

FLOOD INSURANCE STUDY
APPROXIMATE ZONE A FLOODPLAIN DELINEATION STUDIES
WICKENBURG AREA, MARICOPA COUNTY, ARIZONA
MANNING'S ROUGHNESS COEFFICIENT (N-VALUE)
DETERMINATION REPORT

FIS Contract FCD 99 - 02

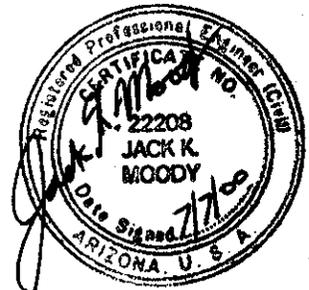
July 7, 2000

Prepared for:

**Flood Control District of Maricopa County
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WP #99958

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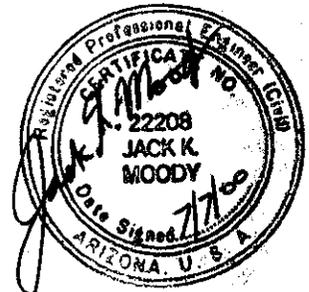
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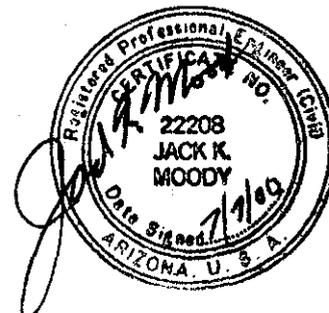
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PROJECT BACKGROUND

Wood, Patel & Associates, Inc. has contracted with the Flood Control District of Maricopa County (FCDMC) to perform Approximate Zone A Floodplain Delineation Studies for the Wickenburg Area in northwestern Maricopa County. Figure 1.1 is the location and vicinity map. It is known as Watershed "G" and encompasses approximately 80 square miles.

In 1994, the Wickenburg Area Drainage Master Study (Wickenburg ADMS) was completed by others under a contract with the Flood Control District of Maricopa County (Black & Veatch, 1994). Nearly all of Watershed "G" is located within the Wickenburg ADMS, and most of the watercourses are the upper reaches of ones delineated in the Wickenburg ADMS.

As part of the Wickenburg ADMS, peak runoff for contributing subbasins was estimated for three hydrologically similar areas: Sols Wash, West Tributaries, and East Tributaries. The three Wickenburg ADMS study areas covered 146 square miles and encompassed the study area of the current Zone A Studies.

In addition to developing peak runoff estimations, the Wickenburg ADMS included floodplain delineations of about 110 miles of watercourses. As stated previously, most of the reaches in the Zone A Studies are extensions of previously-delineated Wickenburg ADMS watercourses. In order to provide continuity, it was necessary to set downstream peak flow values equal to the published peak 100-year flow estimates. This constraint dictated that the Wickenburg ADMS be used as the basis of peak flow estimates for the Zone A studies.

Manning's Equation was used to estimate the normal depth and determine the floodplain limits. As part of the scope for this study, this *Manning's Roughness Coefficient (N-Value) Determination Report* documents the assumptions made in the selection of n values used in the hydraulic computations. The n value selections are based on a compilation of field visit notes, photographs (included as Appendix B of this report), and aerial photographs.

METHODOLOGY

Computations of flow in open channels require evaluation of roughness characteristics of the channel. The roughness coefficient (Manning's n value) in open channels represents the resistance to flow that is related to a variety of factors such as vegetation, obstruction, and type of bed materials. Determination of this resistance to flow for natural washes requires judgement and expertise that is acquired primarily through experience. A description of some of the aspects in determining Manning's n value is covered in this section, and more detailed information can be found in Reference 1.

The n value for a channel or floodplain is determined by evaluating the n value factors of the various components of the waterway. These components are the base n value (n_b), the degree of irregularity of channel cross section (n_1), relative effect of obstructions (n_2), vegetation (n_3), variations in channel cross section (n_4), and degree of meandering (m). These components are used to calculate a composite n value using the following equation:

$$n \text{ value} = (n_b + n_1 + n_2 + n_3 + n_4)m$$

The base n value reflects the type of bed material or surface roughness. This generally ranges from $n_b = 0.02$ for earth to $n_b = 0.028$ for coarse gravel material.

The degree of irregularity of channel cross section consists of the degree of side slope erosion and irregular surfaces of channel in rock. These irregularities may be noted by ridges, depressions, sand bars, and holes on the channel bed. The degree of irregularity ranges from smooth ($n_1 = 0.000$) to severe ($n_1 = 0.020$).

The relative effect of obstructions takes into account the presence and characteristics of obstructions within the waterway. Some of the obstructions may include debris deposits, stumps, exposed roots, logs, piers, and isolated boulders. These obstructions range from negligible ($n_2 = 0.000$) to severe ($n_2 = 0.060$) as the effect is increased.

Vegetation can have a large effect on the n value depending on the type and amount of vegetation, and the depth of flow. The range for vegetation is from small ($n_3 = 0.002$) to very large ($n_3 = 0.100$).

Variations in channel cross sections take into account the effect of channel cross section size and shape along the length of the channel and can be gradual ($n_4 = 0.000$) to frequently alternating ($n_4 = 0.015$). The last

component of the total n value is the degree of meandering. The range for meandering is from minor ($m = 1.00$) to severe ($m = 1.30$). This factor is multiplied by the sum of the other components to calculate the total n value.

The Manning's n values used in this study were estimated by use of the following materials:

1. Extensive field reconnaissance for the purpose of determining Manning's n value.
2. Photographs taken during field reconnaissance trips.
3. Aerial photographs.
4. Reference documents as listed in the references.

The method of determining Manning's n values outlined above has been applied to each typical cross section for each wash of this study area. The calculated Manning's n value was then evaluated to ensure it is reasonable for the wash section.

Note that due to the 20-foot contour interval the low flow channel cannot be defined by the cross sections used in the hydraulic computations, therefore, the cross section bottom was chosen to represent the main conveyance corridor. This includes the low flow channel and the main conveyance area below the overbanks. The main channel n value represents this area.

SUMMARY OF N VALUE ESTIMATION RESULTS

The estimated Manning's n values for all the cross sections and washes are tabulated in Table 3.1 - Input Parameters for Hydraulic Analysis, and is shown as follows. Detailed calculations of n values are included as Appendix A.

Table 3.1 Input Parameters for Hydraulic Analysis

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
Tributary to Sols Wash AH2/ SolsWash Tributary AH2	Wash33T8R6	100 200 300 400	1.866 2.339 2.794 3.665	2,142 1,808 484 183	0.0068 0.0077 0.0100 0.0100	0.05 0.05 0.045 0.05	0.045 0.045 0.045 0.045	0.045 0.045 0.045 0.045
Sols Wash Tributary AH3/ Sols Wash Tributary AH2	Wash22T7R6	100 200	7.598 8.053	633 428	0.0770 0.0120	0.05 0.05	0.055 0.055	0.055 0.055
Sols Wash Tributary AH4/ Sols Wash Tributary AH2	Wash2T7R6	100 200	1.476 2.328	309 68	0.0420 0.1200	0.05 0.05	0.055 0.055	0.055 0.055
Tributary to Hartman Wash/ Hartman Wash	Wash27T7R6	100 200	0.777 1.269	302 47	0.0130 0.0094	0.05 0.05	0.055 0.055	0.055 0.055
Yucca Flat Wash/ Flying Wash	Wash19T7R5	100 200 300 400	2.965 3.571 4.120 4.499	2,085 560 263 55	0.0190 0.0140 0.0250 0.0460	0.05 0.05 0.05 0.05	0.06 0.06 0.06 0.06	0.06 0.06 0.06 0.06
Holly Wash/	Wash20T7R5	200	2.715	132	0.0280	0.05	0.055	0.055

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
Upper Flying "E" Wash		300	3.074	55	0.0160	0.05	0.055	0.055
Cemetery Wash/ Cemetery Wash	Wash28T7R5	300	6.821	675	0.0210	0.055	0.065	0.065
		400	7.427	403	0.0240	0.05	0.06	0.06
		500	7.749	201	0.0280	0.05	0.06	0.06
Turtleback Wash/ Hassayampa River	Wash24T7R5	200	2.283	3,226	0.0200	0.06	0.065	0.065
		300	2.396	3,111	0.0190	0.06	0.065	0.065
		400	2.680	2,754	0.0240	0.06	0.065	0.065
		500	2.908	2,588	0.0220	0.06	0.065	0.065
		600	3.230	2,473	0.0210	0.06	0.065	0.065
		700	3.400	2,359	0.0160	0.06	0.065	0.065
		800	3.722	2,142	0.0093	0.06	0.065	0.065
		900	4.233	1,832	0.0100	0.06	0.07	0.07
		1000	4.725	779	0.0230	0.06	0.07	0.07
		1100	5.009	674	0.0240	0.065	0.075	0.075
		1200	5.350	240	0.0260	0.065	0.075	0.075
		1300	5.578	120	0.0300	0.065	0.075	0.075
Tributary to Mockingbird Wash/ Hassayampa River	Wash17T7R4	100	1.227	673	0.0320	0.05	0.055	0.055
		200	1.700	514	0.0280	0.05	0.055	0.055
		300	2.155	461	0.0360	0.05	0.055	0.055
		400	2.628	393	0.0190	0.05	0.055	0.055
		500	2.969	287	0.0300	0.05	0.055	0.055
		600	3.216	219	0.0420	0.05	0.055	0.055
Tributary to Wash K/ Hassayampa River	Wash10T7R4	200	3.934	652	0.0500	0.05	0.055	0.055
		300	4.408	220	0.0320	0.05	0.055	0.055
		400	4.881	129	0.0330	0.05	0.055	0.055

