



**Haweswater Aqueduct Resilience Programme - Proposed Bowland  
Section**

**Environmental Statement**

**Volume 4**

**Appendix 20.1: Schedule of Mitigation**

June 2021



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## Haweswater Aqueduct Resilience Programme - Proposed Bowland Section

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## **1. Introduction**

- 1) The following appendix summarises the essential mitigation that has been proposed in the various topic chapters of the ES (Volume 2). These topic-specific measures have been identified through the environmental assessment process, and are referred to as 'essential mitigation' to differentiate them from the embedded mitigation and good practice measures which were already part of the Proposed Bowland Section proposals as assessed in the ES.
- 2) The schedule of mitigation links into an Environmental Masterplan (EMP) for the Proposed Bowland Section (Figure 20.1). The EMP comprises a series of drawings illustrating the locations at which site-specific mitigation measures are proposed.
- 3) This schedule of mitigation is presented according to EIA topic areas, and follows the same order of topics as presented in the ES. As noted in paragraph 1, the essential mitigation measures set out in this schedule are additional to the embedded mitigation and good practice measures:
  - As described throughout the ES, the design of the Proposed Bowland Section has been informed by the EIA process, and embedded mitigation measures have been incorporated to take account of identified environmental constraints and considerations
  - Good practice approaches and actions have also been identified to avoid or reduce potential impacts during construction are already covered in Appendix 3.2: Construction Code of Practice (CCoP) and are not repeated further in this document.
- 4) The appendix captures the essential mitigation proposals as they presently stand, however it is acknowledged that some may continue to evolve and be further enhanced during the planning determination process and in the development of planning conditions.

## 2. Landscape and Arboriculture

**Table 1.1: Landscape and Arboriculture Schedule of Mitigation**

Location	Phase	Mitigation Item ID	Mitigation
<p><i>Embedded mitigation forming part of the design and good practice measures set out in the CCoP provide appropriate mitigation for potential effects on landscape character, visual amenity and arboriculture. No further topic-specific essential mitigation is therefore required.</i></p>			
<p><i>As explained in Chapter 20: Environmental Mitigation, the CCoP contains a range of good practice measures to protect the environment. Of particular importance to Landscape and Arboriculture is the requirement in the CCoP to specify tree protection measures in a Site Specific Arboricultural Method Statement (SS-AMS), and to prepare a Tree Protection Plan (TPP) in conjunction with the SS-AMS. The TPP would show areas of existing trees and vegetation within the construction site to be retained (and protected), and those to be removed. Tree removal would be implemented in line with recommendations of Appendix 6.7: Arboricultural Impact Assessment (AIA) and as indicatively shown on Figure 6.6: Preliminary Trees at Risk Plan (in Volume 3 of the ES). Reinstatement and mitigation proposals for the proposed off-site highways works (Volume 5) would be further developed in line with the CCoP and officer consultations.</i></p>			

### 3. Water Environment

Table 1.2: Water Environment Schedule of Mitigation

Location	Phase	Mitigation Item ID <sup>1</sup>	Mitigation
<i>The essential mitigation measures listed below are additional to embedded mitigation forming part of the design, and good practice measures as set out in the CCoP</i>			
<b>Fluvial Geomorphology</b>			
River Hodder (W477)	Enabling Works and Construction	<b>WE1 to WE6</b>	<ul style="list-style-type: none"> <li>Adjust outfall location (WE1)</li> <li>Reinstate the natural bed and augment the sediment (WE2 and WE3)</li> <li>Stabilise the bank (WE4 and WE5).</li> <li>Geomorphological monitoring (WE6).</li> </ul>
Unnamed Watercourse 385 (W462)	Enabling Works and Construction	<b>WE2 to WE5</b>	<ul style="list-style-type: none"> <li>Reinstate the natural bed and augment the sediment (WE2 and WE3)</li> <li>Stabilise the bank (WE4 and WE5).</li> </ul>
River Hindburn (W478)	Enabling Works and Construction	<b>WE7 to WE9, WE12</b>	<ul style="list-style-type: none"> <li>Reinstate the natural bed and augment the sediment on Unnamed Watercourse 169 (WE7)</li> <li>Stabilise the bank on Unnamed Watercourse 169 (WE8)</li> <li>Erosion monitoring (WE12)</li> <li>Remediation for commissioning flows as required (WE9).</li> </ul>
Cod Gill (W206)	Enabling Works and Construction	<b>WE12 to WE12</b>	<ul style="list-style-type: none"> <li>Flow monitoring and erosion monitoring (WE12).</li> </ul>
<b>Surface Water Quality</b>			
River Hodder (W477)	Enabling Works and Construction	<b>WE17 to WE18</b>	<ul style="list-style-type: none"> <li>Supervision by geomorphologist (or Environmental Clerk of Works) (WE17)</li> <li>Adherence to excavation and storage protocols when working in the floodplain (WE18).</li> </ul>
Surface water dependent habitat (Lowland Fen)	Enabling Works	<b>WE19 to WE23</b>	<ul style="list-style-type: none"> <li>Prior to commencement of works, Environmental Clerk of Works and appointed contractor walk the planned route to identify any surface water flow pathways and localised depressions which would convey water across the habitat (WE19)</li> </ul>

