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MERSEY GATEWAY PROJECT

BIODIVERSITY MANAGEMENT PLAN

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MERSEY GATEWAY PROJECT
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1. INTRODUCTION

1.1 The Mersey Gateway Project

- 1.1.1 Halton Borough Council (the “Council”) is promoting a new road crossing of the Mersey Estuary (the “Estuary”) in the Borough of Halton (the “Borough”) and associated works to incorporate the new road crossing into the existing road network and to make changes to that network. Collectively the works required are known as the Mersey Gateway Project (hereafter referred to as the “Project”).
- 1.1.2 The Project will provide effective road connections to the Liverpool City area from north Cheshire in the south, thereby providing effective connectivity for the sub-region and addressing existing congestion in the Borough. The new road capacity ~~provides an opportunity to~~ will re-balance the transportation infrastructure within Halton towards delivering local sustainable transport and economic goals.
- 1.1.3 The Project’s scope includes the following:
- a. The delivery of a new road crossing of the River in Halton, known as the Mersey Gateway Bridge (referred to as the “New Bridge” throughout this plan);
 - b. Incorporation of the New Bridge in the existing highway network. These works are referred to as the Remote Highway Works;
 - c. Modification and de-linking of the Silver Jubilee Bridge (SJB) (excluding the asset management of the SJB works);
 - d. Integration of the revised networks with public transport, cycle and pedestrian links across Halton;
 - e. Integration with the surrounding environment through landscaping adjacent to the New Bridge and SJB; and
 - f. Implementation of tolling and development of associated infrastructure; and
 - g. Letting a Concession Contract for the construction, operation and maintenance of the Project.

1.2 Construction and Operation Code of Practice

- 1.2.1 A Construction and Operation code of Practice for Environmental management (COPE, B4027D/COPE/R01) has been prepared for the Project including the Proposals contained in the Further Applications (hereafter referred to as the “Project including the Proposals”). It defines the measures required to mitigate and monitor the construction and operation of the Project including the Proposals so as to protect the environment. It elaborates upon the mitigation proposals set out in the Further Applications Environmental Statement (ES) and also those that the Council proposes following discussions with stakeholders. It covers specific regulatory and best practice requirements. The COPE sits within the framework of the Project Environmental Management Plan (EMP).
- 1.2.2 The COPE sets out the requirements for a series of more detailed environmental management plans to ensure that the objectives of the COPE are satisfied, environmental legislative requirements are met and the environment is protected.

1.3 Purpose of this Document

- 1.3.1 This document is the **Biodiversity Management Plan (BDMP)** and forms one of the more detailed environmental management plans required by the COPE. It sets out ecological mitigation and monitoring measures required to mitigate the effects of the Project as drawn from the **Further Applications** ES (Chapters 10 (Terrestrial & Avian Ecology) and 11 (Aquatic Ecology)). It has been further developed during consultation with Natural England (NE), the Environment Agency (EA) and the Council's Nature Conservation Officer.
- 1.3.2 This **BDMP** outlines measures for mitigation and management which have been developed to address the ecological effects identified through the Environmental Impact Assessment (EIA) and presented in the **Further Applications** ES. The measures contained within this **BDMP** focus on the following receptors:
- a. The Upper Mersey Estuary (UME) Local Wildlife Site (LWS);
 - b. Wigg Island LWS and Local Nature Reserve (LNR);
 - c. St Helens Canal LWS;
 - d. Manchester Ship Canal LWS;
 - e. Watercourses within the Study Area: Stewards Brook, Bowers Brook Spur, Bowers Brook, Latchford Canal, Halton Brook, and Bridgewater Canal;
 - f. Birds;
 - g. Great Crested Newts;
 - h. Bats; and
 - i. Water Voles.

