

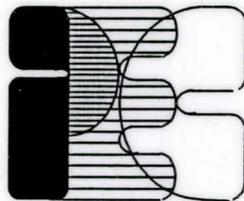
**Upper East Fork Cave Creek
Campo Bello Drive Lateral
Routing Study**

Prepared For:

**The City of Phoenix
and
The Flood Control District of Maricopa County**

Prepared By:

**Project Engineering Consultants, Ltd.
3130 North 35th Avenue, Suite 1
Phoenix, Arizona 85017**



February 10, 1994

**Upper East Fork Cave Creek
Campo Bello Drive Lateral
Routing Study**

Prepared For:

**The City of Phoenix
and
The Flood Control District of Maricopa County**

Prepared By:

**Project Engineering Consultants, Ltd.
3130 North 35th Avenue, Suite 1
Phoenix, Arizona 85017**



February 10, 1994

**Upper East Fork Cave Creek
Campo Bello Drive Lateral
Routing Study**

TABLE OF CONTENTS

- I. PROJECT DESCRIPTION
 - A. Introduction

- II. DESIGN ANALYSIS
 - A. Hydrology
 - B. Hydraulics

- III. ALTERNATIVES ANALYSIS
 - A. Alternate A
 - B. Alternate B
 - C. Alternate C

- IV. CONCLUSION AND RECOMMENDATIONS
 - Comparative Matrix

- V. EXHIBITS
 - Exhibit A Proposed Routing Map - Alternate A
 - Exhibit B Proposed Routing Map - Alternate B
 - Exhibit C Proposed Routing Map - Alternate C
 - Exhibit D Drainage Area Map
 - Exhibit E Composite Curve Number Table
 - Exhibit F Soil Type Map
 - Exhibit G Curve Number By Zoning Table
 - Exhibit H 24 Hour Rainfall Distribution Table
 - Exhibit I Peak Discharge Summary Table
 - Exhibit J Rainfall Intensity Curve from October 6, 1993 Storm Report

- VII. PHOTO DOCUMENTATION

- VIII. APPENDIX
 - Hydraulic Calculations
 - TR-20 Computer Run
 - Alternate A - Plan and Profile Study
 - Alternate B - Plan and Profile Study
 - Alternate C - Plan and Profile Study

I. PROJECT DESCRIPTION

A. Introduction

The Campo Bello Drive Lateral is a joint project between the City of Phoenix (City) and the Flood Control District of Maricopa County (District), with the District acting as the lead agency. The Campo Bello Drive Lateral project was identified in the Upper East Fork Cave Creek Area Drainage Master Plan (ADMS), October/1987, prepared by NBS/Lowry, as one of several recommended alternatives for providing 100-year flood protection within the Upper East Fork Cave Creek watershed. In addition, a preliminary design for the recommended alternates, including the Campo Bello Drive Lateral, was prepared by NBS/Lowry.

The tributary area for the Campo Bello Drive Lateral is approximately one (1) square mile and is bounded on the north by Buffalo Ridge (Utopia Road), on the south by Campo Bello Drive, on the east by Cave Creek Road, and on the west by 12th Street.

The District selected Project Engineering Consultants, Ltd. (PEC) to design the Campo Bello Drive Lateral as proposed in the preliminary design. During the initial site investigation, it was noted that the Candle Creek Unit I subdivision was under construction and in direct conflict with the last 2600 feet of the proposed Campo Bello Drive Lateral alignment. Due to this conflict, the City and the District jointly authorized PEC to perform this Routing Study to identify the feasibility of alternate routes for the Campo Bello Drive Lateral in lieu of the route proposed in the preliminary design. Upon selection and approval by the City and the District, PEC will proceed with the design and document preparation for the preferred lateral alignment.

In addition, PEC was able to photo document the area during the October 6, 1993 storm event. The District rain gauge located in nearby Paradise Valley Park reported 2.32 inches of rainfall in 2.5 hours, which was estimated to be a 25 year return period. These photos are included in this report.

II. DESIGN ANALYSIS

A. Hydrology

Methodology - To be consistent with the hydrology originally developed in the ADMS, the hydrologic analysis for this project was performed using the same U.S. Soil Conservation Service (SCS) TR-20 model and design parameter methodology that was used for the ADMS. Due to the relatively small tributary area for the Campo Bello Lateral as compared with the entire ADMS, a more detailed analysis could be performed with peak discharges expected to be the same or slightly larger than determined in the ADMS. Hydrology calculations and the TR-20 computer run can be found in the Appendix.

Rainfall - Flood routing was developed for the 100-year 24-hour event distributed using the City of Phoenix 24-hour Rainfall Distribution Table, City of Phoenix Stormdrain Design Manual (Exhibit H). The rainfall depth used was 4.04 inches per City of Phoenix criteria.

Drainage Area - The drainage sub-area and zoning boundaries, points of concentration, and reach routing paths were determined using recent 2-foot contour mapping, site investigation, and comparison with the previous analysis provided in the ADMS. These items are identified in the 'Drainage Area Map' (Exhibit D).

Curve Numbers - A composite curve number for each sub-area was determined (Exhibit E) per the City of Phoenix Stormdrain Design Manual using the 'Soil Type Map' (Exhibit F), Phoenix Planning Department zoning maps, 'Curve Number by Zoning Table' (Exhibit G), and computed drainage areas. It should be noted that the entire tributary area for the Campo Bello Lateral has a Type 'B' soil type. A minimum curve number of 95 was used in hillside areas having slopes in excess of 10%.

Times of Concentration - Times of concentration were estimated using the upland method for overland flow conditions and gutter flow times from the City of Phoenix Stormdrain Design Manual for channelized flow conditions. A minimum time of concentration of 10 minutes was used.

Results - Generally, the computed peak discharges for the 100 year return period (Exhibit I) match very closely, or in many cases, yielded slightly greater values than the discharges computed in the ADMS. These results confirmed expectations and verified the results determined in the ADMS.

B. Hydraulics

Methodology - For preliminary design use, single barrel drainage conduits of rectangular cross section were analyzed (assumed to be flowing full) with the hydraulic grade line remaining a minimum of 2 feet below the finished grade. Capacities and velocities were determined using the simple Manning Equation. Hydraulic calculations can be found in the Appendix.

III. ALTERNATIVES ANALYSIS

A. Alternate A

The 'Proposed Routing Map' (Exhibit A) and the 'Plan and Profile Study' (Appendix) delineate storm drain routing for Alternate A as described as follows:

Reach 1 conveys 809 cfs in a drainage conduit along the Grovers Avenue alignment, extending west approximately 1/2 mile from the intersection of 16th Street to the intersection of 12th Street. Several catch basins along both sides of Grovers Avenue must be installed to collect runoff from the north. In addition, a headwall structure in an existing drainage easement and a transverse inlet structure across Grovers Avenue will be required east of the 16th Street intersection to collect concentrated flows in this area. For future use, stubouts will be required at the upstream end of the conduit to intercept future storm drains lines coming down from the north on 16th Street and from the east on Grovers Avenue.

Several water and sewer services along Grovers Avenue including a gas line will cross above the proposed conduit and will need to be protected in place during construction. Placement of the proposed conduit within the street cross section is critical to avoid conflict with an existing 24" water main that runs parallel with the conduit. Approximately 800 feet of existing 8" water line in Grovers Avenue east of 12th Street is in conflict and will need to be relocated.

Utility potholing will be required to verify horizontal and vertical locations of an existing 24" water line at the 12th Street intersection and of an existing 12" water line at 16th Street intersection that will cross above the proposed conduit. It is anticipated that these lines will be able to remain in place if protected during construction.

Reach 2 conveys 809 cfs in a drainage conduit along the 12th Street alignment, extending south approximately 1/4 mile from the intersection of Grovers Avenue and terminating into the 12th Street box culvert structure that will be installed with the Basin No. 5 construction contract. A recently installed 8" water line in 12th Street is in conflict and will need to be relocated while providing uninterrupted service to the residents of the Candle Creek Unit I Subdivision. In addition, recently constructed 12th Street pavement will also be disturbed.

Reach 3 will utilize the existing Candle Creek Unit I landscaped drainage channel to convey 380 cfs approximately 1/4 mile to the west from the Rancho Verde Mirage detention basin to the 12th Street box culvert structure. Channel improvements including a hydraulic drop structure will be required at the inlet of the proposed 12th Street box culvert.

B. Alternate B

The 'Proposed Routing Map' (Exhibit B) and the 'Plan and Profile Study' (Appendix) delineate storm drain routing for Alternate B as described as follows:

Reach 1 conveys 673 cfs in a drainage conduit along the Grovers Avenue alignment, extending west approximately 1/4 mile from the intersection of 16th Street to the extension of an existing drainage easement adjacent to the east property line of the Rancho Verde Mirage condominiums. Several catch basins along both sides of Grovers Avenue must be installed to collect runoff from the north. In addition, a headwall structure in an existing drainage easement and a transverse inlet structure across Grovers Avenue will be required east of the 16th Street intersection to collect concentrated flows in this area. For future use, stubouts will be required at the upstream end of the conduit to intercept future storm drains lines coming down from the north on 16th Street and from the east on Grovers Avenue.

Similar to Alternate A, several water and sewer services in Grovers Avenue including a gas line will need to be protected in place during construction. Also, placement of the conduit within the street cross section is critical to avoid conflict with an existing 24" water main that runs parallel with the conduit.

Utility potholing will be required to verify horizontal and vertical location of an existing 24" water main in Grovers Avenue where the drainage conduit turns to the south to enter the existing drainage easement at Rancho Verde Mirage. At this location, it is anticipated that this water main will be able to remain in place if protected during construction.

Reach 2 conveys 915 cfs in a drainage conduit along the Rancho Verde Mirage drainage easement alignment, extending south approximately 1/4 mile from Grovers Avenue to an existing culvert under the condominium main interior road. The existing culvert will need to be demolished and replaced by the new drainage conduit. During construction, this portion of the interior road must be closed.

Reach 3 conveys 915 cfs in a drainage conduit within Rancho Verde Mirage, extending west approximately 1/8 mile from the main interior road along the alignment of an existing drainage channel, through an existing detention basin, and ending at the Rancho Verde Mirage west property line.

Reach 4 conveys 987 cfs in a drainage conduit from the Rancho Verde Mirage west property line, extending west approximately 1/4 mile along the existing alignment of the Candle Creek Unit I landscaped drainage channel to the box culvert under 12th Street which outfalls into Basin No. 5.

C. Alternate C

The 'Proposed Routing Map' (Exhibit C) and the 'Plan and Profile Study' (Appendix) delineate storm drain routing for Alternate C as described as follows:

Reach 1 conveys 883 cfs in a drainage conduit along the 16th Street alignment, extending south approximately 1/4 mile from the intersection of Grovers Avenue to the intersection of Campo Bello Drive. Similar to Alternates A and B, a headwall structure in an existing drainage easement and a transverse inlet structure across Grovers Avenue will be required east of the 16th Street intersection to collect concentrated flows in this area. For future use, stubouts will be required at the upstream end of the conduit to intercept future storm drains lines coming down from the north on 16th Street and from the east on Grovers Avenue.

Placement of the conduit in the street cross section is critical to avoid conflict with an existing 24" water main and 12" sanitary sewer that runs along 16th Street. Existing water and gas services in 16th Street will cross above the proposed conduit and will need to be protected in place during construction.

Utility potholing will be required to verify horizontal and vertical locations of existing 12" and 30" water lines at the 16th Street intersection. It is anticipated that these lines will be able to remain in place if protected during construction.

Reach 2 conveys 915 cfs in a drainage conduit within the Bell Casas Mobile Home Estates, extending west approximately 1/8 mile from the intersection of 16th Street and Campo Bello Drive to the west property line of Bell Casas. The proposed alignment of the drainage conduit will run under several existing service lines which will need to be protected in place during construction providing uninterrupted service to the mobile homes. In addition, right-of-way acquisition and relocation of two mobile homes will be necessary.

Reach 3 conveys 915 cfs in a drainage conduit within Rancho Verde Mirage, extending west from the interior road along the existing alignment of an existing drainage channel, through an existing detention basin, and ending at the Rancho Verde Mirage west property line. Similar to Alternate No. 2, an existing culvert at the main interior road will need to be demolished and replaced by the drainage conduit.

Reach 4 conveys 987 cfs in a drainage conduit from the Rancho Verde Mirage west property line, extending west approximately 1/4 mile along the existing alignment of the Candle Creek Unit I landscaped drainage channel to the box culvert under 12th Street which outfalls into Basin No. 5.

IV. CONCLUSION AND RECOMMENDATIONS

Data for Alternate A, Alternate B, and Alternate C has been gathered and analyzed. They are presented in matrix form showing the following factors:

1. Ability to Capture and Convey 100 Year Event Stormwater
2. Construction Costs (not including R/W acquisition)
3. Long Term Maintenance Costs
4. Right-of-Way Acquisition
5. Constructability
6. Relocation of Existing Utilities

The above factors were evaluated on a scale of 0 (poor) to 4 (excellent). Importance factors were also included into the matrix on a scale of 0 (little importance) to 3 (very high importance). It must be recognized that these importance factors are subjective and consequently, reflect the professional's best judgement. It is only used as an aid in forming an objective recommendation.

It appears that costs for construction and utility relocation will be on the same order of magnitude for each of the lateral alternates and did not influence the weighted sum in the Comparative Matrix.

After careful evaluation of the above factors, it is our professional judgement that **Alternate A** is the most feasible alignment for the Campo Bello Drive Lateral if the City of Phoenix intends to install the proposed 60" storm drain line in 16th Street north of Campo Bello Drive. It should be noted that until future storm drains are extended to the north and east from the 16th Street and Grovers Avenue intersection (stubouts will be provided), Bell Casas Mobile Home Estates and Rancho Verde Mirage will receive flow-by from the upper leg of the storm drain conduit and from the contributing runoff east of 16th Street.

If the City of Phoenix does not intend to install the proposed 60" storm drain line in 16th Street, PEC recommends the implementation of **Alternate C**. This alignment provides excellent catch basin locations and positive capture of stormwater runoff along 16th Street (see October 6, 1993 photo documentation). It should be noted that the two (2) mobile homes that will need to be relocated with this alternate face a relatively high degree of flood damage risk if the existing conditions remain.

