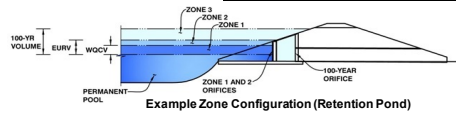


MHFD-Detention, Version 4.07 (June 2025)

Basin ID: School Pond



Example Zone Configuration (Retention Pond)

Selected SCM Type =	EDB	
Watershed Area =	7.44	acres
Watershed Length =	894	ft
Watershed Length to Centroid =	442	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	49.80%	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) =	0.128	acre-feet
Excess Urban Runoff Volume (EURV) =	0.427	acre-feet
2-yr Runoff Volume ($P1 = 1.19$ in.) =	0.314	acre-feet
5-yr Runoff Volume ($P1 = 1.5$ in.) =	0.417	acre-feet
10-yr Runoff Volume ($P1 = 1.75$ in.) =	0.500	acre-feet
25-yr Runoff Volume ($P1 = 2$ in.) =	0.631	acre-feet
50-yr Runoff Volume ($P1 = 2.25$ in.) =	0.759	acre-feet
100-yr Runoff Volume ($P1 = 2.52$ in.) =	0.922	acre-feet
500-yr Runoff Volume ($P1 = 3.68$ in.) =	1.600	acre-feet
Approximate 2-yr Detention Volume =	0.274	acre-feet
Approximate 5-yr Detention Volume =	0.361	acre-feet
Approximate 10-yr Detention Volume =	0.441	acre-feet
Approximate 25-yr Detention Volume =	0.539	acre-feet
Approximate 50-yr Detention Volume =	0.602	acre-feet
Approximate 100-yr Detention Volume =	0.679	acre-feet

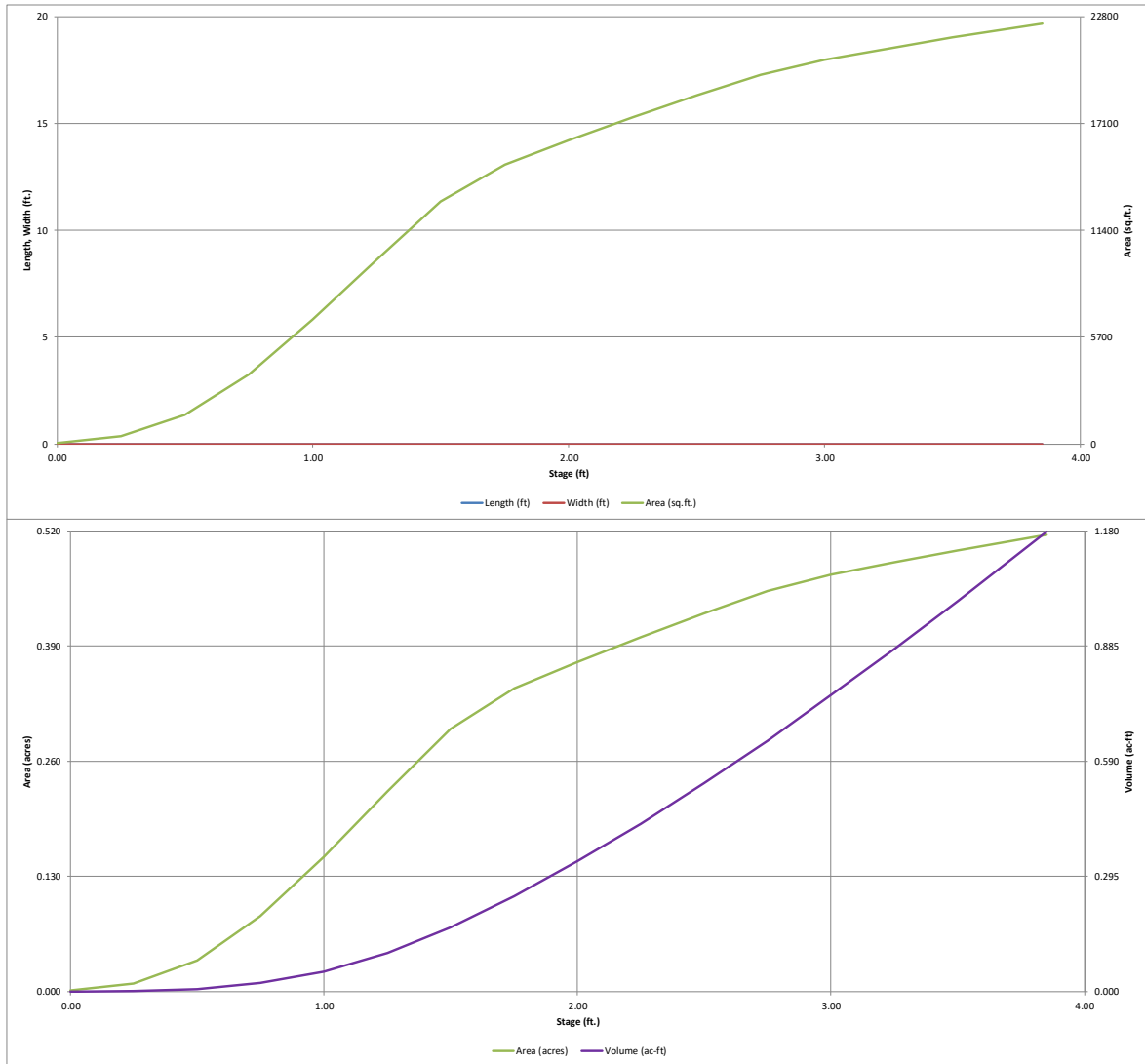
Zone 1 Volume (WQCV) =	0.128	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.299	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.252	acre-feet
Total Detention Basin Volume =	0.679	acre-feet
Initial Surge Volume (ISV) =	user	ft ³
Initial Surge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	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	ft:V
Basin Length-to-Width Ratio (R_{LW}) =	user	

