codling wind park

Environmental Impact Assessment Report

Volume 3

Chapter 24 Noise and Vibration


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Abbreviations

Abbreviation	Term in Full
AADT	Annual Average Daily Traffic
BS	British standard
CEMP	Construction Environmental Management Plan
CNT	Construction Noise Thresholds
CIC	Charge injection calibration
CO_2	Carbon dioxide
CWP	Codling Wind Park
dB	Decibel
DCC	Dublin City Council
DECC	Department of the Environment, Climate and Communications
DMRB	Design Manual for Roads and Bridges
DoEHLG	Department of the Environment, Heritage and Local Government
EC	European Commission
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
ESBN	ESB Networks
ETSU	Energy Technology Support Unit
EU	European Union
GIS	Gas Insulated Switchgear
HDD	Horizontal directional drilling
HV	Heavy goods vehicles
Hz	Hertz
IEMA	Institute of Environmental Management and Assessment
IOA	Institute of Acoustics
NIS	Natura Impact Statement
NMT	Noise monitoring terminal
NRA	National Roads Authority
NSL	Noise Sensitive Location
OWF	Offshore wind farm

Abbreviation	Term in Full
O&M	Operations and maintenance
OSS	Offshore substation structure
OTI	Onshore transmission infrastructure
Pa	Pascal
SEA	Strategic Environmental Assessment
SPL	Sound Pressure Level
TII	Transport Infrastructure Ireland
TJB	Transition joint bay
UKHA	UK Highways Agency
VSR	Vibration-sensitive receptor
WHO	World Health Organisation
WTG	Wind turbine generator

Definitions

Glossary	Meaning
the Applicant	The developer, Codling Wind Park Limited (CWPL).
array site	The area within which the wind turbine generators (WTGs), inter-array cables (IACs) and the offshore substation structures (OSSs) are proposed.
Codling Wind Park (CWP) Project	The proposed development as a whole is referred to as the Codling Wind Park (CWP) Project, comprising of the offshore infrastructure, the onshore infrastructure and any associated temporary works.
Codling Wind Park Limited (CWPL)	A joint venture between Fred. Olsen Seawind (FOS) and Électricité de France (EDF) Renewables, established to develop the CWP Project.
Compound A	A temporary construction compound, support area and storage facility for the landfall works, and to support the installation of the onshore export cables. It will operate as a hub for the onshore construction works as well as acting as a staging post and secure storage for equipment and component deliveries.
Compound B	A temporary construction compound / laydown area for general cable route and onshore substation construction activities.
Compound C	A temporary construction compound for the onshore substation site. Contractor welfare facilities will be located in this compound as well as some material storage space.
Compound D	A temporary construction compound and laydown area to facilitate the construction of the bridge over the cooling water channel.
dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 µPa).
dB(A)	An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz–20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
EirGrid	State-owned electric power transmission system operator in Ireland and nominated Offshore Transmission Asset Owner
Environmental Protection Agency (EPA)	National agency responsible for protecting and improving the environment of Ireland under the Environmental Protection Agency Acts 1992 to 2011.
ESB Networks (ESBN)	Owner of the electricity distribution system in the Republic of Ireland, responsible for carrying out maintenance, repairs and construction on the grid.
ESBN network cables *(previously the ESB grid connection)*	Three onshore export cable circuits connecting the onshore substation to the proposed ESBN Poolbeg substation, which will then transfer the electricity onwards to the national grid.

Glossary	Meaning
Environmental Impact Assessment (EIA)	A systematic means of assessing the likely significant effects of a proposed project, undertaken in accordance with the EIA Directive and the relevant Irish legislation.
Environmental Impact Assessment Report (EIAR)	The report prepared by the Applicant to describe the findings of the EIA for the CWP Project.
export cables	The cables, both onshore and offshore, that connect the offshore substations with the onshore substation.
horizontal directional drilling (HDD)	HDD is a trenchless drilling method used to install cable ducts beneath the ground through which onshore export cables from can be pulled. HDD enables the installation of cables beneath obstacles such as roads, waterways and existing utilities.
hertz (Hz)	Hertz, the unit of sound frequency in cycles per second
inter-array cables (IACs)	The subsea electricity cables between each WTG between and the OSSs.
interconnector cables	The subsea electricity cables between OSSs
landfall	The point at which the offshore export cables are brought onshore and connected to the onshore export cables via the transition joint bays (TJB). For the CWP Project The landfall works include the installation of the offshore export cables within Dublin Bay out to approximately 4 km offshore, where water depths that are too shallow for conventional cable lay vessels to operate.
limit of deviation (LoD)	Locational flexibility of permanent and temporary infrastructure is described as a LoD from a specific point or alignment.
$L_{Aeq,T}$	The equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T).
L_{AFmax}	The instantaneous maximum sound level measured during the sample period using the 'F' time weighting.
L_{A10}	The sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.
L_{A90}	The sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.
Noise Sensitive Location (NSL)	A Noise Sensitive Location (NSL) is any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
offshore export cables	The cables which transport electricity generated by the wind turbine generators (WTGs) from the offshore substation structures (OSSs) to the TJBs at the landfall.
offshore export cable corridor (OECC)	The area between the array site and the landfall, within which the offshore export cables will be installed along with cable protection and other temporary infrastructure for construction.

