



Chapter 16.0

Terrestrial Ecology

16.0 Terrestrial Ecology

16.1 Overview of existing situation

- 16.1.0.1 The Project consists of approximately 25km of breakwater encompassing 70km² of the Severn Estuary with landfall of breakwaters approximately 2km from the entrance to Cardiff Bay in the west and approximately 2km from the mouth of the River Usk in the east.
- 16.1.0.2 In terms of terrestrial ecology, the Project spans the southern edges of the Wentlooge Levels. The Wentlooge Levels form the western part of the Gwent Levels, an area of low-lying land located between Cardiff and Caldicot. The Gwent Levels are the result of at least 2000 years of human intervention, which included the development of an intricate network of drainage channels to reclaim land from the sea, in addition to the construction of physical sea defences. Much of the reclaimed land now lies below Mean High Water (MHW) level.
- 16.1.0.3 The coastal and floodplain grazing marsh associated with the Gwent Levels supports significant wildlife interest, particularly aquatic and semi-aquatic flora and fauna associated with the drainage channel network. In recognition of this, much of the Gwent Levels has been protected by site designation and is notified within six Sites of Special Scientific Interest (SSSIs).
- 16.1.0.4 Traditionally, surface water drainage of farmland within the levels was achieved through a pattern of ridge and furrow (grips), which emptied into ditches surrounding each field. Individual landowners are generally responsible for the maintenance of the field ditches. These ditches generally flow into larger ditches known as 'reens' that are managed by the Caldicot and Wentlooge Levels Internal Drainage Board (CWLIDB). In turn the reens discharge into larger channels (pills) before ultimately discharging into the Severn Estuary via one-way tidal flaps (gouts). The larger reens and pills that discharge into the Severn Estuary are usually the responsibility of Natural Resources Wales (NRW).
- 16.1.0.5 The coastline of the Gwent Levels is characterised by sea defences, fringes of grazed saltmarsh, rock-armouring and intertidal mudflats of the Severn Estuary. The habitat and species assemblage (particularly birds) of the Severn Estuary is internationally recognised and designated as a Special Protection Area (SPA), Special Area of Conservation (SAC), Ramsar site and SSSI.
- 16.1.0.6 The footprint of the Project also encompasses the mouth of the River Rhymney (which is not designated). Although the Project footprint does not enclose the River Usk, indirect effects on this site of European importance for nature conservation (SAC and SSSI) will also be considered.



16.2 Legislative and Policy Requirements

16.2.0.1 Relevant legislation, policies and guidance for the assessment for terrestrial ecology include, but are not restricted to, the following:

- i. The Conservation of Habitats and Species (Amendment) Regulations 2010
- ii. The Wildlife and Countryside Act 1981 (as amended)
- iii. Natural Environment and Rural Communities Act 2006
- iv. The Countryside and Rights of Way Act 2000
- v. Planning Policy Wales (Edition 5, November 2012) – Chapter 5: Conserving and Improving Natural Heritage and the Coast
- vi. Planning Policy Wales – Technical Advice Note 5: Nature Conservation and Planning
- vii. UK Post-2010 Biodiversity Framework (2012)

16.3 Scope of potential impact to be assessed

16.3.0.1 Development of a tidal lagoon will result in direct and indirect impacts to terrestrial ecology during construction, operation and decommissioning phases. It should be noted that the terrestrial ecology assessment will use information from other environmental impact assessment (EIA) studies including coastal processes, coastal birds, intertidal ecology and terrestrial noise and vibration. There will therefore be a close link between specialists working on these various topic areas to confirm data required and to share findings of assessments.

16.3.0.2 It is envisaged that the terrestrial footprint of the Project will comprise:

- i. Landfall points of breakwaters;
- ii. Temporary compounds and infrastructure required for construction of the Project;
- iii. Terrestrial component of the power export cable route and any new infrastructure required to connect to the National Grid (requirements to be confirmed); and
- iv. Onshore operation and control infrastructure required to run the generating station, including car parking.

16.3.0.3 Construction of the lagoon is likely to take 4 to 5 years to complete followed by an operation phase of approximately 120 years. Decommissioning options are discussed further in Chapter 6 Project Description.

16.3.0.4 Cumulative impacts will be assessed in the Environmental Impact Assessment (EIA) i.e. impacts of the Project combined with other developments that already exist, are currently under construction or currently have plans under consideration.

Consultation will be held with the relevant authorities to assess which projects should be reviewed as part of this process in addition to those projects identified in Chapter 3 Structure of the Environmental Statement.

16.3.1 Potential effects during construction

16.3.1.1 It is expected that the construction phase will mainly result in relatively localised near-field effects within and adjacent to the Project's terrestrial footprint. Construction of the Project will result in permanent land-take where new infrastructure is required, as well as temporary land-take associated with construction compounds, material storage and batching plants. Further impacts would result from construction of the National Grid connection works, cable routes, access routes and car parks as outlined in Table 16.1 below.

