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Haweswater Aqueduct Resilience Programme - Proposed Marl Hill Section

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Proposed Ribble Crossing

Chapter 9B: Aquatic Ecology

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Water for the North West

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Ricardo Energy & Environment

Bright Building,

1st Floor, Manchester Science Park,

Pencroft Way,

Manchester,

M15 6GZ

Website: ee.ricardo.com

Tel: Tel: +44 (0) 1235 753000

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9. Ecology – 9B Aquatic Ecology

9.1 Introduction

1) This chapter presents the approach and findings of the ecological impact assessment (EcIA) of potential impacts on nature conservation features arising from the Proposed Ribble Crossing on Terrestrial Ecology. Effects on terrestrial ecology are assessed within Chapter 9A (document reference: RVBC-MH-RC-ES-009-02). This is a supplemental report to the main Aquatic Ecology ES Chapter for the Proposed Marl Hill Section. This Environmental Statement has been produced separately to the main document because the Proposed Ribble Crossing was developed later in the scheme design process.

2) The legislation and planning policies relevant to Aquatic Ecology are considered in Section 9B.3 of the Proposed Marl Hill Section ES (document reference: RVBC-MH-ES-009-02).

3) This chapter begins by outlining the study area and methods for the assessment. The nature, value and sensitivity of the existing baseline environment are then identified before an assessment is made of the potential effects on Aquatic Ecology from the Proposed Ribble Crossing. Mitigation measures have been proposed to avoid, reduce, or offset any potential effects and these embedded mitigation and best practice measures have been taken into account in the assessment, which are mentioned in Chapter 3: Design Evolution & Development Description (document reference: RVBC-MH-RC-ES-003). Additional mitigation measures are further outlined in Section 9B.7.

4) This assessment covers the Proposed Ribble Crossing, located in Lancashire between National Grid References SD 74507 43827 and SD 73354 44003. The study area for the Proposed Ribble Crossing is north of Clitheroe and lies between West Bradford Road / Clitheroe Road and West Bradford Road / Waddington Road, with the B6478 to the west.

5) The construction of the Proposed Marl Hill Section would require access for vehicles to and from the Bonstone and Braddup Compounds via the existing highway network from the A59. The Proposed Ribble Crossing is one of two options to allow the movement of construction vehicles around the Clitheroe area. A full description of the proposed construction traffic routes and the consideration of alternatives is provided in Chapter 3 (document reference: RVBC-MH-RC-ES-003), a description of the other option is provided in the main ES and details of highways improvements (some of which are required for both options) are provided in document reference: RVBC-MH-ES-V5-P2-001).

6) The Proposed Ribble Crossing comprises a temporary road to link West Bradford Road and Pimlico link road that would avoid vehicle movements through Clitheroe, Chatburn, West Bradford and would avoid the centre of the village of Waddington. This route would still require the movement of vehicles through the north of Waddington between West Bradford Road and Slaidburn Road.

7) The road would be a two-lane carriageway 7.7 m wide and 1450 m in length. The road would be suitable for heavy duty use and would be surfaced with a tarmac construction based on a stone aggregate foundation. The road would be temporary and would be in place for the duration of the enabling, construction and commissioning phases of the Proposed Marl Hill Section. The road would be fully removed and the land reinstated on completion of the main works. The road would be reserved for the use of construction traffic. Public access to the road would be prohibited through the provision of vehicle barriers at either end of the road.

8) A temporary bridge crossing of the River Ribble would be incorporated in the road. The bridge would be a Bailey bridge type clear span construction supported on columns either side of the river, of approximately 70 m in length. The bridge would extend over the adjacent flood plain with additional bridge sections either side of the river bridge. Overall, the bridge would be approximately 175 m in length. Earthwork abutments would be required either side of the bridge.

9) With the exception of the bridge the road would be constructed to suit the existing topography. Cuttings and embankments would be kept to a minimum and would only be made to create a suitable profile for the road,

10) Drainage would be provided to keep the road surface and foundations free from water. A drainage system would be put in place that would attenuate and treat the water prior to discharge into the River Ribble at a rate not exceeding greenfield run off.

11) Temporary laydown areas would be established for the construction and removal of the road, but these would not be present when the road is in use.

12) The construction of the road would require removal of topsoil and sub-surface material where required. These materials would be stockpiled adjacent to the road at intervals and they would be re-used to reinstate the land once the road is removed.

9.2 Scoping and Consultations

9.2.1 Scoping

13) Details of scoping are provided in the main Marlhill ES which confirms the Proposed Ribble Crossing was included in the EIA Scoping Addendum in February 2021. Further details regarding scoping and consultation are presented at in Section 4.3 of Chapter 4 EIA methodology (RVBC-MH-ES-004).

9.2.2 Consultation

14) During the course of this assessment, consultation has taken place with relevant statutory and non-statutory consultees, stakeholders and third parties, through both correspondence and face-to-face meetings. This has been summarised in Appendix 4.1 (document reference: RVBC-MH-TA-004).

9.3 Key Legislation and Guidance

15) Please refer to Section 9.3 of the main ES (RVBC-MH-ES-009-02) for details on relevant legislation and guidance.

9.4 Assessment Methodology and Assessment Criteria

9.4.1 Assessment Methodology

16) With the exception of section 9.4.2 Establishing the Baseline, which is provided in the following text and table, please refer to Section 9.4 of the main ES (RVBC-MH-ES-009-02) for details on assessment methods.

9.4.2 Establishing the Baseline

17) The desk study and field survey methodologies and results of the ecological surveys undertaken to provide baseline data in support of the aquatic ecology EcIA are provided within Appendices 9B.1 and 9B.2:

- Appendix 9B.1: HARP Proposed Ribble Crossing Section - Aquatic ecology (WFD communities and white clawed crayfish) baseline information (document reference: RVBC-MH-RC-TA-009-02-01)
- Appendix 9B.2: HARP Proposed Ribble Crossing – Protected species baseline information (document reference: RVBC-MH-RC-TA-009-02-02)

9.4.2.1 Study Area

18) A study area has been defined for the aquatic ecology EcIA assessment as a 500 m buffer around all project development envelopes and informed by the results of the water environment assessment presented in Chapter 7 of the Environmental Statement (document reference: RVBC-MH-RC-ES-007). This allowed for an understanding of the potential direct and/or indirect impacts of the activities associated with the Proposed Ribble Crossing.

19) One WFD surface water body River Ribble – downstream Stock Beck (GB112071065612) was identified in the study area. In addition, any WFD water bodies which lay immediately up and downstream of the study area were also considered for assessment, where required, to ensure that potentially wider reaching impacts of the Proposed Ribble Crossing were considered.

20) The watercourses within the study area, the associated WFD waterbody, and the component of the Proposed Ribble Crossing with hydrological connectivity to the scheme components are shown in

21) Table 9.1.

Table 9.1: Watercourse summary and associated scheme component.

Watercourse	Watercourse ID	WFD waterbody	Relevant scheme component
River Ribble	W2325	River Ribble – downstream Stock Beck (GB112071065612)	Temporary road crossing, within 10 m of two construction laydown areas. Receiving discharge from temporary roads, through four outfalls.
Greg Sike	W2321		Temporary road crossing.
Coplow Brook	W2349		Temporary road crossing, within 5 m of temporary road at several locations, within 10 m of two construction laydown areas.
Unnamed Watercourse 2097	W2348		Temporary road crossing.

9.4.3 Assumptions and Limitations

22) Constraints and or limitation to survey methodology and establishment of the baseline of specific ecological receptors (including desk study data) are identified in Appendices 9B.1 (document reference: RVBC-MH-RC-TA-009-02-01) and 9B.2 (document reference: RVBC-MH-RC-TA-009-02-02).

23) Surveys for otters and the white clawed crayfish and water vole habitat suitability surveys were completed within appropriate seasons over appropriate periods in accordance with industry standards for the specific survey. Nevertheless, the surveys only identify habitats and species present at the time of survey. Additionally, most species investigated are mobile and move into and out of areas over time. For these reasons a precautionary approach has been taken in the prediction of impacts. Where there is any doubt, except where specifically noted, species are assumed present and the impact is given the higher level of significance.

9.5 Baseline Conditions

9.5.1 Information Sources

24) Information from the following sources have been used to inform this EcIA for the Proposed Ribble Crossing:

25) Haweswater Aqueduct Resilience Programme – Proposed Marl Hill– EIA Scoping Report (Jacobs, October 2019)

26) Haweswater Aqueduct Resilience Programme – Proposed Marl Hill– EIA Scoping Addendum (Jacobs, February 2021)

- Lancashire Environmental Records Network (LERN), including pre-existing records of aquatic species within 2 km of the Proposed Marlhill Section
- Ecological datasets for the period 2009 – 2019 were obtained via the Environment Agency Ecology and Fish Data Explorer website
- Environment Agency Catchment Data Explorer to determine the extent and condition of WFD waterbodies and catchments.

- North West River Basin Management Plan (Environment Agency, 2018)
- Natural England habitat and species inventories including:
  - land-based statutory designated wildlife sites in England, including Ramsar sites, proposed Ramsar sites, Special Areas of Conservation (SAC), Possible SACs, Special Protection Areas (SPA), Potential SPAs, Sites of Special Scientific Interest (SSSI), SSSI units, SSSI Impact Risk Zones (IRZ), National Nature Reserves (NNR) and Local Nature Reserves (LNR)
  - European Protected Species Licences (EPSL)
- Ecology Survey Data Reports produced by Ricardo Energy and Environment for the Proposed Ribble Crossing Environmental Statement:
  - Appendix 9B.1: HARP Ribble Crossing - Aquatic ecology (WFD communities and white clawed crayfish) baseline information (document reference: RVBC-MH-RC-TA-009-02-01)
  - Appendix 9B.2: HARP Proposed Ribble Crossing – Protected species survey (document reference: RVBC-MH-RC-TA-009-02-02)

27) The desk study and field survey methodologies are presented in full in Appendices 9B.1 and 9B.2 for WFD communities and white clawed crayfish (*Austropotamobius pallipes*), otter (*Lutra lutra*), and water vole (*Arvicola amphibio*us).

9.5.1.1 Desk study methodology

28) The MAGIC website mapping tool[1] was used to help identify any statutory or non-statutory designated sites for freshwater fish, macrophyte and aquatic macroinvertebrate species within the Proposed Ribble Crossing study area.

29) Historic records of otter and water vole from within 2 km of the proposed scheme were requested from the local environmental records centre LERN in 2019.

30) Ecological datasets for the period 2010 – 2020 were obtained via the Environment Agency Ecology and Fish Data Explorer website[2], this data included:

- National Fish Populations Database (NFPD): Freshwater Fish Counts for all Species for all Areas and all years. NFPD consists of information collected from fisheries monitoring work on rivers and lakes. This monitoring work is undertaken by the Environment Agency.
- Data for freshwater and marine biological surveys for macroinvertebrates, diatoms and macrophytes in England. The Environment Agency undertakes freshwater and marine biological monitoring in England. Freshwater and Marine Biological Surveys England is a large dataset containing taxonomic level species data for biological surveys carried out in freshwater and marine environments. This archive is more commonly known as BIOSYS.

31) Additional data sources utilised during the desk study:

- Aerial photography (MAGIC, 2020);
- Environment Agency Catchment Data Explorer (CDE) (Environment Agency, 2021)[3];
- Designated areas (Natural England, 2021)[4]; and,
- North West River Basin Management Plan (Environment Agency, 2018);

[1] Multi-Agency Geographical Information for the Countryside (MAGIC) [Accessed May 2020] https://magic.defra.gov.uk/MagicMap.aspx. Accessed May-July 2020.
[2] Environment Agency Ecology and Fish Data Explorer website https://environment.data.gov.uk/ecology-fish/. Accessed May-July 2020.
[3] Environment Agency Catchment Data Explorer website https://environment.data.gov.uk/catchment-planning/. Accessed May-July 2020.
[4] Natural England Designated Sites View website https://designatedsites.naturalengland.org.uk/SiteSearch.aspx. Accessed May-July 2020.

9.5.1.2 Field survey methodologies

32) The desk study data, consultations, and habitat suitability assessments were used to inform the scope of further ecological surveys including the distribution of the white clawed crayfish, otter, and water vole populations within the zone of influence. Details of species-specific methodologies and the results of the surveys are summarised in **Table 9.2** and detailed in Appendices 9B.1 (document reference: RVBC-MH-RC-TA-009-02-01) and 9B.2 (document reference: RVBC-MH-RC-TA-009-02-02) to Chapter 9B of the Environmental Statement.

33) Watercourse walk-over habitat surveys were undertaken in February 2021 for watercourses within and adjacent to proposed Ribble crossing and lay down area. The walk-over habitat survey methodology was based on the Environment Agency's 'Restoration of Riverine Salmon Habitats' guidance manual (Hendry & Cragg-Hine, 1997). The Hendry & Cragg-Hine method was developed to be used to inform habitat restoration, fish survey site selection, and fish population studies. Details of the watercourse walkover methodology and the results of the surveys are summarised in Table 9.2 and detailed in Appendix 9B.1 (document reference: RVBC-MH-RC-TA-009-02-01).

