codling wind park

Environmental Impact Assessment Report

Volume 4

Appendix 14.2 Representative Scenario and Limits of Deviation Assessment


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APPENDIX 14.2 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 (250 m rotor diameter) or WTG Layout Option B (276 m 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 of 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 marine archaeology and cultural heritage 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: Direct physical impact to known and potential marine cultural heritage receptors	Array site (including WTGs, inter-array cables (IACs), interconnectors and offshore substation structures (OSSs))	WTG Option A	WTG Option B	Direct physical impacts relate 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. WTG Option A forms the representative scenario as this represents the greatest area of impact, and therefore WTG Option A forms the basis of the assessment for Impact 1: Direct physical impacts in this chapter. WTG Option B, or any other scenario resulting in a lower level of disturbance would not introduce new or different impacts and would not result in an effect of materially different significance. The total area of disturbed sediment for construction activities, including the offshore export cables and landfall is calculated to be 12,675,440 m^2	Questions to demonstrate assessment has considered all scenarios	Response
	Permanent infrastructure				*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 impacts, the proposed mitigation measures address likely significant effects appropriately, immaterial of the layout brought forward. Therefore, WTG Option A forms the presentational basis for the assessment with WTG Option B conclusions being no different. 2. No, WTG Option B would not give rise to a materially different magnitude for Impact 1. This can be demonstrated by reference to **Chapter 14 Marine Archaeology and Cultural Heritage** which shows that based on total area of impact, Option B results in the same magnitude of impact. Furthermore, the proposed mitigation measures address likely significant effects appropriately, immaterial of the layout brought forward. 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 **Section 28** in **Chapter 14 Marine Archaeology and Cultural Heritage**, sensitivity considers a combination of value, tolerance, adaptability and recoverability of the receptor, which is not influenced by details or characteristics of the project. Therefore, WTG Option A forms the presentational basis for the assessment with WTG Option B conclusions being no different. 4. No, in relation to Impact 1, there are no alternative installation methods proposed that would introduce new impact receptor pathways. 5. No, in relation to Impact 1, there are no alternative installation methods proposed that would result in differing magnitudes for Impact 1. 6. No, in relation to Impact 1, there are no alternative installation methods proposed that would influence the sensitivity of the receptor that is being assessed.
	Number of WTG monopile foundations	75	60			
	Number of OSSs monopile foundations	3				
	Total WTG monopile seabed area take (with scour protection) across the array site (m^2)	273,000	218,400			
	Length of inter-array cabling on the seabed (km)	120 - 139	112 - 130			
	IACs and interconnector cables trench depth (m)	1.5				
	Total area of seabed covered by IAC and interconnector cable protection (m^2)	208,600				
	Installation methods and effects					
	Boulder clearance: Array Site seabed clearance area (m^2)	2,556,000 - 2,934,000	2,494,000 - 2,772,000			
	Sandwave clearance: Array Site seabed clearance area (m^2)	205,250 - 259,250	220,000 – 277,500			
	Pre-lay grapnel run (PLGR): Array Site seabed disturbance width (m)	3				
	Removal of existing out of service cables (OOS): Array Site length of OOS cable removal (km)	18				
	IAC and interconnector cable installation: Total seabed disturbed (m^2)	1,911,000 - 2,214,000	1,791,000 - 2,079,000			
	Jack-up vessel (JUV) operations total seabed impact area (m^2)	240,000	180,000			
	WTGs and OSS anchoring operations total seabed impact area (m^2)	280,800	237,600			
	IAC and interconnector cable anchoring operations total seabed impact area (m^2)	371,520	280,800			
	Total area of disturbed sediment for offshore construction activities (m^2)	**6,781,170**	**6,253,900**			

