

## 12 MITIGATION

### 12.1 INTRODUCTION

All mitigation measures for the Proposed Development are set out in the relevant chapters of the EIAR submitted as part of the assessment.

These mitigation measures that will be implemented during the various phases are outlined in Table 12.1. The mitigation measures for the construction phase have been grouped together according to their environmental field/topic and are presented under the following headings:

- Construction Management
- Drainage Design and Maintenance
- Flora and Fauna
- Soils, subsoils and bedrock
- Air Quality/Dust
- Noise and Vibration
- Cultural Heritage
- Traffic

The mitigation and monitoring proposals are set out in separate tables in the OCEMP (Appendix 3c) for clarity and tracking of the pre-commencement survey requirements. Where particular monitoring proposed is considered to be a measure of mitigation, it has been included in the consolidated table for all mitigation measures proposed (Table 12.1). The mitigation proposals in the below format provides an easy to audit list that can be reviewed and reported on during the proposed works.

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
<b>Pre-Commencement Phase</b>				
MM1	EIAR Ch4	During construction of the proposed development, all staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2006'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan		
MM2	EIAR Ch4	Prior to excavation, the Contractor will assess record drawings and the results of the Site Investigation Contract in order to determine the exact depth and location of the existing wastewater collection network within the works area		
MM3	EIAR Ch10	Pre-construction archaeological test trenching will be undertaken within the accessible green field areas to be impacted by ground reduction works to create the diversion channel and local road diversions. This will include investigations on the line of the townland boundary between Mullenmore North and Cartrongilbert (CHS 3). In the event that any unrecorded features of archaeological significance are encountered the archaeologist will consult with Mayo County Council (MCC) and NMS in order to determine appropriate mitigation measures.		
MM3	EIAR Ch5, 6 OCEMP Section 3	A pre-construction invasive species survey will be undertaken at the site of the proposed Scheme		
MM4	EIAR Ch5	Prior to any instream works a crayfish survey will be undertaken by a suitably qualified ecologist and any crayfish encountered will be translocated under licence to areas upstream of the proposed works.		
MM5	EIAR Ch5	Similarly, prior to any instream works being undertaken, a survey for freshwater pearl mussel will be undertaken by a suitably qualified ecologist. In the unlikely event that freshwater pearl mussel are present, a derogation licence will be sought from the NPWS to facilitate their translocation to a suitable location within the river (where it does not dry out for extended periods on an annual basis.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
MM6	EIAR Ch5	Prior to construction, a dedicated otter survey will be undertaken by a suitably qualified ecologist to determine whether the identified holt has since become occupied and active. The status of the holt will be assessed (breeding holt/occasional use etc.) and a derogation licence for potential disturbance will be sought if works are proposed within 30m of an active holt.		
MM7	EIAR Ch5	Prior to construction, a dedicated Badger survey will be undertaken of the entire works area by a suitably qualified ecologist to determine the current status of badger activity throughout the site.		
MM8	EIAR Ch5	<p>The following measures will be put in place to promote biodiversity through the construction and operation of the proposed scheme:</p> <ul style="list-style-type: none"> <li>• The sections of the grasslands that are not in the base of the channel and subject to high levels of erosive stress will be sown with native wildflower seed mixes that are designed to encourage pollinators. The grasslands will be managed as a hay meadow with an annual cut undertaken in late summer or early autumn and all cut material removed.</li> <li>• 20 Bird and bat boxes will be erected throughout the works area for the scheme to provide nesting and roosting opportunities.</li> <li>• The planting of native hedgerows will include species such as hazel and hawthorn that provide a source of food for wildlife.</li> <li>• The grasslands in the diversion channel will not be fertilised or treated with any herbicide or pesticide.</li> </ul> <p>A nesting bank for kingfisher will be constructed adjacent to the River Deel in the vicinity of the flow control structure</p>		
MM9	EIAR Ch10	<p>The following mitigation measures traffic and roads will be implemented:</p> <ul style="list-style-type: none"> <li>• The contractor shall provide general condition and structural surveys of all transport infrastructure (roads (including haulage roads), bridges, access tracks) on all routes, including haulage routes, that may be impacted as a result of the proposed Drainage</li> </ul>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<p>Scheme before works commence on site and after completion and provided to the Ballina Municipal District (BMD)-West Engineer.</p> <ul style="list-style-type: none"> <li>• The contractor shall provide construction details of any lay-buys or hardstand if required to facilitate construction traffic during the construction phase of the Scheme;</li> <li>• The contractor shall be obliged to identify locations of any bridges that have weight/height restrictions along proposed haul routes and comply with these restrictions;</li> <li>• Site entrance locations off the public road may require a durable bound surface and a secure joint must be formed between the access road and the public road. A durable bound surface is required on access roads for a minimum distance of 10m from the public road;</li> <li>• Adequate drainage will be maintained at all times to ensure that no surface water from the site or site access discharges to the public roads;</li> <li>• Cleaning regime for plant will be implemented in order to minimise mud/dust on public roads.</li> </ul>		
MM10	EIAR Ch11	The Employer's Representative (Consultant Engineer) will assess the water distribution drawing and detailed site investigation in order to determine the locations of watermains relative to the proposed works as part of the Design Phase. Any anticipated clashes between the water distribution network and the proposed works will be identified during the design phase and any diversions necessary to avoid accidental clashes during the construction phase will be designed, planned and agreed with Irish Water in advance of the construction phase of the Scheme.		
