2004P040

FINAL
DRAINAGE REPORT

DONATELA II

August 30, 2004
3rd Submittal-August 10, 2004
2nd Submittal-June 23, 2004
1st Submittal-March 22, 2004
DEA PROJECT NO. STPP0000-0011

DAVID EVANS AND ASSOCIATES INC.

FINAL DRAINAGE REPORT
FOR
DONATELA II

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August 30, 2004
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APPENDIX	TITLE
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G	Excerpts of Reports by Others

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1 INTRODUCTION

This Final Drainage Report is prepared under contract for Stapp Investments Inc., Owner/Developer of the proposed Donatela II subdivision. The purpose of this report is to provide the hydrologic and hydraulic analyses to support the proposed development and specifically the Improvement Plans. This report and design follow the procedures outlined in the *City of Avondale Engineering Design Standards*, Section V (Reference 1) and the *Drainage Design Manuals for Maricopa County, Arizona, Volumes I & II* (References 2 and 3).

The project site is located entirely within the Northwest Quarter, Section 36, Township 2 North, Range 1 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona (See Figure 1-Vicinity Map). The site is bounded on the west by the levee for the Agua Fria River and the City of Avondale groundwater recharge facility, on the north by undeveloped land up to Thomas Road, on the east by undeveloped agricultural lands and a school site (Pendergast Elementary School), and on the south by a single-family residential development. Access to the site is provided along 119th Avenue through the site, which then connects northerly to Thomas Road and southerly to McDowell Road. Encanto Boulevard connects the property easterly to 115th Avenue.

Donatella II is a proposed single family 236-unit subdivision site of 73.97± acres. Three lot sizes are proposed. The proposed lot sizes are 60' x 115', 65' x 115', and 70' x 115'. The runoff from the adjacent infrastructure is retained within the project boundary. On-site improvements include paved roads, sidewalks, curb and gutter, landscaping and graded pads.

2 EXISTING DRAINAGE CONDITIONS

The site consists of land that has been utilized for agricultural purposes. In its undeveloped condition, the project site drains in a southerly and westerly direction with slopes ranging from 0.4 to 2 percent. The general vicinity is a combination of residential development and agricultural land.

There is a breakline running northerly and southerly roughly at the middle of the property. This is the drop into the historic floodplain of the Agua Fria River. Construction of the levee on the river in the 1980's has removed this land from the floodplain of the river.

The property falls into two floodplain zones on FEMA Flood Insurance Rate Map (FIRM), Map No. 04013C2080 H (Panel 2080 of 4350), effective date of July 19, 2001 (Reference 9). The two current flood hazard zones on the site are Zone X and Zone AH. Zone X is defined as "*Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from the 100-year flood.*" Zone AH is

defined as "*Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined*". A copy of the FIRM is located in Appendix B.

The elevation of 984 is the determined water surface elevation of ponding behind the levee. The storm water, which ponded there originally came from the same upstream watershed as described above and in Section 3.2. Much of this flow, has been cut off by development and a borrow pit north of the property in the last 10 years. However, Maricopa County and FEMA require development within ponded areas provide a compensatory volume for the developed disturbance area. See Section 3.3.1 and 3.3.2 for additional information.

3 PROPOSED DRAINAGE CONCEPT

The proposed drainage concept is presented in three parts: on-site drainage conveyance, off-site drainage conveyance and on-site storm water retention. On-site storm water retention calculations are summarized in Section 3.3. The hydrologic analysis is included in Section 4.0 and the hydraulic analysis is included in Section 5.0. See Exhibit A, located in the back pocket, for graphical illustration of the proposed drainage concept.

3.1 On-Site Drainage Conveyance

The on-site drainage area is divided into several sub-basins. On-site storm water runoff is conveyed through the site by paved roadway sections with normal crowns and either 4-inch roll curb or 6-inch vertical curb, and graded open spaces to on-site retention facilities. Lots have been graded to drain to the front of the lot and into the roadway. Depressed curbs or scuppers are used to direct the flows from the street into the graded open spaces. The roadway sections are designed to convey the longitudinal 10-year peak flows between the curbs and the 100-year peak flows within the right-of-way at a depth of 8 inches or less.

In the event, the 10-year or 100-year longitudinal street flow exceeds the allowable maximum street capacity storm drain is designed to convey the amount exceeding the maximum street capacity. Flow conveyed by the storm drain is calculated using Stormcad. For each storm drain system the 10-year and 100-year performance is evaluated. See Section 5 for additional information.

3.2 Off-Site Drainage Conveyance

Flows from the upstream watershed are mostly cutoff as described in Section 2.0 above. Runoff generated from the small undeveloped area to the north of the northwestern part of the property is directed along the western property line similar to the undeveloped drainage path and conveyed southerly past the development. A 30-foot tract is provided between the Agua Fria River right-of-

way and the proposed developed lots along the western proposed property line. The intent of the tract is for drainage, landscaping and a trail section. The off-site flows are passed through the site into Basin 5 at the southwest corner of the property. Refer to Appendix G for selected excerpts of the Preliminary Drainage Report for off-site flow calculations and drainage area boundaries (Reference 10). Appendix E shows the calculated flow depth for a typical section along the tract between the levee and the project.

The runoff from the adjacent dairy to the northeast and north of Encanto Boulevard will be captured in the ditch on the north side of the road. It is believed that portion of this flow may overtop the ditch and then convey south toward 117th Avenue and east of the adjacent school property. The open space configuration for Donatella II provides a reasonable accommodation to continue the existing drainage pattern for any potential overflow from the adjacent dairy through Donatella II prior to the development of the adjacent dairy property. This potential flow will enter the site at Encanto Boulevard and 119th Avenue by overtopping the roadway and pass through the proposed project by overflowing basins until it reaches the southwest corner of the site.

3.3 On-Site Storm Water Retention

Avondale requires that the 100-year, 2-hour storm runoff generated from the project site and adjacent half streets to the site be retained within the project site. The weighted runoff coefficient, C_{wt}, is calculated using values from Table 3.2 in the *Drainage Design Manual for Maricopa County, Arizona, Volume I*, (Reference 2). This weighted C value is used to more accurately estimate the retention required for a given sub-basin. The C values used for this project ranged from 0.40 for landscaped retention basins, to 0.95 for paved street sections. The C values used to determine retention required for each sub-basin are detailed in Appendix A.

The required retention volume for the project site is estimated as follows:

$$V_R = C_{wt} * (P / 12) * A$$

Where:

V_R = Calculated volume in acre-ft
C_{wt} = Weighted Runoff coefficient
P = Rainfall depth in inches (2.6 inches)
A = Drainage area in acres

The total volume requirement is provided in several retention basins located in open spaces within the project. Table 3.1 below summarizes the retention requirements for the project. For detailed retention calculations refer to Appendix D.

Summary of Retention Requirements
Table 3.1

Basin Designation*	Volume Required (Ac-ft)	Volume Provided (Ac-ft)	Short/Excess (Ac-ft)	Shortage to Basin
1	0.02	0.23	0.21	N/A
2.1	1.26	1.16	-0.10	Basin 2.2
2.2	*0.75+0.10+1.27=2.12**	1.24	-0.88	Basin 2.3
2.3	0.88+*0.88*=1.76*	0.96	-0.80	Basin 3.1
3.1	0.30+*0.80*=1.10*	1.05	-0.05	Basin 3.2
3.2	2.62+*0.05*=2.67*	3.63	0.96	N/A
4	1.90	0.63	-1.27	Basin 2.2
5**	8.40	8.87	0.47	N/A
6	0.12	0.17	0.05	N/A
TOTAL	16.25	17.94	1.69	

* Includes contributing excess from other basins.
** See Section 3.3.1 for detailed explanation of compensatory retention requirements.

3.3.1 Compensatory Volume

The FEMA FIRM panel Zone AH is based on the work maps prepared by Jerry R. Jones and Associates, dated February 1989 (Reference 10). The Zone AH delineation over the site used 4-foot contour interval topographic mapping. Site specific aerial topographic mapping was performed in May 1999 and September 2003 subsequent to the FEMA study. .

Development feasibility studies performed in 1999 on the site indicated that import of earth to elevate the site is required for development. This recommendation was based on findings from the May 1999 aerial mapping. Subsequent to those findings the owner of the property began importing clean fill onto the site for in preparation for future development. The fill was imported on site in various locations and was stockpiled without compaction. The September 2003 aerial topographic mapping shows the import stockpiled on the site. Refer to Exhibit B for the 1999 topographic mapping and Exhibit C for the 2003 topographic mapping.

Where proposed development will encroach on the Zone AH, Maricopa County Flood Control District (MCFCD) and FEMA require a volume replacement of the existing Zone AH. The proposed project includes the reconfiguring the ponded water volume on the site. The existing volume was calculated using the 1999 contours. The retention volume shown in Table 3.1 for Basin 5 is the sum of the calculated compensatory Zone AH volume plus the 100-yr 2-hr volume from areas contributing to Basin 5.

The imported fill was not compacted over the duration the fill was stockpiled between 1999 to 2003. Based on geotechnical recommendations and subdivision grading plans the stockpiled fill is planned for proper placement and compaction as part of the subdivision project. The project grading reconfigures the floodplain from its existing FEMA configuration and allows the calculated volume based on the 1999 aerial mapping to remain on the project site at or below the 984 elevation.

3.3.2 Compensatory Volume Calculations

The calculation of the compensatory volume was performed using several methods. This allowed for confirmation of the value determined as the existing volume to 984 elevation. The May 1999 mapping was used in each calculation, as this did not include the subsequently imported clean fill within the Zone AH boundary. For detailed compensatory calculations refer to Appendix F.

4 HYDROLOGIC ANALYSIS

The hydrologic analysis for the Donatella II project site will be completed using the procedures in the *City of Avondale Engineering Design Standards* and the *Drainage Design Manual for Maricopa County, Arizona, Volume I.* Rational for Windows (Reference 5) is utilized to compute the on-site peak discharges. The program is based on the Flood Control District of Maricopa County methodology as explained in Volume 1. The following establishes the Rational Method equation and the basic input data required:

$$Q = C_{wt} I A$$

Where:

C_{wt} = The runoff coefficient relating runoff to rainfall
I = Average rainfall intensity in inches/hour, lasting for Tc
T_c = The time of concentration (minutes)
A = The contributing drainage area in acres (from Exhibit A).

The rational program requires the high point of the designated drainage area. Each individual lot owner typically landscapes the backyard. Therefore, the pad elevation is used for the rational data entry in lieu of a standard lot drain time. The low point of the watershed is typically identified as the gutter elevation of the point of interest.

5 HYDRAULIC ANALYSIS

The hydraulic analyses of the proposed stormwater management facilities will be completed according to the *City of Avondale Engineering Design Standards*, and the *Maricopa County Drainage Design Manual, Volume II, Hydraulics*. Due to the size of this project, the site is divided into several drainage areas. Concentration points for peak flows are determined at selected locations to determine if the 10-year flow is contained between the curbs and the 100-year flow is contained in the right-of-way at a depth of 8 inches or less.

FlowMaster is utilized to calculate gutter flow depths using Manning's equation, and typical cross sections with either 4-inch rolled curb or 6-inch vertical curb. The depressed curb and conveyance channels will also be sized using FlowMaster and Manning's equation.

Scupper inlets were sized using Haestad Method's FlowMaster (Reference 6). The bottom width of the inlet will be determined such that the inlet accepts the 10-year flow with the depth below the top of curb elevation. When the 100-year flow depth exceeds the inlet capacity, flow depths are calculated using the weir equation to determine weir depth over the sidewalk. Finished floor elevations adjacent to the scuppers are designed at a minimum of 12-inches above the calculated 100-year water surface elevation. Listed is a summary of flows and concentration points with the number of 4-foot scupper sections (inlet length) required at the specified scupper locations. Calculations from FlowMaster and the weir equation computations are included in Appendix E.

StormCad (Reference 8) was used to size storm drain. The storm drain was designed to convey at a minimum the 10-year storm. Each system was analyzed based on the 100-year storm to determine the performance.

Retention Basin 4 includes a tot lot that City staff requested the elevation set above the high water elevation (995.0) of the basin. Basin 4 does not provide the 100-year 2-hour retention in the basin when the tot lot is elevated. Storm drain conveys the excess from Basin 4 to Basin 2.2 with the inlet rim elevation set at the basin high water elevation (995.0).

Based on calculations provided in Appendix E the storm drain will pass the 25-year storm to Basin 2.2. Peak flows for storms greater than the 25-year storm will split in two directions with a portion flowing north along 119th at a gutter elevation of 96.28 while the remaining flow overtops the crown of 119th Avenue at an elevation of 96.58. The portion that flows over the 119th Avenue crown is conveyed in the streets to Basin 2.3 where the remaining storm water retention volume is located. Storm drain calculations in Appendix E assumes the flow traveling north along the gutter at elevation 96.28 is zero which yields conservative results for the maximum roadway centerline overtopping flow elevation.

Erosion control measures at drainage structure outlets include spillways and riprap.

6 CONCLUSIONS

Based on the results of this study, it can be concluded that:

- The site will be developed according to the *Avondale Drainage Ordinance* and the *Drainage Design Manuals for Maricopa County.*
- The 10-year storm event is designed to be contained within the 4" roll curb, or 6" vertical curb of on-site roadways.
- The 100-year storm event is designed to be contained within the right-of-way.
- Runoff from the 100-year, 2-hour storm produced from the 73.97± acres of the site and adjacent half street will be contained within the site boundary.
- All finish floors elevations will be set a minimum of one foot above the 100-year water surface elevation.
- The Zone AH volume in the pre-developed condition is designed as part of the volume provided in proposed Basin 5.
- Off-site flow along a portion of the northern boundary is collected at a drainage tract and passed through the site adjacent to the existing levee.

7 REFERENCES

1) *City of Avondale, Engineering Design Standards*, Public Works Department Engineering Division, June 1997.
2) *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology*, Flood Control District of Maricopa County, 1995.
3) *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics*, Flood Control District of Maricopa County 1996.
4) *Preliminary Drainage Report for Baker Dairy, prepared for Avondale 28 LLC.*, Roger Baele.
5) Rational For Windows, Version 1.0, Frank M. Gu, P.E.
6) FlowMaster PE, Version 7.0, Haested Methods, 2004.
7) CulvertMaster, Version 1.0, Haested Methods, June 1996.
8) StormCad, Version 5.5, Haested Methods, 2004.
9) *Flood Insurance Rate Map-PANEL MAP NUMBER 04013C2080H*, FEMA. Map revised July 19,2001.
10) *Flood Insurance Study Work Map-Sheets 6 of 23 and 7 of 23*, Jerry R. Jones & Associates, Inc. Sealed February 6, 1989.

APPENDIX A
(Figures)

SCALE: 1"=1000'	VICINITY MAP FIGURE 1 DONATELA	DAVID EVANS AND ASSOCIATES INC. 2141 East Highland Avenue, Suite 200 Phoenix Arizona 85016 Phone: 602.678.5151	DRAWN BY: JOMA
SHEET 1 OF 1			CHECKED BY:
JOB NO.: STPP0011			DATE: 02/04

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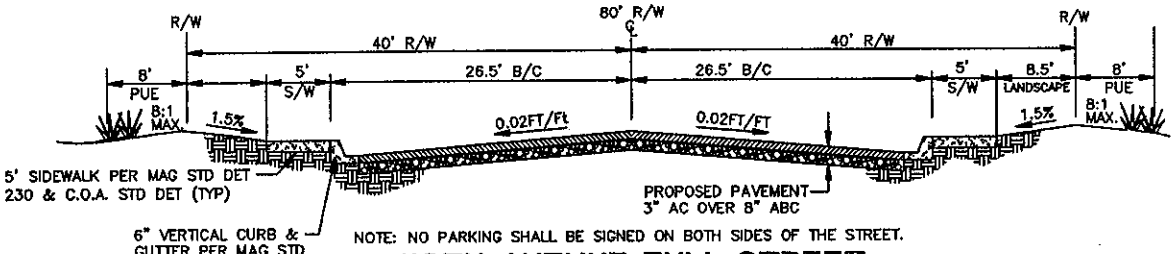
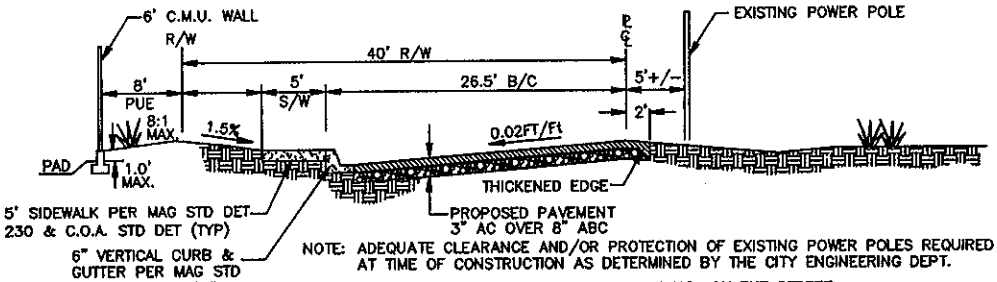


NOTE: NO PARKING SHALL BE SIGNED ON BOTH SIDES OF THE STREET.

119TH AVENUE FULL STREET

FROM SOUTH PROPERTY LINE TO ENCANTO BLVD.
NTS

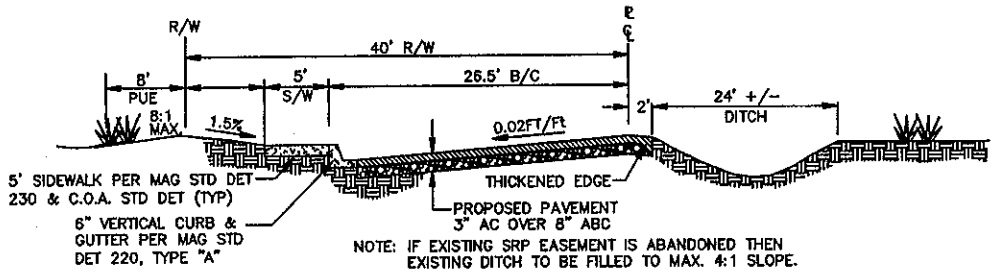


NOTE: ADEQUATE CLEARANCE AND/OR PROTECTION OF EXISTING POWER POLES REQUIRED AT TIME OF CONSTRUCTION AS DETERMINED BY THE CITY ENGINEERING DEPT.

NOTE: NO PARKING SHALL BE SIGNED ON THE STREET.

119TH AVENUE 1/2 STREET

119TH AVE. FROM ENCANTO BLVD. TO VIRGINIA AVE. LOOKING NORTH
NTS

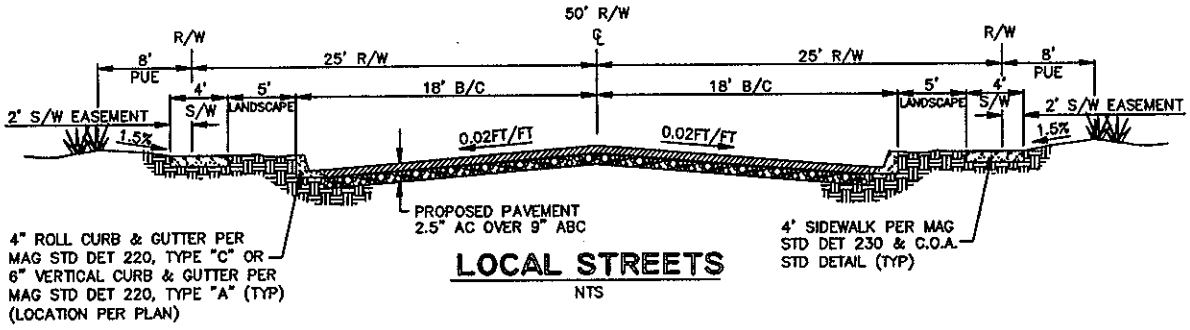


NOTE: IF EXISTING SRP EASEMENT IS ABANDONED THEN EXISTING DITCH TO BE FILLED TO MAX. 4:1 SLOPE.

NOTE: NO PARKING SHALL BE SIGNED ON THE STREET.

ENCANTO BLVD. 1/2 STREET

ENCANTO BLVD. LOOKING WEST
NTS



LOCAL STREETS

NTS

SCALE: 1"=1000'	**ROADWAY SECTIONS FIGURE 2 DONATELA**	DAVID EVANS AND ASSOCIATES INC. 2141 East Highland Avenue, Suite 200 Phoenix Arizona 85016 Phone: 602.678.5151	DRAWN BY: JOMA
SHEET 1 OF 1			CHECKED BY:
JOB NO.: STPP0011			DATE: 02/04

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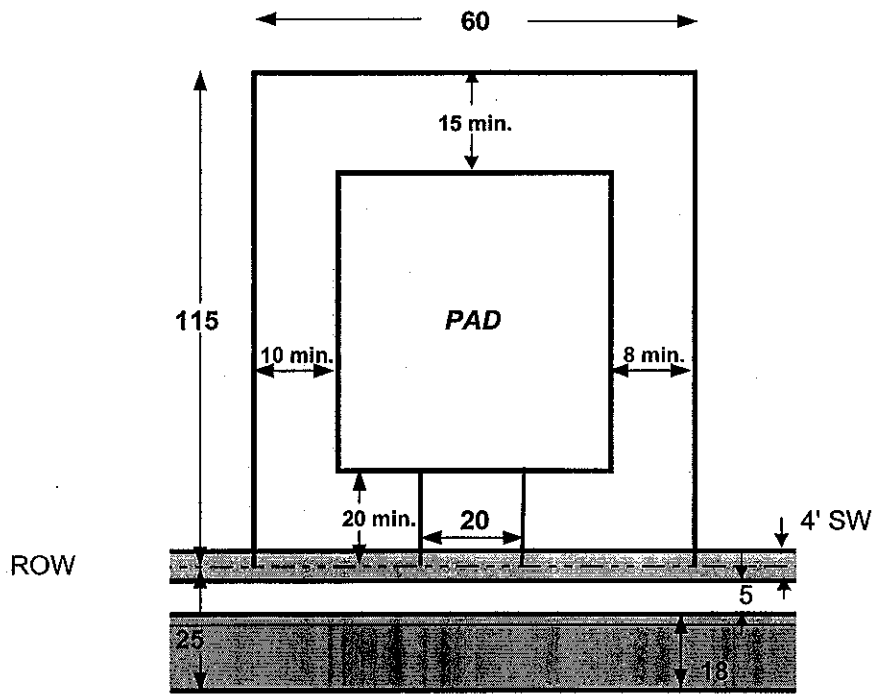
WEIGHTED RUNOFF COEFFICIENT (Cw)

100-YEAR STORM EVENT



HALF R/W TOTAL	**25**	**X**	**60**	**=**	**1500**	**S.F.**	
CONCRETE	*2*	*X*	*60*	=	*120*	*S.F. @*	*0.95*
ASPHALT	*18*	*X*	*60*	=	*1080*	*S.F. @*	*0.95*
RIGHT-OF-WAY	*5*	*X*	*60*	=	*300*	*S.F. @*	*0.35*
LOT AREA TOTAL	**60**	**X**	**115**	**=**	**6900**	**S.F.**	
ROOF (51% OF LOT)				=	*3519*	*S.F. @*	*0.95*
YARD				=	*2898*	*S.F. @*	*0.35*
CONCRETE (7% OF LOT)				=	*483*	*S.F. @*	*0.95*

$$Cw = \frac{(120*0.95)+(1080*0.95)+(300*0.35)+(3519*0.95)+(2898*0.35)+(483*0.95)}{8400}$$

Cw = 0.72

FIGURE 3

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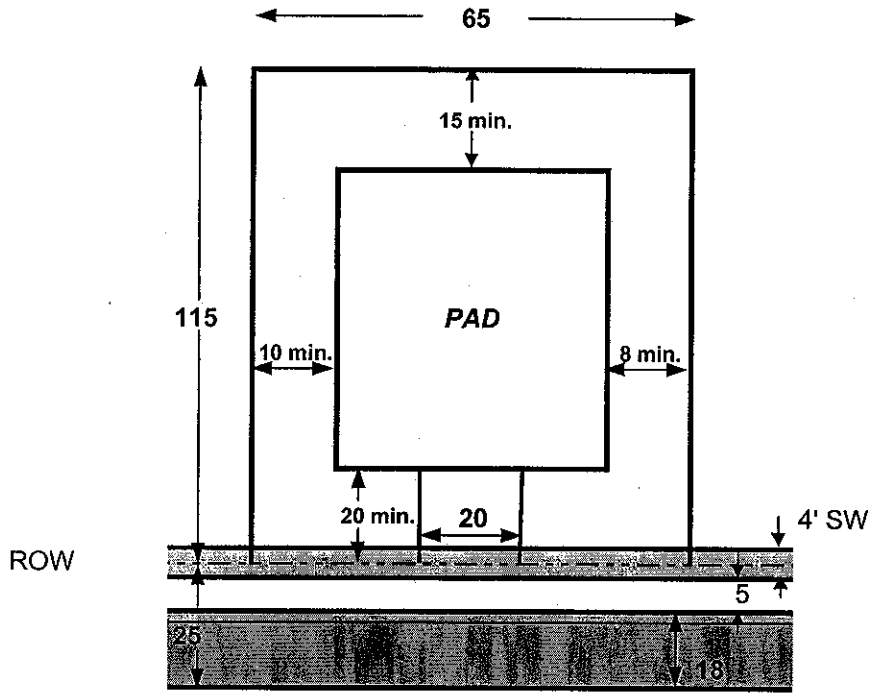
WEIGHTED RUNOFF COEFFICIENT (Cw)

100-YEAR STORM EVENT



HALF R/W TOTAL	**25**	**X**	**65**	**=**	**1625**	**S.F.**	
CONCRETE	*2*	*X*	*65*	=	*130*	*S.F. @*	*0.95*
ASPHALT	*18*	*X*	*65*	=	*1170*	*S.F. @*	*0.95*
RIGHT-OF-WAY	*5*	*X*	*65*	=	*325*	*S.F. @*	*0.35*
LOT AREA TOTAL	**65**	**X**	**115**	**=**	**7475**	**S.F.**	
ROOF (51% OF LOT)				=	*3812*	*S.F. @*	*0.95*
YARD				=	*3140*	*S.F. @*	*0.35*
CONCRETE (7% OF LOT)				=	*523*	*S.F. @*	*0.95*

$$Cw = \frac{(120*0.95)+(1080*0.95)+(300*0.35)+(3519*0.95)+(2898*0.35)+(483*0.95)}{9100}$$

Cw = 0.72

FIGURE 3

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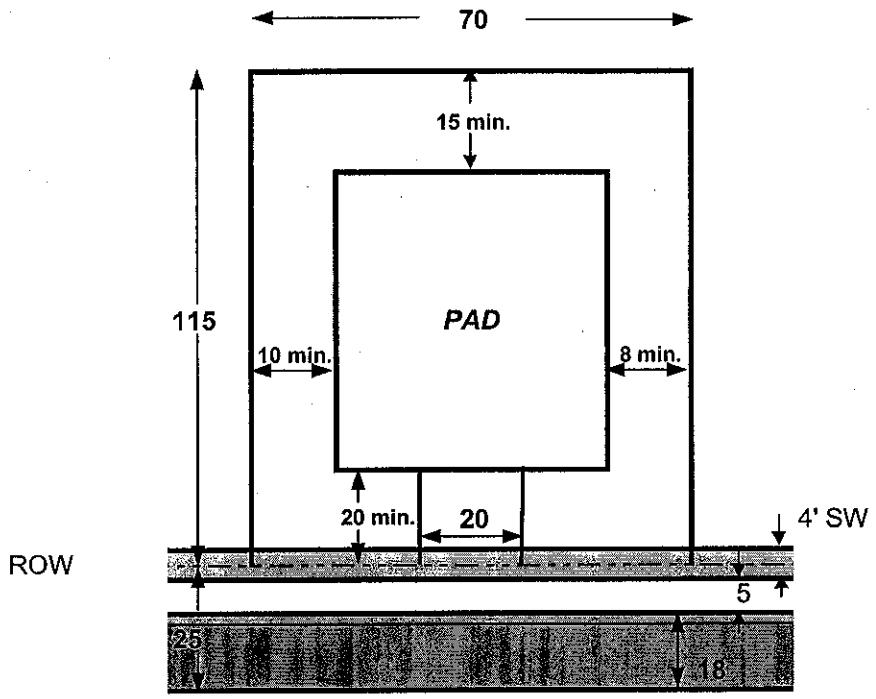
WEIGHTED RUNOFF COEFFICIENT (Cw)

100-YEAR STORM EVENT



HALF R/W TOTAL	**25**	**X**	**70**	**=**	**1750**	**S.F.**	
CONCRETE	*2*	*X*	*70*	=	*140*	*S.F. @*	*0.95*
ASPHALT	*18*	*X*	*70*	=	*1260*	*S.F. @*	*0.95*
RIGHT-OF-WAY	*5*	*X*	*70*	=	*350*	*S.F. @*	*0.35*
LOT AREA TOTAL	**70**	**X**	**115**	**=**	**8050**	**S.F.**	
ROOF (51% OF LOT)				=	*4106*	*S.F. @*	*0.95*
YARD				=	*3381*	*S.F. @*	*0.35*
CONCRETE (7% OF LOT)				=	*564*	*S.F. @*	*0.95*

$$Cw = \frac{(120*0.95)+(1080*0.95)+(300*0.35)+(3519*0.95)+(2898*0.35)+(483*0.95)}{9800}$$

Cw = 0.72

FIGURE 3
3 of 6

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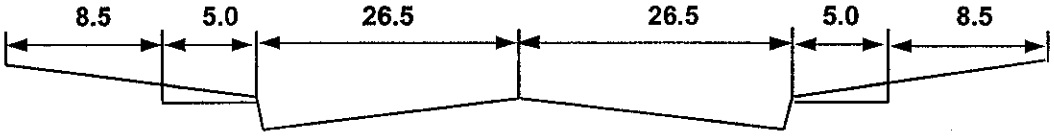
WEIGHTED RUNOFF COEFFICIENT (Cwt)

119th Ave.

