

CAVE CREEK DRAINAGE MASTER PLAN Manning's "n" Value Report for Galloway Wash Tributaries, Willow Springs Wash Tributaries, and Cave Creek Tributaries within Cave Creek, Arizona

Prepared for:



FILE COPY

Flood Control District of Maricopa County
Contract No. FCD2004C072

Prepared by:

HDR

ONE COMPANY
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August 17, 2007

FLOOD CONTROL DISTRICT RECEIVED	
AUG 23 '07	
CH & GM	FINANCE
PIO	LANDS
ADMIN	O & M
REG	P & PM
ENG	FILE
CONTRACTS	
ROUTING	<i>PET</i>



ONE COMPANY
Many SolutionsSM

Comments and Resolutions for Phase II Manning's n Value Report

Project: Cave Creek Drainage Master Plan, Phase II	Computed: M.Fountain	Date: 08/17/2007
Subject: Manning's n Value Report Review	Checked: L.Potter	Date: 08/17/2007
Task: Comment Resolution		

Draft Manning's n Value Report Comments dated July 13th, 2007, Cave Creek DMP

The following is a list of comments and resolutions is categorized by order from which they were received. The original comment is listed first, with the response (action taken) following in **bold print**.

August 17, 2007

- Please remove the word "wash" from the label "Cave Creek Wash Tributaries" in Figures 1 and 2, and elsewhere it may be found within the report

HDR – All occurrences of the word "wash" in the naming reference for the Cave Creek Tributaries have been removed. (Text, Figures, Exhibits, and Data Models)

- On page 5 of the draft, please replace the word "Estimating" in the report title with the word "Estimated".

HDR – Correction has been completed as requested.

- The channel base N value of 0.045 should be reduced where noted on the calc sheets to better reflect the relative photos. The revised channel N values should be closer to 0.04.

HDR – The base n Value has been reduced to 0.040 as recommended.

- The base N value of 0.05 for main channels is too high for a number of locations. This value is for the high-end of the particle class range, and therefore implies that the cobble sizes are predominantly 10" in diameter. The relative photo sets did not bear this out. Therefore the values should be adjusted accordingly. For most locations thus noted a base N value of 0.045 will be more appropriate.

HDR – The base n Value has been reduced to 0.045 as recommended.

- Following revisions suggested above in comments 4 and 5 and by additional redline comments on the calculation sheets, report tables 1 and 2 and the full-size exhibits should be updated.

HDR – All calculation sheet redlines have been completed as recommended. Tables 1 through 6 have been updated to reflect the corresponding values and all exhibits have been revised to reflect the change in the Manning's n Values respectively.

- The font size for the page number on the calculation sheets vary.

HDR – All page numbers and page formatting on the calculations sheets has been revised for uniformity while a correction for the total page count has been completed.

- Several labels on the full-size exhibits should be brought to the front of the layers so they are clearer.

HDR – Obstructed labels have been relocated and brought to the front for clarification of content.

- On the full-size exhibits it looks like the channel and over bank areas are estimated by polygons. If this is the case, then there appear to be areas for which the channel was extended up the side of embankments well beyond the channel shown by aerial photo. The polygons should be checked accordingly and if they are used to automatically establish channel bank stations, they should be revised.

HDR – Polygon areas of extension upon the overbank (as noted per comment redlines) have been revised to reflect the channel accordingly. The polygons provided on the exhibits are utilized for the Manning's n Value and are not utilized to automatically establish the channel banks.

(The process of automated bank collection from GIS is completed within the ArcGIS and HEC-GeORAS during the floodplain delineation process, not a part of this Manning's n Value Report.)

Manning's "n" Value Report for Galloway Wash Tributaries, Willow Springs Wash Tributaries, and Cave Creek Tributaries within Cave Creek, Arizona

A Component of the Cave Creek Drainage Master Plan, Phase II, Floodplain Delineation

Prepared for:



Flood Control District of Maricopa County

Prepared by:

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August 17, 2007

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APPENDIX A

SITE RECONNAISSANCE PHOTOGRAPHY LOG

APPENDIX B

MANNING'S "n" VALUE DETERMINATION AND SITE RECONNAISSANCE PHOTOGRAPHS FOR
GALLOWAY WASH TRIBUTARIES

APPENDIX C

MANNING'S "n" VALUE DETERMINATION AND SITE RECONNAISSANCE PHOTOGRAPHS FOR WILLOW
SPRINGS WASH TRIBUTARIES

APPENDIX D

MANNING'S "n" VALUE DETERMINATION AND SITE RECONNAISSANCE PHOTOGRAPHS FOR CAVE
CREEK TRIBUTARIES

APPENDIX E

MANNING'S "n" VALUE DETERMINATION EXHIBITS

APPENDIX F

DISKETTE OF ELECTRONIC DATA FILES

1.0 INTRODUCTION

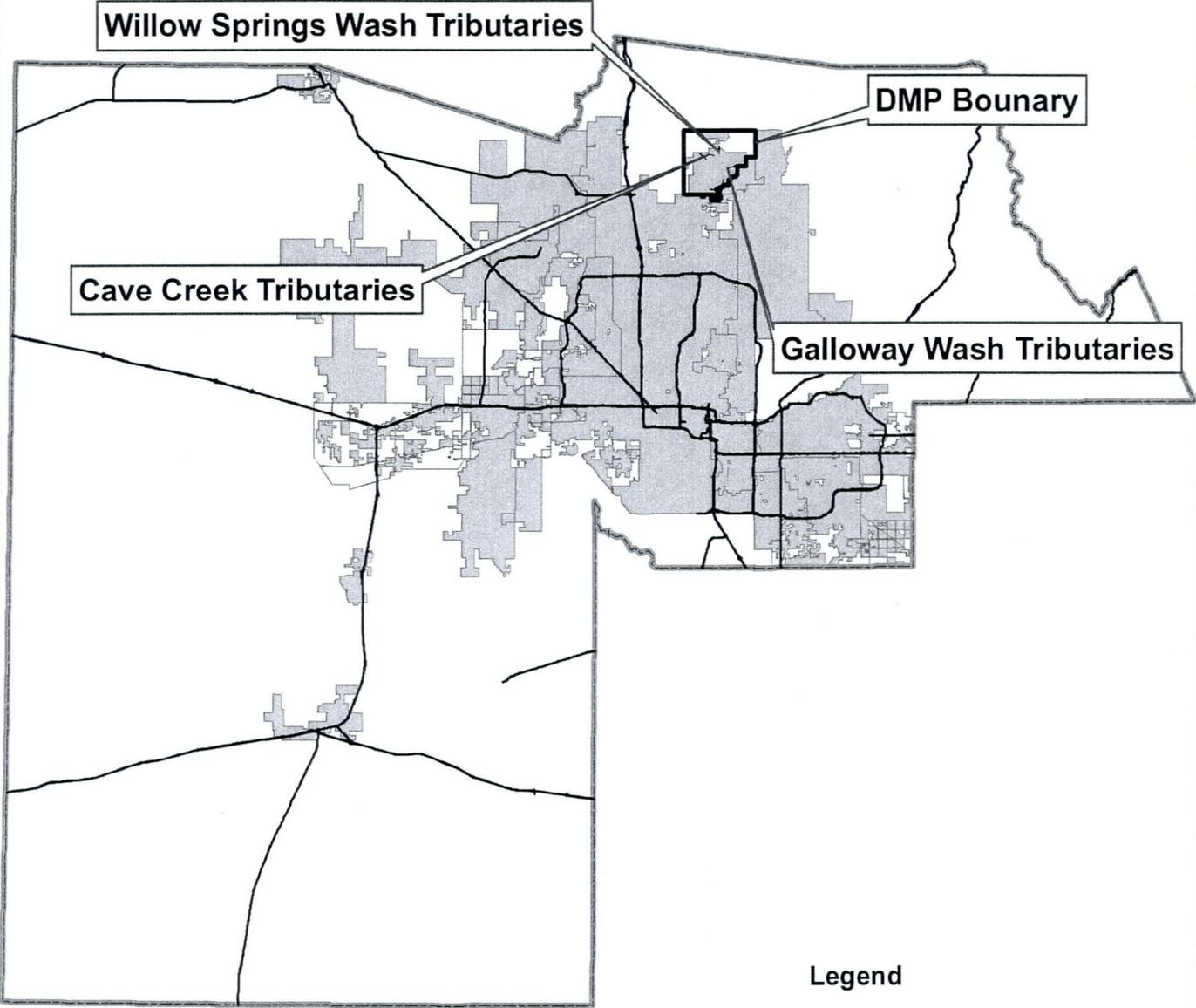
This report is being prepared by HDR Engineering, Inc. in support of the detailed floodplain delineation for Galloway Wash Tributaries, Willow Wash Tributaries, and Cave Creek Tributaries, within Phase II, of the Cave Creek Drainage Master Plan. This report has been prepared under the Flood Control District of Maricopa County (FCDMC) contract number 2004C072. The "n" value assessments, prepared within this report, are approximately located as follows:

- The Galloway Wash Tributaries are bounded on the north by Arroyo Road, the east by 72nd Street, on the south by Tanya Road, and on the west by the Basin Road alignment.
- The Willow Springs Tributaries are bounded on the north by ¼ mile line south of the Spur Cross Preserve, on the east by the 56th Street alignment, on the south by the Hidden Springs Road alignment, and on the west by 54th Street.
- The Cave Creek Tributaries are bounded on the north by the ½ mile line south of Honda Bow Road, on the east by Old Stage Road, on the south by the Lone Mountain Road alignment, and on the west by the 36th Street alignment.

Figure 1, Location Map, and Figure 2, Vicinity Map, are located following this section.

Figure 1: Location Map

Project Locations Within Maricopa County



Legend

- State Highways
- DMP Boundary
- County Boundary
- City Boundary

Manning's "n" Value Report

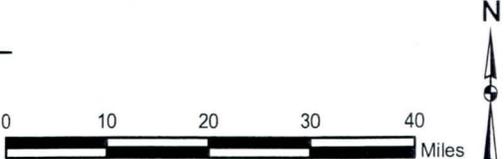
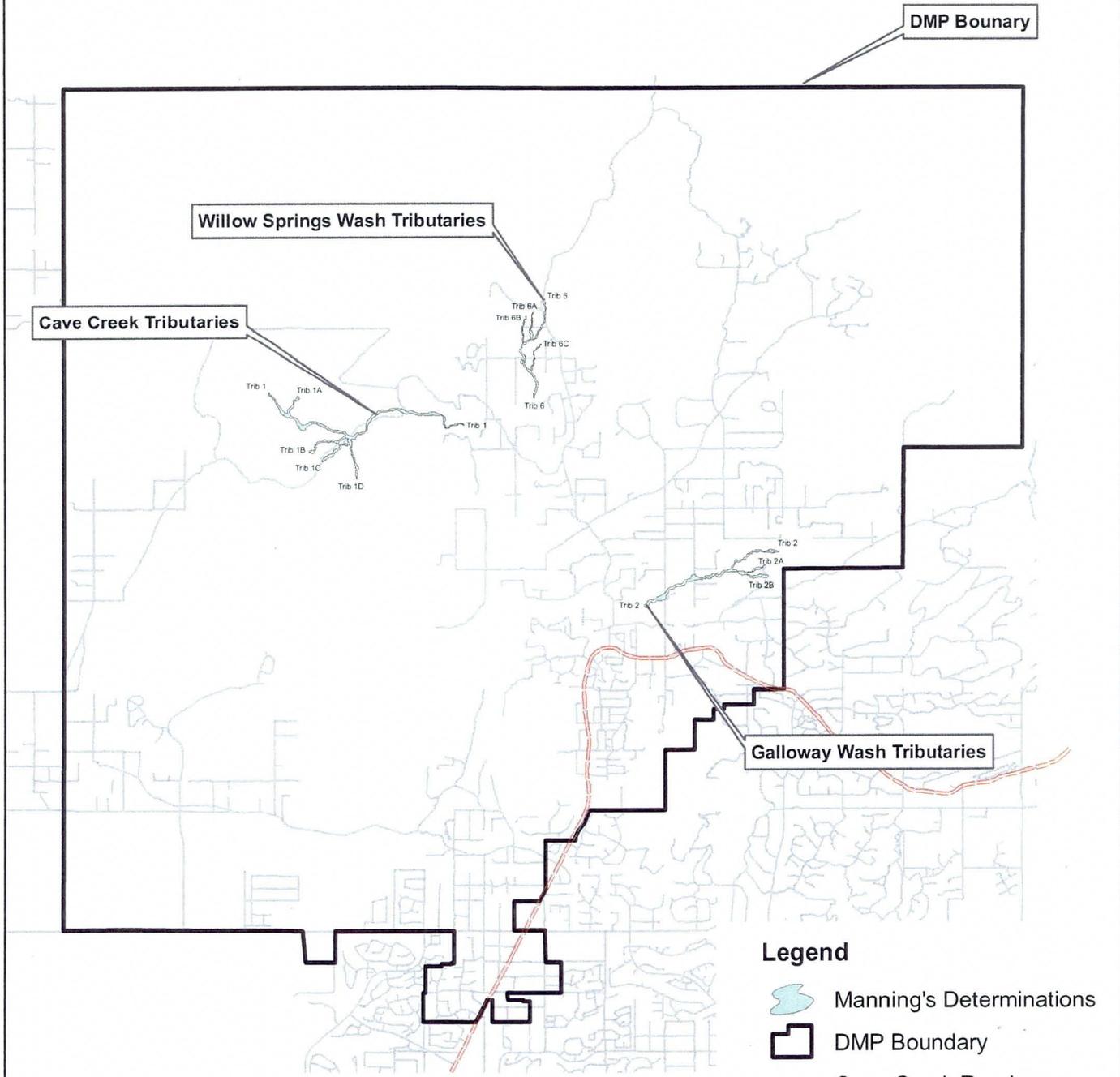


Figure 2: Vicinity Map

Project Vicinities Within Cave Creek DMP



**Cave Creek Drainage Master Plan (DMP)
Phase II - Manning's "n" Value Report**



NOT TO SCALE



2.0 METHODOLOGY

The tributaries described above were examined for areas of similar roughness values. Manning's "n" values were assigned for the existing conditions as they related to each area of similar roughness for the 100-year storm event at the time of the study. The values were determined using the methodology outlined within the United States Geological Survey (USGS) report titled *Estimating Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona* by B.W. Thomsen and H.W. Hjalmarson (April 1991).

Several sources of data were utilized in the development of the "n" values presented within this report. Sources include ortho-rectified aerial photography, (Flight Dates January 2006), site surface photography, and site reconnaissance. Site surface photography and site reconnaissance were conducted on May 18, 24, 25, and 29 of 2007. Appendix A contains the site reconnaissance photo logs.

The "n" values selected represent the roughness factors as close as possible to ensure the energy losses due to friction are properly accounted for. The "n" values were computed by selecting an initial base "n₀" value which represents surface roughness of a straight, uniform channel composed of a known particular bed material. Channel materials and their respective roughness coefficients can vary from the main channel section and within each of the overbanks. Additional factors contributing to the increase of the roughness coefficient include vegetation, channel slope, channel irregularity, obstructions, and a degree of meandering. Each component affects the roughness coefficient with an incremental addition to the base "n₀".

The components of the "n" value equation are computed by:

$$n = (n_0 + n_1 + n_2 + n_3 + n_4) m$$

Where

n₀ = base value of n for a straight uniform channel

n₁ = value for surface irregularities

n₂ = value for obstruction

n₃ = value of vegetation

n₄ = variations in channel cross sections, and

m = degree of meandering

The major adjustments to the base values of "n" utilized within this report are further described in Section 4.0.

3.0 BASE "N" VALUE DETERMINATION

The base "n₀" values utilized within this analysis were selected as average condition within the portions of the wash tributaries with similar characteristics, rather than selecting the smoothest reach possible of existing bed material within each tributary. The bed materials representative of each of the tributaries may vary from fine grain sand to boulders as described in the report titled *Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona*. Tables 1, 2 and 3 illustrate the base "n" value range for each of the study washes and their tributaries.

Table 1: Base "n" Value for Galloway Wash Tributaries

Wash	Tributary	Base "n" Range		
		Left Overbank	Main Channel	Right Overbank
Galloway Wash	Tributary 2	0.030-0.040	0.030-0.045	0.030-0.040
	Tributary 2A	0.030-0.040	0.035-0.040	0.030-0.040
	Tributary 2B	0.040	0.040	0.040

Table 2: Base "n" Value for Willow Springs Wash Tributaries

Wash	Tributary	Base "n" Range		
		Left Overbank	Main Channel	Right Overbank
Willow Springs Wash	Tributary 6	0.030-0.040	0.028-0.045	0.030-0.040
	Tributary 6A	0.035	0.035-0.040	0.035
	Tributary 6B	0.030	0.028-0.035	0.030
	Tributary 6C	0.028-0.035	0.028-0.040	0.028-0.035

Table 3: Base “n” Value for Cave Creek Tributaries

Wash	Tributary	Base “n” Range		
		Left Overbank	Main Channel	Right Overbank
Cave Creek	Tributary 1	0.035-0.050	0.026-0.050	0.030-0.050
	Tributary 1A	0.055	0.050	0.050
	Tributary 1B	0.045	0.045	0.045
	Tributary 1C	0.030-0.040	0.028-0.045	0.030-0.040
	Tributary 1D	0.030-0.035	0.030-0.040	0.030-0.035

4.0 ADJUSTMENTS TO THE BASE VALUE

Major adjustments to the base " n_0 " utilized are for cross-section characteristics. Minor adjustments for the reach characteristics between cross-sections which may include changes of size, shape, and shifts in the direction of flow have not been included as part of this report.

Changes to the base " n_0 " consist of adjustment factors specific to the cross-section which are further described as the degree of channel irregularity (n_1), effects of obstructions (n_2), vegetation (n_3), variations in the channel cross-sections (n_4). Based on the general procedure, the incremental adjustments n_1 through n_4 are added to the base " n_0 " resulting in an increased roughness value. The resultant of the base " n_0 " and the corresponding adjustment factors n_1 through n_4 is then multiplied by the degree of meandering (m), to produce a final " n " value representative of the specific grouping. Refer to Appendix B, C, and D for computations of the Manning Roughness Factor for each wash and their tributaries.

5.0 DETAILED ANALYSIS

Determination of the Manning's Roughness coefficient adjustments factors and their level of impact within each tributary yielded differing results. Portions of the tributaries with similar bed material were evaluated separately to determine the final "n" value for the main channel, left overbank and right overbank. Tables 4-6 illustrate the range for the final roughness coefficient along each wash and their tributaries.

Table 4: Manning's "n" Value for Galloway Wash Tributaries

Wash	Tributary	Manning's "n" Value Range		
		Left Overbank	Main Channel	Right Overbank
Galloway Wash	Tributary 2	0.070-0.085	0.034-0.049	0.070-0.085
	Tributary 2A	0.070-0.080	0.039-0.044	0.070-0.080
	Tributary 2B	0.080	0.044	0.080

Table 5: Manning's "n" Value for Willow Springs Wash Tributaries

Wash	Tributary	Manning's "n" Value Range		
		Left Overbank	Main Channel	Right Overbank
Willow Springs Wash	Tributary 6	0.055-0.085	0.032-0.049	0.055-0.085
	Tributary 6A	0.070	0.039-0.044	0.070
	Tributary 6B	0.065-0.070	0.032-0.039	0.065-0.070
	Tributary 6C	0.055-0.065	0.032-0.044	0.055-0.065

Table 6: Manning's "n" Value for Cave Creek Tributaries

Wash	Tributary	Manning's "n" Value Range		
		Left Overbank	Main Channel	Right Overbank
Cave Creek	Tributary 1	0.060-0.085	0.030-0.054	0.055-0.085
	Tributary 1A	0.080	0.054	0.075
	Tributary 1B	0.070	0.049	0.070
	Tributary 1C	0.055-0.065	0.032-0.049	0.055-0.065
	Tributary 1D	0.055-0.065	0.034-0.044	0.055-0.065

Galloway Wash Tributaries, Willow Springs Wash Tributaries, and Cave Creek Tributaries Manning's "n" Value Report

6.0 REFERENCES

Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona, USGS, April 1991.

Cave Creek Aerial Photography was provided by the Flood Control District of Maricopa County for flight dates of November 2003 through December 2004. Field data was collected May 5, 2006.



**APPENDIX A SITE RECONNAISSANCE PHOTOGRAPHY
LOG**

Galloway Wash Tributaries, Willow Springs Wash Tributaries, and Cave Creek
Tributaries Manning's "n" Value Report

August 17, 2007

Computation



Project:	Cave Creek Drainage Master Plan	Job No.:	40933	Computed:	Mark Fountain	Date:	5/24/2007
Subject:	Phase 2 Manning's Determination	Checked:	Elisa Cote	Date:		Date:	5/29/2007
Task:	Site Evaluation	Sheet:	1	Of:		Of:	32

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
1	1	√					Galloway Wash Tributary, Sheet 1 ds end
	2		√				
	3			√			
	4				√		
	5					√	N-Value Grid
2	6	√					
	7			√			
	8				√		
	9		√				
	10					√	N-Value Grid
3	11	√					Vegetation Increases
	12			√			
	13				√		
	14		√				
	15					√	
4	16						Looking upstream at culvert 24" RCP
	17						Looking downstream at culvert 24" CMP
	18						Looking upstream from culvert 24" CMP
5	19						Looking downstream 24" CMP
	20						Looking upstream 24" CMP w/headwall
	21						Headwall taken at Target Boundary Rd. (sinkholes adjacent to wall)
	22		√				
6	23	√					
	24			√			
	25				√		
	26		√				
	27					√	Sediments much finer

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
7	28	√					
	29			√			Just east of School House Rd
	30				√		
	31		√				
	32					√	N-Value Grid
8	33						Looking west at School House Rd. *Note walking trail
	34	√					Looking north at School House Rd.
	35		√				Looking south at School House Rd.
	36		√				Looking west downstream from School House Rd.
9	37	√					Looking east upstream from School House Rd.
	38						Looking north
	39						Looking south
	40						Looking west at School House Rd.
	41					√	N-Value Grid
10	42	√					
	43			√			
	44				√		
	45		√				
	46					√	N-Value Grid
11	47	√					L (RB)
	48	√					R (LB)
12	49	√					(LB) Big Bend Elevated
	50	√					Big Bend
13	51	√					
	52			√			
	53				√		
	54		√				
	55					√	N-Value Grid
14	56	√					Dense Vegetation
	57		√				Dense Vegetation
15	58	√					
	59			√			
	60				√		
	61		√				
	62					√	N-Value Grid End of Sheet 1 (1/2 mile ~1hr)
16	63	√					Start of Sheet 2
	64			√			
	65				√		
	66		√				
	67					√	N-Value Grid

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
17	68	√					
	69			√			
	70				√		
	71		√				
	72					√	N-Value Grid, Road just upstream
18	73		√				at Rd looking downstream
	74						at Rd looking north
	75						at Rd looking south
	76						at LKN
	77						at LKS
19	78	√					from Rd
20	79				√		At corral
	80				√		very dense vegetation
21	81	√					
	82			√			
	83				√		
	84		√				
	85					√	N-Value Grid
22	86	√					
	87			√			
	88				√		
	89		√				
	90					√	N-Value Grid
23	91	√					
	92			√			On downstream RB overbank not main channel
	93				√		Clearly an overflow flowpath
	94		√				
	95					√	N-Value
24	96	√					Not mapped by JE Fuller, distinguished flowpath will need to be added
	97			√			Not mapped by JE Fuller, distinguished flowpath will need to be added
	98				√		Not mapped by JE Fuller, distinguished flowpath will need to be added
	99		√				Not mapped by JE Fuller, distinguished flowpath will need to be added
	100					√	Not mapped by JE Fuller, distinguished flowpath will need to be added
25	101	√					
	102			√			
	103				√		
	104		√				
	105					√	N-Value

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
26	106	√					At corral
27	107	√					
	108			√			
	109				√		
	110		√				
	111					√	N-Value
28	112	√					At dirt road/man made bank (LB spillway)
	113						
	114						
	115						
29	116						Earthen Dam
	117						
30	118						
	119	√					At man made spillway
	120			√			
	121				√		
	122		√				
	123					√	N-Value
31	124						Earthen Dam (stilling lake), panaramic shots
	125						Earthen Dam (stilling lake), panaramic shots
	126						Earthen Dam (stilling lake), panaramic shots
	127						Earthen Dam (stilling lake), panaramic shots
	128						Earthen Dam (stilling lake), panaramic shots
	129						Earthen Dam (stilling lake), panaramic shots
	130						
	131						
32	132	√					Start of north branch
	133			√			Start of north branch
	134				√		Start of north branch
	135		√				Start of north branch
	136					√	N-Value
N/A	137						Cactus in bloom - photo omitted
33	138	√					
	139			√			
	140				√		
	141		√				
	142					√	N-Value