<sup>1</sup> Mitigation items WE13-16 inclusive have been intentionally omitted.

Location	Phase	Mitigation Item ID <sup>1</sup>	Mitigation
			<ul style="list-style-type: none"> <li>▪ Minimise excavation of habitat as much as practicably possible, and avoid repeated tracking over the habitat, i.e. keeping the disturbance corridor as minimal as possible (WE20)</li> <li>▪ Consideration of introducing a series of pipes, wrapped in a geotextile at the base of the subbase to maintain hydrological connectivity through the access track (WE21)</li> <li>▪ Avoidance of discharging construction runoff into habitat (WE22)</li> <li>▪ Ensuring appropriate mitigation is employed across the area of habitat being crossed (and associated with the culvert crossing). Mitigation such as the installation of splashguards along the edge of the access track to avoid material / silt laden water running off the track and smothering the habitat (WE23).</li> </ul>
<b>Private Water Supplies</b>			
PWS3-8, PWS3-14, PWS3-15, PWS3-16	Enabling Works, Construction, Operational and Decommissioning	WE25 to WE27	<ul style="list-style-type: none"> <li>▪ Site visit and landowner meeting to confirm location and nature of source and associated infrastructure (WE25)</li> <li>▪ Monitoring of flow and quality during the proposed work (WE26)</li> <li>▪ Replacement water supply (temporary or permanent) if indicated by monitoring. Repair or replacement of associated infrastructure if required (WE27).</li> </ul>
PWS3-1, PWS3-2, PWS3-3, PWS3-4, PWS3-7, PWS3-12, PWS3-13	Enabling Works, Construction, Operational and Decommissioning	WE25	<ul style="list-style-type: none"> <li>▪ Site visit and landowner meeting to confirm location and nature of source and associated infrastructure (WE25)</li> <li>▪ None required at present, pending confirmation from site visit</li> </ul>
<b>Watercourses</b>			
Surface water feature – Unnamed Watercourse 385	Enabling Works and Construction	WE28	<ul style="list-style-type: none"> <li>▪ Discharge of (treated) construction discharge to watercourse (WE28).</li> </ul>
<b>GWDTEs</b>			

