Appendix C – Hydraulic Calculations

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

Worksheet for **H-6 10 YR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.500 %
Discharge	33.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2.34
0+15.00	2.26
0+15.50	2.22
0+15.50	1.72
0+23.50	1.52
0+75.50	0.72
0+75.50	1.14
0+80.30	1.22
0+80.30	0.72
1+17.64	0.00
1+17.64	0.50
1+30.00	1.31

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2.34)	(1+30.00, 1.31)	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 2.34 ft
Flow Area	7.2 ft²
Wetted Perimeter	28.25 ft
Hydraulic Radius	0.26 ft
Top Width	27.75 ft
Normal Depth	0.53 ft

Worksheet for **H-6 10 YR

Results	
Critical Depth	0.63 ft
Critical Slope	0.567 %
Velocity	4.58 ft/s
Velocity Head	0.33 ft
Specific Energy	0.85 ft
Froude Number	1.583
Flow Type	Supercritical

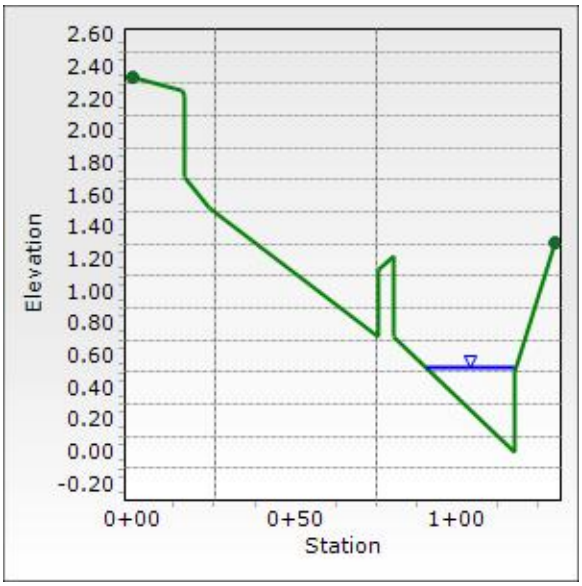
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.63 ft
Channel Slope	1.500 %
Critical Slope	0.567 %

XS for **H-6 10 YR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.500 %
Normal Depth	0.53 ft
Discharge	33.00 cfs



Worksheet for **H-6 100 YR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.500 %
Discharge	92.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2.34
0+15.00	2.26
0+15.50	2.22
0+15.50	1.72
0+23.50	1.52
0+75.50	0.72
0+75.50	1.14
0+80.30	1.22
0+80.30	0.72
1+17.64	0.00
1+17.64	0.50
1+30.00	1.31

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2.34)	(1+30.00, 1.31)	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	0.78 ft
Roughness Coefficient	0.016
Elevation	0.78 ft
Elevation Range	0.00 to 2.34 ft
Flow Area	16.2 ft²
Wetted Perimeter	45.75 ft
Hydraulic Radius	0.35 ft
Top Width	45.12 ft
Normal Depth	0.78 ft

Worksheet for **H-6 100 YR

Results	
Critical Depth	0.94 ft
Critical Slope	0.507 %
Velocity	5.69 ft/s
Velocity Head	0.50 ft
Specific Energy	1.28 ft
Froude Number	1.675
Flow Type	Supercritical

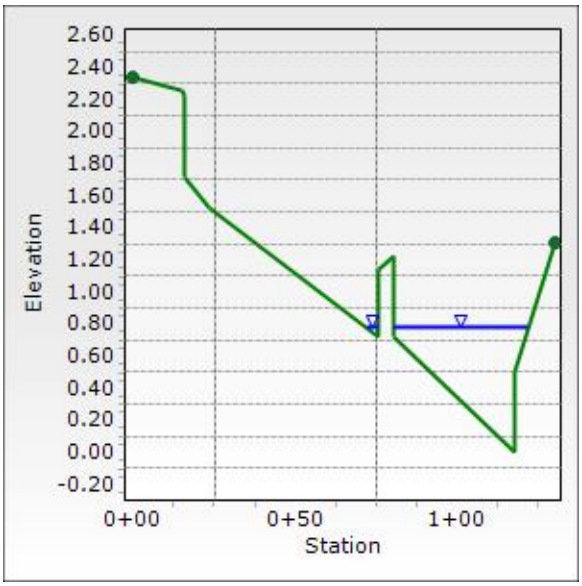
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.78 ft
Critical Depth	0.94 ft
Channel Slope	1.500 %
Critical Slope	0.507 %

XS for **H-6 100 YR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.500 %
Normal Depth	0.78 ft
Discharge	92.00 cfs



Worksheet for GMP 10 YR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.700 %
Discharge	40.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.70
0+10.00	0.50
0+10.50	0.48
0+10.50	0.00
0+12.00	0.13
0+12.00	0.17
0+48.00	0.89
0+48.00	1.37
0+50.00	1.37

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.70)	(0+50.00, 1.37)	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	0.77 ft
Roughness Coefficient	0.016
Elevation	0.77 ft
Elevation Range	0.00 to 1.37 ft
Flow Area	12.0 ft²
Wetted Perimeter	42.73 ft
Hydraulic Radius	0.28 ft
Top Width	42.12 ft
Normal Depth	0.77 ft
Critical Depth	0.79 ft
Critical Slope	0.569 %
Velocity	3.33 ft/s

Worksheet for GMP 10 YR

Results	
Velocity Head	0.17 ft
Specific Energy	0.95 ft
Froude Number	1.101
Flow Type	Supercritical

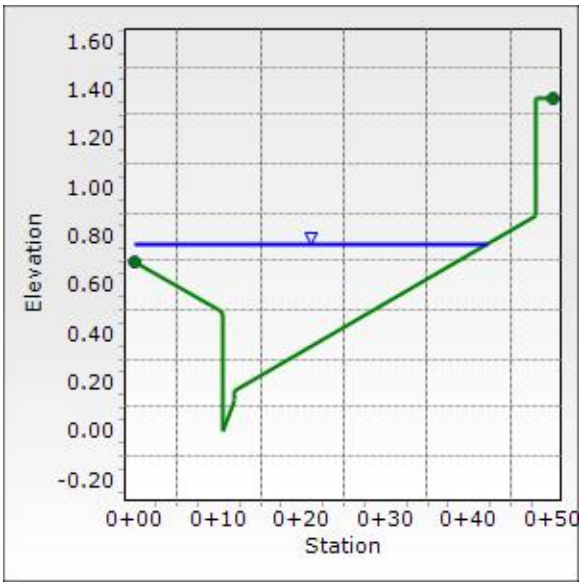
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.77 ft
Critical Depth	0.79 ft
Channel Slope	0.700 %
Critical Slope	0.569 %

XS for GMP 10 YR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.700 %
Normal Depth	0.77 ft
Discharge	40.00 cfs



Worksheet for GMP 100 YR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.700 %
Discharge	118.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.70
0+10.00	0.50
0+10.50	0.48
0+10.50	0.00
0+12.00	0.13
0+12.00	0.17
0+48.00	0.89
0+48.00	1.37
0+50.00	1.37

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.70)	(0+50.00, 1.37)	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	1.04 ft
Roughness Coefficient	0.016
Elevation	1.04 ft
Elevation Range	0.00 to 1.37 ft
Flow Area	24.3 ft²
Wetted Perimeter	49.02 ft
Hydraulic Radius	0.50 ft
Top Width	48.00 ft
Normal Depth	1.04 ft
Critical Depth	1.10 ft
Critical Slope	0.464 %
Velocity	4.86 ft/s

Worksheet for GMP 100 YR

Results	
Velocity Head	0.37 ft
Specific Energy	1.40 ft
Froude Number	1.206
Flow Type	Supercritical

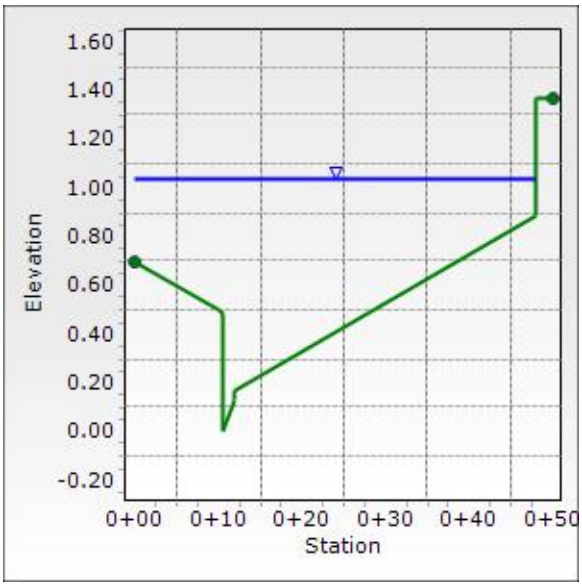
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	1.04 ft
Critical Depth	1.10 ft
Channel Slope	0.700 %
Critical Slope	0.464 %

XS for GMP 100 YR

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.700 %
Normal Depth	1.04 ft
Discharge	118.00 cfs



Worksheet for ON2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.230 %
Discharge	4.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+01.50	0.00
0+02.50	0.08
0+02.50	0.13
0+15.00	0.38
0+27.50	0.13
0+27.50	0.08
0+28.50	0.00
0+30.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+30.00, 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	0.25 ft
Roughness Coefficient	0.016
Elevation	0.25 ft
Elevation Range	0.00 to 0.38 ft
Flow Area	1.5 ft²
Wetted Perimeter	16.61 ft
Hydraulic Radius	0.09 ft
Top Width	16.44 ft
Normal Depth	0.25 ft
Critical Depth	0.29 ft
Critical Slope	0.799 %
Velocity	2.75 ft/s

Worksheet for ON2

Results	
Velocity Head	0.12 ft
Specific Energy	0.37 ft
Froude Number	1.626
Flow Type	Supercritical