Table 16.1 Potential impacts of the Project on terrestrial ecology during construction.

Construction		
Potential source of impact	Potential development impact	Potential effect
Construction vehicles and personnel, artificial light	Visual disturbance Noise disturbance	Disturbance or displacement of protected or otherwise notable species
Landfall of lagoon, construction compounds, storage areas, cable routes, car parks	Temporary and permanent habitat loss, degradation, fragmentation or modification Introduction of new species	Effect on habitat extent and distribution, disturbance, injury or effect on fitness of protected or otherwise notable species
Temporary discharges from construction works to environment, accidental spillages	Pollution of environment	Effect on habitat extent and distribution, disturbance, injury or mortality of protected or otherwise notable species

16.3.2 Potential effects during operation

16.3.2.1 The presence of the lagoon structure and any associated increases in recreational activity that could affect terrestrial ecology receptors will be considered in the impact assessment. Impacts or effects resulting from operation of the Project are outlined in Table 16.2.

Table 16.2 Potential impacts of the Project on terrestrial ecology during operation

Operation		
Potential source of impact	Potential development impact	Potential effect
Maintenance vehicles, recreational use of lagoon, artificial light	Visual disturbance Noise disturbance Permanent habitat loss, degradation, fragmentation or modification Introduction of new species Pollution of environment	Effect on habitat extent and distribution; disturbance, displacement, effect on fitness or injury of protected or otherwise notable species
Presence of breakwaters and associated infrastructure	Permanent habitat loss, degradation, fragmentation or modification Introduction of new species	Effect on habitat extent and distribution; disturbance, displacement or effect on fitness of protected or otherwise notable species

16.3.3 Potential effects during decommissioning phase

16.3.3.1 The Project has a design life of approximately 120 years. The potential decommissioning scenarios are discussed in Chapter 6 Project Description and the impacts on terrestrial ecology receptors will be assessed.

16.3.4 Designated Sites

16.3.4.1 An initial assessment of the potential impacts of the Project will take into account the following designated sites within 2.5km of the Project (Designated sites are shown on Figure 16.1):

Table 16.3 Designated Sites

Site	Designation
Special Areas of Conservation (SAC)	SACs are European protected sites designated under the EU Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora). Article 3 requires the establishment of a European network of important high-quality conservation sites contributing to the conservation of 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended).

Site	Designation
Severn Estuary SAC	<p>An estuary and tidal river designated for its estuarine (Annex I) habitats including mud and sandflats not covered by seawater at low tide as well as Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>). Additional Annex I habitats present include submerged sandbanks and reefs.</p> <p>Rare or notable (Annex II) species forming a primary reason for selection of the site include sea lamprey (<i>Petromyzon marinus</i>), river lamprey (<i>Lampetra fluviatilis</i>) and Twaite shad (<i>Alosa fallax</i>).</p> <p>The proposed lagoon is within the boundaries of the SAC.</p>
River Usk / Afon Wysg SAC	<p>A watercourse supporting a number of Annex II species that form the primary reason for site selection. Annex II species include: sea lamprey; brook lamprey (<i>Lampetra planeri</i>); river lamprey; Twaite shad; Atlantic salmon (<i>Salmo salar</i>); bullhead (<i>Cottus gobio</i>); and otter (<i>Lutra lutra</i>).</p> <p>The River Usk SAC is located approximately 1.7km north-east of the proposed lagoon.</p>
Special Protection Areas (SPA)	<p>SPAs are European protected sites classified in accordance with Article 4 of the EU Birds Directive (Council Directive 79/409/EEC on the conservation of wild birds). SPAs aim to conserve rare and vulnerable birds (as listed on Annex I of the Directive) as well as regularly occurring migratory species.</p>
Severn Estuary SPA	<p>A large estuary of extensive intertidal mud and sand-flats, rocky platforms and islands with one of the highest tidal ranges in the world. The site supports over-wintering or on-passage bird populations of European importance including: Bewick's swan (<i>Cygnus columbianus bewickii</i>); curlew (<i>Numenius arquata</i>); dunlin (<i>Calidris alpina alpina</i>); pintail (<i>Anas acuta</i>); redshank (<i>Tringa totanus</i>); shelduck (<i>Tadorna tadorna</i>); and ringed plover (<i>Charadrius hiaticula</i>).</p> <p>Furthermore, the site qualifies as a wetland of international importance for regularly supporting an assemblage of at least 20,000 waterfowl. Additional species associated with this assemblage include: wigeon (<i>Anas Penelope</i>); lapwing (<i>Vanellus vanellus</i>); teal (<i>Anas crecca</i>); mallard (<i>Anas platyrhynchos</i>); shoveler (<i>Anas clypeata</i>); pochard (<i>Aythya farina</i>); tufted duck (<i>Aythya fuligula</i>); grey plover (<i>Pluvialis squatarola</i>); white-fronted goose (<i>Anser albifrons albifrons</i>); and whimbrel (<i>Numenius phaeopus</i>).</p> <p>The proposed lagoon is within the boundaries of the SPA.</p>
Ramsar	<p>Ramsar sites are wetlands of international importance designated under the Convention on Wetlands (Ramsar, 1971).</p>



