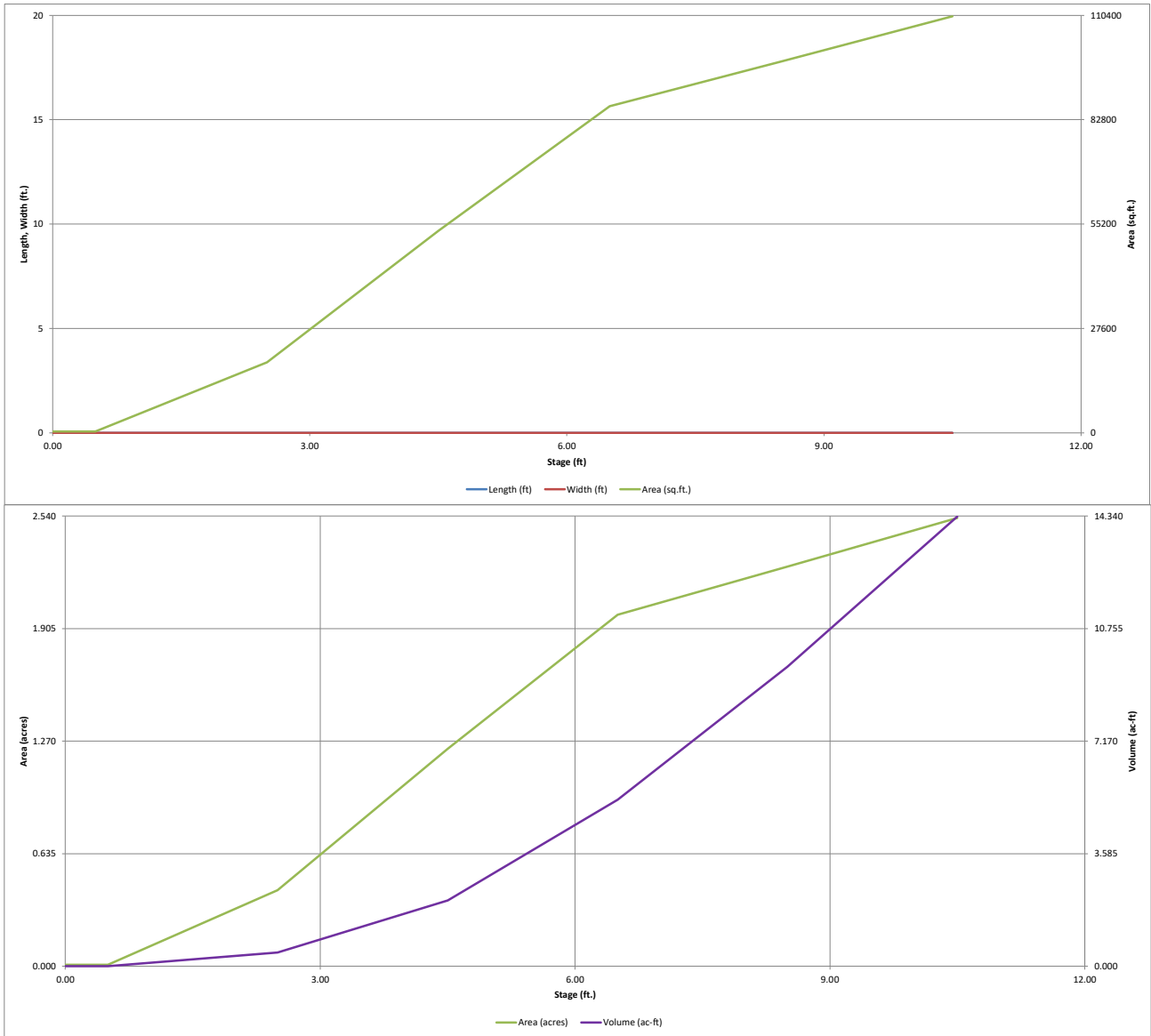


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

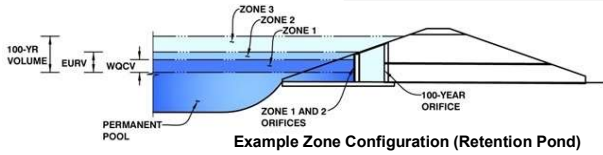


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **STERLING RANCH EAST FILING NO. 5 - FDR**

Basin ID: **POND FSD-14B**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.72	1.261	Orifice Plate
Zone 2 (EURV)	5.84	2.820	Orifice Plate
Zone 3 (100-year)	7.28	2.805	Weir&Pipe (Restrict)
Total (all zones)		6.885	

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 = 0.00 ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = 6.25 ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = 25.00 inches
 Orifice Plate: Orifice Area per Row = N/A sq. inches

