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DRAINAGE REPORT
FOR
SCOTTSDALE ROAD
FROM
McDOWELL ROAD TO OSBORN ROAD

Registered Professional Engineer (Civil)
CERTIFICATE NO.
6317
CARL E.
SNYDER
Date Signed 10-3-85
ARIZONA, U.S.A.

Prepared by

ELLIS-MURPHY, INC.
Scottsdale, Arizona

October 1985

HYDROLOGY REPORT
SCOTTSDALE ROAD DRAINAGE
CITY OF SCOTTSDALE

Purpose

This report and accompanying exhibits have been prepared to present an analysis of storm water runoff tributary to the west side of Scottsdale Road between McDowell Road and Osborn Road.

Area

This report covers the drainage areas which contribute runoff along the west side of Scottsdale Road between Osborn and McDowell Road intersections. The report area is generally bounded on the north by Osborn Road, on the east by the monument line of Scottsdale Road, on the south by McDowell Road, and on the west by the Arizona cross cut canal.

Discussion

Surface drainage in the report area generally flows in an east-southeast direction to Scottsdale Road.

The crown line of Osborn Road acts as a barrier to prevent any off site flows from entering the report area. The crown lines of Thomas Road and Oak Street through the project area also act as a barrier to flows entering from the north along these streets. These flows are directed eastward across Scottsdale Road and out of the project area.

Drainage area boundaries were established from field observation. All of the contributing areas are generally fully developed. Drainage area boundaries, designations and concentration points are as indicated on Exhibit B (included with this report). Runoff computations, hydrographs, street section computations, and summary tables are also included with this report.

Runoff was computed by use of the rational method, utilizing Arizona Department of Transportation Hydrologic Design Data Sheets. Each area was evaluated for the 10, 25, and 100 year storm frequencies.

The computations for Scottsdale Road sections indicate that the future half street section will carry at curb depth 8.0 CFS (Osborn to Thomas), 3.5 CFS (Thomas to Oak), and 5.6 CFS (Oak to McDowell).

The computations indicate that it is evident the street sections will not carry any significant flows to the top of curb level.

Analysis

SCOTTSDALE ROAD DRAINAGE

1. Osborn to Earll

Since all flows from north of Osborn Road are diverted to the east, no appreciable runoff along Scottsdale Road will occur in this sector. A section with a cross slope = 0.020 and 6" vertical curb will accommodate 10-year flows expected through this portion. One-hundred year flows will extend the conveyance area to right-of-way limits assumed to be 55 feet. An approximate lane width of 11 feet will remain dry during the 100-year storm event.

2. Earll to Thomas

At Earll Drive, runoff from Area K enters (Q_{10} = 87.6 CFS and Q_{100} = 145.9 CFS). A portion of the runoff is collected at this location by the 90-inch trunk storm sewer in Scottsdale Road. It is difficult to determine what capacity is available in the trunk for this runoff. Total capacity of the sewer is calculated to be 432 CFS.

It is reasonable to assume that 15% of total capacity is available or 65 CFS. Resultant 10-year runoff along Scottsdale Road becomes 87.6 CFS - 65 CFS = 22.6 CFS. Thusly, 100-year runoff becomes 145.9 - 65.0 = 80.9 CFS. A section with cross slope = 0.025 and depth of flow of approximately 2 inches above the 6"-vert curb will accommodate 10-year flows. One-hundred year flow will be contained in this section to the assumed 55 feet right-of-way limit.

Runoff along the north side of Thomas Road continues eastwardly across Scottsdale Road. This flow is derived from Drainage Areas G thru M and is the resultant of all runoff not collected by present trunk sewer systems. Combined runoff from Areas I, J, L, & M during the 100-year event is 335.3 CFS. These areas are served by the Avalon Road trunk sewer (capacity approximately 120 CFS) and thus resultant Q_{100} from these areas becomes 335.3 - 120 = 215 CFS. Combining this flow with Drainage Area H and G flow, the resultant Q_{100} = 417 CFS at the Thomas Road intersection. Here the flow is further reduced by inlets to the interceptor sewer to Indian Bend Wash. It is assumed the net runoff from the 100-year event is contained along the north side of Thomas eastward to the wash.

3. Thomas to Oak

Runoff from Drainage Area D entering at Virginia Avenue, produces flow along Scottsdale Road. This portion of road has a longitudinal slope of 0.0007 ft per ft.

Q_{10} and Q_{100} runoff is 75.1 and 162.9 CFS, respectively.

Capacity of the road in this sector was computed to be 42.6 CFS, considering a total conveyance area to the assumed 55 ft right-of-way limit. A section of

road with S_c = 0.020 will accommodate the expected 10-year flow along the road from Thomas Road to Virginia Avenue at a depth of approximately 1 inch above the curb. The section will also accommodate expected 100-year flows, utilizing total conveyance to the assumed 55 ft right-of-way limit. The 12' lane will be converted to an average depth of 1-1/2".

None of the proposed road sections can contain the magnitude of runoff computed for the sector from Virginia Avenue to Oak Street. A road section of S_c = 0.030 will carry a total of 42.6 CFS to the assumed 55 ft right-of-way limit. Considerably more capacity must be developed to meet Q_{10} and Q_{100} runoff. Q_{10} runoff will be accommodated in the section at a depth of approximately 10 inches above the curb. At this depth, flow will spread to other areas outside the right-of-way limits. If it is desired to reduce the runoff at Virginia Avenue, a suitable lateral trunk sewer could be installed. This sewer could be located along the west side of Scottsdale Road from Virginia Avenue to Oak Street. This sewer would connect to a twin 42-inch sewer in Oak Street and thus direct the runoff eastward to Indian Bend Wash.

Runoff from Area C is concentrated at the Oak Street and 70th Street intersection. Flow is collected at this point by a 36-inch trunk sewer located in Oak Street, where it is then directed eastward along Oak Street. Flows from Area C not carried by the sewer proceed eastward along the north side of Oak Street across Scottsdale Road toward the wash.

Combined runoff from Areas F and E-1 concentrates along the south side of Thomas Road at the intersection with Scottsdale Road. The combined Q_{10} was computed to be 61.2 CFS. This flow may be diverted by means of a new storm drain connecting to the interceptor sewer on the north side of Thomas Road, and thus minimize flow southward along Scottsdale Road.

4. Oak to McDowell

Runoff from Drainage Area B entering at Palm Lane, produces flow along Scottsdale Road in this sector. The crown surface of the road slopes at 0.0018 ft per ft.

A road section with a cross slope of 0.020 can accommodate the 10-year storm runoff at the top of curb level along the portion of road from Oak Street to Palm Lane. One-hundred year flows will extend the conveyance area of the section to the assumed 55 ft right-of-way limit. An approximate lane width of 11 feet will remain dry during the 100-year storm event.

Q_{10} and Q_{100} runoff from Area B was computed to be 72.2 CFS and 120.3 CFS, respectively.

An existing 36-inch storm sewer extending along the west side of Scottsdale Road from Palm Lane to McDowell Road could collect some of this runoff if there is available capacity.

No Discussion of Area B-1

It has been determined that a 54-inch trunk sewer will be installed along the north side of McDowell eastward from the intersection of Scottsdale Road, extending around intersection on the east side. Reported capacity of this sewer is 174 CFS. Flow along Scottsdale Road from the runoff of Area B could be minimized by intercepting this flow to a trunk sewer along the east side of Scottsdale Road.

A road section with S_c = 0.020 and 6" curb would then be sufficient to carry any remaining flows.

Runoff from Area A (Q_{10} = 68.6 CFS and Q_{100} = 114.3 CFS) enters at the northwest corner of the Scottsdale Road and McDowell Road intersection. This flow continues east along the north side of McDowell Road, and therefore becomes no factor in evaluating drainage along Scottsdale Road.

