codling wind park

Environmental Impact Assessment Report

Volume 4

Appendix 8.2 Representative Scenario and Limits of Deviation Assessment


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APPENDIX 8.2 REPRESENTATIVE SCENARIO AND LIMITS OF DEVIATION ASSESSMENT

1 Introduction

1. Complex, large-scale infrastructure projects with a terrestrial and marine interface such as the CWP Project, are consented and constructed over extended timeframes. The ability to adapt to changing supply chain, policy or environmental conditions and to make use of the best available information to feed into project design, promotes environmentally sound and sustainable development. This ultimately reduces project development costs and therefore electricity costs for consumers and reduces CO_2 emissions.

2. Case law recognises that the plans and particulars submitted with planning applications can allow for a certain limited flexibility, where this is applied reasonably and, in a context-specific way. In addition, section 287A of the Planning and Development Act (PDA) (as inserted by the Planning and Development, Maritime and Valuation (Amendment) Act 2022) has expanded the flexibility available and allows planning applications to be made and decided before the Applicant has confirmed certain details of the project.

3. Due to the complexity of the Codling Wind Park (CWP) Project, significant and rapid progression in wind farm technology development, potential changes in environmental conditions and in policy and legislation, the Applicant considers that consenting a degree of design flexibility is appropriate and legally compliant.

4. In this regard the approach to the design development of the CWP Project has sought to introduce flexibility where required to enable the best available technology to be constructed, whilst at the same time to specify project boundaries, project components and project parameters wherever possible, whilst having regard to known environmental constraints.

2 Approach to Presenting the Project Design

5. The approach to the design development of the CWP Project considers permanent infrastructure, temporary infrastructure and installation methods.

6. In general, the CWP Project has sought to specify the location, scale and extents of permanent and temporary infrastructure, however in some cases a degree of design flexibility is required. Subject to the detail concerned, this flexibility is presented in three ways:

   - **Options:** Consent is sought for up to two options for certain permanent infrastructure details and layouts, for example, wind turbine generator (WTG) Layout Option A (250m rotor diameter) or WTG Layout Option B (276m rotor diameter). Each design option is described in detail in **Chapter 4 Project Description**, which provides the details associated with each option**.**
   - **Dimensional flexibility:** Dimensional flexibility is described as a limited parameter range i.e. upper (maximum) and lower (minimum) values for a given detail such as cable length.
   - **Locational flexibility:** Locational flexibility of permanent infrastructure is described as a Limit of Deviation (LoD) from a specific point or alignment.

7. Installation methods for permanent infrastructure have been identified and described in full, however, as with the design of permanent infrastructure, a degree of flexibility is required as final decisions on methods and techniques to be employed will not be made until the appointment of the primary contractors closer to the time of construction.

8. Where required, flexibility concerning installation methods is presented by means of options. The details associated with the installation methods are specified, where possible, or otherwise described as a limited parameter range i.e. upper (maximum) and lower (minimum) values for a given detail.

3 Representative Scenario Assessment

9. The CWP Project Environmental Impact Assessment Report (EIAR) will identify, describe and assess all of the likely significant effects of the proposed development on the environment. To achieve this for all options and dimensional flexibility, and at the same time to produce application documents that are concise and readable, each chapter of the EIAR will assess a selection of representative scenarios, rather than assessing every possible scenario. A “representative scenario” is a combination of options and dimensional flexibility that has been selected to represent all of the likely significant effects of the project on the environment. Some topics may require several representative scenarios to be identified to ensure all impacts are identified, described and assessed.

10. For subtidal and intertidal ecology this analysis for construction and operation and maintenance (O&M) phase impacts is presented in **Table 1** and **Table 2**, respectively. Each table identifies one or more representative scenarios for each impact with supporting text to demonstrate that no other scenarios would give rise to new or materially different effects; taking into consideration the potential impact of other scenarios on the magnitude of the impact or the sensitivity of the receptor(s) that is being considered.

11. Where the potential for a new or materially different impact is identified, then further representative scenarios must be assessed in full within the main chapter.

12. This is distinct from the approach to assessing locational flexibility, where differences in impacts are assessed in this Appendix. The difference in approaches arises because there is a much higher degree of confidence in the locations and alignments assessed in the main chapter than there is for the final options and dimensions.

13. Overall, this approach will ensure that the EIAR will identify, describe and assess:

- Every impact type that could arise from the proposed development, taking account of the full range of options and dimensional flexibility;
- Every materially different magnitude of impact that could arise from the proposed development within the proposed options and dimensional flexibility; and
- Every materially different sensitivity of receptor that could arise from the proposed development within the proposed options and dimensional flexibility.

