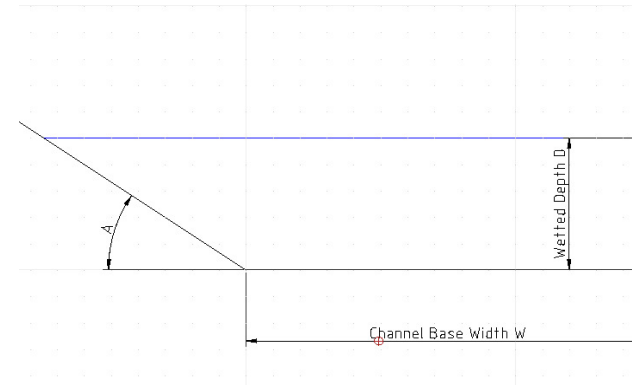


Note: Due to the irregular channel, deliberate insertion of rough cobbles and large perturbation boulders in the channel, to ease fish passage, these estimates of water depth are very approximate

Input Data	Q95	Q70	Q10		
Natural River Flow	0.111	0.323	2.901	m <sup>3</sup> /s	upstream of intake weir
Flow in Bypass Channel (F)	0.111	0.245	1.254	m <sup>3</sup> /s	
Channel base width (W)	1.5	1.5	1.5	m	
Side wall angle (A)	33	33	33	degrees	
Channel wetted depth (D)	0.174	0.256	0.575	m	estimated water depths are iteratively entered until a 2m headloss is achieved
Mannings Rougness (n) (1)	0.216	0.178	0.119		n for boulder/cobble stream = 0.06, plus 0.03 for appreciable obstruction = 0.09. n adjusted for shallow depth: $n = n/D^{0.2}$ (Note 1)
Length channel	18	18	18	m	
Calculated Value					
Wetted perimeter (P)	1.993	2.226	3.131	m	$D+W+D/(\sin A)$
Area (Ar)	0.271	0.406	0.974	m <sup>2</sup>	$D.W+0.5D^2.TAN(A)$
Hydraulic Radius R	0.136	0.182	0.311	m	$Ar/P$
Average velocity (V)	0.409	0.603	1.287	m/s	$F/Ar$
Channel slope required	0.112	0.111	0.111	m/m	$(n.V/R^{0.67})^2$

Headloss	2.01	2.01	2.00	m
----------	------	------	------	---



Simplified section E-E of bypass channel (see Drawing AH05)

Estimated Water Depths in Channel at various bypass flows, 50mm added to calculated depths (see note 3)

Total Flow	Flow in Bypass (2)	Water Depth (3)	Mannings value (depth adjusted)	Average Velocity	Flow Percentile
l/s	l/s	m	n	m/s	
111	111	0.22	0.216	0.41	Q95
323	245	0.31	0.178	0.60	Q70
2901	1254	0.63	0.119	1.29	Q10

- Values taken from Open Channel Hydraulics, Chow (1959), and "Guide for Selecting Mannings Roughness Co-efficients for Natural Channels and Floodplains", GJ Arcement, US Geological Survey, Water Supply Paper 2339, and Micro-Hydro Design Manual, A Harvey, ISBN 1 85339 103 4
- Taken from Calculation Sheet AHC01
- A conservative estimate of 50mm added to depths to allow for dished base of channel (to simplify the calculations above, a flat bottomed channel model is used)

Effect of obstruction (n <sub>3</sub> )		
Channel Conditions	n Value Adjustment <sup>1</sup>	Example
Negligible	0.000-0.004	A few scattered obstructions, which include debris deposits, stumps, exposed roots, logs, piers, or isolated boulders, that occupy less than 5 percent of the cross-sectional area.
Minor	0.005-0.015	Obstructions occupy less than 15 percent of the cross-sectional area, and the spacing between obstructions is such that the sphere of influence around one obstruction does not extend to the sphere of influence around another obstruction. Smaller adjustments are used for curved smooth-surfaced objects than are used for sharp-edged angular objects.
Appreciable	0.020-0.030	Obstructions occupy from 15 percent to 50 percent of the cross-sectional area, or the space between obstructions is small enough to cause the effects of several obstructions to be additive, thereby blocking an equivalent part of a cross section.
Severe	0.040-0.050	Obstructions occupy more than 50 percent of the cross-sectional area, or the space between obstructions is small enough to cause turbulence across most of the cross section.