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Protected Species Survey	Survey Extent	Date of Surveys
Otter	Presence/absence survey were undertaken at three watercourses with suitable habitat to support otter surrounding the proposed Ribble crossing.	February 2021
Water vole	Habitat suitability surveys were undertaken at three watercourses surrounding the proposed Ribble crossing.	February 2021
White clawed crayfish	White clawed crayfish habitat suitability surveys were undertaken at three watercourses surrounding the Proposed Ribble crossing.	February 2021
Watercourse walkover surveys	The watercourse walkover surveys were undertaken to obtain a detailed representation of the location, extent, and condition of habitat features within watercourses and the riparian zone. This was done by walking the riverbank of the selected survey stretch and entering the river when necessary. The habitats and features were present mapped. Incidental findings were also recorded during the walk-over surveys including Invasive Non-native Species (INNS), pollution sources, field boundaries, land use, and bank modifications.	February 2021

9.5.2 Designated Sites

34) There are three statutorily designated sites of national importance located within 5 km of the Proposed Ribble Crossing. As the interest features of Clitheroe Knoll Reefs SSSI (2.3 km south east of the proposals), Coplow Quarry SSSI (0.7 km south east of the proposals), and Salthill and Bellmanpark Quarries SSSI (1.3 km south east of the proposals) are geological in nature, impacts upon these SSSIs are not considered further as part of this EcIA for Aquatic Ecology.

35) No internationally important designated sites or other nationally designated sites are present within 2 km of the Proposed Ribble Crossing.

36) The Proposed Ribble Crossing falls within the IRZ from Langcliffe Cross Meadows, Field Head Meadow, Bell Sykes Meadows and Standridge Farm Pasture SSSIs. The potential impacts to this site are considered as part of the Terrestrial Ecology impact assessment in Chapter 9A (document reference: RVBC-MH-ES-009-01)

37) No NNR were identified within 2 km of the Proposed Ribble Crossing. Two LNR were identified within 2 km of the Proposed Ribble Crossing. These include Cross Hill Quarry LNR (0.2 km south of the proposals) and Salthill Quarry LNR (1.3 km southeast of the proposals). The potential impacts to these sites are considered as part of the Terrestrial Ecology impact assessment in Chapter 9A; a summary of the site features is presented at Table 9A.5 in Chapter 9A Terrestrial Ecology (document reference: RVBC-MH-ES-009-01).

38) A total of 15 Biological Heritage Sites (BHS) were identified within 2 km of the Proposed Ribble Crossing. A summary of the site features is presented at Table 9A.5 in Chapter 9A Terrestrial Ecology (document reference: RVBC-MH-ES-009-01). One BHS, River Ribble from London Road Bridge Preston, in West, to County Boundary, in East BHS (hereafter referred to as River Ribble BHS), contains aquatic ecology receptors and has been included in the Aquatic Ecology EcIA. The potential impacts to the other 14 Biological Heritage Sites and the terrestrial habitats and species in the River Ribble BHS are considered as part of the Terrestrial Ecology impact assessment in Chapter 9A (document reference: RVBC-MH-ES-009-01).

39) Two Local Geodiversity Sites were also identified within 2 km of the Proposed Ribble Crossing but as these designations are geological in nature, impacts upon these sites are not considered further as part of this EcIA for Aquatic Ecology.

40) **Table 9.3** presents the reasons for designations for the sites which support aquatic ecology receptors.

Table 9.3: Aquatic Ecology – Designated Sites

Wildlife Site	Proximity to Proposed Ribble Crossing and Site Area	Summary Features
River Ribble from London Road Bridge Preston, in West, to County Boundary, in East BHS (River Ribble BHS)	Adjacent/crossed by the proposals 298.12 ha	The site comprises the River Ribble and associated semi-natural habitats from the county boundary at Paythorne downstream to London Road Bridge, Walton-le-Dale, Preston. Throughout the length of the River Ribble the General Quality Assessment is Very Good and Good (A and B) with a localised section with the Fairy Good (C) classification. The river is important for salmon, sea trout, otter and water vole. Along the riverbanks sandy cliffs provide nesting habitat for sand martin and kingfisher, and single banks provide suitability for nesting waders such as oystercatcher, common sandpiper, little ringed-plover and ringed plover. Much of the land associated with the river comprises woodland, grassland and, locally, swamp and tall-herb communities. UK BAP Priority Habitats & Species include Lowland Mixed Woodland, Wet Woodland, Lowland Meadow, Fen, Water Vole, Otter and Reed Bunting. A single record of freshwater pearl-mussel dated 1974 came to light in 2003 for a section of the river upstream of Clitheroe.

9.5.3 Macrophytes and Diatoms

41) The Ribble Downstream Stock Beck (GB112071065612) WFD waterbody was classified as 'Good' for combined macrophytes and diatoms in 2019, Cycle 2. The available baseline macrophyte and diatom data from the Environment Agency monitoring sites in the Ribble – downstream Stock Beck WFD surface waterbody are indicative of communities associated with faster flows and subject to slightly elevated nutrient levels. The macrophyte and diatom communities are considered to be sensitive to reductions in water quality, increased nutrient and fine sediments, and decreased flow velocities.

42) Due to the absence of baseline data from the tributaries of the River Ribble (Greg Sike, Coplow Brook, and Unnamed Watercourse 2097) using a precautionary approach the macrophyte and phytobenthos communities are considered to be a comparable quality and sensitivity to reductions in water quality and flow as to the communities in the main River Ribble. However, the communities in the tributaries of the River Ribble

are considered to be of lower ecological value due to the reduced size of the watercourses and the relative population sizes they can support.

43) Further details are provided in Appendix 9B.1 (document reference: RVBC-MH-RC-TA-009-02-01).

9.5.4 Fish

44) The Environment Agency monitoring data from sites in the Ribble – Downstream Stock Beck WFD waterbody indicate the fish communities present within the watercourses within the catchment are typical of fast flowing watercourses dominated by salmonid species but in addition to a number of cyprinid species. The Ribble and tributaries surrounding the Proposed Crossing location support a number of notable and designated species including Atlantic salmon (*Salmo salar*), brown/sea trout (*Salmo trutta*), bullhead (*Cottus gobio*), and European eel (*Anguilla anguilla*). In addition to low abundances of sensitive species such as grayling (*Thymallus thymallus*), and brook lamprey (*Lampetra planeri*). The habitats present in the area surrounding the proposed crossing location contain suitable habitats for spawning Atlantic salmon, brown/sea trout, and bullhead. As a precautionary approach is assumed that these species spawn at, upstream, and downstream of the Proposed Ribble Crossing.

45) Atlantic salmon, brown trout, grayling, and bullhead have low tolerance for environmental disturbance such as reductions in water quality and increased fine sediment input. Atlantic salmon, brown/sea trout, and European eel are sensitive to barriers to movement including increased disturbance of migratory routes. The fish community supported by the River Ribble is considered to be of River Basin District value. However, due to the small size of the impacted watercourses and limited supporting habitat for designated and notable species; the fish communities supported by the small tributaries of the River Ribble (Greg Sike, Coplow Brook, and Unnamed Watercourse 2097) are considered to be of local value.

46) Atlantic salmon spawning takes place between November and January in shallow excavations called redds, found in shallow gravelly areas in clean rivers and streams where the water flows swiftly, and oxygen levels are high. Incubation time depends upon the water temperature. Hatching usually occurs in early spring and the young fish (called “alevins”) remain in the redd for a few weeks, nourished by the attached yolk sac. The young emerge from the gravel in April or May spread out into other parts of the river. At this moment they are about one inch in length. As they grow, the young fish develop prominent markings on their sides and are then known as “parr”. After a period of 1-6 years, the young salmon migrate downstream to the sea as ”smolts”, typically between March and June. Salmon have a homing instinct that draws them back to spawn in the river of their birth after 1-3 years in the sea and upstream migration typically occurs between June and December. This behaviour has resulted in genetically distinct stock between rivers and in some cases even within individual rivers, with some evidence of further genetic distinctiveness in the tributaries of large rivers. This is an important consideration for conservation purposes.

47) Eels are the only European fish to leave freshwater to spawn in the sea – the opposite to salmon, which travel upstream to spawn in freshwater. European eels migrate to their spawning grounds in the Sargasso Sea, off the coast of North America. Migration is greatest on dark, moonless nights, and usually starts in flood water following heavy rain, typically between September and December. Travelling eastwards on ocean currents, the returning young change into transparent 'glass eels' as they reach the shallow waters close to the continent, eventually arriving on the Atlantic coast of Europe, after a journey that can take as long as three years. They enter inshore waters between April and August as young 'elvers', where they live under rocks, in crevices, or in the mud on the bed of estuaries, coastal lagoons, rivers, and lake ponds. Elvers and adult eels are fished commercially, and over-harvesting has contributed to a massive decline in eel numbers, as have pollution, hydropower dams and parasites. Eel do not begin to undertake spawning migrations until the males are at least six years old, and the females even older. Once in decline, their numbers take a long time to recover, as is the case with other long-lived, slow growing animals.

48) Further details are provided in Appendix 9B.1 (document reference: RVBC-MH-RC-TA-009-02-01).

9.5.5 Aquatic Macroinvertebrates

49) The Ribble Downstream Stock Beck (GB112071065612) WFD waterbody was classified as ‘High’ for macroinvertebrates in 2019, Cycle 2. The baseline monitoring data available from Environment Agency monitoring Site 66106 in the Ribble – Downstream Stock Beck Waterbody indicates the macroinvertebrate

communities in the waterbody are associated with good to high water quality with moderate to high flows. The macroinvertebrate baseline data also indicates the watercourse is 'slightly sedimented'. The macroinvertebrates present are considered to be sensitive to reduction in water quality associated with dissolved oxygen, increased sedimentation and reductions in flow velocities.

50) No notable or protected macroinvertebrate species were identified in the available Environment Agency monitoring data from the River Ribble – downstream Stock Beck waterbody.

51) Due to the absence of baseline data from the tributaries of the River Ribble (Greg Sike, Coplow Brook, and Unnamed Watercourse 2097) using a precautionary approach the macroinvertebrate communities are considered to be a comparable quality and sensitivity to reductions in water quality and flow as to the communities in the main River Ribble. However, the communities in the tributaries are considered to be of lower ecological value due to the reduced size of the watercourses are such the relative population sizes they can support.

52) Further details are provided in Appendix 9B.1 (document reference: RVBC-MH-RC-TA-009-02-01).

9.5.6 White Clawed Crayfish

53) No records of white clawed crayfish were received from LERN for within 2 km of the proposed scheme in the period 2010 to 2020. White clawed crayfish were not present in macroinvertebrate monitoring data recorded at sites in the Ribble Downstream Stock Beck waterbody during the period 2010 to 2020.

54) Three watercourses were surveyed in the Ribble Downstream Stock Beck catchment adjacent to the Proposed Ribble Crossing: River Ribble, Greg Sike, and Waddington Brook. All three watercourses were identified as having suitable habitats to support white clawed crayfish. Coplow Brook and Unnamed Watercourse 2097 were not subject to habitat suitability assessments, however, using a precautionary approach the watercourses are assumed to contain suitable habitats to support white clawed crayfish.

55) Further details are provided in Appendix 9B.1 (document reference: RVBC-MH-RC-TA-009-02-01).

9.5.7 Otter

56) Three watercourses were surveyed for otter field signs in the Ribble crossing zone of influence: River Ribble, Greg Sike, and Waddington Brook (upstream Ribble confluence).

57) At the River Ribble, extensive evidence of otter activity was present during the survey in February 2021 in the form of spraint, footprints, and a couch (see Appendix 9B.2 (document reference: RVBC-MH-RC-TA-009-02-02)). Several potential otter holts were also recorded beneath tree roots adjacent to the watercourse, however, the use by otters was not confirmed during the survey due to lack of definitive evidence. The River Ribble surrounding the Proposed Ribble Crossing is considered to provide optimal habitat for otters.

58) Greg Sike contained no holts, couches or spraints during the survey in February 2021. However, a single otter footprint was recorded in an area of sand adjacent to the watercourse. The watercourse provides limited opportunities for refuges, which combined with the paucity of activity evidence, indicates the watercourse is only used intermittently by foraging otter.

59) At Waddington Brook evidence of otter was recorded in the form of spraint and footprints during the survey in February 2021. Habitat was not considered to be of high suitability for otter but is well connected to the optimal habitat on the downstream River Ribble. No otter holts or resting places were identified but there were sections of woody and anthropogenic debris on the bank which could be utilised by otters as refuges.

60) Coplow Brook, and Unnamed Watercourse 2097 were not subject to otter surveys, however due to the location and connectivity to the River Ribble, using a precautionary approach they are assumed to contain suitable habitats to support foraging otters with potential for resting places to be present.

61) Further details are provided in Appendix 9B.2 (document reference: RVBC-MH-RC-TA-009-02-02)

9.5.8 Water Vole

62) No records of water voles were received from LERN for within 2 km of the proposed scheme in the period 2010 to 2020.

63) Three watercourses in the Ribble – Downstream Stock Beck Waterbody the River Ribble, Waddington Brook, and Greg Sike were assessed.

64) The surveyed reach of the River Ribble is largely unsuitable for water vole. Although a densely vegetated area, which could provide suitable burrowing and foraging habitat for water vole, is present on the right-hand bank of the watercourse (immediately downstream of the West Bradford road bridge). This area is likely to be frequently inundated when the river is in spate, it is therefore of lower suitability for water voles.

65) Greg Sike was considered to be generally unsuitable for water vole as the banks of the watercourse were mostly shallow, heavily shaded and lacking herbaceous vegetation. No incidental evidence of water vole was identified during the habitat suitability survey of the watercourse.

66) Waddington Brook (upstream Ribble confluence) was considered to be unsuitable for water vole. No incidental evidence of water vole was identified during the habitat suitability survey of the watercourse.