Table 1 Representative scenario assessment - construction phase impacts

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
Impact 1: Temporary habitat disturbance	Array site (including WTGs, inter-array cables (IACs), interconnectors and offshore substation structures (OSSs)) and offshore export cable corridor (OECC)	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	Installation methods and effects			Temporary disturbance relates to seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation. It should be noted that where boulder clearance overlaps with sand wave clearance, the boulder clearance footprint will be within the sand wave clearance footprint. Offshore, WTG Option A forms the representative scenario as this represents the greatest level of temporary habitat disturbance, and therefore WTG Option A forms the presentational basis of the assessment for Impacts 1: temporary habitat disturbance in this chapter. WTG Option B would result in a lower level of disturbance and would not introduce new impacts, or an impact of materially different magnitude.	*1. Are there infrastructure layout options (permanent or temporary) which may introduce new impacts?* *Note - this could be a new impact entirely or the introduction of an existing impact pathway to a new receptor.* *2. Are there infrastructure layout options (permanent or temporary) which may introduce a materially different magnitude of impact?* *3. Are there infrastructure layout options (permanent or temporary) which may introduce a material change in the sensitivity of the receptor(s) (greater or lesser)?* *4. Are there alternative installation methods which may introduce new impacts?* *5. Are there alternative installation methods which may introduce a materially different magnitude of impact?* *6. Are there alternative installation methods which may materially alter the sensitivity of the relevant receptor(s) (greater or lesser).*	1. No, WTG Option B would not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. It is highly unlikely that, the two layouts will have differing magnitudes for Impact 1. This can be demonstrated by reference to **Table 8-5** in **Chapter 8** which shows that the total area of disturbed sediment for construction activities in WTG Option A (11,931,840m^2) and WTG Option B (11,459,170m^2) is likely to result in the same magnitude of impact for both WTG Option A and WTG Option B. Furthermore, following the proposed primary mitigation measure of pre-construction surveys, it is unlikely that impact 1 will result in any significant effects for either WTG Option A or WTG Option B. Therefore, option A forms the presentational basis for the assessment with option B conclusions being no different. 3. No, WTG Option B will not influence the sensitivity of the receptors that are being assessed. As set out in **Table 8-4** of **Chapter 8**, sensitivity considers the conservation value and ecological sensitivity of the receptor to the impact. 4. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not introduce new impacts. 5. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not introduce materially different magnitude of impact. 6. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not materially alter the sensitivity of the relevant receptors**.**
	Boulder clearance: array site seabed clearance area (m^2)	2,556,000 - 2,934,000	2,494,000 - 2,772,000			
	Sand wave clearance: array site seabed clearance area (m^2)	205,250 - 259,250	220,000 – 277,500			
	IAC and interconnector cable installation: Total seabed disturbed (m^2)	1,911,000 - 2,214,000	1,791,000 - 2,079,000			
	Boulder clearance: OECC seabed clearance area (m^2)	2,220,000 - 2,616,000				
	Sand wave clearance: OECC seabed clearance area (m^2)	198,550				
	Offshore export cable installation: Total seabed disturbed (m^2)	1,890,000 - 2,187,000				
	JUV operations total impact area (m^2)	240,000	180,000			
	WTGs and OSS anchoring operations total impact area (m^2)	280,800	237,600			
	IAC and interconnector cable anchoring operations total impact area (m^2)	371,520	280,800			
	Offshore export cable anchoring operations total impact area (m^2)	630,720				
	Total area of disturbed sediment for offshore construction activities (m^2)	**11,931,840**	**11,459,170**			
	Landfall					
	Installation methods and effects					
	Total seabed disturbed by cofferdam (m^2)	6,100				
	Total seabed disturbed by intertidal cable duct installation (m^2)	36,000				