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
34	143	√					
	144			√			
	145				√		
	146		√				(1.15 mi--9:06am)
	147					√	N-Value, End of sheet 2 North Branch Start of Sheet 3 North Branch
35	148						
	149	√					
	150			√			
	151				√		
	152		√				
36	153					√	N-Value
	154	√			√		Bank photo
37	155		√			√	Bank photo
	156	√					Just downstream of Rd
	157			√			Just downstream of Rd
	158				√		Just downstream of Rd
	159		√				Just downstream of Rd
38	160					√	N-Value, Just downstream of Rd
	161						On Rd LK north
	162						On Rd LK south
	163						NW
	164						NE
39	165	√					Outfall at earthen dam
	166			√			
	167				√		Emergency spillway
	168		√				
	169					√	N-Value
40	170						Panoramic shots looking downstream at earthen dam from stilling lake
	171						Panoramic shots looking downstream at earthen dam from stilling lake
	172						Panoramic shots looking downstream at earthen dam from stilling lake
	173						Panoramic shots looking downstream at earthen dam from stilling lake
41	174	√					
	175			√			
	176				√		
	177		√				
	178					√	N-Value

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
42	179	√					
	180			√			
	181				√		
	182		√				
	183					√	N-Value
43	184						Top of Earthen Dam looking downstream
	185		√				Panoramic shot looking downstream at earth dam (RB is low el spillway)
	186		√				Panoramic shot looking downstream at earth dam (RB is low el spillway)
	187		√				Panoramic shot looking downstream at earth dam (RB is low el spillway)
	188		√				Panoramic shot looking downstream at earth dam (RB is low el spillway)
44	189	√					Last x-section of north branch sheet 3 (1.47 mi 9:43am)
	190			√			Last x-section of north branch sheet 3 (1.47 mi 9:43am)
	191				√		Last x-section of north branch sheet 3 (1.47 mi 9:43am)
	192		√				Last x-section of north branch sheet 3 (1.47 mi 9:43am)
	193					√	N-Value
45	194		√			EOE downstream	
46	195	√					
	196			√			EOE
	197				√		EOE
	198		√				EOE
	199					√	N-Value
	200						Headcutting on overflow
47	201	√					Middle tributary on sheet 3 (end of tributary)
	202			√			Middle tributary on sheet 3 (end of tributary)
	203				√		Middle tributary on sheet 3 (end of tributary)
	204		√				Middle tributary on sheet 3 (end of tributary)
	205					√	N-Value
48	206	√				On top of earthen dam (middle tributary sheet 3)	
49	207	√					
	208			√			
	209				√		
	210		√				
	211					√	N-Value
N/A	212						Skull - photo omitted
50	213	√					Start of south Tributary sheet 3
	214			√			Start of south Tributary sheet 3
	215				√		Start of south Tributary sheet 3
	216		√				Start of south Tributary sheet 3
	217					√	N-Value

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
51	218	√					Just downstream of earthen dam
	219			√			Just downstream of earthen dam
	220				√		Just downstream of earthen dam
	221		√				Just downstream of earthen dam
	222					√	N-Value
	223						Looking south on earthen dam
52	224						Looking south on Rd
	225						Looking south on Rd
	226						Looking south on Rd
	227						Looking North
53	228	√					Looking at culvert towards east 48" CMP
	229						Panoramic sheet of earthen dam (Trib south sheet 3) (2..7mi 11am)
	230						Panoramic sheet of earthen dam (Trib south sheet 3) (2..7mi 11am)
	231						Panoramic sheet of earthen dam (Trib south sheet 3) (2..7mi 11am)
54	232	√					Willow Springs Sheet 1
	233			√			North of Morning Star Rd
	234				√		
	235		√				
	236					√	N-Value
55	237	√					
	238		√				Switches from channelized to shallow flow
56	239	√					Small incised wash
	240		√				
57	241	√					
	242		√				
58	243	√					Last x-section upstream of eastmsot tributary branch
	244		√				Last x-section upstream of eastmsot tributary branch
59	245	√					
	246			√			
	247				√		Just downstream of Morning Star Rd
	248		√				East most branch
	249					√	N-Value
60	250	√					
	251			√			Just upstream of connection to west branch
	252				√		Just upstream of connection to west branch
	253		√				Just upstream of connection to west branch
	254					√	N-Value
61	255	√					At branch Junction-Lateral weir to come
	256	√					At branch Junction-Lateral weir to come
	257		√				At branch Junction-Lateral weir to come

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
62	258	√					
	259			√			
	260				√		
	261		√				
	262					√	N-Value
63	263	√					
	264			√			
	265				√		
	266		√				
	267					√	N-Value
64	268	√					
	269			√			
	270				√		
	271		√				
	272					√	N-Value
65	273	√					
	274			√			
	275				√		
	276		√				
	277					√	N-Value
66	278	√					Junction
	279	√					Junction
	280		√				Junction
	281					√	West branch above upstream junction/apex
67	282	√					West branch above upstream junction/apex
	283			√			West branch above upstream junction/apex
	284				√		West branch above upstream junction/apex
	285		√				
	286					√	N-Value
68	287	√					
	288			√			
	289				√		
	290		√				
	291					√	N-Value
69	292	√					
	293			√			Just downstream of Morning Star Rd
	294				√		West branch of tributary
	295		√				
	296					√	N-Value

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
70	297	√					At Morning Star Rd looking north
	298		√				Looking south
71	299	√					
	300			√			Upstream of Morning Star Rd
	301				√		
	302		√				
72	303					√	N-Value
	304	√					
	305			√			
	306				√		
	307		√				
73	308					√	N-Value
	309	√					At fartheset west fork
	310			√			At fartheset west fork
	311				√		At fartheset west fork
	312		√				At fartheset west fork
74	313					√	N-Value
	314	√					
	315			√			
	316				√		Downstream LB well established
	317		√				
75	318					√	N-Value
	319	√					
	320			√			Just downstream of rd (3 CMP)
	321				√		
	322		√				
76	323					√	N-Value
	324	√					On rd-fenced off cannot go further
N/A	325	√					On rd-at middle branch
77	326	√					photo omitted
	327			√			Just downstream of rd on middle branch
	328				√		
	329		√				
	330					√	N-Value
78	331					√	N-Value
	332	√					
	333			√			
	334				√		
	335		√				
	336					√	N-Value

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
79	337	√					N-Value
	338	√					N-Value
	339		√				N-Value
80	340	√					
	341			√			
	342				√		
	343		√				
81	344					√	N-Value
	345	√					
	346			√			
	347				√		
	348		√				
	349					√	
82	350		√				
	351		√				Looking downstream adjacent to property wall
	352	√					
	353			√			
	354				√		
	355		√				
83	356					√	
	357		√				
84	358		√				
	359	√					
	360	√					Adjacent wash tributary
	361		√				
85	362					√	
	363	√					
	364			√			
	365				√		
	366		√				
86	367					√	
	368		√				
	369	√					
87	370		√				
	371	√					
	372				√		
	373					√	
	374			√			
	375		√				

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
88	376	√					
	377			√			
	378				√		
	379		√				
	380					√	
89	381		√			Culvert 36" CMP	
90	382	√					
	383		√				
91	384	√					
	385		√				
92	386	√					
	387			√			
	388				√		
	389		√				
	390					√	
93	391		√				
	392	√					
	393			√			
	394				√		
	395					√	
94	396		√			Property fence in wash adjacent to corral	
95	397	√					Start of Cave Creek tributary walk
	398			√			
	399				√		
	400		√				
	401					√	
96	402	√					
	403			√			
	404				√		
	405		√				
	406					√	
97	407	√					
	408			√			
	409				√		
	410		√				
	411					√	
98	412	√					
	413		√				

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
99	414	√					
	415			√			
	416				√		
	417		√				
	418					√	
	419		√				
100	420	√					
	421		√				
101	422		√				
	423			√			
	424	√					
	425		√				
102	426	√					All large diameter rock
	427				√		order differs
	428			√			order differs
	429		√				
103	430	√					
	431			√			
	432				√		
	433		√				
	434					√	
104	435	√					
	436			√			
	437				√		
	438		√				
	439					√	
105	440	√					
	441			√			
	442				√		
	443		√				
	444					√	
106	445	√					
	446		√				
107	447	√					
	448	√					
	449			√			
	450				√		
	451		√				
	452					√	

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
108	453	√					
	454			√			
	455				√		
	456		√				
	457					√	
109	458	√					
110	459	√					
	460		√				
111	461	√					
	462			√			
	463				√		
	464		√				
	465					√	
112	466	√					
	467			√			
	468				√		
	469		√				
	470					√	
113	471	√					
	472		√				
114	473	√					
	474			√			
	475				√		
	476		√				
	477					√	
115	478	√					
	479			√			
	480				√		
	481		√				
	482					√	
116	483	√					
	484		√				
	485			√			
117	486	√					Desert motiff
	487			√			
	488				√		
	489		√				
	490					√	
	491	√					Rock bottom change

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
118	492	√					
	493	√					
119	494	√					
	495			√			
	496				√		
	497		√				
	498					√	
120	499	√					
	500			√			
	501				√		
	502		√				
121	503					√	
	504	√					
122	505		√				
	506	√					
123	507		√				
	508	√					
	509			√			
	510				√		
	511		√				
124	512					√	
	513	√					
125	514		√				
	515	√					
	516			√			
	517				√		
	518		√				
126	519					√	
	520	√					
	521			√			
	522				√		
	523		√				
	524					√	
127	525		√				
	526		√				
	527	√					
	528			√			Photo error-no good
	529				√		
	530		√				
	531					√	

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
128	532	√					
	533					√	
129	534	√					
	535			√			
130	536				√		
	537		√				
	538					√	Ends sheet 4 Cave Creek Tributary
	539	√					
	540			√			
131	541				√		
	542		√				
	543					√	Starts sheet 3 Cave Creek Tributary
	544	√					Starts sheet 5 Cave Creek Tributary
	545					√	
132	546	√					
	547			√			
	548				√		
	549		√				
	550					√	
	551	√					
133	552	√					
	553		√				
134	554	√					
	555		√				
135	556	√					
	557		√				Sheet 5 road crossing
136	558	√					Sheet 5 road crossing
	559		√				Sheet 5 road crossing
137	560	√					
	561		√				
138	562	√					
	563		√				
139	564		√				
140	565		√				
141	566	√					
	567	√					
	568		√				
142	569	√					
	570		√				

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
143	571	√					
	572	√					
	573					√	
144	574	√					
	575		√				
145	576		√				
	577		√				
	578	√					
	579		√				
	580	√					
	581	√					
146	582		√				
	583	√					
147	584		√				
	585	√					
148	586		√				
	587	√					
149	588		√				
	589	√					
150	590		√				
	591	√					
	592	√					
151	593		√				
	594	√					
152	595		√				
	596	√					
153	597		√				
	598	√					
N/A	599		√				
N/A	600						Mountains - photo omitted
N/A	601						Mountains - photo omitted
154	602	√					
	603			√			
	604				√		
	605		√				
	606					√	
	607						Roadway photos @ edge

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
155	608						Roadway photos @ edge
	609	√					
	610			√			
	611				√		
	612		√				
	613					√	
156	614						Looking into culvert outlet from access road
	615						Looking into culvert outlet from access road
	616						Rock Size
	617	√					
	618			√			
	619				√		
	620		√				
157	621					√	
	622						Photo of boulders in wash
	623	√					
	624			√			
	625				√		
	626		√				
	627					√	
158	628						Looking into wash (trib to trib)
	629	√					
159	630		√				
	631	√					
	632			√			
	633				√		
	634		√				
160	635					√	
	636	√					
	637			√			
	638				√		
	639		√				
161	640					√	
	641		√				New Bridge
162	642		√				Past bridge going downstream
	643	√					down bridge

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
163	644		√				
	645		√				footer for retaining wall
	646	√					footer for retaining wall
	647	√					
	648			√			
	649				√		
	650			√			
164	651					√	
	652				√		drain discharge into wash
165	653	√					
	654			√			
	655				√		
	656		√				
	657					√	
166	658	√					
	659			√			
	660				√		
	661		√				
	662					√	
	663						Fill at junction
	664	√					end sheet 1 of 1 Galloway Trib
167	665	√					
	666			√			
	667				√		
	668		√				
	669					√	
168	670	√					
	671		√				
169	672	√					
	673	√					
	674		√				
170	675	√					
	676		√				
171	677		√				Looking at culvert
172	678	√					
	679		√				
173	680	√					Upstream at wash
	681	√					Wash disturbance
174	682	√					
	683		√				

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
175	684	√					
	685			√			
	686				√		
	687		√				
	688					√	
176	689						4 culverts under Cave Creek Rd
	690		√				SWPPP Photo
	691		√				Left side at culverts
	692		√				Right side
	693		√				Right side looking at culvert
177	694	√					
	695		√				
178	696	√					
	697			√			
	698				√		
	699		√				
	700					√	
179	701	√					
	702			√			
	703				√		
	704		√				Toward 6 culvert headwall
	705					√	
180	706	√					
	707			√			
	708				√		
	709		√				
	710					√	
181	711	√					
	712			√			
	713				√		
	714		√				
	715					√	End sheet 5 of 11
182	716			√			Wash disturbance
	717		√				
183	718	√					
	719		√				
184	720	√					
	721		√				
	722					√	

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
185	723	√					
	724			√			
	725				√		
	726		√				
	727					√	
186	728		√				CBC and Ramp
	729	√					Toward CBC
187	730	√					
	731			√			
	732				√		
	733		√				
188	734					√	
	735	√					
189	736		√				
	737	√					
190	738		√				
	739					√	
	740	√					
191	741		√				
	742					√	House south of orange house HDPE pipe discharge
	743	√					
192	744		√				
	745					√	
	746	√					
	747			√			
	748				√		
193	749		√				
	750					√	End sheet 4 of 11
	751	√					
	752		√				
194	753					√	
	754		√				Looking at headwall with CBC
	755	√					
195	756		√				
	757					√	
	758	√					
195	759		√				
	760					√	

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
196	761	√					
	762		√				
	763					√	
	764		√				Towards culverts (private driveway)
197	765	√					
	766		√				
	767					√	(concrete & rock)
	768		√				Shotcrete adjacent to roadway
198	769	√					
	770			√			
	771				√		
	772		√				
	773					√	
199	774	√					Junction of washes
	775	√					Junction of washes
	776		√				Junction of washes
	777		√				Towards drop inlet structure
200	778	√					
	779		√				
201	780	√					
	781			√			
	782				√		
	783		√				
	784					√	
202	785						Looking at mountain
	786		√				
	787		√				
	788	√					
	789		√				
	790					√	
203	791	√					
	792		√				
	793					√	
204	794	√					
	795		√				
	796					√	
205	797	√					
	798	√					
	799		√				
	800					√	

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
206	801	√					
	802	√					
	803		√				
	804					√	
207	805	√					
	806		√				
	807					√	End Sht 4 of 11
208	808	√					
	809		√				
	810					√	
209	811	√					
	812		√				
	813					√	
210	814	√					
	815		√				
	816					√	
211	817	√					
	818		√				
	819					√	
212	820	√					
	821		√				
	822					√	
213	823	√					
	824		√				
	825					√	
214	826	√					
	827		√				
	828					√	
215	829	√					
	830	√					
	831		√				
	832					√	
216	833	√					
	834			√			
	835				√		
	836		√				
	837					√	
217	838	√					
	839		√				
	840					√	

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
218	841	√					
	842	√					
	843		√				Across road toward fence
	844					√	
219	845				√		Pavement
	846	√					Pavement Edge
	847	√					Pavement Edge
	848			√			Property fence, concrete headwalls
220	849			√			Interval to fence
	850	√					Looking us at fence end
	851		√				Split downstream looking right
221	852		√				Split downstream looking left
	853	√					
	854		√				
222	855					√	
	856	√					
223	857					√	Tributary
	858	√					
	859		√				Split looking left
	860		√				Split looking right
224	861					√	@ Split
	862			√			House photo-extra
	863	√					@ Junction looking upstream left
	864	√					@ Junction looking upstream right
225	865		√				@ Junction
	866					√	
	867					√	In ditch
	868	√					
226	869		√				
	870					√	
	871	√					Adjacent to property wall
	872	√					At home landscape edge
227	873		√				At home landscape edge
	874					√	At home landscape edge
	875		√				
227	876		√				@ Split looking upstream left
	877		√				@ Split looking upstream right
	878					√	Right side split (upstream)

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
228	879	√					
	880			√			Start day 4, Sht 2 or 11
	881				√		
	882		√				
	883					√	
229	884	√					
	885		√				
230	886	√					
	887	√					
	888				√		
	889		√				
	890					√	
231	891		√				Towards culverts
	892						Down roadway (looking north) rt side
232	893						Opposite roadway left side
	894	√					Towards culverts and tirb (looking upstream)
233	895	√					
	896			√			
	897				√		
	898		√				
	899					√	
234	900	√					
	901			√			
	902				√		
	903		√				
	904					√	
235	905	√					@ wash junction
236	906	√					
	907			√			
	908				√		
	909		√				
	910					√	
237	911	√					
	912			√			
	913				√		
	914		√				
	915					√	

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
238	916	√					Left side of junction
	917	√					Right side of junction
	918		√				Downstream from junction
	919					√	@ junction
239	920	√					
	921			√			
	922				√		
	923		√				
240	924					√	
	925	√					Left @ junction
	926	√					Right @ junction
	927		√				@ junction
241	928					√	@ junction
	929	√					
	930			√			
	931				√		
242	932		√				
	933					√	
	934	√					
	935		√				
243	936					√	
	937	√					Looking @ split
	938	√					
	939			√			
244	940				√		
	941		√				
	942					√	
	943	√					
245	944		√				
	945					√	
	946	√					
	947			√			
246	948				√		
	949		√				
	950					√	
247	951	√					Looking at elevation drop from road-culverts
	952		√				Looking at elevation drop from road-culverts
248	953						Down road (looking east)
248	954	√					
	955	√					Across driveway

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
249	956	√					
	957			√			
	958				√		
	959		√				
	960					√	
250	961				√	Looking @ bank curve	
251	962	√					
	963			√			
	964				√		
	965		√				
252	966				√		
252	967	√					
253	968		√			Roadway crossing-no elevation change	
254	969			√			
	970	√					
255	971	√					
	972			√			
	973				√		
	974		√				
	975					√	
256	976	√					
	977			√			
	978				√		
	979		√				
	980					√	
257	981		√				
	982	√					
	983		√				
258	984			√			Across pile @ fence
	985		√				Wash and foot bridge
	986		√				Foot bridge-wooden
259	987	√					culvert put in 20 years ago
	988	√					culvert put in 20 years ago
	989		√				
260	990		√				
	991	√					
	992		√				
261	993			√			Irrigation on wash banks
	994	√					
	995		√				

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
262	996	√					
	997			√			
	998				√		
	999		√				
	1000					√	
263	1001	√					Looking up Cave Creek Wash
	1002	√					Looking up ramp to home site
	1003	√					Disturbances
	1004		√				Info Cave Creek Wash
264	1005						Roadway
	1006	√					Over bridge (road) elevated view of split
265	1007						Bridge crossing-elevated view
	1008				√		Culvert (roadway) 24 inch concrete pipe
266	1009		√				Toward junction w/culverts
	1010	√					
	1011					√	
267	1012	√					Property fence
	1013		√				Property fence
268	1014	√					@ Concrete driveway entrances
	1015		√				@ Concrete driveway entrances
269	1016		√				
	1017		√				
	1018					√	
	1019	√					
270	1020	√					Toward road, adjacent house
	1021	√					Across roadway
	1022						Cutoff walls @ roadway
	1023						Cutoff walls @ roadway
271	1024	√					
	1025		√				
	1026					√	
272	1027	√					Left @ split
	1028	√					Right @ Split
	1029		√				
	1030					√	
273	1031	√					
	1032		√				
	1033					√	

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
274	1034	√					@ culverts
	1035		√				
	1036					√	
275	1037	√					
	1038		√				@ culverts with drop inlet structure
	1039					√	
276	1040	√					
	1041		√				
	1042					√	
277	1043		√				
	1044	√					Looking towards house
	1045	√					
	1046		√				
278	1047	√					
	1048		√				
	1049	√					
	1050		√				
279	1051	√					Private driveway culvert
	1052		√				
	1053	√					Wall opening (2x)
280	1054		√				
	1055	√					
281	1056	√					12" CMP
	1057		√				
	1058		√				Private wall opening blocks
	1059	√					
	1060	√					
282	1061		√				
	1062	√					
	1063		√				
283	1064	√					@ Junction right
	1065	√					@ Junction left
284	1066		√				
	1067					√	
285	1068	√					
	1069		√				
	1070					√	
286	1071		√				
287	1072		√				Wall openings with screens

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
288	1073	√					Wall openings with screens
	1074	√					
289	1075	√					New road material no low flow
	1076		√				New road material no low flow
290	1077	√					
	1078		√				
	1079					√	
291	1080		√				Road crossing
292	1081	√				√	
	1082		√				
	1083					√	
	1084		√				
293	1085		√				
294	1086	√					Fence @ wash outlet looking upstream
	1087		√				
295	1088	√					
	1089		√				
	1090					√	
296	1091	√					Above roadway @ culdesac end/side
	1092		√				
	1093					√	
297	1094	√					
	1095		√				
	1096					√	
298	1097		√				
	1098	√					
299	1099	√					
	1100		√				
	1101					√	
300	1102	√					Looking @ split
301	1103	√					
	1104		√				24" CMP-look @ right side of photo behind dead trees
	1105					√	
	1106		√				24" CMP installed @ roadway crossing NEW!
302	1107	√					24" CMP installed @ roadway crossing NEW!
	1108		√				
303	1109	√				√	
	1110		√				
	1111					√	
	1112		√				

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
304	1113	√					
N/A	1114						New development east of ocotillo wash - photo omitted
	1115	√					photo omitted
	1116		√				photo omitted
	1117		√				photo omitted
	1118		√				photo omitted
	1119		√				photo omitted
305	1120	√					
	1121		√				
	1122					√	
306	1123	√					
	1124			√			
	1125				√		
	1126		√				
	1127					√	
307	1128	√					
	1129		√				
	1130					√	
308	1131		√				Pedestrian Bridge
	1132	√					
309	1133	√					
	1134		√				
310	1135	√					
	1136		√				
311	1137	√					
	1138		√				
	1139					√	
312	1140	√					
	1141		√				
	1142					√	
313	1143	√					
	1144		√				
314	1145	√					
	1146		√				
	1147					√	
315	1148	√					
	1149		√				
	1150					√	

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
316	1151	√					
	1152	√					
	1153		√				
317	1154	√					
	1155		√				
	1156					√	
318	1157	√					
	1158		√				
	1159					√	
	1160	√					
319	1161	√					Toward corral
	1162		√				
	1163	√					Toward Lowe's construction site
320	1164	√					
	1165		√				
	1166					√	
321	1167	√					
	1168		√				
	1169					√	
322	1170	√					
	1171		√				Down Road
	1172					√	
323	1173	√					
	1174	√					Road improvements cutting off the wash
	1175	√					
324	1176		√				
325	1177	√					
	1178		√				
	1179					√	
	1180		√				Into pipe fence looking downstream
	1181		√				Over pipe fence looking downstream
326	1182	√					Looking back toward roadway
	1183		√				Block wall with two culverts
	1184					√	Culverts CMP 2x24"-grated
	1185	√					
327	1186		√				Looking towards wall with culverts
	1187					√	
	1188	√					Looking into road crossing
327	1189			√			Looking across wash @ roadway
	1190	√					Looking across roadway with new material

Site Number	Photo Number	Upstream	Downstream	Left Bank	Right Bank	n Value	Comments
328	1191	√					
	1192		√				
	1193					√	
329	1194	√					
	1195	√					
	1196		√				
	1197					√	
330	1198	√					
	1199		√				
	1200					√	
331	1201	√					
	1202		√				
	1203					√	
332	1204	√				Looking toward new block wall	
333	1205		√				
	1206	√					Manure dumped into wash blocking flow
334	1207	√					Wash upstream of manure pile
	1208	√					Wash from Lowe's site
	1209	√					Lowe's construction disturbance
	1210	√					Low outfall trib