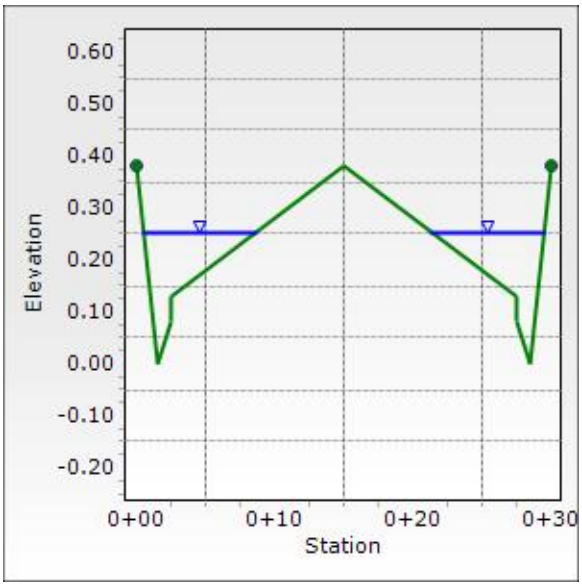
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.25 ft
Critical Depth	0.29 ft
Channel Slope	2.230 %
Critical Slope	0.799 %

XS for ON2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	2.230 %
Normal Depth	0.25 ft
Discharge	4.00 cfs



Worksheet for ON3N

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.840	%
Discharge	7.00	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+42.50	0.83
0+42.50	0.78
0+43.50	0.70
0+45.00	1.08

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+45.00, 1.08)	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	0.42	ft
Roughness Coefficient	0.016	
Elevation	0.42	ft
Elevation Range	0.00 to 1.08	ft
Flow Area	2.9	ft²
Wetted Perimeter	19.30	ft
Hydraulic Radius	0.15	ft
Top Width	19.20	ft
Normal Depth	0.42	ft
Critical Depth	0.43	ft
Critical Slope	0.701	%
Velocity	2.41	ft/s

Worksheet for ON3N

Results	
Velocity Head	0.09 ft
Specific Energy	0.51 ft
Froude Number	1.092
Flow Type	Supercritical

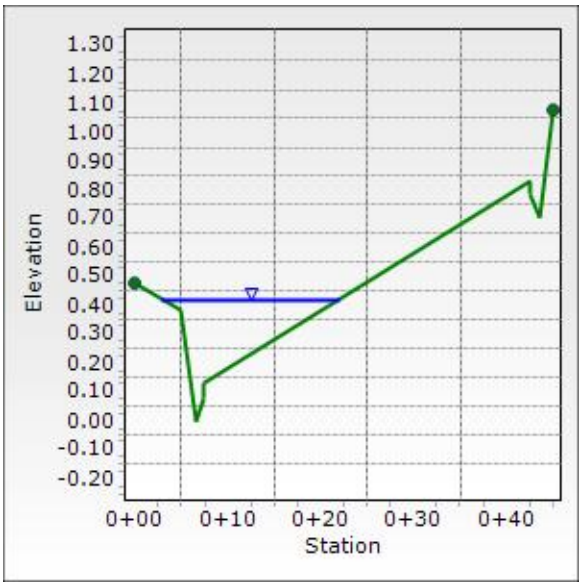
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.42 ft
Critical Depth	0.43 ft
Channel Slope	0.840 %
Critical Slope	0.701 %

XS for ON3N

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.840 %
Normal Depth	0.42 ft
Discharge	7.00 cfs



Worksheet for ON3S

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.840	%
Discharge	7.50	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+42.50	0.83
0+42.50	0.78
0+43.50	0.70
0+45.00	1.08

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+45.00, 1.08)	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	0.43	ft
Roughness Coefficient	0.016	
Elevation	0.43	ft
Elevation Range	0.00 to 1.08	ft
Flow Area	3.1	ft²
Wetted Perimeter	20.21	ft
Hydraulic Radius	0.15	ft
Top Width	20.11	ft
Normal Depth	0.43	ft
Critical Depth	0.44	ft
Critical Slope	0.697	%
Velocity	2.43	ft/s

Worksheet for ON3S

Results	
Velocity Head	0.09 ft
Specific Energy	0.52 ft
Froude Number	1.095
Flow Type	Supercritical

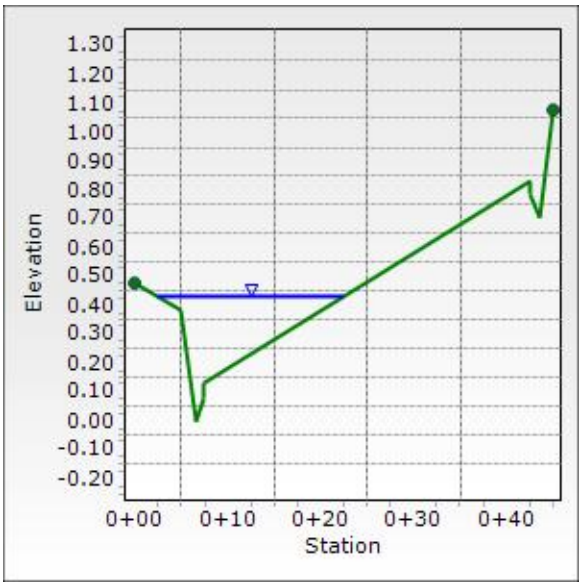
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.43 ft
Critical Depth	0.44 ft
Channel Slope	0.840 %
Critical Slope	0.697 %

XS for ON3S

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.840 %
Normal Depth	0.43 ft
Discharge	7.50 cfs



Worksheet for ON6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.030 %
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+32.50	0.63
0+32.50	0.58
0+33.50	0.50
0+35.00	0.88

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+35.00, 0.88)	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	0.23 ft
Roughness Coefficient	0.016
Elevation	0.23 ft
Elevation Range	0.00 to 0.88 ft
Flow Area	0.6 ft²
Wetted Perimeter	7.22 ft
Hydraulic Radius	0.08 ft
Top Width	7.13 ft
Normal Depth	0.23 ft
Critical Depth	0.24 ft
Critical Slope	0.870 %
Velocity	1.74 ft/s

Worksheet for ON6

Results	
Velocity Head	0.05 ft
Specific Energy	0.28 ft
Froude Number	1.084
Flow Type	Supercritical

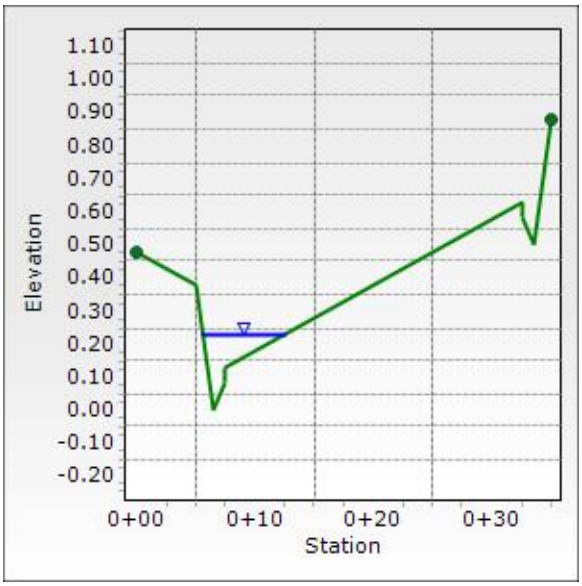
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.23 ft
Critical Depth	0.24 ft
Channel Slope	1.030 %
Critical Slope	0.870 %

XS for ON6

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.030 %
Normal Depth	0.23 ft
Discharge	1.00 cfs



Worksheet for ON8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.890	%
Discharge	4.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+01.50	0.00
0+02.50	0.08
0+02.50	0.13
0+20.00	0.48
0+37.50	0.13
0+37.50	0.08
0+38.50	0.00
0+40.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+40.00, 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 0.48	ft
Flow Area	1.7	ft²
Wetted Perimeter	18.19	ft
Hydraulic Radius	0.09	ft
Top Width	18.01	ft
Normal Depth	0.27	ft
Critical Depth	0.30	ft
Critical Slope	0.787	%
Velocity	2.64	ft/s

Worksheet for ON8

Results	
Velocity Head	0.11 ft
Specific Energy	0.38 ft
Froude Number	1.509
Flow Type	Supercritical

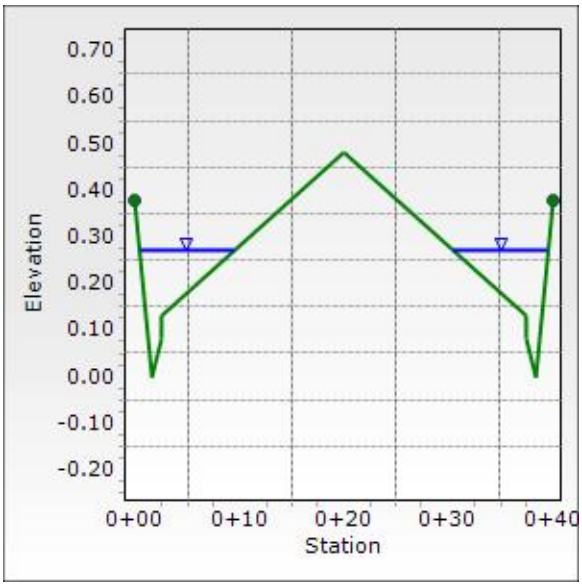
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.27 ft
Critical Depth	0.30 ft
Channel Slope	1.890 %
Critical Slope	0.787 %

XS for ON8

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.890 %
Normal Depth	0.27 ft
Discharge	4.50 cfs



Worksheet for ON10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.600	%
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+32.50	0.63
0+32.50	0.58
0+33.50	0.50
0+35.00	0.88

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+35.00, 0.88)	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 0.88	ft
Flow Area	0.4	ft²
Wetted Perimeter	5.83	ft
Hydraulic Radius	0.07	ft
Top Width	5.75	ft
Normal Depth	0.21	ft
Critical Depth	0.20	ft
Critical Slope	0.937	%
Velocity	1.22	ft/s

Worksheet for ON10

Results	
Velocity Head	0.02 ft
Specific Energy	0.23 ft
Froude Number	0.809
Flow Type	Subcritical