Although Alternate B provides very similar flood protection to that of Alternate A, constructability along Reach 2 is reduced due to tight working space adjacent to the east property line of Rancho Verde Mirage. Another important factor that should be considered is that Reach 2 is adjacent to existing multi-family buildings which could pose 'good neighbor' problems during construction and liability for damage to the existing structures. In addition, right-of-way will need to be acquired on the north end of Reach 2.

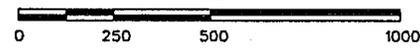
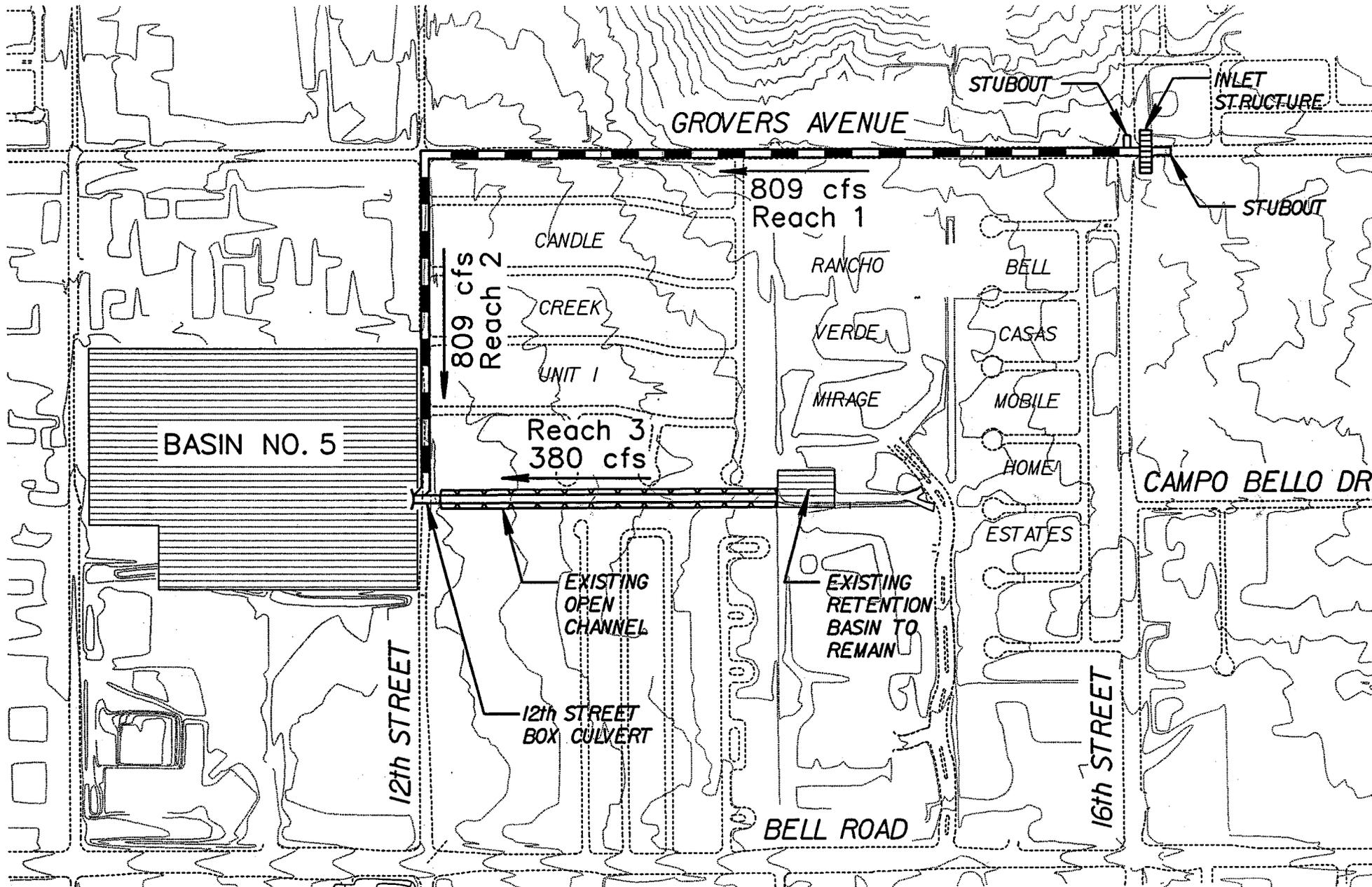
All three alternates lend themselves to the installation of single barrel precast concrete box culverts or the equivalent size of precast concrete circular pipe. A more comprehensive alternate material study can be performed once the actual design of the selected lateral route is in progress.

By prior agreement with the City, the 12th Street box culvert (installed with Basin No. 5) will be redesigned by PEC prior to construction in order to conform to the requirements of the selected lateral route. The culvert as currently detailed in the Basin No. 5 construction documents is intended to be used for bidding purposes only, and any redesign due to requirements of the Campo Bello lateral project will be a change order to the Basin No. 5 construction contract.

COMPARATIVE MATRIX

ITEM	IMPORTANCE FACTOR	<u>ALTERNATES</u>		
		A	B	C
1. Ability to capture and convey 100 year stormwater runoff	3	2	3	4
2. Construction costs (Not including R/W)	2	2	2	2
3. Long term maintenance costs	2	2	3	3
4. R/W acquisition	2	4	3	1
5. Constructability	2	3	1	3
6. Relocation of existing utilities	1	2	2	2
<hr/> Sum of Effects		15	14	15
<hr/> Weighted Sum		30	29	32
<hr/> PEC Recommendation		*		*

<u>Importance Factors</u>				<u>Rating of Items</u>				
0	1	2	3	0	1	2	3	4
Little	Average	High	Very High	Poor	Marginal	Good	Very Good	Excellent

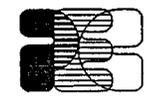


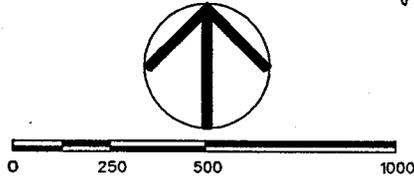
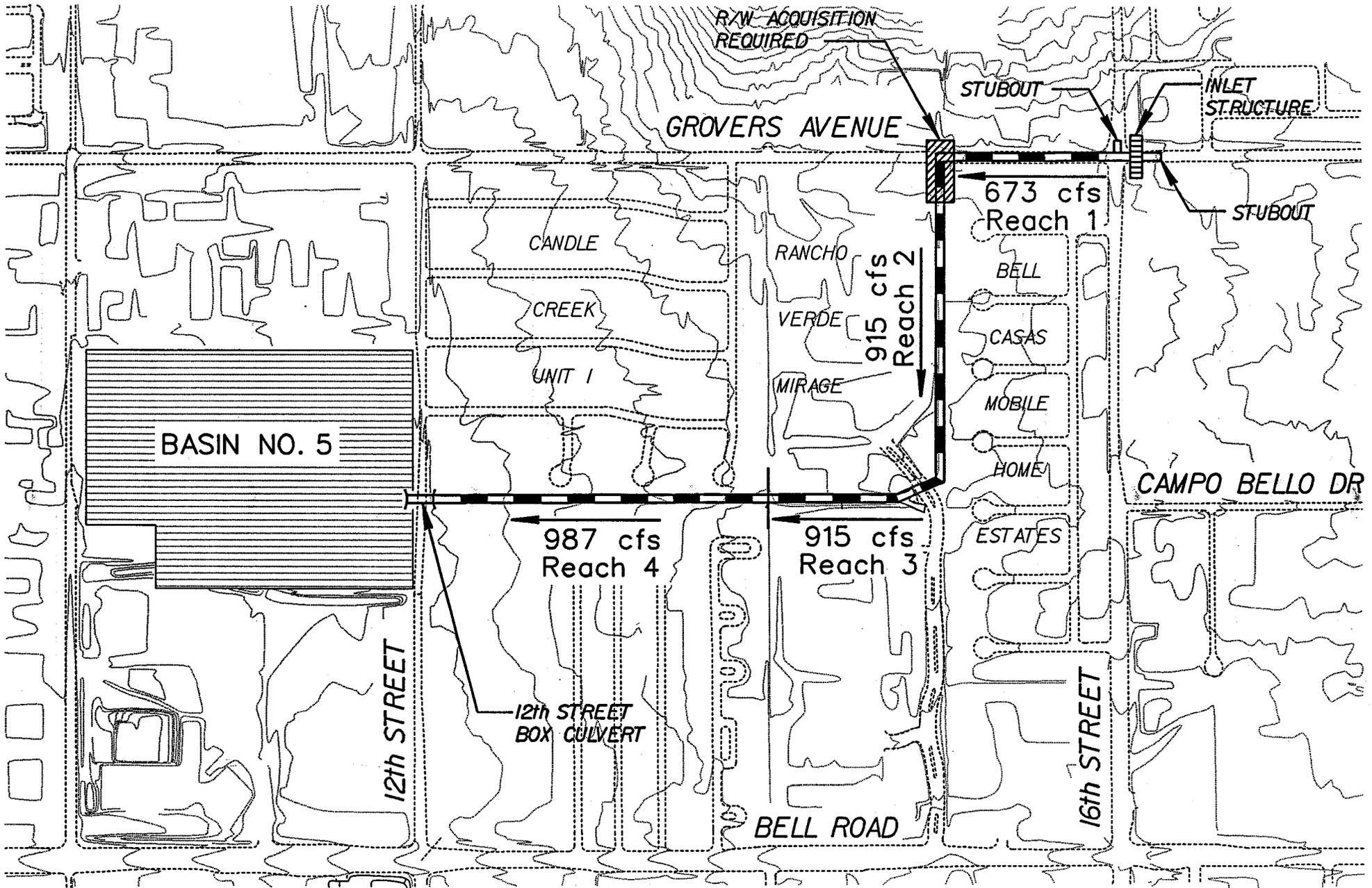
LEGEND

- DRAIN CONDUIT
- OPEN CHANNEL
- BOX CULVERT

PROPOSED ROUTING MAP
CAMPO BELLO DRIVE LATERAL
ALTERNATE NO.A

EXHIBIT 'A'



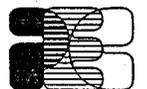


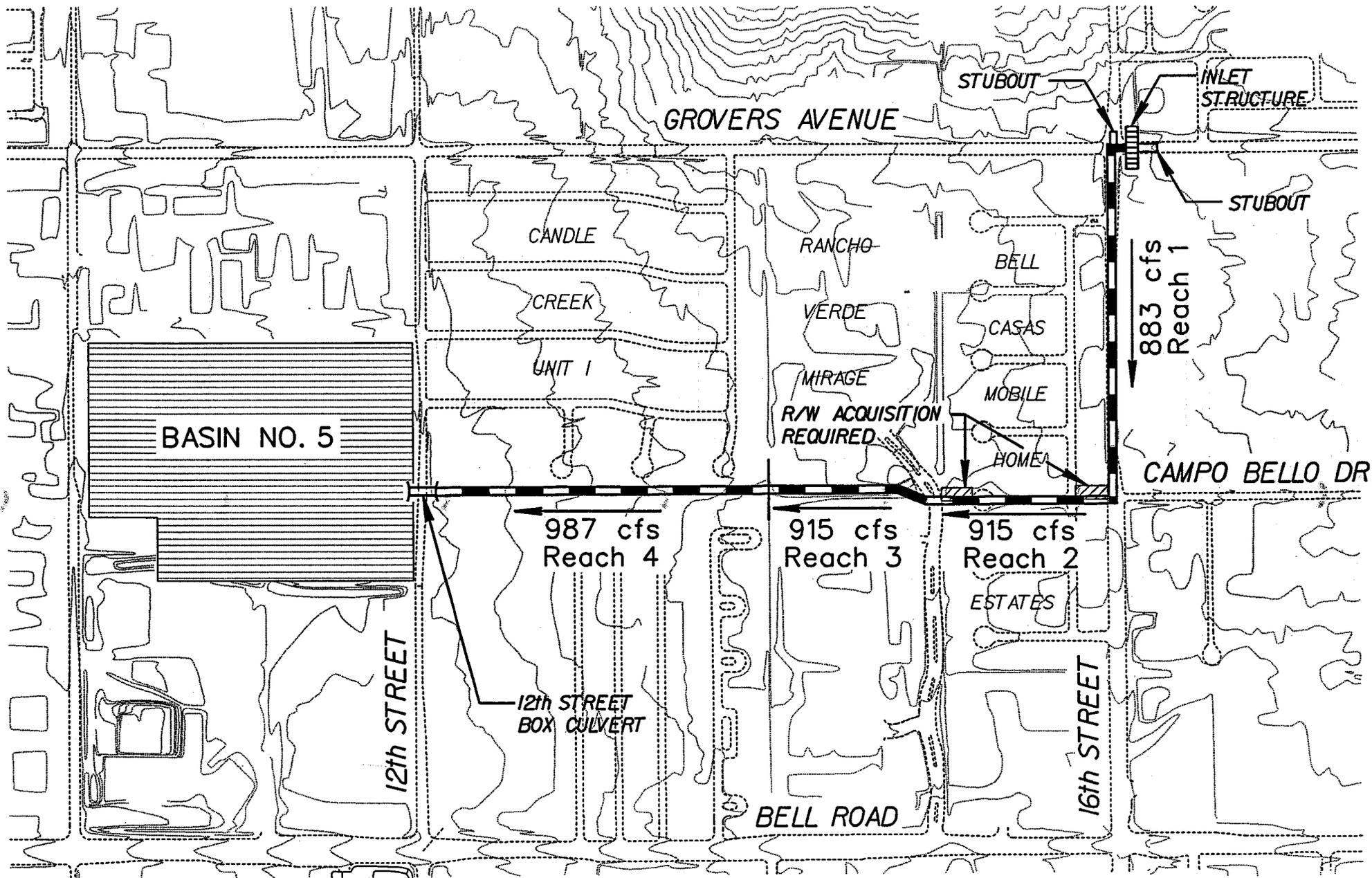
LEGEND

- DRAIN CONDUIT
- BOX CULVERT

PROPOSED ROUTING MAP
CAMPO BELLO DRIVE LATERAL
ALTERNATE NO. B

EXHIBIT 'B'