Conclusions and Recommendations

As a direct result from this report, it is concluded that:

1. Osborn Road, Thomas Road, and Oak Street serve as barriers to flows from major storms and thus prevent runoff from accumulating along the west side of Scottsdale Road south from Osborn Road to McDowell Road.

2. The existing storm drain systems in the project area do effectively mitigate runoff to the westside of Scottsdale Road.

3. The typical half-street section for Scottsdale Road can accommodate the computed runoff and meet city criteria if drainage improvements are provided.

It is further recommended that:

Scottsdale Road pavement sections be utilized as follows:

1. Osborn to Earll

Half-street section be installed with vertical curb and gutter and S_c = 0.020. Section will provide sufficient capacity for the 10-year storm and will provide an 11-ft dry lane width for the 100-year storm.

2. Earll to Thomas

Half-street section be installed with vertical curb and gutter and S_c = 0.025. The 10 and 100-year storms will flow approximately two inches above the curb. The 12-ft lane width during the 100-year event will be flooded at an average depth of approximately 2-1/2 inches.

3. Thomas to Virginia

Half-street section be installed with vertical curb and gutter and S_c = 0.020. Section to a depth of approximately 1 inch above the curb will carry 10-year storm flow. During 100-year storms, a 12-ft lane will be covered to an average depth of 1-1/2 inches.

4. Virginia to Oak

Lateral trunk sewer be installed on west side of Scottsdale Road from Virginia Avenue to Oak Street to intercept runoff from Area D at Virginia Avenue. This sewer will enable a half-street section with S_c = 0.020 to accommodate 10 year storm flows at reasonable depths.

A new storm drain be installed at the Thomas Road intersection to intercept runoff at concentration point E-1. This drain to connect to interceptor on north side of Thomas Road.

5. Oak to Palm Lane

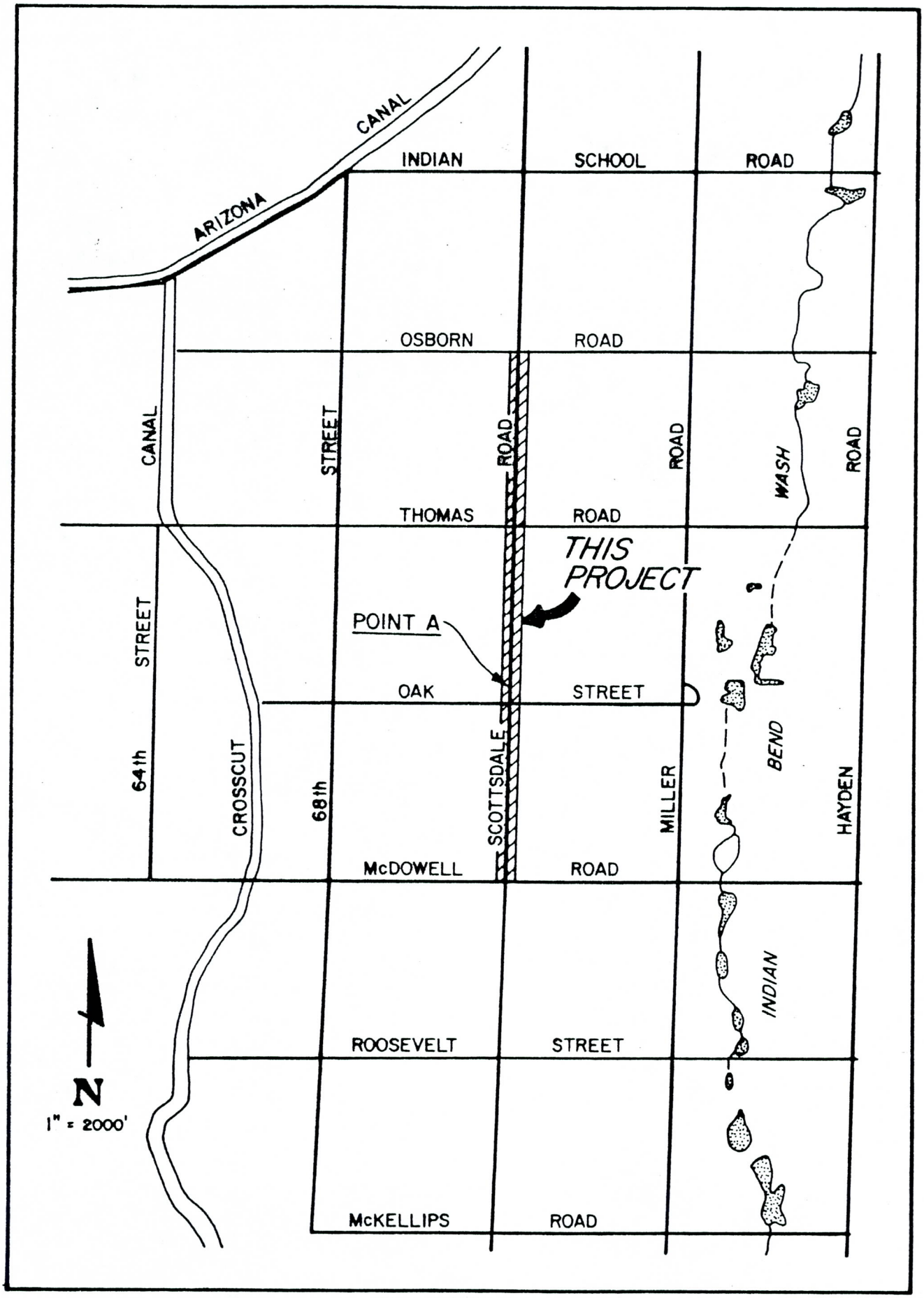
Half-street section with S_c = 0.020 and vertical curb and gutter be installed. This section will accommodate 10-year storm flows. An 11-ft lane width will remain dry for the 100-year event.

6. Palm Lane to McDowell

Trunk sewer be installed on east side of Scottsdale Road connecting to a 54-inch trunk to be installed along north side of McDowell Road.

