.3	*	2	1145	716	5.	11.0	1406.6
1	1148	237	7.	22.3	1408.1	*	1	2348	477	6.	16.2	1407.3	*	2	1148	717	5.	11.0	1406.6
1	1151	238	7.	22.3	1408.1	*	1	2351	478	6.	16.2	1407.3	*	2	1151	718	5.	11.0	1406.6
1	1154	239	7.	22.2	1408.1	*	1	2354	479	6.	16.2	1407.3	*	2	1154	719	5.	11.0	1406.6
1	1157	240	7.	22.2	1408.1	*	1	2357	480	6.	16.2	1407.3	*	2	1157	720	5.	11.0	1406.6
						*							*						

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	35.95-HR
7.	7.30	(CFS)	7.	6.	5.	5.
		(INCHES)	0.140	0.511	0.655	0.655
		(AC-FT)	3.	12.	16.	16.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	35.95-HR
24.	7.40	23.	19.	16.	16.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	35.95-HR
1408.37	7.40	1408.28	1407.75	1407.23	1407.23

CUMULATIVE AREA = 0.46 SQ MI

*** FDKRUT - NEWTON-RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION= 1

*** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

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789 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE


       *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1



       *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1


949 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
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PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

RATIOS APPLIED TO FLOWS

OPERATION	STATION	AREA	PLAN		RATIO 1
					1.00
HYDROGRAPH AT	S1004	0.06	1	FLOW	20.
				TIME	4.45
			2	FLOW	20.
				TIME	0.00
ROUTED TO	R1005	0.06	1	FLOW	20.
				TIME	4.50
			2	FLOW	20.
				TIME	4.50
HYDROGRAPH AT	S1008	0.05	1	FLOW	9.
				TIME	5.05
			2	FLOW	9.
				TIME	4.50
2 COMBINED AT	C1009	0.11	1	FLOW	27.
				TIME	4.50
			2	FLOW	27.
				TIME	4.50
ROUTED TO	R1011	0.11	1	FLOW	27.
				TIME	4.60
			2	FLOW	27.
				TIME	4.60
HYDROGRAPH AT	S1012	0.06	1	FLOW	6.
				TIME	5.50
			2	FLOW	6.
				TIME	4.60
ROUTED TO	R1013	0.06	1	FLOW	6.
				TIME	5.60
			2	FLOW	6.
				TIME	5.60
HYDROGRAPH AT	S1016	0.04	1	FLOW	4.
				TIME	5.55
			2	FLOW	4.
				TIME	5.60
2 COMBINED AT	C1017	0.10	1	FLOW	10.
				TIME	5.55
			2	FLOW	10.
				TIME	5.55
ROUTED TO	R1019	0.10	1	FLOW	10.
				TIME	5.65
			2	FLOW	10.
				TIME	5.65

2 COMBINED AT	C1021	0.21	1	FLOW	32.
				TIME	4.60
			2	FLOW	32.
				TIME	4.60
DIVERSION TO	D1023	0.21	1	FLOW	32.
				TIME	4.60
			2	FLOW	32.
				TIME	4.60
HYDROGRAPH AT	DV1023	0.21	1	FLOW	0.
				TIME	0.05
			2	FLOW	0.
				TIME	0.05
HYDROGRAPH AT	S1024	0.09	1	FLOW	9.
				TIME	5.50
			2	FLOW	9.
				TIME	0.05
ROUTED TO	R1025	0.09	1	FLOW	9.
				TIME	5.55
			2	FLOW	9.
				TIME	5.55
HYDROGRAPH AT	S1028	0.06	1	FLOW	19.
				TIME	4.55
			2	FLOW	19.
				TIME	5.55
DIVERSION TO	DOUT1	0.06	1	FLOW	19.
				TIME	4.55
			2	FLOW	19.
				TIME	4.55
HYDROGRAPH AT	DOUT1	0.06	1	FLOW	0.
				TIME	4.50
			2	FLOW	0.
				TIME	4.50
3 COMBINED AT	C1029	0.37	1	FLOW	9.
				TIME	5.55
			2	FLOW	9.
				TIME	5.55
DIVERSION TO	D1031	0.37	1	FLOW	7.
				TIME	5.55
			2	FLOW	7.
				TIME	5.55
HYDROGRAPH AT	DV1031	0.37	1	FLOW	2.
				TIME	5.55
			2	FLOW	2.
				TIME	5.55
ROUTED TO	R1033	0.37	1	FLOW	2.
				TIME	5.65
			2	FLOW	2.
				TIME	5.65

HYDROGRAPH AT	S1034	0.06	1	FLOW	28.
				TIME	4.25
			2	FLOW	28.
				TIME	5.65
DIVERSION TO	DOUT2	0.06	1	FLOW	28.
				TIME	4.25
			2	FLOW	28.
				TIME	4.25
HYDROGRAPH AT	DOUT2	0.06	1	FLOW	0.
				TIME	4.20
			2	FLOW	0.
				TIME	4.20
2 COMBINED AT	C1035	0.43	1	FLOW	2.
				TIME	5.65
			2	FLOW	2.
				TIME	5.65
DIVERSION TO	D1037	0.43	1	FLOW	2.
				TIME	5.65
			2	FLOW	2.
				TIME	5.65
HYDROGRAPH AT	DV1037	0.43	1	FLOW	0.
				TIME	5.65
			2	FLOW	0.
				TIME	5.65
ROUTED TO	R1039	0.43	1	FLOW	0.
				TIME	5.70
			2	FLOW	0.
				TIME	5.70
HYDROGRAPH AT	S1040	0.04	1	FLOW	4.
				TIME	5.50
			2	FLOW	4.
				TIME	5.70
2 COMBINED AT	C1041	0.47	1	FLOW	5.
				TIME	5.55
			2	FLOW	5.
				TIME	5.55
DIVERSION TO	D1043	0.47	1	FLOW	0.
				TIME	0.05
			2	FLOW	0.
				TIME	0.05
HYDROGRAPH AT	DV1043	0.47	1	FLOW	5.
				TIME	5.55
			2	FLOW	5.
				TIME	5.55
ROUTED TO	R1045	0.47	1	FLOW	5.
				TIME	5.55
			2	FLOW	5.
				TIME	5.55

HYDROGRAPH AT	S1046	0.12	1	FLOW	14.
				TIME	5.50
			2	FLOW	14.
				TIME	5.55
2 COMBINED AT	C1047	0.59	1	FLOW	19.
				TIME	5.50
			2	FLOW	19.
				TIME	5.50
DIVERSION TO	D1048	0.59	1	FLOW	18.
				TIME	5.50
			2	FLOW	18.
				TIME	5.50
HYDROGRAPH AT	DV1048	0.59	1	FLOW	1.
				TIME	5.50
			2	FLOW	1.
				TIME	5.50
DIVERSION TO	D1049	0.59	1	FLOW	0.
				TIME	5.45
			2	FLOW	0.
				TIME	5.45
HYDROGRAPH AT	DV1049	0.59	1	FLOW	1.
				TIME	5.50
			2	FLOW	1.
				TIME	5.50
ROUTED TO	R1051	0.59	1	FLOW	1.
				TIME	5.55
			2	FLOW	1.
				TIME	5.55
HYDROGRAPH AT	S1052	0.21	1	FLOW	26.
				TIME	5.50
			2	FLOW	26.
				TIME	5.55
2 COMBINED AT	C1053	0.80	1	FLOW	27.
				TIME	5.50
			2	FLOW	27.
				TIME	5.50
DIVERSION TO	D1055	0.80	1	FLOW	27.
				TIME	5.50
			2	FLOW	27.
				TIME	5.50
HYDROGRAPH AT	DV1055	0.80	1	FLOW	0.
				TIME	5.45
			2	FLOW	0.
				TIME	5.45
HYDROGRAPH AT	S1056	0.12	1	FLOW	16.
				TIME	5.20
			2	FLOW	16.
				TIME	5.45

DIVERSION TO	DOUT3	0.12	1	FLOW	15.
				TIME	5.20
			2	FLOW	15.
				TIME	5.20
HYDROGRAPH AT	DOUT3	0.12	1	FLOW	1.
				TIME	5.20
			2	FLOW	1.
				TIME	5.20
2 COMBINED AT	C1056A	0.92	1	FLOW	1.
				TIME	5.25
			2	FLOW	1.
				TIME	5.25
DIVERSION TO	D1056	0.92	1	FLOW	1.
				TIME	5.25
			2	FLOW	1.
				TIME	5.25
HYDROGRAPH AT	DV1056	0.92	1	FLOW	0.
				TIME	4.80
			2	FLOW	0.
				TIME	4.80
DIVERSION TO	D1057	0.92	1	FLOW	0.
				TIME	4.40
			2	FLOW	0.
				TIME	4.40
HYDROGRAPH AT	DV1057	0.92	1	FLOW	0.
				TIME	4.40
			2	FLOW	0.
				TIME	4.40
ROUTED TO	R1059	0.92	1	FLOW	0.
				TIME	5.20
			2	FLOW	0.
				TIME	5.20
DIVERSION TO	D1066	0.92	1	FLOW	0.
				TIME	5.20
			2	FLOW	0.
				TIME	5.20
HYDROGRAPH AT	DV1066	0.92	1	FLOW	0.
				TIME	0.05
			2	FLOW	0.
				TIME	0.05
DIVERSION TO	DSOUTH	0.92	1	FLOW	0.
				TIME	0.05
			2	FLOW	0.
				TIME	0.05
HYDROGRAPH AT	DSOUTH	0.92	1	FLOW	0.
				TIME	0.05
			2	FLOW	0.
				TIME	0.05

