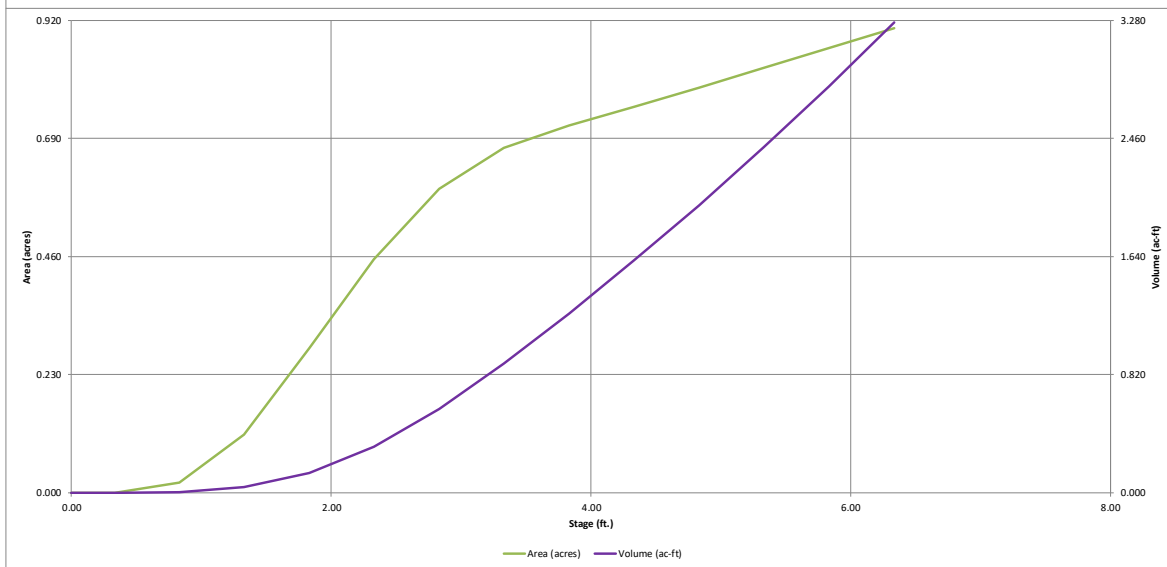
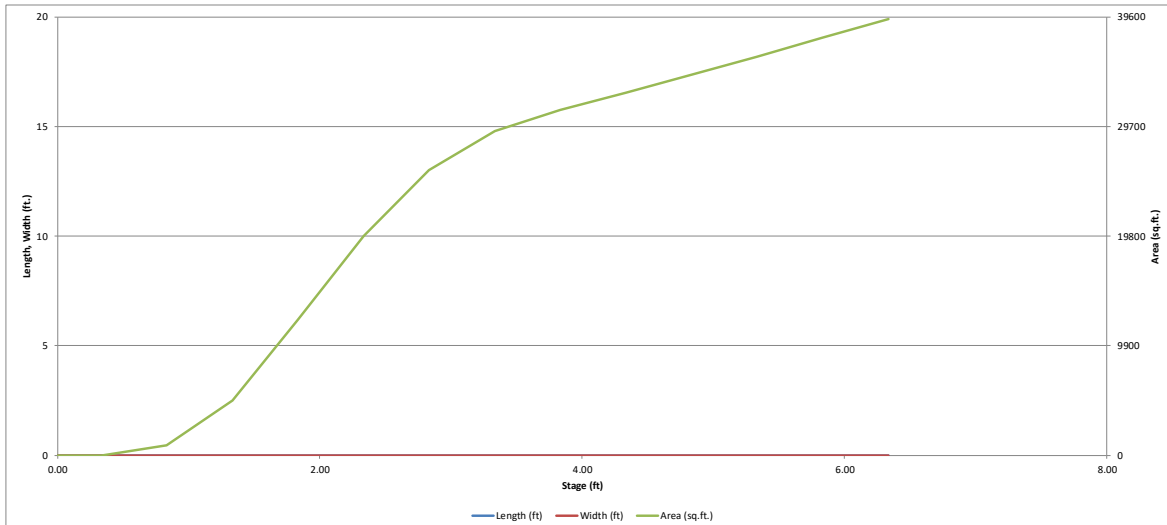




# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

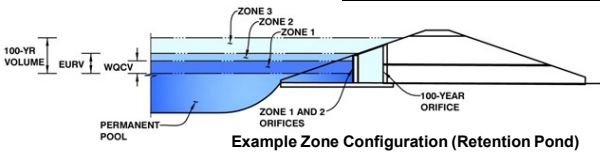
*MHFD-Detention, Version 4.07 (June 2025)*



# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.07 (June 2025)

**Project:** Crosspoint Substation  
**Basin ID:** Detention Pond (EDB-1)



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.30	0.303	Orifice Plate
Zone 2 (EURV)	3.44	0.668	Orifice Plate
Zone 3 (100-year)	4.14	0.496	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>1.467</b>	

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

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 SCM)

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 (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	1.50	2.00	2.50	3.00		
Orifice Area (sq. inches)	0.79	0.79	1.77	1.77	3.14	3.14		

	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)

	Not Selected	Not Selected
Invert of Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Depth at top of Zone using Vertical Orifice =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Vertical Orifice Diameter =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>

ft (relative to basin bottom at Stage = 0 ft)  
 ft (relative to basin bottom at Stage = 0 ft)  
 inches

**Calculated Parameters for Vertical Orifice**

	Not Selected	Not Selected
Vertical Orifice Area =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>
Vertical Orifice Centroid =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>

ft<sup>2</sup>  
 feet

**User Input:** Overflow Weir (Dropbox with Flat or Sloped Grate 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="3.83"/>	<input type="text" value="N/A"/>
Overflow Weir Front Edge Length =	<input type="text" value="4.00"/>	<input type="text" value="N/A"/>
Overflow Weir Grate Slope =	<input type="text" value="0.00"/>	<input type="text" value="N/A"/>
Horiz. Length of Weir Sides =	<input type="text" value="2.50"/>	<input type="text" value="N/A"/>
Overflow Grate Type =	<input type="text" value="Type C Grate"/>	<input type="text" value="N/A"/>
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value="N/A"/>

ft (relative to basin bottom at Stage = 0 ft)  
 feet  
 H:V  
 feet  
 %

**Calculated Parameters for Overflow Weir**

	Zone 3 Weir	Not Selected
Height of Grate Upper Edge, H <sub>t</sub> =	<input type="text" value="3.83"/>	<input type="text" value="N/A"/>
Overflow Weir Slope Length =	<input type="text" value="2.50"/>	<input type="text" value="N/A"/>
Grate Open Area / 100-yr Orifice Area =	<input type="text" value="3.94"/>	<input type="text" value="N/A"/>
Overflow Grate Open Area w/o Debris =	<input type="text" value="6.96"/>	<input type="text" value="N/A"/>
Overflow Grate Open Area w/ Debris =	<input type="text" value="3.48"/>	<input type="text" value="N/A"/>

feet  
 feet  
 ft<sup>2</sup>  
 ft<sup>2</sup>

**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="0.00"/>	<input type="text" value="N/A"/>
Outlet Pipe Diameter =	<input type="text" value="18.00"/>	<input type="text" value="N/A"/>
Restrictor Plate Height Above Pipe Invert =	<input type="text" value="18.00"/>	<input type="text" value="N/A"/>

ft (distance below basin bottom at Stage = 0 ft)  
 inches  
 inches

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

	Zone 3 Restrictor	Not Selected
Outlet Orifice Area =	<input type="text" value="1.77"/>	<input type="text" value="N/A"/>
Outlet Orifice Centroid =	<input type="text" value="0.75"/>	<input type="text" value="N/A"/>
Half-Central Angle of Restrictor Plate on Pipe =	<input type="text" value="3.14"/>	<input type="text" value="N/A"/>