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
Tributary to	Wash22T7R4	100	0.246	2,306	0.0490	0.05	0.06	0.06
Monarch Wash/		200	0.606	2,230	0.0290	0.05	0.06	0.06
Monarch Wash		300	1.004	2,199	0.0240	0.05	0.06	0.06
		400	1.629	2,984	0.0330	0.05	0.06	0.06
		500	2.159	2,008	0.0310	0.05	0.06	0.06
		600	2.633	1,959	0.0250	0.05	0.06	0.06
		700	2.973	1,727	0.0330	0.05	0.06	0.06
Monarch Wash/	Wash14T7R4	1100	4.121	1,305	0.0280	0.05	0.06	0.06
Hassayampa River		1200	4.367	1,289	0.0310	0.05	0.06	0.06
		1300	4.841	1,264	0.0250	0.05	0.06	0.06
		1400	5.447	1,151	0.0710	0.05	0.06	0.06
Wash C/	Wash34T7R4	100	1.030	150	0.0230	0.05	0.06	0.06
Hassayampa River		200	1.504	15	0.0220	0.05	0.06	0.06
		300	1.788	4	0.0470	0.05	0.06	0.06
San Domingo Wash/	Wash35T7R4	100	2.250	12,870	0.0140	0.05	0.06	0.06
Hassayampa River		200	2.667	12,830	0.0370	0.05	0.06	0.06
		300	3.197	12,789	0.0240	0.05	0.06	0.06
		400	3.614	12,749	0.0250	0.05	0.06	0.06
		500	3.841	12,696	0.0290	0.05	0.06	0.06
		600	4.087	12,611	0.0470	0.05	0.06	0.06
		700	4.296	10,655	0.0340	0.05	0.065	0.065
		800	4.883	10,655	0.0480	0.045	0.065	0.065
Tub Spring Wash/		900	0.435	2,819	0.0210	0.05	0.06	0.06
San Domingo Wash		1000	0.890	2,752	0.0390	0.05	0.06	0.06
		1100	1.250	2,644	0.0520	0.05	0.06	0.06
		1200	1.647	1,879	0.0220	0.05	0.06	0.06
		1300	2.026	1,788	0.0590	0.05	0.06	0.06
		1400	2.367	1,322	0.0310	0.05	0.06	0.06
San Domingo Wash/		2000	5.261	10,089	0.0260	0.05	0.06	0.06

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
Hassayampa River		2100	5.602	9,937	0.0260	0.045	0.055	0.055
		2200	5.905	9,814	0.0260	0.045	0.055	0.055
		2300	6.398	9,206	0.0310	0.045	0.055	0.055
		2400	6.852	9,111	0.0300	0.045	0.055	0.055
		2500	7.458	8,352	0.0290	0.045	0.055	0.055
		2600	7.799	8,105	0.0250	0.045	0.055	0.055
		2700	8.121	8,001	0.0260	0.045	0.055	0.055
		2800	8.614	7,669	0.0240	0.045	0.055	0.055
Ox Wash/ Hassayampa River	Wash1T6R4	100	2.324	3,315	0.0170	0.05	0.06	0.06
		200	2.740	3,315	0.0240	0.05	0.06	0.06
		300	3.270	3,315	0.0210	0.055	0.06	0.06
		400	3.858	3,315	0.0120	0.055	0.065	0.065
		500	4.520	3,315	0.0210	0.055	0.065	0.065
		600	5.051	1,595	0.0150	0.055	0.065	0.065
		700	5.487	1,490	0.0170	0.05	0.06	0.06
		800	6.055	557	0.0240	0.05	0.06	0.06
		900	6.528	263	0.0260	0.05	0.06	0.06
		1000	7.134	105	0.0180	0.045	0.055	0.055
		1100	7.437	74	0.0370	0.045	0.055	0.055
Tributary to Little San Domingo Wash/ Little San Domingo Wash	Wash14T6R4	100	0.000	821	0.0130	0.05	0.07	0.07
		200	0.360	601	0.0190	0.05	0.07	0.07
		300	0.852	516	0.0200	0.05	0.07	0.07
		400	1.420	296	0.0150	0.055	0.07	0.07
		500	1.648	258	0.0140	0.06	0.065	0.065
		600	2.367	95	0.0230	0.065	0.06	0.06
Little San Domingo Wash/ Hassayampa River	Wash7T6R3	100	3.809	2,849	0.0140	0.045	0.055	0.055
		200	4.756	2,713	0.0120	0.045	0.055	0.055
		300	5.362	2,576	0.0180	0.045	0.055	0.055
		400	6.006	2,285	0.0140	0.045	0.055	0.055

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
		500	6.309	2,143	0.0200	0.045	0.055	0.055
		600	6.839	1,908	0.0240	0.045	0.055	0.055
		700	7.445	1,635	0.0150	0.045	0.055	0.055
		800	7.748	1,276	0.0120	0.045	0.055	0.055
		900	8.847	1,047	0.0280	0.045	0.055	0.055
		1000	9.226	886	0.0350	0.05	0.06	0.06
		1100	9.699	687	0.0400	0.055	0.065	0.065
		1200	10.002	557	0.0360	0.055	0.065	0.065
		1300	10.343	415	0.0490	0.05	0.06	0.06
		1400	10.760	235	0.0600	0.05	0.06	0.06
		1500	11.176	62	0.0580	0.05	0.06	0.06
Tributary to Sols Wash/ Sols Wash	Wash32T8R5	100	0.455	949	0.0120	0.045	0.055	0.055
		200	0.833	826	0.0210	0.045	0.055	0.055
Tributary to Amir Wash/ Amir Wash	Wash34T8R5	200	0.417	72	0.0270	0.055	0.065	0.065
Wash20T7R4/ Hassayampa River	Wash20T7R4	100	0.133	544	0.0820	0.055	0.06	0.06
		200	0.341	421	0.0360	0.055	0.06	0.06
		300	0.511	322	0.0330	0.055	0.06	0.06
		400	0.682	198	0.0340	0.055	0.06	0.06
Wash28T7R4/ Hassayampa River	Wash28T7R4	100	0.114	1,469	0.0780	0.09	0.12	0.12
		200	0.795	1,271	0.0210	0.07	0.1	0.1
		300	1.155	1,171	0.0240	0.06	0.08	0.08
		400	1.780	943	0.0170	0.055	0.065	0.065
		500	2.102	824	0.0180	0.055	0.065	0.065
		600	2.689	486	0.0320	0.055	0.065	0.065

Wash Name/ Confluence Wash Name	File Name	Cross-Section Number	River Miles to Confluence	Q100 (cfs)	Slope (ft/ft)	"n" value		
						Main Wash	Left Bank	Right Bank
		700	3.371	218	0.0460	0.055	0.065	0.065
Wash3T6R4/ Hassayampa River	Wash3T6R4	100	0.189	4,086	0.0500	0.045	0.055	0.055
		200	0.720	3,955	0.0160	0.045	0.055	0.055
		300	1.439	3,322	0.0270	0.045	0.055	0.055
		400	1.913	2,852	0.0250	0.045	0.055	0.055
		500	2.462	1,202	0.0250	0.045	0.055	0.055
		600	3.011	929	0.0160	0.045	0.055	0.055
		700	4.015	120	0.0600	0.045	0.055	0.055
Wash15T6R4/ Hassayampa River	Wash15T6R4	100	0.152	4,337	0.0200	0.05	0.06	0.06
		200	0.530	3,250	0.0320	0.05	0.06	0.06
		300	0.682	3,150	0.0240	0.05	0.06	0.06
		400	1.174	2,900	0.0310	0.05	0.06	0.06
		500	1.591	2,300	0.0280	0.05	0.06	0.06
		600	2.254	1,337	0.0220	0.05	0.06	0.06
		700	2.652	412	0.0160	0.05	0.065	0.065
		800	3.011	312	0.0300	0.05	0.065	0.065
		900	3.712	50	0.0350	0.05	0.065	0.065

REFERENCES

1. Thomsen, B.W., and Hjalmarson, H.W., *Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona*, prepared by the U.S. Geological Survey, Water resources Division, prepared for the Flood Control District of Maricopa County, April 1991.
2. Chow, V.T., *Open Channel Hydraulics*, New York, McGraw-Hill, 1959.
3. Aldridge, B.N., and Garrett, J.M., *Roughness Coefficients for Stream in Arizona*, U.S. Geological Survey Open-File Report 78-3, 87p., 1973.
4. Black & Veatch, Inc. *Wickenburg ADMS Technical Documentation Report, Hydrological Analyses Floodplain Delineation*, May 1994.

APPENDIX A

Manning's N-Value Calculation Sheets

APPENDIX B

Photographs of Selected Locations in the Study Area

Manning's "n" value calculation record using the FCDMC Method (1991)

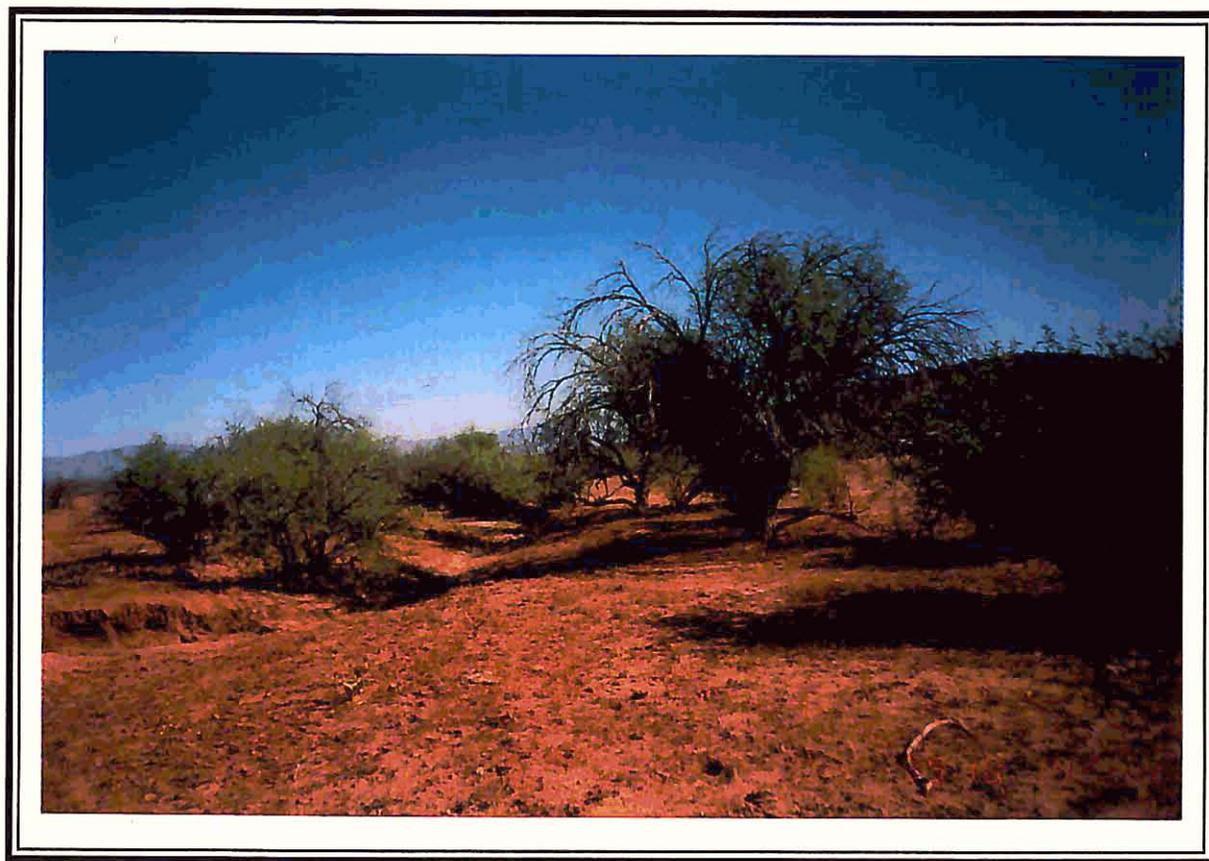
Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Tributary to Sols Wash AH2
 Location: Near Cross Section 100
 Description: _____
 File Name: Wash33T8R6

