

BACKWATER PROFILE
NON-UNIFORM FLOWS

A flood flow passes over a 1V:2.5H spillway with a smooth concrete invert. The spillway crest is broad and its elevation is 122.2 m AHD. The flow rate is 220 m³/s. The spillway crest and chute are 35 m wide. Calculate the free-surface profile above the spillway chute

Rectangular channel		Critical flow conditions		Uniform equilibrium flow conditions				
Density :	998.2 kg/m ³	Q =	220 m ³ /s	ks =	0.001 m	Concrete	Vo =	21.19 m/s
Kin. Viscosity	1E-06 m ² /s	B =	35 m ³ /s				do =	0.29664 m/s
Gravity :	9.81 m/s ²	dc =	1.59 m ³ /s	Vo =	21.1862 m/s	[M]	ks/DH =	0.00086
				do =	0.29664 m	Normal depth	Re =	2.5E+07

Discharge	Slope	Width	Roughness height	Flow depth	Area	Wetted perimeter	Hydraulic diameter	Flow velocity	Froude number	Reynolds number	Darcy coefficient	Darcy coefficient	Shear velocity	Shear Reynolds Nb	
Q	Teta	B	ks	d	A	Pw	DH	V	Fr	Re	ks/DH	f	f	V*	Re*
m ³ /s	degree	m	m	m	m ²	m	m	m/s						m/s	
												Altsul ebrook-White			
220	21.8	35	0.001	1.591	55.6863	38.1821	5.83376	3.9507	1	2.3E+7	0.00017	0.01263	0.01336	0.16143	161.429
			Concrete												
220	21.8	35	0.001	1.55	54.25	38.1	5.69554	4.0553	1.03997	2.3E+6	0.00018	0.01316	0.01387	0.16885	168.851
220	21.8	35	0.001	1.3	45.5	37.6	4.84043	4.83516	1.35396	2.3E+6	0.00021	0.01362	0.01425	0.2041	204.097
220	21.8	35	0.001	1.1	38.5	37.2	4.13978	5.71429	1.73953	2.4E+6	0.00024	0.0141	0.01465	0.24456	244.56

[C] f= 0.01882 Altsul
 f= 0.01892 Colebrook-White

Specific Energy E m	Friction slope Sf	Bed slope So	So - Sf	dE m	dx m	Curviline co-ordinat x m
2.274	0.00182	0.37137				0
			0.36944	0.005	0.0125	
2.278	0.00204	0.37137				0.0125
			0.36859	0.122	0.33	
2.400	0.00351	0.37137				0.3425
			0.36667	0.287	0.784	
2.687	0.00589	0.37137				1.1265

Backwater eq.