

Appendix C – Hydraulic Calculations

- Normal Depth Calculations – Streets
- Normal Depth Calculations – Onsite
- Normal Depth Calculations – Easements
- Riprap Sizing Calculations
- Finished Floor Elevation Checks

ANN1 (10YR)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.550 %
Discharge	16.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	3.93
0+10.00	0.60
0+15.00	0.50
0+15.50	0.48
0+15.50	0.00
0+17.00	0.13
0+17.00	0.17
0+60.00	1.03

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 3.93)	(0+60.00, 1.03)	0.016

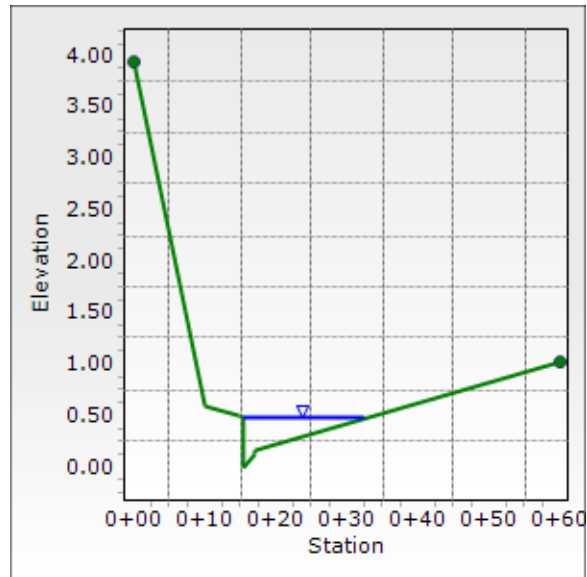
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.48 ft
Roughness Coefficient	0.016
Elevation	0.48 ft
Elevation Range	0.00 to 3.93 ft
Flow Area	3.0 ft ²
Wetted Perimeter	17.36 ft
Hydraulic Radius	0.17 ft
Top Width	16.84 ft
Normal Depth	0.48 ft
Critical Depth	0.61 ft
Critical Slope	0.643 %
Velocity	5.39 ft/s
Velocity Head	0.45 ft

Results	
Specific Energy	0.93 ft
Froude Number	2.262
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.48 ft
Critical Depth	0.61 ft
Channel Slope	3.550 %
Critical Slope	0.643 %

Cross Section for ANN1 (10YR)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.550 %
Normal Depth	0.48 ft
Discharge	16.00 cfs



ANN1 (100YR)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.550 %
Discharge	34.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	3.93
0+10.00	0.60
0+15.00	0.50
0+15.50	0.48
0+15.50	0.00
0+17.00	0.13
0+17.00	0.17
0+60.00	1.03

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 3.93)	(0+60.00, 1.03)	0.016

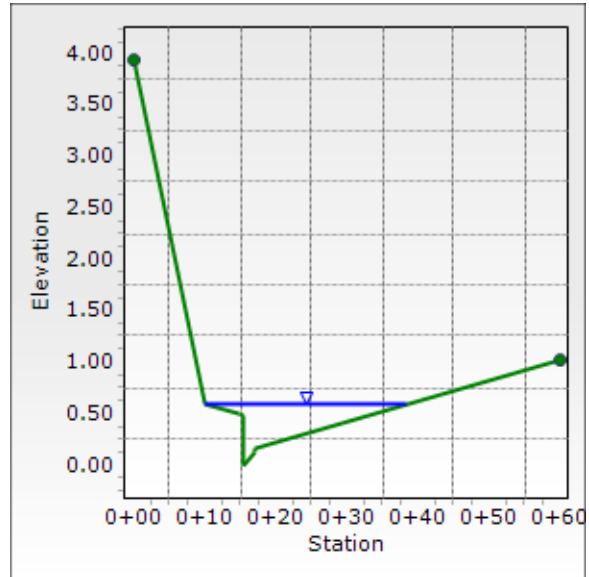
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.60 ft
Roughness Coefficient	0.016
Elevation	0.60 ft
Elevation Range	0.00 to 3.93 ft
Flow Area	5.7 ft ²
Wetted Perimeter	29.04 ft
Hydraulic Radius	0.20 ft
Top Width	28.50 ft
Normal Depth	0.60 ft
Critical Depth	0.76 ft
Critical Slope	0.570 %
Velocity	5.93 ft/s
Velocity Head	0.55 ft

Results	
Specific Energy	1.15 ft
Froude Number	2.332
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.60 ft
Critical Depth	0.76 ft
Channel Slope	3.550 %
Critical Slope	0.570 %

Cross Section for ANN1 (100YR)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.550 %
Normal Depth	0.60 ft
Discharge	34.00 cfs



HUAL1 (10YR)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.320 %
Discharge	3.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.56
0+28.00	0.00
0+55.00	0.54

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.56)	(0+55.00, 0.54)	0.016

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

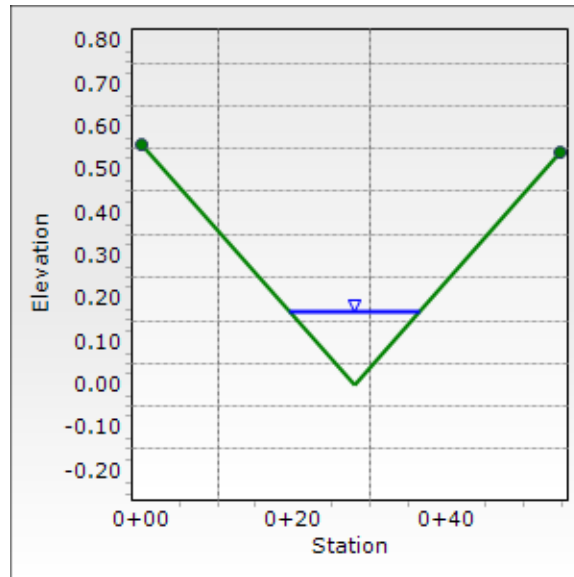
Results	
Normal Depth	0.17 ft
Roughness Coefficient	0.016
Elevation	0.17 ft
Elevation Range	0.00 to 0.56 ft
Flow Area	1.4 ft ²
Wetted Perimeter	17.03 ft
Hydraulic Radius	0.09 ft
Top Width	17.03 ft
Normal Depth	0.17 ft
Critical Depth	0.19 ft
Critical Slope	0.823 %
Velocity	2.07 ft/s
Velocity Head	0.07 ft
Specific Energy	0.24 ft
Froude Number	1.250
Flow Type	Supercritical

GVF Input Data

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.17 ft
Critical Depth	0.19 ft
Channel Slope	1.320 %
Critical Slope	0.823 %

Cross Section for HUAL1 (10YR)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.320 %
Normal Depth	0.17 ft
Discharge	3.00 cfs



HUAL1 (100YR)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.320 %
Discharge	5.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.56
0+28.00	0.00
0+55.00	0.54

