

**Swansea Bay Tidal Lagoon:
Article 4(7), Water Framework Directive:
Advice note by Natural Resources Wales
09/12/2014**

1.0 Background

- 1.1. Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (Water Framework Directive), Articles 4(7), 4(8) and 4(9) state:

Article 4(7)

Member States will not be in breach of this Directive when:

- failure to achieve good groundwater status, good ecological status or, where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, or
- failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities and all the following conditions are met:
 - (a) all practicable steps are taken to mitigate the adverse impact on the status of the body of water;
 - (b) the reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 and the objectives are reviewed every six years;
 - (c) the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and
 - (d) the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.

Article 4(8)

When applying paragraphs 3, 4, 5, 6 and 7, a Member State shall ensure that the application does not permanently exclude or compromise the achievement of the objectives of this Directive in other bodies of water within the same river basin district and is consistent with the implementation of other Community environmental legislation.

Article 4(9)

Steps must be taken to ensure that the application of the new provisions, including the application of paragraphs 3, 4, 5, 6 and 7, guarantees at least the same level of protection as the existing Community legislation.

- 1.2. In this application for Development Consent Order under the Planning Act 2008, the decision as to the application of Article 4(7) of the Water Framework Directive (“WFD”) rests with the Secretary of State. This note is provided by NRW to advise the Examination Panel in making its recommendation to the Secretary of State. It considers those matters under Article 4(7) that fall within NRW’s remit. It will be for the Panel, and ultimately the Secretary of State, to decide how much weight to give to this note in coming to their final judgment.

- 1.3. A marine licence is also required for this scheme under Part 4 of the Marine and Coastal Access Act 2009. In Wales, NRW determines applications for marine licences on behalf of the Welsh Ministers. This advice note is also provided to inform that separate decision-making process which also requires a determination as to the application of Article 4(7).
- 1.4. In order to assist the decision maker NRW has sought to provide advice by way of this report on the implications of the Project on Water Framework Directive compliance. Our advice contained in this report should be considered solely in relation to the specific provisions of the WFD.
- 1.5. All reference to documents stated in this report are detailed in section 9.

2.0. Scope

2.1. NRW's advice on the application of Article 4(7) is given in the following interpretive context:

2.1.1. Article 4(7)(a): NRW will assess the adequacy of the mitigation measures proposed in the specific context of the objectives sought to be achieved under the WFD.

2.1.2. Article 4(7)(c): NRW will assess both alternative limbs of this condition, namely the "overriding public interest" test and the comparative benefits test (i.e. "the benefit to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development").

2.1.3. Article 4(7)(c): When considering the comparative benefits test, and in particular the benefit to sustainable development, NRW will assess the economic benefits of the proposal.

2.1.4. Article 4(7)(c): Issues relating to 'human health' and 'human safety' are not within NRW's remit. Accordingly, it does not provide advice on these matters here.

2.1.5. Article 4(7)(d): When assessing whether there is a "significantly better environmental option", NRW has considered it appropriate to restrict its assessment to other options within Wales' territorial limits and, in particular, those locations that have the hydro-geographical characteristics capable of supporting the proposed activity.

2.2. From the outset, NRW has provided assistance and guidance to the Applicant as to the requirements under WFD, in particular making clear that Article 4(7) should be considered when assessing the development proposals. It is regrettable that the Applicant did not act on this advice until a late stage in the examination. The significant volume of information submitted at a late stage and the limited time afforded to NRW to advise upon the same is not considered to be reasonable and has precluded NRW from advising on Article 4(7) in the level of detail that NRW would normally consider appropriate.

- 2.3 The Applicant's original WFD assessment submitted with the application concluded that it was not necessary for Article 4(7) to be considered for this development. The Applicant subsequently changed its position, acknowledging that Article 4(7) was relevant, and submitted a revised WFD assessment on 5 August 2014 (at Deadline III). The revised assessment was considered by NRW to be inadequate and failed to provide the information necessary to enable Article 4(7) to be properly considered. By letter dated 11 September 2014, NRW made representations to the Panel, identifying the further evidence required to be submitted by the Applicant. In response, the Applicant submitted a further revised WFD assessment for Deadline IV on 7 October 2014 ("**Version 2 Assessment**"). This was subsequently followed by the submission of a note on the application of Article 4(7) at Deadline V of 28 October 2014 ("**the Art 4(7) Report**") and additional information provided by the Applicant at NRW's request (appendix 1) which was received over a period of time up to 03 December 2014..
- 2.4 NRW has reviewed this evidence as a matter of urgency within the limited time available and supplemented it with our own evidence and analysis. However, we reiterate the concerns previously raised with regard to the significant volume of information submitted by the Applicant at a late stage of the examination and the limited time to secure further detail on that information. This has made it impossible for us to advise on Article 4(7) in the level of detail that we would normally consider appropriate.
- 2.5 It should also be stressed that NRW's position on the coastal processes assessment, as outlined in our written representations for Deadline IV, is unchanged. We still have concerns about the level of scientific investigation undertaken for the EIA. As a result, we do not consider it is possible to predict the potential medium to long-term impacts of the proposed development with a high degree of confidence. The sensitive receptors we are most concerned about remain Kenfig SAC, Crymlyn Burrows SSSI and Blackpill SSSI. Additional information was provided by the Applicant at Deadline V (28/10/14) in relation to the coastal processes assessment (*'Document prepared in response to requests for information in relation to coastal processes by NRW at the Issue Specific Hearings held from the week commencing 16 September 2014'*), but having reviewed this document, NRW does not agree with the Applicant's view that an increased level of confidence can be placed on the Environmental Statement predictions as a result of this further information.
- 2.6 NRW's concerns relating to the limitations of the Applicant's coastal processes assessment, as documented in our representations to date, do not affect the overall conclusion of the WFD assessment in relation to Swansea Bay water body that the Project is likely to result in its deterioration, thereby engaging Article 4(7). However, due to the limitations of the coastal processes assessment, only limited confidence can be placed in the conclusions of the WFD assessment of