Site	Designation
Severn Estuary Ramsar Site	<p>An estuary with a high tidal range providing important habitat for over-wintering birds, feeding and nursery grounds for a diverse assemblage of fish, as well as providing passage to spawning rivers for a range of migratory fish including salmon, sea trout (<i>Salmo trutta</i>), lamprey, shad and eel (<i>Anguilla Anguilla</i>).</p> <p>The proposed lagoon is within the boundaries of the Ramsar site.</p>
Sites of Special Scientific Interest (SSSI)	<p>SSSIs form one of the main building blocks of site-based nature and geological conservation legislation. Sites are notified where they support some of the best representative samples of habitat or species assemblages, geology or geo-morphology, within a given geographical area.</p>
Severn Estuary SSSI	<p>Special features of the Severn Estuary are also described in SAC, SPA and Ramsar descriptions above. The Severn Estuary forms the mouth of four major British rivers (Severn, Wye, Usk and Avon) in addition to many smaller rivers. The high tidal range and classic funnel shape supporting intertidal mudflats, sand banks, rocky platforms and saltmarsh makes it one of the largest and most important estuaries in the United Kingdom.</p> <p>The proposed lagoon is within the boundaries of the SSSI where it encompasses intertidal mud-flats with localised stepped transition to grazed upper saltmarsh communities in addition to coastal grassland of sea defences.</p>
River Usk (Lower Usk) / Afon Wysg SSSI	<p>The Usk is one of the longest rivers in Wales and its lower reaches providing a rare example of a relatively unmodified lowland mesotrophic river. The fish fauna is considered of international significance and it is noted for species such as Otter. Tidal reaches dominated by Couch Grass (<i>Elytrigia repens</i>) support regionally rare species including Bulbous Foxtail (<i>Alopecurus bulbosus</i>), Marsh-mallow (<i>Althaea officinalis</i>) and Marsh Helleborine (<i>Epipactis palustris</i>).</p> <p>The proposed lagoon is within 1.7km of the SSSI boundary.</p>
Gwent Levels – St Brides SSSI	<p>The site has three special features: Reen and ditch habitat; Insects and other invertebrates; and shrill carder bee (<i>Bombus sylvarum</i>). Carefully constructed reens of the Levels drain flood waters to the estuary by gravity during the winter months and help irrigate pasture during the summer months. The habitat supports a diverse assemblage of invertebrates including some such as the silver colonel soldier fly (<i>Odontomyia argentata</i>) with a restricted UK distribution.</p> <p>The proposed lagoon is at the southern boundary of the SSSI.</p>

Site	Designation
Gwent Levels – Rumney and Peterstone SSSI	<p>The site has three special features: Reen and ditch habitat; Insects and other invertebrates; and Shrill Carder Bee. In common with the St Brides SSSI (above) the SSSI supports a diverse invertebrate assemblage including water beetles of restricted distribution, including <i>Hydaticus transversalis</i> and soldier-flies such as the ornate brigadier (<i>Odontomyia ornata</i>).</p> <p>The proposed lagoon is at the southern boundary of the SSSI.</p>
Newport Wetlands / Gwlyptiroedd Casnewydd SSSI	<p>Part of the Newport Wetlands National Nature Reserve (NNR), constructed as compensation for loss of the Taf/Ely Estuary SSSI following the construction of the Cardiff Bay Barrage. The site has a number of special features including: reens and ditches; reedbeds; higher plants (such as Hairlike Pondweed <i>Potamogeton trichoides</i> and Rootless Duckweed <i>Wolffia arrhiza</i>); over-wintering birds (such as shoveler and black-tailed godwit <i>Limosa limosa</i>); breeding birds (Cetti's warbler <i>Cettia cetti</i> and water rail <i>Rallus aquaticus</i>); insects and other invertebrates (ornate brigadier, shrill carder bee, silver water-beetle <i>Hydrophilus piceus</i>, <i>Hydaticus transversalis</i> and a spider, the striped stretch spider <i>Tetragnatha striata</i>).</p> <p>The site is approximately 1.9km to the north-east of the proposed lagoon.</p>
Rumney Quarry SSSI	<p>A geological site supporting fossiliferous Silurian Wenlock Rocks of the Cae Castell Formation.</p> <p>The site is approximately 1.5km north-west of the proposed lagoon.</p>
Rhymney River Section SSSI	<p>A geological site presenting formations of Silurian Wenlock Rocks.</p> <p>The site is approximately 1.9km north-west of the proposed lagoon.</p>
Penylan Quarry SSSI	<p>A geological site presenting formations of Silurian Wenlock Rocks.</p> <p>The site is approximately 2.5km north-west of the proposed lagoon.</p>
National Nature Reserves (NNR)	<p>The first NNRs emerged in the early post-war years alongside National Parks, initially to protect sensitive features as well as to provide 'outdoor laboratories' for research. NNRs represent a selection of some of the finest SSSIs and it this underlying designation that provides legal protection.</p>
Newport Wetlands NNR	<p>An area supporting extensive areas of lowland wet grassland, reedbed, saltmarsh and saline lagoons created to partly compensate for loss of the Taf/Ely Estuary SSSI following construction of the Cardiff Bay Barrage.</p>