Location	Phase	Mitigation Item ID <sup>1</sup>	Mitigation
Lower House Cottage	Enabling Works and Construction	WE29-WE35	<p>Mitigation measures to increase the likelihood of recovery of the GWDTE:</p> <ul style="list-style-type: none"> <li>▪ Stagger topsoil-stripping activities, i.e. smaller sections at a time rather than the whole compound footprint (WE29)</li> <li>▪ Monitor weather forecasts, including rainfall / flood warnings and alerts (WE30)</li> <li>▪ Monitor suspended solids concentrations in the groundwater monitoring network pre, during and post-construction (WE31)</li> <li>▪ Set trigger levels for suspended solids concentrations (WE32)</li> <li>▪ Reduce dewatering durations (WE33)</li> <li>▪ Minimise footprint of topsoil stripping and vegetation clearance wherever possible (WE34)</li> <li>▪ Avoidance of topsoil stripping in the Lower Houses Compound immediately upgradient of the site, and any activity that would have a significant impact on habitats within Lower House Cottage (WE35).</li> </ul>
Gamble Hole Farm Pasture	Enabling Works and Construction	WE29-WE39	<ul style="list-style-type: none"> <li>▪ Mitigation measures to increase the likelihood of recovery of the GWDTE as above (WE29 – WE34)</li> <li>▪ Exploring opportunities for hydro-ecological compensation to offset short and long-term impacts to habitats at Gamble Hole Farm Pasture (WE36)</li> <li>▪ Minimising topsoil stripping in the Newton-in-Bowland Compound, and any activity that would have a direct impact on habitats within Gamble Hole Farm Pasture (WE35)</li> <li>▪ Undertake a feasibility assessment for bridging the access road (associated with the Newton-in-Bowland Compound) over the Gamble Hole Farm Pasture site (WE37)</li> <li>▪ Spreading the load of heavy vehicles and plant to reduce compaction effects associated with the Newton-in-Bowland Compound access area (WE38)</li> <li>▪ Clay bunds to be used to prevent backfilled open-cut trenches from acting as a groundwater drain within the Newton-in-Bowland Compound (WE39).</li> </ul>
The Coach House	Enabling Works and Construction	WE29-WE35	<ul style="list-style-type: none"> <li>▪ Mitigation measures to increase the likelihood of recovery of the GWDTE as above (WE29 – WE34)</li> <li>▪ Avoidance of topsoil stripping in the Newton-in-Bowland Compound immediately upgradient of the site, and any activity that would have a significant impact on habitats within The Coach House (WE35).</li> </ul>
River Hodder North	Enabling Works and Construction	WE29-WE35 and WE38	<ul style="list-style-type: none"> <li>▪ Mitigation measures to increase the likelihood of recovery of the GWDTE as above (WE29 – WE34)</li> <li>▪ Minimising topsoil stripping in the Newton-in-Bowland Compound access area, and any activity that would have a direct impact on habitats within River Hodder North (WE35)</li> </ul>



Location	Phase	Mitigation Item ID <sup>1</sup>	Mitigation
			<ul style="list-style-type: none"> <li>Spreading the load of heavy vehicles and plant to reduce compaction effects associated with the Newton-in-Bowland Compound access area (WE38).</li> </ul>
Proposed Ribble Crossing (Volume 6)	Enabling Works, Construction, Commissioning and Decommissioning	WE-RC1 to WE-RC4	<p><b>Fluvial Geomorphology</b></p> <p>To mitigate the impact on fluvial geomorphology from the Proposed Ribble Crossing the following essential mitigation would be required:</p> <ul style="list-style-type: none"> <li>Where necessary reinstate natural bed features to counteract smothering of features by fine sediment during the enabling, construction and decommissioning phases on the River Ribble, Coplow Brook and Greg Sike (WE-RC1)</li> <li>Use a biodegradable geotextile on the banks to allow for vegetation re-establishment along the upper and mid-banks and to aid bank re-stabilisation during reinstatement on the River Ribble, Coplow Brook and Greg Sike (WE-RC2)</li> <li>Ensure riparian vegetation re-establishment is prioritised during reinstatement works on the River Ribble, Coplow Brook and Greg Sike to minimise the risk of bank destabilisation (WE-RC3)</li> <li>Reinstatement work to be supervised by a geomorphologist or Environmental Clerk of Works with experience of channel restoration. This would be of particular importance where bridge crossings would be removed which could result in bank destabilisation on Coplow Brook and Greg Sike, and where sediment augmentation is necessary (WE-RC4).</li> </ul>
		WE-RC5	<p><b>Groundwater</b></p> <ul style="list-style-type: none"> <li>To mitigate the impact on bedrock and alluvial aquifers a piling risk assessment would be carried out to assess these potential impacts and identify mitigation measures (if required) during detailed design of the Proposed Ribble Crossing (WE-RC5).</li> </ul>

## 4. Flood Risk

**Table 1.3: Flood Risk Schedule of Mitigation**

Location	Phase	Mitigation Item ID	Mitigation
<i>The essential mitigation measures listed below are additional to embedded mitigation forming part of the design, and good practice measures as set out in the CCoP</i>			
Commissioning outfall into Cod Gill	Enabling Works and Construction	<b>FR1 and FR2</b>	<ul style="list-style-type: none"> <li>Detailed analysis of the hydrology in the receiving watercourse (<b>FR1</b>).</li> <li>Management of discharge rates to restrict discharges during high water levels in the receiving watercourse (<b>FR2</b>).</li> </ul>
Temporary River Hodder crossing	Enabling Works and Construction	<b>FR3</b>	<ul style="list-style-type: none"> <li>Landowner agreements to manage any potential disruption and to compensate for any losses (<b>FR3</b>).</li> </ul>
Proposed Ribble Crossings (Volume 6)	Enabling Works and Construction	<b>FR-RC1</b>	<ul style="list-style-type: none"> <li>The first stage to mitigating these impacts will be to undertake hydraulic modelling to confirm the baseline flood risk. This will inform the optimisation of the design to reduce the impacts on flood risk (<b>FR-RC1</b>). If, following design optimisation impacts on flood risk remain, additional mitigation options would be assessed.</li> </ul>