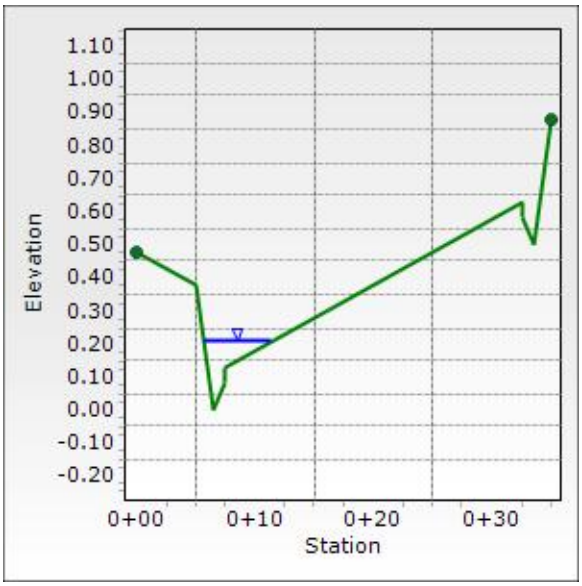
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.21 ft
Critical Depth	0.20 ft
Channel Slope	0.600 %
Critical Slope	0.937 %

XS for ON10

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.600 %
Normal Depth	0.21 ft
Discharge	0.50 cfs



Worksheet for ON12

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.480 %
Discharge	0.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.50
0+00.50	0.48
0+00.50	0.00
0+02.00	0.13
0+02.00	0.17
0+18.50	0.50
0+35.00	0.17
0+35.00	0.13
0+36.50	0.00
0+36.50	0.48
0+37.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.50)	(0+37.00, 0.50)	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 0.50 ft
Flow Area	0.2 ft²
Wetted Perimeter	3.08 ft
Hydraulic Radius	0.06 ft
Top Width	2.82 ft
Normal Depth	0.12 ft
Critical Depth	0.16 ft

Worksheet for ON12

Results	
Critical Slope	0.962 %
Velocity	2.89 ft/s
Velocity Head	0.13 ft
Specific Energy	0.25 ft
Froude Number	2.061
Flow Type	Supercritical

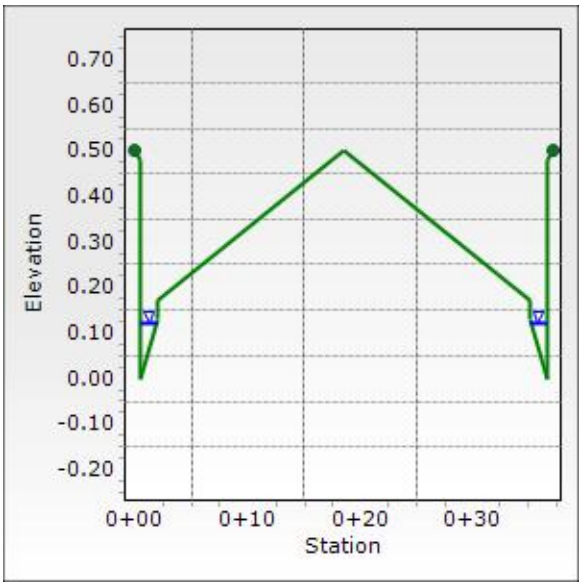
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	4.480 %
Critical Slope	0.962 %

XS for ON12

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	4.480 %
Normal Depth	0.12 ft
Discharge	0.50 cfs



Worksheet for ON13

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.890	%
Discharge	3.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+01.50	0.00
0+02.50	0.08
0+02.50	0.13
0+15.00	0.38
0+27.50	0.13
0+27.50	0.08
0+28.50	0.00
0+30.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+30.00, 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	0.25	ft
Roughness Coefficient	0.016	
Elevation	0.25	ft
Elevation Range	0.00 to 0.38	ft
Flow Area	1.4	ft²
Wetted Perimeter	16.23	ft
Hydraulic Radius	0.09	ft
Top Width	16.06	ft
Normal Depth	0.25	ft
Critical Depth	0.28	ft
Critical Slope	0.812	%
Velocity	2.50	ft/s

Worksheet for ON13

Results	
Velocity Head	0.10 ft
Specific Energy	0.35 ft
Froude Number	1.494
Flow Type	Supercritical

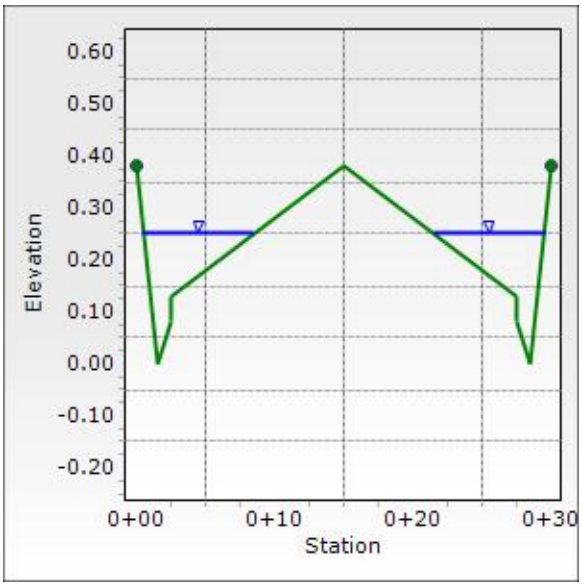
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.25 ft
Critical Depth	0.28 ft
Channel Slope	1.890 %
Critical Slope	0.812 %

XS for ON13

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.890 %
Normal Depth	0.25 ft
Discharge	3.50 cfs



Worksheet for ON14

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.500	%
Discharge	5.40	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+42.50	0.83
0+42.50	0.78
0+43.50	0.70
0+45.00	1.08

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+45.00, 1.08)	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	0.42	ft
Roughness Coefficient	0.016	
Elevation	0.42	ft
Elevation Range	0.00 to 1.08	ft
Flow Area	2.9	ft²
Wetted Perimeter	19.30	ft
Hydraulic Radius	0.15	ft
Top Width	19.20	ft
Normal Depth	0.42	ft
Critical Depth	0.40	ft
Critical Slope	0.712	%
Velocity	1.86	ft/s

Worksheet for ON14

Results	
Velocity Head	0.05 ft
Specific Energy	0.48 ft
Froude Number	0.842
Flow Type	Subcritical

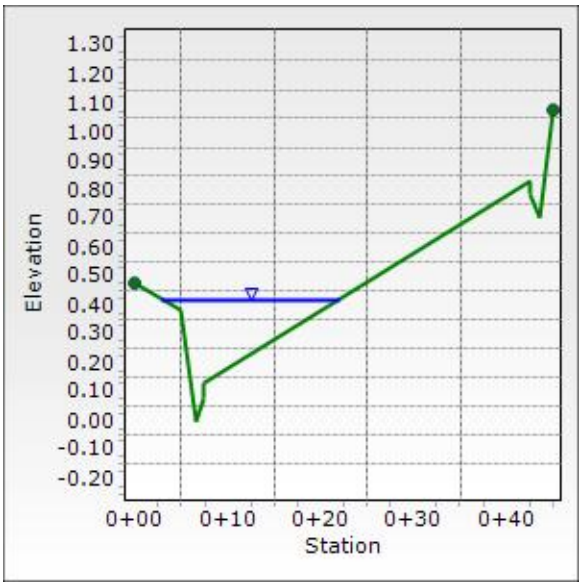
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.42 ft
Critical Depth	0.40 ft
Channel Slope	0.500 %
Critical Slope	0.712 %

XS for ON14

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.500 %
Normal Depth	0.42 ft
Discharge	5.40 cfs



Worksheet for ON17

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.580	%
Discharge	1.50	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.38
0+01.50	0.00
0+02.50	0.08
0+02.50	0.13
0+15.00	0.38
0+27.50	0.13
0+27.50	0.08
0+28.50	0.00
0+30.00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.38)	(0+30.00, 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 0.38	ft
Flow Area	0.8	ft²
Wetted Perimeter	11.16	ft
Hydraulic Radius	0.07	ft
Top Width	11.00	ft
Normal Depth	0.20	ft
Critical Depth	0.22	ft
Critical Slope	0.898	%
Velocity	1.96	ft/s

Worksheet for ON17

Results	
Velocity Head	0.06 ft
Specific Energy	0.26 ft
Froude Number	1.310
Flow Type	Supercritical

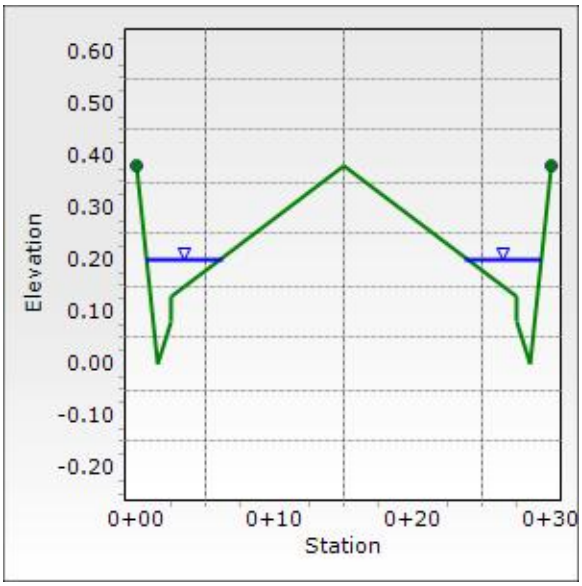
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.22 ft
Channel Slope	1.580 %
Critical Slope	0.898 %

XS for ON17

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	1.580 %
Normal Depth	0.20 ft
Discharge	1.50 cfs



Worksheet for ON19

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.640	%
Discharge	5.50	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+42.50	0.83
0+42.50	0.78
0+43.50	0.70
0+45.00	1.08

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+45.00, 1.08)	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	0.41	ft
Roughness Coefficient	0.016	
Elevation	0.41	ft
Elevation Range	0.00 to 1.08	ft
Flow Area	2.7	ft²
Wetted Perimeter	17.93	ft
Hydraulic Radius	0.15	ft
Top Width	17.83	ft
Normal Depth	0.41	ft
Critical Depth	0.40	ft
Critical Slope	0.711	%
Velocity	2.07	ft/s

Worksheet for ON19

Results	
Velocity Head	0.07 ft
Specific Energy	0.48 ft
Froude Number	0.948
Flow Type	Subcritical

