Summary of Scour Analysis - Input Parameters and Results

Flecha Caida Ranch Estates #1 and #2 and Las Lomas de Catalina (Sections .01-0.10)

GENERAL INPUT PARAMETERS

This section summarizes the general input parameters that were used in the scour analysis. Additional input parameters (if applicable) are provided on the individual computation sheets.

The scour equations are from the "Standards Manual for Drainage Design and Floodplain Management in Tucson, Arizona", City of Tucson, 1989.

Hydraulic Data

	100-yr		
Q_{total} =	3797		total discharge
Q_{ch} =	1210	cfs	channel discharge
A_{ch} =	131.10	sq ft	channel area of flow
T_{ch} =	55.77	feet	channel topwidth of flow
Ymax =	5.03	feet	maximum depth of flow
S_e =	0.0181	ft/ft	energy slope or channel bed slope
TW =	0.00	feet	tailwater depth (if different than Y_{max}; otherwise 0)
n-value =	0.040		Manning's n-value for channel

Note: The energy slope is typically used when the basic hydraulic data is obtained from a HEC-2 or HEC-RAS analysis of the watercourse, and the channel bed slope is typically used when the data is obtained from a normal-depth analysis of the channel section.

For a straight reach, the radius of curvature (r_c) should be equal to or greater than: 557.66 feet

Applied r_c = 350 feet radius of curvature of channel centerline

DESIGN SCOUR DEPTH

Per COT Drainage Design Manual, Equation 6.3:

Z_{gs} =	0.00	feet	(general scour)
Z_a =	1.16	feet	(anti-dune trough)
Z_{ls} =	0.00	feet	(controlling drop scour not applicable)
Z_{bs} =	0.49	feet	(bend scour)
Z_{lft} =	1.00	feet	(low-flow thalweg)
	2.66	feet	
	1.30		(safety factor)
Z_t =	3.45	feet	(minimum recommended design scour depth)

Depth of Scour

Flecha Caida Ranch Estates #1 and #2 and Las Lomas de Catalina (Sections .01-0.10)

GENERAL SCOUR

Per COT Drainage Design Manual, Equation 6.4:

V_m =	9.23	fps	
Y_{max} =	5.03	feet	
Y_h =	2.35	feet	
S_e =	0.0181	ft/ft	
Z_{gs} =	0.00	feet	(if a negative value is calculated, result appears as 0)

ANTI-DUNE TROUGH DEPTH

Per COT Drainage Design Manual, Equation 6.5:

V_m =	9.23	fps
g =	32.20	accelaration due to gravity in ft/s^2
Z_a =	1.16	feet

LOW-FLOW THALWEG

Per COT Drainage Design Manual:

Assume thalweg depth (Z_{lft}) is 2.0 feet for regional watercourses and 1.0 feet for all other watercourses, unless field observations dictate otherwise.

Z_{lft} =	1.00	feet

BEND SCOUR

Per COT Drainage Design Manual, Equation 6.6:

V_m =	9.23	fps	
Y_{max} =	5.03	feet	
Y_h =	2.35	feet	
S_e =	0.0181	ft/ft	
r_c =	350.00	feet	
T =	55.77	feet	
r_c/T =	6.28		(calculated r_c/T is limited to $0.5 < r_c/T < 10$)
Z_{bs} =	0.49	feet	(using r_c/T and substituting Eqn. 6.7 into Eqn. 6.6)

Summary of Scour Analysis - Input Parameters and Results

Flecha Caida Ranch Estates # 1 and #2 and Las Lomas de Catalina (Sections 0.11-0.21)

GENERAL INPUT PARAMETERS

This section summarizes the general input parameters that were used in the scour analysis. Additional input parameters (if applicable) are provided on the individual computation sheets.

The scour equations are from the "Standards Manual for Drainage Design and Floodplain Management in Tucson, Arizona", City of Tucson, 1989.

Hydraulic Data

	100-yr		
Q_{total} =	3219		total discharge
Q_{ch} =	1600	cfs	channel discharge
A_{ch} =	200.29	sq ft	channel area of flow
T_{ch} =	97.25	feet	channel topwidth of flow
Ymax =	3.13	feet	maximum depth of flow
S_e =	0.0180	ft/ft	energy slope or channel bed slope
TW =	0.00	feet	tailwater depth (if different than Y_{max}; otherwise 0)
n-value =	0.040		Manning's n-value for channel

Note: The energy slope is typically used when the basic hydraulic data is obtained from a HEC-2 or HEC-RAS analysis of the watercourse, and the channel bed slope is typically used when the data is obtained from a normal-depth analysis of the channel section.

For a straight reach, the radius of curvature (r_c) should be equal to or greater than: 972.47273 feet

Applied r_c =	350	feet	radius of curvature of channel centerline

DESIGN SCOUR DEPTH

Per COT Drainage Design Manual, Equation 6.3:

Z_{gs} =	0.00	feet	(general scour)
Z_a =	0.87	feet	(anti-dune trough)
Z_{ls} =	0.00	feet	(controlling drop scour not applicable)
Z_{bs} =	0.66	feet	(bend scour)
Z_{lft} =	1.00	feet	(low-flow thalweg)
	2.53	feet	
	1.30		(safety factor)
Z_t =	3.29	feet	(minimum recommended design scour depth)

Depth of Scour

Flecha Caida Ranch Estates # 1 and #2 and Las Lomas de Catalina (Sections 0.11-0.21)

GENERAL SCOUR

Per COT Drainage Design Manual, Equation 6.4:

V_m =	7.99	fps	
Y_{max} =	3.13	feet	
Y_h =	2.06	feet	
S_e =	0.0180	ft/ft	
Z_{gs} =	0.00	feet	(if a negative value is calculated, result appears as 0)

ANTI-DUNE TROUGH DEPTH

Per COT Drainage Design Manual, Equation 6.5:

V_m =	7.99	fps
g =	32.20	accelaration due to gravity in ft/s^2
Z_a =	0.87	feet

LOW-FLOW THALWEG

Per COT Drainage Design Manual:

Assume thalweg depth (Z_{lft}) is 2.0 feet for regional watercourses and 1.0 feet for all other watercourses, unless field observations dictate otherwise.

Z_{lft} =	1.00	feet

BEND SCOUR

Per COT Drainage Design Manual, Equation 6.6:

V_m =	7.99	fps	
Y_{max} =	3.13	feet	
Y_h =	2.06	feet	
S_e =	0.0180	ft/ft	
r_c =	350.00	feet	
T =	97.25	feet	
r_c/T =	3.60		(calculated r_c/T is limited to $0.5 < r_c/T < 10$)
Z_{bs} =	0.66	feet	(using r_c/T and substituting Eqn. 6.7 into Eqn. 6.6)