Site	Designation
	The proposed lagoon is within the 1.5km of the NNR.

16.3.4.2 European sites will be subject to a separate Habitat Regulation Assessment (HRA) and receptor specific assessments relating to designated sites (such as coastal birds and fish of the Severn Estuary SPA/SAC and River Usk SAC) will be undertaken in other chapters including Coastal Birds and Fish.

16.3.4.3 Until detailed coastal processes modelling is completed, the impact to coastal sites distant from the Project is difficult to predict. However, other coastal SSSIs within 20km of the proposed lagoon in addition to those listed above include: Flatholm; Penarth Coast; Sully Island; Hayes Point to Bendrick Rock; Barry Island; Cliff Wood – Golden Stairs; East Aberthaw Coast; Gwent Levels – Nash and Goldcliff; Gwent Levels – Whitson; Gwent Levels – Redwick and Llandevenny; Gwent Levels - Magor and Undy; Portishead Pier to Black Nore; Clevedon Shore; Spring Cove Cliffs; Middle Hope; Brean Down; and Bridgewater Bay.

16.3.5 Habitats

16.3.5.1 In addition to the assessment of designated sites, a further requirement of the EIA will be the consideration of Section 42 habitats and species of 'Principal Importance' for biodiversity in Wales. Section 40 of the Natural Environment and Rural Communities Act 2006 (NERC, 2006) places a duty on decision-makers, such as public bodies as well as regional and local authorities, "to 'have regard' to the conservation of biodiversity in all their activities".

16.3.5.2 Intertidal mudflats, saltmarsh as well as coastal and floodplain grazing marsh associated with the footprint of the Project are listed as Section 42 habitats.

16.3.5.3 The principal terrestrial habitats likely to be affected by construction, operation and/or decommissioning of the Project are likely to include:

- i. **Saltmarsh** – potential for impact at eastern landfall in addition to habitat enclosed within lagoon;
- ii. **Coastal grassland** – potential for impact at landfall points, construction compounds, access tracks or cable routes;
- iii. **Improved grassland** – potential impact at landfall points or construction compounds;
- iv. **Ephemeral, short perennial and bare ground** – potential impact at western landfall;
- v. **Reens and watercourses** – potential impacts relating to construction, including access and cable routes; and



- vi. **Boundary features such as hedgerows** - potential impact relating to construction including access and cable routes.

16.3.6 Species

16.3.6.1 A wide range of protected, rare or otherwise notable species of plant and animal, including NERC (2006) Section 42 species, are considered likely to occur within or in proximity to the Project. The following will require consideration:

- i. **Plants** – Habitats associated with the study area will support rare or notable species. In addition, invasive species listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) may be present locally. For instance, Water Fern (*Azolla filiculoides*) is known to occur in reens close to the eastern landfall.
- ii. **Badgers** – Badgers (*Meles meles*) are widely distributed and setts may occur where suitable conditions exist.
- iii. **Bats** – Foraging activity is likely within the study area, however roosting opportunities at landfall points are limited. The potential exists to disturb bats during construction activities.
- iv. **Otters** – Rivers including the Usk and watercourses of the Gwent Levels are known to support otters (*Lutra lutra*). The potential exists to disturb otters from foraging areas or resting places during construction activities.
- v. **Water Vole** – Watercourses of the Levels provides suitable habitat for water vole (*Arvicola amphibius*) although predation by mink (*Neovison vison*) has much reduced their distribution. It is considered unlikely water voles are present in proximity to the Project, although this will be confirmed through the data search.
- vi. **Birds** – Ground nesting birds such as lapwing (*Vanellus vanellus*) and skylark (*Alauda arvensis*) have the potential to occur within the study area. In addition, birds over-wintering or on-passage in the Severn Estuary forage and may roost inland. The potential exists to disturb both terrestrial breeding and coastal non-breeding birds particularly during construction activities.
- vii. **Herpetofauna** – Common and wide-ranging reptiles such as grass snake (*Natrix natrix*) are found within the Gwent Levels. The presence of fish in the watercourses of the Levels creates sub-optimal conditions for protected amphibians such as great crested newts (*Triturus cristatus*). The potential exists to disturb herpetofauna particularly during construction activities.
- viii. **Invertebrates** – The importance of the Gwent Levels for invertebrates is well recognised, not least through the notification of SSSIs. The potential exists to adversely impact watercourse and grassland habitat during construction and affect the conservation status of ditches and reens during operation.