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank
Channel Material	Miscellaneous				
	Coarse Gravel	nb	0.028	0.028	0.028
	Cobble		0.030 - 0.050		
	Boulder		0.040 - 0.070		
Degree of Irregularity	Smooth	n1	0		
	Minor		0.001 - 0.005	0.002	0.002
	Moderate		0.006 - 0.010		
	Severe		0.011 - 0.020		
Effects of Obstruction (b)	Negligible	n2	0 - 0.004		
	Minor		0.005 - 0.015	0.005	0.005
	Appreciable		0.020 - 0.030		
	Severe		0.040 - 0.060		
Vegetation	Small	n3	0.002 - 0.010		
	Medium		0.010 - 0.025	0.01	0.01
	Large		0.025 - 0.050		
	Very Large		0.050 - 0.100		
Variations in Channel Cross Section.	Gradual	n4	0	0	0
	Occasionally Alt.		0.001 - 0.005		
	Frequently Alt.		0.010 - 0.015		
Degree of Meandering (c)	Minor	m	1.00	1	1
	Appreciable		1.15		
	Severe		1.30		
n = (nb + n1 + n2 + n3 + n4)m			0.045	0.050	0.045
Assigned Manning's n value					

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

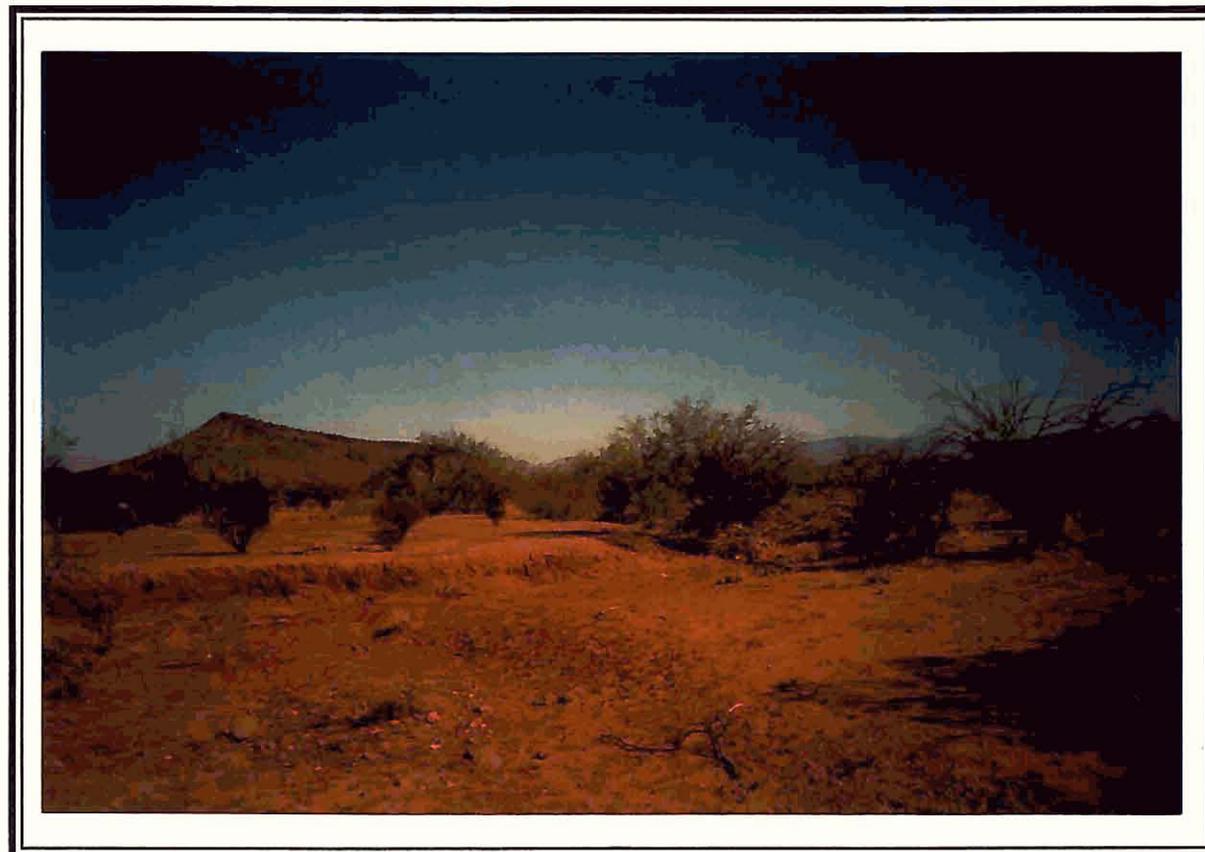
Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Tributary to Sols Wash AH2
 Location: Near Cross Section 300
 Description: _____
 File Name: Wash33T8R6

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.01	0.01	0.01
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.045	0.045	0.045	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Tributary to Sols Wash AH2
 Location: Downstream of Cross Section 400
 Description: Near US 60
 File Name: Wash33T8R6

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank
Channel Material	Miscellaneous	nb	0.028	0.028	0.028
	Coarse Gravel				
	Cobble				
	Boulder				
Degree of Irregularity	Smooth	n1	0	0.002	0.002
	Minor				
	Moderate				
	Severe				
Effects of Obstruction (b)	Negligible	n2	0.005	0.005	0.005
	Minor				
	Appreciable				
	Severe				
Vegetation	Small	n3	0.01	0.015	0.01
	Medium				
	Large				
	Very Large				
Variations in Channel Cross Section.	Gradual	n4	0	0	0
	Occasionally Alt.				
	Frequently Alt.				
Degree of Meandering (c)	Minor	m	1	1	1
	Appreciable				
	Severe				
n = (nb + n1 + n2 + n3 + n4)m			0.045	0.050	0.045
Assigned Manning's n value					

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Sols Wash Tributary AH3
 Location: Near Cross Section 100
 Description: _____
 File Name: Wash22T7R6

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.015	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.050	0.055	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

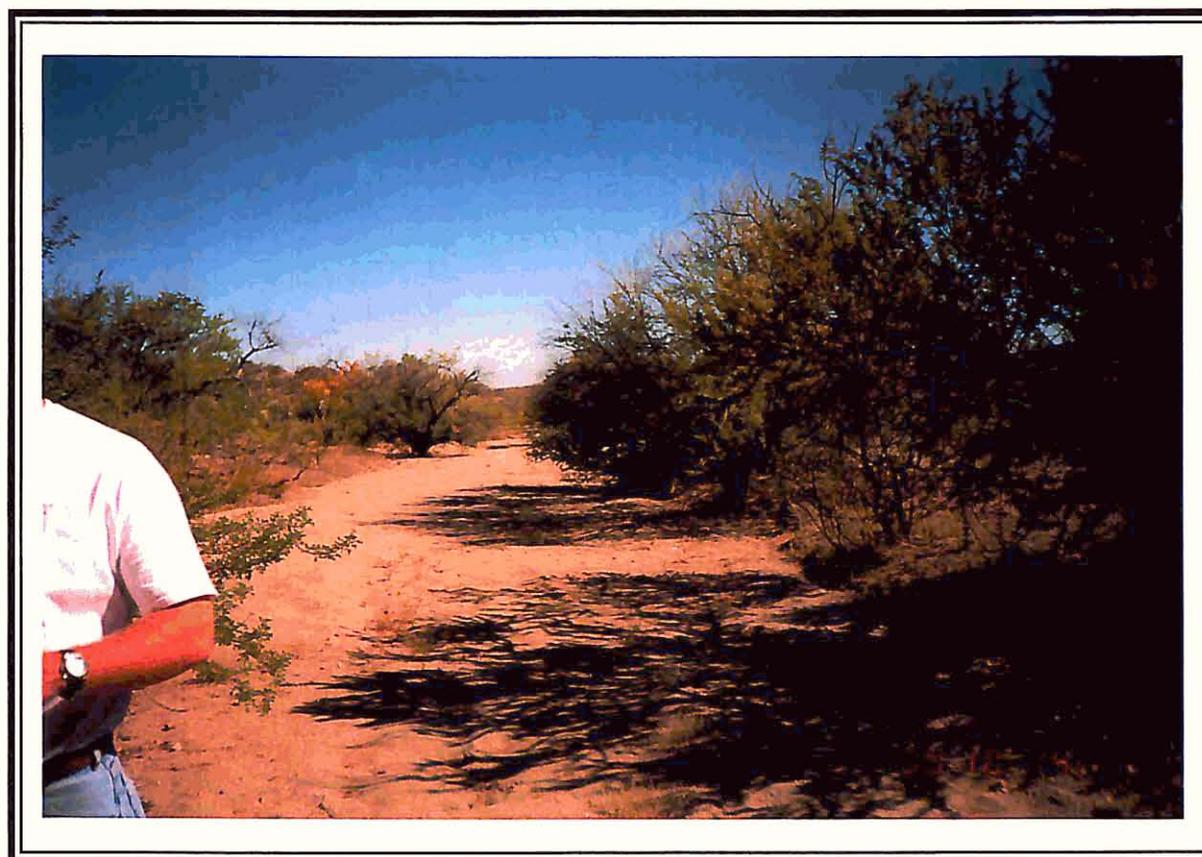
Project: Wickenburg Zone 'A' Study WPA Job No: 99958
 Watercourse: Tributary to Hartman Wash
 Location: Near Cross Section 100
 Description: _____
 File Name: Wash27T7R6