MM11	EIAR Ch11	The locations of the gas pipelines relative to the proposed works will be confirmed as part of the Design Phase. The Employer's Representative (Consulting Engineer) will assess the gas network drawings and result of the detailed site investigation in order to determine the exact depth and location of the existing gas pipelines within the works		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		area. Should it be anticipated that the excavation for the diversion channel and bridge foundations will impact on this pipework, this will be taken into consideration at detailed design stage and any diversions necessary to avoid accidental clashes during construction phase will be designed, planned and agreed with Bord Gáis in advance of the construction phase.		
MM12	EIAR Ch11	The locations of the electricity network relative to the proposed works will be confirmed as part of the Design Phase. The Employer's Representative (Consulting Engineer) will assess the service drawings and results of the detailed site investigation in order to determine the exact depth and location of the existing electricity cables within the works area. Should it be anticipated that the excavation for the proposed works will impact on the electricity network, any diversions necessary to avoid accidental clashes during construction phase will be designed, planned and agreed with the ESB in advance of the construction phase		
MM13	EIAR Ch11	The Employer's Representative (Consultant Engineer) will assess the telecommunications network drawings and the detailed site investigation reports in order to determine the exact depth and location of the existing network within the works area. The locations of the telecommunications cable locations relative to the proposed works have been confirmed as part of the Design Phase. Should it be anticipated that the excavation for the proposed works will impact on this cabling, any diversions necessary to avoid accidental clashes during construction phase will be designed, planned and agreed with the service provider in advance of the construction phase.		
<b>Construction Phase</b>				
<b>Construction Management</b>				
MM14	EIAR Ch3	Construction of the diversion channel will commence at the downstream end and works will proceed in successive sections. Each section will be reinstated in advance of commencing the subsequent section		
MM15	EIAR Ch3	The timing for construction of the river flow control structure is dependent on periods when the river runs dry or there is low flow in the river and outside of the sensitive period for spawning fish in the River Deel.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
MM16	EIAR Ch3 OCEMP Section 8	The construction works have been sequenced, as detailed in Section 3.4, so as to ensure that flow will not be allowed into the channel from the river until the grass lining has been established		
MM17	EIAR Ch3	Construction vehicles will work from hardstanding areas to avoid the generation of mud within the works area. Temporary hardstanding will be constructed of clean shone behind the proposed retaining wall and all machinery will work from this area		
MM18	EIAR Ch3	A temporary construction compound will comprise the following: <ul style="list-style-type: none"> <li>• temporary site offices, port-a-loo toilets, facilities for staff and car-parking areas.</li> <li>• storage areas for construction materials.</li> <li>• bunded containment areas for plant refuelling, maintenance, washing and for the storage of fuels and site generators.</li> <li>• a dedicated waste storage area for any construction waste generated. Skips or bays will be provided for recyclable material.</li> <li>• wheel wash area for construction and delivery vehicles and a designated wash out tank for wash out of concrete trucks following concrete pours.</li> </ul>		
MM19	EIAR Ch4	A traffic management plan (such as rolling traffic management) will be prepared and implemented for the duration of the works in order to ensure that any impacts on traffic mobility are minimised.		
MM20	EIAR Ch11	Good communication between the Communications Officer and the landowners during the construction phase will prevent undue disturbance due to noise, dust and to minimise difficulties caused by the restriction of access to severed land parcels. In cases where impeded drainage during construction will cause obvious difficulty to a particular landowner, temporary measures will be taken to allow waters to drain to less critical areas and so minimise the impact. Any existing service connections severed as a result of construction of the diversion channel will be reinstated.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
<b>Drainage Design and Management</b>				
MM21	EIAR Ch3	Waters will be pumped to lands that are over 30 metres from any watercourse and discharged via a silt bag to a discharge point. The discharge point will consist of a circle of triple silt fences surrounding a circle of straw bales wrapped in Terram.		
MM22	EIAR Ch3	Wash out of concrete truck chutes will be carried out at a designated wash out tank located in the site compound, if required		
MM23	EIAR Ch3	Instream works required for the construction of the river flow control structure will be carried out when the river runs dry or at low flow if this is not possible.		
