FINAL DRAINAGE REPORT

FOUNTAIN HILLS BOULEVARD AT ASHBROOK WASH

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Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

Prepared for:

TOWN OF FOUNTAIN HILLS

JUNE 1995

Prepared By:

STANLEY CONSULTANTS, INC.

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STANLEY CONSULTANTS, INC.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
24999
JEFFREY R.
MINCH
DATE SIGNED 6-22-95
ARIZONA, U.S.A.

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I. INTRODUCTION

A. Introduction and Purpose

The existing Fountain Hills Boulevard dip crossing at Ashbrook Wash is frequently closed to traffic during and after storm events due to high water depth and velocity. Stormwater flows in Ashbrook Wash have closed the Fountain Hills Boulevard crossing 13 times, totaling 25 days over the last five years. Typically, after reopening the crossing, Ashbrook Wash continues to flow across the roadway for prolonged periods. These nuisance flows are due to outflows from four upstream detention dams, forced recharge from upstream effluent watering, and a perched groundwater table.

This report documents the drainage design for the Fountain Hills Boulevard all-weather box culvert crossing (100-year flood event) at Ashbrook Wash, and the associated roadway drainage improvements necessary for the project.

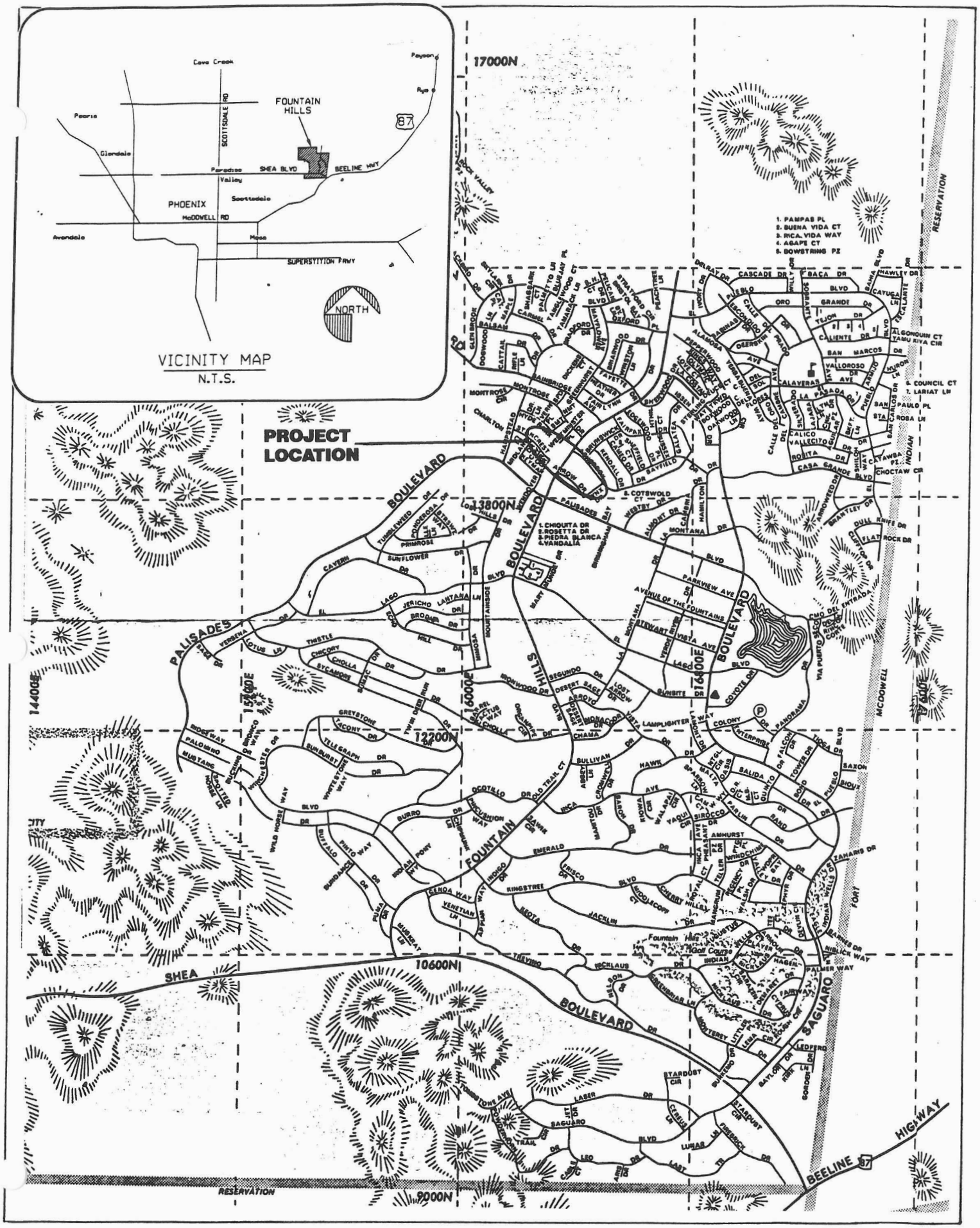
B. Project Location

The project is located on Fountain Hills Boulevard approximately 0.2 miles north of Palisades Boulevard. The project is located entirely within the incorporated limits of the Town of Fountain Hills. A location map of the project site is presented in Figure 1.

C. Description of Improvements

1. Existing Conditions

The existing dip crossing conveys nuisance flows under Fountain Hills Boulevard through an 18 inch corrugated metal pipe. Large rocks frequently plug this culvert which result in flow overtopping the roadway. The Town of Fountain Hills installed



TOWN OF FOUNTAIN HILLS

FIGURE 1

STANLEY CONSULTANTS, INC.
[illegible] EAST CAMELBACK ROAD, SUITE [illegible]
PHOENIX, ARIZONA [illegible] • [illegible]

an 8 inch underdrain (HDPE) beneath the northbound lanes and south of the concrete dip crossing. The underdrain was installed to eliminate groundwater from upwelling and deteriorating the asphaltic pavement.

2. Proposed Improvements

The proposal project will remove the existing dip crossing, construct a new double 12' by 8' reinforced concrete box culvert, reconstruct the roadway, and add a sidewalk along the east side of the roadway. Weep holes will be built into the culvert to relieve groundwater pressures. Catch basins against the box culvert wells constructed for roadway drainage will outfall to the box culvert and outlet wingwall.

The design concept report (DCR) developed by the Town of Fountain Hills recommended a double 12 foot wide by 8 foot tall reinforced box culvert with wingwalls at both the inlet and outlet. A copy of the approved DCR is provided in Appendix A. The Ashbrook Wash box culvert was sized for hydraulic purposes, and to provide a future bicycle path opening beneath Fountain Hills Boulevard.

D. Drainage Plans

The construction plans for the drainage improvements described above are presented in Exhibit I.

II. ASHBROOK WASH

A. General Discussion

The Flood Control District of Maricopa County (FCDMC) is currently performing a Flood Insurance Study (FIS) for the major washes within the Town of Fountain Hills. The District is under contract with George V. Sabol Consulting Engineers, Inc. (GVSCE) in association with McLaughlin Kmetty Engineers, LTD. (MKE) to perform the Fountain Hills (North) Floodplain Delineation Study. GVSCE is performing the hydrologic analysis and MKE is delineating the floodplain and floodway limits.

B. Hydrology

Two hydrologic models (HEC-1) were developed by GVSCE. One model quantifies the existing peak discharges and the other estimates the future peak discharges. Both the existing and future hydrologic models considered the 100-year, 6-hour and 100-year, 24-hour duration storm events. The future peak discharges are based on zoning and current development patterns in the watersheds.

FCDMC provided a summary table with both the existing and future 100-year peak discharges for the Fountain Hills (North) Floodplain Delineation Study. These tables are provided in Appendix B. A summary of the 100-year peak discharges at the Fountain Hills Boulevard crossing of Ashbrook Wash is provided in Table I.

Table I. Ashbrook Wash 100-Year Peak Discharges at Fountain Hills Boulevard

Design Condition	100-Year Peak Discharge (cfs)		Design Discharge (cfs)
	6-Hour Storm	24-Hour Storm	
Existing	1184	1152	1185
Future	1866	1484	1865

Trico International, Inc. performed a Master Drainage Control Study for Fountain Hills in approximately 1970. This study predicted a future 100-year peak flow of 1748 cfs for Ashbrook Wash at Fountain Hills Boulevard.

C. Topographic Mapping

The digital mapping used for the hydraulic analyses of Ashbrook Wash was provided by MKE. The mapping was developed by Kenney Aerial Mapping from photos taken in August 1991. The mapping was prepared by photogrammetric methods to national map accuracy standards of 1"=200' horizontal scale and 2' contour intervals. The topographic mapping is based on ground control survey data provided by Anderson-Nelson, Inc.

The elevations presented on the mapping are based on the National Geodetic Vertical Datum (NGVD) of 1929. However, this project will be constructed using the Town of Fountain Hills Datum. The 1929 NGVD was determined to be 1.4 feet lower than the Town of Fountain Hills Datum. Therefore, all design elevations used in the hydraulic analyses were lowered by 1.4 feet.

A listing of elevation reference marks (ERM's) and the survey notes indicating the difference between the two datums are provided in Appendix C. The closest ERM to the project site is 3-A. ERM 3-A is a brass cap at the center of the cul-de-sac at the south end of Arrow Drive.

D. Hydraulic Analyses

A preliminary existing conditions HEC-2 model for Ashbrook Wash was provided by FCDMC. The design discharges were modified to reflect the FIS 100-year peak discharges for both existing and future conditions. Cross-sections were added using the topographic mapping to better define the hydraulic conditions at the proposed box culvert.

Manning's "n" values used in the HEC-2 analyses are documented in a report for the FIS (1). Expansion and contraction coefficients were adjusted to reflect the impact of the proposed culvert.

The proposed culvert will be constructed at a flatter slope than the existing channel and slightly below the existing invert. Therefore, the channel upstream of the inlet will be graded at approximately a 10 to 1 slope to intersect the existing upstream channel.

Two HEC-2 models were developed for the project and the output for these models are presented in Appendix D. The first model (EXIST2.DAT) quantifies the existing hydraulic conditions at the project site. The proposed conditions model (DESIGN.DAT) used the HEC-2 special culvert routine to determine the impacts of the proposed box culvert.

The proposed condition model indicates a maximum water-surface elevation increase of approximately 0.8 feet above the existing water-surface elevation. Both the existing and future hydrology 100-year floodplains are contained within the recorded drainage tract for Ashbrook Wash. The hydraulic analysis for the existing hydrology indicates a maximum increase of approximately 4 feet-per-second (fps) at the point where the channel excavation ties into the existing channel invert. The hydraulic analyses using the future hydrology indicates a maximum increase of approximately 3 fps at the outlet of the culvert. Tables II and III present a comparison between the existing and proposed hydraulic conditions for the existing and future hydrology, respectively. A map showing cross-section locations and floodplain limits for both the existing and future hydrology is provided in Appendix D.

E. Scour Potential

The slope of Ashbrook Wash at the project site is approximately 0.026 ft/ft. The proposed box culvert will be constructed on a 0.010 ft/ft slope. The Town requested that the upstream channel be excavated at a 10% slope from the inlet to intersect the existing channel invert. It is likely the artificial grade break created by the channel grading will propagate upstream. Therefore, a significant potential exists that the culvert will fill with channel sediment during storm events. It should be noted that the proposed culvert installation may require maintenance after major storm events.

Since a six foot deep cutoff wall will be constructed as part of the outlet wingwalls and apron, and the ratio of the proposed to existing conditions outlet velocity is between 1.2 and 1.3, no additional outlet protection was considered necessary.

Table II. Comparison of Hydraulic Conditions, Existing Hydrology (Q = 1185 cfs)

Cross-Section Number	Existing Invert Elev. (ft)	Design Invert Elev. (ft)	Existing Conditions			Design Conditions			Design - Existing		
			Water Surface Elev. (ft)	Channel Velocity (fps)	Channel Topwidth (ft)	Water Surface Elev. (ft)	Channel Velocity (fps)	Channel Topwidth (ft)	Water Surface Elev. (ft)	Channel Velocity (fps)	Channel Topwidth (ft)
3.190	1634.0	1634.0	1637.7	6.0	84	1637.7	6.0	84	0.0	0.0	0
3.210	1635.9	1634.9	1639.4	8.2	77	1640.0	9.3	25	0.6	1.1	-52
3.236	1640.9	1636.3	1644.4	9.4	71	1642.0	8.4	25	-2.5	-1.0	-46
3.246	1642.0	1642.0	1645.9	3.5	121	1643.9	7.5	90	-1.9	4.0	-30
3.323	1649.8	1649.8	1652.7	8.3	109	1653.2	5.9	111	0.6	-2.3	2
3.421	1660.0	1660.0	1663.4	5.6	88	1662.9	6.8	85	-0.4	1.2	-3
3.478	1666.6	1666.6	1669.5	8.5	74	1669.5	8.3	76	0.0	-0.1	1
3.519	1670.6	1670.6	1674.0	10.4	28	1674.0	10.4	28	0.0	0.0	0
3.531	1671.7	1671.7	1678.4	5.0	33	1678.4	5.0	33	0.0	0.0	0
3.544	1673.7	1673.7	1678.9	1.8	253	1678.9	1.8	253	0.0	0.0	0

Table III. Comparison of Hydraulic Conditions, Future Hydrology (Q = 1865 cfs)

Cross-Section Number	Existing Invert Elev. (ft)	Design Invert Elev. (ft)	Existing Conditions			Design Conditions			Design - Existing		
			Water Surface Elev. (ft)	Channel Velocity (fps)	Channel Topwidth (ft)	Water Surface Elev. (ft)	Channel Velocity (fps)	Channel Topwidth (ft)	Water Surface Elev. (ft)	Channel Velocity (fps)	Channel Topwidth (ft)
3.190	1634.0	1634.0	1638.5	7.3	91	1638.5	7.3	91	0.0	0.0	0
3.210	1635.9	1634.9	1640.2	9.2	88	1641.0	12.2	25	0.8	3.1	-63
3.236	1640.9	1636.3	1645.3	10.9	80	1644.0	9.7	25	-1.3	-1.2	-55
3.246	1642.0	1642.0	1647.1	4.0	149	1646.1	5.1	126	-1.0	1.1	-23
3.323	1649.8	1649.8	1653.3	9.6	111	1653.3	9.6	111	0.0	0.0	0
3.421	1660.0	1660.0	1664.3	6.9	93	1664.3	6.9	93	0.0	0.0	0
3.478	1666.6	1666.6	1670.5	9.5	99	1670.5	9.5	99	0.0	0.0	0
3.519	1670.6	1670.6	1675.4	12.3	28	1675.4	12.3	28	0.0	0.0	0
3.531	1671.7	1671.7	1680.5	6.2	33	1680.5	6.2	33	0.0	0.0	0
3.544	1673.7	1673.7	1681.2	1.7	292	1681.2	1.7	292	0.0	0.0	0

III. ON-SITE DRAINAGE

A. General Discussion

The proposed Fountain Hills Boulevard roadway improvements at Ashbrook Wash include: flattening the roadway sag vertical curve; installing a double 12' by 8' box culvert; collecting the 10-year design storm roadway runoff with catch basins, and discharging the runoff to Ashbrook Wash.

Two major drainage areas were identified which will concentrate storm runoff at the low point of the proposed roadway sag vertical curve. The proposed on-site drainage system is designed to collect all the 10-year storm runoff which reaches the sag low-point and discharge the flows through the box culvert downstream wingwall.

Fountain Hills Boulevard roadway drainage contributing to Ashbrook Wash was evaluated according to ADOT's Highway Drainage Design Manual (2,3). Since the contributing drainage area is less than 160 acres, the Rational Method was used to estimate the peak discharges.

B. Runoff Calculations

Basin 1 is defined as the area contributing to Fountain Hills Boulevard North of Ashbrook Wash. Basin 2 is defined as the area contributing to Fountain Hills Boulevard South of Ashbrook Wash. The two major drainage areas contribute to the sag vertical curve at Ashbrook Wash. Each major basin was further divided into two sub-basins by the sag in Fountain Hills Boulevard. A contributing drainage area map is provided in Appendix E. The contributing area for Basins 1 and 2 is 6.03 and 9.57 acres, respectively. The

contributing drainage area is primarily medium density residential. The runoff coefficient for each sub-basin was area weighted assuming the following land-uses:

1. Streets
2. Moderate Urban - 40% Impervious, and
3. Desert (30% vegetation cover).

Table IV illustrates the weighted runoff coefficient determined for each sub-basin.

Table IV. On-Site Runoff Coefficients

Basin	Sub-basin	Area (Ac)	Land Use	Runoff Coefficient	Weighted Runoff Coefficient
1	1-A	2.74	Moderate urban	0.57	
		1.24	Street	0.95	0.69
	1-B	0.95	Street	0.95	
		1.10	Moderate urban	0.57	0.75
2	2-A	3.60	D-30%	0.48	
		3.10	Moderate urban	0.57	
		1.60	Street	0.95	0.60
	2-B	0.97	Street	0.95	
		0.30	Moderate urban	0.57	0.86

A intensity-duration-frequency (I-D-F) graph was developed for the project site using ADOT criteria (2). The time of concentration for the drainage sub-basins were determined using ADOT criteria (2). The drainage sub-basins contributing to the project site are characterized by steep and short flow paths. The calculations presented in Appendix E indicate time of concentrations less than 10 minutes. Therefore, per ADOT design criteria, the roadway drainage system was designed assuming a 10 minute time of concentration. The

corresponding rainfall intensity from the I-D-F table was determined to be 4.2 inches per hour. The 10-year peak discharges for the project are summarized in Table V.

Table V. 10-Year On-Site Peak Discharges

Basin	Sub-Basin	Peak Discharge (cfs)
1	1-A 1-B	11.5 6.5
2	2-A 2-B	20.9 4.6

The runoff generated by sub-basins 2A and 2B approach the sag vertical curve from the southwest, while the runoff generated by sub-basins 1A and 1B approach the sag vertical curve from the northeast. The street capacity in the sag was estimated to be 8.5 cfs assuming a 0.3% longitudinal slope (4) (AASHTO).

Catch basins were sited to provide one 12-foot dry driving lane in each direction for the 10-year design storm. Catch basin sizing calculations are provided in Appendix E. Hydraulic gradeline calculations (HGL) were performed assuming a 100-year water surface elevation in Ashbrook Wash and a 10-year flow in the storm drain. Under this design condition, the maximum 10-year storm drain HGL is approximately one-half foot below the inlet elevation of catch basin number two. Extreme storm events in excess of the 10-year event will overtop the curb and flow into Ashbrook Wash.

IV. REFERENCES

1. George V. Sabol Consulting Engineers, Inc., et. al., "Fountain Hills (North) Flood Delineation Study Interim Hydraulic Report, Parameter Estimation," Prepared for the Flood Control District of Maricopa County, Contract No. 92-04, May 1993.

2. Arizona Department of Transportation, "Highway Drainage Design Manual, Hydrology," March 1993.

3. State of Arizona, Department of Transportation, Highways Division, Urban Highways Section, "Design Procedures Manual," 1990 Edition.

4. U.S. Department of Transportation, Federal Highway Administration, "Drainage of Highway Pavements," Hydraulic Engineering Circular No. 12, March 1984.

5. U.S. Department of Transportation, Federal Highway Administration, "Hydraulic Design of Highway Culverts," Hydraulic Design Series No. 5., September, 1985.

6. U.S. Department of Transportation, Federal Highway Administration, "Hydraulic Design of Energy Dissipators for Culverts and Channels," Hydraulic Engineering Circular No. 14., September 1983.

7. Arizona Department of Transportation, Inlet Computer Program, Version 3.30, March 1994.

8. U.S. Army Corps of Engineers, Hydrologic Engineering Center, "HEC-2 Water Surface Profiles, User's Manual," September 1990.

EXHIBIT I

Fountain Hills Blvd. Drainage Plans

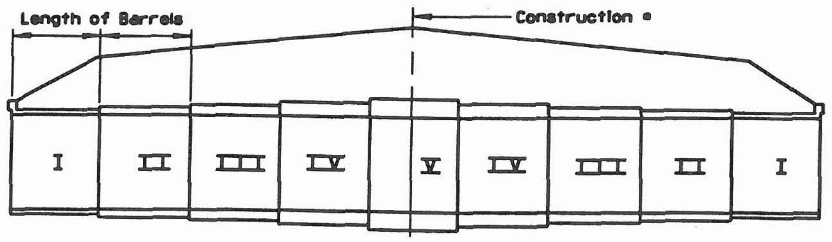
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	3		

0000 MA FTH

DESCRIPTION				STANDARD DRAWINGS REQUIRED	LENGTH OF BARRELS										APPROXIMATE QUANTITIES					REMARKS
					Left of ℄ ▲					Right of ℄ ▲										
STATION or MP	PLAN REF. NO. ○	STR. NO.	SIZE		I	II	III	IV	V	V	IV	III	II	I	Struct. Excav. Cu. Yds.	Class S f'c=3000psi Concrete Cu. Yds.	Reinforcing Steel Lbs.	Structure Backfill Cu. Yds.	Drainage Excav. Cu. Yds.	
142+55	6		2 Barrel 8 x 12	B-02.20, B-04.40 B-01.10, B-04.20	64									74	850	510	66,670	955	N/A	
Total																				

○ Reference numbers correspond to numbers in circles on PLAN SHEETS.

NOTE:
FOR STRUCTURAL EXCAVATION AND STRUCTURE BACKFILL PLACEMENT AND MEASUREMENT, SEE STANDARD DRAWINGS C-13.35, C-13.45 AND C-13.50.



▲ Construction ℄ (Looking Ahead).

DESCRIPTION							● CSP					● CAP				RCP				NRCP	NRCIPCP
									Allowable Coating							Non Trench		Trench			
Station	Plan Ref No. □	Fill Height Range (Ft.) ◓	Size, (In.) Corrugated	Size, (In.) Smooth	Length (Ft.)	Skew (Degree)	Corrugation	Wall Thickness (In.)	Zinc	Aluminum	Bituminous	Corrugation	Wall Thickness (In.)	Uncoated	Bit. Coated	Class	■ Min D-Load	Class	■ Min D-Load	Class	Min Wall Thickness (In.)
141+00, 38' Lt to 142+42.42, 42.5' Lt	P1	1-3		24	144											III	1315	III	1315		
143+30, 40' Lt to 142+71.35, 24.28' Lt	P2	1-3		24	62											III	1315	III	1315		
142+71.35, 40' Lt to 142+71.35, 24.28' Lt	P3	1-3		24	18											III	1315	III	1315		
142+71.35, 24.28' Lt to 142+71.35, 40' Rt	P4	1-3		24	68											III	1315	III	1315		
142+71.35, 40' Rt to 142+71.35, 76.22' Rt	P5	1-3		24	36											III	1315	III	1315		
142+71.35, 76.22' Rt to 142+68.75, 77.16' Rt	P6	1-3		24	4											III	1315	III	1315		

	END TREATMENT													QUANTITIES			REMARKS
	End Sct	CB, MH & Jct Str										Headwall					
							Grate		Gutter Depression								
Station	C-13.20 C-13.25	Manhole No. 3▲	Standard or Detail	Location	H (Ft)	Slotted Drn. Length (Ft)	Type	Elev.	D (In.)	L (Ft.)		Standard or Detail	Location	Pipe Ex (CY) ✱	Pipe Bkfl (CY) ✱	Drn Ex (CY)	
141+00, 38' Lt to 142+42.42, 42.5' Lt	Dtl		C-15.40	Lt	4.00		EF-2	1649.13	2	20.48							CB 1 to ES 1, 17' Wing
143+30, 40' Lt to 142+71.35, 24.28' Lt			C-15.20	Lt	3.62												CB 3 to JCT 1, 17' Wing
142+71.35, 40' Lt to 142+71.35, 24.28' Lt			C-15.20	Lt	3.45				1	13.58							CB 2 to JCT 1, 10' Wing
142+71.35, 24.28' Lt to 142+71.35, 40' Rt			C-13.70														JCT 1 to CB 4, ∢ = 75°00'00"
142+71.35, 40' Rt to 142+71.35, 76.22' Rt			C-15.20	Rt	4.05				1	13.58							CB 4 to JCT 2, 10' Wing
142+71.35, 76.22' Rt to 142+68.75, 77.16' Rt	Dtl		C-13.70	Rt													JCT 2 to ES 2, ∢ = 70°00'00"

CSP - Corrugated Steel Pipe
CAP - Corrugated Aluminum Pipe
RCP - Reinforced Concrete Pipe
NRCP - Non-Reinforced Concrete Pipe
NRCIPCP-Non-Reinforced Cast-In Place Concrete Pipe

□ Reference numbers correspond to numbers in squares on PLAN SHEETS.

◓ The Pipe Has Been Designed For A Fill Height Range As Indicated With The Fill Height Equal To Or Greater Than The Lower Number And Not Exceeding The Higher Number. Fill Heights Are The Maximum Measured From The Top Of Pipe To The Highest Point Of Subgrade Over The Pipe. Should Field Conditions Vary From The Range Indicated. Contact Design For Reevaluation Of Pipe Design Requirements.

■ The Minimum D-LOAD Needed To Produce A 0.01 Inch Crack. RCP May Be Provided By Either Min. D-LOAD Or Class.

✱ PIPE EXCAVATION & PIPE BACKFILL Will Not Be Measured For Payment.

● When Bituminous Coating Is Specified For Either Structural Plate Pipe Or Corrugated Metal Pipe. It Shall Be Applied In Accordance With AASHTO M 243 Or AASHTO M 190, Type A, Respectively. And Coated On Both The Inside And The Outside Of The Pipe Unless Otherwise Specified In These Drawings.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

▲ Include FRAME & COVER STD. C-18.10 & C-18.20

	NAME	DATE
DESIGN	KA	6/95
DRAWN	JJC	6/95
CHECKED	SDI	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130 PHOENIX, ARIZONA 85016 • (602) 912-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

CBC & RCP SUMMARY

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 3

REVISIONS | LOCATION | DATE | FINISHED PLANS

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

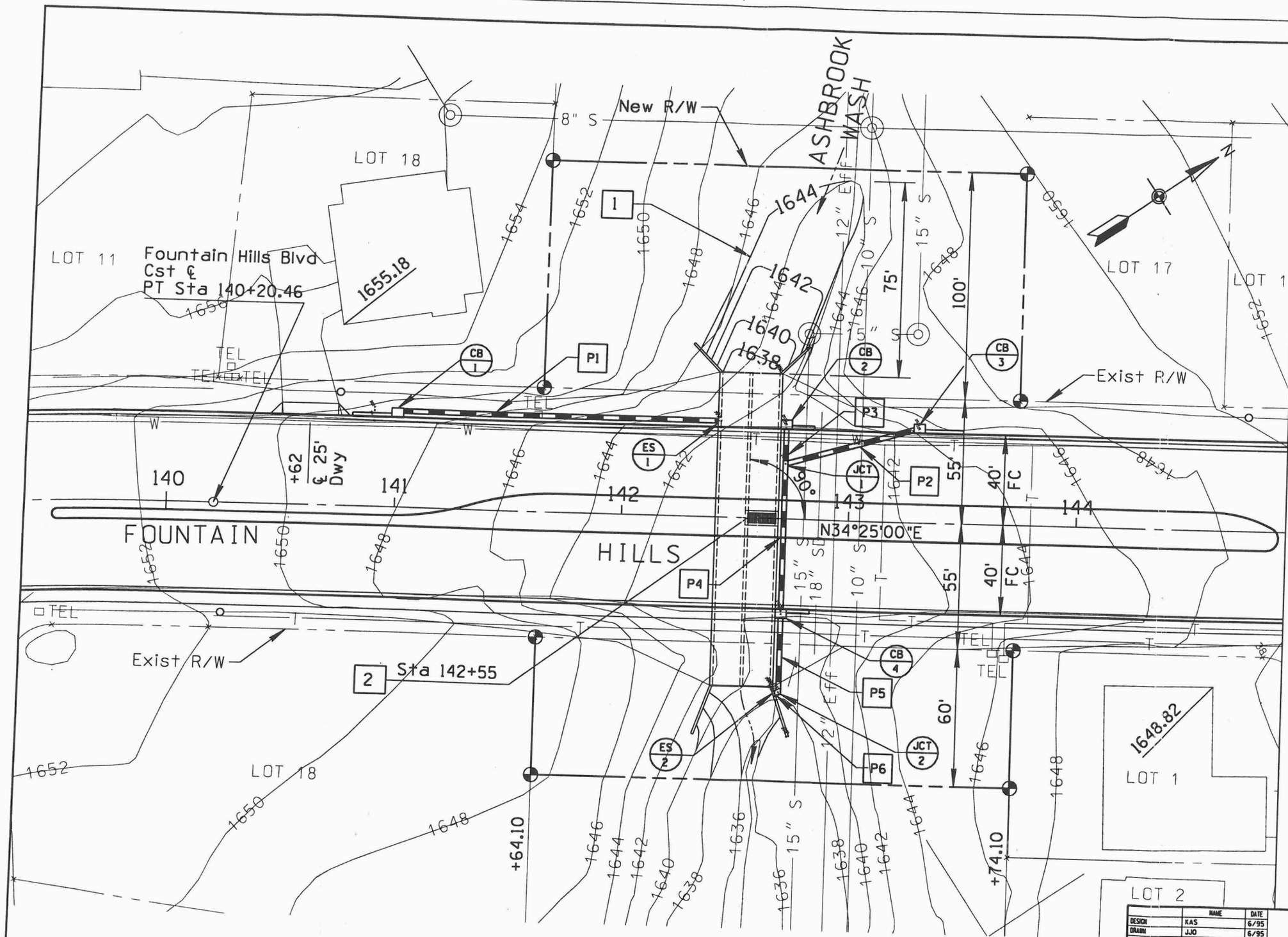
FILE:/12268/PIPESUM.DGN

PRELIMINARY-NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	8		
		0000 MA FTH			



CONSTRUCTION NOTES

1. GRADE WASH BED ALONG FLOWLINE AT 10% FROM CULVERT INLET 75 FEET TO MATCH EXISTING GRADE
2. NEW DOUBLE 12'x 8'x 138' RCBC, 0° SKEW GRATED LIGHT WELL AT CENTERLINE. SEE CULVERT DETAILS

P1 NEW 24" DIAMETER RCP
P2 NEW 24" DIAMETER RCP
P3 NEW 24" DIAMETER RCP
P4 NEW 24" DIAMETER RCP
P5 NEW 24" DIAMETER RCP
P6 NEW 24" DIAMETER RCP

	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
5025 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85018 • (602) 952-8000

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

DRAINAGE PLAN

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 8

___ OF ___

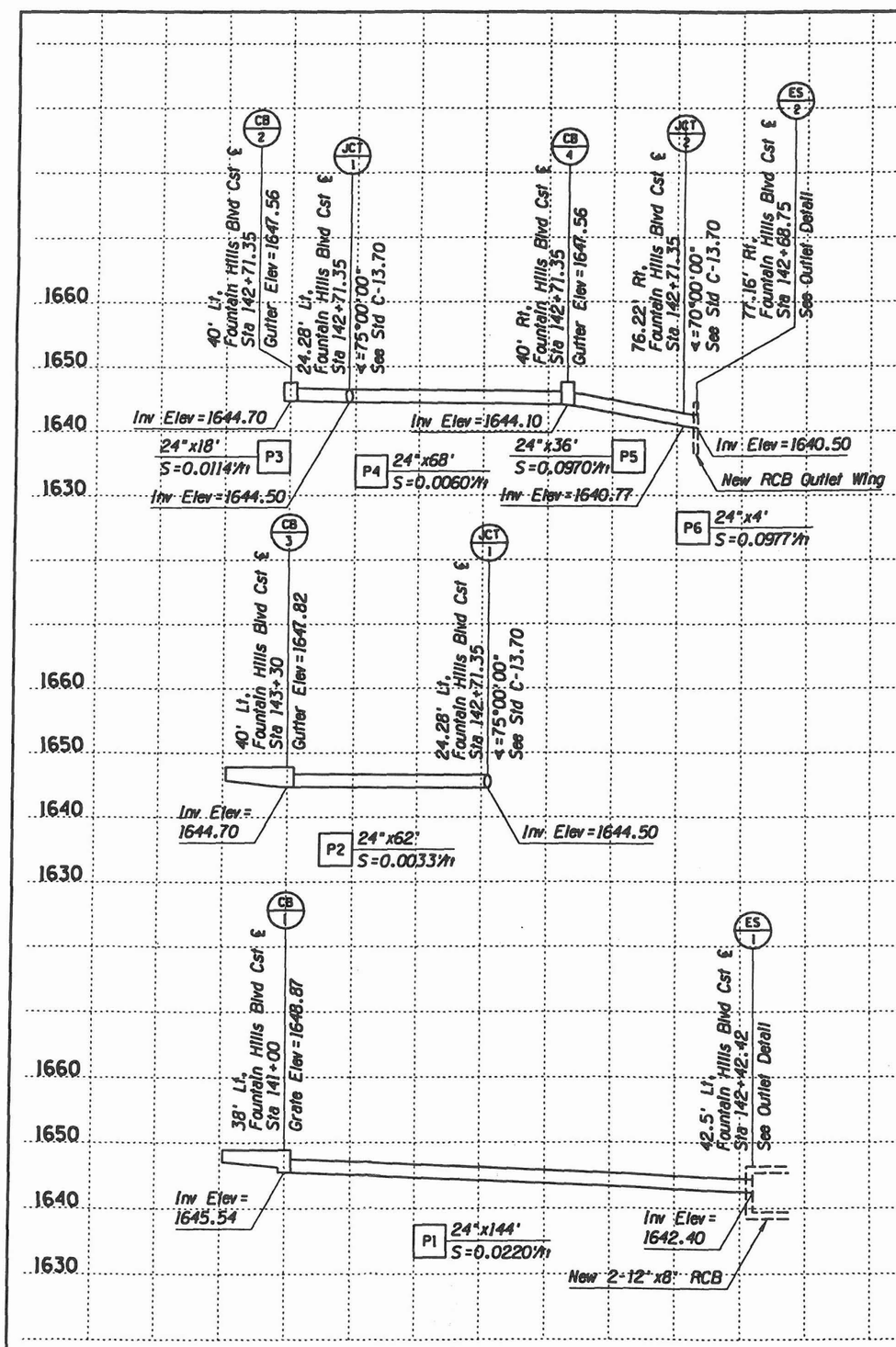
File : /12268/DRN. DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 OIC

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	9		

0000 MA FTH



	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SOW	6/95

STANLEY CONSULTANTS, INC.
1893 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85016 • (602) 952-0600

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

DRAINAGE PROFILES

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 9

File :/12268/DRNPROF.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 OIC

___ OF ___

APPENDIX A

Design Concept Report

Fountain Hills Boulevard at Ashbrook Wash

LETTER OF TRANSMITTAL

To: Stanley Consultants, Inc.
2929 E. Camelback #130
Phoenix, AZ 85016

RECEIVED
OCT 17 1994
STANLEY CONSULTANTS

Town of Fountain Hills
PO Box 17958
Fountain Hills, AZ 85269
(602)837-2003
FAX (602)837-3145

Attn: Steven Wilcox, P.E.

Re: F.H. Blvd. @ Ashbrook Wash

Date: 10-13-94

We are sending the attached ☒ **Originals** ☐ **Copies of the following**

Plats:
- ____ Sketch
- ____ Preliminary Plat
- ____ Pre-Final
- ____ Final
- ____ Map of Dedication

Plans & Drawings:
- ____ Master Plan
- ____ Site Plan
- ____ Water
- ____ Sewer
- ____ Paving
- ____ Grading & Drainage
- ____ Boundary & Topo Survey
- ____ Landscape/Irrigation Plan
- ____ Improvement Plan
- ____ Structural Plan Set

Reports & Descriptions:
- ____ Soils Test
- ____ Legal Description
- ____ Cost Estimates
- ____ Quantity Estimates
- ____ Specifications
- ____ Drainage Study

Forms and Applications:
- ____ Subdivision Application
- ____ Rezoning Application
- ____ Variance Application
- ____ Easement Abandonment
- ____ Special Use Permit
- ____ Temporary Use Permit

Other:
- ____ Specifications
- ____ Change Order

Remarks:
1 Design Concept Report - Rev. Oct. 1994
F.H. Blvd. @ Ashbrook Wash Box Culvert

These are Transmitted (as checked below)

- ☐ For Approval
- ☐ For Your Use
- ☐ As Requested
- ☐ For Review and Comment
- ☐ Approved As Submitted
- ☐ Approved As Noted
- ☐ Returned For Corrections
- ☐ ____
- ☐ Resubmit ____ Copies For Approval
- ☐ Submit ____ Copies For Distribution
- ☐ Return ____ Corrected Prints

Copy To: ____

Sincerely,
Town of Fountain Hills

Jane Nekali
Engrg. Dept.

Received By: ____ Date: ____

PZTRANS01.FRM Revised 8-13-92

DESIGN CONCEPT REPORT

FOUNTAIN HILLS BOULEVARD
AT ASHBROOK WASH
FTH - 0(2)P

AUGUST 1993
Revised: OCTOBER 1994

CERTIFICATE NO.
12124
RANDY L.
HAMMEL
Date Signed 10-12-94
ARIZONA, U.S.A.

I. INTRODUCTION

A. GENERAL

The project is shown in the MAG Transportation Improvement Plan in FY '93-94. The project will reconstruct the existing dip crossing of Fountain Hills Blvd. at Ashbrook Wash with a double-barrel box culvert.

B. PROJECT NEED

- The existing dip crossing of Ashbrook Wash has been frequently closed to traffic during and after storms due to high water depth and velocity. Upon each reopening, water continues to flow across the roadway for a substantial time due to the high perched water table, to flows draining from the 4 upstream detention dams, and to forced recharge from upstream sewage effluent watering.
- The concrete dip crossing pavement and especially the adjacent asphaltic concrete pavement have deteriorated substantially due to the flows in the wash and groundwater upwelling through the pavement.
- The existing design speed of the sag vertical curve at the wash crossing is 20 mph, far below the posted speed of 35 mph. This is particularly critical since there are no street lights.
- Fountain Hills Blvd. is a designated "Road of Regional Significance" and is one of only two north-south through routes in Fountain Hills. Currently carrying 6500 vpd, the Town estimates that traffic will grow to 20,000 vpd by the year 2015.
- Ashbrook Wash is a designated bicycle route in the Fountain Hills Bicycle Plan, and is the primary candidate for a linear park. Pedestrian and bicycle access across Fountain Hills Blvd. through the box culvert is an important long-range consideration.

C. PROJECT DESCRIPTION

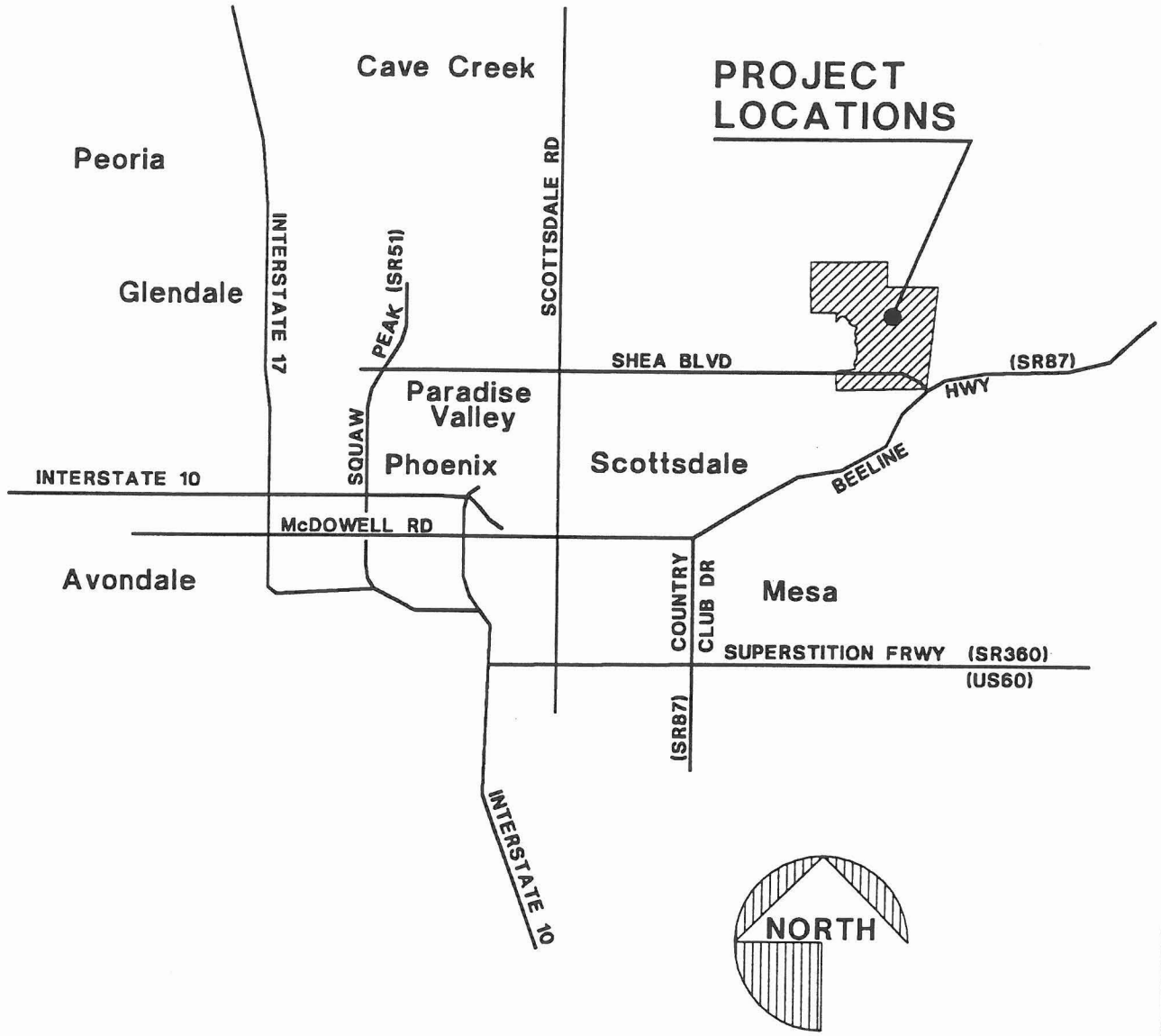
The project is located on Fountain Hills Blvd. roughly 0.2 miles north of Palisades Blvd. and 2.6 miles north of Shea Blvd. The project is located entirely within the recently incorporated Town of Fountain Hills.

The project will remove the existing dip roadway, will construct a new double barrel box culvert (minimum 8' height to accommodate future pedestrian and bicycle traffic along the wash), will reconstruct the roadway to match the existing width, and will add sidewalks along one or both sides of the roadway.

II. EXISTING CONDITIONS

A. ROADWAY

The existing roadway is 80' wide (back-to-back of curb), and is striped for two travel lanes in each direction, a center two-way left-turn lane, and an "edge lane" on each side. ADOT classified the roadway as an Urban Collector. The roadway was constructed by the now-dissolved Fountain Hills Road Districts in 1973 and was under their jurisdiction until after incorporation and acquisition by the Town in 1990.



LOCATION MAP

FIGURE 1

The existing asphaltic concrete pavement is 2" thick on a 1" aggregate base leveling course. The existing wash crossing is concrete (apparently unreinforced) and is believed to be 12" thick. Curbing is extruded "wedge curb" on both sides. (Wedge curb is a 5"x16" concrete curb, which was extruded on top of the asphaltic concrete pavement, and was the standard curb used in Fountain Hills prior to 1984.) There are no sidewalks behind the existing curbs.

The Road Districts slurry sealed the roadway in 1990, just prior to dissolving. The existing asphaltic concrete pavement dip crossing was heavily damaged by flooding in January 1993 (FEMA DSR Numbers 50485, 50486, 50487, 51036, and ADOT #ER-FTH-0(1)), and only some of the repairs have been made to date.

The right-of-way for Fountain Hills Blvd. is 110' wide. Ashbrook Wash (Parcel H of Plat 111 west of Fountain Hills Blvd., and Parcel G of Plat 111 east of Fountain Hills Blvd.) is 210' wide, is a designated drainage easement, and is owned by the Master Developer of Fountain Hills - MCO Properties.

B. DRAINAGE

Roadway drainage flows to the dip crossing at Ashbrook Wash. Ashbrook Wash is the largest wash in Fountain Hills, with a tributary area of approximately 6 square miles. Four detention dams lie upstream from Fountain Hills Blvd. on Ashbrook Wash and its tributaries, which substantially reduce the peak flow but extend the flow duration. The Master Drainage Control Study for Fountain Hills by Trico International in approximately 1970 shows a 100-year peak flow of 1748 cfs for Ashbrook Wash at Fountain Hills Blvd. The Flood Control District of Maricopa County is currently preparing Floodplain Delineation Studies for Fountain Hills, with results expected in December 1993. George Sabol & Associates is their consultant for the north half of the study, which includes Ashbrook Wash.

There is currently an 18" CMP nuisance flow culvert crossing Fountain Hills Blvd. at the Ashbrook Wash concrete dip crossing. The culvert frequently plugs due to large rocks and must be cleaned out. There is an 8" HDPE underdrain under the northbound roadway lanes south of the concrete dip crossing, which was installed by the Town in March 1993 to eliminate groundwater upwelling and deterioration of the asphaltic concrete pavement.

Stormwater flows crossing Fountain Hills Blvd. at Ashbrook Wash have required road closures 13 times, totalling 25 days over the last 5 years. A one-mile longer detour is available via Palisades-Hampstead-Fayette (minor collectors), or a 1.3 mile longer detour is available via the major Palisades-Saguaro roadways (except that the 3 CMP culverts on Saguaro Blvd. at Ashbrook Wash are adequate for only a small design storm). Upon re-opening after storm flows, Ashbrook Wash continues to flow across the roadway for substantial periods due to the 4 upstream detention dams' outflows, a high perched groundwater table caused by rock and clay layers, and forced recharge from upstream effluent watering by MCO Properties. In 1992 at least some flow through the 18" nuisance-

water culvert was experienced in Ashbrook Wash for 12 months, and for 8 months in 1993 (and continues to flow).

C. STRUCTURES

There are no existing structures currently within the project length.

D. UTILITIES

Existing utilities include:

- SRP electric, Dimension Cable TV, US West telephone, and Chaparral City Water Company water pipes along Fountain Hills Blvd.
- Fountain Hills Sanitary District's 15" and 10" sewer lines and an MCO Properties' 12" effluent force main along Ashbrook Wash.

E. TRAFFIC

The roadway currently carries 6500 vpd. The dip crossing sag curve is rated for a design speed of 20 mph vs. a 35 mph posted speed (and a 45 mph posted speed 1000' to the south). This is particularly critical since there are no street lights in the area, nor are any street lights anticipated within the project design life.

There have been 4 accidents in the project length during the last 6 years, including 1 injury accident. No recurring patterns were indicated.

F. ENVIRONMENTAL

Right-of-way/easement requirements: No permanent new right-of-way or easements are needed outside of the Fountain Hills Blvd. right-of-way and Ashbrook Wash parcels. MCO Properties, the Master Developer of Fountain Hills and owner of the Ashbrook Wash parcels, has been agreeable to donation of undevelopable wash land in past roadway projects; and a similar agreement can be anticipated for the needed right-of-way acquisition in Ashbrook Wash for this project.

Land Use: Land along the project length is zoned for multi-family (R-2 and R-3) along the east side of Fountain Hills Blvd. and single family (R1-8) along the west side of Fountain Hills Blvd. In actuality, about half of the multi-family zoned area is expected to develop as single family detached housing. There are four constructed homes and four vacant lots abutting the project.

Geology & Soils: The roadway is underlain by relatively shallow clay and rock lenses.