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.015	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.050	0.055	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

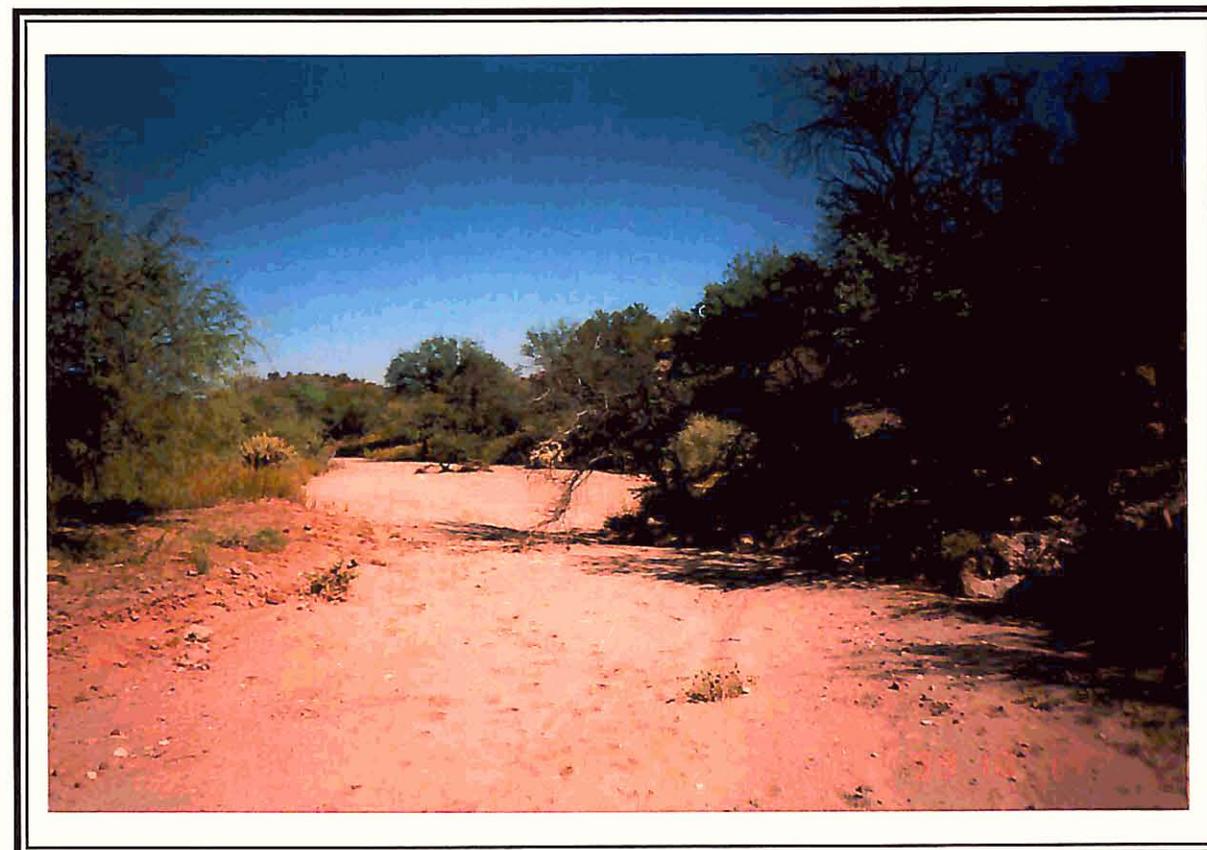
Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Yucca Flat Wash
 Location: Near Cross Section 200
 Description: _____
 File Name: Wash19T7R5

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.015	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0		
	Occasionally Alt.		0.001 - 0.005	0.005		0.005
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.060	0.050	0.060	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

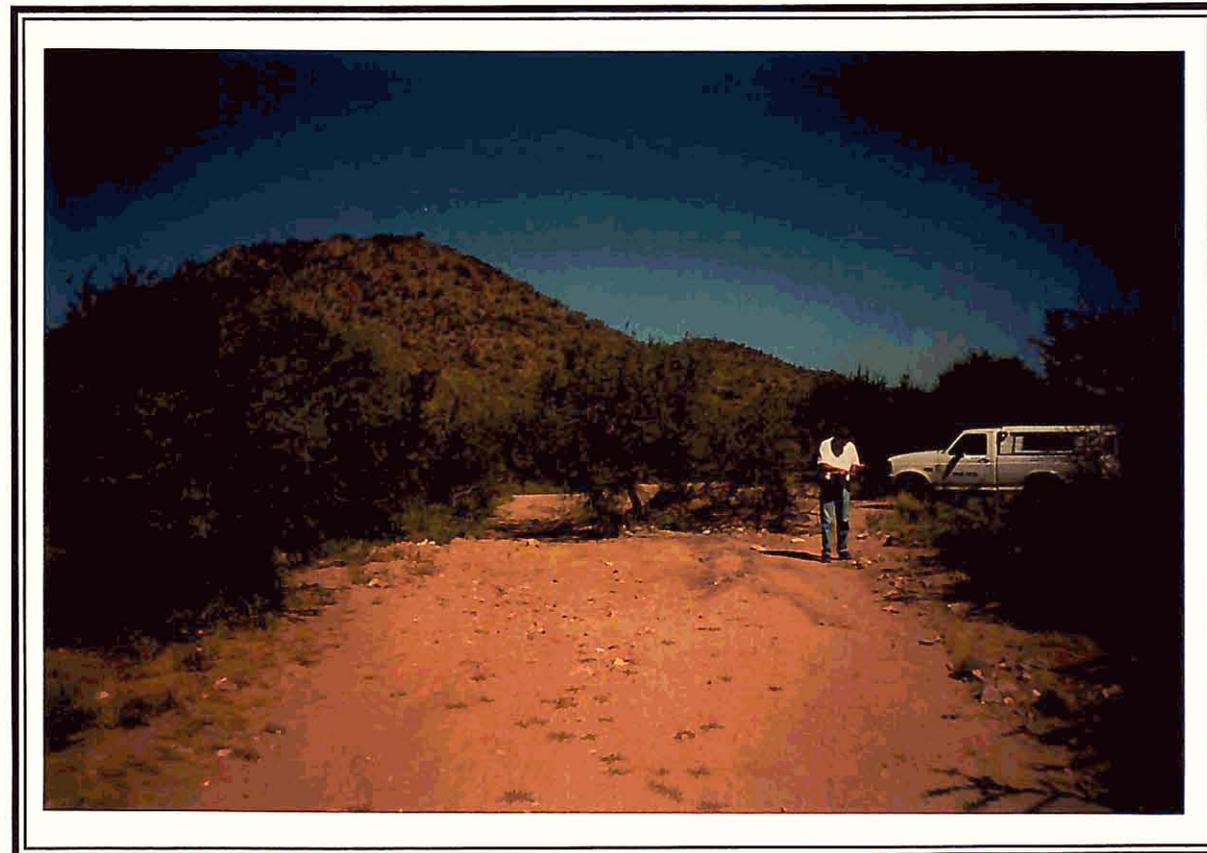
Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Yucca Flat Wash
 Location: Near Cross Section 300
 Description: _____
 File Name: Wash19T7R5

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.015	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0		
	Occasionally Alt.		0.001 - 0.005	0.005		0.005
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.060	0.050	0.060	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

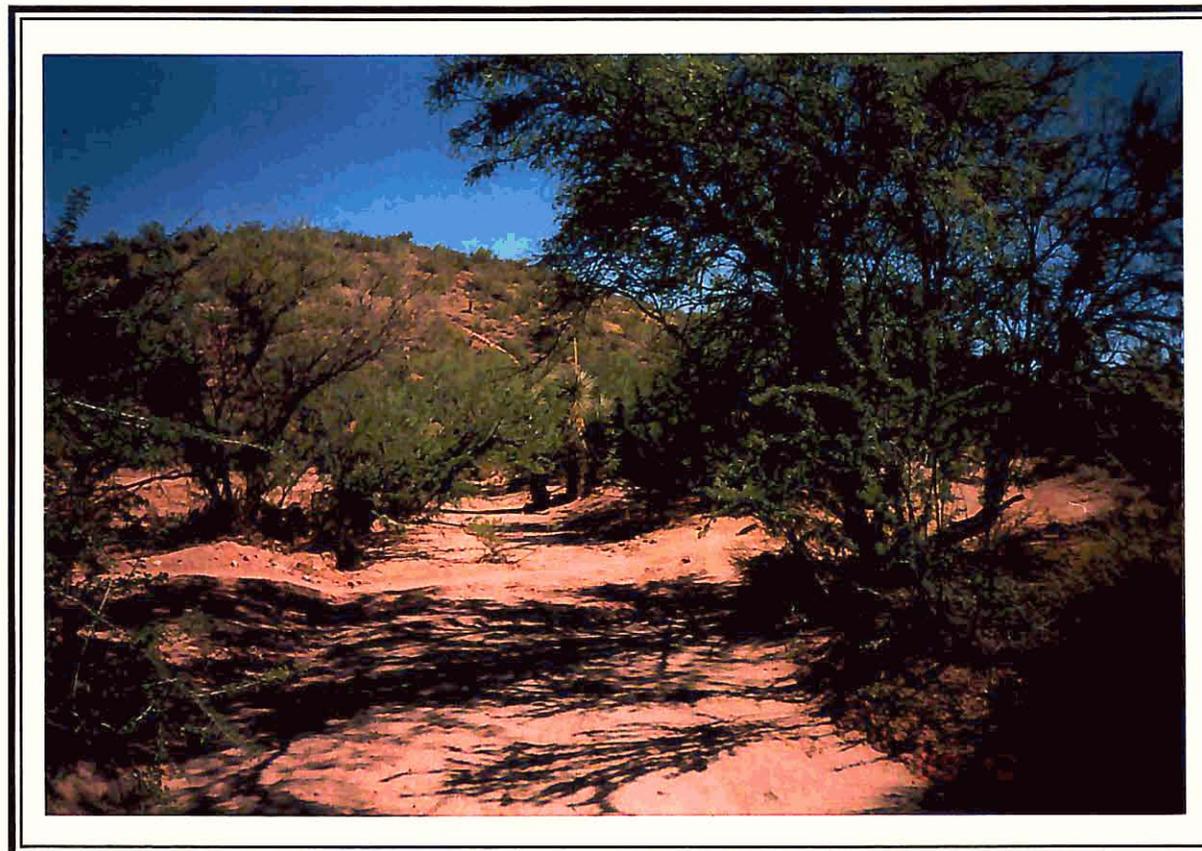
Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Holly Wash
 Location: Near Cross Section 200
 Description: _____
 File Name: Wash20T7R5