1.4 Structure of this BDMP

- 1.4.1 Avian, terrestrial and aquatic ecological effects identified through the EIA process are interlinked. This is particularly relevant in the estuarine environment. The estuarine habitats, which make up the UME LWS are comprised of saltmarshes, mudflats and intertidal habitats and support aquatic organisms and estuarine flora. These organisms and flora in turn provide the food source which supports the birdlife of the Estuary. These factors are highly dependent on one another and changes to variables within the Estuary can have a knock on effect on this sensitive estuarine environment and subsequently the flora and fauna that it supports.
- 1.4.2 As a result this **BDMP** takes into consideration the interactive nature of this environment. All ecological mitigation that has been developed for the UME LWS is set out in **Section 3.2** and **4.2** of this **BDMP**.
- 1.4.3 The **BDMP** is structured as follows:
- 1.4.4 **Section 2:** provides an outline of features having biodiversity value in the Project study area.
- 1.4.5 **Sections 3 to 5:** comprise the three main components of the BDMP; avian (**Section 3**), terrestrial (**Section 4**) and aquatic ecology (**Section 5**). Each of these components of the BDMP is supported by a series of appendices.

2. BIODIVERSITY VALUE OF THE STUDY AREA

Upper Mersey Estuary

- 2.1.1 There are a number of LWS¹ and LNR located in the UME and Halton. These are designated primarily for wildfowl and waders but also because of the saltmarsh and associated intertidal habitats that are located upstream of the ~~Silver Jubilee Bridge (SJB)~~.
- 2.1.2 On the north bank of the Estuary is an area of saltmarsh known as Widnes Warth and on the south bank, is an area of saltmarsh known as Astmoor Saltmarsh. The Astmoor Saltmarsh is bordered by the Estuary and the Manchester Ship Canal. Wigg Island is also located on the edge of the Estuary abutting the Astmoor Saltmarsh. These areas, along with the Estuarine habitats between them, are designated as a LWS.
- 2.1.3 Wigg Island is also designated as a LNR and contains Wigg Island Community Park and comprises 8.7 hectares of woodland and 9.1 hectares of grassland. These habitats support a wide range of flora and fauna including breeding and visiting birds, butterflies and moths, dragonflies and damselflies and a large number of terrestrial invertebrates. An award winning visitor centre was opened on the site in November 2007.
- 2.1.4 The UME LWS supports a small but significant assemblage of wintering and migratory wildfowl and wading birds. This environment also supports an assemblage, albeit of limited species content and density, of marine invertebrates which, together with marine plant species, provide a food resource for the wildfowl and wading birds.
- 2.1.5 There are significant populations of breeding bird species including Priority Species, notably Skylark and Reed Bunting, which use the saltmarsh habitats. [The ecological surveys for the period 2009 to 2011 confirm this view and have refreshed the baseline data.](#)

Middle Mersey Estuary

- 2.1.6 Although the [Further Applications](#) ES concludes that neither habitat nor biodiversity within the Middle Mersey Estuary will not be affected by the construction and operation of the Project [including the Proposals](#) it is important to set out information in relation to its European designation.
- 2.1.7 Immediately downstream of the SJB there are a number of sites having national and international designations for nature conservation purposes including:
- a. The Mersey Estuary Site of Special Scientific Interest (SSSI) as designated under the Wildlife & Countryside Act (1981) (amended by the Countryside and Rights of Way Act 2000);
 - b. The Mersey Estuary Ramsar Site (as designated under the Ramsar Convention on wetlands of international importance);
 - c. The Mersey Estuary Special Protection Area (SPA) for Birds (as designated under the European Commission Council on the Conservation of Wild Birds (79/409/EEC) on April 1979); and
 - d. The Mersey Estuary European Marine Site.
- 2.1.8 The Ramsar Site, SPA and European Marine Site form part of a network of sites that are collectively known as Natura 2000.