HYDROGRAPH AT	D1023	0.00	1	FLOW	32.
				TIME	4.60
			2	FLOW	32.
				TIME	4.60
HYDROGRAPH AT	S3002	0.09	1	FLOW	23.
				TIME	4.45
			2	FLOW	23.
				TIME	4.60
2 COMBINED AT	C3003	0.09	1	FLOW	52.
				TIME	4.55
			2	FLOW	52.
				TIME	4.55
DIVERSION TO	D3002	0.09	1	FLOW	52.
				TIME	4.55
			2	FLOW	52.
				TIME	4.55
HYDROGRAPH AT	DV3002	0.09	1	FLOW	0.
				TIME	4.50
			2	FLOW	0.
				TIME	4.50
ROUTED TO	R3005	0.09	1	FLOW	0.
				TIME	4.75
			2	FLOW	0.
				TIME	4.75
HYDROGRAPH AT	S3008	0.07	1	FLOW	47.
				TIME	4.05
			2	FLOW	47.
				TIME	4.75
DIVERSION TO	DOUT8	0.07	1	FLOW	47.
				TIME	4.05
			2	FLOW	47.
				TIME	4.05
HYDROGRAPH AT	DOUT8	0.07	1	FLOW	22.
				TIME	4.50
			2	FLOW	22.
				TIME	4.50
2 COMBINED AT	C3009	0.16	1	FLOW	22.
				TIME	4.50
			2	FLOW	22.
				TIME	4.50
ROUTED TO	R3011	0.16	1	FLOW	21.
				TIME	4.70
			2	FLOW	21.
				TIME	4.70
HYDROGRAPH AT	S3012	0.19	1	FLOW	85.
				TIME	4.40
			2	FLOW	85.
				TIME	4.70

ROUTED TO	R3013	0.19	1	FLOW	85.
				TIME	4.45
			2	FLOW	85.
				TIME	4.45
HYDROGRAPH AT	S3016	0.15	1	FLOW	5.
				TIME	5.55
			2	FLOW	5.
				TIME	4.45
DIVERSION TO	DOUT9	0.15	1	FLOW	5.
				TIME	5.55
			2	FLOW	5.
				TIME	5.55
HYDROGRAPH AT	DOUT9	0.15	1	FLOW	0.
				TIME	5.35
			2	FLOW	0.
				TIME	5.35
2 COMBINED AT	C3016A	0.34	1	FLOW	85.
				TIME	4.45
			2	FLOW	85.
				TIME	4.45
ROUTED TO	R3017	0.34	1	FLOW	84.
				TIME	4.55
			2	FLOW	84.
				TIME	4.55
HYDROGRAPH AT	S3020	0.13	1	FLOW	89.
				TIME	4.15
			2	FLOW	89.
				TIME	4.55
DIVERSION TO	DOUT10	0.13	1	FLOW	89.
				TIME	4.15
			2	FLOW	89.
				TIME	4.15
HYDROGRAPH AT	DOUT10	0.13	1	FLOW	28.
				TIME	4.90
			2	FLOW	28.
				TIME	4.90
3 COMBINED AT	C3023	0.63	1	FLOW	111.
				TIME	4.85
			2	FLOW	111.
				TIME	4.85
ROUTED TO	R3025	0.63	1	FLOW	108.
				TIME	4.95
			2	FLOW	108.
				TIME	4.95
HYDROGRAPH AT	D1031	0.00	1	FLOW	7.
				TIME	5.55
			2	FLOW	7.
				TIME	5.55

ROUTED TO	R3027	0.00	1	FLOW	7.
				TIME	5.95
			2	FLOW	7.
				TIME	5.95
HYDROGRAPH AT	S3028	0.27	1	FLOW	161.
				TIME	4.15
			2	FLOW	161.
				TIME	5.95
DIVERSION TO	DOUT11	0.27	1	FLOW	161.
				TIME	4.15
			2	FLOW	161.
				TIME	4.15
HYDROGRAPH AT	DOUT11	0.27	1	FLOW	97.
				TIME	4.50
			2	FLOW	97.
				TIME	4.50
2 COMBINED AT	C3031	0.27	1	FLOW	97.
				TIME	4.50
			2	FLOW	97.
				TIME	4.50
DIVERSION TO	D3033	0.27	1	FLOW	49.
				TIME	4.50
			2	FLOW	49.
				TIME	4.50
HYDROGRAPH AT	DV3033	0.27	1	FLOW	49.
				TIME	4.50
			2	FLOW	49.
				TIME	4.50
ROUTED TO	R3035	0.27	1	FLOW	48.
				TIME	4.65
			2	FLOW	48.
				TIME	4.65
HYDROGRAPH AT	S3038	0.13	1	FLOW	62.
				TIME	4.25
			2	FLOW	62.
				TIME	4.65
DIVERSION TO	DOUT12	0.13	1	FLOW	62.
				TIME	4.25
			2	FLOW	62.
				TIME	4.25
HYDROGRAPH AT	DOUT12	0.13	1	FLOW	0.
				TIME	4.20
			2	FLOW	0.
				TIME	4.20
3 COMBINED AT	C3041	1.03	1	FLOW	139.
				TIME	4.95
			2	FLOW	139.
				TIME	4.95

ROUTED TO	R3043	1.03	1	FLOW	137.
				TIME	4.90
			2	FLOW	137.
				TIME	4.90
HYDROGRAPH AT	D3033	0.00	1	FLOW	49.
				TIME	4.50
			2	FLOW	49.
				TIME	4.50
ROUTED TO	R3045	0.00	1	FLOW	48.
				TIME	4.80
			2	FLOW	48.
				TIME	4.80
HYDROGRAPH AT	D1037	0.00	1	FLOW	2.
				TIME	5.65
			2	FLOW	2.
				TIME	5.65
ROUTED TO	R3047	0.00	1	FLOW	2.
				TIME	6.00
			2	FLOW	2.
				TIME	6.00
HYDROGRAPH AT	D1043	0.00	1	FLOW	0.
				TIME	0.05
			2	FLOW	0.
				TIME	0.05
ROUTED TO	R3049	0.00	1	FLOW	0.
				TIME	0.05
			2	FLOW	0.
				TIME	0.05
3 COMBINED AT	C3063	0.00	1	FLOW	48.
				TIME	4.80
			2	FLOW	48.
				TIME	4.80
DIVERSION TO	D3049	0.00	1	FLOW	24.
				TIME	4.80
			2	FLOW	24.
				TIME	4.80
HYDROGRAPH AT	DV3049	0.00	1	FLOW	24.
				TIME	4.80
			2	FLOW	24.
				TIME	4.80
ROUTED TO	R3052	0.00	1	FLOW	23.
				TIME	5.05
			2	FLOW	23.
				TIME	5.05
2 COMBINED AT	C3051	1.03	1	FLOW	158.
				TIME	5.10
			2	FLOW	158.
				TIME	5.10

ROUTED TO	R3054	1.03	1	FLOW	157.
				TIME	5.25
			2	FLOW	157.
				TIME	5.25
HYDROGRAPH AT	S3061	0.30	1	FLOW	124.
				TIME	4.35
			2	FLOW	124.
				TIME	5.25
2 COMBINED AT	C3055	1.33	1	FLOW	199.
				TIME	5.25
			2	FLOW	199.
				TIME	5.25
DIVERSION TO	MANOR	1.33	1	FLOW	127.
				TIME	4.30
			2	FLOW	127.
				TIME	4.30
HYDROGRAPH AT	MANOR	1.33	1	FLOW	199.
				TIME	5.25
			2	FLOW	199.
				TIME	5.25
HYDROGRAPH AT	D3049	0.00	1	FLOW	24.
				TIME	4.80
			2	FLOW	24.
				TIME	4.80
ROUTED TO	R3057	0.00	1	FLOW	23.
				TIME	5.15
			2	FLOW	23.
				TIME	5.15
HYDROGRAPH AT	S3060	0.30	1	FLOW	124.
				TIME	4.35
			2	FLOW	124.
				TIME	5.15
2 COMBINED AT	C3066	0.30	1	FLOW	124.
				TIME	4.35
			2	FLOW	124.
				TIME	4.35
HYDROGRAPH AT	D1048	0.00	1	FLOW	18.
				TIME	5.50
			2	FLOW	18.
				TIME	5.50
ROUTED TO	R1048	0.00	1	FLOW	18.
				TIME	5.55
			2	FLOW	18.
				TIME	5.55
HYDROGRAPH AT	D1049	0.00	1	FLOW	0.
				TIME	5.45
			2	FLOW	0.
				TIME	5.45

ROUTED TO	R3053	0.00	1	FLOW	0.
				TIME	6.40
			2	FLOW	0.
				TIME	6.40
HYDROGRAPH AT	D1055	0.00	1	FLOW	27.
				TIME	5.50
			2	FLOW	27.
				TIME	5.50
ROUTED TO	R3055	0.00	1	FLOW	27.
				TIME	5.70
			2	FLOW	27.
				TIME	5.70
4 COMBINED AT	C3060A	0.30	1	FLOW	129.
				TIME	4.40
			2	FLOW	129.
				TIME	4.40
DIVERSION TO	DOUT13	0.30	1	FLOW	129.
				TIME	4.40
			2	FLOW	129.
				TIME	4.40
HYDROGRAPH AT	DOUT13	0.30	1	FLOW	19.
				TIME	7.60
			2	FLOW	19.
				TIME	7.60
DIVERSION TO	D3065	0.30	1	FLOW	0.
				TIME	0.05
			2	FLOW	0.
				TIME	0.05
HYDROGRAPH AT	DV3065	0.30	1	FLOW	19.
				TIME	7.60
			2	FLOW	19.
				TIME	7.60
ROUTED TO	R3065	0.30	1	FLOW	18.
				TIME	7.75
			2	FLOW	18.
				TIME	7.75
2 COMBINED AT	C3065	1.63	1	FLOW	199.
				TIME	5.25
			2	FLOW	199.
				TIME	5.25
DIVERSION TO	D3062	1.63	1	FLOW	160.
				TIME	4.95
			2	FLOW	160.
				TIME	4.95
HYDROGRAPH AT	DV3062	1.63	1	FLOW	39.
				TIME	5.25
			2	FLOW	39.
				TIME	5.25