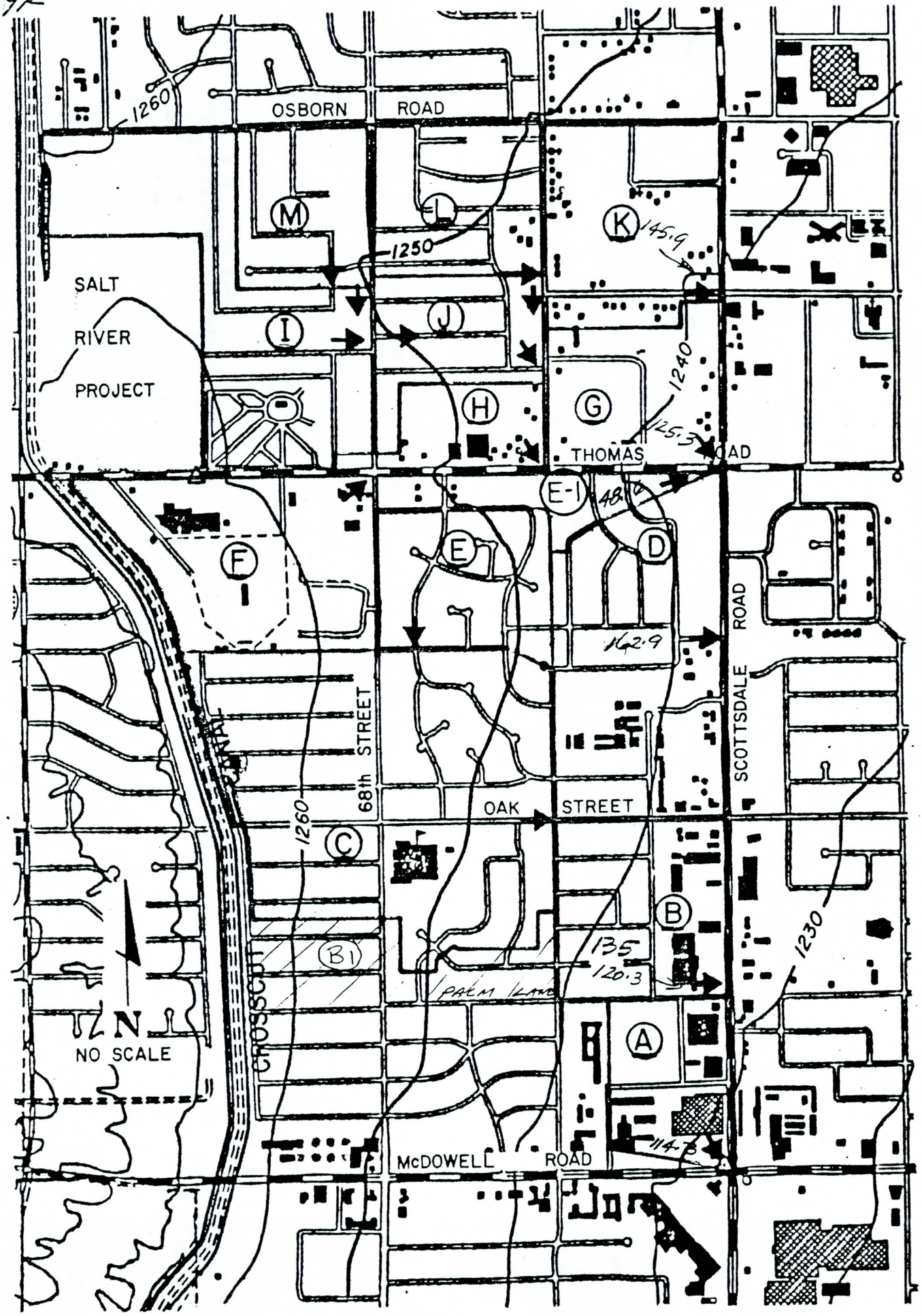
With above sewer in place, a half-street section with S_c = 0.020 and vertical curb and gutter be installed to accommodate 10-year storm flows. An 11-ft land width will remain dry for the 100-year storm flows.

EXHIBIT A



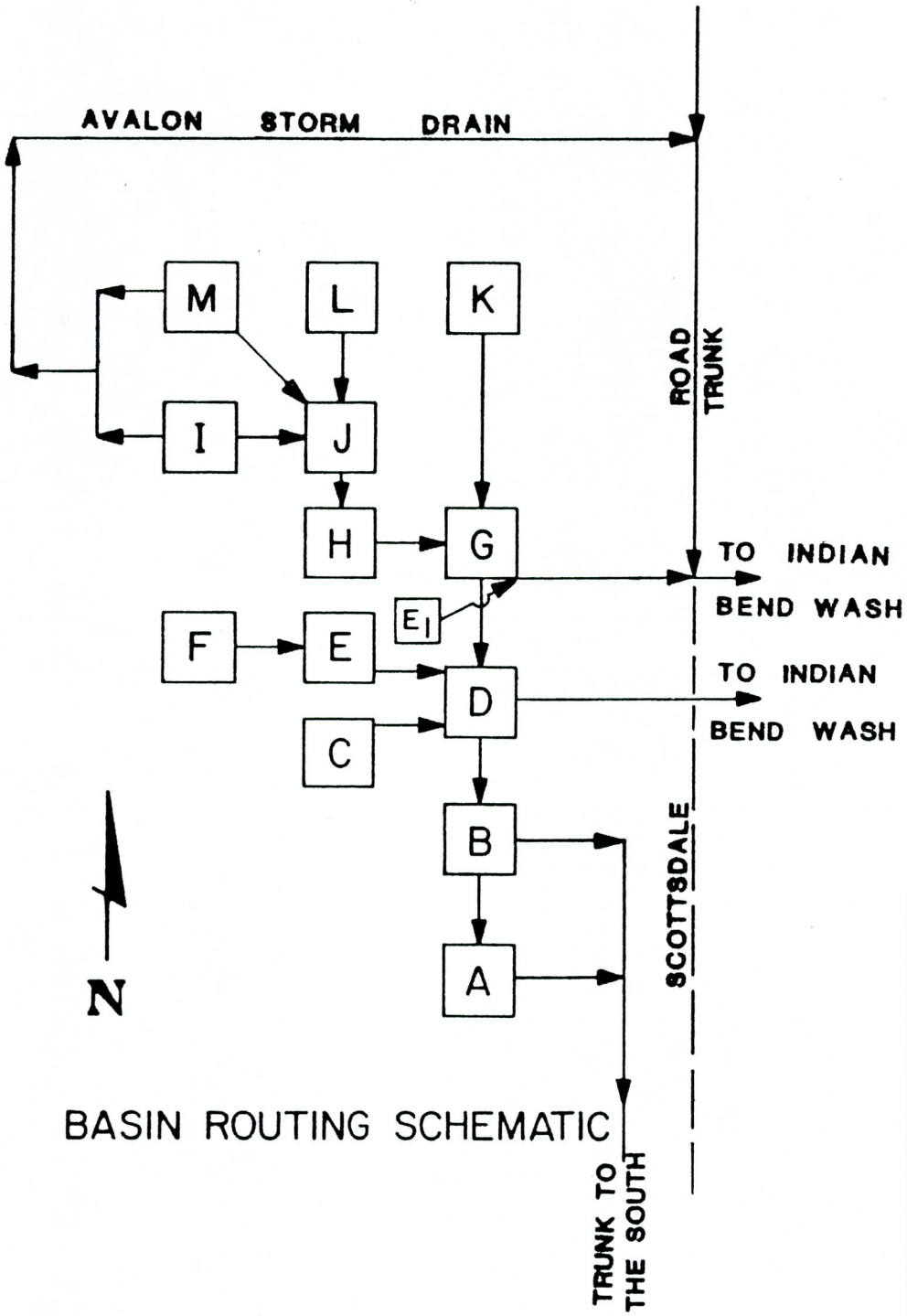
TO ACCOMPANY REPORT BY ELLIS-MURPHY OCT, 1985

EXHIBIT B



TO ACCOMPANY REPORT BY ELLIS-MURPHY MAY, 1985

EXHIBIT C



BASIN ROUTING SCHEMATIC

TO ACCOMPANY REPORT BY ELLIS-MURPHY OCT, 1985

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD. County _____
Location AREA A
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	29.4	acres
	A_2		acres
	A_3		acres
Drainage Length		2400	feet
Elevation			
Top of Drainage Area		1243	feet
At Structure		1229	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.6	inches
Time of Concentration	Tc	23	minutes
Rainfall Intensity	i	2.88 3.62 4.80	inches/hour
Runoff Coefficient	C_1	COMMERCIAL 0.80	
	C_2	STREETS 0.95	
	C_3		
Weighted Runoff Coefficient	C	0.81	
Peak Discharge Qp = CiA =		68.6 86.2 114.3	cfs

Computed by CEJ Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA B
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

AREA B-

Design Frequency		10 25 100	years	100 YR.
Drainage Area	A_1	40.7	acres	24
	A_2		acres	
	A_3		acres	
Drainage Length		2600	feet	4400
Elevation				
Top of Drainage Area		1244	feet	
At Structure		1231	feet	
Drainage Area Slope			%	
Precipitation				
P = 6-hour			inches	
P = 24-hour			inches	