**APPENDIX B MANNING'S "n" VALUE DETERMINATION
AND SITE RECONNAISSANCE
PHOTOGRAPHS FOR GALLOWAY WASH
TRIBUTARIES**

Galloway Wash Tributaries, Willow Springs Wash Tributaries, and Cave Creek
Tributaries Manning's "n" Value Report

August 17, 2007

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 1 - 21 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
	Boulder	0.040 - 0.070				
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.025		0.025
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.085	0.044	0.085

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 22 - 41 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030	0.032	0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.020		0.020
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
			USE:	0.070	0.036	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 42 - 46 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030	0.032	0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.025		0.025
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.080	0.036	0.080

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 47 - 62 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.045	
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.025		0.025
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.085	0.049	0.085

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 63 - 67 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030	0.032	0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004	0.001		
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.025		0.025
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.002		
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.080	0.036	0.080

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 68 - 78 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.025		0.025
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.085	0.044	0.085

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 79 - 85 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030	0.035	0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004	0.001		
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.025	0.025	
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.002		
	Medium		0.010 - 0.025	0.020	0.020	
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.080	0.039	0.080

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 86 - 111 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
	Boulder	0.040 - 0.070				
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.025		0.025
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.080	0.044	
					0.080	

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 112 - 136 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035	0.030	0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004	0.001		
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.020		0.020
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.002		
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
USE:				0.075	0.034	0.075

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 137 - 160 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	0.012 - 0.018			
	Rock Cut	0.025			
	Firm Soil	0.025 - 0.032			
	Coarse Sand	0.026 - 0.035			
	Fine Gravel	0.024			
	Gravel	0.028 - 0.035			
	Coarse Gravel	0.028			
	Cobble	0.030 - 0.050	0.040	0.045	0.040
	Boulder	0.040 - 0.070			
Degree of Irregularity	Smooth	0.000			
	Minor	0.001 - 0.005	0.005	0.001	0.005
	Moderate	0.006 - 0.010			
	Severe	0.011 - 0.020			
Effects of Obstructions	Negligible	0.000 - 0.004		0.001	
	Minor	0.005 - 0.015			
	Appreciable	0.020 - 0.030	0.020		0.020
	Severe	0.040 - 0.060			
Vegetation	Small	0.002 - 0.010		0.002	
	Medium	0.010 - 0.025	0.015		0.015
	Large	0.025 - 0.050			
	Very Large	0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	0.000	0.000	0.000	0.000
	Alternating (occasionally)	0.001 - 0.005			
	Alternating (frequently)	0.010 - 0.015			
Degree of Meandering	Minor	1.00	1.000	1.000	1.000
	Appreciable	1.15			
	Severe	1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$					
USE:			0.080	0.049	0.080

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 161 - 173 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030	0.030	0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004	0.001		
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.020		0.020
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.002		
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.070	0.034	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 174 -188 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
	Boulder	0.040 - 0.070				
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.020		0.020
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.075	0.044	0.075

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 189 - 200 [05-18-2006]
 Section Description: Tributary 2

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.040	0.045	0.040
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.020		0.020
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.080	0.049	0.080

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 201 - 205 [05-18-2006]
 Section Description: Tributary 2A

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0				
	Rock Cut		0.012 - 0.018			
	Firm Soil		0.025			
	Coarse Sand		0.025 - 0.032			
	Fine Gravel		0.026 - 0.035			
	Gravel		0.024			
	Coarse Gravel		0.028 - 0.035	0.030	0.035	0.030
	Cobble		0.028			
	Boulder		0.030 - 0.050			
Degree of Irregularity	Smooth	n1				
	Minor		0.000			
	Moderate		0.001 - 0.005	0.005	0.001	0.005
	Severe		0.006 - 0.010			
Effects of Obstructions	Negligible	n2		0.001		
	Minor		0.000 - 0.004			
	Appreciable		0.005 - 0.015			
	Severe		0.020 - 0.030	0.020		0.020
Vegetation	Small	n3		0.002		
	Medium		0.002 - 0.010			
	Large		0.010 - 0.025	0.015		0.015
	Very Large		0.025 - 0.050			
Variations in the Channel Cross Sections	Gradual	n4		0.000	0.000	
	Alternating (occasionally)		0.000			
	Alternating (frequently)		0.001 - 0.005			
Degree of Meandering	Minor	m		1.000	1.000	
	Appreciable		1.00			
	Severe		1.15			
$n = (n0 + n1 + n2 + n3 + n4) m$						
			USE:	0.070	0.039	
					0.070	

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 206 - 211 [05-18-2006]
 Section Description: Tributary 2A

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.040	0.040	0.040
	Boulder	0.040 - 0.070				
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.020		0.020
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
			USE:	0.080	0.044	0.080

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Galloway Wash Tributaries
 Photograph No: 212 - 231 [05-18-2006]
 Section Description: Tributary 2B

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.040	0.040	0.040
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004	0.001		
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.020	0.020	
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.002		
	Medium		0.010 - 0.025	0.015	0.015	
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
			USE:	0.080	0.044	0.080



GALLOWAY WASH TRIBUTARIES



Site 1 – Photo Number 1



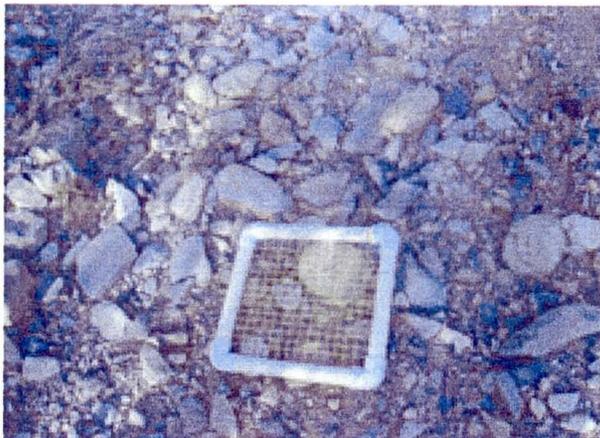
Site 1 – Photo Number 2



Site 1 – Photo Number 3



Site 1 – Photo Number 4

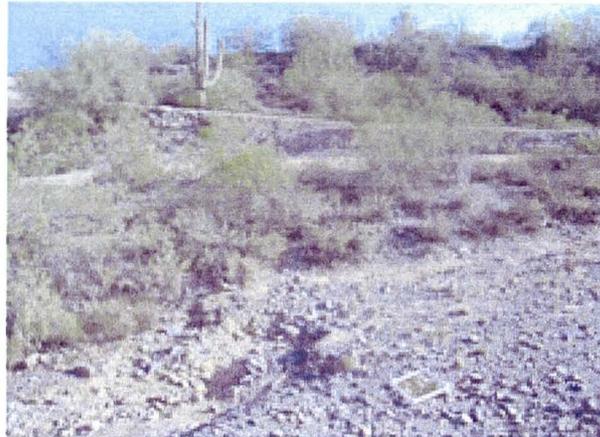


Site 1 – Photo Number 5

GALLOWAY WASH TRIBUTARIES



Site 2 – Photo Number 6



Site 2 – Photo Number 7



Site 2 – Photo Number 8



Site 2 – Photo Number 9



Site 2 – Photo Number 10

GALLOWAY WASH TRIBUTARIES



Site 3 – Photo Number 11



Site 3 – Photo Number 12



Site 3 – Photo Number 13



Site 3 – Photo Number 14



Site 3 – Photo Number 15

GALLOWAY WASH TRIBUTARIES



Site 4 – Photo Number 16



Site 4 – Photo Number 17



Site 4 – Photo Number 18

GALLOWAY WASH TRIBUTARIES



Site 5 – Photo Number 19



Site 5 – Photo Number 20



Site 5 – Photo Number 21



Site 5 – Photo Number 22

GALLOWAY WASH TRIBUTARIES



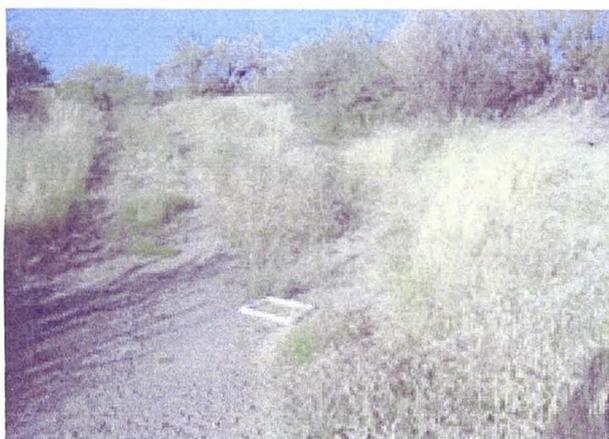
Site 6 – Photo Number 23



Site 6 – Photo Number 24



Site 6 – Photo Number 25



Site 6 – Photo Number 26



Site 6 – Photo Number 27

GALLOWAY WASH TRIBUTARIES



Site 7 – Photo Number 28



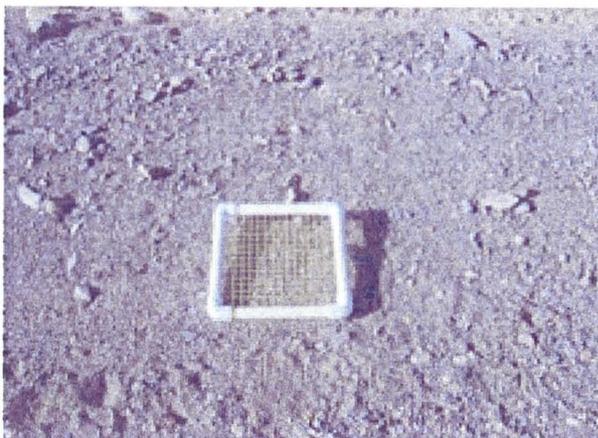
Site 7 – Photo Number 29



Site 7 – Photo Number 30



Site 7 – Photo Number 31



Site 7 – Photo Number 32

GALLOWAY WASH TRIBUTARIES



Site 8 – Photo Number 33



Site 8 – Photo Number 34



Site 8 – Photo Number 35



Site 8 – Photo Number 36

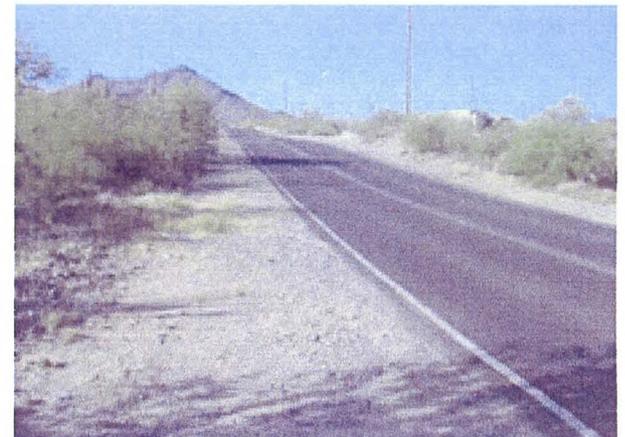
GALLOWAY WASH TRIBUTARIES



Site 9 – Photo Number 37



Site 9 – Photo Number 38



Site 9 – Photo Number 39



Site 9 – Photo Number 40



Site 9 – Photo Number 41

GALLOWAY WASH TRIBUTARIES



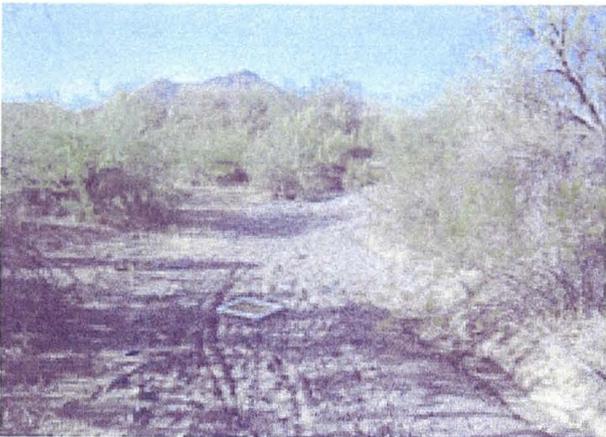
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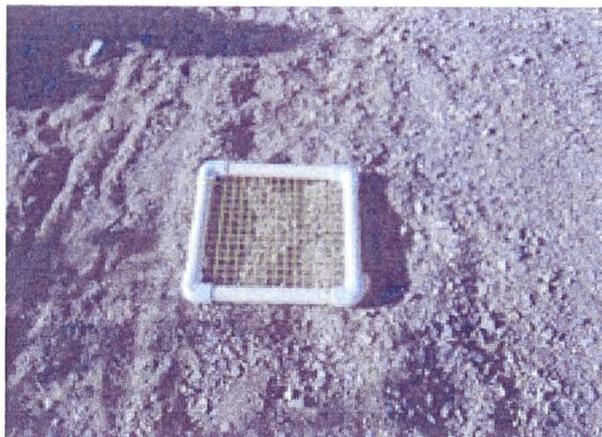
Site 10 – Photo Number 43