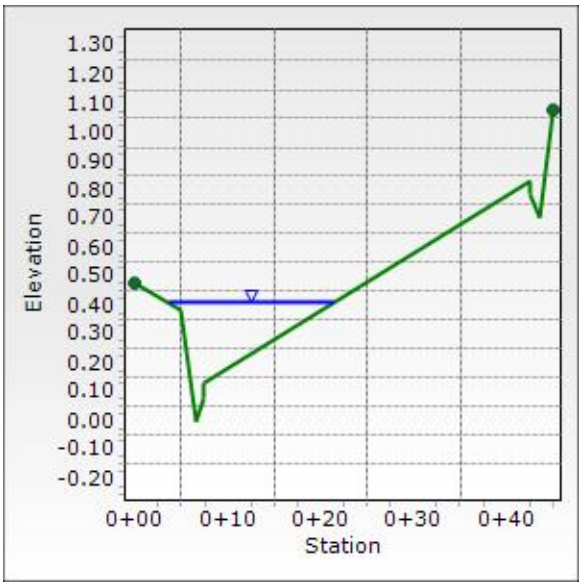
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.41 ft
Critical Depth	0.40 ft
Channel Slope	0.640 %
Critical Slope	0.711 %

XS for ON19

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.640 %
Normal Depth	0.41 ft
Discharge	5.50 cfs



Worksheet for ON22

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.600	%
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+32.50	0.63
0+32.50	0.58
0+33.50	0.50
0+35.00	0.88

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.48)	(0+35.00, 0.88)	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	0.25	ft
Roughness Coefficient	0.016	
Elevation	0.25	ft
Elevation Range	0.00 to 0.88	ft
Flow Area	0.7	ft²
Wetted Perimeter	8.18	ft
Hydraulic Radius	0.09	ft
Top Width	8.10	ft
Normal Depth	0.25	ft
Critical Depth	0.24	ft
Critical Slope	0.870	%
Velocity	1.41	ft/s

Worksheet for ON22

Results	
Velocity Head	0.03 ft
Specific Energy	0.28 ft
Froude Number	0.839
Flow Type	Subcritical

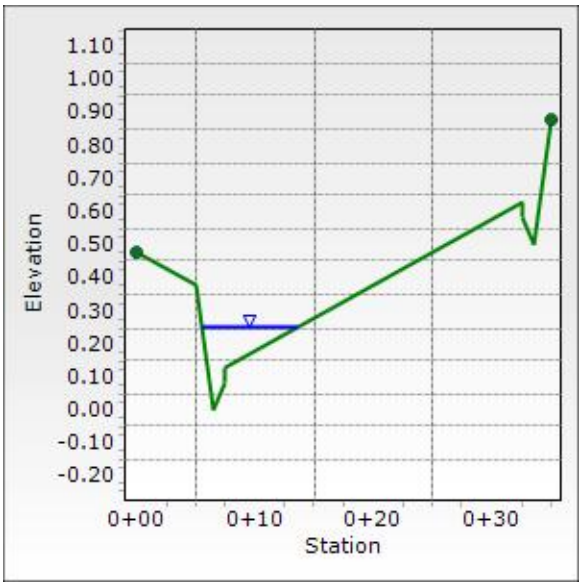
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.00 ft
Number Of Steps	0

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	0.25 ft
Critical Depth	0.24 ft
Channel Slope	0.600 %
Critical Slope	0.870 %

XS for ON22

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.600 %
Normal Depth	0.25 ft
Discharge	1.00 cfs



Worksheet for SW-ON1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	1.500	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.00	cfs

Results		
Normal Depth	0.38	ft
Flow Area	0.4	ft²
Wetted Perimeter	2.40	ft
Hydraulic Radius	0.18	ft
Top Width	2.27	ft
Critical Depth	0.37	ft
Critical Slope	1.715	%
Velocity	2.32	ft/s
Velocity Head	0.08	ft
Specific Energy	0.46	ft
Froude Number	0.939	
Flow Type	Subcritical	

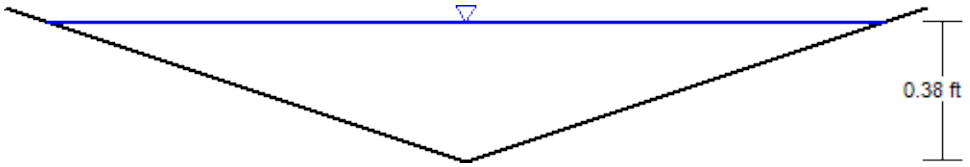
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

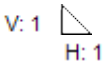
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.38	ft
Critical Depth	0.37	ft
Channel Slope	1.500	%
Critical Slope	1.715	%

XS for SW-ON1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	1.500	%
Normal Depth	0.38	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.00	cfs





Worksheet for SW-ON2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.500	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.00	cfs

Results		
Normal Depth	0.47	ft
Flow Area	0.7	ft²
Wetted Perimeter	2.95	ft
Hydraulic Radius	0.22	ft
Top Width	2.80	ft
Critical Depth	0.37	ft
Critical Slope	1.715	%
Velocity	1.54	ft/s
Velocity Head	0.04	ft
Specific Energy	0.50	ft
Froude Number	0.561	
Flow Type	Subcritical	

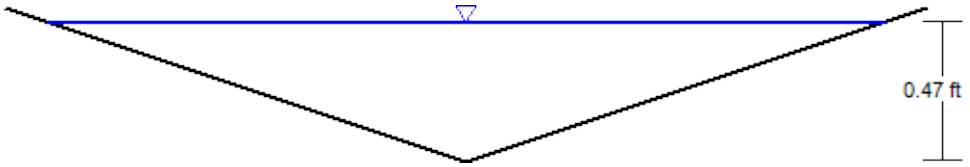
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

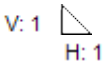
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.47	ft
Critical Depth	0.37	ft
Channel Slope	0.500	%
Critical Slope	1.715	%

XS for SW-ON2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.500	%
Normal Depth	0.47	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.00	cfs





Worksheet for SW-ON3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.570	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs

Results		
Normal Depth	0.35	ft
Flow Area	0.4	ft²
Wetted Perimeter	2.22	ft
Hydraulic Radius	0.17	ft
Top Width	2.10	ft
Critical Depth	0.28	ft
Critical Slope	1.881	%
Velocity	1.36	ft/s
Velocity Head	0.03	ft
Specific Energy	0.38	ft
Froude Number	0.571	
Flow Type	Subcritical	

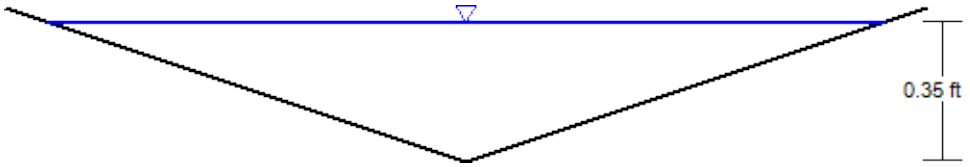
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

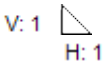
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.35	ft
Critical Depth	0.28	ft
Channel Slope	0.570	%
Critical Slope	1.881	%

XS for SW-ON3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.570	%
Normal Depth	0.35	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs





Worksheet for SW-ON4

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.570	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs

Results		
Normal Depth	0.35	ft
Flow Area	0.4	ft²
Wetted Perimeter	2.22	ft
Hydraulic Radius	0.17	ft
Top Width	2.10	ft
Critical Depth	0.28	ft
Critical Slope	1.881	%
Velocity	1.36	ft/s
Velocity Head	0.03	ft
Specific Energy	0.38	ft
Froude Number	0.571	
Flow Type	Subcritical	

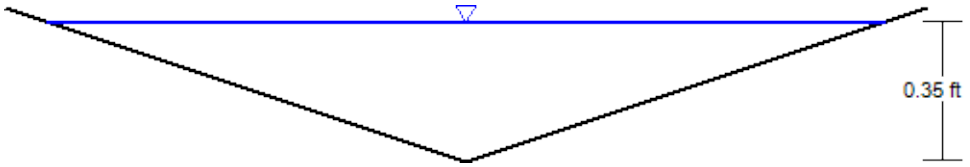
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

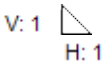
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.35	ft
Critical Depth	0.28	ft
Channel Slope	0.570	%
Critical Slope	1.881	%

XS for SW-ON4

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.570	%
Normal Depth	0.35	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs





Worksheet for SW-ON5

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	1.500	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs

Results		
Normal Depth	0.29	ft
Flow Area	0.3	ft²
Wetted Perimeter	1.85	ft
Hydraulic Radius	0.14	ft
Top Width	1.75	ft
Critical Depth	0.28	ft
Critical Slope	1.881	%
Velocity	1.95	ft/s
Velocity Head	0.06	ft
Specific Energy	0.35	ft
Froude Number	0.899	
Flow Type	Subcritical	

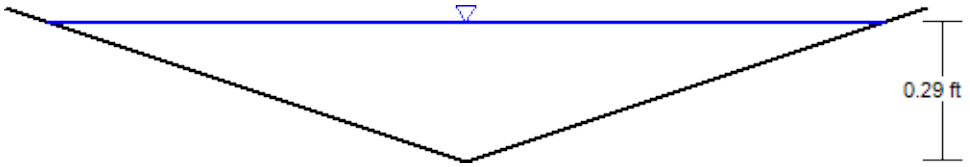
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

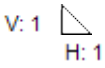
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.29	ft
Critical Depth	0.28	ft
Channel Slope	1.500	%
Critical Slope	1.881	%

XS for SW-ON5

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	1.500	%
Normal Depth	0.29	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs





Worksheet for SW-ON7

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	1.210	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.50	cfs

Results		
Normal Depth	0.46	ft
Flow Area	0.6	ft²
Wetted Perimeter	2.91	ft
Hydraulic Radius	0.22	ft
Top Width	2.76	ft
Critical Depth	0.44	ft
Critical Slope	1.625	%
Velocity	2.37	ft/s
Velocity Head	0.09	ft
Specific Energy	0.55	ft
Froude Number	0.871	
Flow Type	Subcritical	

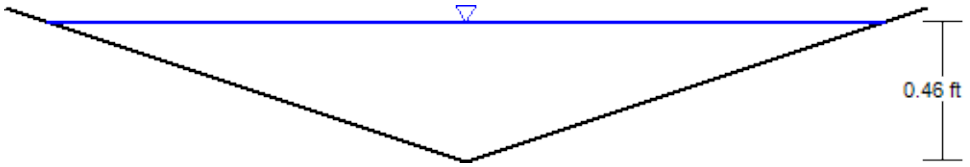
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