LEGEND

- DRAIN CONDUIT
- BOX CULVERT

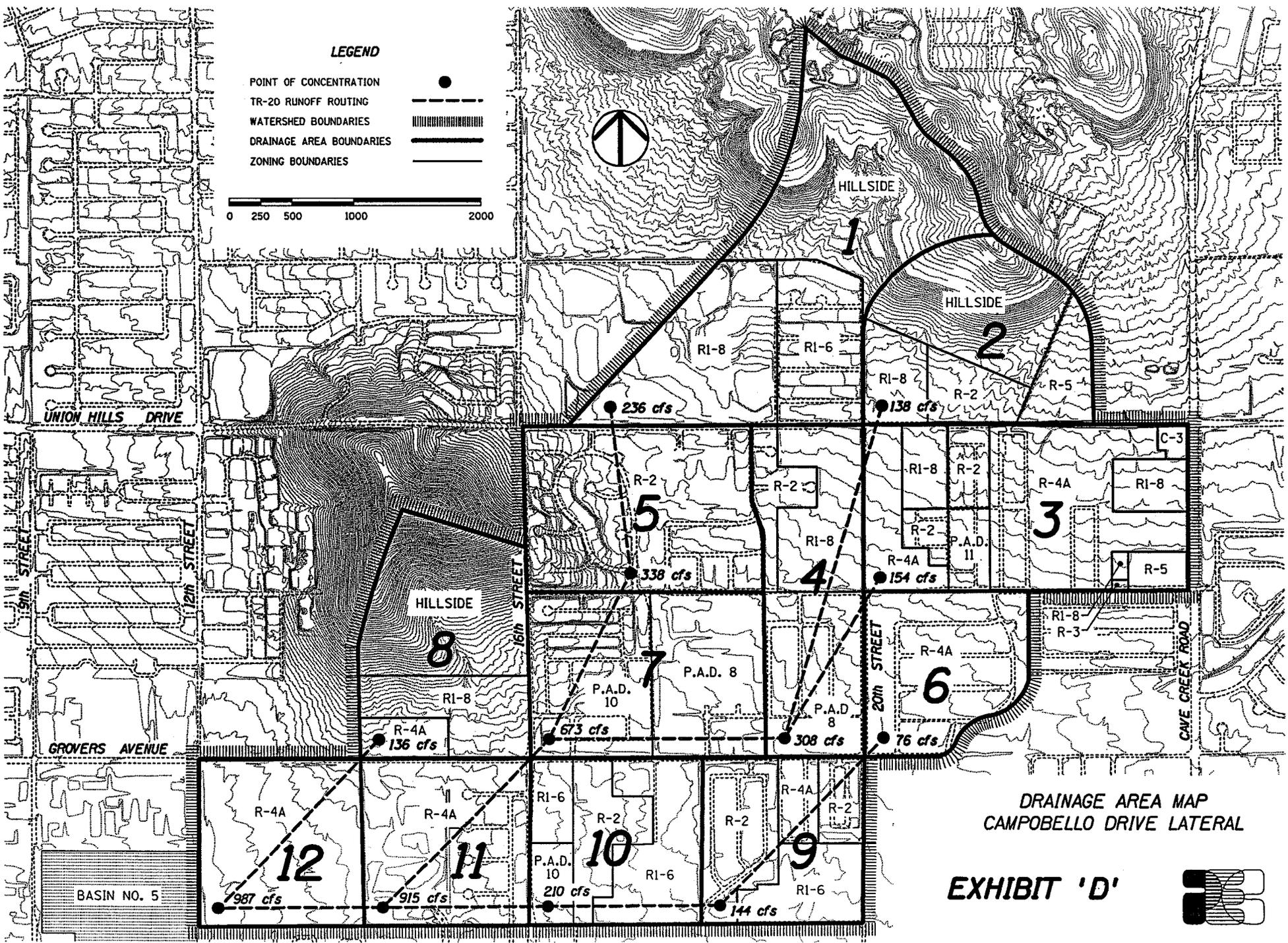
PROPOSED ROUTING MAP
CAMPO BELLO DRIVE LATERAL
ALTERNATE NO.C

EXHIBIT 'C'



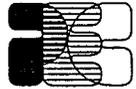
LEGEND

- POINT OF CONCENTRATION ●
- TR-20 RUNOFF ROUTING - - - - -
- WATERSHED BOUNDARIES [hatched pattern]
- DRAINAGE AREA BOUNDARIES [thick solid line]
- ZONING BOUNDARIES [thin solid line]



**DRAINAGE AREA MAP
CAMPOBELLO DRIVE LATERAL**

EXHIBIT 'D'



BASIN NO. 5

236 cfs

138 cfs

338 cfs

154 cfs

673 cfs

308 cfs

76 cfs

987 cfs

915 cfs

210 cfs

144 cfs

UNION HILLS DRIVE

GROVERS AVENUE

9th STREET

12th STREET

16th STREET

20th STREET

CAVE CREEK ROAD

HILLSIDE

HILLSIDE

HILLSIDE

R-4A

R-4A

RI-6

R-2

RI-6

R-4A

R-2

RI-6

P.A.D. 10

P.A.D. 8

P.A.D. 8

R-2

RI-8

R-2

RI-6

RI-8

RI-8

R-2

R-5

RI-8

R-2

R-4A

C-3

R-5

R-4A

P.A.D. 11

RI-8

R-3

R-4A

RI-8

R-4A

136 cfs

R-4A

R-4A

P.A.D. 10

R-2

R-4A

R-2

RI-6

RI-6

R-2

RI-6

R-4A

R-2

RI-6

P.A.D. 10

P.A.D. 8

P.A.D. 8

R-2

RI-8

R-2

RI-6

RI-8

RI-8

R-2

R-5

RI-8

R-2

R-4A

C-3

R-5

R-4A

P.A.D. 11

RI-8

R-3

R-4A

RI-8

R-4A

136 cfs

R-4A

R-4A

P.A.D. 10

R-2

R-4A

R-2

RI-6

RI-6

R-2

RI-6

R-4A

R-2

RI-6

P.A.D. 10

P.A.D. 8

P.A.D. 8

R-2

RI-8

R-2

RI-6

RI-8

RI-8

R-2

R-5

RI-8

R-2

R-4A

C-3

R-5

R-4A

P.A.D. 11

RI-8

R-3

R-4A

RI-8

R-4A

136 cfs

R-4A

R-4A

P.A.D. 10

R-2

R-4A

R-2

RI-6

RI-6

R-2

RI-6

R-4A

R-2

RI-6

P.A.D. 10

P.A.D. 8

P.A.D. 8

R-2

RI-8

R-2

RI-6

RI-8

RI-8

R-2

R-5

RI-8

R-2

R-4A

C-3

R-5

R-4A

P.A.D. 11

RI-8

R-3

R-4A

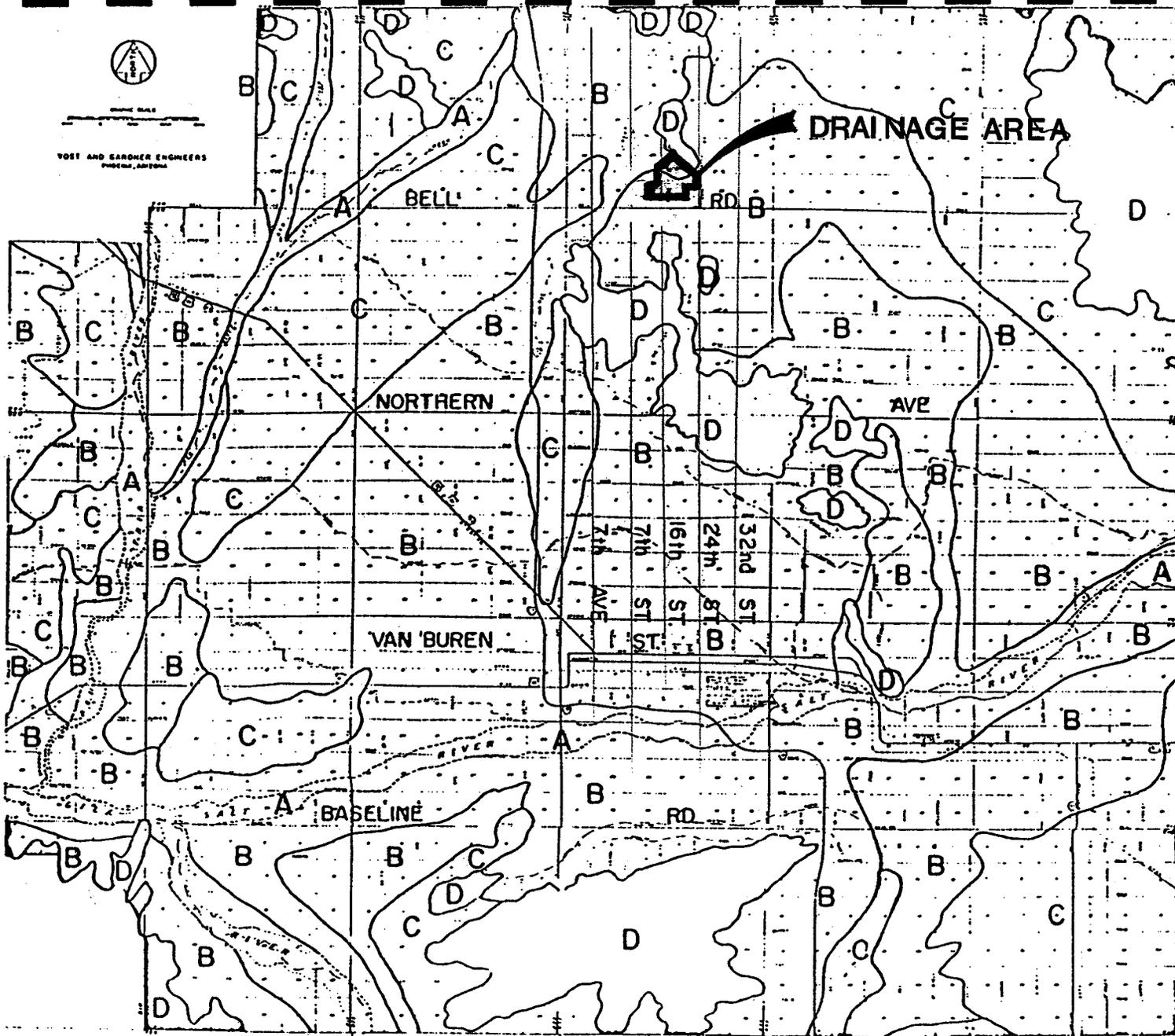
**EXHIBIT E - Composite Curve Number
Campobello Drive Lateral**

JVB 1/18/94

Sub Area	Total Area		Area (Acres) - Type B Soil Cover Complex								Composite Cn		
			C	R1-6	R1-8	R2	R3	R4, R5	PAD	Hillside			
	Acres	Sq. Miles	Cn=92	Cn=84	Cn=82	Cn=84	Cn=85	Cn=86	Cn=84	Cn=98	Compt'd	USE	
1	101.0	0.158		19.9	31.8						49.3	90.20	90
2	54.0	0.084			9.0	8.4		9.0			27.6	91.16	91
3	80.0	0.125	1.5		12.1	8.2	0.3	52.9	5.0			85.17	85
4	50.0	0.078			18.5	7.5			24.0			83.26	83
5	56.0	0.088				56.0						84.00	84
6	35.0	0.055						35.0				86.00	86
7	57.0	0.089							57.0			84.00	84
8	54.0	0.084			15.3			5.1		33.6		92.33	92
9	40.0	0.063		12.5		22.5		5.0				84.25	84
10	40.0	0.063		22.6		12.0			5.4			84.00	84
11	40.0	0.063						40.0				86.00	86
12	40.0	0.063						40.0				86.00	86



ENGINE SCALE
 VOST AND GARDNER ENGINEERS
 PHOENIX, ARIZONA



GROUP "A" 2" per hour & over
 Clayey sandstone, sandy shales
 and shales - subject to erosion

GROUP "B" 0.75" to 2" per hour & over
 Terraces - recent alluvial soil
 and shales - high water table

GROUP "C" 0.05" to 0.07" per hour & over
 Reddish - granitic clay soils

GROUP "D" Less than 0.05" per hour
 Reddish - granitic clay soils
 with steep slopes

NOTE: Slope information was obtained from "Soils of the State of Arizona" U.S. Department of Agriculture, pg. 67

SOIL TYPES

FROM "GENERAL SOIL MAP OF MARICOPA COUNTY"

The information on this report was prepared
 by the Soil Conservation Service, Phoenix, Arizona
 and is based on the soil map of Maricopa County,
 Arizona, prepared by the Soil Conservation Service,
 Phoenix, Arizona, in 1954.