DIVERSION TO	D3063	1.63	1	FLOW	19.
				TIME	5.25
			2	FLOW	19.
				TIME	5.25
HYDROGRAPH AT	DV3063	1.63	1	FLOW	19.
				TIME	5.25
			2	FLOW	19.
				TIME	5.25
ROUTED TO	R3067	1.63	1	FLOW	18.
				TIME	5.55
			2	FLOW	18.
				TIME	5.55
HYDROGRAPH AT	S3074	0.46	1	FLOW	135.
				TIME	4.80
			2	FLOW	135.
				TIME	5.55
2 COMBINED AT	C3075	2.09	1	FLOW	135.
				TIME	4.80
			2	FLOW	135.
				TIME	4.80
DIVERSION TO	DOUT14	2.09	1	FLOW	135.
				TIME	4.80
			2	FLOW	135.
				TIME	4.80
HYDROGRAPH AT	DOUT14	2.09	1	FLOW	0.
				TIME	4.75
			2	FLOW	0.
				TIME	4.75
HYDROGRAPH AT	S3066	0.10	1	FLOW	19.
				TIME	5.00
			2	FLOW	19.
				TIME	4.75
DIVERSION TO	DOUT15	0.10	1	FLOW	19.
				TIME	5.00
			2	FLOW	19.
				TIME	5.00
HYDROGRAPH AT	DOUT15	0.10	1	FLOW	0.
				TIME	4.90
			2	FLOW	0.
				TIME	4.90
DIVERSION TO	D3069	0.10	1	FLOW	0.
				TIME	4.90
			2	FLOW	0.
				TIME	4.90
HYDROGRAPH AT	DV3069	0.10	1	FLOW	0.
				TIME	4.90
			2	FLOW	0.
				TIME	4.90

ROUTED TO	R3071	0.10	1	FLOW	0.
				TIME	7.75
			2	FLOW	0.
				TIME	7.75
2 COMBINED AT	C3077	2.20	1	FLOW	0.
				TIME	4.75
			2	FLOW	0.
				TIME	4.75
HYDROGRAPH AT	S3210	0.18	1	FLOW	136.
				TIME	4.10
			2	FLOW	136.
				TIME	4.75
ROUTED TO	EASTII	0.18	1	FLOW	11.
				TIME	5.95
			2	FLOW	11.
				TIME	5.95
			** PEAK STAGES IN FEET **		
			1	STAGE	34.01
				TIME	6.05
			2	STAGE	34.01
				TIME	6.05
ROUTED TO	R3100	0.18	1	FLOW	11.
				TIME	6.15
			2	FLOW	11.
				TIME	6.15
HYDROGRAPH AT	S3211	0.18	1	FLOW	136.
				TIME	4.10
			2	FLOW	136.
				TIME	6.15
2 COMBINED AT	C3079	0.36	1	FLOW	144.
				TIME	4.10
			2	FLOW	144.
				TIME	4.10
DIVERSION TO	WESTII	0.36	1	FLOW	143.
				TIME	4.10
			2	FLOW	143.
				TIME	4.10
HYDROGRAPH AT	WESTII	0.36	1	FLOW	124.
				TIME	4.25
			2	FLOW	124.
				TIME	4.25
HYDROGRAPH AT	D3063	0.00	1	FLOW	19.
				TIME	5.25
			2	FLOW	19.
				TIME	5.25
ROUTED TO	R3079	0.00	1	FLOW	18.
				TIME	5.55
			2	FLOW	18.

				TIME	5.55
HYDROGRAPH AT	D1056	0.00	1	FLOW	1.
				TIME	5.25
			2	FLOW	1.
				TIME	5.25
ROUTED TO	R3080	0.00	1	FLOW	1.
				TIME	5.45
			2	FLOW	1.
				TIME	5.45
3 COMBINED AT	C3080	0.36	1	FLOW	124.
				TIME	4.25
			2	FLOW	124.
				TIME	4.25
DIVERSION TO	D3081	0.36	1	FLOW	27.
				TIME	4.25
			2	FLOW	27.
				TIME	4.25
HYDROGRAPH AT	DV3081	0.36	1	FLOW	97.
				TIME	4.25
			2	FLOW	97.
				TIME	4.25
ROUTED TO	R3083	0.36	1	FLOW	93.
				TIME	4.35
			2	FLOW	93.
				TIME	4.35
HYDROGRAPH AT	S3084	0.06	1	FLOW	34.
				TIME	4.25
			2	FLOW	34.
				TIME	4.35
2 COMBINED AT	C3085	0.42	1	FLOW	125.
				TIME	4.35
			2	FLOW	125.
				TIME	4.35
DIVERSION TO	D3087	0.42	1	FLOW	43.
				TIME	4.35
			2	FLOW	43.
				TIME	4.35
HYDROGRAPH AT	DV3087	0.42	1	FLOW	82.
				TIME	4.35
			2	FLOW	82.
				TIME	4.35
ROUTED TO	R3089	0.42	1	FLOW	77.
				TIME	4.45
			2	FLOW	77.
				TIME	4.45
2 COMBINED AT	C3091	2.62	1	FLOW	77.
				TIME	4.45
			2	FLOW	77.

				TIME	4.45
DIVERSION TO	D3093	2.62	1	FLOW	77.
				TIME	4.45
			2	FLOW	77.
				TIME	4.45
HYDROGRAPH AT	DV3093	2.62	1	FLOW	0.
				TIME	0.05
			2	FLOW	0.
				TIME	0.05
HYDROGRAPH AT	D1057	0.00	1	FLOW	0.
				TIME	4.40
			2	FLOW	0.
				TIME	4.40
ROUTED TO	R3207	0.00	1	FLOW	0.
				TIME	7.15
			2	FLOW	0.
				TIME	7.15
HYDROGRAPH AT	D1066	0.00	1	FLOW	0.
				TIME	5.20
			2	FLOW	0.
				TIME	5.20
ROUTED TO	R1066	0.00	1	FLOW	0.
				TIME	6.05
			2	FLOW	0.
				TIME	6.05
HYDROGRAPH AT	S3210A	0.16	1	FLOW	82.
				TIME	4.25
			2	FLOW	82.
				TIME	6.05
3 COMBINED AT	C3213	0.16	1	FLOW	82.
				TIME	4.25
			2	FLOW	82.
				TIME	4.25
ROUTED TO	R3326	0.16	1	FLOW	82.
				TIME	4.40
			2	FLOW	82.
				TIME	4.40
HYDROGRAPH AT	S3220	0.15	1	FLOW	83.
				TIME	4.15
			2	FLOW	83.
				TIME	4.40
2 COMBINED AT	C3227	0.31	1	FLOW	153.
				TIME	4.30
			2	FLOW	153.
				TIME	4.30
DIVERSION TO	D400	0.31	1	FLOW	122.
				TIME	4.30
			2	FLOW	0.

				TIME	0.05
HYDROGRAPH AT	DV400	0.31	1	FLOW	31.
				TIME	4.30
			2	FLOW	153.
				TIME	4.30
HYDROGRAPH AT	S3212	0.15	1	FLOW	85.
				TIME	4.20
			2	FLOW	85.
				TIME	4.30
2 COMBINED AT	C900	0.46	1	FLOW	114.
				TIME	4.20
			2	FLOW	235.
				TIME	4.25
ROUTED TO	R3228	0.46	1	FLOW	114.
				TIME	4.25
			2	FLOW	7.
				TIME	7.30
			** PEAK STAGES IN FEET **		
			1	STAGE	0.00
				TIME	0.00
			2	STAGE	1408.37
				TIME	7.40
ROUTED TO	R3227	0.46	1	FLOW	114.
				TIME	4.25
			2	FLOW	7.
				TIME	7.35
HYDROGRAPH AT	D3081	0.00	1	FLOW	27.
				TIME	4.25
			2	FLOW	27.
				TIME	4.25
DIVERSION TO	DWEST	0.00	1	FLOW	13.
				TIME	4.25
			2	FLOW	13.
				TIME	4.25
HYDROGRAPH AT	SPLIT	0.00	1	FLOW	13.
				TIME	4.25
			2	FLOW	13.
				TIME	4.25
ROUTED TO	R3231	0.00	1	FLOW	12.
				TIME	4.55
			2	FLOW	12.
				TIME	4.55
HYDROGRAPH AT	S3210B	0.21	1	FLOW	107.
				TIME	4.25
			2	FLOW	107.
				TIME	4.55
2 COMBINED AT	CICERO	0.21	1	FLOW	107.
				TIME	4.25