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches	WHY SO LONG (2.60
Time of Concentration	Tc	26	minutes	73 MIN
Rainfall Intensity	i	2.70 3.39 4.50	inches/hour	4.50
Runoff Coefficient	C_1	COMMERCIAL 0.80		WHY SO (LOW
	C_2	RES. 0.50		
	C_3	STREET 0.95		
Weighted Runoff Coefficient	C	0.66		0.45
Peak Discharge Qp = CiA =		72.2 90.6 120.3	cfs	48 C

Computed by CES Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA C & C-1
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	93.6	acres
	A_2		acres
	A_3		acres
Drainage Length		3848	feet
Elevation			
Top of Drainage Area		1268	feet
At Structure		1244	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches
Time of Concentration	Tc	32	minutes
Rainfall Intensity	i	2.40 3.02 4.00	inches/hour
Runoff Coefficient	C_1	SCHOOL 0	
	C_2	STREET 0.95	
	C_3	RES 0.50	
Weighted Runoff Coefficient	C	0.54	
Peak Discharge Qp = CiA =		120.7 151.9 201.2	cfs

Computed by CEJ Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA D
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	70.9	acres
	A_2		acres
	A_3		acres
Drainage Length		4100	feet
Elevation			
Top of Drainage Area		1248	feet
At Structure		1234	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches
Time of Concentration	Tc	42	minutes
Rainfall Intensity	i	2.06 2.59 3.43	inches/hour
Runoff Coefficient	C_1	RES 0.50 STREET 0.95	
	C_2	COM. 0.80	
	C_3		
Weighted Runoff Coefficient	C	0.67	
Peak Discharge Qp = CiA =		97.9 123.0 162.9	cfs

Computed by CES Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA E
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	31.0	acres
	A_2		acres
	A_3		acres
Drainage Length			feet
Elevation			
Top of Drainage Area		1252	feet
At Structure		1236	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches
Time of Concentration	Tc	16	minutes
Rainfall Intensity	i	3.45 4.34 5.75	inches/hour
Runoff Coefficient	C_1	RES 0.50 STREET 0.95	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.59	
Peak Discharge Qp = CiA =		63.1 79.4 105.2	cfs

Computed by CEJ Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA E-1
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	17.5	acres
	A_2		acres
	A_3		acres
Drainage Length		2589	feet
Elevation			
Top of Drainage Area		1252	feet
At Structure		1236	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches
Time of Concentration	Tc	24	minutes
Rainfall Intensity	i	2.83 3.55 4.71	inches/hour
Runoff Coefficient	C_1	RES 0.50	
	C_2	STREET 0.95	
	C_3		
Weighted Runoff Coefficient	C	0.59	
Peak Discharge Qp = CiA =		29.2 36.7 48.6	cfs

Computed by CEJ Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA F
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	54.6	acres
	A_2		acres
	A_3		acres
Drainage Length		3900	feet
Elevation			
Top of Drainage Area		1267	feet
At Structure		1251	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches
Time of Concentration	Tc	38	minutes
Rainfall Intensity	i	2.19 2.75 3.64	inches/hour
Runoff Coefficient	C_1	COM. WEIGHTED HDDC 0.60	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.60	
Peak Discharge Qp = CiA =		71.7 90.1 119.2	cfs

Computed by CEJ Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA G
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	32.7	acres
	A_2		acres
	A_3		acres
Drainage Length		2157	feet
Elevation			
Top of Drainage Area		1246	feet
At Structure		1236	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches
Time of Concentration	Tc	23	minutes
Rainfall Intensity	i	2.87 3.61 4.79	inches/hour
Runoff Coefficient	C_1	COMMERCIAL 0.80	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.80	
Peak Discharge Qp = CiA =		75.1 94.4 125.3	cfs

Computed by CEJ Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA H
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	20.1	acres
	A_2		acres
	A_3		acres
Drainage Length		1581	feet
Elevation			
Top of Drainage Area		1251	feet
At Structure		1242	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches
Time of Concentration	Tc	17	minutes
Rainfall Intensity	i	3.41 4.29 5.69	inches/hour
Runoff Coefficient	C_1	COM 0.80	
	C_2	MF 0.60	
	C_3		
Weighted Runoff Coefficient	C	0.67	
Peak Discharge Qp = CiA =		45.9 57.8 76.6	cfs

Computed by CEJ Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA I
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	68.4	acres
	A_2		acres
	A_3		acres
Drainage Length		2400	feet
Elevation			
Top of Drainage Area		1262	feet
At Structure		1252	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches
Time of Concentration	Tc	45	minutes
Rainfall Intensity	i	1.98 2.49 3.30	inches/hour
Runoff Coefficient	C_1	0.95 STREET	
	C_2	0.50 S.F.	
	C_3	0 SCHOOL	
Weighted Runoff Coefficient	C	0.44 0.44 0.44	
Peak Discharge Qp = CiA =		59.6 74.9 99.3	cfs

Computed by CEO Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA J
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	25.3	acres
	A_2		acres
	A_3		acres
Drainage Length		1917	feet
Elevation			
Top of Drainage Area		1252	feet
At Structure		1244	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches
Time of Concentration	Tc	22	minutes
Rainfall Intensity	i	2.95 3.71 4.92	inches/hour
Runoff Coefficient	C_1	RES 0.50	
	C_2		
	C_3		
Weighted Runoff Coefficient	C	0.59	
Peak Discharge Qp = CiA =		44.0 55.4 73.4	cfs

Computed by CEJ Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD. County _____
Location AREA K
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	46.4	acres
	A_2		acres
	A_3		acres
Drainage Length		2604	feet
Elevation			
Top of Drainage Area		1250	feet
At Structure		1240	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches
Time of Concentration	Tc	28	minutes
Rainfall Intensity	i	2.55 3.21 4.25	inches/hour
Runoff Coefficient	C_1	COM 0.80 STREET 0.95	
	C_2	RES 0.50	
	C_3		
Weighted Runoff Coefficient	C	0.74	
Peak Discharge Qp = CiA =		87.6 110.2 145.9	cfs

Computed by CEJ Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA L
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency 10 25 100 years
Drainage Area
A_1 34.5 acres
A_2 _____ acres
A_3 _____ acres
Drainage Length 2350 feet

Elevation
Top of Drainage Area 1254 feet
At Structure 1246 feet

Drainage Area Slope _____ %

Precipitation
P = 6-hour _____ inches
P = 24-hour _____ inches

DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour 1.56 1.96 2.60 inches

Time of Concentration Tc 27 minutes

Rainfall Intensity i 2.60 3.26 4.33 inches/hour

Runoff Coefficient
C_1 MF 0.60 AES 0.5
C_2 STREET 0.95
C_3 _____

Weighted Runoff Coefficient C 0.63

Peak Discharge Qp = CiA = 56.5 70.9 94.1 cfs

Computed by CEJ Date 9-25-85

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

Highway SCOTTSDALE RD County _____
Location AREA M
Project No. _____ Station _____
Name of Stream _____

DESIGN DATA

Design Frequency		10 25 100	years
Drainage Area	A_1	28.1	acres
	A_2		acres
	A_3		acres
Drainage Length		2167	feet
Elevation			
Top of Drainage Area		1258	feet
At Structure		1253	feet
Drainage Area Slope			%
Precipitation			
P = 6-hour			inches
P = 24-hour			inches