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.56)	(0+55.00, 0.54)	0.016

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

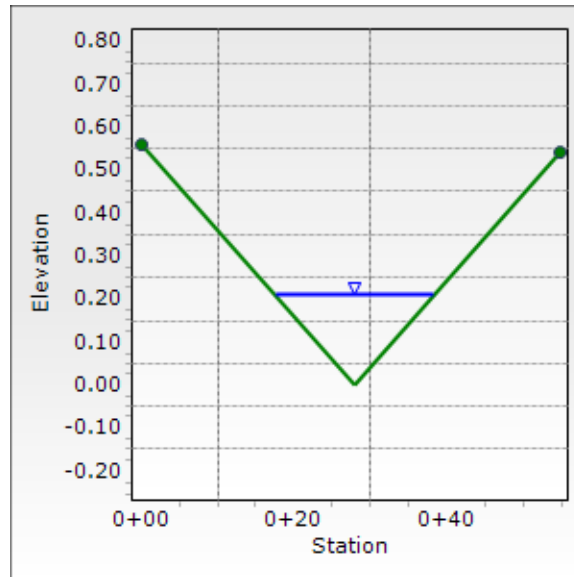
Results	
Normal Depth	0.21 ft
Roughness Coefficient	0.016
Elevation	0.21 ft
Elevation Range	0.00 to 0.56 ft
Flow Area	2.1 ft ²
Wetted Perimeter	20.63 ft
Hydraulic Radius	0.10 ft
Top Width	20.63 ft
Normal Depth	0.21 ft
Critical Depth	0.23 ft
Critical Slope	0.769 %
Velocity	2.35 ft/s
Velocity Head	0.09 ft
Specific Energy	0.29 ft
Froude Number	1.291
Flow Type	Supercritical

GVF Input Data

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.21 ft
Critical Depth	0.23 ft
Channel Slope	1.320 %
Critical Slope	0.769 %

Cross Section for HUAL1 (100YR)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.320 %
Normal Depth	0.21 ft
Discharge	5.00 cfs



HUAL2 (10YR)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.950 %
Discharge	18.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.56
0+28.00	0.00
0+55.00	0.54

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.56)	(0+55.00, 0.54)	0.016

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

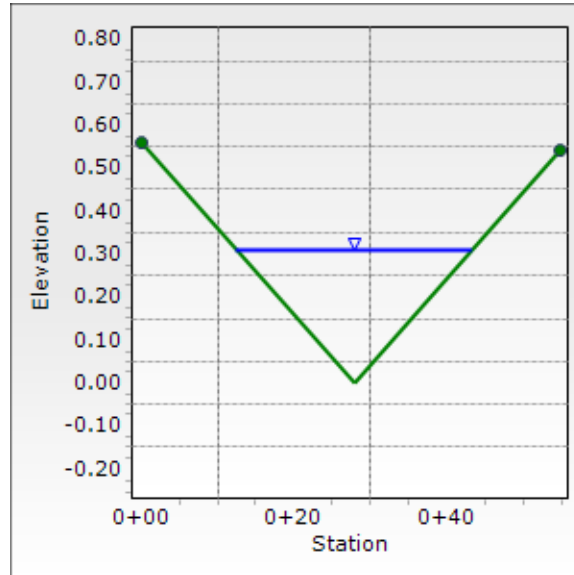
Results	
Normal Depth	0.31 ft
Roughness Coefficient	0.016
Elevation	0.31 ft
Elevation Range	0.00 to 0.56 ft
Flow Area	4.8 ft ²
Wetted Perimeter	31.04 ft
Hydraulic Radius	0.16 ft
Top Width	31.03 ft
Normal Depth	0.31 ft
Critical Depth	0.38 ft
Critical Slope	0.648 %
Velocity	3.74 ft/s
Velocity Head	0.22 ft
Specific Energy	0.53 ft
Froude Number	1.673
Flow Type	Supercritical

GVF Input Data

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.31 ft
Critical Depth	0.38 ft
Channel Slope	1.950 %
Critical Slope	0.648 %

Cross Section for HUAL2 (10YR)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.950 %
Normal Depth	0.31 ft
Discharge	18.00 cfs



HUAL2 (100YR)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.950 %
Discharge	75.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.56
0+28.00	0.00
0+55.00	0.54

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.56)	(0+55.00, 0.54)	0.016

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

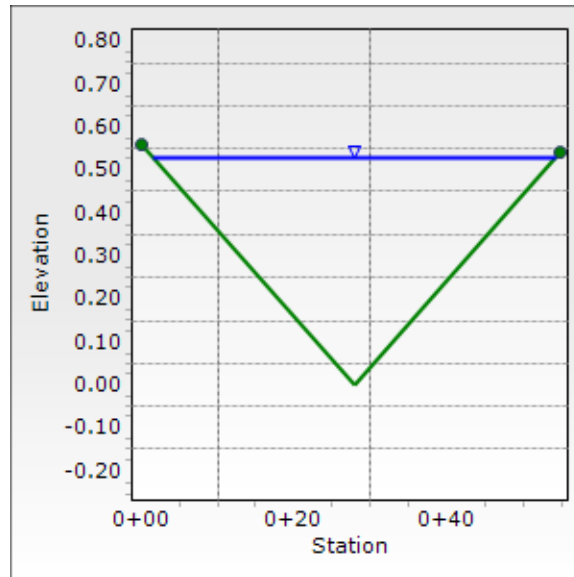
Results	
Normal Depth	0.53 ft
Roughness Coefficient	0.016
Elevation	0.53 ft
Elevation Range	0.00 to 0.56 ft
Flow Area	14.0 ft ²
Wetted Perimeter	52.95 ft
Hydraulic Radius	0.26 ft
Top Width	52.94 ft
Normal Depth	0.53 ft
Critical Depth	0.66 ft
Critical Slope	0.515 %
Velocity	5.35 ft/s
Velocity Head	0.45 ft
Specific Energy	0.97 ft
Froude Number	1.834
Flow Type	Supercritical

GVF Input Data

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.53 ft
Critical Depth	0.66 ft
Channel Slope	1.950 %
Critical Slope	0.515 %

Cross Section for HUAL2 (100YR)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.950 %
Normal Depth	0.53 ft
Discharge	75.00 cfs



DON1-A1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.730 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.48
0+05.00	0.38
0+06.50	0.00
0+07.50	0.08
0+07.50	0.13
0+20.50	0.39
0+33.50	0.13
0+33.50	0.08
0+34.50	0.00
0+35.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+35.00, 0.38)	0.016

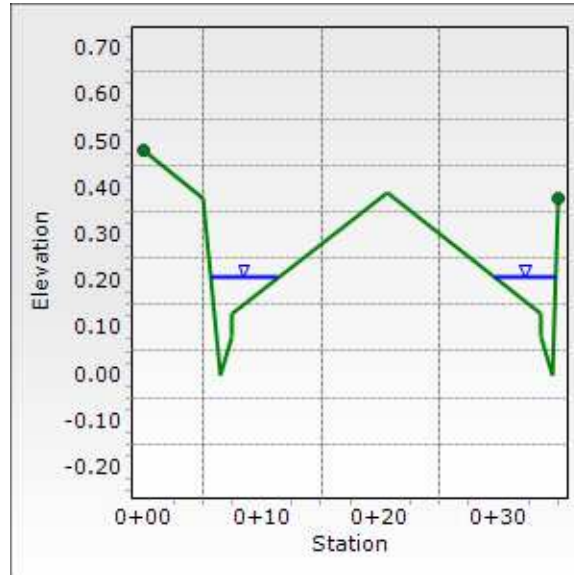
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.21 ft
Roughness Coefficient	0.016
Elevation	0.21 ft
Elevation Range	0.00 to 0.48 ft
Flow Area	0.8 ft ²
Wetted Perimeter	11.10 ft
Hydraulic Radius	0.07 ft
Top Width	10.89 ft
Normal Depth	0.21 ft
Critical Depth	0.20 ft
Critical Slope	0.943 %