EXHIBIT G
CURVE NUMBERS BY ZONING
FOR USE WITH SCS OR TR-20 METHODS OF
DETERMINING RUNOFF IN THE CITY OF PHOENIX

ZONING	TYPE B	TYPE C	TYPE D
RE-43) S-1)	77	83	86
RE-35	79	84	87
RE-25	79	84	87
E1-18	80	84	87
R1-14	80	85	88
R1-10	81	85	89
R1-8	82	87	90
R1-6	84	88	90
R-3	85	88	90
R-4) R-40) R-5)	86	89	91
A-1) A-2)	85	91	93
C-1) C-2) C-3)	92	94	95
CO	88	91	93
PSC	95	95	95
HR	95	95	95
R4A	87	90	92
Hillside (over 10% sloping).	98	98	98

EXHIBIT H
24 HOUR RAINFALL DISTRIBUTION

TIME (HOUR)	ACCUMULATIVE RAINFALL	TIME (HOUR)	ACCUMULATIVE RAINFALL
0	.000	12.5	.83
.5	.004	13.0	.86
1.0	.008	13.5	.88
1.5	.013	14.0	.893
2.0	.018	14.5	.907
2.5	.022	15.0	.92
3.0	.026	15.5	.924
3.5	.031	16.0	.928
4.0	.035	16.5	.933
4.5	.040	17.0	.937
5.0	.044	17.5	.942
5.5	.048	18.0	.947
6.0	.053	18.5	.951
6.5	.057	19.0	.956
7.0	.062	19.5	.96
7.5	.066	20.0	.964
8.0	.071	20.5	.969
8.5	.075	21.0	.973
9.0	.08	21.5	.978
9.5	.093	22.0	.982
10.0	.107	22.5	.987
10.5	.12	23.0	.991
11.0	.14	23.5	.995
11.5	.17	24.0	1.00
12.0	.50		

PEAK DISCHARGE SUMMARY TABLE

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION			RUNOFF AMOUNT (IN)	PEAK DISCHARGE			
						BEGIN (HR)	AMOUNT (IN)	DURATION (HR)		ELEVATION (FT)	TIME (HR)	RATE (CFS)	RATE (CSM)
<u>ALTERNATE 1 STORM 1</u>													
XSECTION	2 RUNOFF	.08	1	2	.08	.0	4.04	24.00	3.05	---	12.44	137.40	1635.7
XSECTION	4 REACH	.08	1	2	.08	.0	4.04	24.00	3.01	---	13.00	107.67	1281.8
XSECTION	3 RUNOFF	.13	1	2	.08	.0	4.04	24.00	2.47	---	12.57	153.98	1231.8
XSECTION	4 REACH	.13	1	2	.08	.0	4.04	24.00	2.46	---	12.89	132.33	1050.7
XSECTION	4 ADDHYD	.21	1	2	.08	.0	4.04	24.00	2.68	---	12.94	237.62	1130.9
XSECTION	4 RUNOFF	.08	1	2	.08	.0	4.04	24.00	2.29	---	12.78	75.11	962.9
XSECTION	4 ADDHYD	.29	1	2	.08	.0	4.04	24.00	2.58	---	12.91	308.29	1074.2
XSECTION	7 REACH	.29	1	2	.08	.0	4.04	24.00	2.57	---	13.05	301.95	1052.1
XSECTION	1 RUNOFF	.16	1	2	.08	.0	4.04	24.00	2.94	---	12.50	236.29	1495.5
XSECTION	5 REACH	.16	1	2	.08	.0	4.04	24.00	2.93	---	12.62	230.72	1460.3
XSECTION	5 RUNOFF	.09	1	2	.08	.0	4.04	24.00	2.39	---	12.56	108.34	1231.1
XSECTION	5 ADDHYD	.25	1	2	.08	.0	4.04	24.00	2.74	---	12.60	338.14	1374.5
XSECTION	7 REACH	.25	1	2	.08	.0	4.04	24.00	2.73	---	12.71	333.64	1356.2
XSECTION	7 ADDHYD	.53	1	2	.08	.0	4.04	24.00	2.65	---	12.81	590.50	1107.9
XSECTION	7 RUNOFF	.09	1	2	.08	.0	4.04	24.00	2.39	---	12.55	112.01	1258.6
XSECTION	7 ADDHYD	.62	1	2	.08	.0	4.04	24.00	2.61	---	12.75	673.20	1082.3
XSECTION	6 RUNOFF	.05	1	2	.08	.0	4.04	24.00	2.57	---	12.51	75.57	1373.9
XSECTION	9 REACH	.05	1	2	.08	.0	4.04	24.00	2.56	---	12.74	70.18	1276.0
XSECTION	9 RUNOFF	.06	1	2	.08	.0	4.04	24.00	2.39	---	12.54	79.70	1265.1
XSECTION	9 ADDHYD	.12	1	2	.08	.0	4.04	24.00	2.47	---	12.60	144.27	1222.6
XSECTION	10 REACH	.12	1	2	.08	.0	4.04	24.00	2.46	---	12.73	140.47	1190.4
XSECTION	10 RUNOFF	.06	1	2	.08	.0	4.04	24.00	2.38	---	12.68	69.42	1102.0
XSECTION	10 ADDHYD	.18	1	2	.08	.0	4.04	24.00	2.43	---	12.71	209.55	1157.7
XSECTION	11 REACH	.18	1	2	.08	.0	4.04	24.00	2.43	---	12.84	204.64	1130.6
XSECTION	11 RUNOFF	.06	1	2	.08	.0	4.04	24.00	2.56	---	12.54	82.57	1310.7
XSECTION	11 ADDHYD	.24	1	2	.08	.0	4.04	24.00	2.46	---	12.72	267.01	1094.3
XSECTION	11 REACH	.62	1	2	.08	.0	4.04	24.00	2.61	---	12.88	659.87	1060.9
XSECTION	11 ADDHYD	.87	1	2	.08	.0	4.04	24.00	2.57	---	12.84	914.55	1056.1
XSECTION	8 RUNOFF	.08	1	2	.08	.0	4.04	24.00	3.14	---	12.45	136.32	1622.9
XSECTION	12 REACH	.08	1	2	.08	.0	4.04	24.00	3.13	---	12.63	132.68	1579.6
XSECTION	12 RUNOFF	.06	1	2	.08	.0	4.04	24.00	2.57	---	12.50	86.75	1376.9
XSECTION	12 ADDHYD	.15	1	2	.08	.0	4.04	24.00	2.89	---	12.54	216.93	1475.7
XSECTION	12 REACH	.87	1	2	.08	.0	4.04	24.00	2.56	---	12.98	893.15	1031.4
XSECTION	12 ADDHYD	1.01	1	2	.08	.0	4.04	24.00	2.61	---	12.86	986.99	974.3

Excerpt from:

STORM REPORT
October 6, 1993

Flood Control District
of Maricopa County

PARADISE VALLEY PARK
GAUGE No. 4650
OCT. 6, 1993
2.32 inches in 2.5 hrs

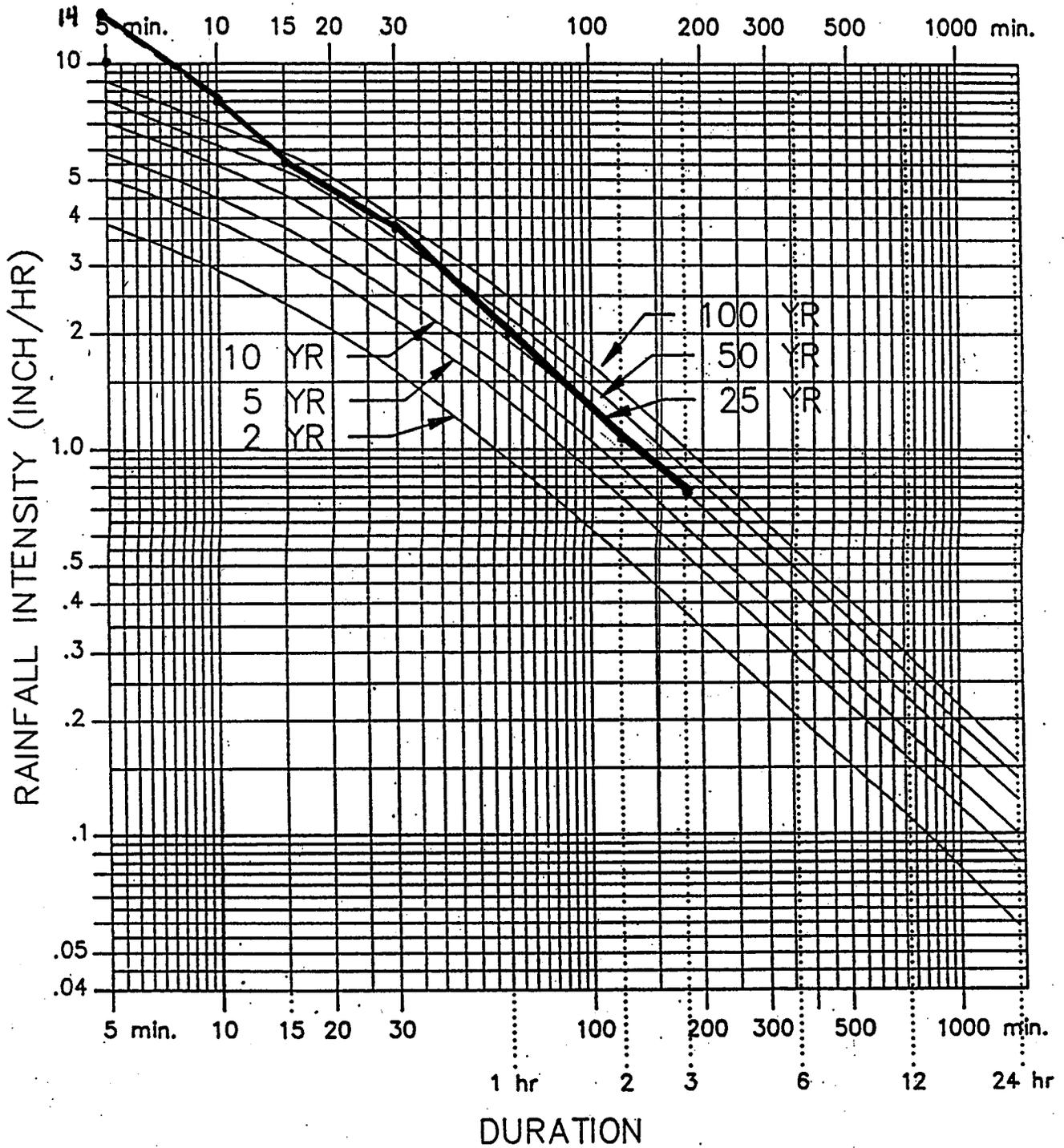
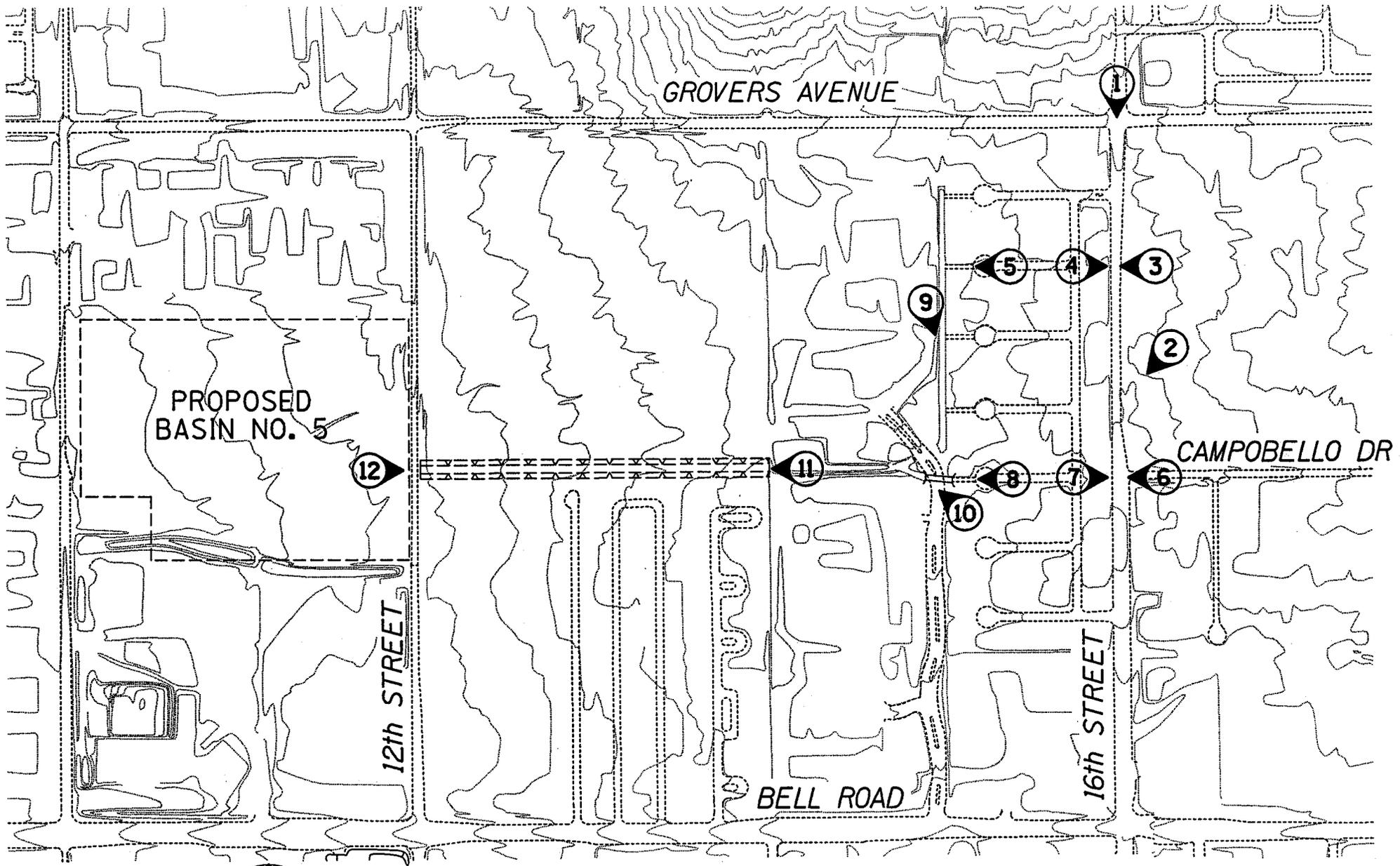


