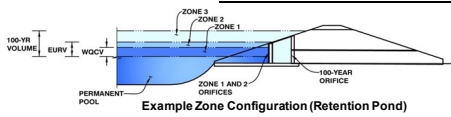


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Ascent Church Expansion**

Basin ID: **Basin 2 & 3**



Revise after addressing comment in drainage report

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	1.71 acres
Watershed Length =	480 ft
Watershed Length to Centroid =	220 ft
Watershed Slope =	0.060 ft/ft
Watershed Imperviousness =	43.30% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	100.0% 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) =	0.027 acre-feet
Excess Urban Runoff Volume (EURV) =	0.078 acre-feet
2-yr Runoff Volume (P1 = 0.9 in.) =	0.047 acre-feet
5-yr Runoff Volume (P1 = 1.2 in.) =	0.071 acre-feet
10-yr Runoff Volume (P1 = 1.46 in.) =	0.100 acre-feet
25-yr Runoff Volume (P1 = 1.86 in.) =	0.161 acre-feet
50-yr Runoff Volume (P1 = 2.18 in.) =	0.204 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	0.257 acre-feet
500-yr Runoff Volume (P1 = 3.4 in.) =	0.381 acre-feet
Approximate 2-yr Detention Volume =	0.044 acre-feet
Approximate 5-yr Detention Volume =	0.065 acre-feet
Approximate 10-yr Detention Volume =	0.091 acre-feet
Approximate 25-yr Detention Volume =	0.113 acre-feet
Approximate 50-yr Detention Volume =	0.123 acre-feet
Approximate 100-yr Detention Volume =	0.144 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
0.90	inches
1.20	inches
1.46	inches
1.86	inches
2.18	inches
2.52	inches
3.40	inches

