Haweswater Aqueduct Resilience Programme - Proposed Bowland Section

Volume 6

Proposed Ribble Crossing

Appendix 7.2 Geomorphology Proforma

June 2021

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1. Introduction

1) A fluvial geomorphology site walkover for the Proposed Ribble Crossing site was undertaken on 12 February 2021. This document details the fluvial geomorphology baselines for the watercourses in the study area based on data gathered during the site walkover. Mitigation and reinstatement requirements have also been identified based on the assessment made as part of the Proposed Ribble Crossing Environmental Statement.

2. Geomorphology Proformas

2.1 River Ribble (W2325)

Watercourse baseline	
Sensitivity	Very High
WFD Surface Water Body	Ribble DS Stock Beck
Reach function	Exchange
Reach process	Laterally adjusting
Flow	Varied depending on geomorphological features present – broken waves, unbroken waves, rippled and chutes all observed
Substrate	Partially consolidated and poorly sorted coarse gravels and cobbles
Features observed	Natural: Step (Illustration 1), pool, lateral, point, and medial bars (Illustration 2), a total of 150 m of bank erosion on both banks Artificial: Road bridge (Illustration 1), bank reinforcement on both banks
Land use	Pasture on both banks
Riparian vegetation	Grass and isolated trees on both banks
Project Interaction	
Scheme components	Access route crossing, within 10 m of two construction laydown areas. Four temporary outfalls, discharge of construction and site run-off
Mitigation requirements (Enabling)	Mitigation measures would be required for the impact of the vegetation clearance. These measures would be employed following the removal of the access route (see reinstatement requirements)
Mitigation requirements (Construction)	Green bank protection would be recommended opposite the outfalls and at locations where erosion is already taking place, with scour matting used around the outfalls. Additional, measures would be employed following the removal of the access route (see reinstatement requirements)
Mitigation requirements (Operational)	No specific mitigation would be required. Impacts would be mitigated by embedded mitigation
Mitigation requirements (Decommissioning)	No specific mitigation would be required. Impacts would be mitigated by embedded mitigation
Reinstatement requirements (where watercourse is physically crossed, or riparian zone is interrupted)	Reinstatement of bed, banks, and riparian vegetation following the removal of the temporary access route. Following removal of the access route, it is recommended the bed is augmented with coarser material. During the reinstatement, coarse material is also recommended to be placed along the bank toe to stabilise the bank with a decomposable geotextile used on the upper banks, to allow for vegetation re-establishment along the upper and mid bank and aid stabilisation. It is recommended that all reinstatement work be supervised by a geomorphologist or Ecological Clerk of Works with experience in channel restoration to ensure appropriate reinstatement. In addition, it is recommended that cleared vegetation is replanted

Photo(s) of watercourse

Illustration 1: Upstream view of road crossing and step

Illustration 2: Upstream view of island

2.2 Unnamed Watercourse 2097 (W2348)

Watercourse baseline	
Sensitivity	Low
WFD Surface Water Body	Ribble DS Stock Beck
Reach function	Sink
Reach process	Aggrading. Some lateral adjustment
Flow	Mostly smooth flow, with some ripples flow at crossing structures
Substrate	Consolidated silt. Some loose cobbles
Features observed	Natural: 10 m of bank erosion (Illustration 3) Artificial: Two culverts, realigned/straightened
Land use	Pasture on both banks
Riparian vegetation	Grass and isolated trees on both banks
Project Interaction	
Project components	Access route crossing
Mitigation requirements (Enabling)	No specific mitigation would be required. Impacts would be mitigated by embedded mitigation
Mitigation requirements (Construction)	No specific mitigation would be required. Impacts would be mitigated by embedded mitigation
Mitigation requirements (Operational)	No specific mitigation would be required. Impacts would be mitigated by embedded mitigation
Mitigation requirements (Decommissioning)	No specific mitigation would be required. Impacts would be mitigated by embedded mitigation
Reinstatement requirements (where watercourse is physically crossed, or riparian zone is interrupted)	Reinstatement of bed, banks, and riparian vegetation following the removal of the temporary access route