100-YEAR STORM EVENT



SIDEWALKS	10.00	X	0.95	*	=	9.50
STREET-B/C	53.00	X	0.95	*	=	50.35
LANDSCAPE	17.00	X	0.35	*	=	5.95
TOTALS	80.00					65.80

$$Cwt = \frac{65.80}{80}$$

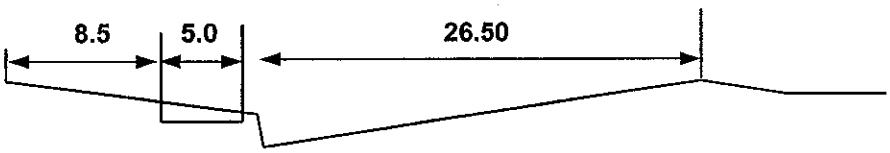
Cwt = 0.82

FIGURE 3
4 of 6

WEIGHTED RUNOFF COEFFICIENT (Cwt)

ENCANTO BLVD. (1/2 Street)

100-YEAR STORM EVENT

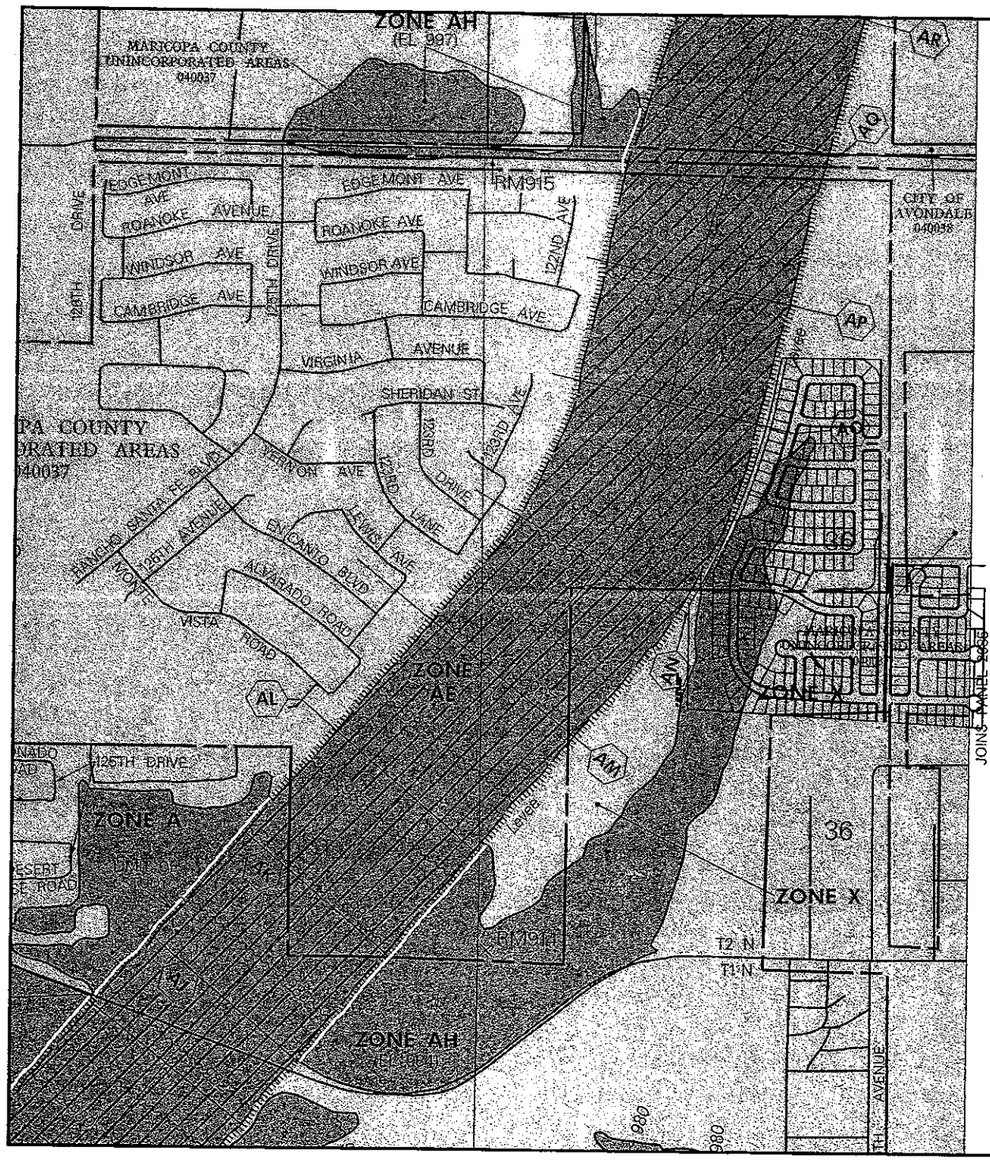


SIDEWALKS	5.00	X	0.95	*	=	4.75
STREET-B/C	26.50	X	0.95	*	=	25.18
LANDSCAPE	8.50	X	0.35	*	=	2.98
TOTALS	40.00					32.90

$$Cwt = \frac{32.90}{40.00}$$

Cwt = 0.82

FIGURE 3
6 of 6



APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 2080 OF 4350

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
AVONDALE, CITY OF	040038	2080	H
GOODYEAR, CITY OF	040046	2080	H
LITCHFIELD PARK, CITY OF	040128	2080	H
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	2080	H
PHOENIX, CITY OF	040051	2080	H

MAP NUMBER 04013C2080 H

MAP REVISED: JULY 19, 2001

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

DRAWN BY: JOMA

CHECKED BY:

DATE: 01/04

DATE	REVISION	BY

DAVID EVANS AND ASSOCIATES INC.
2141 East Highland Avenue, Suite 200
Phoenix Arizona 85016
Phone: 602.678.5151

FLOOD INSURANCE RATE PLAN
FIGURE 4
DONATELA

SCALE: 1"=1000'

SECTION: 36
TWNSHP: T2N
RANGE: R1W

SHEET 1 OF 1

JOB NO.: STPP0011

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APPENDIX C
(Hydrologic Calculations and Data Sheets)

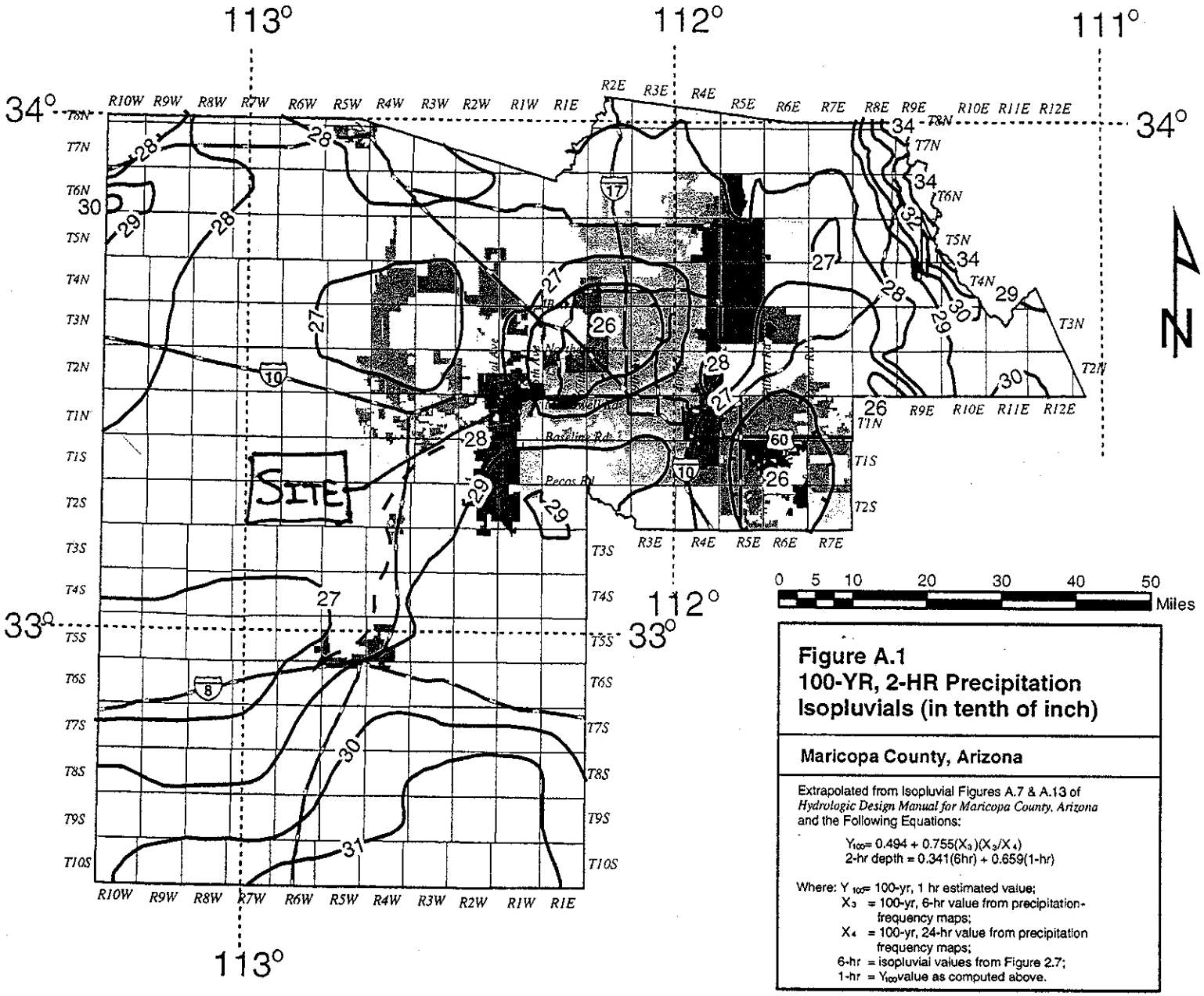

Figure A.1
100-YR, 2-HR Precipitation Isopluvials (in tenth of inch)

Maricopa County, Arizona

Extrapolated from Isopluvial Figures A.7 & A.13 of *Hydrologic Design Manual for Maricopa County, Arizona* and the Following Equations:

$$Y_{100} = 0.494 + 0.755(X_3)(X_3/X_4)$$
$$\text{2-hr depth} = 0.341(\text{6hr}) + 0.659(\text{1-hr})$$

Where: Y_{100} = 100-yr, 1 hr estimated value;
X_3 = 100-yr, 6-hr value from precipitation-frequency maps;
X_4 = 100-yr, 24-hr value from precipitation frequency maps;
6-hr = isopluvial values from Figure 2.7;
1-hr = Y_{100} value as computed above.

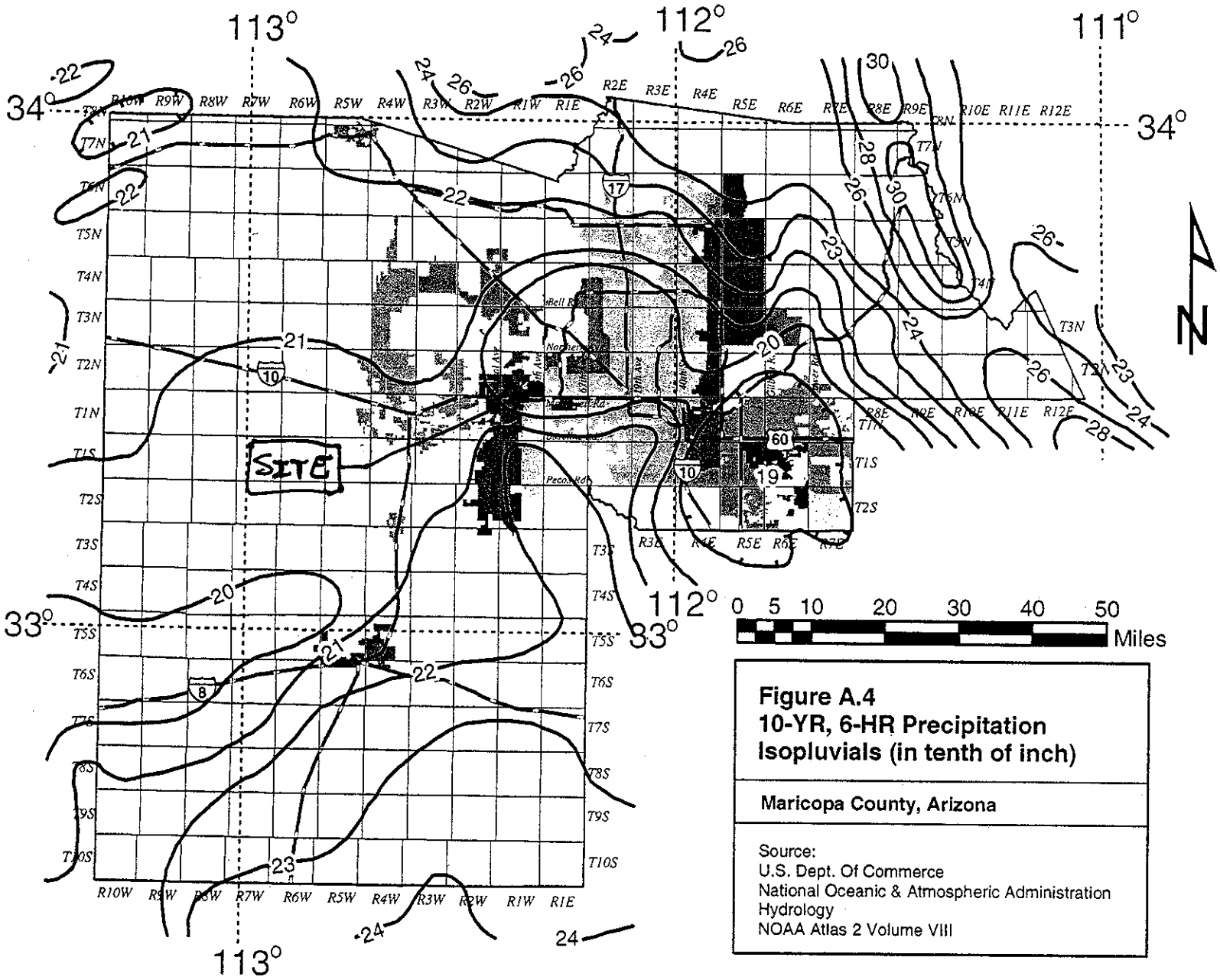

Figure A.4
10-YR, 6-HR Precipitation Isopluvials (in tenth of inch)

Maricopa County, Arizona

Source:
U.S. Dept. Of Commerce
National Oceanic & Atmospheric Administration
Hydrology
NOAA Atlas 2 Volume VIII

RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 2A

Location: 2A

Drainage Basin Data

Water Course Length: 133.00 ft

Basin Area: 0.160 acres

High Elevation: 98.86 ft

Low Elevation: 98.05 ft

Average Slope: 0.0061 ft/ft

Roughness, Kb: 0.0450 (A)

10-Year Runoff Coefficient: 0.584

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	0	0	1	1	1	1
C	0.584	0.584	0.584	0.642	0.701	0.730
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	3.7	4.9	5.7	6.7	7.7	8.7

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Author: Frank M. Gu, P.E.
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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 2B

Location: 2A+2B

Drainage Basin Data

Water Course Length: 509.00 ft

Basin Area: 1.410 acres

High Elevation: 98.86 ft

Low Elevation: 96.23 ft

Average Slope: 0.0052 ft/ft

Roughness, Kb: 0.0391 (A)

10-Year Runoff Coefficient: 0.584

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	2	3	4	5	7	8
C	0.584	0.584	0.584	0.642	0.701	0.730
Tc (min)	9.4	8.3	7.8	7.1	6.8	6.4
i (in/hr)	2.9	4.0	4.8	6.1	7.0	8.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 2C

Location: 2A+2B+2C

Drainage Basin Data

Water Course Length: 955.00 ft

Basin Area: 4.080 acres

High Elevation: 98.86 ft

Low Elevation: 94.01 ft

Average Slope: 0.0051 ft/ft

Roughness, Kb: 0.0362 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	8	10	14	17	21
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	13.2	11.6	10.8	9.9	9.4	8.9
i (in/hr)	2.5	3.5	4.2	5.3	6.1	7.1

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 2D

Location: 2D

Drainage Basin Data

Water Course Length: 487.00 ft

Basin Area: 2.160 acres

High Elevation: 95.66 ft

Low Elevation: 94.01 ft

Average Slope: 0.0034 ft/ft

Roughness, Kb: 0.0379 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	3	5	6	8	10	12
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	10.5	9.3	8.7	7.9	7.5	7.1
i (in/hr)	2.8	3.8	4.6	5.8	6.7	7.7

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 2H

Location: 2H

Drainage Basin Data

Water Course Length: 152.00 ft

Basin Area: 0.250 acres

High Elevation: 97.31 ft

Low Elevation: 96.39 ft

Average Slope: 0.0061 ft/ft

Roughness, Kb: 0.0438 (A)

10-Year Runoff Coefficient: 0.584

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	1	1	2
C	0.584	0.584	0.584	0.642	0.701	0.730
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	3.7	4.9	5.7	6.7	7.7	8.7

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 2I

Location: 2I

Drainage Basin Data

Water Course Length: 150.00 ft

Basin Area: 0.250 acres

High Elevation: 97.30 ft

Low Elevation: 96.29 ft

Average Slope: 0.0067 ft/ft

Roughness, Kb: 0.0438 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	1	1	2
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	5.0	5.0	5.0	5.0	5.0	5.0
i (in/hr)	3.7	4.9	5.7	6.7	7.7	8.7

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 2J

Location: 2I+2J

Drainage Basin Data

Water Course Length: 804.00 ft

Basin Area: 3.080 acres

High Elevation: 97.30 ft

Low Elevation: 90.85 ft

Average Slope: 0.0080 ft/ft

Roughness, Kb: 0.0369 (A)

10-Year Runoff Coefficient: 0.584

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	5	7	8	12	15	18
C	0.584	0.584	0.584	0.642	0.701	0.730
Tc (min)	10.2	9.0	8.4	7.7	7.3	6.9
i (in/hr)	2.8	3.9	4.7	5.9	6.8	7.8

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 2K

Location: 2I+2J+2K

Drainage Basin Data

Water Course Length: 1212.00 ft

Basin Area: 4.440 acres

High Elevation: 97.30 ft

Low Elevation: 87.50 ft

Average Slope: 0.0081 ft/ft

Roughness, Kb: 0.0360 (A)

10-Year Runoff Coefficient: 0.584

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	7	9	11	15	19	23
C	0.584	0.584	0.584	0.642	0.701	0.730
Tc (min)	12.8	11.2	10.5	9.6	9.1	8.6
i (in/hr)	2.5	3.5	4.2	5.4	6.2	7.2

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 2L

Location: 2L

Drainage Basin Data

Water Course Length: 453.00 ft

Basin Area: 0.950 acres

High Elevation: 91.60 ft

Low Elevation: 87.50 ft

Average Slope: 0.0091 ft/ft

Roughness, Kb: 0.0401 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	2	2	3	4	5	6
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	7.3	6.4	6.0	5.6	5.3	5.0
i (in/hr)	3.2	4.4	5.3	6.5	7.6	8.7

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 2L*

Location: 2I+2J+2K+2L

Drainage Basin Data

Water Course Length: 1212.00 ft

Basin Area: 5.390 acres

High Elevation: 97.30 ft

Low Elevation: 87.50 ft

Average Slope: 0.0081 ft/ft

Roughness, Kb: 0.0354 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	8	11	13	19	23	28
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	12.6	11.1	10.4	9.5	9.0	8.5
i (in/hr)	2.5	3.6	4.3	5.4	6.2	7.2

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 2M

Location: 2M

Drainage Basin Data

Water Course Length: 416.00 ft

Basin Area: 0.480 acres

High Elevation: 98.86 ft

Low Elevation: 97.36 ft

Average Slope: 0.0036 ft/ft

Roughness, Kb: 0.0420 (A)

10-Year Runoff Coefficient: 0.656

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	1	2	3	3
C	0.656	0.656	0.656	0.722	0.787	0.820
Tc (min)	10.0	8.8	8.2	7.5	7.1	6.8
i (in/hr)	2.8	3.9	4.7	5.9	6.8	7.9

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 3A

Location: 3A

Drainage Basin Data

Water Course Length: 748.00 ft

Basin Area: 3.750 acres

High Elevation: 96.10 ft

Low Elevation: 89.10 ft

Average Slope: 0.0094 ft/ft

Roughness, Kb: 0.0364 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	9	11	15	18	22
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	9.1	8.0	7.5	6.9	6.5	6.2
i (in/hr)	2.9	4.1	4.9	6.1	7.0	8.1

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 3B

Location: 3A + 3B

Drainage Basin Data

Water Course Length: 1274.00 ft

Basin Area: 7.570 acres

High Elevation: 96.10 ft

Low Elevation: 86.50 ft

Average Slope: 0.0075 ft/ft

Roughness, Kb: 0.0345 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	11	15	18	26	32	39
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	13.2	11.6	10.8	9.8	9.3	8.8
i (in/hr)	2.5	3.5	4.2	5.4	6.2	7.1

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 3C

Location: 3C

Drainage Basin Data

Water Course Length: 437.00 ft

Basin Area: 0.700 acres

High Elevation: 90.30 ft

Low Elevation: 87.50 ft

Average Slope: 0.0064 ft/ft

Roughness, Kb: 0.0410 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	2	2	3	4	4
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	8.2	7.2	6.8	6.2	5.9	5.6
i (in/hr)	3.1	4.3	5.1	6.3	7.3	8.4

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 3D

Location: 3D

Drainage Basin Data

Water Course Length: 430.00 ft

Basin Area: 0.940 acres

High Elevation: 91.50 ft

Low Elevation: 87.50 ft

Average Slope: 0.0093 ft/ft

Roughness, Kb: 0.0402 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	2	2	3	4	5	6
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	7.0	6.2	5.8	5.4	5.1	5.0
i (in/hr)	3.3	4.5	5.4	6.6	7.7	8.7

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 3D*

Location: 3C + 3D

Drainage Basin Data

Water Course Length: 437.00 ft

Basin Area: 1.640 acres

High Elevation: 90.30 ft

Low Elevation: 87.50 ft

Average Slope: 0.0064 ft/ft

Roughness, Kb: 0.0387 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	3	4	5	7	8	10
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	7.9	7.0	6.5	6.0	5.7	5.4
i (in/hr)	3.1	4.3	5.2	6.4	7.4	8.5

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 3E

Location: 3E

Drainage Basin Data

Water Course Length: 903.00 ft

Basin Area: 4.260 acres

High Elevation: 94.70 ft

Low Elevation: 85.50 ft

Average Slope: 0.0102 ft/ft

Roughness, Kb: 0.0361 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	7	10	12	16	20	24
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	9.8	8.7	8.1	7.4	7.0	6.7
i (in/hr)	2.8	4.0	4.7	6.0	6.9	7.9

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 3G

Location: 3G+3F

Drainage Basin Data

Water Course Length: 1023.00 ft

Basin Area: 4.060 acres

High Elevation: 94.70 ft

Low Elevation: 86.50 ft

Average Slope: 0.0080 ft/ft

Roughness, Kb: 0.0362 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	9	10	14	18	22
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	11.6	10.2	9.5	8.7	8.3	7.8
i (in/hr)	2.6	3.7	4.4	5.6	6.5	7.5

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 3G*

Location: 3A +3B +3F + 3G

Drainage Basin Data

Water Course Length: 1274.00 ft

Basin Area: 11.630 acres

High Elevation: 96.10 ft

Low Elevation: 86.50 ft

Average Slope: 0.0075 ft/ft

Roughness, Kb: 0.0333 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	17	24	28	40	50	60
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	12.9	11.3	10.6	9.6	9.1	8.7
i (in/hr)	2.5	3.5	4.2	5.4	6.2	7.2

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 4B

Location: 4B

Drainage Basin Data

Water Course Length: 472.00 ft

Basin Area: 2.430 acres

High Elevation: 100.00 ft

Low Elevation: 97.93 ft

Average Slope: 0.0044 ft/ft

Roughness, Kb: 0.0376 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	4	6	7	9	12	14
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	9.3	8.2	7.7	7.1	6.7	6.3
i (in/hr)	2.9	4.0	4.8	6.1	7.0	8.0

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 4B*

Location: 4A + 4B

Drainage Basin Data

Water Course Length: 675.00 ft

Basin Area: 5.860 acres

High Elevation: 103.00 ft

Low Elevation: 97.93 ft

Average Slope: 0.0075 ft/ft

Roughness, Kb: 0.0352 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	10	14	16	23	28	34
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	9.1	8.0	7.5	6.9	6.5	6.2
i (in/hr)	2.9	4.1	4.9	6.1	7.0	8.1

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Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 4D

Location: 4D

Drainage Basin Data

Water Course Length: 569.00 ft

Basin Area: 2.570 acres

High Elevation: 99.60 ft

Low Elevation: 97.11 ft

Average Slope: 0.0044 ft/ft

Roughness, Kb: 0.0374 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	4	6	7	10	12	14
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	10.4	9.2	8.6	7.9	7.5	7.1
i (in/hr)	2.8	3.9	4.6	5.8	6.7	7.7

