~~culvert~~

whether culvert is hydraulically short or long can not be determined from Barrel length alone.

It depends on

(i) slope — S

(ii) size — d

(iii) entrance geometry — R/ bevelled

(iv) headwater ⟶ H

(v) entrance

(vi) outlet conditions

For coastal regulator in BD $\frac{L}{D} < 20$ culvert is hydraulically short.

D = usually 1.5 m

so if $L < 1.5 \times 20 = 30$ m culvert is always hydraulically short. So type 2

T 2 flow condition shall never

P-2

occur.

~~Foer~~ For Coastal regulator slope is always zero (we do not provide slope in Barrel). ~~So it is always~~. So always less than super critical slope.

So ~~T7~~ T6 flow can never occur in coastal regulator.

So type of flow that can occur in Coastal Regulator is

T1, T3, T4, T5

P-3

T1 → pipe flow (pressure flow)

T3 → Inlet control ~~partially~~ partial flow. (~~H3 flo~~ (orifice flow)

T4 Sub critical flow. ~~Control at ilet~~ ~~on Inlet~~

T5 Subcritical flow control at outlet.

Open channel flow

T1 T2 → Pipe flow

~~T2~~, T3, T4, T5 T6,

→ T3 (orifice flow) $C_d = 0.45 \sim 0.75$

→ T4, T5, T6 Weir flow $C_d = 0.75 \sim 0.95$

P-4

Flow analysis can proced proceed as per article 11-1 — 11-3
GVF (GVF VT Chow page: 297 — 306)

Difference between bridge and culvert:

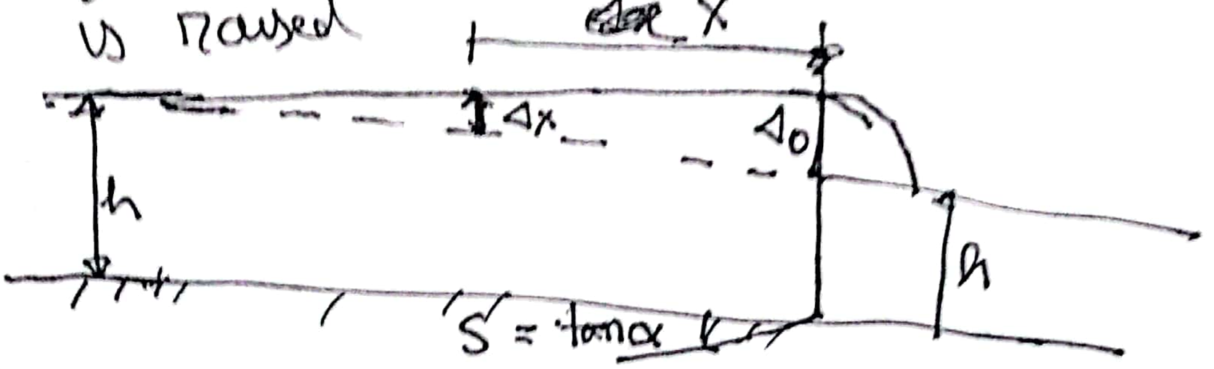
$\frac{L}{W} > 1$ bridge

$\frac{L}{W} < 1$ Culvert

P-5

Backwater Curve

If flow in a channel obstructed by weir/culvert/structure U/S water surface is raised



$$\frac{\Delta x}{h} = \frac{\left[\left(\frac{x \cdot S}{h}\right) - \left(\frac{2\Delta_0}{h}\right)\right]^2}{4\frac{\Delta_0}{h}}$$

x = distance upstream (m)

Δx = raise in water level at distance x (m)

Δ_0 = raise in water level at distance $x = 0$ (m)

S = bottom slope

Question 2 How to determine Δ_0

Orifice/weir formula