Define Zones and Basin Geometry

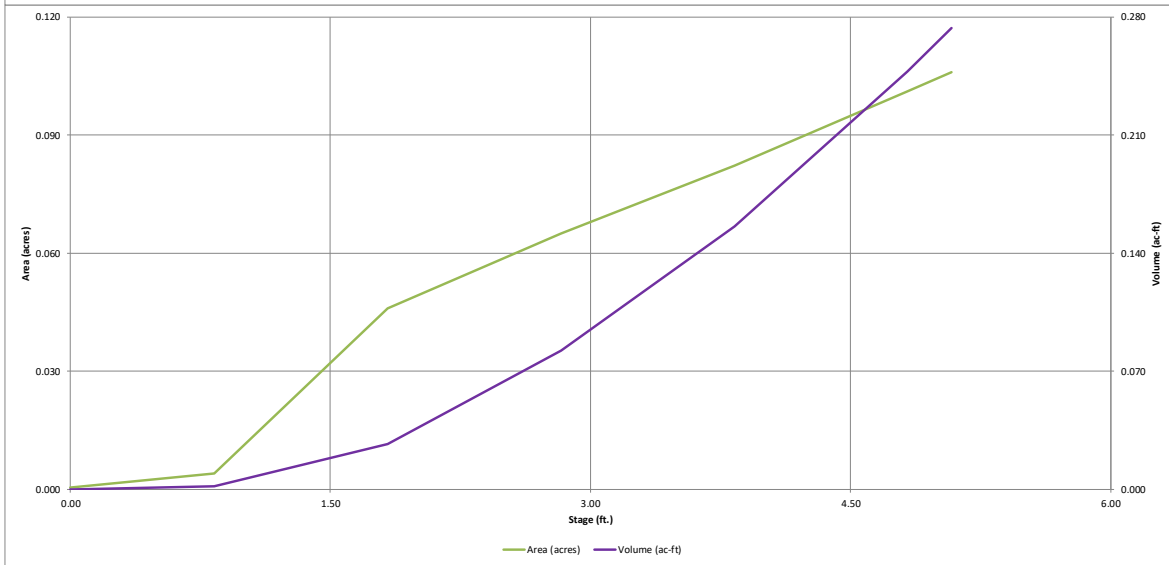
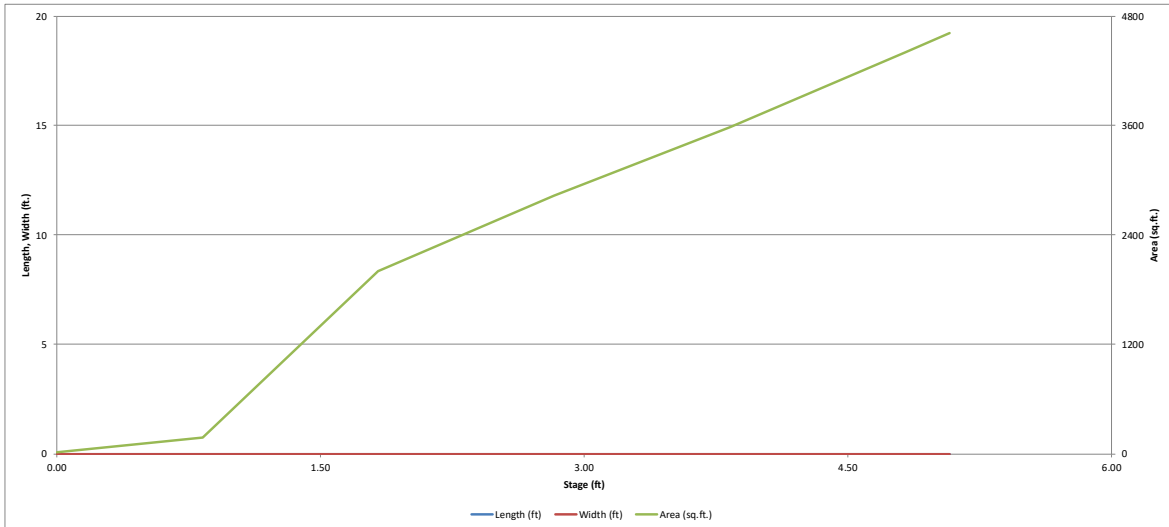
Zone 1 Volume (WQCV) =	0.027 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.051 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.066 acre-feet
Total Detention Basin Volume =	0.144 acre-feet
Initial Surcharge Volume (ISV) =	user ft ³
Initial Surcharge Depth (ISD) =	user ft
Total Available Detention Depth (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 _{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 _{MAN}) =	user ft
Length of Main Basin (L _{MAN}) =	user ft
Width of Main Basin (W _{MAN}) =	user ft
Area of Main Basin (A _{MAN}) =	user ft ²
Volume of Main Basin (V _{MAN}) =	user ft ³
Calculated Total Basin Volume (V _{total}) =	user acre-feet

7144.17

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	--	--	--	20	0.000	--	--
7145	--	0.83	--	--	--	175	0.004	81	0.002
7146	--	1.83	--	--	--	2,001	0.046	1,169	0.027
7147	--	2.83	--	--	--	2,830	0.065	3,584	0.082
7148	--	3.83	--	--	--	3,581	0.082	6,790	0.156
7149	--	4.83	--	--	--	4,403	0.101	10,782	0.248
7149.25	--	5.08	--	--	--	4,615	0.106	11,909	0.273

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

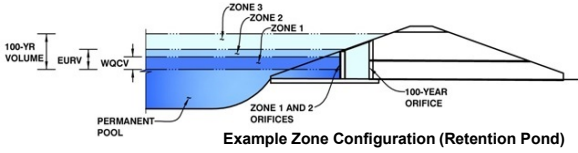
MHFD-Detention, Version 4.06 (July 2022)



DETENTION BASIN OUTLET STRUCTURE DESIGN

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

Project: Ascent Church Expansion
Basin ID: Basin 2 & 3



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.84	0.027	Orifice Plate
Zone 2 (EURV)	2.77	0.051	Circular Orifice
Zone 3 (100-year)	3.69	0.066	Weir&Pipe (Restrict)
Total (all zones)		0.144	

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

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

Calculated Parameters for Underdrain
 Underdrain Orifice Area = ft²
 Underdrain Orifice Centroid = 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 = ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = inches
 Orifice Plate: Orifice Area per Row = sq. inches (diameter = 3/8 inch)

Calculated Parameters for Plate
 WQ Orifice Area per Row = ft²
 Elliptical Half-Width = feet
 Elliptical Slot Centroid = feet
 Elliptical Slot Area = 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	1.00	1.33					
Orifice Area (sq. inches)	0.13	0.13	0.13					