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 4C*

Location: 4A+4B+4D+4C

Drainage Basin Data

Water Course Length: 1166.00 ft

Basin Area: 10.380 acres

High Elevation: 103.00 ft

Low Elevation: 95.52 ft

Average Slope: 0.0064 ft/ft

Roughness, Kb: 0.0336 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	15	21	25	35	44	53
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	13.0	11.5	10.7	9.8	9.3	8.8
i (in/hr)	2.5	3.5	4.2	5.4	6.2	7.1

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 4E*

Location: 4A+4B+4D+4C+4E

Drainage Basin Data

Water Course Length: 1166.00 ft

Basin Area: 11.870 acres

High Elevation: 103.00 ft

Low Elevation: 95.52 ft

Average Slope: 0.0064 ft/ft

Roughness, Kb: 0.0333 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	17	24	29	41	51	61
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	13.0	11.4	10.6	9.7	9.2	8.7
i (in/hr)	2.5	3.5	4.2	5.4	6.2	7.2

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 5A*

Location: 5A - 5G

Drainage Basin Data

Water Course Length: 2299.00 ft

Basin Area: 16.720 acres

High Elevation: 98.50 ft

Low Elevation: 83.00 ft

Average Slope: 0.0067 ft/ft

Roughness, Kb: 0.0324 (A)

10-Year Runoff Coefficient: 0.552

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	19	27	33	46	59	71
C	0.552	0.552	0.552	0.607	0.662	0.690
Tc (min)	19.0	16.7	15.5	14.1	13.3	12.6
i (in/hr)	2.1	2.9	3.5	4.6	5.3	6.2

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 5B

Location: 5B

Drainage Basin Data

Water Course Length: 505.00 ft

Basin Area: 2.290 acres

High Elevation: 98.50 ft

Low Elevation: 96.44 ft

Average Slope: 0.0041 ft/ft

Roughness, Kb: 0.0378 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	4	5	6	9	11	13
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	10.0	8.8	8.3	7.6	7.2	6.8
i (in/hr)	2.8	3.9	4.7	5.9	6.8	7.9

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Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 5C

Location: 5B + 5C

Drainage Basin Data

Water Course Length: 855.00 ft

Basin Area: 4.580 acres

High Elevation: 98.50 ft

Low Elevation: 92.08 ft

Average Slope: 0.0075 ft/ft

Roughness, Kb: 0.0359 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	7	10	12	17	21	25
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	10.6	9.4	8.7	8.0	7.6	7.2
i (in/hr)	2.8	3.8	4.6	5.8	6.7	7.7

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 5D

Location: 5D

Drainage Basin Data

Water Course Length: 698.00 ft

Basin Area: 3.260 acres

High Elevation: 98.50 ft

Low Elevation: 91.85 ft

Average Slope: 0.0095 ft/ft

Roughness, Kb: 0.0368 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	8	9	13	16	19
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	8.7	7.7	7.2	6.6	6.3	6.0
i (in/hr)	3.0	4.1	5.0	6.2	7.1	8.2

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 5E

Location: 5B+5C+5D+5E

Drainage Basin Data

Water Course Length: 1148.00 ft

Basin Area: 8.970 acres

High Elevation: 98.50 ft

Low Elevation: 90.39 ft

Average Slope: 0.0071 ft/ft

Roughness, Kb: 0.0340 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	13	18	22	31	39	47
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	12.5	11.1	10.3	9.4	8.9	8.4
i (in/hr)	2.6	3.6	4.3	5.5	6.3	7.2

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Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 5F

Location: 5F

Drainage Basin Data

Water Course Length: 506.00 ft

Basin Area: 2.340 acres

High Elevation: 96.70 ft

Low Elevation: 90.73 ft

Average Slope: 0.0118 ft/ft

Roughness, Kb: 0.0377 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	4	6	7	10	12	15
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	6.8	6.0	5.6	5.2	5.0	5.0
i (in/hr)	3.3	4.6	5.5	6.7	7.7	8.7

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 5F*

Location: 5B+5C+5D+5E+5F

Drainage Basin Data

Water Course Length: 1148.00 ft

Basin Area: 11.310 acres

High Elevation: 98.50 ft

Low Elevation: 90.39 ft

Average Slope: 0.0071 ft/ft

Roughness, Kb: 0.0334 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	17	23	28	39	49	59
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	12.4	10.9	10.2	9.3	8.8	8.3
i (in/hr)	2.6	3.6	4.3	5.5	6.3	7.3

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 5H

Location: 5B+5C+5D+5E+5F+5H

Drainage Basin Data

Water Course Length: 1397.00 ft

Basin Area: 12.300 acres

High Elevation: 98.50 ft

Low Elevation: 89.17 ft

Average Slope: 0.0067 ft/ft

Roughness, Kb: 0.0332 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	17	24	29	40	51	61
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	14.2	12.5	11.7	10.6	10.1	9.5
i (in/hr)	2.4	3.4	4.0	5.2	6.0	6.9

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Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 5G

Location: 5G

Drainage Basin Data

Water Course Length: 564.00 ft

Basin Area: 3.250 acres

High Elevation: 97.00 ft

Low Elevation: 88.35 ft

Average Slope: 0.0153 ft/ft

Roughness, Kb: 0.0368 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	9	10	14	17	20
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	6.5	5.7	5.4	5.0	5.0	5.0
i (in/hr)	3.4	4.6	5.6	6.7	7.7	8.7

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 5G*

Location: 5B+5C+5D+5E+5F+5G+5H

Drainage Basin Data

Water Course Length: 1470.00 ft

Basin Area: 15.550 acres

High Elevation: 98.50 ft

Low Elevation: 88.35 ft

Average Slope: 0.0069 ft/ft

Roughness, Kb: 0.0326 (A)

10-Year Runoff Coefficient: 0.576

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	21	30	36	51	64	77
C	0.576	0.576	0.576	0.634	0.691	0.720
Tc (min)	14.3	12.6	11.7	10.7	10.1	9.6
i (in/hr)	2.4	3.4	4.0	5.2	6.0	6.9

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: DONATELA II

Project Description: ONSITE RATIONALS

Drainage Point: 6A

Location: 6A

Drainage Basin Data

Water Course Length: 528.00 ft

Basin Area: 0.610 acres

High Elevation: 98.37 ft

Low Elevation: 95.19 ft

Average Slope: 0.0060 ft/ft

Roughness, Kb: 0.0413 (A)

10-Year Runoff Coefficient: 0.656

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	2	2	3	3	4
C	0.656	0.656	0.656	0.722	0.787	0.820
Tc (min)	9.4	8.3	7.8	7.1	6.8	6.4
i (in/hr)	2.9	4.0	4.8	6.1	7.0	8.0

Computed by: PAMO, DEA INC.
Friday, August 27, 2004 11:21:44 a

File: N:\S\STPP0000-0011\Engineering\Hy\Ra\STTP0011-1HyRaX.rat

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APPENDIX D
(Retention Basin Calculations and Data Sheets)

STPP0000-0011
DONATELA II
DRYWELL CALCULATIONS

Required Drain Time 36 hours

Maximum Dissipation Rate 0.50 cfs

0.50 cfs x 36 hours = 64800 cfs

Drywells required = (v - a x (p / 2) x 36) * 43560 / 64800

Where : a is the average area in acres
d is the depth of retention in feet
p is the percolation rate in cfh/sf
v is the basin volume in acre-feet

Retention Basin	Required Volume (ac-ft)	Top Area (ac)	Bottom Area (ac)	Ponding Depth (ft)	Percolation Rate (cfh/sf)	Drywells Required	Drain Time (hr)
1*	0.02	0.30	0.16	0.09	0.000	N/A	N/A
2.1	1.16	0.46	0.32	3.00	0.000	1	28.1
2.2	1.24	0.57	0.26	3.00	0.000	1	30.0
2.3	0.96	0.39	0.25	3.00	0.000	1	23.2
3.1	1.05	0.42	0.29	3.00	0.000	1	25.4
3.2	2.67	1.50	0.94	2.33	0.000	2	32.3
4	0.63	0.26	0.16	3.00	0.000	1	15.2
5**	2.77	2.23	0.34	7.77	0.000	2	33.5
6	0.12	0.10	0.02	2.41	0.000	1	2.9
Total						10	

*Temporary basins and basins with a depth of 1' or less do not require drywells.
**Design number of drywells based on required 100yr-2hr volume. Does not include compensatory volume from ZONE AH.

RETENTION CALCULATIONS
V=C*D*A D=0.22'
DESIGN STORM: 100-year, 2-hour

Retention Basin 1
Contributing Drainage Areas: BASIN 1

Type	Area(Ac) A	'C' Coefficient C	Depth (ft) D	Retention Required (ac-ft)	Retention Required (ft^3)
Residential	0.00	0.72	0.22	0.00	0
Adjacent Infrastructure ROW	0.00	0.82	0.22	0.00	0
Landscaped	0.33	0.31	0.22	0.02	871
Total	0.33		Required	0.02	871

Elevation	Area (ft^2)	Avg. Area (ft^2)	Depth (ft)	Volume (ft^3)	Σ Volume (ft^3)
996	7,114				
		10,072	1.0	10,072	10,072
997	13,030				10,072

		Provided	0.23 ac-ft
Basin HWE=	996.09	Required	0.02 ac-ft
		Balance	0.21 ac-ft

Retention Basin 2.1
Contributing Drainage Areas: 2A, 2B, 2C, 2D, 2E, 2M, BASIN 2.1

Type	Area(Ac) A	'C' Coefficient C	Depth (ft) D	Retention Required (ac-ft)	Retention Required (ft^3)
Residential	6.08	0.72	0.22	0.95	41,382
Adjacent Infrastructure ROW	1.54	0.82	0.22	0.27	11,761
Landscaped	0.63	0.31	0.22	0.04	1,742
Total	8.25		Required	1.26	54,885

Elevation	Area (ft^2)	Avg. Area (ft^2)	Depth (ft)	Volume (ft^3)	Σ Volume (ft^3)
990.5	13,834				
		14,298	0.5	7,149	7,149
991	14,761				
		15,744	1.0	15,744	22,893
992	16,728				
		17,947	*1.0*	*17,947*	*40,840*
993	19,167				
		19,665	0.5	9,833	50,673
993.5	20,164				50,673

		Provided	**1.16 ac-ft**
Basin HWE=	993.50	**Required**	**1.26 ac-ft**
		Balance	**-0.10 ac-ft**
		Excess to Basin 2.2	

Retention Basin 2.2
Contributing Drainage Areas: 2F, 2G, 2H, BASIN 2.2

Type	Area(Ac) A	'C' Coefficient C	Depth (ft) D	Retention Required (ac-ft)	Retention Required (ft^3)
Residential	2.37	0.72	0.22	0.37	16,117
Adjacent Infrastructure ROW	1.69	0.82	0.22	0.30	13,068
Landscaped	1.14	0.31	0.22	0.08	3,485
Total	5.20		Required	0.75	32,670

Elevation	Area (ft^2)	Avg. Area (ft^2)	Depth (ft)	Volume (ft^3)	Σ Volume (ft^3)
985	11,305				
		13,690	1.0	13,690	13,690
986	16,075				
		18,077	1.0	18,077	31,767
987	20,079				
		22,381	1.0	22,381	54,148
988	24,684				54,148

		Provided	**1.24 ac-ft**
		Excess from Basins 2.1 and 4	**1.37 ac-ft**
Basin HWE=	988.00	**Required**	**2.12 ac-ft**
		Balance	**-0.88 ac-ft**
		Excess to Basin 2.3	

RETENTION CALCULATIONS
V=C*D*A D=0.22'
DESIGN STORM: 100-year, 2-hour

Retention Basin 4
Contributing Drainage Areas: 4A, 4B, 4C, 4D, 4E, BASIN 4

Type	Area(Ac) A	'C' Coefficient C	Depth (ft) D	Retention Required (ac-ft)	Retention Required (ft^3)
Residential	11.87	0.72	0.22	1.85	80,586
Adjacent Infrastructure ROW	0.00	0.82	0.22	0.00	0
Landscaped	0.72	0.31	0.22	0.05	2,178
Total	12.59		Required	1.90	82,764

Elevation	Area (ft^2)	Avg. Area (ft^2)	Depth (ft)	Volume (ft^3)	Σ Volume (ft^3)
992	6,921				
		7,618	1.0	7,618	7,618
993	8,315				
		9,075	1.0	9,075	16,693
994	9,836				
		10,660	1.0	10,660	27,353
995	11,484				27,353

		Provided	0.63 ac-ft
Basin HWE=	995.00	Required	1.90 ac-ft
		Balance	-1.27 ac-ft
		Excess to Basin 2.2	

Retention Basin 5
Contributing Drainage Areas: 5A, 5B, 5C, 5D, 5E, 5F, 5G, 5H, BASIN 5

Type	Area(Ac) A	'C' Coefficient C	Depth (ft) D	Retention Required (ac-ft)	Retention Required (ft^3)
Residential	15.55	0.72	0.22	2.43	105,851
Adjacent Infrastructure ROW	0.00	0.82	0.22	0.00	0
Landscaped	5.11	0.31	0.22	0.34	14,810
Compensatory Volume				5.63	
Total	20.66		Required	8.40	120,661

Elevation	Area (ft^2)	Avg. Area (ft^2)	Depth (ft)	Volume (ft^3)	Σ Volume (ft^3)
976	14,892				
		17,487	1.0	17,487	17,487
977	20,082				
		22,721	1.0	22,721	40,208
978	25,360				
		29,831	1.0	29,831	70,039
979	34,303				
		38,873	1.0	38,873	108,912
980	43,443				
		50,082	1.0	50,082	158,994
981	56,722				
		62,932	1.0	62,932	221,926
982	69,141				
		75,169	1.0	75,169	297,095
983	81,196				
		89,217	1.0	89,217	386,312
984	97,238				386,312

		Provided	8.87 ac-ft
Basin HWE=	983.77	Required	8.40 ac-ft
		Balance	0.47 ac-ft

Retention Basin 6
Contributing Drainage Areas: 6A, BASIN 6

Type	Area(Ac) A	'C' Coefficient C	Depth (ft) D	Retention Required (ac-ft)	Retention Required (ft^3)
Residential	0.00	0.72	0.22	0.00	0
Adjacent Infrastructure ROW	0.61	0.82	0.22	0.11	4,792
Landscaped	0.15	0.31	0.22	0.01	436
Total	0.76		Required	0.12	5,227

Elevation	Area (ft^2)	Avg. Area (ft^2)	Depth (ft)	Volume (ft^3)	Σ Volume (ft^3)
992	1,001				
		1,413	1.0	1,413	1,413
993	1,825				
		2,356	1.0	2,356	3,769
994	2,888				
		3,534	1.0	3,534	7,303
995	4,180				7,303

		Provided	0.17 ac-ft
Basin HWE=	994.41	Required	0.12 ac-ft
		Balance	0.05 ac-ft

APPENDIX E

(Hydraulic Calculations-Storm Drain and Street Capacities)

Calculated Flows			Allowable Street Flow					
Conc. Point	Q10 (cfs)	Q100 (cfs)	Curb Type	Street Slope	Max $Q10_{YR}$	Max $Q100_{YR}$	Check 10_{YR}	Check 100_{YR}
2A	1.0	1.0	6" Vertical 119th (1/2)	0.66%	18.58	52.78	Pass	Pass
2B	4.0	8.0	4" Roll Curb-Local	0.50%	11.74	22.55	Pass	Pass
2C	10.0	21.0	4" Roll Curb-Local	0.50%	11.74	22.55	Pass	Pass
2D	6.0	12.0	4" Roll Curb-Local	0.50%	11.74	22.55	Pass	Pass
2D*	15.0	32.0	N/A	SUMP	SUMP	SUMP	Pass	Pass
2E	3.0	5.0	6" Vertical 119th (1/2)	0.30%	12.52	30.77	Pass	Pass
2E*	4.0	8.0	N/A	SUMP	SUMP	SUMP	Pass	Pass
2F	4.0	9.0	6" Vertical 119th Full	0.50%	32.33	79.67	Pass	Pass
2G	6.0	12.0	4" Roll Curb-Local	***0.50%***	***5.87***	***11.28***	Storm Drian	Storm Drain
2H	1.0	2.0	6" Vertical 119th (1/2)	0.68%	18.85	54.26	Pass	Pass
2H*	7.0	14.0	N/A	SUMP	SUMP	SUMP	Pass	Pass
2I	1.0	2.0	6" Vertical 119th (1/2)	0.33%	13.13	37.80	Pass	Pass
2J	8.0	18.0	6" Vertical Local	0.79%	44.25	56.23	Pass	Pass
2K	11.0	23.0	6" Vertical Local	***0.77%***	***21.85***	***27.76***	Pass	Pass
2L	3.0	6.0	4" Roll Curb-Local	0.78%	14.66	34.47	Pass	Pass
2L*	13.0	28.0	N/A	SUMP	SUMP	SUMP	Pass	Pass
2M	1.0	3.0	6" Vertical 119th (1/2)	0.36%	13.72	38.98	Pass	Pass
3A	11.0	22.0	4" Roll Curb-Local	1.08%	17.26	33.15	Pass	Pass
3B	18.0	39.0	6" Vertical Local	0.50%	35.21	44.73	Pass	Pass
3C	2.0	4.0	4" Roll Curb-Local	***0.78%***	***7.33***	***14.09***	Pass	Pass
3D	3.0	6.0	4" Roll Curb-Local	0.77%	14.57	34.47	Pass	Pass
3D*	5.0	10.0	N/A	SUMP	SUMP	SUMP	Pass	Pass
3E	12.0	24.0	4" Roll Curb-Local	1.55%	20.67	39.71	Pass	Pass
3F	8.0	16.0	4" Roll Curb-Local	0.58%	12.54	24.08	Pass	Pass
3G	10.0	22.0	4" Roll Curb-Local	1.64%	21.26	40.85	Pass	Pass
3G*	28.0	60.0	N/A	SUMP	SUMP	SUMP	Pass	Pass
4A	10.0	20.0	4" Roll Curb-Local	0.50%	11.74	22.55	Pass	Pass
4B	7.0	14.0	4" Roll Curb-Local	0.50%	11.74	22.55	Pass	Pass
4B*	16.0	34.0	N/A	SUMP	SUMP	SUMP	Pass	Pass
4D	7.0	14.0	4" Roll Curb-Local	0.50%	11.74	22.55	Pass	Pass
4C*	25.0	53.0	6" Vertical Local	0.50%	35.21	44.73	Pass	See Note

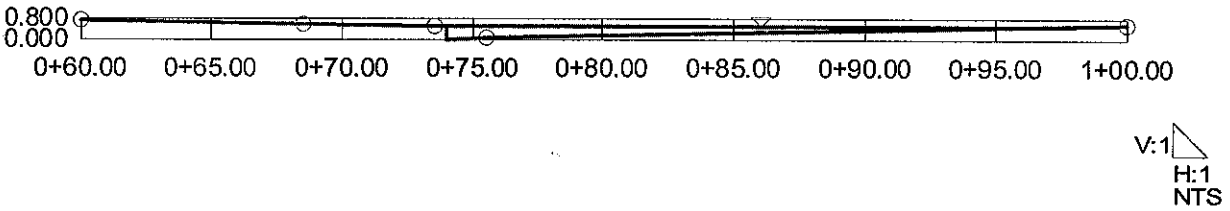
Calculated Flows			Allowable Street Flow					
Conc. Point	Q10 (cfs)	Q100 (cfs)	Curb Type	Street Slope	Max $Q10_{YR}$	Max $Q100_{YR}$	Check 10_{YR}	Check 100_{YR}
4E*	29.0	61.0	N/A	SUMP	SUMP	SUMP	Pass	Pass
5B	6.0	13.0	4" Roll Curb-Local	0.50%	11.74	22.55	Pass	Pass
5C	12.0	25.0	4" Roll Curb-Local	1.24%	18.49	35.52	Pass	Pass
5D	9.0	19.0	4" Roll Curb-Local	0.50%	11.74	22.55	Pass	Pass
5D*	21.0	44.0	6" Vertical Local	0.50%	35.21	44.73	Pass	Storm Drain
5E	22.0	47.0	6" Vertical Local	0.50%	35.21	44.73	Pass	Storm Drain
5F	7.0	15.0	4" Roll Curb-Local	1.59%	20.94	40.22	Pass	Pass
5F*	28.0	59.0	N/A	SUMP	SUMP	SUMP	Pass	Storm Drain
5H	29.0	61.0	6" Vertical Local	0.50%	35.21	44.73	Pass	Storm Drain
5G	10.0	20.0	4" Roll Curb-Local	1.77%	22.09	42.43	Pass	Pass
5G*	36.0	77.0	N/A	SUMP	SUMP	SUMP	Pass	Pass
6A	2.0	4.0	6" Vertical 119th (1/2)	0.55%	16.96	41.66	Pass	Pass

Notes: 1. Combined Flow at 4C* will side weir over curb into basin 4 open space during the 100-year event.
2. Italic and Bold slopes and maximum flows indicate the flow is half the full street flow.

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	X/S 119th Avenue (1/2 street)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.015	
Channel Slope	0.001000	ft/ft
Water Surface Elevation	0.500	ft
Elevation Range	0.00 to 0.70	
Discharge	7.23	cfs



Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	X/S 119th Avenue (1/2 street)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.001000	ft/ft
Water Surface Elevation	0.500	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.015	
Elevation Range	0.00 to 0.70	
Discharge	7.23	cfs
Flow Area	5.9	ft²
Wetted Perimeter	25.045	ft
Top Width	24.540	ft
Actual Depth	0.50	ft
Critical Elevation	0.36	ft
Critical Slope	0.005728	ft/ft
Velocity	1.22	ft/s
Velocity Head	0.02	ft
Specific Energy	0.523	ft
Froude Number	0.44	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+60.00	0+68.50	0.030
0+68.50	0+73.50	0.015
0+73.50	0+75.50	0.013
0+75.50	1+00.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+60.00	0.703
0+68.50	0.575
0+73.50	0.500
0+74.00	0.500
0+74.00	0.000
0+75.50	0.040
1+00.00	0.540

Table
Rating Table for Irregular Channel

Project Description	
Worksheet	X/S 119th Avenue (1/2 street)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

10 - YR

Input Data	
Water Surface Elevation	0.500 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Channel Slope (ft/ft)	0.003300	0.010000	0.000100

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.003300	13.13	2.22	5.9	25.045	24.540
0.003400	13.33	2.26	5.9	25.045	24.540
0.003500	13.53	2.29	5.9	25.045	24.540
0.003600	13.72	2.32	5.9	25.045	24.540
0.003700	13.91	2.36	5.9	25.045	24.540
0.003800	14.09	2.39	5.9	25.045	24.540
0.003900	14.28	2.42	5.9	25.045	24.540
0.004000	14.46	2.45	5.9	25.045	24.540
0.004100	14.64	2.48	5.9	25.045	24.540
0.004200	14.82	2.51	5.9	25.045	24.540
0.004300	14.99	2.54	5.9	25.045	24.540
0.004400	15.17	2.57	5.9	25.045	24.540
0.004500	15.34	2.60	5.9	25.045	24.540
0.004600	15.51	2.63	5.9	25.045	24.540
0.004700	15.67	2.65	5.9	25.045	24.540
0.004800	15.84	2.68	5.9	25.045	24.540
0.004900	16.00	2.71	5.9	25.045	24.540
0.005000	16.17	2.74	5.9	25.045	24.540
0.005100	16.33	2.77	5.9	25.045	24.540
0.005200	16.49	2.79	5.9	25.045	24.540
0.005300	16.65	2.82	5.9	25.045	24.540
0.005400	16.80	2.85	5.9	25.045	24.540
0.005500	16.96	2.87	5.9	25.045	24.540
0.005600	17.11	2.90	5.9	25.045	24.540
0.005700	17.26	2.92	5.9	25.045	24.540
0.005800	17.41	2.95	5.9	25.045	24.540
0.005900	17.56	2.97	5.9	25.045	24.540
0.006000	17.71	3.00	5.9	25.045	24.540
0.006100	17.86	3.02	5.9	25.045	24.540
0.006200	18.00	3.05	5.9	25.045	24.540
0.006300	18.15	3.07	5.9	25.045	24.540
0.006400	18.29	3.10	5.9	25.045	24.540
0.006500	18.43	3.12	5.9	25.045	24.540
0.006600	18.58	3.15	5.9	25.045	24.540

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.006700	18.72	3.17	5.9	25.045	24.540
0.006800	18.85	3.19	5.9	25.045	24.540
0.006900	18.99	3.22	5.9	25.045	24.540
0.007000	19.13	3.24	5.9	25.045	24.540
0.007100	19.27	3.26	5.9	25.045	24.540
0.007200	19.40	3.29	5.9	25.045	24.540
0.007300	19.54	3.31	5.9	25.045	24.540
0.007400	19.67	3.33	5.9	25.045	24.540
0.007500	19.80	3.35	5.9	25.045	24.540
0.007600	19.93	3.38	5.9	25.045	24.540
0.007700	20.06	3.40	5.9	25.045	24.540
0.007800	20.19	3.42	5.9	25.045	24.540
0.007900	20.32	3.44	5.9	25.045	24.540
0.008000	20.45	3.46	5.9	25.045	24.540
0.008100	20.58	3.49	5.9	25.045	24.540
0.008200	20.70	3.51	5.9	25.045	24.540
0.008300	20.83	3.53	5.9	25.045	24.540
0.008400	20.96	3.55	5.9	25.045	24.540
0.008500	21.08	3.57	5.9	25.045	24.540
0.008600	21.20	3.59	5.9	25.045	24.540
0.008700	21.33	3.61	5.9	25.045	24.540
0.008800	21.45	3.63	5.9	25.045	24.540
0.008900	21.57	3.65	5.9	25.045	24.540
0.009000	21.69	3.67	5.9	25.045	24.540
0.009100	21.81	3.69	5.9	25.045	24.540
0.009200	21.93	3.71	5.9	25.045	24.540
0.009300	22.05	3.73	5.9	25.045	24.540
0.009400	22.17	3.75	5.9	25.045	24.540
0.009500	22.29	3.77	5.9	25.045	24.540
0.009600	22.40	3.79	5.9	25.045	24.540
0.009700	22.52	3.81	5.9	25.045	24.540
0.009800	22.63	3.83	5.9	25.045	24.540
0.009900	22.75	3.85	5.9	25.045	24.540
0.010000	22.86	3.87	5.9	25.045	24.540

Table
Rating Table for Irregular Channel

Project Description	
Worksheet	X/S 119th Avenue (1/2 street) 100 - YR
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Water Surface Elevation	0.667 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Channel Slope (ft/ft)	0.003300	0.010000	0.000100

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.003300	32.27	2.88	11.2	38.267	37.633
0.003400	32.75	2.92	11.2	38.267	37.633
0.003500	33.23	2.96	11.2	38.267	37.633
0.003600	33.70	3.00	11.2	38.267	37.633
0.003700	34.17	3.05	11.2	38.267	37.633
0.003800	34.63	3.09	11.2	38.267	37.633
0.003900	35.08	3.13	11.2	38.267	37.633
0.004000	35.53	3.17	11.2	38.267	37.633
0.004100	35.97	3.21	11.2	38.267	37.633
0.004200	36.40	3.24	11.2	38.267	37.633
0.004300	36.83	3.28	11.2	38.267	37.633
0.004400	37.26	3.32	11.2	38.267	37.633
0.004500	37.68	3.36	11.2	38.267	37.633
0.004600	38.10	3.40	11.2	38.267	37.633
0.004700	38.51	3.43	11.2	38.267	37.633
0.004800	38.92	3.47	11.2	38.267	37.633
0.004900	39.32	3.50	11.2	38.267	37.633
0.005000	39.72	3.54	11.2	38.267	37.633
0.005100	40.12	3.58	11.2	38.267	37.633
0.005200	40.51	3.61	11.2	38.267	37.633
0.005300	40.89	3.64	11.2	38.267	37.633
0.005400	41.28	3.68	11.2	38.267	37.633
0.005500	41.66	3.71	11.2	38.267	37.633
0.005600	42.04	3.75	11.2	38.267	37.633
0.005700	42.41	3.78	11.2	38.267	37.633
0.005800	42.78	3.81	11.2	38.267	37.633
0.005900	43.15	3.85	11.2	38.267	37.633
0.006000	43.51	3.88	11.2	38.267	37.633
0.006100	43.87	3.91	11.2	38.267	37.633
0.006200	44.23	3.94	11.2	38.267	37.633
0.006300	44.59	3.97	11.2	38.267	37.633
0.006400	44.94	4.01	11.2	38.267	37.633
0.006500	45.29	4.04	11.2	38.267	37.633
0.006600	45.64	4.07	11.2	38.267	37.633