¹ Formerly known as Sites of Importance for Nature Conservation (SINCs)

- 2.1.9 The principal reason for the SPA designation is the occurrence of very large and internationally important populations of migratory wildfowl and wading birds. These birds are attracted to this area by its large and sheltered nature, grazed diverse flora and rich invertebrate fauna that live in the extensive areas of intertidal sand bank and mud-flats and creek and pool systems.
- 2.1.10 The conservation objective for the internationally important populations of regularly occurring migratory bird species states: '*Subject to natural change, maintain in favourable condition the habitats for the **internationally important populations of regularly occurring migratory bird species**, under the Birds Directive; in particular:*
- **Intertidal sediments**
 - **Rocky shores**
 - **Saltmarsh'**
- 2.1.11 The conservation objective for the internationally important assemblage of waterfowl states: '*Subject to natural change, maintain in favourable condition the habitats for the **internationally important assemblage of waterfowl**, under the Birds Directive, in particular:*
- **Intertidal sediments**
 - **Rocky shores**
 - **Saltmarsh'**

Watercourses

- 2.1.12 A number of watercourses located within the area surrounding the proposed alignment of the Project are considered to offer biodiversity value. These are:
- a. The St Helens Canal LWS. Its biodiversity and nature conservation importance is associated with its eutrophic standing water habitats, reedbed margins and a small amount of developing wet woodland. It also supports good assemblages of fish species and breeding dragonflies.
 - b. The Manchester Ship Canal LWS. This canal is of significant botanical importance for the colonies of wild orchid and species-rich plant communities it supports. It also offers habitat for a range of butterflies species.
 - c. The Steward's Brook. ~~Water voles have been recorded in this canal as noted at~~ [Water voles have not been recorded on the Stewards Brook since 2006, but as a precaution it is assumed they could still be present, as noted in Paragraph 2.1.15.](#)
 - d. Other watercourses in the study area include; the Bowers Brook spur, the Bowers Brook, The Latchford Canal, Halton Brook and the Bridgewater Canal.

Protected Species

- 2.1.13 A meta-population of Great Crested Newts (GCN) on the south side of the A557 Weston Point Expressway between the expressway and the nearby chemical works and in the vicinity of the Weston Link junction are likely to be affected by the construction and operation of the Project. GCN's and their habitats are protected by European and National legislation.
- 2.1.14 Bats, which are also protected by European and National legislation, have been recorded along the Project corridor. Bat foraging and commuting was associated with the Manchester Ship Canal, the disused St. Helen's Canal, the Bridgewater Canal, the disused Runcorn to Latchford Canal and Wigg Island. It is also likely that bats are using surrounding residential properties for roosting.

2.1.15 Although not identified during the Further Applications ES surveys, including surveys carried out in 2011, water voles are likely to could still be present along the Steward's Brook. Similarly to bats, water voles are protected by European and National legislation.

3. AVIAN ECOLOGY

3.1 Summary of Construction and Operational Effects

3.1.1 **Table 1** below provides a schedule of predicted significant effects of the Project including the [Proposals](#) on avian receptors. These effects have been extracted from Chapter 10 of the [Further Applications](#) ES where a detailed effect assessment can be found.

Table 1: Summary of Significant Effects of the Project on Avian Receptors

Project Phase	Effect and ES Reference	Description of Effect	Mitigation / Management Option in BDMP
Upper Mersey Estuary LWS			
Construction Effects	Loss of saltmarsh and intertidal habitats ES: Paragraphs 10.17.64 to 10.17.99	Construction of structures and working areas	Management of Astmoor and Widnes Warth Saltmarshes (Appendix 1)
	Disturbance to breeding, roosting, feeding and loafing and migratory birds ES: Paragraphs 10.17.64 to 10.17.121	Presence and movements of structures, machinery and personnel	
	Disturbance to breeding, roosting, feeding and loafing and migratory birds and oiling of birds ES: Paragraph 10.17.114	Noise and pollution produced by machinery	Implementation of best practice pollution prevention techniques as outlined in the COPE (Section 6.1)
Operational Effects	Disturbance to breeding, feeding, roosting and flying birds ES: Paragraphs 10.17.163 to 10.17.167	Presence of bridge structure	Management of Astmoor and Widnes Warth Saltmarshes (Appendix 1)
	Disturbance to breeding, feeding, roosting birds and disorientation of birds ES: Paragraphs 10.17.178 to 10.17.180	Movements of traffic, noise and artificial light	
	Oiling of birds ES: Paragraphs 10.17.181 to 10.17.182	Pollution from oils and road run-off	Adoption of appropriate design standards as outlined in the COPE (Section 6.1)
Mersey Estuary European Site			
Construction Effects	Oiling of birds and ingestion of chemicals ES: Paragraphs 10.17.133 to 10.17.135	Pollution from oil and chemical spillages in the UME	Implementation of best practice pollution prevention techniques as outlined in the COPE (Section 6.1)
Operational Effects	Pollution of birds using the intertidal habitats and river channels ES: Paragraphs 10.17.200 to 10.17.204	Pollution due to release of oils and other contaminants from traffic	Adoption of appropriate design standards as outlined in the COPE (Section 6.1)
Manchester Ship Canal LWS			
Construction Effects	Disturbance to breeding birds ES: Table 10.58	Construction activities and presence of the New Bridge	Avoidance of bird breeding season or adoption of appropriate precautions (Paragraph 3.2.3)
Wigg Island LWS and LNR			
Construction	Disturbance to breeding birds	Construction activities and	Avoidance of bird breeding