ft<sup>2</sup>  
 feet  
 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

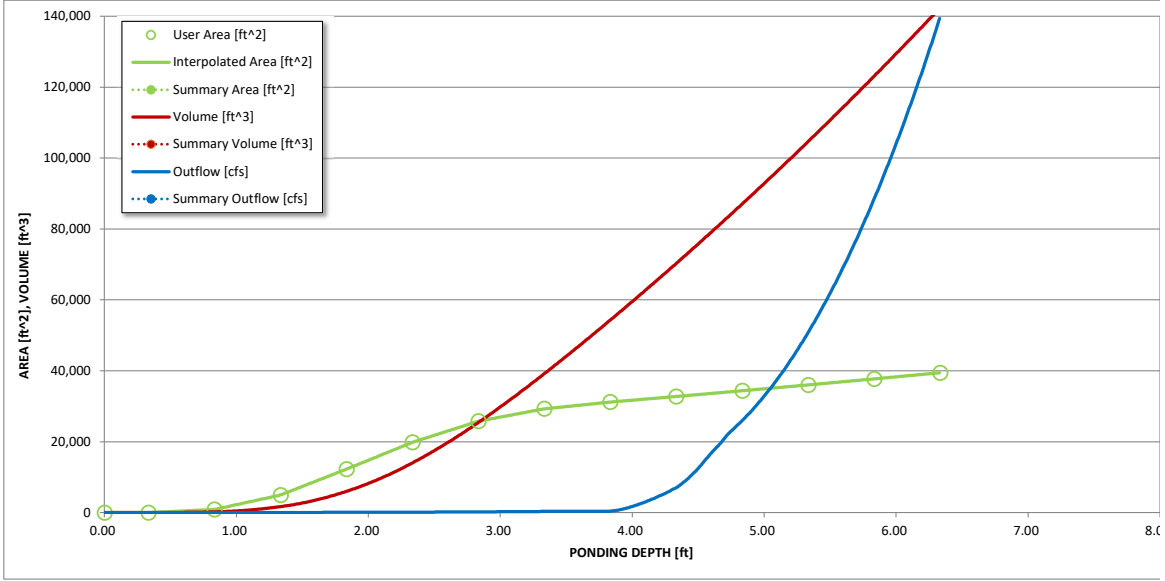
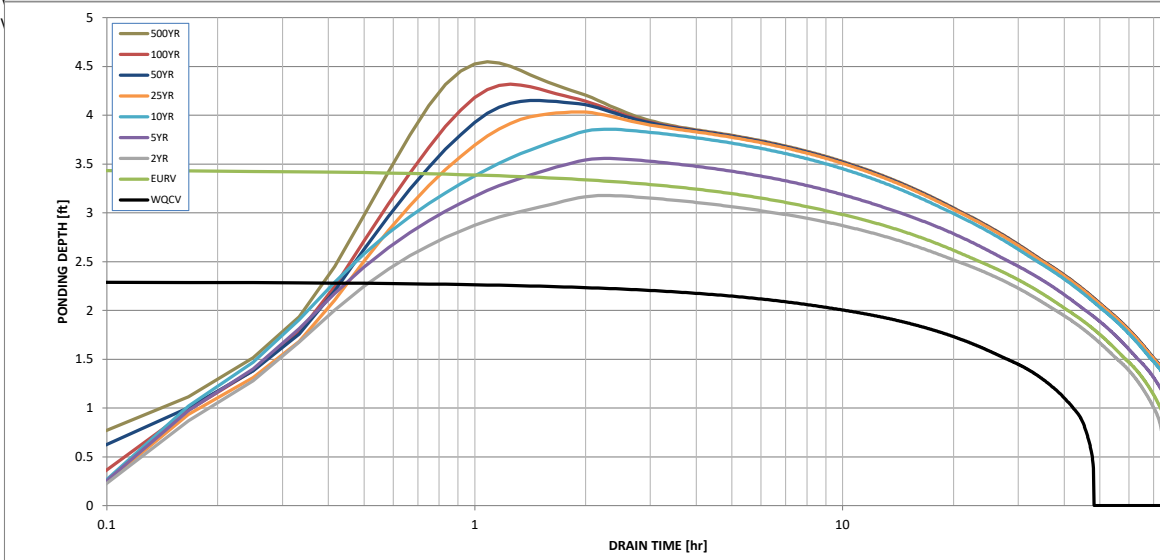
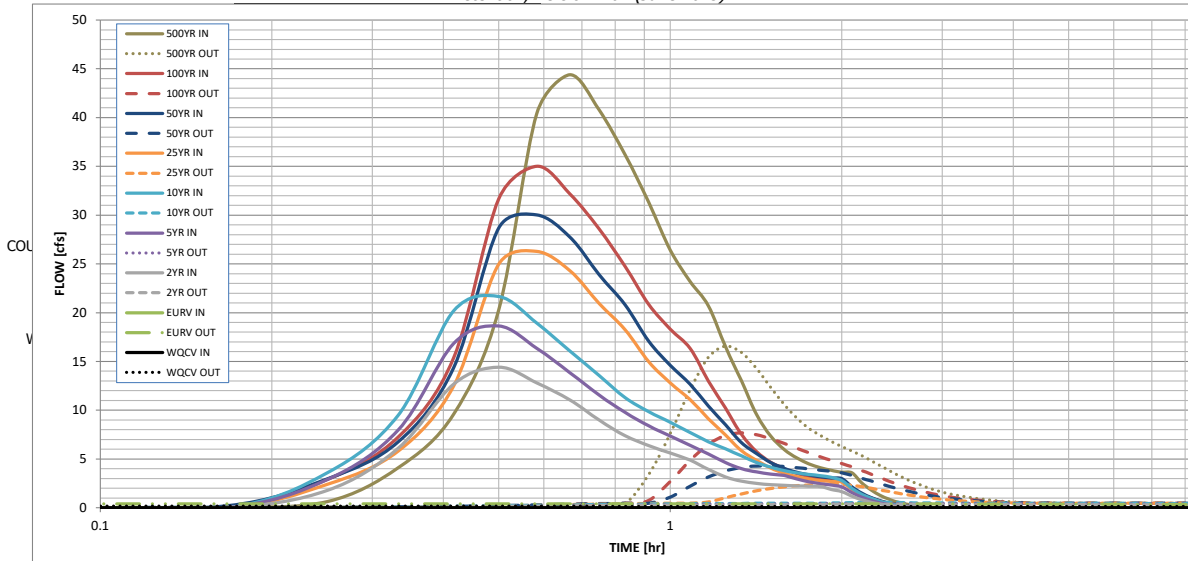
**Routed Hydrograph Results**