MM24	EIAR Ch3	As part of the construction of the river flow control structure, scour protection will be placed on the channel bed in the form of rip-rap.		
MM25	EIAR Ch3	Instream works (including preparatory work) will only be undertaken when the river is dry and outside of the sensitive period for spawning lamprey and salmonid fish in the River Deel from July to September (inclusive) and in consultation with Inland Fisheries Ireland to avoid accidental damage or siltation of spawning beds.		
MM26	EIAR Ch5 NIS Section 4	<p>Construction of the proposed scheme has been specifically designed to avoid the potential for water pollution. Details of the construction work practices and detailed method statements for each construction activity. Measures include:</p> <ul style="list-style-type: none"> <li>• Minimisation of Instream working area as outlined in construction drawings provided in Appendix 3A.</li> <li>• Appropriate timing of works to avoid sensitive periods, flooding or high flows.</li> <li>• Detailed construction drainage design to avoid potential run off</li> <li>• Detailed monitoring regime that ensures all measures are effectively employed during construction.</li> </ul>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<ul style="list-style-type: none"> <li>• Employment of an Environmental Clerk of Works.</li> <li>• Use of Sondes upstream and downstream of the works area to continually monitor water quality during the construction period.</li> <li>• Use of alarms that trigger when there is a 20% difference in turbidity between the upstream and downstream sondes.</li> <li>• Emergency procedures in place to minimise the potential for or impact of any pollution event.</li> </ul>		
MM27	EIAR Ch7	If necessary, water sampling and monitoring of the local water courses will also be completed to test for Total Suspended Solids (TSS) and hydrocarbon concentrations. The necessity will be determined by the Ecological Clerk of Work.		
MM28	EIAR Ch5	<p>The main measures proposed for the control of the spread of invasive species are:</p> <ul style="list-style-type: none"> <li>• The thorough cleaning and disinfecting of machinery and materials prior to introduction on to the site.</li> <li>• The inspection of any topsoil, stone or other imported material (should this be required) to ensure that it is not contaminated with invasive species before allowing it to be brought onto the site.</li> </ul>		
MM29	EIAR Ch5, 8 OCEMP Section 3 NIS Section 2	<p>The following measures will be put in place to avoid the occurrence of any adverse impacts resulting from the use of hydrocarbons on the site.</p> <ul style="list-style-type: none"> <li>• Fuels, chemicals, liquids and solid wastes will be stored on impermeable surfaces. Fuels stored on site will be minimised. Plant refuelling shall be undertaken using a jeep mounted bowser to minimise storage of fuel on site. Small quantities of</li> </ul>		



Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<p>chemicals and petrol required for tools shall be stored with drip trays in a vented fuel store in the temporary works compound</p> <ul style="list-style-type: none"> <li>• Plant refuelling shall be undertaken on impermeable surfaces within a suitably constructed bund in accordance with best practice guidelines . No refuelling will be permitted in or near soil or rock cuttings. Only designated trained operatives will be authorised to refuel plant on-site</li> <li>• Plant shall be inspected regularly for any leaks</li> <li>• Storage of fuel and oil will be regularly inspected for leaks or signs of damage</li> <li>• A lock system will be fitted on all taps, nozzles or valves associated with refuelling equipment</li> <li>• All hydrocarbons and other potential contaminants will be stored within suitably constructed bunds in accordance with best practice guidelines. The bunds will be sized to hold 110% of the volume of the stored contaminants in order to contain a spill should it occur. The base and walls of the bund shall be impermeable to water and oil</li> <li>• Spill kits will be provided at refuelling areas and at high risk/sensitive sites</li> <li>• Large volumes of excavated material will not be allowed to accumulate within the temporary working areas. Any stockpiling of soils will be greater than 10 metres away from any surface waters, and runoff will be prevented by the use of a silt fence</li> </ul>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<ul style="list-style-type: none"> <li>• There will be no storage of materials, machinery or soil in areas that are susceptible to flooding</li> <li>• Where contaminated soil is encountered, the ECoW will assess the extent of contamination and will supervise any operations involving contaminated soil. Any contaminated soil will be transported to an approved waste facility for treatment and safe disposal.</li> <li>• An emergency response plan to deal with accidental spillages is contained within the Outline Construction Environmental Management Plan. This will include providing toolbox talks regarding the appropriate use of spill kits and best practice for the management of accidental spills.</li> </ul>		
MM30	EIAR Ch7 NIS Section 2	<p>Measures to minimise the suspension and transfer of sediment and pollutants to ground and surface waters will be implemented. These measures are as follows:</p> <ul style="list-style-type: none"> <li>• Where dewatering is required, waters will be pumped to lands that are over 30 metres from any watercourse and discharged via a silt bag to a discharge point. The discharge point will consist of a circle of triple silt fences surrounding a circle of straw bales wrapped in Terram. All waters pumped from the excavation will filter through the silt bag, straw bales and silt fences before diffusely discharging to the ground. The discharge points will be constructed prior to commencement of construction works and will be monitored on a daily basis when in use to ensure that the release of any polluting material is mitigated.