Calculated Parameters for Plate
 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	2.10	4.20					
Orifice Area (sq. inches)	4.91	5.94	24.00					
	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 =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice
 Vertical Orifice Area = N/A ft²
 Vertical Orifice Centroid = N/A 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 =	6.25	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	8.00	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Close Mesh Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir
 Height of Grate Upper Edge, H_u = 7.25 feet
 Overflow Weir Slope Length = 4.12 feet
 Grate Open Area / 100-yr Orifice Area = 5.32
 Overflow Grate Open Area w/o Debris = 26.09 ft²
 Overflow Grate Open Area w/ Debris = 13.05 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 =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	30.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	30.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
 Outlet Orifice Area = 4.91 ft²
 Outlet Orifice Centroid = 1.25 feet
 Half-Central Angle of Restrictor Plate on Pipe = 3.14 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 8.50 ft (relative to basin bottom at Stage = 0 ft)
 Spillway Crest Length = 50.00 feet
 Spillway End Slopes = 3.00 H:V
 Freeboard above Max Water Surface = 0.90 feet

Calculated Parameters for Spillway
 Spillway Design Flow Depth = 1.09 feet
 Stage at Top of Freeboard = 10.49 feet
 Basin Area at Top of Freeboard = 2.53 acres
 Basin Volume at Top of Freeboard = 14.30 acre-ft