## 5. Ecology

**Table 1.4: Ecology Schedule of Mitigation**

Location	Phase	Mitigation Item ID	Mitigation
<p><i>The essential mitigation measures listed below are additional to embedded mitigation forming part of the design, and good practice measures as set out in the CCoP 'EA' references relate to aquatic ecology, and 'ET' references relate to terrestrial ecology.</i></p>			
<p>Newton-in-Bowland Compound</p>	<p>Enabling and Construction Phases</p>	<p><b>ET1 to ET8</b></p>	<p>Avoidance, mitigation and compensation measures in relation to impacts on Gamble Hole Farm Pasture BHS is to be agreed with the LPA and relevant statutory consultees and would likely include the following:</p> <ul style="list-style-type: none"> <li>▪ Topsoil stripping would be reduced to a bare minimum, with all soil storage and plant storage outside of the designation. <b>(ET1)</b></li> <li>▪ With the exception of the road crossing location, a buffer of a minimum of 10 m would be maintained around the Gamble Hole Farm Pastures BHS and the important wetland habitat surrounding this site. Within this buffer no topsoil stripping or other groundworks, vehicle or pedestrian access would be permitted and no materials or plant stored. The area would be clearly demarcated to ensure that the buffer is not accessed. <b>(ET2)</b></li> <li>▪ Fen habitats to be removed for the temporary road would be cut as turves and laid in areas of lower species richness within the BHS, but of suitable conditions. <b>(ET3)</b></li> <li>▪ Any marsh helleborine present or any other important plant species identified during pre-commencement surveys would be plug planted in suitable unaffected habitat in the nearby area. <b>(ET4)</b></li> <li>▪ Water connectivity would be maintained between fen habitat areas up and downstream of the road crossing. <b>(ET5)</b></li> <li>▪ Measures would be implemented to prevent pollution of the BHS from construction traffic using the temporary road through the BHS. <b>(ET6)</b></li> <li>▪ Procedures would be implemented to protect the BHS from potential accidental pollution events as a result of works within the compound uphill of the BHS. <b>(ET7)</b></li> <li>▪ Retained BHS habitats within the red line planning boundary and under United Utilities control will be subject to positive management during the enabling and construction phases. <b>(ET8)</b></li> </ul>
<p>Newton in Bowland compound</p>	<p>Enabling works, Construction and</p>	<p><b>EA1</b></p>	<p>No in-river works or high vibration (sheet piling) activities would be undertaken in or immediately adjacent to watercourses during the main salmonid breeding/ upstream migration season between October and May inclusive <b>(EA1)</b>.</p>

Location	Phase	Mitigation Item ID	Mitigation
			<p>Additional mitigation measures to reduce impacts to geomorphology, surface water quality, and sediment management are identified in Water Environment Chapter 7, these measures also provide mitigation for potential impacts to aquatic receptors of the River Hodder and tributaries, and River Hodder BHS</p>
<p>GWDTE (outside BHS boundaries) at Newton-in-Bowland Compound and Lower Houses Compound</p>	<p>Enabling and Construction Phases</p>	<p><b>ET9 to ET15</b></p>	<p>Additional site-specific groundwater mitigation measures for GWDTE habitats within and surrounding the Compounds would include the following:</p> <ul style="list-style-type: none"> <li>▪ Avoiding soil stripping at the areas of swamp and woodland associated with The Coach House GWDTE site located to the west of the Gamble Hole Farm Pastures BHS and at the north eastern edge of the Lower Houses Compound near to the area of marshy grassland <b>(ET9)</b></li> <li>▪ Reducing area of topsoil stripping at the River Hodder North GWDTE site located within the construction access area to the east of the Newton-in-Bowland Compound <b>(ET10)</b></li> <li>▪ Careful consideration in the selection of the backfilling material(s). <b>(ET11)</b></li> <li>▪ Staggering topsoil stripping activities. <b>(ET12)</b></li> <li>▪ Keeping dewatering durations to the absolute minimum. <b>(ET13)</b></li> <li>▪ Works associated with the access routes that pass through the fen and basic flush habitats would be restricted to a narrow corridor and all materials and plant would be stored outside of these locations. <b>(ET14)</b></li> </ul> <p>During soil stripping along the haul road to the Newton-in-Bowland Compound, turfs of fen and basic flush habitat would be translocation and / or seed collected for habitat creation or enhancement on retained land under United Utilities control. <b>(ET15)</b></p>
<p>Lower Houses Compound</p>	<p>Enabling works, Construction and Commissioning Phases</p>	<p><b>EA2</b></p>	<p>No in-river work would be undertaken in tributaries of the River Hindburn during the main salmonid breeding season between October and May inclusive. <b>(EA2)</b></p> <p>Additional mitigation measures to reduce impacts to geomorphology, surface water quality, and sediment management are identified in Water Environment Chapter 7, these measures also provide mitigation for potential impacts to aquatic receptors of the River Hindburn and tributaries, and River Hindburn BHS</p>