Initial Surcharge Area (A_{SV})	=	user	ft ²
Surcharge Volume Length (L_{SV})	=	user	ft
Surcharge Volume Width (W_{SV})	=	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

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

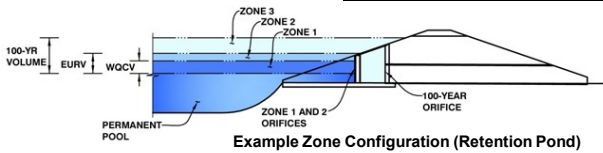


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: Honor Charter Academy

Basin ID: School Pond



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.37	0.128	Orifice Plate
Zone 2 (EURV)	2.25	0.299	Orifice Plate
Zone 3 (100-year)	2.83	0.252	Weir&Pipe (Circular)
Total (all zones)		0.679	

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

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 ft²
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 SCM)

Calculated Parameters for Plate

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 2.63 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

WQ Orifice Area per Row = N/A ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	0.25	0.50	0.90	1.90			
Orifice Area (sq. inches)	0.31	0.44	0.44	0.79	12.57			

	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)

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected		Not Selected	Not Selected
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A ft ²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A feet
Vertical Orifice Diameter =	N/A	N/A	inches		

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

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, H _o =	2.63	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H _t =	2.63 feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	6.00 feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	16.11
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	28.48 ft ²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	14.24 ft ²
Debris Clogging % =	50%	N/A	%		

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Circular	Not Selected		Zone 3 Circular	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77 ft ²
Circular Orifice Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75 feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage=	2.85	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.37	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	4.22	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.52	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.18	acre-ft

