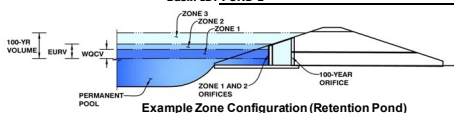


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD- Detention, Version 4.06 (July 2022)

Project: COTTAGES AT KETTLE CREEK

Basin ID: POND 1



Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	6.84	acres
Watershed Length =	935	ft
Watershed Length to Centroid =	387	ft
Watershed Slope =	0.023	ft/ft
Watershed Imperviousness =	62.70%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.140	acre-feet
Excess Urban Runoff Volume (EURV) =	0.527	acre-feet
2-yr Runoff Volume (P1 = 0.91 in.) =	0.282	acre-feet
5-yr Runoff Volume (P1 = 1.19 in.) =	0.377	acre-feet
10-yr Runoff Volume (P1 = 1.45 in.) =	0.475	acre-feet
25-yr Runoff Volume (P1 = 1.84 in.) =	0.640	acre-feet
50-yr Runoff Volume (P1 = 2.17 in.) =	0.803	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	0.995	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	1.328	acre-feet
Approximate 2-yr Detention Volume =	0.262	acre-feet
Approximate 5-yr Detention Volume =	0.355	acre-feet
Approximate 10-yr Detention Volume =	0.448	acre-feet
Approximate 25-yr Detention Volume =	0.600	acre-feet
Approximate 50-yr Detention Volume =	0.694	acre-feet
Approximate 100-yr Detention Volume =	0.792	acre-feet

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.140	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.387	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.265	acre-feet
Total Detention Basin Volume =	0.792	acre-feet
Initial Surcharge Volume (ISV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H _{total}) =	user	ft
Depth of Trickle Channel (H _{TC}) =	user	ft
Slope of Trickle Channel (S _{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S _{main}) =	user	H:V
Basin Length-to-Width Ratio (R _{L/W}) =	user	
Initial Surcharge Area (A _{ISV}) =	user	ft ²
Surcharge Volume Length (L _{ISV}) =	user	ft
Surcharge Volume Width (W _{ISV}) =	user	ft
Depth of Basin Floor (H _{FLOOR}) =	user	ft
Length of Basin Floor (L _{FLOOR}) =	user	ft
Width of Basin Floor (W _{FLOOR}) =	user	ft
Area of Basin Floor (A _{FLOOR}) =	user	ft ²
Volume of Basin Floor (V _{FLOOR}) =	user	ft ³
Depth of Main Basin (H _{MAIN}) =	user	ft
Length of Main Basin (L _{MAIN}) =	user	ft
Width of Main Basin (W _{MAIN}) =	user	ft
Area of Main Basin (A _{MAIN}) =	user	ft ²
Volume of Main Basin (V _{MAIN}) =	user	ft ³
Calculated Total Basin Volume (V _{total}) =	user	acre-feet