Results	
Velocity	1.33 ft/s
Velocity Head	0.03 ft
Specific Energy	0.24 ft
Froude Number	0.889
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.21 ft
Critical Depth	0.20 ft
Channel Slope	0.730 %
Critical Slope	0.943 %

Cross Section for DON1-A1

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.730 %
Normal Depth	0.21 ft
Discharge	1.00 cfs



DON1-A2

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	0.630 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.48
0+05.00	0.38
0+06.50	0.00
0+07.50	0.08
0+07.50	0.13
0+20.50	0.39
0+33.50	0.13
0+33.50	0.08
0+34.50	0.00
0+35.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+35.00, 0.38)	0.016

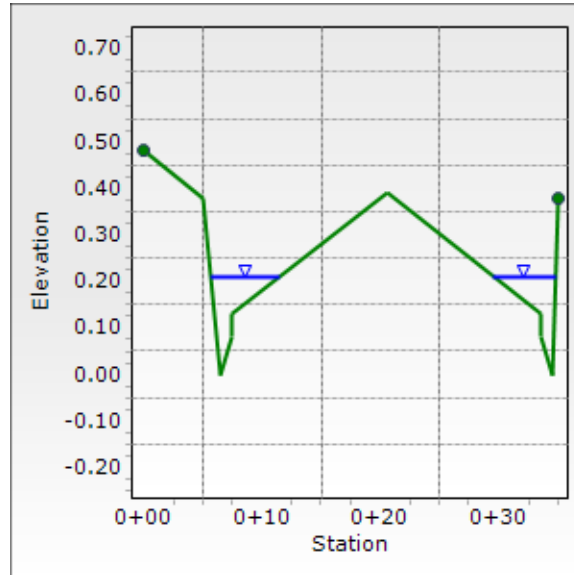
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.21 ft
Roughness Coefficient	0.016
Elevation	0.21 ft
Elevation Range	0.00 to 0.48 ft
Flow Area	0.8 ft ²
Wetted Perimeter	11.54 ft
Hydraulic Radius	0.07 ft
Top Width	11.33 ft
Normal Depth	0.21 ft
Critical Depth	0.20 ft
Critical Slope	0.943 %

Results	
Velocity	1.25 ft/s
Velocity Head	0.02 ft
Specific Energy	0.24 ft
Froude Number	0.829
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.21 ft
Critical Depth	0.20 ft
Channel Slope	0.630 %
Critical Slope	0.943 %

Cross Section for DON1-A2

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.630 %
Normal Depth	0.21 ft
Discharge	1.00 cfs



DON1-B1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	2.000 %
Discharge	1.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.48
0+05.00	0.38
0+06.50	0.00
0+07.50	0.08
0+07.50	0.13
0+20.50	0.39
0+33.50	0.13
0+33.50	0.08
0+34.50	0.00
0+35.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+35.00, 0.38)	0.016

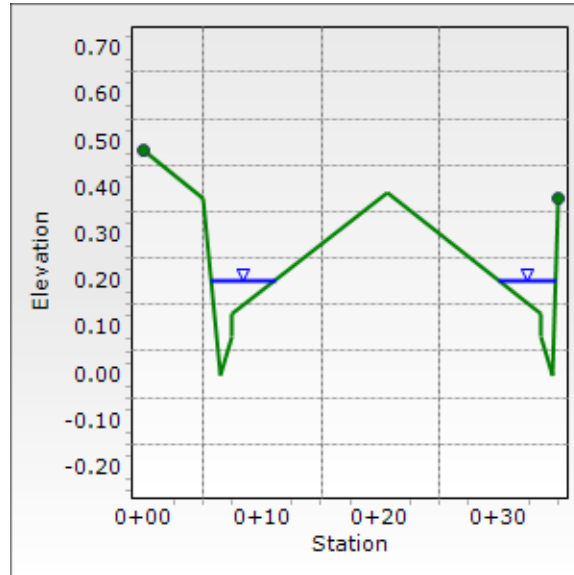
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.20 ft
Roughness Coefficient	0.016
Elevation	0.20 ft
Elevation Range	0.00 to 0.48 ft
Flow Area	0.7 ft ²
Wetted Perimeter	10.53 ft
Hydraulic Radius	0.07 ft
Top Width	10.33 ft
Normal Depth	0.20 ft
Critical Depth	0.23 ft
Critical Slope	0.902 %

Results	
Velocity	2.15 ft/s
Velocity Head	0.07 ft
Specific Energy	0.27 ft
Froude Number	1.461
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.20 ft
Critical Depth	0.23 ft
Channel Slope	2.000 %
Critical Slope	0.902 %

Cross Section for DON1-B1

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	2.000 %
Normal Depth	0.20 ft
Discharge	1.50 cfs



DON1-C1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.040 %
Discharge	2.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2.22
0+06.00	0.22
0+17.00	0.00
0+36.00	0.38
0+55.00	0.00
0+66.00	0.22
0+72.00	2.22

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2.22)	(0+72.00, 2.22)	0.016

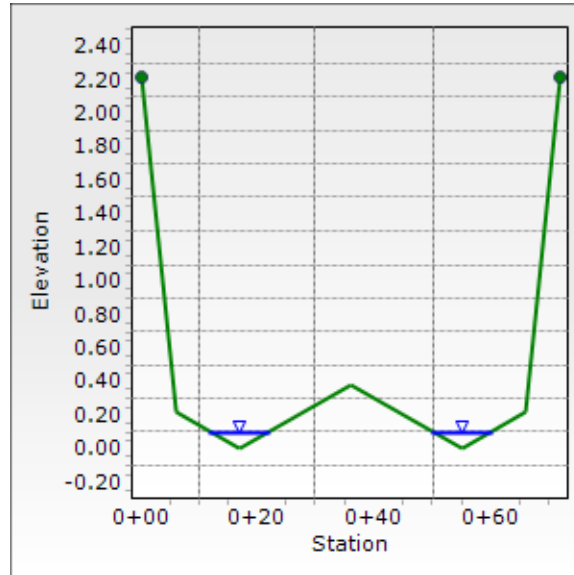
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.10 ft
Roughness Coefficient	0.016
Elevation	0.10 ft
Elevation Range	0.00 to 2.22 ft
Flow Area	1.1 ft ²
Wetted Perimeter	20.97 ft
Hydraulic Radius	0.05 ft
Top Width	20.96 ft
Normal Depth	0.10 ft
Critical Depth	0.13 ft
Critical Slope	0.925 %
Velocity	2.28 ft/s
Velocity Head	0.08 ft
Specific Energy	0.19 ft

Results	
Froude Number	1.753
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.10 ft
Critical Depth	0.13 ft
Channel Slope	3.040 %
Critical Slope	0.925 %

Cross Section for DON1-C1

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	3.040 %
Normal Depth	0.10 ft
Discharge	2.50 cfs



DON1-C3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	2.870 %
Discharge	2.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.48
0+05.00	0.38
0+06.50	0.00
0+07.50	0.08
0+07.50	0.13
0+20.50	0.39
0+33.50	0.13
0+33.50	0.08
0+34.50	0.00
0+35.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+35.00, 0.38)	0.016