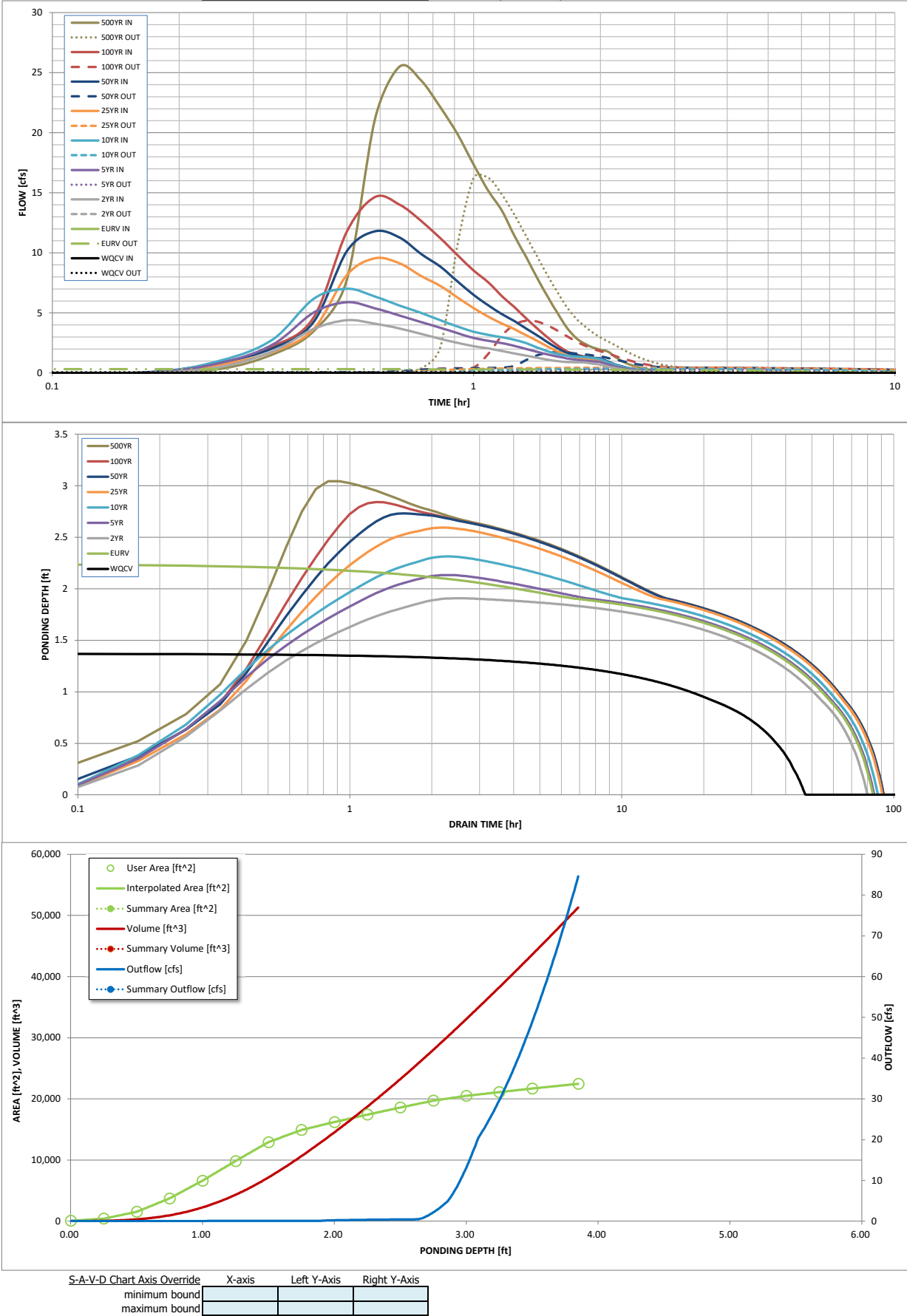
Routed Hydrograph Results

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	1.19	1.50	1.75	2.00	2.25	2.52	3.68
One-Hour Rainfall Depth (in) =	N/A	N/A	0.314	0.417	0.500	0.631	0.759	0.922	1.600
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.314	0.417	0.500	0.631	0.759	0.922	1.600
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.1	0.3	0.4	1.6	2.9	4.5	11.1
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.02	0.04	0.05	0.21	0.39	0.61	1.49
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	0.02	0.04	0.05	0.21	0.39	0.61	1.49
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	4.4	5.9	7.0	9.5	11.8	14.7	25.5
Peak Inflow Q (cfs) =	N/A	N/A	0.1	0.3	0.4	1.6	2.9	4.5	11.1
Peak Outflow Q (cfs) =	N/A	N/A	0.1	0.3	0.4	1.6	2.9	4.5	11.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	1.0	0.3	0.6	1.0	1.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	0.0	0.1	0.4
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) =	40	70	68	71	72	74	73	71	64
Time to Drain 99% of Inflow Volume (hours) =	43	76	73	77	79	81	81	80	76
Maximum Ponding Depth (ft) =	1.38	2.25	1.91	2.13	2.31	2.59	2.73	2.84	3.04
Area at Maximum Ponding Depth (acres) =	0.26	0.40	0.36	0.39	0.41	0.44	0.45	0.46	0.47
Maximum Volume Stored (acre-ft) =	0.131	0.430	0.297	0.383	0.454	0.572	0.630	0.684	0.777