</li> <li>• Any stockpiling will be further than 10 metres from the river bank, and runoff will be prevented by the use of a silt fence.</li> <li>• Prior to construction of the river flow control structure, the instream works areas will be constructed by creating a horseshoe cofferdam. Construction works will be</li> </ul>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<p>carried out when the river runs dry if possible or at low flow conditions (outside of the sensitive period for spawning fish in the River Deel).</p> <ul style="list-style-type: none"> <li>• A triple silt fence will be constructed at all interfaces of the works area with the River Deel in advance of construction works on the banks of the river at the river flow control structure. Works undertaken on the river banks will be carried out at times of good weather and low flow in the river where there is no potential for significant volumes of surface water runoff from the works area or inundation with flood waters.</li> <li>• The entire boundary of the works area within the River Deel will be fenced off with a triple silt fence as shown on Construction Sequence Drawing: Stage 5 (Appendix 3B) for the construction of the intake structure. A solid wall of sand or soil bags will be constructed inside the silt fences to create a solid barrier between the works area and the river. All bankside works will be undertaken at times of good weather and low flow in the River where there is no potential for the works area to become inundated with water.</li> <li>• All works undertaken on the banks will be fully consolidated to prevent scour and run off of silt. Consolidation may include use of protective and biodegradable matting (coirmesh) on the banks and also the sowing of grass seed on bare soil.</li> <li>• Measures specified in the Outline Construction Environmental Management Plan will be adhered to in order to ensure all works are carried out in a manner designed to avoid and minimise any adverse impacts on the receiving environment.</li> <li>• All concrete works will be carried out in dry conditions, with no in-stream pouring of concrete, and in accordance with the best practice measures provided Chapter 3</li> </ul>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<ul style="list-style-type: none"> <li>• A silt fence will be erected on all sides of the temporary site compounds to prevent any run off from the perimeter of the compounds.</li> <li>• There will be no refuelling of machinery within the river channel. Refuelling will take place at designated locations in the site compound at distances of greater than 30 metres from the watercourse.</li> <li>• No vehicles will be left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads will be on site at all times.</li> <li>• Wash out of concrete truck chutes will be carried out at a designated wash out tank located in the site compound, if required.</li> <li>• Any fuel that is stored on the site will be in a double skinned, bunded container that will be located within a designated site compound at a location that is removed from the river. The locations of the site compounds are shown on the construction sequence drawings (Appendix 3B). All construction materials and plant will be stored in the site compounds. The compounds will also house the site offices and port-a-loo toilets. The compounds will be located on ground that is not prone to flooding or will be surrounded by a protective earth bund to prevent inundation. The site compounds will be surfaced with a hard standing to prevent generation of mud. A silt fence will be erected on all sides of the compounds to prevent any run off from the perimeter of the compounds. The locations of the site compounds will be adequately buffered to prevent any surface water runoff.</li> <li>• All vehicles will be regularly maintained and checked for fuel and oil leaks.</li> <li>• See also Chapter 5 of this EIAR for mitigation measures for aquatic ecology.</li> <li>• With regard to the diversion channel, 166,000 m<sup>3</sup> of excavated material is anticipated. This material will be reused where possible on site or contained and</li> </ul>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<p>transported off site as it is generated to reduce any risk of mobilisation to receiving watercourses. Excavated topsoil will be stored separately for reuse in reinstatement works on site and the storage area will be fenced off with silt fencing to prevent any run off.</p> <ul style="list-style-type: none"> <li>• Works in the vicinity of the Mullenmore Stream will take place during a dry period to prevent any erosion of bare soil to Mullenmore South stream and subsequently Lough Conn.</li> </ul> <p>There will be no storage of materials, machinery or soil in areas that are susceptible to flooding.</p>		
MM31	EIAR Ch6	<p>As well as minimising soil erosion, a surface water management system will also minimise the volume of suspended solids transported by surface water run-off and discharged into local watercourses. The following measures will form part of the surface water management system and the contractor will be obliged to implement them during the construction phase:</p> <ul style="list-style-type: none"> <li>• Vegetation and soil will be left in place for as long as possible prior to excavation and stockpiling of soil to be minimised during wet weather periods.</li> <li>• Soil stockpiles will be shaped so as to shed water.</li> <li>• Surface water run-off from exposed soil surface will be intercepted and redirected to the silt management areas as shown on the Construction Sequence Drawings (Appendix 3B).</li> <li>• Granular materials will be placed over bare soil, particularly in the vicinity of watercourses, to prevent erosion of fines and/or rutting by construction machinery.</li> </ul>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
MM32	EIAR Ch7 OCEMP Section 4	Runoff from works, stockpile and compound areas will be monitored and observed daily to ensure that it is not impacting on any local watercourses. Both hydrocarbons and silt cause discolouration so are easy to visually monitor for their presence.		