Optional User Overrides

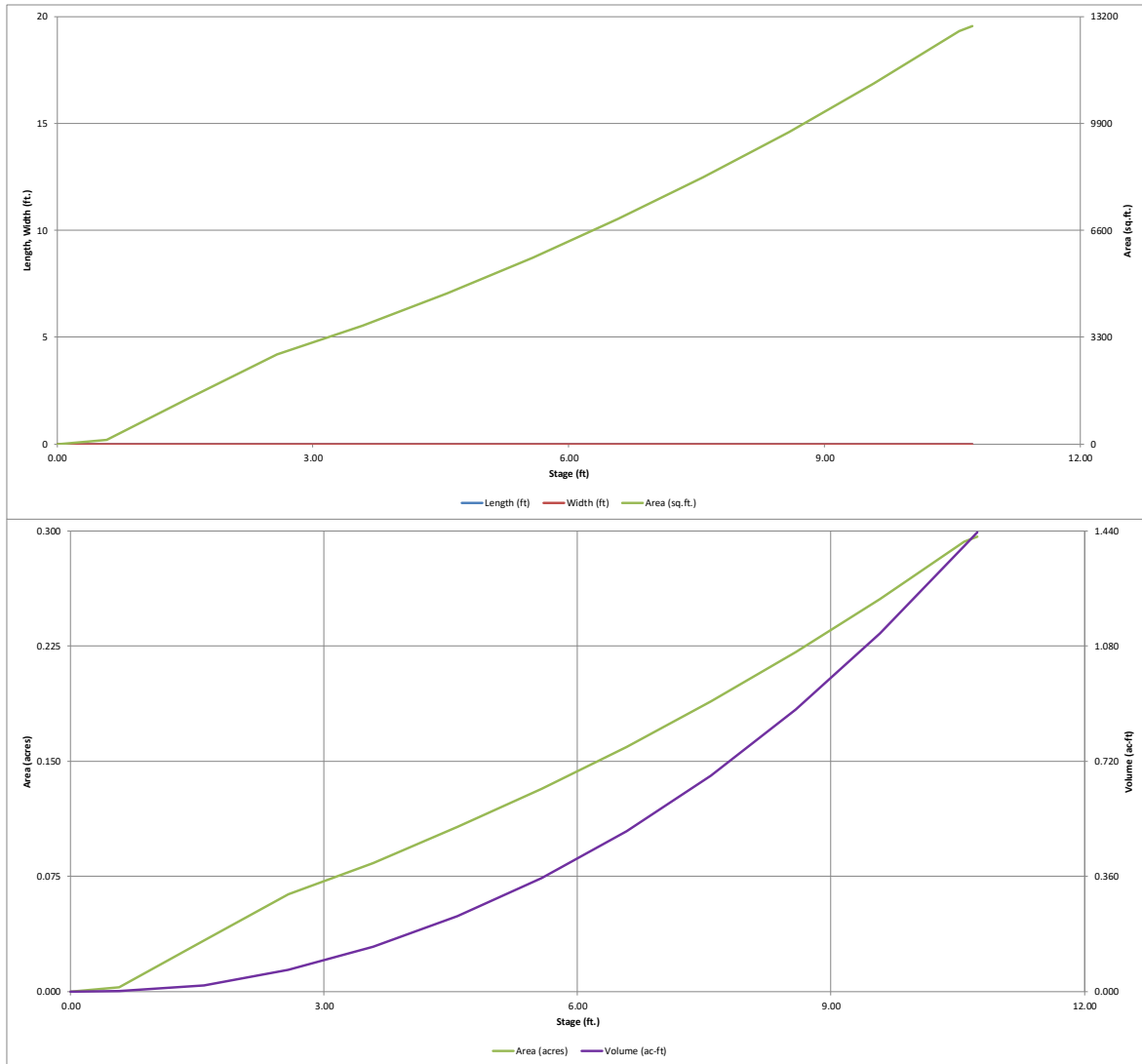
	acre-feet
	acre-feet
0.91	inches
1.19	inches
1.45	inches
1.84	inches
2.17	inches
2.52	inches
	inches

6696.42

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.00	--	--
6697	--	0.58	--	--	--	114	0.003	33	0.001
6698	--	1.58	--	--	--	1,452	0.033	816	0.019
6699	--	2.58	--	--	--	2,761	0.063	2,923	0.067
6700	--	3.58	--	--	--	3,646	0.084	6,126	0.141
6701	--	4.58	--	--	--	4,663	0.107	10,281	0.236
6702	--	5.58	--	--	--	5,760	0.132	15,492	0.356
6703	--	6.58	--	--	--	6,943	0.159	21,844	0.501
6704	--	7.58	--	--	--	8,232	0.189	29,431	0.676
6705	--	8.58	--	--	--	9,626	0.221	38,360	0.881
6706	--	9.58	--	--	--	11,125	0.255	48,736	1.119
6707	--	10.58	--	--	--	12,756	0.293	60,676	1.393
6707.15	--	10.73	--	--	--	12,913	0.296	62,601	1.437
	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

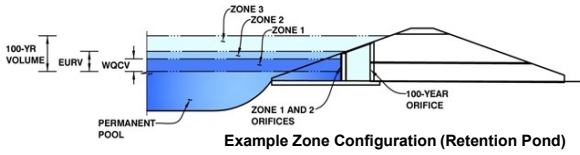
MHFD-Detention, Version 4.06 (July 2022)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention, Version 4.06 (July 2022)*