			2	FLOW	107.
				TIME	4.25
HYDROGRAPH AT	DWEST	0.00	1	FLOW	13.
				TIME	4.25
			2	FLOW	13.
				TIME	4.25
ROUTED TO	RWEST	0.00	1	FLOW	12.
				TIME	4.50
			2	FLOW	12.
				TIME	4.50
HYDROGRAPH AT	STRIP	0.01	1	FLOW	9.
				TIME	4.10
			2	FLOW	9.
				TIME	4.50
2 COMBINED AT	CHURCH	0.01	1	FLOW	17.
				TIME	4.50
			2	FLOW	17.
				TIME	4.50
ROUTED TO	STUB	0.01	1	FLOW	17.
				TIME	4.55
			2	FLOW	17.
				TIME	4.55
2 COMBINED AT	CRECK	0.22	1	FLOW	116.
				TIME	4.25
			2	FLOW	117.
				TIME	4.50
ROUTED TO	STUB2	0.22	1	FLOW	116.
				TIME	4.25
			2	FLOW	116.
				TIME	4.25
2 COMBINED AT	RECKER	0.68	1	FLOW	229.
				TIME	4.25
			2	FLOW	120.
				TIME	4.50
DIVERSION TO	D500	0.68	1	FLOW	229.
				TIME	4.25
			2	FLOW	0.
				TIME	0.05
HYDROGRAPH AT	DV500	0.68	1	FLOW	0.
				TIME	4.20
			2	FLOW	120.
				TIME	4.50
ROUTED TO	R3229	0.68	1	FLOW	0.
				TIME	4.80
			2	FLOW	119.
				TIME	4.25
HYDROGRAPH AT	S3242	0.07	1	FLOW	55.
				TIME	4.05

			2	FLOW	55.
				TIME	4.25
2 COMBINED AT	C58TH	0.74	1	FLOW	55.
				TIME	4.05
			2	FLOW	163.
				TIME	4.20
ROUTED TO	R3242	0.74	1	FLOW	54.
				TIME	4.10
			2	FLOW	163.
				TIME	4.20
HYDROGRAPH AT	S3243	0.07	1	FLOW	58.
				TIME	4.05
			2	FLOW	58.
				TIME	4.20
HYDROGRAPH AT	S3240	0.06	1	FLOW	46.
				TIME	4.05
			2	FLOW	46.
				TIME	4.20
ROUTED TO	R3240	0.06	1	FLOW	46.
				TIME	4.10
			2	FLOW	46.
				TIME	4.10
HYDROGRAPH AT	D3087	0.00	1	FLOW	43.
				TIME	4.35
			2	FLOW	43.
				TIME	4.35
ROUTED TO	R3235	0.00	1	FLOW	42.
				TIME	4.45
			2	FLOW	42.
				TIME	4.45
HYDROGRAPH AT	S3241	0.05	1	FLOW	44.
				TIME	4.05
			2	FLOW	44.
				TIME	4.45
3 COMBINED AT	C3241	0.11	1	FLOW	101.
				TIME	4.10
			2	FLOW	101.
				TIME	4.10
DIVERSION TO	D3241	0.11	1	FLOW	53.
				TIME	4.10
			2	FLOW	53.
				TIME	4.10
HYDROGRAPH AT	DV3241	0.11	1	FLOW	48.
				TIME	4.10
			2	FLOW	48.
				TIME	4.10
ROUTED TO	R3243	0.11	1	FLOW	48.
				TIME	4.25

			2	FLOW	48.
				TIME	4.25
2 COMBINED AT	56TH	0.18	1	FLOW	94.
				TIME	4.15
			2	FLOW	94.
				TIME	4.15
2 COMBINED AT	C56TH	0.92	1	FLOW	148.
				TIME	4.15
			2	FLOW	257.
				TIME	4.20
ROUTED TO	R3252	0.92	1	FLOW	148.
				TIME	4.20
			2	FLOW	256.
				TIME	4.20
HYDROGRAPH AT	S3252	0.07	1	FLOW	55.
				TIME	4.15
			2	FLOW	55.
				TIME	4.20
HYDROGRAPH AT	D3241	0.00	1	FLOW	53.
				TIME	4.10
			2	FLOW	53.
				TIME	4.10
ROUTED TO	R3241	0.00	1	FLOW	52.
				TIME	4.15
			2	FLOW	52.
				TIME	4.15
HYDROGRAPH AT	S3250	0.05	1	FLOW	42.
				TIME	4.15
			2	FLOW	42.
				TIME	4.15
2 COMBINED AT	C3250	0.05	1	FLOW	95.
				TIME	4.15
			2	FLOW	95.
				TIME	4.15
DIVERSION TO	D3250	0.05	1	FLOW	40.
				TIME	4.15
			2	FLOW	40.
				TIME	4.15
HYDROGRAPH AT	DV3250	0.05	1	FLOW	55.
				TIME	4.15
			2	FLOW	55.
				TIME	4.15
ROUTED TO	R3254	0.05	1	FLOW	54.
				TIME	4.30
			2	FLOW	54.
				TIME	4.30
2 COMBINED AT	54TH	0.13	1	FLOW	104.
				TIME	4.25

			2	FLOW	104.
				TIME	4.25
2 COMBINED AT	C54TH	1.05	1	FLOW	249.
				TIME	4.25
			2	FLOW	358.
				TIME	4.25
ROUTED TO	R3253	1.05	1	FLOW	249.
				TIME	4.25
			2	FLOW	358.
				TIME	4.25
HYDROGRAPH AT	S3253	0.07	1	FLOW	55.
				TIME	4.15
			2	FLOW	55.
				TIME	4.25
HYDROGRAPH AT	D3250	0.00	1	FLOW	40.
				TIME	4.15
			2	FLOW	40.
				TIME	4.15
ROUTED TO	R3250	0.00	1	FLOW	40.
				TIME	4.30
			2	FLOW	40.
				TIME	4.30
HYDROGRAPH AT	S3251	0.05	1	FLOW	42.
				TIME	4.15
			2	FLOW	42.
				TIME	4.30
HYDROGRAPH AT	D3093	0.00	1	FLOW	77.
				TIME	4.45
			2	FLOW	77.
				TIME	4.45
ROUTED TO	R3247	0.00	1	FLOW	75.
				TIME	4.60
			2	FLOW	75.
				TIME	4.60
3 COMBINED AT	C3251	0.05	1	FLOW	127.
				TIME	4.60
			2	FLOW	127.
				TIME	4.60
ROUTED TO	R3251	0.05	1	FLOW	123.
				TIME	4.70
			2	FLOW	123.
				TIME	4.70
2 COMBINED AT	HIG	0.13	1	FLOW	149.
				TIME	4.70
			2	FLOW	149.
				TIME	4.70
2 COMBINED AT	HIGLEY	1.17	1	FLOW	374.
				TIME	4.30

			2	FLOW	482.
				TIME	4.25
DIVERSION TO	D3400	1.17	1	FLOW	225.
				TIME	4.30
			2	FLOW	0.
				TIME	0.05
HYDROGRAPH AT	DV3400	1.17	1	FLOW	150.
				TIME	4.30
			2	FLOW	482.
				TIME	4.25
ROUTED TO	EMF-3	1.17	1	FLOW	149.
				TIME	4.30
			2	FLOW	481.
				TIME	4.30

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
FOR PLAN = 1 RATIO= 1.00									
S1004	MANE	1.68	19.79	266.63	0.62	3.00	19.76	267.00	0.62

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.2054E+01 OUTFLOW=0.2047E+01 BASIN STORAGE=0.1717E-02 PERCENT ERROR= 0.2

FOR PLAN = 1 RATIO= 1.00									
R1005	MANE	1.56	19.70	269.77	0.62	3.00	19.68	270.00	0.62

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2047E+01 EXCESS=0.0000E+00 OUTFLOW=0.2047E+01 BASIN STORAGE=0.7347E-04 PERCENT ERROR= 0.0

FOR PLAN = 2 RATIO= 1.00									
R1005	MANE	1.56	19.70	269.77	0.62	3.00	19.68	270.00	0.62

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2047E+01 EXCESS=0.0000E+00 OUTFLOW=0.2047E+01 BASIN STORAGE=0.7347E-04 PERCENT ERROR= 0.0

FOR PLAN = 1 RATIO= 1.00									
S1008	MANE	2.33	9.50	302.12	0.62	3.00	9.49	303.00	0.62

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1590E+01 OUTFLOW=0.1582E+01 BASIN STORAGE=0.4703E-02 PERCENT ERROR= 0.2

FOR PLAN = 1 RATIO= 1.00									
R1011	MANE	1.62	26.63	274.08	0.62	3.00	26.56	276.00	0.62

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3629E+01 EXCESS=0.0000E+00 OUTFLOW=0.3628E+01 BASIN STORAGE=0.2478E-03 PERCENT ERROR= 0.0

FOR PLAN = 2 RATIO= 1.00									
R1011	MANE	1.62	26.63	274.08	0.62	3.00	26.56	276.00	0.62

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3629E+01 EXCESS=0.0000E+00 OUTFLOW=0.3628E+01 BASIN STORAGE=0.2478E-03 PERCENT ERROR= 0.0

FOR PLAN = 1 RATIO= 1.00									
S1012	MANE	2.76	6.09	329.92	0.39	3.00	6.09	330.00	0.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1291E+01 OUTFLOW=0.1282E+01 BASIN STORAGE=0.5890E-02 PERCENT ERROR= 0.2

FOR PLAN = 1 RATIO= 1.00

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R1013  MANE        2.11     6.09    334.63     0.39     3.00     6.08    336.00       0.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1282E+01 EXCESS=0.0000E+00 OUTFLOW=0.1282E+01 BASIN STORAGE=0.1838E-03 PERCENT ERROR=   0.0