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.015	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.050	0.055	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Cemetery Wash
 Location: Near Cross Section 300
 Description: _____
 File Name: Wash28T7R5

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.02	0.015	0.02
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0			
	Occasionally Alt.		0.001 - 0.005	0.005	0.005	0.005
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.065	0.055	0.065	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Cemetery Wash
 Location: Near Cross Section 400
 Description: _____
 File Name: Wash28T7R5

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.015	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0		
	Occasionally Alt.		0.001 - 0.005	0.005		0.005
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.060	0.050	0.060	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Turtleback Wash
 Location: Near Cross Section 900
 Description: _____
 File Name: Wash24T7R5

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.015	0.01	0.015
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.02	0.015	0.02
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0			
	Occasionally Alt.		0.001 - 0.005	0.005	0.005	0.005
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.070	0.060	0.070	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Turtleback Wash
 Location: Near Cross Section 1100
 Description: _____
 File Name: Wash24T7R5

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.01	0.01	0.01
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.02	0.02	0.02
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section	Gradual	n4	0			
	Occasionally Alt.		0.001 - 0.005	0.002	0.002	0.002
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.075	0.065	0.075	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: San Domingo Wash
 Location: Near Cross Section 800
 Description: _____
 File Name: Wash35T7R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.02	0.01	0.02
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.005	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.065	0.045	0.065	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



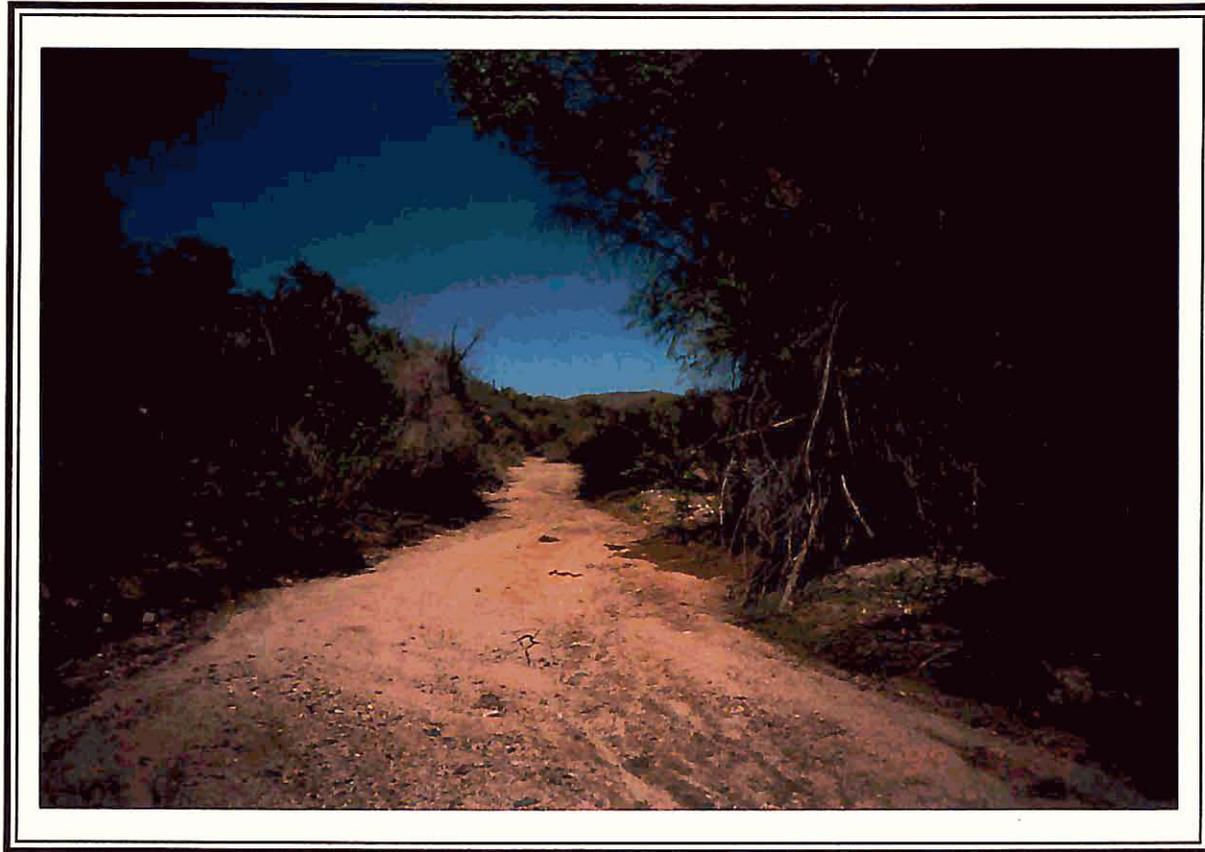
DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Tub Spring Wash
 Location: Near Cross Section 1000
 Description: _____
 File Name: Wash35T7R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.02	0.015	0.02
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.060	0.050	0.060	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: San Domingo Wash
 Location: Near Cross Section 2200
 Description: _____
 File Name: Wash35T7R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.01	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.045	0.055	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Ox Wash
 Location: Near Cross Section 800
 Description: _____
 File Name: Wash1T6R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.02	0.015	0.02
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.060	0.050	0.060	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Ox Wash
 Location: Near Cross Section 500
 Description: _____
 File Name: Wash1T6R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.01	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.02	0.01	0.02
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0			
	Occasionally Alt.		0.001 - 0.005	0.005	0.005	0.005
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.065	0.055	0.065	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.

OX WASH

CROSS SECTION: 800



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Ox Wash
 Location: Near Cross Section 1000
 Description: _____
 File Name: Wash1T6R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.02	0.01	0.02
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.045	0.055	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Tributary to Little San Domingo Wash
 Location: Upstream of Cross Section 100
 Description: _____
 File Name: Wash14T6R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.015	0.01	0.015
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025		0.01	
	Large		0.025 - 0.050	0.025		0.025
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	0
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	1
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.070	0.050	0.070	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.

TRIBUTARY TO LITTLE SAN DOMINGO WASH



UPSTREAM CROSS SECTION 100



UPSTREAM CONFLUENCE

Manning's "n" value calculation record using the FCDMC Method (1991)

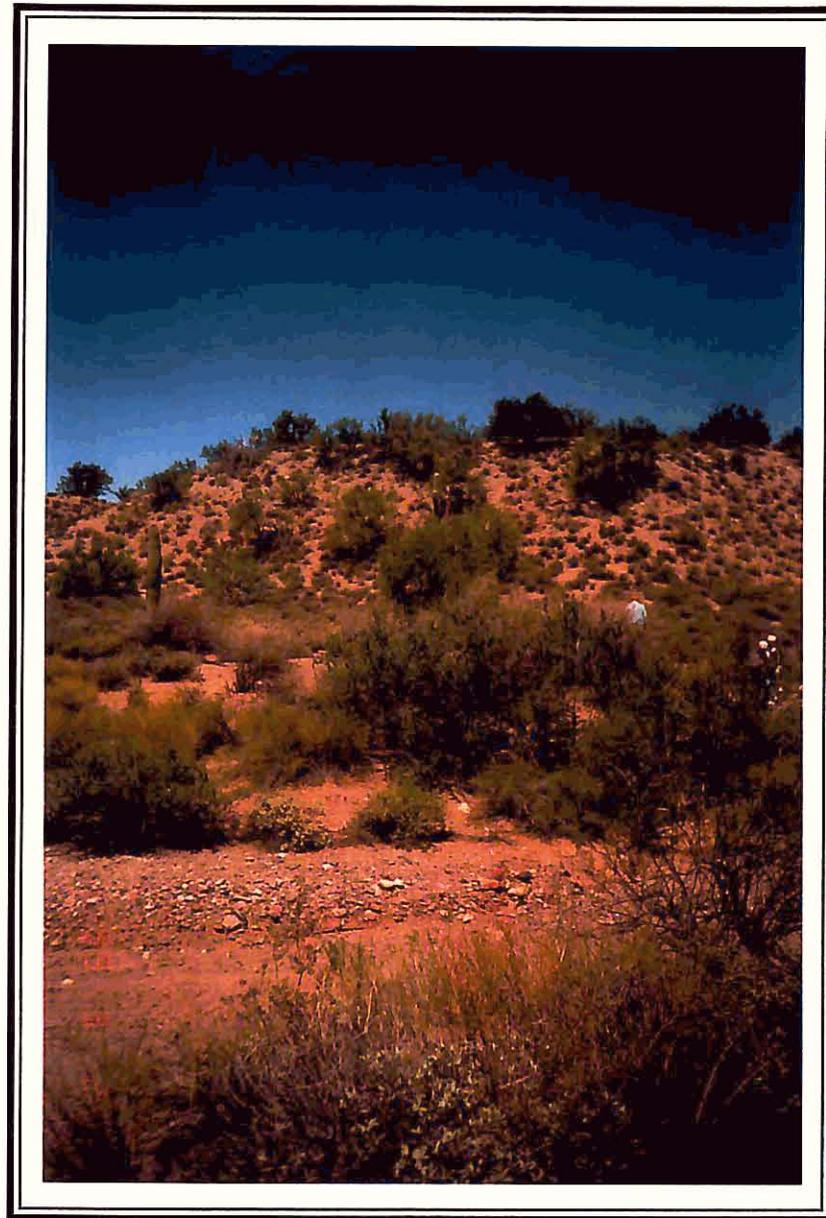
Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Tributary to Little San Domingo Wash
 Location: Near Cross Section 200
 Description: _____
 File Name: Wash14T6R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank
Channel Material	Miscellaneous	nb			
	Coarse Gravel		0.028	0.028	0.028
	Cobble		0.030 - 0.050		
	Boulder		0.040 - 0.070		
Degree of Irregularity	Smooth	n1	0		
	Minor		0.001 - 0.005	0.002	0.002
	Moderate		0.006 - 0.010		
	Severe		0.011 - 0.020		
Effects of Obstruction (b)	Negligible	n2	0 - 0.004		
	Minor		0.005 - 0.015	0.015	0.015
	Appreciable		0.020 - 0.030		
	Severe		0.040 - 0.060		
Vegetation	Small	n3	0.002 - 0.010		
	Medium		0.010 - 0.025	0.01	
	Large		0.025 - 0.050	0.025	0.025
	Very Large		0.050 - 0.100		
Variations in Channel Cross Section.	Gradual	n4	0	0	0
	Occasionally Alt.		0.001 - 0.005		
	Frequently Alt.		0.010 - 0.015		
Degree of Meandering (c)	Minor	m	1.00	1	1
	Appreciable		1.15		
	Severe		1.30		
n = (nb + n1 + n2 + n3 + n4)m			0.070	0.050	0.070
Assigned Manning's n value					