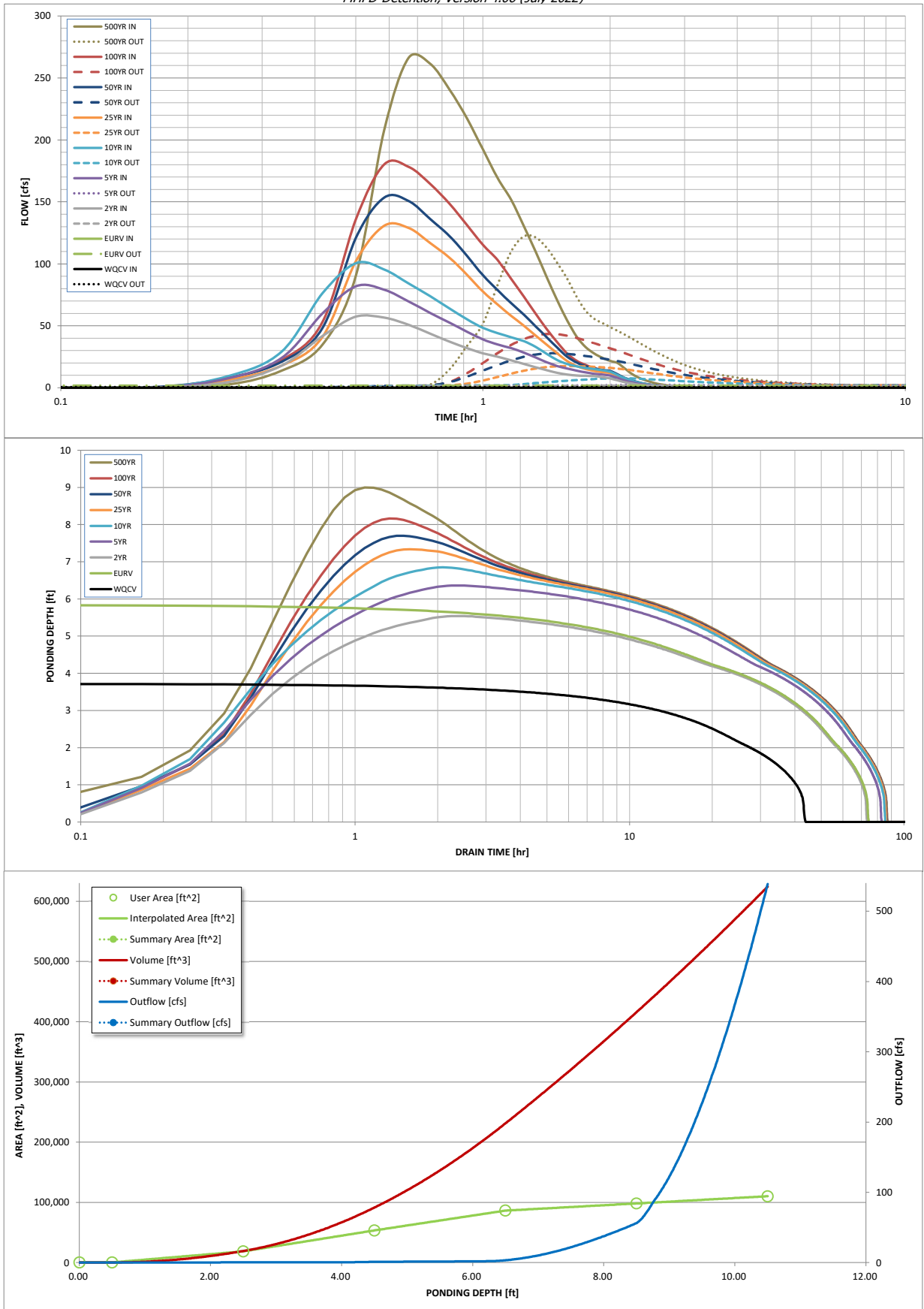
Routed Hydrograph Results

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	3.48
One-Hour Rainfall Depth (in) =	1.261	4.081	3.833	5.369	6.703	8.433	9.867	11.660	17.390
CUHP Runoff Volume (acre-ft) =	N/A	N/A	3.833	5.369	6.703	8.433	9.867	11.660	17.390
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	6.6	18.7	28.4	50.9	63.9	81.9	132.6
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	0.10	0.27	0.42	0.75	0.94	1.20	1.95
Peak Inflow Q (cfs) =	N/A	N/A	57.4	81.9	100.5	130.6	153.4	180.2	266.3
Peak Outflow Q (cfs) =	0.6	1.8	1.7	2.4	7.6	17.5	27.8	43.3	122.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.3	0.3	0.4	0.5	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.2	0.6	1.0	1.6	2.5
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) =	40	66	65	72	72	70	68	66	61
Time to Drain 99% of Inflow Volume (hours) =	42	71	70	78	80	80	79	78	75
Maximum Ponding Depth (ft) =	3.72	5.85	5.54	6.36	6.85	7.33	7.70	8.16	9.00
Area at Maximum Ponding Depth (acres) =	0.92	1.74	1.62	1.93	2.03	2.10	2.15	2.21	2.32
Maximum Volume Stored (acre-ft) =	1.262	4.098	3.561	5.033	6.009	7.000	7.784	8.786	10.666

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	0.53	0.05	2.63
	0:15:00	0.00	0.00	4.70	7.69	9.53	6.40	8.12	7.82	13.74
	0:20:00	0.00	0.00	17.91	23.96	29.10	17.94	21.01	22.34	34.78
	0:25:00	0.00	0.00	41.77	59.94	76.12	40.96	48.16	52.93	90.20
	0:30:00	0.00	0.00	57.35	81.94	100.54	102.08	120.79	135.81	207.63
	0:35:00	0.00	0.00	56.57	79.11	95.49	130.62	153.39	180.21	266.28
	0:40:00	0.00	0.00	50.73	69.58	84.08	129.02	150.63	178.31	261.48
	0:45:00	0.00	0.00	43.64	60.33	73.83	116.71	136.08	164.40	240.61
	0:50:00	0.00	0.00	37.24	52.62	64.00	105.00	122.44	148.47	217.34
	0:55:00	0.00	0.00	31.99	45.25	55.20	91.13	106.40	131.22	192.11
	1:00:00	0.00	0.00	27.83	39.04	48.36	77.54	90.68	115.29	169.06
	1:05:00	0.00	0.00	25.03	34.97	44.05	67.12	78.69	102.98	151.65
	1:10:00	0.00	0.00	22.08	31.93	40.72	58.04	68.20	87.87	130.27
	1:15:00	0.00	0.00	19.18	28.40	37.53	50.06	58.92	73.47	109.79
	1:20:00	0.00	0.00	16.55	24.39	32.92	42.11	49.53	59.70	89.24
	1:25:00	0.00	0.00	14.10	20.64	27.29	34.72	40.77	47.29	70.46
	1:30:00	0.00	0.00	12.03	17.53	22.31	27.68	32.36	36.58	54.32
	1:35:00	0.00	0.00	10.64	15.51	19.11	21.50	24.99	27.57	41.15
	1:40:00	0.00	0.00	9.94	13.74	17.23	17.55	20.34	21.80	32.82
	1:45:00	0.00	0.00	9.61	12.33	15.97	15.17	17.51	18.33	27.69
	1:50:00	0.00	0.00	9.41	11.34	15.08	13.63	15.66	15.96	24.16
	1:55:00	0.00	0.00	8.49	10.60	14.20	12.58	14.38	14.31	21.69
	2:00:00	0.00	0.00	7.49	9.83	12.95	11.89	13.53	13.13	19.90
	2:05:00	0.00	0.00	5.96	7.86	10.28	9.54	10.83	10.27	15.55
	2:10:00	0.00	0.00	4.50	5.89	7.68	7.08	8.01	7.46	11.28
	2:15:00	0.00	0.00	3.41	4.43	5.71	5.29	5.97	5.55	8.36
	2:20:00	0.00	0.00	2.56	3.30	4.22	3.93	4.43	4.14	6.21
	2:25:00	0.00	0.00	1.90	2.43	3.09	2.90	3.26	3.08	4.61
	2:30:00	0.00	0.00	1.39	1.74	2.25	2.10	2.35	2.24	3.36
	2:35:00	0.00	0.00	0.99	1.23	1.63	1.52	1.70	1.63	2.43
	2:40:00	0.00	0.00	0.69	0.87	1.16	1.10	1.23	1.18	1.76
	2:45:00	0.00	0.00	0.45	0.59	0.77	0.75	0.84	0.80	1.19
	2:50:00	0.00	0.00	0.26	0.36	0.46	0.47	0.52	0.50	0.73
	2:55:00	0.00	0.00	0.13	0.19	0.24	0.25	0.28	0.26	0.38
	3:00:00	0.00	0.00	0.05	0.08	0.09	0.10	0.11	0.10	0.14
	3:05:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	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