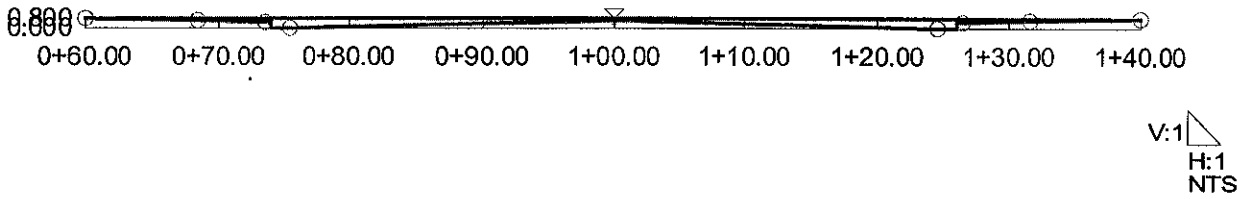
Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.006700	45.98	4.10	11.2	38.267	37.633
0.006800	46.32	4.13	11.2	38.267	37.633
0.006900	46.66	4.16	11.2	38.267	37.633
0.007000	47.00	4.19	11.2	38.267	37.633
0.007100	47.33	4.22	11.2	38.267	37.633
0.007200	47.66	4.25	11.2	38.267	37.633
0.007300	47.99	4.28	11.2	38.267	37.633
0.007400	48.32	4.31	11.2	38.267	37.633
0.007500	48.65	4.34	11.2	38.267	37.633
0.007600	48.97	4.36	11.2	38.267	37.633
0.007700	49.29	4.39	11.2	38.267	37.633
0.007800	49.61	4.42	11.2	38.267	37.633
0.007900	49.93	4.45	11.2	38.267	37.633
0.008000	50.24	4.48	11.2	38.267	37.633
0.008100	50.56	4.51	11.2	38.267	37.633
0.008200	50.87	4.53	11.2	38.267	37.633
0.008300	51.18	4.56	11.2	38.267	37.633
0.008400	51.48	4.59	11.2	38.267	37.633
0.008500	51.79	4.62	11.2	38.267	37.633
0.008600	52.09	4.64	11.2	38.267	37.633
0.008700	52.39	4.67	11.2	38.267	37.633
0.008800	52.69	4.70	11.2	38.267	37.633
0.008900	52.99	4.72	11.2	38.267	37.633
0.009000	53.29	4.75	11.2	38.267	37.633
0.009100	53.59	4.78	11.2	38.267	37.633
0.009200	53.88	4.80	11.2	38.267	37.633
0.009300	54.17	4.83	11.2	38.267	37.633
0.009400	54.46	4.85	11.2	38.267	37.633
0.009500	54.75	4.88	11.2	38.267	37.633
0.009600	55.04	4.91	11.2	38.267	37.633
0.009700	55.32	4.93	11.2	38.267	37.633
0.009800	55.61	4.96	11.2	38.267	37.633
0.009900	55.89	4.98	11.2	38.267	37.633
0.010000	56.17	5.01	11.2	38.267	37.633

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	X/S 119th Avenue (full street)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.013
Channel Slope	0.001000 ft/ft
Water Surface Elevation	0.667 ft
Elevation Range	0.00 to 0.70
Discharge	35.63 cfs



Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	X/S 119th Avenue (full street)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.001000	ft/ft
Water Surface Elevation	0.667	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.013	
Elevation Range	0.00 to 0.70	
Discharge	35.63	cfs
Flow Area	22.4	ft²
Wetted Perimeter	76.280	ft
Top Width	75.267	ft
Actual Depth	0.67	ft
Critical Elevation	0.52	ft
Critical Slope	0.004124	ft/ft
Velocity	1.59	ft/s
Velocity Head	0.04	ft
Specific Energy	0.706	ft
Froude Number	0.51	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+60.00	0+68.50	0.030
0+68.50	0+73.50	0.015
0+73.50	0+75.50	0.013
0+75.50	1+24.50	0.015
1+24.50	1+26.50	0.013
1+26.50	1+31.50	0.015
1+31.50	1+40.00	0.030

Natural Channel Points

Station (ft)	Elevation (ft)
0+60.00	0.703
0+68.50	0.575
0+73.50	0.500
0+74.00	0.500
0+74.00	0.000
0+75.50	0.040
1+00.00	0.540

Worksheet
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
1+24.50	0.040
1+26.00	0.000
1+26.00	0.500
1+26.50	0.500
1+31.50	0.575
1+40.00	0.703

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.007400	39.34	3.33	11.8	50.090	49.080
0.007500	39.60	3.35	11.8	50.090	49.080
0.007600	39.87	3.38	11.8	50.090	49.080
0.007700	40.13	3.40	11.8	50.090	49.080
0.007800	40.39	3.42	11.8	50.090	49.080
0.007900	40.64	3.44	11.8	50.090	49.080
0.008000	40.90	3.46	11.8	50.090	49.080
0.008100	41.16	3.49	11.8	50.090	49.080
0.008200	41.41	3.51	11.8	50.090	49.080
0.008300	41.66	3.53	11.8	50.090	49.080
0.008400	41.91	3.55	11.8	50.090	49.080
0.008500	42.16	3.57	11.8	50.090	49.080
0.008600	42.41	3.59	11.8	50.090	49.080
0.008700	42.65	3.61	11.8	50.090	49.080
0.008800	42.90	3.63	11.8	50.090	49.080
0.008900	43.14	3.65	11.8	50.090	49.080
0.009000	43.38	3.67	11.8	50.090	49.080
0.009100	43.62	3.69	11.8	50.090	49.080
0.009200	43.86	3.71	11.8	50.090	49.080
0.009300	44.10	3.73	11.8	50.090	49.080
0.009400	44.34	3.75	11.8	50.090	49.080
0.009500	44.57	3.77	11.8	50.090	49.080
0.009600	44.80	3.79	11.8	50.090	49.080
0.009700	45.04	3.81	11.8	50.090	49.080
0.009800	45.27	3.83	11.8	50.090	49.080
0.009900	45.50	3.85	11.8	50.090	49.080
0.010000	45.73	3.87	11.8	50.090	49.080

Table
Rating Table for Irregular Channel

Project Description	
Worksheet	X/S 119th Avenue (full street)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

100 - YR

Input Data	
Water Surface Elevation	0.667 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Channel Slope (ft/ft)	0.003000	0.010000	0.000100

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.003000	61.71	2.75	22.4	76.280	75.267
0.003100	62.73	2.80	22.4	76.280	75.267
0.003200	63.74	2.84	22.4	76.280	75.267
0.003300	64.73	2.88	22.4	76.280	75.267
0.003400	65.70	2.93	22.4	76.280	75.267
0.003500	66.66	2.97	22.4	76.280	75.267
0.003600	67.60	3.01	22.4	76.280	75.267
0.003700	68.54	3.05	22.4	76.280	75.267
0.003800	69.46	3.10	22.4	76.280	75.267
0.003900	70.36	3.14	22.4	76.280	75.267
0.004000	71.26	3.18	22.4	76.280	75.267
0.004100	72.15	3.22	22.4	76.280	75.267
0.004200	73.02	3.25	22.4	76.280	75.267
0.004300	73.89	3.29	22.4	76.280	75.267
0.004400	74.74	3.33	22.4	76.280	75.267
0.004500	75.58	3.37	22.4	76.280	75.267
0.004600	76.42	3.41	22.4	76.280	75.267
0.004700	77.25	3.44	22.4	76.280	75.267
0.004800	78.06	3.48	22.4	76.280	75.267
0.004900	78.87	3.51	22.4	76.280	75.267
0.005000	79.67	3.55	22.4	76.280	75.267
0.005100	80.47	3.59	22.4	76.280	75.267
0.005200	81.25	3.62	22.4	76.280	75.267
0.005300	82.03	3.66	22.4	76.280	75.267
0.005400	82.80	3.69	22.4	76.280	75.267
0.005500	83.56	3.72	22.4	76.280	75.267
0.005600	84.32	3.76	22.4	76.280	75.267
0.005700	85.07	3.79	22.4	76.280	75.267
0.005800	85.81	3.82	22.4	76.280	75.267
0.005900	86.55	3.86	22.4	76.280	75.267
0.006000	87.28	3.89	22.4	76.280	75.267
0.006100	88.00	3.92	22.4	76.280	75.267
0.006200	88.72	3.95	22.4	76.280	75.267
0.006300	89.43	3.99	22.4	76.280	75.267

Worksheet
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
1+17.50	0.000
1+18.00	0.330
1+23.00	0.405
1+25.00	0.435

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.005900	12.75	2.41	5.3	33.205	33.000
0.006000	12.86	2.43	5.3	33.205	33.000
0.006100	12.97	2.45	5.3	33.205	33.000
0.006200	13.07	2.47	5.3	33.205	33.000
0.006300	13.18	2.49	5.3	33.205	33.000
0.006400	13.28	2.51	5.3	33.205	33.000
0.006500	13.39	2.53	5.3	33.205	33.000
0.006600	13.49	2.55	5.3	33.205	33.000
0.006700	13.59	2.56	5.3	33.205	33.000
0.006800	13.69	2.58	5.3	33.205	33.000
0.006900	13.79	2.60	5.3	33.205	33.000
0.007000	13.89	2.62	5.3	33.205	33.000
0.007100	13.99	2.64	5.3	33.205	33.000
0.007200	14.09	2.66	5.3	33.205	33.000
0.007300	14.19	2.68	5.3	33.205	33.000
0.007400	14.28	2.69	5.3	33.205	33.000
0.007500	14.38	2.71	5.3	33.205	33.000
0.007600	14.47	2.73	5.3	33.205	33.000
0.007700	14.57	2.75	5.3	33.205	33.000
0.007800	14.66	2.77	5.3	33.205	33.000
0.007900	14.76	2.78	5.3	33.205	33.000
0.008000	14.85	2.80	5.3	33.205	33.000
0.008100	14.94	2.82	5.3	33.205	33.000
0.008200	15.04	2.84	5.3	33.205	33.000
0.008300	15.13	2.85	5.3	33.205	33.000
0.008400	15.22	2.87	5.3	33.205	33.000
0.008500	15.31	2.89	5.3	33.205	33.000
0.008600	15.40	2.91	5.3	33.205	33.000
0.008700	15.49	2.92	5.3	33.205	33.000
0.008800	15.58	2.94	5.3	33.205	33.000
0.008900	15.66	2.96	5.3	33.205	33.000
0.009000	15.75	2.97	5.3	33.205	33.000
0.009100	15.84	2.99	5.3	33.205	33.000
0.009200	15.93	3.00	5.3	33.205	33.000
0.009300	16.01	3.02	5.3	33.205	33.000
0.009400	16.10	3.04	5.3	33.205	33.000
0.009500	16.18	3.05	5.3	33.205	33.000
0.009600	16.27	3.07	5.3	33.205	33.000
0.009700	16.35	3.09	5.3	33.205	33.000
0.009800	16.44	3.10	5.3	33.205	33.000
0.009900	16.52	3.12	5.3	33.205	33.000
0.010000	16.60	3.13	5.3	33.205	33.000
0.010100	16.69	3.15	5.3	33.205	33.000
0.010200	16.77	3.16	5.3	33.205	33.000
0.010300	16.85	3.18	5.3	33.205	33.000
0.010400	16.93	3.19	5.3	33.205	33.000
0.010500	17.01	3.21	5.3	33.205	33.000
0.010600	17.09	3.23	5.3	33.205	33.000
0.010700	17.18	3.24	5.3	33.205	33.000
0.010800	17.26	3.26	5.3	33.205	33.000
0.010900	17.34	3.27	5.3	33.205	33.000
0.011000	17.41	3.29	5.3	33.205	33.000
0.011100	17.49	3.30	5.3	33.205	33.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.011200	17.57	3.32	5.3	33.205	33.000
0.011300	17.65	3.33	5.3	33.205	33.000
0.011400	17.73	3.34	5.3	33.205	33.000
0.011500	17.81	3.36	5.3	33.205	33.000
0.011600	17.88	3.37	5.3	33.205	33.000
0.011700	17.96	3.39	5.3	33.205	33.000
0.011800	18.04	3.40	5.3	33.205	33.000
0.011900	18.11	3.42	5.3	33.205	33.000
0.012000	18.19	3.43	5.3	33.205	33.000
0.012100	18.26	3.45	5.3	33.205	33.000
0.012200	18.34	3.46	5.3	33.205	33.000
0.012300	18.41	3.47	5.3	33.205	33.000
0.012400	18.49	3.49	5.3	33.205	33.000
0.012500	18.56	3.50	5.3	33.205	33.000
0.012600	18.64	3.52	5.3	33.205	33.000
0.012700	18.71	3.53	5.3	33.205	33.000
0.012800	18.79	3.54	5.3	33.205	33.000
0.012900	18.86	3.56	5.3	33.205	33.000
0.013000	18.93	3.57	5.3	33.205	33.000
0.013100	19.00	3.59	5.3	33.205	33.000
0.013200	19.08	3.60	5.3	33.205	33.000
0.013300	19.15	3.61	5.3	33.205	33.000
0.013400	19.22	3.63	5.3	33.205	33.000
0.013500	19.29	3.64	5.3	33.205	33.000
0.013600	19.36	3.65	5.3	33.205	33.000
0.013700	19.43	3.67	5.3	33.205	33.000
0.013800	19.51	3.68	5.3	33.205	33.000
0.013900	19.58	3.69	5.3	33.205	33.000
0.014000	19.65	3.71	5.3	33.205	33.000
0.014100	19.72	3.72	5.3	33.205	33.000
0.014200	19.79	3.73	5.3	33.205	33.000
0.014300	19.86	3.75	5.3	33.205	33.000
0.014400	19.92	3.76	5.3	33.205	33.000
0.014500	19.99	3.77	5.3	33.205	33.000
0.014600	20.06	3.79	5.3	33.205	33.000
0.014700	20.13	3.80	5.3	33.205	33.000
0.014800	20.20	3.81	5.3	33.205	33.000
0.014900	20.27	3.82	5.3	33.205	33.000
0.015000	20.34	3.84	5.3	33.205	33.000
0.015100	20.40	3.85	5.3	33.205	33.000
0.015200	20.47	3.86	5.3	33.205	33.000
0.015300	20.54	3.88	5.3	33.205	33.000
0.015400	20.60	3.89	5.3	33.205	33.000
0.015500	20.67	3.90	5.3	33.205	33.000
0.015600	20.74	3.91	5.3	33.205	33.000
0.015700	20.80	3.93	5.3	33.205	33.000
0.015800	20.87	3.94	5.3	33.205	33.000
0.015900	20.94	3.95	5.3	33.205	33.000
0.016000	21.00	3.96	5.3	33.205	33.000
0.016100	21.07	3.98	5.3	33.205	33.000
0.016200	21.13	3.99	5.3	33.205	33.000
0.016300	21.20	4.00	5.3	33.205	33.000
0.016400	21.26	4.01	5.3	33.205	33.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.016500	21.33	4.02	5.3	33.205	33.000
0.016600	21.39	4.04	5.3	33.205	33.000
0.016700	21.46	4.05	5.3	33.205	33.000
0.016800	21.52	4.06	5.3	33.205	33.000
0.016900	21.59	4.07	5.3	33.205	33.000
0.017000	21.65	4.08	5.3	33.205	33.000
0.017100	21.71	4.10	5.3	33.205	33.000
0.017200	21.78	4.11	5.3	33.205	33.000
0.017300	21.84	4.12	5.3	33.205	33.000
0.017400	21.90	4.13	5.3	33.205	33.000
0.017500	21.96	4.14	5.3	33.205	33.000
0.017600	22.03	4.16	5.3	33.205	33.000
0.017700	22.09	4.17	5.3	33.205	33.000
0.017800	22.15	4.18	5.3	33.205	33.000
0.017900	22.21	4.19	5.3	33.205	33.000
0.018000	22.28	4.20	5.3	33.205	33.000
0.018100	22.34	4.21	5.3	33.205	33.000
0.018200	22.40	4.23	5.3	33.205	33.000
0.018300	22.46	4.24	5.3	33.205	33.000
0.018400	22.52	4.25	5.3	33.205	33.000
0.018500	22.58	4.26	5.3	33.205	33.000
0.018600	22.64	4.27	5.3	33.205	33.000
0.018700	22.71	4.28	5.3	33.205	33.000
0.018800	22.77	4.30	5.3	33.205	33.000
0.018900	22.83	4.31	5.3	33.205	33.000
0.019000	22.89	4.32	5.3	33.205	33.000
0.019100	22.95	4.33	5.3	33.205	33.000
0.019200	23.01	4.34	5.3	33.205	33.000
0.019300	23.07	4.35	5.3	33.205	33.000
0.019400	23.13	4.36	5.3	33.205	33.000
0.019500	23.19	4.37	5.3	33.205	33.000
0.019600	23.25	4.39	5.3	33.205	33.000
0.019700	23.30	4.40	5.3	33.205	33.000
0.019800	23.36	4.41	5.3	33.205	33.000
0.019900	23.42	4.42	5.3	33.205	33.000
0.020000	23.48	4.43	5.3	33.205	33.000
0.020100	23.54	4.44	5.3	33.205	33.000
0.020200	23.60	4.45	5.3	33.205	33.000
0.020300	23.66	4.46	5.3	33.205	33.000
0.020400	23.72	4.47	5.3	33.205	33.000
0.020500	23.77	4.49	5.3	33.205	33.000
0.020600	23.83	4.50	5.3	33.205	33.000
0.020700	23.89	4.51	5.3	33.205	33.000
0.020800	23.95	4.52	5.3	33.205	33.000
0.020900	24.00	4.53	5.3	33.205	33.000
0.021000	24.06	4.54	5.3	33.205	33.000
0.021100	24.12	4.55	5.3	33.205	33.000
0.021200	24.18	4.56	5.3	33.205	33.000
0.021300	24.23	4.57	5.3	33.205	33.000
0.021400	24.29	4.58	5.3	33.205	33.000
0.021500	24.35	4.59	5.3	33.205	33.000
0.021600	24.40	4.60	5.3	33.205	33.000
0.021700	24.46	4.61	5.3	33.205	33.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.021800	24.52	4.63	5.3	33.205	33.000
0.021900	24.57	4.64	5.3	33.205	33.000
0.022000	24.63	4.65	5.3	33.205	33.000
0.022100	24.68	4.66	5.3	33.205	33.000
0.022200	24.74	4.67	5.3	33.205	33.000
0.022300	24.79	4.68	5.3	33.205	33.000
0.022400	24.85	4.69	5.3	33.205	33.000
0.022500	24.91	4.70	5.3	33.205	33.000
0.022600	24.96	4.71	5.3	33.205	33.000
0.022700	25.02	4.72	5.3	33.205	33.000
0.022800	25.07	4.73	5.3	33.205	33.000
0.022900	25.13	4.74	5.3	33.205	33.000
0.023000	25.18	4.75	5.3	33.205	33.000
0.023100	25.24	4.76	5.3	33.205	33.000
0.023200	25.29	4.77	5.3	33.205	33.000
0.023300	25.34	4.78	5.3	33.205	33.000
0.023400	25.40	4.79	5.3	33.205	33.000
0.023500	25.45	4.80	5.3	33.205	33.000
0.023600	25.51	4.81	5.3	33.205	33.000
0.023700	25.56	4.82	5.3	33.205	33.000
0.023800	25.62	4.83	5.3	33.205	33.000
0.023900	25.67	4.84	5.3	33.205	33.000
0.024000	25.72	4.85	5.3	33.205	33.000
0.024100	25.78	4.86	5.3	33.205	33.000
0.024200	25.83	4.87	5.3	33.205	33.000
0.024300	25.88	4.88	5.3	33.205	33.000
0.024400	25.94	4.89	5.3	33.205	33.000
0.024500	25.99	4.90	5.3	33.205	33.000
0.024600	26.04	4.91	5.3	33.205	33.000
0.024700	26.10	4.92	5.3	33.205	33.000
0.024800	26.15	4.93	5.3	33.205	33.000
0.024900	26.20	4.94	5.3	33.205	33.000
0.025000	26.25	4.95	5.3	33.205	33.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.005900	24.50	2.51	9.8	50.207	50.000
0.006000	24.71	2.53	9.8	50.207	50.000
0.006100	24.91	2.55	9.8	50.207	50.000
0.006200	25.11	2.57	9.8	50.207	50.000
0.006300	25.32	2.59	9.8	50.207	50.000
0.006400	25.52	2.61	9.8	50.207	50.000
0.006500	25.72	2.63	9.8	50.207	50.000
0.006600	25.91	2.65	9.8	50.207	50.000
0.006700	26.11	2.67	9.8	50.207	50.000
0.006800	26.30	2.69	9.8	50.207	50.000
0.006900	26.49	2.71	9.8	50.207	50.000
0.007000	26.69	2.73	9.8	50.207	50.000
0.007100	26.88	2.75	9.8	50.207	50.000
0.007200	27.06	2.77	9.8	50.207	50.000
0.007300	27.25	2.79	9.8	50.207	50.000
0.007400	27.44	2.81	9.8	50.207	50.000
0.007500	27.62	2.83	9.8	50.207	50.000
0.007600	27.81	2.85	9.8	50.207	50.000
0.007700	27.99	2.86	9.8	50.207	50.000
0.007800	28.17	2.88	9.8	50.207	50.000
0.007900	28.35	2.90	9.8	50.207	50.000
0.008000	28.53	2.92	9.8	50.207	50.000
0.008100	28.71	2.94	9.8	50.207	50.000
0.008200	28.88	2.96	9.8	50.207	50.000
0.008300	29.06	2.97	9.8	50.207	50.000
0.008400	29.23	2.99	9.8	50.207	50.000
0.008500	29.41	3.01	9.8	50.207	50.000
0.008600	29.58	3.03	9.8	50.207	50.000
0.008700	29.75	3.05	9.8	50.207	50.000
0.008800	29.92	3.06	9.8	50.207	50.000
0.008900	30.09	3.08	9.8	50.207	50.000
0.009000	30.26	3.10	9.8	50.207	50.000
0.009100	30.43	3.11	9.8	50.207	50.000
0.009200	30.59	3.13	9.8	50.207	50.000
0.009300	30.76	3.15	9.8	50.207	50.000
0.009400	30.92	3.17	9.8	50.207	50.000
0.009500	31.09	3.18	9.8	50.207	50.000
0.009600	31.25	3.20	9.8	50.207	50.000
0.009700	31.41	3.22	9.8	50.207	50.000
0.009800	31.58	3.23	9.8	50.207	50.000
0.009900	31.74	3.25	9.8	50.207	50.000
0.010000	31.90	3.26	9.8	50.207	50.000
0.010100	32.06	3.28	9.8	50.207	50.000
0.010200	32.21	3.30	9.8	50.207	50.000
0.010300	32.37	3.31	9.8	50.207	50.000
0.010400	32.53	3.33	9.8	50.207	50.000
0.010500	32.68	3.35	9.8	50.207	50.000
0.010600	32.84	3.36	9.8	50.207	50.000
0.010700	32.99	3.38	9.8	50.207	50.000
0.010800	33.15	3.39	9.8	50.207	50.000
0.010900	33.30	3.41	9.8	50.207	50.000
0.011000	33.45	3.42	9.8	50.207	50.000
0.011100	33.60	3.44	9.8	50.207	50.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.011200	33.76	3.46	9.8	50.207	50.000
0.011300	33.91	3.47	9.8	50.207	50.000
0.011400	34.06	3.49	9.8	50.207	50.000
0.011500	34.20	3.50	9.8	50.207	50.000
0.011600	34.35	3.52	9.8	50.207	50.000
0.011700	34.50	3.53	9.8	50.207	50.000
0.011800	34.65	3.55	9.8	50.207	50.000
0.011900	34.79	3.56	9.8	50.207	50.000
0.012000	34.94	3.58	9.8	50.207	50.000
0.012100	35.09	3.59	9.8	50.207	50.000
0.012200	35.23	3.61	9.8	50.207	50.000
0.012300	35.37	3.62	9.8	50.207	50.000
0.012400	35.52	3.64	9.8	50.207	50.000
0.012500	35.66	3.65	9.8	50.207	50.000
0.012600	35.80	3.66	9.8	50.207	50.000
0.012700	35.94	3.68	9.8	50.207	50.000
0.012800	36.09	3.69	9.8	50.207	50.000
0.012900	36.23	3.71	9.8	50.207	50.000
0.013000	36.37	3.72	9.8	50.207	50.000
0.013100	36.51	3.74	9.8	50.207	50.000
0.013200	36.65	3.75	9.8	50.207	50.000
0.013300	36.78	3.77	9.8	50.207	50.000
0.013400	36.92	3.78	9.8	50.207	50.000
0.013500	37.06	3.79	9.8	50.207	50.000
0.013600	37.20	3.81	9.8	50.207	50.000
0.013700	37.33	3.82	9.8	50.207	50.000
0.013800	37.47	3.84	9.8	50.207	50.000
0.013900	37.60	3.85	9.8	50.207	50.000
0.014000	37.74	3.86	9.8	50.207	50.000
0.014100	37.87	3.88	9.8	50.207	50.000
0.014200	38.01	3.89	9.8	50.207	50.000
0.014300	38.14	3.90	9.8	50.207	50.000
0.014400	38.28	3.92	9.8	50.207	50.000
0.014500	38.41	3.93	9.8	50.207	50.000
0.014600	38.54	3.94	9.8	50.207	50.000
0.014700	38.67	3.96	9.8	50.207	50.000
0.014800	38.80	3.97	9.8	50.207	50.000
0.014900	38.93	3.99	9.8	50.207	50.000
0.015000	39.06	4.00	9.8	50.207	50.000
0.015100	39.19	4.01	9.8	50.207	50.000
0.015200	39.32	4.02	9.8	50.207	50.000
0.015300	39.45	4.04	9.8	50.207	50.000
0.015400	39.58	4.05	9.8	50.207	50.000
0.015500	39.71	4.06	9.8	50.207	50.000
0.015600	39.84	4.08	9.8	50.207	50.000
0.015700	39.97	4.09	9.8	50.207	50.000
0.015800	40.09	4.10	9.8	50.207	50.000
0.015900	40.22	4.12	9.8	50.207	50.000
0.016000	40.35	4.13	9.8	50.207	50.000
0.016100	40.47	4.14	9.8	50.207	50.000
0.016200	40.60	4.16	9.8	50.207	50.000
0.016300	40.72	4.17	9.8	50.207	50.000
0.016400	40.85	4.18	9.8	50.207	50.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.016500	40.97	4.19	9.8	50.207	50.000
0.016600	41.10	4.21	9.8	50.207	50.000
0.016700	41.22	4.22	9.8	50.207	50.000
0.016800	41.34	4.23	9.8	50.207	50.000
0.016900	41.46	4.24	9.8	50.207	50.000
0.017000	41.59	4.26	9.8	50.207	50.000
0.017100	41.71	4.27	9.8	50.207	50.000
0.017200	41.83	4.28	9.8	50.207	50.000
0.017300	41.95	4.29	9.8	50.207	50.000
0.017400	42.07	4.31	9.8	50.207	50.000
0.017500	42.19	4.32	9.8	50.207	50.000
0.017600	42.31	4.33	9.8	50.207	50.000
0.017700	42.43	4.34	9.8	50.207	50.000
0.017800	42.55	4.36	9.8	50.207	50.000
0.017900	42.67	4.37	9.8	50.207	50.000
0.018000	42.79	4.38	9.8	50.207	50.000
0.018100	42.91	4.39	9.8	50.207	50.000
0.018200	43.03	4.40	9.8	50.207	50.000
0.018300	43.15	4.42	9.8	50.207	50.000
0.018400	43.27	4.43	9.8	50.207	50.000
0.018500	43.38	4.44	9.8	50.207	50.000
0.018600	43.50	4.45	9.8	50.207	50.000
0.018700	43.62	4.46	9.8	50.207	50.000
0.018800	43.73	4.48	9.8	50.207	50.000
0.018900	43.85	4.49	9.8	50.207	50.000
0.019000	43.97	4.50	9.8	50.207	50.000
0.019100	44.08	4.51	9.8	50.207	50.000
0.019200	44.20	4.52	9.8	50.207	50.000
0.019300	44.31	4.54	9.8	50.207	50.000
0.019400	44.43	4.55	9.8	50.207	50.000
0.019500	44.54	4.56	9.8	50.207	50.000
0.019600	44.65	4.57	9.8	50.207	50.000
0.019700	44.77	4.58	9.8	50.207	50.000
0.019800	44.88	4.59	9.8	50.207	50.000
0.019900	44.99	4.61	9.8	50.207	50.000
0.020000	45.11	4.62	9.8	50.207	50.000
0.020100	45.22	4.63	9.8	50.207	50.000
0.020200	45.33	4.64	9.8	50.207	50.000
0.020300	45.44	4.65	9.8	50.207	50.000
0.020400	45.56	4.66	9.8	50.207	50.000
0.020500	45.67	4.67	9.8	50.207	50.000
0.020600	45.78	4.69	9.8	50.207	50.000
0.020700	45.89	4.70	9.8	50.207	50.000
0.020800	46.00	4.71	9.8	50.207	50.000
0.020900	46.11	4.72	9.8	50.207	50.000
0.021000	46.22	4.73	9.8	50.207	50.000
0.021100	46.33	4.74	9.8	50.207	50.000
0.021200	46.44	4.75	9.8	50.207	50.000
0.021300	46.55	4.76	9.8	50.207	50.000
0.021400	46.66	4.78	9.8	50.207	50.000
0.021500	46.77	4.79	9.8	50.207	50.000
0.021600	46.88	4.80	9.8	50.207	50.000
0.021700	46.99	4.81	9.8	50.207	50.000