Impact	Relevant project details		Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
	Offshore export cables				
	Permanent infrastructure				
	Number of offshore export cables	3			
	Seabed clearance corridor width per export cable (m)	20			
	Trench depth per export cable (m)	2 (3 m in zones of deeper burial)			
	Cable protection: seabed covered by export cable protection (m^2)	105,000			
	Installation methods and effects				
	Boulder clearance: OECC seabed clearance area (m^2)	2,220,000 - 2,616,000			
	Sandwave clearance: OECC seabed clearance area (m^2)	198,550			
	Pre-lay grapnel run (PLGR): OECC seabed disturbance width (m)	3			
	OECC installation: Total seabed disturbed (m^2)	1,890,000 - 2,187,000			
	OECC anchoring operations total seabed impact area (m^2)	630,720			
	Total area of disturbed sediment for offshore construction activities (m^2)	**5,737,270**			
	Landfall				
	Permanent infrastructure				
	Offshore export cables	3			
	Depth of open cut trenches (m)	3			
	Temporary infrastructure				
	Dimensions of temporary access ramp (including route from main compound) (L x W) (m)	60 x 10			
	Temporary cofferdam made of steel sheet piles: seabed disturbance (m^2)[3]	6,100			
	Installation methods and effects				
	Offshore export cable duct installation across intertidal area: total seabed disturbance (m^2)	36,000			
	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	108,000			

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
	either open cut trenching or a shallow water trenching tool (m^2)					
	Total area of disturbed sediment for landfall construction activities (m^2)	**157,000**				
	Onshore substation					
	Permanent infrastructure					
	Area of reclaimed land from Liffey (m^2)	1,800				
	Onshore substation: length of combi-wall below the HWM (requiring marine piling) (m)	150				
	Onshore substation: Total length of new revetments (m)	150				
	Length of tubular piles and infill sheet piles (m)	40				
Impact 2: Indirect physical impact to known and potential marine cultural heritage receptors	Array site and OECC	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	Permanent infrastructure			Indirect disturbance caused by changes to the hydrodynamic and sedimentary regimes due to spoil removal and sediment redistribution. WTG Option A forms the representative scenario as this represents the greatest area of impact, and therefore WTG Option A forms the basis of the assessment for Impact 2: Indirect physical impacts in this chapter. WTG Option B, or any other scenario resulting in a lower level of disturbance would not introduce new or different impacts and would not result in an effect of materially different significance.	*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?*	1.No, WTG Option B would not introduce any new impacts, the proposed mitigation measures address likely significant effects appropriately, immaterial of the layout brought forward. Therefore, WTG Option A forms the presentational basis for the assessment with WTG Option B conclusions being no different. 2. No, WTG Option B would not give rise to a materially different magnitude for Impact 2. This can be demonstrated by reference to **Chapter 06 Marine Geology, Sediment and Coastal Processes** which shows that based on total area of impact, WTG Option B results in the same magnitude of impact. Furthermore, the proposed mitigation measures address likely significant effects appropriately, immaterial of the layout brought forward. 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 **Section 28** in **Chapter 14 Marine Archaeology and Cultural Heritage**, sensitivity considers a combination of value, tolerance, adaptability and recoverability of the receptor, which is not influenced by details or characteristics of the project. Therefore, WTG Option A forms the presentational basis for the assessment with WTG Option B conclusions being no different.
	Cable protection for the IACs: seabed covered by cable protection (m^2)	208,600	208,600			
	OECC cable protection: seabed covered by export cable protection (m^2)	105,000	105,000			
	Installation methods and effects					
	Sandwave clearance: Array Site seabed clearance area (m^2)	205,250 - 259,250	220,000 – 277,500			
	Sandwave clearance: OECC seabed clearance area (m^2)	198,550	198,550			
	IAC and interconnector cable installation: Total seabed disturbed (m^2)	1,911,000 - 2,214,000	1,791,000 - 2,079,000			
	OECC installation: Total seabed disturbed (m^2)	1,890,000 - 2,187,000	1,890,000 - 2,187,000			

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
					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).*	4. No, in relation to Impact 2, there are no alternative installation methods proposed that would introduce new impact receptor pathways. 5. No, in relation to Impact 2, there are no alternative installation methods proposed that would result in differing magnitudes for Impact 1. 6. No, in relation to Impact 2, there are no alternative installation methods proposed that would influence the sensitivity of the receptor that is being assessed.

