

Appendix D. Calculations for Balland Stream Flood Risk Mitigation to Ashburton

Proposed extension to Linhay Hill Quarry near Ashburton - Flood Risk Mitigation for Ashburton - calculation of flows in the Balland Stream

Natural situation as per Devon Hydrology Study and no intercept by quarry						Existing situation with intercept by quarry extraction area only (i.e. no flow to quarry via side weir)				
Catchment:	Balland Stream total catchment to Devon Hydrology Study Node 3532	Measured sub catchment: downstream of side weir overflow point to quarry Balland Pit	Measured sub catchment: upstream of side weir overflow to point quarry Balland Pit	Sub catchment: quarry extraction area to FEH catchment extent for Balland Stream	Sub catchments totalled	Measured sub catchment: downstream of side weir overflow point to quarry Balland Pit	Measured sub catchment: upstream of side weir overflow to point quarry Balland Pit	Measured sub catchment: quarry extraction area with 24 hr average pumped discharge rate	Balland Stream total catchment to Devon Hydrology Study Node 3532	Reduction in flow rate in Balland Stream at Node 3532
Catchment ID	N3532	BS2	BS1	Q1	BS2+BS1+Q1	BS2	BS1	Q2	BS2+BS1+Q2	
Easting	276245									
Northing	70282									
Area	km2 3.22									
Area	ha 322	174.931	101.826	38.950	315.707	174.931	101.826	51.781	328.538	
Peak river flows	From DHS	by area proportion to river flows at Node 3532			Checksum					Q1 minus Q2
QMED / Q2	m3/s	1.236	0.719	0.275	2.230	1.236	0.719	0.115	2.070	0.160
5yr	m3/s	1.684	0.981	0.375	3.040	1.684	0.981	0.115	2.780	0.260
10yr	m3/s	2.000	1.164	0.445	3.610	2.000	1.164	0.115	3.280	0.330
25yr	m3/s	2.460	1.432	0.548	4.440	2.460	1.432	0.115	4.007	0.433
50yr	m3/s	2.859	1.664	0.637	5.160	2.859	1.664	0.115	4.638	0.522
100yr	m3/s	3.302	1.922	0.735	5.960	3.302	1.922	0.115	5.340	0.620
100yr+20%	m3/s	3.963	2.307	0.882	7.152	3.963	2.307	0.115	6.385	0.767
250yr	m3/s	4.001	2.329	0.891	7.220	4.001	2.329	0.115	6.444	0.776
500yr	m3/s	4.605	2.680	1.025	8.310	4.605	2.680	0.115	7.400	0.910
1000yr	m3/s	5.314	3.093	1.183	9.590	5.314	3.093	0.115	8.522	1.068

Quarry discharge limit is 10,000m3/day
 Attenuation from 1 in 10yr to about 1 in 15yr
 Reduction increases by 0.115m3/s if quarry not pumping to discharge point

Scope for future attenuation

Catchment:	Balland Stream total catchment to Devon Hydrology Study Node 3532	Measured sub catchment: downstream of side weir overflow point to quarry Balland Pit	Sub-catchment for which flows can be attenuated at the quarry	Balland Stream total catchment to Devon Hydrology Study Node 3532, predictions of attenuated flow						
Catchment ID	N3532	BS2	BS1+Q2							
Easting	276245									
Northing	70282									
Area	km2 3.22									
Area	ha 322	174.931	BS1 constant, but Q2 will increase as quarry expands	F1 = restricted flow from BS1+Q2, m3/s:	1.150	1.044	0.751	0.308	0.000	
Peak river flows	From DHS				F1 + BS2	F1 + BS2	F1 + BS2	F1 + BS2	F1 + BS2	F1 + BS2
QMED / Q2	m3/s	1.236			2.385	2.280	1.987	1.543	1.236	
5yr	m3/s	1.684			2.834	2.728	2.435	1.992	1.684	
10yr	m3/s	2.000			3.150	3.044	2.751	2.308	2.000	
25yr	m3/s	2.460			3.610	3.504	3.211	2.768	2.460	
50yr	m3/s	2.859			4.009	3.903	3.610	3.167	2.859	
100yr	m3/s	3.302			4.452	4.346	4.053	3.610	3.302	
100yr+20%	m3/s	3.963			5.113	5.007	4.714	4.270	3.963	
250yr	m3/s	4.001			5.150	5.045	4.751	4.308	4.001	
500yr	m3/s	4.605			5.754	5.649	5.355	4.912	4.605	
1000yr	m3/s	5.314			6.464	6.358	6.065	5.621	5.314	

As Chuley Road SFRA indicates flood occurs at Love Lane for 1 in 10yr, that flow rate is highlighted yellow

So an extreme event could cause flooding due to downstream catchment alone

Effect of restricted flow
 1 in 10yr attenuated to 1 in 25yr
 1 in 10yr attenuated to 1 in 30yr
 1 in 10yr attenuated to 1 in 50yr
 1 in 10yr attenuated to 1 in 100yr
 1 in 10yr attenuated to 1 in 150yr

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