Location	Phase	Mitigation Item ID	Mitigation
Scheme-wide / Generic	Enabling and Construction Phases	<b>ET16 to ET20</b>	<p>Additional site-specific mitigation approaches required for impacts on habitats:</p> <ul style="list-style-type: none"> <li>Temporary construction routes would be finalised to avoid or minimise impacts to hedgerows, trees, watercourses and other sensitive features where practically possible by marking out and micro-siting construction activities with the Ecological Clerk of Works (ECoW) prior to works commencing (<b>ET16</b>).</li> <li>To protect retained habitats and features, working areas would be segregated from adjacent habitats using appropriate fencing or other appropriate form of demarcation with informative warning signs attached (<b>ET17</b>).</li> <li>Locations for stockpiling cut vegetation arisings (e.g. logs, brash, grass) would be discussed and agreed in advance with the ECoW to avoid degradation of existing valued habitats (<b>ET18</b>).</li> <li>Topsoil and subsoil would be conserved where possible and be stored separately (top and sub soils kept separate for each habitat type) for subsequent re-use for habitat reinstatement (<b>ET19</b>).</li> </ul>
Scheme-wide / Generic	Commissioning Phase	<b>ET20 to ET22</b>	<p>Habitat re-instatement and restoration to be implemented delivering at least like for like (quantity and quality) for all valued habitats and habitat features requiring permanent or temporary removal.</p> <ul style="list-style-type: none"> <li>Methods and timings for habitat reinstatement and creation / enhancement would vary according to the target habitat. (<b>ET20</b>)</li> <li>Planting plans would be produced utilising locally appropriate / native species, matching existing botanical diversity and seeking, where possible, to increase diversity would be used. (<b>ET21</b>)</li> <li>Dry stone wall reinstatement using original stones, thus preserving any lichen or bryophyte interest. (<b>ET22</b>)</li> </ul>
Newton-in-Bowland Compound	Commissioning Phase	<b>ET23</b>	<p>Habitats created from translocated turfs / seeds collected from fen and basic flush habitat along the haul road to the Newton-in-Bowland Compound would be entered into a 30 year management plan.</p>
Scheme-wide / Generic	N/A	<b>ET24</b>	<p>A Biodiversity Net Gain strategy would be implemented to offset areas of permanent habitat loss or habitat change and also to provide 10% net gain in biodiversity utilising opportunities for advanced, additional and / or enhanced habitat creation on offsite locations within United Utilities ownership. (<b>ET24</b>).</p>
Proposed Ribble Crossings (Volume 6)	Enabling works, construction, and decommissioning phases	<b>EA-RC1 – EA-RC4</b>	<p>In locations identified as important for salmonid fish, the River Ribble and tributaries, no in-river work would be undertaken during the main breeding season between October and May inclusive (<b>EA-RC1</b>).</p> <p>Piling, which would produce high noise and vibration levels, should not be undertaken during the peak salmon migration period and breeding season October to May inclusive. (<b>EA-RC2</b>)</p>