67) The habitats present at the potentially affected watercourses were of low suitability for water vole and no definitive evidence of water vole was identified along any surveyed watercourses within River Ribble – downstream Stock Beck waterbody. This in addition to the lack of evidence of water vole presence from the wider River Ribble catchment water voles are assumed to absent and are not considered further as part of this assessment.

68) Further details are provided in Appendix 9B.2 (document reference: RVBC-MH-RC-TA-009-02-02).

9.5.9 Summary and Valuation of Ecological Receptors

69) A summary of the value of aquatic ecology receptors within each watercourse is shown in Table 9.4.

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Watercourse	River Ribble (W2325)	Greg Sike (W2321)	Coplow Brook (W2349)	Unnamed Watercourse 2097 (W2348)
WFD waterbody	Ribble – Downstream Stock Beck (GB112071065612)	Ribble – Downstream Stock Beck (GB112071065612)	Ribble – Downstream Stock Beck (GB112071065612)	Ribble – Downstream Stock Beck (GB112071065612)
Designated Sites	Local (River Ribble is designated as a BHS)	Not applicable	Not applicable	Not applicable
Macrophytes and phytobenthos	River Basin District	Local	Local	Local
Fish	River Basin District	Local	Local	Local
Macroinvertebrates	River Basin District	Local	Local	Local
White clawed crayfish	Local - Precautionary approach	Local - Precautionary approach	Local - Precautionary approach	Local - Precautionary approach
Otter	Local	Immediate site	Immediate site	Immediate site
Water vole	Not applicable- not present	Not applicable- not present	Not applicable- not present	Not applicable- not present

9.6 Assessment of likely significant effects

70) The impact assessments undertaken for the Environmental Statement consider the mitigation measures that have been incorporated into the proposed development design as well as best practice construction management activities which would be incorporated into the Construction Code of Practice (CCoP). These embedded mitigation measures to reduce / avoid development impacts include, for example, site drainage, sediment management, water quality monitoring etc.; the embedded mitigation is outlined in the relevant sections of the CCoP.

71) The assessment methodology involved the identification of the nature conservation value of each potentially affected important aquatic ecology receptor using a geographical framework. Those that were found to have at least local value have been subject to systematic impact assessment.

72) The aquatic ecology features scoped out of the assessment of likely significant effects based on the available baseline information are summarised in Table 9.5.

Table 9.5: Features and Effects Scoped Out

Aquatic Ecology Feature	WFD waterbody	Value	Reason
Water vole (all watercourses)	Ribble – Downstream Stock Beck (GB112071065612)	Not applicable	Highly unlikely to be present at potentially impacted watercourses
Invasive non-native species	Ribble – Downstream Stock Beck (GB112071065612)	Not applicable	Terrestrial invasive species are assessed as part of the terrestrial ecology assessment in Chapter 9A (document reference: RVBC-MH-ES-009-01). No aquatic invasive species were identified within the red line boundary for the enabling works and the embedded mitigation in the CCoP are considered sufficient to prevent the introduction of aquatic or riparian invasive species.

9.6.1 Enabling Works Phase

73) Enabling works are anticipated to last a duration of 11 weeks and would include the following activities that have potential to result in biophysical changes to important ecological features:

- Setting up of the contractor's compound (comprising site office, welfare facilities and car park/laydown area) to include site clearance work, minor earthworks operations to level the site and pavement works (compacted stone) for the car park/laydown area
- Temporary construction access to the contractor's compound
- Fencing installation around the construction area as necessary (comprising stock-proof post and wire, silt/sediment fences to prevent sediment reaching watercourses and higher security fences at compounds)
- Preparatory works for the access track and site compounds which would involve site clearance works, including vegetation stripping

- Temporary removal of walls
- Possible overhead service diversions (undertaken in advance of the main construction works) involving some excavation and concrete works for foundations or footings
- Below ground services would require protection (undertaken in advance of the main construction works) involving excavation to locate services and install concrete protection slabs
- Construction of a bridge launch platform to allow assembly and installation of the temporary bridge
- Discharge of site and temporary road drainage to the River Ribble and Coplow Brook

74) Without any specific mitigation (i.e. non-embedded mitigation), these activities would have the potential to cause the following effects during the Enabling works phase have been summarised in Table 9.6.

75) Likely nature conservation impacts to aquatic ecology receptors include:

- Habitat loss (temporary)
- Management changes to habitats (leading to habitat degradation)
- Disturbance of individuals or groups of animals
- Direct injury or mortality of individual animals and plants
- Pollution (a cause of habitat degradation and injury/mortality to species) from sediment laden runoff and chemical pollution
- Impacts from water level changes (a cause of habitat loss, degradation and/or injury/mortality to species)

76) These general types and sources of impact are described in generic terms below and then applied specifically to each valued receptor in Table 9.6.

9.6.1.1 Effects Scoped Out

77) No significant fragmentation or isolation effects are anticipated as a consequence of enabling works for the Proposed Ribble Crossing in respect of the position or function that statutory and non-statutory sites have in the local ecological network.

78) There would be no physical land take within any of the non-statutory designations. Loss of habitats within all these designations and resulting impacts upon species for which the non-statutory sites are designated are therefore also avoided and are scoped out from further assessment.

79) No significant effects upon the position of any of the statutory or non-statutory wildlife sites in the local ecological network are anticipated as a consequence of enabling works for the Proposed Ribble Crossing; there would be no isolation or fragmentation of the wildlife site network locally.

80) The Air Quality assessment presented in Chapter 18 Appendices 18.1 (document reference: RVBC-MH-RC-TA-018-01) and 18.2 (document reference: RVBC-MH-RC-TA-018-02) concludes that no significant changes to air quality would arise along the haulage or site traffic routes as a consequence of the site traffic journeys during any of the project phases. Effects of increased emissions from traffic are therefore scoped out for the enabling phase.

81) Degradation in quality or function of habitats resulting from dust deposition during bulk earthworks and generated from bulk soil storage would be avoided or reduced to non-significant levels by embedded mitigation (further details of embedded measures to protect sensitive features from dust deposition are provided within Section 5.10 of the CCoP). Therefore, dust impacts are scoped out of this assessment.

82) CCoP Section 4.5 'Lighting' requires that artificial lighting, where unavoidably required for safety and security during the construction phase, is designed in accordance with best practice to minimise potential impact upon the environment, including ecological receptors. Therefore, the impacts to aquatic ecology receptors during the enabling works phase have been scoped out of the assessment.

83) No change in water level or flow velocity would occur in the identified watercourses due to any of the proposed activities in the enabling works phase.

84) The important ecological features or impact pathways discussed above are therefore scoped out from the EcIA for the enabling works.

9.6.1.2 Habitat Loss

85) Loss of habitat can directly affect the integrity of individual designated sites and the conservation status of notable habitats and associated protected or notable species if the overall area is reduced, thereby increasing its rarity. Habitat loss can also create a greater edge effect, whereby interior portions of a site or habitat, even if not directly impacted, may become more vulnerable to disturbance, physical damage, or colonisation by non-native species.

86) The enabling phase of the Proposed Ribble Crossing would include vegetation clearance along the proposed temporary road which could interact with the watercourses identified in the Water Environment Chapter 7 (document reference: RVBC-MH-ES-007). Clearance of riparian vegetation is required adjacent to the River Ribble, Coplow Brook, Greg Sike, and Unnamed Watercourse 2019 during the enabling works phase for the Proposed Ribble Crossing to facilitate the creation of the temporary access track and bridges.

87) Clearance of riparian vegetation would be required on the River Ribble for the proposed temporary road and bridge. The riparian vegetation at the proposed crossing location included continuous trees on the left bank. No in-channel works are required at the River Ribble or Ribble BHS during the enabling works phase therefore there would be no direct loss of in channel aquatic habitats that could adversely affect the fish, macroinvertebrate or macrophyte communities supported by the watercourse and Ribble BHS. Otter surveys identified a potential otter holt on the left bank of the River Ribble which would be directly affected by tree removal to facilitate the enabling works for the temporary bridge. In addition, two potential couches (otter resting places) could be disturbed or damaged through removal of the riparian vegetation. Both potential holts and couches were associated with tree roots on the left (southern bank) of the River Ribble along the boundary of the proposed compound / laydown area and bridge location. Further surveys would need to be undertaken to confirm the use of the potential holts prior to commencing the enabling works phase. The loss of otter holts is considered to be permanent, moderate magnitude, reversible (through intervention), and significant at the local level.

88) Clearance of riparian vegetation would be required on Unnamed Watercourse 2097 for the proposed temporary road. The riparian vegetation at the proposed crossing location included continuous trees. No in-channel works are required at Unnamed Watercourse 2097 during the enabling works phase, therefore there would be no direct loss of in channel aquatic habitats that could adversely affect the fish, macroinvertebrate or macrophyte communities supported by the watercourse. The survey data from similar watercourses indicates that Unnamed watercourse 2097 is likely to be used intermittently by foraging otters and the presence of trees could provide suitable holts or resting places. However, with the embedded mitigation included as part of the CCoP which includes pre-commencement surveys for new otter holts and resting places) habitat loss from enabling works for construction of the access track culvert and associated riparian vegetation clearance would not result in a significant impact for otter.

89) Clearance of riparian vegetation would be required on Greg Sike for the proposed temporary road. The riparian vegetation at the proposed crossing location consisted of short grass and the channel was considered to be stable. No in-channel works are required at Greg Sike during the enabling works phase, therefore there would be no direct loss of in channel aquatic habitats that could adversely affect the fish, macroinvertebrate or macrophyte communities supported by the watercourse. The survey data from February 2021 indicate that Greg Sike is used intermittently by foraging otter, but no holts or resting places were identified on the watercourse. Therefore, with the embedded mitigation included as part of the CCoP habitat loss from enabling works for construction of the access track culvert and associated riparian vegetation clearance at Greg Sike would not result in a significant impact for otter.

90) Clearance of riparian vegetation could be required on Coplow Brook for the proposed temporary road. The vegetation clearance would be required for a crossing and at several locations where the temporary road would be adjacent to the watercourse. The riparian vegetation consisted of short grass and trees. No in-channel works are required at Unnamed Watercourse 2097 during the enabling works phase, therefore

there would be no direct loss of in channel aquatic habitats that could adversely affect the fish, macroinvertebrate or macrophyte communities supported by the watercourse. The survey data from similar watercourses indicates that Coplow Brook is likely to be used intermittently by foraging otters and the presence of trees could provide suitable holts or resting places. However, with the embedded mitigation included as part of the CCoP habitat loss from enabling works for construction of the access track culvert and associated riparian vegetation clearance would not result in a significant impact for otter.

91) The temporary access roads, bridges, and compounds would be removed in the decommissioning phase of the Proposed Ribble Crossing. It is therefore assumed that these areas would be returned to the baseline conditions with appropriate landscaping therefore impacts associated with habitat loss (excluding loss of otter holts or resting places) at these locations are considered to be temporary, medium term, and reversible.

9.6.1.3 Disturbance

92) Enabling works activities can result in increased levels of visual, noise, olfactory and vibration disturbance which could impact on habitats or species. Disturbance could affect different habitats and species in different ways at different times of the year. For example, disturbance to fish would be most acute during the migratory or breeding period for migratory fish such as Atlantic salmon.

93) Increased levels of disturbance are likely to increase the effects of habitat loss, fragmentation, and isolation, with habitats beyond the red line boundary effectively 'lost' due to increases in human disturbance. Increased disturbance levels whilst creating the compounds and the access track could act as a barrier to dispersal for species sensitive to increased levels of disturbance. Disturbance of sensitive species is a risk associated with the Proposed Ribble Crossing adjacent to the River Ribble during times of the year when species such as salmonid fish are breeding, or during the night when species like otters and salmonid fish are more active. Due to the proposed embedded mitigation in the CCoP related to lighting direction and shielding, and short duration of the enabling works this is not considered to be significant for salmonid fish or the fish communities of the River Ribble catchments during the enabling works phase.

94) Due to the nature of the impact pathways from noise and vibration during the enabling works the impacts associated with habitat loss at these locations are considered to be temporary, medium term and reversible.

95) The increased noise and vibration and reduced cover at the River Ribble and Ribble BHS adjacent to the temporary bridge and compound/laydown area would increase the likelihood of disturbance to foraging and resting otters (if present at potential holt and couch locations). The absence of night-time works or additional lighting adjacent to watercourses and, the large size of the River Ribble limits potential to disturbance to foraging otters. Disturbance to foraging otters is not considered to be significant during the enabling works phase at the River Ribble, Coplow Brook, Greg Sike, or Unnamed Watercourse 2097. The reduction in suitability of retained potential resting places due to increased disturbance would be significant and could result in the displacement of otters from the immediate area during the proposed works. Impacts would be temporary, medium term, and significant at the local level.

9.6.1.4 Direct Mortality or Injury

96) Enabling works for compounds and access tracks could represent a significant impact to protected or notable species. Direct mortality or injury could occur during enabling works through habitat clearance, by traffic (either site traffic or road traffic), or indirect mortality or injury through stress. Of particular concern for the Proposed Ribble Crossing are enabling works activities which may force species to leave favoured cover/habitat and navigate around or away from the disturbance where they become more prone to death or injury from predation or human influences. This could occur for otter at the proposed access track bridge over the River Ribble, Coplow Brook, Greg Sike, and Unnamed Watercourse 2097. However, the potential for this impact to occur at Coplow Brook, Greg Sike, or Unnamed Watercourse 2097 is low due to the low level of otter use on the watercourses, the limited habitat suitability upstream of the scheme, and the absence of road that otters would need to cross to get upstream of the proposed works. There is a low risk of impacts to otters from this at the River Ribble bridge location due to the absence of in channel works and maintenance of connectivity with upstream habitats via the river. The proposed fencing along the access

track and surrounding compounds further reduces the risk of collision from vehicles or plant during the enabling works.