the Neath Estuary and Tawe Estuary water bodies that the Project will not result in deterioration to these water bodies.

2.7 In relation to the Applicant's assessment of fish in all relevant water bodies, the Applicant has predicted that there will be an adverse impact on fish receptors, based on modelling. NRW remains of the view that the extent of the impacts cannot be quantified with a high degree of certainty and that there therefore remain a risk that the impact level is higher than predicted, or indeed that some impacts may not be accounted for. On this basis NRW consider it reasonable that the DCO secures mitigation and compensation upfront where modelling indicates that adverse impacts are likely to occur. Furthermore the high levels of uncertainty means that a robust monitoring programme, with commitment to further mitigation/compensation if required, needs to be secured in the DCO. NRW believe that, on the balance of the evidence provided by the Applicant and with an appropriate mitigation / compensation strategy in place, it is reasonable to conclude that any impacts are unlikely to result in the objectives of the WFD being compromised. Therefore, on the basis of the above proviso and in line with the applicants WFD revised assessment, it is not considered necessary to include fish within river water bodies as part of the 4(7) derogation. NRW would however advise that the extent and scope of monitoring, mitigation and/or compensation required to not compromise WFD objectives is given due consideration by the Panel and SoS in determination of the DCO.

2.8 It should be noted that NRW does not agree with all of the evidence provided and conclusions stated by the Applicant in the Art 4(7) Report and subsequent submissions outlined in Appendix 1. However, due to time constraints, this advice note only highlights the inaccuracies that make a material difference to the outcome of the Article 4(7) tests.

2.9 The elements at risk of not meeting the WFD objectives in Swansea Bay water body (as identified by the Version 2 Assessment) as a result of the Project are:

- i. Composition and abundance of benthic invertebrate fauna
- ii. Hydro-morphological elements supporting the biological elements
- iii. The Project will also conflict with some of the mitigation measures set out for Swansea Bay water body in the Western Wales River Basin Management Plan 2009.

3.0 Article 4(7)(a): 'all practicable steps are taken to mitigate the adverse impact on the status of the body of water'

3.1 Introduction

3.1.1 The Project would introduce approximately 9.5km of rock armoured sea wall and a bank of turbines and sluice gates into Swansea Bay,

impounding an area of approximately 11.5km². These modifications will change the hydrodynamic and morphological processes of the Swansea Bay coastal water body, which in turn has the potential to impact upon benthic invertebrate communities.

- 3.1.2 The Project is partially or wholly incompatible with the majority of the mitigation measures proposed for the Swansea Bay water body in the Western Wales River Basin Management Plan. The implementation of these is intended to facilitate the achievement of Good Ecological Potential (“GEP”) by 2027.
- 3.1.3 NRW has limited confidence in some elements of the EIA for the Project, particularly over its operational lifetime, and it is therefore possible that not all potential impacts have been identified. The Applicant and NRW also disagree as to the magnitude of effect and significance of some of the predicted impacts.
- 3.1.4 It is recognised that there is an inherent uncertainty in assessing the impacts of innovative schemes such as Swansea Bay Tidal Lagoon.

3.2 Methodology

- 3.2.1 In line with the approach taken in the Version 2 Assessment, NRW has considered the WFD elements at risk of non-temporary deterioration.
- 3.2.2 NRW has assessed specific design components, including the location and arrangement of turbines and sluice gates, and the lagoon wall design, here. The shape and the location of the lagoon, and the long sea outfall extension, are considered under Article 4(7)(d) below (section 6.4).
- 3.2.3 This assessment is informed by the information made available to NRW by the Applicant in the Article 4(7) Report. The Art 4(7) Report has considered the mitigation for environmental pressures specified by UK Technical Advisory Group (2008).
- 3.2.4 This assessment is based upon the potential impacts of the Project and the mitigation proposed with the objective of minimizing or cancelling the adverse impact on the status of the Swansea Bay water body.
- 3.2.5 Impacts upon, and mitigation relating to, fish are not considered within this WFD 4(7) assessment as the Water Framework Directive does not specify fish as a biological element required for assessment in coastal water bodies such as Swansea Bay.
- 3.2.6 All practicable mitigation is that which is technically feasible, not disproportionately costly, and compatible with the new modification, in line with Common Implementation Strategy (CIS) (2009).
- 3.2.7 Mitigation is considered through the design, construction, maintenance and operational phases of the Project.
- 3.2.8 Mitigation must be secured and legally enforceable.