Photo(s) of watercourse

Illustration 3: View from left bank. Undercutting on right bank

2.3 Greg Sike (W2321)

Watercourse baseline	
Sensitivity	High
WFD Surface Water Body	Ribble DS Stock Beck
Reach function	Exchange
Reach process	Mostly stable. Some widening
Flow	Varied depending on geomorphological features present – mostly smooth with broken waves, unbroken waves at riffles
Substrate	Unsorted, part consolidated cobbles and gravels. Some boulders.
Features observed	Natural: Steps (Illustration 4), riffles (Illustration 5), lateral bars, woody debris (Illustration 4), bank erosion (not mapped) (Illustration 5) Artificial: Culvert
Land use	Pasture on both banks
Riparian vegetation	Mostly trees on both banks, with grass at upstream end of surveyed reach
Project Interaction	
Project components	Access route crossing
Mitigation requirements (Enabling)	No specific mitigation would be required. Impacts would be mitigated by embedded mitigation
Mitigation requirements (Construction)	Mitigation measures would be required for the access route. These measures would be employed following the removal of the access route (see reinstatement requirements)
Mitigation requirements (Operational)	No specific mitigation would be required. Impacts would be mitigated by embedded mitigation
Mitigation requirements (Decommissioning)	No specific mitigation would be required. Impacts would be mitigated by embedded mitigation
Reinstatement requirements (where watercourse is physically crossed, or riparian zone is interrupted)	Reinstatement of bed, banks, and riparian vegetation following the removal of the temporary access route. Following removal of the access route, it is recommended the bed is augmented with coarser material. During the reinstatement, coarse material is also recommended to be placed along the bank toe to stabilise the bank with a decomposable geotextile used on the upper banks, to allow for vegetation re-establishment along the upper and mid bank and aid stabilisation. It is recommended that all reinstatement work be supervised by a geomorphologist or Ecological Clerk of Works with experience in channel restoration to ensure appropriate reinstatement

Photo(s) of watercourse

Illustration 4: Upstream view of step and woody debris

Illustration 5: Downstream view of riffle and erosion on left bank

2.4 Coplow Brook (W2349)

Watercourse baseline	
Sensitivity	Medium
WFD Surface Water Body	Ribble DS Stock Beck
Reach function	Source in upstream and downstream reaches. Sink in central reach
Reach process	Upstream reach incising Central reach aggrading due to being overwide, with some incising on meander bends Downstream reach laterally adjusting, with some incising
Flow	Mostly smooth, with some rippled flow with broken and unbroken waves
Substrate	Unsorted, partly consolidated cobles, coarse gravel and silt. Predominantly silt at confluence with River Ribble
Features observed	Natural: Lateral bar, step-pool sequences (Illustration 6), riffles, bank erosion (not mapped) Artificial: 10 m of bank reinforcement, two bridges, two culverts, manmade debris (Illustration 7), , embankment poaching
Land use	Pasture on both banks
Riparian vegetation	Grass on both banks, isolated trees
Project Interaction	
Project components	Access route crossing, within 5 m of access route as several locations, within 10 m of two construction laydown areas. Temporary outfall, discharge of construction and site run-off
Mitigation requirements (Enabling)	Mitigation measures would be required for the impact of the vegetation clearance. These measures would be employed following the removal of the access route (see reinstatement requirements)
Mitigation requirements (Construction)	Green bank protection would be recommended opposite the outfall and at locations where erosion is already taking place, with scour matting used around the outfalls. Additional, measures would be employed following the removal of the access route (see reinstatement requirements)
Mitigation requirements (Operational)	No specific mitigation would be required. Impacts would be mitigated by embedded mitigation
Mitigation requirements (Decommissioning)	No specific mitigation would be required. Impacts would be mitigated by embedded mitigation
Reinstatement requirements (where watercourse is physically crossed, or riparian zone is interrupted)	Reinstatement of bed, banks, and riparian vegetation following the removal of the temporary access route. Following removal of the access route, it is recommended the bed is augmented with coarser material. During the reinstatement, coarse material is also recommended to be placed along the bank toe to stabilise the bank with a decomposable geotextile used on the upper banks, to allow for vegetation re-establishment along the upper and mid bank and aid stabilisation. It is recommended that all reinstatement work be supervised by a geomorphologist or Ecological Clerk of Works with experience in channel restoration to ensure appropriate reinstatement. In addition, it is recommended that cleared vegetation is replanted

Photo(s) of watercourse

Illustration 6: Upstream view of step pool sequence

Illustration 7: Upstream view showing rubble on right bank and in channel