97) Mortality or injury of otter at the potential holt or couch locations could occur if otter were present during the vegetation clearance during the enabling works phase. Additional surveys prior to works commencing would be required to determine presence or absence of otters at these locations, as identified in the CCoP.

98) Due to the low likelihood of direct mortality of otter during the enabling works impacts are considered to be low magnitude but permanent if mortality was to occur.

9.6.1.5 Impacts from Pollution and sedimentation

99) Pollution involves the introduction of a novel substance to the environment which causes harm to organisms (e.g., toxic chemicals such as fuel). It can also arise from an already-present substance that is increased to harmful levels or mobilised in air or water to become more of a risk to organisms (e.g., nutrients, sediments, etc.). The effects are generally seen through mortality, reduced reproduction, and habitat degradation. Pollution can arise from within or outside of notable habitats, or habitats supporting designated or notable species. Where pollution occurs in hydrologically-influenced habitats (such as rivers), there is a higher potential for pollution to impact a larger area.

100) In the absence of mitigation, pollution is a key risk associated with the Proposed Ribble Crossing, in particular to the water environment, which includes a number of ecological receptors located adjacent to, crossed by, or downstream of the Proposed Ribble Crossing compounds and access tracks.

101) Sediment laden runoff impacts would most likely be associated with activities of topsoil stripping, vegetation clearance, necessary earthworks related to the enabling works to construct access tracks and creation of site compounds / construction laydown areas. During the enabling phase, several potential pollutants would be present, including oils, fuels, chemicals, waste, and wastewater. Most of these potential pollutants would be stored within the compound laydown areas. In addition, there would be the potential for pollution from spillages along the access and egress routes from the surrounding road network. This could impact on surface water quality should the pollutant reach the receiving watercourses.

102) Sediment laden runoff impacts, which could lead to degradation in surface water quality, would most likely be associated with activities of topsoil stripping and storage, vegetation clearance, and earthworks required to prepare the compound laydown areas as well as construction of the bridge launch platform. Increases in impermeable areas associated with the compaction of the ground surface and placement of granular material for the formation of hardstanding associated with the site compounds, increases the potential for runoff containing high concentrations of suspended solids to nearby water features, potentially affecting pH and causing high turbidity. As outlined in the CCOP, mitigation measures would be in place with regards to fine sediment controls throughout the enabling phase, including topsoil storage areas to be located as far away as practicable from watercourses.

103) There is a requirement for vegetation stripping and minor earthworks during the enabling phase near the River Ribble and Ribble BHS in preparation of the launch platform from the southern bank. This would also be required for the creation of the site compounds on the north and south banks of the River Ribble. Due to the proximity of the works there would be the potential for sediment laden runoff to enter the watercourse directly. There is the requirement for material storage, and plant to be working near the River Ribble. This has the potential for accidental spillages of potentially polluting substances from plant and materials to enter the River Ribble directly. The River Ribble is a mainstem watercourse and as such it is anticipated to have a high dilution capacity which, combined with construction site drainage and mitigations outlined in the CCOP, would minimise the potential impact of sediment laden runoff or chemical pollution on the River Ribble. The River Ribble supports macrophyte, macroinvertebrate and fish communities that are highly sensitive to increased sedimentation and reductions in water quality. The River Ribble including the Ribble BHS at and downstream of the crossing location has potential to support spawning habitat for highly sensitive species including Atlantic salmon, sea/brown trout, bullhead, and grayling. Therefore, enabling works and associated water quality impacts from increased sedimentation would result in a significant impact at the local scale for fish communities and at the local scale for macroinvertebrate and macrophyte communities due to smothering or a reduction in habitat suitability.

104) Preparatory earthworks are required for the formation of the compound laydown areas, including vegetation stripping and topsoil storage. Exposed soil surfaces, as well as increased impermeable areas could result in sediment laden runoff reaching the Coplow Brook. Site discharges with high sediment content could also affect the water quality of the Coplow Brook. The Water Environment Chapter 7 (document reference: RVBC-MH-ES-007) identifies a minor impact to Coplow Brook, from inputs of sediment laden run off and accidental discharge of chemical pollutants (e.g. oil or fuel from plant) and the associated water quality impacts. Coplow Brook is likely to support macroinvertebrates and macrophytes that are sensitive to increased fine sediment input and siltation. The watercourse has limited supporting habitat for salmonid fish however the fish community is likely to be sensitive to increased sedimentation. The impact of changes in supply of fine sediment would result in a significant effect on fish, macrophytes, and macroinvertebrate communities at the local scale.

105) Due to the proximity of Unnamed Watercourse 2099 to the compound laydown area, and the likely limited dilution capacity of this modified drainage channel there is a risk of deterioration in habitat suitability or a reduction in the distribution or composition of the fish, macroinvertebrate or macrophyte communities supported by the watercourse.

9.6.1.6 Invasive Species

106) Enabling works activity may cause or facilitate the spread of (normally non-native) invasive species. Invasive plant species can colonise new areas of land from seeds contained in the parent plant or the soil, or from fragments of living root or stem. Such reproductive materials can be inadvertently transferred from enabling works areas outside of the scheme boundary if they adhere to vehicles, machinery, tools, or clothing. They can also be inadvertently transferred in waste. Seeds and plant fragments can also be transported by watercourses and surface water runoff to areas not directly impacted by the work but with a hydrological connection.

107) Once present, invasive species can spread rapidly and out-compete the native vegetation that characterises the notable non-designated habitat. Habitat loss and fragmentation can also encourage the colonisation of invasive species by providing a pathway of suitable environmental conditions for invasive species to move closer to areas currently free from these species, this could affect the conservation status of a site, habitat, or species.

108) Terrestrial invasive species are assessed as part of the terrestrial ecology assessment in Chapter 9A (document reference: RVBC-MH-ES-009-01). No aquatic invasive species were identified within the red line boundary for the enabling works and the embedded mitigation in the CCoP are considered sufficient to prevent the introduction of aquatic or riparian invasive species.

9.6.1.7 Summary of Enabling Works Effects

109) The assessment methodology involved the identification of the nature conservation value of each potentially affected important aquatic ecology receptor using a geographical framework. Those that were found to have at least local value have been subject to systematic impact assessment. A summary of the impact assessment of the enabling works phase effects prior to specific mitigation is provided below in **Table 9.6**.

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Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
Ribble BHS	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage. Adversely affect aquatic communities supported by the BHS	Direct, negative, low magnitude, temporary (up to medium term), reversible	Significant Adverse Local
Macrophytes (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage.	Direct, negative, low magnitude, temporary (up to medium term), reversible	Significant Adverse River Basin District
Fish (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage.	Direct negative, medium magnitude (especially in case of silt pollution), temporary (up to medium term), reversible	Significant Adverse River Basin District
			Disturbance enabling works from noise	Indirect, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Aquatic macroinvertebrates (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage.	Direct negative, medium magnitude (especially in case of silt pollution), temporary (up to medium term), reversible	Significant Adverse River Basin District

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
Otter (River Ribble, Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Disturbance during vegetation clearance and noise of enabling works at compound/laydown areas during enabling works	Indirect, negative, low magnitude, temporary (up to medium term), reversible	Not Significant
			Degradation of prey resource	Indirect, negative, low magnitude, temporary (up to medium term), reversible	Not significant
			Habitat loss – removal of potential holt and couches on left (south bank of the River Ribble	Direct, negative, medium magnitude, permanent	Significant Adverse Local
			Direct mortality or injury	Direct, negative, low magnitude, permanent	Not significant
Fish (River Ribble tributaries – Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage.	Direct negative, medium magnitude (especially in case of silt pollution), temporary (up to medium term), reversible	Significant Adverse Local
			Disturbance enabling works from noise	Indirect, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Aquatic macroinvertebrates (River Ribble tributaries – Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage.	Direct negative, medium magnitude (especially in case of silt pollution), temporary (up to medium term), reversible	Significant Adverse Local
Aquatic macrophytes (River Ribble tributaries – Coplow Brook, Greg Sike,	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation vegetation clearance and minor groundworks	Direct negative, medium magnitude (especially in case of	Significant Adverse

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
and Unnamed Watercourse 2097)			for the compound, access track, and site drainage.	silt pollution), temporary (up to medium term), reversible	Local

9.6.2 Construction Phase

110) Construction activities are anticipated to continue for a period of 19 weeks. Habitat reinstatement works relating to construction compound areas (improved grassland habitat) would be undertaken on completion of the temporary road and bridge. Habitat reinstatement for the remainder would only occur during the Proposed Ribble Crossing decommissioning phase, anticipated to be in 2029.

111) The duration, location, and proposed methods for the Construction phase activities are described in full in Chapter 3 (document reference: RVBC-MH-RC-ES-003).

112) Activities anticipated during the construction phase which have the potential to give rise to significant ecological effects are summarised as follows:

- Construction of the temporary haul road to include:
  - Topsoil stripping of areas occupied by the roads, cuttings, embankments, and associated structures to depths defined for each particular location
  - Stockpiling of stripped topsoil outside of the flood plain until reinstatement
  - Earthworks would be kept to a minimum as far as reasonably practicable but would involve some cut and fill.
  - Filled areas would be placed in layers and compacted by rollers
  - Potential excavation of rock which may require removal by bulldozer or hydraulic breaker
- It is anticipated that SuDS would be used for carriageway drainage comprising a dry swale running parallel to the carriageway providing both attenuation and filtering of any surface runoff. Construction would include:
  - Excavation of the drain with material being deposited adjacent to the drain in the road verge or transported for reuse or disposal
  - Gravel bedding would be placed at the bottom of the excavated trench and the drainage pipes placed on top. Filter material (crushed rock) is then placed over the pipe
  - Filter drains would have a geotextile surround to prevent sediment ingress into the filter material
  - If the drainage pipe crosses the road carriageway, it would have a concrete surround which would then be backfilled with acceptable earthworks material
- Five outfalls would be constructed from the carriageway drainage network to appropriate adjacent watercourses. Construction would include:
  - Installation of a headwall at the point of discharge (in situ concrete with a facing/finish in keeping with the area)
  - Excavation to form the base of the headwall, steel fixing, shuttering, concreting and backfilling operations.
  - During excavations, temporary diversion or damming of the watercourse may be required
- Construction of temporary watercourse crossings using over bridges at the River Ribble, Coplow Brook, Greg Sike and Unnamed Watercourse 2097.
- Following pavement construction, any necessary safety barriers and signs would be installed:
  - Safety barrier installation involves driving steel posts into the ground or excavating small footings and placing concrete into which the posts are set.
  - Sign installation would involve excavation for the foundations which are concrete and setting the posts
  - Some signs may be lit and would require cabling to be passed through the service ducts

- Installation of the temporary bailey bridge crossing the Ribble would incorporate a deck, supported on piers and abutments which in turn are supported by foundations. Construction would include:
  - Piled foundations (assumed driven piles using a pile driver)
  - Concrete bridge piers (including placing and vibrating concrete into formwork)
- Concrete abutments (compacting formwork by vibration)
- The bridge deck would be a modular system that would be assembled upon the south bank:
  - A section of frame (beams and joists) would be assembled upon the working platform
  - Once complete the section of frame would be jacked from this launch area towards the opposite bank, creating the space to assemble the next section
  - This would be repeated until the river has been spanned by the steel work
  - The decking to the frame would then be progressively installed working from one riverbank to the other
- Topsoiling and seeding would be undertaken as soon as possible after earthworks construction is completed (enabling subsoil to be sealed preventing sediment run-off)
- The topsoil would be transported from the topsoil storage locations to the works and would be placed by a tracked excavator. Grass seeding may be by hand or by machine spreading, undertaken in the relevant areas specified in the landscape design
- Habitat reinstatement. Methods and timing of habitat reinstatement would vary according to the target habitat and would be agreed with the LPA.

113) Likely nature conservation impacts in the absence of mitigation include:

- Management changes to habitats (leading to habitat degradation)
- Disturbance of individuals or groups of animals and associated habitat fragmentation
- Direct injury or mortality of individual animals and plants
- Pollution (a cause of habitat degradation and injury / mortality to species)
- Impacts from water level changes (a cause of habitat loss, degradation and/or injury/mortality to species)
- Invasive species (a cause of mortality or habitat degradation impacts).

114) These general types and sources of impact are described in generic terms below and then applied specifically to each valued receptor in **Table 9.7**.

9.6.2.1 Habitat Fragmentation and disturbance

115) Habitat fragmentation generally results in a reduction in habitat connectivity and the increasing isolation of remaining areas. Fragmentation can occur through removal of habitat that creates a gap between two retained areas of habitat on either side. Such fragmentation becomes ecologically significant when species associated with that habitat type are then unable or unwilling to cross this gap, thus creating a barrier effect. Physical barriers to species movement such as culverts can also cause habitat fragmentation within aquatic environment. Fragmentation can also sever a habitat's connection with the physical processes necessary to sustain that habitat. If the habitat reliant on such processes suffers degradation or loss as a result, then the habitat's conservation status is affected. Any impacts associated with fragmentation of habitats through installation fencing in the enabling phase is considered to continue through to the end of the construction phase but will only be considered in the enabling phase to avoid duplication of potential impacts.

