codling wind park

Environmental Impact Assessment Report

Volume 4

Appendix 6.2 Representative Scenario and Limits of Deviation Assessment


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APPENDIX 6.2 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 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 CWP Project, significant and rapid progression in wind farm technology development, potential changes in environmental conditions and in policy and legislation, CWPL 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, 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 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 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 geology, sediments and coastal processes this analysis for construction and 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 disturbance of the seabed resulting from pre-installation methods and effects, cable and monopile installation leading to increases in suspended sediment concentrations, and associated deposition.	Array site (including WTGs, OSSs and offshore export cables within the array site), offshore export cables (including transition zone)	WTG Option A	WTG Option B		Questions to demonstrate assessment has considered all scenarios	Response
	Installation methods and effects			The temporary disturbance of the seabed can increase local suspended sediment concentrations during pre-installation methods and effects, cable and monopile installation (source); the sediments liberated during construction are transported in the direction of the prevailing tidal flow (pathway) and are then deposited on the seabed (receptor). Offshore, WTG Option A forms the representative scenario as this represents the greatest level of temporary seabed disturbance and therefore the greatest volume of liberated sediment. Therefore WTG Option A forms the presentational basis of the assessment for Impact 1 in this chapter. It should be noted that the pre-lay grapnel run along IAC and OECC footprint is equivalent to the IAC and OECC cable installation footprint. For boulder clearance, the use of a displacement plough forms the presentational basis of this assessment as this represents the greatest level of temporary sediment disturbance. The use of a subsea grab is typically used for relocating larger boulders or boulders located on a slope and thus would result in a lower level of disturbance and would not introduce new impacts, or an impact of greater magnitude. For cable installation, the use of jetting forms the presentational basis of this assessment as it typically results in greater sediment suspension, introducing the potential for distribution of greater volumes of material over a larger spatial area than other cable laying techniques which may be employed during construction. The use of other methods would result in a lower level of disturbance and would not introduce new impacts, or an impact of greater magnitude. Similarly, within the transition zone, the shallow water wheeled jet trenching system will form the presentational basis of this assessment.	*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 that have not directly been considered as part of the assessment. 2. No, WTG Option B would not give rise to a materially different magnitude for Impact 1. This can be demonstrated by reference to the baseline assessment (**Section 6.6** of the main EIAR chapter) which show homogeneity in terms of surficial sedimentology across the Array site, as the total area of disturbed sediment is larger for Option A, it will form the presentational basis for the assessment with WTG Option B anticipated to be lower in terms of magnitude of impact. 3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Section 6.4.3** of the main EIAR chapter, receptor sensitivity is determined by considering a combination of value, tolerance, adaptability, and recoverability, which is not influenced by details or characteristics of the project. Therefore, WTG Option A forms the presentational basis for the assessment. 4. No, in relation to Impact 1, where alternative methods were used these would not introduce new impact receptor pathways. 5. No, in relation to Impact 1, where alternative methods were used these would not introduce a materially different magnitude of impact. 6. No, in relation to Impact 1, where alternative methods were used these would not materially alter the sensitivity of the receptor.
	Boulder clearance: array site seabed clearance area (m^2)	2,556,000 - 2,934,000	2,494,000 - 2,772,000			
	Boulder clearance: OECC seabed clearance area (m^2)	2,220,000 - 2,616,000	2,220,000 - 2,616,000			
	Pre-lay grapnel run along IAC (m^2)	1,911,000 - 2,214,000	1,791,000 - 2,079,000			
	Pre-lay grapnel run along OECC (m^2)	1,890,000 - 2,187,000	1,890,000 - 2,187,000			
	IAC and interconnector cable installation: Total seabed disturbed (m^2)	1,911,000 - 2,214,000	1,791,000 - 2,079,000			
	Offshore export cable installation: Total seabed disturbed (m^2)	1,890,000 - 2,187,000	1,890,000 - 2,187,000			
	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	108,000			
	Total area of disturbed sediment for offshore construction activities (m^2)	**10,059,000**	**9,762,000**			
	Total volume of WTG monopile drill arisings (m^3)	**24,516**	**23,220**			
	Boulder clearance methods	Displacement plough and subsea grab	Displacement plough and subsea grab			
	Cable installation options	Ploughing, trenching, jetting including open cut for landfall	Ploughing, trenching, jetting including open cut for landfall			

