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### 9.1 INTRODUCTION

COWL is committed to constructing and operating Rhyl Flats wind farm to high environmental standards.

This section provides a summary of the mitigation measures as well as proposed commitments to monitoring.

### 9.2 MITIGATION

A summary of mitigation measures is presented in *Table 9.1*.

Mitigation measures proposed during construction will be adopted by COWL and imposed as conditions of contract on the Engineering, Procurement and Construction (EPC) contractor and any sub-contractors employed to build the wind farm.

Mitigation measures proposed during operation will be adopted by COWL and imposed as conditions of the contract on the EPC contractor where relevant to the design of the wind farm.

### 9.3 MONITORING

Monitoring requirements can be summarised as follows:

- A pre and post-construction monitoring programme will identify the rate at which scour takes place as a result of the presence of the turbines. The scope of the monitoring work will be guided by HR Wallingford and agreed in advance with CEFAS.
- Given the limited availability of information concerning electromagnetic effects to fish, post construction monitoring will include measurements of electromagnetic fields and observations of fish response. The scope of this monitoring will be agreed in advance with CEFAS.
- Once the wind farm has been installed, the behaviour of commercial vessels should be monitored.

*Table 9.1* summarises the specific mitigation measures which will be implemented.

**Table 9.1** *Mitigation Measures to be Implemented during Construction and Operation*

Environmental Issue/Impact	Mitigation Measures
Coastal Geomorphology	<ul style="list-style-type: none"> <li>• Trenching (open cut method only) to be undertaken at low tide from Mean Low Water Spring (MLWS) to the sea defences, thus minimising the potential for material to be re-suspended.</li> <li>• The trench (open cut method only) will immediately be backfilled once the cable has been installed, thus minimising the exposure of excavated material to coastal processes.</li> <li>• Following backfilling (open cut method only) the beach will be regraded and re-profiled to its former state, in order to minimise changes to beach sediment dynamics.</li> <li>• Compaction impacts will be managed through good plant use according to best practice management.</li> </ul>
Flood Defence	<ul style="list-style-type: none"> <li>• Open cut trenching will only be undertaken at such a time when the risks of a storm surge are anticipated to be minimal.</li> <li>• Any construction work involving the flood defence crossing (open cut option) will be undertaken at low tide.</li> <li>• The stop boards associated with the cable landfall will be replaced with concrete, thus improving the condition of the existing sea defences.</li> <li>• An emergency response plan (dealing with accidental breaching) will be incorporated into the Contractors' invitation to tender. The Contractor will be responsible for providing appropriate mitigation measures in the event of a breach during construction.</li> <li>• COWL will continue to liaise with the Environment Agency during detailed design to ensure that the final sea defence design and construction methods are acceptable.</li> </ul>
Physical Impacts to the Seabed	<ul style="list-style-type: none"> <li>• A post-construction monitoring programme will identify the rate at which scour takes place. Appropriate scour protection measures will be recommended at such a time that suitable information to inform design becomes available.</li> </ul>