	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 Circular	Not Selected	
Invert of Vertical Orifice =	<input type="text" value="1.75"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="2.77"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	<input type="text" value="0.50"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Vertical Orifice
 Vertical Orifice Area = ft²
 Vertical Orifice Centroid = 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 =	<input type="text" value="3.25"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	<input type="text" value="2.00"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Gate Slope =	<input type="text" value="0.00"/>	<input type="text" value="N/A"/>	H:V
Horiz. Length of Weir Sides =	<input type="text" value="2.00"/>	<input type="text" value="N/A"/>	feet
Overflow Gate Type =	<input type="text" value="Type C Gate"/>	<input type="text" value="N/A"/>	
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value="N/A"/>	%

Calculated Parameters for Overflow Weir
 Height of Gate Upper Edge, H₁ = feet
 Overflow Weir Slope Length = feet
 Gate Open Area / 100-yr Orifice Area =
 Overflow Gate Open Area w/o Debris = ft²
 Overflow Gate Open Area w/ Debris = ft²

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 =	<input type="text" value="2.50"/>	<input type="text" value="N/A"/>	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	<input type="text" value="12.00"/>	<input type="text" value="N/A"/>	inches
Restrictor Plate Height Above Pipe Invert =	<input type="text" value="3.33"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
 Outlet Orifice Area = ft²
 Outlet Orifice Centroid = feet
 Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway
 Spillway Design Flow Depth = feet
 Stage at Top of Freeboard = feet
 Basin Area at Top of Freeboard = acres
 Basin Volume at Top of Freeboard = acre-ft