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
				For monopile installation activities WTG Option A forms the representative scenario as this represents the anticipated greatest volume of disturbed sediment. Therefore Option A forms the presentational basis of the assessment for Impact 1 monopile installation activities in this chapter. The total volume of disturbed sediment (drill arisings) for monopile installation activities based on this representative scenario is calculated to be 24,516 m^3. The total area of disturbed sediment for construction activities based on this representative scenario is calculated to be 10,059,000 m^2. The total volume of drill arisings is 24,516 m^3.		
Impact 2: Temporary disturbance of the seabed resulting from pre-sweeping / sand wave levelling activities leading to increases in suspended sediment concentrations, and associated deposition.	Array site (including WTGs, OSSs and offshore export cables within the array site), and offshore export cable corridor	WTG Option A	WTG Option B	The temporary disturbance of the seabed can increase local suspended sediment concentrations during pre-sweeping / sand wave levelling and subsequent dredge disposal activities (source); the sediments liberated during these activities are transported in the direction of the prevailing tidal flow (pathway), and are then deposited on the seabed (receptor). WTG Option B forms the representative scenario as this represents the greatest level of temporary seabed disturbance. WTG Option A would result in a lower level of disturbance. Therefore Option B forms the presentational basis of the assessment for Impact 2 in this chapter. For Pre-sweeping / sand wave levelling, the TSHD method forms the presentational basis of this assessment as this has the potential to liberate greater volume of sediment during dredging and disposal activities compared to the use of mass flow excavation and therefore would result in a lower level of disturbance and would not introduce new impacts, or an impact of greater magnitude. The total area of disturbed sediment for pre-sweeping / sand wave levelling activities based on this representative scenario is calculated to be 476,050 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	1. No, WTG Option A would not introduce any new impacts that have not directly been considered as part of the assessment. 2. No, WTG Option A would not give rise to a materially different magnitude for Impact 2. This can be demonstrated by reference to the baseline assessment (**Section 6.6** of the main EIAR chapter) which show homogeneity in terms of surficial sedimentology across the Array site, as the total area of disturbed sediment is larger for Option B, it will form the presentational basis for the assessment with WTG Option A anticipated to be lower in terms of magnitude of impact. 3. No, WTG Option A will not influence the sensitivity of the receptor that is being assessed. As set out in **Section 6.4.3** of the main EIAR chapter, receptor sensitivity is determined by considering a combination of value, tolerance, adaptability, and recoverability, which is not influenced by details or characteristics of the project. Therefore, WTG Option B forms the presentational basis for the assessment. 4. No, in relation to Impact 2, where alternative pre-sweeping / sand wave levelling methods were used these would not introduce new impact receptor pathways. 5. No, in relation to Impact 2, where alternative pre-sweeping / sand wave levelling methods these would not introduce a materially different magnitude of impact.
	Installation methods and effects					
	Pre-sweeping / Sand wave levelling: array site sand wave clearance total area (m^2)	205,250 - 259,250	220,000 – 277,500			
	Pre-sweeping / Sand wave levelling: OECC sand wave clearance total area (m^2)	198,550	198,550			
	Total area disturbed during pre-sweeping / sand wave levelling (m^2)	**457,800**	**476,050**			
	Pre-sweeping / sand wave levelling methods	(TSHD) and mass flow excavation	(TSHD) and mass flow excavation			

