

### Example Problem

- Convert the following 2-hr UH to a 3-hr UH using the S-curve method

Time (hr)	2-hr UH ordinate (cfs)
0	0
1	75
2	250
3	300
4	275
5	200
6	100
7	75
8	50
9	25
10	0

### Solution

Make a spreadsheet with the 2-hr UH ordinates, then copy them in the next column lagged by  $D=2$  hours. Keep adding columns until the row sums are fairly constant. The sums are the ordinates of your S-curve

## Unit hydrograph

### Example Problem

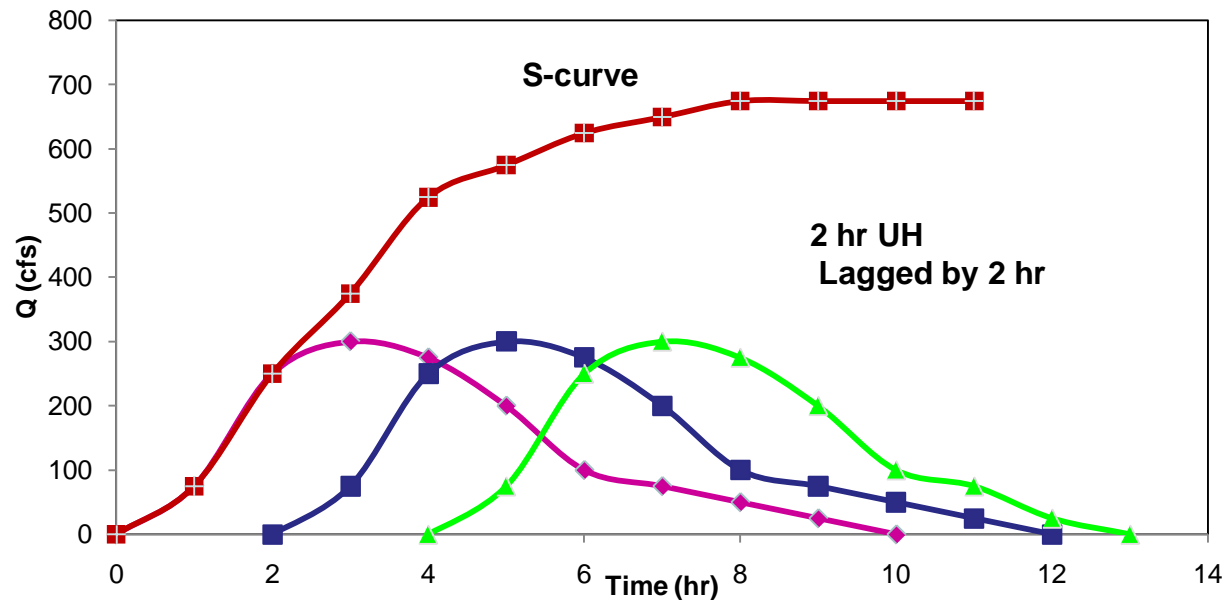
Contd...

Time (hr)	2-hr UH	2-HR lagged UH's					Sum
0	0						0
1	75						75
2	250	0					250
3	300	75					375
4	275	250	0				525
5	200	300	75				575
6	100	275	250	0			625
7	75	200	300	75			650
8	50	100	275	250	0		675
9	25	75	200	300	75		675
10	0	50	100	275	250	0	675
11		25	75	200	300	75	675

## Example Problem

Contd...

Draw your S-curve, as shown in figure below



Make a spreadsheet with the 2-hr UH ordinates, then copy them in the next column lagged by  $D=2$  hours. Keep adding columns until the row sums are fairly constant. The sums are the ordinates of your S-curve.

## Unit hydrograph

### Example Problem

Contd...

Time (hr)	S-curve ordinate	S-curve lagged 3hr	Difference	3-HR UH ordinate
0	0		0	0
1	75		75	50
2	250		250	166.7
3	375	0	375	250
4	525	75	450	300
5	575	250	352	216
6	625	375	250	166.7
7	650	525	125	83.3
8	675	575	100	66.7
9	675	625	50	33.3
10	675	650	25	16.7
11	675	675	0	0

## Unit hydrograph

### Example Problem

Find the one hour unit hydrograph using the excess rainfall hyetograph and direct runoff hydrograph given in the table

Time (1hr)	Excess Rainfall (in)	Direct Runoff (cfs)
1	1.06	428
2	1.93	1923
3	1.81	5297
4		9131
5		10625
6		7834
7		3921
8		1846
9		1402
10		830
11		313

### Example Problem

Contd...

#### Solution

- The ERH and DRH in table have M=3 and N=11 pulses respectively.
- Hence, the number of pulses in the unit hydrograph is  $N-M+1=11-3+1=9$ .
- Substituting the ordinates of the ERH and DRH into the equations in table yields a set of 11 simultaneous equations

$$U_1 = \frac{Q_2 - P_2 U_1}{P_1} = \frac{1,928 - 1.93 \times 404}{1.06} = 1,079 \text{ cfs/in}$$

Similarly calculate for remaining ordinates and the final UH is tabulated below

n	1	2	3	4	5	6	7	8	9
$U_n$ (cfs/in)	404	1,079	2,343	2,506	1,460	453	381	274	173