MM33	EIAR Ch7	Should aggradation occur upstream of the river flow control structure, removal gravels in this reach will be carried out when the river is dry using a tracked machine which will access the river bank from the vicinity of the intake structure.		
MM34	EIAR Ch7	The energy dissipation structure will reduce velocities of water entering the washlands and therefore the potential for erosion. The scour protection will also reduce the potential for erosion where velocities are predicted to be highest in the Works Area.		
<b>Flora and Fauna</b>				
MM35	EIAR Ch3	As part of site reinstatement, Soil will be placed on top of stone gabions at the upstream and downstream ends of the intake structure and taller native vegetation such as Hazel and Hawthorn will be planted in these areas.		
MM36	EIAR Ch3	The terrestrial area at the River Flow Control Structure will be reinstated by re-seeding with native grass and planting of native tree species on the banks.		
MM37	EIAR Ch3	Reinstatement of area around the grass lined diversion, bridges, energy dissipation structure and road realignment will be completed with the placement of topsoil, raking and reseeding with grass (channel base) and wild flower seed (channel banks).		
MM38	EIAR Ch5, 9 NIS Section 2	The loss of 1,471m of hedgerow and tree line and 0.46ha. of woodland habitat will be mitigated through the planting of 2,445m of native hedgerows and treelines along with replanting of native trees around the intake structure and the flow control structure.		
MM39	EIAR Ch5 NIS Section 4	Habitat loss will also be minimised by the fencing off the construction area at the outset of the works and preventing all vehicular access to these areas during construction		
MM40	EIAR Ch5	The original bed of the river removed to facilitate construction will be replaced during the operational phase of the development to ensure that there is no loss of fisheries habitat associated with the proposed scheme		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
MM41	EIAR Ch5	Instream work will only be undertaken, when the river is dry or outside the sensitive period for spawning lamprey and salmonid fish in the River Deel (July 1st to October September 30th)		
MM42	EIAR Ch5	When dewatering the river (if necessary), no more than 50% of the river will be blocked at any one time, thus allowing continued passage for the aquatic KERs through the catchment		
MM43	EIAR Ch5	Where cofferdams are required to facilitate a dry working area, the area inside the cofferdam will be electro-fished under licence from the IFI prior to drawdown.		
MM44	EIAR Ch5	All plant, machinery and equipment will be thoroughly cleaned and disinfected using Virkon 1% biocide prior to arrival and departure from the site to prevent the spread of invasive species such as Asian Clam, Zebra Mussel, Crayfish plague.		
MM45	EIAR Ch5	Where otter holts are identified as being in active use as a breeding holt at the time of the proposed works – these works will be suspended until breeding activity has concluded. All works will be undertaken in accordance with the 'Guidelines for Treatment of Otters prior to the Construction of National Road Schemes' (NRA 2008) following the procedure set out in EP 20 of the OPW 'Drainage Maintenance and Construction Environmental Guidance' (OPW 2019) In addition to the above, all works will be undertaken between the hours of 8am and 6 pm thus avoiding the main periods of activity for this crepuscular species.		
MM46	EIAR Ch5	Should any badger active setts be encountered, during the dedicated pre-construction badger survey (if badgers have migrated into the area since the recent dedicated surveys that have been undertaken), they will be similarly avoided where possible.		
MM47	EIAR Ch5	Should badger setts be identified within the development footprint during the pre-construction surveys (i.e. if the abandoned sett is re-occupied or if additional new setts are identified), a licence will be sought to exclude the Badgers in advance of the undertaking of any construction or clearance works.		