Site 10 – Photo Number 44



Site 10 – Photo Number 45



Site 10 – Photo Number 46

GALLOWAY WASH TRIBUTARIES



Site 11 – Photo Number 47



Site 11 – Photo Number 48



Site 12 – Photo Number 49



Site 12 – Photo Number 50

GALLOWAY WASH TRIBUTARIES



Site 13 – Photo Number 51



Site 13 – Photo Number 52



Site 13 – Photo Number 53

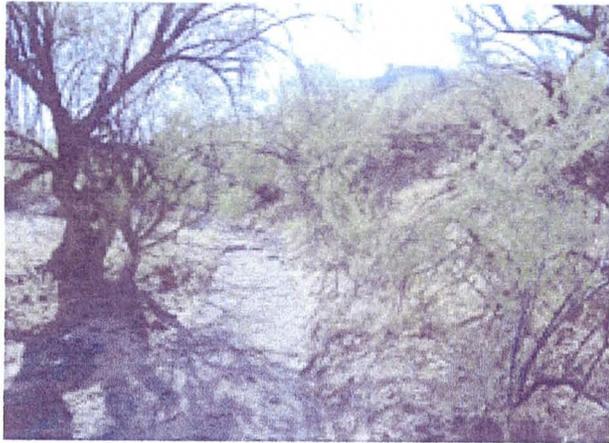


Site 13 – Photo Number 54



Site 13 – Photo Number 55

GALLOWAY WASH TRIBUTARIES



Site 14 – Photo Number 56



Site 14 – Photo Number 57

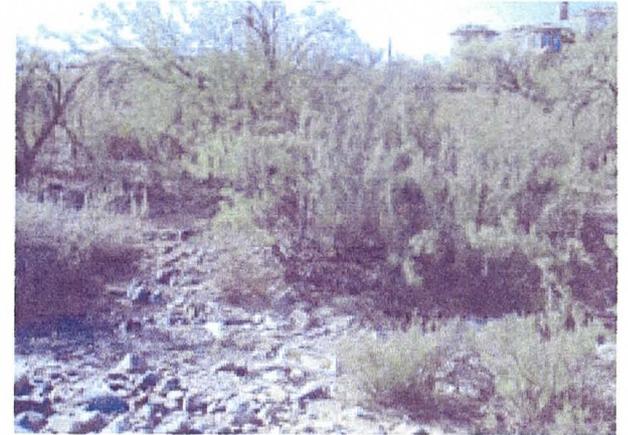
GALLOWAY WASH TRIBUTARIES



Site 15 – Photo Number 58



Site 15 – Photo Number 59



Site 15 – Photo Number 60



Site 15 – Photo Number 61



Site 15 – Photo Number 62

GALLOWAY WASH TRIBUTARIES



Site 16 – Photo Number 63



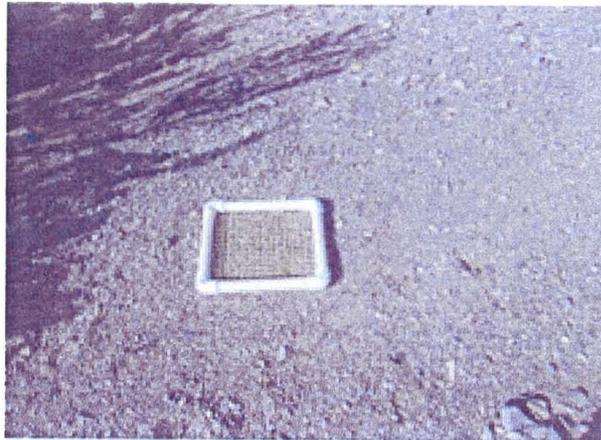
Site 16 – Photo Number 64



Site 16 – Photo Number 65



Site 16 – Photo Number 66



Site 16 – Photo Number 67

GALLOWAY WASH TRIBUTARIES



Site 17 – Photo Number 68



Site 17 – Photo Number 69



Site 17 – Photo Number 70



Site 17 – Photo Number 71



Site 17 – Photo Number 72

GALLOWAY WASH TRIBUTARIES



Site 18 – Photo Number 73



Site 18 – Photo Number 74



Site 18 – Photo Number 75



Site 18 – Photo Number 76



Site 18 – Photo Number 77



Site 18 – Photo Number 78

GALLOWAY WASH TRIBUTARIES



Site 19 – Photo Number 79



Site 20 – Photo Number 80

GALLOWAY WASH TRIBUTARIES



Site 21 – Photo Number 81



Site 21 – Photo Number 82



Site 21 – Photo Number 83



Site 21 – Photo Number 84

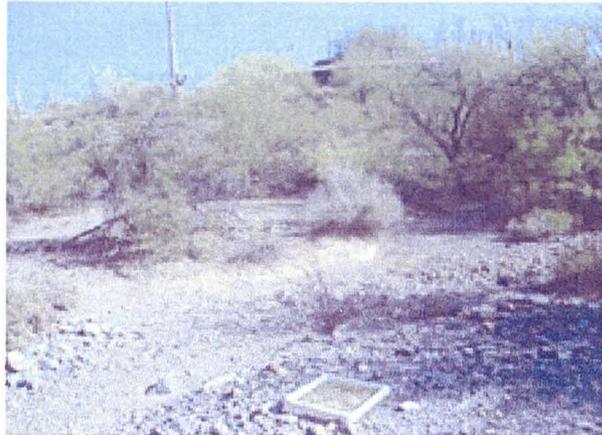


Site 21 – Photo Number 85

GALLOWAY WASH TRIBUTARIES



Site 22 – Photo Number 86



Site 22 – Photo Number 87



Site 22 – Photo Number 88



Site 22 – Photo Number 89



Site 22 – Photo Number 90

GALLOWAY WASH TRIBUTARIES



Site 23 – Photo Number 91



Site 23 – Photo Number 92



Site 23 – Photo Number 93



Site 23 – Photo Number 94



Site 23 – Photo Number 95

GALLOWAY WASH TRIBUTARIES



Site 24 – Photo Number 96



Site 24 – Photo Number 97



Site 24 – Photo Number 98



Site 24 – Photo Number 99



Site 24 – Photo Number 100

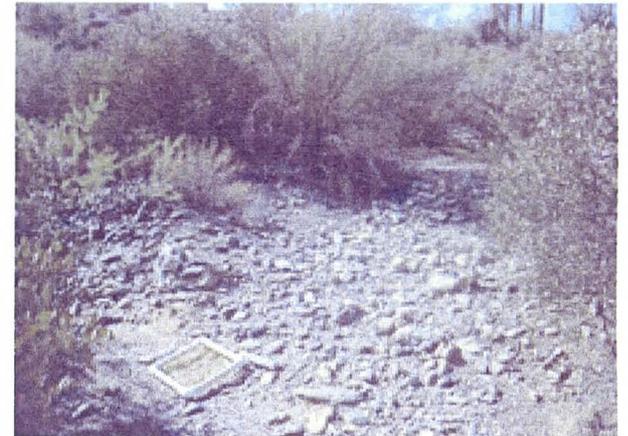
GALLOWAY WASH TRIBUTARIES



Site 25 – Photo Number 101



Site 25 – Photo Number 102



Site 25 – Photo Number 103



Site 25 – Photo Number 104



Site 25 – Photo Number 105

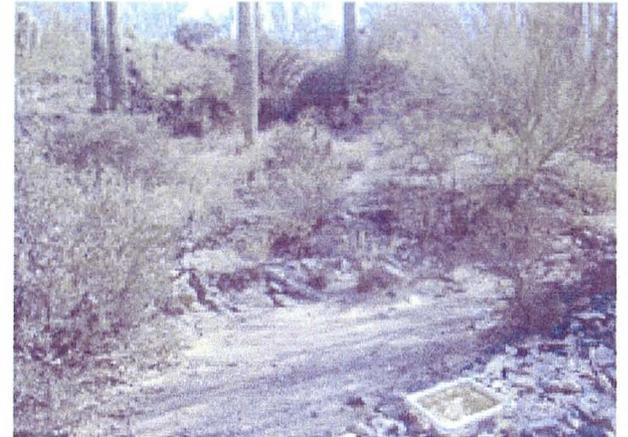
GALLOWAY WASH TRIBUTARIES



Site 26 – Photo Number 106



Site 27 – Photo Number 107



Site 27 – Photo Number 108



Site 27 – Photo Number 109



Site 27 – Photo Number 110



Site 27 – Photo Number 111

GALLOWAY WASH TRIBUTARIES



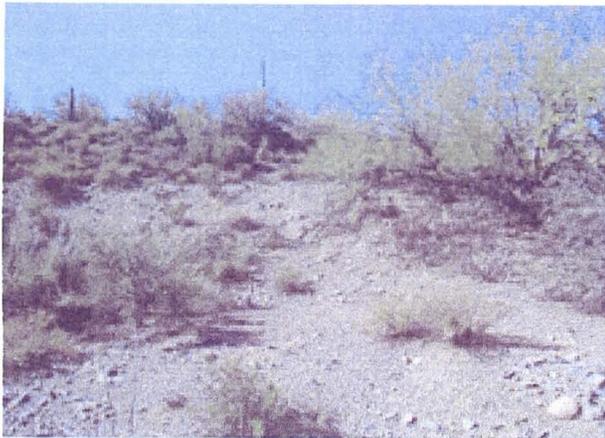
Site 28 – Photo Number 112



Site 28 – Photo Number 113



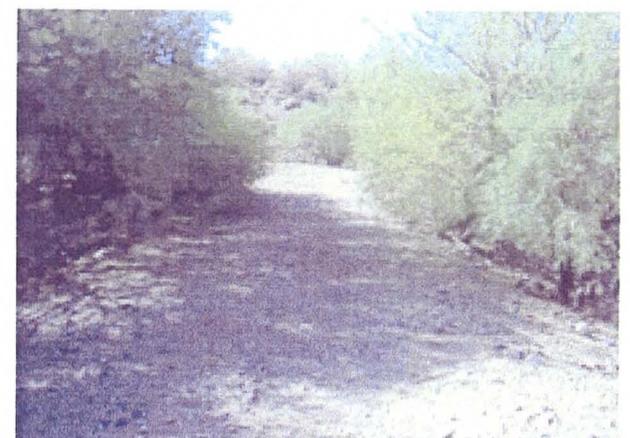
Site 28 – Photo Number 114



Site 28 – Photo Number 115



Site 29 – Photo Number 116



Site 29 – Photo Number 117

GALLOWAY WASH TRIBUTARIES



Site 30 – Photo Number 118



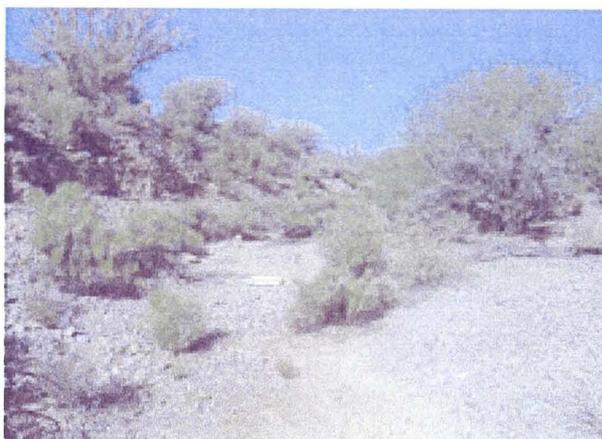
Site 30 – Photo Number 119



Site 30 – Photo Number 120



Site 30 – Photo Number 121



Site 30 – Photo Number 122



Site 30 – Photo Number 123

GALLOWAY WASH TRIBUTARIES



Site 31 – Photo Number 124



Site 31 – Photo Number 125



Site 31 – Photo Number 126



Site 31 – Photo Number 127



Site 31 – Photo Number 128



Site 31 – Photo Number 129

GALLOWAY WASH TRIBUTARIES



Site 31 – Photo Number 130



Site 31 – Photo Number 131

GALLOWAY WASH TRIBUTARIES



Site 32 – Photo Number 132



Site 32 – Photo Number 133



Site 32 – Photo Number 134



Site 32 – Photo Number 135

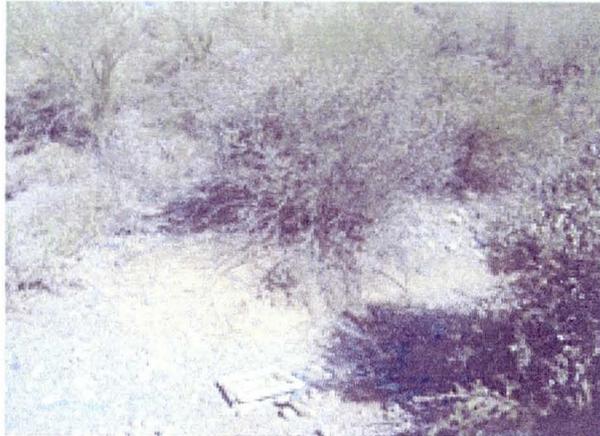


Site 32 – Photo Number 136

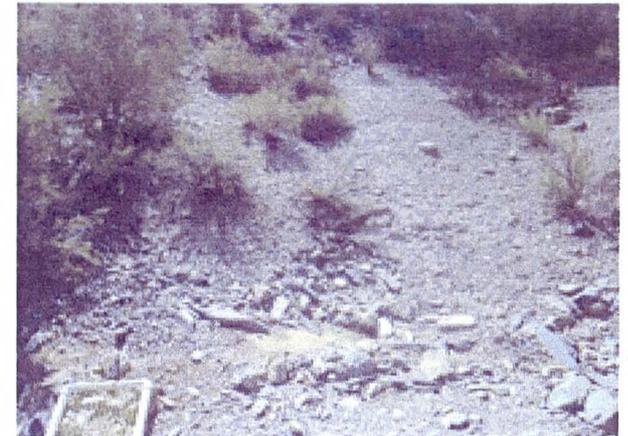
GALLOWAY WASH TRIBUTARIES



Site 33 – Photo Number 138



Site 33 – Photo Number 139



Site 33 – Photo Number 140



Site 33 – Photo Number 141



Site 33 – Photo Number 142

GALLOWAY WASH TRIBUTARIES



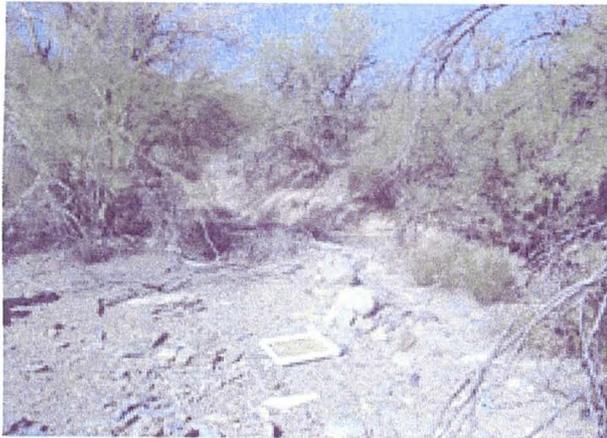
Site 34 – Photo Number 143



Site 34 – Photo Number 144



Site 34 – Photo Number 145



Site 34 – Photo Number 146



Site 34 – Photo Number 147

GALLOWAY WASH TRIBUTARIES



Site 35 – Photo Number 148



Site 35 – Photo Number 149



Site 35 – Photo Number 150



Site 35 – Photo Number 151



Site 35 – Photo Number 152



Site 35 – Photo Number 153

GALLOWAY WASH TRIBUTARIES



Site 36 – Photo Number 154



Site 36 – Photo Number 155

GALLOWAY WASH TRIBUTARIES



Site 37 – Photo Number 156



Site 37 – Photo Number 157



Site 37 – Photo Number 158



Site 37 – Photo Number 159

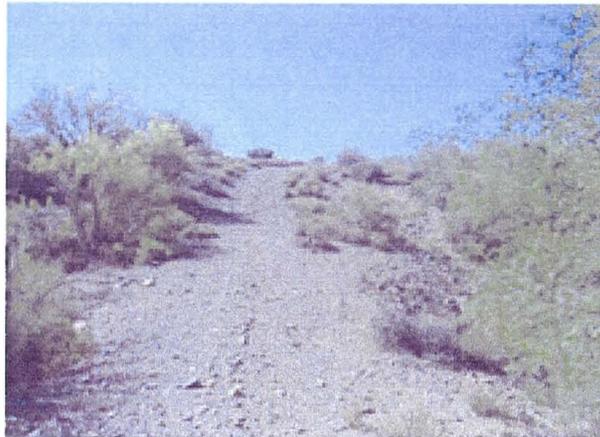


Site 37 – Photo Number 160

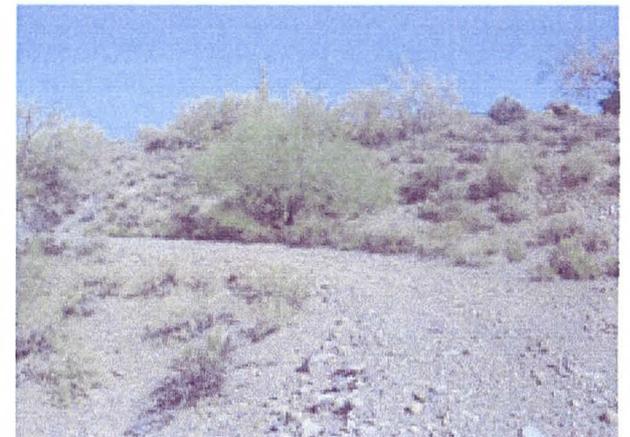
GALLOWAY WASH TRIBUTARIES



Site 38 – Photo Number 161



Site 38 – Photo Number 162



Site 38 – Photo Number 163



Site 38 – Photo Number 164

GALLOWAY WASH TRIBUTARIES



Site 39 – Photo Number 165



Site 39 – Photo Number 166



Site 39 – Photo Number 167



Site 39 – Photo Number 168



Site 39 – Photo Number 169

GALLOWAY WASH TRIBUTARIES



Site 40 – Photo Number 170



Site 40 – Photo Number 171

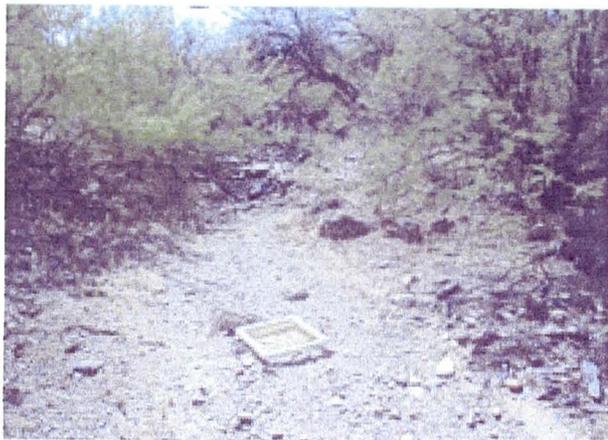


Site 40 – Photo Number 172



Site 40 – Photo Number 173

GALLOWAY WASH TRIBUTARIES



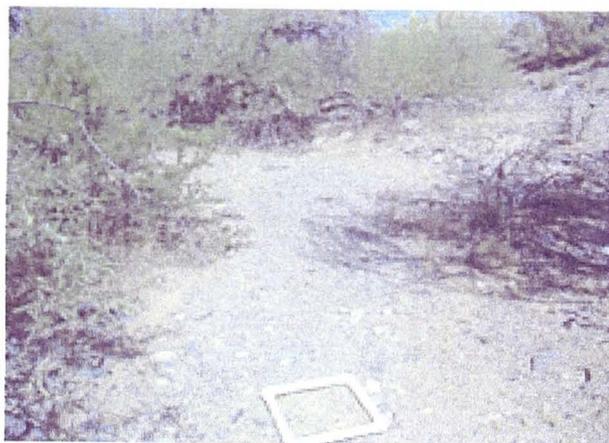
Site 41 – Photo Number 174



Site 41 – Photo Number 175



Site 41 – Photo Number 176



Site 41 – Photo Number 177



Site 41 – Photo Number 178

GALLOWAY WASH TRIBUTARIES



Site 42 – Photo Number 179



Site 42 – Photo Number 180



Site 42 – Photo Number 181



Site 42 – Photo Number 182



Site 42 – Photo Number 183

GALLOWAY WASH TRIBUTARIES



Site 43 – Photo Number 184



Site 43 – Photo Number 185



Site 43 – Photo Number 186



Site 43 – Photo Number 187



Site 43 – Photo Number 188

GALLOWAY WASH TRIBUTARIES



Site 44 – Photo Number 189



Site 44 – Photo Number 190



Site 44 – Photo Number 191



Site 44 – Photo Number 192



Site 44 – Photo Number 193



Site 45 – Photo Number 194

GALLOWAY WASH TRIBUTARIES



Site 46 – Photo Number 195



Site 46 – Photo Number 196



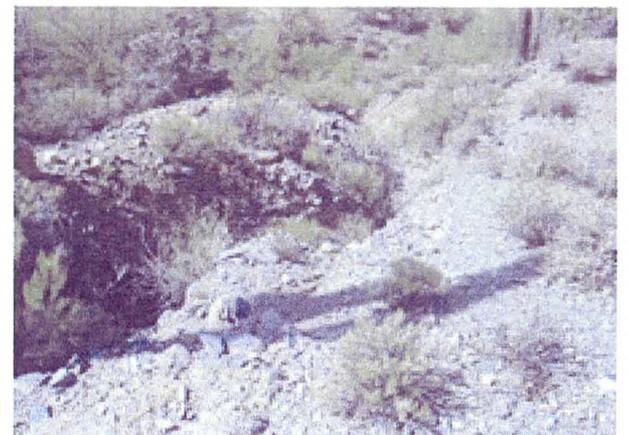
Site 46 – Photo Number 197



Site 46 – Photo Number 198



Site 46 – Photo Number 199



Site 46 – Photo Number 200

GALLOWAY WASH TRIBUTARIES



Site 47 – Photo Number 201



Site 47 – Photo Number 202



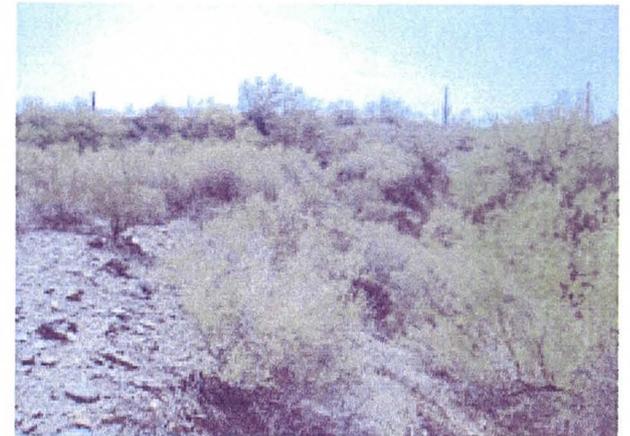
Site 47 – Photo Number 203



Site 47 – Photo Number 204



Site 47 – Photo Number 205



Site 48 – Photo Number 206

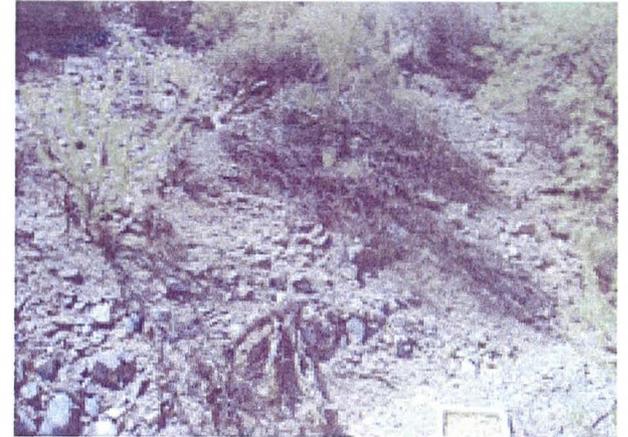
GALLOWAY WASH TRIBUTARIES



Site 49 – Photo Number 207



Site 49 – Photo Number 208



Site 49 – Photo Number 209



Site 49 – Photo Number 210



Site 49 – Photo Number 211

GALLOWAY WASH TRIBUTARIES



Site 50 – Photo Number 213



Site 50 – Photo Number 214



Site 50 – Photo Number 215

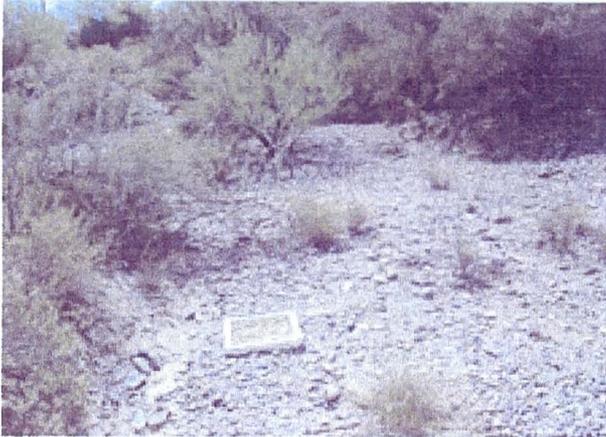


Site 50 – Photo Number 216



Site 50 – Photo Number 217

GALLOWAY WASH TRIBUTARIES



Site 51 – Photo Number 218



Site 51 – Photo Number 219



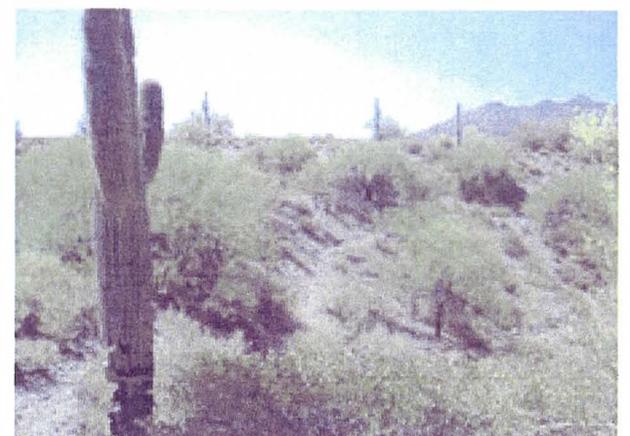
Site 51 – Photo Number 220



Site 51 – Photo Number 221



Site 51 – Photo Number 222



Site 51 – Photo Number 223

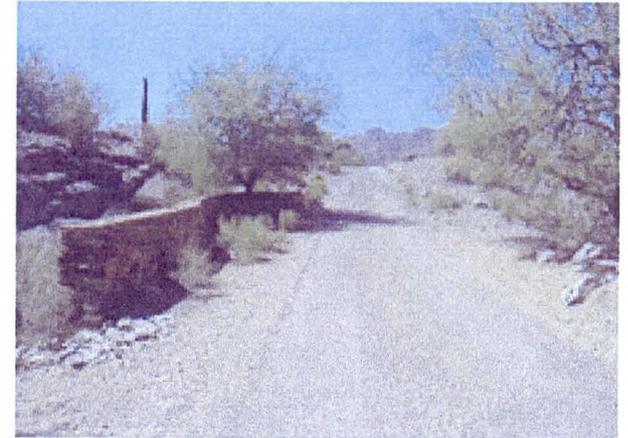
GALLOWAY WASH TRIBUTARIES



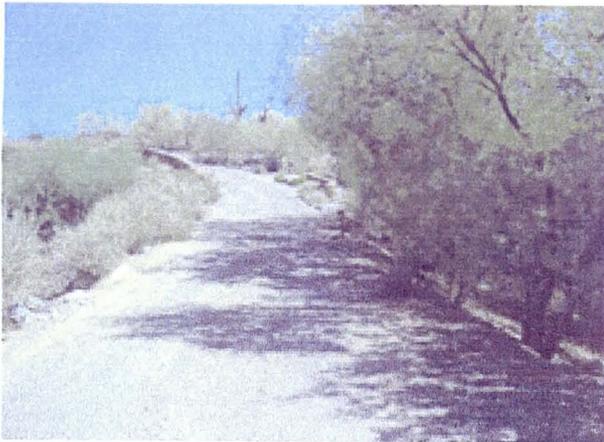
Site 52 – Photo Number 224



Site 52 – Photo Number 225



Site 52 – Photo Number 226



Site 52 – Photo Number 227

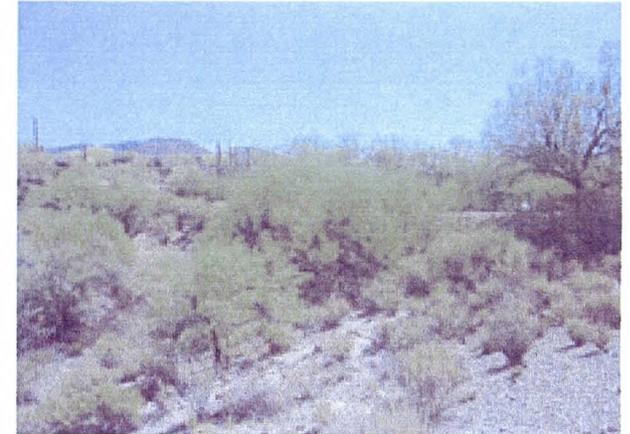
GALLOWAY WASH TRIBUTARIES



Site 53 – Photo Number 228



Site 53 – Photo Number 229



Site 53 – Photo Number 230



Site 53 – Photo Number 231



**APPENDIX C MANNING'S "n" VALUE DETERMINATION
AND SITE RECONNAISSANCE
PHOTOGRAPHS FOR WILLOW SPRINGS
WASH TRIBUTARIES**

Galloway Wash Tributaries, Willow Springs Wash Tributaries, and Cave Creek
Tributaries Manning's "n" Value Report

August 17, 2007

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 232 - 236 [05-18-2007]
 Section Description: Tributary 6C

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.028	0.028	0.028
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	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		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.058	0.032	0.058

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 237 - 240 [05-18-2007]
 Section Description: Tributary 6C

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	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		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.065	0.044	0.065

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 241 - 244 [05-18-2007]
 Section Description: Tributary 6C

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030	0.028	0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	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		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.060	0.032	0.060

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 245 - 255 [05-18-2007]
 Section Description: Tributary 6C

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030	0.035	0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.055	0.039	0.055

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 256 - 267 [05-18-2007]
 Section Description: Tributary 6

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035		0.028	
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030		0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.055	0.032	0.055

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 268 - 281 [05-18-2007]
 Section Description: Tributary 6

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.045	
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030	0.020		0.020
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.025		0.025
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.085	0.049	0.085

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 282 - 308 [05-18-2007]
 Section Description: Tributary 6B

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030	0.035	0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004	0.001		
	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	0.002		
	Medium		0.010 - 0.025	0.020	0.020	
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.070	0.039	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 309 - 313 [05-18-2007]
 Section Description: Tributary 6B

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035		0.028	
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030		0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005		0.001	0.005
	Moderate		0.006 - 0.010	0.006		
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.066	0.032	0.065

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 314- 324 [05-18-2007]
 Section Description: Tributary 6B

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035		0.030	
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030		0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
USE:				0.065	0.034	0.065

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDM METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 325 - 336 [05-18-2007]
 Section Description: Tributary 6A

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0				
	Rock Cut		0.012 - 0.018			
	Firm Soil		0.025			
	Coarse Sand		0.025 - 0.032			
	Fine Gravel		0.026 - 0.035			
	Gravel		0.024	0.035	0.035	0.035
	Coarse Gravel		0.028 - 0.035			
	Cobble		0.028			
Degree of Irregularity	Boulder	n1	0.030 - 0.050			
			0.040 - 0.070			
	Smooth		0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
Effects of Obstructions	Moderate	n2	0.006 - 0.010			
	Severe		0.011 - 0.020			
	Negligible		0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
Vegetation	Appreciable	n3	0.020 - 0.030			
	Severe		0.040 - 0.060			
	Small		0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
Variations in the Channel Cross Sections	Large	n4	0.025 - 0.050			
	Very Large		0.050 - 0.100			
	Gradual		0.000	0.000	0.000	0.000
Degree of Meandering	Alternating (occasionally)	m	0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
	Minor		1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
			USE:	0.070	0.039	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 337 - 339 [05-18-2007]
 Section Description: Tributary 6

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035	0.035	0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.010	0.001	0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.020	0.002	0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.070	0.039	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 340 - 344 [05-18-2007]
 Section Description: Tributary 6

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
	Boulder	0.040 - 0.070				
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.070	0.044	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 345 - 351 [05-24-2007]
 Section Description: Tributary 6A

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.070	0.044	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDM METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 352 - 362 [05-24-2007]
 Section Description: Tributary 6

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.040	0.045	0.040
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004	0.001		
	Minor		0.005 - 0.015	0.010	0.010	
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.002		
	Medium		0.010 - 0.025	0.020	0.020	
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
USE:			0.075	0.049	0.075	

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDM METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 363 - 369 [05-24-2007]
 Section Description: Tributary 6

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018				
	Rock Cut		0.025				
	Firm Soil		0.025 - 0.032				
	Coarse Sand		0.026 - 0.035	0.035	0.028	0.035	
	Fine Gravel		0.024				
	Gravel		0.028 - 0.035				
	Coarse Gravel		0.028				
	Cobble		0.030 - 0.050				
	Boulder		0.040 - 0.070				
Degree of Irregularity	Smooth	n1	0.000				
	Minor		0.001 - 0.005	0.005	0.001	0.005	
	Moderate		0.006 - 0.010				
	Severe		0.011 - 0.020				
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001		
	Minor		0.005 - 0.015				
	Appreciable		0.020 - 0.030	0.020		0.020	
	Severe		0.040 - 0.060				
Vegetation	Small	n3	0.002 - 0.010		0.002		
	Medium		0.010 - 0.025	0.020		0.020	
	Large		0.025 - 0.050				
	Very Large		0.050 - 0.100				
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005				
	Alternating (frequently)		0.010 - 0.015				
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000	
	Appreciable		1.15				
	Severe		1.30				
$n = (n0 + n1 + n2 + n3 + n4) m$							
				USE:	0.080	0.032	0.080

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 370 - 385 [05-24-2007]
 Section Description: Tributary 6

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004			
	Minor		0.005 - 0.015	0.015	0.001	0.015
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010			
	Medium		0.010 - 0.025	0.020	0.002	0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.075	0.044	0.075

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 386 - 390 [05-24-2007]
 Section Description: Tributary 6

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035		0.028	
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.035	0.035
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	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		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.075	0.032	0.075

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Willow Springs Wash Tributaries
 Photograph No: 391 - 396 [05-24-2007]
 Section Description: Tributary 6

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035		0.035	
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.035		0.035
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	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		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
			USE:	0.075	0.039	0.075