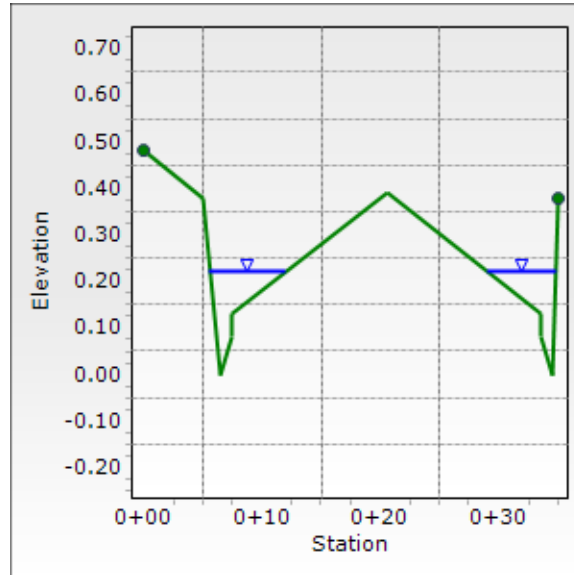
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.22 ft
Roughness Coefficient	0.016
Elevation	0.22 ft
Elevation Range	0.00 to 0.48 ft
Flow Area	0.9 ft ²
Wetted Perimeter	12.51 ft
Hydraulic Radius	0.07 ft
Top Width	12.30 ft
Normal Depth	0.22 ft
Critical Depth	0.26 ft
Critical Slope	0.849 %

Results	
Velocity	2.75 ft/s
Velocity Head	0.12 ft
Specific Energy	0.34 ft
Froude Number	1.784
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.22 ft
Critical Depth	0.26 ft
Channel Slope	2.870 %
Critical Slope	0.849 %

Cross Section for DON1-C3

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	2.870 %
Normal Depth	0.22 ft
Discharge	2.50 cfs



DON1-D

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.000 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.48
0+05.00	0.38
0+06.50	0.00
0+07.50	0.08
0+07.50	0.13
0+20.50	0.39
0+33.50	0.13
0+33.50	0.08
0+34.50	0.00
0+35.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+35.00, 0.38)	0.016

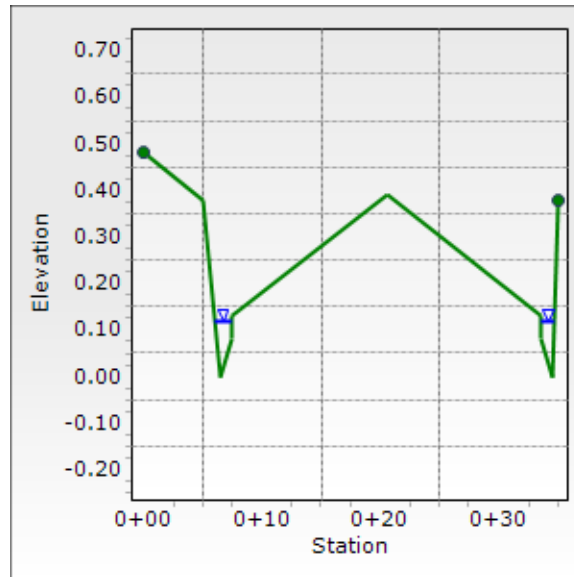
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.12 ft
Roughness Coefficient	0.016
Elevation	0.12 ft
Elevation Range	0.00 to 0.48 ft
Flow Area	0.2 ft ²
Wetted Perimeter	2.74 ft
Hydraulic Radius	0.07 ft
Top Width	2.61 ft
Normal Depth	0.12 ft
Critical Depth	0.16 ft
Critical Slope	0.990 %

Results	
Velocity	2.69 ft/s
Velocity Head	0.11 ft
Specific Energy	0.23 ft
Froude Number	1.773
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.12 ft
Critical Depth	0.16 ft
Channel Slope	3.000 %
Critical Slope	0.990 %

Cross Section for DON1-D

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.000 %
Normal Depth	0.12 ft
Discharge	0.50 cfs



DON1-E1

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	1.500 %
Discharge	6.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.48
0+05.00	0.38
0+06.50	0.00
0+07.50	0.08
0+07.50	0.13
0+20.50	0.39
0+33.50	0.13
0+33.50	0.08
0+34.50	0.00
0+35.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+35.00, 0.38)	0.016

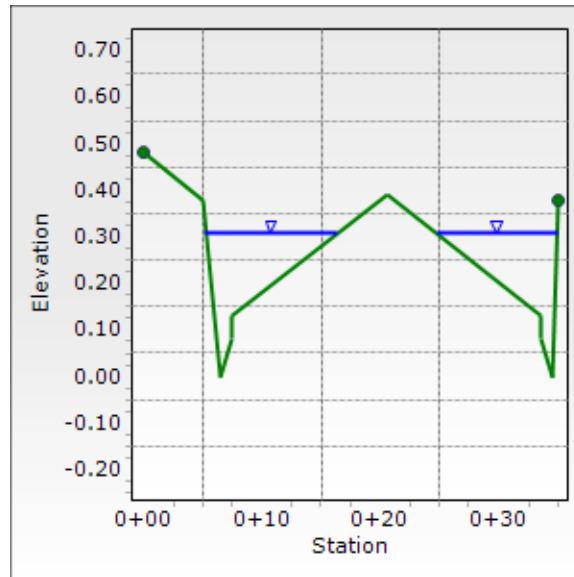
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.31 ft
Roughness Coefficient	0.016
Elevation	0.31 ft
Elevation Range	0.00 to 0.48 ft
Flow Area	2.3 ft ²
Wetted Perimeter	21.45 ft
Hydraulic Radius	0.11 ft
Top Width	21.20 ft
Normal Depth	0.31 ft
Critical Depth	0.34 ft
Critical Slope	0.760 %

Results	
Velocity	2.58 ft/s
Velocity Head	0.10 ft
Specific Energy	0.41 ft
Froude Number	1.374
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.31 ft
Critical Depth	0.34 ft
Channel Slope	1.500 %
Critical Slope	0.760 %

Cross Section for DON1-E1

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.500 %
Normal Depth	0.31 ft
Discharge	6.00 cfs



DON1-F2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.600 %
Discharge	7.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2.22
0+06.00	0.22
0+17.00	0.00
0+36.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2.22)	(0+36.00, 0.38)	0.016

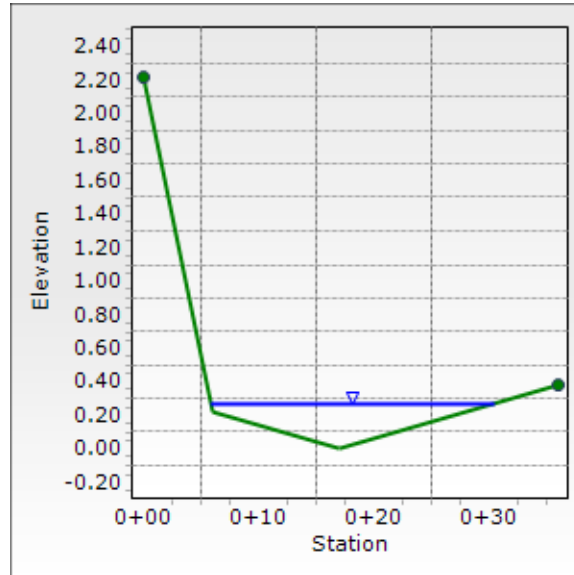
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.27 ft
Roughness Coefficient	0.016
Elevation	0.27 ft
Elevation Range	0.00 to 2.22 ft
Flow Area	3.5 ft ²
Wetted Perimeter	24.56 ft
Hydraulic Radius	0.14 ft
Top Width	24.55 ft
Normal Depth	0.27 ft
Critical Depth	0.26 ft
Critical Slope	0.722 %
Velocity	1.98 ft/s
Velocity Head	0.06 ft
Specific Energy	0.33 ft
Froude Number	0.918
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.27 ft
Critical Depth	0.26 ft
Channel Slope	0.600 %
Critical Slope	0.722 %