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: Direct physical impact to known and potential marine cultural heritage receptors	Array site and OECC	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	
	O&M vessels			Direct impacts during operation could occur as a result of routine or exceptional maintenance activities if these disturb the seabed beyond the construction phase footprint. Both WTG Options require the same vessels for maintenance and repair. Therefore, no representative scenario is required.	*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)?*	A single assessment scenario has been adopted for Impact 1, as the number of vessels required for maintenance are the same under WTG Option A and WTG Option B.
	Jack-up Vessels (JUVs) Peak vessel numbers	2				
	Service Operation Vessel (SOV) Peak vessel numbers	1				
	Crew Transfer Vessel (CTV) Peak vessel numbers	6				
	Cable maintenance vessel Peak vessel numbers	2				
	Auxiliary vessel Peak vessel numbers	3				
	Jack-up Vessels (JUVs) Annual round trips	3				
	Service Operation Vessel (SOV) Annual round trips	26				
	Crew Transfer Vessel (CTV) Annual round trips	1152				
	Cable maintenance vessel Annual round trips	1				
	Auxiliary vessel Annual round trips	27				

Impact 2: Indirect physical impact to known and potential marine cultural heritage receptors	Array site and OECC	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	Permanent infrastructure			Indirect disturbance caused by changes in local scouring and sedimentation patterns. WTG Option A forms the representative scenario as this represents the greatest area of impact, and therefore Option A forms the basis of the assessment for Impact 2: Indirect physical impacts in this chapter. WTG Option B, or any other scenario resulting in a lower level of disturbance would not introduce new or different impacts and would not result in an effect of materially different significance.	*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 impacts, the proposed mitigation measures address likely significant effects appropriately, immaterial of the layout brought forward. 2. No, WTG Option B would not give rise to a materially different magnitude for Impact 2. This can be demonstrated by reference to **Chapter 06 Marine Geology, Sediment and Coastal Processes** which shows that based on total area of impact, WTG Option B results in the same magnitude of impact. Furthermore, the proposed mitigation measures address likely significant effects appropriately, immaterial of the layout brought forward. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Section 28** in **Chapter 14 Marine Archaeology and Cultural Heritage**, sensitivity considers a combination of value, tolerance, adaptability and recoverability of the receptor, which is not influenced by details or characteristics of the project.
	Cable protection for the IACs and interconnector cables: seabed covered by cable protection (m^2)	208,600	208,600			
	OECC cable protection: seabed covered by export cable protection (m^2)	105,000	105,000			

4 Limit of Deviation Assessment

14. As described in **Section 1** of this document, locational flexibility of permanent 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	
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 for sheet piling at toe of the revetement

16. For the purposes of the EIAR, the main chapter for marine archaeology and cultural heritage assesses the specific preferred location for permanent infrastructure. 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 marine archaeology and cultural heritage 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 the tables 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: Direct physical impact to known and potential marine cultural heritage receptors	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. No, disturbance to known and potential marine cultural heritage during construction activities has been calculated based on the upper limit for WTGs, OSSs, IAC, interconnector and export cable lengths which factors in the proposed LoD for these project elements. Temporary disturbance from landfall works is calculated based on the size of the proposed temporary infrastructure, which is immaterial of the infrastructure location. The implementation of the LoD does not therefore alter the assigned magnitude of the impact.
	WTGs (inc. monopile locations and scour protection)	100 m from the centre point of each WTG location		
	OSSs (inc. monopile locations 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.		
	Landfall			
	TJB	0.5 m either side (i.e. east / west) of the preferred TJB location		
	Intertidal cable ducts (and associated offshore export cables within the ducts	The OECC		
	Intertidal offshore export cables (non-ducted sections)	The OECC		
Impact 2: Indirect physical impact to known and potential marine cultural heritage receptors	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. No, disturbance to known and potential marine cultural heritage during construction activities has been calculated based on the upper limit for WTGs, OSSs, IAC, interconnector and export cable lengths which factors in the proposed LoD for these project elements. Temporary disturbance from landfall works is calculated based on the size of the proposed temporary infrastructure, which is immaterial of the infrastructure location. The implementation of the LoD does not therefore alter the assigned magnitude of the impact.
	WTGs (inc. monopile locations and scour protection)	100 m from the centre point of each WTG location		
	OSSs (inc. monopile locations 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.		

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: Direct physical impact to known and potential marine cultural heritage receptors	N/A			
Impact 2: Indirect physical impact to known and potential marine cultural heritage receptors	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 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. No, disturbance to known and potential marine cultural heritage during operational activities has been calculated based on the upper limit for WTGs, OSSs, IAC, interconnector and export cable lengths which factors in the proposed LoD for these project elements. The implementation of the LoD does not therefore alter the assigned magnitude of the impact.
	WTGs (inc. monopile locations and scour protection)	100 m from the centre point of each WTG location		
	OSSs (inc. monopile locations 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.		