WILLOW SPRINGS TRIBUTARIES



Site 54 – Photo Number 232



Site 54 – Photo Number 233



Site 54 – Photo Number 234



Site 54 – Photo Number 235



Site 54 – Photo Number 236

WILLOW SPRINGS TRIBUTARIES



Site 55 – Photo Number 237



Site 55 – Photo Number 238



Site 56 – Photo Number 239



Site 56 – Photo Number 240



Site 57 – Photo Number 241



Site 57 – Photo Number 242

WILLOW SPRINGS TRIBUTARIES



Site 58 – Photo Number 243



Site 58 – Photo Number 244

WILLOW SPRINGS TRIBUTARIES



Site 59 – Photo Number 245



Site 59 – Photo Number 246



Site 59 – Photo Number 247



Site 59 – Photo Number 248



Site 59 – Photo Number 249

WILLOW SPRINGS TRIBUTARIES



Site 60 – Photo Number 250



Site 60 – Photo Number 251



Site 60 – Photo Number 252



Site 60 – Photo Number 253



Site 60 – Photo Number 254

WILLOW SPRINGS TRIBUTARIES



Site 61 – Photo Number 255



Site 61 – Photo Number 256

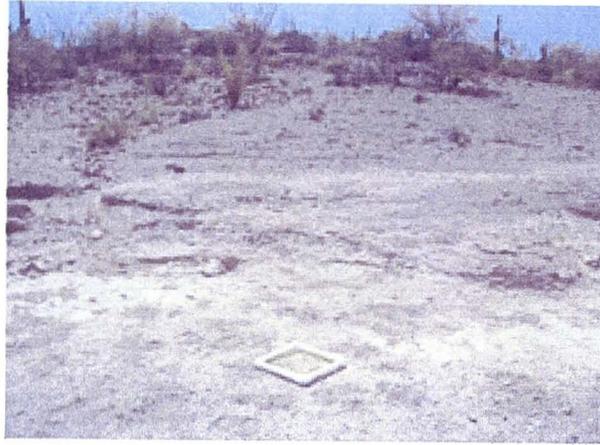


Site 61 – Photo Number 257

WILLOW SPRINGS TRIBUTARIES



Site 62 – Photo Number 258



Site 62 – Photo Number 259



Site 62 – Photo Number 260



Site 62 – Photo Number 261



Site 62 – Photo Number 262

WILLOW SPRINGS TRIBUTARIES



Site 63 – Photo Number 263



Site 63 – Photo Number 264



Site 63 – Photo Number 265



Site 63 – Photo Number 266



Site 63 – Photo Number 267

WILLOW SPRINGS TRIBUTARIES



Site 64 – Photo Number 268



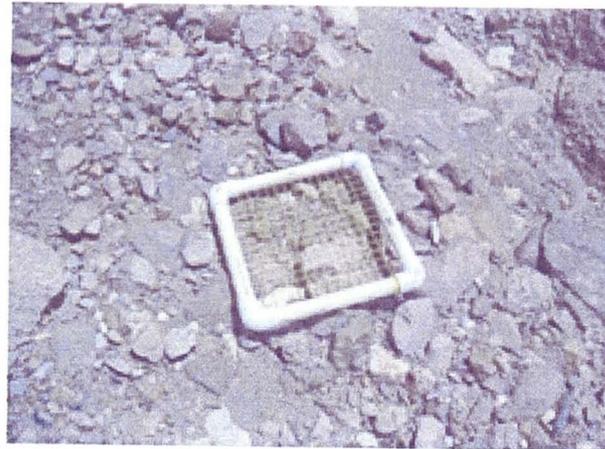
Site 64 – Photo Number 269



Site 64 – Photo Number 270



Site 64 – Photo Number 271



Site 64 Photo Number 272

WILLOW SPRINGS TRIBUTARIES



Site 65 – Photo Number 273



Site 65 – Photo Number 274



Site 65 – Photo Number 275



Site 65 – Photo Number 276



Site 65 – Photo Number 277

WILLOW SPRINGS TRIBUTARIES



Site 66 – Photo Number 278



Site 66 – Photo Number 279



Site 66 – Photo Number 280



Site 66 – Photo Number 281

WILLOW SPRINGS TRIBUTARIES



Site 67 – Photo Number 282



Site 67 – Photo Number 283



Site 67 – Photo Number 284



Site 67 – Photo Number 285



Site 67 – Photo Number 286

WILLOW SPRINGS TRIBUTARIES



Site 68 – Photo Number 287



Site 68 – Photo Number 288



Site 68 – Photo Number 289



Site 68 – Photo Number 290



Site 68 – Photo Number 291

WILLOW SPRINGS TRIBUTARIES



Site 69 – Photo Number 292



Site 69 – Photo Number 293



Site 69 – Photo Number 294



Site 69 – Photo Number 295



Site 69 – Photo Number 296

WILLOW SPRINGS TRIBUTARIES



Site 70 – Photo Number 297



Site 70 – Photo Number 298

WILLOW SPRINGS TRIBUTARIES



Site 71 – Photo Number 299



Site 71 – Photo Number 300



Site 71 – Photo Number 301



Site 71 – Photo Number 302



Site 71 – Photo Number 303

WILLOW SPRINGS TRIBUTARIES



Site 72 – Photo Number 304



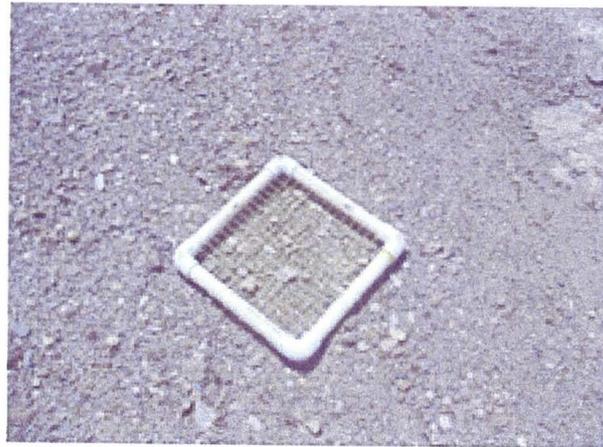
Site 72 – Photo Number 305



Site 72 – Photo Number 306



Site 72 – Photo Number 307

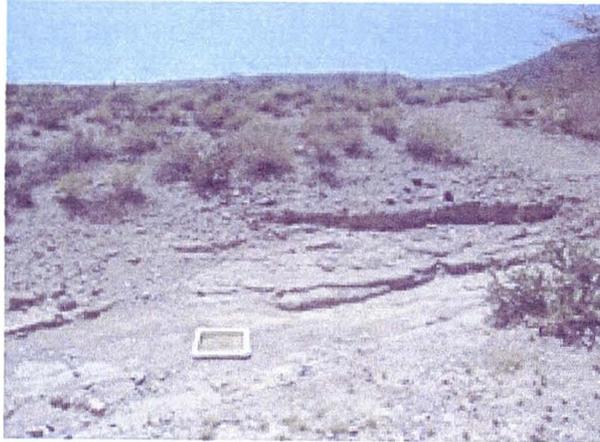


Site 72 – Photo Number 308

WILLOW SPRINGS TRIBUTARIES



Site 73 – Photo Number 309



Site 73 – Photo Number 310



Site 73 – Photo Number 311



Site 73 – Photo Number 312



Site 73 – Photo Number 313

WILLOW SPRINGS TRIBUTARIES



Site 74 – Photo Number 314



Site 74 – Photo Number 315



Site 74 – Photo Number 316



Site 74 – Photo Number 317



Site 74 – Photo Number 318

WILLOW SPRINGS TRIBUTARIES



Site 75 – Photo Number 319



Site 75 – Photo Number 320



Site 75 – Photo Number 321



Site 75 – Photo Number 322



Site 75 – Photo Number 323



Site 75 – Photo Number 324

WILLOW SPRINGS TRIBUTARIES



Site 76 – Photo Number 325



Site 77 – Photo Number 327



Site 77 – Photo Number 328



Site 77 – Photo Number 329



Site 77 – Photo Number 330



Site 77 – Photo Number 331

WILLOW SPRINGS TRIBUTARIES



Site 78 – Photo Number 332



Site 78 – Photo Number 333



Site 78 – Photo Number 334



Site 78 – Photo Number 335



Site 78 – Photo Number 336

WILLOW SPRINGS TRIBUTARIES



Site 79 – Photo Number 337



Site 79 – Photo Number 338



Site 79 – Photo Number 339

WILLOW SPRINGS TRIBUTARIES



Site 80 – Photo Number 340



Site 80 – Photo Number 341



Site 80 – Photo Number 342

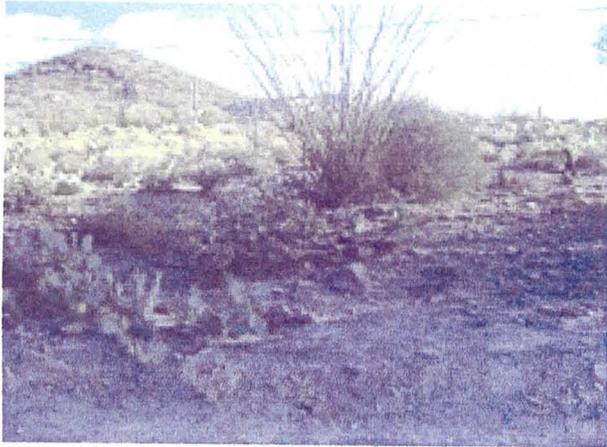


Site 80 – Photo Number 343



Site 80 – Photo Number 344

WILLOW SPRINGS TRIBUTARIES



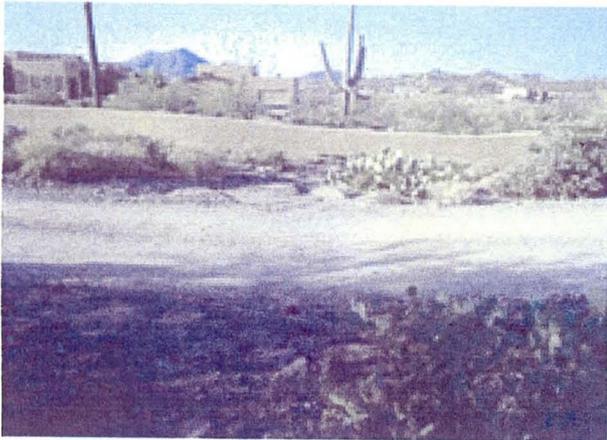
Site 81 – Photo Number 345



Site 81 – Photo Number 346



Site 81 – Photo Number 347



Site 81 – Photo Number 348

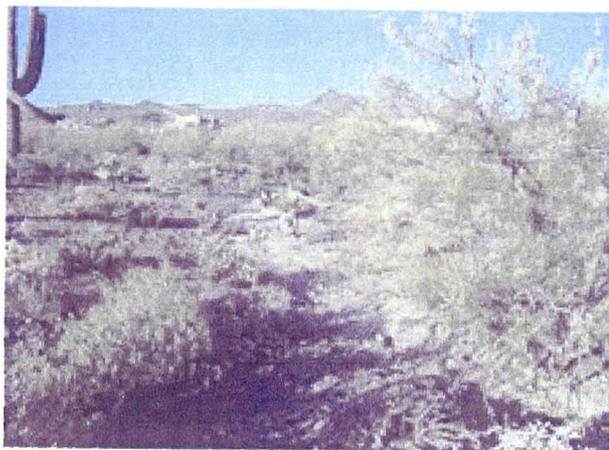


Site 81 – Photo Number 349



Site 81 – Photo Number 350

WILLOW SPRINGS TRIBUTARIES



Site 81 – Photo Number 351



Site 82 – Photo Number 352



Site 82 – Photo Number 353



Site 82 – Photo Number 354



Site 82 – Photo Number 355

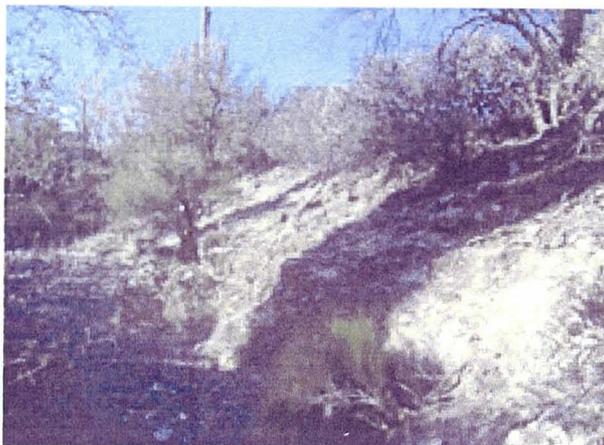


Site 82 – Photo Number 356

WILLOW SPRINGS TRIBUTARIES



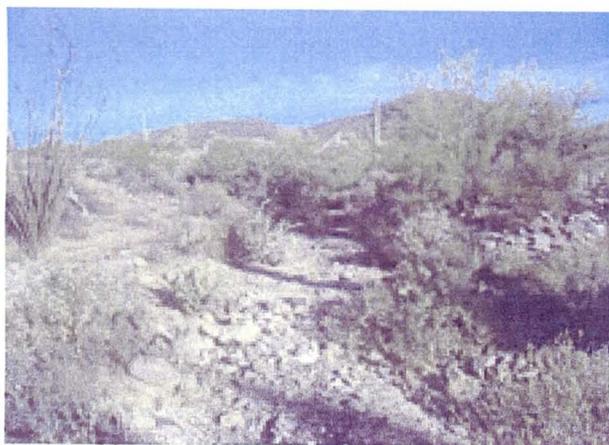
Site 82 – Photo Number 357



Site 83 – Photo Number 358



Site 84 – Photo Number 359



Site 84 – Photo Number 360



Site 84 – Photo Number 361



Site 84 – Photo Number 362

WILLOW SPRINGS TRIBUTARIES



Site 85 – Photo Number 363



Site 85 – Photo Number 364



Site 85 – Photo Number 365

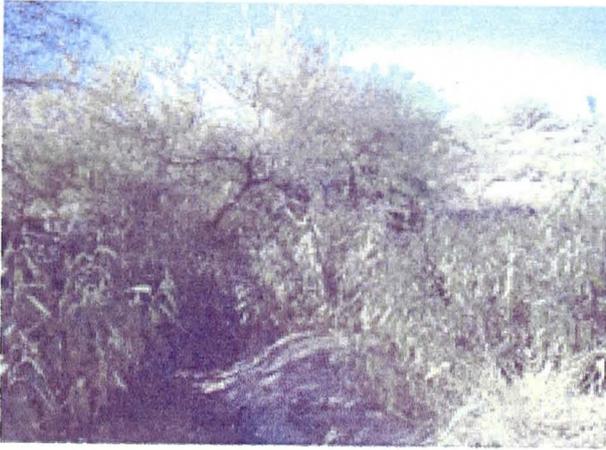


Site 85 – Photo Number 366



Site 85 – Photo Number 367

WILLOW SPRINGS TRIBUTARIES

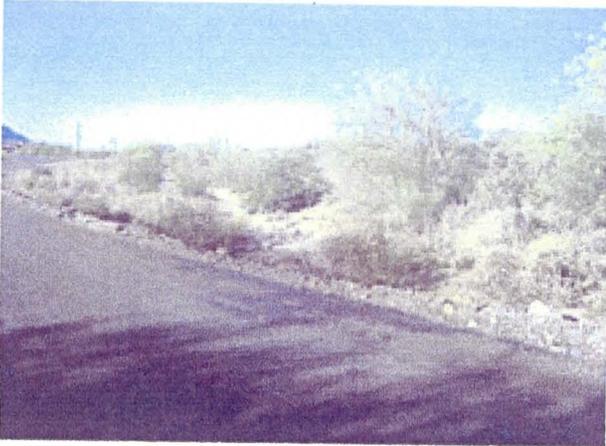


Site 86 – Photo Number 368



Site 86 – Photo Number 369

WILLOW SPRINGS TRIBUTARIES



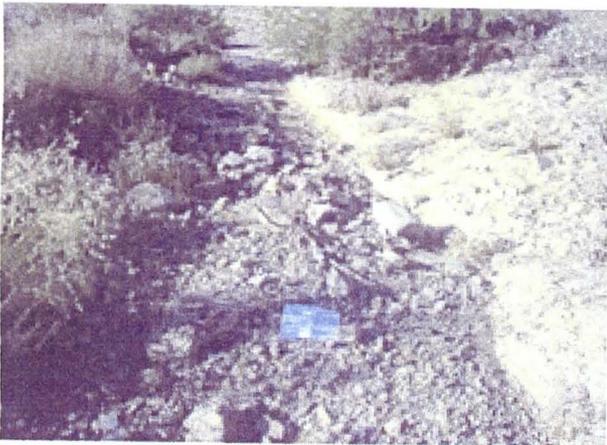
Site 87 – Photo Number 370



Site 87 – Photo Number 371



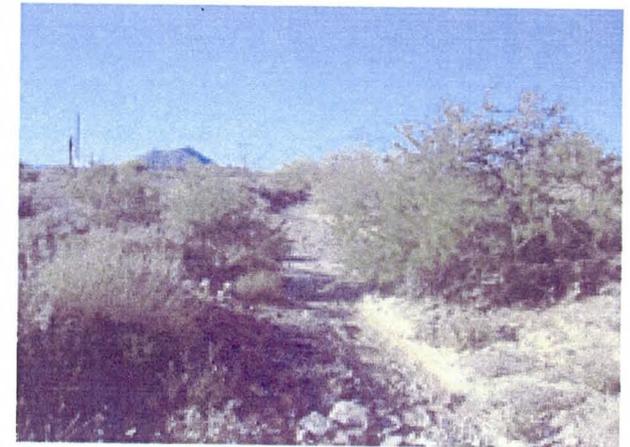
Site 87 – Photo Number 372



Site 87 – Photo Number 373

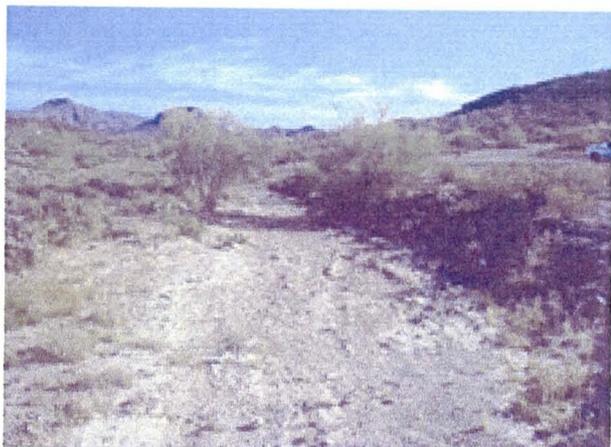


Site 87 – Photo Number 374



Site 87 – Photo Number 375

WILLOW SPRINGS TRIBUTARIES



Site 88 – Photo Number 376



Site 88 – Photo Number 377



Site 88 – Photo Number 378



Site 88 – Photo Number 379



Site 88 – Photo Number 380

WILLOW SPRINGS TRIBUTARIES



Site 89 – Photo Number 381



Site 90 – Photo Number 382



Site 90 – Photo Number 383



Site 91 – Photo Number 384



Site 91 – Photo Number 385

WILLOW SPRINGS TRIBUTARIES



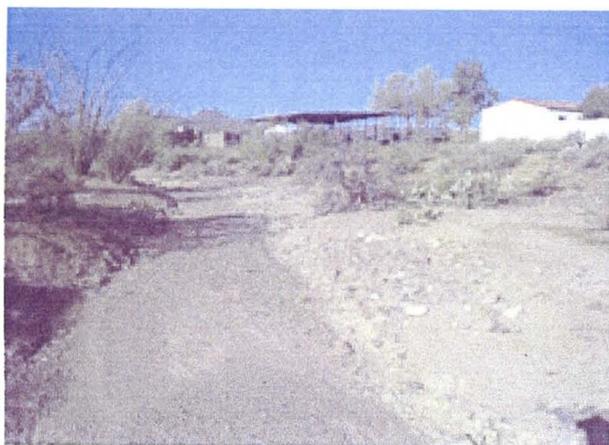
Site 92 – Photo Number 386



Site 92 – Photo Number 387



Site 92 – Photo Number 388



Site 92 – Photo Number 389



Site 92 – Photo Number 390

WILLOW SPRINGS TRIBUTARIES



Site 93 – Photo Number 391



Site 93 – Photo Number 392



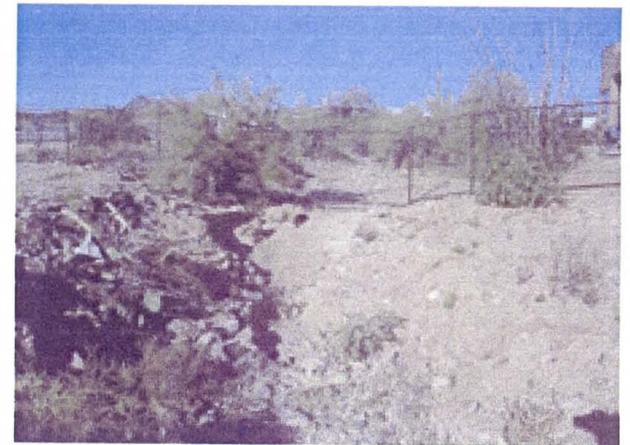
Site 93 – Photo Number 393



Site 93 – Photo Number 394



Site 93 – Photo Number 395



Site 94 – Photo Number 396



**APPENDIX D MANNING'S "n" VALUE DETERMINATION
AND SITE RECONNAISSANCE
PHOTOGRAPHS FOR CAVE CREEK
TRIBUTARIES**

Galloway Wash Tributaries, Willow Springs Wash Tributaries, and Cave Creek
Tributaries Manning's "n" Value Report

August 17, 2007

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 397 - 401 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	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		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
			USE:	0.075	0.044	0.075

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDM METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 402 - 406 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032		0.026	
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.070	0.030	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDM METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 407 - 411 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
	Boulder	0.040 - 0.070				
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.070	0.044	
					0.070	

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 412 - 419 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035		0.028	
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			0.035
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.070	0.032	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 420 - 434 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070	0.050	0.050	0.050
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.085	0.054	0.085

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 435 - 446 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.045	0.045	0.045
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.080	0.049	
					0.080	

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 447 - 452 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.050	0.045	0.045	
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
			USE:	0.085	0.049	0.080

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 453 - 465 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070	0.045	0.045	0.045
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.020		0.020
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.080	0.049	0.080

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 466 - 470 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.045	0.045	0.045
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004	0.001		
	Minor		0.005 - 0.015	0.010	0.010	
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.002		
	Medium		0.010 - 0.025	0.020	0.020	
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.080	0.049	0.080

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 471 - 485 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.040	0.035	0.040
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004	0.010	0.001	0.010
	Minor		0.005 - 0.015			
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.070	0.039	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 486 - 493 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.045	0.050	0.045
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.015		0.015
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.075	0.054	0.075

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 494 - 498 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	0.012 - 0.018			
	Rock Cut	0.025			
	Firm Soil	0.025 - 0.032			
	Coarse Sand	0.026 - 0.035			
	Fine Gravel	0.024			
	Gravel	0.028 - 0.035	0.035	0.028	0.035
	Coarse Gravel	0.028			
	Cobble	0.030 - 0.050			
	Boulder	0.040 - 0.070			
Degree of Irregularity	Smooth	0.000			
	Minor	0.001 - 0.005	0.005	0.001	0.005
	Moderate	0.006 - 0.010			
	Severe	0.011 - 0.020			
Effects of Obstructions	Negligible	0.000 - 0.004		0.001	
	Minor	0.005 - 0.015	0.010		0.010
	Appreciable	0.020 - 0.030			
	Severe	0.040 - 0.060			
Vegetation	Small	0.002 - 0.010		0.002	
	Medium	0.010 - 0.025	0.010		0.010
	Large	0.025 - 0.050			
	Very Large	0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	0.000	0.000	0.000	0.000
	Alternating (occasionally)	0.001 - 0.005			
	Alternating (frequently)	0.010 - 0.015			
Degree of Meandering	Minor	1.00	1.000	1.000	1.000
	Appreciable	1.15			
	Severe	1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$		USE:	0.060	0.032	0.060

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 499 - 503 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035	0.030	0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.015		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.065	0.034	0.055

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 504 - 519 [05-24-2006]
 Section Description: Tributary 1

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.045	0.045	0.045
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.070	0.049	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDM METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 520 - 540 [05-24-2006]
 Section Description: Tributary 1A

Sites

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.050	0.050
	Boulder		0.055			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.080	0.054	0.075

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 541 - 559 [05-24-2006]
 Section Description: Tributary 1B

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.045	0.045	0.045
	Boulder	0.040 - 0.070				
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004	0.001		
	Minor		0.005 - 0.015	0.010	0.010	
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.002		
	Medium		0.010 - 0.025	0.010	0.010	
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.070	0.049	0.070

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 560 - 563 [05-24-2006]
 Section Description: Tributary 1C

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035		0.030	
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.035	0.035
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.060	0.034	0.060

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 564 - 570 [05-24-2006]
 Section Description: Tributary 1C

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050	0.035	0.045	0.035
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
			USE:	0.060	0.049	0.060

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 571 [05-24-2006]
 Section Description: Tributary 1C

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035		0.028	
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035			0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.035	
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.015
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.060	0.032	0.060

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDM METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 572 - 573 [05-24-2006]
 Section Description: Tributary 1C

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030		0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004	0.001		
	Minor		0.005 - 0.015	0.010	0.010	
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010	0.002		
	Medium		0.010 - 0.025	0.010	0.010	
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.055	0.044	0.055