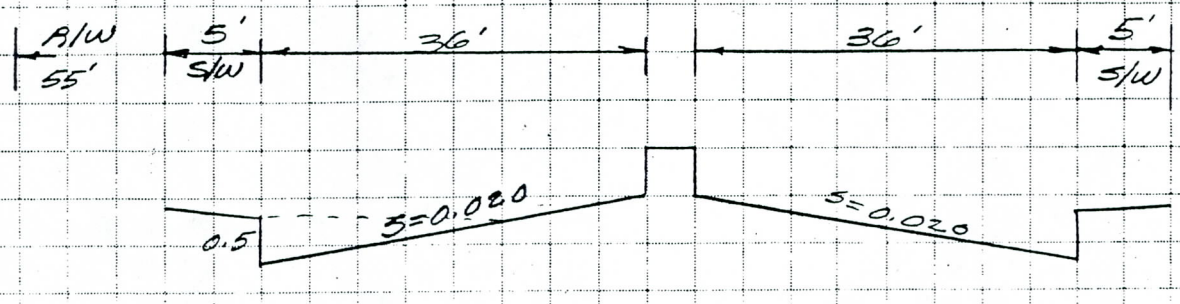
DESIGN COMPUTATIONS

Precipitation P_1 = 1-hour		1.56 1.96 2.60	inches
Time of Concentration	Tc	30	minutes
Rainfall Intensity	i	2.48 3.11 4.13	inches/hour
Runoff Coefficient	C_1	MF 0.60 RES 0.50	
	C_2	STREETS 0.95	
	C_3		
Weighted Runoff Coefficient	C	0.59	
Peak Discharge Qp = CiA =		41.1 51.6 68.5	cfs

Computed by CEJ Date 9-25-85

ELLIS-MURPHY CONSULTING ENGINEERS LAND SURVEYORS	CLIENT	JOB NO. 175 - 7296	
	PROJECT SCOTTSDALE ROAD	SHEET 1 OF 3	
	DESIGN FOR	DESIGNER	DATE
	TYPICAL SECTION	CHECKER	DATE

OSBORNE TO THOMAS $S = 0.0035$



STREET CAPACITY TABLE

$S_c = 0.020$

DEPTH AT CURB (FT)	SLOPE (FT/FT)	n	VEL. (FPS)	Q (CFS) (1/2 STREET)
0.72	0.0035	0.015	2.93	38.0
0.5	0.0035	0.015	1.57	8.0
0.6	0.0035	0.015	2.24	19.5

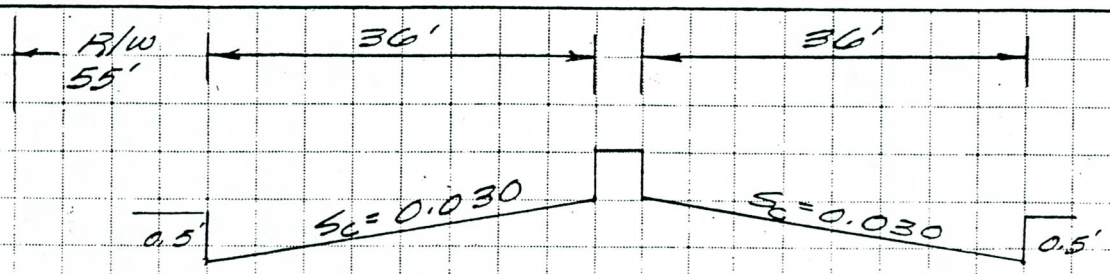
OAK TO McDONELL $S = 0.0018$

0.5	0.0018	0.015	1.12	5.6
0.6	0.0018	0.015	1.61	14.0

THOMAS TO OAK $S = 0.0007$

0.5	0.0007	0.015	0.70	3.5
0.72	"	"	1.31	17.0

ELLIS-MURPHY CONSULTING ENGINEERS LAND SURVEYORS	CLIENT	JOB NO. 175-7296	
	PROJECT SCOTTSDALE ROAD	SHEET 2 OF 3	
	DESIGN FOR	DESIGNER	DATE
	TYPICAL SECTION	CHECKER	DATE



STREET CAPACITY

DEPTH AT CURB (FT)	SLOPE FT/FT	n	VEL (FPS)	Q (CFS)
0.72	0.0035	0.015	1.84	12.0 (1/2 ST.)
AREA ADJACENT (CURB TO R/W) 0.22 × 19	0.0035	0.015	1.84	7.7
		TOTAL TO R/W		19.7 CFS
0.72	0.0018	0.015	1.32	8.5 1/2 ST.
AREA ADJ 0.22 × 19	"	"	"	5.5
		TOTAL TO R/W		14.0 CFS
0.72	0.0007	0.015	0.82	5.3 1/2 ST.
AREA ADJ. 0.22 × 19	"	"	"	3.4
		TOTAL TO R/W		8.7 CFS

ABOVE SECTIONS ARE ANALYZED FOR 12' DRY LANE ($S_c = 0.030$)

ELLIS-MURPHY CONSULTING ENGINEERS LAND SURVEYORS	CLIENT	JOB NO. 175-7296	
	PROJECT SCOTTSDALE ROAD	SHEET 3 OF 3	
	DESIGN FOR	DESIGNER	DATE
	TYPICAL SECTION	CHECKER	DATE

SECTION SAME AS ON SHT 2
$S_c = 0.030$

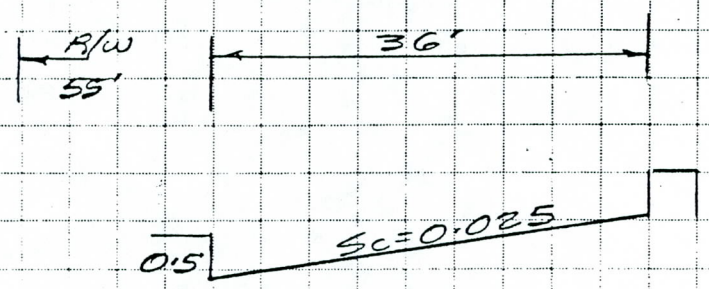
DEPTH	SLOPE	n	VEL.	Q
1.08	0.0035	0.015	3.81	74.1 ½ ST.
AREA ADJ. (CURB TO R/W)				
0.58 × 19/2 =	"	"	3.81	21.0
(TRIANGULAR AREA)				
			TOTAL TO R/W	95.1 CFS
1.08	0.0018		2.73	53.1
AREA ADJ	"	"	"	15.0
			TOTAL TO R/W	68.1 CFS
1.08	0.0007		1.70	33.2
AREA ADJ	"	"	"	9.4
			TOTAL TO R/W	42.6 CFS

ABOVE SECTIONS ARE ANALYZED FOR FLOW LEVEL TO CROWN GRADE

12' LANE WILL BE COVERED TO AVERAGE DEPTH OF 2"

1.2	0.0007	0.015	1.94	46.0
AREA ADJ.	"	"	"	25.8
1.3	"	"	2.13	58.3
AREA ADJ	"	"	"	32.4

ELLIS-MURPHY CONSULTING ENGINEERS LAND SURVEYORS	CLIENT	JOB NO. 175-7296	
	PROJECT SCOTTSDALE ROAD	SHEET 4 OF	
	DESIGN FOR	DESIGNER	DATE
	TYPICAL SECTION	CHECKER	DATE



DEPTH	SLOPE	n	V	Q
0.5	0.0035	0.015	0.79	2.0
0.90	"	"	3.39	55.0
AREA ADJ 0.40 x 19	"	"	"	26.0
		TOTAL TO R/W		81.0 CFS
0.7	"	"	2.30	21.0 CFS

ELLIS-MURPHY CONSULTING ENGINEERS AND SURVEYORS	CLIENT CITY OF SCOTTSDALE	JOB NO. 175-7296	
	PROJECT SCOTTSDALE RD.	SHEET	OF
	DESIGN FOR DRAINAGE	DESIGNER	DATE
		CHECKER	DATE