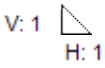
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.46	ft
Critical Depth	0.44	ft
Channel Slope	1.210	%
Critical Slope	1.625	%

XS for SW-ON7

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	1.210	%
Normal Depth	0.46	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.50	cfs





Worksheet for SW-ON9

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.500	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs

Results		
Normal Depth	0.36	ft
Flow Area	0.4	ft²
Wetted Perimeter	2.27	ft
Hydraulic Radius	0.17	ft
Top Width	2.16	ft
Critical Depth	0.28	ft
Critical Slope	1.881	%
Velocity	1.29	ft/s
Velocity Head	0.03	ft
Specific Energy	0.39	ft
Froude Number	0.537	
Flow Type	Subcritical	

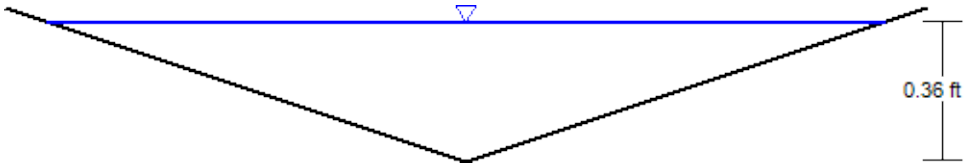
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

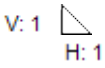
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.36	ft
Critical Depth	0.28	ft
Channel Slope	0.500	%
Critical Slope	1.881	%

XS for SW-ON9

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.500	%
Normal Depth	0.36	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs





Worksheet for SW-ON10

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	2.110	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs

Results		
Normal Depth	0.27	ft
Flow Area	0.2	ft²
Wetted Perimeter	1.73	ft
Hydraulic Radius	0.13	ft
Top Width	1.65	ft
Critical Depth	0.28	ft
Critical Slope	1.881	%
Velocity	2.22	ft/s
Velocity Head	0.08	ft
Specific Energy	0.35	ft
Froude Number	1.055	
Flow Type	Supercritical	

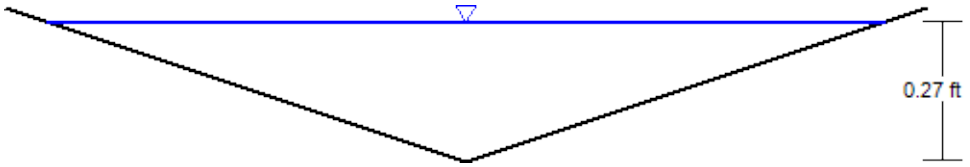
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

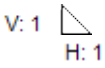
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.27	ft
Critical Depth	0.28	ft
Channel Slope	2.110	%
Critical Slope	1.881	%

XS for SW-ON10

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	2.110	%
Normal Depth	0.27	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs





Worksheet for SW-ON11

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.580	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	2.00	cfs

Results		
Normal Depth	0.59	ft
Flow Area	1.0	ft²
Wetted Perimeter	3.72	ft
Hydraulic Radius	0.28	ft
Top Width	3.53	ft
Critical Depth	0.49	ft
Critical Slope	1.564	%
Velocity	1.93	ft/s
Velocity Head	0.06	ft
Specific Energy	0.65	ft
Froude Number	0.628	
Flow Type	Subcritical	

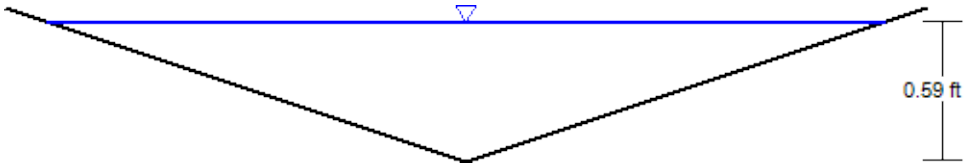
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

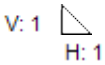
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.59	ft
Critical Depth	0.49	ft
Channel Slope	0.580	%
Critical Slope	1.564	%

XS for SW-ON11

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.580	%
Normal Depth	0.59	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	2.00	cfs





Rating Table for SW-ON11

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.580	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	2.00	cfs

Discharge (cfs)	Normal Depth (ft)	Velocity (ft/s)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)
0.50	0.35	1.37	0.4	2.21	2.10
1.00	0.45	1.63	0.6	2.86	2.72
1.50	0.53	1.80	0.8	3.34	3.16
2.00	0.59	1.93	1.0	3.72	3.53

Worksheet for SW-ON15

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.990	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.50	cfs

Results		
Normal Depth	0.48	ft
Flow Area	0.7	ft²
Wetted Perimeter	3.02	ft
Hydraulic Radius	0.23	ft
Top Width	2.86	ft
Critical Depth	0.43	ft
Critical Slope	1.625	%
Velocity	2.20	ft/s
Velocity Head	0.07	ft
Specific Energy	0.55	ft
Froude Number	0.793	
Flow Type	Subcritical	

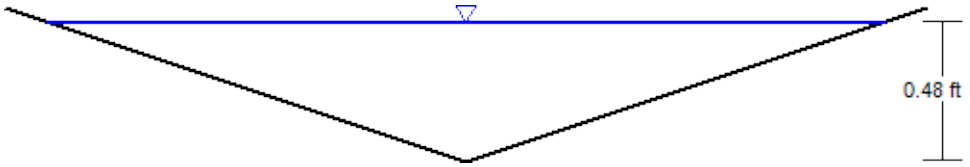
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

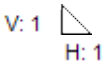
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.48	ft
Critical Depth	0.43	ft
Channel Slope	0.990	%
Critical Slope	1.625	%

XS for SW-ON15

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.990	%
Normal Depth	0.48	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.50	cfs





Worksheet for SW-ON16

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.520	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.00	cfs

Results		
Normal Depth	0.46	ft
Flow Area	0.6	ft²
Wetted Perimeter	2.92	ft
Hydraulic Radius	0.22	ft
Top Width	2.77	ft
Critical Depth	0.37	ft
Critical Slope	1.715	%
Velocity	1.56	ft/s
Velocity Head	0.04	ft
Specific Energy	0.50	ft
Froude Number	0.572	
Flow Type	Subcritical	

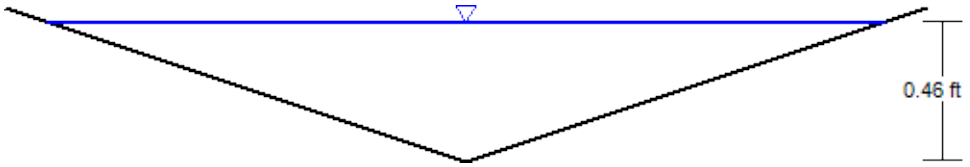
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

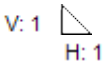
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.46	ft
Critical Depth	0.37	ft
Channel Slope	0.520	%
Critical Slope	1.715	%

XS for SW-ON16

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.520	%
Normal Depth	0.46	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.00	cfs





Worksheet for SW-ON19

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.670	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.00	cfs

Results		
Normal Depth	0.44	ft
Flow Area	0.6	ft²
Wetted Perimeter	2.79	ft
Hydraulic Radius	0.21	ft
Top Width	2.65	ft
Critical Depth	0.37	ft
Critical Slope	1.715	%
Velocity	1.71	ft/s
Velocity Head	0.05	ft
Specific Energy	0.49	ft
Froude Number	0.644	
Flow Type	Subcritical	

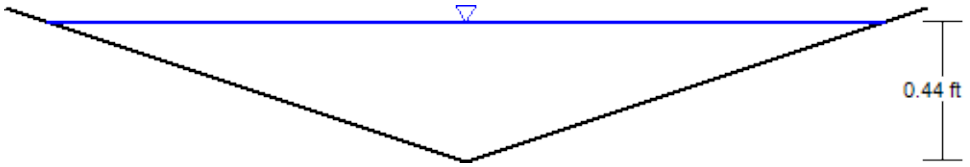
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

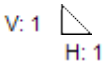
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.44	ft
Critical Depth	0.37	ft
Channel Slope	0.670	%
Critical Slope	1.715	%

XS for SW-ON19

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.670	%
Normal Depth	0.44	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.00	cfs





Worksheet for SW-ON21

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.790	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs

Results		
Normal Depth	0.33	ft
Flow Area	0.3	ft²
Wetted Perimeter	2.08	ft
Hydraulic Radius	0.16	ft
Top Width	1.98	ft
Critical Depth	0.28	ft
Critical Slope	1.881	%
Velocity	1.53	ft/s
Velocity Head	0.04	ft
Specific Energy	0.37	ft
Froude Number	0.666	
Flow Type	Subcritical	

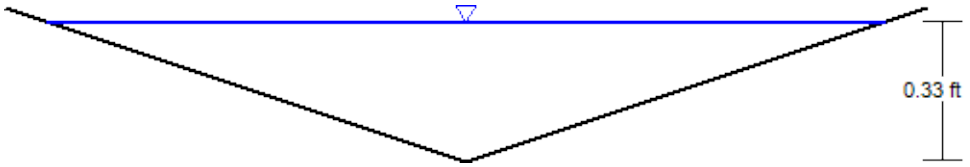
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

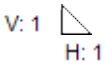
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.33	ft
Critical Depth	0.28	ft
Channel Slope	0.790	%
Critical Slope	1.881	%

XS for SW-ON21

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.790	%
Normal Depth	0.33	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs





Worksheet for SW-ON22

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.790	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs

Results		
Normal Depth	0.33	ft
Flow Area	0.3	ft²
Wetted Perimeter	2.08	ft
Hydraulic Radius	0.16	ft
Top Width	1.98	ft
Critical Depth	0.28	ft
Critical Slope	1.881	%
Velocity	1.53	ft/s
Velocity Head	0.04	ft
Specific Energy	0.37	ft
Froude Number	0.666	
Flow Type	Subcritical	

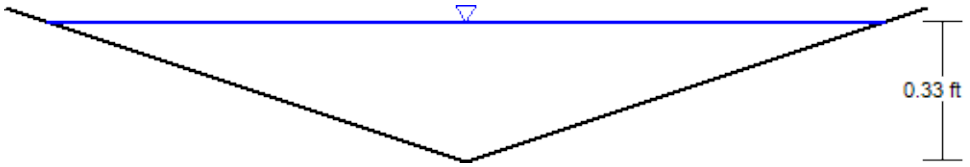
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