Cross Section for DON1-F2

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.600 %
Normal Depth	0.27 ft
Discharge	7.00 cfs



DON1-G

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.640 %
Discharge	1.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.48
0+05.00	0.38
0+06.50	0.00
0+07.50	0.08
0+07.50	0.13
0+20.50	0.39
0+33.50	0.13
0+33.50	0.08
0+34.50	0.00
0+35.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+35.00, 0.38)	0.016

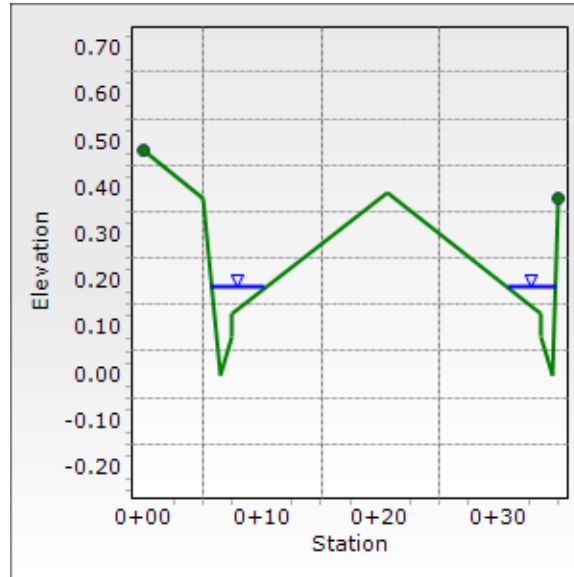
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.19 ft
Roughness Coefficient	0.016
Elevation	0.19 ft
Elevation Range	0.00 to 0.48 ft
Flow Area	0.5 ft ²
Wetted Perimeter	8.79 ft
Hydraulic Radius	0.06 ft
Top Width	8.59 ft
Normal Depth	0.19 ft
Critical Depth	0.20 ft
Critical Slope	0.943 %

Results	
Velocity	1.85 ft/s
Velocity Head	0.05 ft
Specific Energy	0.24 ft
Froude Number	1.299
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.19 ft
Critical Depth	0.20 ft
Channel Slope	1.640 %
Critical Slope	0.943 %

Cross Section for DON1-G

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.640 %
Normal Depth	0.19 ft
Discharge	1.00 cfs



DON1-H2A

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Channel Slope	3.870 %
Discharge	75.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	3.48
0+00.00	0.48
0+05.00	0.38
0+06.50	0.00
0+07.50	0.08
0+07.50	0.13
0+20.50	0.39
0+33.50	0.13
0+33.50	0.08
0+34.50	0.00
0+35.00	0.38
0+35.00	3.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 3.48)	(0+35.00, 3.38)	0.016

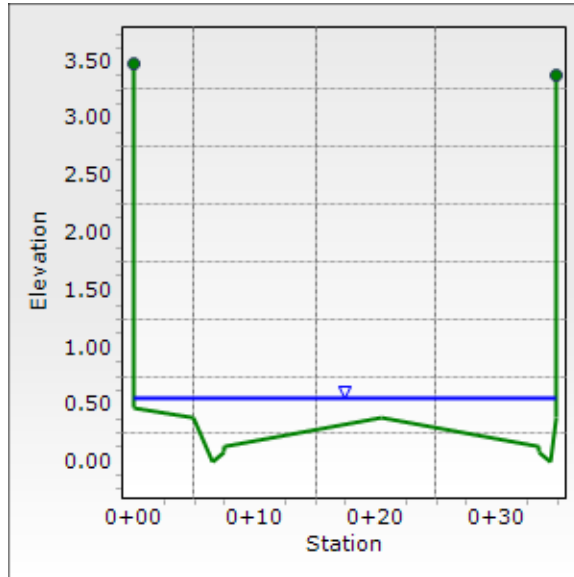
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.55 ft
Roughness Coefficient	0.016
Elevation	0.55 ft
Elevation Range	0.00 to 3.48 ft
Flow Area	9.7 ft ²
Wetted Perimeter	35.52 ft
Hydraulic Radius	0.27 ft
Top Width	35.00 ft
Normal Depth	0.55 ft

Results	
Critical Depth	0.79 ft
Critical Slope	0.481 %
Velocity	7.71 ft/s
Velocity Head	0.92 ft
Specific Energy	1.47 ft
Froude Number	2.577
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.55 ft
Critical Depth	0.79 ft
Channel Slope	3.870 %
Critical Slope	0.481 %

Cross Section for DON1-H2A

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.870 %
Normal Depth	0.55 ft
Discharge	75.00 cfs



DON1-H2B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.500 %
Discharge	77.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	3.48
0+00.00	0.48
0+05.00	0.38
0+06.50	0.00
0+07.50	0.08
0+07.50	0.13
0+20.50	0.39
0+33.50	0.13
0+33.50	0.08
0+34.50	0.00
0+35.00	0.38
0+35.00	3.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 3.48)	(0+35.00, 3.38)	0.016

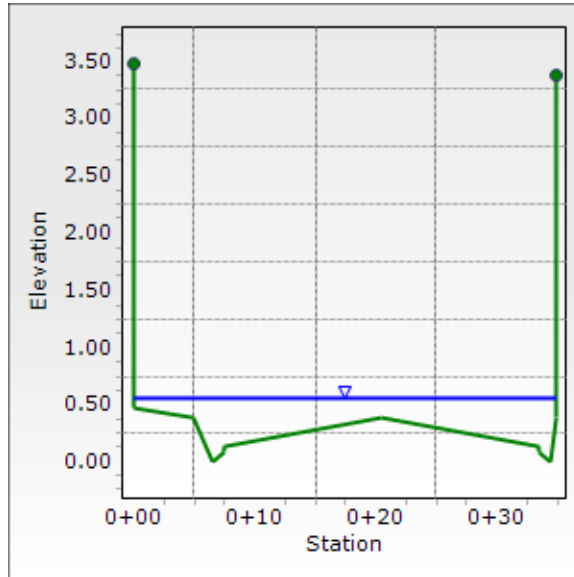
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.56 ft
Roughness Coefficient	0.016
Elevation	0.56 ft
Elevation Range	0.00 to 3.48 ft
Flow Area	10.2 ft ²
Wetted Perimeter	35.55 ft
Hydraulic Radius	0.29 ft
Top Width	35.00 ft
Normal Depth	0.56 ft

Results	
Critical Depth	0.80 ft
Critical Slope	0.478 %
Velocity	7.55 ft/s
Velocity Head	0.89 ft
Specific Energy	1.45 ft
Froude Number	2.468
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.56 ft
Critical Depth	0.80 ft
Channel Slope	3.500 %
Critical Slope	0.478 %

Cross Section for DON1-H2B

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.500 %
Normal Depth	0.56 ft
Discharge	77.00 cfs



DON1-H4

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.500 %
Discharge	81.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2.22
0+06.00	0.22
0+17.00	0.00
0+36.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2.22)	(0+36.00, 0.38)	0.016