FOR PLAN = 2  RATIO= 1.00
R1013  MANE        2.11     6.09    334.63     0.39     3.00     6.08    336.00       0.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1282E+01 EXCESS=0.0000E+00 OUTFLOW=0.1282E+01 BASIN STORAGE=0.1838E-03 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
S1016  MANE        2.72     3.51    331.42     0.39     3.00     3.50    333.00       0.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.7495E+00 OUTFLOW=0.7443E+00 BASIN STORAGE=0.3502E-02 PERCENT ERROR=   0.2

FOR PLAN = 1  RATIO= 1.00
R1019  MANE        2.14     9.57    336.97     0.39     3.00     9.57    339.00       0.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2026E+01 EXCESS=0.0000E+00 OUTFLOW=0.2025E+01 BASIN STORAGE=0.3438E-03 PERCENT ERROR=   0.0

FOR PLAN = 2  RATIO= 1.00
R1019  MANE        2.14     9.57    336.97     0.39     3.00     9.57    339.00       0.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2026E+01 EXCESS=0.0000E+00 OUTFLOW=0.2025E+01 BASIN STORAGE=0.3438E-03 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
S1024  MANE        2.76     9.11    332.53     0.39     3.00     9.10    330.00       0.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1936E+01 OUTFLOW=0.1923E+01 BASIN STORAGE=0.8833E-02 PERCENT ERROR=   0.2

FOR PLAN = 1  RATIO= 1.00
R1025  MANE        1.63     9.10    333.71     0.39     3.00     9.09    333.00       0.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1923E+01 EXCESS=0.0000E+00 OUTFLOW=0.1922E+01 BASIN STORAGE=0.2292E-03 PERCENT ERROR=   0.0

FOR PLAN = 2  RATIO= 1.00
R1025  MANE        1.63     9.10    333.71     0.39     3.00     9.09    333.00       0.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1923E+01 EXCESS=0.0000E+00 OUTFLOW=0.1922E+01 BASIN STORAGE=0.2292E-03 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
S1028  MANE        1.66    19.08    271.08     0.62     3.00    18.98    273.00       0.62

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.2153E+01 OUTFLOW=0.2143E+01 BASIN STORAGE=0.2448E-02 PERCENT ERROR=   0.3
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FOR PLAN = 1  RATIO= 1.00
   R1033  MANE        2.72      2.28    338.01      0.02      3.00      2.28    339.00        0.02

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.4854E+00 EXCESS=0.0000E+00 OUTFLOW=0.4851E+00 BASIN STORAGE=0.1001E-03 PERCENT ERROR=   0.0

FOR PLAN = 2  RATIO= 1.00
   R1033  MANE        2.72      2.28    338.01      0.02      3.00      2.28    339.00        0.02

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.4854E+00 EXCESS=0.0000E+00 OUTFLOW=0.4851E+00 BASIN STORAGE=0.1001E-03 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
   S1034  MANE        2.48     28.48    255.90      0.71      3.00     28.46    255.00        0.71

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.2480E+01 OUTFLOW=0.2470E+01 BASIN STORAGE=0.9382E-03 PERCENT ERROR=   0.4

FOR PLAN = 1  RATIO= 1.00
   R1039  MANE        2.40      0.34    344.31      0.00      3.00      0.34    342.00        0.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.7361E-01 EXCESS=0.0000E+00 OUTFLOW=0.7356E-01 BASIN STORAGE=0.1416E-04 PERCENT ERROR=   0.0

FOR PLAN = 2  RATIO= 1.00
   R1039  MANE        2.40      0.34    344.31      0.00      3.00      0.34    342.00        0.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.7361E-01 EXCESS=0.0000E+00 OUTFLOW=0.7356E-01 BASIN STORAGE=0.1416E-04 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
   S1040  MANE        3.00      4.23    331.43      0.39      3.00      4.21    330.00        0.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.8953E+00 OUTFLOW=0.8890E+00 BASIN STORAGE=0.4123E-02 PERCENT ERROR=   0.2

FOR PLAN = 1  RATIO= 1.00
   R1045  MANE        1.34      4.55    333.93      0.04      3.00      4.54    333.00        0.04

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9625E+00 EXCESS=0.0000E+00 OUTFLOW=0.9623E+00 BASIN STORAGE=0.9682E-04 PERCENT ERROR=   0.0

FOR PLAN = 2  RATIO= 1.00
   R1045  MANE        1.34      4.55    333.93      0.04      3.00      4.54    333.00        0.04

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9625E+00 EXCESS=0.0000E+00 OUTFLOW=0.9623E+00 BASIN STORAGE=0.9682E-04 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
   S1046  MANE        3.00     14.30    330.81      0.49      3.00     14.30    330.00        0.49
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CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.3046E+01 OUTFLOW=0.3024E+01 BASIN STORAGE=0.1465E-01 PERCENT ERROR=   0.2

        FOR PLAN = 1  RATIO= 1.00
           R1051  MANE        2.19      0.85    333.90      0.01      3.00      0.85    333.00        0.01

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1794E+00 EXCESS=0.0000E+00 OUTFLOW=0.1793E+00 BASIN STORAGE=0.2978E-04 PERCENT ERROR=   0.0

        FOR PLAN = 2  RATIO= 1.00
           R1051  MANE        2.19      0.85    333.90      0.01      3.00      0.85    333.00        0.01

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1794E+00 EXCESS=0.0000E+00 OUTFLOW=0.1793E+00 BASIN STORAGE=0.2978E-04 PERCENT ERROR=   0.0

        FOR PLAN = 1  RATIO= 1.00
           S1052  MANE        2.95     26.14    327.67      0.49      3.00     26.14    330.00        0.49

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.5563E+01 OUTFLOW=0.5523E+01 BASIN STORAGE=0.2656E-01 PERCENT ERROR=   0.2

        FOR PLAN = 1  RATIO= 1.00
           S1056  MANE        2.75     16.35    311.95      0.46      3.00     16.35    312.00        0.46

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.2940E+01 OUTFLOW=0.2922E+01 BASIN STORAGE=0.9687E-02 PERCENT ERROR=   0.3

        FOR PLAN = 1  RATIO= 1.00
           R1059  MANE        3.00      0.05    362.25      0.00      3.00      0.05    363.00        0.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1949E-01 EXCESS=0.0000E+00 OUTFLOW=0.1970E-01 BASIN STORAGE=0.7331E-04 PERCENT ERROR=  -1.5

        FOR PLAN = 2  RATIO= 1.00
           R1059  MANE        3.00      0.05    362.25      0.00      3.00      0.05    363.00        0.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1949E-01 EXCESS=0.0000E+00 OUTFLOW=0.1970E-01 BASIN STORAGE=0.7331E-04 PERCENT ERROR=  -1.5

        FOR PLAN = 1  RATIO= 1.00
           S3002  MANE        1.97     23.25    265.43      0.46      3.00     23.14    267.00        0.46

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.2303E+01 OUTFLOW=0.2295E+01 BASIN STORAGE=0.1500E-02 PERCENT ERROR=   0.3

        FOR PLAN = 1  RATIO= 1.00
           R3005  MANE        3.00      0.06    287.74      0.00      3.00      0.06    288.00        0.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9349E-02 EXCESS=0.0000E+00 OUTFLOW=0.9333E-02 BASIN STORAGE=0.5787E-05 PERCENT ERROR=   0.1
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FOR PLAN = 2  RATIO= 1.00
   R3005  MANE        3.00      0.06    287.74      0.00      3.00      0.06    288.00        0.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9349E-02 EXCESS=0.0000E+00 OUTFLOW=0.9333E-02 BASIN STORAGE=0.5787E-05 PERCENT ERROR=   0.1

FOR PLAN = 1  RATIO= 1.00
   S3008  MANE        2.02     47.29    241.70      1.08      3.00     47.24    243.00        1.08

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.4018E+01 OUTFLOW=0.4015E+01 BASIN STORAGE=0.3173E-03 PERCENT ERROR=   0.1

FOR PLAN = 1  RATIO= 1.00
   R3011  MANE        1.05     21.14    280.25      0.16      3.00     20.67    282.00        0.16

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1335E+01 EXCESS=0.0000E+00 OUTFLOW=0.1395E+01 BASIN STORAGE=0.1856E-03 PERCENT ERROR=  -4.5

FOR PLAN = 2  RATIO= 1.00
   R3011  MANE        1.05     21.14    280.25      0.16      3.00     20.67    282.00        0.16

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1335E+01 EXCESS=0.0000E+00 OUTFLOW=0.1395E+01 BASIN STORAGE=0.1856E-03 PERCENT ERROR=  -4.5

FOR PLAN = 1  RATIO= 1.00
   S3012  MANE        3.00     84.92    263.80      1.00      3.00     84.86    264.00        1.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1016E+02 OUTFLOW=0.1015E+02 BASIN STORAGE=0.6678E-02 PERCENT ERROR=   0.1

FOR PLAN = 1  RATIO= 1.00
   R3013  MANE        1.71     84.70    267.90      1.00      3.00     84.63    267.00        1.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1015E+02 EXCESS=0.0000E+00 OUTFLOW=0.1015E+02 BASIN STORAGE=0.5717E-03 PERCENT ERROR=   0.0

FOR PLAN = 2  RATIO= 1.00
   R3013  MANE        1.71     84.70    267.90      1.00      3.00     84.63    267.00        1.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1015E+02 EXCESS=0.0000E+00 OUTFLOW=0.1015E+02 BASIN STORAGE=0.5717E-03 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
   S3016  MANE        3.00      4.55    332.69      0.11      3.00      4.55    333.00        0.11