3.3 Mitigation measures proposed

A range of mitigation measures for impacts of the Project have been proposed by the Applicant as listed below. Enhancement measures have also been incorporated into the Project design. There is low confidence in the likelihood of success of some of the proposed mitigation and enhancement measures, as they are untested and therefore unproven. Where this is the case, this has been identified by an asterisk (*) below.

3.3.1 Mitigation during the design phase

The following mitigation measures were introduced when the Project was being designed:

- 3.3.1.1. Removal of the existing Swansea eastern breakwater and replacement with lagoon wall which has a reflection coefficient greater than the existing vertical wall.
- 3.3.1.2. Soft engineering within the lagoon impoundment where appropriate. The Project involves removing the existing seawall within the port and re-profiling the bank where appropriate to incorporate soft engineering options including coastal grassland, salt marsh*, beach and sand dune.
- 3.3.1.3. Minimisation of environmental impacts through structural design of lagoon wall to minimise wave reflection and associated impacts.
- 3.3.1.4. Variable speed turbines with pumping option selected to enable natural tidal conditions to be replicated as closely as possible within the lagoon impoundment, thereby reducing intertidal losses.
- 3.3.1.5. Location of turbine and sluice gate housing to reduce the potential quantity of material for disposal offsite (Ch 4, ES).
- 3.3.1.6. Enhancement measures incorporated into the design of the Project including:
 - I. Incorporation of bio-blocks and rock pools
 - II. Rocky habitat creation in form of lagoon wall to encourage re-colonisation

3.3.2 Mitigation during the construction phase

- 3.3.2.1. Re-use of capital dredged material for lagoon wall construction where possible to minimise disposal requirements.
- 3.3.2.2. Implementation of best practice during capital dredging. An appropriate dredging strategy (for example, "Best Practice Guidance identified in Marine Minerals Guidance 1: Extraction by dredging from the English seabed (Office of the Deputy Prime Minister, 2002)), or other appropriate industry standards with respect to the dredging and disposal of dredged material will be applied

- 3.3.2.3. Capital dredging will be undertaken between April and October to minimise dispersion of sediment which could impact upon habitats and species.
- 3.3.2.4. Strategy for management of invasive and non-native species (INNS) which may impact upon biological communities.

3.3.3 Mitigation during the maintenance and operational phases

- 3.3.3.1. Implementation of best practice during maintenance dredging. Due to the uncertainty in predicting the requirement for maintenance dredging, the detail of mitigation associated with maintenance dredging events will be covered under the provisions of the marine licence/s which Tidal Lagoon Swansea Bay (TLSB) will be required to obtain for maintenance dredging activities within the lagoon. The Construction Environmental Monitoring Plan (CEMP) and the Operational Environmental Monitoring Plan (OEMP) specifically identify that Best Available Techniques and industry guidance will be used as appropriate in the development of all mitigation measures for the lifetime of the Project.
- 3.3.3.2. The proposed operational life of the structure is 120 years. Within this timeframe, some unidentified impacts may become apparent. These will be considered by the AEMP, subject to pre-commencement agreement on its content and associated provisions which form a long term commitment to monitoring in consultation with NRW and the local planning authorities. This will serve to improve the understanding of responses to hydro-morphological pressures
- 3.3.3.3. *Sabellaria* translocation has been proposed*
- 3.3.3.4. Reintroduction of the native oyster has been proposed*
- 3.3.3.5. Management strategies detailed within the AEMP and OEMP will seek to encourage natural recovery of disturbed areas
- 3.3.3.6. INNS strategy for management of invasive and non-native species which may impact upon biological communities

3.4 Consideration of all practicable mitigation

- 3.4.1. On the basis of the evidence available, as outlined in the Version 2 Assessment and Article 4(7) Report, a significant range of mitigation measures have been considered.
- 3.4.2. NRW acknowledge that the Project would result in the direct loss of benthic habitats and species under the footprint of the sea wall and turbine housing, which are intrinsic components of the Project. NRW agrees that it is technically infeasible to mitigate for the direct impacts of loss of benthic habitats and species without compromising other design mitigation such as the reflection coefficient of slope of wall.

- 3.4.3. The introduction of a considerable amount of hard engineering and additional dredging within the Swansea Bay water body is incompatible with some of the water body mitigation measures set out within the Western Wales River Basin Management Plan (2009). NRW considers that mitigation incorporated into the construction phase and enhancement measures incorporated into the Project design will minimise the potential impacts of dredging.
- 3.4.4. NRW considers that only a limited number of enhancement measures have been incorporated into the Project design and only low confidence can be ascribed to some of these measures in some instances as identified by a *. The number of bio-blocks to be incorporated is small for a construction of this size. A maximum of 20 has been proposed (as stated within the AEMP revision 3) which equates to approximately 1 every 950m assuming they would be placed on both sides of the lagoon wall. It is noted that the type of rock to be used in the construction of the lagoon wall is granite which is different to the local rock and therefore NRW does not have high confidence in the assertion that the lagoon walls will create a habitat similar to the existing local habitat.
- 3.4.5. NRW is satisfied that all mitigation and enhancement measures could in principle be secured by mechanisms including the DCO, AEMP and the relevant marine licence conditions.
- 3.4.6. The Applicant has provided sufficient detail for NRW to be satisfied that technical feasibility and disproportionate cost has been applied to identify practicable mitigation measures. Within the time and evidence made available it has not been possible to quantitatively examine all mitigation measures for disproportionate cost. However, in these instances there is sufficient qualitative and some quantitative information for us to be satisfied that a reasonable case has been made.
- 3.4.7. Information regarding mitigation for the decommissioning phase of the Project has not been presented, as there is currently no decommissioning strategy in place for the Project.