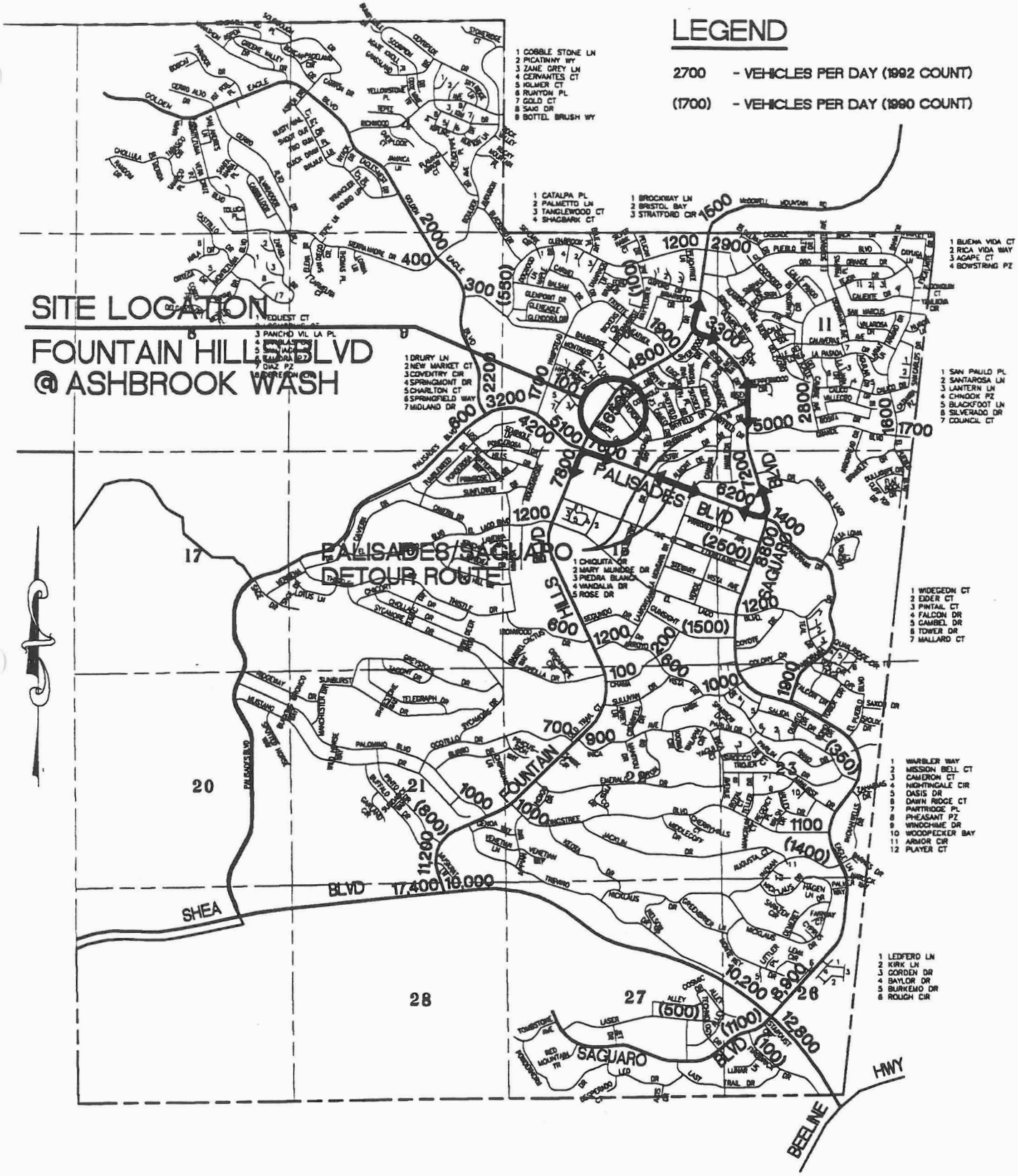
Surface Water Resources: Ashbrook Wash is a frequently running stream with heavy vegetation and tree growth.

III. PROPOSED IMPROVEMENTS

A. PROJECT CONSTRAINTS

The purposes of the proposed construction are to provide an all-weather crossing of Ashbrook Wash, and to provide a pedestrian/bicycle undercrossing of Fountain Hills Blvd. for a potential future park/trail system.

WEEKDAY TRAFFIC COUNTS



The following issues present constraints or challenges:

- The box culvert and approach fills cannot cause flooding outside of the Ashbrook Wash drainage parcel.
- The 8' clear height of the box culvert for future pedestrian/bicyclist use creates a long roadway replacement and potential utility lowering concerns.

B. TRAFFIC ENGINEERING CONSIDERATIONS

Current ADT	-	6,500
2010 ADT	-	30,000 (MAG projection; combined F.H. Blvd. & Saguaro Blvd.)
Design ADT (2015)	-	20,000 (Town estimate)
Proposed Design Speed	-	45 mph (for posted speed of 35 mph)

Matching the existing roadway width and 4-lane configuration with median left turn pockets (or a continuous two-way left turn lane) will be adequate through the project life. On-street "edge-lanes" provide for bike usage and an occasional on-street parked car.

A 16' wide, raised, landscaped median (with a SB left turn pocket at Arrow Drive) is planned. However, design alternates for Fountain Hills Blvd., Shea to Palisades, are currently being reviewed by the Town. If the selected alternate for the Shea to Palisades segment does not contain a raised, landscaped median, a two-way continuous, asphaltic concrete paved, left turn lane will be used in this project.

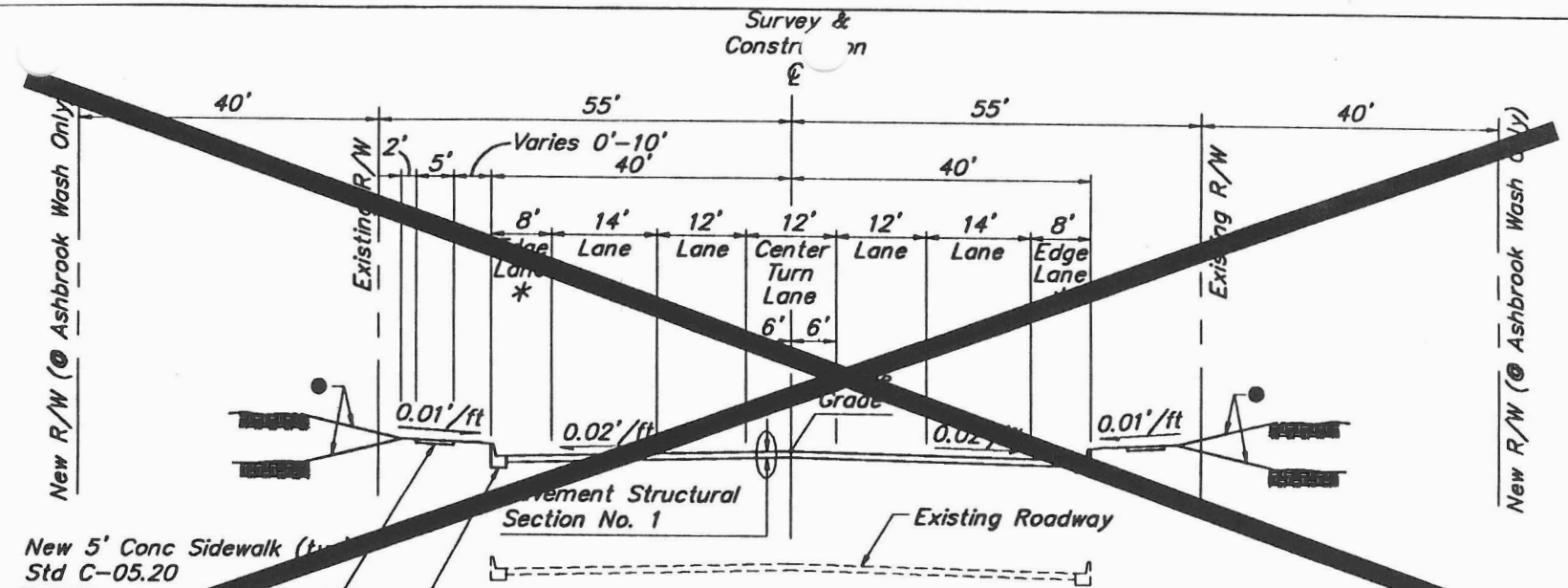
Five foot wide (or wider) sidewalk on Fountain Hills Blvd. are recommended. Although there are no connecting sidewalks at the present time, it is anticipated that Fountain Hills Blvd. will ultimately have sidewalk on at least the east side, particularly to the south leading to Palisades Blvd., the center of Town, and the Jr./Sr. High School. (Construction of a sidewalk on the west side may not be included in this project, but may be deferred until its future connections are known.)

The box culvert clear height will be 8', and a center light-well will be provided to accommodate future pedestrian/bicycle traffic undercrossing Fountain Hills Blvd. along the wash.

Signing and striping will be performed by Town forces.

C. RIGHT-OF-WAY

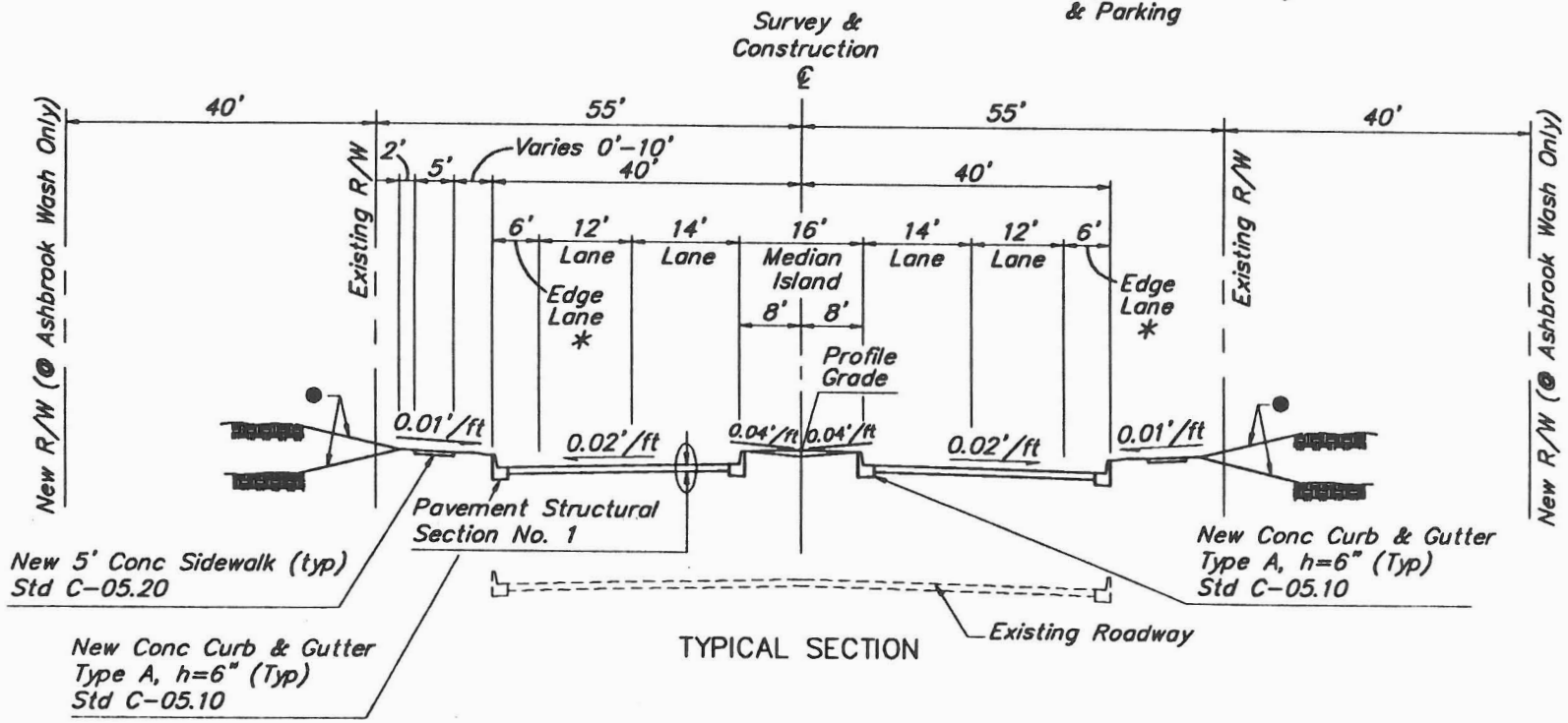
Forty feet of additional right-of-way width is needed in the Ashbrook Wash parcels. This land is currently owned by the Fountain Hills Master Developer - MCO Properties. Temporary Construction Easements may be required from some individual homeowners.



ALTERNATE TYPICAL SECTION

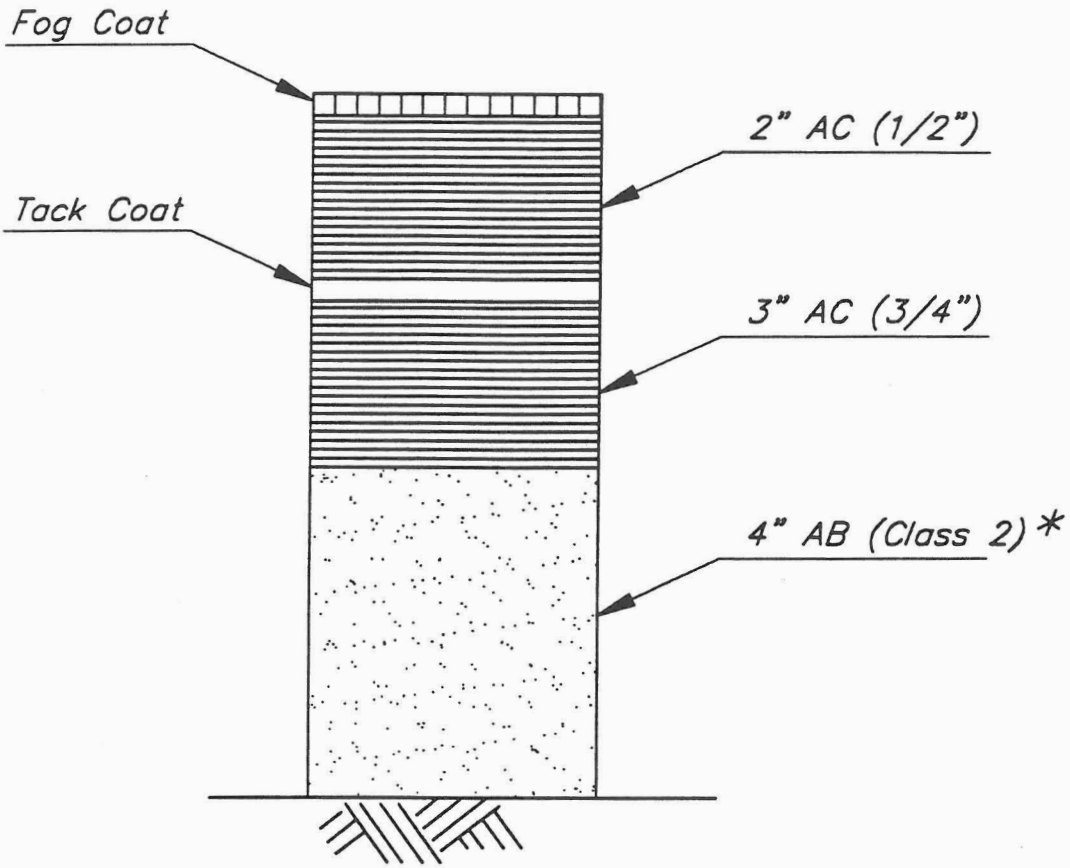
● 4:1 Slope Or Hold 1' Inside R/W

* Edge Lane For Bicycles & Parking



TYPICAL SECTION

7



Total Thickness = 9"

PAVEMENT STRUCTURAL SECTION NO. 1

** At New Box Culvert, AB Leveling Course Above Concrete Top Slab*

D. LANDSCAPING

The center median and shoulder areas will be landscaped to reflect the natural desert that is native to the area. The cut-fill slopes will be revegetated or re-seeded with native plant species.

E. DRAINAGE

George Sabol & Associates is currently preparing a Floodplain Delineation Study of Fountain Hills (North) for the Flood Control District of Maricopa County, including Ashbrook Wash. Their analysis will include both hydrology (HEC-1) and hydraulics (HEC-2) for both the current and the ultimate 100-year storm conditions. Results will be available in December 1993, and the crossing re-modeled for the box culvert crossing.

Underdrains adjacent to the box culvert will be provided to handle subsurface water flows, and a separate pipe culvert and catch basins will accommodate roadway drainage.

F. STRUCTURE

A double barrel box culvert 190' x 12' x 8', (8' clear height), with a center light-well, is being used to accommodate potential pedestrian/bicycle undercrossing traffic. Inlet and outlet wingwalls, per ADOT Std. Details (2:1 slope). An outlet apron or riprap will be considered during design. (An outlet apron is undesirable due to coordination needs for the future bikeway.)

G. AESTHETIC CONSIDERATIONS

Several items will be evaluated for aesthetic characteristics, including:

- Box culvert railings
- Landscaping
- Riprap and erosion protection measures.

H. UTILITY IMPACTS

Lowering or relocation of several utilities at the box culvert may be required, depending on their existing depth. Potholing and determination of prior rights/cost responsibility will be made during the design phase.

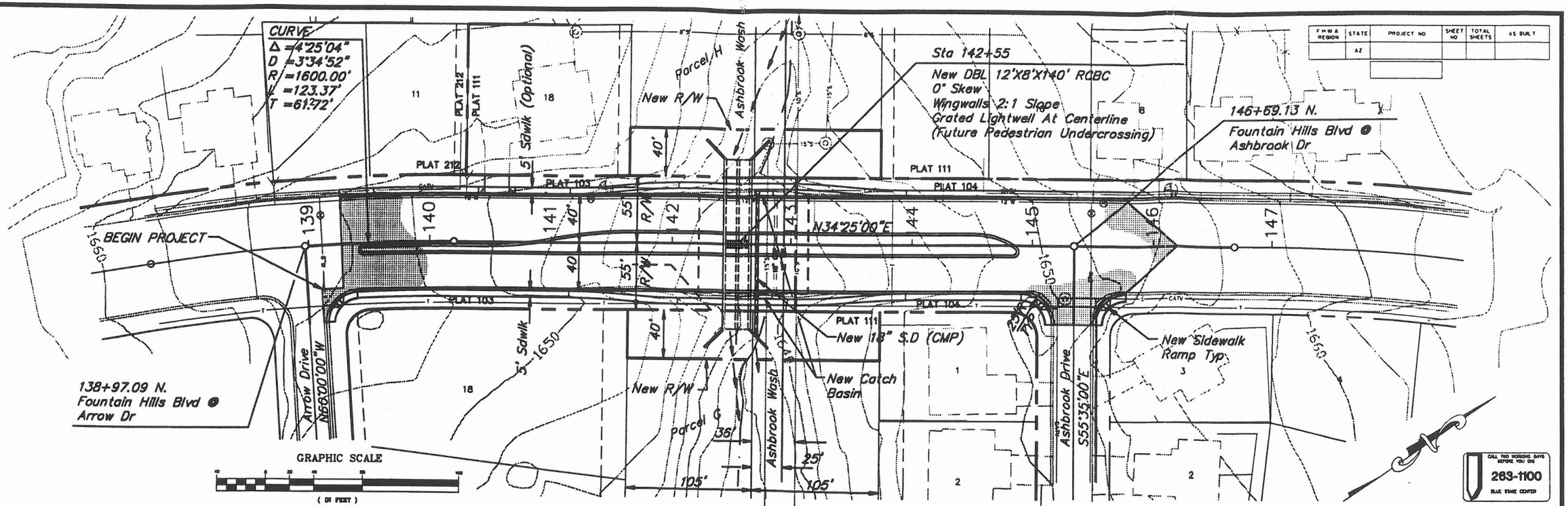
I. CONSTRUCTION ACTIVITIES

Construction activities are expected to inconvenience the public with increases in dust, noise, minor delays, and access disruptions. Water will be used to control dust, and disturbed areas re-seeded. The roadway will be closed during construction, with access provided to the local residential driveways impacted. Palisades Blvd./Saguaro Blvd. will be signed as the detour route.

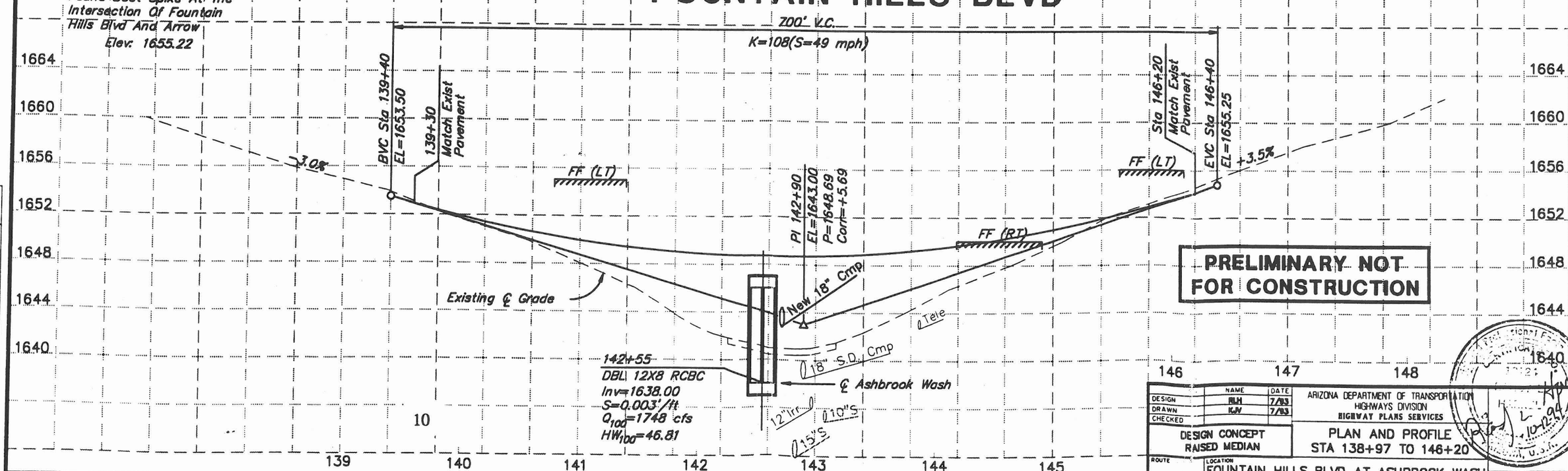
J. ENVIRONMENTAL CONSIDERATIONS

No significant adverse effects are anticipated on land use, socio-economic conditions, surface water resources, biological resources, air quality, or cultural resources. The project falls under the requirements for Nationwide Discharge Permit #14, as determined by the

F.H.W.A. REGION	STATE	PROJECT NO	SHEET NO	TOTAL SHEETS	AS BUILT
	AZ				



FOUNTAIN HILLS BLVD



	NAME	DATE
DESIGN	RLH	7/93
DRAWN	KJV	7/93
CHECKED		

DESIGN CONCEPT
RAISED MEDIAN

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
HIGHWAY PLANS SERVICES

PLAN AND PROFILE
STA 138+97 TO 146+20

ROUTE

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

SHEET 1 OF 1

SURVEY NO	FINISHED PLANS	REVISIONS	LOCATION	DATE

Corps of Engineers. Standard erosion control measures during construction will be utilized. Some additional noise is anticipated from the higher roadway elevation, but may be offset by the smoother surface and flatter grades. An improved visual appearance is anticipated.

K. COSTS

Estimated cost is $474,000, including construction and construction engineering.

APPENDIX

Figure 4.42
Culvert Design Form

Project: Fountain Hills Blvd @ Ashbrook Wash

Station: _____
Sheet _____ of _____

CULVERT DESIGN FORM
Designer/Date: RLH / 7-2-93
Reviewer/Date: _____ / _____

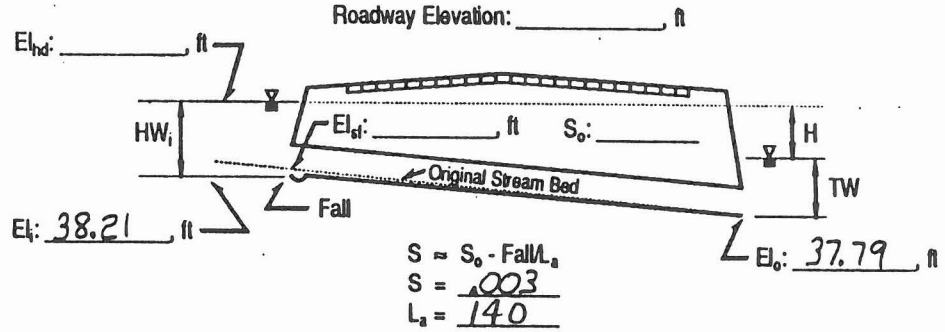
Hydrological Data

See Add'l shts

☒ Method: Ref: Master Drainage Control Study - Trico
☐ Drainage Area: _____ ☐ Stream Slope: _____
☐ Channel Shape: _____
☐ Routing: _____ ☐ Other: _____

Design Flows/Tailwater

R.I., years	Flow, cfs	TW, ft
100	1748	2



Culvert Description: Material - Shape - Size - Entrance	Total Flow Q, cfs	Flow Per Barrel Q/N (1)	Headwater Calculations: Inlet Control HW_i/D (2)	HW_i	Fall (3)	EL_{hi} (4)	Outlet Control TW (5)	d_c	$\frac{d_c + D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)	Control Headwater Elevation	Outlet Velocity	Comments
Dbl 12x8 RCBC, 45° Wingwalls	1748	874	1.08	8.64		46.81	2	6.2	7.1	7.1	0.2	1.8	46.69	46.81	11.7	
(2:1 slope), no outlet apron																

Technical Footnotes:

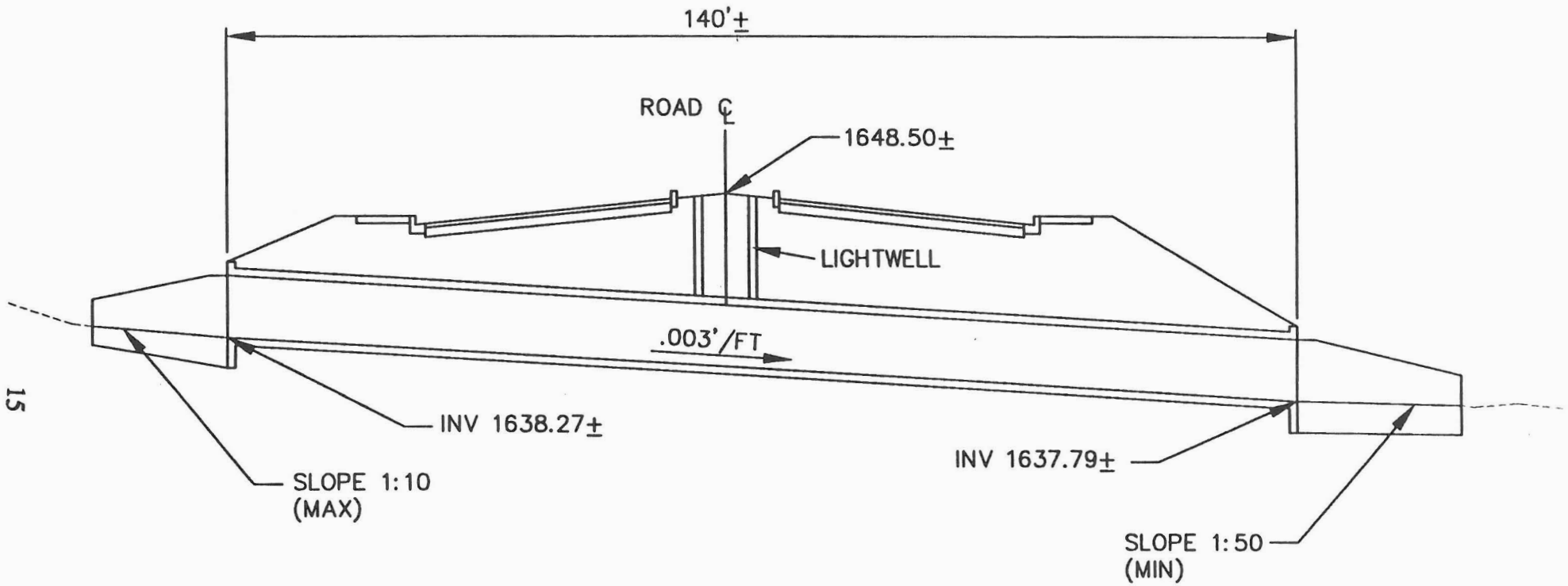
(1) Use Q/NB for box culverts.
(2) HW_i/D = HW/D or HW_f/D from design charts
(3) FALL ≐ $HW_i - (EL_{hd} - EL_{sf})$; Fall is zero for culverts on grade.
(4) $EL_{hi} = HW_i + EL_i$ (invert of inlet control section)
(5) TW based on downstream control or flow depth in channel.
(6) h_o = TW or $(d_c + D)/2$ (whichever is greater).
(7) $H = \left[1 + k_e + (29n^2L)/R^{1.33}\right] V^2/2g$
(8) $EL_{ho} = EL_o + H + h_o$

Subscript Definitions:

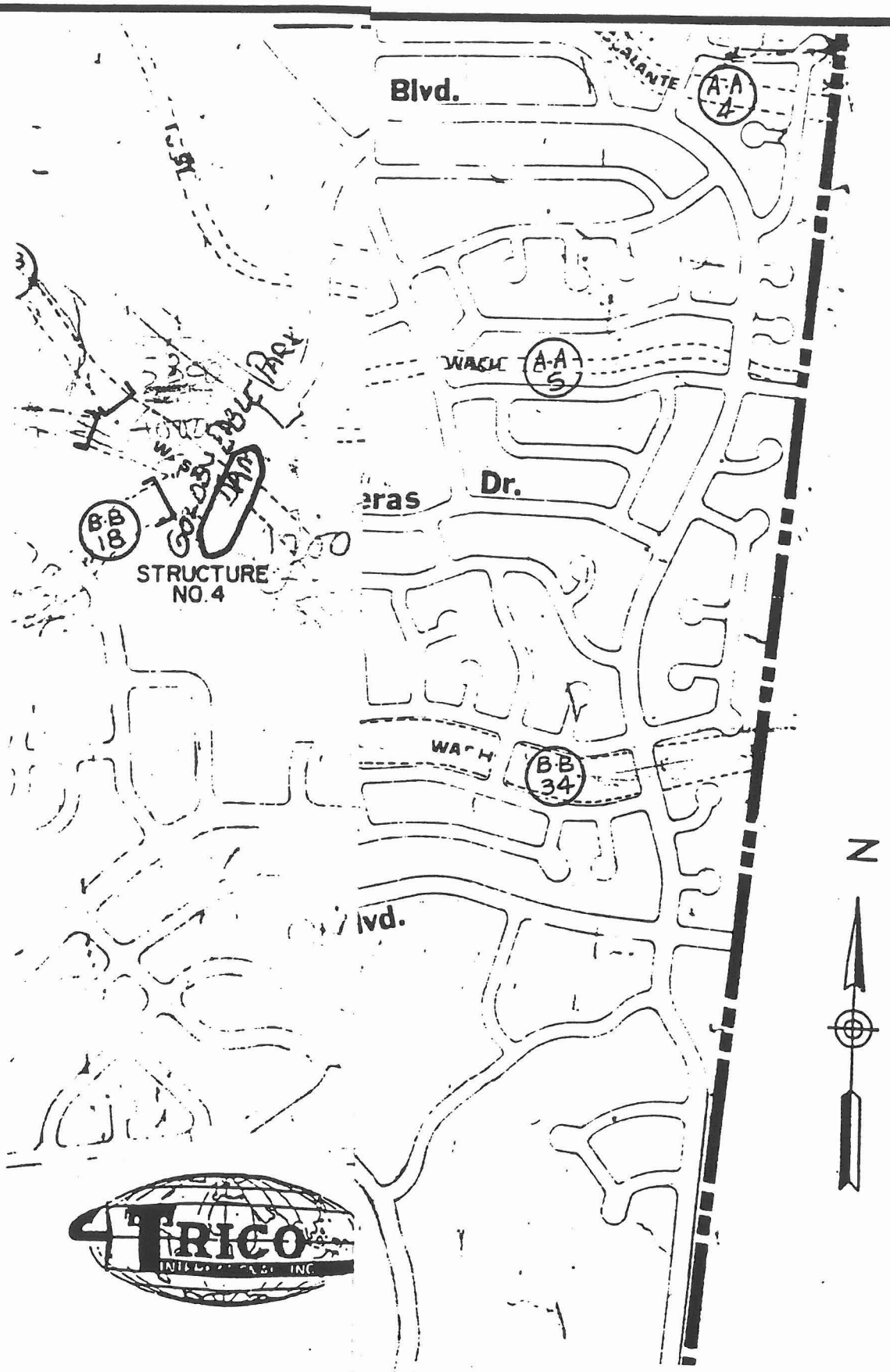
a. approximate
f. culvert fact
hd. Design Headwater
hi. Headwater in inlet control
ho. Headwater in outlet control
i. Inlet control section
o. Outlet
sf. Streambed at culvert face
TW. Tailwater

Comments / Discussion:

Culvert Barrel Selected:
Size: DBL 12x8
Shape: -
Material: RCBC n: .012
Entrance: Std



FOUNTAIN HILLS BOULEVARD
AT ASHBROOK WASH
NEW 2-12'x8'x140'±



MASTER DRAINAGE CONTROL

FOUNTAIN HILLS, ARIZONA

DRAINAGE MAP

CONCENTRATION POINTS

CHANNEL	Q(cfs)	B	D	R/W	CHANNEL	Q(cfs)	B	D	R/W
AA - 1	460	60	2.0	80	CC - 14	668	50	2.5	80
AA - 2	2865	300	2.5	330	CC - 15	1142	100	2.0	150
AA - 3	705	60	2.5	90	CC - 16*	2875	150	2.5	170
AA - 4	1725	100	2.0	130	CC - 17	708	40	2.5	60
AA - 5	653	40	2.5	90	DD - 1	358	30	2.5	50
BB - 1	3011	240	2.0	270	DD - 2	273	40	2.0	60
BB - 2	115	20	1.5	30	DD - 3	499	50	2.0	100
BB - 3	2904	240	2.0	270	DD - 4	373	35	2.0	60
BB - 4	678	150	2.0	180	DD - 5	395	50	2.0	80
BB - 5	1058	50	3.0	80	DD - 6	825	100	2.0	120
BB - 6	753	60	2.0	90	DD - 7	91	30	1.5	50
BB - 7	1894	70	3.0	100	DD - 8	55	30	1.5	50
BB - 8	607	60	2.0	80	DD - 9	56	30	1.5	50
BB - 9	530	60	2.0	80	DD - 10	157	30	1.5	50
BB - 10	500	40	2.0	60	DD - 11	91	30	1.5	50
BB - 11	237	40	1.5	60	DD - 12	248	30	2.0	50
BB - 12	1361	70	2.5	100	EE - 1	387	40	2.0	60
BB - 13	354	40	2.0	60	EE - 2	450	50	2.0	70
BB - 14	1856	100	2.5	130	EE - 3	993	100	2.0	120
BB - 15	2336	100	3.0	130	EE - 4	560	60	12.0	80
BB - 16	300	40	2.0	60	EE - 5	271	40	2.0	60
BB - 17	578	60	2.0	80	EE - 6	726	70	2.0	110
BB - 18	864	100	2.0	115	EE - 7	1667	100	3.0	120
BB - 19	252	30	2.0	50	EE - 8	182	40	1.5	60
BB - 20	418	40	2.0	60	EE - 9	470	50	2.0	70
BB - 21	422	40	2.0	60	EE - 10	2082	110	3.0	150
BB - 22	1326	100	2.0	130	EE - 11	463	60	2.0	80
BB - 23	2392	150	2.5	180	EE - 12	2424	120	3.0	150
BB - 24	1748	100	2.0	200	EE - 13	380	50	2.0	70
BB - 25	377	25	2.0	50	EE - 14	893	70	2.5	110
BB - 26	2020	120	2.5	200	EE - 15	127	20	2.0	40
BB - 27	434	30	2.0	60	EE - 16	353	13	3.0	25
BB - 28	100	30	1.5	60	EE - 17	1339	100	2.5	140
BB - 29	900	60	2.5	80	EE - 18	446	50	2.0	80
BB - 30	2893	180	2.5	230	FF - 1	752	60	2.0	80
BB - 31	448	401	2.5	70	FF - 2	289	50	1.5	70
BB - 32	798	100	2.0	130	FF - 3	822	100	2.0	120
BB - 33	1410	120	2.5	220	FF - 4	358	50	1.5	70
BB - 34	4407	200	2.5	300	FF - 5	231	40	1.5	60
CC - 1	380	40	2.0	60	FF - 6	366	40	1.5	60
CC - 2	450	100	1.5	120	FF - 7	597	50	2.0	70
CC - 3	196	35	1.5	45	FF - 8	446	50	2.0	70
CC - 4	503	50	2.0	80	BB-35	444	70	2.0	40
CC - 5	220	90	1.5	120					
CC - 6	300	40	2.0	70					
CC - 7	444	120	1.5	150					
CC - 8	380	40	2.0	70					
CC - 9	315	60	1.5	80					
CC - 10	955	160	2.0	200					
CC - 11	405	50	2.0	70					
CC - 12	105	50	1.5	70					
CC - 13	512	60	2.0	80					

NOTE: All "Q" values computed by Soil Conservation Service TR-20 Routing Computer Program.

* "Q" values are without Structure Number 33

TRICO

100 YR PEAK FLOWS

DRAINAGE CHANNEL DATA

NOTE: THIS EXHIBIT IS A PARTIAL REPRODUCTION OF A LARGER MAP ORIGINALLY PREPARED BY TRICO INTERNATIONAL ENG.

FIGURE 9

APPENDIX B

Existing and Future 100-Year Peak Discharges

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
2801 West Durango Street
Phoenix, Arizona 85009

(602) 506-1501

LETTER OF TRANSMITTAL

DATE 12-16-94	JOB NO
ATTENTION	
RE ASHBROOK WASH	

TO JEFF MINCH
STANLEY CONSULTANTS, INC.

WE ARE SENDING YOU ☐ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
			SHEET 9 OF 10 OF THE DELINEATION DRAWINGS
			PRINTOUT OF ASHBROOK WASH HEC-2 MODELS
			ASHBROOK WASH HEC-2 MODELS ON DISKETTE
			TABLE F-3 FROM THE HYDROLOGY REPORT
			TABLE F-5 FROM THE HYDROLOGY REPORT

THESE ARE TRANSMITTED as checked below:

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REMARKS HERE IS THE UPDATED INFORMATION FOR ASHBROOK WASH. THE DISTRICTS REVIEW OF THESE HEC-2 MODELS AND FLOODPLAIN DELINEATION HASN'T BEEN COMPLETED YET.

COPY TO _____

SIGNED: Tim Murphy

6910-009 R8-93

If enclosures are not as noted, kindly notify us at once.

Table F-3

Existing Condition
100-year Peak Discharges in HEC-1
In Numerical Order By Operation Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
201A	318	213	6-hour controls
201B	151	92	6-hour controls
201C	143	87	6-hour controls
201D	93	61	6-hour controls
201E	225	153	6-hour controls
202A	67	39	6-hour controls
202B	35	19	6-hour controls
202C	19	10	6-hour controls
202D	96	60	6-hour controls
202E	214	124	6-hour controls
202F	36	20	6-hour controls
202G	38	20	6-hour controls
202H	351	208	6-hour controls
202I	36	21	6-hour controls
203A	389	262	6-hour controls
203B	93	55	6-hour controls
203C	154	99	6-hour controls
203D	161	103	6-hour controls
203E	201	120	6-hour controls
203F	524	345	6-hour controls
203G	356	238	6-hour controls
203H	343	223	6-hour controls
203I	170	116	6-hour controls
203J	77	46	6-hour controls
203K	478	272	6-hour controls
204A	214	130	6-hour controls
204B	208	134	6-hour controls
204C	205	119	6-hour controls
204D	128	74	6-hour controls
204E	189	111	6-hour controls
204F	260	147	6-hour controls
205A	210	130	6-hour controls
205B	486	284	6-hour controls
205C	107	65	6-hour controls
205D	665	405	6-hour controls
205E	301	203	6-hour controls
205F	325	197	6-hour controls
205G	349	214	6-hour controls
205H	350	237	6-hour controls
205I	559	367	6-hour controls
205J	551	361	6-hour controls
205K	266	183	6-hour controls
205L	263	147	6-hour controls
205M	335	195	6-hour controls
205N	211	141	6-hour controls
206A	408	224	6-hour controls
206B	304	168	6-hour controls

Table F-3

Existing Condition
100-year Peak Discharges in HEC-1
In Numerical Order By Operation Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
206C	45	26	6-hour controls
206D	195	110	6-hour controls
206E	45	25	6-hour controls
206F	259	159	6-hour controls
206G	112	75	6-hour controls
206H	153	89	6-hour controls
206I	67	37	6-hour controls
206J	200	111	6-hour controls
206K	103	62	6-hour controls
206L	123	73	6-hour controls
206M	198	109	6-hour controls
206N	458	259	6-hour controls
207A	382	254	6-hour controls
207B	306	202	6-hour controls
207C	321	197	6-hour controls
207D	349	219	6-hour controls
207E	180	123	6-hour controls
207F	213	135	6-hour controls
207G	294	201	6-hour controls
207H	188	122	6-hour controls
207I	109	70	6-hour controls
207J	162	102	6-hour controls
207K	283	171	6-hour controls
207L	203	119	6-hour controls
207M	270	158	6-hour controls
207N	109	64	6-hour controls
207O	330	183	6-hour controls
208A	331	189	6-hour controls
208B	45	27	6-hour controls
208C	127	76	6-hour controls
208D	118	74	6-hour controls
208E	107	66	6-hour controls
208F	133	80	6-hour controls
208G	244	153	6-hour controls
208H	72	44	6-hour controls
208I	213	131	6-hour controls
208J	106	70	6-hour controls
208K	106	60	6-hour controls
208L	101	61	6-hour controls
208M	249	162	6-hour controls
208N	86	54	6-hour controls
208O	386	249	6-hour controls
208P	145	84	6-hour controls
208Q	169	106	6-hour controls
208R	25	15	6-hour controls
208S	160	95	6-hour controls
208T	283	170	6-hour controls

Table F-3

Existing Condition
100-year Peak Discharges in HEC-1
In Numerical Order By Operation Type

HEC-1	Discharge, in cfs		
ID	6-hr	24-hr	Control
208U	379	209	6-hour controls
208V	71	41	6-hour controls
208W	122	71	6-hour controls
208X	206	115	6-hour controls
209A	792	478	6-hour controls
209B	156	94	6-hour controls
209C	105	65	6-hour controls
209D	563	327	6-hour controls
209E	238	153	6-hour controls
209F	360	233	6-hour controls
209G	337	219	6-hour controls
209H	203	115	6-hour controls
209I	481	270	6-hour controls
210A	294	164	6-hour controls
210B	172	110	6-hour controls
210C	165	95	6-hour controls
210D	301	180	6-hour controls
210E	62	37	6-hour controls
210F	184	110	6-hour controls
210G	293	185	6-hour controls
210H	163	94	6-hour controls
210I	94	58	6-hour controls
210J	213	130	6-hour controls
210K	207	117	6-hour controls
210L	255	153	6-hour controls
210M	286	178	6-hour controls
210N	130	66	6-hour controls
211A	283	173	6-hour controls
211AA	78	47	6-hour controls
211AB	135	74	6-hour controls
211AC	90	51	6-hour controls
211AD	132	76	6-hour controls
211AE	114	63	6-hour controls
211AF	177	96	6-hour controls
211B	249	147	6-hour controls
211C	134	77	6-hour controls
211D	159	89	6-hour controls
211E	507	279	6-hour controls
211F	332	190	6-hour controls
211G	18	11	6-hour controls
211H	181	103	6-hour controls
211I	78	47	6-hour controls
211J	37	22	6-hour controls
211K	302	169	6-hour controls
211L	301	162	6-hour controls
211M	203	117	6-hour controls
211N	51	30	6-hour controls

Table F-3

Existing Condition
100-year Peak Discharges in HEC-1
In Numerical Order By Operation Type

HEC-1	Discharge, in cfs		
ID	6-hr	24-hr	Control
211O	107	62	6-hour controls
211P	119	65	6-hour controls
211Q	56	32	6-hour controls
211R	200	118	6-hour controls
211S	125	73	6-hour controls
211T	162	95	6-hour controls
211U	56	34	6-hour controls
211V	16	9	6-hour controls
211W	105	58	6-hour controls
211X	503	304	6-hour controls
211Y	216	128	6-hour controls
211Z	249	137	6-hour controls
BB512R	30	0	6-hour controls
BB523R	19	0	6-hour controls
BB543R	210	122	6-hour controls
BB545R	51	31	6-hour controls
BB611R	151	126	6-hour controls
BB614R	39	24	6-hour controls
BB615R	18	11	6-hour controls
BB619L	171	0	6-hour controls
C501	446	298	6-hour controls
C502	622	419	6-hour controls
C502R	537	361	6-hour controls
C503I	769	543	6-hour controls
C503O	323	278	6-hour controls
C504I	62	39	6-hour controls
C504O	30	20	6-hour controls
C505I	32	19	6-hour controls
C506	34	15	6-hour controls
C507I	203	118	6-hour controls
C507O	203	118	6-hour controls
C508O	208	122	6-hour controls
C511O	263	201	6-hour controls
C512I	280	215	6-hour controls
C512O	102	14	6-hour controls
C513O	369	232	6-hour controls
C514	496	321	6-hour controls
C514R	388	251	6-hour controls
C515	609	405	6-hour controls
C517	1227	975	6-hour controls
C517L	741	516	6-hour controls
C517R	661	462	6-hour controls
C518	1331	1091	6-hour controls
C519	1406	1177	6-hour controls
C521	1407	1230	6-hour controls
C523I	386	248	6-hour controls
C523O	286	202	6-hour controls

Table F-3

Existing Condition
100-year Peak Discharges in HEC-1
In Numerical Order By Operation Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
C524	282	228	6-hour controls
C525	358	249	6-hour controls
C526	523	343	6-hour controls
C527	665	426	6-hour controls
C528	690	411	6-hour controls
C529	917	596	6-hour controls
C530	1472	1064	6-hour controls
C530R	785	472	6-hour controls
C531	1639	1241	6-hour controls
C532	1970	1654	6-hour controls
C532L	1791	1420	6-hour controls
C533	2232	2000	6-hour controls
C534	2507	2390	6-hour controls
C534R	2392	2220	6-hour controls
C535	2520	2425	6-hour controls
C536I	2586	2520	6-hour controls
C536O	326	321	6-hour controls
C536R	2516	2443	6-hour controls
C537	344	348	24-hour control
C538I	463	489	24-hour control
C538O	434	446	24-hour control
C540	545	560	24-hour control
C540L	230	133	6-hour controls
C540R	452	459	24-hour control
C541	651	655	24-hour control
C543	210	122	6-hour controls
C544	102	62	6-hour controls
C546	171	102	6-hour controls
C547	525	335	6-hour controls
C548	1038	1038	6-hour controls
C548L	713	721	24-hour control
C548R	635	412	6-hour controls
C549	2880	3095	24-hour control
C549L	1128	1105	6-hour controls
C549R	2026	2112	24-hour control
C550	687	455	6-hour controls
C552	1244	951	6-hour controls
C552L	878	617	6-hour controls
C552R	518	339	6-hour controls
C553	1345	1057	6-hour controls
C555	285	187	6-hour controls
C556	1752	1505	6-hour controls
C556L	1513	1249	6-hour controls
C556R	385	260	6-hour controls
C557	1879	1647	6-hour controls
C557R	1833	1595	6-hour controls
C558	1918	1696	6-hour controls