Project: COTTAGES AT KETTLE CREEK
Basin ID: POND 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.58	0.140	Orifice Plate
Zone 2 (EURV)	6.74	0.387	Rectangular Orifice
Zone 3 (100-year)	8.17	0.265	Weir&Pipe (Restrict)
Total (all zones)		0.792	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.58	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	sq. inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.25	2.50					
Orifice Area (sq. inches)	0.48	0.48	0.48					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangula	Not Selected	
Invert of Vertical Orifice =	3.58	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	6.74	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	2.00	N/A	inches
Vertical Orifice Width =	0.55		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangula	Not Selected	
Vertical Orifice Area =	0.01	N/A	ft ²
Vertical Orifice Centroid =	0.08	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	7.33	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Gate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.00	N/A	feet
Overflow Gate Type =	Type C Gate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Gate Upper Edge, H ₁ =	7.33	N/A	feet
Overflow Weir Slope Length =	3.00	N/A	feet
Gate Open Area / 100-yr Orifice Area =	27.02	N/A	
Overflow Gate Open Area w/o Debris =	6.26	N/A	ft ²
Overflow Gate Open Area w/ Debris =	3.13	N/A	ft ²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	3.40		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.23	N/A	ft ²
Outlet Orifice Centroid =	0.17	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.90	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	8.23	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	10.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.61	feet
Stage at Top of Freeboard =	9.84	feet
Basin Area at Top of Freeboard =	0.27	acres
Basin Volume at Top of Freeboard =	1.19	acre-ft

