

APPENDIX A

Manning's n Table of Values

This page intentionally left blank.

Table A-1 Roughness Coefficients (Manning's n) for Sheet Flow

Surface Description ¹	Manning's n
Smooth surfaces (concrete, asphalt, gravel or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover < 20%	0.06
Residue cover > 20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses ^A	0.24
Bermuda grass	0.41
Range (natural)	0.13
Woods ^B	
Light underbrush	0.40
Dense underbrush	0.80
¹ Source: SCS, TR-55, Second Edition, June 1986. ^A Includes species such as bluestem grass, buffalo grass, grama grass, and native grass mixtures. ^B When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.	

Table A-2 Manning's n Values

Street and Pavement Gutters ²		Manning's n
Asphalt pavement		0.016
Concrete gutter		0.016
Concrete pavement		0.018
Culverts and Storm Sewers ³	Roughness or Corrugation	Manning's n
Concrete Pipe	Smooth	0.013
Concrete Boxes	Smooth	0.013
Corrugated Polyethylene	Corrugated	Per manufacturer
Smooth Polyethylene	Smooth	0.011
Polyvinyl chloride (PVC)	Smooth	0.011

Artificial Channels ⁴		Depth Ranges		
Category	Lining Type	0-0.5 ft	0.5-2.0 ft	>2.0 ft
Grassed	Grass	0.050	0.040	0.035
Rigid	Concrete	0.016	0.013	0.013
	Grouted Riprap	0.040	0.030	0.028
	Gabions	0.030	0.030	0.030
	Stone Masonry	0.042	0.032	0.030
	Soil Cement	0.025	0.022	0.020
	Asphalt	0.018	0.016	0.016
Unlined	Bare Soil	0.023	0.020	0.020
	Rock Cut	0.045	0.035	0.025
Temporary*	Woven Paper Net	0.016	0.015	0.015
	Jute Net	0.028	0.022	0.019
	Fiberglass Roving	0.028	0.022	0.019
	Straw with Net	0.065	0.033	0.025
	Curled Wood Mat	0.066	0.035	0.028
	Synthetic Mat	0.036	0.025	0.021
Gravel Riprap	1-inch D ₅₀	0.044	0.033	0.030
	2-inch D ₅₀	0.066	0.041	0.034
Rock Riprap	6-inch D ₅₀	0.104	0.069	0.035
	12-inch D ₅₀	—	0.078	0.040

Natural Channels ⁵	Manning's n
NATURAL STREAMS	
Main Channels	
1. Clean, straight, full, no rifts or deep pools	0.030
2. Same as "1", but more stones and weeds	0.035
3. Clean, winding, some pools and shoals	0.040
4. Same as "3", but some weeds and stones	0.045
5. Same as "4", lower stages, more ineffective slopes and sections	0.048
6. Same as "4" but more stones	0.050
7. Sluggish reaches, weedy, deep pools	0.070
8. Very weedy reaches, deep pools, or floodways with heavy stands of timber and brush	0.100
Floodplain – Pasture	
1. Short grass	0.030
2. Tall grass	0.035
Floodplain – Cultivated Areas	
1. No crop	0.030
2. Mature row crops	0.035
3. Mature field crops	0.040
Floodplain – Brush	
1. Heavy weeds scattered brush	0.050
2. Light brush and trees, in winter	0.050
3. Light brush and trees, in summer	0.060
4. Medium to dense brush, in winter	0.070
5. Medium to dense brush in summer	0.100
Floodplain – Trees	
1. Heavy stand of timber, few down trees, little undergrowth, flow below branches	0.100
2. Same as "1", but with flow in branches	0.120
3. Dense willows, summer, straight	0.150
<p>* Lining designed for the interim condition, typically serving the needs of construction sequencing</p> <p>2 Source: HEC-22, 2001</p> <p>3 Source: Typical manufacturer data</p> <p>4 Source: HEC-15, 1988</p> <p>5 Source: HEC-RAS Hydraulic Reference Manual, 2008</p>	

This page intentionally left blank.