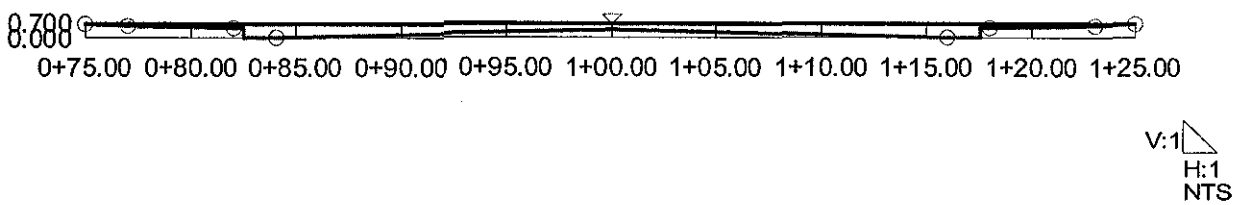
Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.021800	47.09	4.82	9.8	50.207	50.000
0.021900	47.20	4.83	9.8	50.207	50.000
0.022000	47.31	4.84	9.8	50.207	50.000
0.022100	47.42	4.85	9.8	50.207	50.000
0.022200	47.52	4.86	9.8	50.207	50.000
0.022300	47.63	4.88	9.8	50.207	50.000
0.022400	47.74	4.89	9.8	50.207	50.000
0.022500	47.84	4.90	9.8	50.207	50.000
0.022600	47.95	4.91	9.8	50.207	50.000
0.022700	48.06	4.92	9.8	50.207	50.000
0.022800	48.16	4.93	9.8	50.207	50.000
0.022900	48.27	4.94	9.8	50.207	50.000
0.023000	48.37	4.95	9.8	50.207	50.000
0.023100	48.48	4.96	9.8	50.207	50.000
0.023200	48.58	4.97	9.8	50.207	50.000
0.023300	48.69	4.98	9.8	50.207	50.000
0.023400	48.79	4.99	9.8	50.207	50.000
0.023500	48.90	5.00	9.8	50.207	50.000
0.023600	49.00	5.02	9.8	50.207	50.000
0.023700	49.10	5.03	9.8	50.207	50.000
0.023800	49.21	5.04	9.8	50.207	50.000
0.023900	49.31	5.05	9.8	50.207	50.000
0.024000	49.41	5.06	9.8	50.207	50.000
0.024100	49.52	5.07	9.8	50.207	50.000
0.024200	49.62	5.08	9.8	50.207	50.000
0.024300	49.72	5.09	9.8	50.207	50.000
0.024400	49.82	5.10	9.8	50.207	50.000
0.024500	49.93	5.11	9.8	50.207	50.000
0.024600	50.03	5.12	9.8	50.207	50.000
0.024700	50.13	5.13	9.8	50.207	50.000
0.024800	50.23	5.14	9.8	50.207	50.000
0.024900	50.33	5.15	9.8	50.207	50.000
0.025000	50.43	5.16	9.8	50.207	50.000

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	X/S Local (6" Vertical)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.017
Channel Slope	0.001000 ft/ft
Water Surface Elevation	0.605 ft
Elevation Range	0.00 to 0.61
Discharge	20.01 cfs



Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	X/S Local (6" Vertical)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	0.001000	ft/ft
Water Surface Elevation	0.605	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.017	
Elevation Range	0.00 to 0.61	
Discharge	20.01	cfs
Flow Area	15.6	ft²
Wetted Perimeter	51.009	ft
Top Width	50.000	ft
Actual Depth	0.61	ft
Critical Elevation	0.40	ft
Critical Slope	0.006876	ft/ft
Velocity	1.29	ft/s
Velocity Head	0.03	ft
Specific Energy	0.631	ft
Froude Number	0.41	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+75.00	0+77.00	0.015
0+77.00	0+82.00	0.030
0+82.00	0+84.00	0.013
0+84.00	1+16.00	0.015
1+16.00	1+18.00	0.013
1+18.00	1+23.00	0.030
1+23.00	1+25.00	0.015

Natural Channel Points

Station (ft)	Elevation (ft)
0+75.00	0.605
0+77.00	0.575
0+82.00	0.500
0+82.50	0.500
0+82.50	0.000
0+84.00	0.040
1+00.00	0.360

Worksheet
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
1+16.00	0.040
1+17.50	0.000
1+17.50	0.500
1+18.00	0.500
1+23.00	0.575
1+25.00	0.605

Table
Rating Table for Irregular Channel

Project Description	
Worksheet	X/S Local (6" Vertical)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

10-YR

Input Data	
Water Surface Elevation	0.500 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Channel Slope (ft/ft)	0.002500	0.025000	0.000100

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.002500	24.89	2.25	11.0	37.007	36.000
0.002600	25.39	2.30	11.0	37.007	36.000
0.002700	25.87	2.34	11.0	37.007	36.000
0.002800	26.35	2.39	11.0	37.007	36.000
0.002900	26.81	2.43	11.0	37.007	36.000
0.003000	27.27	2.47	11.0	37.007	36.000
0.003100	27.72	2.51	11.0	37.007	36.000
0.003200	28.16	2.55	11.0	37.007	36.000
0.003300	28.60	2.59	11.0	37.007	36.000
0.003400	29.03	2.63	11.0	37.007	36.000
0.003500	29.46	2.67	11.0	37.007	36.000
0.003600	29.87	2.71	11.0	37.007	36.000
0.003700	30.29	2.74	11.0	37.007	36.000
0.003800	30.69	2.78	11.0	37.007	36.000
0.003900	31.09	2.82	11.0	37.007	36.000
0.004000	31.49	2.85	11.0	37.007	36.000
0.004100	31.88	2.89	11.0	37.007	36.000
0.004200	32.27	2.92	11.0	37.007	36.000
0.004300	32.65	2.96	11.0	37.007	36.000
0.004400	33.03	2.99	11.0	37.007	36.000
0.004500	33.40	3.03	11.0	37.007	36.000
0.004600	33.77	3.06	11.0	37.007	36.000
0.004700	34.13	3.09	11.0	37.007	36.000
0.004800	34.49	3.12	11.0	37.007	36.000
0.004900	34.85	3.16	11.0	37.007	36.000
0.005000	35.21	3.19	11.0	37.007	36.000
0.005100	35.56	3.22	11.0	37.007	36.000
0.005200	35.90	3.25	11.0	37.007	36.000
0.005300	36.25	3.28	11.0	37.007	36.000
0.005400	36.59	3.31	11.0	37.007	36.000
0.005500	36.92	3.34	11.0	37.007	36.000
0.005600	37.26	3.37	11.0	37.007	36.000
0.005700	37.59	3.40	11.0	37.007	36.000
0.005800	37.92	3.43	11.0	37.007	36.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.005900	38.24	3.46	11.0	37.007	36.000
0.006000	38.57	3.49	11.0	37.007	36.000
0.006100	38.89	3.52	11.0	37.007	36.000
0.006200	39.20	3.55	11.0	37.007	36.000
0.006300	39.52	3.58	11.0	37.007	36.000
0.006400	39.83	3.61	11.0	37.007	36.000
0.006500	40.14	3.64	11.0	37.007	36.000
0.006600	40.45	3.66	11.0	37.007	36.000
0.006700	40.75	3.69	11.0	37.007	36.000
0.006800	41.06	3.72	11.0	37.007	36.000
0.006900	41.36	3.75	11.0	37.007	36.000
0.007000	41.66	3.77	11.0	37.007	36.000
0.007100	41.95	3.80	11.0	37.007	36.000
0.007200	42.25	3.83	11.0	37.007	36.000
0.007300	42.54	3.85	11.0	37.007	36.000
0.007400	42.83	3.88	11.0	37.007	36.000
0.007500	43.12	3.91	11.0	37.007	36.000
0.007600	43.41	3.93	11.0	37.007	36.000
0.007700	43.69	3.96	11.0	37.007	36.000
0.007800	43.97	3.98	11.0	37.007	36.000
0.007900	44.25	4.01	11.0	37.007	36.000
0.008000	44.53	4.03	11.0	37.007	36.000
0.008100	44.81	4.06	11.0	37.007	36.000
0.008200	45.09	4.08	11.0	37.007	36.000
0.008300	45.36	4.11	11.0	37.007	36.000
0.008400	45.63	4.13	11.0	37.007	36.000
0.008500	45.90	4.16	11.0	37.007	36.000
0.008600	46.17	4.18	11.0	37.007	36.000
0.008700	46.44	4.21	11.0	37.007	36.000
0.008800	46.71	4.23	11.0	37.007	36.000
0.008900	46.97	4.25	11.0	37.007	36.000
0.009000	47.23	4.28	11.0	37.007	36.000
0.009100	47.50	4.30	11.0	37.007	36.000
0.009200	47.76	4.33	11.0	37.007	36.000
0.009300	48.01	4.35	11.0	37.007	36.000
0.009400	48.27	4.37	11.0	37.007	36.000
0.009500	48.53	4.40	11.0	37.007	36.000
0.009600	48.78	4.42	11.0	37.007	36.000
0.009700	49.04	4.44	11.0	37.007	36.000
0.009800	49.29	4.46	11.0	37.007	36.000
0.009900	49.54	4.49	11.0	37.007	36.000
0.010000	49.79	4.51	11.0	37.007	36.000
0.010100	50.04	4.53	11.0	37.007	36.000
0.010200	50.28	4.55	11.0	37.007	36.000
0.010300	50.53	4.58	11.0	37.007	36.000
0.010400	50.78	4.60	11.0	37.007	36.000
0.010500	51.02	4.62	11.0	37.007	36.000
0.010600	51.26	4.64	11.0	37.007	36.000
0.010700	51.50	4.67	11.0	37.007	36.000
0.010800	51.74	4.69	11.0	37.007	36.000
0.010900	51.98	4.71	11.0	37.007	36.000
0.011000	52.22	4.73	11.0	37.007	36.000
0.011100	52.46	4.75	11.0	37.007	36.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.011200	52.69	4.77	11.0	37.007	36.000
0.011300	52.93	4.79	11.0	37.007	36.000
0.011400	53.16	4.82	11.0	37.007	36.000
0.011500	53.39	4.84	11.0	37.007	36.000
0.011600	53.62	4.86	11.0	37.007	36.000
0.011700	53.86	4.88	11.0	37.007	36.000
0.011800	54.08	4.90	11.0	37.007	36.000
0.011900	54.31	4.92	11.0	37.007	36.000
0.012000	54.54	4.94	11.0	37.007	36.000
0.012100	54.77	4.96	11.0	37.007	36.000
0.012200	54.99	4.98	11.0	37.007	36.000
0.012300	55.22	5.00	11.0	37.007	36.000
0.012400	55.44	5.02	11.0	37.007	36.000
0.012500	55.67	5.04	11.0	37.007	36.000
0.012600	55.89	5.06	11.0	37.007	36.000
0.012700	56.11	5.08	11.0	37.007	36.000
0.012800	56.33	5.10	11.0	37.007	36.000
0.012900	56.55	5.12	11.0	37.007	36.000
0.013000	56.77	5.14	11.0	37.007	36.000
0.013100	56.99	5.16	11.0	37.007	36.000
0.013200	57.20	5.18	11.0	37.007	36.000
0.013300	57.42	5.20	11.0	37.007	36.000
0.013400	57.63	5.22	11.0	37.007	36.000
0.013500	57.85	5.24	11.0	37.007	36.000
0.013600	58.06	5.26	11.0	37.007	36.000
0.013700	58.28	5.28	11.0	37.007	36.000
0.013800	58.49	5.30	11.0	37.007	36.000
0.013900	58.70	5.32	11.0	37.007	36.000
0.014000	58.91	5.34	11.0	37.007	36.000
0.014100	59.12	5.36	11.0	37.007	36.000
0.014200	59.33	5.37	11.0	37.007	36.000
0.014300	59.54	5.39	11.0	37.007	36.000
0.014400	59.75	5.41	11.0	37.007	36.000
0.014500	59.95	5.43	11.0	37.007	36.000
0.014600	60.16	5.45	11.0	37.007	36.000
0.014700	60.37	5.47	11.0	37.007	36.000
0.014800	60.57	5.49	11.0	37.007	36.000
0.014900	60.78	5.51	11.0	37.007	36.000
0.015000	60.98	5.52	11.0	37.007	36.000
0.015100	61.18	5.54	11.0	37.007	36.000
0.015200	61.38	5.56	11.0	37.007	36.000
0.015300	61.59	5.58	11.0	37.007	36.000
0.015400	61.79	5.60	11.0	37.007	36.000
0.015500	61.99	5.61	11.0	37.007	36.000
0.015600	62.19	5.63	11.0	37.007	36.000
0.015700	62.39	5.65	11.0	37.007	36.000
0.015800	62.58	5.67	11.0	37.007	36.000
0.015900	62.78	5.69	11.0	37.007	36.000
0.016000	62.98	5.70	11.0	37.007	36.000
0.016100	63.18	5.72	11.0	37.007	36.000
0.016200	63.37	5.74	11.0	37.007	36.000
0.016300	63.57	5.76	11.0	37.007	36.000
0.016400	63.76	5.78	11.0	37.007	36.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.016500	63.96	5.79	11.0	37.007	36.000
0.016600	64.15	5.81	11.0	37.007	36.000
0.016700	64.34	5.83	11.0	37.007	36.000
0.016800	64.53	5.85	11.0	37.007	36.000
0.016900	64.73	5.86	11.0	37.007	36.000
0.017000	64.92	5.88	11.0	37.007	36.000
0.017100	65.11	5.90	11.0	37.007	36.000
0.017200	65.30	5.91	11.0	37.007	36.000
0.017300	65.49	5.93	11.0	37.007	36.000
0.017400	65.68	5.95	11.0	37.007	36.000
0.017500	65.86	5.97	11.0	37.007	36.000
0.017600	66.05	5.98	11.0	37.007	36.000
0.017700	66.24	6.00	11.0	37.007	36.000
0.017800	66.43	6.02	11.0	37.007	36.000
0.017900	66.61	6.03	11.0	37.007	36.000
0.018000	66.80	6.05	11.0	37.007	36.000
0.018100	66.98	6.07	11.0	37.007	36.000
0.018200	67.17	6.08	11.0	37.007	36.000
0.018300	67.35	6.10	11.0	37.007	36.000
0.018400	67.54	6.12	11.0	37.007	36.000
0.018500	67.72	6.13	11.0	37.007	36.000
0.018600	67.90	6.15	11.0	37.007	36.000
0.018700	68.09	6.17	11.0	37.007	36.000
0.018800	68.27	6.18	11.0	37.007	36.000
0.018900	68.45	6.20	11.0	37.007	36.000
0.019000	68.63	6.22	11.0	37.007	36.000
0.019100	68.81	6.23	11.0	37.007	36.000
0.019200	68.99	6.25	11.0	37.007	36.000
0.019300	69.17	6.27	11.0	37.007	36.000
0.019400	69.35	6.28	11.0	37.007	36.000
0.019500	69.53	6.30	11.0	37.007	36.000
0.019600	69.70	6.31	11.0	37.007	36.000
0.019700	69.88	6.33	11.0	37.007	36.000
0.019800	70.06	6.35	11.0	37.007	36.000
0.019900	70.24	6.36	11.0	37.007	36.000
0.020000	70.41	6.38	11.0	37.007	36.000
0.020100	70.59	6.39	11.0	37.007	36.000
0.020200	70.76	6.41	11.0	37.007	36.000
0.020300	70.94	6.43	11.0	37.007	36.000
0.020400	71.11	6.44	11.0	37.007	36.000
0.020500	71.29	6.46	11.0	37.007	36.000
0.020600	71.46	6.47	11.0	37.007	36.000
0.020700	71.63	6.49	11.0	37.007	36.000
0.020800	71.81	6.50	11.0	37.007	36.000
0.020900	71.98	6.52	11.0	37.007	36.000
0.021000	72.15	6.54	11.0	37.007	36.000
0.021100	72.32	6.55	11.0	37.007	36.000
0.021200	72.49	6.57	11.0	37.007	36.000
0.021300	72.66	6.58	11.0	37.007	36.000
0.021400	72.84	6.60	11.0	37.007	36.000
0.021500	73.01	6.61	11.0	37.007	36.000
0.021600	73.17	6.63	11.0	37.007	36.000
0.021700	73.34	6.64	11.0	37.007	36.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.021800	73.51	6.66	11.0	37.007	36.000
0.021900	73.68	6.67	11.0	37.007	36.000
0.022000	73.85	6.69	11.0	37.007	36.000
0.022100	74.02	6.70	11.0	37.007	36.000
0.022200	74.18	6.72	11.0	37.007	36.000
0.022300	74.35	6.73	11.0	37.007	36.000
0.022400	74.52	6.75	11.0	37.007	36.000
0.022500	74.68	6.76	11.0	37.007	36.000
0.022600	74.85	6.78	11.0	37.007	36.000
0.022700	75.01	6.79	11.0	37.007	36.000
0.022800	75.18	6.81	11.0	37.007	36.000
0.022900	75.34	6.82	11.0	37.007	36.000
0.023000	75.51	6.84	11.0	37.007	36.000
0.023100	75.67	6.85	11.0	37.007	36.000
0.023200	75.84	6.87	11.0	37.007	36.000
0.023300	76.00	6.88	11.0	37.007	36.000
0.023400	76.16	6.90	11.0	37.007	36.000
0.023500	76.33	6.91	11.0	37.007	36.000
0.023600	76.49	6.93	11.0	37.007	36.000
0.023700	76.65	6.94	11.0	37.007	36.000
0.023800	76.81	6.96	11.0	37.007	36.000
0.023900	76.97	6.97	11.0	37.007	36.000
0.024000	77.13	6.99	11.0	37.007	36.000
0.024100	77.29	7.00	11.0	37.007	36.000
0.024200	77.45	7.02	11.0	37.007	36.000
0.024300	77.61	7.03	11.0	37.007	36.000
0.024400	77.77	7.04	11.0	37.007	36.000
0.024500	77.93	7.06	11.0	37.007	36.000
0.024600	78.09	7.07	11.0	37.007	36.000
0.024700	78.25	7.09	11.0	37.007	36.000
0.024800	78.41	7.10	11.0	37.007	36.000
0.024900	78.57	7.12	11.0	37.007	36.000
0.025000	78.72	7.13	11.0	37.007	36.000

Table
Rating Table for Irregular Channel

Project Description	
Worksheet	X/S Local (6" Vertical)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

100-YR

Input Data	
Water Surface Elevation	0.605 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Attribute	Minimum	Maximum	Increment
Channel Slope (ft/ft)	0.002500	0.025000	0.000100

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.002500	31.63	2.03	15.6	51.009	50.000
0.002600	32.26	2.07	15.6	51.009	50.000
0.002700	32.87	2.11	15.6	51.009	50.000
0.002800	33.48	2.15	15.6	51.009	50.000
0.002900	34.07	2.19	15.6	51.009	50.000
0.003000	34.65	2.23	15.6	51.009	50.000
0.003100	35.22	2.26	15.6	51.009	50.000
0.003200	35.79	2.30	15.6	51.009	50.000
0.003300	36.34	2.34	15.6	51.009	50.000
0.003400	36.89	2.37	15.6	51.009	50.000
0.003500	37.43	2.41	15.6	51.009	50.000
0.003600	37.96	2.44	15.6	51.009	50.000
0.003700	38.48	2.47	15.6	51.009	50.000
0.003800	39.00	2.51	15.6	51.009	50.000
0.003900	39.51	2.54	15.6	51.009	50.000
0.004000	40.01	2.57	15.6	51.009	50.000
0.004100	40.51	2.60	15.6	51.009	50.000
0.004200	41.00	2.64	15.6	51.009	50.000
0.004300	41.48	2.67	15.6	51.009	50.000
0.004400	41.96	2.70	15.6	51.009	50.000
0.004500	42.44	2.73	15.6	51.009	50.000
0.004600	42.91	2.76	15.6	51.009	50.000
0.004700	43.37	2.79	15.6	51.009	50.000
0.004800	43.83	2.82	15.6	51.009	50.000
0.004900	44.28	2.85	15.6	51.009	50.000
0.005000	44.73	2.88	15.6	51.009	50.000
0.005100	45.18	2.90	15.6	51.009	50.000
0.005200	45.62	2.93	15.6	51.009	50.000
0.005300	46.06	2.96	15.6	51.009	50.000
0.005400	46.49	2.99	15.6	51.009	50.000
0.005500	46.92	3.02	15.6	51.009	50.000
0.005600	47.34	3.04	15.6	51.009	50.000
0.005700	47.76	3.07	15.6	51.009	50.000
0.005800	48.18	3.10	15.6	51.009	50.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.005900	48.59	3.12	15.6	51.009	50.000
0.006000	49.00	3.15	15.6	51.009	50.000
0.006100	49.41	3.18	15.6	51.009	50.000
0.006200	49.81	3.20	15.6	51.009	50.000
0.006300	50.21	3.23	15.6	51.009	50.000
0.006400	50.61	3.25	15.6	51.009	50.000
0.006500	51.01	3.28	15.6	51.009	50.000
0.006600	51.40	3.30	15.6	51.009	50.000
0.006700	51.78	3.33	15.6	51.009	50.000
0.006800	52.17	3.35	15.6	51.009	50.000
0.006900	52.55	3.38	15.6	51.009	50.000
0.007000	52.93	3.40	15.6	51.009	50.000
0.007100	53.31	3.43	15.6	51.009	50.000
0.007200	53.68	3.45	15.6	51.009	50.000
0.007300	54.05	3.47	15.6	51.009	50.000
0.007400	54.42	3.50	15.6	51.009	50.000
0.007500	54.79	3.52	15.6	51.009	50.000
0.007600	55.15	3.55	15.6	51.009	50.000
0.007700	55.51	3.57	15.6	51.009	50.000
0.007800	55.87	3.59	15.6	51.009	50.000
0.007900	56.23	3.61	15.6	51.009	50.000
0.008000	56.59	3.64	15.6	51.009	50.000
0.008100	56.94	3.66	15.6	51.009	50.000
0.008200	57.29	3.68	15.6	51.009	50.000
0.008300	57.64	3.71	15.6	51.009	50.000
0.008400	57.98	3.73	15.6	51.009	50.000
0.008500	58.33	3.75	15.6	51.009	50.000
0.008600	58.67	3.77	15.6	51.009	50.000
0.008700	59.01	3.79	15.6	51.009	50.000
0.008800	59.35	3.82	15.6	51.009	50.000
0.008900	59.68	3.84	15.6	51.009	50.000
0.009000	60.02	3.86	15.6	51.009	50.000
0.009100	60.35	3.88	15.6	51.009	50.000
0.009200	60.68	3.90	15.6	51.009	50.000
0.009300	61.01	3.92	15.6	51.009	50.000
0.009400	61.34	3.94	15.6	51.009	50.000
0.009500	61.66	3.96	15.6	51.009	50.000
0.009600	61.99	3.98	15.6	51.009	50.000
0.009700	62.31	4.01	15.6	51.009	50.000
0.009800	62.63	4.03	15.6	51.009	50.000
0.009900	62.95	4.05	15.6	51.009	50.000
0.010000	63.26	4.07	15.6	51.009	50.000
0.010100	63.58	4.09	15.6	51.009	50.000
0.010200	63.89	4.11	15.6	51.009	50.000
0.010300	64.21	4.13	15.6	51.009	50.000
0.010400	64.52	4.15	15.6	51.009	50.000
0.010500	64.83	4.17	15.6	51.009	50.000
0.010600	65.13	4.19	15.6	51.009	50.000
0.010700	65.44	4.21	15.6	51.009	50.000
0.010800	65.75	4.23	15.6	51.009	50.000
0.010900	66.05	4.25	15.6	51.009	50.000
0.011000	66.35	4.27	15.6	51.009	50.000
0.011100	66.65	4.28	15.6	51.009	50.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.011200	66.95	4.30	15.6	51.009	50.000
0.011300	67.25	4.32	15.6	51.009	50.000
0.011400	67.55	4.34	15.6	51.009	50.000
0.011500	67.84	4.36	15.6	51.009	50.000
0.011600	68.14	4.38	15.6	51.009	50.000
0.011700	68.43	4.40	15.6	51.009	50.000
0.011800	68.72	4.42	15.6	51.009	50.000
0.011900	69.01	4.44	15.6	51.009	50.000
0.012000	69.30	4.46	15.6	51.009	50.000
0.012100	69.59	4.47	15.6	51.009	50.000
0.012200	69.88	4.49	15.6	51.009	50.000
0.012300	70.16	4.51	15.6	51.009	50.000
0.012400	70.45	4.53	15.6	51.009	50.000
0.012500	70.73	4.55	15.6	51.009	50.000
0.012600	71.01	4.57	15.6	51.009	50.000
0.012700	71.29	4.58	15.6	51.009	50.000
0.012800	71.58	4.60	15.6	51.009	50.000
0.012900	71.85	4.62	15.6	51.009	50.000
0.013000	72.13	4.64	15.6	51.009	50.000
0.013100	72.41	4.66	15.6	51.009	50.000
0.013200	72.68	4.67	15.6	51.009	50.000
0.013300	72.96	4.69	15.6	51.009	50.000
0.013400	73.23	4.71	15.6	51.009	50.000
0.013500	73.51	4.73	15.6	51.009	50.000
0.013600	73.78	4.74	15.6	51.009	50.000
0.013700	74.05	4.76	15.6	51.009	50.000
0.013800	74.32	4.78	15.6	51.009	50.000
0.013900	74.59	4.80	15.6	51.009	50.000
0.014000	74.85	4.81	15.6	51.009	50.000
0.014100	75.12	4.83	15.6	51.009	50.000
0.014200	75.39	4.85	15.6	51.009	50.000
0.014300	75.65	4.86	15.6	51.009	50.000
0.014400	75.92	4.88	15.6	51.009	50.000
0.014500	76.18	4.90	15.6	51.009	50.000
0.014600	76.44	4.91	15.6	51.009	50.000
0.014700	76.70	4.93	15.6	51.009	50.000
0.014800	76.96	4.95	15.6	51.009	50.000
0.014900	77.22	4.96	15.6	51.009	50.000
0.015000	77.48	4.98	15.6	51.009	50.000
0.015100	77.74	5.00	15.6	51.009	50.000
0.015200	78.00	5.01	15.6	51.009	50.000
0.015300	78.25	5.03	15.6	51.009	50.000
0.015400	78.51	5.05	15.6	51.009	50.000
0.015500	78.76	5.06	15.6	51.009	50.000
0.015600	79.02	5.08	15.6	51.009	50.000
0.015700	79.27	5.10	15.6	51.009	50.000
0.015800	79.52	5.11	15.6	51.009	50.000
0.015900	79.77	5.13	15.6	51.009	50.000
0.016000	80.02	5.14	15.6	51.009	50.000
0.016100	80.27	5.16	15.6	51.009	50.000
0.016200	80.52	5.18	15.6	51.009	50.000
0.016300	80.77	5.19	15.6	51.009	50.000
0.016400	81.02	5.21	15.6	51.009	50.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Top Width (ft)
0.016500	81.26	5.22	15.6	51.009	50.000
0.016600	81.51	5.24	15.6	51.009	50.000
0.016700	81.76	5.26	15.6	51.009	50.000
0.016800	82.00	5.27	15.6	51.009	50.000
0.016900	82.24	5.29	15.6	51.009	50.000
0.017000	82.49	5.30	15.6	51.009	50.000
0.017100	82.73	5.32	15.6	51.009	50.000
0.017200	82.97	5.33	15.6	51.009	50.000
0.017300	83.21	5.35	15.6	51.009	50.000
0.017400	83.45	5.36	15.6	51.009	50.000
0.017500	83.69	5.38	15.6	51.009	50.000
0.017600	83.93	5.40	15.6	51.009	50.000
0.017700	84.17	5.41	15.6	51.009	50.000
0.017800	84.40	5.43	15.6	51.009	50.000
0.017900	84.64	5.44	15.6	51.009	50.000
0.018000	84.88	5.46	15.6	51.009	50.000
0.018100	85.11	5.47	15.6	51.009	50.000
0.018200	85.35	5.49	15.6	51.009	50.000
0.018300	85.58	5.50	15.6	51.009	50.000
0.018400	85.82	5.52	15.6	51.009	50.000
0.018500	86.05	5.53	15.6	51.009	50.000
0.018600	86.28	5.55	15.6	51.009	50.000
0.018700	86.51	5.56	15.6	51.009	50.000
0.018800	86.74	5.58	15.6	51.009	50.000
0.018900	86.97	5.59	15.6	51.009	50.000
0.019000	87.20	5.61	15.6	51.009	50.000
0.019100	87.43	5.62	15.6	51.009	50.000
0.019200	87.66	5.64	15.6	51.009	50.000
0.019300	87.89	5.65	15.6	51.009	50.000
0.019400	88.12	5.66	15.6	51.009	50.000
0.019500	88.34	5.68	15.6	51.009	50.000
0.019600	88.57	5.69	15.6	51.009	50.000
0.019700	88.80	5.71	15.6	51.009	50.000
0.019800	89.02	5.72	15.6	51.009	50.000
0.019900	89.24	5.74	15.6	51.009	50.000
0.020000	89.47	5.75	15.6	51.009	50.000
0.020100	89.69	5.77	15.6	51.009	50.000
0.020200	89.92	5.78	15.6	51.009	50.000
0.020300	90.14	5.79	15.6	51.009	50.000
0.020400	90.36	5.81	15.6	51.009	50.000
0.020500	90.58	5.82	15.6	51.009	50.000
0.020600	90.80	5.84	15.6	51.009	50.000
0.020700	91.02	5.85	15.6	51.009	50.000
0.020800	91.24	5.87	15.6	51.009	50.000
0.020900	91.46	5.88	15.6	51.009	50.000
0.021000	91.68	5.89	15.6	51.009	50.000
0.021100	91.90	5.91	15.6	51.009	50.000
0.021200	92.11	5.92	15.6	51.009	50.000
0.021300	92.33	5.94	15.6	51.009	50.000
0.021400	92.55	5.95	15.6	51.009	50.000
0.021500	92.76	5.96	15.6	51.009	50.000
0.021600	92.98	5.98	15.6	51.009	50.000
0.021700	93.19	5.99	15.6	51.009	50.000