Glossary	Meaning
offshore infrastructure	The permanent offshore infrastructure, comprising of the WTGs, IACs, OSSs, interconnector cables, offshore export cables and other associated infrastructure such as cable and scour protection.
offshore substation structure (OSS)	A fixed structure located within the array site, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
offshore transmission infrastructure (OfTI)	The offshore transmission assets comprising the OSSs and offshore export cables. The EIAR considers both permanent and temporary works associated with the OfTI.
onshore export cables	The cables which transport electricity generated by the WTGs from the TJBs at the landfall to the onshore substation.
onshore substation	Site containing electrical equipment to enable connection to the national grid.
onshore substation site	The area within which permanent and temporary works will be undertaken to construct the onshore substation.
operations and maintenance (O&M) activities	Activities (e.g., monitoring, inspections, reactive repairs, planned maintenance) undertaken during the O&M phase of the CWP Project.
O&M phase	This is the period of time during which the CWP project will be operated and maintained.
pascal (Pa)	Pascal, the SI unit of pressure.
parameters	Set of parameters by which the CWP Project is defined and which are used to form the basis of assessments.
Poolbeg 220kV substation	This is the ESBN substation that the ESBN network cables connect into, from the onshore substation. This substation will then transfer the electricity onwards to the national grid
Peak Particle Velocity (PPV)	Peak Particle Velocity is a measure of the velocity of vibration displacement in terms of millimetres per second (mm/s). It is defined as follows within BS 7385-2 (BSI 1993) as ‘the maximum instantaneous velocity of a particle at a point during a given time interval’
revetment	A facing of impact-resistant material applied to a bank or wall in order to absorb the energy of incoming water and protect it from erosion.
sheet piles	Sections of sheet materials with interlocking edges that are driven into the ground to provide earth retention and excavation support. Sheet piling is used in construction to provide both temporary and permanent walls.
Sound Pressure Level (SPL)	Sound Pressure Level typically expressed in decibels
temporary cofferdam	A barrier to tidal inundation whilst the existing stone covered foreshore is temporarily removed to install the landfall cable ducts.
temporary HDD compound 1	The area within Compound C that will house the ESBN network cable HDD entry or exit pits as well as associated plant, equipment and facilities.

Glossary	Meaning
temporary HDD compound 2	The area adjacent to the Poolbeg 200kV substation that will house the ESBN network cable HDD entry or exit pits as well as associated plant, equipment and facilities.
temporary tunnel compound 1	The area within Compound A, near the landfall, within which the Compound A tunnel launch shaft will be located.
temporary tunnel compound 2	The area within which the Shellybanks Road tunnel reception shaft will be located.
temporary tunnel compound 3	The area within the onshore substation site, within which the onshore substation tunnel launch shaft will be located.
Transport Infrastructure Ireland (TII)	Transport Infrastructure Ireland (TII) is a state agency under the aegis of the Department of Transport, working at both national and regional level, in partnership with Local Authorities regarding national roads and greenways, and the National Transport Authority (NTA) regarding light rail and metro.
transition joint bay (TJB)	This is required as part of the OTI and is located at the landfall. It is an underground bay housing a joint which connects the offshore and onshore export cables.
tunnel	The onshore export cables will be installed within a tunnel that extends from within Compound A, near the landfall, to the onshore substation site.
tunnel shaft	Located within the temporary tunnel compounds, the tunnel shafts will facilitate the two tunnel drives required to complete the construction of the tunnel.
Vibration Dose Value (VDV)	Vibration Dose Value (VDV) is a cumulative measurement of vibration level over an 8-hour or 16-hour period.
World Health Organization (WHO)	The World Health Organization is the United Nations agency that connects nations, partners and people to promote health. The WHO leads global efforts to expand universal health coverage and directs and coordinates the world's response to health emergencies.
wind turbine generator	All the components of a wind turbine, including the tower, nacelle, and rotor.