Environmental Issue/Impact	Mitigation Measures
Water Quality	<ul style="list-style-type: none"> <li>• The offshore contractor will ensure that all discharges from the rigs and ships will be in accordance with MARPOL 73/78, the UK Merchant Shipping (Prevention of Pollution) Regulations 1983 and the Merchant Shipping (Prevention of Pollution by Garbage) Regulations (1988) and that the chemical constituents of rig wash, cement and epoxy paints are environmentally acceptable under the Harmonised Mandatory Control System as described above.</li> <li>• Quantities of all chemicals used will be monitored.</li> <li>• Good working practice throughout the construction period will prevent and contain any accidental spills and avoid the dropping of solid objects overboard.</li> <li>• Monitoring of suspended solids will be undertaken before and during cable installation and the construction of the cable landfall. If the levels of suspended sediment rise above a critical level, construction work will either stop or a 'curtain' will be installed to protect Environment Agency water quality monitoring sites from sediment plumes, resulting in deterioration of water quality.</li> </ul>
Sediment Quality	<ul style="list-style-type: none"> <li>• The contractor will be responsible for ensuring that the chemical constituents of any grouting cement used are environmentally acceptable under the Harmonised Mandatory Control System.</li> <li>• Quantities of all chemicals used will be monitored.</li> <li>• Post construction monitoring will be carried out to monitor scour. When sufficient information has been collected regarding the potential for scour, appropriate mitigation will be implemented in order to minimise scour, thus minimising the potential for contaminant release from disturbed sediments.</li> </ul>
Air Quality	<ul style="list-style-type: none"> <li>• The contractor will use vessels which are well maintained and use high economy fuels (low sulphur fuels if possible).</li> </ul>
Benthic flora and fauna	<ul style="list-style-type: none"> <li>• A post-construction monitoring programme will identify the rate at which scour takes place. Appropriate scour protection measures will be recommended at such a time that suitable information to inform design becomes available. Appropriate scour protection measures will help minimise impacts to benthic flora and fauna</li> </ul>
Intertidal flora and fauna	<ul style="list-style-type: none"> <li>• Trenching will take place at low tide from the Mean Low Water Spring to the sea defences, thus minimising the potential for material to be re-suspended causing smothering impacts to intertidal organisms.</li> <li>• The trench will immediately be backfilled once the cable has been installed, thus minimising the exposure of excavated material to coastal processes reducing the potential for smothering impacts.</li> </ul>

Environmental Issue/Impact	Mitigation Measures
Physical Impacts to fish	<ul style="list-style-type: none"> <li>Design of scour protection measures will be undertaken with ecological factors in mind in order to maximise the potential for increasing biodiversity.</li> </ul>
Underwater Noise Impacts to Fish	<p>There are a number of methods by which the impacts of noise from piling activity can be minimised as utilising attenuation techniques to reduce sound propagation from the pile, <i>ie</i> bubble curtains. Bubble curtain systems have been employed as part of the remedial measures for the PIDP and in field measurements indicate level reductions of 4 – 12 dB.</p>
Electromagnetic Impacts to Fish	<ul style="list-style-type: none"> <li>The cable will be buried at a minimum depth of 1 m.</li> <li>The cable will include several layers of insulation.</li> <li>Post construction monitoring of electromagnetic fields and elasmobranch response to noise.</li> </ul>
Physical Impacts to Marine Mammals	<ul style="list-style-type: none"> <li>Opportunistic observations of marine mammals and recording of their behaviour response to the presence of the construction vessels will be made.</li> <li>All construction vessels will take great care when close to marine mammals.</li> <li>With the possible exception of an emergency situation, at no time will approach vessels approach marine mammals at high speed or make rapid changes in course in their vicinity.</li> </ul>
Noise Impacts to Marine Mammals	<ul style="list-style-type: none"> <li>There are a number of methods by which the potential for impacts to marine mammals from noise generated by piling can be minimised by utilising attenuation techniques to reduce sound propagation from the pile, <i>ie</i> bubble curtains.</li> <li>Piling will not be undertaken if marine mammals are sighted in the area.</li> </ul>