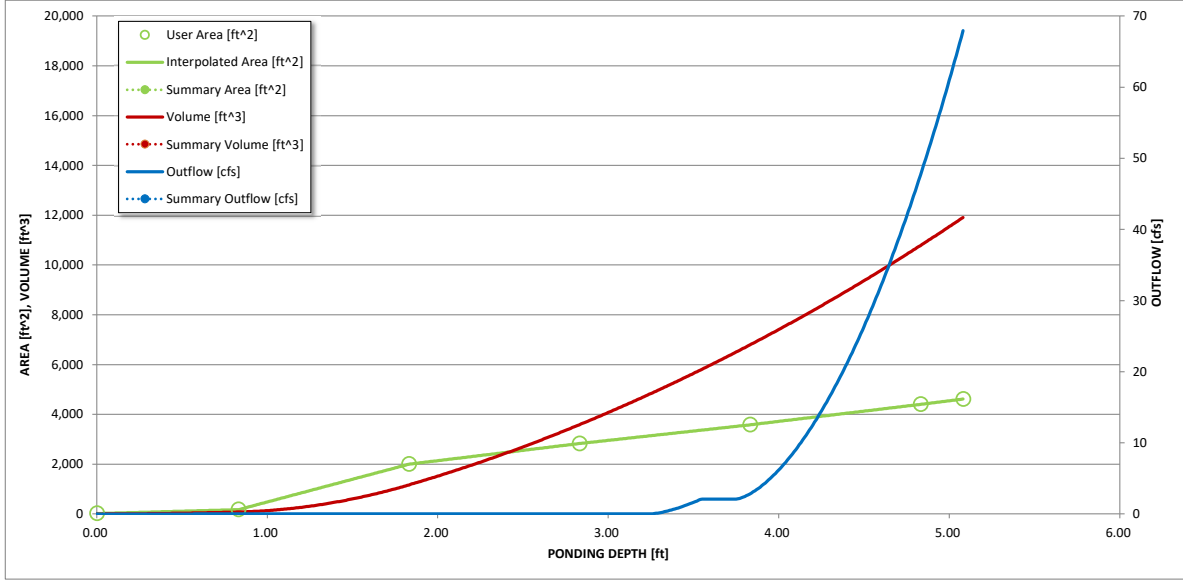
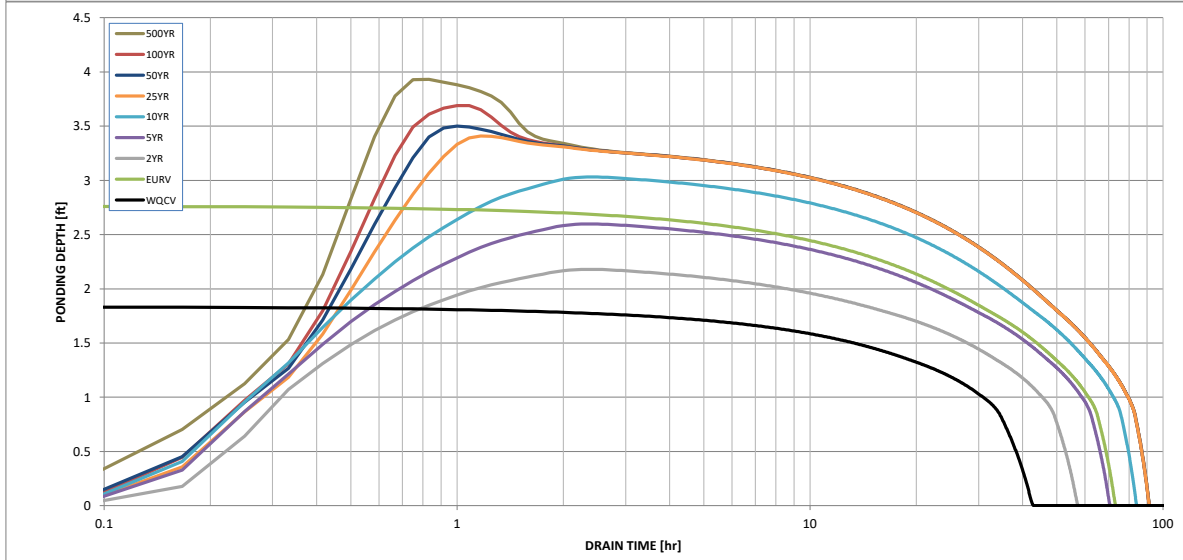
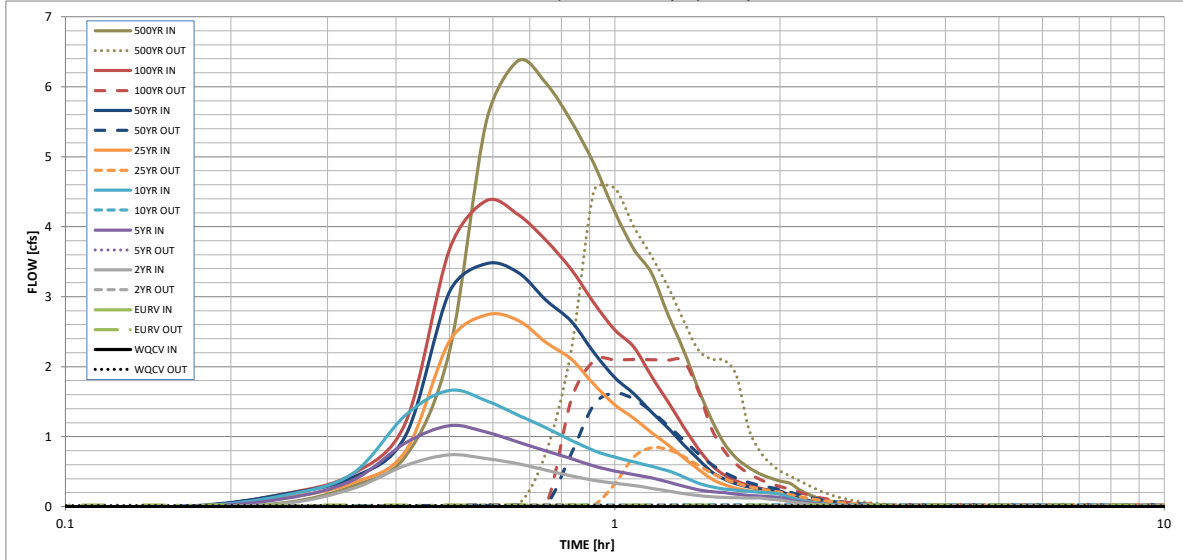
Routed Hydrograph Results