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
	Total area of seabed in transition zone affected by support structures (m^2)	6,900				
	Total area of seabed in transition zone affected by installation of cables using either open cut trenching or a shallow water trenching tool (m^2)	108,000				
	Total area of disturbed sediment for landfall construction activities (m^2)	**157,000**				
Impact 2: Temporary increase in Suspended Sediment Concentrations (SSC)	Array site (including WTGs, inter-array cables (IACs), interconnectors and offshore substation structures (OSSs)) and OECC	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	As above for Impact 1.	As above for Impact 1.	As above for Impact 1.	Temporary increases in suspended sediment concentrations (SSC) relates to seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation. Increases in SSC occur as a result of temporary disturbance to the seabed and as such the construction activities relating to these impacts are the same and all three impacts have been assessed together. It should be noted that where boulder clearance overlaps with sand wave clearance, the boulder clearance footprint will be within the sand wave clearance footprint. Offshore, WTG Option A forms the representative scenario as this represents the greatest level of temporary habitat disturbance, and therefore WTG Option A forms the presentational basis of the assessment for Impact 2: temporary increases in SSC in this chapter. WTG Option B would result in a lower level of disturbance and would not introduce new impacts, or an impact of materially different magnitude. The total area of	*1. Are there infrastructure layout options (permanent or temporary) which may introduce new impacts?* *Note - this could be a new impact entirely or the introduction of an existing impact pathway to a new receptor.* *2. Are there infrastructure layout options (permanent or temporary) which may introduce a materially different magnitude of impact?* *3. Are there infrastructure layout options (permanent or temporary) which may introduce a material change in the sensitivity of the receptor(s) (greater or lesser)?* *4. Are there alternative installation methods which may introduce new impacts?* *5. Are there alternative installation methods which may introduce a materially different magnitude of impact?* *6. Are there alternative installation methods which may*	1. No, WTG Option B would not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. It is highly unlikely that, the two layouts will have differing magnitudes for Impact 2. This can be demonstrated by reference to **Table 8-5** in **Chapter 8** which shows that the total area of disturbed sediment for construction activities in WTG Option A (11,931,840 m^2) and WTG Option B (11,459,170 m^2) is likely to result in the same magnitude of impact for both WTG Option A and WTG Option B. Furthermore, following the proposed primary mitigation measure of pre-construction surveys, it is unlikely that Impact 3 will result in any significant effects for either WTG Option A or WTG Option B. Therefore, option A forms the presentational basis for the assessment with WTG Option B conclusions being no different. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Table 8-4 of Chapter 8**, sensitivity considers the conservation value and ecological sensitivity of the receptor to the impact. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not introduce new impacts. 5. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not introduce materially different magnitude of impact.

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
				disturbed sediment for construction activities based on this representative scenario is calculated to be 12,088,840 m^2.	*materially alter the sensitivity of the relevant receptor(s) (greater or lesser).*	6. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not materially alter the sensitivity of the relevant receptors**.**
Impact 3: Remobilisation of contaminated sediments	Array site (including WTGs, inter-array cables (IACs), interconnectors and offshore substation structures (OSSs)) and OECC	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	As above for Impact 1.	As above for Impact 1.	As above for Impact 1.	Remobilisation of contaminated sediments relates to seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation. Remobilisation of contaminated sediments occur as a result of temporary disturbance to the seabed and as such the construction activities relating to these impacts are the same as those of Impact 1. It should be noted that where boulder clearance overlaps with sand wave clearance, the boulder clearance footprint will be within the sand wave clearance footprint. Offshore, WTG Option A forms the representative scenario as this represents the greatest level of temporary habitat disturbance, and therefore WTG Option A forms the presentational basis of the assessment for Impact 3: remobilisation of contaminated sediments in this chapter. WTG Option B would result in a lower level of disturbance and would not introduce new impacts, or an impact of materially different magnitude. The total area of disturbed sediment for construction activities based on this representative scenario is calculated to be 12,088,840 m^2.	*1. Are there infrastructure layout options (permanent or temporary) which may introduce new impacts?* *Note - this could be a new impact entirely or the introduction of an existing impact pathway to a new receptor.* *2. Are there infrastructure layout options (permanent or temporary) which may introduce a materially different magnitude of impact?* *3. Are there infrastructure layout options (permanent or temporary) which may introduce a material change in the sensitivity of the receptor(s) (greater or lesser)?* *4. Are there alternative installation methods which may introduce new impacts?* *5. Are there alternative installation methods which may introduce a materially different magnitude of impact?* *6. Are there alternative installation methods which may materially alter the sensitivity of the relevant receptor(s) (greater or lesser).*	1. No, WTG Option B would not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. It is highly unlikely that, the two layouts will have differing magnitudes for Impact 3. This can be demonstrated by reference to **Table 8-5** in **Chapter 8** which shows that the total area of disturbed sediment for construction activities in Option A (11,931,840m^2) and Option B (11,459,170m^2) is likely to result in the same magnitude of impact for both WTG Option A and Option B. Furthermore, following the proposed primary mitigation measure of pre-construction surveys, it is unlikely that impact 3 will result in any significant effects for either WTG Option A or WTG Option B. Therefore, option A forms the presentational basis for the assessment with option B conclusions being no different. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Table 8-4** of **Chapter 8**, sensitivity considers the conservation value of the receptor and ecological sensitivity of the receptor to the impact. 4. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not introduce new impacts. 5. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not introduce materially different magnitude of impact. 6. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not materially alter the sensitivity of the relevant receptors**.**