Table F-3

Existing Condition
100-year Peak Discharges in HEC-1
In Numerical Order By Operation Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
C560I	1989	1781	6-hour controls
C560O	287	275	6-hour controls
C560R	1953	1745	6-hour controls
C563	599	359	6-hour controls
C563L	240	148	6-hour controls
C563R	372	214	6-hour controls
C564	804	492	6-hour controls
C564R	684	417	6-hour controls
C565	938	598	6-hour controls
C566	313	198	6-hour controls
C567	478	305	6-hour controls
C567L	383	245	6-hour controls
C568	1428	1067	6-hour controls
C568L	961	625	6-hour controls
C568R	701	455	6-hour controls
C570	628	414	6-hour controls
C570R	467	310	6-hour controls
C572	647	427	6-hour controls
C573	1872	1532	6-hour controls
C573L	1460	1101	6-hour controls
C573R	772	514	6-hour controls
C574	643	372	6-hour controls
C575	704	411	6-hour controls
C576	803	475	6-hour controls
C577	2187	1879	6-hour controls
C578I	2231	1922	6-hour controls
C578O	381	319	6-hour controls
C580	1031	633	6-hour controls
C580R	889	541	6-hour controls
C581	1511	1085	6-hour controls
C581R	1368	935	6-hour controls
C582	1886	1521	6-hour controls
C582R	1698	1306	6-hour controls
C583	1928	1580	6-hour controls
C584I	1999	1683	6-hour controls
C584O	469	351	6-hour controls
C585	295	282	6-hour controls
C586O	162	108	6-hour controls
C587	401	375	6-hour controls
C590	819	502	6-hour controls
C590L	353	212	6-hour controls
C590R	472	293	6-hour controls
C591	1402	1193	6-hour controls
C593	972	593	6-hour controls
C594	1030	645	6-hour controls
C595	1205	1172	6-hour controls
C595L	468	436	6-hour controls

Table F-3

Existing Condition
100-year Peak Discharges in HEC-1
In Numerical Order By Operation Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
C595R	1119	741	6-hour controls
C596	1268	1221	6-hour controls
C597	460	388	6-hour controls
C598	587	517	6-hour controls
C599I	1917	1967	24-hour control
C599O	954	966	24-hour control
C600O	266	171	6-hour controls
C601	462	300	6-hour controls
C602	635	418	6-hour controls
C602L	515	338	6-hour controls
C603	936	617	6-hour controls
C605O	115	89	6-hour controls
C606	206	146	6-hour controls
C606R	94	58	6-hour controls
C607	230	161	6-hour controls
C608	957	972	24-hour control
C608L	954	967	24-hour control
C609O	61	48	6-hour controls
C611I	299	188	6-hour controls
C611O	151	126	6-hour controls
C611R	241	142	6-hour controls
C612	119	64	6-hour controls
C613	956	972	24-hour control
C615	51	31	6-hour controls
C617	270	159	6-hour controls
C617L	255	149	6-hour controls
C618	398	239	6-hour controls
C618I	370	225	6-hour controls
C618O	367	220	6-hour controls
C619I	520	317	6-hour controls
C619L	503	307	6-hour controls
C619O	363	176	6-hour controls
C620	485	312	6-hour controls
C620R	335	187	6-hour controls
C621	1184	1152	6-hour controls
C621L	957	975	24-hour control
C622	1965	2053	24-hour control
C622L	1121	753	6-hour controls
C622R	1376	1384	24-hour control
C624	223	125	6-hour controls
C626	2983	3180	24-hour control
C626C	2895	3096	24-hour control
C626R	342	198	6-hour controls
C627	2996	3187	24-hour control
CLEAR	1646	1570	6-hour controls
CLEAR	1364	1278	6-hour controls
D503L	323	278	6-hour controls

Table F-3

Existing Condition
100-year Peak Discharges in HEC-1
In Numerical Order By Operation Type

HEC-1	Discharge, in cfs		
ID	6-hr	24-hr	Control
D503R	0	0	6-hour controls
D504L	22	20	6-hour controls
D504R	8	0	6-hour controls
D505L	14	13	6-hour controls
D505R	18	6	6-hour controls
D506L	0	0	6-hour controls
D506R	34	15	6-hour controls
D508L	135	56	6-hour controls
D508R	72	66	6-hour controls
D512L	72	14	6-hour controls
D512R	30	0	6-hour controls
D523L	266	202	6-hour controls
D523R	19	0	6-hour controls
D543L	0	0	6-hour controls
D543R	210	122	6-hour controls
D545L	51	31	6-hour controls
D545R	51	31	6-hour controls
D611L	0	0	6-hour controls
D611R	151	126	6-hour controls
D614L	16	10	6-hour controls
D614R	39	24	6-hour controls
D615L	33	21	6-hour controls
D615R	18	11	6-hour controls
D619L	171	0	6-hour controls
D619R	192	176	6-hour controls
501502	437	294	6-hour controls
502503	609	412	6-hour controls
503504	0	0	6-hour controls
508507	130	54	6-hour controls
511512	263	200	6-hour controls
513514	355	229	6-hour controls
515517	600	402	6-hour controls
516517	495	333	6-hour controls
517518	1211	967	6-hour controls
518519	1323	1087	6-hour controls
519591	1402	1174	6-hour controls
520591	76	45	6-hour controls
522523	201	126	6-hour controls
523524	263	201	6-hour controls
523548	16	0	6-hour controls
524525	280	228	6-hour controls
525526	355	248	6-hour controls
526527	517	340	6-hour controls
528530	680	408	6-hour controls
530531	1455	1056	6-hour controls
531532	1619	1230	6-hour controls
532533	1956	1649	6-hour controls

Table F-3

Existing Condition
100-year Peak Discharges in HEC-1
In Numerical Order By Operation Type

HEC-1	Discharge, in cfs		
ID	6-hr	24-hr	Control
533534	2189	1959	6-hour controls
534535	2495	2378	6-hour controls
535536	2496	2397	6-hour controls
536537	326	321	6-hour controls
537538	339	341	24-hour control
538540	433	438	24-hour control
539540	185	108	6-hour controls
540541	541	545	24-hour control
541548	649	654	24-hour control
542543	149	88	6-hour controls
543544	0	0	6-hour controls
543547	202	121	6-hour controls
544545	102	61	6-hour controls
545546	51	31	6-hour controls
545547	50	30	6-hour controls
546547	170	102	6-hour controls
547548	521	330	6-hour controls
548549	1028	1025	6-hour controls
549626	2865	3072	24-hour control
550552	675	450	6-hour controls
551552	341	216	6-hour controls
552553	1236	947	6-hour controls
553556	1338	1053	6-hour controls
554555	184	120	6-hour controls
555556	279	184	6-hour controls
556557	1744	1498	6-hour controls
557558	1871	1640	6-hour controls
558560	1908	1691	6-hour controls
559560	106	62	6-hour controls
560585	287	275	6-hour controls
561563	327	187	6-hour controls
562563	123	74	6-hour controls
563564	584	355	6-hour controls
564565	783	484	6-hour controls
565568	927	593	6-hour controls
566567	308	196	6-hour controls
567568	468	301	6-hour controls
568573	1420	1060	6-hour controls
569570	382	248	6-hour controls
571572	24	14	6-hour controls
572573	644	426	6-hour controls
574575	638	371	6-hour controls
575576	691	407	6-hour controls
576577	800	474	6-hour controls
577578	2184	1874	6-hour controls
578587	381	319	6-hour controls
579580	787	477	6-hour controls

Table F-3

Existing Condition
100-year Peak Discharges in HEC-1
In Numerical Order By Operation Type

HEC-1	Discharge, in cfs		
ID	6-hr	24-hr	Control
580581	1019	629	6-hour controls
581582	1488	1076	6-hour controls
582583	1867	1510	6-hour controls
583584	1903	1568	6-hour controls
584597	466	351	6-hour controls
586587	161	108	6-hour controls
587595	401	374	6-hour controls
588590	297	178	6-hour controls
589590	180	109	6-hour controls
591521	1390	1188	6-hour controls
592593	158	93	6-hour controls
593594	963	590	6-hour controls
594595	1007	635	6-hour controls
595596	1201	1167	6-hour controls
597598	458	387	6-hour controls
599608	954	966	24-hour control
600601	263	169	6-hour controls
601602	458	298	6-hour controls
602603	632	415	6-hour controls
603622	918	605	6-hour controls
604606	17	11	6-hour controls
606607	204	145	6-hour controls
607608	228	160	6-hour controls
608613	957	972	24-hour control
609611	61	48	6-hour controls
610611	200	116	6-hour controls
611612	0	0	6-hour controls
611620	151	126	6-hour controls
613621	956	972	24-hour control
614615	39	24	6-hour controls
615618	33	21	6-hour controls
615619	18	10	6-hour controls
616617	55	31	6-hour controls
617618	263	157	6-hour controls
618619	389	235	6-hour controls
619620	192	176	6-hour controls
619620	136	0	6-hour controls
620621	482	312	6-hour controls
621622	1175	1147	6-hour controls
622549	1954	2028	24-hour control
623624	133	73	6-hour controls
624626	215	124	6-hour controls
625626	76	46	6-hour controls
626627	2981	3176	24-hour control

Table F-5

Future Condition
100-year Peak Discharges
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
201A	376	241	6-hour controls
201B	151	92	6-hour controls
201C	238	134	6-hour controls
201D	115	71	6-hour controls
201E	263	175	6-hour controls
202A	115	63	6-hour controls
202B	56	31	6-hour controls
202C	26	14	6-hour controls
202D	171	99	6-hour controls
202E	328	183	6-hour controls
202F	46	24	6-hour controls
202G	46	25	6-hour controls
202H	561	310	6-hour controls
202I	59	33	6-hour controls
203A	397	267	6-hour controls
203B	133	75	6-hour controls
203C	197	119	6-hour controls
203D	184	115	6-hour controls
203E	302	170	6-hour controls
203F	524	345	6-hour controls
203G	412	267	6-hour controls
203H	592	337	6-hour controls
203I	397	233	6-hour controls
203J	123	70	6-hour controls
203K	482	276	6-hour controls
204A	334	187	6-hour controls
204B	365	209	6-hour controls
204C	275	149	6-hour controls
204D	149	82	6-hour controls
204E	224	126	6-hour controls
204F	260	147	6-hour controls
205A	210	130	6-hour controls
205B	362	237	6-hour controls
205C	107	65	6-hour controls
205D	665	405	6-hour controls
205E	301	203	6-hour controls
205F	325	197	6-hour controls
205G	349	214	6-hour controls
205H	350	237	6-hour controls
205I	559	367	6-hour controls
205J	551	361	6-hour controls
205K	266	183	6-hour controls
205L	263	147	6-hour controls
205M	366	210	6-hour controls
205N	211	141	6-hour controls
206A	408	224	6-hour controls
206B	304	169	6-hour controls

Table F-5

Future Condition
100-year Peak Discharges
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
206C	61	35	6-hour controls
206D	205	114	6-hour controls
206E	71	38	6-hour controls
206F	441	247	6-hour controls
206G	213	125	6-hour controls
206H	188	106	6-hour controls
206I	75	40	6-hour controls
206J	200	111	6-hour controls
206K	171	96	6-hour controls
206L	191	106	6-hour controls
206M	198	109	6-hour controls
206N	459	260	6-hour controls
207A	382	254	6-hour controls
207B	306	202	6-hour controls
207C	321	197	6-hour controls
207D	424	255	6-hour controls
207E	286	178	6-hour controls
207F	253	153	6-hour controls
207G	277	190	6-hour controls
207H	312	181	6-hour controls
207I	213	120	6-hour controls
207J	270	154	6-hour controls
207K	362	209	6-hour controls
207L	236	136	6-hour controls
207M	372	205	6-hour controls
207N	160	87	6-hour controls
207O	413	227	6-hour controls
208A	480	253	6-hour controls
208B	82	46	6-hour controls
208C	144	85	6-hour controls
208D	225	126	6-hour controls
208E	192	107	6-hour controls
208F	224	122	6-hour controls
208G	398	224	6-hour controls
208H	99	59	6-hour controls
208I	370	204	6-hour controls
208J	221	128	6-hour controls
208K	165	88	6-hour controls
208L	183	101	6-hour controls
208M	484	276	6-hour controls
208N	131	78	6-hour controls
208O	703	392	6-hour controls
208P	204	111	6-hour controls
208Q	273	158	6-hour controls
208R	35	19	6-hour controls
208S	229	129	6-hour controls
208T	433	239	6-hour controls

Table F-5

Future Condition
100-year Peak Discharges
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
208U	483	252	6-hour controls
208V	97	53	6-hour controls
208W	170	93	6-hour controls
208X	247	135	6-hour controls
209A	951	549	6-hour controls
209B	266	146	6-hour controls
209C	170	98	6-hour controls
209D	802	432	6-hour controls
209E	445	250	6-hour controls
209F	439	273	6-hour controls
209G	625	348	6-hour controls
209H	242	136	6-hour controls
209I	604	326	6-hour controls
210A	397	213	6-hour controls
210B	307	178	6-hour controls
210C	245	135	6-hour controls
210D	448	250	6-hour controls
210E	93	52	6-hour controls
210F	306	165	6-hour controls
210G	504	282	6-hour controls
210H	234	127	6-hour controls
210I	149	86	6-hour controls
210J	324	183	6-hour controls
210K	270	145	6-hour controls
210L	413	230	6-hour controls
210M	462	264	6-hour controls
210N	162	81	6-hour controls
211A	444	249	6-hour controls
211AA	96	57	6-hour controls
211AB	149	79	6-hour controls
211AC	90	51	6-hour controls
211AD	139	78	6-hour controls
211AE	114	63	6-hour controls
211AF	194	102	6-hour controls
211B	357	195	6-hour controls
211C	134	77	6-hour controls
211D	184	103	6-hour controls
211E	509	281	6-hour controls
211F	332	190	6-hour controls
211G	18	11	6-hour controls
211H	247	133	6-hour controls
211I	121	70	6-hour controls
211J	51	28	6-hour controls
211K	363	191	6-hour controls
211L	317	169	6-hour controls
211M	278	152	6-hour controls
211N	72	39	6-hour controls

Table F-5

Future Condition
100-year Peak Discharges
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
211O	143	78	6-hour controls
211P	119	65	6-hour controls
211Q	74	39	6-hour controls
211R	283	155	6-hour controls
211S	144	83	6-hour controls
211T	231	127	6-hour controls
211U	61	37	6-hour controls
211V	16	9	6-hour controls
211W	108	59	6-hour controls
211X	629	362	6-hour controls
211Y	271	158	6-hour controls
211Z	249	137	6-hour controls
BB512R	131	80	6-hour controls
BB523R	68	18	6-hour controls
BB543R	252	143	6-hour controls
BB545R	84	48	6-hour controls
BB611R	169	143	6-hour controls
BB614R	43	26	6-hour controls
BB615R	19	12	6-hour controls
BB619L	402	0	6-hour controls
C501	524	332	6-hour controls
C502	699	458	6-hour controls
C502R	592	388	6-hour controls
C503I	891	616	6-hour controls
C503O	344	298	6-hour controls
C504I	105	62	6-hour controls
C504O	64	34	6-hour controls
C505I	72	35	6-hour controls
C506	74	34	6-hour controls
C507I	392	234	6-hour controls
C507O	392	234	6-hour controls
C508O	327	182	6-hour controls
C511O	482	259	6-hour controls
C512I	504	279	6-hour controls
C512O	276	190	6-hour controls
C513O	380	237	6-hour controls
C514	486	319	6-hour controls
C514R	381	249	6-hour controls
C515	599	402	6-hour controls
C517	1181	938	6-hour controls
C517L	720	508	6-hour controls
C517R	597	433	6-hour controls
C518	1199	996	6-hour controls
C519	1257	1063	6-hour controls
C521	1453	1241	6-hour controls
C523I	586	370	6-hour controls
C523O	570	280	6-hour controls

Table F-5

Future Condition
100-year Peak Discharges
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
C524	555	329	6-hour controls
C525	596	399	6-hour controls
C526	798	512	6-hour controls
C527	987	627	6-hour controls
C528	548	361	6-hour controls
C529	917	596	6-hour controls
C530	1340	1005	6-hour controls
C530R	629	417	6-hour controls
C531	1504	1172	6-hour controls
C532	1854	1578	6-hour controls
C532L	1661	1344	6-hour controls
C533	2132	1920	6-hour controls
C534	2427	2310	6-hour controls
C534R	2306	2142	6-hour controls
C535	2441	2346	6-hour controls
C536I	2496	2430	6-hour controls
C536O	326	321	6-hour controls
C536R	2427	2354	6-hour controls
C537	346	358	24-hour control
C538I	473	499	24-hour control
C538O	442	456	24-hour control
C540	560	561	24-hour control
C540L	254	147	6-hour controls
C540R	464	468	24-hour control
C541	658	633	6-hour controls
C543	252	143	6-hour controls
C544	171	96	6-hour controls
C546	271	152	6-hour controls
C547	758	443	6-hour controls
C548	1172	1241	24-hour control
C548L	747	726	6-hour controls
C548R	883	535	6-hour controls
C549	3524	4013	24-hour control
C549L	1331	1370	24-hour control
C549R	2508	2760	24-hour control
C550	687	455	6-hour controls
C552	1312	1001	6-hour controls
C552L	878	617	6-hour controls
C552R	679	420	6-hour controls
C553	1440	1127	6-hour controls
C555	489	289	6-hour controls
C556	1906	1626	6-hour controls
C556L	1601	1309	6-hour controls
C556R	682	404	6-hour controls
C557	2067	1780	6-hour controls
C557R	2002	1720	6-hour controls
C558	2110	1821	6-hour controls

Table F-5

Future Condition
100-year Peak Discharges
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
C560I	2201	1892	6-hour controls
C560O	294	283	6-hour controls
C560R	2157	1857	6-hour controls
C563	864	491	6-hour controls
C563L	319	197	6-hour controls
C563R	549	297	6-hour controls
C564	1195	696	6-hour controls
C564R	994	579	6-hour controls
C565	1398	870	6-hour controls
C566	590	330	6-hour controls
C567	892	508	6-hour controls
C567L	713	408	6-hour controls
C568	2210	1638	6-hour controls
C568L	1429	916	6-hour controls
C568R	1263	752	6-hour controls
C570	1154	652	6-hour controls
C570R	882	496	6-hour controls
C572	1187	671	6-hour controls
C573	2843	2380	6-hour controls
C573L	2245	1687	6-hour controls
C573R	1391	792	6-hour controls
C574	911	489	6-hour controls
C575	1002	541	6-hour controls
C576	1146	628	6-hour controls
C577	3345	2969	6-hour controls
C578I	3404	3058	6-hour controls
C578O	1078	460	6-hour controls
C580	1285	771	6-hour controls
C580R	1090	639	6-hour controls
C581	2031	1409	6-hour controls
C581R	1747	1164	6-hour controls
C582	2498	1968	6-hour controls
C582R	2209	1654	6-hour controls
C583	2567	2065	6-hour controls
C584I	2656	2209	6-hour controls
C584O	925	393	6-hour controls
C585	360	339	6-hour controls
C586O	246	168	6-hour controls
C587	1112	477	6-hour controls
C590	1323	741	6-hour controls
C590L	524	299	6-hour controls
C590R	800	444	6-hour controls
C591	1321	1119	6-hour controls
C593	1545	866	6-hour controls
C594	1636	944	6-hour controls
C595	1603	1629	24-hour control
C595L	1110	553	6-hour controls

Table F-5

Future Condition
100-year Peak Discharges
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
C595R	1764	1082	6-hour controls
C596	1679	1696	24-hour control
C597	900	483	6-hour controls
C598	884	691	6-hour controls
C599I	2474	2655	24-hour control
C599O	1631	1143	6-hour controls
C600O	373	241	6-hour controls
C601	663	419	6-hour controls
C602	950	589	6-hour controls
C602L	769	487	6-hour controls
C603	1313	833	6-hour controls
C605O	129	107	6-hour controls
C606	256	184	6-hour controls
C606R	131	78	6-hour controls
C607	295	207	6-hour controls
C608	1642	1161	6-hour controls
C608L	1629	1147	6-hour controls
C609O	69	56	6-hour controls
C611I	402	242	6-hour controls
C611O	201	143	6-hour controls
C611R	338	190	6-hour controls
C612	119	64	6-hour controls
C613	1639	1162	6-hour controls
C615	55	34	6-hour controls
C617	372	204	6-hour controls
C617L	355	193	6-hour controls
C618	518	302	6-hour controls
C618I	499	282	6-hour controls
C618O	482	280	6-hour controls
C619I	655	408	6-hour controls
C619L	637	399	6-hour controls
C619O	596	185	6-hour controls
C620	741	355	6-hour controls
C620R	573	223	6-hour controls
C621	1866	1484	6-hour controls
C621L	1633	1169	6-hour controls
C622	2429	2697	24-hour control
C622L	1474	979	6-hour controls
C622R	1877	1761	6-hour controls
C624	238	130	6-hour controls
C626	3692	4117	24-hour control
C626C	3561	4012	24-hour control
C626R	367	207	6-hour controls
C627	3714	4130	24-hour control
CLEAR	2109	2017	6-hour controls
CLEAR	1610	1464	6-hour controls
D503L	344	298	6-hour controls

Table F-5

Future Condition
100-year Peak Discharges
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
D503R	0	0	6-hour controls
D504L	23	22	6-hour controls
D504R	41	12	6-hour controls
D505L	16	14	6-hour controls
D505R	56	21	6-hour controls
D506L	0	0	6-hour controls
D506R	74	34	6-hour controls
D508L	232	111	6-hour controls
D508R	95	71	6-hour controls
D512L	145	110	6-hour controls
D512R	131	80	6-hour controls
D523L	502	262	6-hour controls
D523R	68	18	6-hour controls
D543L	0	0	6-hour controls
D543R	252	143	6-hour controls
D545L	84	48	6-hour controls
D545R	84	48	6-hour controls
D611L	32	0	6-hour controls
D611R	169	143	6-hour controls
D614L	18	11	6-hour controls
D614R	43	26	6-hour controls
D615L	36	22	6-hour controls
D615R	19	12	6-hour controls
D619L	402	0	6-hour controls
D619R	194	185	6-hour controls
501502	511	327	6-hour controls
502503	687	453	6-hour controls
503504	0	0	6-hour controls
508507	224	108	6-hour controls
511512	472	258	6-hour controls
513514	366	234	6-hour controls
515517	590	400	6-hour controls
516517	495	333	6-hour controls
517518	1163	931	6-hour controls
518519	1192	992	6-hour controls
519591	1254	1060	6-hour controls
520591	119	70	6-hour controls
522523	309	181	6-hour controls
523524	484	259	6-hour controls
523548	60	15	6-hour controls
524525	550	325	6-hour controls
525526	586	395	6-hour controls
526527	776	505	6-hour controls
528530	545	360	6-hour controls
530531	1326	996	6-hour controls
531532	1490	1162	6-hour controls
532533	1850	1575	6-hour controls

Table F-5

Future Condition
100-year Peak Discharges
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
533534	2100	1889	6-hour controls
534535	2417	2300	6-hour controls
535536	2419	2320	6-hour controls
536537	326	321	6-hour controls
537538	343	351	24-hour control
538540	441	448	24-hour control
539540	196	111	6-hour controls
540541	553	548	6-hour controls
541548	657	632	6-hour controls
542543	184	105	6-hour controls
543544	0	0	6-hour controls
543547	241	140	6-hour controls
544545	167	95	6-hour controls
545546	83	47	6-hour controls
545547	81	47	6-hour controls
546547	269	152	6-hour controls
547548	732	436	6-hour controls
548549	1160	1216	24-hour control
549626	3504	3968	24-hour control
550552	675	450	6-hour controls
551552	416	252	6-hour controls
552553	1308	998	6-hour controls
553556	1432	1121	6-hour controls
554555	303	178	6-hour controls
555556	475	282	6-hour controls
556557	1899	1619	6-hour controls
557558	2055	1770	6-hour controls
558560	2104	1813	6-hour controls
559560	151	85	6-hour controls
560585	294	283	6-hour controls
561563	468	251	6-hour controls
562563	141	83	6-hour controls
563564	833	483	6-hour controls
564565	1151	681	6-hour controls
565568	1371	862	6-hour controls
566567	572	326	6-hour controls
567568	855	497	6-hour controls
568573	2187	1622	6-hour controls
569570	693	389	6-hour controls
571572	33	19	6-hour controls
572573	1172	667	6-hour controls
574575	906	488	6-hour controls
575576	985	537	6-hour controls
576577	1143	628	6-hour controls
577578	3329	2951	6-hour controls
578587	1073	459	6-hour controls
579580	942	546	6-hour controls

Table F-5

Future Condition
100-year Peak Discharges
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs 6-hr	24-hr	Control
580581	1267	765	6-hour controls
581582	1981	1389	6-hour controls
582583	2472	1950	6-hour controls
583584	2536	2039	6-hour controls
584597	903	392	6-hour controls
586587	245	167	6-hour controls
587595	1105	476	6-hour controls
588590	437	248	6-hour controls
589590	299	164	6-hour controls
591521	1319	1115	6-hour controls
592593	226	126	6-hour controls
593594	1532	859	6-hour controls
594595	1595	929	6-hour controls
595596	1595	1619	24-hour control
597598	883	473	6-hour controls
599608	1630	1143	6-hour controls
600601	366	238	6-hour controls
601602	651	415	6-hour controls
602603	923	581	6-hour controls
603622	1284	816	6-hour controls
604606	17	11	6-hour controls
606607	253	182	6-hour controls
607608	290	206	6-hour controls
608613	1641	1161	6-hour controls
609611	69	56	6-hour controls
610611	272	152	6-hour controls
611612	27	0	6-hour controls
611620	169	143	6-hour controls
613621	1632	1162	6-hour controls
614615	43	26	6-hour controls
615618	36	22	6-hour controls
615619	19	11	6-hour controls
616617	72	39	6-hour controls
617618	359	200	6-hour controls
618619	507	299	6-hour controls
619620	194	185	6-hour controls
619620	353	0	6-hour controls
620621	723	354	6-hour controls
621622	1865	1458	6-hour controls
622549	2409	2662	24-hour control
623624	148	79	6-hour controls
624626	231	129	6-hour controls
625626	92	56	6-hour controls
626627	3689	4113	24-hour control

APPENDIX C

Survey Notes and ERM Listing

INDEX PAGE

JOB NO.	PROJECT	PAGE NUMBER
12268	FOUNTAIN HILLS Ashbrook culvert	1-17
12310	Fountain Hills Blvd Design Survey	19-

①

FOUNTAIN HILLS
ARIZONA

CULVERT STUDY
FOUNTAIN HILLS BLVD., ARROW DR.
TO ASHBROOK DR.

8-1-94
S. ANDERSON
J. ODELL
HOT, CLEAR

GTS4 W60118
NA-1 506076

E.R.M.						1644.18
3-A	5.11	1649.29				
					0.54	1648.75
#284	7.46	1656.21				
C.P.S.					2.39	1653.82
B.M.	2.53	1656.35				
					7.60	1648.75
	0.75	1649.50				
ERM					5.31	1644.19
						(+0.01)
#284						
B.M.						1655.22
	0.92	1656.14				
					10.55	1645.59
	6.45	1652.04				
#21					0.94	1651.10
	1.10	1652.20				
					6.60	1645.60
	11.41	1657.01				
BM					1.78	1655.23
						(+0.01)
BM						1655.22
	4.31	1660.03				
#20					8.63	1651.40
	8.75	1660.15				
BM					4.93	1655.22

B.C. FLUSH, E Cal-de-sac S. END ARROW DR.
Flood Control Datum

FTN. HILLS BLVD. & ARROW DR.
1655.22 (1.40 DIFF.)

FROM ABOVE

FTN. HILLS BLVD. & ARROW DR. C.P.S. #284
Town of Ftn. Hills Datum

RR SPIKE @ FTN. HILLS BLVD & ASHBROOK DR.

FROM ABOVE

NAIL @ F.H.B. N. of ARROW

FROM ABOVE

STANLEY CONSULTANTS

Computed by JRM Date 3/30/95
Checked by Date
Reviewed by Date
Approved by Date

Job No. 12268 Page No.
Subject FOUNTAIN HILLS BLVD.
ASHBROOK WASH CULVERT

Sheet No. 1 of 1

DATUM DIFFERENCE:

FCDMC ELEV. + 1.4' = FOUNTAIN HILLS ELEV.

HW_{100} = 1642.0' + 1.4' = 1643.4' (SECNO 3.236)

Q_{100} = 1185 cfs

S = 0.0100 ft/ft

SKEW = 0°

RECEIVED
JUL 25 1994
STANLEY CONSULTANTS

TRANSMITTAL

): JEFF MINCH
STANLY CONSULTANTS

FROM: *George V. Sabol Consulting Engineers, Inc.*
7950 East Acoma Drive, Suite 211
Scottsdale, Arizona 85260-6962
(602) 483-3368 FAX (602) 483-3990

DATE: 21 Aug 94

PROJECT No./Name: 35 Fountain Hills North

SUBJECT: ERM - Bench Mark List

ENCLOSED ARE THE FOLLOWING

ERM Description / List

REMARKS

COPIES

SIGNED DJT.PL

ID Num.	ELEV (ft)	DESCRIPTION
1-A	1544.63	Top of Brass Cap set by G.L.O., near the intersection of Grande Boulevard and El Pueblo Boulevard, being the Southeast corner of Section 11, Township 3 North, Range 6 East.
1-B	1556.30	Top of Brass Cap, at a point of curvature of center line of La Casa Drive, approximately 80 feet West of Del Cambre Avenue, being in the Southwest 1/4 of Section 11, Township 3 North, Range 6 East.
1-C	1603.59	Top of Brass Cap on centerline of Deerskin Drive, approximately 190 feet Northeast from the intersection of Deerskin Drive and Escondido Drive, being in the Northwest 1/4 of Section 11, Township 3 North, Range 6 East.
1-D	1655.56	Top of Brass Cap, at point of curvature of centerline of McDowell Mountain Road, approximately 80 feet North of the South line of Section 3, Township 3 North, Range 6 East.
1-E	1551.77	Top of Brass Cap, at Station 41 + 33 on McDowell Mountain Road, approximately 185 feet East of Escalante Wash, being in the Southeast 1/4 of Section 2, Township 3 North, Range 6 East.
1-F	1521.64	Top of Brass Cap set by G.L.O., stamped 1/16 Section 1 and 12, located approximately 36 feet East of the Southwest corner of Section 1, Township 3 North, Range 6 East.
1-G	1537.66	Brass Cap in concrete at center of Northeast curb return at Southeast corner of intersection of San Marcus and El Pueblo Boulevard, being in the Northeast 1/4 of Section 11, Township 3 North, Rang 6 East.
1-H	1529.73	Top of Brass Cap at intersection of Vallecito Drive and Rosita Drive, being in the Southeast 1/4 of Section 11, Township 3 North, Range 6 East.
2-A	1630.62	Top of Brass Cap in concrete at the middle of Northeast curb return at intersection of Fountain Hills Boulevard and Kings Way, being in the Northeast 1/4 of Section 10, Township 3 North, Range 6 East.
2-B	1619.45	Top of Brass Cap at the intersection of Saguaro Boulevard and Sterling Way, being in the Southwest 1/4 of Section 11, Township 3 North, Range 6 East.

ID Num.	ELEV (ft)	DESCRIPTION
2-C	1581.56	Top of Brass Cap at the center of the cul-de-sac at the West end of De Anza Drive, being in the Southwest 1/4 of Section 11, Township 3 north, Range 6 east.
3-A	1644.18	Top of Brass Cap at center of cul-de-sac at the South end of Arrow Drive, near the Southwest corner of Southeast 1/4 of Section 10, Township 3 North, Range 6 East.
3-B	1636.82	Top of Brass Cap in concrete at middle of Southeast curb return at the intersection of Fountain Hills Boulevard and Edgeworth Drive, being in the Southeast 1/4 of Section 10, Township 3 North, Range 6 East.
4-A	1700.67	Top of Brass Cap at the intersection of Hampstead Drive and Bainbridge Avenue, being in the Northwest 1/4 of Section 10, Township 3 North, Range 6 East.
5-A	1684.27	Top of Brass Cap at the intersection of Glenbrook Boulevard and Tanglewood Court, being in the Northwest 1/4 of Section 10, Township 3 North, Range 6 East.
6-A	1707.36	Top of Brass Cap at the intersection of Mountainside Drive and Lost Hills Drive, being in the Northwest 1/4 of Section 15, Township 3 North, Range 6 East.
6-B	1813.51	Top of Brass Cap at a point of tangency on Cavern Drive approximately 430 feet Northeast of the intersection of El Lago Boulevard and Cavern Drive, being in the Northeast 1/4 of Section 16, Township 3 North, Range 6 East.
6-C	1869.71	Top of Brass Cap at a point of tangency on Sunflower Drive, approximately 80 feet Southeast of the intersection of Palisades Boulevard and Sunflower Drive, being in the Northeast 1/4 of Section 16, Township 3 North, Range 6 East.
6-D	1730.12	Top of Brass Cap at the intersection of Palisades Boulevard and Golden Eagle Boulevard, being in the Southeast 1/4 of Section 9, Township 3 North, Range 6 East.

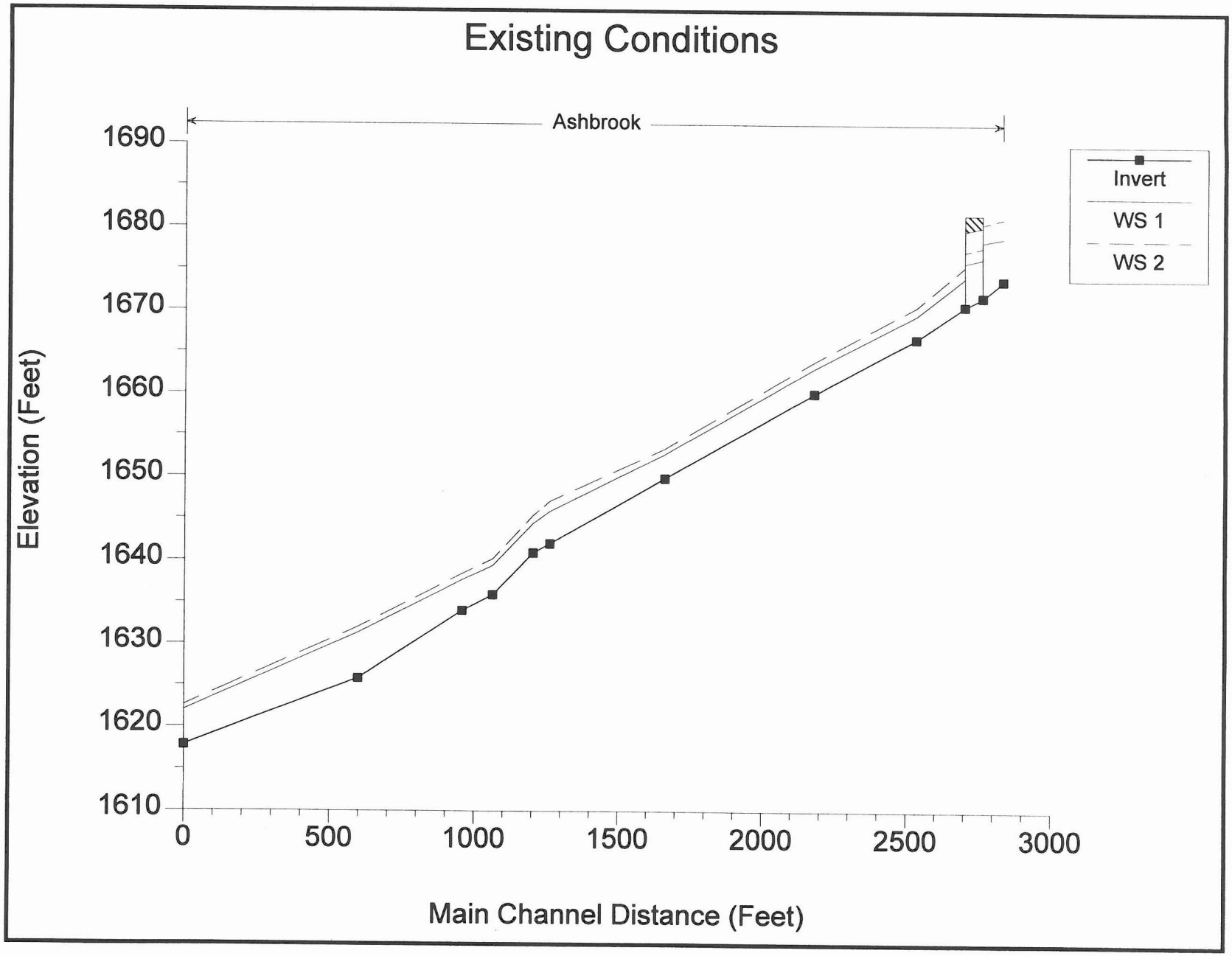
ID Num.	ELEV (ft)	DESCRIPTION
7-A	1830.08	Top of Brass Cap at the intersection of Blackbird Drive and Audubon Place, being in the Southeast 1/4 of Section 4, Township 3 North, Range 6 East.
7-B	1750.17	Top of Brass Cap at the intersection of Golden Eagle Boulevard and Bainbridge Avenue, being in the Northeast 1/4 of Section 9, Township 3 North, Range 6 East.
8-A	1876.03	Top of Brass Cap at the intersection of Golden Eagle Boulevard and Aspen Drive, being in the Southeast 1/4 of Section 4, Township 3 North, Range 6 East.
8-B	1925.49	Top of Brass Cap at the intersection of Golden Eagle Boulevard and Nyack Drive, being in the Southwest 1/4 of Section 4, Township 3 North, Range 6 East.
8-C	1809.90	Top of Brass Cap at the intersection of Kipling Drive and Runyon Place, being in the Southeast 1/4 of Section 4, Township 3 North, Range 6 East.
9-A	1924.94	Top of Brass Cap at the intersection of Marathon Drive and Greene Valley Drive, being in the Northeast 1/4 of Section 5, Township 3 North, Range 6 East.
9-B	1980.84	Top of Brass Cap at the North end of Marathon Drive cul-de-sac, being in the Northeast 1/4 of Section 5, Township 3 North, Range 6 East.
9-C	1893.64	Top of Brass Cap at a point of tangency on the centerline of Aspen Drive, approximately 400 feet Northwest of the intersection of Aspen Drive and Rusty Nail Court, being in the Northwest 1/4 of Section 4, Township 3 North, Range 6 East.
9-D	1856.71	Top of Brass Cap at the West end of Grassland Drive cul-de-sac, being in the Northwest 1/4 of Section 4, Township 3 North, Range 6 East.
10-A	1982.50	Top of Brass Cap at the intersection of El Lago Boulevard and Palisades Boulevard, being in the Northwest 1/4 of Section 16, Township 3 North, Range 6 East.

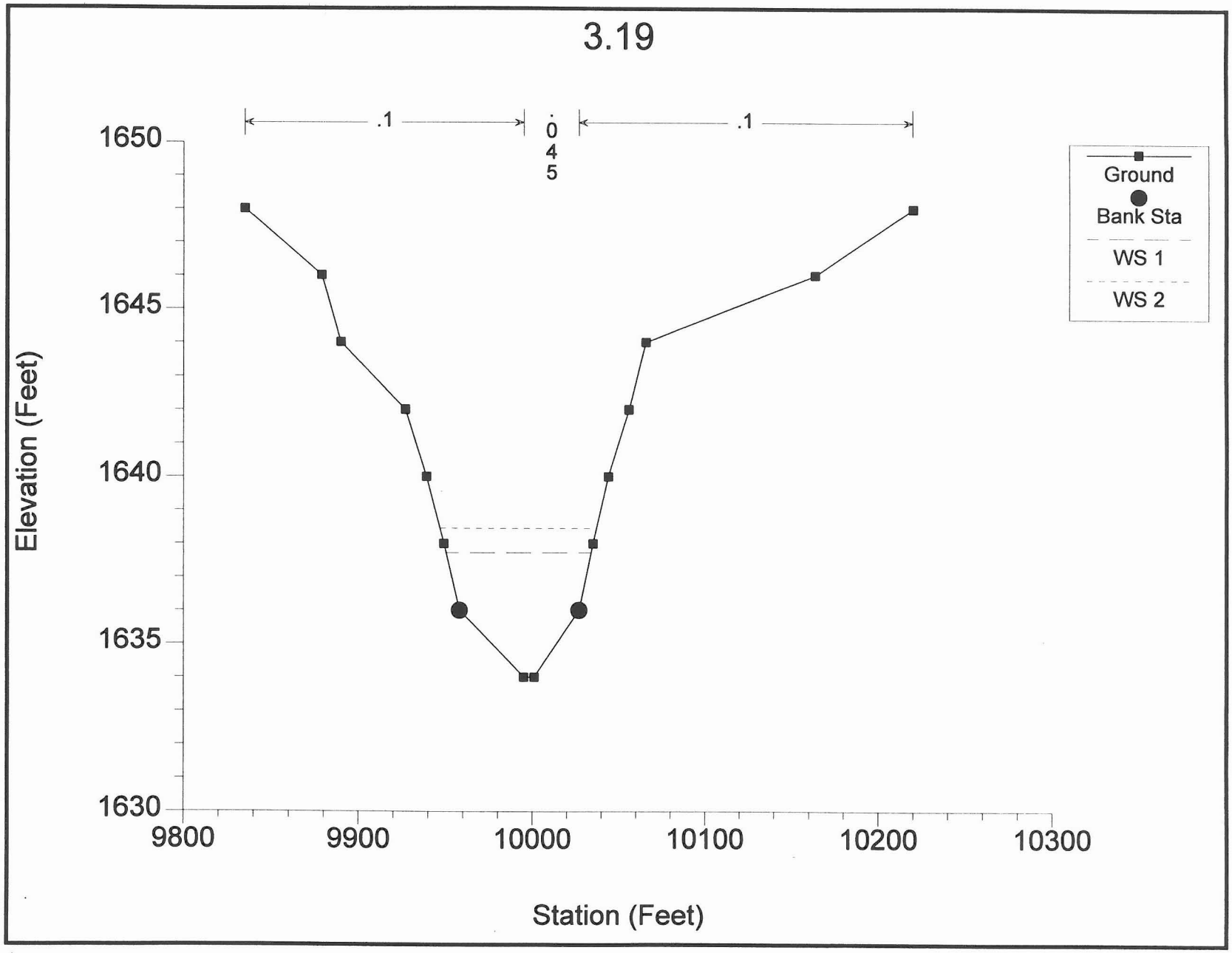
ID Num.	ELEV (ft)	DESCRIPTION
11-A	1772.83	Top of Brass Cap set in concrete on the East side of Longmont Wash approximately 30 feet South of Fountain Hills bench mark #295, being near the Southwest corner of Northeast 1/4 of Section 9, Township 3 North, Range 6 East.
12-A	2025.18	Top of Brass Cap set by G.L.O., stamped elev = 2026.82 (Fountain Hills bench mark #240) and located approximately 300 feet West of the intersection of Thistle Drive and Palisades Boulevard and approximately 40 feet North of Palisades Boulevard, being the West 1/4 corner of Section 16, Township 3 North, Range 6 East.
12-B	2015.48	Top of Brass Cap set in concrete located S 89°52'21" W 1618.00 feet of bench mark 12-A, being in the Northeast 1/4 of Section 17, Township 3 North, Range 6 East.
12-C	1894.76	Top of Brass Cap set by G.L.O., (Fountain Hills bench mark #252), being the Common corner of Sections 8, 9, 16 and 17, Township 3 North, Range 6 East.
12-D	1929.94	Top of Brass Cap set by G.L.O. (Fountain Hills bench mark #299) being the West 1/4 corner of Section 9, Township 3 North, Range 6 East.
12-E	1869.37	Top of Brass Cap set by G.L.O. (Fountain Hills bench mark #302) at the intersection of Sierra Madre Drive and Zapata Drive, being in the Southeast 1/4 of Section 5, Township 3 North, Range 6 East.
12-F	1822.68	Top of Brass Cap at the intersection of Sierra Madre Drive and Lorma Lane, being in the Northwest 1/4 of Section 9, Township 3 North, Range 6 East.
13-A	1873.28	Top of Brass Cap in concrete at North end of East headwall of box culvert in Zapata Wash at Montezuma Boulevard, being in the Northeast 1/4 of Section 8, Township 3 North, Range 6 East.
13-B	1954.42	Top of Brass Cap in concrete in rock outcrop on West side of Montezuma Boulevard and North side of Montezuma Wash, being in the Northeast 1/4 of Section 8, Township 3 North, Range 6 East.

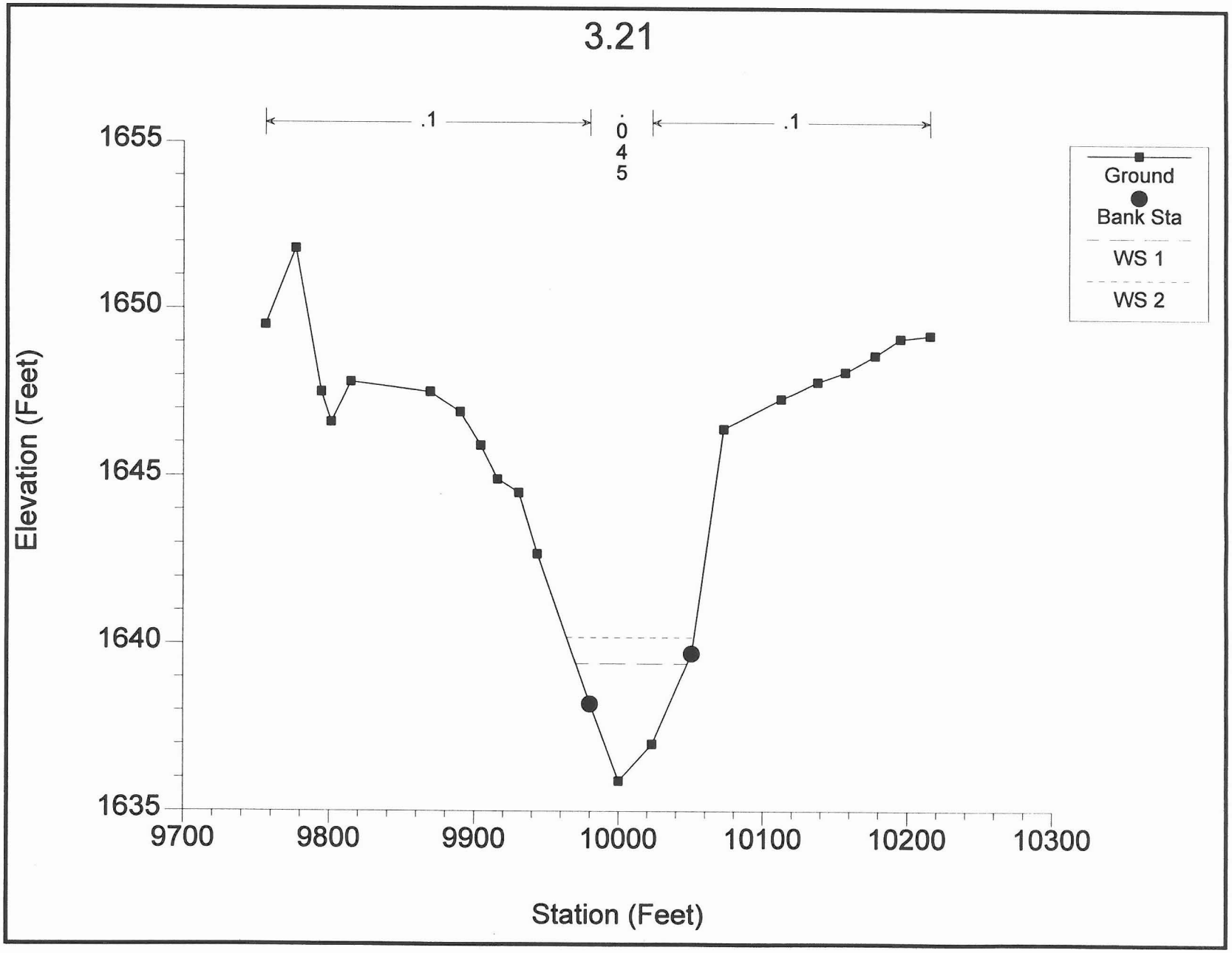
ID Num.	ELEV (ft)	DESCRIPTION
14-A	2091.39	Top of Brass Cap (Fountain Hills panel point #203 elev = 2092.98) at the intersection of Golden Eagle Boulevard and Cierro Alto Drive, being in the Northeast 1/4 of Section 5, Township 3 North, Range 6 East.
14-B	2119.31	Top of Brass Cap located on the South side of Golden Eagle Boulevard, approximately 2300 feet Easterly from the intersection of Montezuma Boulevard and Golden Eagle Boulevard, being in the Northwest 1/4 of Section 5, Township 3 North, Range 6 East.
14-C	1996.54	Top of Brass Cap in concrete on parcel 36, approximately 350 feet Northwesterly of intersection of Montezuma Boulevard and Cholula Drive, being in the Southwst 1/4 of Section 5, Township 3 North, Range 6 East.
15-A	2051.40	Top of Brass Cap in concrete located on the Southwest side of Ramon Drive, approximately 210 feet Southeast of the intersection of Cholula Drive and Ramon Drive, being in the Southwest 1/4 of Section 5, Township 3 North, Range 6 East.