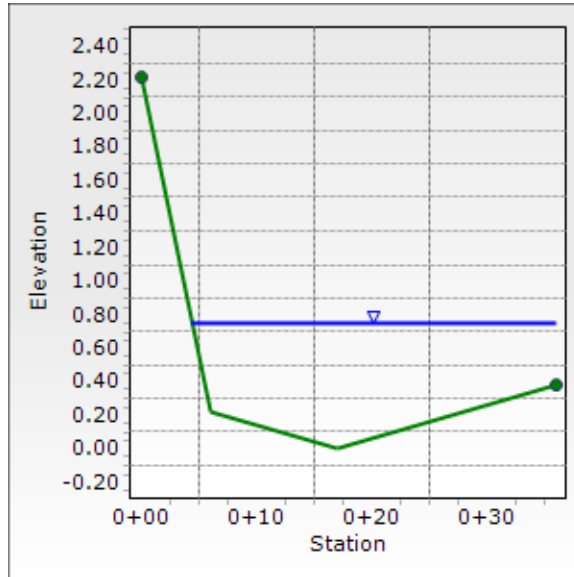
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.75 ft
Roughness Coefficient	0.016
Elevation	0.75 ft
Elevation Range	0.00 to 2.22 ft
Flow Area	18.1 ft ²
Wetted Perimeter	32.05 ft
Hydraulic Radius	0.56 ft
Top Width	31.59 ft
Normal Depth	0.75 ft
Critical Depth	0.77 ft
Critical Slope	0.454 %
Velocity	4.48 ft/s
Velocity Head	0.31 ft
Specific Energy	1.06 ft
Froude Number	1.045
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.75 ft
Critical Depth	0.77 ft
Channel Slope	0.500 %
Critical Slope	0.454 %

Cross Section for DON1-H4

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	0.500 %
Normal Depth	0.75 ft
Discharge	81.00 cfs



ON1-B2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	5.120 %
Discharge	1.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	6.00
0+00.00	0.30
0+15.00	0.00
0+30.00	0.30
0+30.00	6.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 6.00)	(0+30.00, 6.00)	0.016

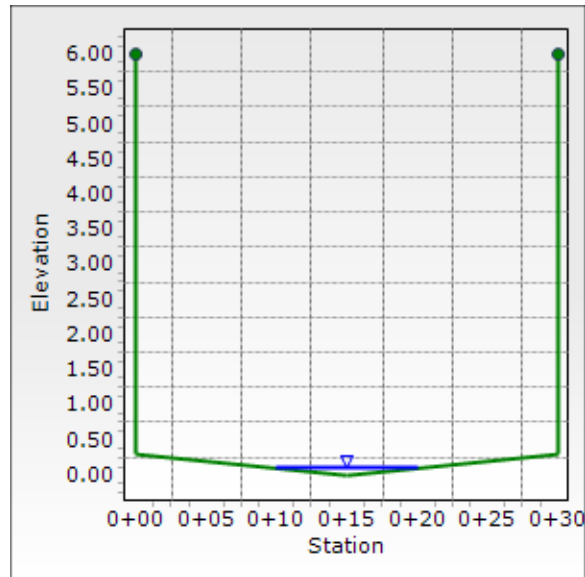
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.10 ft
Roughness Coefficient	0.016
Elevation	0.10 ft
Elevation Range	0.00 to 6.00 ft
Flow Area	0.5 ft ²
Wetted Perimeter	10.18 ft
Hydraulic Radius	0.05 ft
Top Width	10.18 ft
Normal Depth	0.10 ft
Critical Depth	0.14 ft
Critical Slope	0.903 %
Velocity	2.90 ft/s
Velocity Head	0.13 ft
Specific Energy	0.23 ft
Froude Number	2.264
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.10 ft
Critical Depth	0.14 ft
Channel Slope	5.120 %
Critical Slope	0.903 %

Cross Section for ON1-B2

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	5.120 %
Normal Depth	0.10 ft
Discharge	1.50 cfs



ON1-C2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.710 %
Discharge	2.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	6.00
0+00.00	0.30
0+15.00	0.00
0+30.00	0.30
0+30.00	6.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 6.00)	(0+30.00, 6.00)	0.016

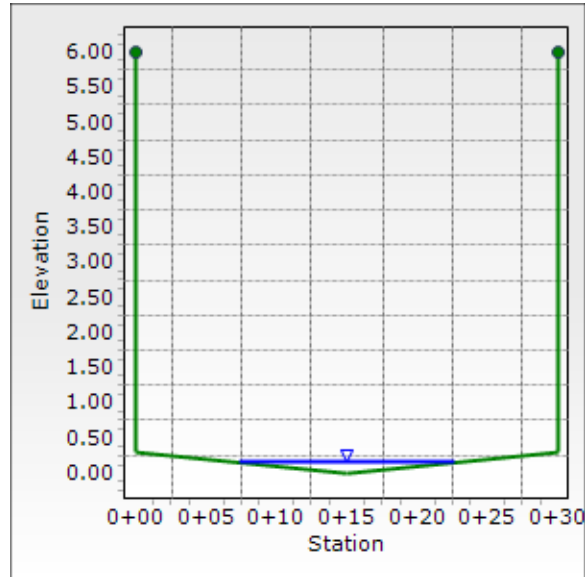
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.15 ft
Roughness Coefficient	0.016
Elevation	0.15 ft
Elevation Range	0.00 to 6.00 ft
Flow Area	1.1 ft ²
Wetted Perimeter	15.17 ft
Hydraulic Radius	0.08 ft
Top Width	15.16 ft
Normal Depth	0.15 ft
Critical Depth	0.17 ft
Critical Slope	0.844 %
Velocity	2.17 ft/s
Velocity Head	0.07 ft
Specific Energy	0.23 ft
Froude Number	1.393
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.15 ft
Critical Depth	0.17 ft
Channel Slope	1.710 %
Critical Slope	0.844 %

Cross Section for ON1-C2

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	1.710 %
Normal Depth	0.15 ft
Discharge	2.50 cfs



ON1-E2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	4.850 %
Discharge	4.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	6.00
0+00.00	0.10
0+05.00	0.00
0+10.00	0.10
0+10.00	6.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 6.00)	(0+10.00, 6.00)	0.016

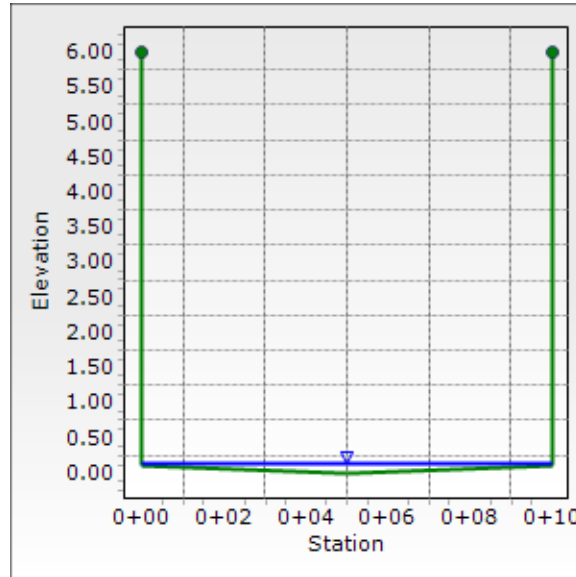
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.14 ft
Roughness Coefficient	0.016
Elevation	0.14 ft
Elevation Range	0.00 to 6.00 ft
Flow Area	0.9 ft ²
Wetted Perimeter	10.09 ft
Hydraulic Radius	0.09 ft
Top Width	10.00 ft
Normal Depth	0.14 ft
Critical Depth	0.22 ft
Critical Slope	0.694 %
Velocity	4.23 ft/s
Velocity Head	0.28 ft
Specific Energy	0.42 ft
Froude Number	2.425
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.14 ft
Critical Depth	0.22 ft
Channel Slope	4.850 %
Critical Slope	0.694 %