24 NOISE AND VIBRATION

24.1 Introduction

1. Codling Wind Park Limited (hereafter 'the Applicant') is proposing to develop the Codling Wind Park (CWP) Project, a proposed offshore wind farm (OWF) located in the Irish Sea approximately 13–22 km off the east coast of Ireland, at County Wicklow.

2. This chapter forms part of the Environmental Impact Assessment Report (EIAR) for the CWP Project. The purpose of the EIAR is to provide the decision-maker, stakeholders and all interested parties with the environmental information required to develop an informed view of any likely significant effects resulting from the CWP Project, as required by the European Union (EU) Directive 2011/92/EU (as amended by Directive 2014/52/EU) (the EIA Directive).

3. This assessment of airborne noise and vibration (hereafter referred to as noise and vibration) focuses on the offshore and onshore components of the CWP Project.

4. The offshore components include the monopile construction and decommissioning works of the wind turbine generators (WTGs) and offshore substation structures (OSSs), in addition to the potential operational noise and vibration impacts of the WTGs on sensitive onshore receptors.

5. The onshore transmission infrastructure (OTI) components include assessment for the construction, operation and maintenance (O&M), and decommissioning phases. The OTI is situated on the Poolbeg Peninsula and incorporates the permanent and temporary works associated with the transition joint bays (TJBs), the onshore export cables, the onshore substation, and the Electricity Supply Board Networks (ESBN) network cables to connect the onshore substation to the Poolbeg 220kV substation.

6. The chapter will describe the potential impacts of the landfall, where the offshore export cables are brought onshore and connected to the onshore export cables at the TJBs. It will also describe the potential impacts of works to install the offshore export cable through the intertidal area (OfTI (intertidal area)) to the landfall location.

7. This chapter has been informed by **Chapter 4 Project Description** and **Chapter 27 Traffic and Transport**.

8. The outcome of the assessment has informed the following chapters:

   - **Chapter 29 Population**; and
   - **Chapter 30 Human Health**.

9. This chapter only considers noise and vibration impacts on sensitive human receptors. Airborne noise and vibration impacts on ecological receptors are assessed in the following chapters:

   - **Chapter 21 Onshore Biodiversity**; and
   - **Chapter 10 Ornithology**.

10. Potential underwater noise impacts on marine mammals and fish are addressed in EIAR **Chapter 11 Marine Mammals** and **Chapter 9 Fish, Shellfish, and Turtle Ecology**, respectively.

11. In summary, this EIAR chapter:

    - Details the EIA scoping and consultation process undertaken and sets out the scope of the impact assessment for noise and vibration;
    - Identifies the key legislation, and guidance relevant to noise and vibration, with reference to the most up-to-date guidance and assessment methodologies;
    - Confirms the study area for the assessment and presents the adopted impact assessment methodology for noise and vibration;

- Describes and characterises the baseline environment for noise and vibration, established from desk studies and project survey data;
- Defines the project design parameters for the impact assessment and describes any primary mitigation measures relevant to the noise and vibration assessment;
- Presents the assessment of potential impacts on noise and vibration and identifies any assumptions and limitations encountered in compiling the impact assessment; and
- Details any additional mitigation and / or monitoring necessary to prevent, minimise, reduce or offset potentially significant effects identified in the impact assessment.

12. The assessment should be read in conjunction with **Appendix 24.1 Cumulative Effects Assessment**, which considers other plans, projects, and activities that may act cumulatively with the CWP Project and provides an assessment of the potential cumulative impacts on noise and vibration.

13. A summary of the cumulative effects assessment (CEA) for noise and vibration is presented in **Section 24.11**.

14. Additional information to support the assessment includes:

- **Appendix 24.1 Cumulative Effects Assessment.**
- **Appendix 24.2 Representative Scenario and Limits of Deviation Assessment.**
- **Appendix 24.3 Operational phase Offshore Wind Farm (OWF) WTG noise.**
- **Appendix 24.4 OTI construction phase modelling.**
- **Appendix 24.5 OTI construction phase noise levels.**
- **Appendix 24.6 OTI operational phase modelling.**
- **Appendix 24.7 DCC noise risk assessment- OTI construction phase.**
- **Appendix 24.8 Calibration certificates for monitoring equipment.**

24.2 Consultation

15. Consultation with statutory and non-statutory organisations is a key part of the EIA process. Consultation regarding noise and vibration has been undertaken to inform the approach and scope of the assessment.

16. The key elements to date have included EIA scoping, consultation events and meetings with key stakeholders. The feedback received throughout this process has been considered in preparing the EIAR. EIA consultation is described further in **Chapter 5 EIA Methodology**, the **Planning Documents** and in the **Public and Stakeholder Consultation Report**, which has been submitted as part of the planning application.