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)



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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.06	0.01	0.35
	0:15:00	0	0.00	0.51	0.83	1.03	0.69	0.87	0.85	1.54
	0:20:00	0	0.00	1.80	2.36	2.79	1.76	2.06	2.21	3.48
	0:25:00	0	0.00	3.66	5.03	6.17	3.65	4.24	4.61	7.76
	0:30:00	0	0.00	4.39	5.88	7.01	8.15	10.15	11.78	21.14
	0:35:00	0	0.00	4.10	5.39	6.36	9.55	11.79	14.65	25.49
	0:40:00	0	0.00	3.72	4.79	5.62	9.14	11.28	14.03	24.35
	0:45:00	0	0.00	3.25	4.24	5.00	8.08	9.91	12.67	22.13
	0:50:00	0	0.00	2.85	3.78	4.39	7.26	8.86	11.23	19.85
	0:55:00	0	0.00	2.50	3.30	3.86	6.27	7.61	9.79	17.34
	1:00:00	0	0.00	2.23	2.92	3.44	5.40	6.50	8.54	15.16
	1:05:00	0	0.00	2.05	2.68	3.18	4.70	5.63	7.54	13.52
	1:10:00	0	0.00	1.83	2.49	2.97	4.11	4.90	6.40	11.40
	1:15:00	0	0.00	1.63	2.26	2.77	3.64	4.31	5.47	9.63
	1:20:00	0	0.00	1.44	2.00	2.48	3.14	3.70	4.53	7.87
	1:25:00	0	0.00	1.26	1.75	2.12	2.67	3.13	3.69	6.32
	1:30:00	0	0.00	1.10	1.54	1.81	2.20	2.55	2.94	4.95
	1:35:00	0	0.00	0.98	1.37	1.57	1.79	2.05	2.29	3.75
	1:40:00	0	0.00	0.92	1.22	1.45	1.48	1.67	1.81	2.92
	1:45:00	0	0.00	0.89	1.11	1.37	1.30	1.47	1.53	2.44
	1:50:00	0	0.00	0.87	1.03	1.32	1.20	1.35	1.37	2.14
	1:55:00	0	0.00	0.78	0.97	1.25	1.13	1.27	1.26	1.93
	2:00:00	0	0.00	0.69	0.90	1.15	1.08	1.21	1.19	1.78
	2:05:00	0	0.00	0.54	0.71	0.90	0.85	0.95	0.91	1.35
	2:10:00	0	0.00	0.42	0.54	0.69	0.64	0.72	0.68	0.99
	2:15:00	0	0.00	0.32	0.42	0.53	0.49	0.55	0.51	0.74
	2:20:00	0	0.00	0.24	0.32	0.40	0.37	0.42	0.39	0.56
	2:25:00	0	0.00	0.18	0.24	0.30	0.28	0.31	0.29	0.42
	2:30:00	0	0.00	0.14	0.17	0.22	0.20	0.23	0.22	0.31
	2:35:00	0	0.00	0.10	0.13	0.16	0.15	0.17	0.16	0.23
	2:40:00	0	0.00	0.07	0.09	0.12	0.11	0.12	0.12	0.17
	2:45:00	0	0.00	0.05	0.06	0.08	0.08	0.09	0.08	0.12
	2:50:00	0	0.00	0.03	0.04	0.05	0.05	0.06	0.05	0.07
	2:55:00	0	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	3:00:00	0	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02
	3:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

[illegible]