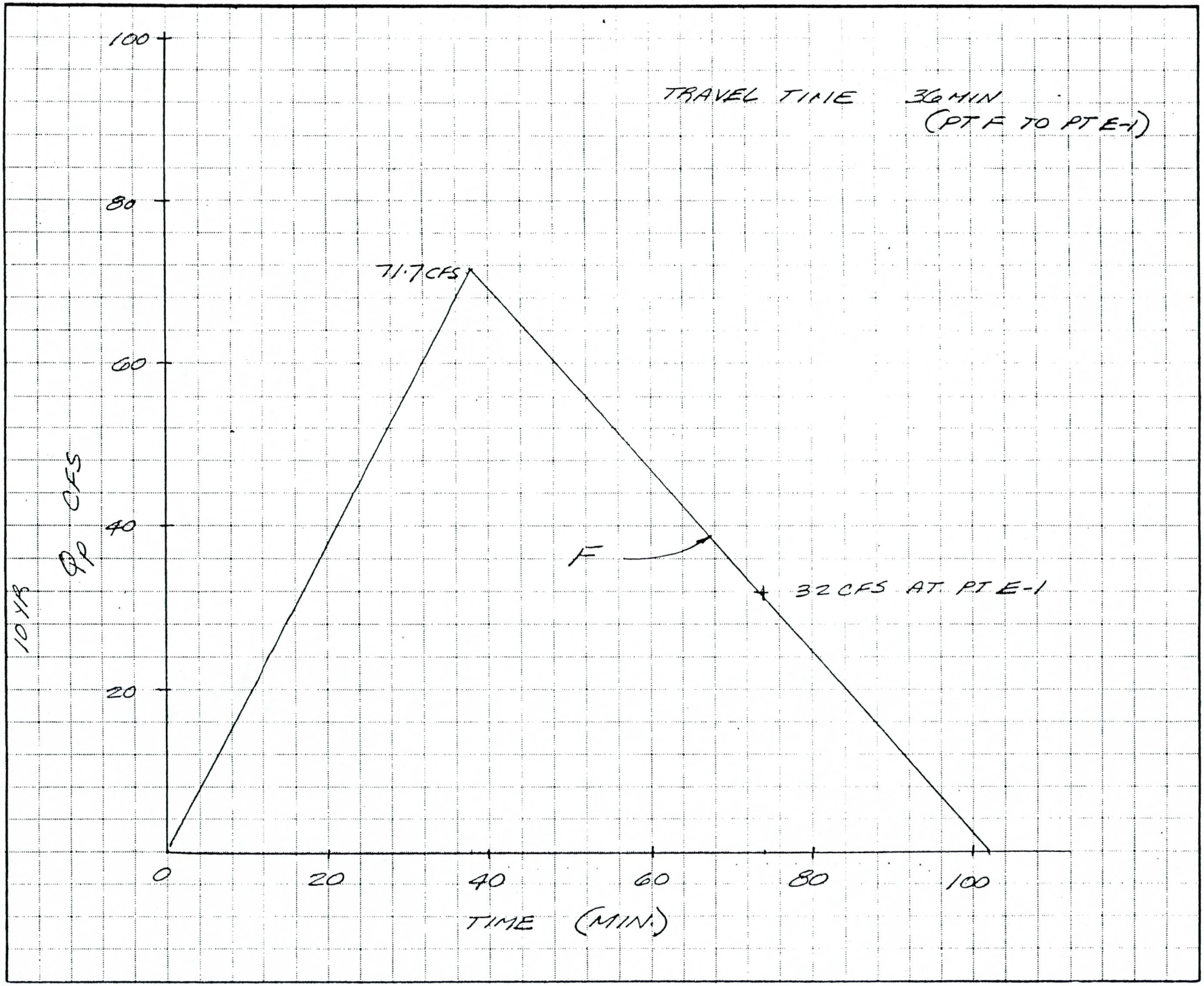
SUMMARY OF FLOWS

CONC. PT.	AREAS	STORM 10YR	25YR	100YR	REMARKS
J	I, M, L, J	189.1	237.6		PART OF FLOW WILL BE TAKEN BY AVALON TRUNK
H	I, M, L, J, H	226.6	295.4		FLOW ONTO THOMAS RD N. SIDE
K	K	87.6	110.2		PART OF FLOW WILL BE TAKEN BY SCTDLE TRUNK
G	G	75.1	94.4		FLOW ONTO THOMAS RD. N SIDE
E-1	F, E-1	61.2	76.7		FLOW INTO SCTDLE TRUNK CONTINUES EAST NEED INLET TO CONN TO TRUNK
D	D	97.9	123.0		FLOW ONTO W. SIDE SCTDLE RD
C	C	120.7	151.9		PART FLOW INTO OAK TRUNK
B	B	72.2	90.6		FLOW TO PALM LE & SCTDLE RD.
A	A	68.6	86.2		FLOW TO SCTDLE RD & McDOWELL RD INTERS.

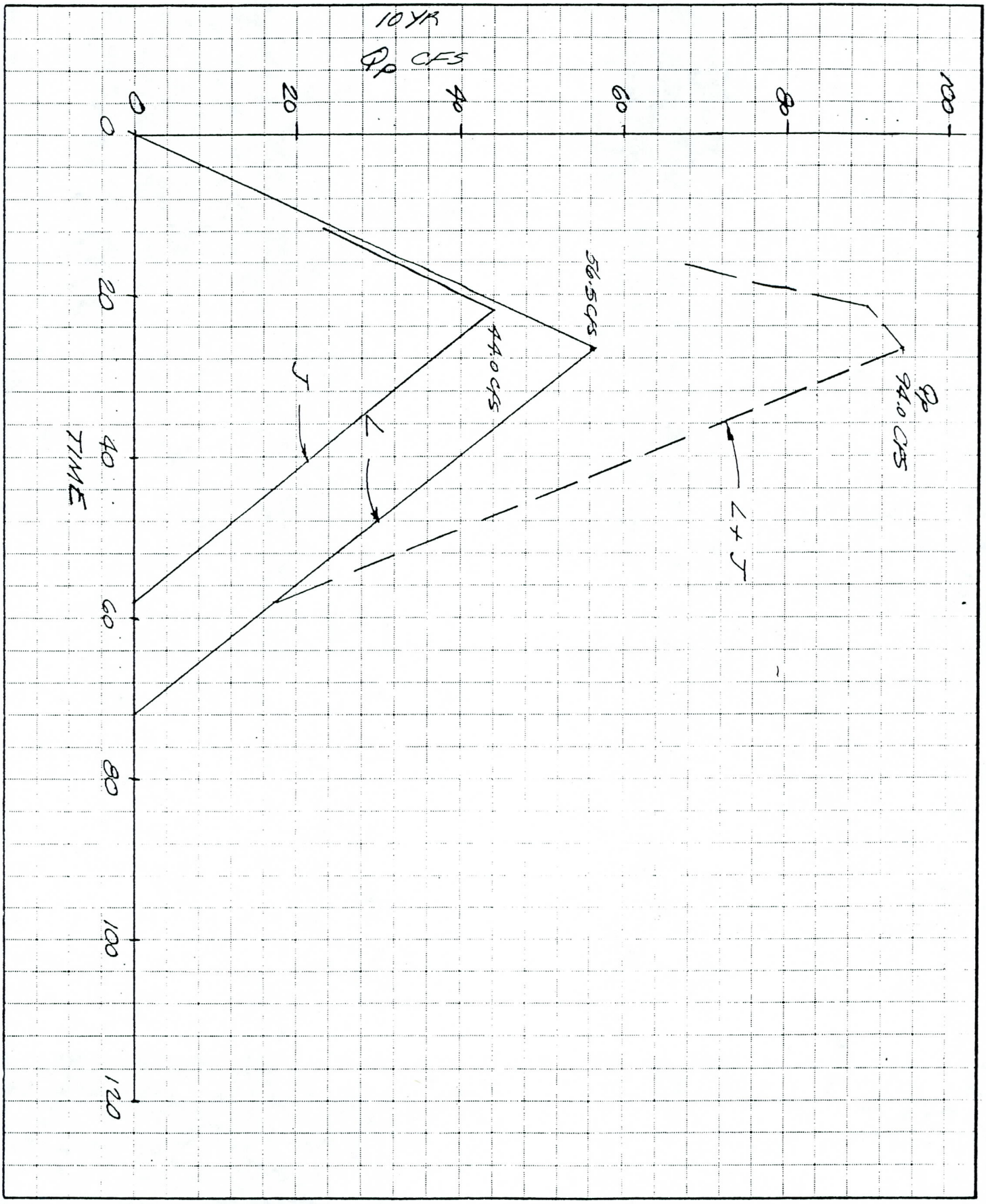
ELLIS-MURPHY CONSULTING ENGINEERS LAND SURVEYORS	CLIENT CITY OF SCOTTSDALE	JOB NO. 175-7296	
	PROJECT SCOTTSDALE RO HYDRO	SHEET 1 OF 1	
	DESIGN FOR PEAK FLOWS	DESIGNER CES	DATE 9-25-85
	SUMMARY TABLE	CHECKER	DATE