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 574-575 [05-24-2006]
 Section Description: Tributary 1C

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035		0.030	
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	0.040
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.065	0.034	0.065

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 576 & 578 - 579 [05-24-2006]
 Photograph No: 581-584 [05-24-2006]
 Section Description: Tributary 1C & 1D

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030	0.035	0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.015
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.055	0.039	0.060

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 577 [05-24-2006]
 Section Description: Tributary 1C

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment	Left Overbank	Main Channel	Right Overbank	
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035		0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
Boulder	0.040 - 0.070					
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.015
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$						
			USE:	0.060	0.044	0.060

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 585-597 [05-24-2006]
 Section Description: Tributary 1D

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030	0.035	0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.055	0.039	0.055

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 598 [05-24-2006]
 Section Description: Tributary 1D

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.035	0.030	0.035
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050			
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	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		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.065	0.034	0.065

DETERMINATION OF MANNING'S ROUGHNESS COEFFICIENTS BY FCDMC METHOD

Project: Cave Creek DMP-Phase II
 Stream: Cave Creek Tributaries
 Photograph No: 599 [05-24-2006]
 Section Description: Tributary 1D

Rough Sketch of Typical Channel Cross Section:

Insert Sketch Here

Channel Conditions		Manning's n Adjustment		Left Overbank	Main Channel	Right Overbank
Channel Bed Material	Concrete	n0	0.012 - 0.018			
	Rock Cut		0.025			
	Firm Soil		0.025 - 0.032			
	Coarse Sand		0.026 - 0.035			
	Fine Gravel		0.024			
	Gravel		0.028 - 0.035	0.030		0.030
	Coarse Gravel		0.028			
	Cobble		0.030 - 0.050		0.040	
	Boulder		0.040 - 0.070			
Degree of Irregularity	Smooth	n1	0.000			
	Minor		0.001 - 0.005	0.005	0.001	0.005
	Moderate		0.006 - 0.010			
	Severe		0.011 - 0.020			
Effects of Obstructions	Negligible	n2	0.000 - 0.004		0.001	
	Minor		0.005 - 0.015	0.010		0.010
	Appreciable		0.020 - 0.030			
	Severe		0.040 - 0.060			
Vegetation	Small	n3	0.002 - 0.010		0.002	
	Medium		0.010 - 0.025	0.010		0.010
	Large		0.025 - 0.050			
	Very Large		0.050 - 0.100			
Variations in the Channel Cross Sections	Gradual	n4	0.000	0.000	0.000	0.000
	Alternating (occasionally)		0.001 - 0.005			
	Alternating (frequently)		0.010 - 0.015			
Degree of Meandering	Minor	m	1.00	1.000	1.000	1.000
	Appreciable		1.15			
	Severe		1.30			
$n = (n0 + n1 + n2 + n3 + n4) m$			USE:	0.055	0.044	0.055