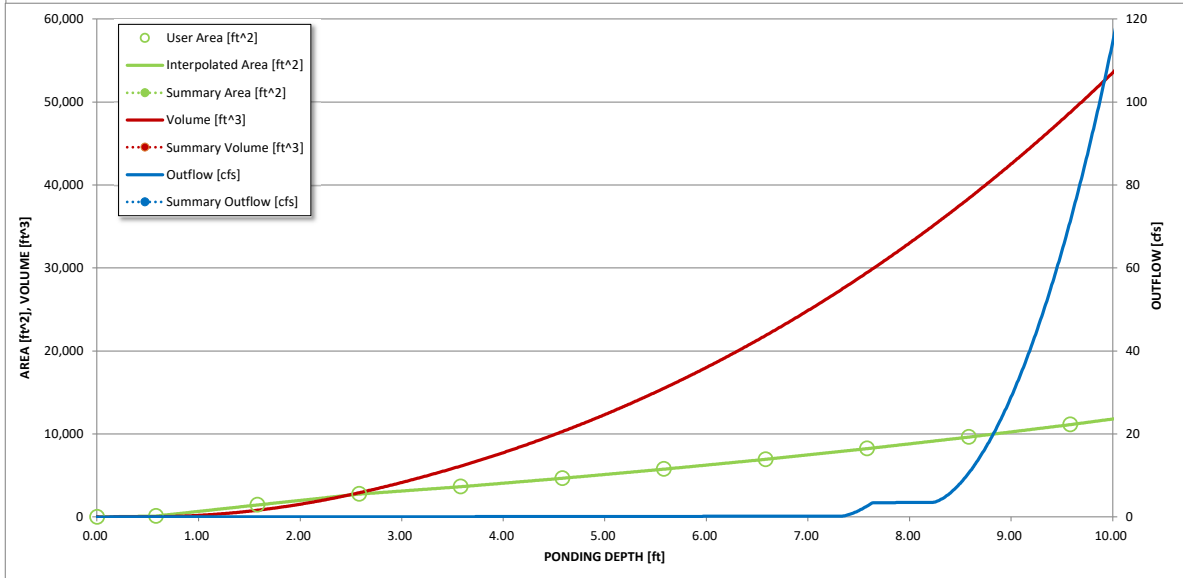
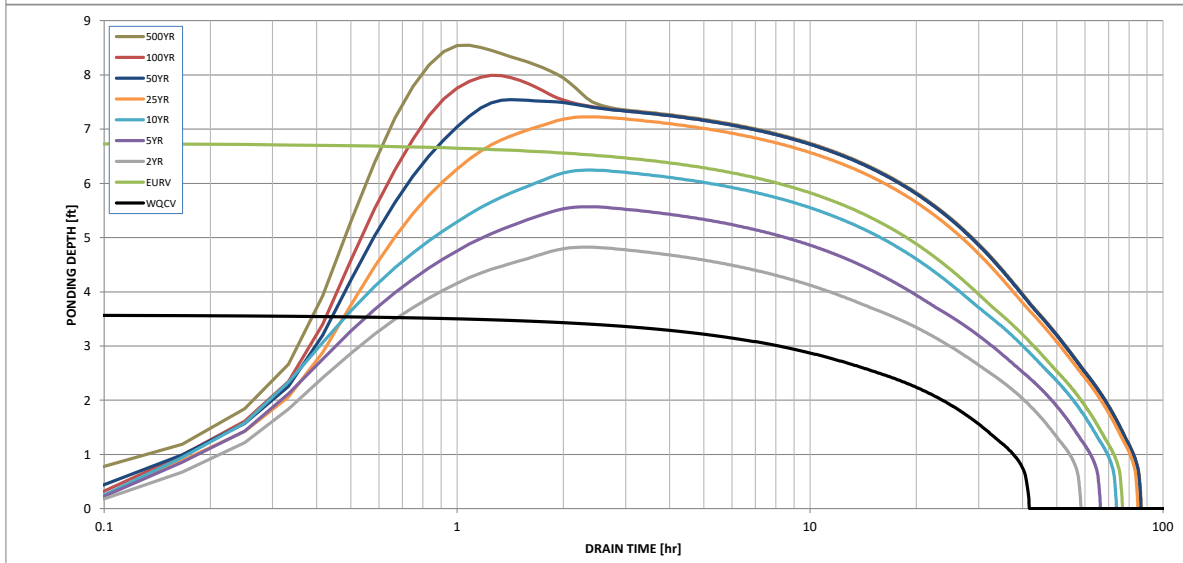
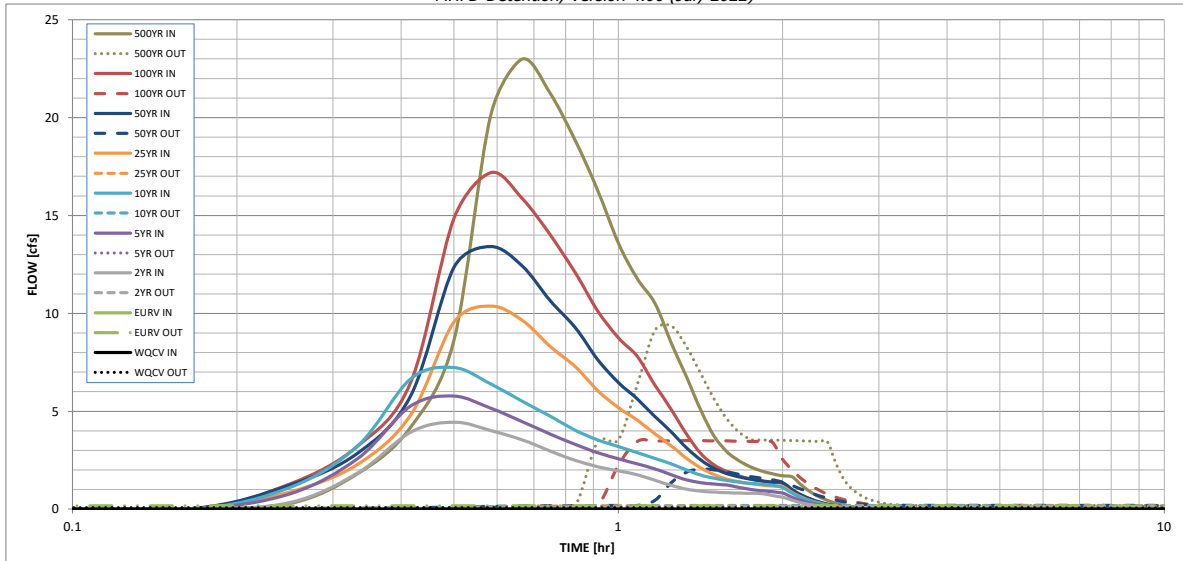
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.91	1.19	1.45	1.84	2.17	2.52	3.14
One-Hour Rainfall Depth (in) =	0.140	0.527	0.282	0.377	0.475	0.640	0.803	0.995	1.328
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.282	0.377	0.475	0.640	0.803	0.995	1.328
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.0	0.0	0.1	0.5	2.0	4.0	7.1
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.07	0.30	0.58	1.04
Peak Inflow Q (cfs) =	N/A	N/A	4.4	5.8	7.2	10.4	13.4	17.2	23.0
Peak Outflow Q (cfs) =	0.1	0.2	0.1	0.2	0.2	0.2	2.0	3.5	9.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.6	2.0	0.4	1.0	0.9	1.3
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	0.3	0.5	0.5
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	66	52	58	64	73	72	70	67
Time to Drain 99% of Inflow Volume (hours) =	40	72	56	63	70	79	80	79	77
Maximum Ponding Depth (ft) =	3.58	6.74	4.82	5.57	6.24	7.22	7.54	7.99	8.54
Area at Maximum Ponding Depth (acres) =	0.08	0.16	0.11	0.13	0.15	0.18	0.19	0.20	0.22
Maximum Volume Stored (acre-ft) =	0.141	0.527	0.262	0.353	0.449	0.610	0.666	0.754	0.872

