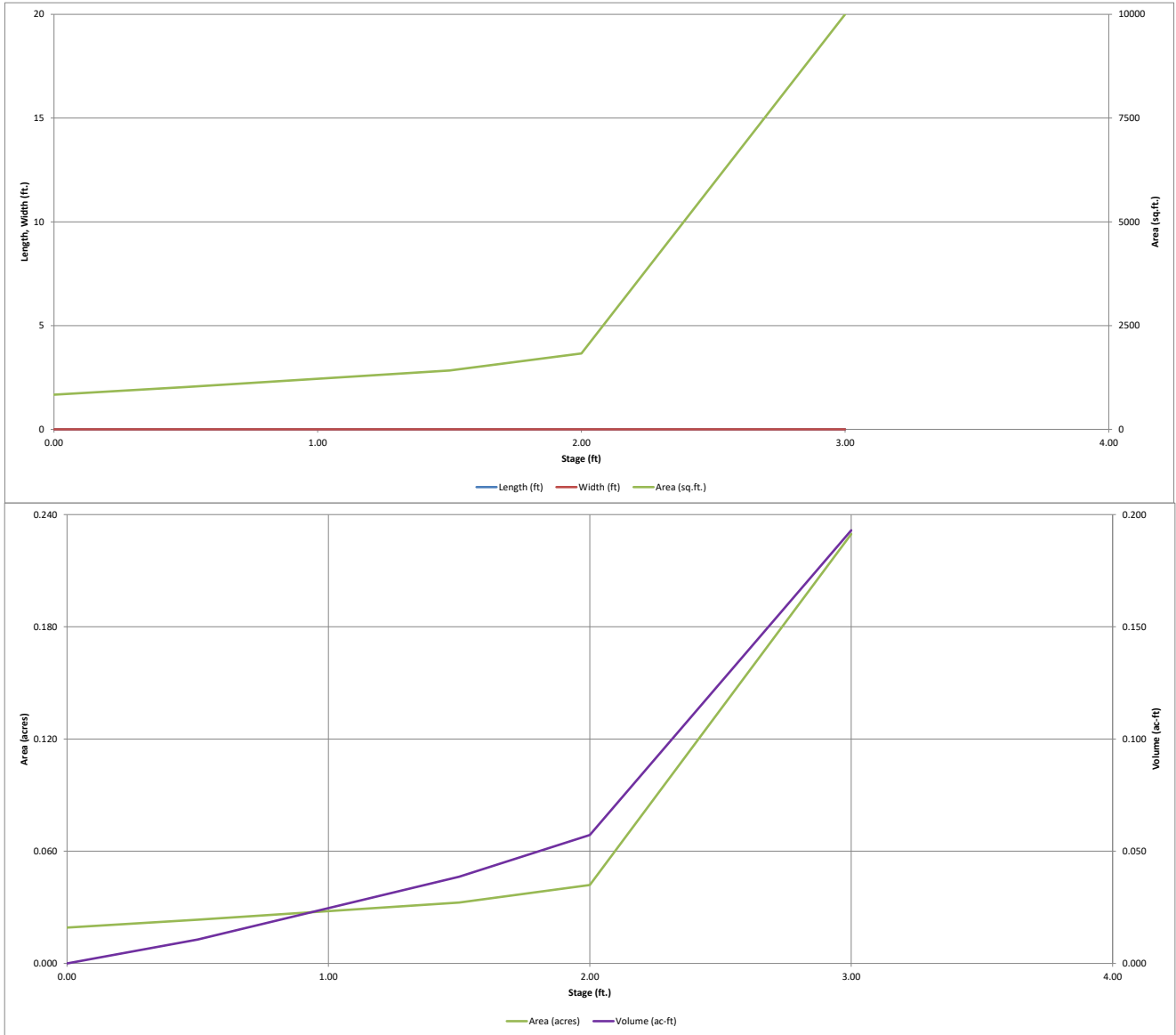




# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

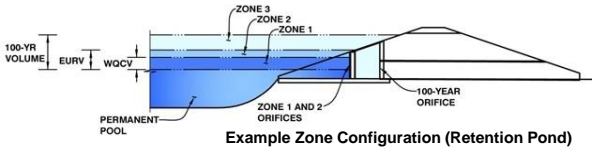
*MHFD-Detention, Version 4.06 (July 2022)*



# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

**Project:** Fox Run Nature Center  
**Basin ID:** WQ-1 (Subbasin P-1)



**Example Zone Configuration (Retention Pond)**

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.48	0.010	Filtration Media
Zone 2 (100-year)	2.82	0.144	Weir (No Pipe)
Zone 3			
Total (all zones)		0.154	

**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 =  ft<sup>2</sup>  
 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

**Calculated Parameters for Plate**

WQ Orifice Area per Row =  ft<sup>2</sup>  
 Elliptical Half-Width =  feet  
 Elliptical Slot Centroid =  feet  
 Elliptical Slot Area =  ft<sup>2</sup>

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

	Row 1 (optional)	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**User Input: Vertical Orifice (Circular or Rectangular)**

Invert of Vertical Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
 Depth at top of Zone using Vertical Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
 Vertical Orifice Diameter =  inches

**Calculated Parameters for Vertical Orifice**

Vertical Orifice Area =  ft<sup>2</sup>  
 Vertical Orifice Centroid =  feet

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

Overflow Weir Front Edge Height, Ho =  ft (relative to basin bottom at Stage = 0 ft)  
 Overflow Weir Bottom Length =  feet  
 Overflow Weir Side Slopes =  H:V  
 Horiz. Length of Weir Sides =  feet  
 Overflow Grate Type =   
 Debris Clogging % =  %

**Calculated Parameters for Overflow Weir**

Height of Grate Upper Edge, H<sub>1</sub> =  feet  
 Overflow Weir Slope Length =  feet  
 Grate Open Area / 100-yr Orifice Area =   
 Overflow Grate Open Area w/o Debris =  ft<sup>2</sup>  
 Overflow Grate Open Area w/ Debris =  ft<sup>2</sup>

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

Depth to Invert of Outlet Pipe =  ft (distance below basin bottom at Stage = 0 ft)  
 Circular Orifice Diameter =  inches

**Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate**

Outlet Orifice Area =  ft<sup>2</sup>  
 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  
 Spillway position relative to Overflow Weir =