EXHIBIT J

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



PROPOSED
BASIN NO. 5

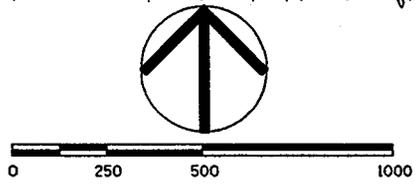
GROVERS AVENUE

12th STREET

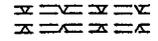
BELL ROAD

16th STREET

CAMOBELLO DR

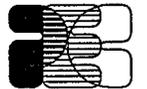


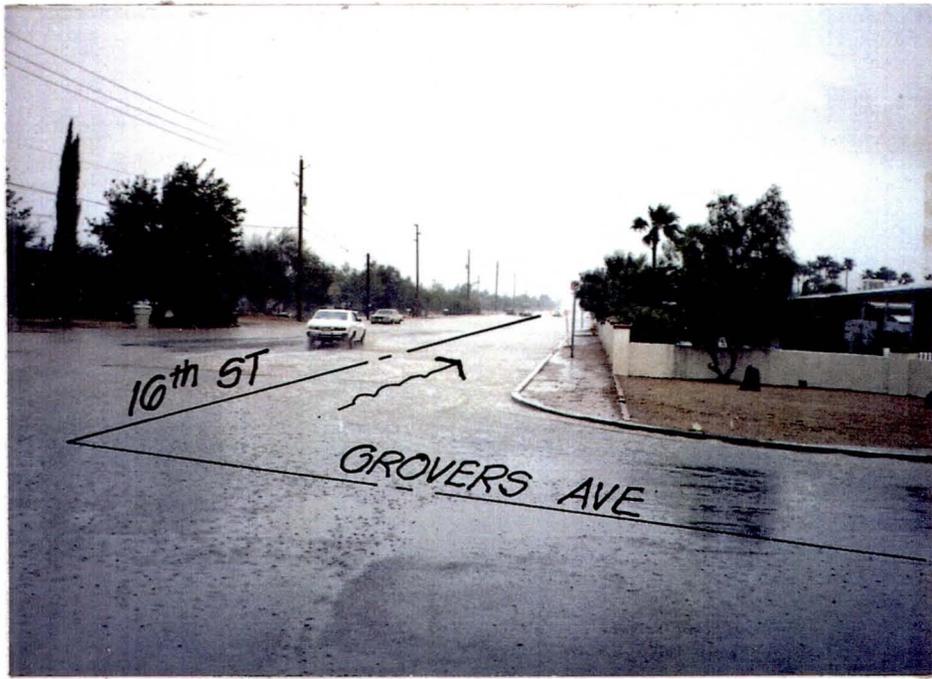
LEGEND

- EXIST OPEN CHANNEL 
- EXIST BOX CULVERT 

DATE OF PHOTOS
OCTOBER 6, 1993

PHOTO DOCUMENTATION
EXISTING CONDITIONS





1



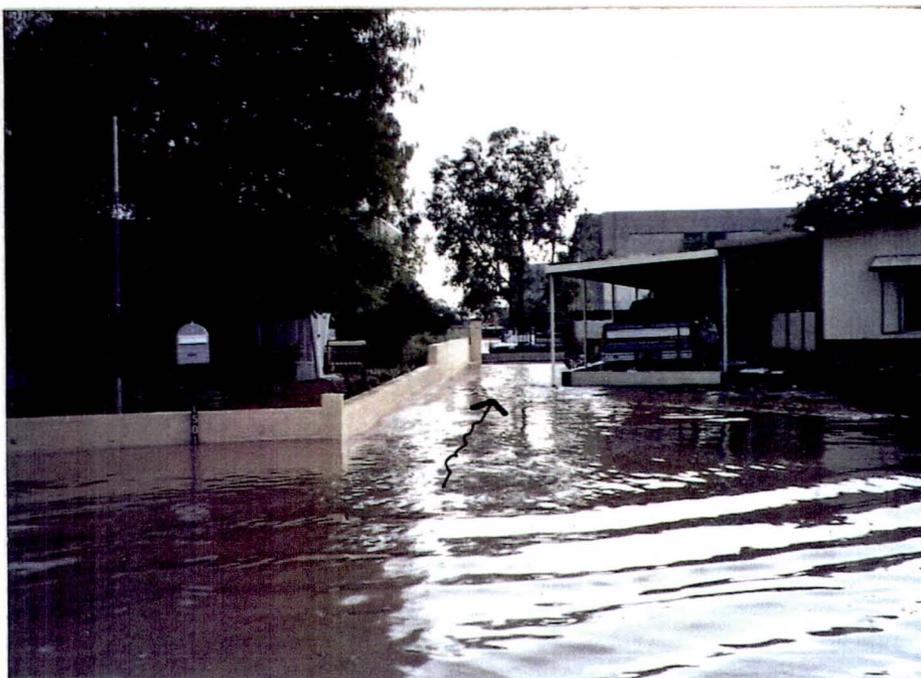
2



3



4



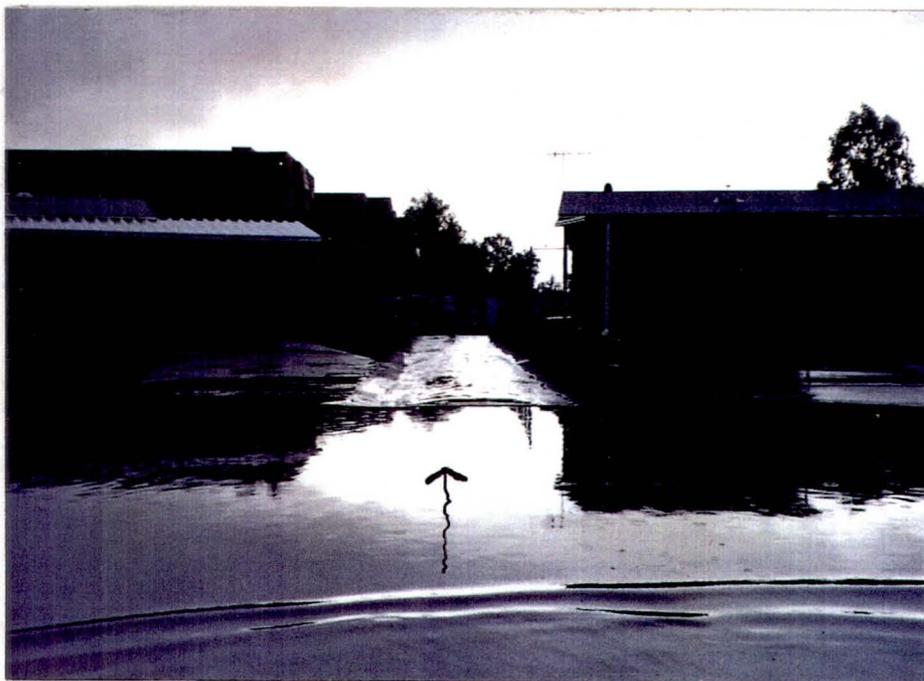
5



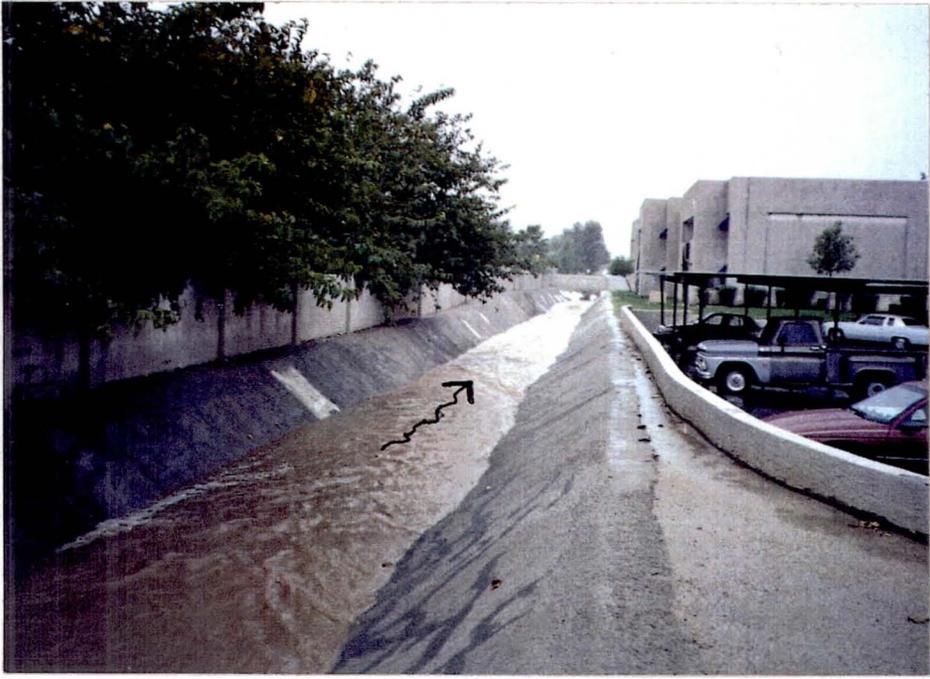
6



7



8



9



10

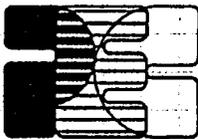


11



12

APPENDIX



PROJECT ENGINEERING
CONSULTANTS, LTD.
3130 N. 35th AVENUE, SUITE 1
PHOENIX, ARIZONA 85017

CAMPO BELLO PROJECT

FLOW RATE CALCULATIONS

Sht: 1 OF 1

Job# 93041

By: K. SHORT

Date: 2-7-94

Chkd:

Date:

Manning's Eqn.

$$Q = \frac{1.49}{n} AR^{2/3} S_0^{1/2}$$

$$R = \frac{A}{P}$$

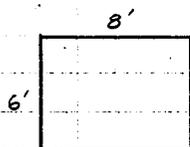
$$V = \frac{Q}{A}$$

FOR CONCRETE CULVERTS: $n = 0.013$

* ASSUME FLOWING FULL

$$S_0 = 0.005$$

$$S_0 = 0.010$$



$$Q = 557.2 \text{ cfs}$$

$$V = 11.6 \text{ FPS}$$

$$Q = 788.0 \text{ cfs}$$

$$V = 16.4 \text{ FPS}$$

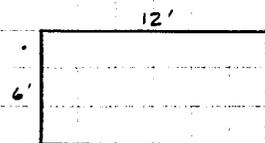


$$Q = 739.4 \text{ cfs}$$

$$V = 12.3 \text{ FPS}$$

$$Q = 1045.7 \text{ cfs}$$

$$V = 17.4 \text{ FPS}$$



$$Q = 926.3 \text{ cfs}$$

$$V = 12.9 \text{ FPS}$$

$$Q = 1310.0 \text{ cfs}$$

$$V = 18.2 \text{ FPS}$$



$$Q = 823.4 \text{ cfs}$$

$$V = 12.9 \text{ FPS}$$

$$Q = 1164.4 \text{ cfs}$$

$$V = 18.2 \text{ FPS}$$

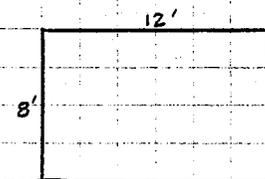


$$Q = 1104.1 \text{ cfs}$$

$$V = 13.8 \text{ FPS}$$

$$Q = 1561.4 \text{ cfs}$$

$$V = 19.5 \text{ FPS}$$



$$Q = 1394.7 \text{ cfs}$$

$$V = 14.5 \text{ FPS}$$

$$Q = 1972.4 \text{ cfs}$$

$$V = 20.5 \text{ FPS}$$

*****80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****

JOB TR-20	SUMMARY NOPLOTS				
TITLE 000 CAMPOBELLO DRAIN ROUTE STUDY	DATE: 1-21-94				
TITLE 000 JOB NUMBER: 93041	FILENAME: CAMPO.DAT				
5 RAINFL 1		.0208			
8	0.	.004	.008	.0130	.018
8	.022	.026	.031	.035	.04
8	.044	.048	.053	.057	.062
8	.066	.071	.075	.080	.093
8	.107	.120	.140	.170	.500
8	.830	.860	.880	.893	.907
8	.920	.924	.928	.933	.937
8	.942	.947	.951	.956	.960
8	.964	.969	.973	.978	.982
8	.987	.991	.995	1.00	1.00
9 ENDTBL					
6 RUNOFF 1 002	6	.084	91.	.17	
6 REACH 3 004	6 5	2800.	.037	1.66	
6 RUNOFF 1 003	7	.125	85.	.61	
6 REACH 3 004	7 6	1600.	.03	1.66	
6 ADDHYD 4 004	5 6 7				
6 RUNOFF 1 004	5	.078	83.	.98	
6 ADDHYD 4 004	5 7 6				
6 REACH 3 007	6 3	1900.	.25	1.54	
6 RUNOFF 1 001	6	.158	90.	.45	
6 REACH 3 005	6 5	1700.	.21	1.54	
6 RUNOFF 1 005	7	.088	84.	.56	
6 ADDHYD 4 005	5 7 6				
6 REACH 3 007	6 5	1550.	.28	1.54	
6 ADDHYD 4 007	3 5 4				
6 RUNOFF 1 007	5	.089	84.	.52	
6 ADDHYD 4 007	4 5 3				
6 RUNOFF 1 006	5	.055	86.	.42	
6 REACH 3 009	5 6	1950.	.23	1.54	
6 RUNOFF 1 009	7	.063	84.	.50	
6 ADDHYD 4 009	6 7 5				
6 REACH 3 010	5 7	1300.	.23	1.54	
6 RUNOFF 1 010	6	.063	84.	.79	
6 ADDHYD 4 010	6 7 5				
6 REACH 3 011	5 6	1400.	.22	1.54	
6 RUNOFF 1 011	7	.063	86.	.54	
6 ADDHYD 4 011	6 7 5				
6 REACH 3 011	3 6	1950.	.14	1.60	
6 ADDHYD 4 011	5 6 3				
6 RUNOFF 1 008	6	.084	92.	.25	
6 REACH 3 012	6 7	1900.	.26	1.54	
6 RUNOFF 1 012	5	.063	86.	.41	
6 ADDHYD 4 012	5 7 6				
6 REACH 3 012	3 5	1300.	.033	1.66	
6 ADDHYD 4 012	5 6 7				
ENDATA					
7 INCREM 6		.08			
7 COMPUT 7 002	012		4.04	24.	1 2 01 01
ENDCMP 1					
ENDJOB 2					