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.28
	0:15:00	0.00	0.00	0.34	0.78	1.10	0.88	1.22	1.28	1.81
	0:20:00	0.00	0.00	1.85	2.59	3.24	2.30	2.87	3.22	4.19
	0:25:00	0.00	0.00	3.93	5.26	6.65	4.80	5.79	6.48	8.63
	0:30:00	0.00	0.00	4.44	5.77	7.23	9.55	12.35	14.85	20.12
	0:35:00	0.00	0.00	4.02	5.15	6.40	10.38	13.42	17.19	22.99
	0:40:00	0.00	0.00	3.54	4.47	5.51	9.65	12.43	15.88	21.24
	0:45:00	0.00	0.00	2.96	3.83	4.75	8.31	10.65	14.02	18.83
	0:50:00	0.00	0.00	2.49	3.31	4.03	7.28	9.28	12.08	16.29
	0:55:00	0.00	0.00	2.17	2.88	3.53	6.06	7.63	10.12	13.60
	1:00:00	0.00	0.00	1.95	2.58	3.19	5.18	6.47	8.75	11.77
	1:05:00	0.00	0.00	1.76	2.31	2.89	4.54	5.63	7.80	10.53
	1:10:00	0.00	0.00	1.47	2.06	2.59	3.85	4.73	6.34	8.49
	1:15:00	0.00	0.00	1.21	1.76	2.31	3.23	3.94	5.09	6.75
	1:20:00	0.00	0.00	1.02	1.49	2.00	2.59	3.13	3.83	5.04
	1:25:00	0.00	0.00	0.92	1.35	1.73	2.10	2.51	2.84	3.70
	1:30:00	0.00	0.00	0.86	1.28	1.57	1.75	2.07	2.25	2.91
	1:35:00	0.00	0.00	0.83	1.22	1.46	1.53	1.81	1.91	2.46
	1:40:00	0.00	0.00	0.82	1.10	1.37	1.39	1.64	1.69	2.15
	1:45:00	0.00	0.00	0.80	1.00	1.31	1.29	1.52	1.54	1.94
	1:50:00	0.00	0.00	0.79	0.93	1.27	1.22	1.44	1.44	1.80
	1:55:00	0.00	0.00	0.69	0.88	1.21	1.18	1.39	1.36	1.70
	2:00:00	0.00	0.00	0.60	0.82	1.09	1.14	1.35	1.32	1.64
	2:05:00	0.00	0.00	0.45	0.60	0.80	0.84	0.99	0.97	1.21
	2:10:00	0.00	0.00	0.32	0.43	0.58	0.61	0.72	0.70	0.87
	2:15:00	0.00	0.00	0.23	0.31	0.41	0.44	0.51	0.51	0.63
	2:20:00	0.00	0.00	0.16	0.22	0.29	0.31	0.36	0.36	0.44
	2:25:00	0.00	0.00	0.11	0.15	0.20	0.21	0.25	0.25	0.31
	2:30:00	0.00	0.00	0.07	0.10	0.14	0.15	0.17	0.17	0.21
	2:35:00	0.00	0.00	0.05	0.07	0.09	0.10	0.11	0.11	0.14
	2:40:00	0.00	0.00	0.02	0.04	0.05	0.06	0.07	0.07	0.08
	2:45:00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.04
	2:50:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00