16.4 Existing baseline data, consultation and need for survey

16.4.1 Introduction

16.4.1.1 In order to undertake an EIA that considers all relevant issues arising from the project on terrestrial ecology receptors, baseline data will be required. Data will need to adequately describe all ecological receptors with the potential to be directly or indirectly affected during the construction, operation and decommissioning phases of the project. The requirement and scope of baseline data makes assumptions on the broad footprint of the proposed lagoon.

16.4.2 Existing data resources

16.4.2.1 The South East Wales Biodiversity Records Centre (SEWBRc) collate, manage and disseminate biological information within the study area. Natural Resources Wales (NRW) would also be expected to hold data regarding designated sites including an account of special features of specific sites as well as monitoring reports and condition assessments.

16.4.2.2 Geographical Information System (GIS) resources including phase 1 habitat data and boundaries for designated sites are held by organisations including NRW.

16.4.2.3 County recorders of specific taxonomic groups may be able to provide additional information not held by SEWBRc.

16.4.3 Consultation

16.4.3.1 Given the location of the Project within sites of designated nature conservation interest, NRW will be a key consultee. Other parties expected to be consulted would include:

- i. The City of Cardiff Council;
- ii. Newport City Council;
- iii. The Wildlife Trust of South and West Wales;
- iv. Gwent Wildlife Trust;
- v. Royal Society for the Protection of Birds (RSPB)
- vi. Caldicot and Wentlooge Levels Internal Drainage Board (or any future organisation responsible for management); and
- vii. Organisations or individuals holding data for specific groups (for example, Botanical Society of the British Isles (BSBI) for vascular plants and Gwent Ornithological Society for birds).

16.4.3.2 In the event that coastal process modelling indicates wider geographical impacts it may be necessary to consult more comprehensively including with Natural England.

16.5 Proposed assessment methodology

16.5.1 Consultation and desk study

16.5.1.1 In the early stages of the Project, a data search would be commissioned from SEWBReC and requesting information regarding protected or otherwise notable sites (within 10km), habitats and species (within 2.5km) and NRW requesting other relevant survey data.

16.5.2 Habitats

16.5.2.1 Extended phase 1 habitat surveys (JNCC, 2010) would be undertaken for specific parts of the study area namely: land within 500m of each landfall point; compounds associated with construction or operation of the lagoon; and haul or cable routes. Extended phase 1 habitat survey comprises habitats and other features of ecological interest being mapped and described using target notes. Particular note would be made of protected and/or notable species (as well as the potential for them to occur) during site visits following the Institute of Environmental Assessment Guidelines (IEA, 1995).

16.5.2.2 A phase 1 habitat survey would be undertaken of terrestrial land bordering but not necessarily directly affected by the Project, such as the coastal strip enclosed by the new lagoon.

16.5.2.3 Specific habitats would also be targeted for more detailed sampling and described in terms of the National Vegetation Classification (Rodwell, 2000). Habitats likely to be sampled include saltmarsh under the proposed footprint of the eastern landfall.

16.5.2.4 A specific methodology would also be employed to establish the baseline conditions of reens and ditches of the Gwent Levels. NRW have delineated field blocks and intersecting main reens within each component SSSI of the Gwent Levels. It is proposed that a baseline assessment is carried out for target watercourses following the NRW-adapted methodology developed from the national survey of ditch systems by Buglife (Palmer et al. 2010). The location of sampling points will be determined through consultation with NRW.

16.5.3 Species

16.5.3.1 **Plants** – The potential occurrence of protected, rare or notable plant species will be investigated through consultation, phase 1 habitat survey and where required, specific searches.

16.5.3.2 **Badgers** – A search for field signs suggesting the presence of badgers including setts, latrines, snuffle holes, trails, as well as guard hairs caught on fences will be carried out and focussed on the construction footprint including any required cable route.