3.5. Summary

- 3.5.1. On the basis of the evidence available, NRW considers that a reasonable case has been made that all practicable steps will be taken to mitigate the adverse impact on the status of the body of water.

4.0. Article 4(7)b: ‘the reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 and the objectives are reviewed every six years;’

- 4.1. Should development consent be granted, the reasons for the modifications will be reported in the next publication of the Western Wales River Basin Management Plan.

5.0. Article 4(7)c: ‘the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development’.

The two parts of this test are considered separately below in sections 5.1 and 5.2.

5.1. The reasons for those modifications or alterations are of overriding public interest

5.1.1 Scope of overriding public interest and background information

5.1.1.1. The Applicant has outlined its case for ‘overriding public interest’ in the Article 4(7) Report.

5.1.1.2. Overriding public interest in the context of the WFD is interpreted as overriding the objectives of the WFD. The overarching aim of the WFD is long-term sustainable water management based on a high level of protection of the aquatic environment. Specific objectives are defined in Article 4.1 which are to achieve good status by 2015 in all surface and groundwater bodies and to prevent any further deterioration of status.

5.1.1.3. The applicant has relied on a wide range of policies relating to sustainable development and renewable energy at the European, UK and Welsh levels that support the case for there being an overriding public interest for the development of a tidal lagoon.

5.1.1.4. NRW has referred to European guidance (CIS, 2009) to frame consideration of the case made by the Applicant. CIS (2009) also refers to further guidance relating to the similar test of ‘Imperative Reasons of Overriding Public Interest’ under the Habitats Directive.

5.1.2. Basis of advice on consistency of the Project with overriding public interest.

5.1.2.1. CIS (2009) states that ‘It is reasonable to consider the reasons of overriding public interest in a Water Framework Directive context refers to situations where plans or Projects envisaged prove to be indispensable within the framework of

- i. Actions or policies aiming to protect fundamental value for citizens’ lives (health, safety, environment);
- ii. Fundamental policies for the state and the society;
- iii. Carrying out activities of an economic or social nature, fulfilling specific obligations of public services.’

5.1.2.2. Considering each of these in turn:

- i. This is considered in more detail in the context of environmental benefits in section 5.2. In summary, whilst some existing environmental benefits of achieving the WFD objectives within Swansea Bay will be foregone, the overall Project is deemed to be of benefit to the environment and thus provides fundamental value for citizens' lives.
- ii. The Project is consistent with a range of fundamental policies on sustainable development, renewable energy and planning at European, UK and Wales scales. For example: the EU Directive on the Promotion of Energy from Renewable Sources; the UK Renewable Energy Strategy (2009); the Climate Change Strategy for Wales (2010).
- iii. The generation of electricity, as distinct from its provision, is not considered as fulfilling a specific obligation of public service.

5.1.2.3. The outcome of the assessment using CIS (2009) as a framework is also consistent with Welsh Government (2009a) as the proposed development meets requirements of being long term and of national importance due to the significant contribution to renewable energy generation and the delivery of sustainable development policies in Wales.

5.1.2.4. Welsh Government (2009a) states: 'When considering cases against these principles, in general, projects of national importance are most likely to be judged as giving rise to imperative reasons of overriding public interest. Important regional projects might also be so judged. Whilst projects of more local significance are not ruled out, it is less likely that their potential benefits will be considered to override the harm to the nature conservation value of the sites.' As a Nationally Significant Infrastructure Project as defined under the Planning Act 2008, the Project is of national significance and therefore "more likely to be judged" as giving rise to reasons of overriding public interest.

5.1.3. Public Participation and Opinion

5.1.3.1. CIS (2009) states that 'public participation will contribute considerably in determining overriding public interest'. The nationally significant infrastructure planning process conducted in open examination serves as the mechanism for public participation.

5.1.3.2. Formal questionnaires completed by almost 2500 local people in the initial stages showed that 86% were in favour of the development as proposed in 2013 (TLSB, News Update 17th October 2013). Environmental information at this time was available in the Preliminary Environmental Information Report. A further 157 local people have invested collectively £400,000 in the Project via the community share

offer. The independent Active Supporters Group (ASG) for Swansea Bay Tidal Lagoon has almost 1,000 members.

5.1.4. Summary

5.1.4.1. NRW considers that on the basis of the evidence available, a reasonable case has been made for the Project being of overriding public interest.

5.2. Benefits to the environment and to society of achieving the objectives of the WFD are outweighed by the benefits of the new modifications or alterations to sustainable development

5.2.1. Background and Scope

5.2.1.1. This section compares the environmental benefits foregone by not achieving WFD objectives, with the benefits of the Project in terms of sustainable development. Human health and human safety are not considered.