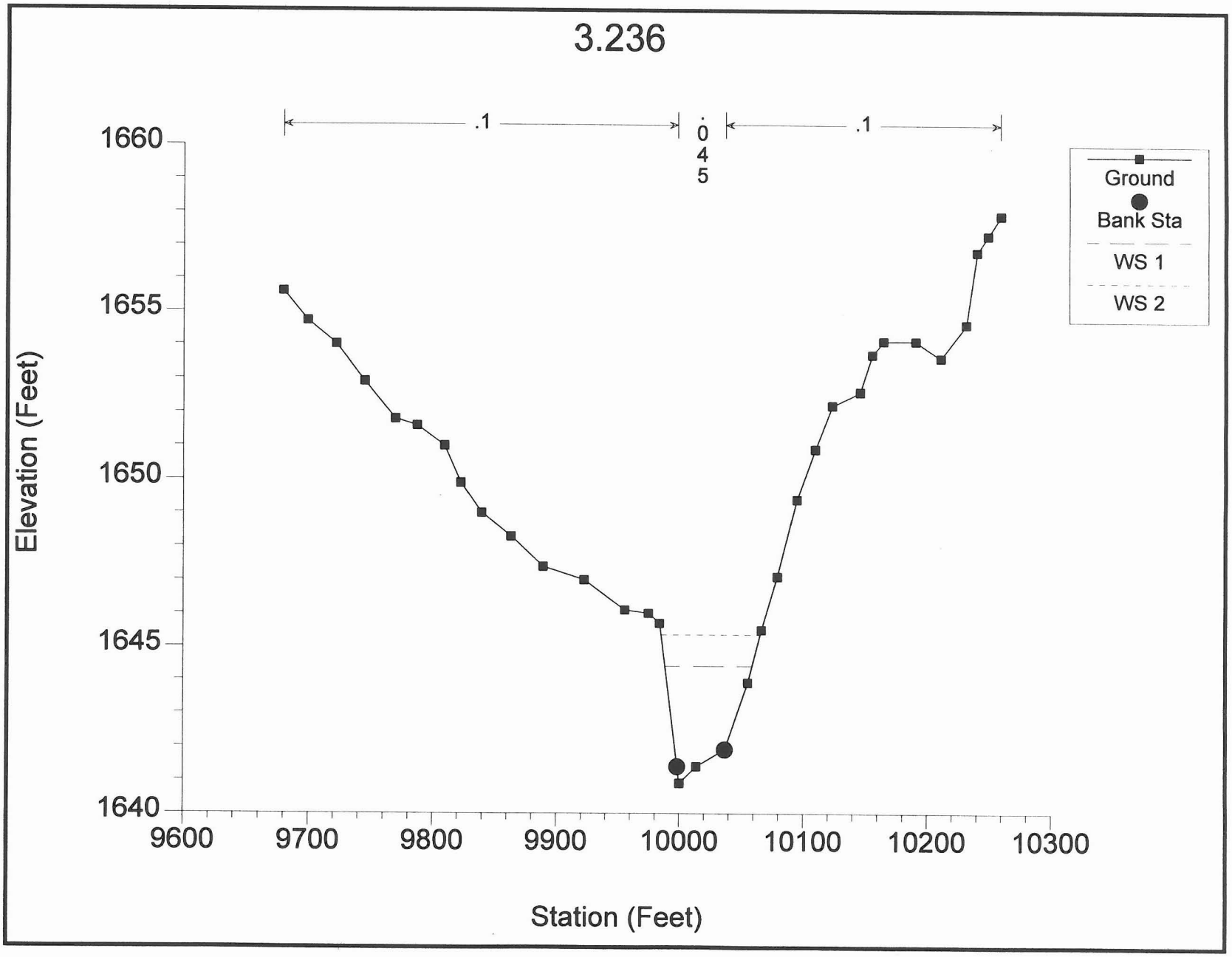
APPENDIX D

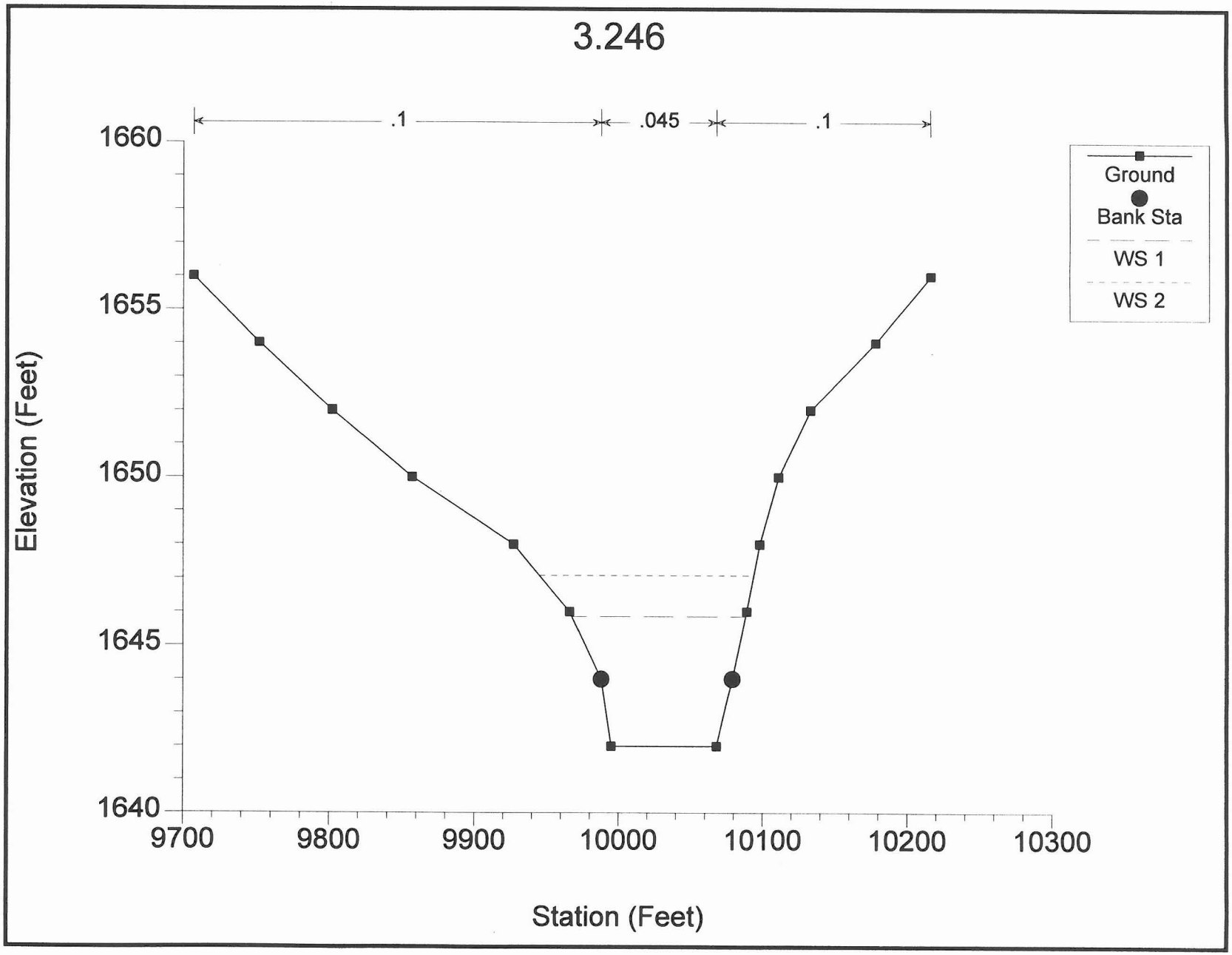
HEC-2 Output Files

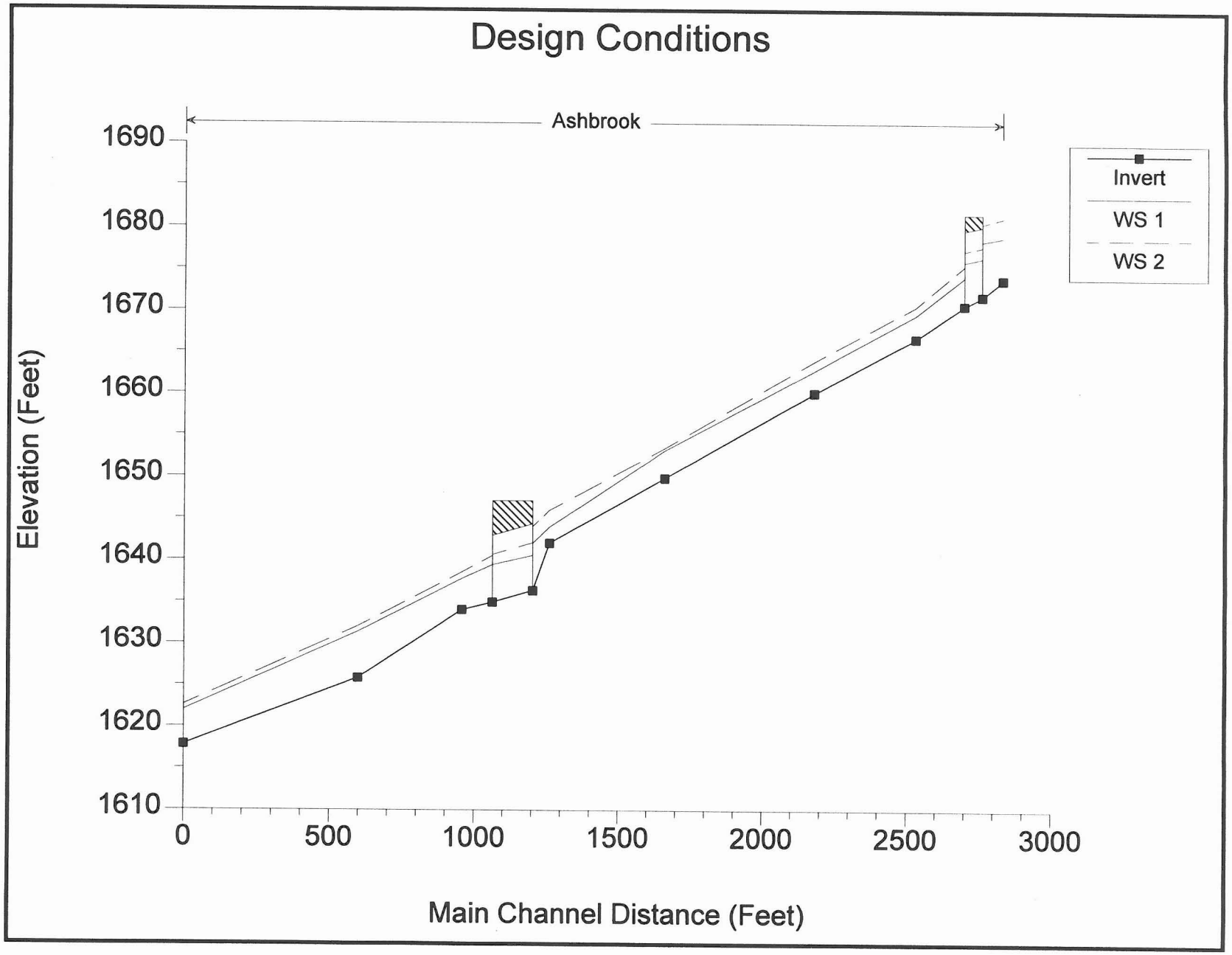

Existing Conditions
Ashbrook
Invert
WS 1
WS 2
Elevation (Feet)
1690
1680
1670
1660
1650
1640
1630
1620
1610
0
500
1000
1500
2000
2500
3000
Main Channel Distance (Feet)

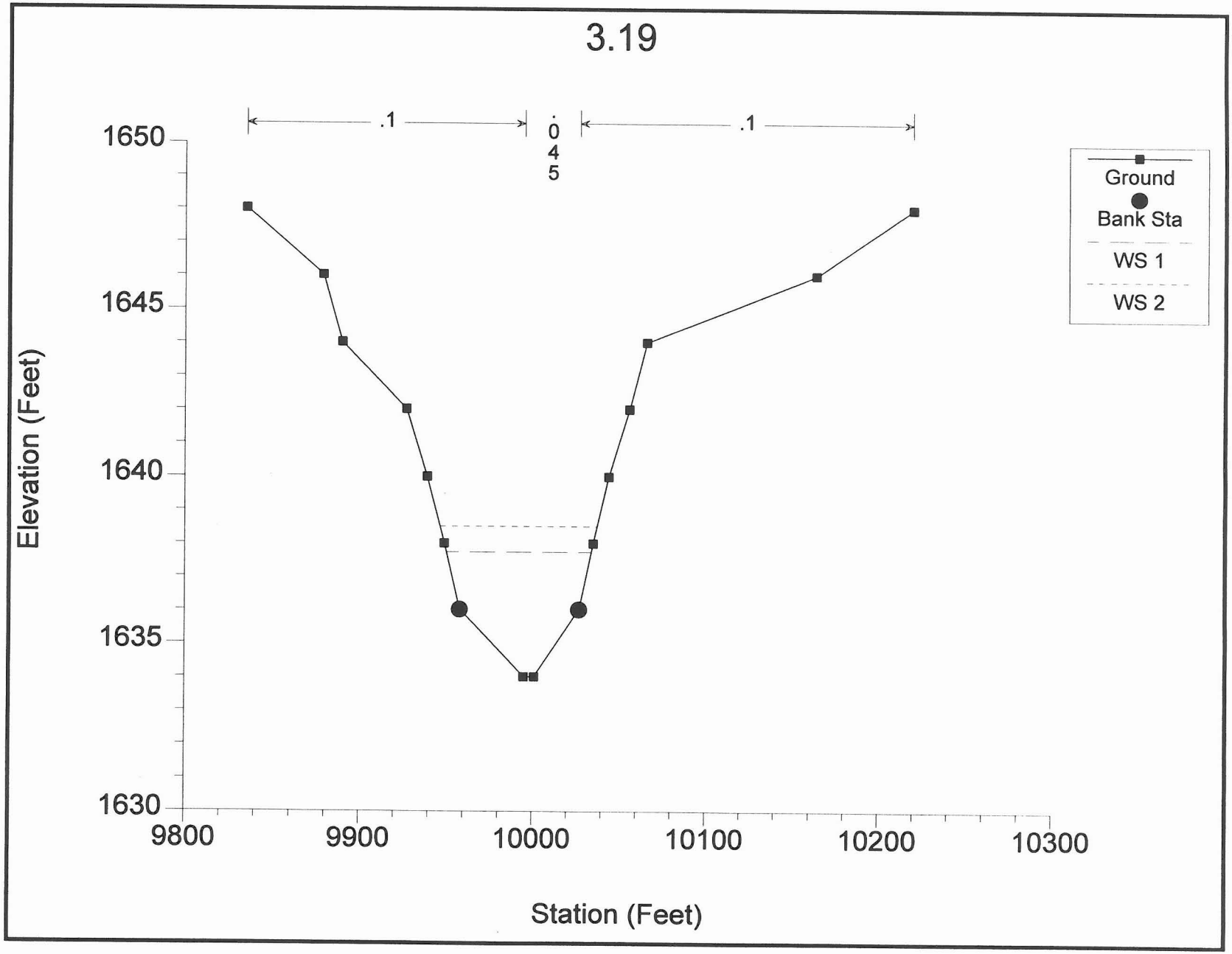

3.19
.1
.045
.1
Ground
Bank Sta
WS 1
WS 2
Elevation (Feet)
1650
1645
1640
1635
1630
9800
9900
10000
10100
10200
10300
Station (Feet)

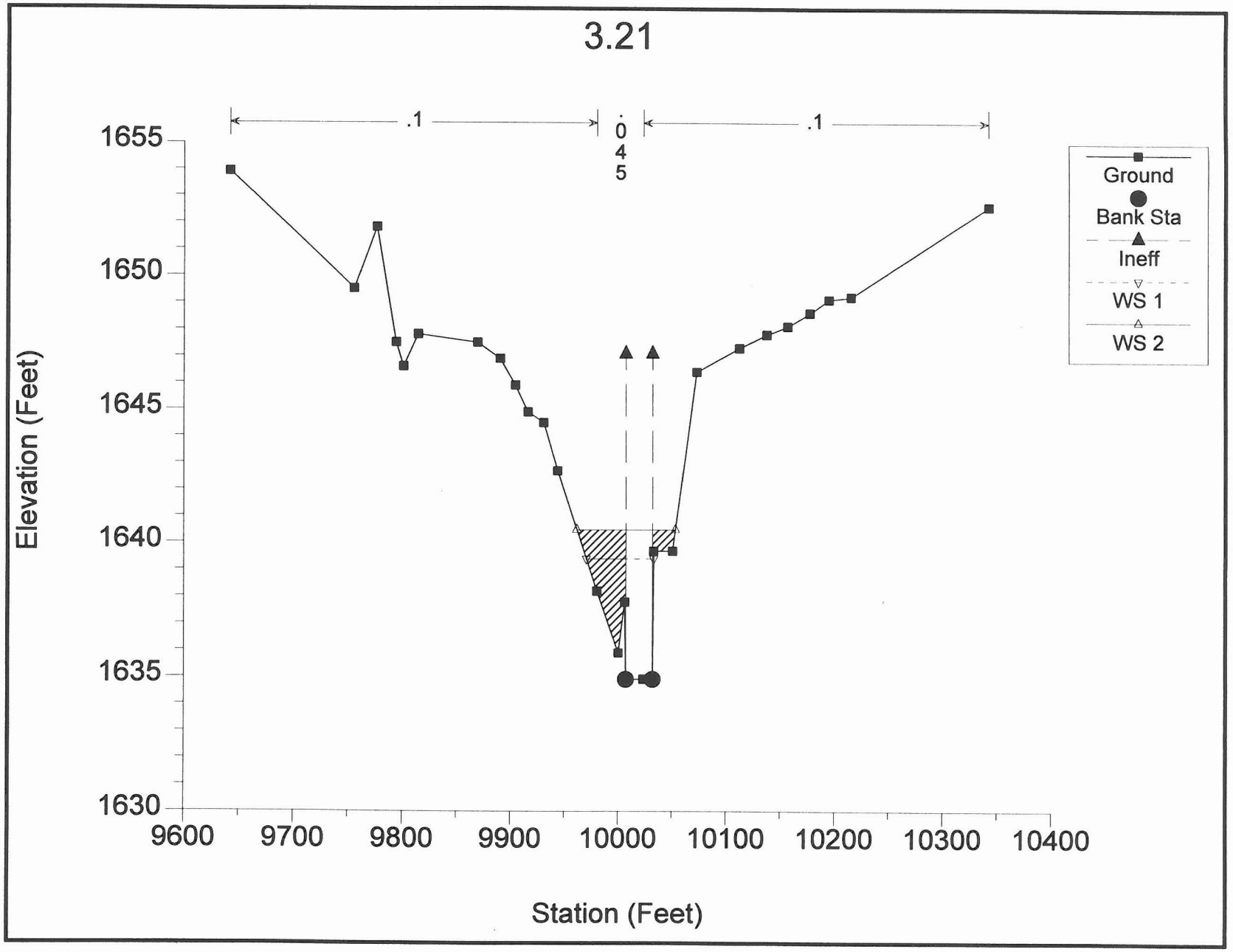

3.21
.1
.045
.1
Ground
Bank Sta
WS 1
WS 2
Elevation (Feet)
1655
1650
1645
1640
1635
9700
9800
9900
10000
10100
10200
10300
Station (Feet)

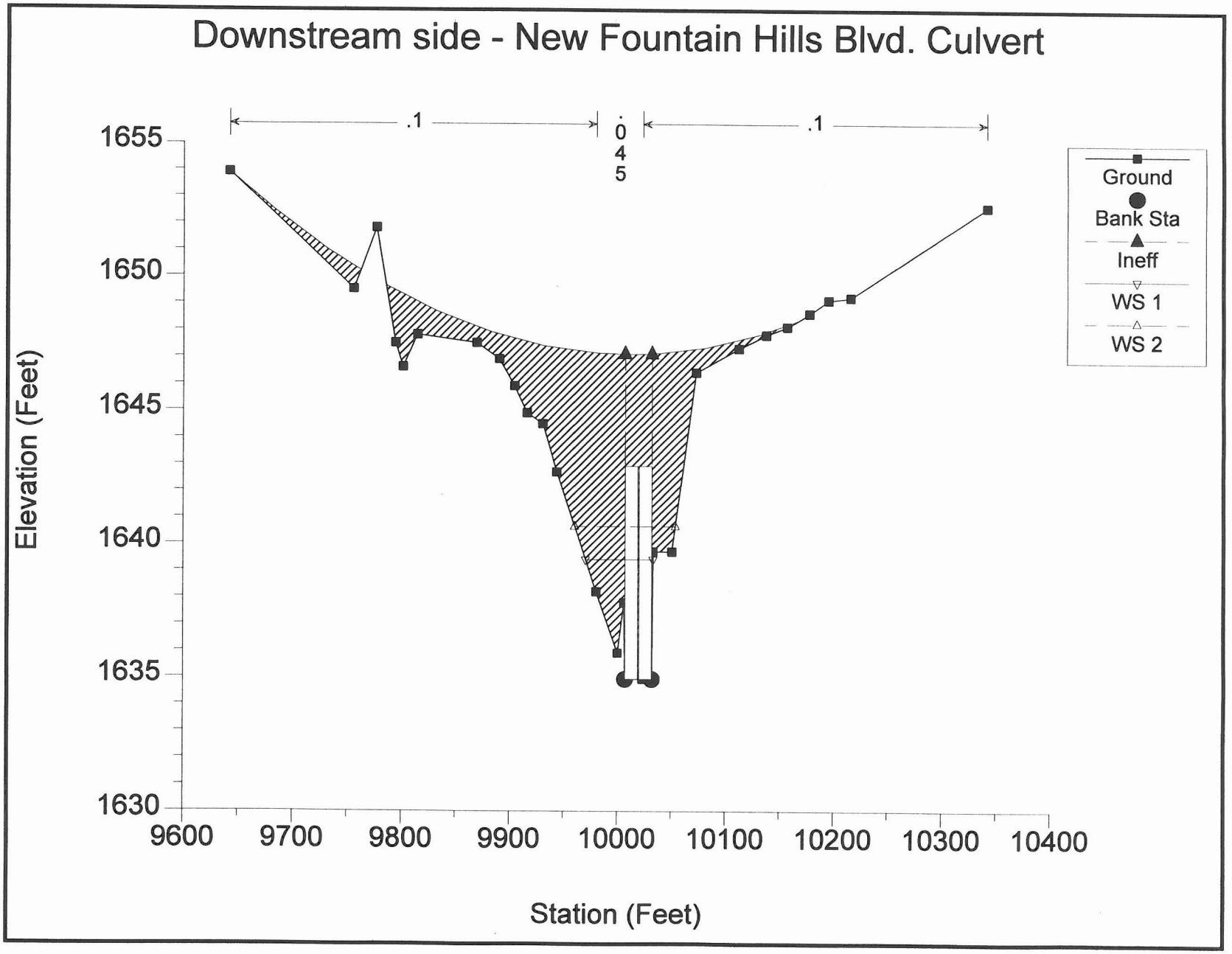

3.236
.1
.045
.1
Ground
Bank Sta
WS 1
WS 2
Elevation (Feet)
1660
1655
1650
1645
1640
9600
9700
9800
9900
10000
10100
10200
10300
Station (Feet)

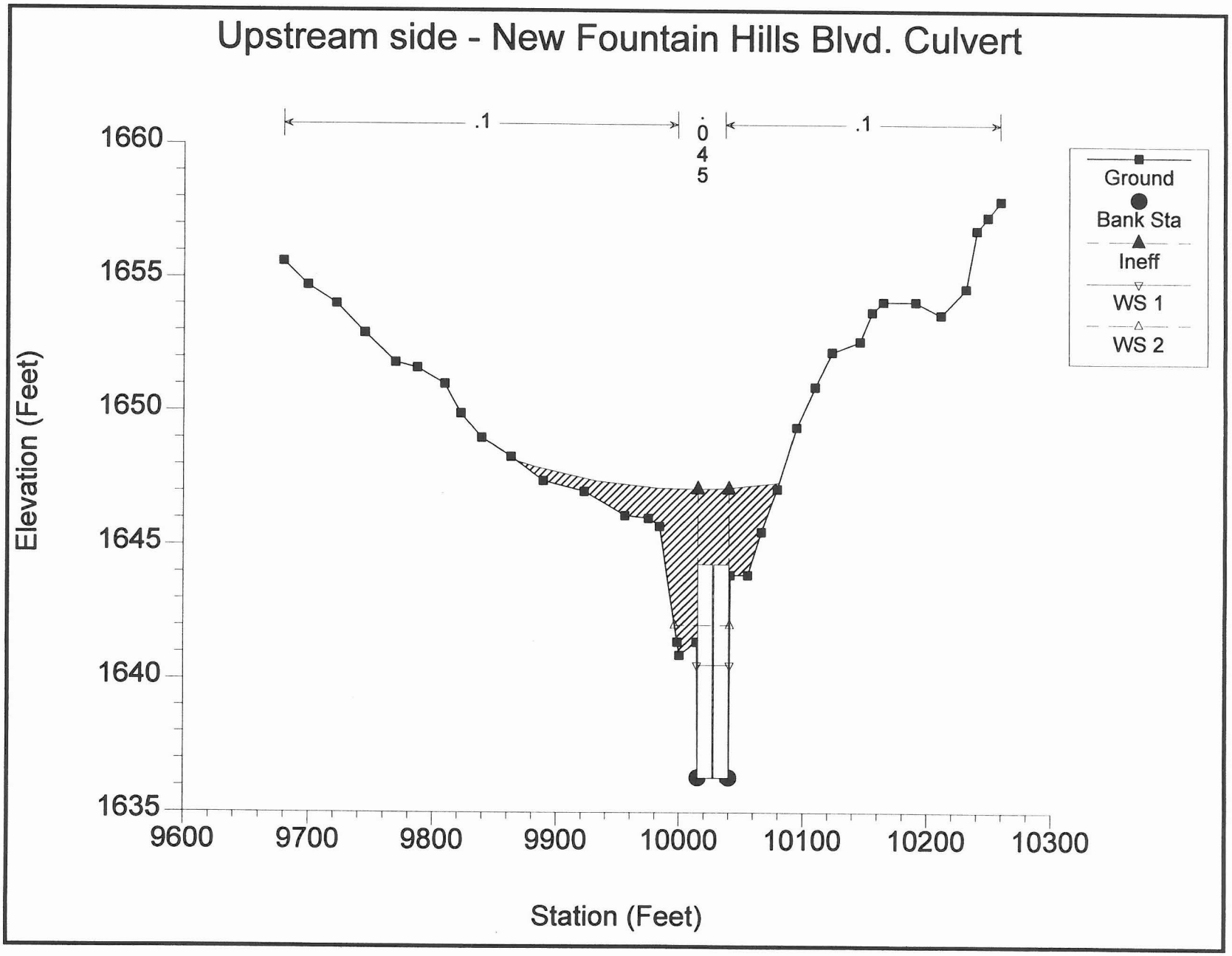

3.246
.1
.045
.1
Ground
Bank Sta
WS 1
WS 2
Elevation (Feet)
1660
1655
1650
1645
1640
9700
9800
9900
10000
10100
10200
10300
Station (Feet)

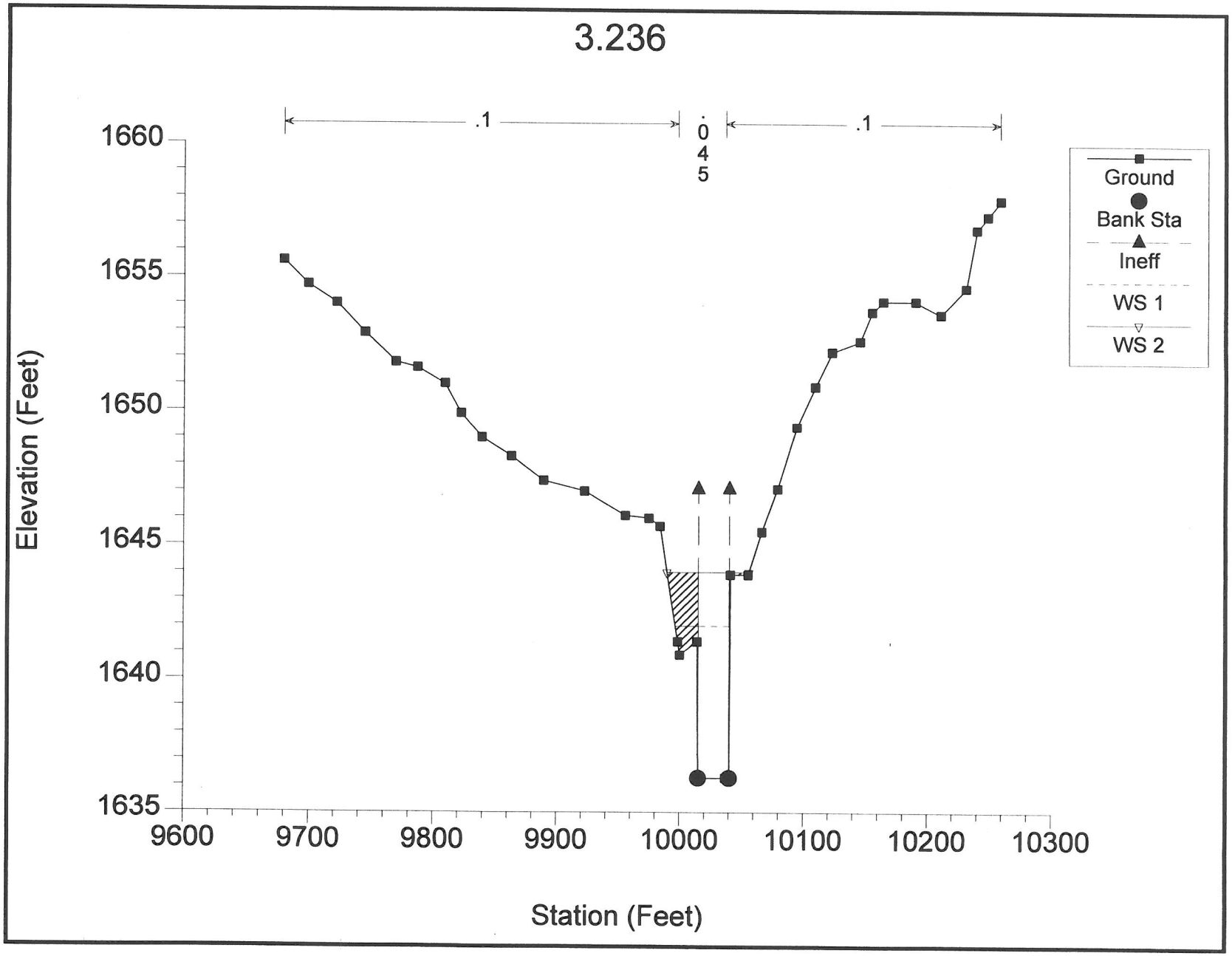

Design Conditions
Ashbrook
Invert
WS 1
WS 2
Elevation (Feet)
1690
1680
1670
1660
1650
1640
1630
1620
1610
0
500
1000
1500
2000
2500
3000
Main Channel Distance (Feet)

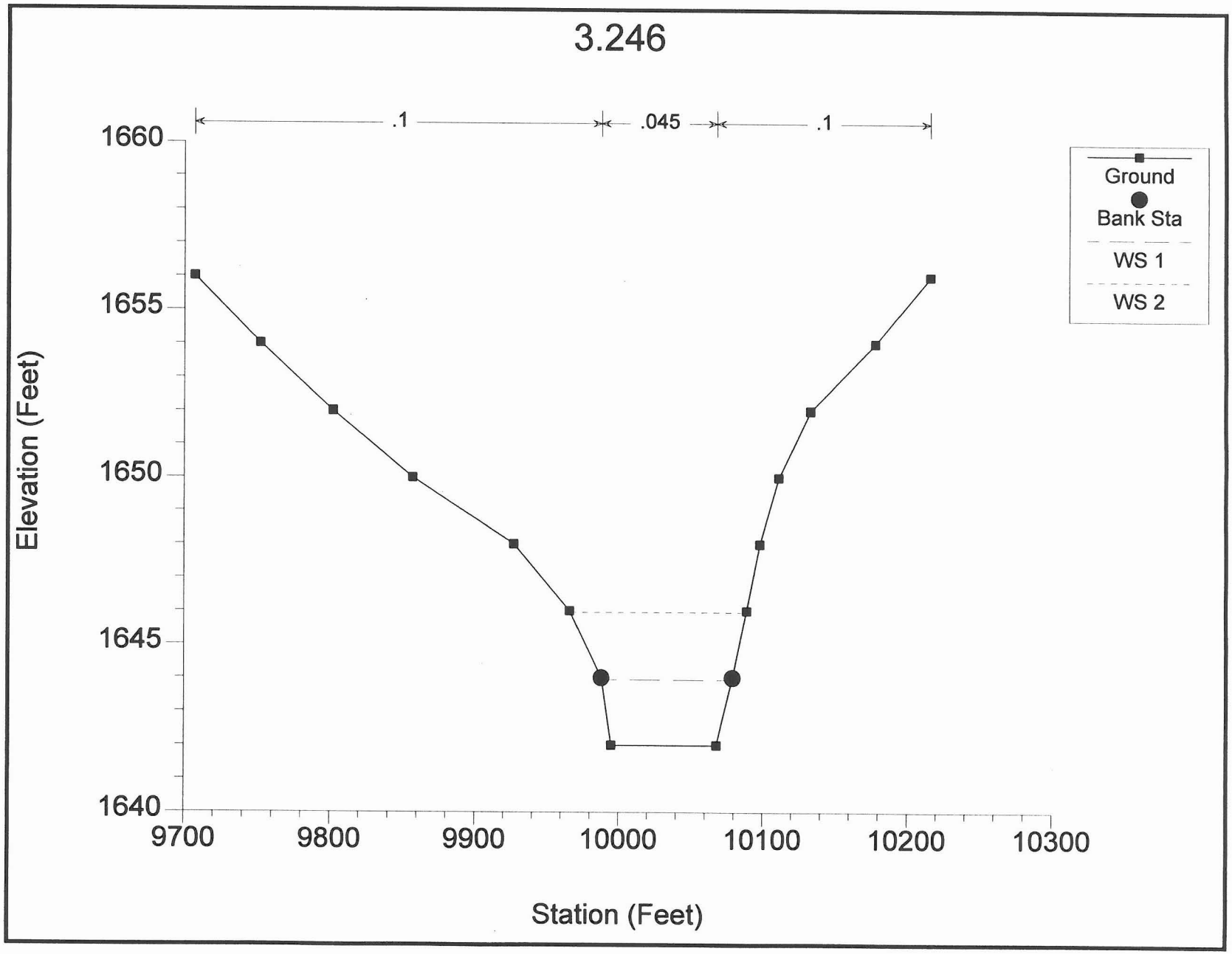

3.19
.1
.045
.1
Ground
Bank Sta
WS 1
WS 2
Elevation (Feet)
1650
1645
1640
1635
1630
9800
9900
10000
10100
10200
10300
Station (Feet)


3.21
.1
.045
.1
Ground
Bank Sta
Ineff
WS 1
WS 2
Elevation (Feet)
1655
1650
1645
1640
1635
1630
9600
9700
9800
9900
10000
10100
10200
10300
10400
Station (Feet)


Downstream side - New Fountain Hills Blvd. Culvert
.1
.1
0
4
5
Ground
Bank Sta
Ineff
WS 1
WS 2
Elevation (Feet)
1655
1650
1645
1640
1635
1630
9600
9700
9800
9900
10000
10100
10200
10300
10400
Station (Feet)


Upstream side - New Fountain Hills Blvd. Culvert
.1
.045
.1
Ground
Bank Sta
Ineff
WS 1
WS 2
Elevation (Feet)
1660
1655
1650
1645
1640
1635
9600
9700
9800
9900
10000
10100
10200
10300
Station (Feet)


3.236
.1
.045
.1
Ground
Bank Sta
Ineff
WS 1
WS 2
Elevation (Feet)
1660
1655
1650
1645
1640
1635
9600
9700
9800
9900
10000
10100
10200
10300
Station (Feet)


3.246
.1
.045
.1
Ground
Bank Sta
WS 1
WS 2
Elevation (Feet)
1660
1655
1650
1645
1640
9700
9800
9900
10000
10100
10200
10300
Station (Feet)

Existing Conditions

```
*********************************************
*  HEC-2 WATER SURFACE PROFILES             *
*                                           *
*  Version   4.6.2;  May 1991               *
*                                           *
*  RUN DATE    23MAR95    TIME   12:54:56   *
*********************************************
```

```
****************************************
*  U.S. ARMY CORPS OF ENGINEERS        *
*  HYDROLOGIC ENGINEERING CENTER       *
*  609 SECOND STREET, SUITE D          *
*  DAVIS, CALIFORNIA 95616-4687        *
*          (916) 756-1104              *
****************************************
```

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

THIS RUN EXECUTED 23MAR95 12:54:56

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

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

```
T1   *  Fountain Hills North FIS                          File:   EXIST2.DAT
T2   *  Stanley Consultants, Inc.                    Project No:   12268
T3   *  Existing Ashbrook 100-Yr Discharge               Revised:   03-23-95
T4   *  Prelim. model provided by: Flood Control District of Maricopa County
T2   *  FCDMC #92-04    Developed by:  George V. Sabol Consulting Engineers
T4   *  GR data taken from stereo model; received 19 Oct 93 from KAM.
T4   *  Extended section GR data received 19 Oct 93 from KAM.
T5   *  200 scale 2 ft CI mapping flown by Kenny Aerial Mapping on 8/29/91,
T6   *  with survey control by Anderson Nelson 12-11-92.
T7   *  Supplemental cross section data (GR & BT) surveyed by ALS as noted.
T8   *  Source of 100-yr Flowrate from HEC-1 Analysis By GVSCE.
T8   *          Files: EX100-6.OH1 and EX100-24.OH1
T8   *          Existing conditions hydrology developed for FIS.  Future
T8   *          conditions hydrology based on zoning and current development
T8   *          patterns for the watershed.
T8   *  X5 Records are from Hydrology Report, Section 3.5, Table F8.
T9   *  Special culvert routine used.   Sub Critical Analysis.
T9   *  Floodplain limits are plotted at each cross section using starting
T9   *  (SSTA) and ending (ENDST) stations unless there is ineffective flow area
T9   *  or a conflict with topographic contours, in which case, the contours are
T9   *  used to plot the floodplain.
```

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0	0	0	0	1621.95	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	0	-1	0	0	0	-1	0	0	0

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

38	43	42	1	2	25	4	13	14	15
55	26	56	0	38	43	42	39	33	3
5	26	57	8	17	34	11			
105									

```
J5  LPRNT    NUMSEC                    ********REQUESTED SECTION NUMBERS********

    -10       -10


QT        2       1385       1875
NC    0.100      0.100      0.045        0.1          0.3

NH        3         .1     9971.8       .045     10023.9          .1     10128.6
          HEC-1 Concentration Point C622R:  24-hr storm controls existing.
          HEC-1 Concentration Point C622R:  6-hr storm controls future.
X1    3.008         29     9962.7    10023.9        575        600       573.7
GR   1630.8     9799.0     1631.8     9817.3     1631.6     9843.0      1631.1     9864.0     1631.0     9876.2
GR   1631.1     9882.4     1630.6     9891.7     1629.0     9913.4      1628.9     9921.5     1627.7     9938.8
GR   1625.3     9948.5     1621.1     9962.7     1619.7     9971.8      1618.7     9986.5     1617.8    10000.0
GR   1618.7    10005.4     1618.1    10015.6     1620.5    10023.9      1620.1    10039.5     1618.7    10052.9
GR   1619.3    10056.9     1622.3    10065.0     1624.3    10076.9      1625.7    10081.4     1628.5    10096.9
GR   1628.8    10111.2     1629.7    10114.7     1629.8    10118.3      1631.1    10128.6


NH        3         .1     9988.7       .045     10017.8          .1     10148.2
                ARROW WASH Tributary
X1    3.121         24     9988.7    10017.8        565        600       598.0
GR   1641.5     9787.2     1640.8     9824.7     1640.9     9830.1      1637.9     9837.6     1637.4     9868.2
GR   1636.6     9880.2     1636.6     9890.8     1636.4     9910.9      1634.2     9929.4     1629.3     9961.2
GR   1629.1     9977.0     1628.9     9988.7     1625.8    10000.0      1629.3    10017.8     1630.5    10027.0
GR   1632.7    10043.1     1636.2    10055.6     1637.4    10065.6      1638.3    10080.0     1638.6    10096.9
GR   1639.3    10113.9     1640.1    10128.6     1640.8    10138.9      1641.3    10148.2

          ARROW  WASH   Tributary

        HEC-1 Concentration Point C621

QT        2       1185       1865

        SECNO 3.190 added using FCDMC topo mapping for special culvert routine

NH        3         .1       9995       .045     10027          .1     10220
X1    3.190         16       9958      10027       205        264      359.7
GR     1648       9835       1646       9879      1644       9890       1642       9927       1640       9939
GR     1638       9949       1636       9958      1634       9995       1634      10001       1636      10027
GR     1638      10035       1640      10044      1642      10056       1644      10066       1646      10164
GR     1648      10220


        Section 3.210 derived from 3.208 by moving 8.3' upstream to the
        downstream face of the proposed culvert.
```

```
NH        3        .1      9980      .045   10023.3        .1   10215.8
          HEC-1 Concentration Point C621:  6-hr storm controls existing.
          HEC-1 Concentration Point C621:  6-hr storm controls future.
X1    3.210       22      9980   10050.6      63.3      79.3       105
GR   1649.5   9756.0    1651.8    9776.8    1647.5    9794.4    1646.6    9801.3    1647.8    9814.7
GR   1647.5   9869.3    1646.9    9890.1    1645.9    9904.2    1644.9    9915.9    1644.5    9930.6
GR   1642.7   9943.5    1638.2    9980.0    1635.9   10000.0    1637.0   10023.3    1639.7   10050.6
GR   1646.4  10072.8    1647.3   10112.6    1647.8   10137.9    1648.1   10157.1    1648.6   10177.8
GR   1649.1  10195.3    1649.2   10215.8
```

Section 3.236 derived from 3.241 by moving 29′ downstream to the upstream face of the proposed culvert.

```
NH        3        .1    9998.3      .045   10036.8        .1   10258.8
X1    3.236        34    9998.3   10036.8       140       140       140
GR   1655.6   9679.6    1654.7    9699.2    1654.0    9722.2    1652.9    9744.9    1651.8    9769.6
GR   1651.6   9787.1    1651.0    9809.3    1649.9    9822.4    1649.0    9839.1    1648.3    9863.0
GR   1647.4   9889.1    1647.0    9922.3    1646.1    9955.6    1646.0    9974.8    1645.7    9983.9
GR   1641.4   9998.3    1640.9   10000.0    1641.4   10013.6    1641.9   10036.8    1643.9   10055.3
GR   1645.5  10066.3    1647.1   10079.1    1649.4   10094.6    1650.9   10109.4    1652.2   10123.1
GR   1652.6  10145.6    1653.7   10155.4    1654.1   10164.4    1654.1   10190.1    1653.6   10210.6
GR   1654.6  10230.9    1656.8   10239.6    1657.3   10248.5    1657.9   10258.8
```

```
NH        3        .1      9988      .045      10068        .1      10216
X1    3.246        16      9988     10079       55.5      59.5       58.5
GR     1656      9707      1654      9752       1652      9802       1650      9857      1648      9927
GR     1646      9966      1644      9988       1642      9995       1642     10068      1644     10079
GR     1646     10089      1648     10098       1650     10111       1652     10133      1654     10178
GR     1656     10216
```

HEC-1 Concentration Point C613

```
QT        2       970      1640

NH        3        .1    9994.8      .045   10035.6        .1      10196
          HEC-1 Concentration Point C613:  24-hr storm controls existing.
          HEC-1 Concentration Point C613:  6-hr storm controls future.
X1    3.323        30    9986.8   10035.6       390       410       400
GR   1661.3   9850.1    1660.8    9863.7    1663.4    9877.7    1663.2    9892.7    1658.3    9909.9
GR   1657.2   9934.0    1656.7    9948.5    1656.4    9961.8    1655.6    9978.7    1654.5    9986.8
GR   1649.8   9994.8    1649.8   10000.0    1651.4   10014.0    1652.0   10035.6    1651.5   10056.8
GR   1651.0  10074.8    1650.4   10089.9    1650.3   10093.9    1653.2   10099.9    1656.3   10104.6
GR   1658.7  10112.2    1660.4   10118.8    1660.6   10128.2    1661.2   10138.4    1662.0   10146.3
GR   1663.1  10154.2    1663.3   10161.8    1663.7   10171.9    1663.6   10187.9    1663.3   10196.0
```

```
NH        3        .1      9986      .045   10028.9        .1   10250.3
X1    3.421        29    9977.8   10028.9       510       505     518.2
GR   1667.8    9775.1    1668.8    9788.5    1669.6    9813.4    1670.1    9817.7    1670.2    9880.7
GR   1669.5    9899.9    1668.4    9935.3    1667.7    9953.4    1667.1    9965.8    1662.4    9977.8
GR   1660.1    9986.0    1660.0   10000.0    1660.5   10016.3    1661.0   10028.9    1661.4   10051.0
GR   1661.9   10057.7    1665.2   10069.8    1668.4   10078.2    1670.4   10084.7    1670.6   10110.0
GR   1670.9   10124.0    1673.8   10138.4    1674.2   10151.7    1674.0   10161.5    1674.3   10210.7
GR   1674.3   10222.3    1675.4   10233.3    1675.3   10239.5    1674.2   10250.3

  ******************************************************************************
  ***************************    Culvert  608    ******************************
  ******************************************************************************

        HEC-1 Concentration Point C608

QT        2       970      1640

NH        3        .1    9973.3      .045   10019.6        .1   10305.1
          HEC-1 Concentration Point C608:  24-Hr storm controls existing.
          HEC-1 Concentration Point C608:  6-Hr storm controls future.
          CULVERT  608:  ASHBROOK WASH and HAMPSTEAD DRIVE
            Culvert 608     Downstream: expanded flow. (SECTION 1 OF SC ROUTINE)
X1    3.487        38    9973.3   10019.6       350       340     351.5
GR   1683.7    9708.3    1682.9    9729.6    1682.8    9752.4    1680.6    9768.8    1680.0    9782.9
GR   1679.7    9846.6    1678.4    9856.0    1677.3    9873.6    1677.2    9905.2    1675.0    9916.4
GR   1675.0    9949.4    1670.5    9960.7    1668.0    9973.3    1667.2    9982.3    1666.6    9990.5
GR   1666.6   10000.0    1666.7   10012.0    1668.6   10019.6    1669.8   10032.0    1669.0   10043.4
GR   1670.4   10059.0    1671.5   10065.9    1676.5   10081.4    1677.2   10093.7    1677.2   10109.9
GR   1676.8   10124.4    1678.8   10132.2    1680.3   10140.9    1681.0   10151.4    1681.0   10168.1
GR   1681.6   10224.8    1682.0   10244.0    1682.9   10255.5    1682.1   10265.9    1682.7   10274.1
GR   1683.4   10288.2    1683.5   10303.3    1683.5   10305.1

        Use NC Record to set Contraction and Expansion Coefficients for Culvert.

NC                                     0.3       0.5
NH        3      0.100    9978.5    0.045   10029.4     0.100   10282.7

            Culvert 608  Outlet.   3-10'x 7' Box       (SECTION 2 OF SC ROUTINE)
              Photogrammetric x-sec. located 24.4' Downstream. (No Elev. Adjust.
X1    3.519        30    9988.7   10017.1       170       170     168.3
X3       10                                                                1678.5    1678.5
GR   1688.0    9703.2    1686.8    9716.7    1686.3    9734.4    1685.9    9751.2    1684.6    9768.9
GR   1681.6    9793.0    1682.1    9800.9    1681.3    9839.1    1680.2    9861.1    1679.0    9880.8
GR   1680.4    9889.8    1679.0    9923.2    1674.9    9945.8    1673.2    9957.2    1672.5    9978.5
GR   1670.8    9988.7    1670.8   10000.0    1670.6   10017.1    1671.7   10029.4    1675.6   10052.6
GR   1678.0   10070.8    1679.1   10110.3    1680.8   10149.4    1682.6   10183.3    1683.9   10203.9
GR   1683.9   10221.3    1683.4   10222.7    1683.5   10254.8    1683.9   10257.7    1684.3   10282.7
```