Project Phase	Effect and ES Reference	Description of Effect	Mitigation / Management Option in BDMP
Effects	ES: Paragraph 10.17.233	presence of the bridge structure	season or adoption of appropriate precautions (Paragraph 3.2.3)
Operational Effects	Disturbance to resident, breeding, visiting and roosting birds. ES: Paragraphs 10.17.242 to 10.17.244	Presence of moving traffic, noise and artificial lighting	Management of Astmoor and Widnes Warth Saltmarshes (Section 3.2)
St Helens Canal LWS			
Operational Effects	Disturbance to birds ES: Paragraph 10.17.215	Presence of the bridge and traffic use	Avoidance of bird breeding season or adoption of appropriate precautions (Appendix 1)

3.2 Mitigation of Avian Effects

- 3.2.1 This section of the **BDMP** sets out the essential mitigation and management that is required to mitigate the direct and indirect construction and operational effects of the Project [including the Proposals](#) (as listed in **Table 1** above) on birdlife that utilises the UME and surrounding terrestrial habitats.

Upper Mersey Estuary LWS

- 3.2.2 Details relating to the proposed mitigation scheme for the ecological effects of the Project [including the Proposals](#) on habitats and birds within the UME LWS are provided at **Appendix 1** of this **BDMP**.

Disturbance to Breeding Birds

- 3.2.3 Vegetation clearance required as part of the construction of the Project [including the Proposals](#) will be carried out outside the breeding season (March to August inclusive) where possible. Where this is not possible all clearance will be preceded by an inspection by a competent ornithologist. Where nesting birds are identified they will be protected from damage until the young have fledged.

3.3 Monitoring

- 3.3.1 **Appendix A3** of the **COPE** sets out a framework for avian ecological monitoring that will be implemented within the UME before, during and after construction of the Project [including the Proposals](#).

4. TERRESTRIAL ECOLOGY

4.1 Terrestrial Ecology Summary of Effects

4.1.1 **Table 2** below provides a schedule of predicted significant effects of the Project including the [Proposals](#) on terrestrial ecology receptors. These effects have been extracted from Chapter 10 of the [Further Applications](#) ES where a detailed effect assessment can be found. Relevant mitigation and management options in respect to the UME mitigation package are discussed above at **Section 3.2**, and information in relation to the protection of surface water quality features are detailed in the **COPE**.

Table 2: Schedule of Significant Effects of the Project on Terrestrial Ecology Receptors