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	0.90	1.20	1.46	1.86	2.18	2.52	3.40
One-Hour Rainfall Depth (in) =	0.027	0.078	0.047	0.071	0.100	0.161	0.204	0.257	0.381
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.047	0.071	0.100	0.161	0.204	0.257	0.381
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.0	0.2	0.5	1.3	1.8	2.4	3.8
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.2	0.5	1.3	1.8	2.4	3.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.09	0.28	0.78	1.08	1.43	2.23
Peak Inflow Q (cfs) =	N/A	N/A	0.7	1.2	1.7	2.7	3.5	4.4	6.4
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.0	0.0	0.8	1.6	2.1	4.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.1	0.6	0.9	0.9	1.2
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.3	0.6	0.7	0.8
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	64	51	62	73	76	74	71	65
Time to Drain 99% of Inflow Volume (hours) =	41	69	54	67	79	84	83	81	78
Maximum Ponding Depth (ft) =	1.84	2.77	2.18	2.60	3.03	3.41	3.50	3.69	3.93
Area at Maximum Ponding Depth (acres) =	0.05	0.06	0.05	0.06	0.07	0.07	0.08	0.08	0.08
Maximum Volume Stored (acre-ft) =	0.027	0.078	0.044	0.067	0.095	0.122	0.129	0.144	0.163

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	0.01	0.00	0.06
	0:15:00	0.00	0.00	0.05	0.11	0.16	0.13	0.18	0.18	0.29
	0:20:00	0.00	0.00	0.26	0.37	0.47	0.34	0.42	0.46	0.73
	0:25:00	0.00	0.00	0.59	0.91	1.31	0.80	1.03	1.21	2.22
	0:30:00	0.00	0.00	0.74	1.16	1.66	2.36	3.07	3.67	5.50
	0:35:00	0.00	0.00	0.69	1.06	1.51	2.74	3.47	4.37	6.37
	0:40:00	0.00	0.00	0.61	0.92	1.31	2.66	3.35	4.18	6.05
	0:45:00	0.00	0.00	0.52	0.79	1.13	2.34	2.95	3.80	5.50
	0:50:00	0.00	0.00	0.44	0.69	0.95	2.11	2.65	3.39	4.90
	0:55:00	0.00	0.00	0.38	0.58	0.80	1.75	2.20	2.91	4.21
	1:00:00	0.00	0.00	0.33	0.51	0.71	1.45	1.84	2.53	3.68
	1:05:00	0.00	0.00	0.30	0.46	0.64	1.26	1.61	2.28	3.33
	1:10:00	0.00	0.00	0.26	0.41	0.58	1.06	1.35	1.86	2.74
	1:15:00	0.00	0.00	0.22	0.35	0.51	0.88	1.12	1.50	2.24
	1:20:00	0.00	0.00	0.19	0.29	0.43	0.70	0.89	1.14	1.70
	1:25:00	0.00	0.00	0.16	0.24	0.34	0.54	0.68	0.84	1.25
	1:30:00	0.00	0.00	0.14	0.21	0.28	0.40	0.50	0.59	0.90
	1:35:00	0.00	0.00	0.13	0.20	0.25	0.31	0.39	0.45	0.69
	1:40:00	0.00	0.00	0.13	0.18	0.23	0.26	0.33	0.37	0.56
	1:45:00	0.00	0.00	0.12	0.16	0.22	0.23	0.28	0.31	0.47
	1:50:00	0.00	0.00	0.12	0.15	0.21	0.21	0.25	0.26	0.41
	1:55:00	0.00	0.00	0.11	0.14	0.20	0.19	0.23	0.23	0.36
	2:00:00	0.00	0.00	0.09	0.13	0.18	0.19	0.22	0.21	0.33
	2:05:00	0.00	0.00	0.07	0.10	0.13	0.14	0.16	0.16	0.24
	2:10:00	0.00	0.00	0.05	0.07	0.10	0.10	0.12	0.11	0.18
	2:15:00	0.00	0.00	0.04	0.05	0.07	0.07	0.09	0.08	0.13
	2:20:00	0.00	0.00	0.03	0.04	0.05	0.05	0.06	0.06	0.09
	2:25:00	0.00	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.07
	2:30:00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.03	0.05
	2:35:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	2:40:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	2:45:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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