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
Impact 4: Introduction of INNS	Array site (including WTGs, inter-array cables (IACs), interconnectors and offshore substation structures (OSSs)) and OECC	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	Installation methods and effects			There are no known INNS in the offshore development area, therefore this impact relates to the potential transference of INNS from construction vessels or plant into the CWP Project offshore development area. WTG Option A forms the representative scenario as this represents the number of vessels required, and therefore WTG Option A forms the presentational basis of the assessment for Impact 4. WTG Option B would result in a lower potential for the introduction of INNS and would not introduce new impacts, or an impact of materially different magnitude.	*1. Are there infrastructure layout options (permanent or temporary) which may introduce new impacts?* *Note - this could be a new impact entirely or the introduction of an existing impact pathway to a new receptor.* *2. Are there infrastructure layout options (permanent or temporary) which may introduce a materially different magnitude of impact?* *3. Are there infrastructure layout options (permanent or temporary) which may introduce a material change in the sensitivity of the receptor(s) (greater or lesser)?* *4. Are there alternative installation methods which may introduce new impacts?* *5. Are there alternative installation methods which may introduce a materially different magnitude of impact?* *6. Are there alternative installation methods which may materially alter the sensitivity of the relevant receptor(s) (greater or lesser).*	1. No, WTG Option B would not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. It is highly unlikely that, the two layouts will have differing magnitudes for Impact 4. This can be demonstrated by reference to **Table 8-5 in Chapter 8** which shows that the total number of construction vessels (round trips) WTG Option A (2,406) and WTG Option B (2,384) is likely to result in the same magnitude of impact for both WTG Option A and WTG Option B. Furthermore, the proposed primary mitigation measure of a biosecurity plan for all CWP Project construction activities will remove the route to impact and it is unlikely that impact 4 will result in any significant effects for either WTG Option A or WTG Option B. Therefore, WTG Option A forms the presentational basis for the assessment with WTG Option B conclusions being no different. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Table 8-4** of **Chapter 8**, sensitivity considers the conservation value of the receptor and ecological sensitivity of the receptor to the impact. 4. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not introduce new impacts. 5. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not introduce materially different magnitude of impact. 6. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not materially alter the sensitivity of the relevant receptors**.**
	Total construction vessels (round trips)	2,409	2,387			

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
Impact 5: Accidental Pollution events	Array site (including WTGs, inter-array cables (IACs), interconnectors and offshore substation structures (OSSs)) and OECC	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	As above for Impact 4.	As above for Impact 4.	As above for Impact 4.	Accidental pollution events relates to the potential for Accidental pollution such as oil and hydraulic fluids being introduced to the environment from vessels during construction activities. WTG Option A forms the representative scenario as this represents the number of vessels required, and therefore WTG Option A forms the presentational basis of the assessment for Impact 5. WTG Option B would result in a lower potential for accidental pollution events to occur and would not introduce new impacts, or an impact of materially different magnitude.	*1. Are there infrastructure layout options (permanent or temporary) which may introduce new impacts?* *Note - this could be a new impact entirely or the introduction of an existing impact pathway to a new receptor.* *2. Are there infrastructure layout options (permanent or temporary) which may introduce a materially different magnitude of impact?* *3. Are there infrastructure layout options (permanent or temporary) which may introduce a material change in the sensitivity of the receptor(s) (greater or lesser)?* *4. Are there alternative installation methods which may introduce new impacts?* *5. Are there alternative installation methods which may introduce a materially different magnitude of impact?* *6. Are there alternative installation methods which may materially alter the sensitivity of the relevant receptor(s) (greater or lesser).*	1. No, WTG Option B would not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. It is highly unlikely that, the two layouts will have differing magnitudes for Impact 5. This can be demonstrated by reference to **Table 8-5** in **Chapter 8** which shows that the total number of construction vessels (round trips) WTG Option A (2,409) and WTG Option B (2,387) is likely to result in the same magnitude of impact for both WTG Option A and Option B. Furthermore, the primary project mitigation outlined in **Chapter 8 Section 8.9**, in the form of a CEMP, will ensure that vessels follow best practice guidelines for the prevention of pollution at sea and that analogous protocols are adhered to, to minimise such risk associated with works in intertidal habitats. Therefore, option A forms the presentational basis for the assessment with option B conclusions being no different. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Table 8-4** of **Chapter 8**, sensitivity considers the conservation value of the receptor and ecological sensitivity of the receptor to the impact. 4. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not introduce new impacts. 5. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not introduce materially different magnitude of impact. 6. No, the installation methods for the permanent infrastructure, including installation of foundations and cables do not materially alter the sensitivity of the relevant receptors**.**