Cross Section for ON1-E2

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	4.850 %
Normal Depth	0.14 ft
Discharge	4.00 cfs



ON1-H1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.400 %
Discharge	75.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	6.00
0+00.00	0.30
0+15.00	0.00
0+30.00	0.30
0+30.00	6.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 6.00)	(0+30.00, 6.00)	0.016

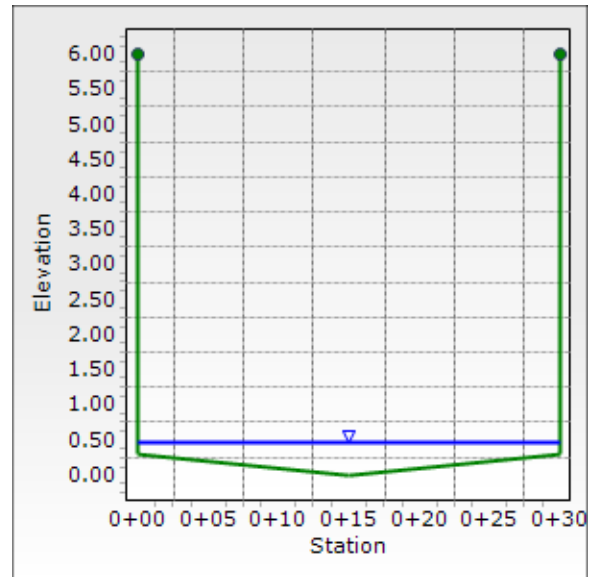
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.47 ft
Roughness Coefficient	0.016
Elevation	0.47 ft
Elevation Range	0.00 to 6.00 ft
Flow Area	9.5 ft ²
Wetted Perimeter	30.34 ft
Hydraulic Radius	0.31 ft
Top Width	30.00 ft
Normal Depth	0.47 ft
Critical Depth	0.73 ft
Critical Slope	0.465 %
Velocity	7.90 ft/s
Velocity Head	0.97 ft
Specific Energy	1.44 ft
Froude Number	2.474
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.47 ft
Critical Depth	0.73 ft
Channel Slope	3.400 %
Critical Slope	0.465 %

Cross Section for ON1-H1

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	3.400 %
Normal Depth	0.47 ft
Discharge	75.00 cfs



ON1-H3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Channel Slope	2.000 %
Discharge	77.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	6.00
0+00.00	0.30
0+15.00	0.00
0+30.00	0.30
0+30.00	6.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 6.00)	(0+30.00, 6.00)	0.016

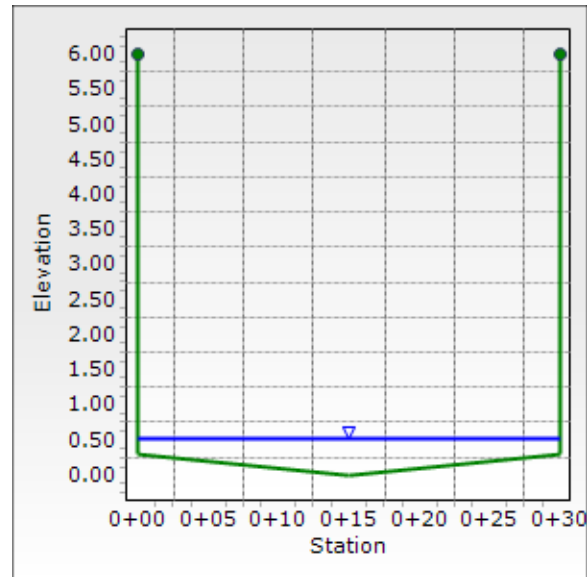
Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	0.53 ft
Roughness Coefficient	0.016
Elevation	0.53 ft
Elevation Range	0.00 to 6.00 ft
Flow Area	11.3 ft ²
Wetted Perimeter	30.46 ft
Hydraulic Radius	0.37 ft
Top Width	30.00 ft
Normal Depth	0.53 ft
Critical Depth	0.74 ft
Critical Slope	0.462 %
Velocity	6.79 ft/s
Velocity Head	0.72 ft
Specific Energy	1.24 ft
Froude Number	1.948
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.53 ft
Critical Depth	0.74 ft
Channel Slope	2.000 %
Critical Slope	0.462 %

Cross Section for ON1-H3

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Channel Slope	2.000 %
Normal Depth	0.53 ft
Discharge	77.00 cfs