116) No artificial light is required on or adjacent to the watercourses during the night so no additional disturbance is anticipated due to changes in light levels in the River Ribble or tributaries.

117) The temporary bridges at all locations would be clear span and require no in channel construction or permanent structures. Consequently, they are highly unlikely to prevent upstream passage of fish. However, the increased levels of disturbance from noise during the installation/construction of the bridges has potential to deter migratory fish and otter from moving through the areas.

118) Atlantic salmon upstream migration typically occurs between June and December with spawning taking place typically between November and January in shallow excavations called redds. Young salmon migrate downstream to the sea as "smolts", typically between March and June. Eels are the only European fish to leave freshwater to spawn in the sea – the opposite to salmon. European eel downstream migration, for spawning, is greatest on dark, moonless nights, and usually starts in flood water following heavy rain, typically between September and December. Juvenile eels typically enter inshore and freshwater habitats between April and August as young 'elvers', where they live in estuaries, coastal lagoons, rivers, lake, and ponds. Further detail is provided in the Baseline Conditions - Fish Section 9.5.4..

119) The construction of the temporary bridge crossing for the Proposed Ribble Crossing would be predominantly undertaken from the south bank of the water course with no proposed works (excluding the clear span bridge superstructure) in or within 10m of the watercourse. The width of the River Ribble, the absence of new in-channel structures, and distance from the water's edge mean there would be no additional physical barriers associated with the bridge construction that could prevent upstream or downstream movement of migratory fish or otters.

120) Hearing in salmon is restricted to frequencies below 380hz and with sensitivity reduced above 150hz (Hawkins and Johnstone, 1978[5]). Salmon are considered to be most sensitive to frequencies between 5hz and 150hz Knudsen et al[6]. Therefore, they are considered to be sensitive to the low frequency noise and vibrations generated during the proposed construction activities e.g. piling, compaction of road surface.

121) The construction phase of the Proposed Ribble Crossing would require piling for the bridge footing. The piling would be undertaken over a period of three weeks and would produce significant noise and vibration adjacent to the River Ribble. The highest level of noise/vibration disturbance would occur during the three weeks required for piling for the bridge footings with lower levels of noise and vibration produced by movement of heavy plant undertaking the prosed construction phase activities. If the piling were to occur during peak upstream spawning migration this could prevent passage to upstream spawning grounds which would significantly affect the salmon populations in the wider catchment. If the piling were to be undertaken during smolt migration this could result in a delay to downstream migration and delay the timing of smolt reaching adult feeding grounds. The Noise and Vibration Assessment in Chapter 17 (document reference: RVBC-MH-RC-ES-017) identifies that at 100 m from the bridge piling for the Ribble Crossing, the following range in vibration levels may be expected during piling:

- With a 50 % chance of exceedance during vibratory piling: 0.1 to 0.2 mm/s PPV for steady-state and transient conditions, respectively
- With a 5 % chance of exceedance during vibratory piling: 0.4 to 1.1 mm/s PPV for steady-state and transient conditions, respectively.

122) The Noise and Vibration Assessment in Chapter 17 (document reference: RVBC-MH-RC-ES-017) identifies the potential for vibration above the human response level only during start up and run down modes. Therefore, for the purposes of this assessment there are considered to be impacts to fish and otters within 100m of the piling works. The potential magnitude of the vibration at the piling is significantly higher and considered to represent a barrier to fish and movement up or down the watercourse during piling activities. Additional disturbance and associated habitat fragmentation through bankside activity and increased noise levels during the construction of new temporary road and drainage works. (Includes earthworks (EW) within laydown areas, earthworks and drainage along route and paving of route at the end of the programme (production rate 125 m/wk) for a duration of 12 weeks) and installation of the modular bridge sections (4 weeks). Bridge piling and high noise/vibration activities undertaken during the peak Atlantic salmon and

[5] Hawkins A. D. and Johnstone, A. D. F. (1978) Hearing of the Atlantic Salmon Salmo salar. Journal of fish biology 13, 655-675

[6] Knudsen, Frank & Enger, P. & Sand, O. (2005). Avoidance responses to low frequency sound in downstream migrating Atlantic salmon smolt, Salmo salar. Journal of Fish Biology. 45. 227 - 233. 10.1111/j.1095-8649.1994.tb01302.x.

eel migration periods would result in significant adverse effects to the fish community of the River Ribble and Ribble BHS. Relevant sensitive protected species (Atlantic salmon, sea trout, and European eel) are known to predominantly migrate in the hours of darkness. Piling and other high noise and vibration activities would be confined to daylight hours therefore this would reduce the potential for significant adverse effects as it would give fish the opportunity to pass through the area at night. It is considered critical that this is undertaken outside key migration windows to prevent any migration deterrents that could affect recruitment within the catchment.

123) The vibration from piling is likely to cause disturbance and temporary exclusion of otter from daytime resting places within at least 100m of the crossing during piling and other high noise and vibration causing activities. Due to the potential otter resting places this has the potential for significant impacts to local otter populations.

124) No potential adverse effects to macroinvertebrates and macrophytes are anticipated due to increased noise and vibration adjacent to the River Ribble, tributaries, and the Ribble BHS due to the absence of known deleterious effects associated with noise for these aquatic communities.

125) The construction of the temporary bridge crossings over the River Ribble, Coplow Brook, Greg Sike and Unnamed Watercourse 2097 could result in habitat fragmentation if they prevent fish and otter from reaching upstream habitats. The small tributaries Coplow Brook and Unnamed Watercourse 2097 contain limited supporting habitat for migratory fish species upstream of the proposed bridge crossings. They are also considered to be of limited value for foraging and commuting otters due to the small size, lack of connectivity to notable upstream food sources, and limited availability of suitable prey within the channel. Therefore, impacts to otter and fish in Coplow Brook and Unnamed Watercourse 2097 from habitat fragmentation due installation of the access track bridges would not result in a significant effect on the communities present.

126) The impacts identified relating to habitat fragmentation and disturbance during the construction activities are considered to be temporary, short term, and reversible.

9.6.2.2 Habitat Loss and deterioration

127) Loss of habitat can directly affect the integrity of individual designated sites and the conservation status of notable habitats and associated protected or notable species if the overall area is reduced, thereby increasing its rarity. Habitat loss can also create a greater edge effect, whereby interior portions of a site or habitat, even if not directly impacted, may become more vulnerable to disturbance, physical damage, or colonisation by non-native species.

128) Loss of notable habitat adjacent to a designated or otherwise important site (the importance may be for an associated species) may also adversely affect the integrity of that site or conservation status of the associated species if such habitat performs a supporting or buffering function that helps to preserve the qualifying habitats or species.

129) During the construction phase there would be a requirement for the installation of temporary clear span bailey bridges on three minor watercourses within the assessment area to facilitate the temporary road route. The activities associated with the construction of the temporary bridge crossings including working within the vicinity of the watercourse and the tracking of plant, which have the potential to generate impacts relating to bank disturbance. There would also be a requirement for the construction of temporary drainage outfalls on Coplow Brook and the River Ribble. The installation of the temporary outfalls would result in temporary habitat loss within the footprint of the outfall and required works area.

130) Clear span temporary bailey bridges would be installed on Coplow Brook and Greg Sike and therefore the need for working in these watercourses to construct the crossings is removed. However, there would still be a requirement for in-channel working on Coplow Brook to construct a drainage outfall headwall. Outfall construction could disturb bed and bank features and cause compaction of bed substrate. Baseline data indicates that Coplow Brook is of up to local value for macrophytes, macroinvertebrates, and fish. Due to the small scale of the outfall footprint impacts from habitat loss from construction of the temporary outfall in Coplow Brook would not result in a significant impact for macroinvertebrates, macrophytes, or fish.

131) Due to the requirement for a clear span bailey bridge on Greg Sike, but no requirement for in-channel working there would be no potential for significant impacts from habitat loss for macrophytes, macroinvertebrates, or fish in the watercourse.

132) A further bailey bridge is required to be installed across Unnamed Watercourse 2097 to facilitate the access haul route. The Water Environment Chapter 7 (document reference: RVBC-MH-ES-007) identified that the impact to bank disturbance is Negligible. This, in addition to no in-channel working, indicates there would be no potential for significant impacts from habitat loss for macrophytes, macroinvertebrates, or fish in Unnamed Watercourse 2097.

133) The temporary bridge crossing over the River Ribble would be clear span and constructed on raised bridge piers and associated abutments (formed in the channel floodplain) and the bridge piers or deck would not be in direct contact with the bed or banks of the watercourse once constructed. Therefore, impacts to bank disturbance would be minimised and there would be no loss of in channel habitats for macrophytes, fish, or macroinvertebrates, supported by the River Ribble including the Ribble BHS. The presence of the clear span bridge would increase shading in the watercourse causing a deterioration in habitat suitability for the macrophyte species present. However due to the narrow width (<10m) and elevated position above the bank level the impacts from shading on habitat deterioration would be minimised. The impact of habitat deterioration shading is not considered be significant for macrophytes in the River Ribble and Ribble BHS.

134) The proposed works include construction of four temporary drainage outfalls along the banks of the River Ribble in the Ribble BHS. The Water Environment Assessment Chapter 7 (document reference: RVBC-MH-RC-ES-007) identifies that the River Ribble is a mainstem watercourse and as such it is anticipated to have a significant dilution capacity, therefore would have sufficient capacity to buffer any potential impacts related to bank or bed disturbance. Habitat loss would be limited to within the footprint of the four temporary outfalls. Due to the small scale of the habitat loss the impacts to the Ribble BHS or otter, macrophytes, macroinvertebrates, and fish communities are not considered to be significant.

135) The temporary outfalls would be removed at the end of the operation phase. It is assumed that these areas would be returned to the baseline conditions with appropriate landscaping therefore impacts associated with habitat loss at these locations are considered to be temporary, medium term and reversible. Areas of riparian vegetation surrounding the proposed structures would be reinstated and restored to the existing condition following completion for the construction phase.

9.6.2.3 Impacts from Pollution and sedimentation

136) Pollution involves the introduction of a novel substance to the environment which causes harm to organisms (e.g., toxic chemicals such as fuel). It can also arise from an already-present substance that is increased to harmful levels or mobilised in air or water to become more of a risk to organisms (e.g., nutrients, sediments, etc.). The effects are generally seen through mortality, reduced reproduction, and habitat degradation. Pollution can arise from within or outside of notable habitats, or habitats supporting designated or notable species. Where pollution occurs in hydrologically-influenced habitats (such as rivers), there is a higher potential for pollution to impact a larger area.

137) In the absence of mitigation, pollution is a key risk associated with the Proposed Ribble Crossing, in particular to the water environment, which includes a number of ecological receptors located adjacent to, crossed by, or downstream of the Proposed Ribble Crossing compounds and access tracks.

138) Sediment laden runoff impacts would most likely be associated with activities of topsoil stripping, vegetation clearance, necessary earthworks related to the enabling works to construct access tracks and creation of site compounds / construction laydown areas. During the construction phase, several potential pollutants would be present, including oils, fuels, chemicals, waste, and wastewater. Most of these potential pollutants would be stored within the compound laydown areas. In addition, there would be the potential for pollution from spillages along the access and egress routes from the surrounding road network. This could impact on surface water quality should the pollutant reach the receiving watercourses.

139) Sediment laden runoff impacts which could lead to degradation in surface water quality would most likely be associated with activities of topsoil stripping and storage, vegetation clearance, and earthworks required to prepare the compound laydown areas as well as construction of the bridge launch platform. Increases in

impermeable areas associated with the compaction of the ground surface and placement of granular material for the formation of hardstanding associated with the site compounds increases the potential for runoff containing high concentrations of suspended solids to nearby water features, potentially affecting pH and high turbidity. As outlined in the CCOP, mitigations would be in place with regards to fine sediment controls throughout the enabling phase, including topsoil storage areas to be located as far away as practicable from watercourses.

140) The construction of the temporary bridge including pilings, road paving, and use and paving of compound/laydown areas would occur within close proximity to the River Ribble. Due to the proximity of the works, there would be the potential for sediment laden runoff to enter the watercourse directly. There is the requirement for material storage, and plant to be working near the River Ribble. This has the potential for accidental spillages of potentially polluting substances from plant and materials to enter the River Ribble directly. The Water Environment Chapter 7 (document reference: RVBC-MH-ES-007) identifies that the River Ribble is a mainstem watercourse and as such it is anticipated to have a high dilution capacity which, combined with construction site drainage and mitigations outlined in the CCOP, would minimise the potential impact of sediment laden runoff or chemical pollution on the River Ribble. The River Ribble supports macrophyte, macroinvertebrate and fish communities that are highly sensitive to increased sedimentation and reductions in water quality. The River Ribble including the Ribble BHS at and downstream of the crossing location has potential to support spawning habitat for highly sensitive species including Atlantic salmon, sea/brown trout, bullhead, and grayling. Therefore, enabling works and associated water quality impacts from increased sedimentation would result in a significant impact at the local scale for fish communities and at the local scale for macroinvertebrate and macrophyte communities due to smothering or a reduction in habitat suitability.