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



RIGHT OVERBANK

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Tributary to Little San Domingo Wash
 Location: Near Cross Section 300
 Description: West Railroad
 File Name: Wash14T6R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.015	0.01	0.015
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025		0.01	
	Large		0.025 - 0.050	0.025		0.025
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	0
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	1
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.070	0.050	0.070	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Tributary to Little San Domingo Wash
 Location: Near Cross Section 400
 Description: Upstream of US 93
 File Name: Wash14T6R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005			
	Moderate		0.006 - 0.010	0.008	0.008	0.008
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025		0.012	
	Large		0.025 - 0.050	0.025		0.025
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0			
	Occasionally Alt.		0.001 - 0.005	0.004	0.002	0.004
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.070	0.055	0.070	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM @ CULVERT

Manning's "n" value calculation record using the FCDMC Method (1991)

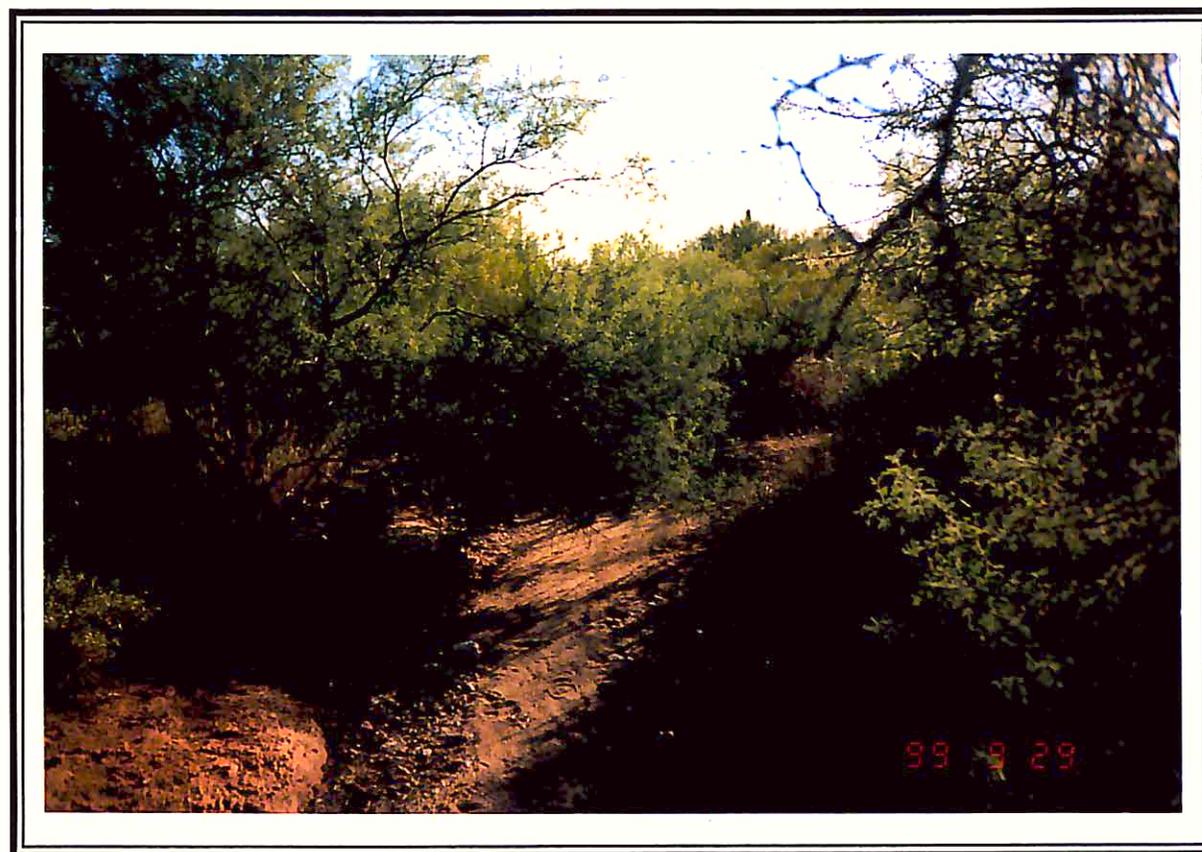
Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Tributary to Little San Domingo Wash
 Location: Near Cross Section 600
 Description: _____
 File Name: Wash14T6R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.02		0.02
	Large		0.025 - 0.050		0.03	
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0		
	Occasionally Alt.		0.001 - 0.005	0.005		0.005
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.060	0.065	0.060	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



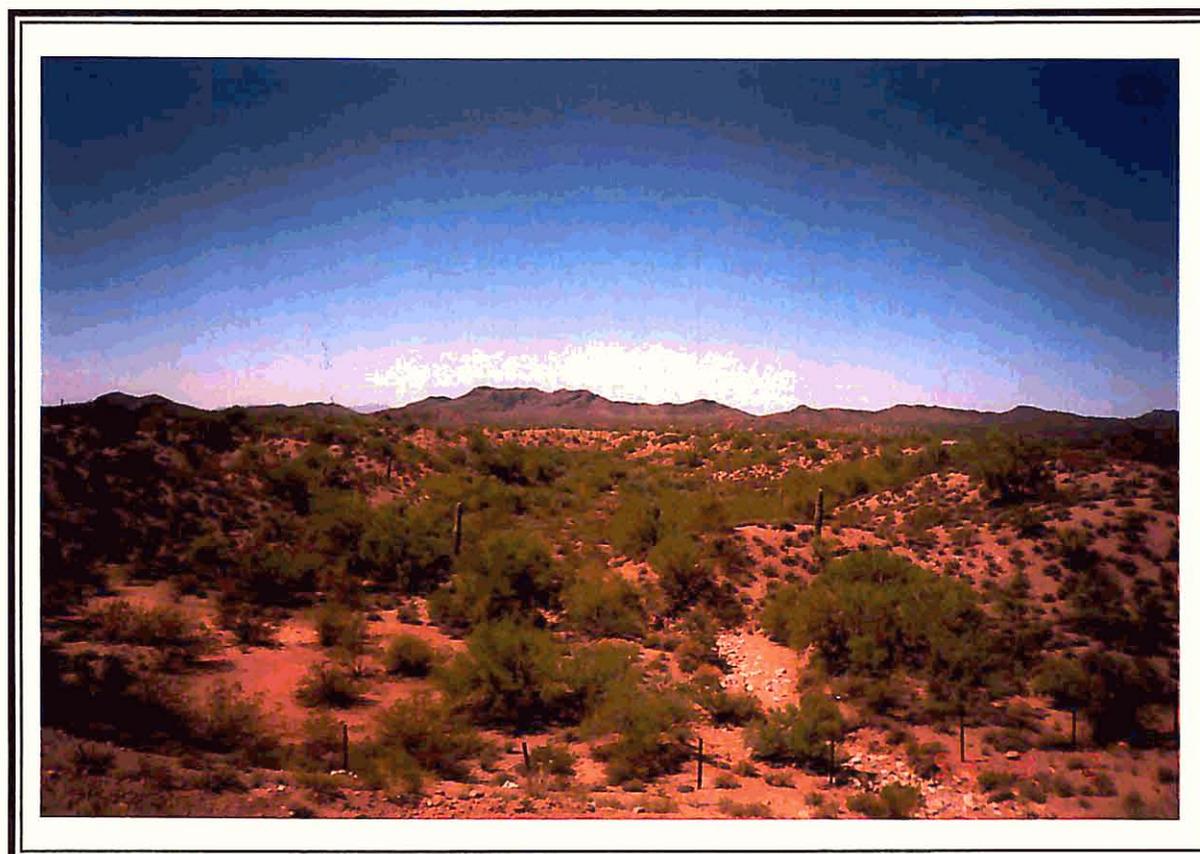
UPSTREAM



DOWNSTREAM



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Little San Domingo Wash
 Location: Near Cross Section 200
 Description: _____
 File Name: Wash7T6R3

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.01	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.045	0.055	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Little San Domingo Wash
 Location: Near Cross Section 300
 Description: _____
 File Name: Wash7T6R3

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank
Channel Material	Miscellaneous	nb	0.028	0.028	0.028
	Coarse Gravel				
	Cobble				
	Boulder				
Degree of Irregularity	Smooth	n1	0	0.002	0.002
	Minor				
	Moderate				
	Severe				
Effects of Obstruction (b)	Negligible	n2	0 - 0.004	0.005	0.005
	Minor				
	Appreciable				
	Severe				
Vegetation	Small	n3	0.002 - 0.010	0.02	0.01
	Medium				
	Large				
	Very Large				
Variations in Channel Cross Section.	Gradual	n4	0	0	0
	Occasionally Alt.				
	Frequently Alt.				
Degree of Meandering (c)	Minor	m	1.00	1	1
	Appreciable				
	Severe				
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.045	0.055
Assigned Manning's n value					

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Little San Domingo Wash
 Location: Near Cross Section 500
 Description: _____
 File Name: Wash7T6R3

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.01	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.045	0.055	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Little San Domingo Wash
 Location: Near Cross Section 800
 Description: _____
 File Name: Wash7T6R3