Date 04/06/21 Project 291400024

By MSB

Riprap Lining Calculation ON1-H2A

$$d_{50} = (3V * (S^{0.17}/S_s - 1))^2$$

V = 6.83 ft/s

S = 0.025 ft/ft

S_s = 2.65 Specific Gravity

d₅₀ = 0.5432 = 0.5432 x 12in/ft = 6.52-inches → Use d₅₀ = 6-inches

Date 04/06/21 Project 291400024

By MSB

Riprap Lining Calculation
ON1-H2B

$$d_{50} = (3V * (S^{0.17}/S_s - 1))^2$$

V = 5.17 ft/s

S = 0.01 ft/ft

S_s = 2.65 Specific Gravity

d₅₀ = 0.2279 = 0.2279 x 12in/ft = 2.73-inches → Use d₅₀ = 6-inches

Ann and Hualapai - Technical Drainage Study								
LOT #	FFE	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
1	104.90	100.72	99.08	0.40	0.20	4.16	DON1-B1	Street B
1	104.90	100.34	95.85	0.20	0.10	4.74	DON1-C1	Eula Way
1	104.90	105.46	102.55	1.20	0.60	-1.38	ANN	Ann Road, Solid grout 1 courses
1	104.90	100.64	97.40	1.60	0.10	4.44	DON1-B2	Drainage Easement, Solid grout 3 courses
2	108.50	105.57	100.72	0.40	0.20	2.91	DON1-B1	Street B
2	108.50	109.43	105.29	1.20	0.60	-1.75	ANN	Ann Road, Solid grout 1 course
3	113.30	110.88	109.78	0.42	0.21	2.38	DON1-A1	Street F
3	113.30	109.78	105.57	0.40	0.20	3.50	DON1-B1	Street B
4	114.30	115.78	109.43	1.20	0.60	-2.30	ANN	Ann Road, Solid grout 1 course
4	114.30	111.68	110.88	0.42	0.21	2.58	DON1-A1	Street F
5	113.90	111.68	110.46	0.42	0.21	2.18	DON1-A1	Street F
5	113.90	120.58	115.78	1.20	0.60	-7.50	ANN	Ann Road, Solid grout 2 courses
5	113.90	123.00	122.56	0.38	0.19	-9.10	HUAL1	Hualapai Way, Solid grout 1 course
6	113.40	110.46	110.08	0.42	0.21	2.90	DON1-A1	Street F
6	113.40	122.56	120.10	0.38	0.19	-9.16	HUAL1	Hualapai Way, Solid grout 1 course
7	113.40	110.53	110.08	0.42	0.21	2.83	DON1-A2	Street F
7	113.40	120.10	118.08	0.38	0.19	-6.70	HUAL1	Hualapai Way, Solid grout 1 course
8	113.20	110.53	109.37	0.28	0.14	2.77	DON1-E2	Street F
8	113.20	118.12	118.08	0.38	0.19	-4.92	HUAL1	Hualapai Way, Solid grout 1 course
8	113.20	117.05	109.37	1.64	0.14	-3.75	DON1-E2	Drainage Easement, Solid grout 3 courses
9	111.60	109.37	107.35	0.58	0.29	2.03	DON1-E1	Street F
9	111.60	119.50	118.12	0.38	0.19	-7.90	HUAL1	Hualapai Way, Solid grout 1 course
9	111.60	117.05	109.35	1.64	0.14	-5.35	DON1-E2	Drainage Easement, Solid grout 3 courses
10	111.00	107.69	107.35	0.58	0.29	3.11	DON1-E1	Street F
10	111.00	119.50	118.26	1.06	0.53	-9.18	HUAL2	Hualapai Way, Solid grout 2 courses
11	110.50	107.69	106.96	0.38	0.19	2.81	DON1-G	Street F
11	110.50	118.26	115.65	1.06	0.53	-8.44	HUAL2	Hualapai Way, Solid grout 2 courses
12	109.30	106.96	104.92	0.38	0.19	2.34	DON1-G	Street F
12	109.30	115.65	113.30	1.06	0.53	-7.03	HUAL2	Hualapai Way, Solid grout 2 courses
13	107.20	104.92	103.69	0.38	0.19	2.28	DON1-G	Street F
13	107.20	113.30	111.48	1.06	0.53	-6.78	HUAL2	Hualapai Way, Solid grout 2 courses
13	107.20	108.81	104.77	1.10	0.55	-2.33	DON1-H2A	Street E, Solid grout 2 courses
13	107.20	110.08	108.96	1.97	0.47	-3.44	DON1-H1	Drainage Easement, Solid grout 3 courses
14	111.20	108.81	105.71	1.10	0.55	1.67	DON1-H2A	Street E
14	111.20	113.10	111.48	1.06	0.53	-2.58	HUAL2	Hualapai Way, Solid grout 2 courses
14	111.20	110.08	108.96	1.97	0.47	0.56	DON1-H1	Drainage Easement, Solid grout 3 courses
15	107.60	105.53	101.23	1.10	0.55	1.35	DON1-H2A	Street E
16	103.10	101.23	96.89	1.10	0.55	1.15	DON1-H2A	Street E
17	98.80	96.89	93.36	1.10	0.55	1.19	DON1-H2A	Street E
18	95.80	93.36	91.73	1.18	0.59	1.64	DON1-H2B	Street E
18	95.80	89.45	88.98	1.52	0.76	5.21	DON1-H4	Eula Street
18	95.80	91.73	89.45	2.03	0.53	3.39	DON1-H3	Drainage Easement, Solid grout 4 courses
19	95.80	92.81	91.68	1.18	0.59	2.19	DON1-H2B	Street E
19	95.80	91.38	89.65	1.52	0.76	3.28	DON1-H4	Eula Street
19	95.80	91.68	89.65	2.03	0.53	3.44	DON1-H3	Drainage Easement, Solid grout 4 courses
20	98.30	96.14	92.81	1.18	0.59	1.36	DON1-H2B	Street E
21	107.30	104.61	103.08	0.38	0.19	2.69	DON1-G	Street F
21	107.30	102.02	96.14	1.18	0.59	4.48	DON1-H2B	Street E
22	109.00	106.35	104.61	0.38	0.19	2.65	DON1-G	Street F
23	110.50	107.86	106.35	0.38	0.19	2.64	DON1-G	Street F
24	110.50	107.89	106.97	0.58	0.29	2.41	DON1-E1	Street F
24	110.50	105.98	104.80	0.54	0.27	4.36	DON1-F1	Street D
25	103.00	100.50	96.35	0.54	0.27	2.34	DON1-F1	Street D
26	98.90	96.35	93.46	0.54	0.27	2.39	DON1-F1	Street D
26	98.90	92.66	91.38	0.50	0.25	6.12	DON1-F2	Eula Street
27	99.00	96.37	93.86	0.54	0.27	2.47	DON1-F1	Street D
27	99.00	93.73	93.23	0.50	0.25	5.15	DON1-F2	Eula Street
28	103.40	100.50	96.37	0.54	0.27	2.74	DON1-F1	Street D
29	111.10	109.60	106.97	0.58	0.29	1.30	DON1-E1	Street F
29	111.10	105.98	100.50	0.54	0.27	4.96	DON1-F1	Street D
30	112.60	110.07	109.60	0.58	0.29	2.33	DON1-E1	Street F
31	113.60	110.26	110.07	0.58	0.29	3.14	DON1-E1	Street F
32	113.10	110.26	109.75	0.42	0.21	2.80	DON1-A2	Street F
32	113.10	109.04	104.79	0.40	0.20	4.04	DON1-B1	Street B

LOT #	FFE	High	Low	Criteria	Depth	Freeboard	Section #	Remarks
33	107.30	104.79	100.70	0.40	0.20	2.49	DON1-B1	Street B
34	105.00	100.70	98.54	0.40	0.20	4.28	DON1-B1	Street F
34	105.00	95.85	93.23	0.20	0.10	9.33	DON1-C1	Eula Street
34	105.00	100.72	97.20	1.60	0.10	4.46	DON1-B2	Drainage Easement, Solid grout 3 courses
35	98.30	100.13	99.13	0.20	0.10	-1.65	DON1-C1	Eula Street, Solid grout 1 course
35	98.30	97.85	92.82	0.24	0.12	0.59	DON1-D	Street A
35	98.30	98.75	94.05	1.20	0.60	-1.27	ANN	Ann Road, Solid grout 2 courses
36	94.90	92.82	89.28	0.24	0.12	2.22	DON1-D	Street A
36	94.90	94.05	89.30	1.20	0.60	0.03	ANN	Ann Road, Solid grout 2 courses
37	91.60	93.74	90.43	0.24	0.12	-2.00	DON1-D	Street A, Solid grout 1 course
37	91.60	88.81	87.29	0.24	0.12	2.93	DON1-D	Street I
37	91.60	89.28	87.29	0.44	0.22	2.26	DON1-C3	Street C
38	93.30	97.86	92.40	0.24	0.12	-4.42	DON1-D	Street A, Solid grout 1 course
38	93.30	95.85	92.58	0.20	0.10	-2.37	DON1-C1	Eula Street, Solid grout 1 course
38	93.30	90.55	89.28	0.44	0.22	2.69	DON1-C3	Street C
38	93.30	92.58	90.57	1.65	0.15	0.80	DON1-C2	Drainage Easement, Solid grout 3 courses
39	93.70	93.54	92.88	0.20	0.10	0.34	DON1-C1	Eula Street, Solid grout 1 course
39	93.70	90.55	89.32	0.44	0.22	3.09	DON1-C3	Street C
39	93.70	92.58	90.57	1.65	0.15	1.20	DON1-C2	Drainage Easement, Solid grout 3 courses
40	91.80	89.32	86.66	0.44	0.22	2.42	DON1-C3	Street C