141) The proposed temporary road route is within 10 m of Coplow Brook at multiple locations including a crossing. The compound laydown area in the north as well as the smaller laydown area to the south are also near to the Coplow Brook. Sediment laden runoff entering this watercourse from these activities may lead to short-term degradations in water quality. The Water Environment Assessment Chapter 7 (document reference: RVBC-MH-RC-ES-007) identifies a minor impact to Coplow Brook, from inputs of sediment laden run off and accidental discharge of chemical pollutants (e.g. oil or fuel from plant) and the associated water quality impacts. Coplow Brook is likely to support macroinvertebrates and macrophytes that are sensitive to increased fine sediment input and siltation. The watercourse has limited supporting habitat for salmonid fish however the fish community is likely to be sensitive to increased sedimentation. The impact of changes in supply of fine sediment would result in a significant effect on fish, macrophytes, and macroinvertebrate communities at the local scale.

142) The Water Environment Assessment Chapter 7 (document reference: RVBC-MH-RC-ES-007) identifies that due to the smaller extents impacted from the proposed temporary road route (which runs perpendicular to the watercourses in this location), focussed on the crossing locations would result in negligible impacts to water quality from sediment inputs or chemical pollution. Consequently, despite the likely sensitivity of the aquatic ecology receptors in the watercourse, the impacts to otter, fish, macroinvertebrate, and macrophyte communities are not considered to be significant.

143) Impacts from increased sedimentation and a reduction in water quality during construction of bridges, outfalls, access track and compounds at all watercourses are considered to be temporary, medium term and reversible following cessation of the construction works.

9.6.2.4 Invasive Species

144) Construction activity may cause or facilitate the spread of (normally non-native) invasive species. Invasive plant species can colonise new areas of land from seeds contained in the parent plant or the soil, or from fragments of living root or stem. Such reproductive materials can be inadvertently transferred from construction areas outside of the scheme boundary if they adhere to vehicles, machinery, tools or clothing. They can also be inadvertently transferred in waste. Seeds and plant fragments can also be transported by watercourses and surface water runoff to areas not directly impacted by the work but with a hydrological connection.

145) Once present, invasive species can spread rapidly and out-compete the native vegetation that characterises the notable non-designated habitat. Habitat loss and fragmentation can also encourage the colonisation of invasive species by providing a pathway of suitable environmental conditions for invasive species to move closer to areas currently free from these species, this could affect the conservation status of a site, habitat or species.

146) Terrestrial invasive species are assessed as part of the terrestrial ecology assessment in Chapter 9A (document reference: RVBC-MH-ES-009-01). No aquatic invasive species were identified within the red line boundary for the enabling works and the embedded mitigation in the CCoP are considered sufficient to prevent the introduction of aquatic or riparian invasive species. No impacts are anticipated for aquatic ecology receptors within the River Ribble, its tributaries, or the River Ribble BHS due to introduction or spread of aquatic invasive non-native species during the construction phase.

9.6.2.5 Changes to flow regime

147) Drainage from the temporary road would be discharged into the River Ribble through four temporary outfalls and into Coplow Brook through one temporary outfall. Changes in flow volume and velocity can result in localised changes to habitat availability for macroinvertebrate, macrophyte, and fish communities. However, the Water Environment Chapter 7 (document reference: RVBC-MH-ES-007) identified that the discharge from the temporary road matches the existing greenfield runoff rate with no significant changes in flow that could alter the habitats within the River Ribble or Coplow Brook. Consequently, no significant adverse changes are anticipated to the macroinvertebrate, macrophyte, or fish communities of the River Ribble or Ribble BHS.

148) The operation of the temporary drainage outfalls and associated changes to the flow regime would continue for the duration of the construction and operation phase until the outfall structures are removed during the decommissioning phase.

9.6.2.6 Summary of Construction Works Effects

149) The assessment methodology involved the identification of the nature conservation value of each potentially affected important aquatic ecology receptor using a geographical framework. Those that were found to have at least local value have been subject to systematic impact assessment. A summary of the impact assessment of the construction works phase effects prior to specific mitigation is provided below in **Table 9.7**.

Table 9.7: Summary of Construction Phase Effects

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
Ribble BHS	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage. Adversely affect aquatic communities supported by the BHS	Direct, negative, low magnitude, temporary (up to short term), reversible	Significant Adverse Local
			Habitat fragmentation and disturbance due to high noise and vibration construction activities including piling	Direct negative, medium magnitude (piling works), temporary (short term), reversible	Significant Adverse Local
			Habitat loss and degradation from construction and presence of the bridge and outfalls	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant
			Flow changes due to operation of the drainage outfalls on the River Ribble	Direct, negligible, temporary, reversible	Not significant
Macrophytes (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage.	Direct, negative, low magnitude, temporary (short term), reversible	Significant Adverse River Basin District
			Flow changes due to operation of the drainage outfalls on the River Ribble	Direct, negligible, temporary, reversible	Not significant

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
			Habitat loss and degradation from construction and presence of the bridge and outfalls	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Fish (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage.	Direct negative, medium magnitude (especially in case of silt pollution), temporary (short term), reversible	Significant Adverse River Basin District
			Habitat fragmentation and disturbance due to high noise and vibration construction activities including piling	Direct negative, medium magnitude (piling works), temporary (short term), reversible	Significant Adverse River Basin District
			Flow changes due to operation of the drainage outfalls on the River Ribble	Direct, negligible, temporary, reversible	Not significant
			Habitat loss and degradation from construction and presence of the bridge and outfalls	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Aquatic macroinvertebrates (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage. Adversely affect aquatic communities supported by the BHS	Direct, negative, low magnitude, temporary (up to short term), reversible	Significant Adverse Local
			Flow changes due to operation of the drainage outfalls on the River Ribble	Direct, negligible, temporary, reversible	Not significant

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
			Habitat loss and degradation from construction and presence of the bridge and outfalls	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Otter (River Ribble, Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Habitat fragmentation and disturbance due to high noise and vibration construction activities including piling	Direct negative, medium magnitude (piling works), temporary (short term), reversible	Significant Adverse Local
			Habitat loss and degradation from construction and presence of the bridge and outfalls	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant
			Degradation of prey resource	Indirect, negative, low magnitude, temporary (up to medium term), reversible	Not significant
			Direct mortality or injury	Direct, negative, low magnitude, permanent	Not significant
Fish (River Ribble tributaries – Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage.	Direct negative, low magnitude, temporary (short term), reversible	Not significant
			Habitat loss and degradation from construction and presence of the bridge and outfall (Coplow Brook)	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant
			Flow changes due to operation of the drainage outfall on Coplow Brook	Direct, negligible, temporary, reversible	Not significant

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
			Disturbance during construction works from noise	Indirect, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Aquatic macroinvertebrates (River Ribble tributaries – Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage.	Direct negative, medium magnitude (especially in case of silt pollution), temporary (up to medium term), reversible	Significant Adverse Local
			Flow changes due to operation of the drainage outfall on Coplow Brook	Direct, negligible, temporary, reversible	Not significant
			Habitat loss and degradation from construction and presence of the bridge and outfall (Coplow Brook)	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Aquatic macrophytes (River Ribble tributaries – Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage.	Direct negative, medium magnitude (especially in case of silt pollution), temporary (up to medium term), reversible	Significant Adverse Local
			Flow changes due to operation of the drainage outfall on Coplow Brook	Direct, negligible, temporary, reversible	Not significant
			Habitat loss and degradation from construction and presence of the bridge and outfall (Coplow Brook)	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant

9.6.3 Operational Phase

150) The operational phase of the Proposed Ribble Crossing would include the following activities which could interact with the aquatic ecology receptors of the watercourses identified in the baseline section:

- Use of temporary road route and compound laydown areas
- Use of temporary bridges
- Soil storage within compound laydown areas
- Discharge of surface water run-off.

151) Likely nature conservation impacts in the absence of mitigation include:

- Disturbance of individuals or groups of animals and associated habitat fragmentation
- Direct injury or mortality of individual animals and plants
- Changes to flow regime.
- Pollution (a cause of habitat degradation and injury / mortality to species)
  - Release of polluting substances (oils, fuels, and chemicals).
  - Increased fine sediment input

9.6.3.1 Disturbance and habitat fragmentation

152) During the operation of the temporary road and bridges no significant additional impacts from disturbance are anticipated for aquatic ecology receptors above those identified for the construction phase and the current baseline conditions with the existing traffic noise and visual disturbance caused by the West Bradford Road Bridge.

153) There would be no significant additional light disturbance to aquatic ecology receptors as the new access road and associated bridges over watercourses would be unlit (other than at the junctions with the main road network which would not illuminate watercourses). In addition, use out of working hours would be limited (due to restrictions on timings of deliveries to avoid disturbance of local residents) other than for the shift change of workers.

154) The most sensitive species to visual, noise, and vibration disturbance are migratory fish (including Atlantic salmon and European eel) and otter which have highest activity levels during the night-time (for fish migration). The limited use of the access road and bridges during night-time limits the potential for disturbance which could create habitat fragmentation for these species.

155) The new River Ribble bridge superstructure would be significantly elevated above the water level with the supports set back from the edge of the watercourse. As described in the construction phase assessment there would be no physical barrier to movement of fish or otter on the River Ribble or tributaries. The road would have crossing points for walkers and farmers and their cattle and would not pose a barrier to wildlife along the River Ribble corridor.

156) Due to the nature of the impact pathways from noise, vibration, and visual disturbance and cessation of the activity at the site following removal of the compounds and access track, the impacts associated with habitat loss at these locations are considered to be temporary, medium term, and reversible.

9.6.3.2 Direct Mortality or Injury

157) Operation of the Proposed Ribble Crossing could represent a significant impact to protected or notable species. Direct mortality or injury could occur during operation by traffic (either site traffic or road traffic), or indirect mortality or injury through stress. Of particular concern for the Proposed Ribble Crossing is where particular construction activities may force species to leave favoured cover/habitat and navigate around or away from the disturbance where they become more prone to death or injury from predation or anthropogenic influences.

158) Mortality or injury of valued species is a risk associated with the Proposed Ribble Crossing both directly within the red line boundary, and indirectly if otters are displaced by disturbance into more hazardous environments. However, due to the height and access under the proposed River Ribble bridge, low level of otter activity on tributaries, and installation of fencing around the access tracks and compounds, the likelihood of killing or injuring otters is low. These factors are considered sufficient to mitigate the risk of negative impacts. Therefore, impacts to otter direct mortality during operation of the Proposed Ribble Crossing would not result in a significant effect.

159) Due to the low likelihood of direct mortality of otter during the operational phase impacts are considered to be low magnitude but permanent if mortality was to occur.

9.6.3.3 Changes to flow regime

160) No impacts associated with changes in flow regime above those identified in the construction phase have been identified for the aquatic ecology receptors in the Rive Ribble, tributaries, or Ribble BHS.

9.6.3.4 Impacts from Pollution and sedimentation

161) The temporary road route and associated watercourse crossings would be in use throughout the operational phase of the Proposed Ribble Crossing. Sources of sediment laden runoff during the operational phase would be greatly reduced compared to the enabling and construction phases. The mitigation outlined in the CCOP with regards to plant operation and drainage management would be in place during the operational phase. As with the enabling and construction phases, topsoil storage areas would be located sufficient distances from watercourses as to minimise the impact of sediment laden runoff from these sources. The drainage implemented during the construction phase would be in operation throughout the operational phase, therefore there would still be a requirement to discharge site drainage to the River Ribble and Coplow Brook

162) The Water Environment Chapter 7 (document reference: RVBC-MH-ES-007) assessment identified that the potential impacts to water quality from sediment laden run off and accidental chemical pollution during operation of the Proposed Ribble crossing would be negligible for the River Ribble, Coplow Brook, Greg Sike, and Unnamed Watercourse 2097. Consequently, in the absence of potential impacts to water quality in the watercourses there is a negligible risk of impacts to the Ribble BHS, otters, or the macrophyte, macroinvertebrate, and fish communities of the River Ribble, Coplow Brook, Greg Sike, or Unnamed Watercourse 2097. No significant impacts to the aquatic ecology receptors due to reduction in water quality have been identified for the operational phase.

9.6.3.5 Summary of Operational Works Effects

163) The assessment methodology involved the identification of the nature conservation value of each potentially affected important aquatic ecology receptor using a geographical framework. Those that were found to have at least local value have been subject to systematic impact assessment. A summary of the impact assessment of the operational works phase effects prior to specific mitigation is provided below in **Table 9.8**.