- 16.5.3.3 **Bats** - The open and exposed character of coastal habitats present does not appear to favour bats and the nature of the project is also likely to have limited potential impact. Survey of any potential roost sites will be undertaken following confirmation of the construction footprint including cable route. Additionally, following good practice guidelines of the Bat Conservation Trust (Hundt, 2012), three surveys of two to three hours duration will be carried out along a defined transect route centred on landfall points. The survey will be undertaken between spring and autumn and deployment of remote detectors will coincide with survey visits.
- 16.5.3.4 **Otters** - A survey targeting specific areas within the study area considered more likely to be subject to disturbance during construction and operation of the Project will be undertaken. Survey will entail a search for field signs including sprainting sites, in addition to remote monitoring through deployment of trail cameras.
- 16.5.3.5 **Water vole** – Targeted survey of watercourses and immediate area potentially impacted by construction activities will be undertaken. A late summer search for droppings, latrines, feeding stations and burrows would be carried out.
- 16.5.3.6 **Birds** - Terrestrial breeding bird surveys of land likely to be impacted during construction would follow a methodology based on defined transects routes with mapping of birds seen or heard using Common Bird Census (CBC) codes of the British Trust for Ornithology (BTO) (Marchant, 1983). Three survey visits during the bird breeding season (March-July) will be undertaken. Inland foraging by over-wintering birds will also be assessed using desk study information as well as data obtained from over-wintering bird surveys currently being undertaken.
- 16.5.3.7 **Herpetofauna** – It is proposed that potential reptile habitat likely to be affected during construction is surveyed following the guidelines outlined in the Herpetofauna Workers Manual (Gent & Gibson, 1998). A series of visits will be carried out between April and September, at times of day and during weather conditions considered likely to favour detection of basking animals (intermittent sunshine in early morning or late afternoon with ambient temperature between 10 and 17oC). Each visit would involve checking beneath deployed artificial refugia, as well as visual searches for any reptiles basking in the open.
- 16.5.3.8 The requirement for targeted survey of amphibians will be informed from habitat surveys and consultation with NRW.
- 16.5.3.9 **Invertebrates** - Specific re-en invertebrate surveys following a methodology based on the approach of Buglife (Palmer et al, 2010) following consultation with NRW will be undertaken. The requirement for further targeted invertebrate surveys will be informed from the results of habitat surveys and consultation with NRW.



16.5.4 Proposed impact assessment methodology

- 16.5.4.1 An assessment methodology based on the guidelines of the Chartered Institute of Ecology and Environmental Management (IEEM, 2006) will be used.
- 16.5.4.2 Using the guidelines, the focus of the impact assessment is directed at activities with the potential to cause significant ecological effects on "Key Ecological Receptors" rather than attempting a detailed investigation of all potential ecological issues relating to a project.
- 16.5.4.3 The guidelines recommend the collation of existing baseline information to enable the identification of key ecological receptors. This will be carried out by a combination of desk study/data search and survey. For each receptor:
- i. the **value** of the receiving receptor (site/feature/species) is determined;
 - ii. the **magnitude** of the potential impact on the receptor is identified; and
 - iii. an overall **predicted impact significance** is given.

Table 16.4 Potential value of ecological receptors (adapted from IEEM, 2006)

Level of Value	Examples
International (Very High)	<ul style="list-style-type: none"> • An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, pSAC, Ramsar site, etc) or an area which the country agency has determined meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified. • Internationally significant and viable areas of a habitat type listed in Annex 1 of the Habitats Directive. • Regularly occurring, globally threatened species (i.e. IUCN Red listed) or species listed on Annex 1 of the Berne Convention. • Regularly occurring populations of internationally important species that are rare or threatened in the UK or of uncertain conservation status. • A regularly occurring, nationally significant population/number of any internationally important species.
National (High)	<ul style="list-style-type: none"> • A nationally designated site (SSSI, NNR, MNR) or a discrete area, which the country conservation agency has determined meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified. UKBAP habitats and species.
Regional/ County (Medium)	<ul style="list-style-type: none"> • Viable areas of key habitat identified in the Regional/County BAP (Biodiversity Action Plan) or smaller areas of such habitat which are essential to maintain the viability of a larger whole. • Viable areas of key habitat identified as being of Regional value. • Any regularly occurring significant population listed in a Local Red Data Book. • Significant populations of a regionally/county important species.
District / Borough (Low)	<ul style="list-style-type: none"> • Areas of habitat identified in a sub-County (District/Borough) BAP or in the relevant Natural Area profile. • District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on District/Borough ecological criteria (District sites, where they exist, will often have been identified in local plans). • Sites/features that are scarce within the District/Borough or which appreciably enrich the District/Borough habitat resource.
Parish/Local (Negligible)	<ul style="list-style-type: none"> • Areas of habitat considered to appreciably enrich the habitat resource within the context of the Parish, e.g. species-rich hedgerows. • No site designation. • Species present are common and widespread.

N.B. Where species or habitats occur in more than one category above, the highest value is applied.

16.5.4.4 Only ecological receptors assigned to the District geographical frame of reference/level of value (as shown in the table above) or higher are considered Key Ecological Receptors in the assessment. However, any protected species or habitats considered important under planning policies will be subject to specific mitigation measures.