MM48	EIAR Ch5	All works will be carried out in accordance with the 'Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes' (NRA 2008) and OPW EP 23 – Badger Procedure (OPW 2019)		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
MM49	EIAR Ch6	<p>All Japanese Knotweed within and surrounding the site of the proposed works will be subject to the Invasive Species Management Plan (Chapter 5). The following measures will be implemented in order to mitigate against the risk of moving soil contaminated with Japanese Knotweed;</p> <ul style="list-style-type: none"> <li>• A pre-construction invasive species survey will be undertaken at the site of the proposed Scheme</li> <li>• In advance of any works being carried out on the site of the proposed flood relief scheme, any invasive species that occur within the identified works area will be subject to treatment with a non-persistent glyphosate herbicide. This will be undertaken at the end of the growing season (late August – September) and the method of application and chemical formulation will be agreed with all relevant stakeholders prior to application and treatment. Some of the stands are currently being treated in advance of any works. It is intended that these advance works will weaken the plant in advance of the construction works</li> <li>• Treatment will be undertaken from hand held sprayers and will avoid the potential for spray drift into other areas.</li> <li>• In all areas where Japanese Knotweed has been identified within the footprint of the proposed works (including areas within 7 metres of recorded stems) will be fenced off and included within the Knotweed Management Plan.</li> <li>• Knotweed and contaminated soil will be excavated from its current location and removed to a containment bund within the works area for ongoing treatment. The location of this bund is shown in Chapter 5, Figure 5.8.</li> </ul>		



Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<ul style="list-style-type: none"> <li>The loading of each truck will be undertaken on a surface that can be easily cleaned (such as a radon barrier) and will be inspected by a suitably qualified ecologist and if necessary, brushed down before departure to ensure that there is no knotweed present on the outside of it.</li> <li>The excavation will be overseen by a suitably qualified ecologist and will involve the excavation of the Knotweed and associated rhizomes. The ecologist will inspect the excavated area following removal and will determine whether all rhizomes have been removed. Once satisfied, the sites will be declared free from Knotweed.</li> <li>All excavation machinery will be thoroughly cleaned and disinfected prior to leaving the section of the proposed works that is subject to the Knotweed Management Plan.</li> <li>Following completion of the construction and reinstatement, the site will be sown with grass seed mix and allowed to quickly re-vegetate.</li> <li>Follow up surveys will be undertaken for at least three years following the construction to ensure that these small stands are completely eradicated.</li> </ul>		
MM50	EIAR Ch7	The diversion channel will be grass lined and is designed in accordance with fully researched and data substantiated methodology (CIRIA, 2003) for grass lined waterways to maximise the erosion resistance of the wash land. Areas of predicted high velocities will be reinforced with a geotextile layer and scour protection. In addition, the energy dissipation structure has been designed so as to reduce the velocities of flood waters entering the washlands from the diversion channel.		
MM51	EIAR Ch7	Cattle will not be permitted on the diversion channel to minimise disturbance. Sheep grazing has been shown to be effective for maintaining the grassed area with little/ no disturbance.		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
<b>Soils, Subsoils and Bedrock</b>				
MM52	EIAR Ch3	Where soil is to be stored for an extended period of time, it will be sown with grass seed to prevent any windblow or water erosion and subsequent run-off.		
MM53	EIAR Ch3 OCEMP Section 3	Where soil is not required for re-use, it will be removed by a licensed waste contractor.		
MM54	EIAR Ch6	Where it is necessary to remove bedrock to facilitate construction of the proposed scheme, suitable material will be reused elsewhere where possible. Material removed from site will be transported to the closest suitably licensed facility to be processed and used on other construction projects in the vicinity, where possible.		
MM55	EIAR Ch6 OCEMP Section 2, 3	Excavated subsoils will be reused as fill where possible. Any remaining volumes of surplus materials will be transported to the closest suitably licensed facility to be processed and reused in other construction projects in the vicinity, where possible. Where reuse is not possible, material will be transported to an approved waste facility for safe disposal.		
MM56	EIAR Ch6 OCEMP Section 2, 3	Any excavated topsoil will be stored on site and used to reinstate the channel. All storage will be undertaken within the identified temporary works area. The amount stored at any time will be minimised by completing the channel on a sectional basis with each section being completed before proceeding to the next Topsoil storage areas will be defined and fenced off with silt fencing to prevent run off.		
<b>Air Quality/Dust</b>				
MM57	EIAR Ch4, 8 OCEMP Section 3	In periods of extended dry weather, dust suppression (localised wetting of surfaces) may be necessary within and around the site to ensure dust does not cause a nuisance.		
MM58	EIAR Ch4	Mitigation measures will be implemented in relation to exhaust emissions and climate during the construction phase switching machinery off when not in use, maintaining all construction vehicles and plant in good operational order and sourcing material which will be required in large volumes such as aggregates locally where possible to reduce potential emissions		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
MM59	EIAR Ch4	If needed, environmental monitoring will occur at agreed locations for dust to confirm the effectiveness of the dust suppression measures adopted.		