Table 9.8: Summary of Operational Phase Effects

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
Ribble BHS	Ribble – Downstream Stock Beck	Local	Pollution and increased fine sediment input into River Ribble	Direct negative, low magnitude, temporary (medium term), reversible	Not significant
			Habitat fragmentation including disturbance due to noise, lighting and vibration from vehicles using the Proposed Ribble Crossing	Direct negative, low magnitude, temporary (medium term), reversible	Not significant
			Flow changes due to operation of the drainage outfalls on the River Ribble	Direct, negligible, temporary, reversible	Not significant
Macrophytes (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation due to use of compound, access track, and site drainage.	Direct, negative, low magnitude, temporary (medium term), reversible	Not significant
			Flow changes due to operation of the drainage outfalls on the River Ribble	Direct, negligible, temporary, reversible	Not significant
Fish (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation due to use of compound, access track, and site drainage.	Direct, negative, low magnitude, temporary (medium term), reversible	Not significant
			Habitat fragmentation and disturbance due to noise, lighting and vibration from vehicles using the Proposed Ribble Crossing	Direct negative, low magnitude, temporary (medium term), reversible	Not significant

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
			Flow changes due to operation of the drainage outfalls on the River Ribble	Direct, negligible, temporary, reversible	Not significant
Aquatic macroinvertebrates (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation due to use of compound, access track, and site drainage.	Direct, negative, low magnitude, temporary (medium term), reversible	Not significant
			Habitat fragmentation and disturbance due to noise, lighting and vibration from vehicles using the Proposed Ribble Crossing	Direct negative, low magnitude, temporary (medium term), reversible	Not significant
			Flow changes due to operation of the drainage outfalls on the River Ribble	Direct, negligible, temporary, reversible	Not significant
Otter (River Ribble, Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Habitat fragmentation and disturbance due to noise, lighting and vibration from vehicles using the Proposed Ribble Crossing	Direct, negative, low magnitude, temporary (medium term), reversible	Not significant
			Direct mortality or injury	Direct, negative, low magnitude, permanent	Not significant
Fish (River Ribble tributaries – Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation due to use of compound, access track, and site drainage.	Direct, negative, low magnitude, temporary (medium term), reversible	Not significant
			Habitat fragmentation and disturbance	Direct negative, low magnitude, temporary (medium term), reversible	Not significant

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
			Flow changes due to operation of the drainage outfalls on the River Ribble	Direct, negligible, temporary, reversible	Not significant
			Disturbance during use of access track and bridge	Indirect, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Aquatic macroinvertebrates (River Ribble tributaries – Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation due to use of compound, access track, and site drainage.	Direct, negative, low magnitude, temporary (medium term), reversible	Not significant
			Habitat fragmentation and disturbance	Direct negative, low magnitude, temporary (medium term), reversible	Not significant
			Flow changes due to operation of the drainage outfalls on the River Ribble	Direct, negligible, temporary, reversible	Not significant
Aquatic macrophytes (River Ribble tributaries – Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation due to use of compound, access track, and site drainage.	Direct, negative, low magnitude, temporary (medium term), reversible	Not significant
			Habitat fragmentation and disturbance	Direct negative, low magnitude, temporary (medium term), reversible	Not significant
			Flow changes due to operation of the drainage outfalls on the River Ribble	Direct, negligible, temporary, reversible	Not significant

9.6.4 Decommissioning Phase

164) The decommissioning phase of the Proposed Ribble Crossing would include the following activities which could have an impact on the aquatic ecology receptors in the watercourses baseline:

- Replacement of removed soil and removal of soil storage
- Removal of temporary bridges
- Removal of temporary drainage outfalls to surface water features
- Removal of temporary roads.

165) Likely nature conservation impacts in the absence of mitigation include:

- Management changes to habitats (leading to habitat degradation)
- Disturbance of individuals or groups of animals and associated habitat fragmentation
- Direct injury or mortality of individual animals and plants
- Pollution (a cause of habitat degradation and injury / mortality to species)
  - Release of polluting substances (oils, fuels, and chemicals).
  - Increased fine sediment input
- Impacts from water level changes (a cause of habitat loss, degradation and/or injury/mortality to species)
- Invasive species (a cause of mortality or habitat degradation impacts).

166) De-watering of the decommissioned but retained sections of aqueduct would require discharges into surface

9.6.4.1 Habitat Loss and Degradation

167) Loss or degradation of notable habitat adjacent to a designated or otherwise important site (the importance may be for an associated species) may also adversely affect the integrity of that site or conservation status of the associated species if such habitat performs a supporting or buffering function that helps to preserve the qualifying habitats or species.

168) During the decommissioning phase there would be a requirement to remove the three clear span bailey bridges on minor watercourses and removal of the large clear span bridge and it's footing from the Ribble crossing. In addition, the removal of the four surface water drainage outfalls on the River Ribble and one outfall on Coplow Brook would be required. Removal of the structures would result in habitat degradation in the surrounding are whilst works are undertaken with potential destabilisation of the banks at Coplow Brook, Greg Sike, and Unnamed Watercourse 2097 following removal of the temporary structures.

169) Destabilisation of the bank and changes the geomorphological process and habitats that support the aquatic ecology receptors. The baseline ecology data for the watercourses indicates that they are of local value for macroinvertebrates, macrophytes, fish, and site value for otter and are likely to support communities that are sensitive changes in substrate and increased erosion. Due to the high magnitude of changes in the habitats without additional mitigation (as identified in the Water Environment Assessment Chapter 7 (document reference: RVBC-MH-RC-ES-007) the habitat degradation would result in a significant impact for macroinvertebrates, macrophytes, or fish within the tributaries of the River Ribble (Greg Sike, Coplow Brook, and Unnamed Watercourse 2097).

170) The Water Environment Assessment Chapter 7 (document reference: RVBC-MH-RC-ES-007) identified that removal of the four temporary outfalls in the River Ribble could disturb bed and bank features and cause compaction of bed substrate in the River Ribble. Sediment mobilisation due to disturbance of the bank and bed could degrade the downstream habitats and adversely affect the suitability for fish, macroinvertebrate, and macrophytes. The impacts to the Ribble BHS or otter, macrophytes, macroinvertebrates, and fish communities are considered to be significant without additional mitigation.

171) These areas would be returned to baseline conditions with appropriate landscaping during the decommissioning phase therefore impacts associated with habitat loss at these locations are considered to be temporary, medium term and reversible. Areas of riparian vegetation surrounding the proposed structures would be reinstated and restored to the existing condition during the decommissioning phase.

9.6.4.2 Habitat Fragmentation and disturbance

172) Habitat fragmentation generally results in a reduction in habitat connectivity and the increasing isolation of remaining areas. Any impacts associated with fragmentation of habitats through installation fencing, bridges, and construction in the enabling phase and construction phase is considered to continue through to the end of the construction phase but would only be considered in the enabling and construction phases to avoid duplication of potential impacts.

173) No artificial light is required on or adjacent to the watercourses during the night during the decommissioning phases, so no additional disturbance is anticipated due to changes in light levels in the River Ribble or tributaries.

174) The removal of temporary bridges at all locations would require no in channel works. Consequently, they are highly unlikely to prevent upstream passage of fish. However, the increased levels of disturbance from noise during the installation/construction of the bridges has potential to deter migratory fish and otter from moving through the areas.

175) As identified in the construction phase assessment the River Ribble (including Ribble BHS) and its tributaries support migratory fish species and otter which are sensitive to increased visual and noise disturbance. Additional disturbance and associated habitat fragmentation through bankside activity and increased noise levels are likely to occur during the removal of the temporary road, bridges, and drainage works.

176) High noise/vibration activities and works undertaken in or immediately adjacent to the watercourses during the Atlantic salmon and eel migration periods would result in significant adverse effects to the fish community of the River Ribble and Ribble BHS. However, relevant sensitive protected species (Atlantic salmon, sea trout, and European eel) are known to predominantly migrate in the hours of darkness. Piling and other high noise and vibration activities would be confined to daylight hours therefore this would reduce the potential for significant adverse effects as it would give fish the opportunity to pass through the area at night. It is considered critical that this is undertaken outside key migration windows to prevent any migration deterrents that could affect recruitment within the catchment.

177) The impact on macroinvertebrates and macrophytes in all watercourses and the Ribble BHS are considered to be negligible due to the absence of known deleterious impacts associated with noise and absence of requirements to migrate up the watercourse.

178) The removal of the temporary bridges over the Coplow Brook, Greg Sike and Unnamed Watercourse 2097 could result in habitat fragmentation if they prevent fish and otter from reaching upstream habitats. The small tributaries Coplow Brook and Unnamed Watercourse 2097 contain limited supporting habitat for migratory fish species upstream of the proposed bridge crossings. They are also considered to be of limited value for foraging and commuting otters due to the small size, lack of connectivity to notable upstream food sources, and limited availability of suitable prey within the channel. Therefore, impacts to otter and fish in Coplow Brook and Unnamed Watercourse 2097 from habitat fragmentation during removal of the access track bridges would not result in a significant effect on the communities present.

179) The impacts identified relating to habitat fragmentation relates to disturbance during the decommissioning activities only consequently impacts associated with habitat fragmentation at these locations are considered to be temporary, short term, and reversible.

9.6.4.3 Impacts from Pollution and sedimentation

180) In the absence of mitigation, pollution is a key risk associated with the Proposed Ribble Crossing decommissioning phase, in particular to the water environment, which includes a number of ecological receptors located adjacent to, crossed by, or downstream of the Proposed Ribble Crossing bridges and access tracks.

181) Sediment laden runoff impacts would most likely be associated with activities of topsoil stripping, vegetation clearance, necessary earthworks related to the enabling works to construct access tracks and creation of site compounds / construction laydown areas. During the construction phase, several potential pollutants would be present, including oils, fuels, chemicals, waste, and wastewater. Most of these potential pollutants would be stored within the compound laydown areas. In addition, there would be the potential for pollution from spillages along the access and egress routes from the surrounding road network. This could impact on surface water quality should the pollutant reach the receiving watercourses.

182) Sediment laden runoff impacts which could lead to degradation in surface water quality would most likely be associated with activities of topsoil stripping and storage, vegetation clearance, and earthworks required to prepare the compound laydown areas as well as construction of the bridge launch platform. Increases in impermeable areas associated with the compaction of the ground surface and placement of granular material for the formation of hardstanding associated with the site compounds increases the potential for runoff containing high concentrations of suspended solids to nearby water features, potentially affecting pH and high turbidity. As outlined in the CCOP, mitigations would be in place with regards to fine sediment controls throughout the decommissioning phase, including topsoil storage areas to be located as far away as practicable from watercourses.

183) The removal of the temporary bridge, track and compound/laydown areas would occur within close proximity to the River Ribble. Due to the proximity of the works, there would be the potential for sediment laden runoff to enter the watercourse directly. There is the requirement for material storage, and plant to be working near the River Ribble. This has the potential for accidental spillages of potentially polluting substances from plant and materials to enter the River Ribble directly. The Water Environment Chapter 7 (document reference: RVBC-MH-ES-007) identifies that the River Ribble is a mainstem watercourse and as such it is anticipated to have a high dilution capacity which, combined with construction site drainage and mitigations outlined in the CCOP, would minimise the potential impact of sediment laden runoff or chemical pollution on the River Ribble. The River Ribble supports macrophyte, macroinvertebrate and fish communities that are highly sensitive to increased sedimentation and reductions in water quality. The River Ribble including the Ribble BHS at and downstream of the crossing location has potential to support spawning habitat for highly sensitive species including Atlantic salmon, sea/brown trout, bullhead, and grayling. Therefore, enabling works and associated water quality impacts from increased sedimentation would result in a significant impact at the local scale for fish communities and at the local scale for macroinvertebrate and macrophyte communities due to smothering or a reduction in habitat suitability.

184) The proposed temporary road route is within 10 m of Coplow Brook at multiple locations including a crossing. The compound laydown area in the north as well as the smaller laydown area to the south are also near to the Coplow Brook. Sediment laden runoff entering this watercourse from these activities may lead to short-term degradations in water quality. The Water Environment Chapter 7 (document reference: RVBC-MH-ES-007) identifies a minor impact to Coplow Brook, from inputs of sediment laden run off and accidental discharge of chemical pollutants (e.g. oil or fuel from plant) and the associated water quality impacts. Coplow Brook is likely to support macroinvertebrates and macrophytes that are sensitive to increased fine sediment input and siltation. The watercourse has limited supporting habitat for salmonid fish however the fish community is likely to be sensitive to increased sedimentation. The impact of changes in supply of fine sediment would result in a significant effect on fish, macrophytes, and macroinvertebrate communities at the local scale.

185) The Water Environment Chapter 7 (document reference: RVBC-MH-ES-007) identifies that due to the smaller extents impacted from the proposed temporary road route (which runs perpendicular to the watercourses in this location), focussed on the crossing locations would result in negligible impacts to water quality from sediment inputs or chemical pollution. Consequently, despite the likely sensitivity of the aquatic ecology receptors in the watercourse the impacts to otter, fish, macroinvertebrate, and macrophyte communities are not considered to be significant.

186) Impacts from increased sedimentation and a reduction in water quality during removal of bridges, outfalls, access track and compounds at all watercourses are considered to be temporary, medium term and reversible following cessation of the decommissioning works and reestablishment of vegetation.

9.6.4.4 Invasive Species

187) Decommissioning activities may cause or facilitate the spread of (normally non-native) invasive species. Invasive plant species can colonise new areas of land from seeds contained in the parent plant or the soil, or from fragments of living root or stem. Such reproductive materials can be inadvertently transferred from construction areas outside of the scheme boundary if they adhere to vehicles, machinery, tools, or clothing. They can also be inadvertently transferred in waste. Seeds and plant fragments can also be transported by watercourses and surface water runoff to areas not directly impacted by the work but with a hydrological connection.

188) Once present, invasive species can spread rapidly and out-compete the native vegetation that characterises the notable non-designated habitat. Habitat loss and fragmentation can also encourage the colonisation of invasive species by providing a pathway of suitable environmental conditions for invasive species to move closer to areas currently free from these species, this could affect the conservation status of a site, habitat, or species.

189) Terrestrial invasive species are assessed as part of the terrestrial ecology assessment in Chapter 9A (document reference: RVBC-MH-ES-009-01). No aquatic invasive species were identified within the red line boundary for the enabling works and the embedded mitigation in the CCoP are considered sufficient to prevent the introduction of aquatic or riparian invasive species. No impacts are anticipated for aquatic ecology receptors within the River Ribble, its tributaries, or the River Ribble BHS due to introduction or spread of aquatic invasive non-native species during the decommissioning phase.