**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

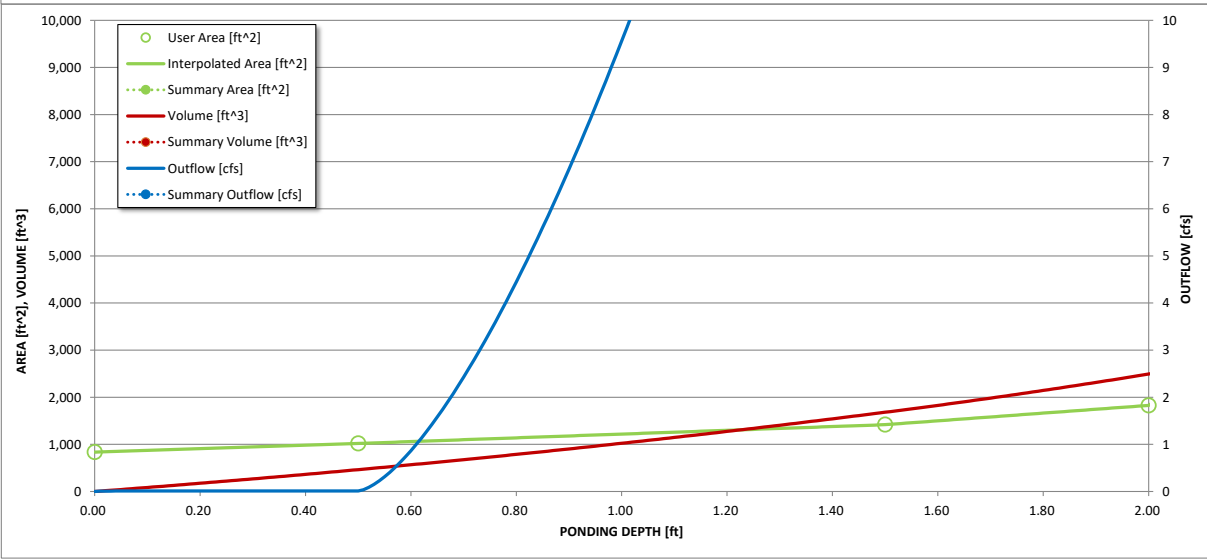
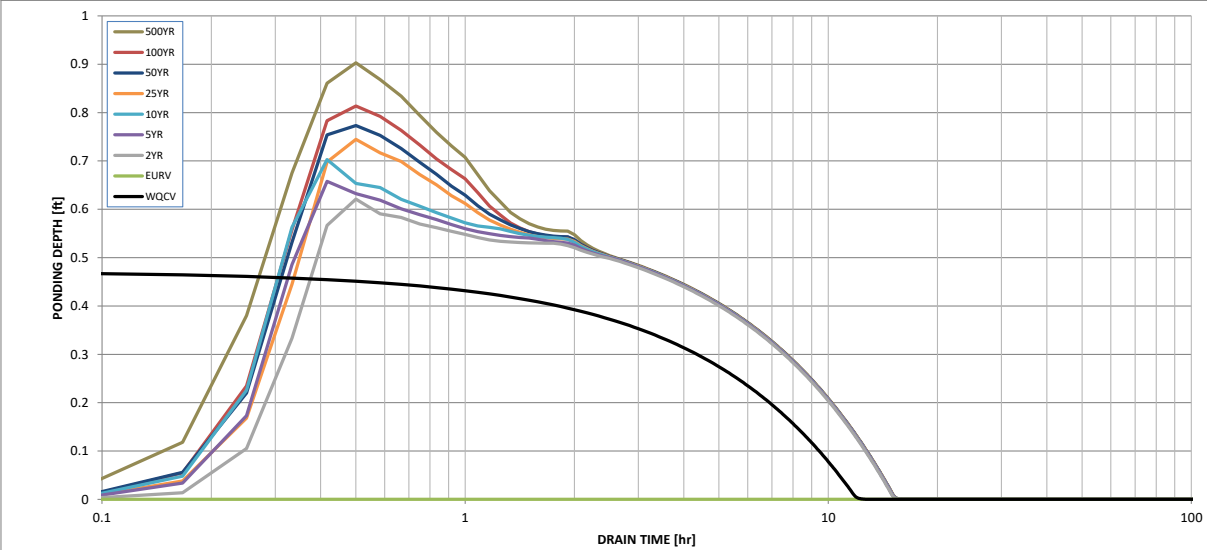
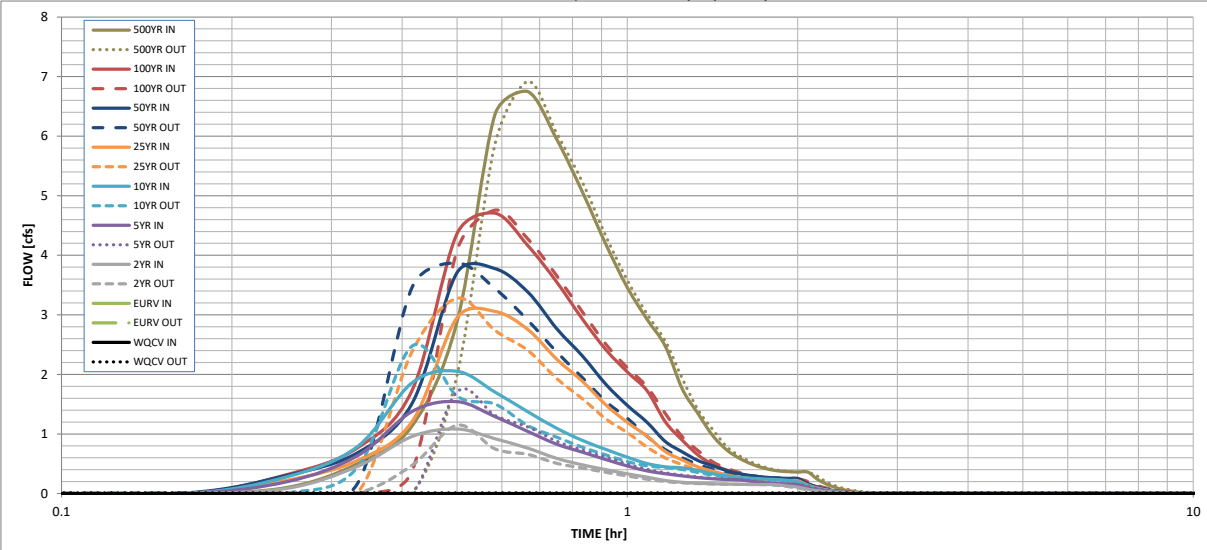
**Routed Hydrograph Results**