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SC    3.013      0.5      2.63        0        7       10     61.5      8.1  1673.19  1672.71

NH        3    0.100    9980.8    0.045  10013.8    0.100    10300

            Culvert 608  Inlet.    3-10'x7'  Box       (SECTION 3 OF SC ROUTINE)
              Photogrammetric x-sec. located 10' Upstream. (No Elev. Adjust.)
            Culvert 608 BT information surveyed by ALS. West top of curb.
X1    3.531       21    9980.8   10013.8     61.5     61.5     61.5
X2                          2   1680.19   1681.95
X3       10                                                        1681.57  1681.57

BT      -11   9708.7    1690.0                9800  1684.76                9850  1682.76
BT            9900    1681.89                9950  1681.57               10000  1681.87
BT           10050    1682.36               10100  1682.86               10150  1683.35
BT           10200     1683.8               10300   1685.5

GR  1690.0   9708.7     1686.7    9747.3   1683.8   9786.3   1680.6   9833.4   1678.7   9874.1
GR  1677.5   9920.2     1677.2    9952.6   1677.1   9974.2   1673.1   9980.8   1671.8   9991.0
GR  1673.2  10000.0     1671.7   10013.8   1672.3  10022.9   1677.1  10025.3   1679.3  10033.9
GR  1679.8  10071.4     1680.7   10123.5   1682.0  10161.6   1682.7  10205.9   1682.8  10240.9
GR  1685.5    10300

        Return  Contraction and Expansion coefficients to Normal

NC                                    0.1      0.3

NH        3       .1    9962.2      .045  10028.7       .1  10309.5
            Culvert 608    Upstream:  expanded flow.  (SECTION 4 OF SC ROUTINE)
X1    3.544       30    9950.2   10057.3       75       75     71.3
GR  1691.5   9663.5     1686.9    9680.4   1686.0   9706.3   1684.4   9731.7   1682.5   9764.7
GR  1680.6   9792.6     1679.2    9806.3   1678.1   9851.1   1677.0   9894.2   1677.4   9903.1
GR  1677.6   9933.6     1676.9    9950.2   1673.8   9962.2   1674.0   9972.0   1674.2  10000.0
GR  1673.7  10013.1     1674.6   10028.7   1675.2  10047.5   1676.7  10057.3   1676.5  10070.2
GR  1682.7  10078.0     1683.3   10092.7   1683.0  10114.2   1684.9  10143.3   1687.2  10167.5
GR  1689.5  10185.7     1690.3   10216.9   1691.0  10240.9   1690.4  10277.5   1691.3  10309.5
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T1   *  Fountain Hills North FIS                        File:   EXIST2.DAT
T2   *  Stanley Consultants, Inc.                  Project No:   12268
T3   *  Existing Ashbrook 100-Yr Discharge            Revised:   03-23-95

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

                3                           .009                                    1622

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     15                  -1                                      -1
```

THIS RUN EXECUTED 23MAR95 12:54:58

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

Existing Ashbrook 100-Yr

SUMMARY PRINTOUT

	SECNO	Q	ELMIN	CWSEL	CRIWS	AREA	TOPWID	QLOB	QCH	QROB	VLOB	VCH	VROB
	3.008	1385.00	1617.80	1621.95	1621.28	265.07	104.23	.96	1191.59	192.45	.79	6.52	2.37
	3.008	1875.00	1617.80	1622.56	1621.75	329.51	108.75	4.00	1581.98	289.02	1.12	7.20	2.72
*	3.121	1385.00	1625.80	1631.31	1631.31	200.51	84.77	218.22	1133.56	33.22	2.97	10.15	2.16
*	3.121	1875.00	1625.80	1631.95	1631.95	257.75	93.63	346.60	1459.56	68.84	3.44	11.20	2.59
	3.190	1185.00	1634.00	1637.73	1637.01	207.34	83.73	11.32	1163.65	10.02	1.68	5.98	1.67
	3.190	1865.00	1634.00	1638.49	1637.73	273.35	90.66	34.20	1800.51	30.28	2.44	7.29	2.43
	3.210	1185.00	1635.90	1639.38	1639.37	149.53	77.03	9.01	1175.99	.00	1.58	8.18	.00
	3.210	1865.00	1635.90	1640.18	1640.13	215.25	88.19	34.42	1830.27	.31	2.18	9.19	.82
*	3.236	1185.00	1640.90	1644.42	1644.42	158.45	70.67	39.83	1068.94	76.23	2.61	9.36	2.63
*	3.236	1865.00	1640.90	1645.31	1645.31	225.80	79.82	77.63	1617.28	170.09	3.03	10.88	3.30
*	3.246	1185.00	1642.00	1645.86	1643.93	360.32	120.68	12.46	1166.93	5.61	.66	3.51	.65
*	3.246	1865.00	1642.00	1647.08	1644.56	525.50	149.03	54.36	1787.31	23.33	.95	4.02	.99
*	3.323	970.00	1649.80	1652.65	1652.65	159.10	108.80	.00	583.98	386.02	.00	8.25	4.37
*	3.323	1640.00	1649.80	1653.28	1653.28	229.11	111.15	.00	964.92	675.08	.00	9.64	5.23
*	3.421	970.00	1660.00	1663.35	1662.56	210.77	87.65	1.04	816.80	152.16	.90	5.56	2.42
*	3.421	1640.00	1660.00	1664.26	1663.33	293.58	93.34	6.45	1335.00	298.55	1.45	6.90	3.12
*	3.487	970.00	1666.60	1669.47	1669.47	124.64	74.43	9.18	953.96	6.86	1.70	8.47	1.04
*	3.487	1640.00	1666.60	1670.51	1670.51	218.20	98.99	34.01	1524.39	81.59	2.15	9.48	1.97
*	3.519	970.00	1670.60	1674.04	1674.04	93.59	28.40	.00	970.00	.00	.00	10.36	.00
*	3.519	1640.00	1670.60	1675.42	1675.42	132.85	28.40	.00	1640.00	.00	.00	12.34	.00
*	3.531	970.00	1671.70	1678.39	.00	195.68	33.00	.00	970.00	.00	.00	4.96	.00
*	3.531	1640.00	1671.70	1680.52	.00	266.12	33.00	.00	1640.00	.00	.00	6.16	.00

	SECNO	Q	ELMIN	CWSEL	CRIWS	AREA	TOPWID	QLOB	QCH	QROB	VLOB	VCH	VROB
*	3.544	970.00	1673.70	1678.86	1675.78	648.85	253.06	87.00	857.44	25.57	.57	1.84	.78
*	3.544	1640.00	1673.70	1681.20	1676.41	1294.10	292.29	370.97	1208.38	60.65	.73	1.69	.83

Existing Ashbrook 100-Yr

SUMMARY PRINTOUT

	SECNO	Q	ELMIN	XLCH	K*CHSL	EG	10*KS	VCH	ALPHA	DEPTH	K*XNCH	.01K	HL
	3.008	1385.00	1617.80	.00	.00	1622.53	92.67	6.52	1.37	4.15	45.16	143.87	.00
	3.008	1875.00	1617.80	.00	.00	1623.25	90.88	7.20	1.39	4.76	45.85	196.68	.00
*	3.121	1385.00	1625.80	598.00	13.38	1632.64	162.75	10.15	1.80	5.51	45.00	108.57	7.17
*	3.121	1875.00	1625.80	598.00	13.38	1633.51	161.16	11.20	1.89	6.15	45.00	147.70	7.06
	3.190	1185.00	1634.00	359.70	22.80	1638.28	158.93	5.98	1.08	3.73	62.45	94.00	5.56
	3.190	1865.00	1634.00	359.70	22.80	1639.29	173.75	7.29	1.11	4.49	62.74	141.49	5.71
	3.210	1185.00	1635.90	105.00	18.10	1640.41	230.07	8.18	1.06	3.48	45.57	78.12	1.98
	3.210	1865.00	1635.90	105.00	18.10	1641.47	220.62	9.19	1.11	4.28	47.78	125.56	2.03
*	3.236	1185.00	1640.90	140.00	35.71	1645.66	189.04	9.36	1.42	3.52	45.00	86.19	2.91
*	3.236	1865.00	1640.90	140.00	35.71	1646.93	179.65	10.88	1.52	4.41	45.00	139.14	2.78
*	3.246	1185.00	1642.00	58.50	18.80	1646.04	21.84	3.51	1.12	3.86	46.85	253.57	.28
*	3.246	1865.00	1642.00	58.50	18.80	1647.33	19.78	4.02	1.23	5.08	47.20	419.31	.26
*	3.323	970.00	1649.80	400.00	19.50	1653.40	496.08	8.25	1.31	2.85	53.03	43.55	2.11
*	3.323	1640.00	1649.80	400.00	19.50	1654.31	465.44	9.64	1.29	3.48	54.50	76.02	2.01
*	3.421	970.00	1660.00	518.20	19.68	1663.77	108.04	5.56	1.27	3.35	55.86	93.32	10.34
*	3.421	1640.00	1660.00	518.20	19.68	1664.89	114.82	6.90	1.30	4.26	55.86	153.05	10.54
*	3.487	970.00	1666.60	351.50	18.78	1670.56	202.85	8.47	1.17	2.87	45.00	68.11	5.06
*	3.487	1640.00	1666.60	351.50	18.78	1671.81	157.74	9.48	1.48	3.91	45.00	130.58	4.68
*	3.519	970.00	1670.60	168.30	23.77	1675.70	200.87	10.36	1.00	3.44	45.00	68.44	3.40
*	3.519	1640.00	1670.60	168.30	23.77	1677.78	178.62	12.34	1.00	4.82	45.00	122.71	2.82
*	3.531	970.00	1671.70	61.50	17.89	1678.77	21.22	4.96	1.00	6.69	45.00	210.55	3.07
*	3.531	1640.00	1671.70	61.50	17.89	1681.11	21.77	6.16	1.00	8.82	45.00	351.49	3.33
*	3.544	970.00	1673.70	71.30	28.05	1678.91	10.32	1.84	1.37	5.16	68.63	301.98	.10
*	3.544	1640.00	1673.70	71.30	28.05	1681.23	4.87	1.69	1.40	7.50	68.63	742.80	.06

Existing Ashbrook 100-Yr

SUMMARY PRINTOUT TABLE 105

	SECNO	CWSEL	HL	OLOSS	TOPWID	QLOB	QCH	QROB
	3.008	1621.95	.00	.00	104.23	.96	1191.59	192.45
	3.008	1622.56	.00	.00	108.75	4.00	1581.98	289.02
*	3.121	1631.31	7.17	.23	84.77	218.22	1133.56	33.22
*	3.121	1631.95	7.06	.26	93.63	346.60	1459.56	68.84
	3.190	1637.73	5.56	.08	83.73	11.32	1163.65	10.02
	3.190	1638.49	5.71	.08	90.66	34.20	1800.51	30.28
	3.210	1639.38	1.98	.15	77.03	9.01	1175.99	.00
	3.210	1640.18	2.03	.15	88.19	34.42	1830.27	.31
*	3.236	1644.42	2.91	.06	70.67	39.83	1068.94	76.23
*	3.236	1645.31	2.78	.10	79.82	77.63	1617.28	170.09
*	3.246	1645.86	.28	.10	120.68	12.46	1166.93	5.61
*	3.246	1647.08	.26	.14	149.03	54.36	1787.31	23.33
*	3.323	1652.65	2.11	.17	108.80	.00	583.98	386.02
*	3.323	1653.28	2.01	.23	111.15	.00	964.92	675.08
*	3.421	1663.35	10.34	.03	87.65	1.04	816.80	152.16
*	3.421	1664.26	10.54	.04	93.34	6.45	1335.00	298.55
*	3.487	1669.47	5.06	.20	74.43	9.18	953.96	6.86
*	3.487	1670.51	4.68	.20	98.99	34.01	1524.39	81.59
*	3.519	1674.04	3.40	.29	28.40	.00	970.00	.00
*	3.519	1675.42	2.82	.53	28.40	.00	1640.00	.00
*	3.531	1678.39	3.07	.00	33.00	.00	970.00	.00
*	3.531	1680.52	3.33	.00	33.00	.00	1640.00	.00
*	3.544	1678.86	.10	.03	253.06	87.00	857.44	25.57
*	3.544	1681.20	.06	.06	292.29	370.97	1208.38	60.65

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=      3.121  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.121  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3.121  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.121  PROFILE=  2  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      3.236  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.236  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3.236  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.236  PROFILE=  2  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      3.246  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      3.246  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      3.323  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.323  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3.323  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.323  PROFILE=  2  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      3.421  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      3.421  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      3.487  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.487  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3.487  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.487  PROFILE=  2  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      3.519  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.519  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      3.519  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      3.519  PROFILE=  2  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      3.531  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      3.531  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.544  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      3.544  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

Future Conditions

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**********************************************
*  HEC-2 WATER SURFACE PROFILES              *
*                                            *
*  Version   4.6.2;  May 1991                *
*                                            *
*  RUN DATE    23MAR95    TIME   12:54:46    *
**********************************************
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****************************************
*  U.S. ARMY CORPS OF ENGINEERS        *
*  HYDROLOGIC ENGINEERING CENTER       *
*  609 SECOND STREET, SUITE D          *
*  DAVIS, CALIFORNIA 95616-4687        *
*          (916) 756-1104              *
****************************************
```

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

THIS RUN EXECUTED 23MAR95 12:54:46

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

 Version   4.6.2;  May 1991
*************************************
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T1   *  Fountain Hills North FIS                          File:   DESIGN.DAT
T2   *  Stanley Consultants, Inc.                    Project No:   12268
T3   *  Design Ashbrook 100-Year Discharge              Revised:   03-23-95
T4   *  Prelim. model provided by: Flood Control District of Maricopa County
T2   *  FCDMC #92-04    Developed by:  George V. Sabol Consulting Engineers
T4   *  GR data taken from stereo model; received 19 Oct 93 from KAM.
T4   *  Extended section GR data received 19 Oct 93 from KAM.
T5   *  200 scale 2 ft CI mapping flown by Kenny Aerial Mapping on 8/29/91,
T6   *  with survey control by Anderson Nelson 12-11-92.
T7   *  Supplemental cross section data (GR & BT) surveyed by ALS as noted.
T8   *  Source of 100-yr Flowrate from HEC-1 Analysis By GVSCE.
T8   *          Files: EX100-6.OH1 and EX100-24.OH1
T8   *          Existing conditions hydrology developed for FIS.  Future
T8   *          conditions hydrology based on zoning and current development
T8   *          patterns for the watershed.
T8   *  X5 Records are from Hydrology Report, Section 3.5, Table F8.
T9   *  Special culvert routine used.   Sub Critical Analysis.
T9   *  Floodplain limits are plotted at each cross section using starting
T9   *  (SSTA) and ending (ENDST) stations unless there is ineffective flow area
T9   *  or a conflict with topographic contours, in which case, the contours are
T9   *  used to plot the floodplain.
```

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0	0	0	0	1621.95	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	0	-1	0	0	0	-1	-1	0	0

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

38	43	42	1	2	25	4	13	14	15
55	26	56	0	38	43	42	39	33	3
5	26	57	8	17	34	11			
105									

```
J5  LPRNT    NUMSEC                    ********REQUESTED SECTION NUMBERS********

    -10       -10


QT        2       1385       1875
NC    0.100      0.100      0.045        0.1         0.3

NH        3         .1     9971.8       .045     10023.9          .1     10128.6
          HEC-1 Concentration Point C622R:  24-hr storm controls existing.
          HEC-1 Concentration Point C622R:  6-hr storm controls future.
X1    3.008         29     9962.7    10023.9         575         600       573.7
GR   1630.8     9799.0     1631.8     9817.3      1631.6      9843.0      1631.1     9864.0     1631.0     9876.2
GR   1631.1     9882.4     1630.6     9891.7      1629.0      9913.4      1628.9     9921.5     1627.7     9938.8
GR   1625.3     9948.5     1621.1     9962.7      1619.7      9971.8      1618.7     9986.5     1617.8    10000.0
GR   1618.7    10005.4     1618.1    10015.6      1620.5     10023.9      1620.1    10039.5     1618.7    10052.9
GR   1619.3    10056.9     1622.3    10065.0      1624.3     10076.9      1625.7    10081.4     1628.5    10096.9
GR   1628.8    10111.2     1629.7    10114.7      1629.8     10118.3      1631.1    10128.6


NH        3         .1     9988.7       .045     10017.8          .1     10148.2
                ARROW WASH Tributary
X1    3.121         24     9988.7    10017.8         565         600       598.0
GR   1641.5     9787.2     1640.8     9824.7      1640.9      9830.1      1637.9     9837.6     1637.4     9868.2
GR   1636.6     9880.2     1636.6     9890.8      1636.4      9910.9      1634.2     9929.4     1629.3     9961.2
GR   1629.1     9977.0     1628.9     9988.7      1625.8     10000.0      1629.3    10017.8     1630.5    10027.0
GR   1632.7    10043.1     1636.2    10055.6      1637.4     10065.6      1638.3    10080.0     1638.6    10096.9
GR   1639.3    10113.9     1640.1    10128.6      1640.8     10138.9      1641.3    10148.2

          ARROW  WASH   Tributary

        HEC-1 Concentration Point C621

QT        2       1185       1865

        SECNO 3.190 added using FCDMC topo mapping for special culvert routine

NH        3         .1       9995       .045      10027          .1      10220
            2-12'X 8' RCB   Downstream: expanded flow. (SECTION 1 OF SC ROUTINE)
X1    3.190         16       9958      10027        205         264      359.7
GR     1648       9835       1646       9879       1644       9890       1642       9927       1640       9939
GR     1638       9949       1636       9958       1634       9995       1634      10001       1636      10027
GR     1638      10035       1640      10044       1642      10056       1644      10066       1646      10164
GR     1648      10220


        Changed elev at Sta. 10023.3 from 1637.0 to 1634.92, and STCHR from
                10023.3 to 10032; Section 3.210 derived from 3.208 by moving
                8.3' upstream to the downstream face of the proposed culvert.
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NC                                        0.6        0.8
NH        3        .1       9980       .045    10023.3        .1    10215.8
          HEC-1 Concentration Point C621:  6-hr storm controls existing.
          HEC-1 Concentration Point C621:  6-hr storm controls future.
            Oultet. 2-12'X 8' RCB                    (SECTION 2 OF SC ROUTINE)
X1    3.210        26    10007.0    10032.0       63.3       79.3      105.0
X3       10                           10007    1647.09      10032    1647.09

GR   1649.5     9756.0    1651.80     9776.8    1647.50     9794.4    1646.60     9801.3    1647.80     9814.7
GR   1647.5     9869.3    1646.90     9890.1    1645.90     9904.2    1644.90     9915.9    1644.50     9930.6
GR   1642.7     9943.5    1638.20     9980.0    1635.90    10000.0    1637.79    10006.0    1634.92    10007.0
GR   1634.9    10023.3    1634.92    10032.0    1639.70    10033.0    1639.70    10050.6    1646.40    10072.8
GR   1647.3    10112.6    1647.80    10137.9    1648.10    10157.1    1648.60    10177.8    1649.10    10195.3
GR   1649.2    10215.8


SC    2.012        0.2       3.00          0          8         12        140       12.1    1636.30    1634.92


        Originally SECNO 3.241 but duplicated 29' downstream for SC routine,
                changed elev. @ Sta. 10036.8 from 1641.9 to 1636.30, STCHR
                from 10036.8 to 10040,  mapping at this location did not
                reflect accuracy of digitized cross-sections.

NH        3        .1     9998.3       .045    10036.8        .1    10258.8
            Proposed Double 12' x 8' Reinforce Box Culvert (ADOT Standard)
            Inlet.  2-12'x 8' RCB                    (SECTION 3 OF SC ROUTINE)
X1    3.236        38    10015.0    10040.0      140.0      140.0      140.0
X2                            2    1644.30    1647.09
X3       10                           10015    1647.09      10040    1647.09

BT      -19      9642    1653.91                 9682    1652.51                 9732    1650.98
BT               9782    1649.71                 9832    1648.69                 9882    1647.92
BT               9932    1647.40                 9982    1647.13              10014.5    1647.09
BT              10027    1647.10                10032    1647.11              10039.5    1647.13
BT              10082    1647.34                10132    1647.83                10182    1648.56
BT              10232    1649.55                10282    1650.78                10332    1652.27
BT              10342    1652.60

GR   1655.6     9679.6    1654.70     9699.2    1654.00     9722.2    1652.90     9744.9    1651.80     9769.6
GR   1651.6     9787.1    1651.00     9809.3    1649.90     9822.4    1649.00     9839.1    1648.30     9863.0
GR   1647.4     9889.1    1647.00     9922.3    1646.10     9955.6    1646.00     9974.8    1645.70     9983.9
GR   1641.4     9998.3    1640.90    10000.0    1641.40    10013.6    1641.40    10014.0    1636.30    10015.0
GR   1636.3    10036.8    1636.30    10040.0    1643.90    10041.0    1643.90    10055.3    1645.50    10066.3
GR   1647.1    10079.1    1649.40    10094.6    1650.90    10109.4    1652.20    10123.1    1652.60    10145.6
GR   1653.7    10155.4    1654.10    10164.4    1654.10    10190.1    1653.60    10210.6    1654.60    10230.9
GR   1656.8    10239.6    1657.30    10248.5    1657.90    10258.8


        SECNO 3.246 added using FCDMC topo mapping for special culvert routine
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NH        3        .1      9988      .045     10068        .1     10216
            2-12'X 8' RCB  Upstream:  expanded flow.  (SECTION 4 OF SC ROUTINE)
X1    3.246       16      9988     10079      55.5      59.5      58.5
GR     1656     9707      1654      9752      1652      9802      1650      9857      1648      9927
GR     1646     9966      1644      9988      1642      9995      1642     10068      1644     10079
GR     1646    10089      1648     10098      1650     10111      1652     10133      1654     10178
GR     1656    10216

        HEC-1 Concentration Point C613


QT        2      970      1640

NC                                   0.1       0.3
NH        3        .1    9994.8      .045   10035.6        .1     10196
          HEC-1 Concentration Point C613:  24-hr storm controls existing.
          HEC-1 Concentration Point C613:  6-hr storm controls future.
X1    3.323       30    9986.8   10035.6       390       410       400
GR   1661.3   9850.1    1660.8    9863.7    1663.4    9877.7    1663.2    9892.7    1658.3    9909.9
GR   1657.2   9934.0    1656.7    9948.5    1656.4    9961.8    1655.6    9978.7    1654.5    9986.8
GR   1649.8   9994.8    1649.8   10000.0    1651.4   10014.0    1652.0   10035.6    1651.5   10056.8
GR   1651.0  10074.8    1650.4   10089.9    1650.3   10093.9    1653.2   10099.9    1656.3   10104.6
GR   1658.7  10112.2    1660.4   10118.8    1660.6   10128.2    1661.2   10138.4    1662.0   10146.3
GR   1663.1  10154.2    1663.3   10161.8    1663.7   10171.9    1663.6   10187.9    1663.3   10196.0


NH        3        .1      9986      .045   10028.9        .1    10250.3
X1    3.421       29    9977.8   10028.9       510       505     518.2
GR   1667.8   9775.1    1668.8    9788.5    1669.6    9813.4    1670.1    9817.7    1670.2    9880.7
GR   1669.5   9899.9    1668.4    9935.3    1667.7    9953.4    1667.1    9965.8    1662.4    9977.8
GR   1660.1   9986.0    1660.0   10000.0    1660.5   10016.3    1661.0   10028.9    1661.4   10051.0
GR   1661.9  10057.7    1665.2   10069.8    1668.4   10078.2    1670.4   10084.7    1670.6   10110.0
GR   1670.9  10124.0    1673.8   10138.4    1674.2   10151.7    1674.0   10161.5    1674.3   10210.7
GR   1674.3  10222.3    1675.4   10233.3    1675.3   10239.5    1674.2   10250.3

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***************************    Culvert  608    ******************************
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        HEC-1 Concentration Point C608

QT        2      970      1640

NH        3        .1    9973.3      .045   10019.6        .1    10305.1
          HEC-1 Concentration Point C608:  24-Hr storm controls existing.
          HEC-1 Concentration Point C608:  6-Hr storm controls future.
          CULVERT  608:  ASHBROOK WASH and HAMPSTEAD DRIVE
            Culvert 608    Downstream: expanded flow. (SECTION 1 OF SC ROUTINE)
X1    3.487       38    9973.3   10019.6       350       340     351.5
GR   1683.7   9708.3    1682.9    9729.6    1682.8    9752.4    1680.6    9768.8    1680.0    9782.9
GR   1679.7   9846.6    1678.4    9856.0    1677.3    9873.6    1677.2    9905.2    1675.0    9916.4
GR   1675.0   9949.4    1670.5    9960.7    1668.0    9973.3    1667.2    9982.3    1666.6    9990.5
GR   1666.6  10000.0    1666.7   10012.0    1668.6   10019.6    1669.8   10032.0    1669.0   10043.4
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GR   1670.4    10059.0    1671.5    10065.9    1676.5    10081.4    1677.2    10093.7    1677.2    10109.9
GR   1676.8    10124.4    1678.8    10132.2    1680.3    10140.9    1681.0    10151.4    1681.0    10168.1
GR   1681.6    10224.8    1682.0    10244.0    1682.9    10255.5    1682.1    10265.9    1682.7    10274.1
GR   1683.4    10288.2    1683.5    10303.3    1683.5    10305.1

        Use NC Record to set Contraction and Expansion Coefficients for Culvert.

NC                                   0.3        0.5
NH       3      0.100     9978.5     0.045    10029.4      0.100    10282.7

            Culvert 608  Outlet.   3-10'x 7' Box       (SECTION 2 OF SC ROUTINE)
              Photogrammetric x-sec. located 24.4' Downstream. (No Elev. Adjust.
X1    3.519        30     9988.7    10017.1       170        170      168.3
X3       10                                                                    1678.5    1678.5
GR   1688.0     9703.2    1686.8     9716.7    1686.3     9734.4    1685.9     9751.2    1684.6     9768.9
GR   1681.6     9793.0    1682.1     9800.9    1681.3     9839.1    1680.2     9861.1    1679.0     9880.8
GR   1680.4     9889.8    1679.0     9923.2    1674.9     9945.8    1673.2     9957.2    1672.5     9978.5
GR   1670.8     9988.7    1670.8    10000.0    1670.6    10017.1    1671.7    10029.4    1675.6    10052.6
GR   1678.0    10070.8    1679.1    10110.3    1680.8    10149.4    1682.6    10183.3    1683.9    10203.9
GR   1683.9    10221.3    1683.4    10222.7    1683.5    10254.8    1683.9    10257.7    1684.3    10282.7


SC    3.013       0.5       2.63         0         7         10      61.5       8.1   1673.19   1672.71

NH       3      0.100     9980.8     0.045    10013.8      0.100    10300

            Culvert 608  Inlet.    3-10'x7'  Box       (SECTION 3 OF SC ROUTINE)
              Photogrammetric x-sec. located 10' Upstream. (No Elev. Adjust.)
            Culvert 608 BT information surveyed by ALS. West top of curb.
X1    3.531        21     9980.8    10013.8      61.5       61.5      61.5
X2                           2     1680.19   1681.95
X3       10                                                                    1681.57   1681.57

BT      -11    9708.7     1690.0                9800    1684.76                 9850    1682.76
BT             9900     1681.89                9950    1681.57                10000    1681.87
BT            10050     1682.36               10100    1682.86                10150    1683.35
BT            10200     1683.8                10300    1685.5

GR   1690.0    9708.7    1686.7     9747.3    1683.8     9786.3    1680.6     9833.4    1678.7     9874.1
GR   1677.5    9920.2    1677.2     9952.6    1677.1     9974.2    1673.1     9980.8    1671.8     9991.0
GR   1673.2   10000.0    1671.7    10013.8    1672.3    10022.9    1677.1    10025.3    1679.3    10033.9
GR   1679.8   10071.4    1680.7    10123.5    1682.0    10161.6    1682.7    10205.9    1682.8    10240.9
GR   1685.5   10300

        Return  Contraction and Expansion coefficients to Normal

NC                                   0.1        0.3

NH       3        .1     9962.2      .045    10028.7        .1    10309.5
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Culvert 608 Upstream: expanded flow. (SECTION 4 OF SC ROUTINE)

X1	3.544	30	9950.2	10057.3	75	75	71.3			
GR	1691.5	9663.5	1686.9	9680.4	1686.0	9706.3	1684.4	9731.7	1682.5	9764.7
GR	1680.6	9792.6	1679.2	9806.3	1678.1	9851.1	1677.0	9894.2	1677.4	9903.1
GR	1677.6	9933.6	1676.9	9950.2	1673.8	9962.2	1674.0	9972.0	1674.2	10000.0
GR	1673.7	10013.1	1674.6	10028.7	1675.2	10047.5	1676.7	10057.3	1676.5	10070.2
GR	1682.7	10078.0	1683.3	10092.7	1683.0	10114.2	1684.9	10143.3	1687.2	10167.5
GR	1689.5	10185.7	1690.3	10216.9	1691.0	10240.9	1690.4	10277.5	1691.3	10309.5

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T1   *  Fountain Hills North FIS                          File:   DESIGN.DAT
T2   *  Stanley Consultants, Inc.                   Project No:   12268
T3   *  Design Ashbrook 100-Year Discharge             Revised:   03-23-95

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

              3                         .009                                1622

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

    15                 -1                                   -1
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THIS RUN EXECUTED 23MAR95 12:54:48

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

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

Design Ashbrook 100-Year

SUMMARY PRINTOUT

	SECNO	Q	ELMIN	CWSEL	CRIWS	AREA	TOPWID	QLOB	QCH	QROB	VLOB	VCH	VROB
	3.008	1385.00	1617.80	1621.95	1621.28	265.07	104.23	.96	1191.59	192.45	.79	6.52	2.37
	3.008	1875.00	1617.80	1622.56	1621.75	329.51	108.75	4.00	1581.98	289.02	1.12	7.20	2.72
*	3.121	1385.00	1625.80	1631.31	1631.31	200.51	84.77	218.22	1133.56	33.22	2.97	10.15	2.16
*	3.121	1875.00	1625.80	1631.95	1631.95	257.75	93.63	346.60	1459.56	68.84	3.44	11.20	2.59
	3.190	1185.00	1634.00	1637.73	1637.01	207.34	83.73	11.32	1163.65	10.02	1.68	5.98	1.67
	3.190	1865.00	1634.00	1638.49	1637.73	273.35	90.66	34.20	1800.51	30.28	2.44	7.29	2.43
*	3.210	1185.00	1634.90	1640.01	1639.02	127.34	25.00	.00	1185.00	.00	.00	9.31	.00
*	3.210	1865.00	1634.90	1641.01	1640.46	152.38	25.00	.00	1865.00	.00	.00	12.24	.00
*	3.236	1185.00	1636.30	1641.97	.00	141.78	25.00	.00	1185.00	.00	.00	8.36	.00
*	3.236	1865.00	1636.30	1643.96	.00	191.67	25.00	.00	1865.00	.00	.00	9.73	.00
*	3.246	1185.00	1642.00	1643.93	1643.93	157.48	90.35	.00	1185.00	.00	.00	7.52	.00
*	3.246	1865.00	1642.00	1646.12	1644.56	393.89	126.06	25.93	1827.42	11.65	1.04	5.11	1.03
	3.323	970.00	1649.80	1653.21	1652.65	220.44	110.90	.00	572.41	397.59	.00	5.93	3.21
*	3.323	1640.00	1649.80	1653.28	1653.28	229.11	111.15	.00	964.92	675.08	.00	9.64	5.23
	3.421	970.00	1660.00	1662.90	1662.56	171.58	84.83	.25	834.82	134.93	.79	6.76	2.83
*	3.421	1640.00	1660.00	1664.26	1663.33	293.58	93.34	6.45	1335.00	298.55	1.45	6.90	3.12
	3.487	970.00	1666.60	1669.50	1669.46	127.20	75.82	9.53	952.84	7.63	1.68	8.34	1.04
*	3.487	1640.00	1666.60	1670.51	1670.51	218.20	98.99	34.01	1524.39	81.59	2.15	9.48	1.97
*	3.519	970.00	1670.60	1674.04	1674.04	93.63	28.40	.00	970.00	.00	.00	10.36	.00
*	3.519	1640.00	1670.60	1675.42	1675.42	132.85	28.40	.00	1640.00	.00	.00	12.34	.00
*	3.531	970.00	1671.70	1678.39	.00	195.68	33.00	.00	970.00	.00	.00	4.96	.00
*	3.531	1640.00	1671.70	1680.52	.00	266.12	33.00	.00	1640.00	.00	.00	6.16	.00

	SECNO	Q	ELMIN	CWSEL	CRIWS	AREA	TOPWID	QLOB	QCH	QROB	VLOB	VCH	VROB
*	3.544	970.00	1673.70	1678.86	1675.78	648.94	253.07	87.02	857.41	25.57	.57	1.84	.78
*	3.544	1640.00	1673.70	1681.20	1676.41	1294.10	292.29	370.97	1208.38	60.65	.73	1.69	.83

Design Ashbrook 100-Year

SUMMARY PRINTOUT

	SECNO	Q	ELMIN	XLCH	K*CHSL	EG	10*KS	VCH	ALPHA	DEPTH	K*XNCH	.01K	HL
	3.008	1385.00	1617.80	.00	.00	1622.53	92.67	6.52	1.37	4.15	45.16	143.87	.00
	3.008	1875.00	1617.80	.00	.00	1623.25	90.88	7.20	1.39	4.76	45.85	196.68	.00
*	3.121	1385.00	1625.80	598.00	13.38	1632.64	162.75	10.15	1.80	5.51	45.00	108.57	7.17
*	3.121	1875.00	1625.80	598.00	13.38	1633.51	161.16	11.20	1.89	6.15	45.00	147.70	7.06
	3.190	1185.00	1634.00	359.70	22.80	1638.28	158.93	5.98	1.08	3.73	62.45	94.00	5.56
	3.190	1865.00	1634.00	359.70	22.80	1639.29	173.75	7.29	1.11	4.49	62.74	141.49	5.71
*	3.210	1185.00	1634.90	105.00	8.57	1641.36	374.22	9.31	1.00	5.11	72.84	61.26	2.44
*	3.210	1865.00	1634.90	105.00	8.57	1643.33	443.59	12.24	1.00	6.11	73.79	88.55	2.75
*	3.236	1185.00	1636.30	140.00	10.00	1643.05	164.67	8.36	1.00	5.67	63.31	92.34	1.70
*	3.236	1865.00	1636.30	140.00	10.00	1645.43	175.53	9.73	1.00	7.66	65.83	140.77	2.10
*	3.246	1185.00	1642.00	58.50	97.44	1644.81	253.05	7.52	1.00	1.93	45.35	74.49	1.18
*	3.246	1865.00	1642.00	58.50	97.44	1646.52	42.31	5.11	1.14	4.12	46.95	286.71	.45
	3.323	970.00	1649.80	400.00	19.50	1653.60	183.36	5.93	1.29	3.41	54.32	71.63	8.74
*	3.323	1640.00	1649.80	400.00	19.50	1654.31	465.44	9.64	1.29	3.48	54.50	76.02	3.75
	3.421	970.00	1660.00	518.20	19.68	1663.53	200.38	6.76	1.26	2.90	55.86	68.52	9.86
*	3.421	1640.00	1660.00	518.20	19.68	1664.89	114.82	6.90	1.30	4.26	55.86	153.05	10.54
	3.487	970.00	1666.60	351.50	18.78	1670.56	193.21	8.34	1.18	2.90	45.00	69.78	6.90
*	3.487	1640.00	1666.60	351.50	18.78	1671.81	157.74	9.48	1.48	3.91	45.00	130.58	4.68
*	3.519	970.00	1670.60	168.30	23.77	1675.70	200.55	10.36	1.00	3.44	45.00	68.50	3.31
*	3.519	1640.00	1670.60	168.30	23.77	1677.78	178.62	12.34	1.00	4.82	45.00	122.71	2.82
*	3.531	970.00	1671.70	61.50	17.89	1678.77	21.22	4.96	1.00	6.69	45.00	210.55	3.07
*	3.531	1640.00	1671.70	61.50	17.89	1681.11	21.77	6.16	1.00	8.82	45.00	351.49	3.33
*	3.544	970.00	1673.70	71.30	28.05	1678.91	10.31	1.84	1.37	5.16	68.63	302.03	.10
*	3.544	1640.00	1673.70	71.30	28.05	1681.23	4.87	1.69	1.40	7.50	68.63	742.80	.06

Design Ashbrook 100-Year

SUMMARY PRINTOUT TABLE 105

	SECNO	CWSEL	HL	OLOSS	TOPWID	QLOB	QCH	QROB
	3.008	1621.95	.00	.00	104.23	.96	1191.59	192.45
	3.008	1622.56	.00	.00	108.75	4.00	1581.98	289.02
*	3.121	1631.31	7.17	.23	84.77	218.22	1133.56	33.22
*	3.121	1631.95	7.06	.26	93.63	346.60	1459.56	68.84
	3.190	1637.73	5.56	.08	83.73	11.32	1163.65	10.02
	3.190	1638.49	5.71	.08	90.66	34.20	1800.51	30.28
*	3.210	1640.01	2.44	.64	25.00	.00	1185.00	.00
*	3.210	1641.01	2.75	1.49	25.00	.00	1865.00	.00
*	3.236	1641.97	1.70	.00	25.00	.00	1185.00	.00
*	3.236	1643.96	2.10	.00	25.00	.00	1865.00	.00
*	3.246	1643.93	1.18	.12	90.35	.00	1185.00	.00
*	3.246	1646.12	.45	.64	126.06	25.93	1827.42	11.65
	3.323	1653.21	8.74	.05	110.90	.00	572.41	397.59
*	3.323	1653.28	3.75	.19	111.15	.00	964.92	675.08
	3.421	1662.90	9.86	.07	84.83	.25	834.82	134.93
*	3.421	1664.26	10.54	.04	93.34	6.45	1335.00	298.55
	3.487	1669.50	6.90	.13	75.82	9.53	952.84	7.63
*	3.487	1670.51	4.68	.20	98.99	34.01	1524.39	81.59
*	3.519	1674.04	3.31	.30	28.40	.00	970.00	.00
*	3.519	1675.42	2.82	.53	28.40	.00	1640.00	.00
*	3.531	1678.39	3.07	.00	33.00	.00	970.00	.00
*	3.531	1680.52	3.33	.00	33.00	.00	1640.00	.00
*	3.544	1678.86	.10	.03	253.07	87.02	857.41	25.57
*	3.544	1681.20	.06	.06	292.29	370.97	1208.38	60.65

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=     3.121  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.121  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3.121  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.121  PROFILE=  2  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     3.210  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=     3.210  PROFILE=  2  WSEL ASSUMED BASED ON MIN DIFF
CAUTION SECNO=     3.210  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=     3.236  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     3.236  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     3.246  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.246  PROFILE=  1  MINIMUM SPECIFIC ENERGY
WARNING SECNO=     3.246  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     3.323  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.323  PROFILE=  2  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     3.421  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     3.487  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.487  PROFILE=  2  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=     3.519  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.519  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     3.519  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     3.519  PROFILE=  2  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     3.531  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     3.531  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     3.544  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     3.544  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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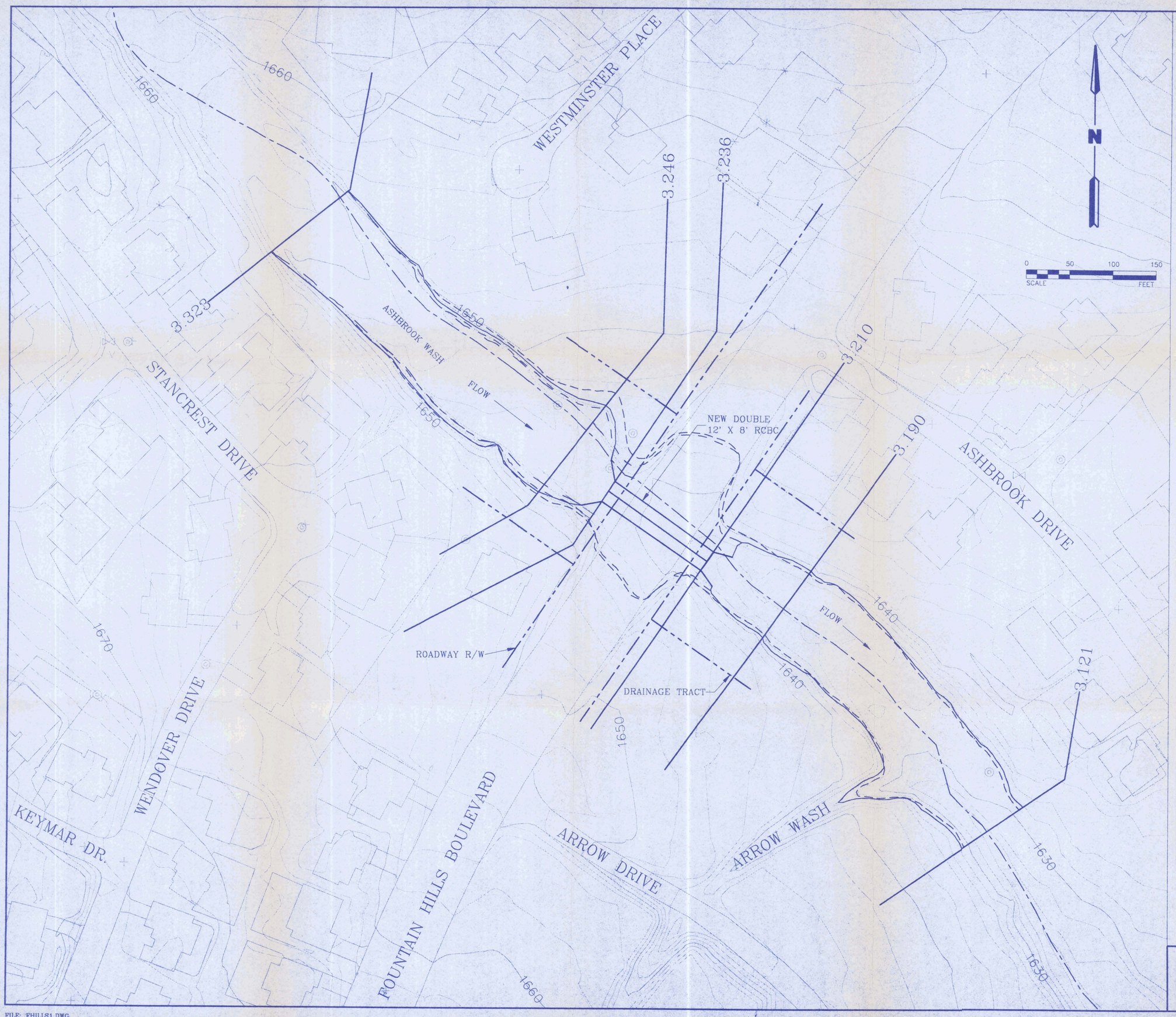
TOWN OF FOUNTAIN HILLS

FOUNTAIN HILLS BOULEVARD AT ASHBROOK WASH



LEGEND

EXISTING HYDROLOGY PEAK DISCHARGE Q_{100} =1185 cfs
EXISTING CONDITION FLOODPLAIN LIMITS
DESIGN CONDITION FLOODPLAIN LIMITS

FUTURE HYDROLOGY PEAK DISCHARGE Q_{100} =1865 cfs
EXISTING CONDITION FLOODPLAIN LIMITS
FUTURE CONDITION FLOODPLAIN LIMITS

HYDRAULIC BASELINE
CROSS SECTION NUMBER 3.210

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON 1929 NGVD

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
3-A	1644.18	TOP OF BRASS CAP AT CENTER OF CUL-DE-SAC AT THE SOUTH END OF ARROW DRIVE, NEAR THE SOUTWEST CORNER OF SOUTHEAST 1/4 OF SECTION 10, TOWNSHIP 3 NORTH, RANGE 6 EAST.

NOTE: FOUNTAIN HILLS DATUM -1.4' = 1929 NGVD

STANLEY CONSULTANTS, INC.
2929 E CAMELBACK RD SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

DES. JRM CKD. GSB
DRN. JRM APP. SOW
DATE: APRIL 1995
SHEET 1 of 1
DWG.
PROJ. NO. 12268-1230-568

FILE: FHILLS1.DWG

APPENDIX E

On-Site Drainage Calculations

DESIGNED BY JRB	DATE 9/16/94	SHEET NO. 1	PAGE NO.
CHECKED BY	DATE	OF	JOB NO.
REVIEWED BY	DATE	SUBJECT: FOUNTAIN HILLS (ASHBROOK WASH)	
APPROVED BY	DATE	(ONSITE DRAINAGE)	

Peak Discharges (Onsite Drainage)

REFERENCES: 1. ADOT HIGHWAY DRAINAGE DESIGN MANUAL, HYDROLOGY MARCH 1993.
2. ADOT DESIGN PROCEDURES MANUAL, 1990 EDITION.