*****END OF 80-80 LIST*****

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION			RUNOFF AMOUNT (IN)	PEAK DISCHARGE			
						BEGIN (HR)	AMOUNT (IN)	DURATION (HR)		ELEVATION (FT)	TIME (HR)	RATE (CFS)	RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 2	RUNOFF	.08	1	2	.08	.0	4.04	24.00	3.05	---	12.44	137.40	1635.7
XSECTION 4	REACH	.08	1	2	.08	.0	4.04	24.00	3.01	---	13.00	107.67	1281.8
XSECTION 3	RUNOFF	.13	1	2	.08	.0	4.04	24.00	2.47	---	12.57	153.98	1231.8
XSECTION 4	REACH	.13	1	2	.08	.0	4.04	24.00	2.46	---	12.89	132.33	1058.7
XSECTION 4	ADDHYD	.21	1	2	.08	.0	4.04	24.00	2.68	---	12.94	237.62	1136.9
XSECTION 4	RUNOFF	.08	1	2	.08	.0	4.04	24.00	2.29	---	12.78	75.11	962.9
XSECTION 4	ADDHYD	.29	1	2	.08	.0	4.04	24.00	2.58	---	12.91	308.29	1074.2
XSECTION 7	REACH	.29	1	2	.08	.0	4.04	24.00	2.57	---	13.05	301.95	1052.1
XSECTION 1	RUNOFF	.16	1	2	.08	.0	4.04	24.00	2.94	---	12.50	236.29	1495.5
XSECTION 5	REACH	.16	1	2	.08	.0	4.04	24.00	2.93	---	12.62	230.72	1460.3
XSECTION 5	RUNOFF	.09	1	2	.08	.0	4.04	24.00	2.39	---	12.56	108.34	1231.1
XSECTION 5	ADDHYD	.25	1	2	.08	.0	4.04	24.00	2.74	---	12.60	338.14	1374.5
XSECTION 7	REACH	.25	1	2	.08	.0	4.04	24.00	2.73	---	12.71	333.64	1356.2
XSECTION 7	ADDHYD	.53	1	2	.08	.0	4.04	24.00	2.65	---	12.81	590.50	1107.9
XSECTION 7	RUNOFF	.09	1	2	.08	.0	4.04	24.00	2.39	---	12.55	112.01	1258.6
XSECTION 7	ADDHYD	.62	1	2	.08	.0	4.04	24.00	2.61	---	12.75	673.20	1082.3
XSECTION 6	RUNOFF	.05	1	2	.08	.0	4.04	24.00	2.57	---	12.51	75.57	1373.9
XSECTION 9	REACH	.05	1	2	.08	.0	4.04	24.00	2.56	---	12.74	70.18	1276.0
XSECTION 9	RUNOFF	.06	1	2	.08	.0	4.04	24.00	2.39	---	12.54	79.70	1265.1
XSECTION 9	ADDHYD	.12	1	2	.08	.0	4.04	24.00	2.47	---	12.60	144.27	1222.6
XSECTION 10	REACH	.12	1	2	.08	.0	4.04	24.00	2.46	---	12.73	140.47	1190.4
XSECTION 10	RUNOFF	.06	1	2	.08	.0	4.04	24.00	2.38	---	12.68	69.42	1102.0
XSECTION 10	ADDHYD	.18	1	2	.08	.0	4.04	24.00	2.43	---	12.71	209.55	1157.7
XSECTION 11	REACH	.18	1	2	.08	.0	4.04	24.00	2.43	---	12.84	204.64	1130.6
XSECTION 11	RUNOFF	.06	1	2	.08	.0	4.04	24.00	2.56	---	12.54	82.57	1310.7
XSECTION 11	ADDHYD	.24	1	2	.08	.0	4.04	24.00	2.46	---	12.72	267.01	1094.3
XSECTION 11	REACH	.62	1	2	.08	.0	4.04	24.00	2.61	---	12.88	659.87	1060.9
XSECTION 11	ADDHYD	.87	1	2	.08	.0	4.04	24.00	2.57	---	12.84	914.55	1056.1
XSECTION 8	RUNOFF	.08	1	2	.08	.0	4.04	24.00	3.14	---	12.45	136.32	1622.9
XSECTION 12	REACH	.08	1	2	.08	.0	4.04	24.00	3.13	---	12.63	132.68	1579.6
XSECTION 12	RUNOFF	.06	1	2	.08	.0	4.04	24.00	2.57	---	12.50	86.75	1376.9
XSECTION 12	ADDHYD	.15	1	2	.08	.0	4.04	24.00	2.89	---	12.54	216.93	1475.7
XSECTION 12	REACH	.87	1	2	.08	.0	4.04	24.00	2.56	---	12.98	893.15	1031.4
XSECTION 12	ADDHYD	1.01	1	2	.08	.0	4.04	24.00	2.61	---	12.86	986.99	974.3

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
 (A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
 A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

XSEC REACH ID	REACH LENGTH (FT)	HYDROGRAPH INFORMATION						ROUTING PARAMETERS							PEAK TRAVEL TIME				
		INFLOW		OUTFLOW		OUTFLOW+ INTERV.AREA		BASE- FLOW	VOLUME ABOVE BASE	MAIN INCR	ITER- #	Q AND A EQUATION	LENGTH FACTOR	PEAK RATIO	S/Q @PEAK (K)	ATT- KIN COEFF (C)	STOR- AGE (HR)	KINE- MATIC (HR)	
		PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	(CFS)	(IN)	(HR)		COEFF (X)	POWER (M)	FACTOR (K*)	O/I (Q*)	(SEC)	(C)	(HR)	(HR)
ALTERNATE	1	STORM	1																
4	2800	134	12.5	107	13.0	---	---	0	3.05	.08	1	.037	1.66	.496	.798	1752	.15	.08	.51
4	1600	154	12.6	132	12.9	237	13.0	0	2.47	.08	1	.030	1.66	.203	.860	1076	.24	.24	.31
7	1900	308	12.9	302	13.0	---	---	0	2.58	.08	1	.250	1.54	.034	.981	407	.52	.16	.11
5	1700	236	12.5	231	12.6	336	12.6	0	2.94	.08	1	.210	1.54	.054	.976	448	.49	.16	.12
7	1550	336	12.6	333	12.7	---	---	0	2.74	.08	1	.280	1.54	.028	.992	299	.65	.08	.08
9	1950	75	12.5	70	12.7	143	12.6	0	2.57	.08	1	.230	1.54	.123	.929	722	.33	.16	.20
10	1300	143	12.6	140	12.7	209	12.7	0	2.47	.08	1	.230	1.54	.041	.979	384	.55	.08	.11
11	1400	209	12.7	204	12.9	267	12.7	0	2.43	.08	1	.220	1.54	.037	.973	373	.56	.16	.10
11	1950	672	12.7	660	12.9	---	---	0	2.61	.08	1	.140	1.60	.026	.982	363	.57	.16	.10
12	1900	135	12.5	133	12.6	217	12.6	0	3.14	.08	1	.260	1.54	.071	.981	530	.43	.08	.15
12	1300	912	12.8	892	13.0	---	---	0	2.57	.08	1	.033	1.66	.029	.979	407	.52	.16	.11

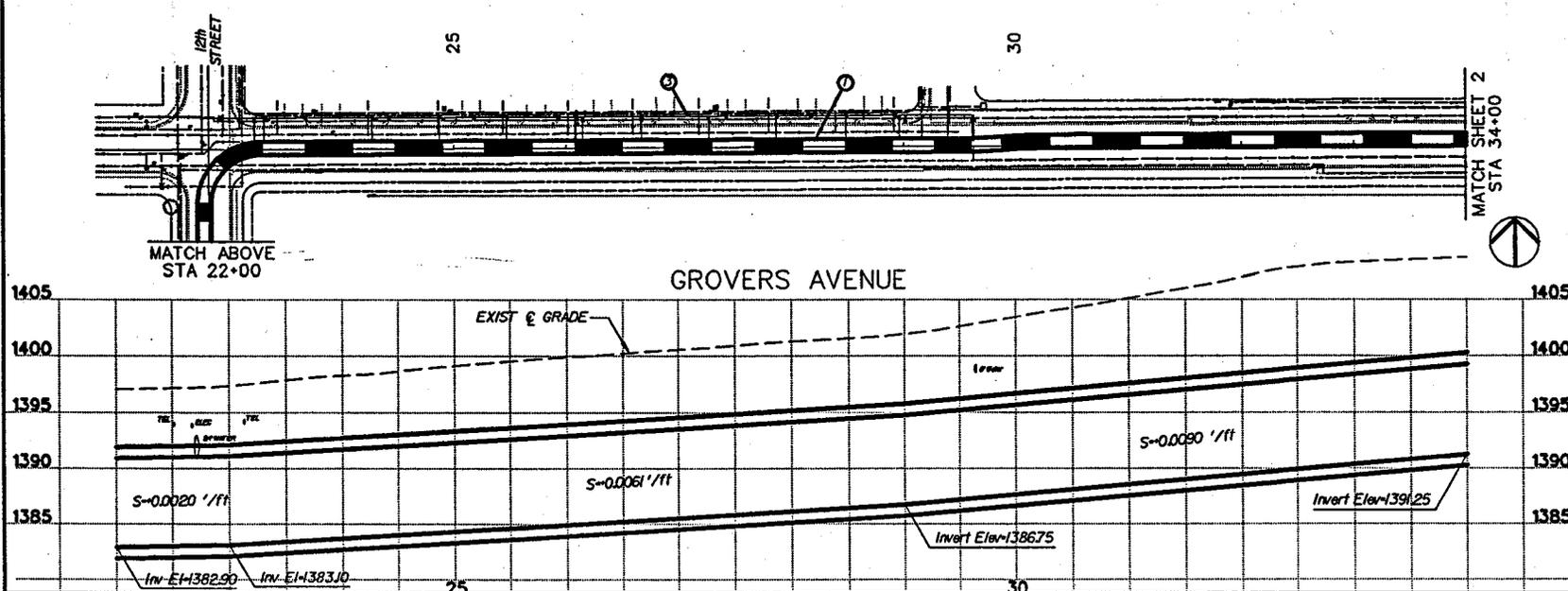
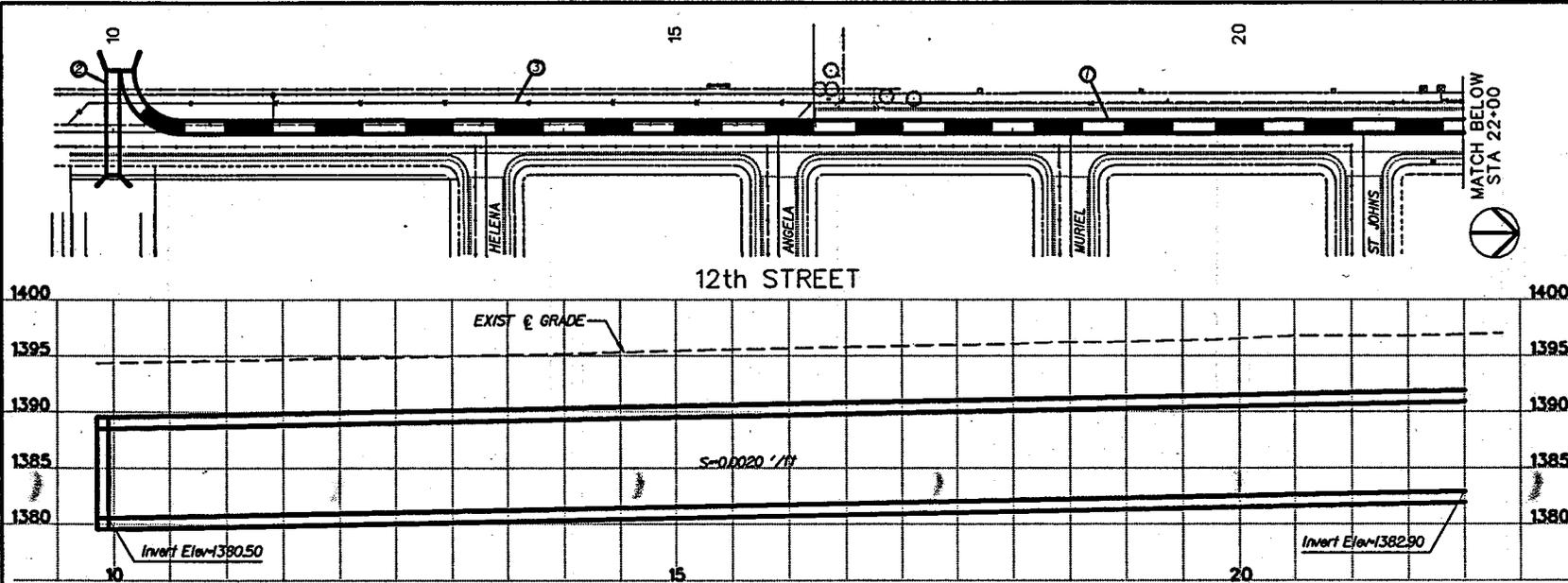
SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
XSECTION 1	.16	
ALTERNATE 1		236.29
XSECTION 2	.08	
ALTERNATE 1		137.40
XSECTION 3	.13	
ALTERNATE 1		153.98
XSECTION 4	.29	
ALTERNATE 1		308.29
XSECTION 5	.25	
ALTERNATE 1		338.14
XSECTION 6	.05	
ALTERNATE 1		75.57
XSECTION 7	.62	
ALTERNATE 1		673.20
XSECTION 8	.08	
ALTERNATE 1		136.32
XSECTION 9	.12	
ALTERNATE 1		144.27
XSECTION 10	.18	
ALTERNATE 1		209.55
XSECTION 11	.87	
ALTERNATE 1		914.55
XSECTION 12	1.01	
ALTERNATE 1		986.99

MAIN - UNEXPECTED RECORD FOUND(IGNORED) >>>

<<<

ALTERNATE A



CONSTRUCTION NOTES

NO	DESCRIPTION	QUANT
①	Construct 10 x 8 Concrete Box	2427 LF
②	Construct 10 x 6 Concrete Box Culvert	92 LF
③	Relocate 6" Water Line	1371 LF