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
						6. No, in relation to Impact 2, where alternative pre-sweeping / sand wave levelling were used these would not materially alter the sensitivity of the receptor.
Impact 3: Alteration to seabed morphology during seabed preparation	See Impact 2 for relevant project details			During seabed preparation, pre-sweeping / sand wave levelling (source) will directly impact upon seabed morphology (receptor). WTG Option B forms the representative scenario as this represents the greatest area of seabed level alteration. WTG Option A would result in a lower level of disturbance as it has a smaller area of seabed alteration. Therefore Option B forms the presentational basis of the assessment for Impact 3. For Pre-sweeping / sand wave levelling methods, the TSHD and mass flow excavation methods are anticipated to have the same impact on the seabed morphology and therefore a representative scenario is not required. The total area of altered seabed for Pre-sweeping / Sand wave levelling activities based on this representative scenario is calculated to be 476,050 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 A would not introduce any new impacts that have not directly been considered as part of the assessment. 2. No, WTG Option A would not give rise to a materially different magnitude for Impact 3. WTG Option B forms the presentational basis for the assessment of sand wave clearance activities as the total area of disturbed sediment is larger for Option B. 3. No, WTG Option A will not influence the sensitivity of the receptor that is being assessed. As set out in **Section 6.4.3** of the main EIAR chapter, receptor sensitivity is determined by considering a combination of value, tolerance, adaptability, and recoverability, which is not influenced by details or characteristics of the project. Therefore, WTG Option B, forms the presentational basis for the assessment. 4. No, in relation to Impact 3, as described, the use of alternative methods will not introduce new impacts. 5. No, in relation to Impact 3, as described, the use of alternative methods will not introduce a materially different magnitude of impact. 6. No, in relation to Impact 3, as described, the use of alternative methods will not materially alter the sensitivity of the receptor.
Impact 4: Localised alteration to the hydrodynamic, wave and sediment regimes and coastal processes.	Array site (including WTGs, OSSs and offshore export cables within the array site), and offshore export cable corridor	WTG Option A	WTG Option B	During construction, specifically during the installation of WTG structures, OSS, scour protection, cable installation and installation of cable protection, anchoring of vessels and deployment of jack up vessels on site and the use of temporary structures at the landfall (source) has the potential to alter the hydrodynamic, wave and sediment regimes with potential downstream effects on local coastal processes (receptors). WTG Option A forms the representative scenario for the design parameters assessed for vessel	*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?*	1. No, WTG Option B would not introduce any new impacts. The impacts associated with vessel anchoring requirements remain the same regardless of the infrastructure layout options. 2. No, WTG Option B would not give rise to a materially different magnitude for Impact 4. WTG Option A forms the presentational basis for the assessment of alterations to the hydrodynamic, wave and sediment regimes and coastal processes.
	Temporary infrastructure					
	Vessel anchoring parameters: Total impact area for WTG and OSS installation (m^2)	280,800	237,600			

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
	Vessel anchoring parameters: Total impact area for inter array and interconnector cable installation (m^2)	371,520	280,800	anchoring during construction and installation. This is because, in terms of localised alteration to the hydrodynamic, wave and sediment regimes and coastal processes this represents the greatest total impacted area, and therefore WTG Option A forms the presentational basis of the assessment for Impact 4 in this chapter. At the landfall, cable ducts will be installed by open cut. The total impacted area based on this representative scenario is calculated to be 1,296,040 m^2.	*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).*	3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Section 6.4.3** of the main EIAR chapter, receptor sensitivity is determined by considering a combination of value, tolerance, adaptability, and recoverability, which is not influenced by details or characteristics of the project. Therefore, WTG Option A, forms the presentational basis for the assessment. 4. No, in relation to Impact 4, the two cable duct installation methods at the landfall would not introduce any new impact receptor pathways that have not already been considered as part of the assessment. 5. No, in relation to Impact 4, where alternative methods were used these would not introduce a materially different magnitude of impact. 6. No, in relation to Impact 4, as described, the use of alternative methods will not materially alter the sensitivity of the receptor.
	Vessel anchoring parameters: Total impact area export cable installation (m^2)	630,720	630,720			
	Total impacted area due to vessel anchoring for array site and offshore export cable corridor (m^2)	**1,283,040**	**1,149,120**			
	Landfall	Open cut				
	Installation method and effects					
	Total seabed disturbed by cofferdam (m^2)	6,100				
	Total area of seabed in transition zone affected by support structures (m^2)	6,900				
	Total impacted area for landfall construction activities (m^2)	**13,000**				

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: Localised alteration of hydrodynamic and wave conditions across the site and effects on the sediment transport regime and coastal processes	Array site (including WTGs, OSSs and offshore export cables within the array site), and offshore export cable corridor	WTG Option A	WTG Option B	The alteration of hydrodynamic and wave conditions across the site and indirect effects on the sediment transport regime and coastal processes due to the presence of permanent windfarm infrastructure (source) has the potential to directly alter the hydrodynamic, wave and sediment regimes including	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.*	1. No, WTG Option B would not introduce any new impacts that have not directly been considered as part of the assessment 2. No, WTG Option B would not give rise to a materially different magnitude for Impact 1. WTG Option A forms the presentational basis for the assessment of localised alteration of hydrodynamic and wave conditions across the site and indirect effects on the sediment transport regime and coastal processes.
	Total WTG monopile seabed area take (with scour protection) across the array site (m^2)	273,000	218,400			
	Total OSS monopile seabed area take (with scour protection) across the array site (m^2)	10,920	10,920			
	Total area of seabed covered by cable protection (m^2)	208,600	208,600			