Location	Terrestrial Ecology Receptor Effect and ES Reference	Effect	Description of Effect	Mitigation / Management Option in BDMP
Upper Mersey Estuary LWS				
Construction Effects	Widnes Warth Saltmarsh and Astmoor Saltmarsh ES: Paragraphs 10.17.53 to 10.17.81	Loss of vegetation	Construction and use of stone haul road	Management of Astmoor and Widnes Warth Saltmarshes (Appendix 1) and implementation of measures to for saltmarsh restoration (Appendix 1)
		Loss of seedbank		
		Damage to soil structure		
	Intertidal sand, silt or mudflats including sandbanks ES: Paragraphs 10.17.82 to 10.17.99	Loss of vegetation	Construction of cofferdams and working areas for construction of piers	
		Loss of seedbank		
Damage to soil structure	Use of hovercrafts			
Release of sediments	Use of low ground pressure tractors			
Operational Effects	All habitats ES: Paragraphs 10.17.144 to 10.17.158 and 10.17.178 to 10.17.196	Pollution of saltmarsh and other intertidal habitats and river channels	Release of oils and other pollutants from traffic	Implementation of best practice pollution prevention techniques as outlined in the COPE (Section 6.1)
		Inhibition of growth or dieback of vegetation	Shading of saltmarsh vegetation	Management of Astmoor and Widnes Warth Saltmarshes (Appendix 1)
Mersey Estuary European Marine Site				
Construction Effects	Habitats in the European Site ES: Paragraphs 10.17.126 to 10.17.131	Oiling and chemical contamination of waters and intertidal habitats in the European Site	Pollution from oil and chemical spillages in the UME	Implementation of best practice pollution prevention techniques as outlined in the COPE (Section 6.1)
Operational Effects	All habitats ES: Paragraphs 10.17.192 to 10.17.196	Pollution of saltmarsh and other intertidal habitats and river channels	Pollution caused by the release of oils, petrol and other contaminants from traffic	Adoption of appropriate design standards as outlined in the COPE (Section 6.1)
St Helens Canal LWS				
Construction	Vegetation	Loss of aquatic and water	Infilling a section of	Provision of

Location	Terrestrial Ecology Receptor Effect and ES Reference	Effect	Description of Effect	Mitigation / Management Option in BDMP
Effects	ES: Paragraph 10.17.210	margin habitats and vegetation	the Canal	compensatory habitat (Appendix 3)
	Fauna ES: Paragraph 10.17.212	Disturbance to water vole	Construction activities involving movements of machinery and noise	Provision of compensatory habitat (Appendix 3)
	Vegetation ES: Paragraph 10.17.210	Fragmentation of the canal habitat		
Operational Effects	Vegetation ES: Paragraph 10.17.215	Shading of canal vegetation and change to the local environment	Presence of the New Bridge structure	Provision of compensatory habitat (Appendix 3)
Manchester Ship Canal LWS				
Construction Effects	Vegetation ES: Paragraph 10.17.220	Mechanical and trampling damage to soils, vegetation and storage of materials	Construction activities involving access, movements of machinery and personnel and storage of materials	Translocation of flora (Appendix 3)
	Butterflies ES: Paragraph 10.17.222	Damage to butterflies	Construction activities	Translocation of butterfly flora (Appendix 3)
Operational Effects	Vegetation ES: Paragraphs 10.17.224 to 10.17.229	Inhibition of plant growth of orchids and other plant species requiring sunny habitats and moist soils	Presence of the New Bridge including shading and interception of rainfall	Soil Treatment (Appendix 3)
		Inhibition of plant growth	Compacted and poorly drained soils	Soil Treatment (Appendix 3)
		Sparse vegetation and poor habitat for invertebrates and other fauna	Shading, dry and compacted soils	Soil Treatment (Appendix 3)
Wigg Island LWS and LNR				
Construction Effects	Vegetation ES: Paragraphs 10.17.232 to 10.17.234	Loss of habitat and vegetation. Mechanical and trampling damage to soils, vegetation and plant species	Construction activities, involving access, movements of machinery and personnel and storage of materials	Management of Astmoor and Widnes Warth Saltmarshes (Appendix 1)
	Butterflies ES: Table 10.60	Damage and losses of butterfly and other invertebrate habitats	Construction activities	Landscaping (Appendix 3)
	Aesthetic appeal ES: Paragraphs 10.17.236 to 10.17.238	Reduction in aesthetic appeal and tranquillity of the LNR	Construction activities and presence of the New Bridge structure	Landscaping (Appendix 3)
Operational Effects	Vegetation ES: Paragraphs 10.17.239 to 10.17.240	Inhibition of plant growth of herbaceous and woody species	Presence of the New Bridge structure including shading	Management of Astmoor and Widnes Warth Saltmarshes (Appendix 1)
		Inhibition of plant growth. Poor habitat for invertebrates and other fauna	Interception of rainfall by the New Bridge structure	
	Aesthetic appeal	Reduction in aesthetic appeal and tranquillity of	Presence of moving traffic, noise and	Landscaping (Appendix 3)