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.8362E+00 OUTFLOW=0.8316E+00 BASIN STORAGE=0.2481E-02 PERCENT ERROR=   0.3

FOR PLAN = 1  RATIO= 1.00
   R3017  MANE        2.53     84.57    271.95      0.57      3.00     84.36    273.00        0.57
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CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1016E+02 EXCESS=0.0000E+00 OUTFLOW=0.1016E+02 BASIN STORAGE=0.4667E-03 PERCENT ERROR=   0.0

        FOR PLAN = 2  RATIO= 1.00
           R3017  MANE        2.53     84.57    271.95      0.57      3.00     84.36    273.00        0.57

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1016E+02 EXCESS=0.0000E+00 OUTFLOW=0.1016E+02 BASIN STORAGE=0.4667E-03 PERCENT ERROR=   0.0

        FOR PLAN = 1  RATIO= 1.00
           S3020  MANE        1.56     89.18    247.37      1.16      3.00     88.94    249.00        1.16

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.8055E+01 OUTFLOW=0.8048E+01 BASIN STORAGE=0.4272E-03 PERCENT ERROR=   0.1

        FOR PLAN = 1  RATIO= 1.00
           R3025  MANE        2.15    108.79    296.60      0.40      3.00    108.15    297.00        0.40

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1361E+02 EXCESS=0.0000E+00 OUTFLOW=0.1361E+02 BASIN STORAGE=0.5413E-03 PERCENT ERROR=   0.0

        FOR PLAN = 2  RATIO= 1.00
           R3025  MANE        2.15    108.79    296.60      0.40      3.00    108.15    297.00        0.40

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1361E+02 EXCESS=0.0000E+00 OUTFLOW=0.1361E+02 BASIN STORAGE=0.5413E-03 PERCENT ERROR=   0.0

        FOR PLAN = 1  RATIO= 1.00
           R3027  MANE        3.00      6.84    359.83     -1.00      3.00      6.84    357.00       -1.00

        FOR PLAN = 2  RATIO= 1.00
           R3027  MANE        3.00      6.84    359.83     -1.00      3.00      6.84    357.00       -1.00

        FOR PLAN = 1  RATIO= 1.00
           S3028  MANE        3.00    160.97    247.77      1.07      3.00    160.74    249.00        1.07

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1550E+02 OUTFLOW=0.1548E+02 BASIN STORAGE=0.3158E-02 PERCENT ERROR=   0.1

        FOR PLAN = 1  RATIO= 1.00
           R3035  MANE        0.64     48.05    278.10      0.28      3.00     47.88    279.00        0.28

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3946E+01 EXCESS=0.0000E+00 OUTFLOW=0.4063E+01 BASIN STORAGE=0.1428E-02 PERCENT ERROR=  -3.0

        FOR PLAN = 2  RATIO= 1.00
           R3035  MANE        0.64     48.05    278.10      0.28      3.00     47.88    279.00        0.28
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CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3946E+01 EXCESS=0.0000E+00 OUTFLOW=0.4063E+01 BASIN STORAGE=0.1428E-02 PERCENT ERROR=  -3.0

        FOR PLAN = 1  RATIO= 1.00
           S3038  MANE        3.17     62.63    255.90      1.00      3.00     62.42    255.00        1.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.6954E+01 OUTFLOW=0.6943E+01 BASIN STORAGE=0.3612E-02 PERCENT ERROR=   0.1

        FOR PLAN = 1  RATIO= 1.00
           R3043  MANE        3.00    137.51    295.47      0.32      3.00    136.86    294.00        0.32

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1763E+02 EXCESS=0.0000E+00 OUTFLOW=0.1765E+02 BASIN STORAGE=0.2019E-02 PERCENT ERROR=  -0.1

        FOR PLAN = 2  RATIO= 1.00
           R3043  MANE        3.00    137.51    295.47      0.32      3.00    136.86    294.00        0.32

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1763E+02 EXCESS=0.0000E+00 OUTFLOW=0.1765E+02 BASIN STORAGE=0.2019E-02 PERCENT ERROR=  -0.1

        FOR PLAN = 1  RATIO= 1.00
           R3045  MANE        0.61     47.65    288.06     -1.00      3.00     47.60    288.00       -1.00

        FOR PLAN = 2  RATIO= 1.00
           R3045  MANE        0.61     47.65    288.06     -1.00      3.00     47.60    288.00       -1.00

        FOR PLAN = 1  RATIO= 1.00
           R3047  MANE        3.00      1.95    360.33     -1.00      3.00      1.95    360.00       -1.00

        FOR PLAN = 2  RATIO= 1.00
           R3047  MANE        3.00      1.95    360.33     -1.00      3.00      1.95    360.00       -1.00

        FOR PLAN = 1  RATIO= 1.00
           R3049  MANE        3.00      0.00    533.03     -1.00      3.00      0.00    534.00       -1.00

        FOR PLAN = 2  RATIO= 1.00
           R3049  MANE        3.00      0.00    533.03     -1.00      3.00      0.00    534.00       -1.00

        FOR PLAN = 1  RATIO= 1.00
           R3052  MANE        0.51     23.59    301.56     -1.00      3.00     23.07    303.00       -1.00

        FOR PLAN = 2  RATIO= 1.00
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   R3052  MANE        0.51     23.59    301.56     -1.00      3.00     23.07    303.00       -1.00


FOR PLAN = 1  RATIO= 1.00
   R3054  MANE        3.00    156.57    315.92      0.36      3.00    156.54    315.00        0.36

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1999E+02 EXCESS=0.0000E+00 OUTFLOW=0.2000E+02 BASIN STORAGE=0.2696E-02 PERCENT ERROR=   0.0


FOR PLAN = 2  RATIO= 1.00
   R3054  MANE        3.00    156.57    315.92      0.36      3.00    156.54    315.00        0.36

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1999E+02 EXCESS=0.0000E+00 OUTFLOW=0.2000E+02 BASIN STORAGE=0.2696E-02 PERCENT ERROR=   0.0


FOR PLAN = 1  RATIO= 1.00
   S3061  MANE        3.24    124.11    260.65      0.92      3.00    123.95    261.00        0.92

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1475E+02 OUTFLOW=0.1473E+02 BASIN STORAGE=0.1007E-01 PERCENT ERROR=   0.1


FOR PLAN = 1  RATIO= 1.00
   R3057  MANE        0.51     23.54    307.52     -1.00      3.00     23.02    309.00       -1.00


FOR PLAN = 2  RATIO= 1.00
   R3057  MANE        0.51     23.54    307.52     -1.00      3.00     23.02    309.00       -1.00


FOR PLAN = 1  RATIO= 1.00
   S3060  MANE        3.24    124.11    260.65      0.92      3.00    123.95    261.00        0.92

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1475E+02 OUTFLOW=0.1473E+02 BASIN STORAGE=0.1007E-01 PERCENT ERROR=   0.1


FOR PLAN = 1  RATIO= 1.00
   R1048  MANE        1.72     17.86    333.88     -1.00      3.00     17.86    333.00       -1.00


FOR PLAN = 2  RATIO= 1.00
   R1048  MANE        1.72     17.86    333.88     -1.00      3.00     17.86    333.00       -1.00


FOR PLAN = 1  RATIO= 1.00
   R3053  MANE        3.00      0.09    386.67     -1.00      3.00      0.09    387.00       -1.00


FOR PLAN = 2  RATIO= 1.00
   R3053  MANE        3.00      0.09    386.67     -1.00      3.00      0.09    387.00       -1.00
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FOR PLAN = 1  RATIO= 1.00
   R3055  MANE        3.00     26.61    341.08     -1.00      3.00     26.58    342.00       -1.00


FOR PLAN = 2  RATIO= 1.00
   R3055  MANE        3.00     26.61    341.08     -1.00      3.00     26.58    342.00       -1.00


FOR PLAN = 1  RATIO= 1.00
   R3065  MANE        1.02     18.54    463.28      0.19      3.00     18.15    465.00        0.19

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3003E+01 EXCESS=0.0000E+00 OUTFLOW=0.3013E+01 BASIN STORAGE=0.2789E-02 PERCENT ERROR=  -0.5


FOR PLAN = 2  RATIO= 1.00
   R3065  MANE        1.02     18.54    463.28      0.19      3.00     18.15    465.00        0.19

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3003E+01 EXCESS=0.0000E+00 OUTFLOW=0.3013E+01 BASIN STORAGE=0.2789E-02 PERCENT ERROR=  -0.5


FOR PLAN = 1  RATIO= 1.00
   R3067  MANE        3.00     18.82    331.65      0.01      3.00     18.29    333.00        0.01

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6426E+00 EXCESS=0.0000E+00 OUTFLOW=0.6736E+00 BASIN STORAGE=0.1423E-03 PERCENT ERROR=  -4.9


FOR PLAN = 2  RATIO= 1.00
   R3067  MANE        3.00     18.82    331.65      0.01      3.00     18.29    333.00        0.01

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6426E+00 EXCESS=0.0000E+00 OUTFLOW=0.6736E+00 BASIN STORAGE=0.1423E-03 PERCENT ERROR=  -4.9


FOR PLAN = 1  RATIO= 1.00
   S3074  MANE        3.15    134.77    288.22      0.71      3.00    134.71    288.00        0.71

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1739E+02 OUTFLOW=0.1733E+02 BASIN STORAGE=0.1252E-01 PERCENT ERROR=   0.2