Environmental Issue/Impact	Mitigation Measures
Impacts to birds	<ul style="list-style-type: none"> <li>• further aerial and boat based bird surveys and annual benthic sampling, will be undertaken as necessary up to the onset of construction, during construction, operation and during the decommissioning phases to provide further information about the use of the study area by bird species such as common scoter and red-throated diver. This information will be used to refine the proposals wherever possible (eg timing of activities; routing of shipping traffic).</li> <li>• the findings of ongoing CCW aerial surveys will be used to help refine the timing of the laying of the sub-sea cable from the wind farm site to the landfall. This will be undertaken at a time that keeps the risk of impacts to sensitive bird species to a minimum;</li> <li>• routes used by construction boat traffic will follow existing shipping routes to reduce the risk of additional disturbance;</li> <li>• the construction programme will minimise work offshore in March to reduce the risk of impacts to concentrations of common scoter that are known to be present in the study area;</li> <li>• a separation distance of over 300 metres has been allowed between the wind turbines to reduce the risk of a barrier effect to the movement of birds in the north south direction, whilst a 2 km separation has been allowed in the east west direction to help reduce the risk of impacts to birds flying parallel to the coast;</li> <li>• habitat loss will be reduced to a necessary minimum to avoid loss of benthic communities and habitat for fish species;</li> <li>• best site management practices will be implemented to reduce the risk of impacts to surrounding habitat and species.</li> </ul>
Impacts to Fisheries	<ul style="list-style-type: none"> <li>• COWL will continue consultation and inform fishing interests in advance of the timing and nature of construction activity.</li> <li>• Subject to the requirements of affected fishing groups, continue liaison with fishing groups.</li> <li>• COWL will carry out post construction fish monitoring (through analysis of catch/overflight data).</li> <li>• COWL will carry out post construction monitoring of effects to fish from presence of electromagnetic cable.</li> </ul>
Archaeology	<ul style="list-style-type: none"> <li>• Any further geophysical survey will be reviewed by a suitably experienced archaeologist.</li> </ul>

Environmental Issue/Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>• The specification and implementation of marine geotechnical surveys (boreholes) will be subject to archaeological advice. Where Holocene material is apparent, provision will be made for recovery of continuous undisturbed samples.</li> <li>• A Written Scheme of Investigation (WSI) will be developed for the construction phase in consultation with Cadw and Clwyd Powys Archaeological Trust.</li> <li>• Preparation of the WSI will be informed by archaeological coring across the foreshore. Where Holocene material is apparent, provision will be made for complete recovery of cores. If suitable horizons are identified, provision will be made for palaeo-environmental assessment and radiocarbon dating of sub-samples.</li> <li>• The position and extent of the designated area around the <i>Resurgam</i> will be marked as an exclusion zone on scheme masterplans, including contract documents.</li> <li>• An exclusion zone will be defined around the <i>SS Penrhos</i>, which will be marked on scheme masterplans, including contract documents.</li> <li>• Existing data relating to the 11 sidescan anomalies will be reviewed in consultation with Cadw. If warranted, exclusion zones will be defined around anomalies that are suspected as being of archaeological importance. In the event that an exclusion zone would impinge on construction and an archaeological origin to the anomaly is still suspected, then further archaeological investigation (<i>eg</i> diving inspection) will be undertaken to resolve the situation.</li> <li>• Further exclusion zones will be defined around any other features shown to be of archaeological importance prior to or in the course of construction.</li> <li>• A protocol will be prepared setting out procedures for dealing with any features that appear to be of archaeological importance which are discovered in the course of construction. The protocol will make provision for the institution of temporary exclusion zones around areas of possible archaeological interest, for prompt archaeological advice and, if necessary, for archaeological inspection of important features prior to further construction in the vicinity. The protocol will also provide for the reporting of archaeological discoveries to Cadw, the National Monuments Record of Wales, and Clwyd Powys Archaeological Trust. The protocol will comply with the <i>Merchant Shipping Act 1995</i>, including notification of the Receiver of Wreck, and accord with the JNAPC Code of Practice for Seabed Developers. The protocol will be appended to the WSI for the construction phase referred to above.</li> </ul>