Impact magnitude

16.5.4.5 In order to assess the effects of the Project, potential impacts are identified and characterised. Knowledge of the activities likely to be associated with the Project in combination with the processes in place to avoid, reduce or mitigate potential impacts is required. The potential for enhancement is also identified.

16.5.4.6 If, after all of these measures are implemented, a residual impact is still considered likely, compensatory measures might need to be considered in order to offset the impact. The significance of residual impact is relevant at three separate levels:

- i. impact on overall biodiversity resources;
- ii. context in terms of planning policies; and
- iii. legal requirements.

16.5.4.7 Characterisation of the potential impacts considers the following parameters:

Table 16.5 Characterisation of impacts

Parameter	Consideration
Direction of impact	i.e. positive or negative, is the impact likely to be good or bad for the feature or species?
Magnitude	What size or amount of an impact is there (described in words, such as “complete loss”).
Extent and context	Area or numbers affected (including percentage of total resource).
Probability of occurring	Certain (>95%), probable (50-94%), unlikely (5-49%) or extremely unlikely (<5%).
Complexity	Direct, Indirect, Cumulative.
Duration	The duration over which the impact is expected to last prior to recovery or replacement of the feature.
Reversibility	Is it an irreversible (permanent) or reversible (temporary) within an appropriate ecological time-frame such as the lifespan of an affected species?
	Seasonality or time of day in combination with frequency of an event (e.g. number of dog walkers passing a roost of overwintering waders).



16.5.4.8 The magnitude of the potential impact is then assessed for each receptor using the categories set out in Table 16.6 below.

Table 16.6 Assessing the magnitude of each impact on an ecological receptor

Impact description	Criteria
Major Negative	The change is likely to cause a permanent adverse effect on the integrity of an ecological receptor. The Project will have effects which would adversely impact on the integrity of a site (at regional to international level).
Moderate Negative	The Project will not adversely impact upon the integrity of a site, but the effect on the site is likely to be significant in terms of its ecological objectives (e.g. key attributes of a site will be altered, but not so much as to result in a change in the site's evaluation). The Project will have permanent and severe impacts upon undesignated habitats of county importance. The Project will result in changes in the distribution of a legally protected species, but not affect its population status or conservation status but the population will become more vulnerable.
Minor Negative	Neither of the above applies, although some negative impact to a designated site or undesignated habitat of regional / county importance is evident. The Project will have permanent and severe impacts upon undesignated habitats of local / negligible importance. The Project will have an adverse effect on a legally protected species but with no significant reduction in conservation status.
Neutral	Although it is not always possible to state categorically that there will be no impact on a receptor the term neutral will be used where the level of exposure is considered to be less than the tolerance of the receptor, therefore an impact is unlikely. Or there will be no impact at all on that habitat or species/faunal group.
Positive	The change is likely to benefit the receptor in terms of its conservation status, but not so far as to achieve favourable conservation status.

Significance criteria

16.5.4.9 Based on the value of the receptor and the predicted magnitude of the potential impact, the significance of an impact can then be determined according to Table 16.7. Residual impact is the significance of impact considered after mitigation measures have been taken into account.

Table 16.7 Impact significance

Nature Conservation Value	Magnitude of Potential Impact				
	Major Negative	Moderate Negative	Minor Negative	Neutral	Positive
International/ Very High	Major Adverse	Major Adverse	Moderate to Minor Adverse	No Impact	Major - minor Beneficial
National/ High	Major Adverse	Major to Moderate Adverse	Minor Adverse	No Impact	Major - minor Beneficial
Regional/ Medium	Moderate Adverse	Moderate – Minor Adverse	Minor Adverse	No Impact	Moderate Beneficial
District/ Low	Minor Adverse	Minor Adverse	Insignificant	No Impact	Minor Beneficial
Local/Negligible	Minor/ Insignificant	Insignificant	Insignificant	No Impact	Insignificant