Location	Phase	Mitigation Item ID	Mitigation
			<p>Piling and any high noise and vibration works in and adjacent to rivers should only be undertaken during daylight to reduce the potential for disturbance of fish migration and allow passage of fish species during the night-time without hinderance or additional stress. (EA-RC3)</p> <p>Pre commencement monitoring surveys are required to determine the level of use of the potential otter holts and couches identified on the south bank of the River Ribble (EA-RC4)</p>

## 6. Cultural Heritage

**Table 1.5: Cultural Heritage Schedule of Mitigation**

Location	Phase	Mitigation Item ID	Mitigation
<i>The essential mitigation measures listed below are additional to embedded mitigation forming part of the design, and good practice measures as set out in the CCoP</i>			
Newton-in-Bowland Compound and Lower Houses Compound	Prior to Enabling Works	<b>CH1 with potential for CH2-CH4</b>	<p>Prior to the enabling works, archaeological trial trenching would be undertaken in line with the Chartered Institute for Archaeologists (CIfA) <i>Standard and guidance for archaeological field evaluation</i> (CIfA, 2020). This would target both known archaeological remains and areas of archaeological potential for unknown remains arising from the geophysical survey undertaken from 16 - 19 September 2020 on the Proposed Newton-in-Bowland Compound (Appendix 10.3 in Volume 4) and undertaken from 12 – 13 April 2021 on the Proposed Lower Houses Compound (Appendix 10.4 in Volume 4) (<b>CH1</b>).</p> <p>Following archaeological trial trenching (<b>CH1</b>), archaeological mitigation to make a permanent record of any affected previously unknown archaeological remains could include:</p> <ul style="list-style-type: none"> <li>▪ Detailed archaeological excavation (<b>CH2</b>)</li> <li>▪ Strip, map and sample (<b>CH3</b>)</li> <li>▪ Archaeological recording during construction ('watching brief') (<b>CH4</b>).</li> </ul>
Proposed Ribble Crossings (Volume 6)	Prior to Enabling Works	<b>CH-RC1 with potential for CH-RC2 to CH-RC5</b>	<p>Prior to the enabling works, once details of the construction easement within the planning application boundary have been finalised, a staged programme of archaeological investigation would be undertaken. This may comprise an archaeological geophysical survey undertaken in line with the Chartered Institute for Archaeologists (CIfA) <i>Standard and guidance for archaeological geophysical survey</i> (CIfA, 2020a<sup>2</sup>) (<b>CH-RC1</b>). Following on from the geophysical survey (Mitigation Item CH1) archaeological trial trenching may be undertaken in line with the CIfA <i>Standard and guidance for archaeological field evaluation</i> (CIfA, 2020b<sup>3</sup>) (<b>CH-RC2</b>). This would target both known archaeological remains, and areas of archaeological potential for unknown remains arising from the geophysical survey (<b>CH-RC1</b>).</p> <p>Following archaeological trial trenching (<b>CH-RC2</b>), archaeological mitigation to make a permanent record of any affected previously unknown archaeological remains could include:</p> <ul style="list-style-type: none"> <li>▪ Detailed archaeological excavation (<b>CH-RC3</b>)</li> </ul>

<sup>2</sup> Chartered Institute for Archaeologists (2020a) *Standard and guidance for archaeological geophysical survey* [Online] Available from: [https://www.archaeologists.net/sites/default/files/CIfAS%26GGeophysics\\_3.pdf](https://www.archaeologists.net/sites/default/files/CIfAS%26GGeophysics_3.pdf) [Accessed April 2021]

<sup>3</sup> Chartered Institute for Archaeologists (2020b) *Standard and guidance for archaeological field evaluation* [Online] Available from: [https://www.archaeologists.net/sites/default/files/CIfAS%26GFieldevaluation\\_3.pdf](https://www.archaeologists.net/sites/default/files/CIfAS%26GFieldevaluation_3.pdf) [Accessed April 2021]

Location	Phase	Mitigation Item ID	Mitigation
			<ul style="list-style-type: none"> <li>▪ Strip, map and sample (CH-RC4)</li> <li>▪ Archaeological recording during construction ('watching brief') (CH-RC5).</li> </ul>
		CH-RC6	Prior to the enabling works and trial trenching (CH-RC2) a geoarchaeological and palaeoenvironmental assessment would be undertaken to include North of Bradford Bridge (7014) paleochannel. This may include a review of existing geotechnical information followed by a programme of hand auger sampling, assessment, analysis and reporting undertaken in line with Historic England's Geoarchaeology Using Earth Sciences to Understand the Archaeological Record (Historic England, 2015 <sup>4</sup> ) (CH-RC6).