*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	0.92	1.20	1.46	1.85	2.17	2.51	3.42
One-Hour Rainfall Depth (in) =	N/A	N/A	0.057	0.081	0.107	0.156	0.193	0.237	0.345
CUHP Runoff Volume (acre-ft) =	0.010	0.093	0.057	0.081	0.107	0.156	0.193	0.237	0.345
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.0	0.1	0.4	1.2	1.7	2.2	3.5
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.10	0.30	0.83	1.14	1.51	2.40
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	1.1	1.5	2.1	3.1	3.8	4.7	6.7
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	1.1	1.7	2.5	3.3	3.9	4.8	6.9
Peak Inflow Q (cfs) =	0.0	18.0	1.1	1.7	2.5	3.3	3.9	4.8	6.9
Peak Outflow Q (cfs) =	N/A	N/A	N/A	11.5	5.7	2.7	2.3	2.2	2.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	11.5	5.7	2.7	2.3	2.2	2.0
Structure Controlling Flow =	Filtration Media	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 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) =	12	0	13	12	11	9	8	7	3
Time to Drain 99% of Inflow Volume (hours) =	12	0	15	14	14	13	13	12	11
Maximum Ponding Depth (ft) =	0.48	2.44	0.62	0.66	0.70	0.74	0.77	0.81	0.90
Area at Maximum Ponding Depth (acres) =	0.02	0.12	0.02	0.02	0.03	0.03	0.03	0.03	0.03
Maximum Volume Stored (acre-ft) =	0.010	0.094	0.014	0.014	0.016	0.017	0.017	0.018	0.021

# 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	0.00	0.01	0.00
	0:15:00	0.00	0.00	0.09	0.20	0.28	0.22	0.30	0.32	0.50
	0:20:00	0.00	0.00	0.45	0.63	0.79	0.56	0.68	0.77	1.14
	0:25:00	0.00	0.00	0.96	1.38	1.86	1.21	1.52	1.74	2.88
	0:30:00	0.00	0.00	1.08	1.54	2.05	2.95	3.71	4.36	6.36
	0:35:00	0.00	0.00	0.92	1.29	1.70	3.06	3.78	4.71	6.75
	0:40:00	0.00	0.00	0.76	1.04	1.37	2.75	3.38	4.16	5.95
	0:45:00	0.00	0.00	0.59	0.83	1.10	2.26	2.77	3.55	5.06
	0:50:00	0.00	0.00	0.48	0.69	0.89	1.88	2.31	2.93	4.18
	0:55:00	0.00	0.00	0.40	0.57	0.74	1.49	1.83	2.41	3.46
	1:00:00	0.00	0.00	0.33	0.46	0.61	1.19	1.48	2.04	2.92
	1:05:00	0.00	0.00	0.28	0.38	0.50	0.96	1.20	1.73	2.47
	1:10:00	0.00	0.00	0.22	0.33	0.45	0.71	0.87	1.21	1.76
	1:15:00	0.00	0.00	0.19	0.30	0.43	0.56	0.70	0.90	1.34
	1:20:00	0.00	0.00	0.17	0.27	0.39	0.45	0.55	0.65	0.97
	1:25:00	0.00	0.00	0.16	0.25	0.33	0.38	0.47	0.49	0.73
	1:30:00	0.00	0.00	0.16	0.24	0.30	0.31	0.38	0.39	0.58
	1:35:00	0.00	0.00	0.16	0.23	0.27	0.27	0.33	0.33	0.49
	1:40:00	0.00	0.00	0.15	0.20	0.25	0.25	0.30	0.29	0.42
	1:45:00	0.00	0.00	0.15	0.18	0.24	0.23	0.27	0.26	0.38
	1:50:00	0.00	0.00	0.15	0.17	0.24	0.22	0.26	0.25	0.37
	1:55:00	0.00	0.00	0.13	0.16	0.22	0.22	0.25	0.25	0.36
	2:00:00	0.00	0.00	0.11	0.15	0.20	0.21	0.25	0.25	0.36
	2:05:00	0.00	0.00	0.07	0.10	0.13	0.14	0.17	0.16	0.24
	2:10:00	0.00	0.00	0.05	0.06	0.09	0.09	0.11	0.11	0.16
	2:15:00	0.00	0.00	0.03	0.04	0.06	0.06	0.07	0.07	0.10
	2:20:00	0.00	0.00	0.02	0.02	0.03	0.04	0.04	0.04	0.06
	2:25:00	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.03	0.04
	2:30:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	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	