9.6.4.5 Summary of Decommissioning Phase Effects

190) The assessment methodology involved the identification of the nature conservation value of each potentially affected important aquatic ecology receptor using a geographical framework. Those that were found to have at least local value have been subject to systematic impact assessment. A summary of the impact assessment of the decommissioning works phase effects prior to specific mitigation is provided below in **Table 9.9**

[illegible]: Summary of Decommissioning Phase Effects

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
Ribble BHS	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation during decommissioning works that adversely affect aquatic communities in the BHS	Direct, negative, low magnitude, temporary (up to short term), reversible	Significant Adverse Local
			Habitat fragmentation due to visual and noise disturbance during removal of bridges and outfalls	Direct negative, medium magnitude, temporary (short term), reversible	Significant Adverse Local
			Habitat loss and degradation during removal of bridge and outfall structures	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Macrophytes (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation during decommissioning works	Direct, negative, low magnitude, temporary (up to short term), reversible	Significant Adverse River Basin District
			Habitat loss and degradation during removal of bridge and outfall structures	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Fish (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation during decommissioning works	Direct, negative, low magnitude, temporary (up to short term), reversible	Significant Adverse River Basin District
			Habitat fragmentation due to visual and noise disturbance during removal of bridges and outfalls	Direct negative, medium magnitude, temporary (short term), reversible	Significant Adverse River Basin District
			Habitat loss and degradation during removal of bridge and outfall structures	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
Aquatic macroinvertebrates (River Ribble)	Ribble – Downstream Stock Beck	River Basin District	Pollution and increased sedimentation during decommissioning works	Direct, negative, low magnitude, temporary (up to short term), reversible	Significant Adverse River Basin District
			Habitat fragmentation due to visual and noise disturbance during removal of bridges and outfalls	Direct negative, medium magnitude, temporary (short term), reversible	Significant Adverse River Basin District
			Habitat loss and degradation during removal of bridge and outfall structures	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Otter (River Ribble, Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Habitat fragmentation and disturbance due to visual disturbance and high noise and vibration decommissioning	Direct negative, medium magnitude, temporary (short term), reversible	Significant Adverse Local
			Habitat loss and degradation during removal of bridge and outfall structures	Direct, negative, low magnitude, temporary (up to medium term), reversible	Not significant
			Degradation of prey resource	Indirect, negative, low magnitude, temporary (up to medium term), reversible	Not significant
Fish (River Ribble tributaries – Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation vegetation clearance and minor groundworks for the compound, access track, and site drainage.	Direct negative, low magnitude, temporary (short term), reversible	Not significant
			Pollution and increased sedimentation during decommissioning works	Direct, negative, low magnitude, temporary (up to short term), reversible	Significant Adverse Local

Environmental / Community Asset	WFD waterbody	Value	Potential Effect(s) Prior to Specific Mitigation	Nature of effects	Significance of Effect (Pre-Specific Mitigation)
			Habitat fragmentation due to visual and noise disturbance during removal of bridges and outfalls	Direct negative, low magnitude, temporary (short term), reversible	Not significant
			Habitat loss and degradation during removal of bridge and outfall structures	Direct, negative, medium magnitude, temporary (up to medium term), reversible	Significant Adverse Local
Aquatic macroinvertebrates (River Ribble tributaries – Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation during decommissioning works	Direct, negative, low magnitude, temporary (up to short term), reversible	Significant Adverse Local
			Habitat fragmentation due to visual and noise disturbance during removal of bridges and outfalls	Direct negative, low magnitude, temporary (short term), reversible	Not significant
			Habitat loss and degradation during removal of bridge and outfall structures	Direct, negative, medium magnitude, temporary (up to medium term), reversible	Significant Adverse Local
Aquatic macrophytes (River Ribble tributaries – Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Ribble – Downstream Stock Beck	Local	Pollution and increased sedimentation during decommissioning works	Direct, negative, low magnitude, temporary (up to short term), reversible	Significant Adverse Local
			Habitat loss and degradation during removal of bridge and outfall structures	Direct, negative, medium magnitude, temporary (up to medium term), reversible	Significant Adverse Local

9.7 Mitigation and Residual Effects

191) Mitigation is most effective if considered as an integral part of the Proposed Ribble Crossing design in order to avoid, reduce or offset any adverse effects on the aquatic ecology or wider environment.

192) There is potential for adverse effects to macrophytes, fish, aquatic macroinvertebrates, and otter in the River Ribble and Tributaries from a reduction in water quality and increased disturbance during the enabling works, construction, and decommissioning phases. Therefore, additional mitigation would be required to further reduce the surface water quality impacts from the Proposed Ribble Crossing.

193) The proposed additional mitigation measures consider current best practice, legislation, and guidance during the enabling works, construction, and decommissioning phases of the Proposed Ribble Crossing. Additional mitigation measures to reduce impacts to geomorphology, surface water quality, and sediment management are identified in Water Environment Chapter 7 Section 7.7 Water Environment Assessment Chapter 7 (document reference: RVBC-MH-RC-ES-007) these include:

- Construction Method Statements (CMS) for each construction activity.
- A site Pollution Prevention Plan for enabling, construction activities.
- 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 (**Mitigation Item WE-RC1**)
- 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 (**Mitigation Item WE-RC2**)
- 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 (**Mitigation Item WE- RC3**)
- 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 (**Mitigation Item WE-RC4**).
- 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 (**Mitigation Item WE-RC5**

194) Reinstatement of terrestrial habitats described in Chapter 9A Section 9A.7 (document reference: RVBC-MH-RC-ES-009-01) would also reduce the potential for sediment transfer during site restoration in the commissioning and operation phases.

9.7.1 Fish

195) Additional mitigation above that described in the CCoP required to reduce the potential for adverse effects from increased sedimentation from use of the proposed success tracks and compounds, and in river working for the installation of the culverts and temporary outfalls. The implementation of a low speed limit on the bridge would further reduce the potential for disturbance or habitat fragmentation due to noise and vibration during the operational phase of the Proposed Ribble Crossing.

196) 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 (**Mitigation item EA-RC1**). In-river works between May and September inclusive also have the potential to result in adverse effects on salmonid fry and parr and other fish species but are less likely to result in significant effects on recruitment as whole. This in combination with good practice construction methodologies and pollution prevention are considered to provide sufficient protection.

197) Piling, which would produce high noise and vibration levels, required for construction and decommissioning of the Ribble crossing bridge should not be undertaken during the peak salmon migration period and

breeding season October to May (**Mitigation item EA-RC2**). The timing of other high noise and vibration activities adjacent to water courses should also where possible undertaken outside of the period October to May. Piling and any 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 (**Mitigation item EA-RC3**).

198) During the operational phase the access road and Ribble crossing bridge would not be used during night-time for deliveries, and other uses during nights would be limited to shift change. This is considered sufficient to provide periods to allow migratory fish to pass through with minimal disturbance.

199) Timing restrictions for in river works in combination with the mitigation outlined the Water Environment Chapter 7 Section 7.7 (document reference: RVBC-MH-RC-ES-007) are considered to be sufficient to reduce the significance of potential impacts from sedimentation, water quality, disturbance and habitat fragmentation on the fish communities of the River Ribble, Ribble BHS, and Ribble tributaries (Coplow Brook, Greg Sike, and Unnamed Watercourse 2097).

9.7.2 Aquatic Macrophytes

200) Additional general mitigation measures to reduce impacts to geomorphology, water quality, and sediment management identified above and in Water Environment Chapter 7 Section 7.7 (document reference: RVBC-MH-RC-ES-007). These mitigation measures are considered to be sufficient to reduce the significance of potential impacts to aquatic macrophyte communities of the River Ribble, Ribble BHS, and Ribble tributaries (Coplow Brook, Greg Sike, and Unnamed Watercourse 2097) from increased sediments water quality degradation during the enabling, construction, and decommissioning phase.

201) No further site specific essential mitigation measures are therefore required for aquatic macrophytes.

9.7.3 Otter

202) 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 (see Appendix 9B.2 (document reference: RVBC-MH-RC-TA-009-02-02)). If they are in use by otter as resting or breeding places prior to the enabling works a method statement would be required to prevent disturbance or damage where possible. Where it is not possible to avoid damage or disturbance to the resting place a Natural England Protected Species Mitigation Licence would be required to temporarily exclude otters under to prevent the risk or injury or mortality during the proposed works. Removal or damage to an otter holt would require creation of an artificial otter holt within the home range of the otters present to compensate for the loss. As otters are highly mobile and utilise a range of resting places and holts across their home range it is not known if the potential holts identified would be present (could be naturally altered during high flow) or in use when the enabling works start.

203) The timing of mitigation identified for fish above for high noise, vibration and visual disturbance activities during the construction and decommissioning works are considered sufficient to reduce the potential for significant impacts from disturbance and habitat fragmentation for otters on the River Ribble. The implementation of a low speed limit on the bridge would further reduce the potential for disturbance or habitat fragmentation due to noise and vibration during the operational phase of the Proposed Ribble Crossing.

204) Additional general mitigation measures to reduce impacts to geomorphology, water quality, and sediment management are identified above and in Water Environment Chapter 7 Section 7.7 (document reference: RVBC-MH-RC-ES-007). These mitigation measures are considered to be sufficient to reduce the significance of potential impacts to otter populations of the River Ribble, Ribble BHS, and Ribble tributaries (Coplow Brook, Greg Sike, and Unnamed Watercourse 2097) from increased disturbance, habitat loss and degradation during the enabling, construction, and decommissioning phases.

205) Pre enabling works checks for otter resting places are also specified as part of the CCoP.

9.7.4 Ribble BHS

206) Additional general mitigation measures to reduce impacts to geomorphology, water quality, and sediment management identified above and in Water Environment Chapter 7 Section 7.7 (document reference: RVBC-MH-RC-ES-007). These mitigation measures in addition the specific mitigation identified for the fish communities and otter populations of the River Ribble are considered to be sufficient to reduce the significance of potential impacts to the communities supported by the Ribble BHS during the enabling, construction, and decommissioning phase.

207) No further site specific essential mitigation measures are therefore required for the River Ribble BHS.

9.7.5 Residual Effects

208) Following the application of additional mitigation measures, the residual significant impacts likely to occur during any of the project phases: enabling, construction, commissioning, operation, or decommissioning, are identified in **Table 9.10**. In summary, no residual significant impacts of are expected related to aquatic ecology features of River Ribble – downstream Stock Beck (GB112071065612) waterbody, for the phases assessed.

Table 9.10: Summary of Mitigation and Residual Effects

Environmental / Community Asset	Specific Mitigation	Magnitude (With Mitigation)	Residual Effect and Significance
Ribble BHS	Surface water quality and fluvial geomorphology mitigation measures identified above and in the Water Environment Chapter 7 Section 7.7. Timing of in river works and piling works (July to September) Avoidance of night-time working and artificial illumination of the watercourses	Low	Not significant
Macrophytes River Ribble	Surface water quality and fluvial geomorphology mitigation measures identified above and in the Water Environment Chapter 7 Section 7.7.	Low	Not significant
Fish River Ribble	Surface water quality and fluvial geomorphology mitigation measures identified in the Water Environment Chapter 7 Section 7.7. Timing of in river works and piling works (July to September) Avoidance of night-time working and artificial illumination of the watercourse	Low	Not significant

Environmental / Community Asset	Specific Mitigation	Magnitude (With Mitigation)	Residual Effect and Significance
Aquatic macroinvertebrates River Ribble	Surface water quality and fluvial geomorphology mitigation measures identified in the Water Environment Chapter 7 Section 7.7. Timing of in river works (July to September).	Low	Not significant
Otter River Ribble and Ribble tributaries (Coplow Brook, Greg Sike, and Unnamed Watercourse 2097)	Surface water quality and fluvial geomorphology mitigation measures identified in the Water Environment Chapter 7 Section 7.7. Pre-commencement checks and monitoring of potential otter holts. Method statement for enabling works and Natural England mitigation licence if required. Timing of in river works and piling works (July to September) Avoidance of night-time working and artificial illumination of the watercourse	Low	Not significant
Macrophytes River Ribble	Surface water quality and fluvial geomorphology mitigation measures identified above and in the Water Environment Chapter 7 Section 7.7.	Low	Not significant
Fish River Ribble	Surface water quality and fluvial geomorphology mitigation measures identified in the Water Environment Chapter 7 Section 7.7. Timing of in river works and piling works (July to September) Avoidance of night-time working and artificial illumination of the watercourse	Low	Not significant
Aquatic macroinvertebrates River Ribble	Surface water quality and fluvial geomorphology mitigation measures identified in the Water Environment Chapter 7 Section 7.7. Timing of in river works (July to September).	Low	Not significant

9.8 Conclusion

209) This chapter of the ES considered the potential aquatic ecology impacts associated with enabling works, construction, operation, and decommissioning impacts at nearby watercourses within 500 m with hydrological connectivity from the route of the Proposed Ribble Crossing.

210) After undertaking the assessment of the likely impact of the Proposed Scheme on the aquatic ecology receptors considered in this chapter potential impacts were identified for fish, macroinvertebrates, macrophytes, and otter during the enabling works, construction, and decommissioning phases. Therefore, it was necessary to identify mitigation measures to minimise the potential impacts.

211) Following incorporation of all mitigation measures the magnitude, probability, scale, and duration of the impacts to aquatic ecology receptors would be reduced to minor for the residual effects for aquatic ecology receptors during all phases of the proposed Ribble Crossing.

9.9 Glossary and Key Terms

212) Key phrases and terms used within this technical chapter relating to Aquatic Ecology are defined within Appendix 1.2: Glossary and Key Terms.