The peak flows will be estimated using the Rational Method

Area A_{1-A}

Area (ac)	Type of surface	C FIGURE 23	CA
1.24	Street	0.95	1.18
2.74	Moderate urban (40% impervious)	0.57	1.56
3.98			2.74

$$\text{Weighted } C = \frac{2.74}{3.98} = 0.69$$

$$S = \frac{H}{L} = \frac{1678 - 1648.5}{1000'} = \frac{29.5}{0.1894} = 155.76 \text{ FT/MI}$$

Time of concentration:-

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

K_b = watershed resistance coefficient (Table 2-1)

Description of landform

Urban; Paved; Overland flow only $K_b = 0.02$

$$\therefore\ T_c = 11.4\,(0.1894 \text{ mi})^{0.5}\,(0.02)^{0.52}\,(155.76 \text{ FT/MI})^{-0.31}\, i^{-0.38}$$

$$T_c = 0.1357\, i^{-0.38}$$

Trial Tc, hr	i, in/hr	Calculated Tc, hr
0.17 (10 min)	4.20	0.08 (4.7 min)

$T_c < 10$ min

Use $T_c = 0.17$ hr

$\therefore\ i = 4.2$ in/hr

DESIGNED BY JRB DATE 9/26/94 SHEET NO. 2 PAGE NO.
CHECKED BY DATE OF JOB NO.
REVIEWED BY DATE SUBJECT: FOUNTAIN HILLS (AINBROOK WASH)
APPROVED BY DATE (ONSITE DRAINAGE)

Area A_{1-B}

Area (ac)	Type of surface	C FIGURE 2.3	CA
0.95	Street	0.95	0.90
1.10	Moderate urban (40% impervious)	0.57	0.63
2.05			1.53

$$\text{Weighted } C = \frac{1.53}{2.05} = 0.75$$

$$S = \frac{H}{L} = \frac{1671.0 - 1648.5}{880'} = \frac{22.5}{0.1667\text{ mi}} = 135\text{ ft/mi}$$

$$T_c = 11.4\,(0.1667\text{ mi})^{0.5}\,(0.02)^{0.52}\,(135\text{ ft/mi})^{-0.31}\,i^{-0.38}$$

$$\therefore T_c = 0.1330\,i^{-0.38}$$

Trial Tc, hr	i, in/hr	Calculated Tc, hr
0.17 (10 min)	4.20	0.08 (4.6 min)

$T_c < 10$ min

Use $T_c = 0.17$ hr

$i = 4.2$ in/hr

Area A_{2-A}

Area (ac)	Type of surface	C	CA
3.60	D-30%	0.48	1.73
3.10	Moderate urban (40% impervious)	0.57	1.77
1.60	Street	0.95	1.52
8.30			5.02

$$\text{Weighted } C = \frac{5.02}{8.30} = 0.60$$

$$S = \frac{H}{L} = \frac{1720 - 1648.5}{1840'} = \frac{71.50}{0.3485} = 205\text{ ft/mi}$$

$$T_c = 11.4\,(0.3485)^{0.5}\,(0.02)^{0.52}\,(205\text{ ft/mi})^{-0.31}\,i^{-0.38} = 0.1690\,i^{-0.38}$$

Trial Tc, hr	i, in/hr	Calculated Tc, hr
0.17 (10 min)	4.20	0.10 (6 min)

$T_c < 10$ min

Use $T_c = 0.17$ hr

$i = 4.2$ in/hr

DESIGNED BY ...AB... DATE ..9/26/94... SHEET NO. ...3... PAGE NO. .....
CHECKED BY ..... DATE ..... OF ..... JOB NO. .....
REVIEWED BY ..... DATE ..... SUBJECT: FOUNTAIN HILLS (ASHBROOK WASH)
APPROVED BY ..... DATE ..... (ONSITE DRAINAGE)

Area 2-B

Area (ac)	Type of surface	C	CA
0.97	Street	0.95	0.92
0.30	Moderate urban (40% impervious)	0.57	0.17
1.27			1.09

Weighted $C = \frac{1.09}{1.27} = 0.86$

$S = \frac{H}{L} = \frac{1675 - 1648.5}{1000'} = \frac{26.50}{0.1894 mi} = 140 \text{ ft/mi}$

$T_c = 11.4 (0.1894)^{0.5} (0.02)^{0.52} (140 \text{ ft/mi})^{-0.31} i^{-0.38} = 0.1402 \, i^{-0.38}$

Trial Tc, hr	i, in/hr	Calculated Tc, hr
0.17 (10 min)	4.20	0.08 (4.7 min)

$T_c < 10$ min

Use $T_c = 0.17$ hr

$\therefore i = 4.2$ in/hr

Peak Discharges:

$Q_{1-A} = C i A = 0.69 \times 4.20 \times 3.98 = 11.5$ cfs

$Q_{1-B} = 0.75 \times 4.20 \times 2.05 = 6.5$ cfs

$Q_{2-A} = 0.60 \times 4.20 \times 8.30 = 20.9$ cfs

$Q_{2-B} = 0.86 \times 4.20 \times 1.27 = 4.6$ cfs

TOWN OF FOUNTAIN HILLS

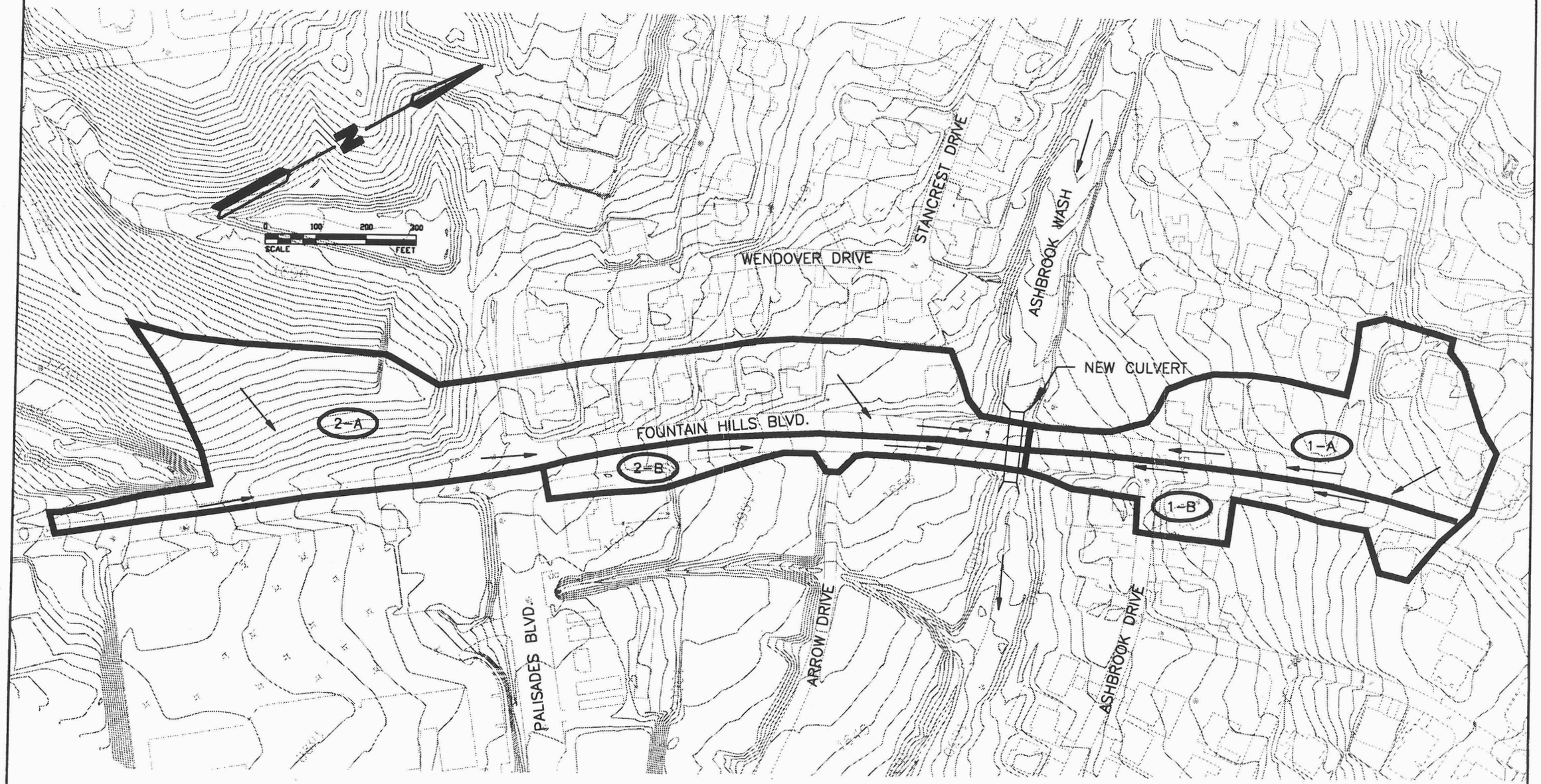
FOUNTAIN HILLS BOULEVARD AT ASHBROOK WASH

LEGEND

Drainage Basin Boundary

Drainage Basin Label (1-A)

Flow Direction



STANLEY CONSULTANTS, INC.

2929 E CAMELBACK RD SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

DES. JRB CKD. JRM
DRN. JRM APP. SDW
DATE: MARCH 1995

SHEET 1 of 1

DWG. OFFSITE

PROJ. NO. 12288-1230-568

Return Frequency	Rainfall Depth (inches)
2–year, 6–hour	1.15
2–year, 24–hour	1.60
100–year, 6–hour	3.20
100–year, 24–hour	4.00

Short–Duration Rainfall Zone = 8

ADOT RAINFALL INTENSITY–DURATION–FREQUENCY SITE SPECIFIC I–D–F TABLE

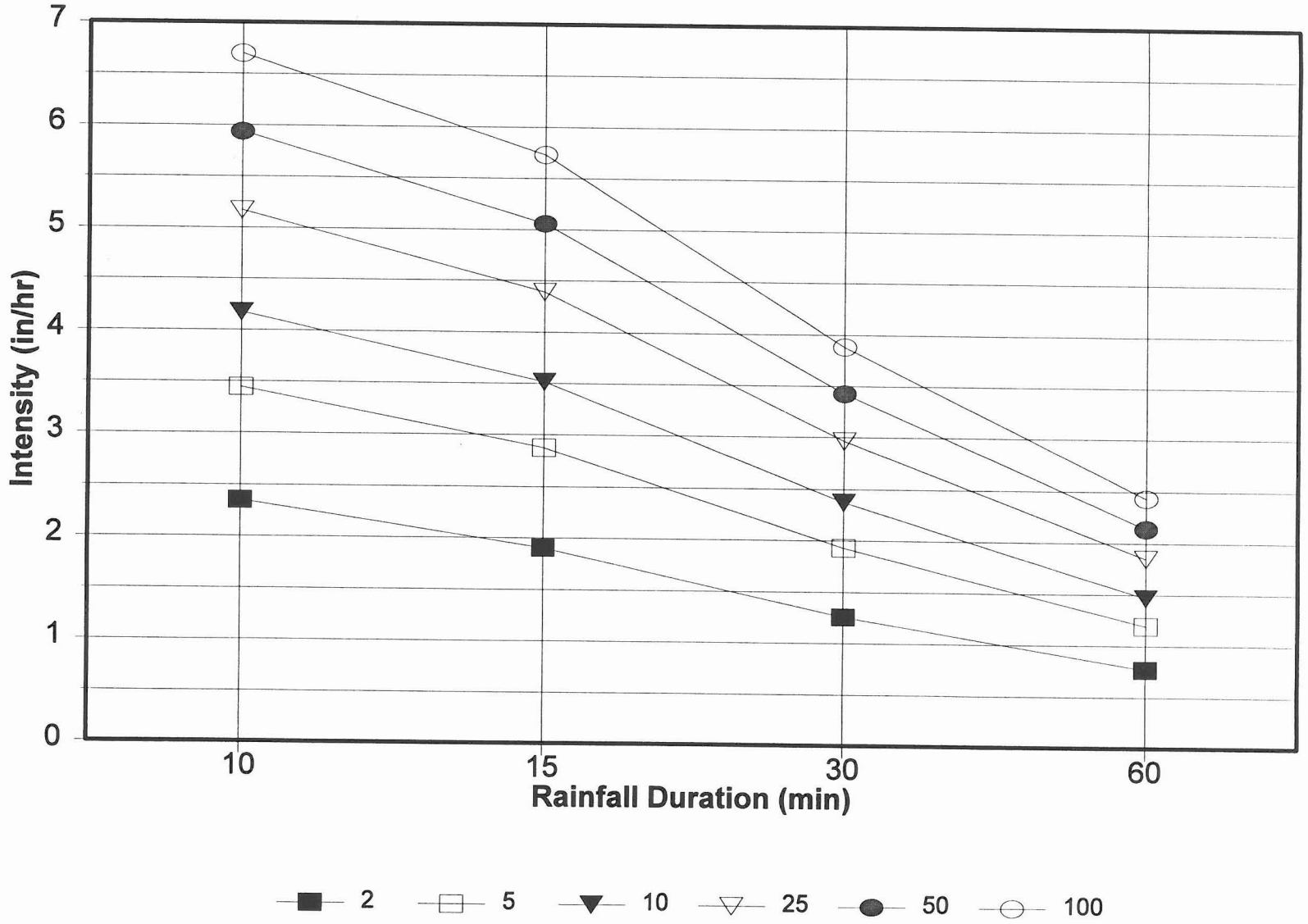
Duration	Duration (hrs)	Rainfall Depth (inches/hour) Frequency (N–year)						
		2	5	10	25	50	100	500
5–min	0.08	3.13	4.54	5.48	6.76	7.75	8.74	11.01
10–min	0.17	2.35	3.45	4.17	5.17	5.94	6.70	8.46
15–min	0.25	1.90	2.88	3.52	4.39	5.06	5.73	7.27
30–min	0.50	1.26	1.93	2.37	2.97	3.43	3.88	4.94
1–hour	1.00	0.77	1.19	1.47	1.85	2.14	2.43	3.09
2–hour	2.00	0.45	0.68	0.83	1.03	1.19	1.35	1.71
3–hour	3.00	0.33	0.49	0.59	0.74	0.85	0.96	1.21
6–hour	6.00	0.19	0.28	0.33	0.41	0.47	0.53	0.67
12–hour	12.00	0.11	0.16	0.19	0.23	0.27	0.30	0.38
24–hour	24.00	0.07	0.09	0.11	0.13	0.15	0.17	0.21

ADOT RAINFALL DEPTH–DURATION–FREQUENCY SITE SPECIFIC D–D–F TABLE

Duration	Duration (min)	Rainfall Depth (inches) Frequency (N–year)						
		2	5	10	25	50	100	500
5–min	5	0.26	0.38	0.46	0.56	0.65	0.73	0.92
10–min	10	0.39	0.57	0.70	0.86	0.99	1.12	1.41
15–min	15	0.48	0.72	0.88	1.10	1.27	1.43	1.82
30–min	30	0.63	0.96	1.18	1.48	1.71	1.94	2.47
1–hour	60	0.77	1.19	1.47	1.85	2.14	2.43	3.09
2–hour	120	0.90	1.35	1.65	2.06	2.38	2.69	3.41
3–hour	180	0.99	1.46	1.78	2.21	2.54	2.87	3.63
6–hour	360	1.15	1.66	2.01	2.48	2.84	3.20	4.03
12–hour	720	1.38	1.93	2.30	2.81	3.21	3.60	4.51
24–hour	1440	1.60	2.19	2.59	3.14	3.57	4.00	4.98

Town of Fountain Hills

Site Specific IDF Curves



ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

06-22-1995

PROJECT NAME- FOUNTAIN HILLS BLVD
HIGHWAY NAME-
LOCATION - W.B. STA 141+00
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER - PAGE

CURB OPENING W/ GRATE--ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.720
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	6.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.000
Gutter Slope-Ft./Ft.--Sw	=	0.042
Gutter Depression-Inches--	=	1.001
Manning's 'N	=	0.016
Flow-CFS--Q	=	20.900
SPREAD-Ft.--T	=	20.179
Average Velocity-V-fps	=	5.078
FLOW in Gutter-CFS--Q	=	5.444
% Flow in Gutter-CFS	=	26.049
Velocity of Flow in Gutter-fps	=	6.717
Depth at Curb Line-Inches--d	=	5.364

CURB OPENING--ADOT STD. C-15.40
GRATE TYPE: ADOT STD.--EF--2

Grate Length--Ft.	=	3.250
Grate Width---Ft.	=	1.500
Grate Area--Sq. Ft.	=	3.480
Splash-Over Velocity--FPS	=	3.558
Depth at INLET Curb Line-Inches--d	=	7.364
Local Gutter Depression-Inches	=	2.000
Length of opening: TOTAL Intercept--Ft.	=	42.930
Capture Ratio -- GRATE	=	0.500
Capture Ratio -- CURB OPENING	=	0.800

CURB OPENING:

LENGTH	Efficiency	Q(C.O.)	Q(GRATE)	Q(INT.)	Q(By-Pass)	% CAPT.
3.500	0.114	2.389	4.015	6.404	14.496	30.64
6.500	0.207	4.334	3.868	8.202	12.698	39.25
10.500	0.324	6.777	3.661	10.438	10.462	49.94
17.500	0.509	10.629	3.262	13.891	7.009	66.47

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

06-22-1995

PROJECT NAME- FOUNTAIN HILLS BLVD
HIGHWAY NAME-
LOCATION - W.B. STA 142+71.35
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER - PAGE

CURB OPENING INLET--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	6.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.000
Gutter Slope-Ft./Ft.--Sw	=	0.042
Gutter Depression-Inches--	=	1.001
Flow-CFS--Q	=	11.200
Local Gutter Depression-Inches	=	1.000
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	d(weir)	d(orifice)	d(INLET)	SPREAD
3.083	11.279	38.838	38.838	155.488
6.583	8.517	10.678	10.678	38.155
9.583	7.170	6.500	7.170	23.537
13.583	6.008	3.717	6.008	18.699
20.583	4.784	1.619	4.784	13.597

*** d(INLET) is Greater of WEIR or ORIFICE Depth.! ***

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

03-27-1995

PROJECT NAME- FOUNTAIN HILLS BLVD.
HIGHWAY NAME-
LOCATION - E.B. STA. 142+71.35
Ver 3.30: March 1994

TRACS NO.-
DESIGNER - JRM
CHECKER -
PAGE

CURB OPENING INLET--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	6.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.000
Gutter Slope-Ft./Ft.--Sw	=	0.042
Gutter Depression-Inches--	=	1.001
Flow-CFS--Q	=	11.100
Local Gutter Depression-Inches	=	1.000
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	d(weir)	d(orifice)	d(INLET)	SPREAD
3.083	11.211	38.197	38.197	152.816
6.583	8.466	10.537	10.537	37.569
9.583	7.127	6.433	7.127	23.359
13.583	5.973	3.651	5.973	18.549
20.583	4.756	1.590	4.756	13.479

*** d(INLET) is Greater of WEIR or ORIFICE Depth.! ***

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

03-24-1995

PROJECT NAME- FOUNTAIN HILLS BLVD. TRACS NO.-
HIGHWAY NAME- DESIGNER - VRM
LOCATION - STA. 143+30 W.B. CHECKER - PAGE
Ver 3.30: March 1994

CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.589
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.020
Shoulder Width-Ft.--	=	6.000
Shoulder Slope-Ft./Ft.--Ss	=	0.020
Gutter Width-Ft.--W	=	2.000
Gutter Slope-Ft./Ft.--Sw	=	0.042
Gutter Depression-Inches--	=	1.001
Manning's 'N	=	0.016
Flow-CFS--Q	=	11.500
SPREAD-Ft.--T	=	19.713
Average Velocity-V-fps	=	2.927
FLOW in Gutter-CFS--Q	=	3.064
% Flow in Gutter-CFS	=	26.643
Velocity of Flow in Gutter-fps	=	3.869
Depth at Curb Line-Inches--d	=	5.252

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q	=	11.500
Gutter Velocity at INLET-fps	=	3.869
GUTTER FLOW at INLET-CFS--Q	=	3.064
Depth at INLET Curb Line-Inches--d	=	0.000
Local Gutter Depression-Inches	=	0.000
Length of opening: TOTAL Intercept--Ft.	=	38.489
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.112	1.292	10.208
6.583	0.233	2.676	8.824
9.583	0.330	3.790	7.710
13.583	0.450	5.171	6.329
20.583	0.634	7.290	4.210

```
$       Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12268)
$       Storm Sewer Hydraulic Grade Line Analysis for Fountain Hills Blvd.
$       10-Year Hydrology using ADOT Methodology
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          E            END SECTION
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels.
$
$       Junction 1 head losses calculated using ASCE No. 77 (1992).
$               hj = hv(outlet) - 0.25(hv(inlet))
$               hj = minor junction losses (ft)
$               hv = velocity head (ft)
$
$       Inlet on mainline head losses calculated using ASCE No. 77 (1992).
$               hj = hv(outlet) - 0.5(hv(inlet))
$               hj = minor junction losses (ft)
$               hv = velocity head (ft)
$
$       Bend head losses calculated using ASCE No. 77 (1992).
$               hb = 0.45(hv(outlet))   (70 deg. bend interpolated)
$               hb = minor bend losses (ft)
$               hv = velocity head (ft)
$
SEWER               ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --  ---- ---- ---- ---- ---- ---- ----- ---- ----    --       - -----
DA C  2                                                 24       6  11.2
DA C  3                                                                7.3
DA C  4                                                               11.1
$       Assumed ultimate developed 100-year water-surface elevation in
$       Ashbrook Wash as outlet condition for storm drain system.
$       Datum difference: Fountain Hills = FCDMC + 1.4'
OUTLET    STATIONING       0  T.W. ELEV  1642.40   E  2
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   ---  - -- - -- US------- DS------- ---- ---- ---- ---- ---- ----
DSGN  P2  C  3 J  1 US1646.70 DS1646.50   62           .012        24 CIRC
DSGN  P3  C  2 J  1 US1646.70 DS1646.50   18           .012        24 CIRC
DSGN  P4  J  1 C  4 US1646.50 DS1646.10   68           .012        24 CIRC
DSGN  P5  C  4 J  2 US1646.10 DS1642.77   36           .012        24 CIRC
DSGN  P6  J  2 E  2 US1642.77 DS1642.50    4           .012        24 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.               LOSS
$*   ---  - -- - --  ---- ---- ----     -----
ANAL  P2  C  3 J  1         24
ANAL  P3  C  2 J  1         24
ANAL  P4  J  1 C  4         24           0.51
ANAL  P5  C  4 J  2         24           1.17
ANAL  P6  J  2 E  2         24           0.66
ENDATA
```

SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
P2	C 3	J 1	.00	.00	.00	.00	.00	.00	.00	7.30
P3	C 2	J 1	.00	.00	.00	.00	.00	.00	.00	11.20
P4	J 1	C 4	.00	.00	.00	.00	.00	.00	.00	18.50
P5	C 4	J 2	.00	.00	.00	.00	.00	.00	.00	29.60
P6	J 2	E 2	.00	.00	.00	.00	.00	.00	.00	29.60

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
P2	C 3	J 1	1644.70	1644.50	62	.00323	1	24	24	CIRC
P3	C 2	J 1	1644.70	1644.50	18	.01111	1	24	24	CIRC
P4	J 1	C 4	1644.50	1644.10	68	.00588	1	24	24	CIRC
P5	C 4	J 2	1644.10	1640.77	36	.09250	1	24	24	CIRC
P6	J 2	E 2	1640.77	1640.50	4	.06750	1	24	24	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
P2	C 3	J 1	.012	.00	7.30	1647.10	1647.05	.00089	.51	2.3**	13.9
P3	C 2	J 1	.012	.00	11.20	1647.09	1647.05	.00209	.46	3.6**	25.8
P4	J 1	C 4	.012	.51	18.50	1647.05	1646.15	.00570	.81	5.9**	18.8
P5	C 4	J 2	.012	1.17	29.60	1646.15	1643.12	.01459	.44	9.4**	74.5
P6	J 2	E 2	.012	.66	29.60	1643.12	1642.40	.01459	.48	9.6*	63.7

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

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

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
P2	C 3	170
P3	C 2	126
P4	J 1	108
P5	C 4	40
P6	J 2	4

```
$       Stanley Consultants, Inc. - Phoenix, AZ (Project No. 12268)
$       Storm Sewer Hydraulic Grade Line Analysis for Fountain Hills Blvd.
$       10-Year Hydrology using ADOT Methodology
$
$       LETTER          REPRESENTS
$       ------          ------------
$          C            CATCH BASIN
$          E            END SECTION
$          J            JUNCTION
$
$       Run ID's correspond to the construction plans pipe run labels.
$
SEWER               ANALYSIS                        SEWER     FREQUENCY= 10YR
$ AREA ID   DRAINAGE SUBAREAS A THRU F   TIME CONCEN.   MIN.  DEGN INC  SUPPLY**
$LINE INLET A    B    C    D    E    F   LEN   VEL  TC  SIZE  3 OR 6    Q
$  - --   ---- ---- ---- ---- ---- ---- ----- ---- ----    --        - -----
DA C  1                                                   24       6  13.9
$       Assumed ultimate developed 100-year water-surface elevation in
$       Ashbrook Wash as outlet condition for storm drain system.
$       Datum difference: Fountain Hills = FCDMC + 1.4'
OUTLET    STATIONING       0  T.W. ELEV  1645.40   E  1
$ RUN ID  U.S. D.S.  SOFFIT    SOFFIT   RUN  CA   Q    N    LOSS MAX
$         L IN L IN   ELEV      ELEV    LEN  ADD  ADD       COEF RISE
$*   ---  - -- - -- US------- DS------- ---- ---- ---- ---- ---- ---- ----
DSGN  P1  C  1 E  1 US1647.54 DS1644.40  144           .012        24 CIRC
$ RUN ID  U.S. D.S. BARR RISE SPAN      HEAD
$         L IN L IN  NO.                LOSS
$*   ---  - -- - --  ---- ---- ----     -----
ANAL  P1  C  1 E  1         24
ENDATA
```

SEWER

CUMULATIVE RUNOFF CALCULATIONS FOR PIPE RUNS

RUN	U.S. I.D.	D.S. I.D.	"CA"	"TC"	AREA	CUMULATIVE "CA"	CUMULATIVE "TC"	SUPPLY Q	INTENSITY	FLOW
P1	C 1	E 1	.00	.00	.00	.00	.00	.00	.00	13.90

SEWER

SEWER ANALYSIS

CONFIGURATION DATA

RUN	U.S. ID	D.S. ID	U.S. F.L. ELEV	D.S. F.L. ELEV	LENGTH FEET	SLOPE	BBLS	RISE	SPAN	SHAPE
P1	C 1	E 1	1645.54	1642.40	144	.02181	1	24	24	CIRC

HYDRAULIC DATA

RUN	U.S. ID	D.S. ID	'N'	JUNC LOSS	FLOW	U.S. HEAD	D.S. HEAD	HYDR. GRAD	DEPTH	VELOC.	PIPE CAPAC.
ENTRANCE CONTROLS. TOTAL HEAD AT UPSTREAM END FOR RUN NO. P1 IS 2.15											
P1	C 1	E 1	.012	.00	13.90	1647.69	1645.40	.00322	.43	4.4**	36.2

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

STATIONING

RUN	UPSTREAM JUNCTION ID	STATIONING
P1	C 1	144

TOWN OF FOUNTAIN HILLS

STREET PAVING PROJECT

FOUNTAIN HILLS BLVD. AT ASHBROOK WASH

STP-FTH-0(2)P
0000 MA FTH

VICINITY MAP
N.T.S.

MAYOR
JOHN M. CUTILLO

TOWN COUNCIL
FRANK CLARK
WALLY HUDSON
DON LAWRENCE
WILLIAM J. O'BRIEN
PEG TIBBETTS
MARIANNE WIGGISHOFF

TOWN MANAGER
PAUL L. NORDIN

FLOOD CONTROL DISTRICT
RECEIVED
JUN 28 1995

	CHENG		P & PM
	DEF		REG
	ADMIN		LMGT
	FINANCE		FILE
	C & M		
	ENGR		

REMARKS

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

File: /12268/FHCOVER.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	2		
		0000 MA FTH			

PROJECT ELEVATION

Average Project Elevation = 1650'

DESIGN DATA

1993 A.D.T. = 6500
2010 A.D.T. = 30000
Min Design Speed = 45 MPH

LENGTH OF PROJECT

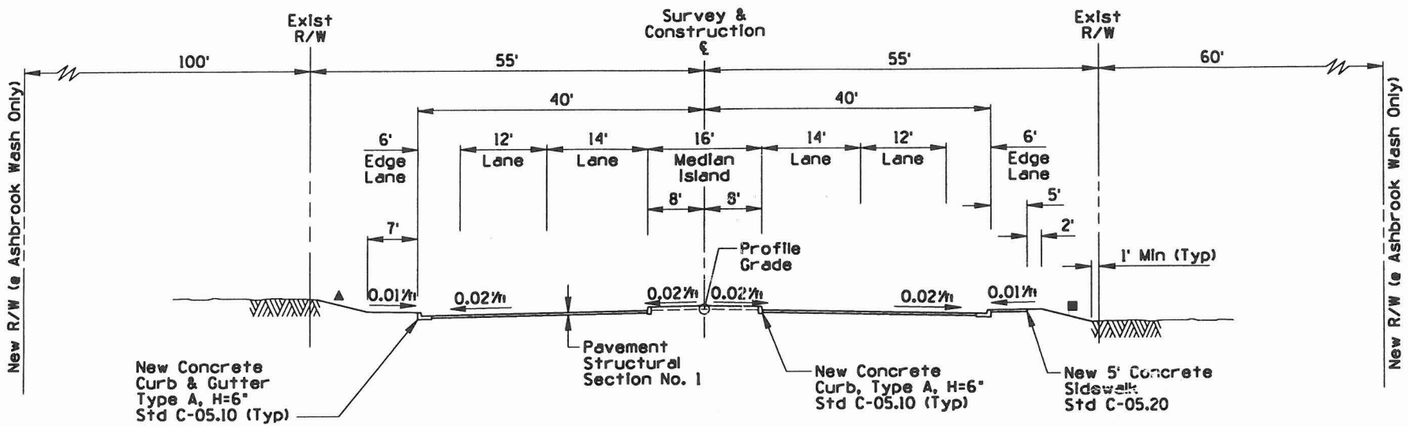
Sta 139+08 to Sta 146+40 = 732.00'
Gross and Net Length = 0.14 Miles

MIDPOINT OF PROJECT

Central Zone
State Plane Coordinates
E = 557,800
N = 951,000

INDEX OF DRAWINGS

DWG NO.	DRAWING TYPE
1	Face Sheet
1A-1B	Standard Drawing List
2	Design Sheet
3	CBC & RCP Summary
4-5	Details
6	CBC Details
7	Roadway Plan & Profile
8	Drainage Plan
9	Drainage Profiles
10	Detour Plan
11	Signing & Striping Plan
12	Landscaping Plan
13	Landscaping Details
14	Irrigation Plan
15	Irrigation Details
16	Waterline Plan
17	Waterline Details



TYPICAL SECTION

NTS

■ 4:1 Slope or Hold 1-Ft Inside R/W
▲ 3:1 Backslope or Hold 1-Ft Inside R/W

GENERAL NOTES

The roadway plans have been designed utilizing the 1994 Construction Standard Drawings (C-Series), and current revisions.

The project roadway shall be striped by the Town of Fountain Hills in accordance with the current edition of the Signing and Marking Standard Drawings (M&S-Series) and Striping Plan.

Bench Markers will be furnished by the State, and placed by the Contractor. Std C-21.10 and C-21.20.

For R/W information not shown, obtain from the Engineer.

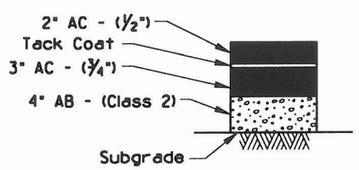
Existing utility locations are approximate. The contractor shall verify the exact location and depth of all underground facilities.

Upon removal, disposal of the existing Portland cement concrete and asphaltic concrete shall be the responsibility of the contractor.

All station references to Fountain Hills Boulevard indicate the Median construction and survey centerline.

All pavement sawcuts shall be full depth.

The project signing shall be completed by the Town of Fountain Hills in accordance with the Signing and Striping Plan.



PAVEMENT STRUCTURAL SECTION NO. 1

NTS

EARTHWORK QUANTITIES

Roadway Excavation	164	CY
Shrink	(17)	CY
Drainage Excavation	316	CY
Shrink	(32)	CY
Structural Excavation	1250	CY
Shrink	(125)	CY
Total Excavation (Shrunk)	1556	CY
Embankment	7825	CY
Ground Compaction	257	CY
Structural Backfill	588	CY
Total Embankment	7494	CY
Borrow (In-Place)	5938	CY

	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

DESIGN SHEET

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 2

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN=SPECIFICATION•••••
•••••SYSTIME•••••

FILE:/12268/TYP-SECT.DGN

PRELIMINARY-NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

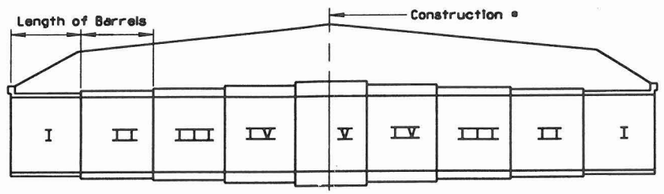
___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	3		
		0000 MA FTH			

DESCRIPTION				STANDARD DRAWINGS REQUIRED	LENGTH OF BARRELS										APPROXIMATE QUANTITIES					REMARKS
STATION or MP	PLAN REF. NO. ◯	STR. NO.	SIZE		Left of ℄ ▲					Right of ℄ ▲					Struct. Excav. Cu. Yds.	Class S f'c=3000psi Concrete Cu. Yds.	Reinforcing Steel Lbs.	Structure Backfill Cu. Yds.	Drainage Excav. Cu. Yds.	
					I	II	III	IV	V	V	IV	III	II	I						
142+55	6		2 Barrel 8 x 12	B-02.20, B-04.40	64									74	850	510	66,670	955	N/A	
				B-01.10, B-04.20																
Total																				

◯ Reference numbers correspond to numbers in circles on PLAN SHEETS.

NOTE:
FOR STRUCTURAL EXCAVATION AND STRUCTURE BACKFILL PLACEMENT AND MEASUREMENT, SEE STANDARD DRAWINGS C-13.35, C-13.45 AND C-13.50.



▲ Construction ℄ (Looking Ahead).

DESCRIPTION								◐ CSP					● CAP				RCP				NR CP	NR CIP CP	END TREATMENT												QUANTITIES			REMARKS
										Allowable Coating							Non Trench		Trench				End Sct ▲	CB, MH & Jct Str								Headwall						
																											Grate		Gutter Depression									
Station	Plan Ref No. □	Fill Height Range (Ft.) ◐	Size, (in.) Corrugated	Size, (in.) Smooth	Length (Ft.)	Skew (Degree)	Corrugation	Wall Thickness (in.)	Zinc	Aluminum	Bituminous	Corrugation	Wall Thickness (in.)	Uncoated	Bit. Coated	Class	■Min D-Load	Class	■Min D-Load	Class	Min Wall Thickness (in.)	C-13.20 C-13.25	Manhole No. ▲	Standard or Detail	Location	H (Ft)	Slotted Drn. Length (Ft)	Type	Elev.	D (in.)	L (Ft.)	Standard or Detail	Location	Pipe Ex (CY) ✱	Pipe Bk-fl (CY)✱	Drn Ex (CY)	
141+00, 38' Lt to 142+42.42, 42.5' Lt	P1	1-3		24	144											III	1315	III	1315			D+1		C-15.40	Lt	4.00		EF-2	1648.13	2	20.48						CB 1 to ES 1, 17' Wing
143+30, 40' Lt to 142+71.35, 24.28' Lt	P2	1-3		24	62											III	1315	III	1315					C-15.20	Lt	3.62											CB 3 to JCT 1, 17' Wing
142+71.35, 40' Lt to 142+71.35, 24.28' Lt	P3	1-3		24	18											III	1315	III	1315					C-15.20	Lt	3.45				1	13.58						CB 2 to JCT 1, 10' Wing
142+71.35, 24.28' Lt to 142+71.35, 40' Rt	P4	1-3		24	68											III	1315	III	1315					C-13.70													JCT 1 to CB 4, ∢ = 75°00'00"
142+71.35, 40' Rt to 142+71.35, 76.22' Rt	P5	1-3		24	36											III	1315	III	1315					C-15.20	Rt	4.05				1	13.58						CB 4 to JCT 2, 10' Wing
142+71.35, 76.22' Rt to 142+68.75, 77.16' Rt	P6	1-3		24	4											III	1315	III	1315			D+1		C-13.70	Rt												JCT 2 to ES 2, ∢ = 70°00'00"

CSP - Corrugated Steel Pipe
CAP - Corrugated Aluminum Pipe
RCP - Reinforced Concrete Pipe
NRCP - Non-Reinforced Concrete Pipe
NRCIPCP-Non-Reinforced Cast-In Place Concrete Pipe

□ Reference numbers correspond to numbers in squares on PLAN SHEETS.

◐ The Pipe Has Been Designed For A Fill Height Range As Indicated With The Fill Height Equal To Or Greater Than The Lower Number And Not Exceeding The Higher Number. Fill Heights Are The Maximum Measured From The Top Of Pipe To The Highest Point Of Subgrade Over The Pipe. Should Field Conditions Vary From The Range Indicated, Contact Design For Reevaluation Of Pipe Design Requirements.

■ The Minimum D-LOAD Needed To Produce A 0.01 Inch Crack. RCP May Be Provided By Either Min. D-LOAD Or Class.

✱ PIPE EXCAVATION & PIPE BACKFILL Will Not Be Measured For Payment.

● When Bituminous Coating Is Specified For Either Structural Plate Pipe Or Corrugated Metal Pipe, It Shall Be Applied In Accordance With AASHTO M 243 Or AASHTO M 190, Type A, Respectively, And Coated On Both The Inside And The Outside Of The Pipe Unless Otherwise Specified In These Drawings.

NOTE:
FOR PIPE CULVERT PLACEMENT SEE STANDARD DRAWING C-13.15

▲ Include FRAME & COVER STD. C-18.10 & C-18.20

	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 952-5500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

CBC & RCP SUMMARY

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 3

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

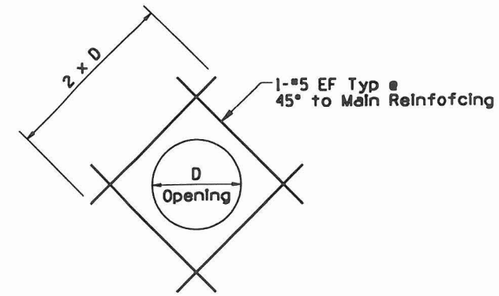
•••••DGN•SPECIFICATION••••• FILE:/12268/PIPESUM.DGN
•••••SYSTIME•••••

PRELIMINARY-NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

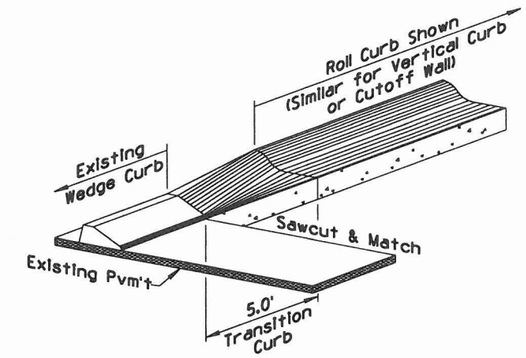
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	4		
		0000 MA FTH			



TYPICAL BOX CULVERT WALL AND ROOF OPENING DETAIL

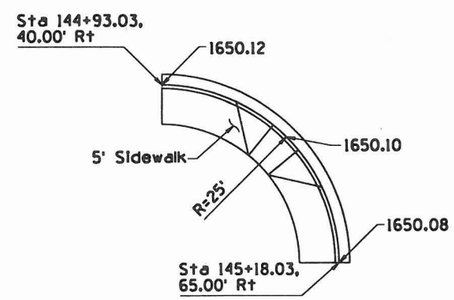
NTS

NOTE:
Wall reinforcing steel shall be cut as required around openings. Bars may be shifted 6" maximum to avoid cutting. Replacement reinforcing steel of the same size and number shall be placed, half on each side of the opening, bundled with typical bars. Bars shall be developed beyond the openings.



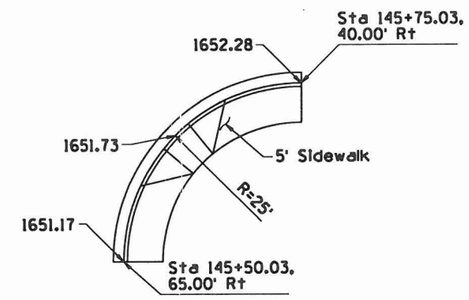
TYPICAL WEDGE CURB TO ROLL CURB, VERTICAL CURB, OR CUTOFF WALL TRANSITION

NTS



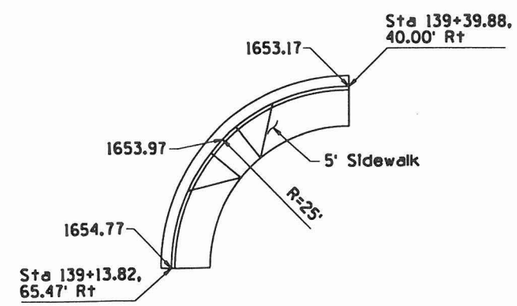
ELEVATIONS FOR SOUTH CURB OF ASHBROOK DRIVE AT FOUNTAIN HILLS BOULEVARD

NTS



ELEVATIONS FOR NORTH CURB OF ASHBROOK DRIVE AT FOUNTAIN HILLS BOULEVARD

NTS



ELEVATIONS FOR NORTH CURB OF ARROW DRIVE AT FOUNTAIN HILLS BOULEVARD

NTS

CURB RETURN DETAILS

	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
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TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

DETAILS

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 4

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN=SPECIFICATION•••••
•••••SYSTIME•••••

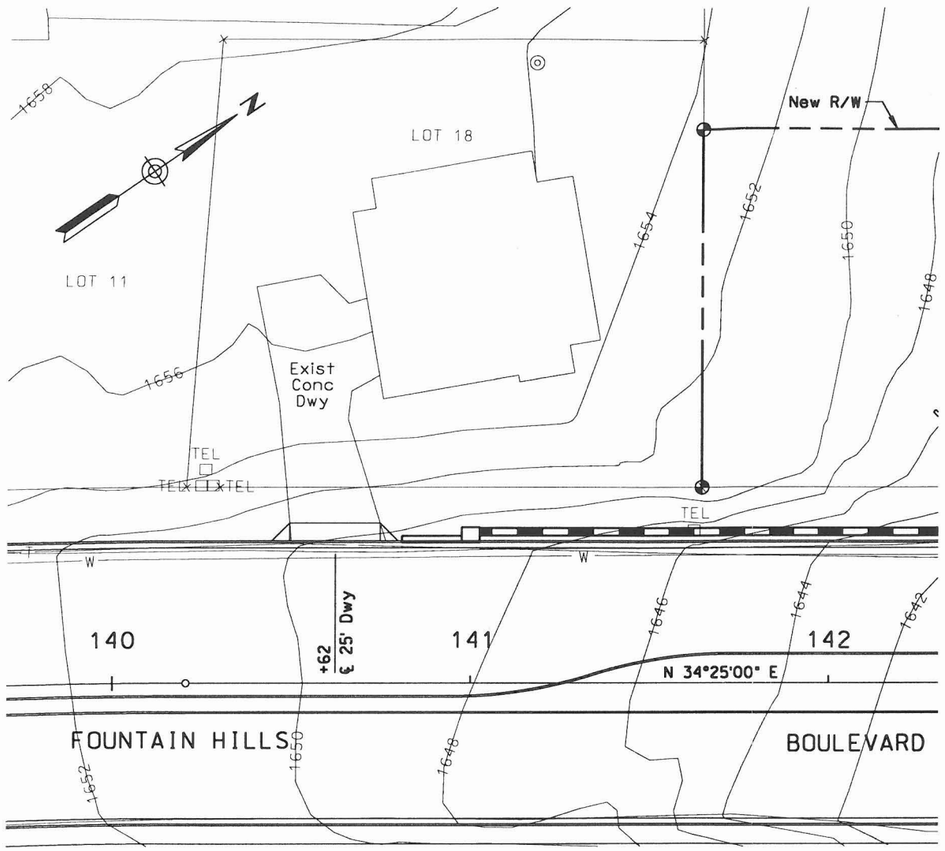
FILE:/12268/CURB.DGN

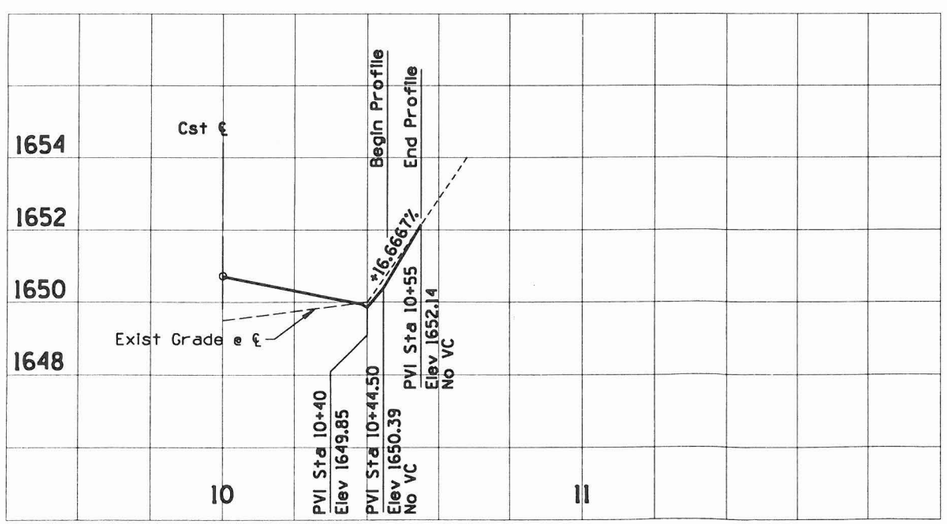
PRELIMINARY-NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

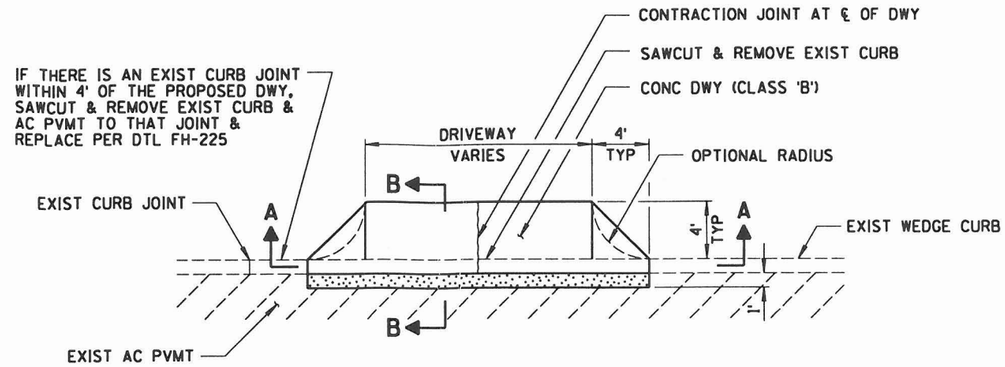
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	5		
		0000 MA FTH			

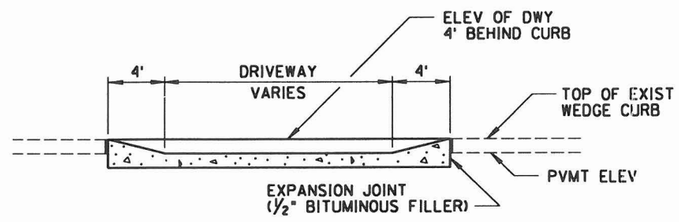




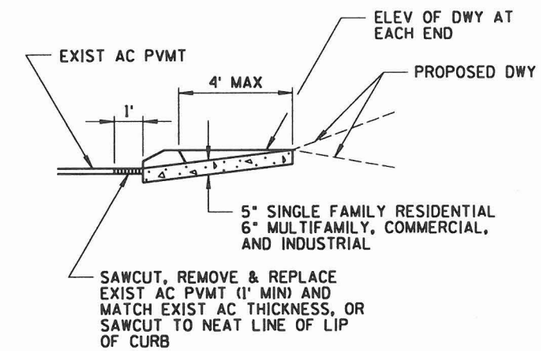
DRIVEWAY DETAIL

NOTE:
THIS DETAIL DOES NOT APPLY TO LOCATIONS WITH A FUTURE HANDICAP ACCESSIBLE SIDEWALK.