5.2.1.2. The benefits comparison is first made in relation to Swansea Bay by comparing the economic cost of foregoing the environmental opportunities of not achieving WFD objectives, to the economic benefits of the Project to Wales. Environmental benefits are then considered in the wider context of renewable energy generation.

5.2.1.3. Welsh Assembly Government (2009b) defines sustainable development as 'enhancing the economic, social and environmental wellbeing of people and communities, achieving a better quality of life for our own and future generations.'

5.2.2. Benefits foregone as a result of not achieving WFD objectives in Swansea Bay

5.2.2.1. The benefits foregone as a result of not achieving the WFD objectives (Good ecological potential) include a loss of intertidal and subtidal seabed underneath the lagoon wall and turbine housing, and also seabed which is capital dredged. This amounts to 88.98ha and 400ha respectively which represents 6.7% of the area of Swansea Bay water body. These impacts are also relevant to the mitigation outlined in the 2009 western Wales river basin Management Plan for Swansea Bay which can no longer be achieved as a result of the Project.

5.2.2.2. Due to the outstanding issues with the coastal processes assessment, NRW does not consider it is possible to predict the potential medium to long-term coastal process impacts of the Project with a high degree

of confidence which introduces ambiguity on exactly what benefits are foregone as a result of not achieving the WFD objectives.

- 5.2.2.3. The loss of, and potential changes, to habitats represents a significant impact to benthic faunal species abundance within Swansea Bay which could provide a range of ecosystem processes and services. Fletcher et. al. (2008) identified ecosystem processes and services provided by broadscale intertidal sand, muddy sand and mixed sediments and subtidal sand. Relevant ecosystem services are:
- i. Fisheries
 - ii. Other wild harvesting
 - iii. Natural Hazard Protection
 - iv. Environmental Resilience
 - v. Regulation of Pollution
 - vi. Recreation/Sport
 - vii. Spiritual and Cultural Wellbeing
 - viii. Research and Education
- 5.2.2.4. On the basis of the evidence that NRW has been able to collate in the time available it is considered that the most significant ecosystem benefits foregone in the context of the Project in Swansea Bay are fisheries, natural hazard protection, recreation/sport and environmental resilience as a result of reducing the hydromorphological dynamics of Swansea Bay.
- 5.2.2.5. Loss of recreational amenity includes the potential impact on existing sandy beaches and the loss of integrity of the Bay as a whole to recreational water users (e.g. windsurfers, sail craft, kayakers, paddle boarders).
- 5.2.2.6. It has been possible to qualitatively identify the ecosystem benefits foregone as stated above, however it has not been possible within the time available to be confident of aligning these lost benefits into the context of good status as defined in the normative definitions of ecological status in Annex V of the WFD.
- 5.2.2.7. Section 5.2.4. provides a quantitative analysis of benefits forgone, however, this uses a different method to that of considering ecosystem services

5.2.3. Qualitative benefits of the Project to sustainable development

The Applicant outlines a number of benefits of the project to sustainable development in the Article 4(7) Report, ES and subsequent submissions (Appendix 1). Those that are considered relevant are shown below as well as additional benefits identified by NRW.

- 5.2.3.1. The applicant states that economically the Project offers:
- i. A capital investment of £756M of which £300M will be spent in Wales (assumed by Cardiff Business School to be 40%).

- ii. Potential additional economic output in Wales of £454M, and £173M Gross Value Added (GVA) in the three year development phase;
- iii. Over £5M annual local spend during the operational phase;
- iv. A further potential £1.5M-2.1M per annum GVA to be achieved through associated leisure opportunities;
- v. Approximately 5540 person years (1850 full-time equivalent employment) of mixed-skills employment in Wales during the three year construction period considered to be a major beneficial, short term effect on the Swansea economy (ES Ch22).
- vi. Creation of 81 long term operational jobs. This has been identified as being a minor beneficial long-term impact on the Swansea economy (ES Ch22).

5.2.3.2. The applicant states that socially, the Project offers:

- i. Promotion of social recreational space, sport, art, culture and visitor facilities ranging from public art to sailing facilities
- ii. Provision of educational facilities and outreach

It is noted that the Panel is considering if these facilities can be secured in the DCO

5.2.3.3. The applicant outlines that environmentally, the Project offers:

- i. The production of renewable energy which is considered to be of national importance. The Welsh Government is committed to playing its part in the wider global effort to tackle the impacts of climate change (Welsh Government, 2012). This project could be viewed as being of international significance as it represents the first example of this particular type of renewable energy generation. Arguably, tidal lagoon technology is more widely transferable to other countries than is barrage technology, since it does not require the impoundment of complete estuaries. It can therefore be constructed to whatever scale is deemed most appropriate to local circumstances.
- ii. Generation of over 400,000 MWh (ES Ch5) of electricity by the lagoon every year for 120 years, which is predicted to provide nearly all of the domestic electricity requirements for the Swansea Bay region. The Welsh Government (2014b) estimated that renewable electricity generation in 2012 was 2,719,322 MWh. The Project would therefore represent 15% of actual renewable energy generation, compared with the 2012 baseline. This is deemed to be a very significant contribution to renewable energy in Wales.
- iii. The provision of carbon neutral energy generation in approximately 4 years (equating to ~3% of its operational

lifetime). Using the ratio of CO₂ saved as a proportion of renewable energy generated calculated from Welsh Government (2014b) statistics, the Project would realise a saving of 182,000 tonnes CO₂ per year.