16.6 References

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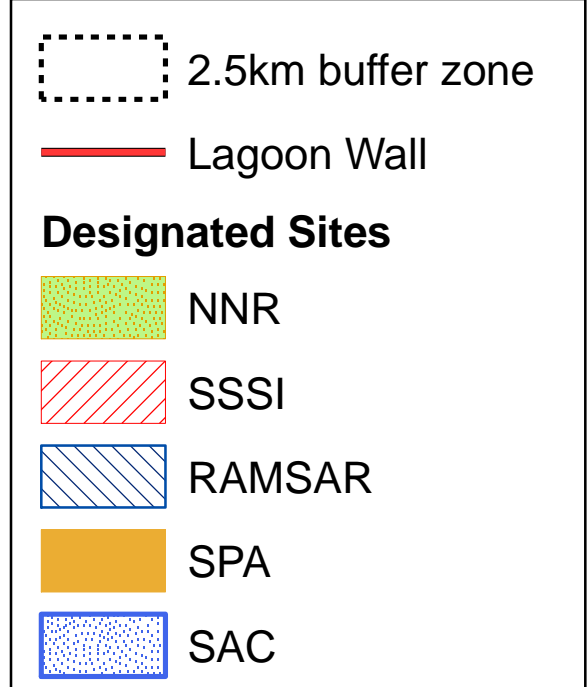
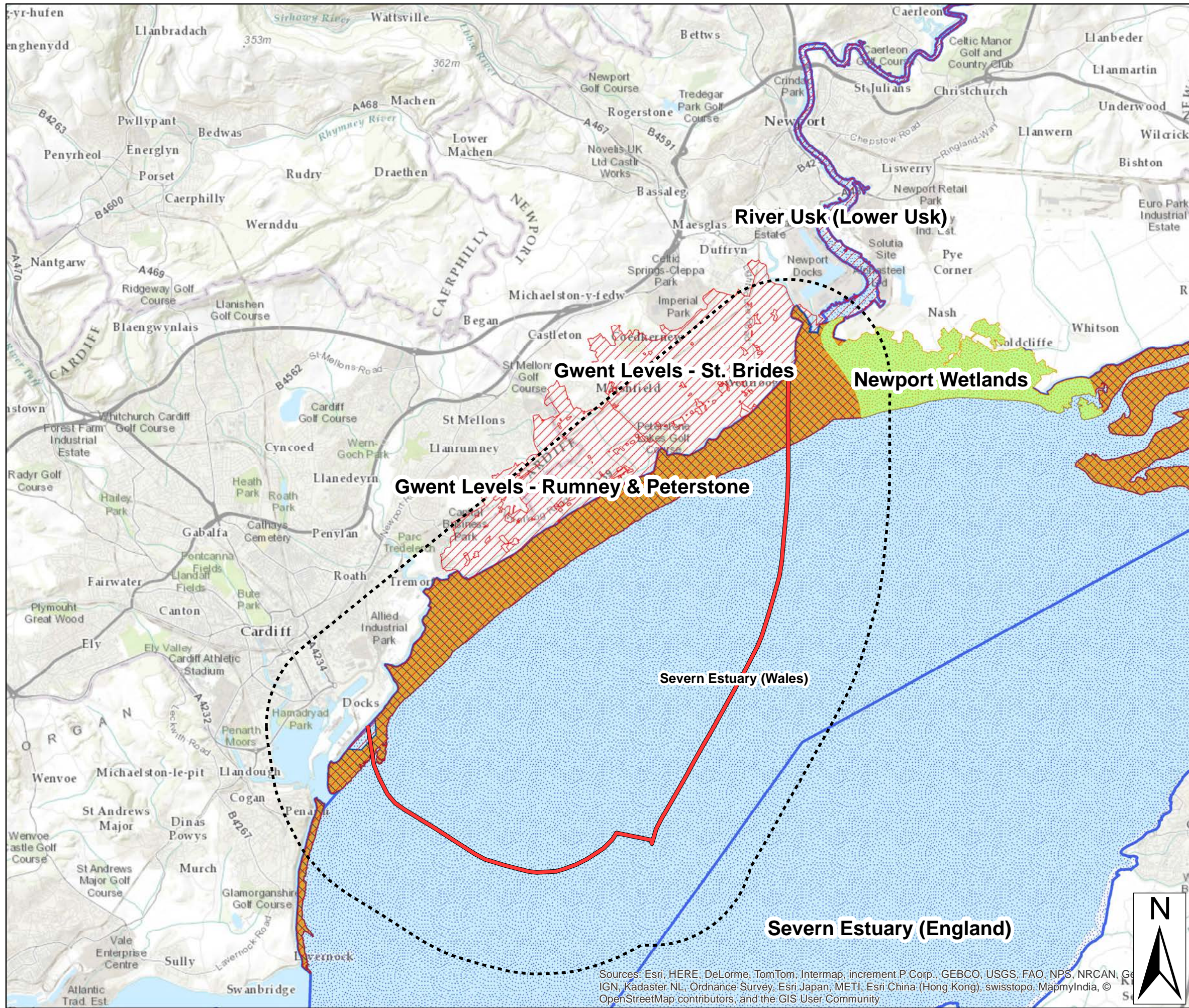
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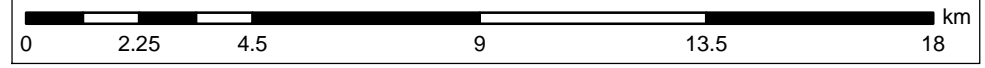
Figures



Designated sites within 2.5km buffer zone of the Project

Figure 16.1

Date FEB 2015	Drawn By SC
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Scale @ A3 1:150,000

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