Table 2 Representative scenario assessment - operational phase impacts

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
Impact 1: Long term habitat loss	Array site (including WTGs, inter-array cables (IACs), interconnectors and offshore substation structures (OSSs)) and OECC	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	Permanent infrastructure			The long term habitat loss relates to the footprints of foundations including scour protection and areas of cable protection installations on the seabed that will remain for the operational lifetime of the CWP Project. WTG Option A forms the representative scenario as this represents the greatest level of long term habitat loss, and therefore WTG Option A forms the presentational basis of the assessment for Impact 1, long term habitat loss in this chapter. WTG Option B would result in a lower level of disturbance and would not introduce new impacts, or an impact of materially different magnitude.	*1. Are there infrastructure layout options which may introduce new impacts?* *Note - this could be a new impact entirely or the introduction of an existing impact pathway to a new receptor.* *2. Are there infrastructure layout options which may introduce a materially different magnitude of impact (greater or lesser)?* *3. Are there infrastructure layout options which may introduce a material change in the sensitivity of the receptor(s) (greater or lesser)?*	1. No, WTG Option B would not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. It is highly unlikely that, the two layouts will have differing magnitudes for operational phase Impact 1. This can be demonstrated by reference to **Table 8-5** in **Chapter 8** which shows that the total area of habitat loss for construction activities in WTG Option A (599,320 m^2) and WTG Option B (530,720 m^2) results in a very small change in the percentage of habitat within the development area with the potential to be impacted and as such is likely to have the same magnitude of impact for both WTG Option A and WTG Option B. Furthermore, following the proposed primary mitigation measure of pre-construction surveys, it is unlikely that impacts 1 will result in any significant effects for either WTG Option A or WTG Option B. Therefore, option A forms the presentational basis for the assessment with option B conclusions expected to be no different. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Table 8-4** of **Chapter 8**, sensitivity considers the conservation value of the receptor and ecological sensitivity of the receptor to the impact.
	Total WTG monopile seabed area (with scour protection) across the array site (m^2)	273,000	218,400			
	Total OSS monopile seabed area (with scour protection) across the array site (m^2)	10,920	10,920			
	Interconnector and inter-array cabling- total area of seabed covered by cable protection (m^2)	208,600	194,600			
	Offshore export cables-total area of seabed covered by cable protection (m^2)	105,000	105,000			
	Area of reclaimed land from Liffey (m^2)	1,800				
	Total area of potential long-term habitat loss (m^2)	**599,320**	**530,720**			
Impact 2: Habitat Creation (increased hard substrate)	Array site (including WTGs, inter-array cables (IACs), interconnectors, offshore substation structures (OSSs)), OECC and onshore substation	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	As above for Impact 1.	As above for Impact 1.	As above for Impact 1.	Habitat creation relates to increased hard substrate due to the introduction of turbine foundation and scour and cable protection which will become colonised by benthic epifaunal species and create hard substrate habitats. WTG Option A forms the representative scenario as this represents the greatest level of habitat creation, and therefore WTG Option A forms the presentational basis of the assessment for Impact 2,	*1. Are there infrastructure layout options which may introduce new impacts?* *Note - this could be a new impact entirely or the introduction of an existing impact pathway to a new receptor.* *2. Are there infrastructure layout options which may introduce a materially different magnitude of impact (greater or lesser)?*	1. No, WTG Option B would not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. It is highly unlikely that, the two layouts will have differing magnitudes for operational phase Impact 2. This can be demonstrated by reference to **Table 8-5 in Chapter 8** which shows that the total area of potential hard substrate habitat gained for construction activities in WTG Option A (599,320 m^2) and WTG Option B (530,720 m^2) results in a very small change in the percentage of habitat within the development area with the potential to be impacted and as such is likely to have the same magnitude of impact for both WTG Option A and WTG Option B. Furthermore, following the proposed primary mitigation measure of pre-construction surveys, it is unlikely that impact 7 will result in