<sup>4</sup> Historic England (2015) *Geoarchaeology Using Earth Sciences to Understand the Archaeological Record* [Online] Available from: <https://historicengland.org.uk/images-books/publications/geoarchaeology-earth-sciences-to-understand-archaeological-record/heag067-geoarchaeology/> [Accessed April 2021]



## 7. Soils, Geology and Land Quality

Table 1.6: Soils, Geology and Land Quality Schedule of Mitigation

Location	Phase	Mitigation Item ID	Mitigation
<i>Embedded mitigation forming part of the design and good practice measures set out in the CCoP are considered to provide appropriate mitigation for potential effects on Soils, Geology and Land Quality. No further topic-specific essential mitigation is therefore required.</i>			

## 8. Materials and Waste

Table 1.7: Materials and Waste Schedule of Mitigation

Waste type	Phase	Mitigation Item ID	Mitigation
<i>Embedded mitigation forming part of the design and good practice measures set out in the CCoP are considered to provide appropriate mitigation for potential effects on Materials and Waste. No further topic-specific essential mitigation is therefore required.</i>			

## 9. Public Access and Recreation

Table 1.8: Public Access and Recreation Schedule of Mitigation

Location	Phase	Mitigation Item ID	Mitigation
<i>Embedded mitigation forming part of the design and good practice measures set out in the CCoP are considered to provide appropriate mitigation for potential effects on Public Access and Recreation. No further topic-specific essential mitigation is therefore required.</i>			

## 10. Communities and Health

Table 1.9: Communities and Health Schedule of Mitigation

Location	Phase	Mitigation Item ID	Mitigation
<i>Embedded mitigation forming part of the design and good practice measures set out in the CCoP are considered to provide appropriate mitigation for potential effects on Communities and Health. No further topic-specific essential mitigation is therefore required.</i>			

## 11. Major Accidents

Table 1.10: Major Accidents Schedule of Mitigation

Location	Phase	Mitigation Item ID	Mitigation
<i>The essential mitigation measures listed below are additional to embedded mitigation forming part of the design, and good practice measures as set out in the CCoP</i>			
Newton-in-Bowland Compound and Lower Houses Compound	Enabling Works, Construction and Commissioning	<b>MA1</b>	The contractor will seek practicable measures through selection of plant and equipment and/or methods of operation to reduce the maximum diesel fuel storage on site ( <b>MA1</b> ).
	Enabling Works, Construction and Commissioning	<b>MA2</b>	Estimated fuel storage requirements will be defined during detailed design together with anticipated controls to ensure that risk of a pollution incident is as low as reasonably practicable. These will be submitted and agreed with the Environment Agency ( <b>MA2</b> ).
Proposed Ribble Crossing	Enabling Works	<b>MA3</b>	A design solution would be developed to enable the Proposed Ribble Crossing to be constructed safely over the existing ethylene pipeline without compromising the safe day-to-day operation of the infrastructure. The essential mitigation objective is to develop a design solution and formally agree this with the pipeline operator ( <b>Mitigation Item MA3</b> ). Once a solution has been formally agreed with the pipeline operator this would become embedded mitigation as it would be delivered as an integral part of the engineering design of the dedicated haulage route.
Proposed Ribble Crossing, Park and Ride, HGV Holding Area (Ribblesdale Cement Works)	Enabling Works, Construction and Operation	<b>MA4</b>	Although it is not anticipated that the Johnson Matthey site in Clitheroe would pose any specific risks to construction, operation or decommissioning of the Proposed Ribble Crossing (Volume 5) or park and rise and HGV holding areas, United Utilities will engage with the site operators to exchange relevant construction and operational data and identify any necessary action plans. This will enable United Utilities to either validate the current working assumption that no embedded mitigation would be required to mitigate risks from the industrial facility ( <b>Mitigation Item MA4</b> ), or confirm next steps