CAVE CREEK TRIBUTARIES



Site 95 – Photo Number 397



Site 95 – Photo Number 398



Site 95 – Photo Number 399



Site 95 – Photo Number 400



Site 95 – Photo Number 401

CAVE CREEK TRIBUTARIES



Site 96 – Photo Number 402



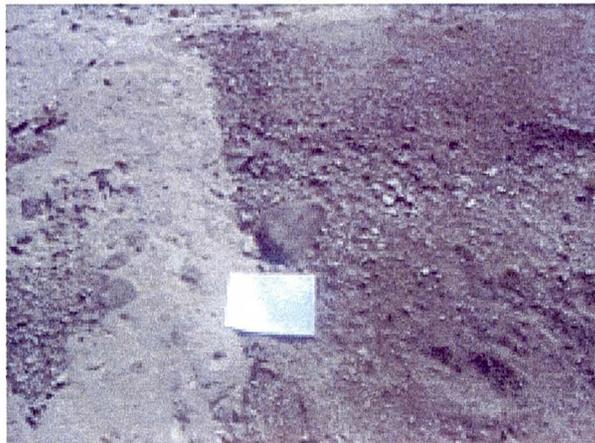
Site 96 – Photo Number 403



Site 96 – Photo Number 404



Site 96 – Photo Number 405



Site 96 – Photo Number 406

CAVE CREEK TRIBUTARIES



Site 97 – Photo Number 407



Site 97 – Photo Number 408



Site 97 – Photo Number 409



Site 97 – Photo Number 410



Site 97 – Photo Number 411

CAVE CREEK TRIBUTARIES



Site 98 – Photo Number 412



Site 98 – Photo Number 413

CAVE CREEK TRIBUTARIES



Site 99 – Photo Number 414



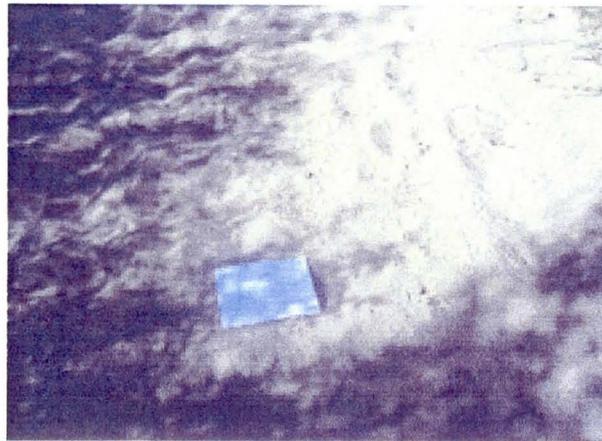
Site 99 – Photo Number 415



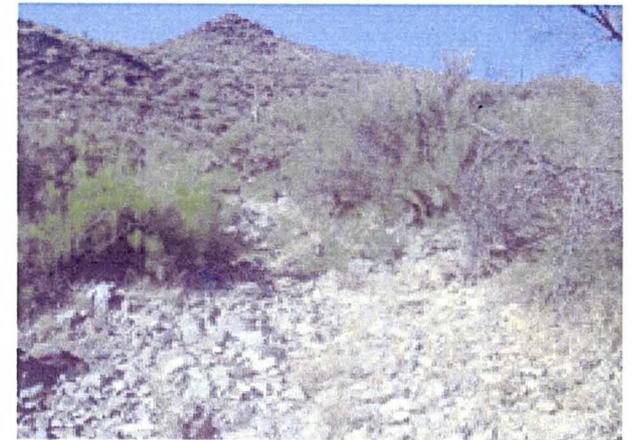
Site 99 – Photo Number 416



Site 99 – Photo Number 417

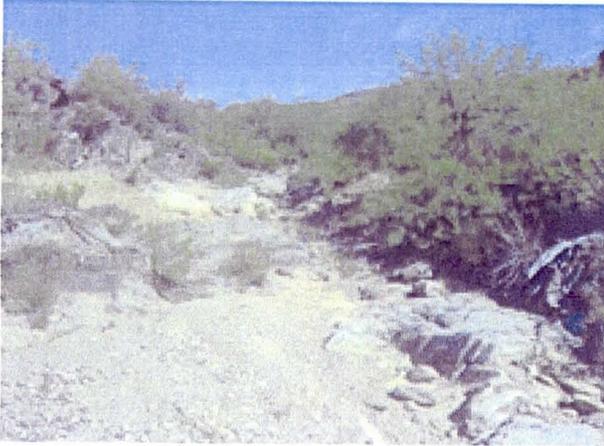


Site 99 – Photo Number 418



Site 99 – Photo Number 419

CAVE CREEK TRIBUTARIES



Site 100 – Photo Number 420



Site 100 – Photo Number 421



Site 101 – Photo Number 422



Site 101 – Photo Number 423



Site 101 – Photo Number 424



Site 101 – Photo Number 425

CAVE CREEK TRIBUTARIES



Site 102 – Photo Number 426



Site 102 – Photo Number 427



Site 102 – Photo Number 428



Site 102 – Photo Number 429

CAVE CREEK TRIBUTARIES



Site 103 – Photo Number 430



Site 103 – Photo Number 431



Site 103 – Photo Number 432



Site 103 – Photo Number 433



Site 103 – Photo Number 434

CAVE CREEK TRIBUTARIES



Site 104 – Photo Number 435



Site 104 – Photo Number 436



Site 104 – Photo Number 437



Site 104 – Photo Number 438



Site 104 Photo Number 439

CAVE CREEK TRIBUTARIES



Site 105 – Photo Number 440



Site 105 – Photo Number 441



Site 105 – Photo Number 442



Site 105 – Photo Number 443



Site 105 – Photo Number 444

CAVE CREEK TRIBUTARIES



Site 106 – Photo Number 445



Site 106 – Photo Number 446

CAVE CREEK TRIBUTARIES



Site 107 – Photo Number 447



Site 107 – Photo Number 448



Site 107 – Photo Number 449



Site 107 – Photo Number 450



Site 107 – Photo Number 451



Site 107 – Photo Number 452

CAVE CREEK TRIBUTARIES



Site 108 – Photo Number 453



Site 108 – Photo Number 454



Site 108 – Photo Number 455



Site 108 – Photo Number 456



Site 108 – Photo Number 457

CAVE CREEK TRIBUTARIES



Site 109 – Photo Number 458



Site 110 – Photo Number 459



Site 110 – Photo Number 460

CAVE CREEK TRIBUTARIES



Site 111 – Photo Number 461



Site 111 – Photo Number 462



Site 111 – Photo Number 463



Site 111 – Photo Number 464



Site 111 – Photo Number 465

CAVE CREEK TRIBUTARIES



Site 112 – Photo Number 466



Site 112 – Photo Number 467



Site 112 – Photo Number 468



Site 112 – Photo Number 469



Site 112 – Photo Number 470

CAVE CREEK TRIBUTARIES



Site 113 – Photo Number 471



Site 113 – Photo Number 472

CAVE CREEK TRIBUTARIES



Site 114 – Photo Number 473



Site 114 – Photo Number 474



Site 114 – Photo Number 475



Site 114 – Photo Number 476



Site 114 – Photo Number 477

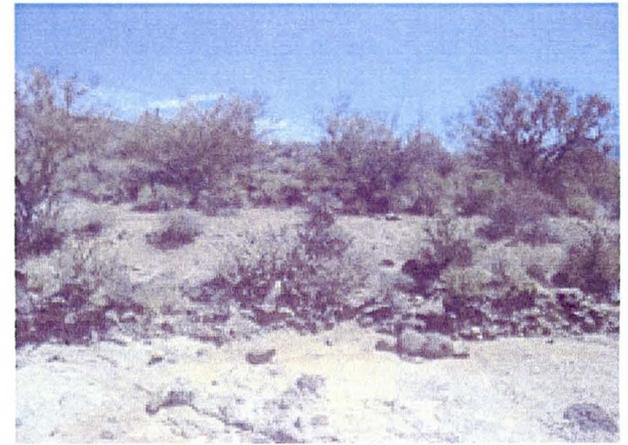
CAVE CREEK TRIBUTARIES



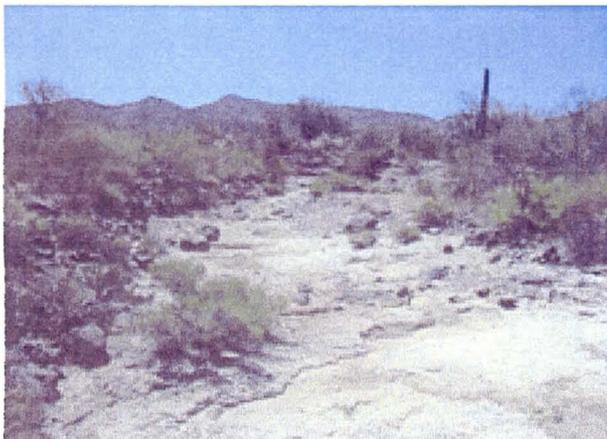
Site 115 – Photo Number 478



Site 115 – Photo Number 479



Site 115 – Photo Number 480



Site 115 – Photo Number 481



Site 115 – Photo Number 482

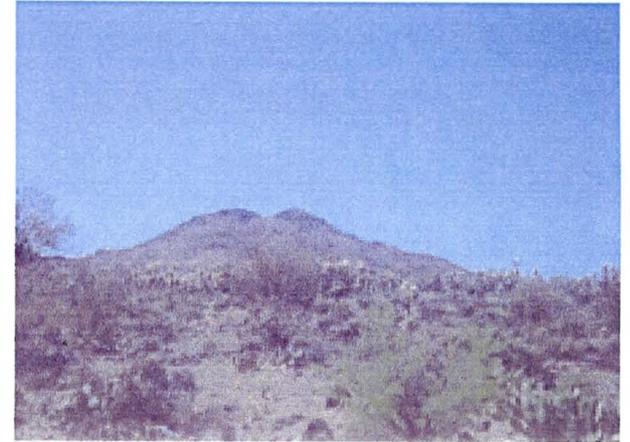
CAVE CREEK TRIBUTARIES



Site 116 – Photo Number 483



Site 116 – Photo Number 484



Site 116 – Photo Number 485

CAVE CREEK TRIBUTARIES



Site 117 – Photo Number 486



Site 117 – Photo Number 487



Site 117 – Photo Number 488



Site 117 – Photo Number 489



Site 117 – Photo Number 490



Site 117 – Photo Number 491

CAVE CREEK TRIBUTARIES



Site 118 – Photo Number 492

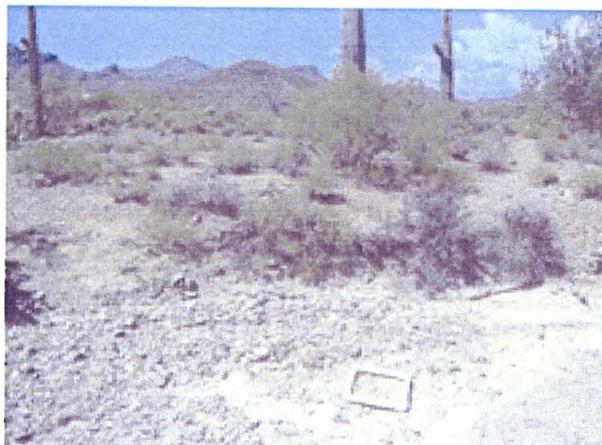


Site 118 – Photo Number 493

CAVE CREEK TRIBUTARIES



Site 119 – Photo Number 494



Site 119 – Photo Number 495



Site 119 – Photo Number 496



Site 119 – Photo Number 497



Site 119 – Photo Number 498

CAVE CREEK TRIBUTARIES



Site 120 – Photo Number 499



Site 120 – Photo Number 500



Site 120 – Photo Number 501



Site 120 – Photo Number 502

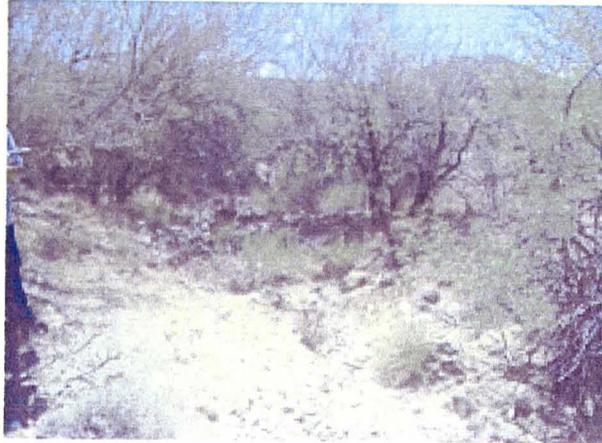


Site 120 – Photo Number 503

CAVE CREEK TRIBUTARIES



Site 121 – Photo Number 504



Site 121 – Photo Number 505



Site 122 – Photo Number 506



Site 122 – Photo Number 507

CAVE CREEK TRIBUTARIES



Site 123 – Photo Number 508



Site 123 – Photo Number 509



Site 123 – Photo Number 510

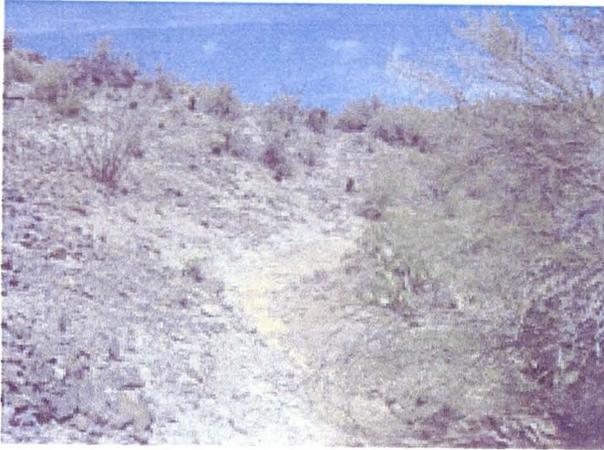


Site 123 – Photo Number 511



Site 123 – Photo Number 512

CAVE CREEK TRIBUTARIES



Site 124 – Photo Number 513



Site 124 – Photo Number 514

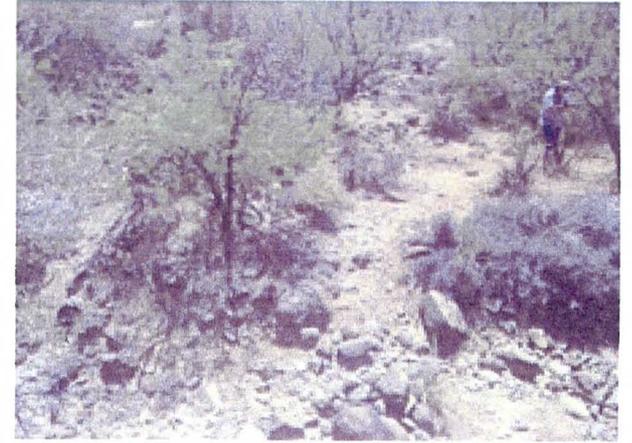
CAVE CREEK TRIBUTARIES



Site 125 – Photo Number 515



Site 125 – Photo Number 516



Site 125 – Photo Number 517



Site 125 – Photo Number 518



Site 125 – Photo Number 519

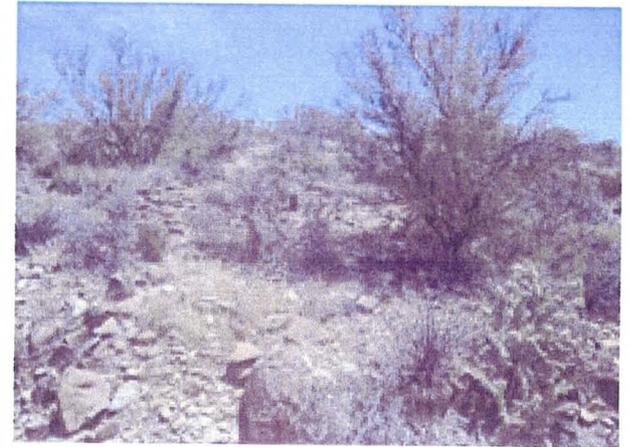
CAVE CREEK TRIBUTARIES



Site 126 – Photo Number 520



Site 126 – Photo Number 521



Site 126 – Photo Number 522



Site 126 – Photo Number 523



Site 126 – Photo Number 524



Site 126 – Photo Number 525

CAVE CREEK TRIBUTARIES



Site126 – Photo Number 526



Site 127 – Photo Number 527

Photo Number 528 Omitted



Site 127 – Photo Number 529



Site 127 – Photo Number 530



Site 127 – Photo Number 531

CAVE CREEK TRIBUTARIES



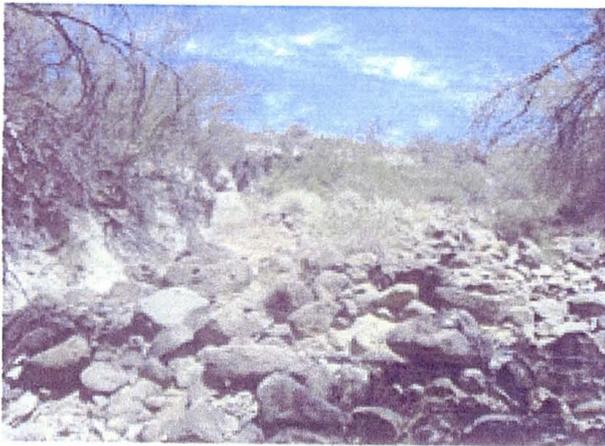
Site 128 – Photo Number 532



Site 128 – Photo Number 533



Site 129 – Photo Number 534

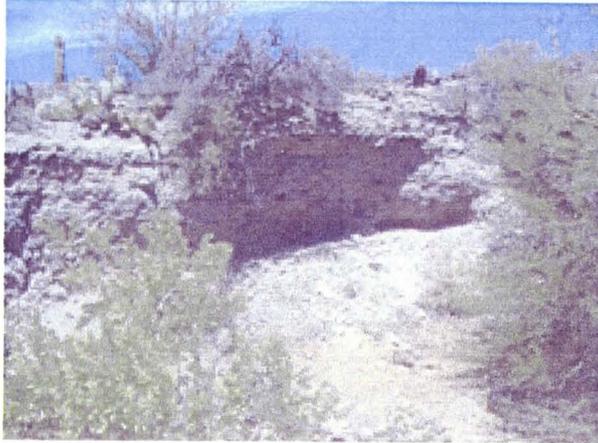


Site 129 – Photo Number 535

CAVE CREEK TRIBUTARIES



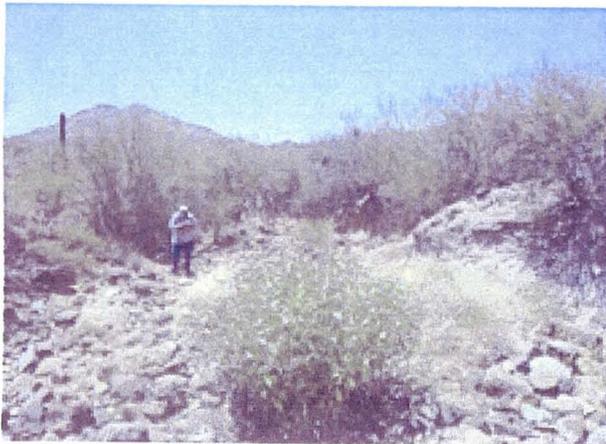
Site 130 – Photo Number 536



Site 130 – Photo Number 537



Site 130 – Photo Number 538



Site 130 – Photo Number 539



Site 130 – Photo Number 540

CAVE CREEK TRIBUTARIES



Site 131 – Photo Number 541



Site 131 – Photo Number 542



Site 131 – Photo Number 543



Site 131 – Photo Number 544



Site 131 – Photo Number 545

CAVE CREEK TRIBUTARIES



Site 132 – Photo Number 546



Site 132 – Photo Number 547



Site 132 – Photo Number 548



Site 132 – Photo Number 549



Site 132 – Photo Number 550



Site 132 – Photo Number 551

CAVE CREEK TRIBUTARIES



Site 133 – Photo Number 552



Site 133 – Photo Number 553



Site 134 – Photo Number 554



Site 134 – Photo Number 555



Site 135 – Photo Number 556



Site 135 – Photo Number 557

CAVE CREEK TRIBUTARIES



Site 136 – Photo Number 558



Site 136 – Photo Number 559



Site 137 – Photo Number 560



Site 137 – Photo Number 561



Site 138 – Photo Number 562



Site 138 – Photo Number 563

CAVE CREEK TRIBUTARIES



Site 139 – Photo Number 564



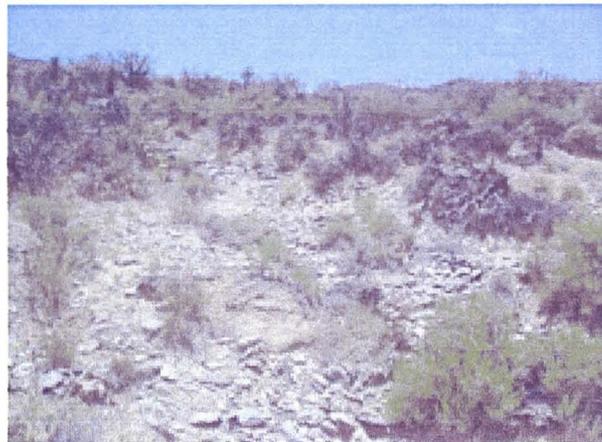
Site 140 – Photo Number 565



Site 141 – Photo Number 566



Site 141 – Photo Number 567



Site 141 – Photo Number 568

CAVE CREEK TRIBUTARIES



Site 142 – Photo Number 569



Site 142 – Photo Number 570



Site 143 – Photo Number 571



Site 143 – Photo Number 572



Site 143 – Photo Number 573

CAVE CREEK TRIBUTARIES



Site 144 – Photo Number 574



Site 144 – Photo Number 575



Site 145 – Photo Number 576



Site 145 – Photo Number 577



Site 145 – Photo Number 578



Site 145 – Photo Number 579

CAVE CREEK TRIBUTARIES



Site 145 – Photo Number 580



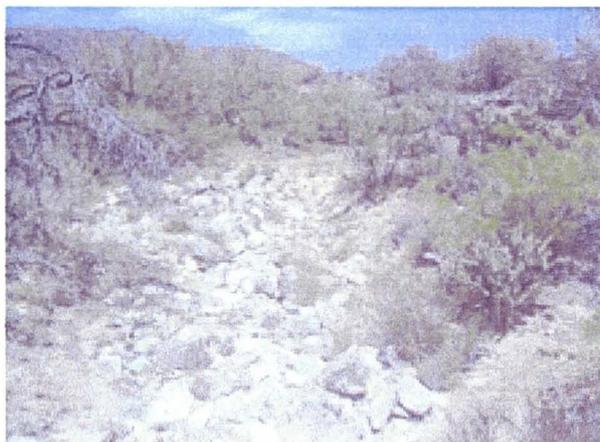
Site 145 – Photo Number 581



Site 145 – Photo Number 582



Site 146 – Photo Number 583



Site 146 – Photo Number 584

CAVE CREEK TRIBUTARIES



Site 147 – Photo Number 585



Site 147 – Photo Number 586



Site 148 – Photo Number 587



Site 148 – Photo Number 588



Site 149 – Photo Number 589



Site 149 – Photo Number 590

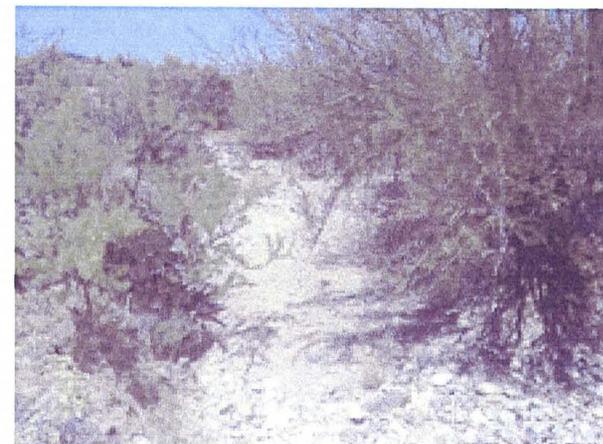
CAVE CREEK TRIBUTARIES



Site 150 – Photo Number 591



Site 150 – Photo Number 592



Site 150 – Photo Number 593



Site 151 – Photo Number 594



Site 151 – Photo Number 595

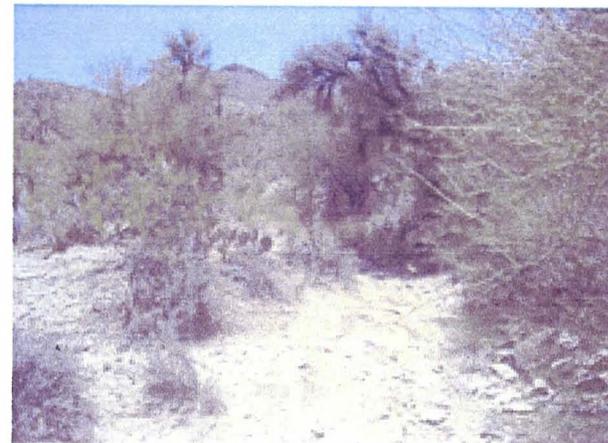
CAVE CREEK TRIBUTARIES



Site 152 – Photo Number 596



Site 152 – Photo Number 597



Site 153 – Photo Number 598



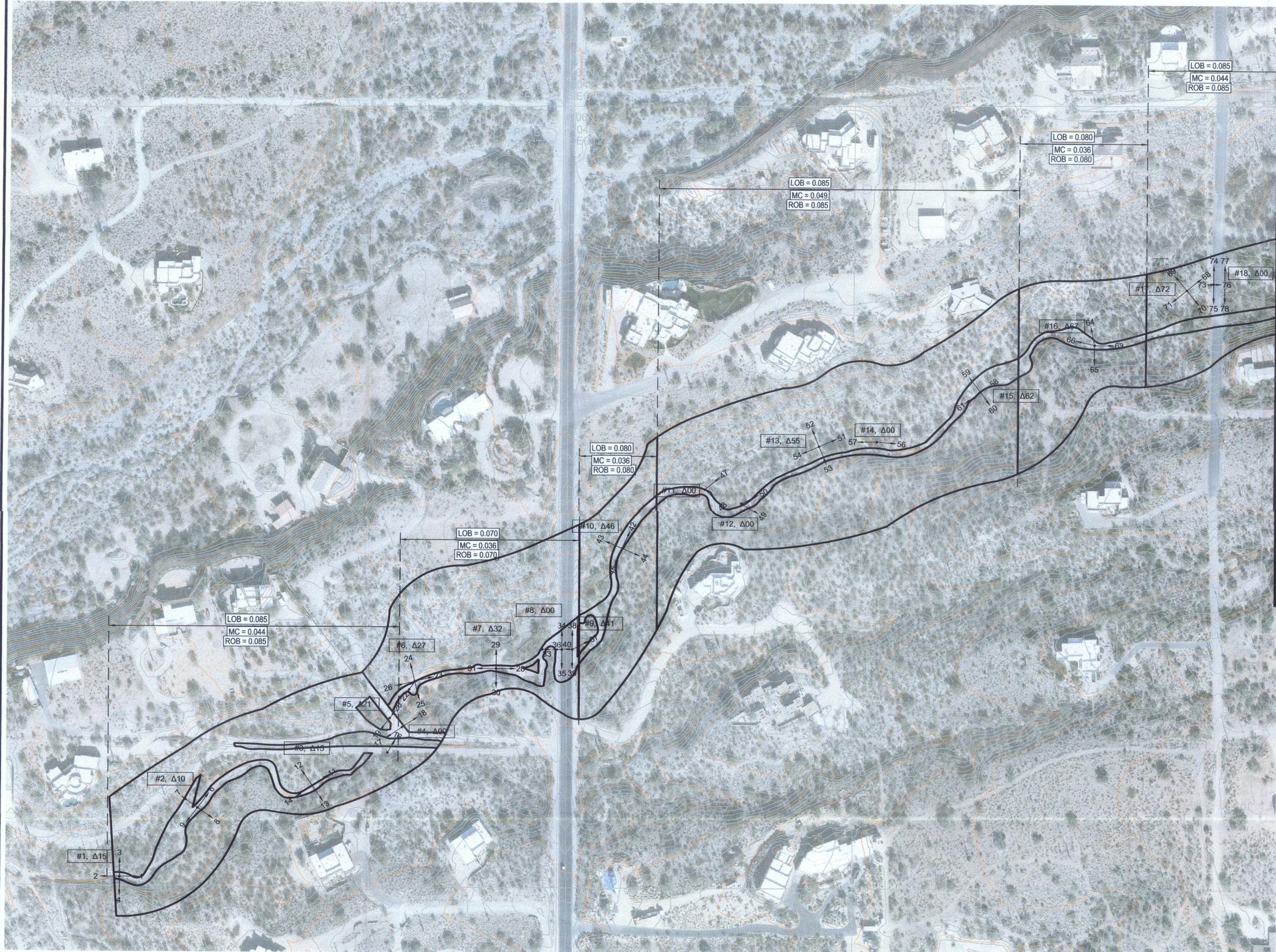
Site 153 – Photo Number 599



**APPENDIX E MANNING'S "n" VALUE DETERMINATION
EXHIBITS**

Galloway Wash Tributaries, Willow Springs Wash Tributaries, and Cave Creek
Tributaries Manning's "n" Value Report

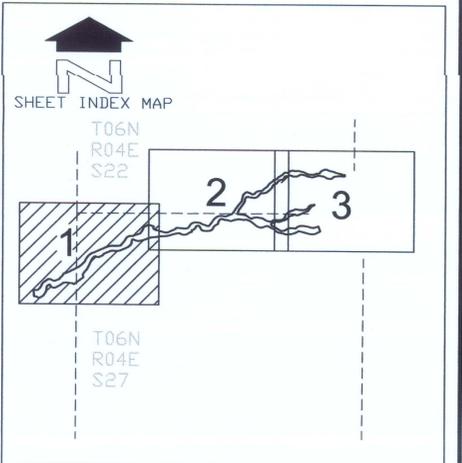
August 17, 2007



MATCHLINE SEE SHEET 2

LEGEND

- PHOTOGRAPHIC LOCATION AND DIRECTION INDICATORS
-
- POINT DESIGNATION
-
- MANNING'S ROUGHNESS COEFFICIENT SEGMENT
-
- MANNING'S n VALUE
- LOB = LEFT OVER BANK
MC = MAIN CHANNEL
ROB = RIGHT OVER BANK
- SECTION IDENTIFICATION T06N R04E S14
- EXISTING FEMA FLOOD HAZARD ZONES:
- ZONE A -----
- ZONE AO -----
- ZONE FW -----



NOTES

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

NO.	REVISION	BY	DATE
2			
1			



MANNING'S N VALUE DETERMINATION FOR GALLOWAY WASH TRIBUTARIES CAVE CREEK, AZ

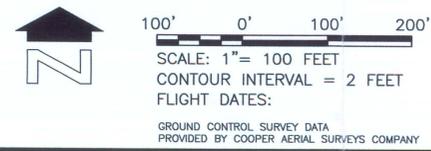
HDR ENGINEERING, INC.
3200 East Camelback Road, Suite 350
PHOENIX, ARIZONA 85018-2311
(602) 522-7700

PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DESIGN	M. FOUNTAIN	8-17-07
DESIGN CHK.	L. POTTER	8-17-07
PLANS	D. WESTMORELAND	8-17-07
PLANS CHK.	M. FOUNTAIN	8-17-07

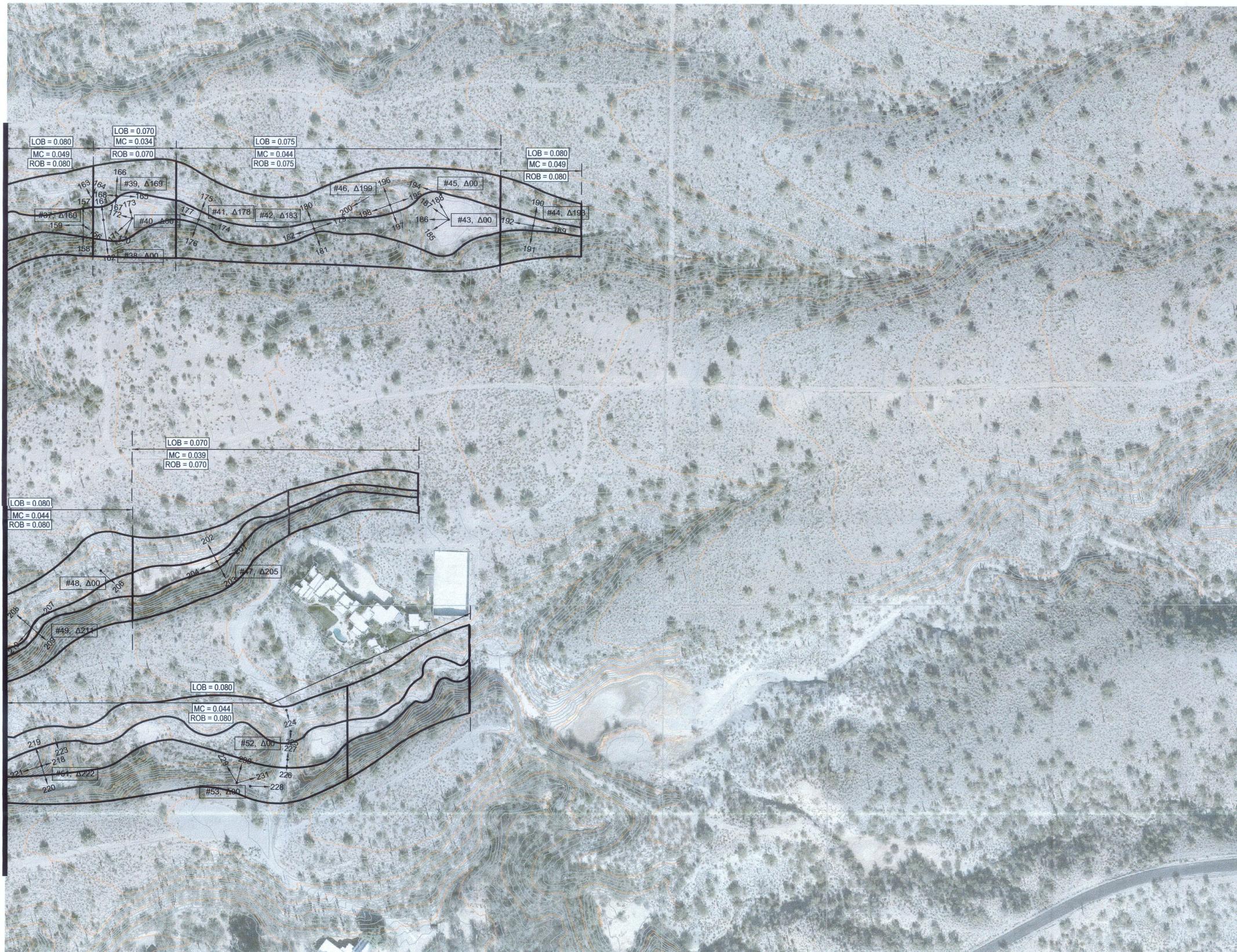
THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY



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MATCHLINE SEE SHEET 2



LEGEND

PHOTOGRAPHIC LOCATION AND DIRECTION INDICATORS

POINT DESIGNATION

MANNING'S ROUGHNESS COEFFICIENT SEGMENT

MANNING'S n VALUE

LOB = LEFT OVER BANK
MC = MAIN CHANNEL
ROB = RIGHT OVER BANK

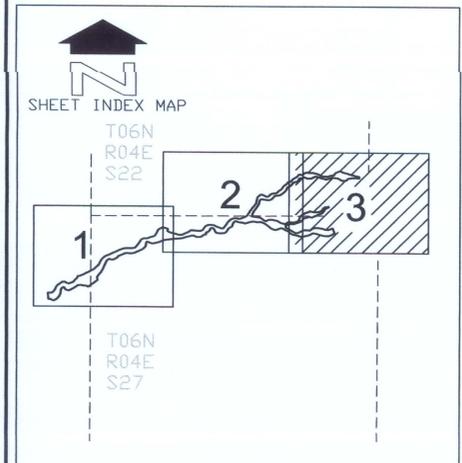
SECTION IDENTIFICATION T06N R04E S14

EXISTING FEMA FLOOD HAZARD ZONES:

ZONE A

ZONE AO

ZONE FW



NOTES

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

NO.	REVISION	BY	DATE
1			

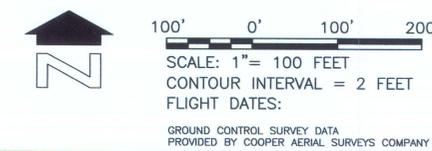
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

MANNING'S N VALUE DETERMINATION FOR GALLOWAY WASH TRIBUTARIES CAVE CREEK, AZ

HDR ENGINEERING, INC.
3200 East Camelback Road, Suite 350
PHOENIX, ARIZONA 85018-2311
(602) 522-7700

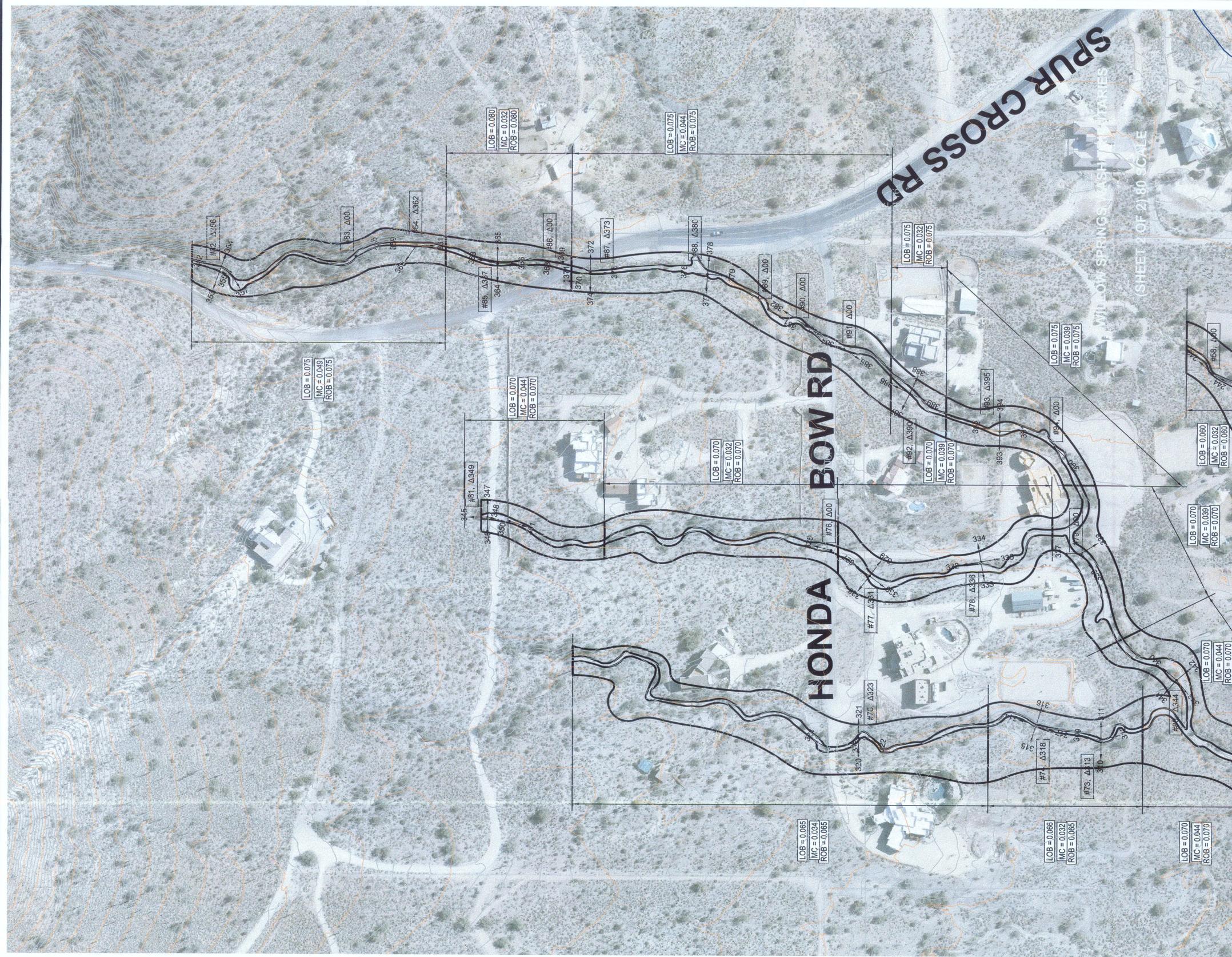
PRELIMINARY
NOT FOR
CONSTRUCTION

BY	DATE
DESIGN M. FOUNTAIN	8-17-07
DESIGN CHK. L. POTTER	8-17-07
PLANS D. WESTMORELAND	8-17-07
PLANS CHK. M. FOUNTAIN	8-17-07



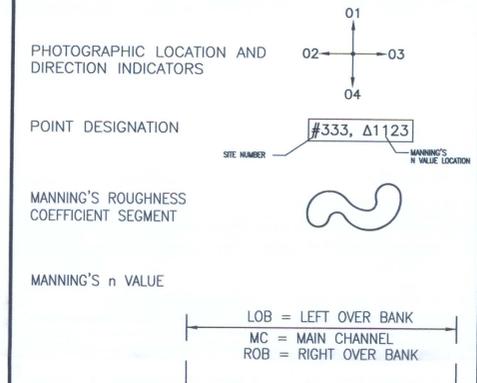
THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

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MATCHLINE SEE SHEET 1

LEGEND



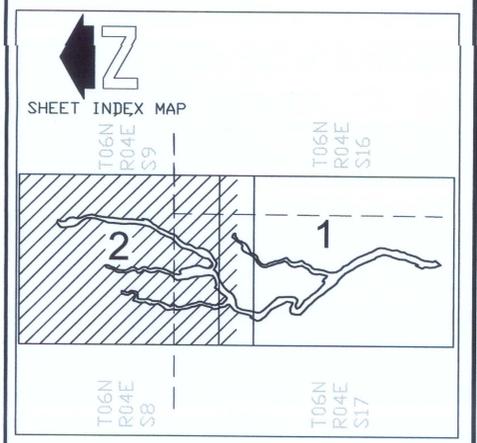
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EXISTING FEMA FLOOD HAZARD ZONES:

ZONE A _____

ZONE AO _____

ZONE FW _____



NOTES

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

MANNING'S N VALUE DETERMINATION FOR WILLOW SPRINGS WASH TRIBUTARIES CAVE CREEK, AZ

HDR ENGINEERING, INC.
3200 East Camelback Road, Suite 350
PHOENIX, ARIZONA 85018-2311
(602) 522-7700

PRELIMINARY NOT FOR CONSTRUCTION

DESIGN	BY	DATE
DESIGN CHK.	M. FOUNTAIN	8-17-07
PLANS	L. POTTER	8-17-07
PLANS CHK.	D. WESTMORELAND	8-17-07
	M. FOUNTAIN	8-17-07



THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

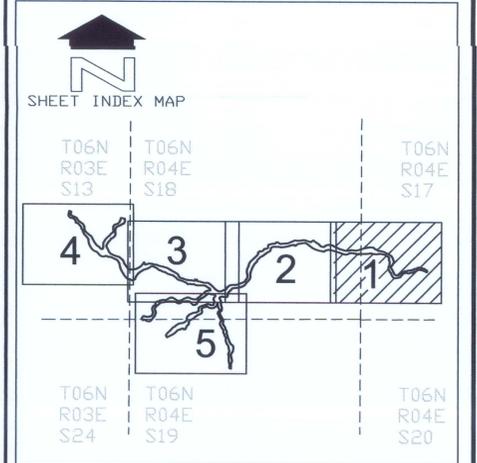
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MATCHLINE SEE SHEET 2



LEGEND

- PHOTOGRAPHIC LOCATION AND DIRECTION INDICATORS
- POINT DESIGNATION
- MANNING'S ROUGHNESS COEFFICIENT SEGMENT
- MANNING'S n VALUE
 - LOB = LEFT OVER BANK
 - MC = MAIN CHANNEL
 - ROB = RIGHT OVER BANK
- SECTION IDENTIFICATION T06N R04E S14
- EXISTING FEMA FLOOD HAZARD ZONES:
 - ZONE A
 - ZONE AO
 - ZONE FW



NOTES

CAVE CREEK DRAINAGE MASTER PLAN
 PROJECT CONTROL NUMBER: 690.02.20
 CONTRACT NUMBER: FCD 2004C072

NO.	REVISION	BY	DATE
2			
1			



MANNING'S N VALUE DETERMINATION FOR CAVE CREEK TRIBUTARIES CAVE CREEK, AZ

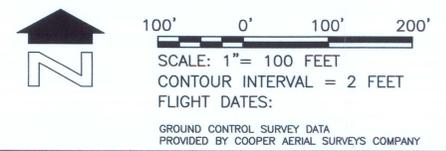
HDR ENGINEERING, INC.
 3200 East Camelback Road, Suite 350
 PHOENIX, ARIZONA 85018-2311
 (602) 522-7700

PRELIMINARY
 NOT FOR
 CONSTRUCTION

	BY	DATE
DESIGN	M. FOUNTAIN	8-17-07
DESIGN CHK.	L. POTTER	8-17-07
PLANS	D. WESTMORELAND	8-17-07
PLANS CHK.	M. FOUNTAIN	8-17-07