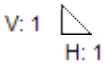
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.33	ft
Critical Depth	0.28	ft
Channel Slope	0.790	%
Critical Slope	1.881	%

XS for SW-ON22

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.790	%
Normal Depth	0.33	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs





Worksheet for SW-ON23A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.970	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs

Results		
Normal Depth	0.32	ft
Flow Area	0.3	ft²
Wetted Perimeter	2.01	ft
Hydraulic Radius	0.15	ft
Top Width	1.90	ft
Critical Depth	0.28	ft
Critical Slope	1.881	%
Velocity	1.66	ft/s
Velocity Head	0.04	ft
Specific Energy	0.36	ft
Froude Number	0.733	
Flow Type	Subcritical	

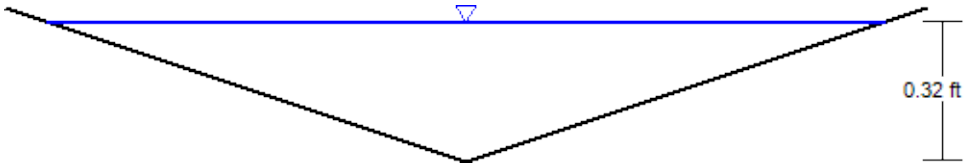
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

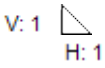
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.32	ft
Critical Depth	0.28	ft
Channel Slope	0.970	%
Critical Slope	1.881	%

XS for SW-ON23A

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.970	%
Normal Depth	0.32	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs





Worksheet for SW-ON23B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	1.850	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs

Results		
Normal Depth	0.28	ft
Flow Area	0.2	ft²
Wetted Perimeter	1.78	ft
Hydraulic Radius	0.13	ft
Top Width	1.69	ft
Critical Depth	0.28	ft
Critical Slope	1.881	%
Velocity	2.11	ft/s
Velocity Head	0.07	ft
Specific Energy	0.35	ft
Froude Number	0.993	
Flow Type	Subcritical	

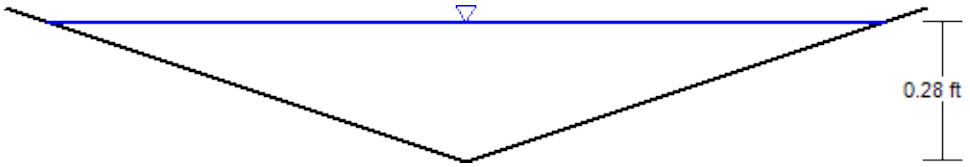
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

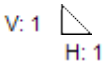
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.28	ft
Critical Depth	0.28	ft
Channel Slope	1.850	%
Critical Slope	1.881	%

XS for SW-ON23B

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	1.850	%
Normal Depth	0.28	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs





Worksheet for SW-ON24

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.510	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs

Results		
Normal Depth	0.36	ft
Flow Area	0.4	ft²
Wetted Perimeter	2.26	ft
Hydraulic Radius	0.17	ft
Top Width	2.15	ft
Critical Depth	0.28	ft
Critical Slope	1.881	%
Velocity	1.30	ft/s
Velocity Head	0.03	ft
Specific Energy	0.38	ft
Froude Number	0.542	
Flow Type	Subcritical	

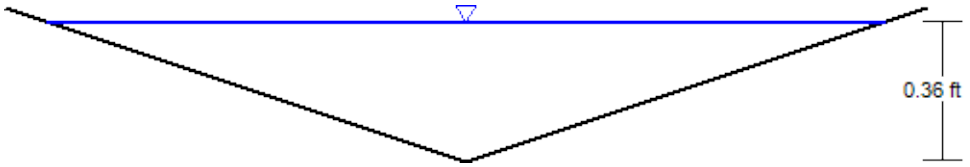
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

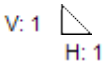
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.36	ft
Critical Depth	0.28	ft
Channel Slope	0.510	%
Critical Slope	1.881	%

XS for SW-ON24

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.510	%
Normal Depth	0.36	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	0.50	cfs





Worksheet for SW-ON25

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.670	%
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.00	cfs

Results		
Normal Depth	0.44	ft
Flow Area	0.6	ft²
Wetted Perimeter	2.79	ft
Hydraulic Radius	0.21	ft
Top Width	2.65	ft
Critical Depth	0.37	ft
Critical Slope	1.715	%
Velocity	1.71	ft/s
Velocity Head	0.05	ft
Specific Energy	0.49	ft
Froude Number	0.644	
Flow Type	Subcritical	

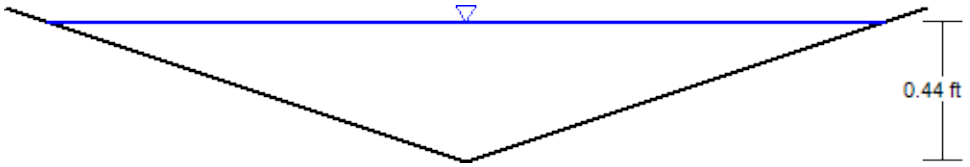
GVF Input Data		
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

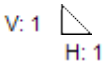
GVF Output Data		
Upstream Depth	0.00	ft
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.44	ft
Critical Depth	0.37	ft
Channel Slope	0.670	%
Critical Slope	1.715	%

XS for SW-ON25

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.025	
Channel Slope	0.670	%
Normal Depth	0.44	ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Discharge	1.00	cfs





Type CM Drop Inlet Sizing in Sump

DI#3

Known:

D_p=	Ponding Depth at Inlet	0.38	ft
W=	Gutter Width	1.5	ft
L_g=	Length of Grate	12.5	ft
L_c=	Length of Curb Opening	14.5	ft
H_c=	Curb Opening Height	0.5	ft
C_{wc}=	Weir coefficient for curb opening	2.3	
C_{wg}=	Weir coefficient for grate	3.0	
C_o=	Orifice coefficient	0.67	
R_o=	Grate opening factor	0.60	
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

P_g=	Active grate weir length (agwl) = 2*W+Lg	15.50	ft
P_{agl}	Adjusted agwl = 2*(1-Cfg/100)*W+Lg	14.00	ft
A_g=	Grate area = W*L_g	18.75	ft^2
A_{aga}=	Adjusted open grate area = Ag*Ro*(1-Cfg/100)	5.63	ft^2
	check - If Dp<1.792*Aaga/Pagl; weir; else orifice	weir	
Q_{ig}=	Flow intercepted by grate If "weir" controls Qig=Cwg*Pagl*$Dp^{1.5}$ If "orifice" controls Qig=Co*Aaga*$(64.4*Dp)^{0.5}$	9.8	cfs

Curb Opening Capacity Calculations

Pc =	Active curb opening weir length (acowl) = Lc+1.8*W	17.20	ft
Pacl =	Adjusted acowl = Lc+1.8*(1-Cfc/100)*W	15.85	ft
Ac=	curb opening area (coa) = Lc*Hc	7.25	ft^2
A_{aca}=	Adjusted coa = Ac*(1-Cfc/100)	3.63	ft^2
	check - If Dp<Hc; weir; else orifice	weir	
Qic=	Flow intercepted by curb opening If "weir" controls Qic=Cwc*Pacl*Dp1.5 If "orifice" controls Qic=Co*Aaca*(64.4*Dp-Hc/2)0.5	8.5	cfs

Total Inlet Calculations

Qti =	Total flow intercepted = Qig+Qic	18.4	cfs
q =	Interception per unit ratio = Q_{ti}/L_g	1.27	cfs/ft

Type CM Drop Inlet Sizing on a C. G.

DI#4

Known:

Q_s=	Half Street Flow	5.9	cfs
S_o=	Longitudinal Slope	0.005	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	1.86	fps
D=	Flow Depth	0.42	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	7.5	ft
L_c=	Length of Curb Opening	9.5	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = $1-0.09*(V_s-V_o)$ if $V_s>V_o$; else $R_f=1$	1.00	
	V_o= Splash over velocity=$p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3$†	8.71	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.24	
	Q_w= Frontal flow=A_w*V_s	1.41	cfs
	Q_x= Side flow = Q_s-Q_w	4.49	cfs
R_s=	Side flow factor = $1/(1+(0.15*V_s^{1.8})/(S_x*(L_g*(1-C_{fg}/100))^{2.3}))$	0.48	
Q_{ig}=	Flow intercepted = $[R_f*E_o+R_s*(1-E_o)]*Q_s$	3.6	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.071	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = $0.60*Q_s^{0.42}*So^{0.30}*(1/n*S_e)^{0.6}$	15.07	ft
Q_{ic}=	Flow intercepted = $(1-(1-(L_c*(1-C_{fc}/100))/L_t)^{1.8})*Q_s$	2.9	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = $Q_{ig}+Q_{ic}$	5.9	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.0	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.62	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	100	%

Type CM Drop Inlet Sizing on a C. G.