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
				habitat creation in this chapter. WTG Option B would result in a lower level of disturbance and would not introduce new impacts, or an impact of materially different magnitude.	*3. Are there infrastructure layout options which may introduce a material change in the sensitivity of the receptor(s) (greater or lesser)?*	any significant effects for either WTG Option A or WTG Option B. Therefore, WTG Option A forms the presentational basis for the assessment with WTG Option B conclusions expected to be no different. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Table 8-4** of **Chapter 8**, sensitivity considers the conservation value of the receptor and ecological sensitivity of the receptor to the impact.
Impact 3: Temporary habitat disturbance	Array site (including WTGs, inter-array cables (IACs), interconnectors and offshore substation structures (OSSs)) and OECC	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	Temporary habitat disturbance relates to maintenance activities such as cable repair, vessel jack-up operations and deployment of scour protection.			Temporary habitat disturbance relates to maintenance activities such as cable repair, vessel jack-up operations and deployment of scour protection. Due to the increased number of WTGs WTG Option A forms the representative scenario, however there is anticipated to be very little difference in the frequency and extent of maintenance activities between the two options.	*1. Are there infrastructure layout options which may introduce new impacts?* *Note - this could be a new impact entirely or the introduction of an existing impact pathway to a new receptor.* *2. Are there infrastructure layout options which may introduce a materially different magnitude of impact (greater or lesser)?* *3. Are there infrastructure layout options which may introduce a material change in the sensitivity of the receptor(s) (greater or lesser)?*	1. No, WTG Option B would not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. It is highly unlikely that, the two layouts will have differing magnitudes for operational phase Impact 1. This impact relates mainly to unscheduled maintenance and repair activities and as such the extent and frequencies at which this impact will occur are unknown. However, it is highly unlikely that either WTG Option A or WTG Option B would result in a greater need for maintenance and repair activities during the operation and maintenance phase. Furthermore, the magnitude of the impact of temporary habitat disturbance during operation and maintenance is likely to be considerably less than that of the construction phase which is likely to be not significant. Therefore, option A forms the presentational basis for the assessment with option B conclusions expected to be no different. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Table 8-4** of **Chapter 8**, sensitivity considers the conservation value of the receptor and ecological sensitivity of the receptor to the impact.
Impact 4: Presence of Electro Magnetic Fields (EMF) and / or Temperature changes resulting from presence of electrical infrastructure	Array site (including WTGs, inter-array cables (IACs), interconnectors and offshore substation structures (OSSs)) and OECC	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	Interconnector and IAC length (km)	127.4 - 147.6	119.4 - 138.6	The presence of EMF and / or temperature changes relates to the electromagnetic frequency from the OECC, interconnectors and IACs during the operational phase.	*1. Are there infrastructure layout options which may introduce new impacts?* *Note - this could be a new impact entirely or the introduction of an existing impact pathway to a new receptor.*	1. No, WTG Option B would not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. It is highly unlikely that, the two layouts will have differing magnitudes for operational phase Impact 4. The maximum total length of cable with the potential to emit EMF and / or temperature changes during the operational phase in WTG
	Interconnector and IAC minimum depth of cover (m)	1.0	1.0			
	Interconnector and IAC voltage (kV)	66	66			
	OECC length (km)	126 - 146	126 - 146			
	OECC minimum depth of cover (m)	1.4	1.4			

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
	OECC voltage (kV)	220	220	WTG Option A forms the representative scenario as this represents the greatest length of cable with the potential to emit EMF and / or temperature changes, and therefore WTG Option A forms the presentational basis of the assessment for Impact 4: EMF and / or potential temperature changes in this chapter. WTG Option B would result in a shorter cable length and therefore smaller area with the potential to be impacted by EMF and / or temperature changes and would not introduce new impacts, or an impact of materially different magnitude.	*2. Are there infrastructure layout options which may introduce a materially different magnitude of impact (greater or lesser)?* *3. Are there infrastructure layout options which may introduce a material change in the sensitivity of the receptor(s) (greater or lesser)?*	Option A (293.6 km) and WTG Option B (284.6 km). Given the very small difference in cable length between WTG Option A and WTG Option B, the assessment of both options likely result in the same magnitude of impact for both WTG Option A and WTG Option B (**Chapter 8, Table 8-5**). Furthermore, following the proposed primary mitigation measure of cable burial, it is unlikely that impact 4 will result in any significant effects for either WTG Option A or WTG Option B. Therefore, option A forms the presentational basis for the assessment with option B conclusions being no different. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Table 8-4** of **Chapter 8**, sensitivity considers the conservation value of the receptor and ecological sensitivity of the receptor to the impact.
	Total length of cables with the potential to emit EMF and/or Temperature changes	**253.4 – 293.6**	**245.4 – 284.6**			
Impact 5: Introduction of INNS	Array site (including WTGs, inter-array cables (IACs), interconnectors and offshore substation structures (OSSs)) and OECC	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	Total O&M vessels (round trips)	1,209	1,209	There are no known INNS in the offshore development area, therefore this impact relates to the potential transference of INNS from construction vessels or plant into the offshore development area. The estimated number of vessels required during operation and maintenance are the same regardless of the WTG option selected. Therefore, there is only one scenario for this potential impact, and this represents the representative Scenario.	*1. Are there infrastructure layout options which may introduce new impacts?* *Note - this could be a new impact entirely or the introduction of an existing impact pathway to a new receptor.* *2. Are there infrastructure layout options which may introduce a materially different magnitude of impact (greater or lesser)?* *3. Are there infrastructure layout options which may introduce a material change in the sensitivity of the receptor(s) (greater or lesser)?*	1. No, WTG Option B would not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. It is highly unlikely that, the two layouts will have differing magnitudes for Impact 5. The estimated number of vessels required during operation and maintenance are the same regardless of the WTG option selected. Furthermore, the proposed primary mitigation measure of a biosecurity plan for all CWP Project operation and maintenance activities will remove the route to impact and it is unlikely that impact 5 will result in any significant effects for either WTG Option A or WTG Option B. Therefore, option A forms the presentational basis for the assessment with option B conclusions being no different. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Table 8-4 of Chapter 8**, sensitivity considers the conservation value of the receptor and ecological sensitivity of the receptor to the impact.
Impact 6: Accidental pollution events	As above for Impact 5.	As above for Impact 5.	As above for Impact 5.	Accidental pollution events relates to the potential for accidental pollution such as oil and hydraulic fluids being	*1. Are there infrastructure layout options which may introduce new impacts?*	1. No, WTG Option B would not introduce any new impact receptor pathways that have not already been considered as part of the assessment.