## 12. Transport Planning

**Table 1.11: Transport Planning Schedule of Mitigation**

Location	Phase	Mitigation Item ID	Mitigation
<p><i>Embedded mitigation forming part of the design and good practice measures set out in the CCoP are considered to provide appropriate mitigation for potential effects on Transport Planning. No further topic-specific essential mitigation is therefore required.</i></p>			
<p>A Construction Traffic Management Plan (CTMP) is necessary to minimise the likely effects of HGV traffic during the construction of the Proposed Bowland Section. It provides the framework for the management of construction traffic to the proposed compounds and mine grouting areas. It outlines mitigation embedded in the design of the Proposed Bowland Section and details additional mitigation measures prescribed in the ES for each section covering the following aspects:</p> <ul style="list-style-type: none"> <li>▪ Proposed vehicle routing</li> <li>▪ Proposed peak traffic flows</li> <li>▪ Other road users</li> <li>▪ Traffic management.</li> </ul>			

### 13. Noise and Vibration

**Table 1.12: Noise and Vibration Schedule of Mitigation**

Location	Phase	Mitigation Item ID	Mitigation
<p><i>Embedded mitigation forming part of the design and good practice measures set out in the CCoP are considered to provide appropriate mitigation for potential effects on Noise and Vibration. No further topic-specific essential mitigation is therefore required.</i></p>			
<p><i>Appendix 17.2 presents available information on technical knowledge and reasonable assumptions regarding likely activities, typical plant and equipment, and anticipated timing and durations. This provides a robust basis for construction noise and vibration assessment, which considers the worst-case construction phases in terms of potential for effects to occur. Therefore, the Noise and Vibration assessment is made incorporating the Construction Assessment Approach &amp; Scenarios in Appendix 17.2 as part of embedded mitigation.</i></p>			
Newton-in-Bowland Compound and Lower Houses Compound	Enabling Works and Construction	<b>NV1</b>	Temporary barriers during the use of rock breakers (and other tools / equipment that may generate high levels of noise emission) when used in close proximity to Fober Farm and Lower Houses Farm ( <b>NV1</b> ).
Newton-in-Bowland Compound	Enabling Works and Construction	<b>NV2</b>	Blasting of hard rock would only be undertaken where alternative methods are not reasonably practicable. Where blasting is required (e.g. the Newton-in-Bowland portal), and prior to the blasting being undertaken, an assessment would be carried out by the appointed contractor to determine the predicted vibration and air overpressure levels at the nearest sensitive receptors following the guidance contained in BS 6472-2 <sup>5</sup> . The assessment approach, measurements and controls would be agreed with the local planning authority. Further details are available in Appendix 17.4 of Volume 4 ( <b>NV2</b> ).
Proposed Ribble Crossings (Volume 6 of the ES)	Enabling Works and Construction	<b>NV-RC1 to NV-RC4</b>	<p>Specific noise control measures that would be used by the contractor would comprise:</p> <ul style="list-style-type: none"> <li>Temporary noise hoardings/barriers installed around work sites prior to works commencing. A resulting conservative 5 dB reduction has been assumed at all locations. More substantial tall noise barriers (providing 10 dB noise reduction) would be installed between the compound and laydown area at the northern end of the route and Waddington and West Bradford C of E Primary School, to interrupt the line of sight from the school buildings to the construction activities (<b>NV-RC1</b>)</li> </ul>

<sup>5</sup> British Standard 6472-2: 2008 - Guide to evaluation of human exposure to vibration in buildings; Part 2 Blast-induced vibration

Location	Phase	Mitigation Item ID	Mitigation
			<ul style="list-style-type: none"> <li>▪ Where practicable, works at the areas closest to the school would be programmed around school hours, and to occur during school holidays where this is practicable. It is noted that the construction of the route itself could occur from late June to late August. If practicable, construction could be programmed to occur during the school holidays. If practicable the noisiest items of plant would be programmed for use outside of school hours, particularly the road sweeper and larger excavators <b>(NV-RC2)</b></li> <li>▪ During the enabling works, smaller, lower noise emitting (70 dBA @ 10 m), excavators would be used to establish the site compound at the north end of the route, this has been included within the assessment presented <b>(NV-RC3)</b></li> <li>▪ Pneumatic hand tools would be fitted with efficient silencers <b>(NV-RC4)</b>.</li> </ul>



## 14. Air Quality and Climate Change

Table 1.13: Air Quality Schedule of Mitigation

Location	Phase	Mitigation Item ID	Mitigation
<i>Embedded mitigation forming part of the design and good practice measures set out in the CCoP are considered to provide appropriate mitigation for potential effects on Air Quality and Climate Change. No further topic-specific essential mitigation is therefore required.</i>			