DI#5

Known:

Q_s=	Half Street Flow	5.5	cfs
S_o=	Longitudinal Slope	0.0064	ft/ft
n=	Manning's Roughness Coefficient	0.016	
V_s=	Flow Velocity	2.07	fps
D=	Flow Depth	0.41	ft
S_x=	Street Transverse Slope	0.02	ft/ft
W=	Gutter Width	2	ft
a=	Gutter Depression	5.0	in
L_g=	Length of Grate	5.0	ft
L_c=	Length of Curb Opening	7.0	ft
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

R_f=	Frontal flow factor = 1-0.09*(V_s-V_o) if V_s>V_o; else R_f=1	1.00	
	V_o= Splash over velocity=p+q*(L_g*(1-(C_{fg}/100)))-r*(L_g*(1-(C_{fg}/100)))^2+s*(L_g*(1-(C_{fg}/100)))^3†	7.22	fps
E_o=	Grate flow ratio = Q_w/Q_s	0.28	
	Q_w= Frontal flow=A_w*V_s	1.52	cfs
	Q_x= Side flow = Q_s-Q_w	3.98	cfs
R_s=	Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/(S_x*(L_g*(1-C_{fg}/100))$^{2.3}$))	0.23	
Q_{ig}=	Flow intercepted = [R_f*E_o+R_s*(1-E_o)]*Q_s	2.4	cfs
	†p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate)		

Curb Opening Capacity Calculations

S_e=	Equivalent cross slope = Sx+Sw*Eo	0.079	ft/ft
S_w=	Gutter cross slope = (0.137+afeet)/W	0.214	ft/ft
L_t=	Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*S_e)$^{0.6}$	14.75	ft
Q_{ic}=	Flow intercepted = (1-(1-(L_c*(1-C_{fc}/100))/L_t)$^{1.8}$)*Q_s	2.1	cfs

Total Inlet Calculations

Q_{ti}=	Total flow intercepted = Q_{ig}+Q_{ic}	4.6	cfs
Q_{tq}=	Flow bypass = Q_s-Q_{ti}	0.9	cfs
q=	Interception per unit ratio = Q_{ti}/L_g	0.65	cfs/ft
E_q=	Efficiency = (Qti/Qs)*100	83	%

Type CM Drop Inlet Sizing in Sump

DI#6

Known:

D_p=	Ponding Depth at Inlet	0.5	ft
W=	Gutter Width	1.5	ft
L_g=	Length of Grate	7.5	ft
L_c=	Length of Curb Opening	9.5	ft
H_c=	Curb Opening Height	0.5	ft
C_{wc}=	Weir coefficient for curb opening	2.3	
C_{wg}=	Weir coefficient for grate	3.0	
C_o=	Orifice coefficient	0.67	
R_o=	Grate opening factor	0.60	
C_{fg}=	Clogging Factor for Grate	50	%
C_{fc}=	Clogging Factor for Curb Opening	50	%

Grate Capacity Calculations:

P_g=	Active grate weir length (agwl) = 2*W+Lg	10.50	ft
P_{agl}	Adjusted agwl = 2*(1-Cfg/100)*W+Lg	9.00	ft
A_g=	Grate area = W*L_g	11.25	ft^2
A_{aga}=	Adjusted open grate area = Ag*Ro*(1-Cfg/100)	3.38	ft^2
	check - If Dp<1.792*Aaga/Pagl; weir; else orifice	weir	
Q_{ig}=	Flow intercepted by grate If "weir" controls Qig=Cwg*Pagl*$Dp^{1.5}$ If "orifice" controls Qig=Co*Aaga*$(64.4*Dp)^{0.5}$	9.5	cfs

Curb Opening Capacity Calculations

Pc =	Active curb opening weir length (acowl) = Lc+1.8*W	12.20	ft
Pacl =	Adjusted acowl = Lc+1.8*(1-Cfc/100)*W	10.85	ft
Ac=	curb opening area (coa) = Lc*Hc	4.75	ft^2
A_{aca}=	Adjusted coa = Ac*(1-Cfc/100)	2.38	ft^2
	check - If Dp<Hc; weir; else orifice	orifice	
Qic=	Flow intercepted by curb opening If "weir" controls Qic=Cwc*Pacl*Dp1.5 If "orifice" controls Qic=Co*Aaca*(64.4*Dp-Hc/2)0.5	9.0	cfs

Total Inlet Calculations

Qti =	Total flow intercepted = Qig+Qic	18.5	cfs
q =	Interception per unit ratio = Q_{ti}/L_g	1.95	cfs/ft

```
T1 DURANGO AND GRAND MONTECITO                                          0
T2 MAIN1
T3 KHA JOB# 092935040 BY:SS/MS
SO   1000.0002473.000 30                        2476.4
R    1035.7202473.357 30      .013                                  .000    .000 0
R    1039.7202473.406 30      .013                                  .000 -90.000 1
R    1140.4352474.846 30      .013                                  .000    .000 0
JX   1144.4352474.895 30 30   .013   10.500         2474.874        -79.3     81.600
R    1200.8392475.459 30      .013                                  .000    .000 0
JX   1204.8392475.510 30 30   .013   15.500         2475.478          8.3      -81.200
R    1417.9042478.856 24      .013                                  .000    .000 0
R    1421.9042478.935 24      .013                                  .000    .000 1
R    1635.0142483.996 24      .013                                  .000    .000 0
R    1639.0142484.116 24      .013                                  .000 -90.000 1
R    1696.0752486.170 24      .013                                  .000    .000 0
SH   1696.0752486.170 24
CD   6  4   0    .000   0.500     .000  .000  .000   .00
CD   8  4   0    .000   0.670     .000  .000  .000   .00
CD  12  4   0    .000   1.000     .000  .000  .000   .00
CD  18  4   0    .000   1.500     .000  .000  .000   .00
CD  24  4   0    .000   2.000     .000  .000  .000   .00
CD  30  4   0    .000   2.500     .000  .000  .000   .00
CD  36  4   0    .000   3.000     .000  .000  .000   .00
CD  42  4   0    .000   3.500     .000  .000  .000   .00
CD  48  4   0    .000   4.000     .000  .000  .000   .00
CD  54  4   0    .000   4.500     .000  .000  .000   .00
CD  60  4   0    .000   5.000     .000  .000  .000   .00
CD  66  4   0    .000   5.500     .000  .000  .000   .00
CD  72  4   0    .000   6.000     .000  .000  .000   .00
Q            14.000   .0
```

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2473.000	3.400	2476.400	40.00	8.15	1.03	2477.43	.00	2.13	.00	2.500	.000	.00	0 .0
35.720	.0100					.0095	.34	3.40	.00	2.00	.013	.00	.00	PIPE
1035.720	2473.357	3.383	2476.740	40.00	8.15	1.03	2477.77	.00	2.13	.00	2.500	.000	.00	0 .0
4.000	.0123					.0095	.04	3.38	.00	1.82	.013	.00	.00	PIPE
1039.720	2473.406	3.729	2477.135	40.00	8.15	1.03	2478.17	.00	2.13	.00	2.500	.000	.00	0 .0
100.715	.0143					.0095	.96	3.73	.00	1.72	.013	.00	.00	PIPE
1140.435	2474.846	3.247	2478.093	40.00	8.15	1.03	2479.12	.00	2.13	.00	2.500	.000	.00	0 .0
JUNCT STR	.0123					.0073	.03	.00	.00		.013	.00	.00	PIPE
1144.435	2474.895	4.142	2479.037	29.50	6.01	.56	2479.60	.00	1.85	.00	2.500	.000	.00	0 .0
56.404	.0100					.0052	.29	4.14	.00	1.57	.013	.00	.00	PIPE
1200.839	2475.459	3.869	2479.328	29.50	6.01	.56	2479.89	.00	1.85	.00	2.500	.000	.00	0 .0
JUNCT STR	.0128					.0032	.01	.00	.00		.013	.00	.00	PIPE
1204.839	2475.510	4.394	2479.904	14.00	4.46	.31	2480.21	.00	1.35	.00	2.000	.000	.00	0 .0
201.587	.0157					.0038	.76	4.39	.00	.99	.013	.00	.00	PIPE
1406.426	2478.676	2.000	2480.676	14.00	4.46	.31	2480.98	.00	1.35	.00	2.000	.000	.00	0 .0
3.078	.0157					.0036	.01	2.00	.00	.99	.013	.00	.00	PIPE
1409.503	2478.724	1.959	2480.683	14.00	4.48	.31	2480.99	.00	1.35	.57	2.000	.000	.00	0 .0
HYDRAULIC JUMP														

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1409.503	2478.724	.899	2479.623	14.00	10.22	1.62	2481.25	.00	1.35	1.99	2.000	.000	.00	0 .0
8.401	.0157					.0228	.19	.90	2.17	.99	.013	.00	.00	PIPE
1417.904	2478.856	.886	2479.742	14.00	10.42	1.69	2481.43	.00	1.35	1.99	2.000	.000	.00	0 .0
4.000	.0198					.0235	.09	.89	2.23	.93	.013	.00	.00	PIPE
1421.904	2478.935	.882	2479.817	14.00	10.49	1.71	2481.53	.00	1.35	1.99	2.000	.000	.00	0 .0
85.221	.0237					.0237	2.02	.88	2.26	.88	.013	.00	.00	PIPE
1507.125	2480.959	.882	2481.841	14.00	10.49	1.71	2483.55	.00	1.35	1.99	2.000	.000	.00	0 .0
85.091	.0237					.0246	2.09	.88	2.26	.88	.013	.00	.00	PIPE
1592.216	2482.980	.864	2483.844	14.00	10.77	1.80	2485.64	.00	1.35	1.98	2.000	.000	.00	0 .0
42.798	.0237					.0272	1.17	.86	2.34	.88	.013	.00	.00	PIPE
1635.014	2483.996	.834	2484.830	14.00	11.29	1.98	2486.81	.00	1.35	1.97	2.000	.000	.00	0 .0
4.000	.0300					.0290	.12	.83	2.51	.83	.013	.00	.00	PIPE
1639.014	2484.116	.834	2484.950	14.00	11.29	1.98	2486.93	.00	1.35	1.97	2.000	.000	.00	0 .0
9.370	.0360					.0281	.26	.83	2.51	.79	.013	.00	.00	PIPE
1648.384	2484.453	.848	2485.301	14.00	11.02	1.89	2487.19	.00	1.35	1.98	2.000	.000	.00	0 .0

13.323	.0360				.0255	.34	.85	2.42	.79	.013	.00	.00	PIPE		
1661.707	2484.933	.880	2485.813	14.00	10.51	1.72	2487.53	.00	1.35	1.99	2.000	.000	.00	0	.0
9.137	.0360				.0224	.20	.88	2.26	.79	.013	.00	.00	PIPE		