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
				introduced to the environment from vessels during construction activities. The estimated number of vessels required during operation and maintenance are the same regardless of the WTG option selected. Therefore, there is only one scenario for this potential impact, and this represents the representative Scenario.	*Note - this could be a new impact entirely or the introduction of an existing impact pathway to a new receptor.* *2. Are there infrastructure layout options which may introduce a materially different magnitude of impact (greater or lesser)?* *3. Are there infrastructure layout options which may introduce a material change in the sensitivity of the receptor(s) (greater or lesser)?*	2. It is highly unlikely that, the two layouts will have differing magnitudes for Impact 6. The estimated number of vessels required during operation and maintenance are the same regardless of the WTG option selected. Furthermore, the primary project mitigation outlined in **Chapter 8 Section 8.9**, in the form of a CEMP, will ensure that vessels follow best practice guidelines for the prevention of pollution at sea and that analogous protocols are adhered to, to minimise such risk associated with works in intertidal habitats. Therefore, option A forms the presentational basis for the assessment with option B conclusions being no different. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Table 8-4 of Chapter 8**, sensitivity considers the conservation value of the receptor and ecological sensitivity of the receptor to the impact.

4 Limit of Deviation Assessment

14. As described in **Section 1** of this document, locational flexibility of permanent and temporary infrastructure is described as a LoD from a specific point or alignment.

15. The project components for which a LoD has been defined are presented in **Table 3**. These are further described in EIAR Chapter 4 Project Description and have been presented on the planning drawings that accompany the planning application.

Table 3 Defined limits of deviation

Project component	LoD
Offshore project components	
WTGs	100 m from the centre point of each WTG location
WTG monopile locations	Same as WTGs.
WTG monopile scour protection	Same as WTGs.
OSSs	100 m from the centre point of each OSS location
OSS monopile locations	Same as OSSs.
OSS monopile scour protection	Same as OSSs.
IACs and interconnector cables	100 m either side of the preferred alignment of each IAC and interconnector cable 200 m from the centre point of each WTG location
Offshore export cables	250 m either side of the preferred alignment within the array site. The OECC outside of the array site.
Landfall	
Transition Joint Bays (TJBs)	0.5 m either side (i.e. east / west) of the preferred TJB location.
Landfall cable ducts (and associated offshore export cables within the ducts)	Defined LoD boundary
Intertidal cable ducts (and associated offshore export cables within the ducts).	The OECC
Intertidal offshore export cables (non ducted sections).	The OECC
Onshore substation	
Location of onshore substation revetment perimeter structure	Defined LoD boundary

16. For the purposes of the EIAR, the main chapter for subtidal and intertidal ecology assesses the specific preferred location for permanent. However, this document provides further analysis to determine if the proposed LoD for permanent infrastructure may give rise to any new or materially different effects, taking into consideration the potential impact of the proposed LoD on the magnitude of the impact.

17. For subtidal and intertidal ecology this analysis for construction and O&M phase impacts is presented in **Table 4** and **Table 5**, respectively. Where the potential for a LoD to cause a new or materially different effect is identified, then this is noted in **Table 4** and **Table 5** below and is considered in full within the main chapter.