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
	Total area of seabed covered by export cable protection (m^2)	105,000	105,000	effects on local coastal processes (receptor). For permanent infrastructure offshore and at the onshore substation WTG Option A forms the representative scenario as this represents the greatest total seabed area take. Therefore Option A forms the presentational basis of the assessment for Impact 1 in this chapter. The total impacted area based on this representative scenario is calculated to be 599,620 m^2. At the onshore substation, the total length of perimeter structures based on this representative scenario is calculated to be 300 m.	*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).*	3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in **Section 6.4.3** of the main EIAR chapter, receptor sensitivity is determined by considering a combination of value, tolerance, adaptability, and recoverability, which is not influenced by details or characteristics of the project. Therefore, WTG Option A forms the presentational basis for the assessment of localised alteration of hydrodynamic and wave conditions across the site and indirect effects on the sediment transport regime and coastal processes. 4. No, in relation to Impact 1, where alternative methods were used these would not introduce new impact receptor pathways. 5. No, in relation to Impact 1, where alternative methods were used these would not introduce a materially different magnitude of impact. 6. No, in relation to Impact 1, where alternative methods were used these would not materially alter the sensitivity of the receptor.
	Total seabed area take (m^2)	**597,520**	**542,920**			
	Onshore substation					
	Permanent infrastructure					
	Onshore substation: length of combi-wall below the HWM (requiring marine piling) (m)	150				
	Onshore substation: Total length of new revetments (m)	150				
	Total length of perimeter structures (m)	**300**				
	Area of reclaimed land at onshore substation (m^2)	1,800				

<table>
<tr><th>Impact</th><th>Relevant project details</th><th>Representative scenario(s) and notes / assumptions</th><th colspan="2">Rationale for representative scenario(s)</th></tr>
<tr><td>Impact 2: Scour around installed structures and associated sediment transportation and deposition leading to changes in seabed composition, structure, or morphology.</td><td>See Impact 1 for relevant project details.</td><td>Scour around implemented scour protection systems (e.g. edge scour) and scour around other seabed infrastructure (e.g. cable protection) and associated sediment transportation and deposition (source) can lead to changes in seabed composition, structure, and morphology (receptor).

For permanent infrastructure offshore and at the onshore substation WTG Option A forms the representative scenario as this represents the greatest total seabed area take. Therefore Option A forms the presentational basis of the assessment for Impact 1 in this chapter.

The total impacted area based on this representative scenario is calculated to be 599,620 m^2.

At the onshore substation, the total length of perimeter structures based on this representative scenario is calculated to be 300 m.</td><td>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).</td><td>1. No, WTG Option B would not introduce any new impacts that have not directly been considered as part of the assessment

2. No, WTG Option B would not give rise to a materially different magnitude for Impact 2. WTG Option A forms the presentational basis for the assessment of scour around installed structures and associated sediment transportation and deposition leading to changes in seabed composition, structure, or morphology.

3. No, WTG Option B will not influence the sensitivity of the receptor that is being assessed. As set out in Section 6.4.3 of the main EIAR chapter, receptor sensitivity is determined by considering a combination of value, tolerance, adaptability, and recoverability, which is not influenced by details or characteristics of the project. Therefore, WTG Option A forms the presentational basis for the assessment of scour around installed structures and associated sediment transportation and deposition leading to changes in seabed composition, structure, or morphology.

4. No, in relation to Impact 2, where alternative methods were used these would not introduce new impact receptor pathways.

5. No, in relation to Impact 2, where alternative methods were used these would not introduce a materially different magnitude of impact.

6. No, in relation to Impact 2, where alternative methods were used these would not materially alter the sensitivity of the receptor.</td></tr>
<tr><td>Impact 3: Operation and maintenance</td><td colspan="3">Array site (including WTGs, OSSs and offshore export cables within the array site), and offshore export cable corridor
Temporary Infrastructure
JUVs Peak vessel numbers: WTG Option A 2; WTG Option B 2
Service Operation Vessel Peak vessel numbers: WTG Option A 1; WTG Option B 1
CTVs Peak vessel numbers: WTG Option A 6; WTG Option B 6</td><td>Vessel anchoring (source) can lead to scouring which directly impacts the seabed composition, structure and morphology and can lead to the redistribution of liberated sediments via tidal currents (receptor).