CITY OF PHOENIX, ARIZONA
Engineering Department

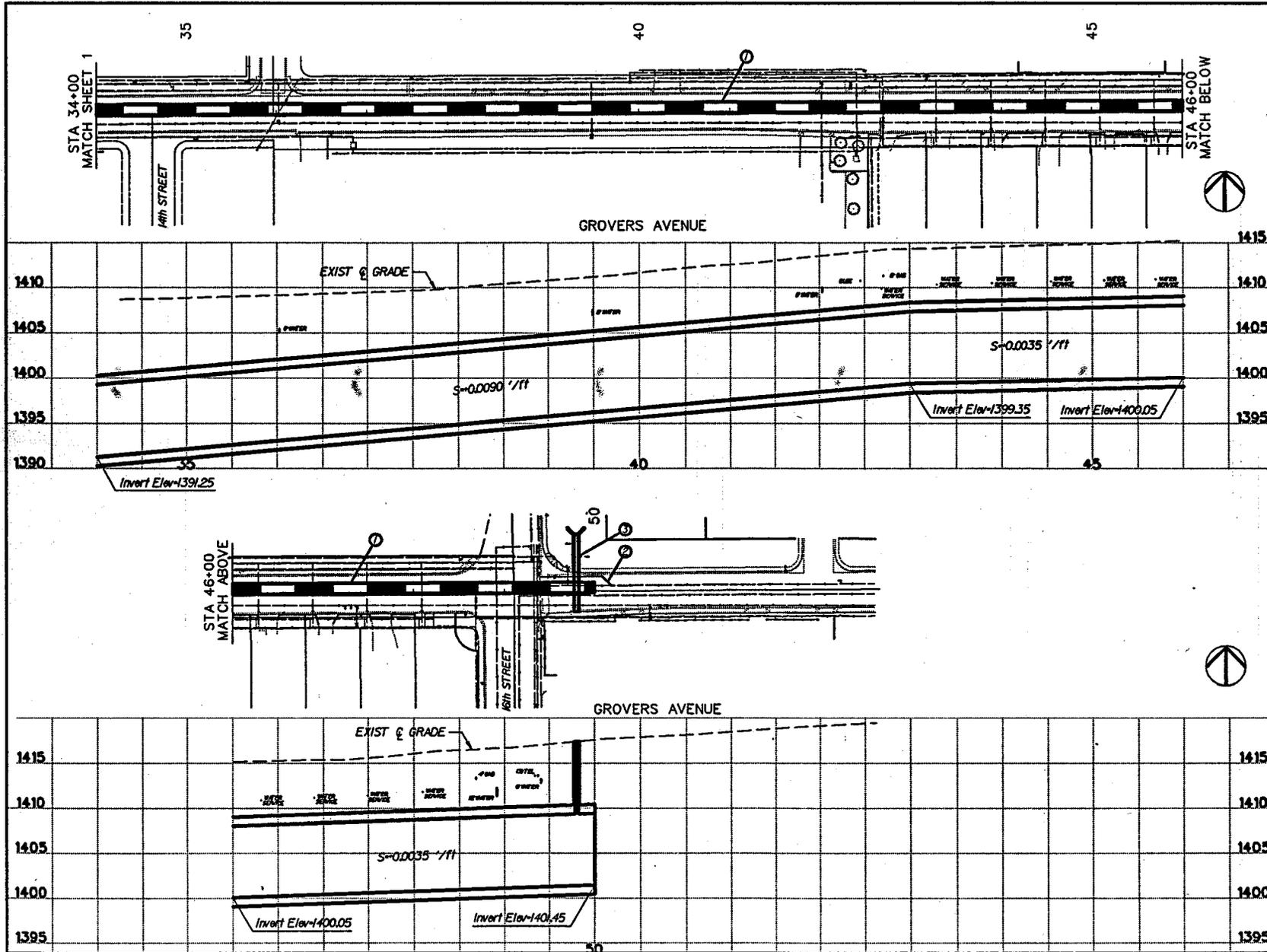
PROJECT ENGINEERING CONSULTANTS, LTD.
300 North 34th Street, Suite 1
Phoenix, Arizona 85018
Phone: 948-144-7600

ST-896837

**CAMPO BELLO LATERAL
ALTERNATE A
PLAN AND PROFILE STUDY**

CHK'D DATE 2/94 SCALE SHEETS
DES.'S DATE 2/94 1" = 50' HORIZONTAL 1" = 5' VERTICAL NO. 1 OF 2
CHK'D DATE 2/94

ALTERNATE A

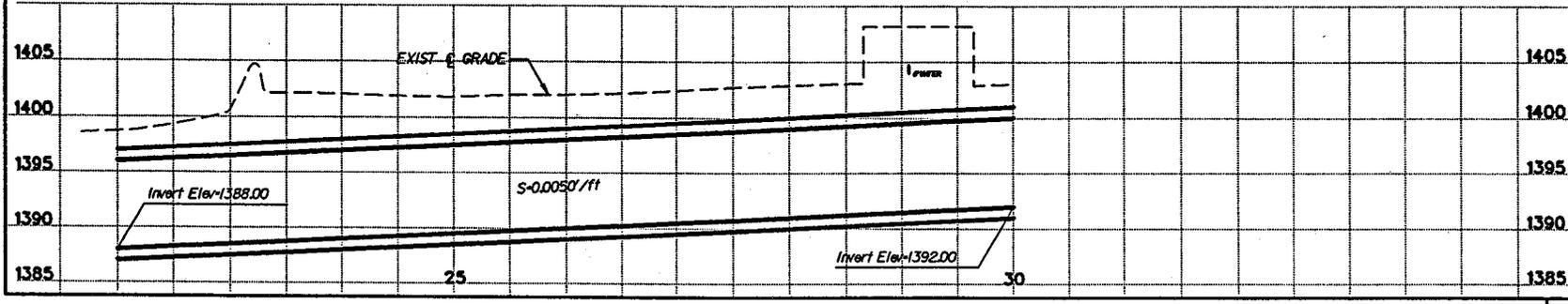
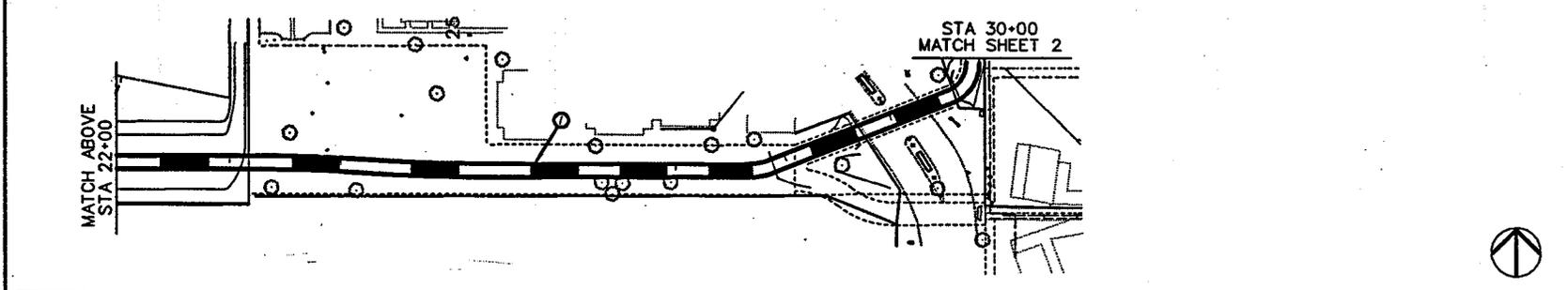
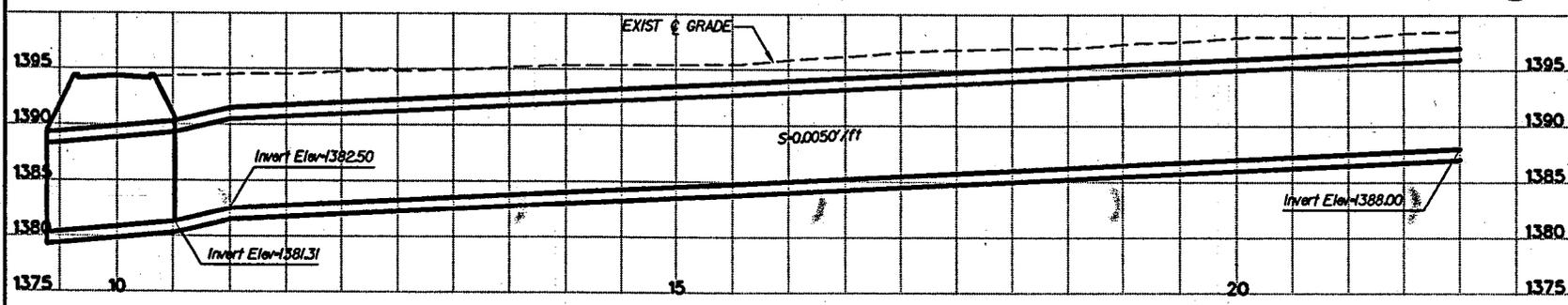
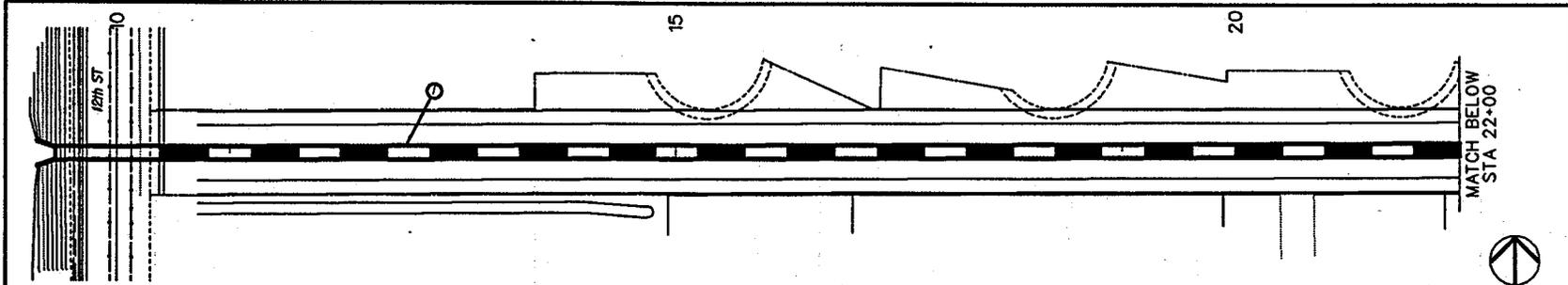


CONSTRUCTION NOTES

NO	DESCRIPTION	QUANT
①	Construct 10 x 8 Concrete Box	1600 LF
②	Relocate 8" Water Line	82 LF
③	Inlet Structure	1 EA

CITY OF PHOENIX, ARIZONA ENGINEERING DEPARTMENT	
PROJECT ENGINEERING CONSULTANTS, LTD. <small>2005 NORTH 30TH AVENUE, SUITE 1 PHOENIX, ARIZONA 85018 PHONE 602-241-1541</small>	
ST-896837	
CAMPO BELLO LATERAL ALTERNATE A PLAN AND PROFILE STUDY	
<small>DESIGN DATE 2/24 CHECKED DATE 2/24 CIVIL DATE 2/24</small>	<small>SCALE P = 50' HORIZONTAL V = 3" VERTICAL</small>
SHEETS NO. 2 OF 2	

ALTERNATE B



CONSTRUCTION NOTES

NO	DESCRIPTION	QUANT
①	Construct 10 x 8 Concrete Box	2427 LF
②	Construct 10 x 6 Concrete Box Culvert	92 LF
③	Relocate 8" Water Line	1371 LF

CITY OF PHOENIX, ARIZONA
ENGINEERING DEPARTMENT

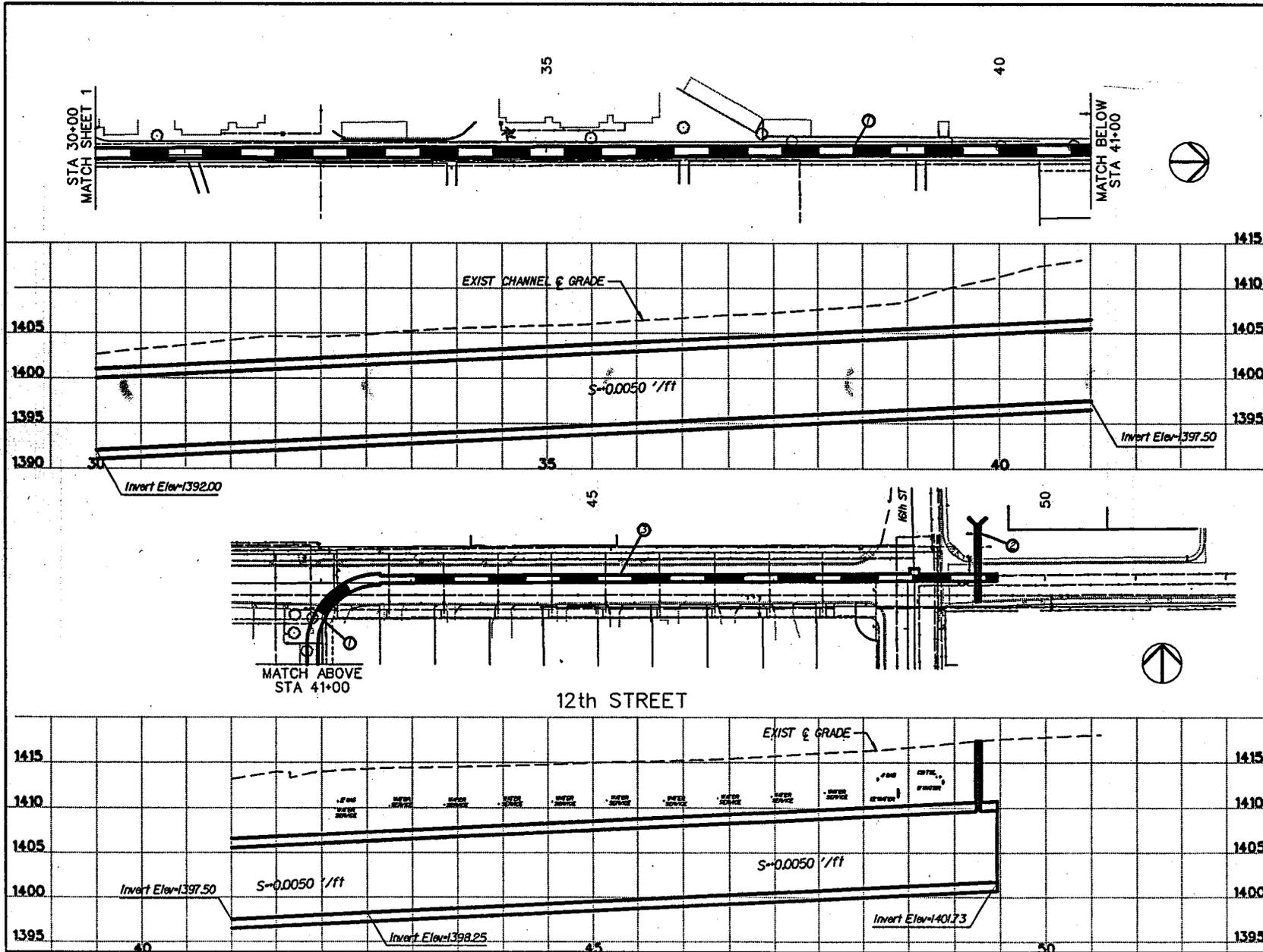
PROJECT ENGINEERING CONSULTANTS, LTD.
303 NORTH 3RD AVENUE, SUITE 1
PHOENIX, ARIZONA 85007
PHONE 262-6847-7441