SECTION A-A



SECTION B-B

DRIVEWAY CONNECTION DETAIL

	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
7529 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 952-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

DETAILS

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 5

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

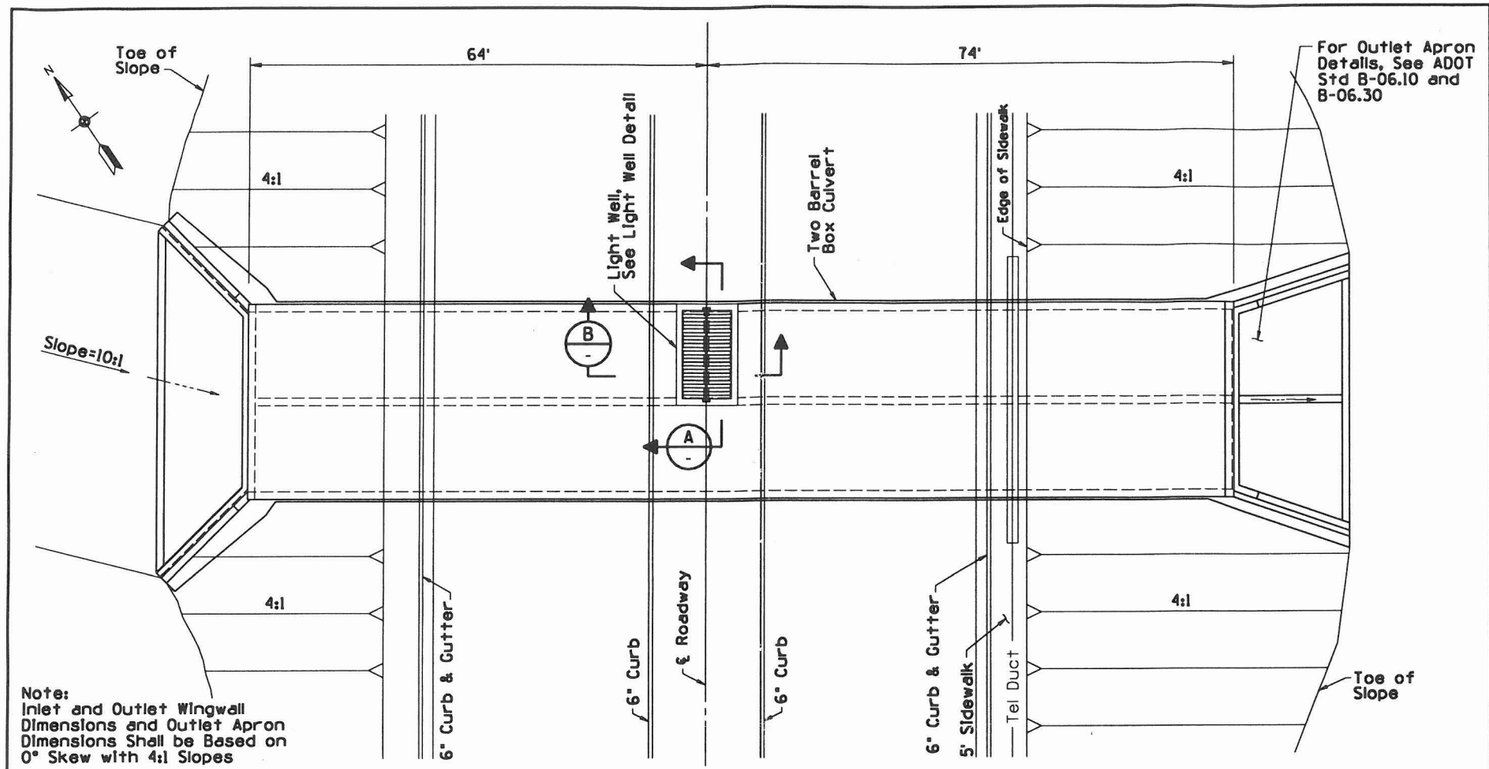
FILE:/12268/DWY.DGN

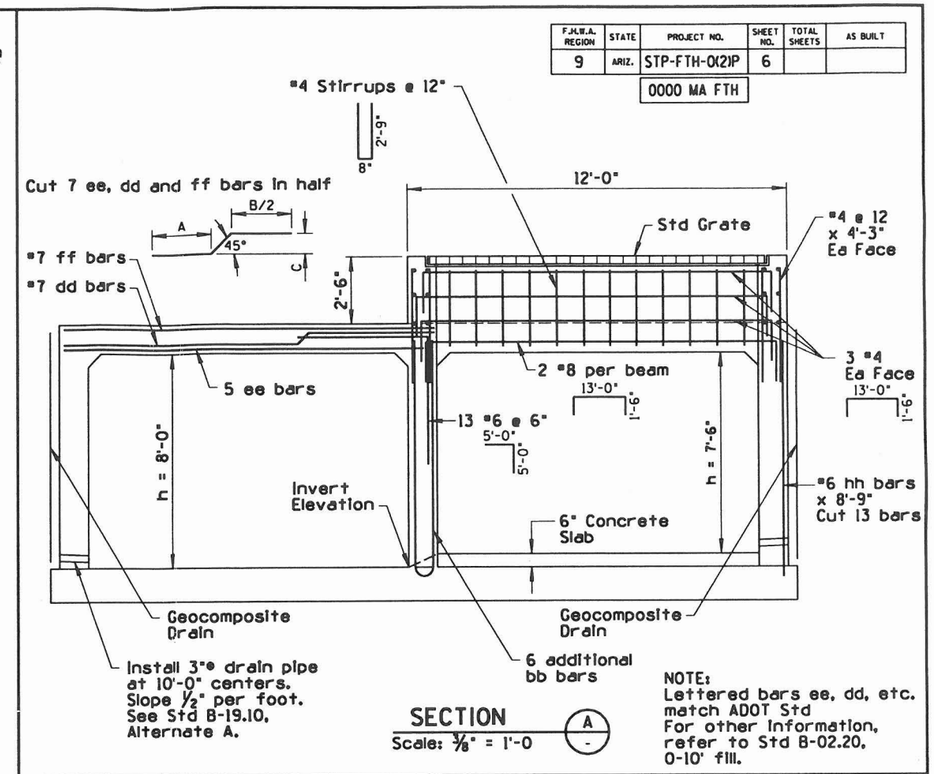
PRELIMINARY-NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

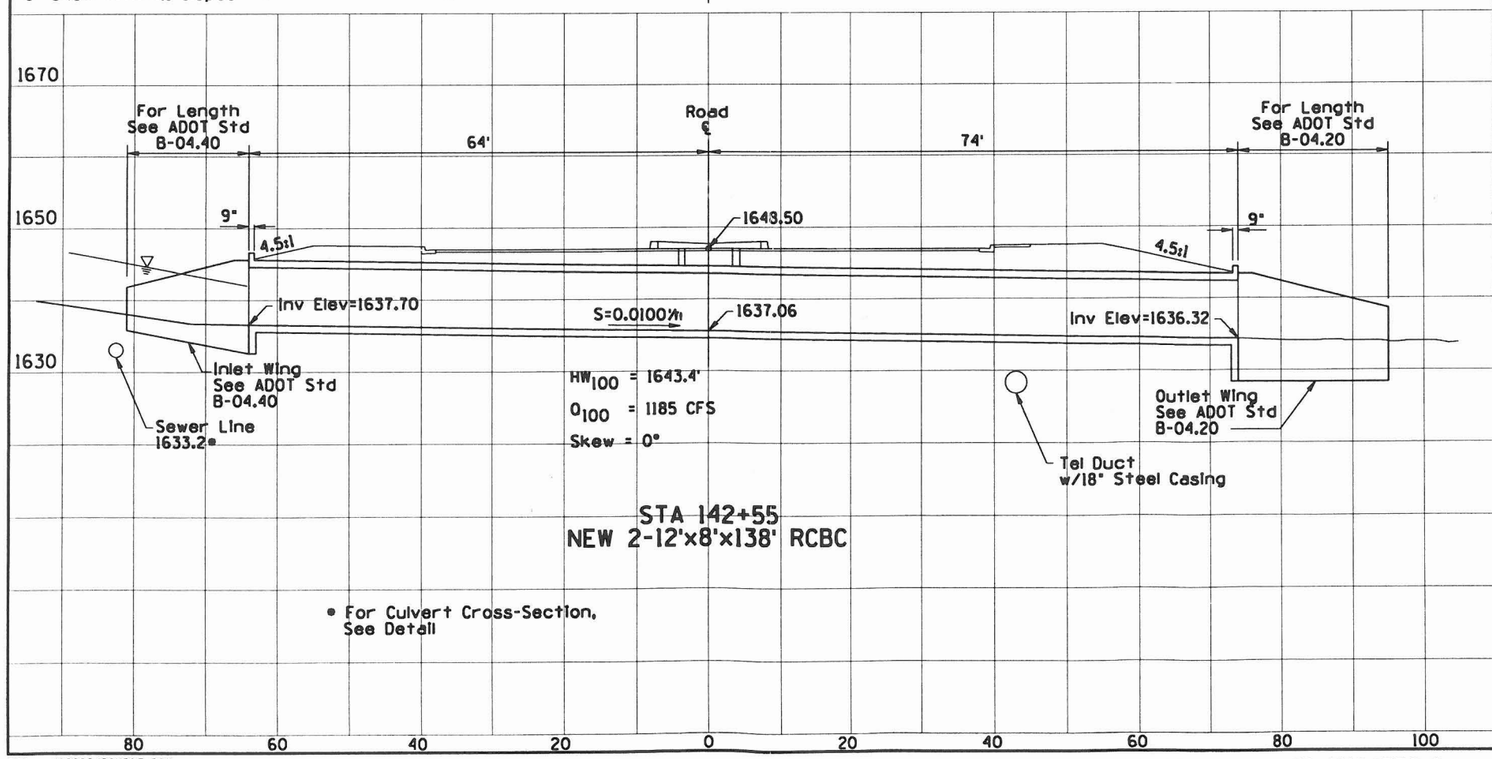
___ OF ___

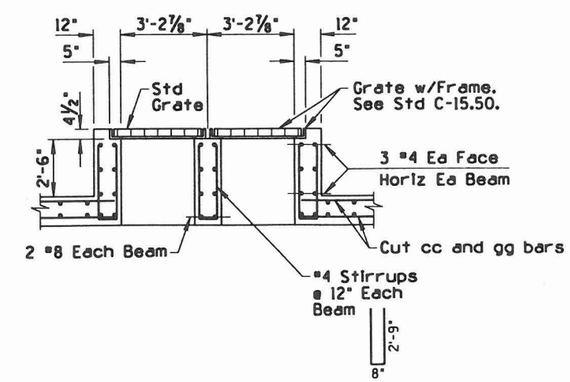
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	6		
		0000 MA FTH			





SECTION A
Scale: ⅜" = 1'-0





SECTION B
Scale: ⅜" = 1'-0

	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

CBC DETAILS

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 6

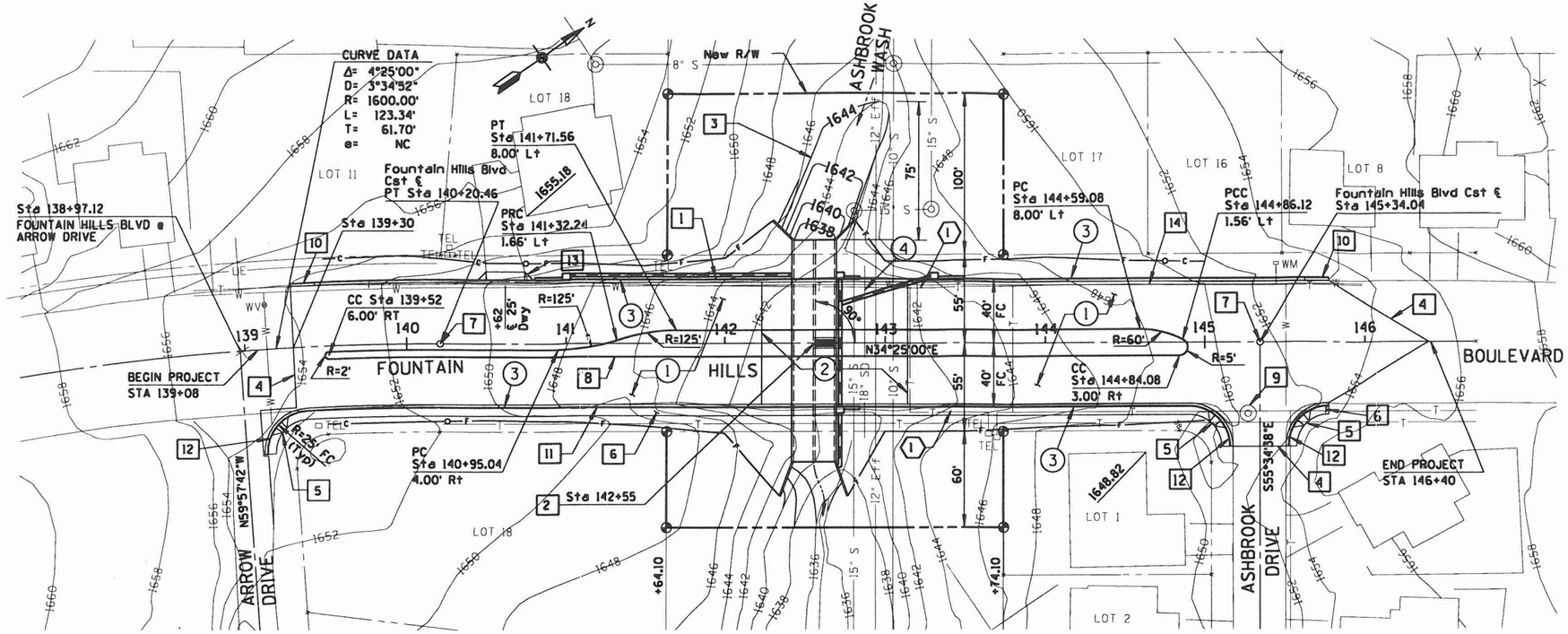
File :/12268/BOXP&E.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

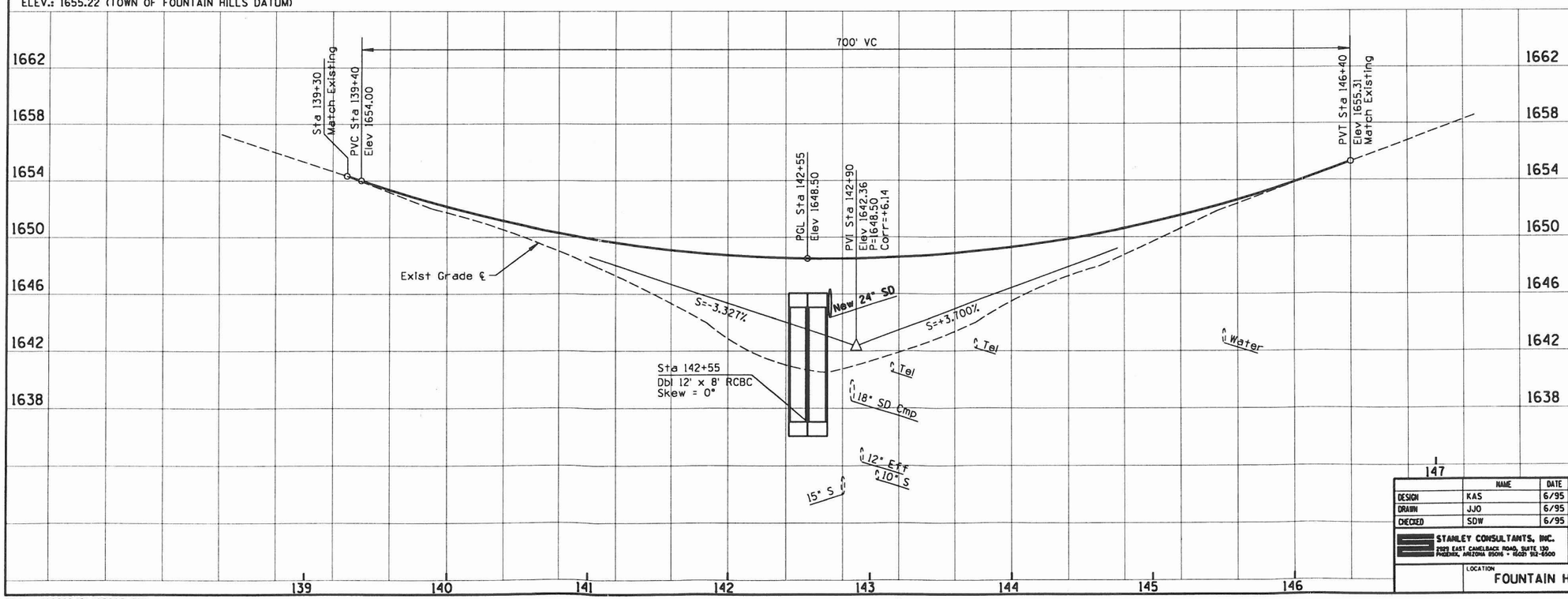
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	7		
		0000 MA FTH			



BENCHMARK:

FOUNTAIN HILLS BLVD. & ARROW DR., FOUND CPS # 284
ELEV.: 1655.22 (TOWN OF FOUNTAIN HILLS DATUM)

SCALE:
HORIZ. 1"=40'
VERT. 1"=4'



CONSTRUCTION NOTES

1. NEW CONCRETE CURB & GUTTER, TYPE A, h=6", ADOT STD C-5.10 STA 139+30.00 TO STA 145+75.03
2. NEW DOUBLE 12'x 8'x 138' RCBC, 0° SKEW GRATED LIGHT WELL AT CENTERLINE. SEE CULVERT DETAILS
3. GRADE WASH BED ALONG FLOWLINE AT 10% FROM CULVERT INLET 75 FEET TO MATCH EXISTING GRADE
4. SAWCUT FULL DEPTH AND MATCH EXISTING PAVEMENT
5. NEW SIDEWALK RAMP, SEE ADOT STD C-05.30, TYPE 2, AND CURB RETURN DETAILS
6. NEW CONCRETE SIDEWALK, 5 FT WIDE. SEE ADOT STD C-05.20
7. INSTALL NEW FLUSH CAP SURVEY MONUMENT PER ADOT STD C-21.10
8. NEW CONCRETE CURB, TYPE A, H=6", ADOT STD C-5.10
9. RESET MANHOLE FRAME AND COVER SEE ADOT STD C-18.30
10. NEW CURB & GUTTER TRANSITION SEE CURB & GUTTER TRNS DETAIL
11. NEW CONCRETE CURB & GUTTER, TYPE A, h=6", ADOT STD C-5.10 STA 139+39.88 TO STA 144+93.03
12. NEW CONCRETE CURB & GUTTER, TYPE A, h=6", ADOT STD C-5.10 SEE CURB RETURN DETAIILS
13. NEW 25' CONCRETE DRIVEWAY SEE DRIVEWAY DETAIL
14. RELOCATE EXISTING WATER LINE SEE WATER LINE PLANS

REMOVAL NOTES

1. REMOVE 5118 SY ASPHALTIC CONCRETE PVMT
   STA 139+30 TO STA 142+22.80
   STA 143+13.48 TO STA 145+77.04
2. REMOVE 777 SY CONCRETE PVMT
   STA 142+22.80 TO STA 143+13.48
3. REMOVE 1136 LF CONCRETE CURB & GUTTER
   STA 139+30.00 TO STA 142+22.80, LT
   STA 139+13.82 TO STA 142+22.80, RT
   STA 143+13.48 TO STA 145+75.00, LT
   STA 143+13.48 TO STA 145+18.03, RT
   STA 145+50.03 TO STA 145+75.03, RT
4. REMOVE 81 LF 18" SD PIPE
   STA 142+93.97, 40.72' RT TO
   STA 142+94.69, 40.27' LT

NOTES BY OTHERS

1. RELOCATE EXISTING TELEPHONE LINE

	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-5600

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

ROADWAY PLAN & PROFILE

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 7

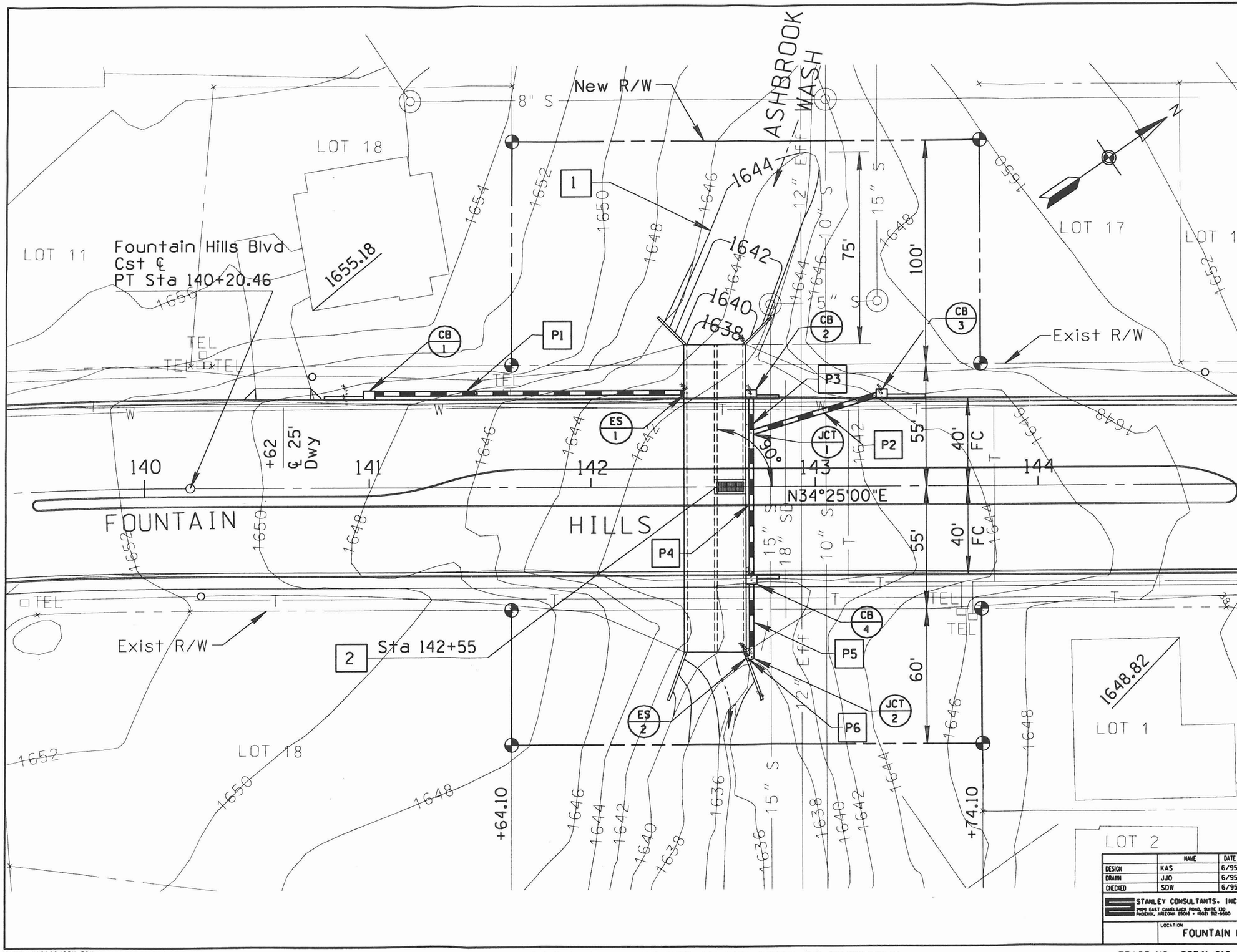
File :/12268/PLA&PROF.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	8		
		0000 MA FTH			



CONSTRUCTION NOTES

1. GRADE WASH BED ALONG FLOWLINE AT 10% FROM CULVERT INLET 75 FEET TO MATCH EXISTING GRADE
2. NEW DOUBLE 12'× 8'× 138' RCBC, 0° SKEW GRATED LIGHT WELL AT CENTERLINE. SEE CULVERT DETAILS

P1 NEW 24" DIAMETER RCP
P2 NEW 24" DIAMETER RCP
P3 NEW 24" DIAMETER RCP
P4 NEW 24" DIAMETER RCP
P5 NEW 24" DIAMETER RCP
P6 NEW 24" DIAMETER RCP

	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 951-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

DRAINAGE PLAN

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 8

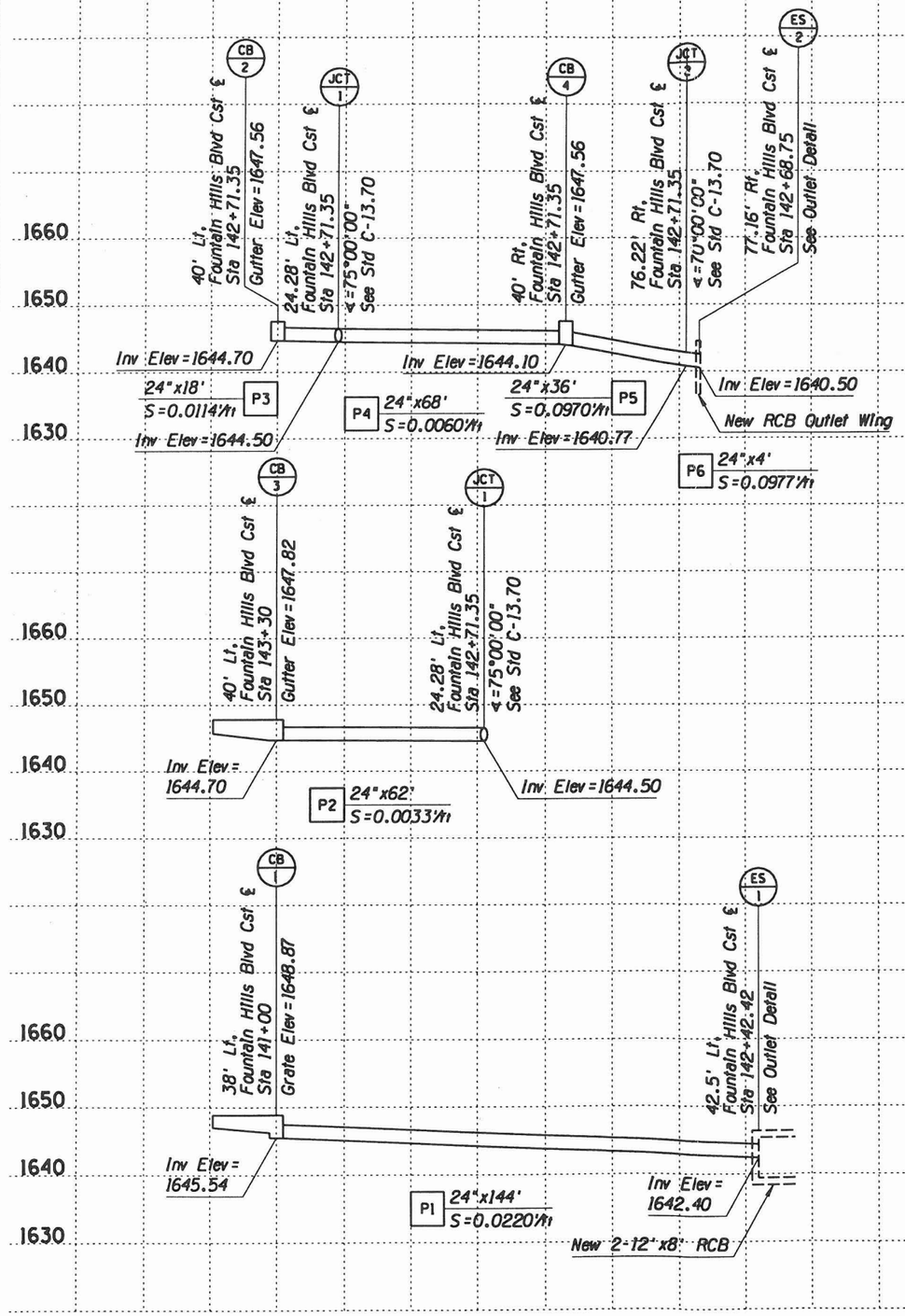
File :/12268/DRN.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	9		
		0000 MA FTH			



	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

DRAINAGE PROFILES

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 9

File :/12268/DRNPROF.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	10		
		0000 MA FTH			

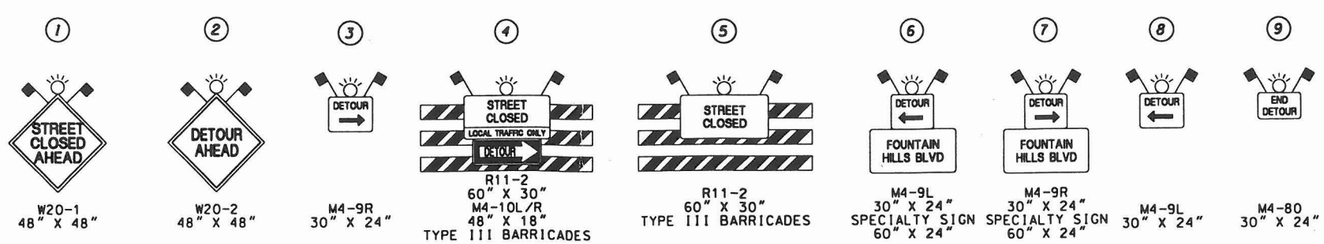
DETOUR PLAN

GENERAL NOTES

1. All signing, striping, barricades and channelization shall be in accordance with the "Manual On Uniform Traffic Control Devices" (MUTCO) (Current Edition) and the ADOT "Traffic Control Manual for Highway Construction and Maintenance" (TCM) (Current Edition).
2. Channelization and signing of the approaches to the Fountain Hills Boulevard/Palisades Boulevard intersection and the Fountain Hills Boulevard/Saguaro Boulevard intersection shall conform with Figure 6.33 and Figure 6.34 of the ADOT TCM.
3. Steady burn yellow lights (Type C) shall be mounted on each barricade used for channelization. Flashing yellow lights (Type A) shall be mounted on each sign and road closure barricade installation.
4. All orange construction, detour, and specialty signs shall use high reflectivity reflective sheeting.
5. All Specialty Signs shall be black legend on orange background. The legend shall be Type C with 5-inch text height.
6. Sign locations may be adjusted to fit field conditions as directed by the Engineer.
7. Sign mounting height shall be a minimum 7-foot mounting height from the bottom of the sign to the near edge of pavement. If a supplemental panel is used at a sign installation, the mounting height may be reduced to 5-feet from the bottom of the supplemental panel to the near edge of pavement.
8. The drawing is schematic only and not to scale.
9. All existing signs that are in conflict with the construction and/or detour signs shall be removed or covered in place.
10. All M4-9 signs shall be placed 100 feet in advance of the applicable intersection.
11. The Contractor shall maintain access to residences and streets at all times.
12. Traffic control construction signs shall not be displayed to traffic more than 24 hours prior to the actual start of construction and detour activities.

APPROXIMATE TRAFFIC CONTROL QUANTITIES

ITEM	UNIT	QUANTITY
Vertical Panels	Ea/Day	2400
Barricades (Type III)	Ea/Day	720
Flashing Warning Light (Type A)	Ea/Day	1200
Steady-Burning Warning Light (Type C)	Ea/Day	2400
High Intensity Sheeting (Small Sign)	Ea/Day	660
High Intensity Sheeting (Medium Sign)	Ea/Day	660
Embedded Sign Posts	Ea/Day	1440
Portable Sign Stand	Ea/Day	360
Specialty Sign	Sq Ft	20



	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

DETOUR PLAN

ROUTE

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 10

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

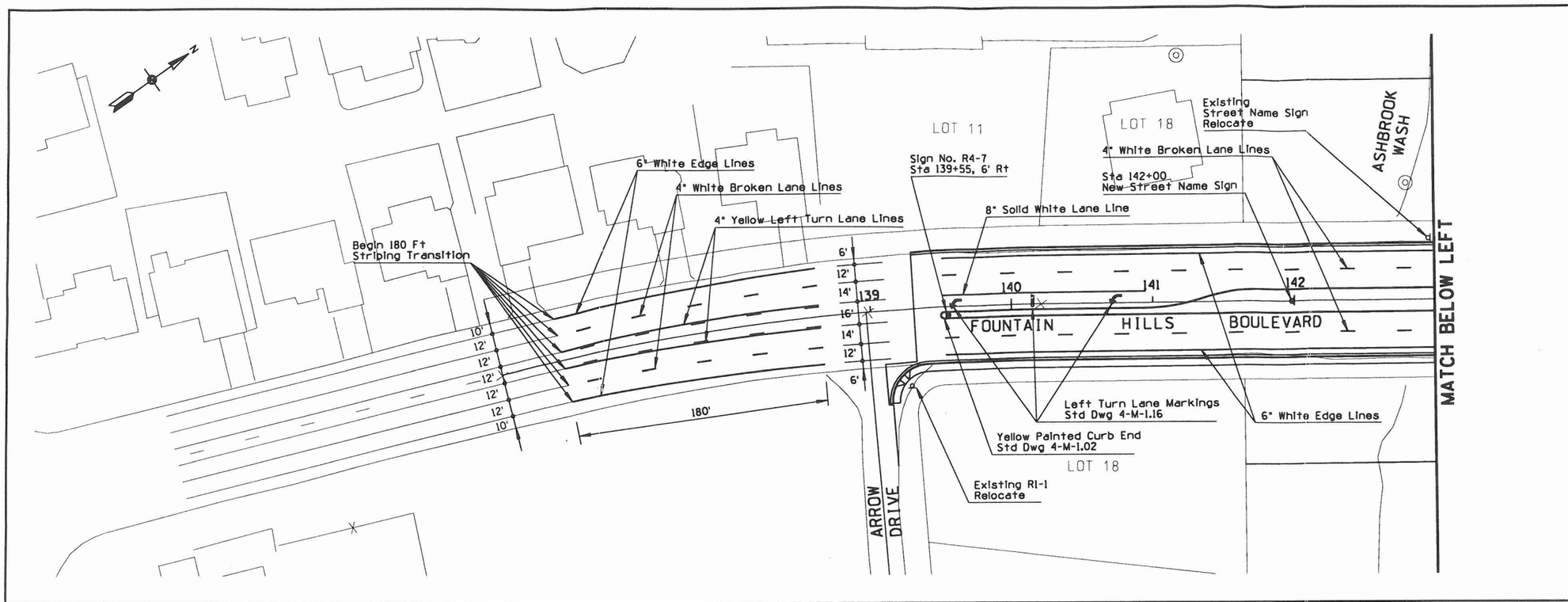
VIEW NAME: /12268/DETOUR1.DGN

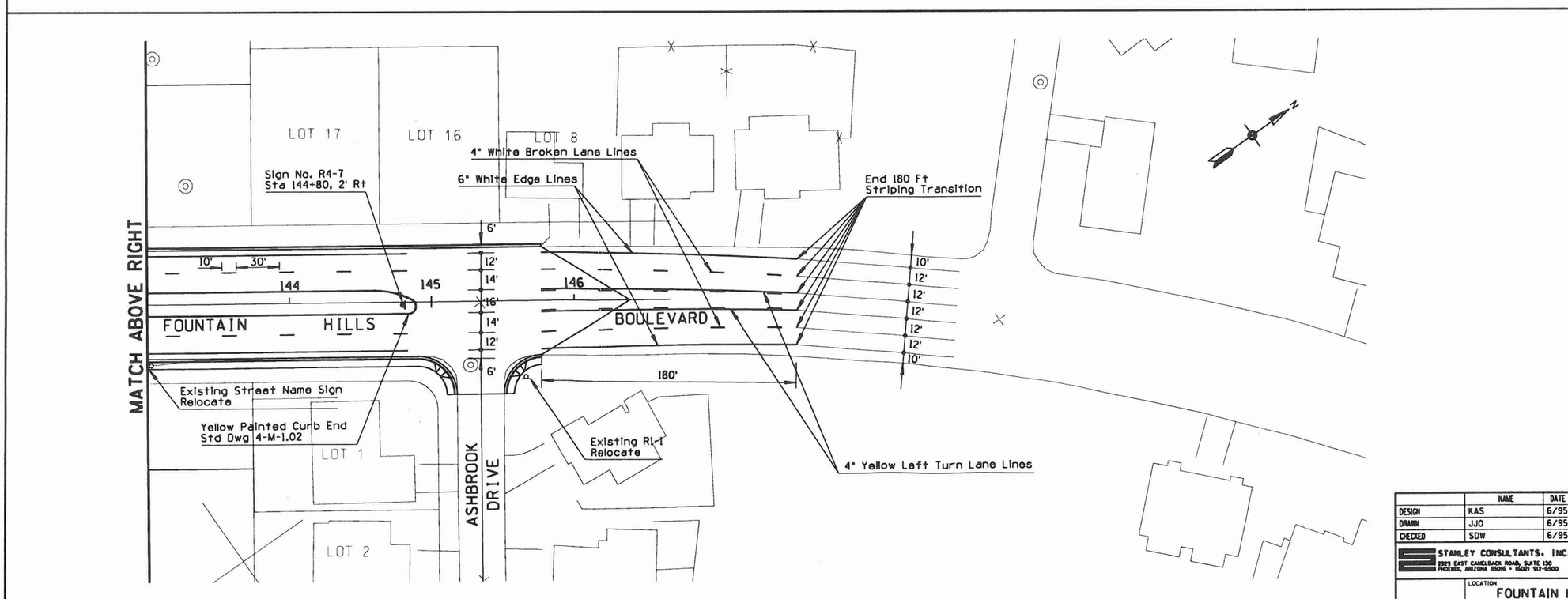
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	11		
		0000 MA FTH			





	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 120
PHOENIX, ARIZONA 85016 • (602) 912-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

SIGNING & STRIPING PLAN

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 11

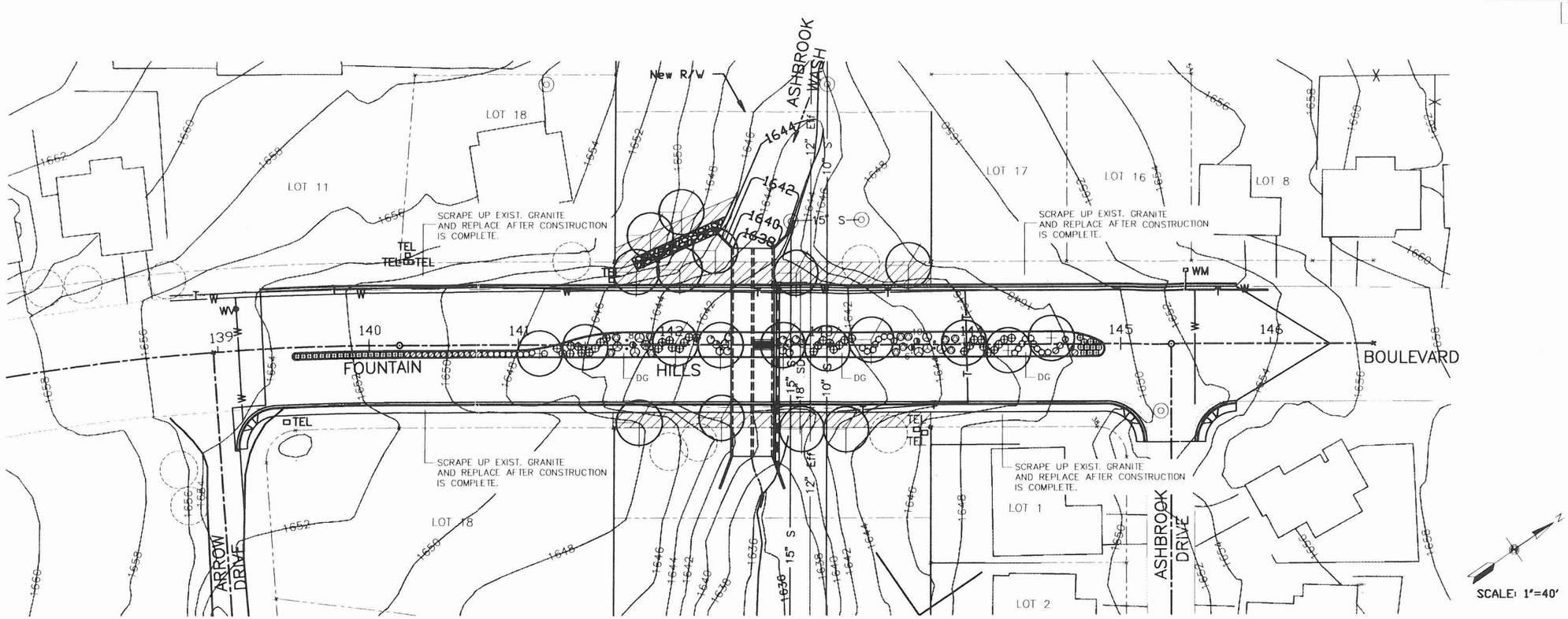
File: /12268/FHSTRIPE.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	STP-FTH-0(?)F			
		0000 MA FTH			



PLANT LIST

	BOTANICAL NAME	COMMON NAME	SIZE	QUANTITY	NOTES
	EXISTING TREE				
	CERCIDIUM PRAECOX	PALO BREA	36" BOX	5	–
	PROSOPIS ALBA	MESQUITE	36" BOX	16	–
	CAESALPINIA PULCHERRIMA	RED BIRD-OF-PARIDISE	5 GAL.	12	–
	CALLIANDRA ERIOPHYLLA	FAIRY DUSTER	5 GAL.	26	–
	CONVOLVULUS CNEORUM	MORNING BUSH	5 GAL.	19	–
	DALEA GREGII	TRAILING INDIGO BUSH	5 GAL.	29	–
	DASYLIRON WHEELERI	DESERT SPOON	5 GAL.	7	–
	HESPERALOE PARVIFLORIA	RED YUCCA	5 GAL.	11	–
	LEUCOPHYULLUM F. 'GREEN CLOUD'	GREEN CLOUD	5 GAL.	36	–
	CARNEGIEA GIGANTEA	SAGUARO	10'/8'/6'	1/1/1	–
	FEROCACTUS WISLIZENII	BARREL CACTUS	3'	4	–
	FOUQUIERIA SPLENDENS	OCOTILLO	6'	1	–
DG	DECOMPOSED GRANITE	(TO MATCH EXISTING)	1/2" MINUS	6,292 SF	

BOTANICAL NAME	COMMON NAME	PURE LIVE SEED POUNDS/ACRE	QUANT.
NATIVE SEED MIX #1			6,102 SF
ARISIDA PURPUREA	PURPLE THREE AWN	2.5	
BAILEYA MULTIRADIATA	DESERT MARIGOLD	3.0	
ESCHOLZIA CALIFORNIA	CALIFORNIA POPPY MIX	2.0	
ESCHOLZIA MEXICANA	MEXICAN POPPY MIX	2.0	
PHACELIA COMPANCILARIA	DESERT BLUE BELLS	2.0	
SPHAERALTEA AMIGUA	GLOBE MALLOW	1.0 HULLED BLACK SEED	
		12.0	

	NAME	DATE
DESIGN	GMS	6/95
DRAWN	TEAM	6/95
CHECKED	GMS	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016-4242 (602) 956-6300

SAKATO SAKATO

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

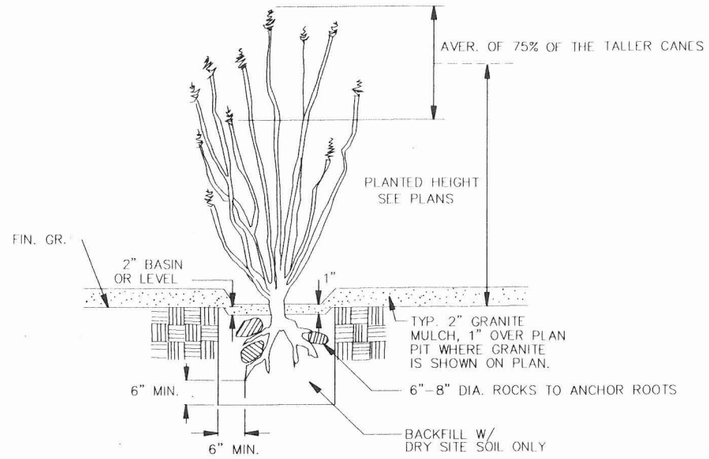
DWG NO.

NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

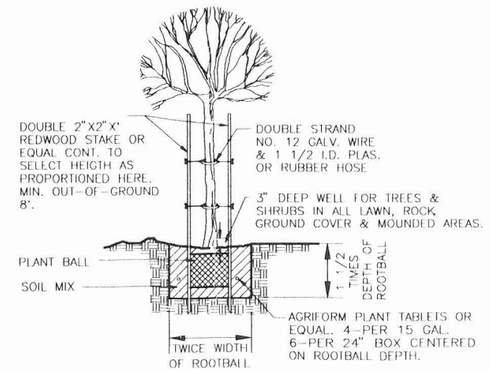
OF

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ	STP-FTH-0(2)F			
		0000 MA FTH			



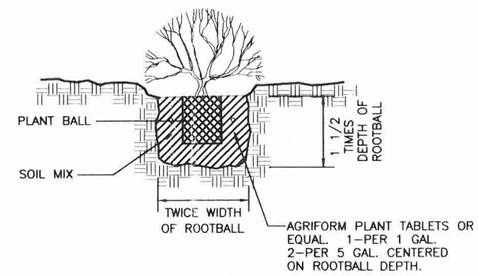
CACTUS/OCOTILLO PLANTING

N.T.S. OCOT



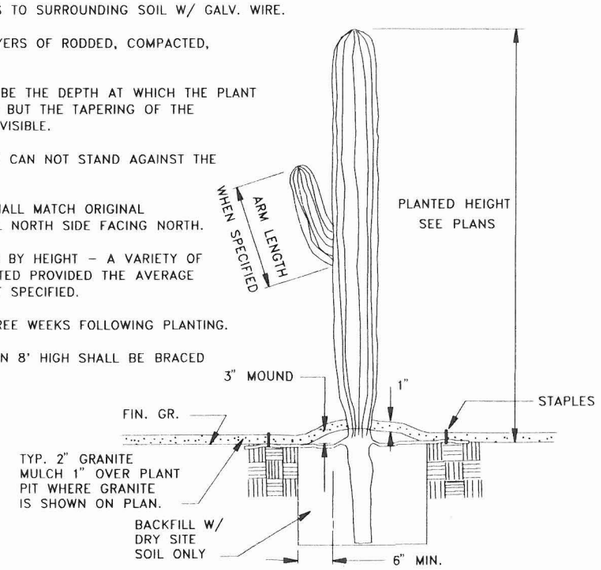
TREE PLANTING

TREE



NOTE:

- ROOT PRUNE ALL SHREDDED OR DAMAGED ROOTS.
- ENSURE ALL WOUNDS TO THE ROOT SYSTEM ARE CLEAN CUT BEFORE PLANTING. APPLY DUSTING SULFUR TO ALL AREAS BELOW GRADE.
- PLANT PIT SHALL BE 6" MIN. WIDER THAN THE EXTENT OF THE SEVERED LATERAL ROOTS.
- CUT THROUGH TAPROOT TO PROVIDE A FLAT BASE W/ DIA. SUFFICIENT TO SUPPORT THE WEIGHT OF THE UNSUPPORTED SAGUARO. STAPLE ROOTS TO SURROUNDING SOIL W/ GALV. WIRE.
- BACKFILL PIT W/ 6" LAYERS OF RODDED, COMPACTED, DRY, SITE SOIL
- PLANTING DEPTH SHALL BE THE DEPTH AT WHICH THE PLANT WAS GROWN OR DEEPER BUT THE TAPERING OF THE ROOT COLLAR MUST BE VISIBLE.
- ENSURE SURFACE WATER CAN NOT STAND AGAINST THE ROOT COLLAR.
- SAGUARO PLACEMENT SHALL MATCH ORIGINAL ORIENTATION W/ORIGINAL NORTH SIDE FACING NORTH.
- SAGUARO ARE SPECIFIED BY HEIGHT - A VARIETY OF HEIGHTS MAY BE ACCEPTED PROVIDED THE AVERAGE IS NOT LESS THAN THAT SPECIFIED.
- DO NOT WATER FOR THREE WEEKS FOLLOWING PLANTING.
- SAGUAROS GREATER THAN 8' HIGH SHALL BE BRACED FOR STABILITY.



CACTUS/SAGUARO PLANTING

SAG

SHRUB PLANTING

SHR

PLANT LIST

	BOTANICAL NAME	COMMON NAME	SIZE	QUANT.	NOTES
	EXISTING TREE				
	CERCIDIUM PRAECOX	PALO BREA	36" BOX	5	-
	PROSOPIS ALBA	MESQUITE	36" BOX	16	-
	CAESALPINIA PULCHERRIMA	RED BIRD-OF-PARIDISE	5 GAL.	12	-
	CALLIANDRA ERIOPHYLLA	FAIRY DUSTER	5 GAL.	26	-
	CONVOLVULUS CNEORUM	MORNING BUSH	5 GAL.	19	-
	DALEA GREGII	TRAILING INDIGO BUSH	5 GAL.	29	-
	DASYLIRON WHEELERI	DESERT SPOON	5 GAL.	7	-
	HESPERALOE PARVIFLORIA	RED YUCCA	5 GAL.	11	-
	LEUCOPHYULLUM F. 'GREEN CLOUD'	GREEN CLOUD	5 GAL.	36	-
	CARNEGIEA GIGANTEA	SAGUARO	10'/8'/6'	1/1/1	-
	FEROCACTUS WISLIZENII	BARREL CACTUS	3'	4	-
	FOUQUIERIA SPLENDENS	OCOTILLO	6'	1	-
DG	DECOMPOSED GRANITE	(TO MATCH EXISTING)	1/2" MINUS	6,292 SF	

BOTANICAL NAME	COMMON NAME	PURE LIVE SEED POUNDS/ACRE	QUANT.
NATIVE SEED MIX #1			6,102 SF
ARISIDA PURPUREA	PURPLE THREE AWN	2.5	
BAILEYA MULTIRADIATA	DESERT MARIGOLD	3.0	
ESCHOLZIA CALIFORNIA	CALIFORNIA POPPY MIX	2.0	
ESCHOLZIA MEXICANA	MEXICAN POPPY MIX	2.0	
PHACELIA COMPANCILARIA	DESERT BLUE BELLS	2.0	
SPHAERALTEA AMIGUA	GLOBE MALLOW	1.0 HULLED BLACK SEED	
		12.0	

	NAME	DATE
DESIGN	GMS	6/95
DRAWN	TEAM	6/95
CHECKED	GMS	6/95

STANLEY CONSULTANTS, INC.
8989 EAST CAMELBACK ROAD, SUITE 130
SCOTTSDALE, ARIZONA 85256- (602) 952-5555

SAKATO SAKATO

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO.

NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS241 01C

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP FTH-0029			
		0000 MA FTH			

TREE CIRCUIT

KEY	BOTANICAL NAME	COMMON NAME	SIZE	EMITTER TYPE	GPH/PORT	NO. OF DIST. TUBES/PLANT @ CONST.	NO. OF DIST. TUBES/PLANT @ POTENTIAL
CP	CERCIDIUM PRAECOX	PALO BREA	36" BOX	MULTI-PORT	1	4	12
PA	PROSOPIS ALBA	ARGENTINE MESQUITE	36" BOX	MULTI-PORT	1	4	12

EMITTER NOTES:
1. WHERE PLANS INDICATE A TREE WATERED ON SHRUB CIRCUIT PROVIDE TWICE THE NUMBER OF DISTRIBUTION TUBES SHOWN ABOVE. SHRUB CIRCUITS SHALL RUN APPROX. 1/2 THE TIME OF TREES. CONTRACTOR SHALL NOT PLACE TREES ON SHRUB CIRCUITS WERE TREE CIRCUITS HAVE BEEN INDICATED.
2. MAXIMUM THREE (3) SHRUBS OR GROUND COVER MAY BE WATERED USING ONE MULTI-PORT EMITTER.

SHRUB and ACCENT CIRCUIT

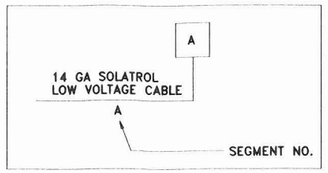
KEY	BOTANICAL NAME	COMMON NAME	SIZE	EMITTER TYPE	GPH/PORT	NO. OF DIST. TUBES/PLANT @ CONST.	NO. OF DIST. TUBES/PLANT @ POTENTIAL
Cp	CAESALPINIA PULCHERRIMA	RED BIRD-OF-PARADISE	5 GAL.	SINGLE PORT	1	1	1
Ce	CALLIANDRA ERIOPHYLLA	FAIRY DUSTER	5 GAL.	SINGLE PORT	1	1	1
Cc	CONVOVULUS CNEORUM	MORNING BUSH	5 GAL.	SINGLE PORT	1	1	1
Dg	DALEA GREGGII	TRAILING INDIGO BUSH	5 GAL.	SINGLE PORT	1	1	1
Dw	DASYLIRON WHEELERI	DESERT SPOON	5 GAL.	SINGLE PORT	1	1	1
Hp	HESPERALOE PARVIFOLIA	RED YUCCA	5 GAL.	SINGLE PORT	1	1	1
Lf	LEUCOPHYLLUM FRUTSCENS	GREEN CLOUD SAGE	5 GAL.	SINGLE PORT	1	1	1

CACTI

KEY	BOTANICAL NAME	COMMON NAME	SIZE	EMITTER TYPE	GPH/PORT	NO. OF DIST. TUBES/PLANT @ CONST.	NO. OF DIST. TUBES/PLANT @ POTENTIAL
Cg	CARNEGIEA GIGANTEA	SAGUARO	10',8',6'	N.I.C.	–	–	–
Fw	FEROCACTUS WISLIZENII	FISH HOOK BARREL	3'	N.I.C.	–	–	–
Os	OCOTILLO SPLENDENS	OCOTILLO	6'	N.I.C.	–	–	–

EMITTER SCHEDULE

A-SCH-E2



COMMON WIRE SCHEDULE

CONTROLLER A

STA.	SEG.	AWG	LENGTH	STA.	SEG.	AWG	LENGTH
A1	A	14	20'				
A2	A	14	21'				

MAXIMUM NO. OF VALVES OPERATING SIMULTANEOUSLY SHALL BE: 1 MAXIMUM NO. OF VALVES OPERATING SIMULTANEOUSLY PER SEGMENT SHALL BE: 1

MAX. CNTL. WIRE SCHED.

A-SCH-W3

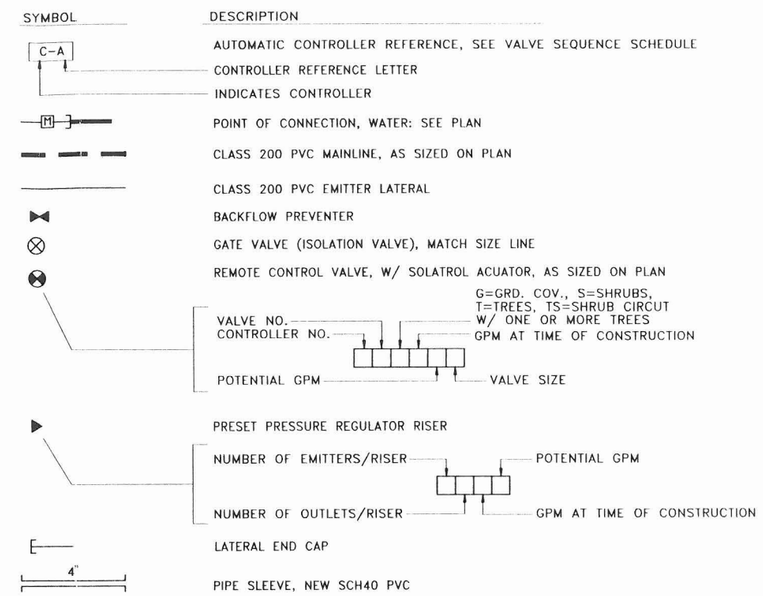
CNTL. NO. A FREEWAY STA.
P.O.C. NO. A FREEWAY STA.

	GROUP A TREES STA.	GPM AT CON.	GPM AT POT.	GROUP B SHRUBS STA.	GPM AT CON.	GPM AT POT.
	A2	1.4	4.2	A1	2.3	2.3
TOTAL:		1.4	4.2		2.3	2.3
HOURS:			5.6			2.0

C= @ CONSTRUCTION; P= @ POTENTIAL FLOW
MAXIMUM WATERING TIME/DAY AT POTENTIAL PEAK DEMAND, ANY CONTROLLER TO BE 2.6 HOURS.
MAXIMUM WATERING TIME/DAY AT POTENTIAL PEAK DEMAND, THIS CONTROLLER IS: 7.6

VALVE SEQ. SCHEDULE

A-SCH-VS



IRRIGATION SCHEDULE

A-SCH-IR

1. SYSTEM HAS BEEN DESIGNED FOR THE FOLLOWING PRESSURES: P.O.C. A = 65 PSI
2. IRRIGATION LINES ARE DIAGRAMMATIC. EXACT LOCATIONS TO BE DETERMINED BY THE CONTRACTOR.
3. CONTRACTOR IS RESPONSIBLE FOR CONDUCTING SITE INSPECTIONS & CHECKING TESTING LOGS TO DETERMINE SUBSURFACE CONDITIONS PRIOR TO BIDDING.
4. UTILITY LINES SHALL BE LOCATED & VERIFIED BY BLUE STAKE PRIOR TO EXCAVATION.
5. ALL CONSTRUCTION SHALL TAKE PLACE WITHIN THE ADOT R.O.W. OR ADOT EASEMENT AS DESIGNATED ON PLANS.
6. PROVIDE LATERAL END FLUSH CAPS AS PER PLAN AND IN ACCORDANCE WITH THE SPECIAL PROVISIONS.

IRRIGATION NOTES

	NAME	DATE
DESIGN	GMS	6/95
DRAWN	TEAM	6/95
CHECKED	GMS	6/95

STANLEY CONSULTANTS, INC.
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SAKATO SAKATO

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

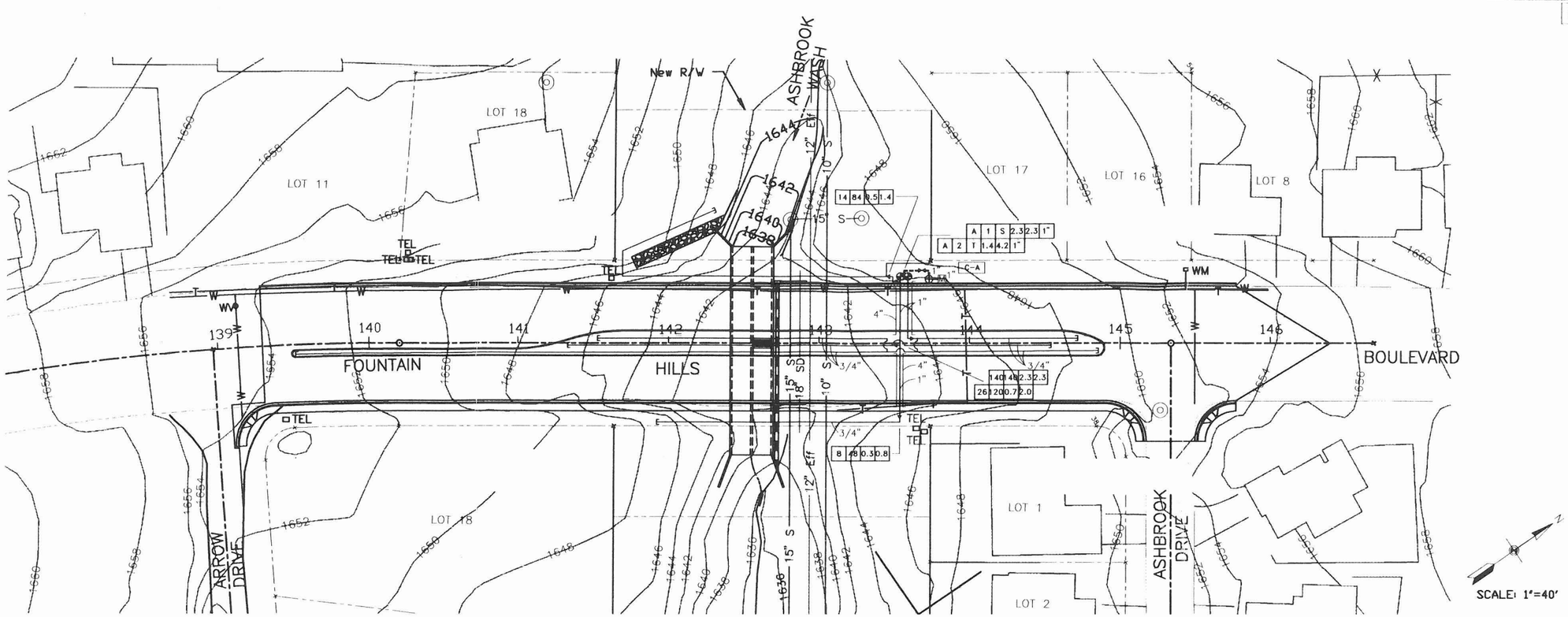
DWG NO.

NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

OF

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)F			
		0000 MA FTH			



SYMBOL	DESCRIPTION
C-A	AUTOMATIC CONTROLLER REFERENCE, SEE VALVE SEQUENCE SCHEDULE
	CONTROLLER REFERENCE LETTER
	INDICATES CONTROLLER
M	POINT OF CONNECTION, WATER: SEE PLAN
	CLASS 200 PVC MAINLINE, AS SIZED ON PLAN
	CLASS 200 PVC EMITTER LATERAL
	BACKFLOW PREVENTER
	GATE VALVE (ISOLATION VALVE), MATCH SIZE LINE
	REMOTE CONTROL VALVE, W/ SOLATROL ACUATOR, AS SIZED ON PLAN
	VALVE NO. / CONTROLLER NO. / G=GRD. COV., S=SHRUBS, T=TREES, TS=SHRUB CIRCUT / W/ ONE OR MORE TREES / GPM AT TIME OF CONSTRUCTION / POTENTIAL GPM / VALVE SIZE
	PRESET PRESSURE REGULATOR RISER
	NUMBER OF EMITTERS/RISER / POTENTIAL GPM / NUMBER OF OUTLETS/RISER / GPM AT TIME OF CONSTRUCTION
	LATERAL END CAP
4"	PIPE SLEEVE, NEW SCH40 PVC

IRRIGATION SCHEDULE

A-SCH-IR

	NAME	DATE
DESIGN	GMS	6/95
DRAWN	TEAM	6/95
CHECKED	GMS	6/95

STANLEY CONSULTANTS, INC.
8985 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85018 (602) 952-0380

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ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TOWN OF FOUNTAIN HILLS
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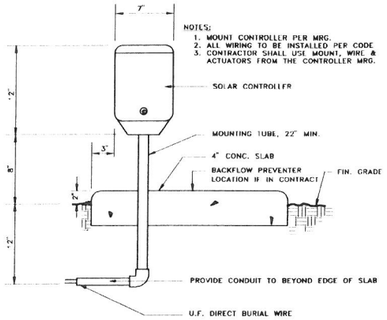
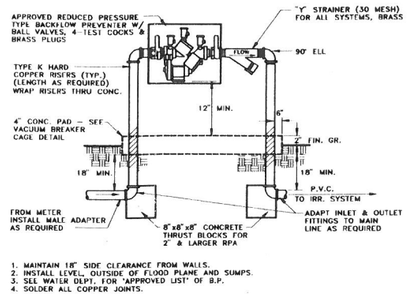
9	ARIZ.	STP-FTH-0(2)F			
		0000 MA FTH			



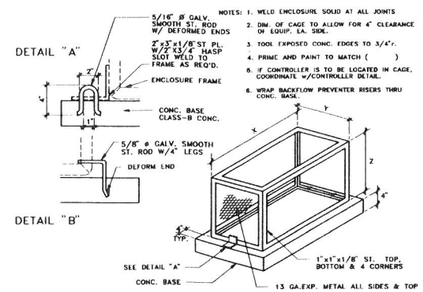
CONTROLLER DETAIL

IN BACKFLOW PREVENTER CAGE — CON-CS



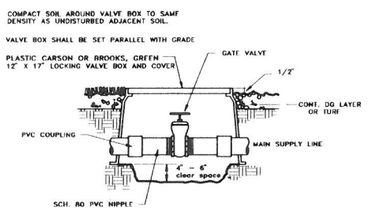
RPA

Backflow Preventer — RPA-1



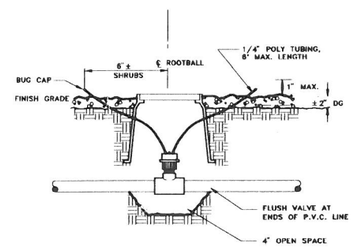
VACUUM BREAKER CAGE

BFP-C



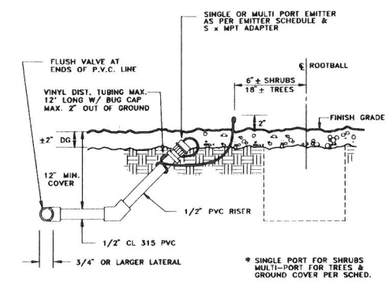
GATE VALVE

Brass — GT-V1



TREE EMITTER

In Emitter Box — EM-BW-T



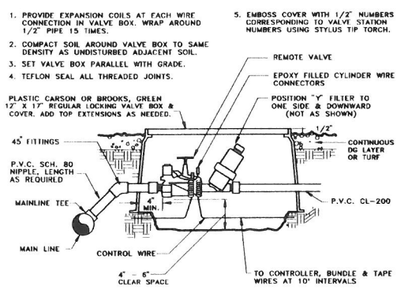
EMITTER DETAIL

EM-RB-S

1. CONTRACTOR SHALL NOT VARY SUBSTANTIALLY FROM PLAN WITHOUT PRIOR ENGINEER OR LANDSCAPE ARCHITECT APPROVAL. THE CONTRACTOR SHALL MAKE NECESSARY IN FIELD ADJUSTMENTS TO AVOID OBSTRUCTIONS OR COMPENSATE FOR DIFFERENCES BETWEEN THE SITE AND PLAN. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR REVISION OF MAJOR DEPARTURES FROM THE PLAN WITHOUT APPROVAL OF THE OWNER'S REPRESENTATIVE.
2. CONTRACTOR SHALL PERFORM THE FOLLOWING:
   A. VISIT SITE AND VERIFY EXISTING GRADES, CONSTRUCTION AND CONDITIONS.
   B. VERIFY UTILITY LOCATIONS PRIOR TO CONSTRUCTION AND MAKE ANY NOTIFICATIONS REQUIRED.
   C. NOTIFY L.A. OF DISCREPANCIES BETWEEN PLAN AND FIELD.
   D. RESTORE CONTRACTOR DAMAGED EXISTING WORK TO THE SATISFACTION OF THE ENGINEER OR L.A. WITHOUT COST TO THE OWNER.
   E. SATISFY HIMSELF THAT THE PLAN CAN BE CONSTRUCTED, FUNCTIONAL AND COMPLETE.
3. CONTRACTOR SHALL DETERMINE HIS OWN BIDDING QUANTITIES. ALL QUANTITIES SHOWN IN THESE PLANS ARE TO GIVE THE CONTRACTOR A COMPARISON COUNT ONLY.
4. ALL MATERIALS AND WORKMANSHIP SHALL BE TRUE TO TYPE, FORM, FINISH AND OF THE HIGHEST STANDARDS OF THE TRADE. DAMAGED OR INFERIOR MATERIALS SHALL BE REMOVED FROM THE SITE WITHOUT DELAY.
5. THE IRRIGATION CONTRACTOR SHALL COORDINATE ALL IRRIGATION WORK WITH OTHER CONTRACTORS.
6. ALL EQUIPMENT SHALL BE MAINTAINED WHILE UNDER CONSTRUCTION. MAINTENANCE INCLUDES; WATER SCHEDULING, REPLACEMENT OF DEFECTIVE OR DAMAGED EQUIPMENT, ADJUSTMENT AND READJUSTMENT OF HEADS AND OTHER EQUIPMENT.
7. CONTRACTOR SHALL INSURE THE FOLLOWING:
   A. TWO 2" SCH. 40 SLEEVES OR LARGER ARE PLACED UNDER WALKS, DRIVES, ETC. WHERE AND AS NEEDED. OFFSET SLEEVES TO AVOID OBSRUCTIONS & ALLOW REPLACEMENT OF PIPE. THE CONTRACTOR SHALL NOT SLEEVE GASKET FIT PIPE WITHOUT PRIOR APPROVAL. EXTEND PAST OBSTRUCTION 12"MIN.
   B. LINES AND VALVES ARE TO BE PLACED WITHIN PLANTING BEDS & PROJECT LIMITS. THESE PLANS ARE SCHEMATIC. CONTRACTOR SHALL SIZE PIPE. PLAN SIZES ARE MINIMUMS..
   C. 100% COVERAGE OF IRRIGATION SYSTEM (55% DIAMETER OR CLOSER SPACING FOR TURF) TO ALL PLANTS REGARDLESS OF SIZE OR TYPE AND SHALL CONFIRM ALL NON-IRRIGATED AREAS PRIOR TO SUBMITTING A BID.
8. PROVIDE IRRIGATION MAINTENANCE AS DESCRIBED IN ITEM 6 AFTER ACCEPTANCE FOR THE PERIOD INDICATED IN THE LANDSCAPE SPECIFICATIONS OR 90 DAYS WHICHEVER IS GREATER.
9. THE IRRIGATION SYSTEM IS DESIGNED FOR A MIN. PRESSURE OF (50) PSI AND A MAX FLOW OF (2.0) GPM. THE CONTRACTOR SHALL CONFIRM EXISTING PRESSURE AND DEFICIENCY PRIOR TO CONSTRUCTION.

IRRIGATION NOTES

IRN



EMITTER VALVE

See Remote Valve Specifications — EM-V1

Project: ASHBROOK WASH

Controller: A Group: Valves: 1

Design Pressure	50	P.S.I.
Pressure Verified With City		P.S.I.
Friction Loss Through:		
A- Water Meter & Service Line	1.00	P.S.I.
B- Backflow Preventer & Filter	11.00	P.S.I.
C- Main Line Pipe	–	P.S.I.
D- Valve	2.00	P.S.I.
E- Lateral Line Pipe	1.00	P.S.I.
F- Other, Elev. Chg.	–	P.S.I.
G- Total Friction Loss (Sum of Items [A] thru [F])	15.00	P.S.I.
H- Required Pressure At Head	30.00	P.S.I.
I- Total Calculated Pressure Req. (Sum of Items [G] And [H])	–	P.S.I.
J- 5% Minimum Allowance (Multiply Item [I] By .05)	2.25	P.S.I.
Total Pressure Required At Source (Sum of Items [I] And [J])	47.25	P.S.I.

FRICTION LOSS

X HIGH FLOW ___ LONG RUN — FL-SPEC2

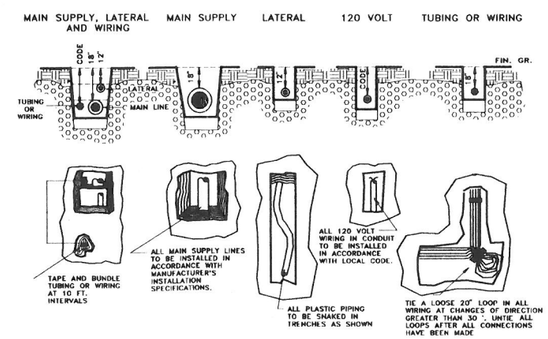
By: GMS Date: 6/15/95

CANOPY	PLANT SIZE	GAL. PER HR.	EMITTER TYPE
16'	60"Box	10	(2) XBT-10-6
12'	48"Box	6	(2) XBT-10-6
8'	36"Box	4	(2) XBT-10-6
4'	24"Box	2	(1) XBT-10-6
2'	15Gallon	2	(1) XBT-10-6
2'	5Gallon	1	(1) XBT-10
2'	Shrubs/G.C.	1	(1) XBT-10
	Annuals	6 Available	(1) XBT-10-6 (48" O.C. BETWEEN PLANTS)

1. THE NO. OF EMITTER HDS. PER PLANT SHALL BE AS SHOWN IN BRACKETS ABOVE.
2. INITIALLY OPEN THE NO. OF PORTS NEEDED TO PROVIDE THE GPM SHOWN. OPEN ADDITIONAL PORTS AS NEEDED AFTER RECEIVING PERMISSION OF THE OWNER.
3. SHRUBS & GROUND COVER MAY BE WATERED USING (1) SNGL-PORT EMITTER PER PLANT OR (1) MULTI-PORT EMITTER PER 4 PLANTS WITHIN 4' OF HEAD USING VINYL TUBING.

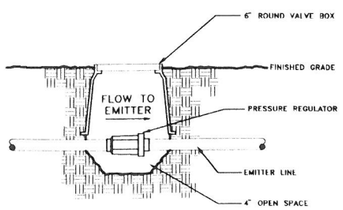
EMITTER SCHEDULE

Rainbird Emitters — ES-RB



TRENCHING DETAIL

TRN



PRESSURE REGULATOR

PR

	NAME	DATE
DESIGN	GMS	6/95
DRAWN	TEAM	6/95
CHECKED	GMS	6/95

STANLEY CONSULTANTS, INC.
5900 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85018- (602) 952-0380

SAKATO SAKATO

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

LOCATION: FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO.

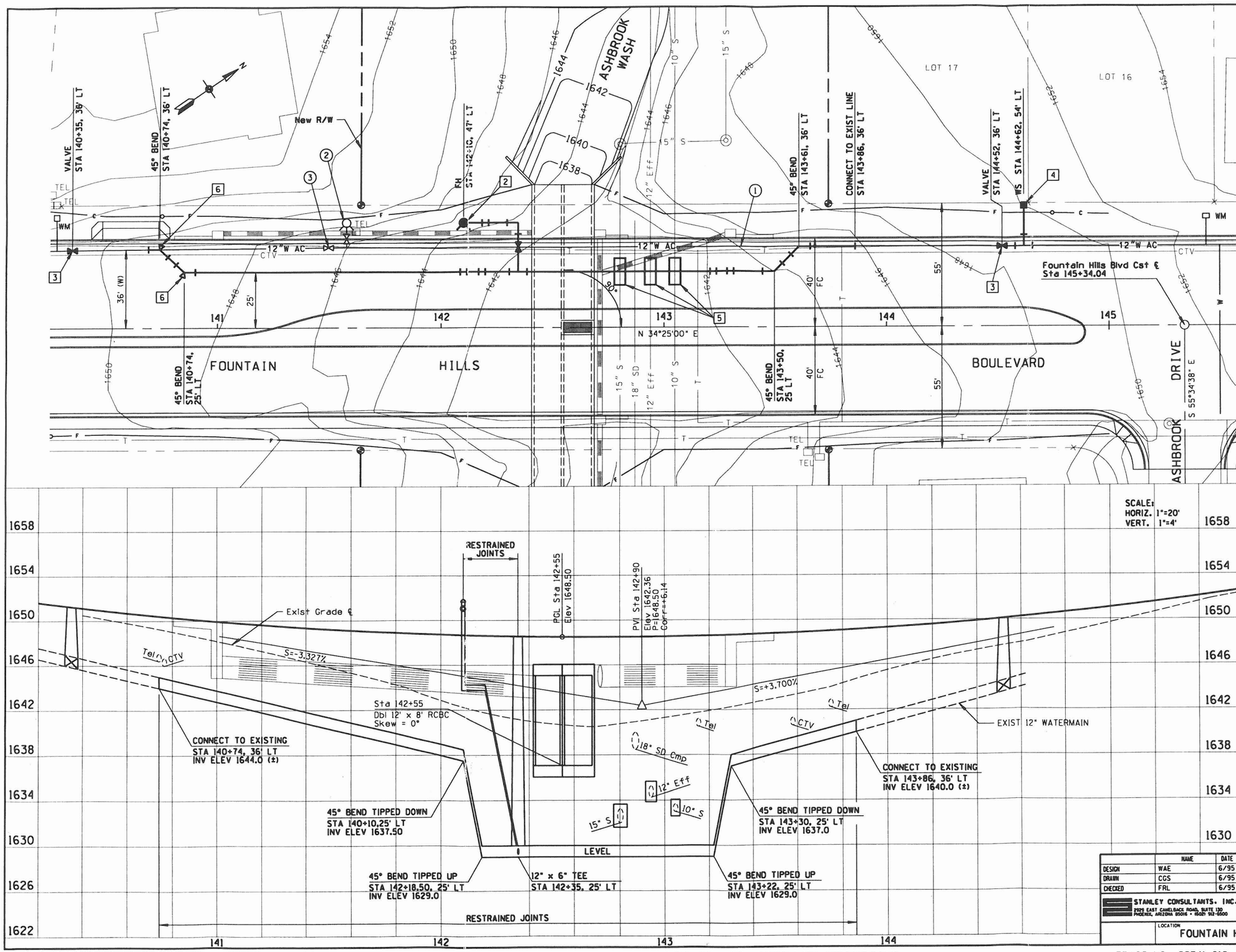
NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

OF

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	16		

0000 MA FTH



CONSTRUCTION NOTES

1. NEW 12" RESTRAINED MECHANICAL JOINT DUCTILE IRON PIPE. 312 LIN FT.
2. NEW FIRE HYDRANT COMPLETE WITH VALVE, BOX, COVER, EXTENSION STEM, 90° BEND TIPPED UP, 45° BEND TIPPED DOWN, AND 60 LIN FT 6" RESTRAINED MECHANICAL JOINT DUCTILE IRON PIPE. SEE ADOT STD C-26.30 AND C-23.30, TYPE C.
3. NEW 12" VALVE, CUT-IN SLEEVE, BOX AND COVER ON EXISTING 12" WATER MAIN. SEE ADOT STD C-23.15 AND C-23.30, TYPE C.
4. NEW 1" WATER SERVICE WET TAP ON EXISTING WATER MAIN. SEE DETAIL DWG NO. 16.
5. NEW SANITARY ENCASEMENT. SEE ADOT STD C-22.15.
6. NEW THRUST BLOCK. SEE ADOT STD C-23.10.

REMOVAL NOTES

1. REMOVE EXISTING 12" WATER MAIN AND BACKFILL.
2. REMOVE AND SALVAGE EXISTING FIRE HYDRANT AND VALVE.
3. REMOVE AND SALVAGE EXISTING 12"BUTTERFLY VALVE.

NOTE:
ALL SALVAGED MATERIALS SHALL BE DELIVERED TO
CHAPARRAL CITY WATER CO.
12021 PANORAMA DRIVE
FOUNTAIN HILLS, AZ

	NAME	DATE
DESIGN	WAE	6/95
DRAWN	CGS	6/95
CHECKED	FRL	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

WATERLINE PLAN

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 16

File :/12268/W-RELOC.DGN

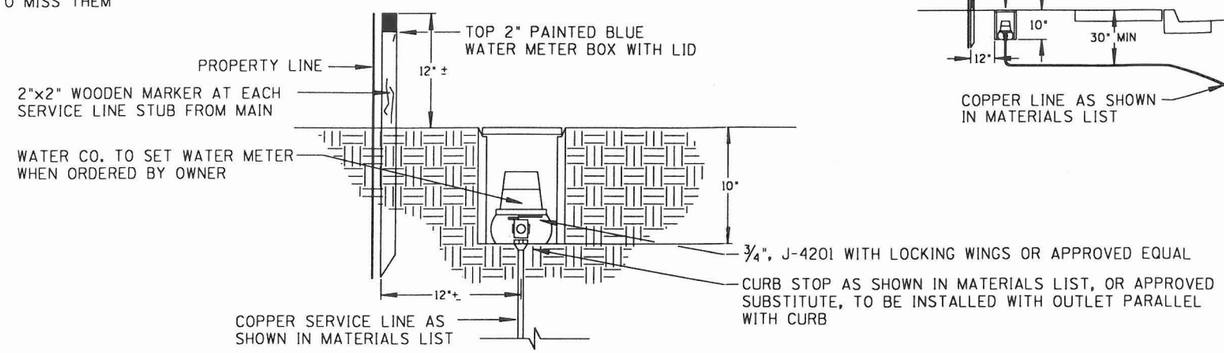
PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

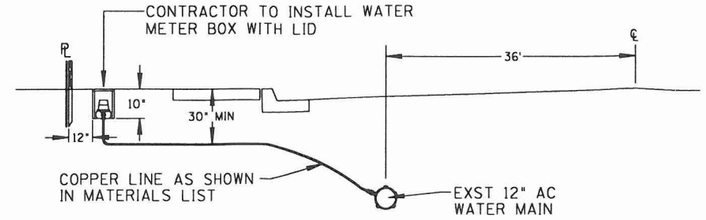
TRACS NO. SS341 01C

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P	17		
		0000 MA FTH			

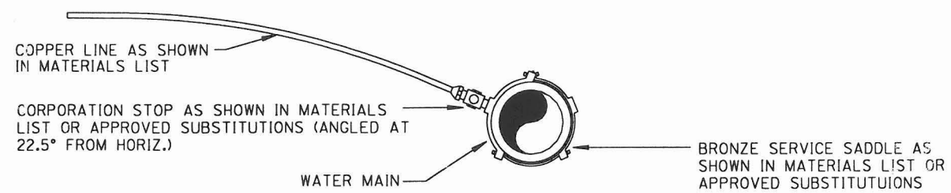
CAUTION: BEFORE SERVICES ARE INSTALLED THE DRIVEWAY LOCATIONS SHOULD BE VERIFIED AND THE SERVICE CONSTRUCTED TO MISS THEM





NOTE:

1. ENGINEER TO SET "BLUE TOPS" FOR ALL WATER METER BOXES TO MATCH TOP OF CURB GRADE. INSTALL TOP OF SERVICE CURB STOP 10" BELOW "BLUE TOP" EXCEPT FOR SPECIAL CONDITIONS (IRRIG., LARGE METERS, ETC.)



WATER SERVICE INSTALLATION

MATERIALS LIST	SERVICE LINE SIZES			
	3/4"	1"	1 1/2"	2"
SERVICE SADDLE △3	JONES J-975 (I.P. THREADS) △1 JONES J-979 (I.P. THREADS) △2	JONES 38-131 (I.P. THREADS) △1 JONES J-979 (I.P. THREADS) △2	JONES J-979 (I.P. THREADS)	JONES J-979 (I.P. THREADS)
CORPORATION STOP	FORD F-1100 JONES J-3403 MUELLER H-15028	FORD F-1100 JONES J-3403	FORD FB-1100 JONES J-1935 MUELLER H-15023	FORD FB-1100 JONES J-1935 MUELLER H-15023
CURB STOP WITH LOCKING WINGS	FORD KV43-332W JONES J-4201 MUELLER H-14258	FORD KV43-444W JONES J-4201	FORD KV43-666W JONES J-1975W MUELLER H-14277	FORD KV43-777W JONES J-1975W MUELLER H-14277
SERVICE LINE	COPPER (TYPE K-SOFT)	COPPER (TYPE K-SOFT)	COPPER (TYPE K-HARD)	COPPER (TYPE K-HARD)

△1 USED WHEN WATER MAIN IS 8" OR SMALLER

△2 USED WHEN WATER MAIN IS LARGER THAN 8"

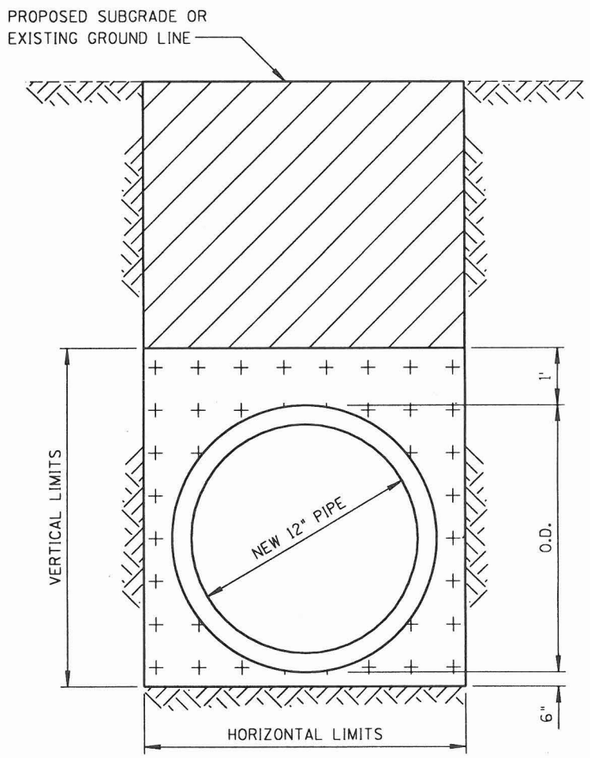
△3 SERVICE SADDLES BY OTHER MANUFACTURERS ARE ACCEPTABLE PROVIDED THEY ARE DOUBLE-STRAP, ALL-BRASS SADDLES. CONTRACTOR SHALL SUBMIT ANY PROPOSED ALTERNATE MANUFACTURER'S SERVICE SADDLE FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION.

1. BRANCHES BEFORE THE METER ARE NOT ALLOWED; i.e., ONLY ONE METER PER SERVICE TAP

WATER SERVICE INSTALLATION MATERIALS LIST

TRENCH BACKFILL

BEDDING



TYPICAL TRENCH DETAIL

NO SCALE

NOTE:
EXCEPT MODIFIED HEREON, NEW PIPE INSTALLATION SHALL CONFORM WITH THE REQUIREMENTS OF ADOT STD C-13.15

	NAME	DATE
DESIGN	WAE	6/95
DRAWN	CGS	6/95
CHECKED	FRL	6/95

STANLEY CONSULTANTS, INC.
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PHOENIX, ARIZONA 85016 • (602) 912-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

WATERLINE DETAILS

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO. 17

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

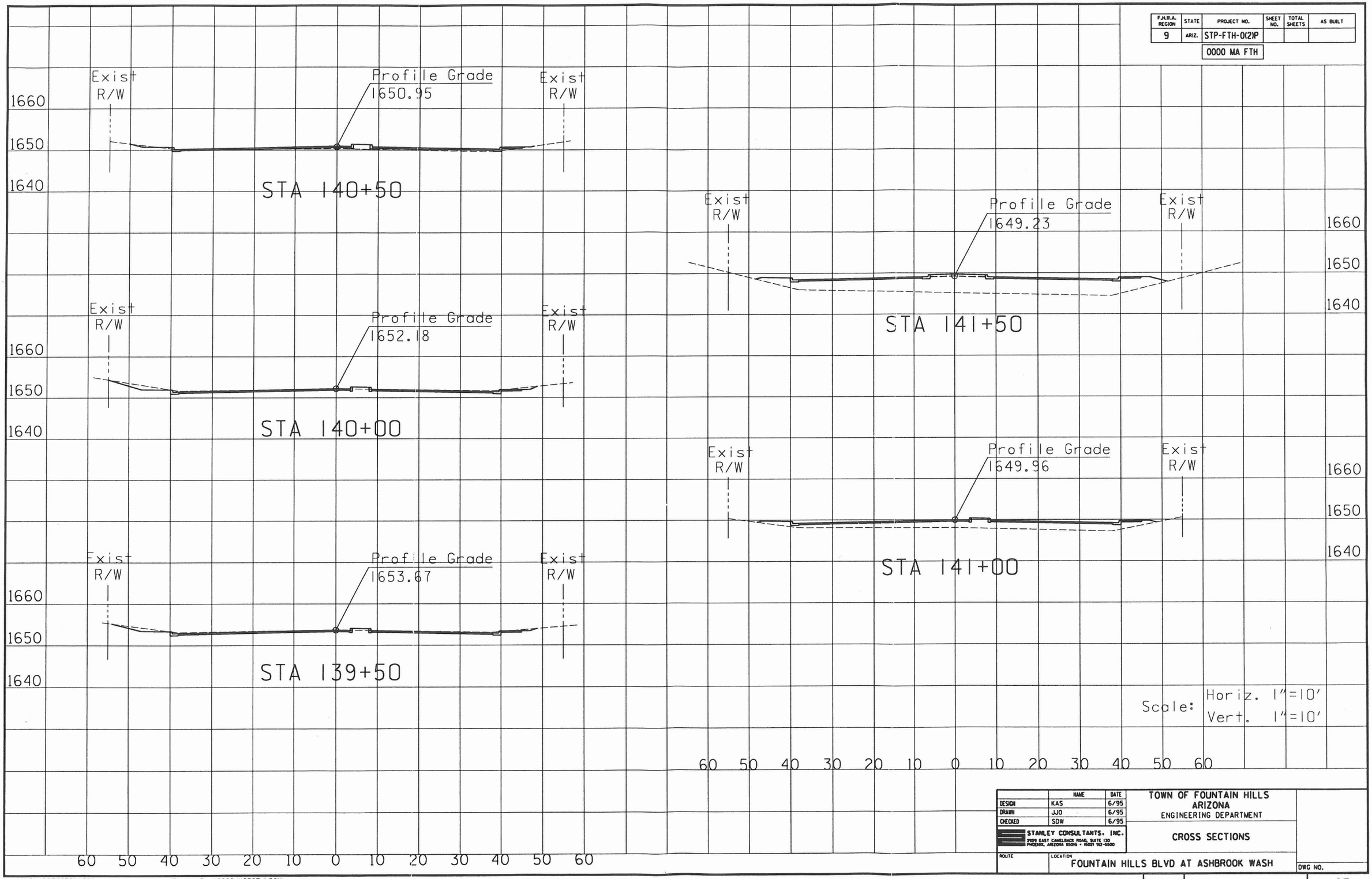
FILE:/12268/W-DTLS.DGN

PRELIMINARY-NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P			
		0000 MA FTH			



	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

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2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

CROSS SECTIONS

ROUTE

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO.

SURVEY NO. | FINISHED PLANS | REVISIONS | LOCATION | DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

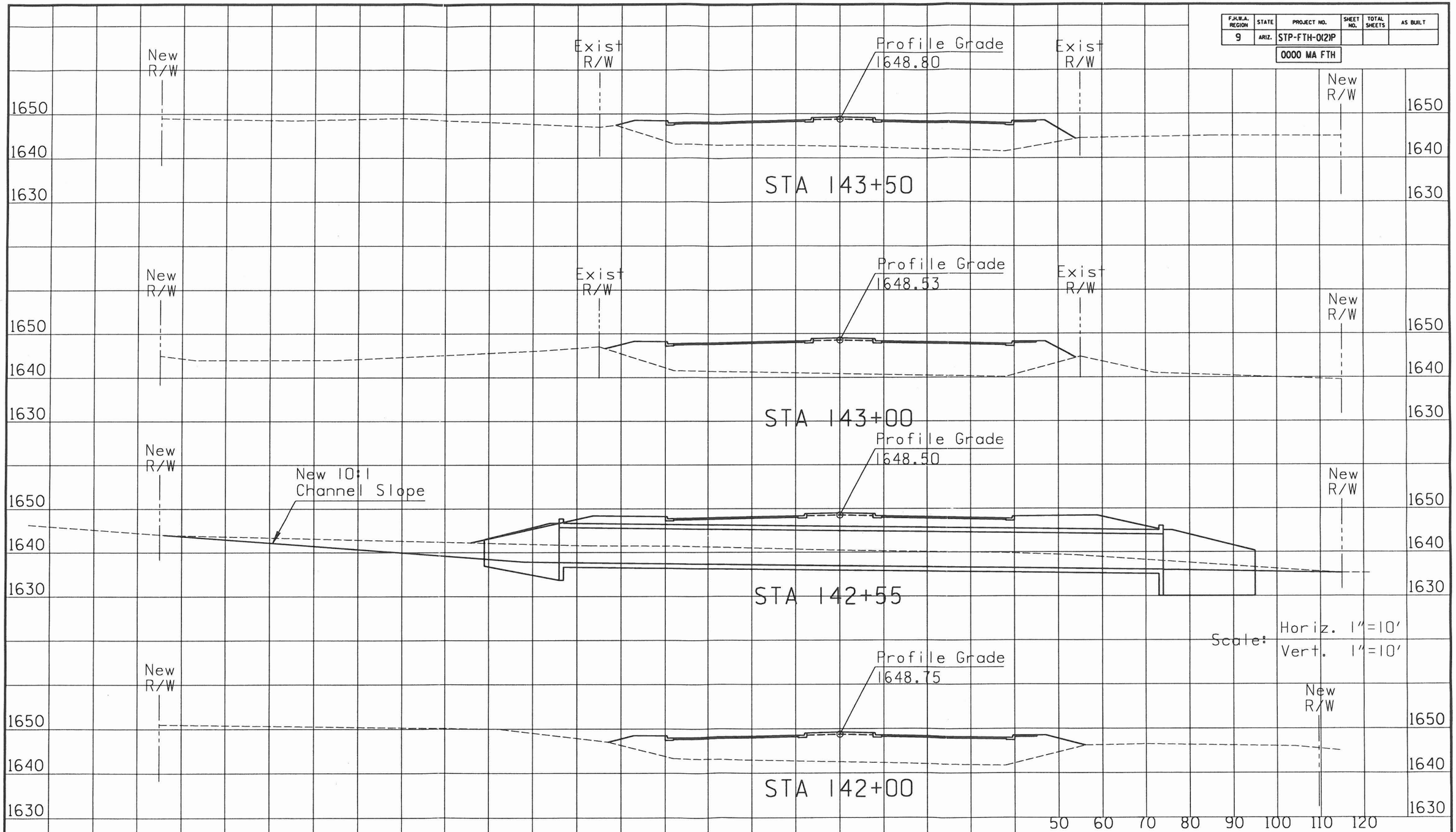
VIEW NAME: /12268/XSECT-1.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P			
		0000 MA FTH			



	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 952-6000

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

CROSS SECTIONS

ROUTE

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO.

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

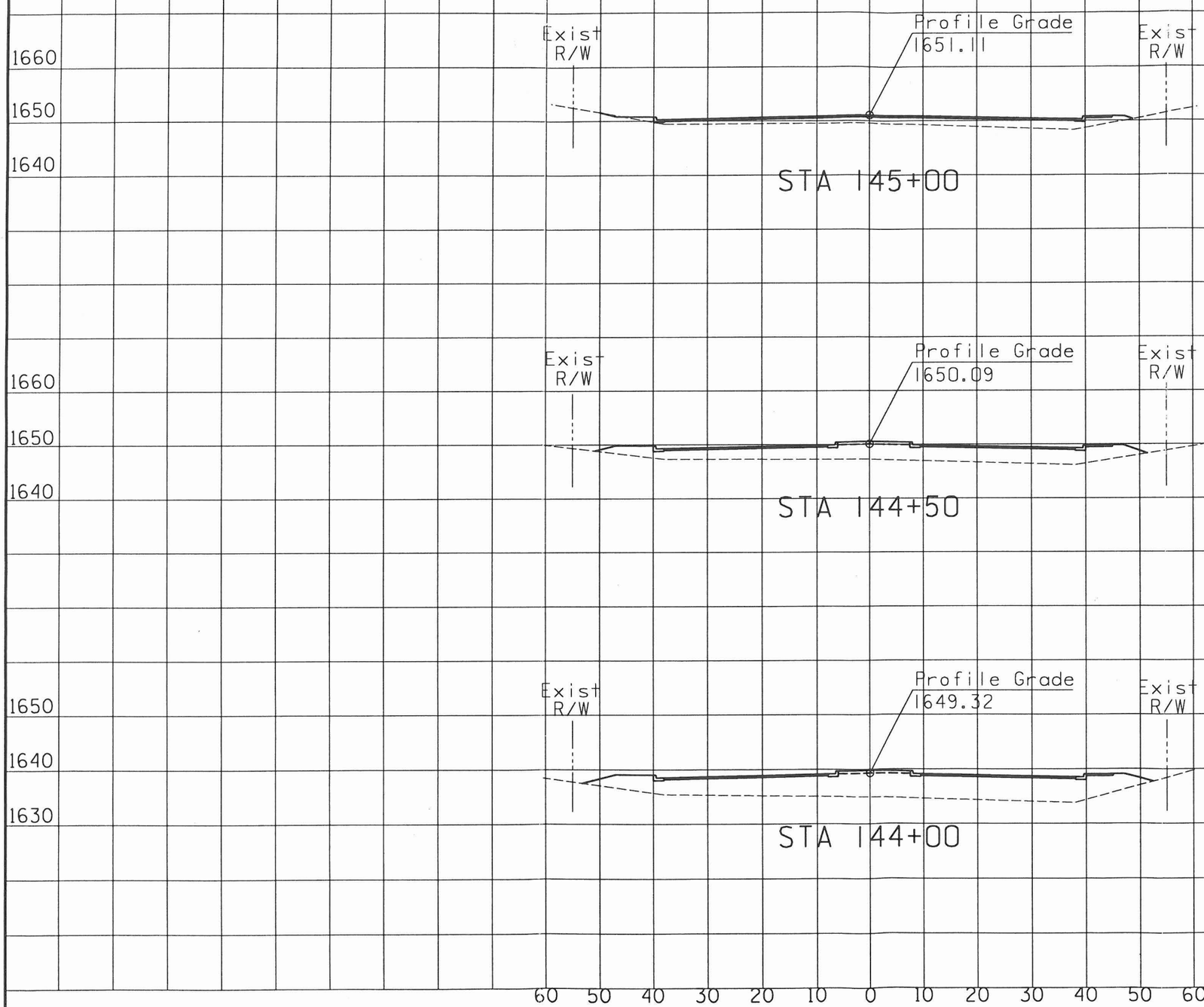
VIEW NAME: /12268/XSECT-2.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	STP-FTH-0(2)P			
		0000 MA FTH			



Scale: Horiz. 1"=10'
Vert. 1"=10'

	NAME	DATE
DESIGN	KAS	6/95
DRAWN	JJO	6/95
CHECKED	SDW	6/95

STANLEY CONSULTANTS, INC.
8222 EAST CAMELBACK ROAD, SUITE 130
SCOTTSDALE, ARIZONA 85251 • (602) 312-6500

TOWN OF FOUNTAIN HILLS
ARIZONA
ENGINEERING DEPARTMENT

CROSS SECTIONS

ROUTE

LOCATION
FOUNTAIN HILLS BLVD AT ASHBROOK WASH

DWG NO.

SURVEY NO.	FINISHED PLANS	REVISIONS	LOCATION	DATE

•••••DGN•SPECIFICATION•••••
•••••SYSTIME•••••

VIEW NAME: /12268/XSECT-3.DGN

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

TRACS NO. SS341 01C

___ OF ___