Both WTG Options require the same vessels for maintenance</td><td>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.</td><td>A single representative scenario has been adopted for impact 3, as the number of vessels required for maintenance are the same under Option A and B.</td></tr>
</table>

Impact	Relevant project details			Representative scenario(s) and notes / assumptions	Rationale for representative scenario(s)	
	Cable maintenance vessels Peak vessel numbers	2	2	and repair. Therefore, no representative scenario is required.	*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).*	
	Auxiliary vessel Peak vessel numbers	3	3			
	JUVs annual rounds	3	3			
	Service Operation Vessel annual rounds	26	26			
	CTVs annual rounds	1152	1152			
	Cable maintenance vessels annual rounds	1	1			
	Auxiliary vessel annual rounds	27	27			

4 Limit of Deviation Assessment

14. As described in **Section 2** of this document, locational flexibility of permanent and temporary infrastructure is described as a Limit of Deviation (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 offshore export cable corridor (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 boundary

16. For the purposes of the EIAR, the main chapter for marine geology, sediments, and coastal processes assess 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 geology, sediments and coastal processes 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: Temporary disturbance of the seabed resulting from pre-installation methods and effects, cable and monopile installation leading to increases in suspended sediment concentrations, and associated deposition.	Offshore cables		*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, temporary disturbance of the seabed leading to increases in suspended sediment concentrations and associated deposition has been assessed based on the upper limit for 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.
	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 offshore export cable corridor (OECC) outside of the array site		
	WTG monopile and scour protection	100 m from the centre point of each WTG location		
Impact 2: Temporary disturbance of the seabed resulting from pre-sweeping / sand wave levelling activities leading to increases in suspended sediment concentrations, and associated deposition.	Offshore cables		*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, temporary disturbance of the seabed resulting from pre-sweeping / sand wave levelling activities has been assessed based on the upper limit for the Array site, 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.
	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 offshore export cable corridor (OECC) outside of the array site		
Impact 3: Alteration to seabed morphology during seabed preparation	Offshore cables		*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, alteration to seabed morphology has been assessed based on the upper limit for the array site, 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.
	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 offshore export cable corridor (OECC) outside of the array site		
Impact 4: Localised alteration to the hydrodynamic, wave and sediment regimes and coastal processes.	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, localised alteration to the hydrodynamic, wave and sediment regimes and coastal processes has been assessed based on the upper limit of the temporary and permanent infrastructure 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.
	WTG, monopile and scour protection	100 m from the centre point of each WTG location		
	OSS, monopile and scour protection	100 m from the centre point of each OSS location		
	Offshore cables			
	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		

Impact	Relevant project element	Limit of deviation	Questions to demonstrate assessment has considered all scenarios	Response
	Offshore export cables	250 m either side of the preferred alignment boundary within the array site The offshore export cable corridor (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		

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: Localised alteration of hydrodynamic and wave conditions across the site and effects on the sediment transport regime and coastal processes	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, localised alteration of hydrodynamic and wave conditions across the site and indirect effects on the sediment transport regime and coastal processes has been assessed based on the upper limit for the array site, IAC, interconnector, export cable lengths, and onshore substation 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.
	WTG, monopile and scour protection	100 m from the centre point of each WTG location		
	OSS, monopile and scour protection	100 m from the centre point of each WTG location		
	Offshore export cables			
	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 offshore export cable corridor (OECC) outside of the array site		
	Onshore substation			
	Location of onshore substation revetment perimeter structure	Defined LoD for sheet piling at toe of the revetment		
Impact 2: Scour around installed structures and associated sediment transportation and deposition leading to changes in seabed	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).*	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, scour around installed structures and associated sediment transportation and deposition leading to changes in seabed composition, structure, or morphology has been assessed based
	WTG, monopile and scour protection	100 m from the centre point of each WTG location		
	OSS, monopile and scour protection	100 m from the centre point of each OSS location		
	Offshore export cables			

Impact	Relevant project element	Limit of deviation	Questions to demonstrate assessment has considered all scenarios	Response
composition, structure, or morphology	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	*2. Does the proposed LoD (locational flexibility) introduce a materially different magnitude of impact?*	on the upper limit for the array site, 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.
	Offshore export cables	250 m either side of the preferred alignment within the array site The offshore export cable corridor (OECC) outside of the array site		
Impact 3: Operation and maintenance	n/a		n/a	n/a