Program Package Serial Number: 7370

WATER SURFACE PROFILE LISTING Date: 5- 2-2024 Time: 4:47:24

DURANGO AND GRAND MONTECITO 0

MAIN1

KHA JOB# 092935040 BY:SS/MS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1670.844	2485.261	.912	2486.174	14.00	10.02	1.56	2487.73	.00	1.35	1.99	2.000	.000	.00	0 .0
6.561	.0360					.0197	.13	.91	2.11	.79	.013	.00	.00	PIPE
1677.405	2485.498	.947	2486.445	14.00	9.56	1.42	2487.86	.00	1.35	2.00	2.000	.000	.00	0 .0
5.036	.0360					.0173	.09	.95	1.97	.79	.013	.00	.00	PIPE
1682.441	2485.679	.982	2486.661	14.00	9.11	1.29	2487.95	.00	1.35	2.00	2.000	.000	.00	0 .0
3.821	.0360					.0153	.06	.98	1.83	.79	.013	.00	.00	PIPE
1686.261	2485.816	1.020	2486.836	14.00	8.69	1.17	2488.01	.00	1.35	2.00	2.000	.000	.00	0 .0
2.996	.0360					.0135	.04	1.02	1.71	.79	.013	.00	.00	PIPE
1689.257	2485.924	1.059	2486.983	14.00	8.28	1.07	2488.05	.00	1.35	2.00	2.000	.000	.00	0 .0
2.273	.0360					.0119	.03	1.06	1.59	.79	.013	.00	.00	PIPE
1691.531	2486.006	1.101	2487.107	14.00	7.90	.97	2488.08	.00	1.35	1.99	2.000	.000	.00	0 .0
1.765	.0360					.0105	.02	1.10	1.47	.79	.013	.00	.00	PIPE
1693.295	2486.070	1.144	2487.214	14.00	7.53	.88	2488.09	.00	1.35	1.98	2.000	.000	.00	0 .0
1.273	.0360					.0093	.01	1.14	1.37	.79	.013	.00	.00	PIPE
1694.568	2486.115	1.190	2487.306	14.00	7.18	.80	2488.11	.00	1.35	1.96	2.000	.000	.00	0 .0
.854	.0360					.0082	.01	1.19	1.27	.79	.013	.00	.00	PIPE
1695.423	2486.146	1.239	2487.385	14.00	6.85	.73	2488.11	.00	1.35	1.94	2.000	.000	.00	0 .0
.492	.0360					.0073	.00	1.24	1.18	.79	.013	.00	.00	PIPE

Program Package Serial Number: 7370

WATER SURFACE PROFILE LISTING Date: 5- 2-2024 Time: 4:47:24

DURANGO AND GRAND MONTECITO 0

MAIN1

KHA JOB# 092935040 BY:SS/MS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1695.915	2486.164	1.291	2487.455	14.00	6.53	.66	2488.12	.00	1.35	1.91	2.000	.000	.00	0 .0
.160	.0360					.0064	.00	1.29	1.09	.79	.013	.00	.00	PIPE
1696.075	2486.170	1.348	2487.517	14.00	6.22	.60	2488.12	.00	1.35	1.88	2.000	.000	.00	0 .0

```
T1 DURANGO AND GRAND MONTECITO                                          0
T2 MAIN_LAT1
T3 KHA JOB# 092935040 BY:SS/MS
SO   1000.0002475.478 30                        2479.9
R    1032.7722475.806 30      .013                                .000    .000 0
R    1036.7722475.901 30      .013                                .000 -64.300 1
R    1055.3232476.596 30      .013                                .000    .000 0
SH   1055.3232476.596 30
CD   6  4   0    .000   0.500     .000  .000  .000   .00
CD   8  4   0    .000   0.670     .000  .000  .000   .00
CD  12  4   0    .000   1.000     .000  .000  .000   .00
CD  18  4   0    .000   1.500     .000  .000  .000   .00
CD  24  4   0    .000   2.000     .000  .000  .000   .00
CD  30  4   0    .000   2.500     .000  .000  .000   .00
CD  36  4   0    .000   3.000     .000  .000  .000   .00
CD  42  4   0    .000   3.500     .000  .000  .000   .00
CD  48  4   0    .000   4.000     .000  .000  .000   .00
CD  54  4   0    .000   4.500     .000  .000  .000   .00
CD  60  4   0    .000   5.000     .000  .000  .000   .00
CD  66  4   0    .000   5.500     .000  .000  .000   .00
CD  72  4   0    .000   6.000     .000  .000  .000   .00
Q             15.500   .0
```

Program Package Serial Number: 7370

WATER SURFACE PROFILE LISTING Date: 5- 2-2024 Time: 4:50:21

DURANGO AND GRAND MONTECITO 0

MAIN_LAT1

KHA JOB# 092935040 BY:SS/MS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2475.478	4.422	2479.900	15.50	3.16	.15	2480.05	.00	1.33	.00	2.500	.000	.00	0 .0
32.772	.0100					.0014	.05	4.42	.00	1.07	.013	.00	.00	PIPE
1032.772	2475.806	4.141	2479.947	15.50	3.16	.15	2480.10	.00	1.33	.00	2.500	.000	.00	0 .0
4.000	.0237					.0014	.01	4.14	.00	.84	.013	.00	.00	PIPE
1036.772	2475.901	4.092	2479.993	15.50	3.16	.15	2480.15	.00	1.33	.00	2.500	.000	.00	0 .0
18.551	.0375					.0014	.03	4.09	.00	.75	.013	.00	.00	PIPE
1055.323	2476.596	3.424	2480.020	15.50	3.16	.15	2480.17	.00	1.33	.00	2.500	.000	.00	0 .0

```
T1 DURANGO AND GRAND MONTECITO                                          0
T2 MAIN2
T3 KHA JOB# 092935040 BY:SS/MS
SO   1000.0002474.874 24                        2479.0
R    1049.8202476.304 24      .013                                 .000    .000 0
JX   1053.8202476.381 18 18   .013    5.9           2474.874        45.0      0.000
R    1210.8722477.952 18      .013                                 .000    .000 0
R    1214.8722477.994 18      .013                                 .000  61.400 1
R    1233.9472478.186 18      .013                                 .000    .000 0
SH   1233.9472478.186 18
CD   6  4   0    .000   0.500     .000  .000  .000   .00
CD   8  4   0    .000   0.670     .000  .000  .000   .00
CD  12  4   0    .000   1.000     .000  .000  .000   .00
CD  18  4   0    .000   1.500     .000  .000  .000   .00
CD  24  4   0    .000   2.000     .000  .000  .000   .00
CD  30  4   0    .000   2.500     .000  .000  .000   .00
CD  36  4   0    .000   3.000     .000  .000  .000   .00
CD  42  4   0    .000   3.500     .000  .000  .000   .00
CD  48  4   0    .000   4.000     .000  .000  .000   .00
CD  54  4   0    .000   4.500     .000  .000  .000   .00
CD  60  4   0    .000   5.000     .000  .000  .000   .00
CD  66  4   0    .000   5.500     .000  .000  .000   .00
CD  72  4   0    .000   6.000     .000  .000  .000   .00
Q             4.600   .0
```

Program Package Serial Number: 7370

WATER SURFACE PROFILE LISTING Date: 5- 2-2024 Time: 4:53: 0

DURANGO AND GRAND MONTECITO 0

MAIN2

KHA JOB# 092935040 BY:SS/MS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2474.874	4.126	2479.000	10.50	3.34	.17	2479.17	.00	1.16	.00	2.000	.000	.00	0 .0
49.820	.0287					.0022	.11	4.13	.00	.72	.013	.00	.00	PIPE
1049.820	2476.304	2.803	2479.107	10.50	3.34	.17	2479.28	.00	1.16	.00	2.000	.000	.00	0 .0
JUNCT STR	.0193					.0020	.01	2.80	.00		.013	.00	.00	PIPE
1053.820	2476.381	2.851	2479.232	4.60	2.60	.11	2479.34	.00	.82	.00	1.500	.000	.00	0 .0
157.052	.0100					.0019	.30	2.85	.00	.69	.013	.00	.00	PIPE
1210.872	2477.952	1.581	2479.533	4.60	2.60	.11	2479.64	.00	.82	.00	1.500	.000	.00	0 .0
4.000	.0105					.0019	.01	1.58	.00	.68	.013	.00	.00	PIPE
1214.872	2477.994	1.573	2479.567	4.60	2.60	.11	2479.67	.00	.82	.00	1.500	.000	.00	0 .0
8.990	.0101					.0019	.02	1.57	.00	.69	.013	.00	.00	PIPE
1223.862	2478.084	1.500	2479.584	4.60	2.60	.11	2479.69	.00	.82	.00	1.500	.000	.00	0 .0
10.085	.0101					.0018	.02	1.50	.00	.69	.013	.00	.00	PIPE
1233.947	2478.186	1.411	2479.596	4.60	2.67	.11	2479.71	.00	.82	.71	1.500	.000	.00	0 .0

```
T1 DURANGO AND GRAND MONTECITO                                          0
T2 MAIN2_LAT1
T3 KHA JOB# 092935040 BY:SS/MS
SO   1000.0002476.362 18                        2479.2
R    1026.1752477.158 18      .013                                .000    .000 0
SH   1026.1752477.158 18
CD   6  4   0    .000   0.500     .000  .000  .000   .00
CD   8  4   0    .000   0.670     .000  .000  .000   .00
CD  12  4   0    .000   1.000     .000  .000  .000   .00
CD  18  4   0    .000   1.500     .000  .000  .000   .00
CD  24  4   0    .000   2.000     .000  .000  .000   .00
CD  30  4   0    .000   2.500     .000  .000  .000   .00
CD  36  4   0    .000   3.000     .000  .000  .000   .00
CD  42  4   0    .000   3.500     .000  .000  .000   .00
CD  48  4   0    .000   4.000     .000  .000  .000   .00
CD  54  4   0    .000   4.500     .000  .000  .000   .00
CD  60  4   0    .000   5.000     .000  .000  .000   .00
CD  66  4   0    .000   5.500     .000  .000  .000   .00
CD  72  4   0    .000   6.000     .000  .000  .000   .00
Q              5.900   .0
```

Program Package Serial Number: 7370

WATER SURFACE PROFILE LISTING Date: 5- 2-2024 Time: 4:55:56

DURANGO AND GRAND MONTECITO 0

MAIN2_LAT1

KHA JOB# 092935040 BY:SS/MS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2476.362	2.838	2479.200	5.90	3.34	.17	2479.37	.00	.94	.00	1.500	.000	.00	0 .0
26.175	.0304					.0032	.08	2.84	.00	.59	.013	.00	.00	PIPE
1026.175	2477.158	2.125	2479.282	5.90	3.34	.17	2479.46	.00	.94	.00	1.500	.000	.00	0 .0

♠