Location	Terrestrial Ecology Receptor Effect and ES Reference	Effect	Description of Effect	Mitigation / Management Option in BDMP
	ES: Paragraph 10.17.244	the LNR	artificial lighting	
	Bats ES: Table 10.61	Disturbance to bats	Presence of moving traffic, noise and artificial lighting	Landscaping (Appendix 3)
Bats				
Construction Effects	Bats ES: Paragraphs 10.17.252 to 10.17.260	Loss of roosts	Construction of the Project including demolition of buildings, felling of trees, crossing of canals and de-linking	Implementation of bat mitigation (Appendix 3)
		Fragmentation of foraging habitat		
		Loss, reduction or deterioration of foraging habitat		
Operational Effects	Bats ES: Paragraphs 10.17.262 to 10.17.265	Loss of roosts	Construction of the Project including demolition of buildings, felling of trees, crossing of canals and de-linking	Implementation of bat mitigation (Appendix 3)
		Loss, reduction or deterioration of foraging habitat		
		Disorientation due to lighting and collisions with traffic		
Weston Link Junction				
Construction Effects	Great Crested Newts ES: Paragraphs 10.17.266 to 10.17.271	Loss of GCN foraging habitat	Improvement of the Weston Link Junction on the A557 Weston Point Expressway	Implementation of great crested newt mitigation (Appendix 3)
		Loss of GCN habitat used for shelter and protection		
		Loss of GCN hibernation habitat		
		Injury or killing GCNs		
Operational Effects	Great Crested Newts ES: Paragraph 10.17.272 to 273	Loss of GCN foraging habitat	Traffic use of the Weston Point Expressway bringing traffic closer to the GCN ponds along part of the Expressway.	Implementation of great crested newt mitigation (Appendix 3)
		Loss of GCN habitat used for shelter and protection		
		Loss of GCN hibernation habitat		
		Injury or killing GCNs		
St Michael's Golf Course				
Construction Effects	Water Voles ES: Paragraphs 10.17.275 to 10.17.281	Disturbance to water voles	Construction of Toll Plazas and associated highway works in the former St Michael's Golf Course and the culverting of a section of ditch	Implementation of water vole mitigation (Appendix 3)
		Potential losses of water vole burrows		
		Losses of aquatic and water-margin vegetation (foraging habitat)		
		Loss of water-margin and bankside vegetation cover		
Operational Effects	Water Voles ES: Paragraphs 10.17.282 to 10.17.284	Disturbance to water voles	Presence of culvert, traffic movements including noise and light and the use of toll booths in the former St Michael's Golf Course	Implementation of water vole mitigation (Appendix 3)
		Potential losses of water vole burrows		
		Losses of aquatic and water-margin vegetation (foraging habitat)		
		Loss of water-margin and bankside vegetation cover		

4.2 Terrestrial Ecology Mitigation

Upper Mersey Estuary LWS

- 4.2.1 **Section 3.2** and **Appendix 1** provides details on the mitigation package that is to be adopted as part of the Project [including the Proposals](#) at the Astmoor and Widnes Warth Saltmarshes. This package will mitigate the effects of the Project [including the Proposals](#), during both construction and operation, on avian and habitat receptors.
- 4.2.2 **Appendix 2** provides further details the desired saltmarsh plant communities and their management requirements.

Terrestrial Ecology Habitats

- 4.2.3 **Appendix 3** provides details on the mitigation package that is to be adopted as part of the Project [including the Proposals](#) for habitats and protected species outside the UME LWS which are likely to be affected by the Project (as detailed in **Table 2**). This package will mitigate the effects of the Project [including the Proposals](#), during both construction and operation on terrestrial ecology receptors.