Environmental Issue/Impact	Mitigation Measures
Airborne Noise	<ul style="list-style-type: none"> <li>To control noise from the construction of the landfill, it is appropriate that the guidance contained within BS 5228 : 1997 Noise and vibration control on construction and open sites Part 1 : Code of practice for basic information and procedures for noise and vibration control is followed. This will minimise the potential for disturbance by any construction activity associated with the landfill.</li> </ul>
Tourism and Amenity	<ul style="list-style-type: none"> <li>COWL will contact the UK Hydrographic office in advance of the construction period to ensure that details are included in weekly notices to mariners and via NAVTEXT broadcasts.</li> <li>Prior to arrival on site, the offshore construction manager will review the precise risks and agree the detailed contingency plans, roles and responsibilities in managing hazards.</li> <li>The drilling/piling rigs will be registered as a navigational hazard to shipping with the HM Coastguard and Hydrographic Office. While on station, the rigs will use navigational lights and warning devices (obstruction lights and foghorn) to advise its shipping presence.</li> <li>A dedicated guard vessel will be present on site to warn other sea users of the construction activity.</li> </ul>
Shipping and Navigation	<ul style="list-style-type: none"> <li>As a first measure, COWL has already contacted the regular runners and obtained feedback during the consultation process.</li> <li>If construction schedules for North Holye and Rhyl Flats wind farms are anticipated to overlap, a workshop will be held with NWP in order to discuss the construction phasing.</li> <li>Both during construction and operation the site area will be marked with buoys marking the limits of the exclusion zones.</li> <li>The movement of the rig and construction vessels to and from the wind farm site will be carefully planned with regard to the existing routing pattern in the area to minimise the effects to passing vessels. Details of rig movements will be circulated to mariners so they can plan their routes accordingly. The support vessels will also ensure the positions they take do not create a navigational obstruction.</li> <li>Navigational warnings: COWL will contact the Hydrographic Office in advance of rig deployment to ensure that details of the construction operations are included in weekly notices to mariners and via NAVTEXT broadcasts.</li> <li>Prior to mobilisation of the rig and construction vessels to site, the offshore construction manager will review the precise risks and agree the detailed contingency plans, roles and responsibilities in managing hazards.</li> </ul>



Environmental Issue/Impact	Mitigation Measures
	<ul style="list-style-type: none"> <li>• Location aids: The wind farm and exclusion zones will be registered as a navigational hazard to shipping with the HM coastguard and the Hydrographic Office. The turbines at the field extremities will be marked with appropriate navigational lights.</li> <li>• The potential exists for transmitting the climatic and sea state data obtained from the meteorological masts to the Mostyn-Dublin ferry. This may help ensure vessels meet their schedules, saving time and fuel and minimising waiting times in the proximity to the wind farm.</li> <li>• Shipping activity will periodically be monitored following the establishment of the wind farm to analyse vessel behaviour and ensure that the measures in place to minimise risks to shipping are sufficient.</li> </ul>
Traffic and Transport	<ul style="list-style-type: none"> <li>• Suitable measures will be taken during the construction period to prevent the deposit of mud and dirt on the public highway and to prevent the propagation of dust from the site.</li> <li>• The distribution of HGVs bringing construction materials, or other equipment, to the site will be organised to avoid vehicles travelling in convoy.</li> <li>• Adequate storage facilities will be provided within the docks to ensure that vehicles do not wait, or park, on the public highway.</li> <li>• Any specialist abnormal loads will be programmed to avoid periods of peak traffic flows on local roads.</li> <li>• Any specialist abnormal loads will be brought to the site by the approved primary road network in the area and with consultation via the Local Highways Authority and Police.</li> </ul>
The Local Economy	<ul style="list-style-type: none"> <li>• Consultation has already been undertaken with the local councils and the National Assembly for Wales and communication will continue in order to exploit any opportunities which may help enhance the employment opportunities and the local economy.</li> </ul>
Seascape, Landscape and Visual Amenity	<ul style="list-style-type: none"> <li>• The simple, formal, regular arrangement of same design/size turbines will suit the simple, bland and relatively constant character of the seascape.</li> <li>• Slender turbine towers with a dull light grey finish above the platform level will minimise visibility against sea and sky (between the waterline and the platform level, the towers will be painted yellow for navigational safety).</li> <li>• Internal lifting gear within the turbine towers will avoid the need for external lifting gear for regular maintenance.</li> <li>• During construction and decommissioning, works should be kept to the minimum timescales possible, to minimise the potential for impact (see <i>Annex K</i>).</li> </ul>