Table
Rating Table for Irregular Channel

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.021800	93.41	6.01	15.6	51.009	50.000
0.021900	93.62	6.02	15.6	51.009	50.000
0.022000	93.84	6.03	15.6	51.009	50.000
0.022100	94.05	6.05	15.6	51.009	50.000
0.022200	94.26	6.06	15.6	51.009	50.000
0.022300	94.47	6.07	15.6	51.009	50.000
0.022400	94.68	6.09	15.6	51.009	50.000
0.022500	94.90	6.10	15.6	51.009	50.000
0.022600	95.11	6.11	15.6	51.009	50.000
0.022700	95.32	6.13	15.6	51.009	50.000
0.022800	95.53	6.14	15.6	51.009	50.000
0.022900	95.74	6.15	15.6	51.009	50.000
0.023000	95.94	6.17	15.6	51.009	50.000
0.023100	96.15	6.18	15.6	51.009	50.000
0.023200	96.36	6.19	15.6	51.009	50.000
0.023300	96.57	6.21	15.6	51.009	50.000
0.023400	96.78	6.22	15.6	51.009	50.000
0.023500	96.98	6.23	15.6	51.009	50.000
0.023600	97.19	6.25	15.6	51.009	50.000
0.023700	97.39	6.26	15.6	51.009	50.000
0.023800	97.60	6.27	15.6	51.009	50.000
0.023900	97.80	6.29	15.6	51.009	50.000
0.024000	98.01	6.30	15.6	51.009	50.000
0.024100	98.21	6.31	15.6	51.009	50.000
0.024200	98.42	6.33	15.6	51.009	50.000
0.024300	98.62	6.34	15.6	51.009	50.000
0.024400	98.82	6.35	15.6	51.009	50.000
0.024500	99.02	6.37	15.6	51.009	50.000
0.024600	99.23	6.38	15.6	51.009	50.000
0.024700	99.43	6.39	15.6	51.009	50.000
0.024800	99.63	6.40	15.6	51.009	50.000
0.024900	99.83	6.42	15.6	51.009	50.000
0.025000	100.03	6.43	15.6	51.009	50.000

DAVID EVANS AND ASSOCIATES INC.

JN. STPP0011

BY PAMO DATE 06/23/04

JOB DESCRIPTION DONATELLA II

SHEET 1 OF 1 SHEETS

CALCULATION FOR 119TH AVENUE OVER TOPPING FLOW FROM BASIN 4 TO BASIN 2.2

CHECKED BY _____ DATE _____

BREAK OVER ELEV OF 119TH AVE = 96.58

FOR 25 YR EVENT & 100 YEAR EVENTS THE DETERMINED FLOW IN PIPE SYSTEM IS BASED ON BACKWATER ELEVATION 96.58 AT CROWN OF 119TH A

THESE ELEVATIONS AND FLOWS ARE USED TO SET INITIAL CONDITIONS OF THE DIVERTED FLOW.

A SECOND ARBITRARY FLOW IS USED TO DETERMINE FLOW IN PIPE AND BACKWATER ELEVATION. THIS BACKWATER ELEVATION IS USED TO DETERMINE DEPTH OF WEIR OVER 119TH AVE AND FLOW OVER TOPPING ROADWAY.

WEIR ASSUMPTIONS:

$$Q = C L H^{3/2}$$

where

$C = 2.8$

$L = 50$

H = depth based on second arbitrary flow

BASED ON THE DESCRIPTION ABOVE THE FOLLOWING DIVERSION RATING TABLE VALUES WERE FOUND.

100-YEAR STORM (0.43' OVER CROWN)

ELEV	PIPE FLOW	WEIR FLOW	TOTAL FLOW
96.58	30.8	0	30.8
97.02	32	39.5	71.5

25-YEAR STORM (0.33' OVER CROWN)

ELEV	PIPE FLOW	WEIR FLOW	TOTAL FLOW
96.59	36.1	0	36.1
96.92	37	26.5	63.5

SEE STORMCAD OUTPUT FOR HWE FOR EACH STORM EVENT

Calculation Results Summary

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Scenario: 10-year

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutte Depth (ft)
I-4	Curb Inlet	Curb 6 (COP P1569-1), L=10'	2.50	0.00	100.0	9.58	0.2
I-2	Curb Inlet	Curb 6 (COP P1569-1), L=3'	3.50	0.00	100.0	17.49	0.3
I-3	Curb Inlet	Curb 6 (COP P1569-1), L=3'	3.50	0.00	100.0	17.49	0.3
I-1	Grate Inlet	Grate MAG 535, TYPE 'F'	28.00	0.00	100.0	123.21	2.4
I-5	Curb Inlet	Curb 6 (COP P1569-1), L=10'	2.50	0.00	100.0	9.58	0.2

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-8	1	36 inch	Circular	106.89	40.00	6.81	88.72	88.06
P-7	1	36 inch	Circular	144.50	40.00	6.09	89.76	89.32
P-5	1	36 inch	Circular	491.31	35.00	6.83	92.07	90.76
P-6.1	1	15 inch	Circular	29.00	2.50	9.45	91.08	90.76
P-6.2	1	15 inch	Circular	19.75	2.50	11.52	91.41	90.76
P-4	1	36 inch	Circular	48.50	35.00	4.95	93.01	92.87
P-3.2	1	15 inch	Circular	12.25	3.50	4.33	94.03	94.01
P-2	1	30 inch	Circular	151.96	28.00	5.70	94.71	94.01
P-3.1	1	15 inch	Circular	20.25	3.50	3.91	94.05	94.01
P-1	1	30 inch	Circular	41.21	28.00	5.70	94.91	94.71

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	40.00	90.00	86.50	86.50
J-5	40.00	96.32	89.32	88.72
J-4	40.00	95.51	90.76	89.76
J-3	35.00	96.22	92.87	92.07
I-4	2.50	95.58	92.08	91.08
I-5	2.50	95.58	92.41	91.41
J-2	35.00	96.26	94.01	93.01
I-3	3.50	96.39	94.03	94.03
J-1	28.00	96.80	94.71	94.71
I-2	3.50	96.39	95.05	94.05
I-1	28.00	95.00	95.91	94.91

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Calculation Results Summary

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Scenario: 25-year

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
I-4	Curb Inlet	Curb 6 (COP P1569-1), L=10'	3.50	0.00	100.0	11.99	0.27
I-2	Curb Inlet	Curb 6 (COP P1569-1), L=3'	4.50	0.00	100.0	20.68	0.44
I-3	Curb Inlet	Curb 6 (COP P1569-1), L=3'	4.50	0.00	100.0	20.68	0.44
I-1	Grate Inlet	Grate MAG 535, TYPE 'F'	40.00	0.00	100.0	251.45	5.03
I-5	Curb Inlet	Curb 6 (COP P1569-1), L=10'	3.50	0.00	100.0	11.99	0.27

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-8	1	36 inch	Circular	106.89	56.00	7.92	89.43	88.43
P-7	1	36 inch	Circular	144.50	56.00	7.92	91.05	90.03
P-5	1	36 inch	Circular	491.31	49.00	6.93	94.70	92.05
P-6.1	1	15 inch	Circular	29.00	3.50	2.85	92.14	92.05
P-6.2	1	15 inch	Circular	19.75	3.50	2.85	92.11	92.05
P-4	1	36 inch	Circular	48.50	49.00	6.93	95.76	95.50
P-3.2	1	15 inch	Circular	12.25	4.50	3.67	96.32	96.26
P-2	1	30 inch	Circular	151.96	40.00	8.15	97.71	96.26
P-3.1	1	15 inch	Circular	20.25	4.50	3.67	96.36	96.26
P-1	1	30 inch	Circular	41.21	40.00	8.15	97.19	96.80

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	56.00	90.00	86.50	86.50
J-5	56.00	96.32	90.03	89.43
J-4	56.00	95.51	92.05	91.05
J-3	49.00	96.22	95.50	94.70
I-4	3.50	95.58	93.14	92.14
I-5	3.50	95.58	93.11	92.11
J-2	49.00	96.26	96.76	95.76
I-3	4.50	96.39	96.32	96.32
J-1	40.00	96.80	96.80	96.80
I-2	4.50	96.39	97.36	96.36
I-1	40.00	95.00	96.00	95.00

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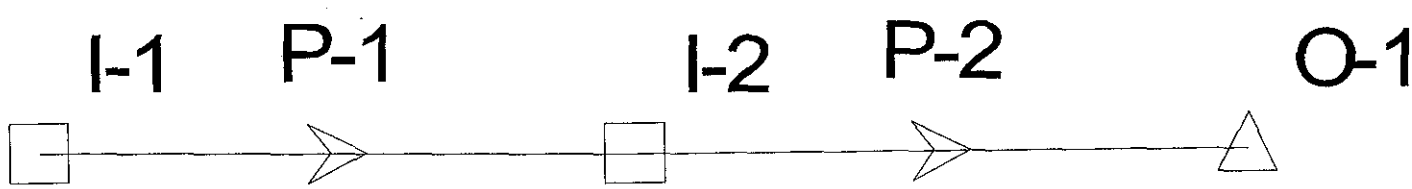
Scenario: 10-year



Calculation Results Summary

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Scenario: 10-year

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
I-2	Curb Inlet	Curb 6 (COP P1569-1), L=17'	14.00	0.00	100.0	23.79	0.48
I-1	Curb Inlet	Curb 6 (COP P1569-1), L=17'	14.00	0.00	100.0	23.79	0.48

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-2	1	30 inch	Circular	22.41	28.00	12.98	84.15	83.43
P-1	1	24 inch	Circular	36.00	14.00	6.61	84.19	84.15

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	28.00	85.00	82.00	82.00
I-2	28.00	86.50	84.15	84.15
I-1	14.00	86.50	84.19	84.19

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Completed: 08/27/2004 12:13:38 PM

Calculation Results Summary

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Scenario: 100-year

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
I-2	Curb Inlet	Curb 6 (COP P1569-1), L=17'	30.00	0.00	100.0	39.54	0.79
I-1	Curb Inlet	Curb 6 (COP P1569-1), L=17'	30.00	0.00	100.0	39.54	0.79

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-2	1	30 inch	Circular	22.41	60.00	15.36	84.74	84.19
P-1	1	24 inch	Circular	36.00	30.00	9.55	85.12	84.74

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	60.00	85.00	82.00	82.00
I-2	60.00	86.50	84.74	84.74
I-1	30.00	86.50	85.12	85.12

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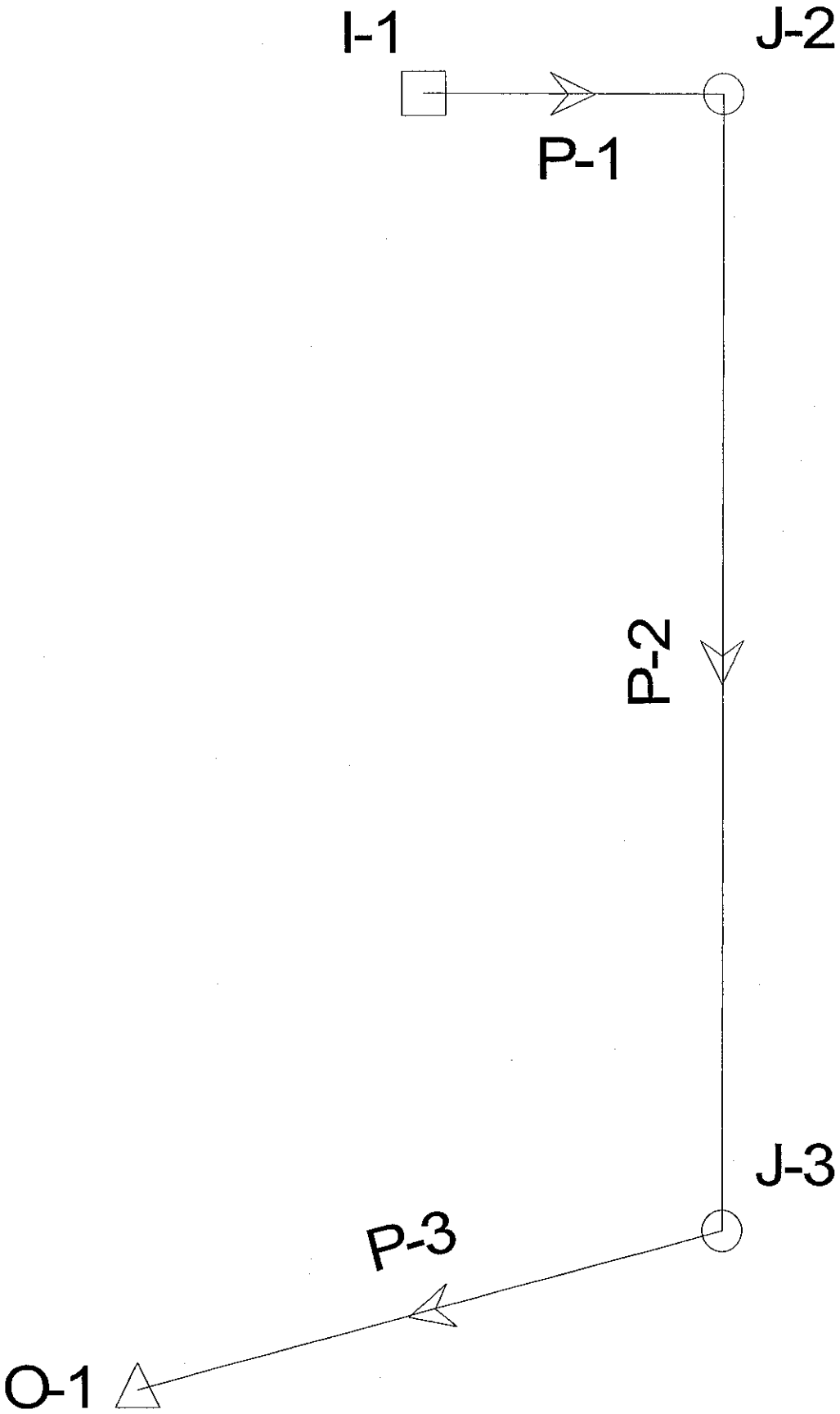
Completed: 08/27/2004 12:13:25 PM

Scenario: 10-year



Calculation Results Summary

==========
Scenario: 10-year

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
I-1	Curb Inlet	Curb 6 (COP P1569-1), L=3'	4.00	0.00	100.0	19.12	0.41

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-3	1	18 inch	Circular	75.41	4.00	5.89	92.16	92.00
P-2	1	18 inch	Circular	132.65	4.00	5.55	93.69	92.23
P-1	1	18 inch	Circular	19.75	4.00	5.95	94.48	94.49

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	4.00	93.50	92.00	92.00
J-3	4.00	97.00	92.16	92.16
J-2	4.00	97.39	94.49	93.69
I-1	4.00	96.86	94.60	94.48

==========
Completed: 08/26/2004 03:41:01 PM

Calculation Results Summary

==========
Scenario: 100-year

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
I-1	Curb Inlet	Curb 6 (COP P1569-1), L=3'	8.00	0.00	100.0	30.35	0.64

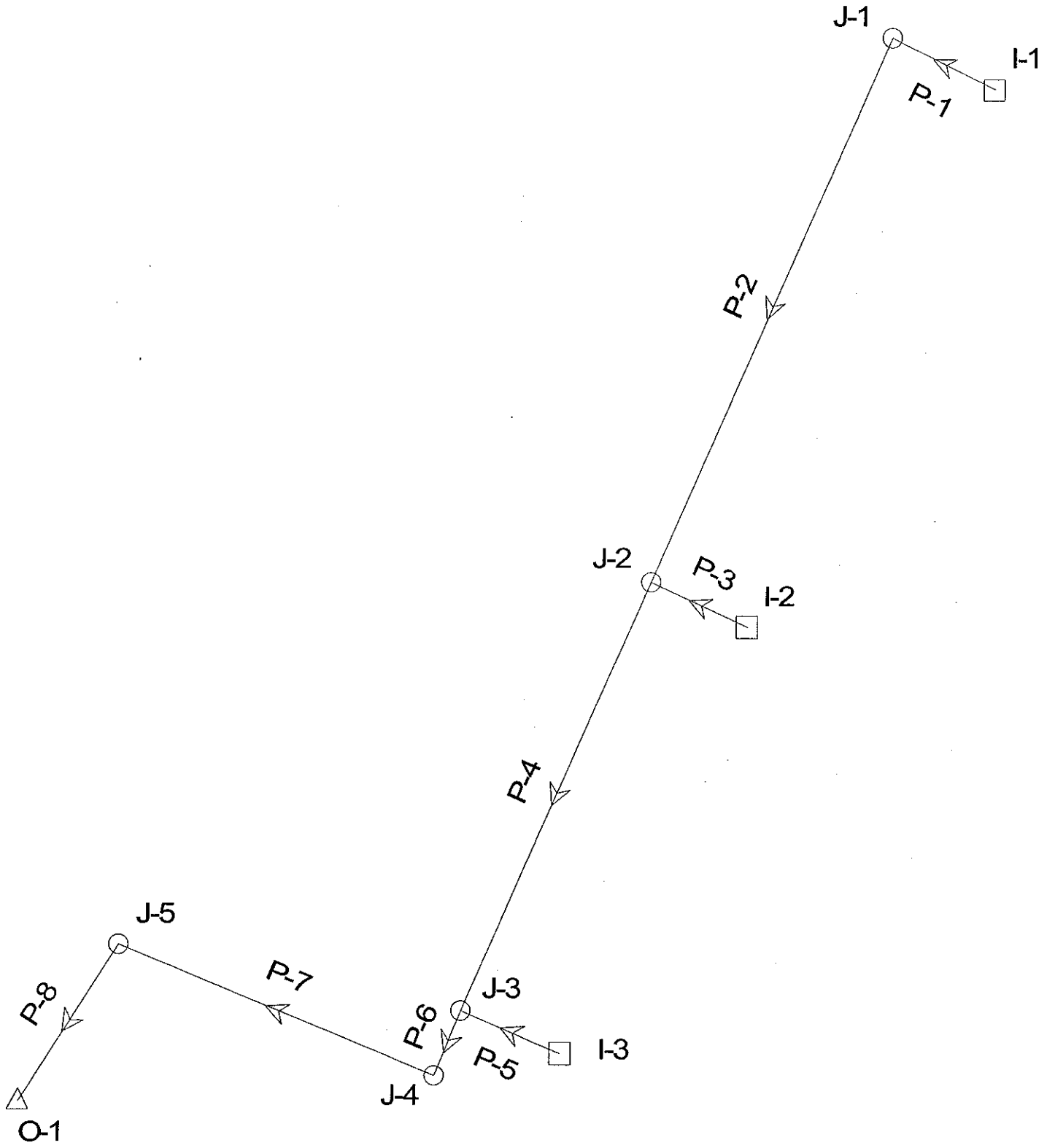
CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-3	1	18 inch	Circular	75.41	8.00	6.99	92.49	92.00
P-2	1	18 inch	Circular	132.65	8.00	6.55	94.02	92.57
P-1	1	18 inch	Circular	19.75	8.00	4.53	94.93	94.82

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	8.00	93.50	92.00	92.00
J-3	8.00	97.00	92.49	92.49
J-2	8.00	97.39	94.82	94.02
I-1	8.00	96.86	95.25	94.93

==========
Completed: 08/26/2004 03:40:50 PM

Scenario: 10-year



Calculation Results Summary

==========
Scenario: 10-year

>>>> Info: I-3 No bypass target specified. Bypass is assumed to travel to O-1.
>>>> Info: I-2 No bypass target specified. Bypass is assumed to travel to O-1.
>>>> Info: I-1 No bypass target specified. Bypass is assumed to travel to O-1.

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gut Spr (f
I-3	Curb Inlet	Curb 6 (COP P1569-1), L=17'	7.86	2.96	72.7	18
I-2	Curb Inlet	Curb 6 (COP P1569-1), L=17', Double Wing	10.02	1.81	84.7	14
I-1	Curb Inlet	Curb 6 (COP P1569-1), L=10'	4.34	7.16	37.7	14

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-8	1	30 inch	Circular	26.24	22.22	6.06	986.57	986.50
P-7	1	30 inch	Circular	147.02	22.22	4.53	987.70	987.27
P-6	1	30 inch	Circular	27.22	22.22	4.53	988.58	988.50
P-4	1	30 inch	Circular	170.95	14.36	2.92	988.79	988.58
P-5	1	24 inch	Circular	13.25	7.86	2.50	988.60	988.58
P-3	1	24 inch	Circular	13.25	10.02	3.19	989.72	989.69
P-2	1	18 inch	Circular	282.86	4.34	2.45	990.17	989.69
P-1	1	18 inch	Circular	13.25	4.34	2.45	990.99	990.97

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	22.22	988.00	986.50	986.50
J-5	22.22	988.00	987.27	986.57
J-4	22.22	988.90	988.50	987.70
J-3	22.22	989.05	988.58	988.58
J-2	14.36	989.77	989.69	988.79
I-3	7.86	989.07	988.60	988.60
I-2	10.02	990.11	990.72	989.72
J-1	4.34	991.21	990.97	990.17
I-1	4.34	991.49	991.08	990.99

==========

Calculation Results Summary

==========

Scenario: 100-year

>>>> Info: I-3 No bypass target specified. Bypass is assumed to travel to O-1.
>>>> Info: I-2 No bypass target specified. Bypass is assumed to travel to O-1.
>>>> Info: I-1 No bypass target specified. Bypass is assumed to travel to O-1.