- iv. Mitigation for the impacts of climate change, which is considered to be of high significance. It is beyond the scope of this report to detail all mitigated impacts of climate change, however it should be acknowledged that these include benefits to human health, human safety, and the environment.
- v. Conformity with Sustainable Building (BREEAM) standard for all buildings is integral to the Project
- vi. A variety of habitat enhancement measures
- vii. Reuse of 'brown land'

5.2.4. Quantitative economic analysis: The environmental opportunities lost as a result of not achieving WFD objectives in Swansea Bay water body vs the benefits of economic investment in Wales as a result of the Project

5.2.4.1. The applicant's case for the lagoon is based upon the results of input-output modelling (which shows how changes in one sector feed through to remaining sectors of an economy) as summarised in Environmental Statement Appendix 22.1 'Turning the tide: the economic significance of the tidal lagoon Swansea Bay'.

5.2.4.2. The results of this analysis are sensitive to the assumptions made by the Cardiff Business School model, particularly the assumptions regarding sourcing of the proportion of income to Wales. For the purposes of the assessment the further spend related to associated leisure opportunities has been set to a baseline of £1.5 million.

5.2.4.3. Swansea Bay water body is likely to deteriorate to 'Bad' status due to impacts on biological and hydro-morphological elements arising from the Project. Therefore, the quantification is based upon the value perceived by the public to be attached to the benefits of improving the status of Swansea Bay from Bad to Good status.

5.2.4.4. NRW has reviewed appropriate methods for the quantification of the benefits of achieving the objectives of the WFD. NRW has referred to the National Water Environment Benefits Survey (NWEBS) to monetise the benefits foregone as a result of not achieving the WFD objectives. NWEBS was commissioned by the Environment Agency (EA) and the valuations between status classes are available for coastal and transitional water bodies for each River Basin. NWEBS data has been used in the River Basin Planning Process to justify investment to raise the overall chemical and ecological status of water bodies to 'Good'.

5.2.4.5. The NWEBS survey was undertaken with members of the public who stated a willingness to pay for a range of environmental status

conditions. This allowed derivation of a value per square kilometre of different WFD ecological statuses. These valuations are weighted by River Basin population. There are other methods to monetise the environment (ecosystem services valuation) however these tend to be less mature, and there has not been sufficient time for NRW to consider them.

- 5.2.4.6. Applying the data outlined above and discounting over 40 years (in accordance with the discounting guidelines set by HM Treasury's Green Book) shows that the economic benefits of the lagoon to Wales are approximately £256 million and the environmental benefits foregone in Swansea Bay water body are £36.7 million. This gives a benefit to cost ratio of 7 and a Net Present Value of £219 million.
- 5.2.4.7. The assumptions made regarding Welsh sourcing in the economic model are especially important as the proposed economic benefits of the lagoon are primarily generated by the development and construction elements. Therefore, the benefits of the Project could change significantly if the assumption of 40% of the capital investment being in Wales is not accurate.
- 5.2.4.8. Sensitivity analysis shows that the environment would have to be valued at 7 times the NWEBS derived value for the benefits-to-cost ratio to be less than 1.

5.2.5. Comparison of the environment benefits foregone as a result of not achieving WFD objectives to the benefits of the Project to sustainable development.

- 5.2.5.1. The quantitative economic analysis suggests that the benefits of the Project to sustainable development as a result of economic investment outweigh the environmental benefits foregone as a result of not achieving WFD objectives.
- 5.2.5.2. The benefit to the environment of renewable energy leading to reduction in CO₂ emissions in the context of sustainable development is more difficult to quantify accurately. However, the significantly high contribution of the Project to meeting CO₂ emission targets and support for those policies and legislation at a national, UK and European level suggests that they outweigh the benefits that are foregone as a result of not achieving the objectives of the WFD.

5.2.6. Summary

In both a local (Swansea Bay) and wider environmental context, NRW considers that on the basis of the information available that the benefits to the environment and to society of achieving the objectives set out in Water Framework Directive would be outweighed by the benefits of the new modifications to sustainable development proposed here. It should be noted that NRW has not given consideration to the

benefits in terms of human health and human safety, to which the decision maker is referred before a conclusion is reached on Article 4(7)(c).

6.0 Article 4(7)d: the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.

6.1. Introduction

- 6.1.1. Significantly better environmental options are considered for the generation of electricity by tidal lagoons in Welsh territorial seas.
- 6.1.2. The Applicant has provided a case on why Swansea Bay has been chosen for the development of a tidal lagoon (the Article 4(7) Report), and has provided further information on consideration of other locations for a range of criteria (appendix1). Some of the further information (appendix 1) is not relevant within the scope of Article 4(7) and is limited in its consideration of significantly better environmental options that are not technically feasible or disproportionately costly. NRW has provided further evidence and analysis to complete this test.
- 6.1.3. An assessment of the lagoon location and design is made within this section. Other considerations such as the location of turbines and the sluice gates, and the wall design, are considered in section 3.0.
- 6.1.4. It should be noted that there is no strategic plan or assessment of tidal range developments available for the UK.