FOR PLAN = 1  RATIO= 1.00
   S3066  MANE        3.00     18.68    298.32      0.49      3.00     18.66    300.00        0.49

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.2755E+01 OUTFLOW=0.2743E+01 BASIN STORAGE=0.5343E-02 PERCENT ERROR=   0.2


FOR PLAN = 1  RATIO= 1.00
   R3071  MANE        3.00      0.01    476.22      0.00      3.00      0.01    474.00        0.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3813E-02 EXCESS=0.0000E+00 OUTFLOW=0.4297E-02 BASIN STORAGE=0.4650E-04 PERCENT ERROR= -13.9
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FOR PLAN = 2  RATIO= 1.00
   R3071  MANE        3.00      0.01    476.22      0.00      3.00      0.01    474.00        0.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3813E-02 EXCESS=0.0000E+00 OUTFLOW=0.4297E-02 BASIN STORAGE=0.4650E-04 PERCENT ERROR= -13.9

FOR PLAN = 1  RATIO= 1.00
   S3210  MANE        1.86    135.95    246.31      1.30      3.00    135.90    246.00        1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1251E+02 OUTFLOW=0.1250E+02 BASIN STORAGE=0.1695E-02 PERCENT ERROR=   0.1

FOR PLAN = 1  RATIO= 1.00
   R3100  MANE        2.97     10.62    373.76      2.46      3.00     10.62    375.00        2.46

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2371E+02 EXCESS=0.0000E+00 OUTFLOW=0.2360E+02 BASIN STORAGE=0.1450E+00 PERCENT ERROR=  -0.2

FOR PLAN = 2  RATIO= 1.00
   R3100  MANE        2.97     10.62    373.76      2.46      3.00     10.62    375.00        2.46

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2371E+02 EXCESS=0.0000E+00 OUTFLOW=0.2360E+02 BASIN STORAGE=0.1450E+00 PERCENT ERROR=  -0.2

FOR PLAN = 1  RATIO= 1.00
   S3211  MANE        1.68    136.32    245.35      1.30      3.00    135.90    246.00        1.30

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1251E+02 OUTFLOW=0.1250E+02 BASIN STORAGE=0.1719E-02 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
   R3079  MANE        2.89     18.98    331.49     -1.00      3.00     18.13    333.00       -1.00

FOR PLAN = 2  RATIO= 1.00
   R3079  MANE        2.89     18.98    331.49     -1.00      3.00     18.13    333.00       -1.00

FOR PLAN = 1  RATIO= 1.00
   R3080  MANE        3.00      1.28    329.67     -1.00      3.00      1.28    330.00       -1.00

FOR PLAN = 2  RATIO= 1.00
   R3080  MANE        3.00      1.28    329.67     -1.00      3.00      1.28    330.00       -1.00

FOR PLAN = 1  RATIO= 1.00
   R3083  MANE        1.20     94.49    261.75      1.40      3.00     92.88    261.00        1.39
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CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2686E+02 EXCESS=0.0000E+00 OUTFLOW=0.2681E+02 BASIN STORAGE=0.1965E+00 PERCENT ERROR=  -0.5

        FOR PLAN = 2  RATIO= 1.00
           R3083  MANE        1.20     94.49    261.75      1.40      3.00     92.88    261.00        1.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2686E+02 EXCESS=0.0000E+00 OUTFLOW=0.2681E+02 BASIN STORAGE=0.1965E+00 PERCENT ERROR=  -0.5

        FOR PLAN = 1  RATIO= 1.00
           S3084  MANE        3.00     33.72    255.08      1.07      3.00     33.70    255.00        1.07

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.3501E+01 OUTFLOW=0.3495E+01 BASIN STORAGE=0.1271E-02 PERCENT ERROR=   0.1

        FOR PLAN = 1  RATIO= 1.00
           R3089  MANE        1.97     79.70    267.47      0.65      3.00     76.73    267.00        0.65

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1471E+02 EXCESS=0.0000E+00 OUTFLOW=0.1463E+02 BASIN STORAGE=0.7991E-01 PERCENT ERROR=  -0.1

        FOR PLAN = 2  RATIO= 1.00
           R3089  MANE        1.97     79.70    267.47      0.65      3.00     76.73    267.00        0.65

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1471E+02 EXCESS=0.0000E+00 OUTFLOW=0.1463E+02 BASIN STORAGE=0.7991E-01 PERCENT ERROR=  -0.1

        FOR PLAN = 1  RATIO= 1.00
           R3207  MANE        3.00      0.05    476.26     -1.00      3.00      0.05    477.00       -1.00

        FOR PLAN = 2  RATIO= 1.00
           R3207  MANE        3.00      0.05    476.26     -1.00      3.00      0.05    477.00       -1.00

        FOR PLAN = 1  RATIO= 1.00
           R1066  MANE        3.00      0.05    408.94     -1.00      3.00      0.05    408.00       -1.00

        FOR PLAN = 2  RATIO= 1.00
           R1066  MANE        3.00      0.05    408.94     -1.00      3.00      0.05    408.00       -1.00

        FOR PLAN = 1  RATIO= 1.00
          S3210A  MANE        1.98     82.08    253.41      1.11      3.00     82.05    255.00        1.11

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.9465E+01 OUTFLOW=0.9456E+01 BASIN STORAGE=0.4272E-02 PERCENT ERROR=   0.0

        FOR PLAN = 1  RATIO= 1.00
           R3326  MANE        3.00     81.90    263.27      1.11      3.00     81.80    264.00        1.11
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CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9499E+01 EXCESS=0.0000E+00 OUTFLOW=0.9495E+01 BASIN STORAGE=0.8395E-03 PERCENT ERROR=   0.0

        FOR PLAN = 2  RATIO= 1.00
           R3326  MANE        3.00     81.90    263.27      1.11      3.00     81.80    264.00        1.11

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9499E+01 EXCESS=0.0000E+00 OUTFLOW=0.9495E+01 BASIN STORAGE=0.8395E-03 PERCENT ERROR=   0.0

        FOR PLAN = 1  RATIO= 1.00
           S3220  MANE        1.70     82.99    248.13      1.09      3.00     82.71    249.00        1.09

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.8525E+01 OUTFLOW=0.8519E+01 BASIN STORAGE=0.2482E-02 PERCENT ERROR=   0.0

        FOR PLAN = 1  RATIO= 1.00
           S3212  MANE        2.26     85.12    250.60      1.11      3.00     84.80    252.00        1.11

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.8873E+01 OUTFLOW=0.8868E+01 BASIN STORAGE=0.7093E-03 PERCENT ERROR=   0.1

        FOR PLAN = 1  RATIO= 1.00
           R3228  MANE        1.74    113.92    255.21      0.51      3.00    113.80    255.00        0.51

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1247E+02 EXCESS=0.0000E+00 OUTFLOW=0.1248E+02 BASIN STORAGE=0.2272E-03 PERCENT ERROR=   0.0

        FOR PLAN = 2  RATIO= 1.00
           R3227  MANE        1.06      6.96    448.84      0.65      3.00      6.96    450.00        0.65

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1593E+02 EXCESS=0.0000E+00 OUTFLOW=0.1591E+02 BASIN STORAGE=0.1403E-01 PERCENT ERROR=   0.0

        FOR PLAN = 1  RATIO= 1.00
           R3231  MANE        1.17     12.49    271.79     -1.00      3.00     12.04    273.00       -1.00


        FOR PLAN = 2  RATIO= 1.00
           R3231  MANE        1.17     12.49    271.79     -1.00      3.00     12.04    273.00       -1.00


        FOR PLAN = 1  RATIO= 1.00
          S3210B  MANE        2.14    107.44    255.84      1.11      3.00    107.31    255.00        1.11

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1242E+02 OUTFLOW=0.1241E+02 BASIN STORAGE=0.4613E-02 PERCENT ERROR=   0.0

        FOR PLAN = 1  RATIO= 1.00
           RWEST  MANE        1.15     12.51    271.38     -1.00      3.00     12.10    270.00       -1.00
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FOR PLAN = 2  RATIO= 1.00
   RWEST  MANE        1.15     12.51    271.38     -1.00      3.00     12.10    270.00       -1.00


FOR PLAN = 1  RATIO= 1.00
   STRIP  MANE        3.00      9.32    245.51      1.51      3.00      9.31    246.00        1.51

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.8892E+00 OUTFLOW=0.8883E+00 BASIN STORAGE=0.8377E-04 PERCENT ERROR=   0.1


FOR PLAN = 1  RATIO= 1.00
    STUB  MANE        0.83     17.21    272.17      3.55      3.00     17.03    273.00        3.55

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2079E+01 EXCESS=0.0000E+00 OUTFLOW=0.2080E+01 BASIN STORAGE=0.3217E-05 PERCENT ERROR=   0.0


FOR PLAN = 2  RATIO= 1.00
    STUB  MANE        0.32     17.31    270.68      3.54      3.00     16.80    273.00        3.55

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2079E+01 EXCESS=0.0000E+00 OUTFLOW=0.2079E+01 BASIN STORAGE=0.4164E-06 PERCENT ERROR=   0.0


FOR PLAN = 1  RATIO= 1.00
   STUB2  MANE        0.59    115.78    256.32      1.33      3.00    115.62    255.00        1.33

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1569E+02 EXCESS=0.0000E+00 OUTFLOW=0.1569E+02 BASIN STORAGE=0.9679E-04 PERCENT ERROR=   0.0