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gut Spr (f
I-3	Curb Inlet	Curb 6 (COP P1569-1), L=17'	13.49	13.71	49.6	25
I-2	Curb Inlet	Curb 6 (COP P1569-1), L=17', Double Wing	16.58	9.91	62.6	19
I-1	Curb Inlet	Curb 6 (COP P1569-1), L=10'	6.03	15.97	27.4	18

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-8	1	30 inch	Circular	26.24	36.10	7.35	986.70	986.50
P-7	1	30 inch	Circular	147.02	36.10	7.35	988.54	987.40
P-6	1	30 inch	Circular	27.22	36.10	7.35	989.11	988.90
P-4	1	30 inch	Circular	170.95	22.61	4.61	989.57	989.05
P-5	1	24 inch	Circular	13.25	13.49	4.29	989.10	989.05
P-3	1	24 inch	Circular	13.25	16.58	5.28	989.84	989.77
P-2	1	18 inch	Circular	282.86	6.03	3.41	990.70	989.77
P-1	1	18 inch	Circular	13.25	6.03	3.41	991.24	991.21

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	36.10	988.00	986.50	986.50
J-5	36.10	988.00	987.40	986.70
J-4	36.10	988.90	989.34	988.54
J-3	36.10	989.05	989.05	989.05
J-2	22.61	989.77	990.47	989.57
I-3	13.49	989.07	989.07	989.07
I-2	16.58	990.11	990.84	989.84
J-1	6.03	991.21	991.50	990.70
I-1	6.03	991.49	991.42	991.24

==========

SCUPPER SIZE AND LOCATION

Design Storm: 100yr, 2hr
Q's found by Rational Method

Basin Designation	Location (CP)	FLOW		SCUPPER	
		100 yr (cfs)	10 yr (cfs)	Opening Length (ft)	Allowable Q * (cfs)
Basin 2.1	CP 2D*	32	15	20	18.72
Basin 2.3	CP 2L*	28	13	16	14.95
Basin 3.1	CP 3D*	10	5	16	14.95
Basin 3.2	CP 3E	24	12	12	11.18
Basin 4	CP 4E*	61	29	32	30.02
Basin 6	CP 6A	4	2	8	7.42

* Based on 20 percent clogging factor.

Worksheet
Worksheet for Sharp Crested Rectangular Weir

Project Description	
Worksheet	2-4 FT scuppers
Type	Sharp Crested Rectangular Weir
Solve For	Discharge

Input Data		
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	3.33	US
Crest Length	6.400	ft
Number of Contractions	2	

← 8' (0.8) = 6.4' USING 20% Clogging Factor

Results		
Discharge	7.42	cfs
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	3.2	ft²
Velocity	2.32	ft/s
Wetted Perimeter	7.400	ft
Top Width	6.400	ft

Worksheet
Worksheet for Sharp Crested Rectangular Weir

Project Description	
Worksheet	3-4 FT scuppers
Type	Sharp Crested Rectangular Weir
Solve For	Discharge

Input Data		
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	3.33	US
Crest Length	9.600	ft
Number of Contractions	2	

← 12' (0.8) = 9.6' USING 20% Clogging factor

Results		
Discharge	11.18	cfs
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	4.8	ft²
Velocity	2.33	ft/s
Wetted Perimeter	10.600	ft
Top Width	9.600	ft

Worksheet
Worksheet for Sharp Crested Rectangular Weir

Project Description	
Worksheet	4-4 FT scuppers
Type	Sharp Crested Rectangular Weir
Solve For	Discharge

Input Data		
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	3.33	US
Crest Length	12.800	ft
Number of Contractions	2	

16' (0.8) = 12.8' USING 20% Clogging factor

Results		
Discharge	14.95	cfs
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	6.4	ft²
Velocity	2.34	ft/s
Wetted Perimeter	13.800	ft
Top Width	12.800	ft

Worksheet
Worksheet for Sharp Crested Rectangular Weir

Project Description	
Worksheet	6-4 FT scuppers
Type	Sharp Crested Rectangular Weir
Solve For	Discharge

Input Data		
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	3.33	US
Crest Length	19.200	ft
Number of Contractions	2	

← 24'(0.8) = 19.2' USING 20% Clogging factor

Results		
Discharge	22.49	cfs
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	9.6	ft²
Velocity	2.34	ft/s
Wetted Perimeter	20.200	ft
Top Width	19.200	ft

Worksheet
Worksheet for Sharp Crested Rectangular Weir

Project Description	
Worksheet	5-4 FT scuppers
Type	Sharp Crested Rectangular Weir
Solve For	Discharge

Input Data		
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	3.33	US
Crest Length	16.000	ft
Number of Contractions	2	

← 20' (0.8) = 16' USING 20% Clogging factor

Results		
Discharge	18.72	cfs
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	8.0	ft²
Velocity	2.34	ft/s
Wetted Perimeter	17.000	ft
Top Width	16.000	ft

Worksheet
Worksheet for Sharp Crested Rectangular Weir

Project Description	
Worksheet	8-4 FT scuppers
Type	Sharp Crested Rectangular Weir
Solve For	Discharge

Input Data		
Headwater Elevation	0.50	ft
Crest Elevation	0.00	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	3.33	US
Crest Length	25.600	ft
Number of Contractions	2	

← 32'(0.8) = 25.6' USING 20% Clogging Factor

Results		
Discharge	30.02	cfs
Headwater Height Above Crest	0.50	ft
Tailwater Height Above Crest	0.00	ft
Flow Area	12.8	ft²
Velocity	2.35	ft/s
Wetted Perimeter	26.600	ft
Top Width	25.600	ft

Worksheet
Worksheet for Curb Inlet In Sag

Project Description	
Worksheet	COP1569-1 (3-FT opening with depth at top of curb)
Type	Curb Inlet In Sag
Solve For	Spread

Input Data		
Discharge	3.90	cfs
Gutter Width	1.420	ft
Gutter Cross Slope	0.042	ft/ft
Road Cross Slope	0.020	ft/ft
Curb Opening Length	2.400	ft ← 3'(0.8) = 2.4' USING 20% CLOGGING FACTOR
Opening Height	0.500	ft
Curb Throat Type	Horizontal	
Local Depression	2.0	in
Local Depression Width	3.000	ft

Results		
Spread	23.329	ft
Throat Incline Angle	90.00	degrees
Depth	0.498	ft
Gutter Depression	0.4	in
Total Depression	2.4	in

Worksheet
Worksheet for Curb Inlet In Sag

Project Description	
Worksheet	COP1569-1 (3-FT opening with depth at back of walk)
Type	Curb Inlet In Sag
Solve For	Spread

Input Data		
Discharge	4.52	cfs
Gutter Width	1.420	ft
Gutter Cross Slope	0.042	ft/ft
Road Cross Slope	0.020	ft/ft
Curb Opening Length	2.400	ft
Opening Height	0.500	ft
Curb Throat Type	Horizontal	
Local Depression	2.0	in
Local Depression Width	3.000	ft

Results		
Spread	27.163	ft
Throat Incline Angle	90.00	degrees
Depth	0.575	ft
Gutter Depression	0.4	in
Total Depression	2.4	in

Worksheet
Worksheet for Curb Inlet In Sag

Project Description	
Worksheet	COP1569-1 (17-FT wing with depth at top of curb)
Type	Curb Inlet In Sag
Solve For	Spread

Input Data		
Discharge	26.10	cfs
Gutter Width	1.420	ft
Gutter Cross Slope	0.042	ft/ft
Road Cross Slope	0.020	ft/ft
Curb Opening Length	16.000	ft
Opening Height	0.500	ft
Curb Throat Type	Horizontal	
Local Depression	2.0	in
Local Depression Width	20.000	ft

← 20' (0.8) = 16' USING 20% clogging factor

Results		
Spread	13.236	ft
Throat Incline Angle	90.00	degrees
Depth	0.500	ft
Gutter Depression	0.4	in
Total Depression	2.4	in

Worksheet
Worksheet for Curb Inlet In Sag

Project Description	
Worksheet	COP1569-1 (17-FT wing with depth at back of walk)
Type	Curb Inlet In Sag
Solve For	Spread

Input Data		
Discharge	30.20	cfs
Gutter Width	1.420	ft
Gutter Cross Slope	0.042	ft/ft
Road Cross Slope	0.020	ft/ft
Curb Opening Length	16.000	ft
Opening Height	0.500	ft
Curb Throat Type	Horizontal	
Local Depression	2.0	in
Local Depression Width	20.000	ft

Results		
Spread	14.768	ft
Throat Incline Angle	90.00	degrees
Depth	0.577	ft
Gutter Depression	0.4	in
Total Depression	2.4	in

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	OS-2/Levee channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

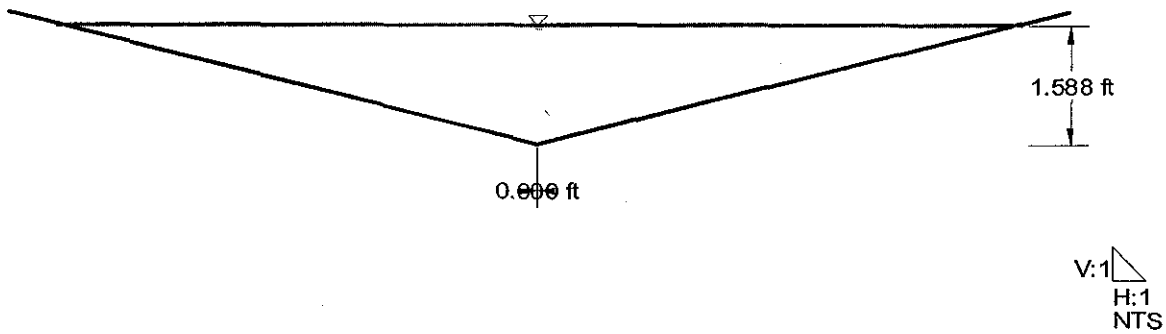
Input Data		
Mannings Coefficient	0.030	
Channel Slope	0.003000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	0.000	ft
Discharge	23.00	cfs

Results		
Depth	1.588	ft
Flow Area	10.1	ft²
Wetted Perimeter	13.095	ft
Top Width	12.704	ft
Critical Depth	1.16	ft
Critical Slope	0.016383	ft/ft
Velocity	2.28	ft/s
Velocity Head	0.08	ft
Specific Energy	1.669	ft
Froude Number	0.45	
Flow Type	Subcritical	

Cross Section
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	OS-2/Levee channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.030	
Channel Slope	0.003000	ft/ft
Depth	1.588	ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	0.000	ft
Discharge	23.00	cfs



APPENDIX F
(FEMA Zone AH Volume Calculations-Compensatory Volume)

FEMA ZONE AH COMPENSATORY VOLUME COMPARISION

Method	Volume		
	(CY)	(CF)	(Acre-ft)
Grid	9251	249,777	5.73
Composite	9804	264,708	6.08
End Area	9266	250,182	5.74
Prismoidal	9199	248,373	5.70
Top Area*			5.63
Average			5.78

* See Calculation Based on Range Statistics

Project: STPP0011-0 Fri March 05 13:59:57 2004

Site Volume Table: Unadjusted

Cut yards	Fill yards	Net yards	Method

Project: STPP0011-0 Fri March 05 13:59:57 2004

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Site: STPP0011-0

Stratum: volume 984 elev984 fema fp

8552	9251	699	(F) Grid
8633	9804	1171	(F) Composite
51500	9266	42234	(C) End area
51375	9199	42176	(C) Prismoidal

Project: STPP0011-0 Fri March 05 14:03:56 2004

Range Statistics

Range	Beg.	End.	Area	Percent
1	983.00	984.00	79892.67	41.4
2	982.00	983.00	79984.93	41.5
3	981.00	982.00	30736.80	15.9
4	980.00	981.00	2165.34	1.1
5	979.00	980.00	159.40	0.1

DAVID EVANS AND ASSOCIATES INC.

JN. STTP0011

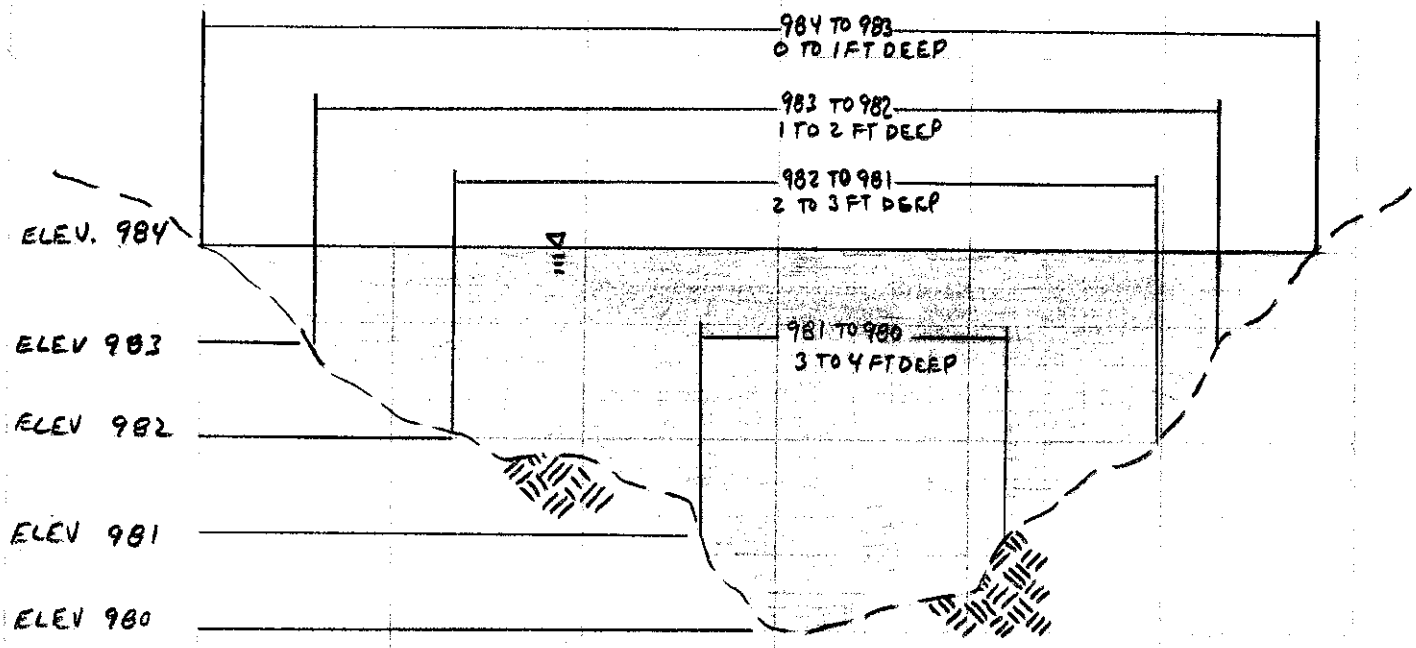
BY PAMO DATE 03/04/04

JOB DESCRIPTION DONATELA (A.K.A. BAKER DAIRY)

SHEET 1 OF 1 SHEETS

CALCULATION FOR ZONE AH - CROSS SECTION

CHECKED BY _____ DATE _____



SECTION OF FEMA ZONE AH
BASED ON AUTODESK LDD OUTPUT

EXISTING CONDITION ZONE AH VOLUME

COMPENSATORY ZONE AH VOLUME

Elevation	Area (ft^2)	Depth (ft)	Volume (ft^3)	Σ Volume (ft^3)
984	79,893	0.5	39,946	39,946
983	79,985	1.5	119,977	159,923
982	30,737	2.5	76,842	236,765
981	2,165	3.5	7,579	244,344
980	159	4.5	717	245,061
			Provided	**5.63** ac-ft

APPENDIX G
(Excerpts of Reports by Others)

PRELIMINARY DRAINAGE REPORT

For

BAKER DAIRY

PREPARED FOR:

Avondale 28 LLC

7637 E. Via Del Reposo

Scottsdale, AZ 85258

PREPARED BY:

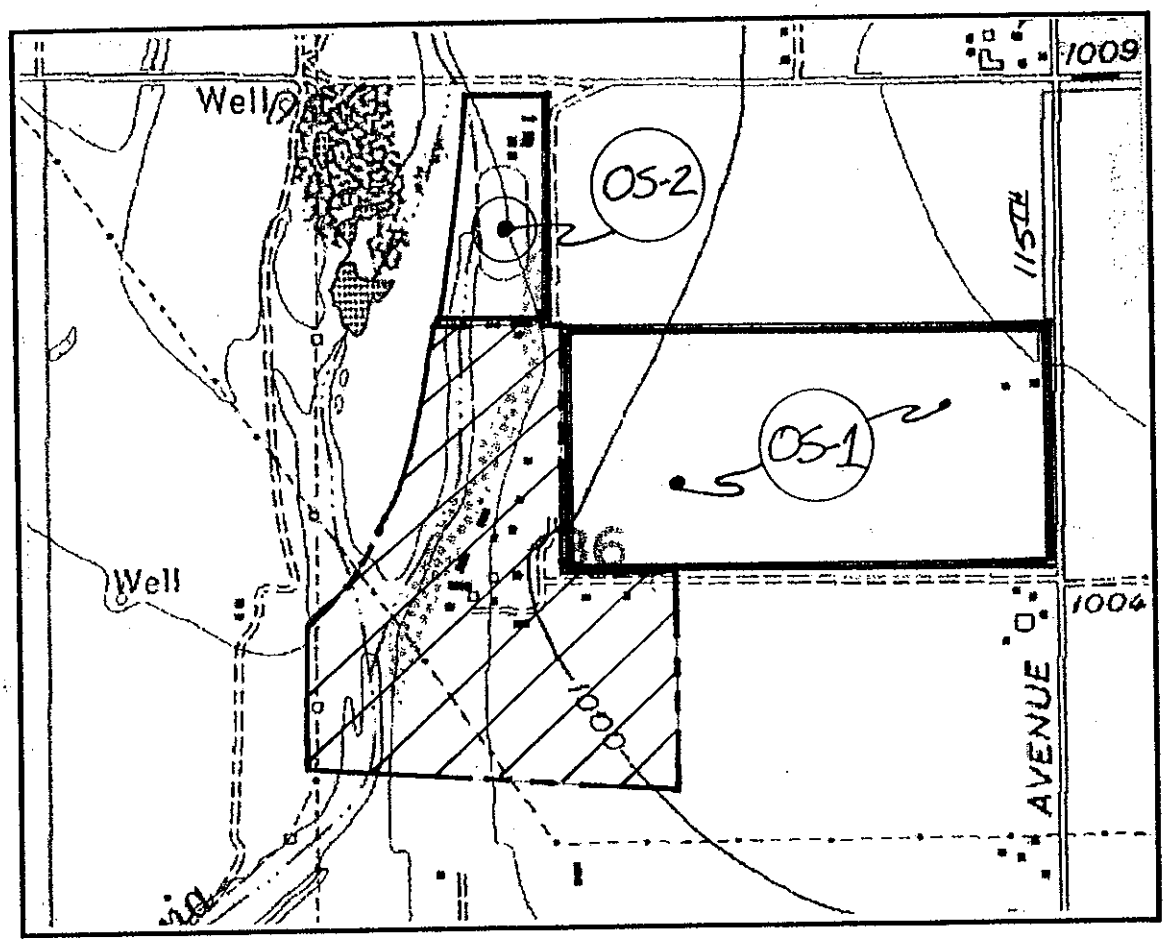
Roger E. Baele, PE, RLS

5447 E. Oakhurst Way

Scottsdale, AZ 85254

Exhibit A-2

OFFSITE DRAINAGE AREA MAP



RATIONAL METHOD SUMMARY OF DISCHARGES

DRAINAGE BASIN DESIGNATION	10-YR [cfs]	50-YR [cfs]	100-YR [cfs]
A-1	45	63	71
B-1	13	19	21
B-2	8	11	12
B-3	7	10	11
C-1	7	9	10
C-2	11	16	18
C-3	14	20	23
C-4	14	20	22
C-5	12	16	18
C-6	21	30	33
C-7	4	6	7
C-8	2	2	3
OS-1	54	74	84
OS-2	17	22	23

CITY OF AVONDALE

HYDROLOGIC DESIGN DATA RECORD
RATIONAL METHOD

LOCATION DATA

Project	Baker Dairy
Concentration Point	OS-1

DESIGN DATA

Drainage Area	80.00	Acres
Drainage Length	3300	Feet
Elevation		
Top of Drainage Area	1017	Feet
Bottom of Drainage Area	1000	Feet*
Drainage Area Slope	0.5	Percent
Velocity	2.0	Ft/Sec

DESIGN COMPUTATIONS

Runoff Coefficient	0.25	-
Time of Concentration, (Tc)	28	Minutes

* ***Note if outfall elevation is 1000.0, this is an assumed elevation subject to final grading plan.***

							Units
Frequency	2	5	10	25	50	100	*Years*
Rainfall Intensity			2.7		3.7	4.2	*Inch/hr*
Peak Discharge	0	0	54	0	74	84	*Ft^3/Sec*

CITY OF AVONDALE

HYDROLOGIC DESIGN DATA RECORD
RATIONAL METHOD

LOCATION DATA

Project	Baker Dairy
Concentration Point	OS-2

DESIGN DATA

Drainage Area	15.80	Acres
Drainage Length	1300	Feet
Elevation		
Top of Drainage Area	1007	Feet
Bottom of Drainage Area	1000	Feet*
Drainage Area Slope	0.5	Percent
Velocity	2.0	Ft/Sec

DESIGN COMPUTATIONS

Runoff Coefficient	0.25	-
Time of Concentration, (Tc)	11	Minutes

** Note if outfall elevation is 1000.0, this is an assumed elevation subject to final grading plan.*

							Units
Frequency	2	5	10	25	50	100	*Years*
Rainfall Intensity			4.3		5.5	5.7	*Inch/hr*
Peak Discharge	0	0	17	0	22	23	*Ft^3/Sec*

LEGEND

4A	DRAINAGE AREA DESIGNATION
	DRAINAGE AREA BOUNDARY LINE
	STORM DRAIN PIPE
	MATCHLINE TO NEXT SHEET
0.50%	FLOW DIRECTION/STREET SLOPE
45	LOT NUMBER
FF	FINISH FLOOR ELEVATION
P	PAD ELEVATION
CP4A	CONCENTRATION POINT
96.68	TOP OF CURB ELEVATION
Vp	RETENTION VOLUME PROVIDED
Vr	RETENTION VOLUME REQUIRED
HW	BASIN HIGH WATER ELEVATION
BTM	BASIN BOTTOM ELEVATION

0 30 60 120

SCALE: 1"=60'

DATE	REVISION	BY

DONATELLA II
EXHIBIT A
ON-SITE DRAINAGE MAP

SECTION: 36	TWNSHP: 2N	RANGE: 1W	
DESIGN BY: PMM 08/30/04 PAMO	DATE: 08/30/04		
CHECKED BY:	DRAWN BY: JOMA 8/30/04 PAMO		
JOB NO.: STPP0011	SHEET 1 OF 3		

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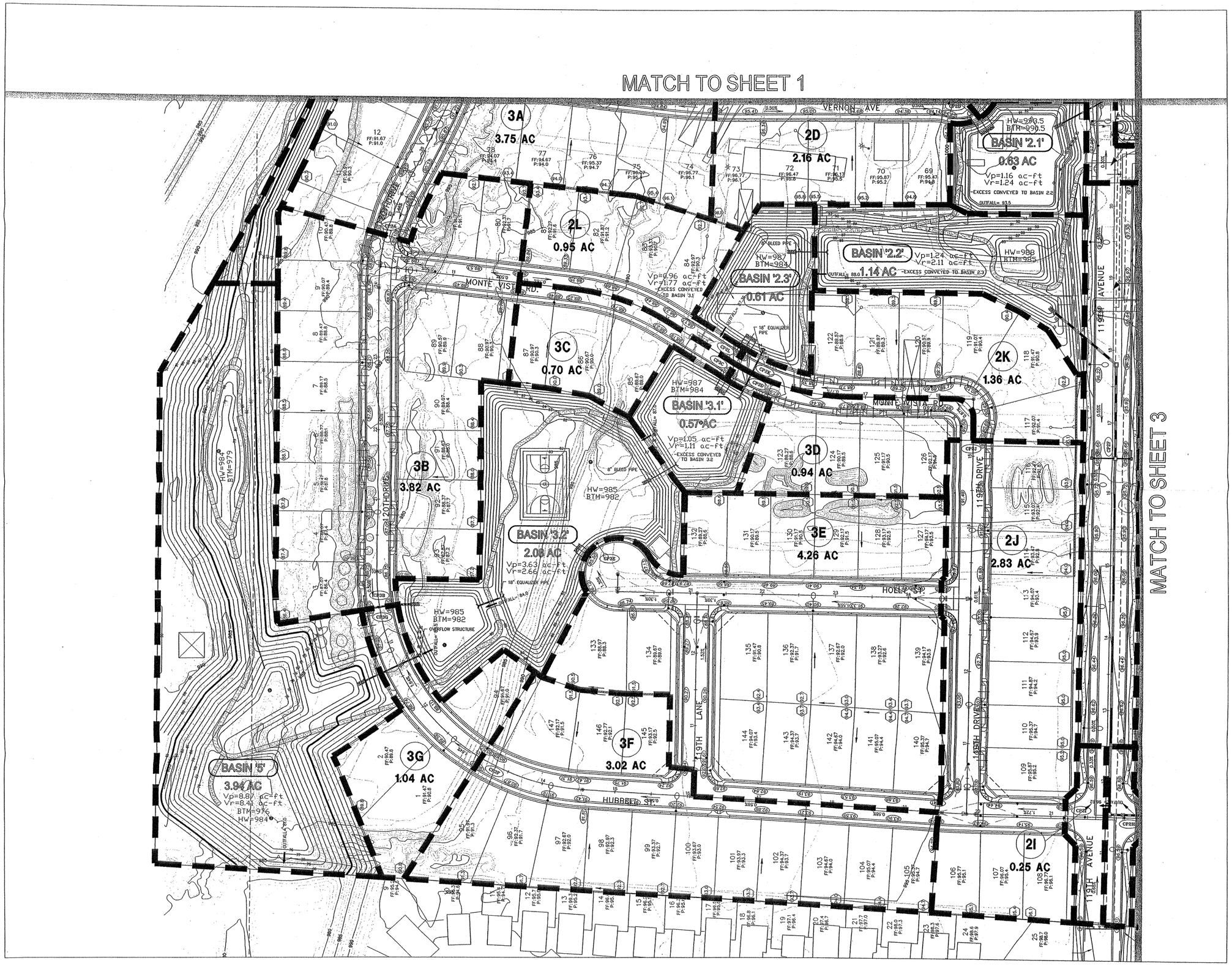

LEGEND

4A	DRAINAGE AREA DESIGNATION
	DRAINAGE AREA BOUNDARY LINE
	STORM DRAIN PIPE
	MATCHLINE TO NEXT SHEET
0.50%	FLOW DIRECTION/STREET SLOPE
45	LOT NUMBER
FF	FINISH FLOOR ELEVATION
P	PAD ELEVATION
CP4A	CONCENTRATION POINT
96.00	TOP OF CURB ELEVATION
Vp	RETENTION VOLUME PROVIDED
Vr	RETENTION VOLUME REQUIRED
HW	BASIN HIGH WATER ELEVATION
BTM	BASIN BOTTOM ELEVATION

0 30 60 120

SCALE: 1"=60'

DATE	REVISION	BY

DONATELLA II
EXHIBIT A
ON-SITE DRAINAGE MAP

SECTION: 36	TWNSHP: 2N	RANGE: 1W	
DESIGN BY: PAMD 08/30/04	DATE: 08/30/04		
CHECKED BY:	DRAWN BY: PAMD 8/30/04		
JOB NO.: STPP0011	SHEET 2 OF 3		