DRAINAGE AREA	T_p (MIN.)	Q_p (CFS) 10 YR	25 YR	100 YR
A	23	68.6	86.2	114.3
B	26	72.2	90.6	120.3
C	32	120.7	151.9	201.2
D	42	97.9	123.0	162.9
E	16	63.1	79.4	105.2
E-1	24	29.2	36.7	48.6
F	38	71.7	90.1	119.2
G	23	75.1	94.4	125.3
H	17	45.9	57.8	76.6
I	45	59.6	74.9	99.3
J	22	44.0	55.4	73.4
K	28	87.6	110.2	145.9
L	27	56.5	70.9	94.1
M	30	41.1	51.6	68.5

ELLIS-MURPHY CONSULTING ENGINEERS LAND SURVEYORS	CLIENT CITY OF SCOTTSDALE	JOB NO. 175-7296	
	PROJECT SCOTTSDALE RD	SHEET	OF
	DESIGN FOR DRAINAGE	DESIGNER	DATE
	HYDROGRAPH	CHECKER	DATE



ELLIS-MURPHY CONSULTING ENGINEERS LAND SURVEYORS	CLIENT CITY OF SCOTTSDALE	JOB NO.	
	PROJECT SCOTTSDALE RD HYDRO.	SHEET OF	
	DESIGN FOR HYDROGRAPH	DESIGNER	DATE
		CHECKER	DATE



ELLIS-MURPHY CONSULTING ENGINEERS LAND SURVEYORS	CLIENT	JOB NO. 175-7296	
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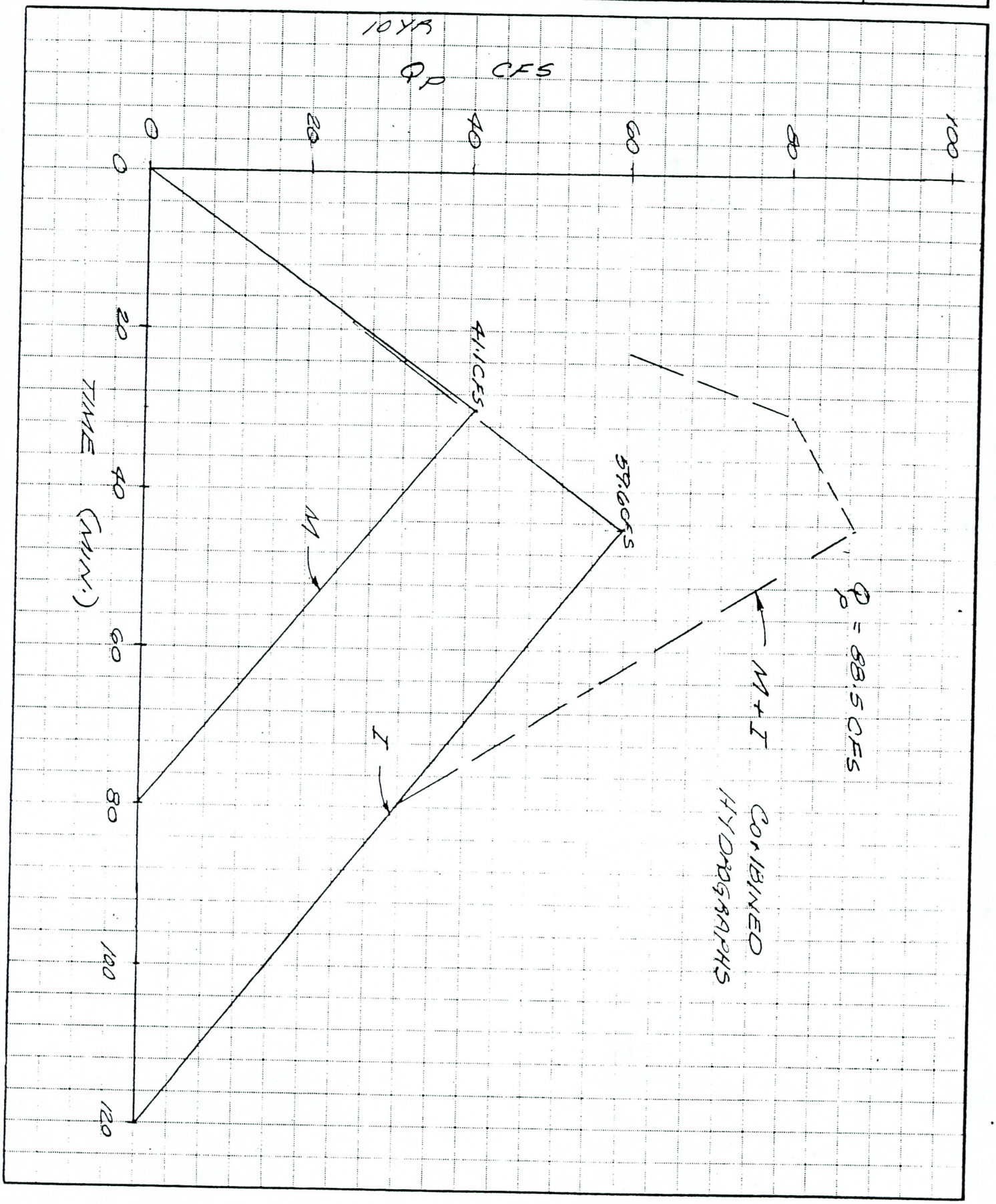
	DESIGN FOR DRAINAGE HYDROGRAPH	DESIGNER CES	DATE 9-25-85
		CHECKER	DATE



