Given: Water flows up a 0.5-ft tall ramp in a constant width rectangular channel.
q = 5.75 ft^2/s; upstream depth is equal to 2.3 ft. Ignore energy losses.

Find: 1. water surface elevation
2. if the bump height is increased to 1.2 ft, what happens?

Solution:

$E = y + (q^2)/2/g/(y^2)$

critical depth occurs when Fr = 1

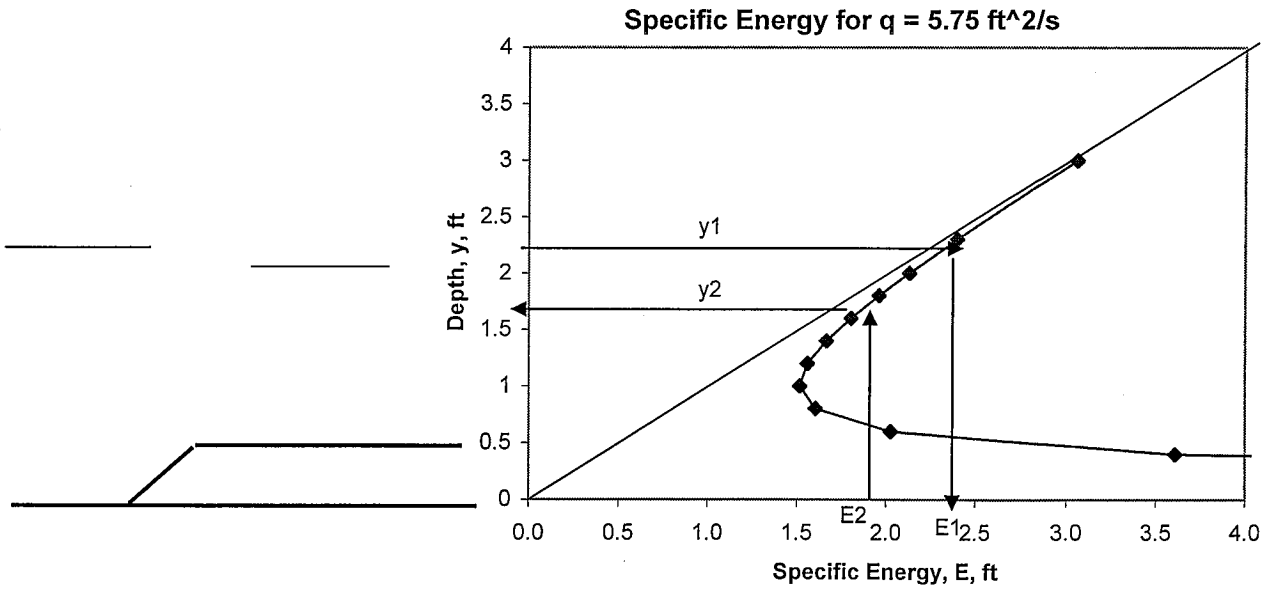
$yc = (q^2/g)^{0.33}$

yc = 1.0 ft

minimum specific energy = 1.5yc

Ec = 1.5 ft

E, ft	y, ft
13.0	0.2
3.6	0.4
2.0	0.6
1.6	0.8
1.5	1
1.6	1.2
1.7	1.4
1.8	1.6
2.0	1.8
2.1	2
2.4	2.3
3.1	3
4.0	4



For a bump height of 0.5 ft:

$z1 + y1 + (V1^2)/2/g = z2 + y2 + (V2^2)/2/g$
with the datum at z1,
E1 = 0.5 + E2 or
E2 = E1 - 0.5 ft.
for a depth of 2.3 ft, E1 = 2.4 ft
so E2 = 2.4 ft - 0.5 ft = 1.90 ft
and $E2 = y2 + (q^2)/2/g/(y^2)$
solving for y2 yields y2 = 1.72 ft, 0.64 ft.
y2 must equal 1.72 ft
elevation at point 2 = z2 + y2 = 0.5 ft + 1.72 ft = 2.22 ft.