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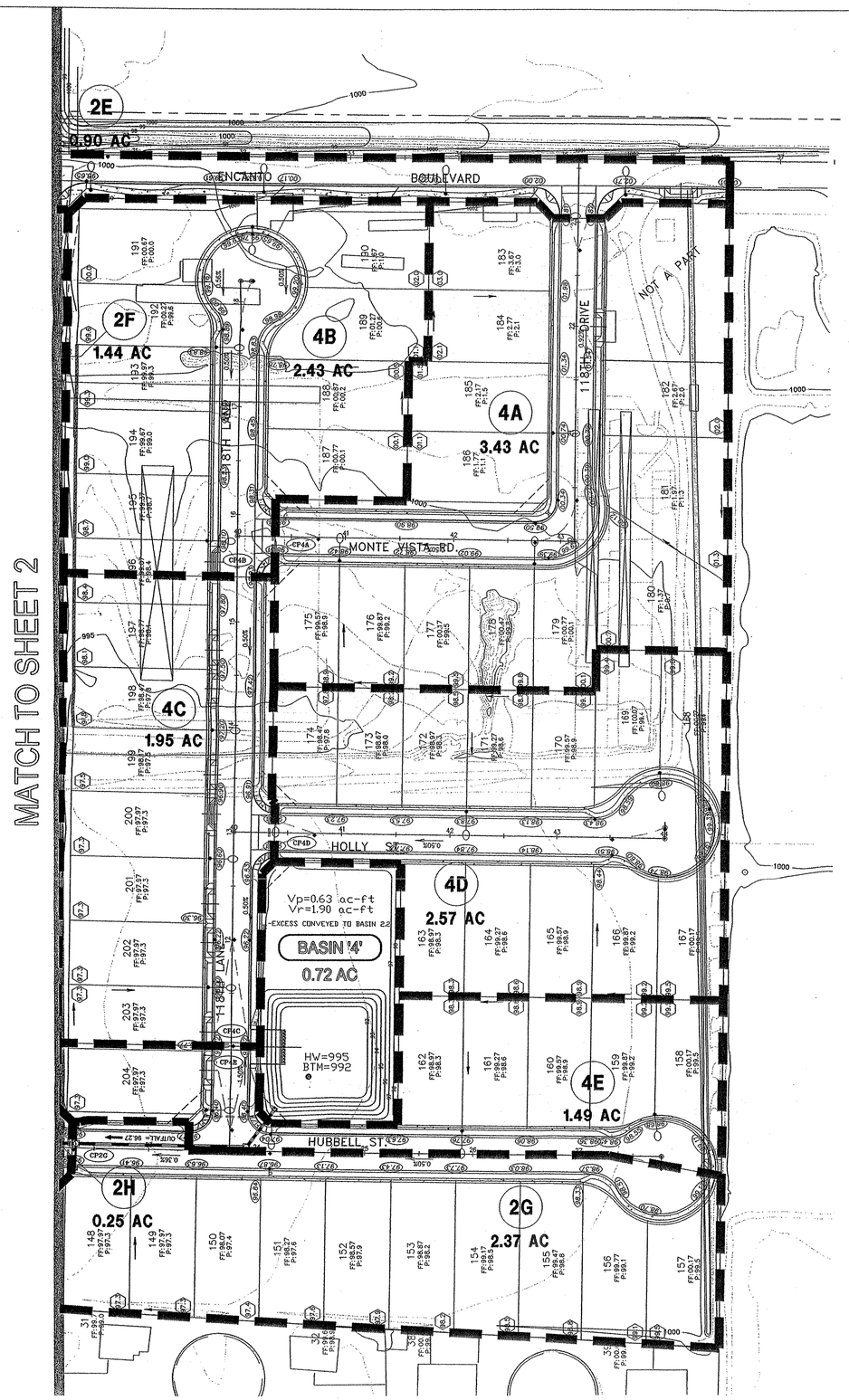

LEGEND

4A	DRAINAGE AREA DESIGNATION
	DRAINAGE AREA BOUNDARY LINE
	STORM DRAIN PIPE
	MATCHLINE TO NEXT SHEET
0.50%	FLOW DIRECTION/STREET SLOPE
45	LOT NUMBER
FF	FINISH FLOOR ELEVATION
P	PAD ELEVATION
CP4A	CONCENTRATION POINT
96.08	TOP OF CURB ELEVATION
Vp	RETENTION VOLUME PROVIDED
Vr	RETENTION VOLUME REQUIRED
HW	BASIN HIGH WATER ELEVATION
BTM	BASIN BOTTOM ELEVATION

0 30 60 120

SCALE: 1"=60'

DATE	REVISION	BY

DONATELLA II
EXHIBIT A
ON-SITE DRAINAGE MAP

SECTION: 36	TWNSHP: 2N	RANGE: 1W	
DESIGN BY: PAMD 08/30/04	DATE: 08/30/04		
CHECKED BY:	DRAWN BY: JOMA 8/30/04 PAMD		
JOB NO.: STPP0011	SHEET 3 OF 3		

N:\S\STPP0000-0011\STPP0011-01\dwg\Hy\STPP0011-OHyEm-A03.dwg joma Aug 30, 2004 2:17:36pm

LEGEND

SITE BOUNDARY

ZONE AH PONDING ELEVATIONS

- ELEV 984 TO 983
- ELEV 983 TO 982
- ELEV 982 TO 981
- ELEV 981 TO 980
- ELEV 980 TO 979

0 50 100 200

SCALE: 1"=100'

CALL TWO WORKING DAYS BEFORE YOU DIG
602 263-1100
BLUE STAKE CENTER

DATE	REVISION	BY

DAVID EVANS AND ASSOCIATES INC.
2141 E. Highland Avenue, Suite 200
Phoenix Arizona 85016
Phone: 602.678.5151

EXHIBIT B
MAY 1999 AERIAL TOPO MAPPING WITH FEMA ZONE AH LIMITS

DONATELA
AVONDALE, ARIZONA

SECTION: 36	TWNSHP: 2N	RANGE: 1W	
DESIGN BY: PAMD		DATE: 03/2004	
CHECKED BY:		DRAWN BY:	
JOB NO.: STPP0000-0011		SHEET 1 OF 1	

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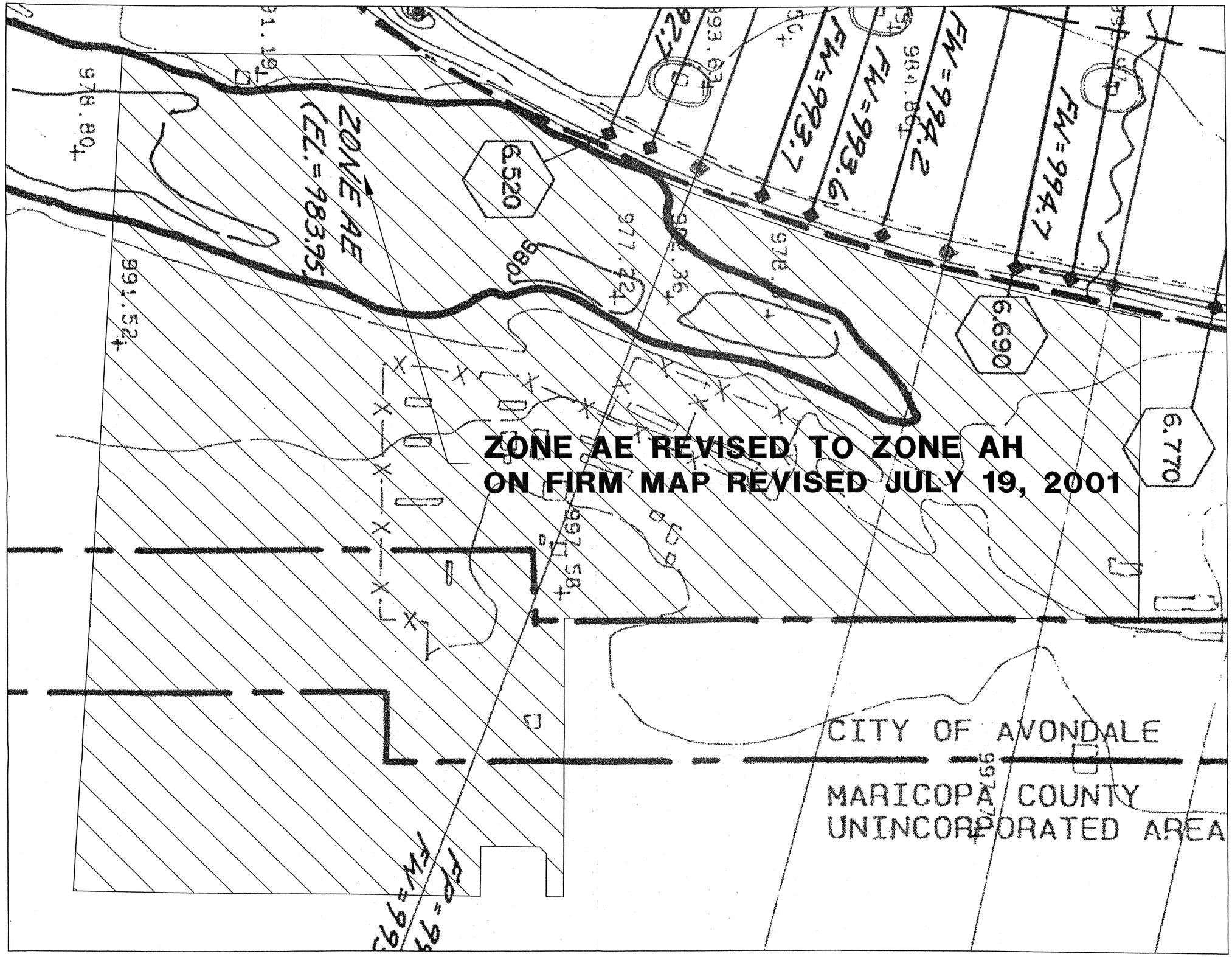

LEGEND

SITE BOUNDARY

0 50 100 200

SCALE: 1"=100'

CALL TWO WORKING DAYS BEFORE YOU DIG
602 263-1100
BLUE STAKE CENTER

DATE	REVISION	BY

DAVID EVANS AND ASSOCIATES INC.
2141 E. Highland Avenue, Suite 200
Phoenix Arizona 85016
Phone: 602.678.5151

EXHIBIT D
FEMA WORK MAP AND SITE WITH FEMA ZONE AH LIMITS

DONATELA
AVONDALE, ARIZONA

SECTION: 36	TWNSHP: 2N	RANGE: 1W
DESIGN BY: PAMD	DATE: 03/2004	
CHECKED BY:	DRAWN BY:	
JOB NO.: STPP0000-0011	SHEET 1 OF 1	

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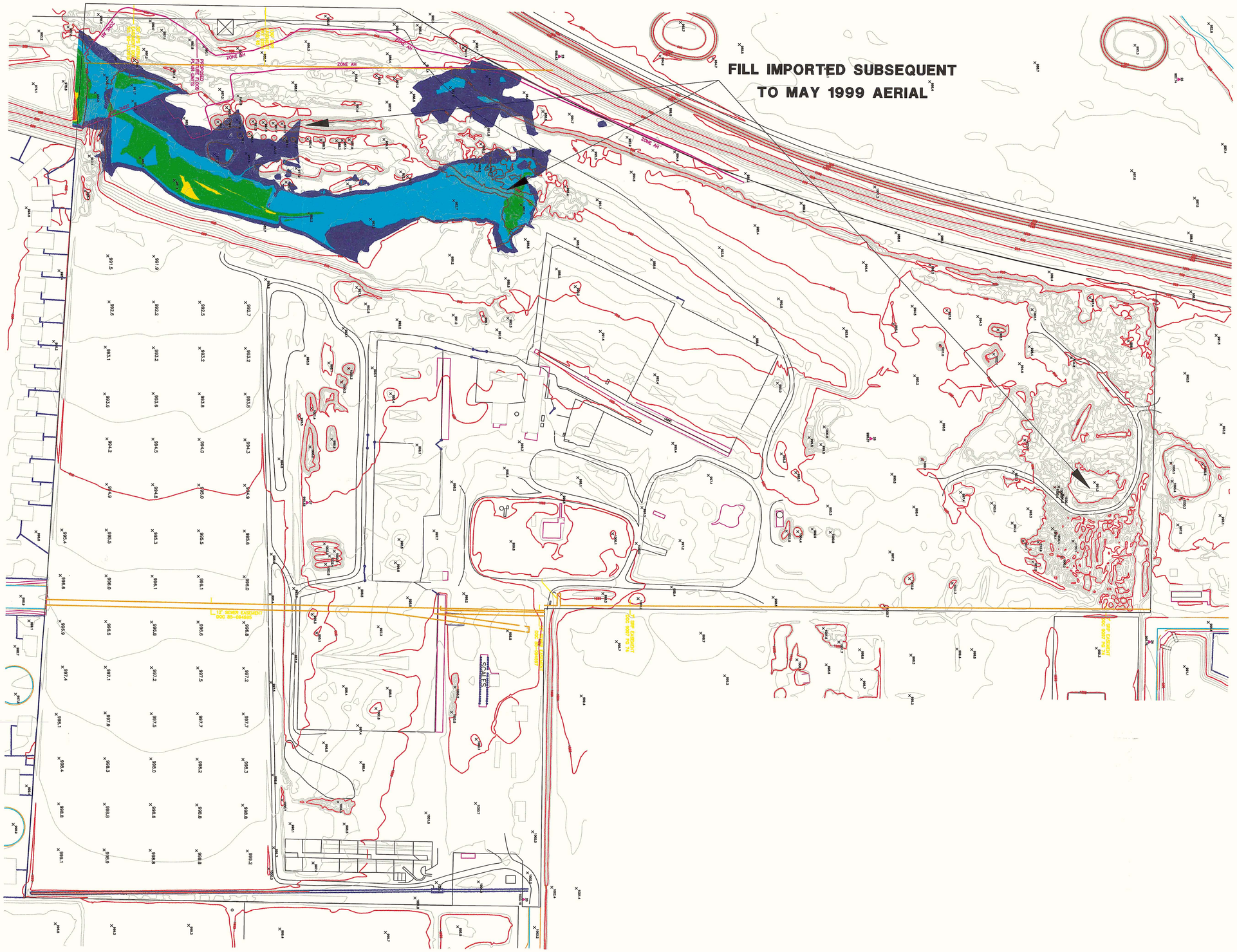

LEGEND

SITE BOUNDARY

ZONE AH PONDING ELEVATIONS

- ELEV 984 TO 983
- ELEV 983 TO 982
- ELEV 982 TO 981
- ELEV 981 TO 980
- ELEV 980 TO 979

NOTE: ZONE AH PONDING ELEVATIONS SHOWN BASED ON MAY 1999 AERIAL TOPO MAPPING

0 50 100 200

SCALE: 1"=100'

CALL TWO WORKING DAYS BEFORE YOU DIG
602 263-1100
BLUE STAKE CENTER

DATE	REVISION	BY

DAVID EVANS AND ASSOCIATES INC.
2141 E. Highland Avenue, Suite 200
Phoenix Arizona 85016
Phone: 602.678.5151

EXHIBIT C
SEPT 2003 AERIAL TOPO MAPPING WITH FEMA ZONE AH LIMITS

DONATELA
AVONDALE, ARIZONA

SECTION: 36	TWNSHP: 2N	RANGE: 1W	
DESIGN BY: PAMD	DATE: 03/2004		
CHECKED BY:	DRAWN BY:		
JOB NO.: STPP0000-0011	SHEET 1 OF 1		

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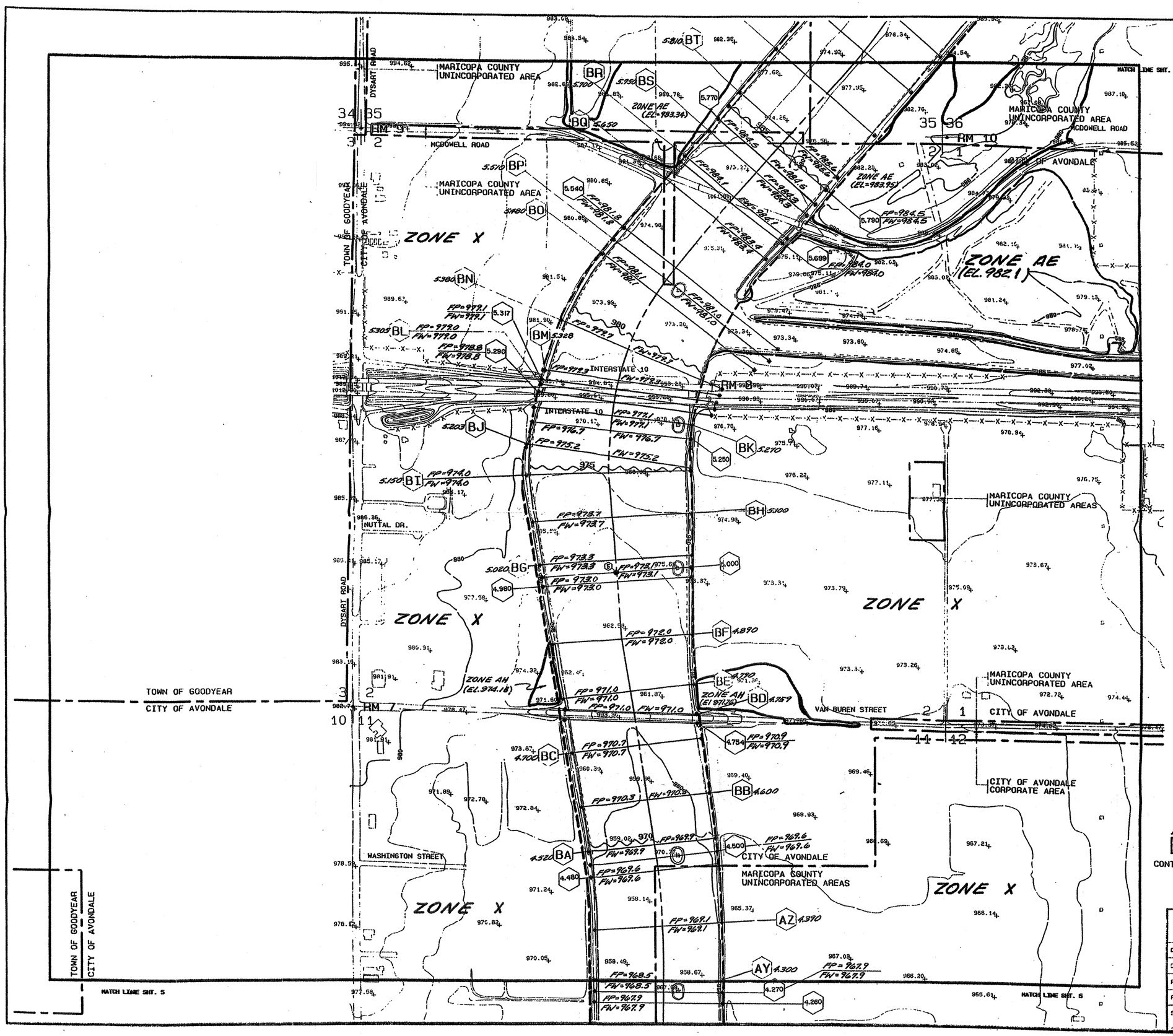

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT.NGVD)	DESCRIPTION OF LOCATION
RM 7	982.19	1/8" REBAR IN HANDHOLE AT THE INTERSECTION OF VAN BUREN STREET & DYSART ROAD.
RM 8	994.71	A.D.O.T. BRASS CAP @ N.E.CORNER OF INTERSTATE HIGHWAY 10 BRIDGE OVER THE AGUA FRIA RIVER.
RM 9	993.98	BRASS CAP IN HANDHOLE AT THE INTERSECTION OF MCDOWELL & DYSART ROADS.
RM 10	979.21	5/8" REBAR FLUSH WITH PAVEMENT AT THE INTERSECTION OF MCDOWELL & EL MIRAGE ROADS.

FLOOD HAZARD ZONE X DELINEATED FROM FLOOD INSURANCE RATE MAPS
EFFECTIVE DATE: APRIL 15, 1988

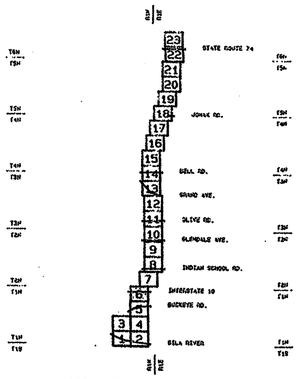

PLATE INDEX

LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- THALWEG(STA.100+00) #=RIVER MILE
- FP=100 YR. WSEL FW=FLOODWAY WSEL — CROSS SECTION ◆=END OF CODING
- ZONE BOUNDARY
- CORPORATE LIMITS
- BASE FLOOD ELEVS.

NOTES:

MAP BASED ON 1"=400' TOPOGRAPHIC MAPPING PREPARED BY COOPER AERIAL SURVEY COMPANY FROM PHOTOGRAPHS TAKEN IN MAY, 1987. CONTRACT NO. C.A.S. 870526

ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

SCALE: 1" = 400'

CONTOUR INTERVAL 4 FEET

FLOOD INSURANCE STUDY
WORK MAP
MARICOPA COUNTY, ARIZONA

15677 ROBERT E. BAELE 2-6-89 ARIZONA, U.S.A.

Jerry R. Jones & Associates, Inc.
ANCHOR CENTRE 2
2207 E. CAMELBACK RD., SUITE 302
PHOENIX, AZ., 85016 (602) 956-9850

AGUA FRIA RIVER FLOOD INSURANCE STUDY
JOB NO. 286-080.01

	BY	DATE
DESIGN	M.R.JOH / R.MILLER	1-89
DESIGN CHK.	R.BAELE	1-29-89
PLANS	T.PATTERSON	1-89
	C.SWEEZO	
PLANS CHK.	R.MILLER / R.BAELE	2-3-89
SUBMITTED BY: R. Baele	DATE: 2-6-89	

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: R.R. Johnson DATE: 1-1-90
APPROVED BY: R.E. Fogarnes DATE: 9-1-90
CHIEF ENGINEER AND GENERAL MANAGER

SHEET 6 OF 23

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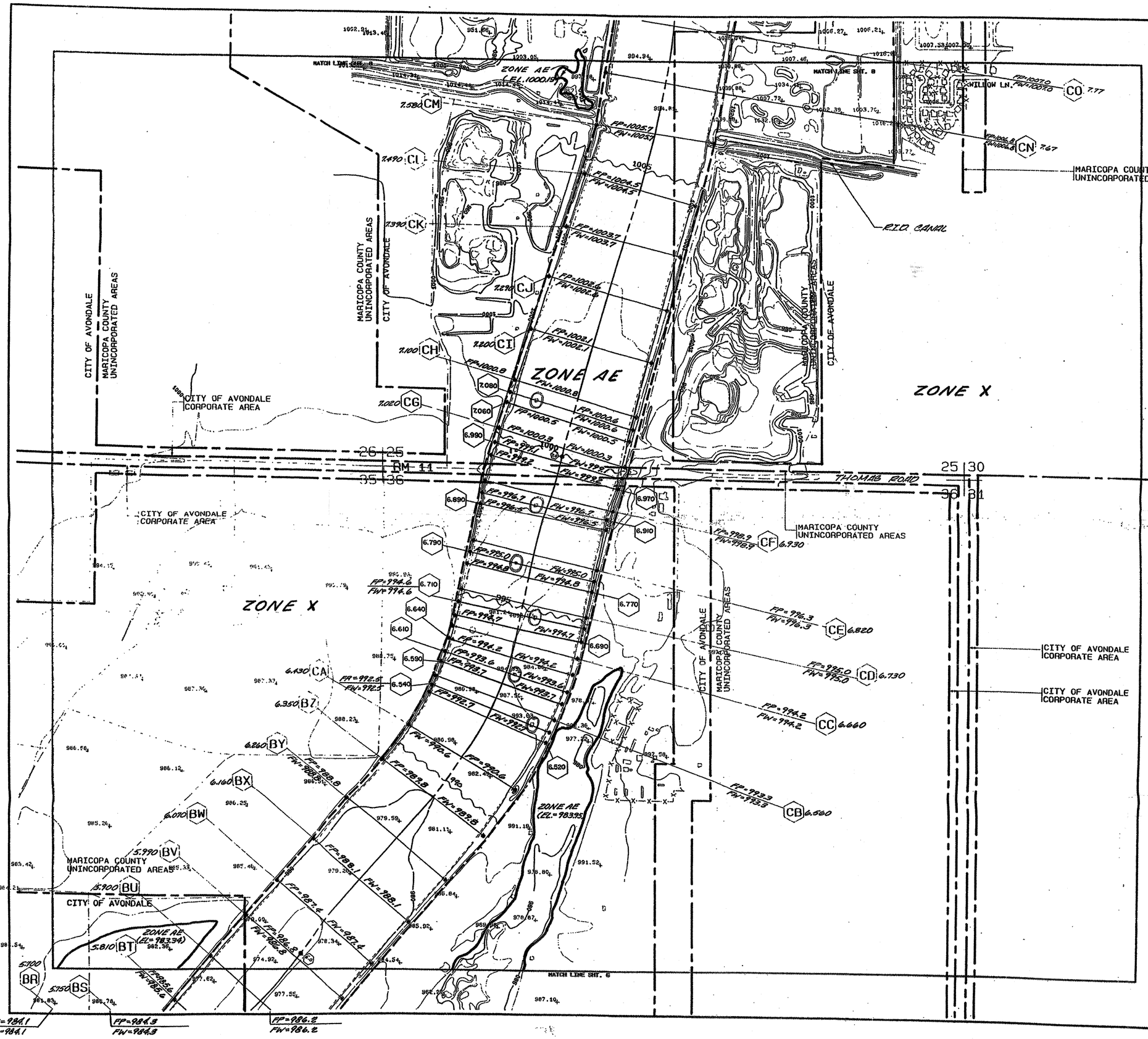

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT.NGVD)	DESCRIPTION OF LOCATION
RM 11	995.24	A 1/2" INCH PIN AT THE INTERSECTION OF THOMAS & EL MIRAGE ROADS.

FLOOD HAZARD ZONE X DELINEATED FROM FLOOD INSURANCE RATE MAPS
EFFECTIVE DATE: APRIL 15, 1988

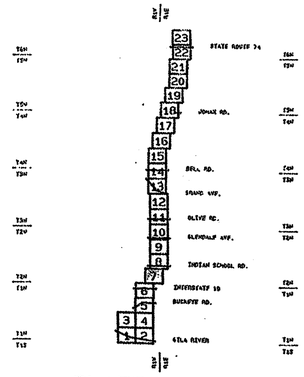

PLATE INDEX

LEGEND

- 100-YEAR FLOOD LIMITS
- FLOODWAY LIMITS
- THALWEG(STA.100+00) #=RIVER MILE
- FP=100 YR. WSEL FW=FLOODWAY WSEL — CROSS SECTION ◆=END OF CODING
- ZONE BOUNDARY
- CORPORATE LIMITS
- NOTES: BASE FLOOD ELEVS.

MAP BASED ON 1"=400' TOPOGRAPHIC MAPPING PREPARED BY COOPER AERIAL SURVEY COMPANY FROM PHOTOGRAPHS TAKEN IN MAY, 1987. CONTRACT NO. C.A.S. 870526

ELEVATIONS BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

FLOOD INSURANCE STUDY
WORK MAP
MARICOPA COUNTY, ARIZONA

SCALE: 1"= 400'

CONTOUR INTERVAL 4 FEET

16677 ROGER E. BAELE ARIZONA, U.S.A.

Jerry R. Jones & Associates, Inc.
ANCHOR CENTRE 2
2207 E.CAMELBACK RD., SUITE 302
PHOENIX, AZ., 85016 (602) 956-9850

AGUA FRIA RIVER FLOOD INSURANCE STUDY
JOB NO. 286-080.01

	BY	DATE
DESIGN	M.PIZK R.MILLER	1-89
DESIGN CHK.	R.BAELE	1-29-89
PLANS	T.PATTERSON C.SWEEZO	1-89
PLANS CHK.	R.MILLER R.BAELE	2-3-89
SUBMITTED BY: K.Baele		DATE: 2-6-89

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: R.R. Johnson DATE: 4/2/89
APPROVED BY: [illegible] DATE: 4-3-89
CHIEF ENGINEER AND GENERAL MANAGER

SHEET 7 OF 23

MP# TOPO SHT. 7 - 2600 [0, 45] PF: 608000 1207 03-Nov-88 08:39 AM / 86080.00-3