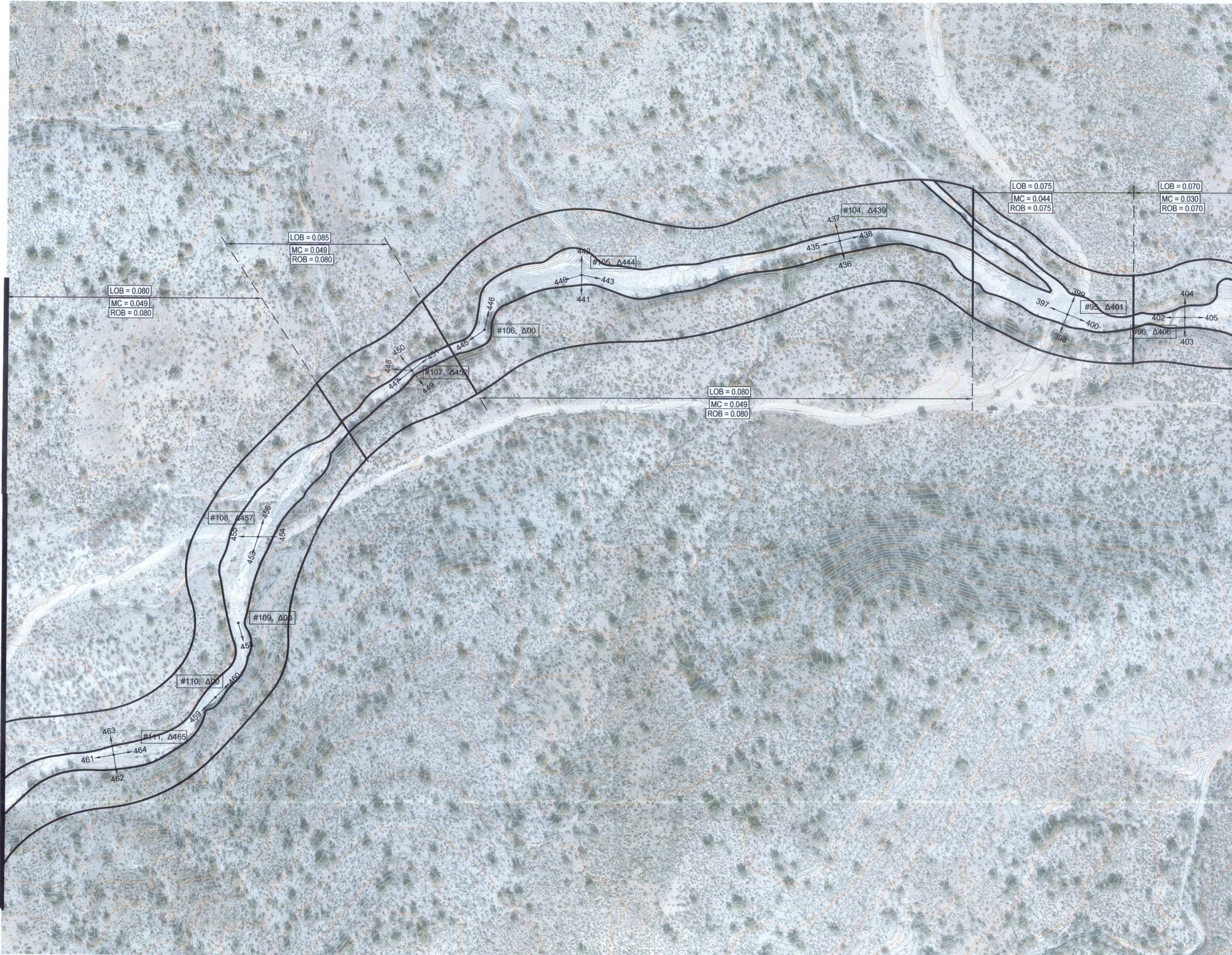
THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY



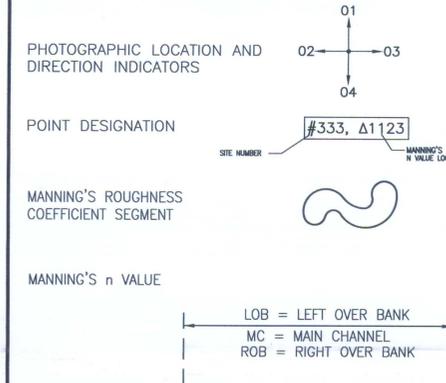
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MATCHLINE SEE SHEET 3



MATCHLINE SEE SHEET 1

LEGEND



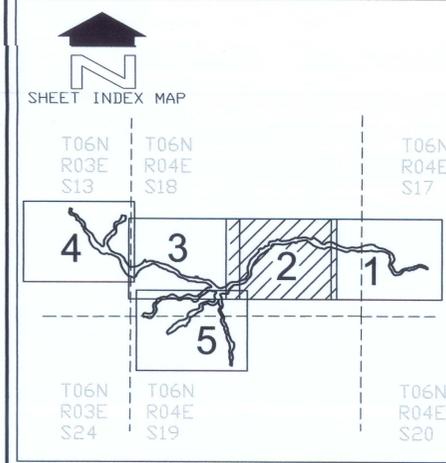
SECTION IDENTIFICATION T06N R04E S14

EXISTING FEMA FLOOD HAZARD ZONES:

ZONE A

ZONE AO

ZONE FW



NOTES

CAVE CREEK DRAINAGE MASTER PLAN
 PROJECT CONTROL NUMBER: 690.02.20
 CONTRACT NUMBER: FCD 2004C072

NO.	REVISION	BY	DATE
2			
1			

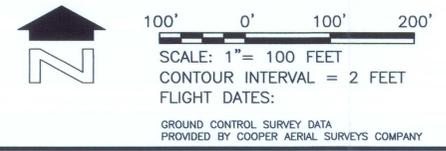
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

MANNING'S N VALUE DETERMINATION FOR CAVE CREEK TRIBUTARIES CAVE CREEK, AZ

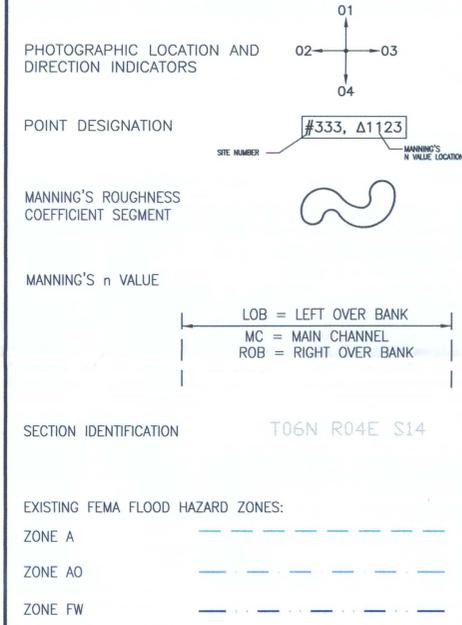
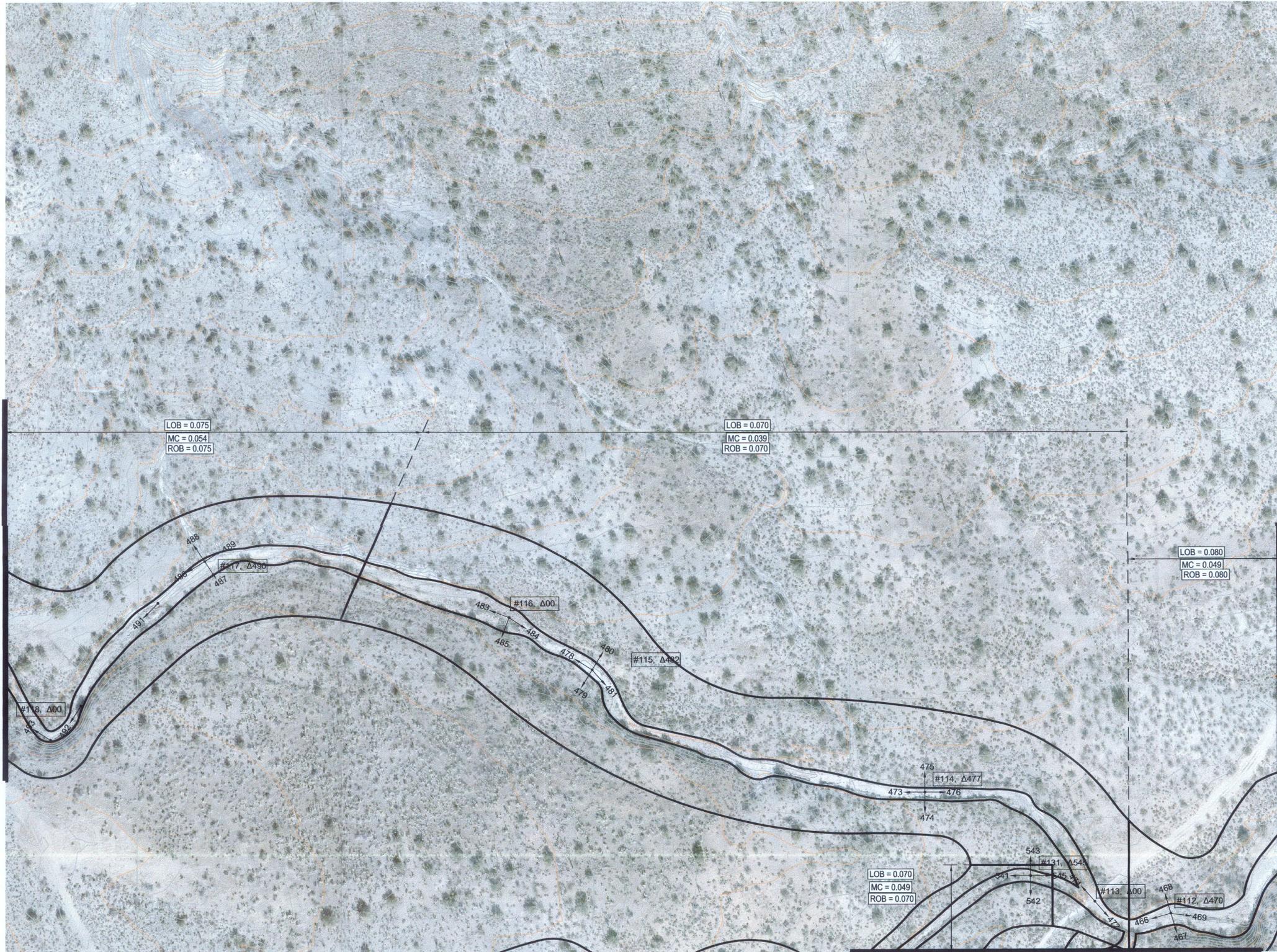
HDR ENGINEERING, INC. 3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
PRELIMINARY NOT FOR CONSTRUCTION	BY	DATE
DESIGN	M. FOUNTAIN	8-17-07
DESIGN CHK.	L. POTTER	8-17-07
PLANS	D. WESTMORELAND	8-17-07
PLANS CHK.	M. FOUNTAIN	8-17-07

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY



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CAVE CREEK DRAINAGE MASTER PLAN
 PROJECT CONTROL NUMBER: 690.02.20
 CONTRACT NUMBER: FCD 2004C072

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

MANNING'S N VALUE DETERMINATION FOR CAVE CREEK TRIBUTARIES CAVE CREEK, AZ

HDR ENGINEERING, INC.
 3200 East Camelback Road, Suite 350
 PHOENIX, ARIZONA 85018-2311
 (602) 522-7700

PRELIMINARY
 NOT FOR
 CONSTRUCTION

DESIGN	BY	DATE
DESIGN	M. FOUNTAIN	8-17-07
DESIGN CHK.	L. POTTER	8-17-07
PLANS	D. WESTMORELAND	8-17-07
PLANS CHK.	M. FOUNTAIN	8-17-07

MATCHLINE SEE SHEET 4

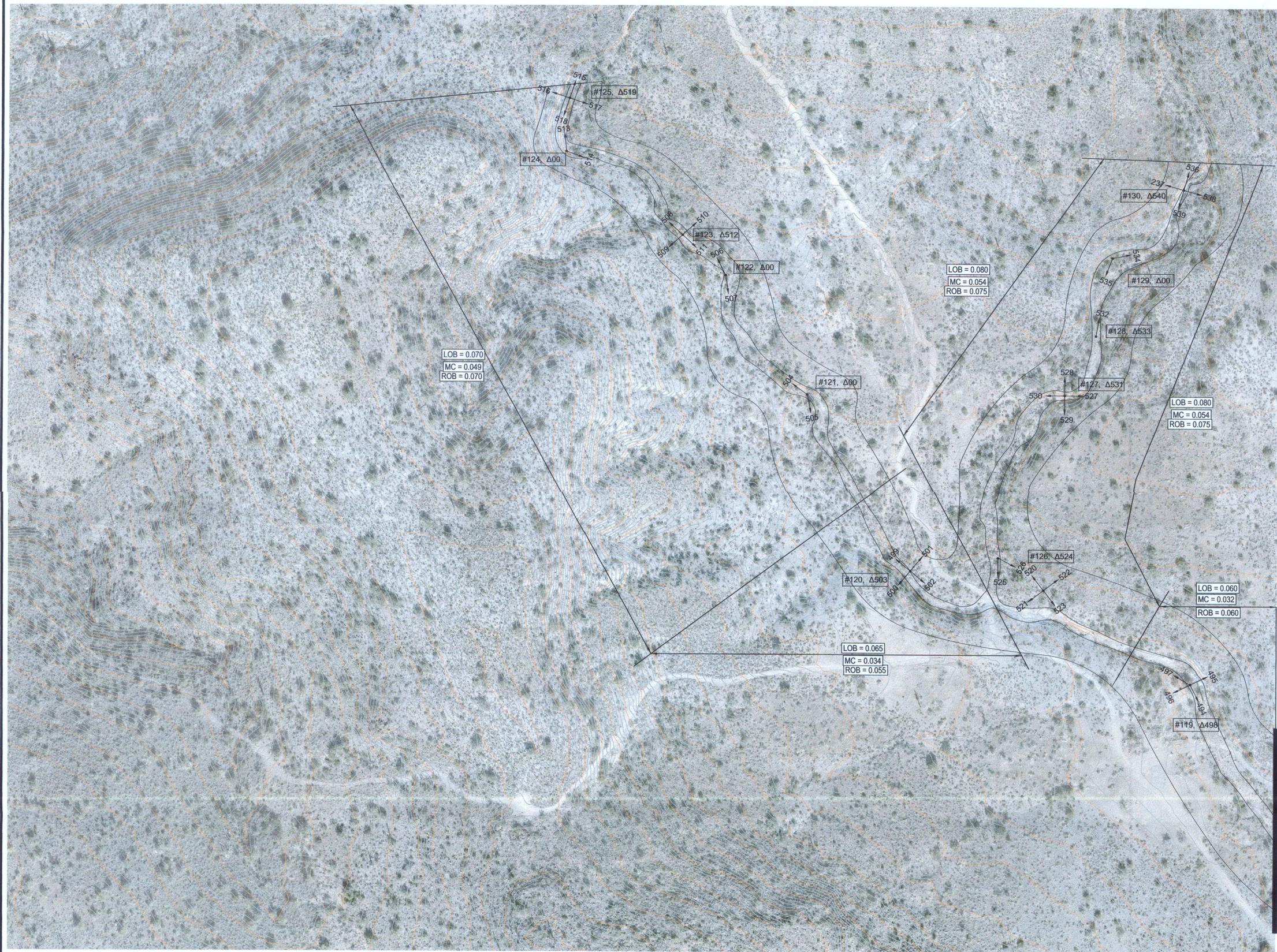
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MATCHLINE SEE SHEET 5

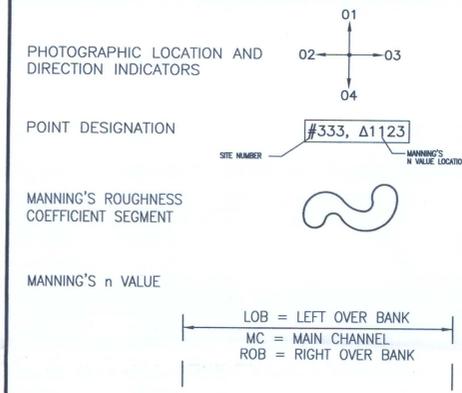
THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

COOPER AERIAL SURVEYS COMPANY





LEGEND



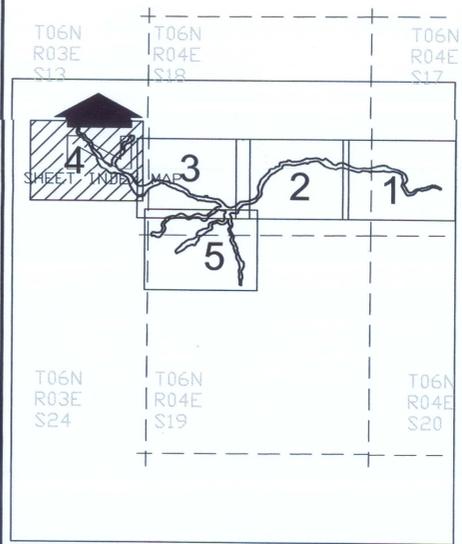
SECTION IDENTIFICATION T06N R04E S14

EXISTING FEMA FLOOD HAZARD ZONES:

ZONE A _____

ZONE AO _____

ZONE FW _____



NOTES

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

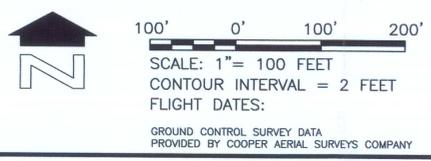
MANNING'S N VALUE DETERMINATION FOR CAVE CREEK TRIBUTARIES CAVE CREEK, AZ

HDR ENGINEERING, INC. 3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
DESIGN	M. FOUNTAIN	8-17-07
DESIGN CHK.	L. POTTER	8-17-07
PLANS	D. WESTMORELAND	8-17-07
PLANS CHK.	M. FOUNTAIN	8-17-07

PRELIMINARY NOT FOR CONSTRUCTION

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

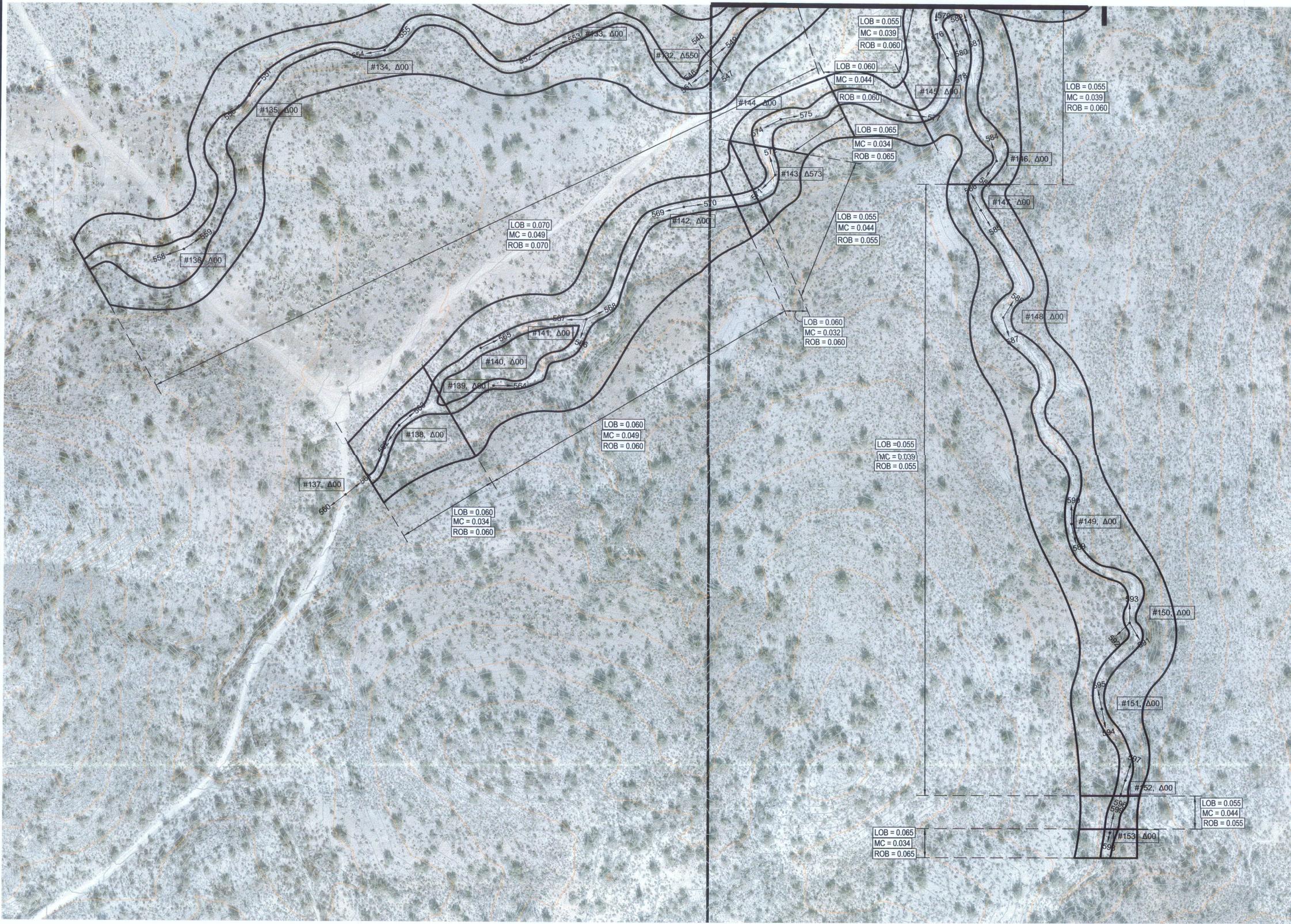
COOPER AERIAL SURVEYS COMPANY



MATCHLINE SEE SHEET 3

C:\pwork\pwork\mde\mde4103\CaveCreekS14.dwg Layout1, 8/17/2007 8:10:38 AM, mde

MATCHLINE SEE SHEET 3



LEGEND

PHOTOGRAPHIC LOCATION AND DIRECTION INDICATORS

POINT DESIGNATION

SITE NUMBER: #333, Δ1123

MANNING'S ROUGHNESS COEFFICIENT SEGMENT

MANNING'S n VALUE

LOB = LEFT OVER BANK
MC = MAIN CHANNEL
ROB = RIGHT OVER BANK

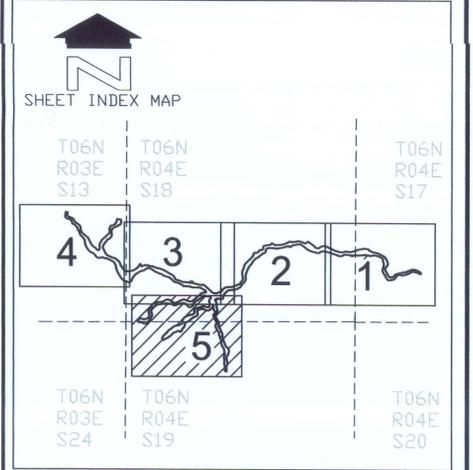
SECTION IDENTIFICATION T06N R04E S14

EXISTING FEMA FLOOD HAZARD ZONES:

ZONE A

ZONE AO

ZONE FW



NOTES

CAVE CREEK DRAINAGE MASTER PLAN
PROJECT CONTROL NUMBER: 690.02.20
CONTRACT NUMBER: FCD 2004C072

NO.	REVISION	BY	DATE
2			
1			

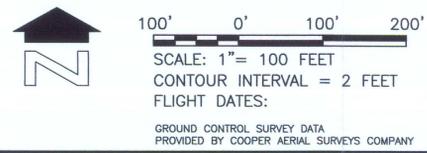
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

MANNING'S N VALUE DETERMINATION FOR CAVE CREEK TRIBUTARIES CAVE CREEK, AZ

HDR ENGINEERING, INC. 3200 East Camelback Road, Suite 350 PHOENIX, ARIZONA 85018-2311 (602) 522-7700		
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DESIGN CHK.	L. POTTER	8-17-07
PLANS	D. WESTMORELAND	8-17-07
PLANS CHK.	M. FOUNTAIN	8-17-07

90750

SHEET 5 OF 5



THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1" = 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

C:\Working\Photo\middle\48103\CaveCreek\Sheet5.dwg, Layout1, 8/17/2007 7:53:18 AM, middle



APPENDIX F DISKETTE OF ELECTRONIC DATA FILES

Galloway Wash Tributaries, Willow Springs Wash Tributaries, and Cave Creek
Tributaries Manning's "n" Value Report

August 17, 2007