<b>Noise and Vibration</b>				
MM60	EIAR Ch4 OCEMP Section 3	Noise control measures that will be employed include: <ul style="list-style-type: none"> <li>• selection of plant with low inherent potential for generation of noise and/ or vibration;</li> <li>• erection of enclosures as necessary around noisy processes and items such as generators, heavy mechanical plant or high duty compressors;</li> <li>• placing of noisy / vibratory plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.</li> </ul>		
MM61	EIAR Ch8	It is proposed that various practices be adopted during construction for the control of noise, including: <ul style="list-style-type: none"> <li>• where noise levels at NSLs are anticipated to exceed the daytime noise criteria, hoarding extending to a height of 2.4 m will be erected between the works area and the NSL. If such measures are installed, the construction operations are expected to meet or be less than the 70 dB <math>L_{Aeq(1hr)}</math> criterion</li> <li>• an alternative piling process which is viable to reduce noise and vibration impacts such as the Giken Seisakusho 'Silent Piler', or Variable Frequency Hammer or Variable Static Moment piling will be employed, if it is necessary to include sheet piling in the works. The Giken piling rig employs a 'press-in' method of piling in lieu of the more typical vibratory or impact type of piling. This method allows pre-formed piles to be installed with minimal noise and vibration generation. Noise level data for the Giken 'Silent Piler' indicates a measured sound pressure level of 75dB(A) at a distance of 1m (White et al, 2002). Assuming the piling rig operates continuously for one hour, this would result in a noise level of 65dB LAeq, 1hr at a distance of 10m, which would be a closer distance than the piling works would be</li> </ul>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<p>to any noise sensitive location. This level would be within the established criteria at each location and, hence, would allow piling activities to occur at any of the proposed works locations without a significant risk of noise emission exceeding the criteria.</p> <ul style="list-style-type: none"> <li>• limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;</li> <li>• establishing channels of communication between the contractor/developer, Local Authority and residents; inform affected residents of time of blasting or piling 24 hours in advance;</li> <li>• appointing a site representative responsible for matters relating to noise;</li> <li>• monitoring typical levels of noise during critical periods and at sensitive locations and along the river bed.</li> </ul> <p>Furthermore, a variety of practicable noise control measures will be employed. These will include:</p> <ul style="list-style-type: none"> <li>• selection of plant with low inherent potential for generation of noise;</li> <li>• erection of enclosures as necessary around noisy processes and items such as generators, heavy mechanical plant or high duty compressors;</li> <li>• placing of noisy plant as far away from sensitive properties as permitted by site constraints</li> </ul>		
MM62	EIAR Ch8	<p>The following survey methodology will be employed for attended noise monitoring:</p> <ul style="list-style-type: none"> <li>• measure LAeq, LAMax, LAMin, LA10 and LA90 over a sample period of 15 minutes;</li> <li>• detailed notes will be taken in relation to primary noise sources, weather and prevailing winds;</li> </ul>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<ul style="list-style-type: none"> <li>measurements will be conducted at various locations on a cyclical basis over the course of a typical day.</li> </ul> <p>Noise monitoring will be conducted in accordance with <i>ISO 1996: 2007: Acoustics – Description, measurement and assessment of environmental noise.</i></p>		
MM63	EIAR Ch4	Open lines of communication with local residents with regards to work schedules, programme and a reassurance of the temporary nature of the works generating noise and nuisance as well as adhering to agreed hours of construction		
MM64	EIAR Ch8	<p>For control of vibration, the following practices will be adopted during construction:</p> <ul style="list-style-type: none"> <li>establishing channels of communication between the contractor/developer, Local Authority and residents; inform affected residents of time of blasting or piling 24 hours in advance;</li> <li>appointing a site representative responsible for matters relating to vibration;</li> <li>monitoring typical levels of vibration during critical periods and at sensitive locations and along the river bed.</li> <li>If traditional piling methods are employed, a test pile will be erected at the piling location closest to the nearest sensitive locations. Vibration monitoring will then be conducted to confirm that ground borne vibration will be within the guidance criteria limits listed in Table 8.5 of Chapter 8 and that no structural damage will therefore occur to adjacent buildings. Vibration may also impact on aquatic species such as the fresh water pearl mussel. Vibration monitoring will also be conducted at locations along the river bed which are in proximity to piling activities in order to ensure that vibration will not adversely affect the aquatic environment. The vibration transmission associated with piling can be significantly reduced if piling operations are conducted using methods that are viable to reducing vibration</li> </ul>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<p>impacts such as the 'press-in' method. Although the exact levels will depend on ground composition, research indicates that vibration levels at a distance of 10m from the piling rig would be of the order of 1mm/s (White et al. 2002). This level is well below the BS 5228 guidance criteria limits.</p> <p>Furthermore, a variety of practicable vibration control measures will be employed. These will include:</p> <ul style="list-style-type: none"> <li>• selection of plant with low inherent potential for generation of vibration;</li> <li>• placing of vibratory plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.</li> </ul> <p>Vibration from construction activities will be limited to the values set out in Table 8.5 of Chapter 8.</p>		
MM65	EIAR Ch8	<p>The following survey methodology will be employed for attended vibration monitoring or test pile measurements:</p> <ul style="list-style-type: none"> <li>• measure the maximum ppv at each location over a sample period of 15 minutes;</li> <li>• detailed notes will be taken in relation to primary vibration sources;</li> <li>• measurements will be conducted at the locations on a cyclical basis over the course of a typical day (attended vibration monitoring only).</li> </ul> <p>Vibration monitoring will be conducted in accordance with either <i>BS 7385-1 (1990) Evaluation and measurement for vibration in buildings — Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings</i> or as appropriate.</p>		
<b>Cultural Heritage</b>				
MM66	EIAR Ch10	<p>A detailed building survey of the mill ruins will be undertaken by a suitably-qualified and experienced archaeologist in order to compile a full record of the extant structures in written, drawn and photographic formats.</p>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
MM67	EIAR Ch10	It is proposed to carry out works within the channel of the River Deel at the location of the River flow control system (RFCS). Works in this area will be subject to archaeological monitoring.		