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.005	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.01	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.045	0.055	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Little San Domingo Wash
 Location: Near Cross Section 900
 Description: _____
 File Name: Wash7T6R3

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank
Channel Material	Miscellaneous				
	Coarse Gravel	nb	0.028	0.028	0.028
	Cobble		0.030 - 0.050		
	Boulder		0.040 - 0.070		
Degree of Irregularity	Smooth	n1	0		
	Minor		0.001 - 0.005	0.002	0.002
	Moderate		0.006 - 0.010		
	Severe		0.011 - 0.020		
Effects of Obstruction (b)	Negligible	n2	0 - 0.004		
	Minor		0.005 - 0.015	0.01	0.005
	Appreciable		0.020 - 0.030		
	Severe		0.040 - 0.060		
Vegetation	Small	n3	0.002 - 0.010		
	Medium		0.010 - 0.025	0.015	0.01
	Large		0.025 - 0.050		
	Very Large		0.050 - 0.100		
Variations in Channel Cross Section.	Gradual	n4	0	0	0
	Occasionally Alt.		0.001 - 0.005		
	Frequently Alt.		0.010 - 0.015		
Degree of Meandering (c)	Minor	m	1.00	1	1
	Appreciable		1.15		
	Severe		1.30		
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.045	0.055
Assigned Manning's n value					

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Little San Domingo Wash
 Location: Near Cross Section 1100
 Description: _____
 File Name: Wash7T6R3

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.01	0.01	0.01
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.02	0.015	0.02
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0		
	Occasionally Alt.		0.001 - 0.005	0.005		0.005
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.065	0.055	0.065	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

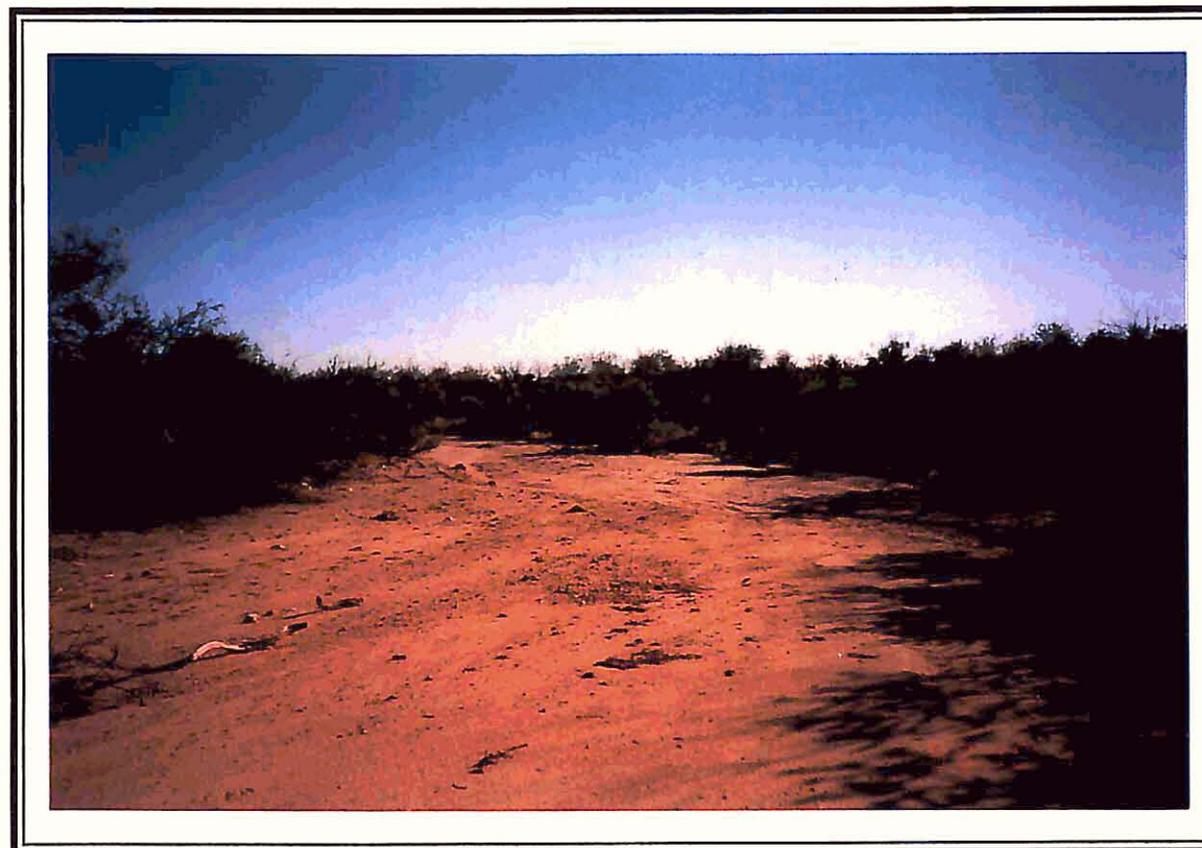
Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Tributary to Sols Wash
 Location: Near Cross Section 200
 Description: _____
 File Name: Wash32T8R5

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.015	0.01	0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0		
	Occasionally Alt.		0.001 - 0.005	0.005		0.005
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.045	0.055	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Tributary to Amir Wash
 Location: Near Cross Section 200
 Description: Near US 93
 File Name: Wash34T8R5

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.005	0.005	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.025	0.015	0.025
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0			
	Occasionally Alt.		0.001 - 0.005	0.002	0.002	0.002
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.065	0.055	0.065	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM



UPSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Wash28T7R4
 Location: Near Cross Section 100
 Description: Railroad Bridge
 File Name: Wash28T7R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank
Channel Material	Miscellaneous	nb			
	Coarse Gravel		0.028	0.028	0.028
	Cobble		0.030 - 0.050		
	Boulder		0.040 - 0.070		
Degree of Irregularity	Smooth	n1	0		
	Minor		0.001 - 0.005	0.002	0.002
	Moderate		0.006 - 0.010		
	Severe		0.011 - 0.020		
Effects of Obstruction (b)	Negligible	n2	0 - 0.004		
	Minor		0.005 - 0.015	0.02	0.02
	Appreciable		0.020 - 0.030		
	Severe		0.040 - 0.060		
Vegetation	Small	n3	0.002 - 0.010		
	Medium		0.010 - 0.025		
	Large		0.025 - 0.050		0.03
	Very Large		0.050 - 0.100	0.06	0.06
Variations in Channel Cross Section.	Gradual	n4	0		
	Occasionally Alt.		0.001 - 0.005		
	Frequently Alt.		0.010 - 0.015	0.01	0.01
Degree of Meandering (c)	Minor	m	1.00	1	1
	Appreciable		1.15		
	Severe		1.30		
n = (nb + n1 + n2 + n3 + n4)m					
Assigned Manning's n value			0.120	0.090	0.120