6.2. Consideration of other means which are a significantly better environmental option for the lagoon having a regard to the location using an assessment of the environmental characteristics of other locations in Wales.

- 6.2.1. Wales supports some of the largest tidal ranges in the world (Atlas of UK Marine Renewable Energy Resources, 2008).
- 6.2.2. The Crown Estate (2012) has identified areas which were suitable for tidal barrage or tidal lagoon hydroelectric schemes. Opportunities for the generation of tidal range energy is primarily limited to the north and south coast of Wales and maximised towards the east. Further work by the Crown Estate to identify specific areas is ongoing but not available when this report was produced. It is only these areas that will be considered further.
- 6.2.3. The Swansea Bay WFD water body is categorised as the most common coastal water body 'type' in Wales: 'moderately exposed, euhaline, macrotidal'. The Swansea Bay water body is at moderate status and not considered to serve a disproportionately large role, ecologically, in the wider Western Wales river basin. The other WFD coastal water bodies in Wales

are of the same or less common typologies and at good or moderate status (2013 classification). Other WFD coastal water bodies in Wales would not offer significantly better environmental locations as they are of the same or higher status and of less common typologies.

- 6.2.4. 31% of Welsh Seas are designated as a Special Area of Conservation (SAC) and 8% a Special Protection Area (SPA) of which a significant proportion is in the coastal zone. The north and south coast of Wales beyond Swansea Bay supports a range of designated sites for habitats and species. International conservation designations include the Severn Estuary and Liverpool Bay Special Protection Areas, and also Special Areas of Conservation in the Dee Estuary, Menai Straits and Conwy Bay, and Carmarthen Bay. The area between Gower and Barry is the only coastal area in the north or south Wales coast that does not host any marine SACs or SPAs, however does host coastal SACs and SSSIs.
- 6.2.5. A tidal lagoon may have large physical footprints and may have significant environmental impacts on both the physical environment and associated habitats (DECC 2011). It has not been possible within the time available to explore all other locations and the range of benefits and impacts that each location provides with respect to designated sites for biodiversity. However, it has been considered likely that the biodiversity features of other designated sites may be impacted by a tidal lagoon and that the spatial scale of impact is likely to be greater for marine SACs than coastal SACs and SSSIs.
- 6.2.6. The report already produced by the Panel in this process, (Report on Implications for European Sites; Planning Inspectorate, 2014), reflects the current position for potential impacts on European Sites. The summary states that the European site of most concern is Kenfig SAC, due to the uncertainty surrounding potential changes that could occur to the dune features, and species dependent on the dune features, as a result of the long-term maintenance dredge disposal at the Outer Swansea disposal ground.
- 6.2.7. A higher level of protection and value is afforded to habitats and species designated as SPAs or SACs. It is unlikely that these designated sites would offer significantly better environmental options because of the potential impact to biodiversity. The area between Gower and Barry does not host any marine SACs or SPAs and could offer a better environmental location on the basis of biodiversity, however it is also recognised that this areas hosts coastal SACs and SSSIs. Time has not allowed further evidence to be provided by the applicant which may have addressed whether a tidal lagoon between Gower and Barry would be significantly better in an environmental context. In the absence of such information, NRW is unable to fully advise on this issue.
- 6.2.8. The coast of Wales offers significant recreational activities (Countryside Council for Wales, 2009). Recreational activities are distributed throughout the coastline including 100 designated bathing water beaches which could be impacted as a result of a lagoon if it was located within the geographic

range of effects. Activity 'hotspots' for recreation include Anglesey, Pembrokeshire, Llyn Peninsula and Gower which with the exception of Gower would be unlikely to support a viable tidal range development.

- 6.2.9. In the absence of a more detailed assessment of all possible locations and lagoon designs and recreation activity impacted by each, NRW is unable to fully advise whether other locations offer significantly better options for recreation.
- 6.2.10. It has not been possible for NRW to map the extent of marine fin fisheries resource in Wales to allow an accurate and meaningful assessment within the time available. Shellfish Water Protected Areas provide an indication of where the predominant shellfisheries are in Wales, which includes, Burry Inlet and 3 Rivers on the south coast. In north Wales, there are significant shellfisheries in the Dee estuary, Menai Strait and other smaller areas near the Great Orme. Swansea Bay has 3 Shellfish Water Protected Areas and a further designated area in Queens Dock. Harvesting of shellfish within the remit of the Shellfish Water Protected Area in Swansea Bay West in which the Project would be located has not been in operation since 2011, however on the basis of this information provided NRW is unable to advise whether other significantly better environmental options exist on the basis of shellfisheries considered under Shellfish Water Protected Areas.

6.4. Consideration of lagoon design

- 6.4.1. A number of lagoon designs have been proposed and qualitative environmental considerations taken into account in those designs (TLSB Environmental Statement Chapter 3: Site Selection and Option Appraisal).
- 6.4.2. A cost/benefit analysis for the energy production of different lagoon designs has been presented. Consideration of disproportionate costs is not quantitatively presented for the environmental impacts of different lagoon designs.
- 6.4.3. It was not possible for NRW to assess design options confidently without preliminary environmental impact assessments for each option, including access to the high level coastal process modelling during pre application consultation on different design options within Swansea Bay.
- 6.4.4. Swansea long sea outfall will be extended to discharge outside of the lagoon wall. A number of options were considered with stakeholders throughout the examination and the choice was based on environmental factors.
- 6.4.5. Other lagoon designs are not considered to be significantly better environmental options.