Table 4 Limit of deviation assessment - construction phase impacts

Impact	Relevant project element	Limit of deviation	Questions to demonstrate assessment has considered all scenarios	Response
Impact 1: Temporary seabed habitat disturbance	Generating station		*1. Does the proposed LoD (locational flexibility) introduce new impacts? (i.e. the introduction of an existing impact pathway to a new receptor).* *2. Does the proposed LoD (locational flexibility) introduce a materially different magnitude of impact?*	1. No, the implementation of the LoD does not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. Temporary habitat disturbance during pre-installation activities has been calculated based on the upper limit for IAC, interconnector and export cable lengths which factors in the proposed LoD for these project elements. Temporary habitat disturbance from landfall works is calculated based on the size of the proposed temporary infrastructure, which is immaterial of the infrastructure location. Whilst the LoD may alter the proportions of each habitat type with the potential to be impacted, the proportional differences are small, relative to the overall availability of each habitat, and would not constitute a material change in magnitude of any of impacts 1, 2 and 3. However, the LoD may impact the habitat type in which the location of the impact falls and this could alter the potential maximum area of a given habitat type to be impacted by temporary habitat disturbance. The implementation of the LoD is therefore unlikely to alter the assigned magnitude of the impact.
	IACs and interconnector cables	100 m either side of the preferred alignment of each IAC and interconnector cable. 200 m from the centre point of each WTG location.		
	Offshore export cables			
	Offshore export cables	250 m either side of the preferred alignment within the array site. The OECC outside of the array site.		
	Landfall			
	Intertidal cable ducts (and associated offshore export cables within the ducts)	The OECC		
	Intertidal offshore export cables (non ducted sections)	The OECC		
Impact 2 Temporary increase in Suspended Sediment Concentrations (SSC)	As Above	As Above	As Above	As Above
Impact 3: Remobilisation of contaminated sediments	As Above	As Above	As Above	As Above

Table 5 Limit of deviation assessment - operational phase impacts

Impact	Relevant project element	Limit of deviation	Questions to demonstrate assessment has considered all scenarios	Response
Impact 1: Long term habitat loss	Generating station including WTGs, interconnectors and IACs		*1. Does the proposed LoD (locational flexibility) introduce new impacts? (i.e. the introduction of an existing impact pathway to a new receptor).* *2. Does the proposed LoD (locational flexibility) introduce a materially greater magnitude of impact?*	1. No, the implementation of the LoD does not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. Long term habitat loss during operational activities has been calculated based on the upper limit for WTG and OSS scour protection and IAC, interconnector and export cable lengths and cable protection which factors in the proposed LoD for these project elements. Long term habitat loss is calculated based on the area of the proposed infrastructure including scour and cable protection, which is immaterial of the infrastructure location. Whilst the LoD may alter the proportions of each habitat type with the potential to be impacted, the proportional differences are small relative to the overall availability of each habitat and is unlikely to constitute a material change in magnitude of any of operational phase impact 1. However, the LoD may change the habitat type in which the location of the impact falls and this could alter the potential maximum area of a given habitat type to be impacted by long term habitat loss. The implementation of the LoD is therefore unlikely to alter the assigned magnitude of the impact.
	WTG locations and scour protection	100 m from the centre point of each WTG location		
	OSSs and scour protection	100 m from the centre point of each OSS location		
	IACs and interconnector cables	100 m either side of the preferred alignment of each IAC and interconnector cable 200 m from the centre point of each WTG location		
	Offshore export cables			
	Offshore export cables	250 m either side of the preferred alignment within the array site. The OECC outside of the array site.		
	Onshore substation revetment	0.5–1.0 m horizontal width		
Impact 4: Presence of EMF and / or Temperature changes resulting from presence of electrical infrastructure	Generating station		*1. Does the proposed LoD (locational flexibility) introduce new impacts? (i.e. the introduction of an existing impact pathway to a new receptor).* *2. Does the proposed LoD (locational flexibility) introduce a materially different magnitude of impact?*	1. No, the implementation of the LoD does not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 2. The presence of EMF and / or temperature changes during the operational phase have been calculated based on the upper limit for IAC, interconnector and export cable lengths which factors in the proposed LoD for these project elements. Whilst the LoD may alter the proportions of each habitat type with the potential to be impacted, the proportional differences are small and are unlikely to not constitute a material change in magnitude of any of operational phase impact 4. However, the LoD may change the habitat type in which the location of the impact falls and this could alter the potential maximum area of a given habitat type to be impacted by EMF and / or temperature changes. The implementation of the LoD does not therefore alter the assigned magnitude of the impact.
	IACs and interconnector cables	100 m either side of the preferred alignment of each IAC and interconnector cable 200 m from the centre point of each WTG location		
	Offshore export cables			
	Offshore export cables	250 m either side of the preferred alignment within the array site. The OECC outside of the array site.		