ST-896837

CAMPO BELLO LATERAL
ALTERNATE B
PLAN AND PROFILE STUDY

DATE: 2/94 SCALE: HORIZONTAL: 1" = 50' VERTICAL: 1" = 5'
SHEETS: NO. 1 OF 2

ALTERNATE B



CONSTRUCTION NOTES

NO	DESCRIPTION	QUANT
①	Construct 10 x 8 Concrete Box	2427 LF
②	Inlet Structure	1 EA
③	Construct 8 x 8 Concrete Box	696 LF

CITY OF PHOENIX, ARIZONA
ENGINEERING DEPARTMENT

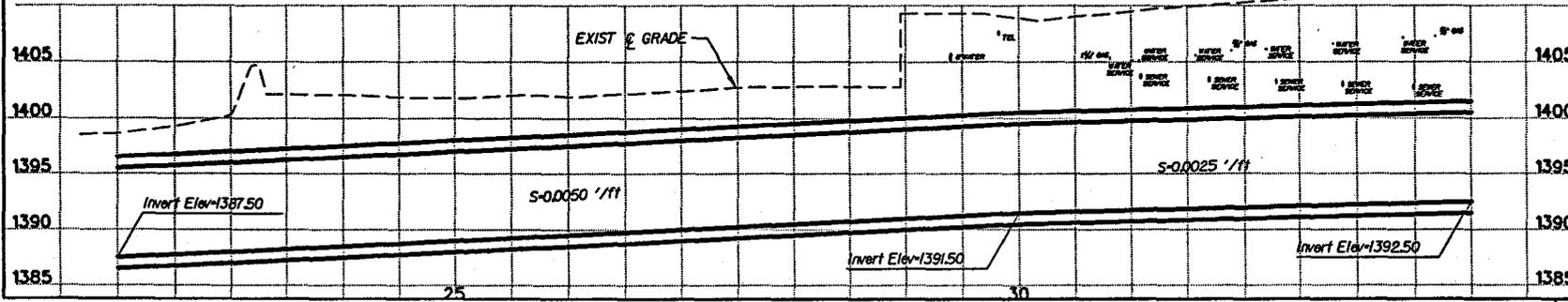
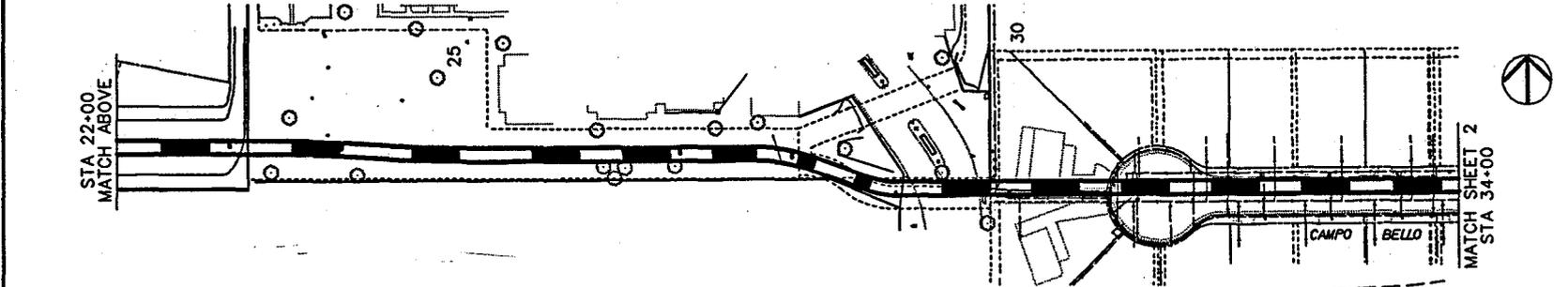
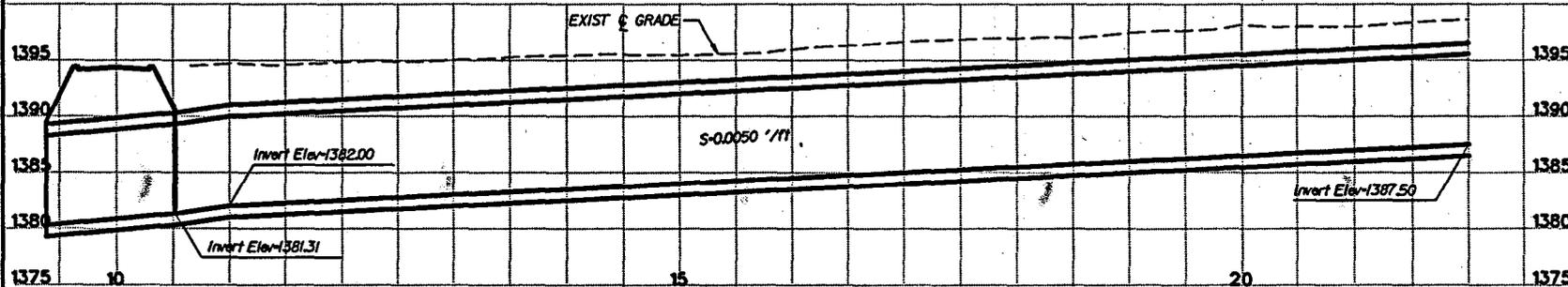
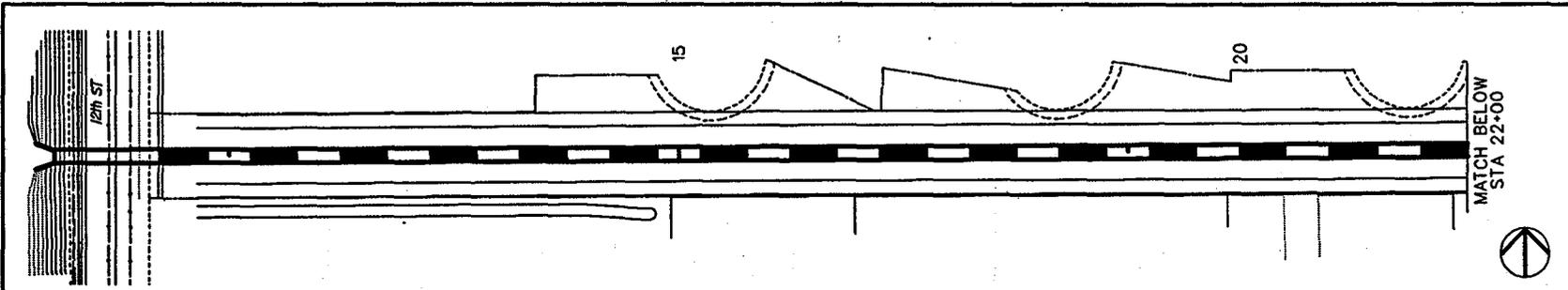
PROJECT ENGINEERING CONSULTANTS, LTD.
2310 NORTH 28th AVENUE, SUITE 1
PHOENIX, ARIZONA 85016
PHONE 852-1221-7221

ST-896837

**CAMPO BELLO LATERAL
ALTERNATE B
PLAN AND PROFILE STUDY**

DATE DATE 2/94	SCALE	SHEETS
DESIGN DATE 2/94	P = 50' HORIZONTAL	NO. 2 OF 2
CHECK DATE 2/94	P = 3" VERTICAL	

ALTERNATE C



CONSTRUCTION NOTES

NO	DESCRIPTION	QUANT
①	Construct 10 x 8 Concrete Box	2427 LF
②	Construct 10 x 6 Concrete Box Culvert	92 LF

CITY OF PHOENIX, ARIZONA
ENGINEERING DEPARTMENT

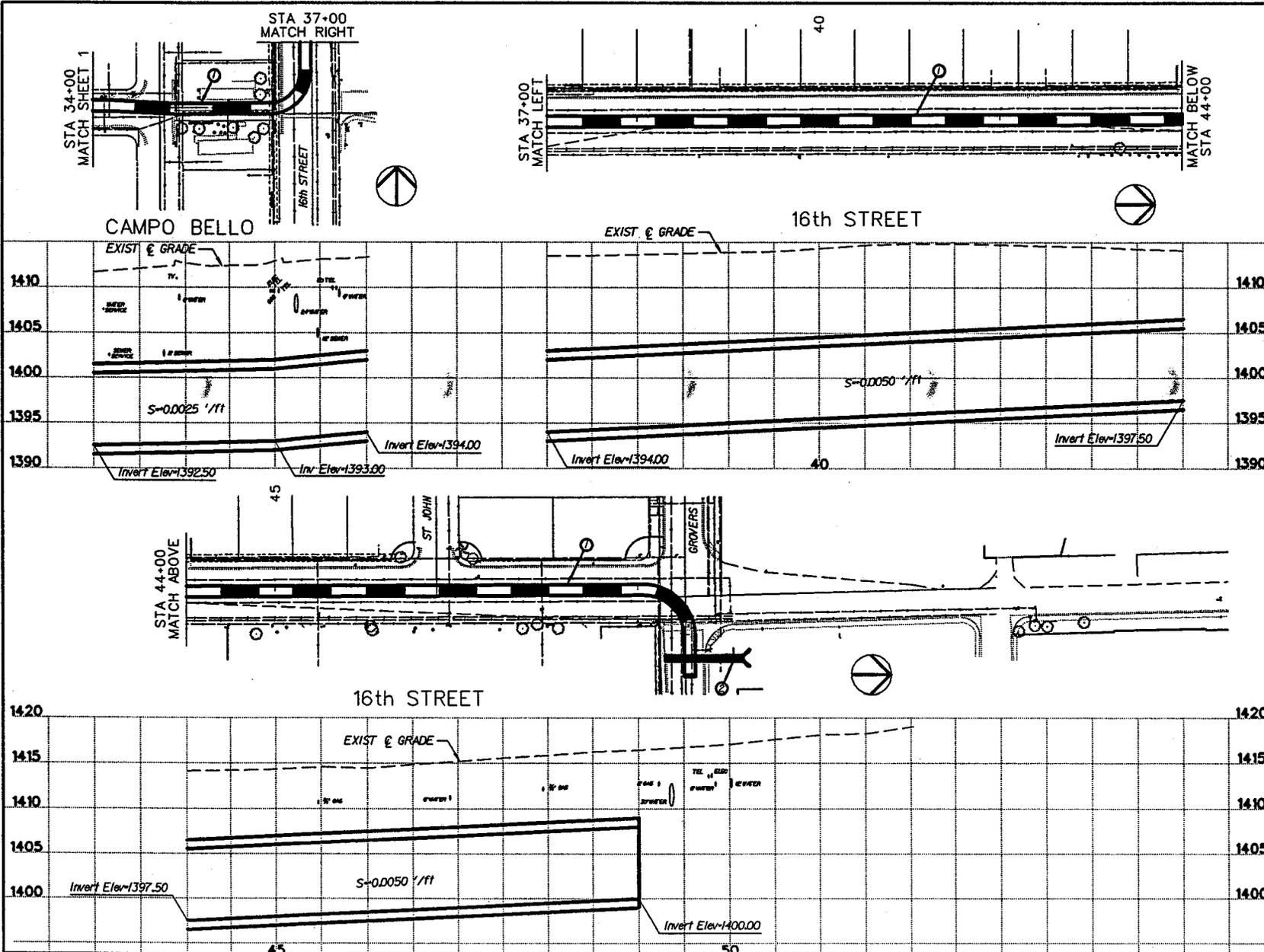
PROJECT ENGINEERING CONSULTANTS, LTD.
3430 NORTH 25th AVENUE, SUITE 1
PHOENIX, ARIZONA 85016
PHONE: 948-864-1100

ST-896837

**CAMPO BELLO LATERAL
ALTERNATE C
PLAN AND PROFILE STUDY**

DATE: 2/94 SCALE: 1" = 50' HORIZONTAL
REV: 2/94 1" = 2' VERTICAL
CHK: 2/94 SHEETS: NO. 1 OF 2

ALTERNATE C



CONSTRUCTION NOTES

NO	DESCRIPTION	QUANT
①	Construct 10 x 8 Concrete Box	1620 LF
②	Inlet Structure	1EA

CITY OF PHOENIX, ARIZONA
ENGINEERING DEPARTMENT

PROJECT ENGINEERING CONSULTANTS, LTD.
210 NORTH 30th AVENUE, SUITE 1
PHOENIX, ARIZONA 85007
PHONE: 948-244-7447

ST-896837

**CAMPO BELLO LATERAL
ALTERNATE A
PLAN AND PROFILE STUDY**

DESIGNED DATE 2/94 SCALE SHEETS
 DESIGNED DATE 2/94 1" = 50' HORIZONTAL NO. 2 OF 2
 CHECKED DATE 2/94 1" = 5' VERTICAL