*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 =									
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.303	0.970	0.845	1.114	1.336	1.579	1.807	2.066	2.639
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.845	1.114	1.336	1.579	1.807	2.066	2.639
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.3	3.1	4.6	8.0	10.0	12.8	17.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.12	0.29	0.43	0.76	0.94	1.20	1.67
Peak Inflow Q (cfs) =	N/A	N/A	14.4	18.6	21.7	26.3	30.0	35.0	44.4
Peak Outflow Q (cfs) =	0.2	0.4	0.4	0.4	0.6	2.4	4.3	7.7	16.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.1	0.3	0.4	0.6	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.3	0.5	1.0	1.8
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) =	43	67	65	71	75	74	72	71	67
Time to Drain 99% of Inflow Volume (hours) =	46	74	72	78	83	83	82	81	80
Maximum Ponding Depth (ft) =	2.30	3.44	3.18	3.56	3.86	4.03	4.15	4.32	4.55
Area at Maximum Ponding Depth (acres) =	0.44	0.68	0.65	0.69	0.72	0.73	0.74	0.75	0.77
Maximum Volume Stored (acre-ft) =	0.306	0.971	0.791	1.047	1.258	1.388	1.469	1.595	1.770

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.07 (June 2025)*



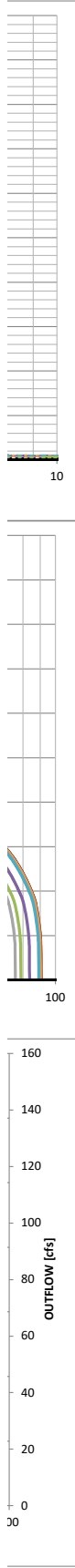
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