4.3 Monitoring

- 4.3.1 As stated at **Section 3.3 Appendix B3** sets out a framework for ecology monitoring that will be implemented within the UME LWS before, during and after construction of the Project [including the Proposals](#).

5. AQUATIC ECOLOGY

5.1 Summary of Aquatic Ecological Effects

5.1.1 **Table 3** below provides a schedule of predicted significant effects of the Project [including the Proposals](#) on aquatic ecology receptors. These effects have been extracted from Chapter 11 of the ES where a detailed effect assessment can be found.

Table 3: Schedule Significant Effects of the Project on Aquatic Ecology Receptors

Location	Aquatic Ecology Receptor	Effect	Description of Effect	Mitigation / Management Option in BDMP
Construction Effects				
Mersey Estuary	Epifauna and fish	Underwater noise	Potential disturbance, auditory problems, loss of balance and coordination, from pile driving noise. In extreme cases possible mortality near pile driving source. Noise from hover barges.	Use of vibro instead of percussive piling. Maintenance of 'noise free' window during times of peak migration. Appendix A4 of COPE
	Marine mammals		Potential disturbance, auditory problems, loss of balance and coordination, from pile driving noise. In extreme cases possible mortality near pile driving source. Noise from hover barges.	Establishment of a safety zone to protect marine mammals. Appendix A4 of COPE
	Intertidal and subtidal habitat	Release of pollutants	Erosion of sediments/spillages and leakages of material. Potential release of contaminants within intertidal zone e.g. planings containing tar.	Removal of excavated material and dewater to appropriate disposal sites. Adhere to relevant waste legislation (e.g. Duty of Care Guidance). Store hazardous materials in secure containers to avoid spillage and leakage. COPE (Section 6.1)
	Infauna and benthic algae		Potentially direct damage to organisms if above Predicted No Effect Concentrations (PNECs) for specific taxa. Bioaccumulation of contaminants along food chain.	Removal of excavated material and dewater to appropriate disposal sites. Adhere to relevant waste legislation (e.g. Duty of Care Guidance). Store hazardous materials in secure containers to avoid

				spillage and leakage. COPE (Section 6.1)
	Epifauna and fish		Potentially direct adverse effect on epifauna and fish species (depending on type of pollutant and its concentration in sediments/water column). Damage due to consumption of contaminated prey items and bioaccumulation of contaminants.	Removal of excavated material and dewater to appropriate disposal sites. Adhere to relevant waste legislation (e.g. Duty of Care Guidance). Store hazardous materials in secure containers to avoid spillage and leakage. COPE (Section 6.1)
	Intertidal and subtidal_habitat	Habitat loss/disruption	Construction of tower, piers cofferdams and stone haul road. Direct loss of sediment habitat, tower surfaces would create a small area of new habitat.	None
	Infauna and benthic algae		Construction of tower, piers cofferdams and stone haul road. Direct loss of sediment habitat, tower surfaces would create a small area of new habitat.	None
	Epifauna and fish		Fish can move away from impacted areas and relocate to areas away from the site of construction. If stone haul road construction removes saltmarsh scrapes (potentially important habitat) this would decrease availability of potentially important intertidal refuge areas for fish. Cofferdam and pier structures may disorientate and impede salmon migration.	Ensure adequate space between pilings for fish to pass through. Appendix A4 of COPE
	Canal fauna and flora		Infilling of section of the St. Helens Canal. Displacement of organisms and reduction of available habitat for aquatic flora and fauna.	None
Operation				
	Canal fauna and flora	Guanotrophy:	Potential adverse impact due to increased organic input from roosting birds. Depletion of	None

			<p>dissolved oxygen levels in water column due to increased bacterial activity. Potential local reduction in macroinvertebrate diversity.</p>	
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5.2 Aquatic Ecology Mitigation and Monitoring

- 5.2.1 **Appendix A4** of the **COPE** sets out a framework for aquatic ecology mitigation and monitoring that will be implemented before, during and after construction of the Project [including the Proposals](#).