FOR PLAN = 2  RATIO= 1.00
   STUB2  MANE        0.17    116.60    270.32      1.33      3.00    115.58    255.00        1.33

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1569E+02 EXCESS=0.0000E+00 OUTFLOW=0.1569E+02 BASIN STORAGE=0.1453E-04 PERCENT ERROR=   0.0


FOR PLAN = 1  RATIO= 1.00
   R3229  MANE        3.00      0.03    289.92      0.00      3.00      0.03    291.00        0.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.8294E-02 EXCESS=0.0000E+00 OUTFLOW=0.8288E-02 BASIN STORAGE=0.4528E-05 PERCENT ERROR=   0.0


FOR PLAN = 2  RATIO= 1.00
   R3229  MANE        0.53    120.33    271.11      0.87      3.00    119.41    255.00        0.87

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3160E+02 EXCESS=0.0000E+00 OUTFLOW=0.3159E+02 BASIN STORAGE=0.1389E-01 PERCENT ERROR=   0.0


FOR PLAN = 1  RATIO= 1.00
   S3242  MANE        2.10     55.10    243.01      1.35      3.00     55.10    243.00        1.35
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CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.4843E+01 OUTFLOW=0.4838E+01 BASIN STORAGE=0.5870E-03 PERCENT ERROR=   0.1

          FOR PLAN = 1  RATIO= 1.00
             R3242  MANE        1.93     54.79    247.39      0.12      3.00     54.42    246.00       0.12

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.4847E+01 EXCESS=0.0000E+00 OUTFLOW=0.4851E+01 BASIN STORAGE=0.5704E-04 PERCENT ERROR=  -0.1

          FOR PLAN = 2  RATIO= 1.00
             R3242  MANE        0.47    162.75    252.58      0.92      3.00    162.64    252.00       0.92

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3643E+02 EXCESS=0.0000E+00 OUTFLOW=0.3642E+02 BASIN STORAGE=0.1389E-01 PERCENT ERROR=   0.0

          FOR PLAN = 1  RATIO= 1.00
             S3243  MANE        2.10     58.37    243.20      1.35      3.00     58.31    243.00       1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.5132E+01 OUTFLOW=0.5127E+01 BASIN STORAGE=0.6221E-03 PERCENT ERROR=   0.1

          FOR PLAN = 1  RATIO= 1.00
             S3240  MANE        1.99     46.23    242.31      1.35      3.00     46.11    243.00       1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.4048E+01 OUTFLOW=0.4045E+01 BASIN STORAGE=0.4863E-03 PERCENT ERROR=   0.1

          FOR PLAN = 1  RATIO= 1.00
             R3240  MANE        2.06     45.74    247.70      1.35      3.00     45.59    246.00       1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.4044E+01 EXCESS=0.0000E+00 OUTFLOW=0.4046E+01 BASIN STORAGE=0.4835E-04 PERCENT ERROR=  -0.1

          FOR PLAN = 2  RATIO= 1.00
             R3240  MANE        2.06     45.74    247.70      1.35      3.00     45.59    246.00       1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.4044E+01 EXCESS=0.0000E+00 OUTFLOW=0.4046E+01 BASIN STORAGE=0.4835E-04 PERCENT ERROR=  -0.1

          FOR PLAN = 1  RATIO= 1.00
             R3235  MANE        1.84     42.24    265.88     -1.00      3.00     41.79    267.00      -1.00

          FOR PLAN = 2  RATIO= 1.00
             R3235  MANE        1.84     42.24    265.88     -1.00      3.00     41.79    267.00      -1.00

          FOR PLAN = 1  RATIO= 1.00
             S3241  MANE        1.98     44.55    242.66      1.35      3.00     44.45    243.00       1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.3903E+01 OUTFLOW=0.3900E+01 BASIN STORAGE=0.4714E-03 PERCENT ERROR=   0.1
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FOR PLAN = 1  RATIO= 1.00
   R3243  MANE        3.26     47.76    254.78      1.90      3.00     47.74    255.00        1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1119E+02 EXCESS=0.0000E+00 OUTFLOW=0.1112E+02 BASIN STORAGE=0.6807E-01 PERCENT ERROR=   0.0

FOR PLAN = 2  RATIO= 1.00
   R3243  MANE        3.26     47.76    254.78      1.90      3.00     47.74    255.00        1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1119E+02 EXCESS=0.0000E+00 OUTFLOW=0.1112E+02 BASIN STORAGE=0.6807E-01 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
   R3252  MANE        1.87    147.53    252.11      0.43      3.00    147.51    252.00        0.43

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2109E+02 EXCESS=0.0000E+00 OUTFLOW=0.2106E+02 BASIN STORAGE=0.3055E-01 PERCENT ERROR=   0.0

FOR PLAN = 2  RATIO= 1.00
   R3252  MANE        0.48    256.45    252.68      1.07      3.00    256.07    252.00        1.07

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.5265E+02 EXCESS=0.0000E+00 OUTFLOW=0.5263E+02 BASIN STORAGE=0.1991E-01 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
   S3252  MANE        3.01     54.62    249.13      1.35      3.00     54.52    249.00        1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.5132E+01 OUTFLOW=0.5127E+01 BASIN STORAGE=0.4169E-03 PERCENT ERROR=   0.1

FOR PLAN = 1  RATIO= 1.00
   R3241  MANE        2.02     52.71    250.66     -1.00      3.00     52.43    249.00       -1.00

FOR PLAN = 2  RATIO= 1.00
   R3241  MANE        2.02     52.71    250.66     -1.00      3.00     52.43    249.00       -1.00

FOR PLAN = 1  RATIO= 1.00
   S3250  MANE        3.00     42.28    247.56      1.35      3.00     42.11    249.00        1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.3903E+01 OUTFLOW=0.3899E+01 BASIN STORAGE=0.3611E-03 PERCENT ERROR=   0.1

FOR PLAN = 1  RATIO= 1.00
   R3254  MANE        3.12     54.38    258.85      3.19      3.00     53.95    258.00        3.19

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9244E+01 EXCESS=0.0000E+00 OUTFLOW=0.9197E+01 BASIN STORAGE=0.4798E-01 PERCENT ERROR=   0.0
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```
FOR PLAN = 2  RATIO= 1.00
   R3254  MANE        3.12     54.38    258.85      3.19      3.00     53.95    258.00       3.19

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9244E+01 EXCESS=0.0000E+00 OUTFLOW=0.9197E+01 BASIN STORAGE=0.4798E-01 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
   R3253  MANE        1.18    248.80    256.74      0.63      3.00    248.75    255.00       0.63

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3537E+02 EXCESS=0.0000E+00 OUTFLOW=0.3535E+02 BASIN STORAGE=0.3345E-01 PERCENT ERROR=   0.0

FOR PLAN = 2  RATIO= 1.00
   R3253  MANE        0.48    358.06    255.06      1.20      3.00    358.04    255.00       1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6695E+02 EXCESS=0.0000E+00 OUTFLOW=0.6693E+02 BASIN STORAGE=0.1622E-01 PERCENT ERROR=   0.0

FOR PLAN = 1  RATIO= 1.00
   S3253  MANE        3.01     54.62    249.13      1.35      3.00     54.52    249.00       1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.5132E+01 OUTFLOW=0.5127E+01 BASIN STORAGE=0.4169E-03 PERCENT ERROR=   0.1

FOR PLAN = 1  RATIO= 1.00
   R3250  MANE        3.09     39.62    259.90     -1.00      3.00     39.55    258.00      -1.00

FOR PLAN = 2  RATIO= 1.00
   R3250  MANE        3.09     39.62    259.90     -1.00      3.00     39.55    258.00      -1.00

FOR PLAN = 1  RATIO= 1.00
   S3251  MANE        3.00     42.65    247.37      1.35      3.00     42.28    249.00       1.35

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.3903E+01 OUTFLOW=0.3900E+01 BASIN STORAGE=0.3401E-03 PERCENT ERROR=   0.1

FOR PLAN = 1  RATIO= 1.00
   R3247  MANE        2.94     76.17    274.41     -1.00      3.00     74.52    276.00      -1.00

FOR PLAN = 2  RATIO= 1.00
   R3247  MANE        2.94     76.17    274.41     -1.00      3.00     74.52    276.00      -1.00

FOR PLAN = 1  RATIO= 1.00
   R3251  MANE        3.46    126.37    282.82      8.75      3.00    123.47    282.00       8.74
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CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2528E+02 EXCESS=0.0000E+00 OUTFLOW=0.2519E+02 BASIN STORAGE=0.1029E+00 PERCENT ERROR=   0.0

        FOR PLAN = 2  RATIO= 1.00
           R3251  MANE        3.46    126.37    282.82      8.75      3.00    123.47    282.00        8.74

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2528E+02 EXCESS=0.0000E+00 OUTFLOW=0.2519E+02 BASIN STORAGE=0.1029E+00 PERCENT ERROR=   0.0

        FOR PLAN = 1  RATIO= 1.00
           EMF-3  MANE        1.17    149.68    260.15      0.42      3.00    149.37    258.00        0.42

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2626E+02 EXCESS=0.0000E+00 OUTFLOW=0.2625E+02 BASIN STORAGE=0.2036E-01 PERCENT ERROR=   0.0

        FOR PLAN = 2  RATIO= 1.00
           EMF-3  MANE        0.92    482.18    257.00      1.55      3.00    481.50    258.00        1.55

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9724E+02 EXCESS=0.0000E+00 OUTFLOW=0.9718E+02 BASIN STORAGE=0.6418E-01 PERCENT ERROR=   0.0


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