# 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.



SOURCE	CUHP	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]	CUHP
0:00:00	0	0.00	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	0.00
0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.20	0.02	0.64	0.00
0:15:00	0	0.00	1.77	2.89	3.57	2.39	2.96	2.91	4.09	0.00
0:20:00	0	0.00	6.09	7.96	9.50	5.82	6.75	7.25	9.57	0.00
0:25:00	0	0.00	12.68	16.82	20.17	12.47	14.35	15.36	20.26	0.00
0:30:00	0	0.00	14.40	18.63	21.65	24.97	28.67	31.68	40.43	0.00
0:35:00	0	0.00	12.81	16.34	18.92	26.27	30.03	35.01	44.39	0.00
0:40:00	0	0.00	11.06	13.86	16.06	24.32	27.75	32.19	40.77	0.00
0:45:00	0	0.00	8.99	11.56	13.57	20.95	23.90	28.59	36.19	0.00
0:50:00	0	0.00	7.39	9.77	11.28	18.25	20.81	24.74	31.30	0.00
0:55:00	0	0.00	6.36	8.39	9.85	14.97	17.07	20.85	26.40	0.00
1:00:00	0	0.00	5.60	7.35	8.76	12.80	14.60	18.32	23.19	0.00
1:05:00	0	0.00	4.89	6.39	7.71	11.09	12.66	16.35	20.71	0.00
1:10:00	0	0.00	3.93	5.52	6.77	9.13	10.42	13.00	16.49	0.00
1:15:00	0	0.00	3.17	4.63	6.03	7.45	8.51	10.22	13.00	0.00
1:20:00	0	0.00	2.72	4.01	5.33	5.84	6.67	7.50	9.56	0.00
1:25:00	0	0.00	2.50	3.67	4.63	4.87	5.56	5.76	7.36	0.00
1:30:00	0	0.00	2.37	3.46	4.16	4.07	4.64	4.68	5.98	0.00
1:35:00	0	0.00	2.30	3.32	3.82	3.55	4.05	4.00	5.12	0.00
1:40:00	0	0.00	2.25	2.95	3.58	3.19	3.63	3.53	4.51	0.00
1:45:00	0	0.00	2.21	2.68	3.42	2.96	3.37	3.21	4.12	0.00
1:50:00	0	0.00	2.18	2.48	3.30	2.80	3.18	2.99	3.83	0.00
1:55:00	0	0.00	1.88	2.33	3.11	2.69	3.06	2.85	3.65	0.00
2:00:00	0	0.00	1.65	2.15	2.79	2.62	2.98	2.80	3.58	0.00
2:05:00	0	0.00	1.18	1.55	1.99	1.88	2.14	2.01	2.57	0.00
2:10:00	0	0.00	0.83	1.09	1.40	1.33	1.51	1.43	1.83	0.00
2:15:00	0	0.00	0.58	0.75	0.98	0.93	1.06	1.01	1.29	0.00
2:20:00	0	0.00	0.39	0.50	0.66	0.64	0.72	0.69	0.88	0.00
2:25:00	0	0.00	0.26	0.33	0.44	0.42	0.48	0.46	0.58	0.00
2:30:00	0	0.00	0.16	0.22	0.29	0.29	0.32	0.31	0.39	0.00
2:35:00	0	0.00	0.09	0.13	0.17	0.17	0.20	0.19	0.24	0.00
2:40:00	0	0.00	0.04	0.07	0.08	0.09	0.10	0.10	0.12	0.00
2:45:00	0	0.00	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.00
2:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:05:00	0	0.00	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	0.00
3:15:00	0	0.00	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	0.00
3:25:00	0	0.00	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	0.00
3:35:00	0	0.00	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	0.00
3:45:00	0	0.00	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	0.00
3:55:00	0	0.00	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	0.00
4:05:00	0	0.00	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	0.00
4:15:00	0	0.00	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	0.00
4:25:00	0	0.00	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	0.00
4:35:00	0	0.00	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	0.00
4:45:00	0	0.00	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	0.00
4:55:00	0	0.00	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	0.00
5:05:00	0	0.00	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	0.00
5:15:00	0	0.00	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	0.00
5:25:00	0	0.00	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	0.00
5:35:00	0	0.00	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	0.00
5:45:00	0	0.00	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	0.00
5:55:00	0	0.00	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	0.00