ELLIS-MURPHY CONSULTING ENGINEERS LAND SURVEYORS	CLIENT CITY OF SCOTTSDALE	JOB NO.	
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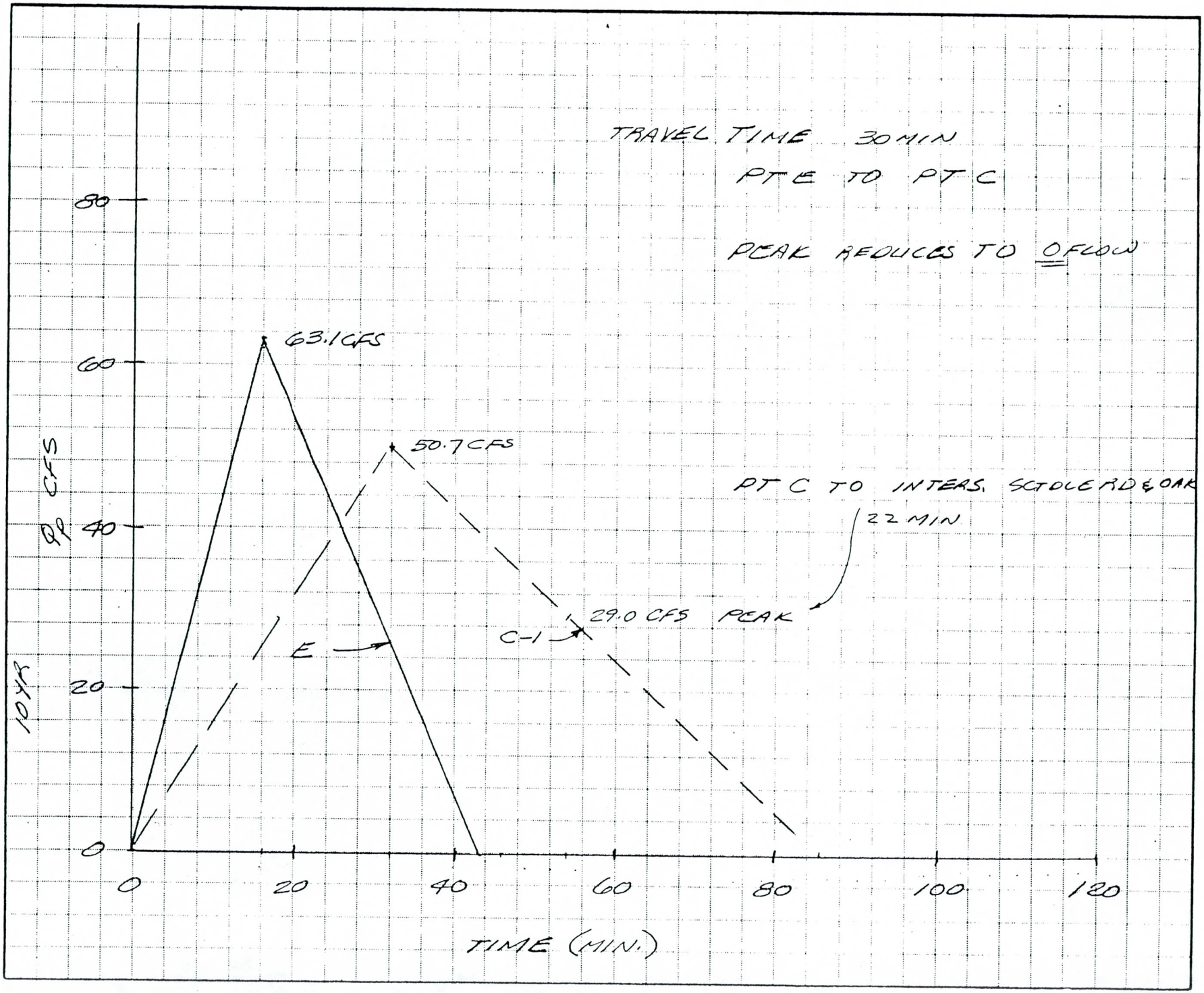
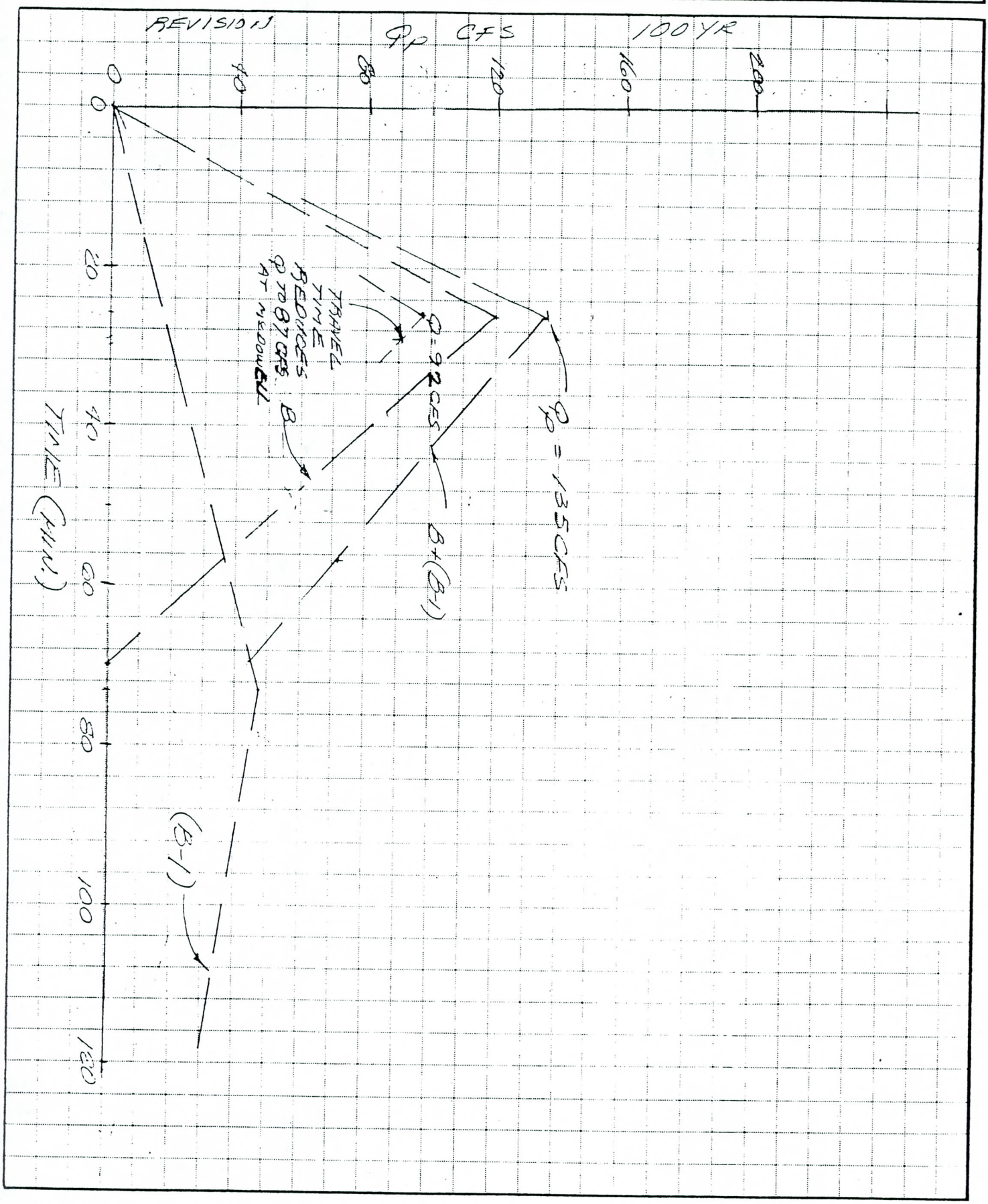
	DESIGN FOR DRAINAGE	DESIGNER	DATE
	HYDROGRAPH	CHECKER	DATE



ELLIS-MURPHY CONSULTING ENGINEERS LAND SURVEYORS	CLIENT CITY OF SCOTTSDALE	JOB NO. 175-7296	
	PROJECT SCOTTSDALE S.D.	SHEET OF	
	DESIGN FOR DRAINAGE	DESIGNER CES	DATE 11-15-85
	HYDROGRAPH	CHECKER	DATE