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



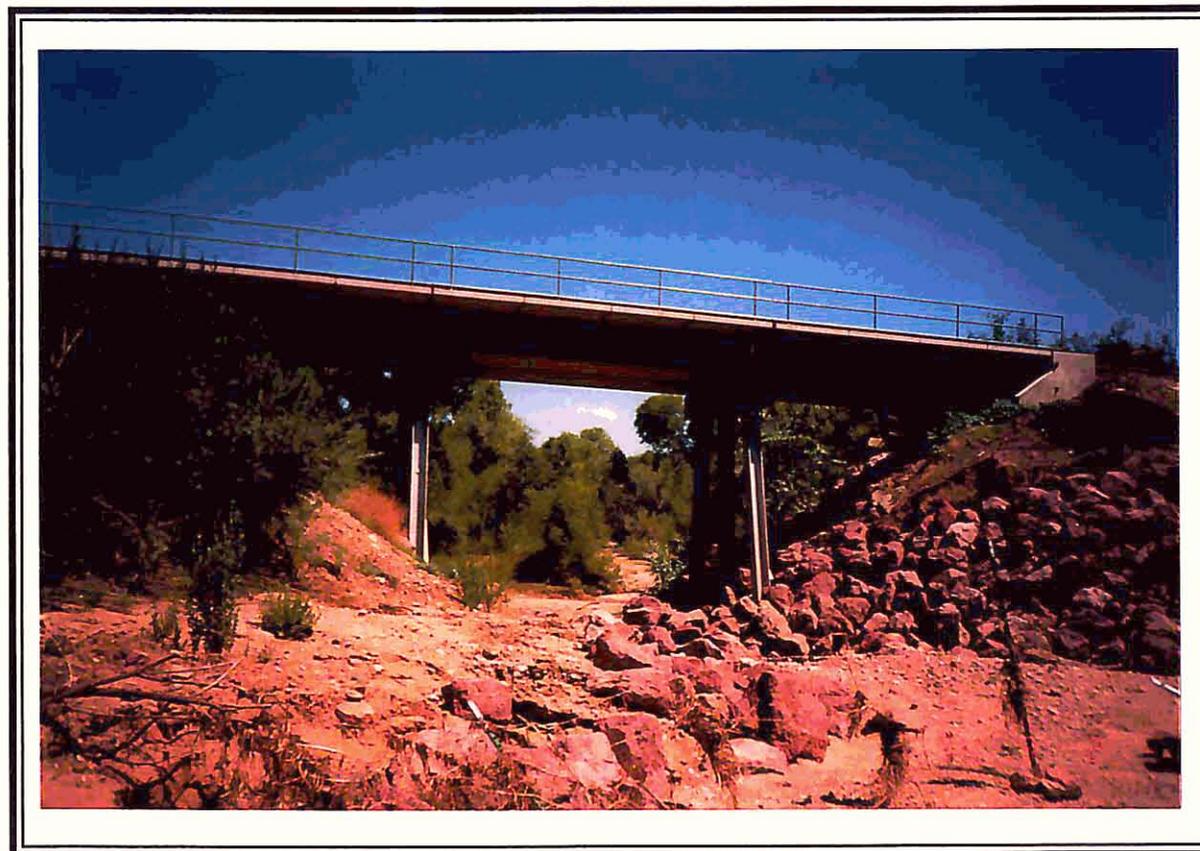
UPSTREAM



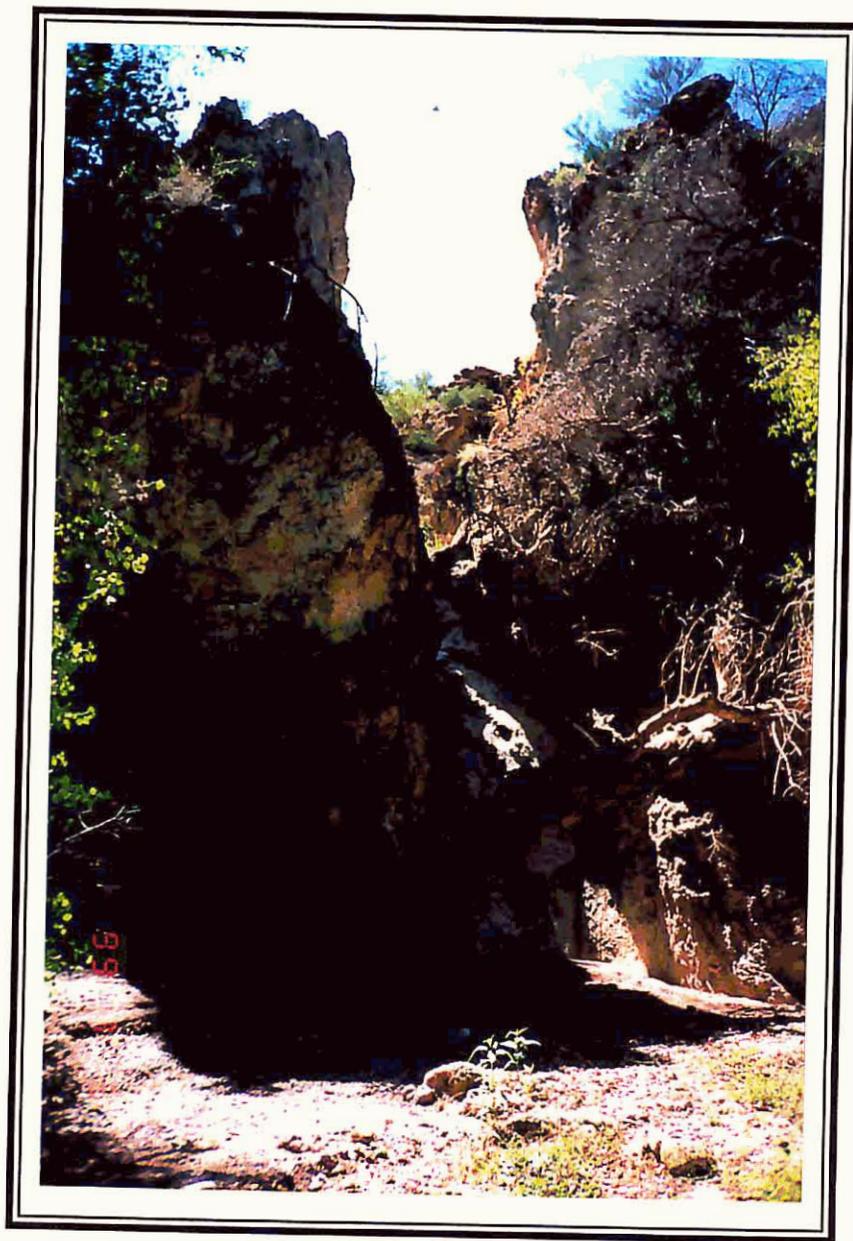
DOWNSTREAM



UPSTREAM



DOWNSTREAM



UPSTREAM AT DROP

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Wash3T6R4
 Location: Near Cross Section 600
 Description: _____
 File Name: Wash3T6R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank
Channel Material	Miscellaneous	nb			
	Coarse Gravel		0.028	0.028	0.028
	Cobble		0.030 - 0.050		
	Boulder		0.040 - 0.070		
Degree of Irregularity	Smooth	n1	0		
	Minor		0.001 - 0.005	0.002	0.002
	Moderate		0.006 - 0.010		
	Severe		0.011 - 0.020		
Effects of Obstruction (b)	Negligible	n2	0 - 0.004		
	Minor		0.005 - 0.015	0.005	0.005
	Appreciable		0.020 - 0.030		
	Severe		0.040 - 0.060		
Vegetation	Small	n3	0.002 - 0.010	0.008	
	Medium		0.010 - 0.025	0.02	0.02
	Large		0.025 - 0.050		
	Very Large		0.050 - 0.100		
Variations in Channel Cross Section.	Gradual	n4	0	0	0
	Occasionally Alt.		0.001 - 0.005	0.002	
	Frequently Alt.		0.010 - 0.015		
Degree of Meandering (c)	Minor	m	1.00	1	1
	Appreciable		1.15		
	Severe		1.30		
n = (nb + n1 + n2 + n3 + n4)m			0.055	0.045	0.055
Assigned Manning's n value					

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

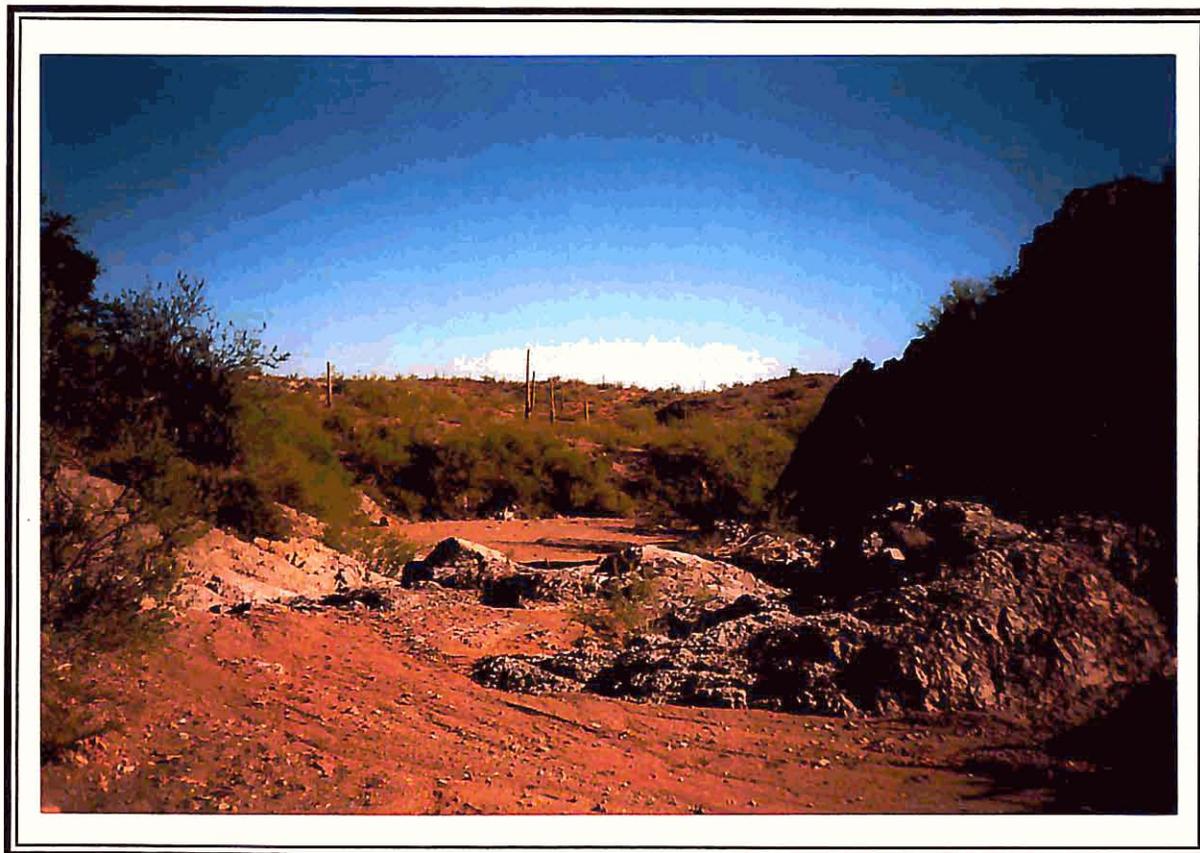
Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Wash15T6R4
 Location: Near Cross Section 300
 Description: _____
 File Name: Wash15T6R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank
Channel Material	Miscellaneous	nb	0.028	0.028	0.028
	Coarse Gravel				
	Cobble				
	Boulder				
Degree of Irregularity	Smooth	n1	0	0.007	0.007
	Minor				
	Moderate				
	Severe				
Effects of Obstruction (b)	Negligible	n2	0.005	0.005	0.005
	Minor				
	Appreciable				
	Severe				
Vegetation	Small	n3	0.02	0.01	0.02
	Medium				
	Large				
	Very Large				
Variations in Channel Cross Section.	Gradual	n4	0	0	0
	Occasionally Alt.				
	Frequently Alt.				
Degree of Meandering (c)	Minor	m	1	1	1
	Appreciable				
	Severe				
n = (nb + n1 + n2 + n3 + n4)m			0.060	0.050	0.060
Assigned Manning's n value					

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM

Manning's "n" value calculation record using the FCDMC Method (1991)

Project: Wickenburg Zone "A" Study WPA Job No: 99958
 Watercourse: Wash15T6R4
 Location: Near Cross Section 700
 Description: _____
 File Name: Wash15T6R4

Channel Conditions		Manning's Adjustment (a)	Left Overbank	Channel	Right Overbank	
Channel Material	Miscellaneous	nb				
	Coarse Gravel		0.028	0.028	0.028	0.028
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0			
	Minor		0.001 - 0.005	0.002	0.002	0.002
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstruction (b)	Negligible	n2	0 - 0.004			
	Minor		0.005 - 0.015	0.005	0.005	0.005
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025		0.015	
	Large		0.025 - 0.050	0.03		0.03
	Very Large		0.050 - 0.100			
Variations in Channel Cross Section.	Gradual	n4	0	0	0	
	Occasionally Alt.		0.001 - 0.005			
	Frequently Alt.		0.010 - 0.015			
Degree of Meandering (c)	Minor	m	1.00	1	1	
	Appreciable		1.15			
	Severe		1.30			
n = (nb + n1 + n2 + n3 + n4)m			0.065	0.050	0.065	
Assigned Manning's n value						

- Notes: (a) Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (nb) before multiplying by the adjustment for meander.
 (b) Conditions considered in other steps must not be duplicated in this section.
 (c) Adjustment values apply to flow confined in the channel and do not apply where flow breaks out of channel banks and crosses meanders.



UPSTREAM



DOWNSTREAM