<b>Traffic</b>				
MM68	EIAR Ch11	The construction of the reinforced concrete bridges will be carried out by a suitably qualified and experienced contractor who will be supervised to ensure that the works are carried out correctly. This will ensure that the bridges will be constructed safely and ensure the structural integrity of the structure		
MM69	EIAR Ch11	<p>Road Transport and Traffic Management Report will be prepared to include a map indicating the proposed public roads or haulage routes for removal of surplus material off site, as listed in Table 11.5 of Chapter 11.</p> <p>In addition, the following mitigation measure will be implemented within the Plan:</p> <ul style="list-style-type: none"> <li>• The locations at which traffic management measures will be put in place will be agreed with the BMD-West Engineer prior to commencement of the construction phase.</li> <li>• The contractor will confirm the proposed laden weight of trucks identified, max length of same, Journey time and number of trips per route per day to and from works sites.</li> <li>• The contractor will confirm the proposed start and finish times as outlined in this document and days for truck haulage and estimate the minimum and maximum number of days for full operation.</li> <li>• Pull-in lay-bys or hardstands for overtaking of slow moving traffic will be identified along the proposed haulage routes.</li> <li>• Any traffic control measures will be carried out with the agreement and under the supervision of the local Area Engineer. Road signage on the public road network will</li> </ul>		

Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		<p>comply with the Department of the Transport's Traffic Signs Manual "Chapter 8 Temporary Traffic Measures and Signs for Roadworks".</p> <ul style="list-style-type: none"> <li>Traffic management measures will be designed in accordance with the "Guidance for the Control and Management of Traffic at Roadworks – Second Edition".</li> </ul>		
MM70	EIAR Ch11	<p>The contractor will also be obliged to provide the following mitigation measures:</p> <ul style="list-style-type: none"> <li>Road signage on the public road network will comply with the Department of the Transport's Traffic Signs Manual "Chapter 8 Temporary Traffic Measures and Signs for Roadworks".</li> <li>Site entrance locations off the public road may require a durable bound surface and a secure joint must be formed between the access road and the public road. A durable bound surface is required on access roads for a minimum distance of 10 m from the public road</li> <li>Adequate drainage will be maintained at all times to ensure that no surface water from the site or site access discharges to the public roads</li> <li>Cleaning regime for plant will be implemented in order to minimise mud/dust on public roads</li> </ul>		
MM71	EIAR Ch11	<p>Construction works will be sequenced so as to avoid unnecessary interruption to road users insofar as is practicable. The realigned Lake Road will be constructed in advance of constructing the two new bridges thereby providing an alternative route to the R315 locally at the Mullenmore Bridge. This will minimise the potential requirement for a closure of the R315. Any road and lane closures will be timed to minimise the impact to the flow of traffic, and if possible, work will be carried out at off peak times to reduce the impact, particularly on heavy goods vehicles. All residents and interested parties shall be consulted when</p>		



Reference No.	Reference	Mitigation Measure	Audit Result	Action Required
		planning these road closures to optimise the timing of same. A complete schedule of road closures will be published in advance of the works commencing to facilitate residents in making alternative arrangements where necessary		
MM72	EIAR Ch11	New bridges are proposed for the L1105 and R315. Access to property along the Lake Road will be maintained by realigning the road and creating a new junction with the R315 Regional Road.		
MM73	EIAR Ch11	The Lake Road diversion will be constructed in advance of the other elements of the scheme so that access is maintained in the vicinity of the Lake Road. Maintenance of access will also be taken into account in the overall sequencing of the works.		
<b>Operational Phase</b>				
MM74	EIAR Ch6	A monitoring programme will include for an annual hydro geomorphological review and comparative assessment made		
MM75	EIAR Ch3	Monitoring of morphological adjustment and bed sediment characteristics Gravel tagging will be carried out to inform the frequency of routine maintenance but is not proposed as a means of determining the effectiveness of the mitigation implemented		
MM76	EIAR Ch7	Data from hydrometric gauges installed in connection with the Scheme will be monitored and the hydraulic model will be periodically recalibrated following high flow events to inform if any adjustments are required to the adjustable steel plates on the river flow control structure and along the intake weir.		

**Table 11.1 Mitigation Measures**