6.5. Considerations for significantly better environmental options

- 6.5.1. The Applicant provides a large amount of evidence why Swansea Bay has been chosen for development of a tidal lagoon (Article 4(7) Report and Appendix 1). NRW acknowledges the wider difficulties of financial viability,

the economic, social and environmental considerations for a first development of this type and the implications for subsequent tidal range developments. However, some of this detail is not relevant within the scope of Article 4(7) and is limited in its consideration of significantly better environmental locations that are not technically feasible or disproportionately costly. NRW also acknowledges that the absence of a strategic plan or assessment available for tidal range developments in the UK makes this analysis difficult due to a lack of existing environmental information and reasoning for site location.

6.5.2. On the basis of NRW's analysis of other uses, designated features and sites in the coastal environment of Wales, other options for the lagoon location are unlikely to be significantly better environmental options with the exception of those between Gower and Barry which could present beneficial options for biodiversity. Within the time and evidence available NRW has not been able to determine if this area could be significantly better, technically feasible and not disproportionately costly for development of a tidal lagoon.

6.5.3. Other lagoon designs within Swansea Bay are not considered by NRW to be significantly better environmental options.

6.6. Summary

6.6.1. NRW considers it likely that other locations that could be considered as being better environmental options are geographically limited in Wales. In the absence of a national strategic plan for tidal range developments and on the evidence made available, it has not been possible to be confident that the limited range of other locations that could provide a better environmental option are significant, are technically feasible and not of disproportionate cost.

7.0 Consideration of Article 4(8) and Article 4(9)

7.1. NRW considers that on the basis of the evidence available, the application of Article 4(7), subject to appropriate regulatory control, would not permanently exclude or compromise the achievement of the objectives of this Directive in other bodies of water within the same river basin district. Having considered NRW's advice the decision maker must be satisfied that the application of a derogation under Article 4(7) is consistent with the implementation of other Community environmental legislation and guarantees the same level of protection as under existing EU legislation as per Article 4(8) and 4(9).

8.0 Summary

8.1. This advice is provided within the scope and caveats as detailed in section 2 of this report.

- 8.2. On the basis of the evidence available, NRW considers that a reasonable case has been made that all practicable steps will be taken to mitigate the adverse impact on the status of the body of water.
- 8.3. NRW considers that on the basis of the information available that a reasonable case has been made that the reasons for the Project are of overriding public interest and the benefits to the environment and to society of achieving the objectives set out in Water Framework Directive would be outweighed by the benefits of the new modifications to sustainable development proposed here. The decision maker is reminded also to consider benefits in terms of human health and human safety before a conclusion is reached on Article 4(7)(c).
- 8.4. NRW considers it likely that other locations that could be considered as being better environmental options would be significantly geographically limited in Wales. In the absence of a national strategic plan for tidal range developments and with the evidence made available, it has not been possible to be confident that the limited range of other locations that could provide a better environmental option are significant, are technically feasible and not of disproportionate cost.
- 8.5. NRW considers that on the basis of the evidence available, the application of Article 4(7), subject to appropriate regulatory control, would not permanently exclude or compromise the achievement of the objectives of this Directive in other bodies of water within the same river basin district. Having considered NRW's advice the decision maker must be satisfied that the application of a derogation under 4(7) is consistent with the implementation of other Community environmental legislation and guarantees the same level of protection as under existing EU legislation as per Article 4(8) and 4(9).

9.0 References

Atlas of UK Marine Renewable Energy Resources. (2008). ABPmer. Date of access (01/10/2014) <http://www.renewables-atlas.info/>

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Fletcher, S., Saunders, J and Herbert, R.J.H (2011). A review of the ecosystem services provided by broad-scale marine habitats in England's MPA network. *Journal of Coastal Research*, SI 64 (Proceedings of the 11th International Coastal Symposium).

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Welsh Government (2009a). Planning Policy Wales Technical Advice Note 5: Nature Conservation and Planning.

Welsh Government (2009b). One Wales: One Planet: The sustainable Development Scheme of the Welsh Assembly Government.

Welsh Government (2012). Energy Wales: a Low Carbon Transition.

Welsh Government (2014a). Energy Wales: a Low Carbon Transition Delivery Plan

Welsh Government (2014b). Low Carbon Energy Generation on Wales. Baseline study of renewable energy.

Appendix 1: Further information provided by the applicant to support the 4(7) Assessment.

The following files were provided by the applicant and are provided here in the zip file.

- TLSB response NRW Art 4 7 info requirements
- 14A. Note clarifying jobs figures in 22.5.3.16 of ES
- 14B. Note on jobs associated with turbine assembly plant
- 2.4.12_Eastern Landfall Plan
- 2.4.13_Eastern Landfall Sections
- 2.4.16_Saltmarsh Plan
- 2.4.17_Saltmarsh Sections



Appendix 1.zip

A further document was made available to NRW which is considered commercial and in confidence and is not included in the above Zip file:

TLSB - Saltmarsh and Eastern Landfall - Soft Engineering Estimate - 01-1...