17. **Table 24-1** provides a summary of the status of responses relating to key consultees during the consultation process relevant to noise and vibration and details how these issues have been considered in the production of this EIAR chapter.

Table 24-1 Consultation responses relevant to noise and vibration

Consultee	Comment	How issues have been addressed
Scoping responses		
Environmental department in Local Authorities Dublin City Council (DCC) Wicklow County Council Dún Laoghaire Rathdown County Council	Feedback was sought in relation to the study area, data sources, and the proposed approaches to baseline monitoring and the impact assessment. No direct responses were received about the Scoping Report; however, topic-specific engagement was undertaken with DCC (see below).	N/A
Topic specific meetings		
DCC 3 November 2022 Introductory meeting & discussion on proposed baseline noise monitoring	DCC requested that the noise and vibration assessment take into consideration: Frequency & a baseline programme that, if possible, includes for frequency that might be useful; Reference to the DCC Air Quality Monitoring & Noise Control Unit's Good Practice Guide for Construction and Demolition (hereafter referred to as DCC GPG); Engagement with the local communities and stakeholders will be an important aspect of the CWP Project; Additional baseline data may be available, such as other recent planning applications in the area; and The revised Dublin City Noise Action Plan / Mapping is scheduled for publication in later 2022 / early 2023.	Baseline monitoring was undertaken in November 2022 and accounted for frequency. Construction criteria have been set using the guidance outlined in the DCC GPG document. The risk category rating of the site has been identified and suitable mitigation measures are outlined relative to the risk rating, including details of liaison with the public in relation to construction noise and vibration. There has been ongoing engagement with local communities and stakeholders in relation to the CWP Project and this is detailed in the **Public and Stakeholder Consultation Report**. The CWP project has taken account of surrounding developments in the area & has reviewed the strategic noise maps for Dublin City and Dublin agglomeration during the preparation of this chapter.

24.3 Legislation and guidance

24.3.1 Legislation

18. The legislation that is applicable to the assessment of noise and vibration is summarised below. Further detail is provided in **Chapter 2 Policy and Legislative Context**.

- European Communities (EC) (Environmental Noise) Regulations 2018 (S.I. No. 549 / 2018) as amended by EC (Environmental Noise) Amendment) Regulations 2021 (S.I. No. 663/2021);
- EC (Noise Emission by Equipment For Use Outdoors) Regulations, 2001 (S.I. No. 632/2001) as amended by EC Noise Emission by Equipment for Use Outdoors (Amendment) Regulations (S.I. No. 241 / 2006);
- European Union (EU) Directive 2011/92/EU (as amended by Directive 2014/52/EU) on the assessment of the effects of certain public and private projects on the environment (the EIA Directive);
- The Planning and Development Act, 2000 (as amended); and
- The Planning and Development Regulations, 2001 (as amended).

24.3.2 Policy

19. The overarching planning policy relevant to the CWP Project is described in EIAR **Chapter 2 Policy and Legislative Context**.

20. The assessment of the CWP Project against relevant planning policy is provided in the **Planning Report**. This includes planning policy relevant to Noise and Vibration.

24.3.3 Guidance

The principal guidance and best practice documents used to inform the assessment of potential impacts on noise and vibration are summarised below.

- British Standard Institute (BSI) British Standard (BS) European Standards (EN) 61672-1 (2013) Electroacoustics. Sound level meters – Specification (hereafter referred to as BS EN 61672-1) (BSI 2013);
- BS 5228 (2009 +A1 2014) Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise (hereafter referred to as BS 5228 – 1) (BSI 2009 +A1 2014a);
- BS 5228 (2009 +A1 2014) Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (hereafter referred to as BS 5228 – 2) (BSI 2009 +A1 2014b);
- BS 7385 (1993) Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (hereafter referred to as BS 7385 – 2). (BSI 1993);
- BS 6472 (2008) Guide to Evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting (hereafter referred to as BS 6472 – 1). (BSI 2008);
- BS 8233:2014 Sound Insulation and Noise Reduction for Buildings (hereafter referred to as BS 8233 (BSI 2014);
- BS 4142 (2014+A1 2019) Methods for rating and assessing industrial and commercial sound (hereafter referred to as BS 4142) (BSI 2014 +A1 2019);
- Danish Ministry of the Environment, Executive Order on Noise from Wind Turbines: BEK no.135 of 7 February 2019;
- Department of Communications, Climate Action and Environment & Sustainable Energy Authority of Ireland (2017). Guidance on EIS and NIS Preparation for Offshore Renewable Projects;

- Department of Education and Skills, School Design Guide SDG-021-5 Acoustic Performance in Schools, 1st Edition, May 2012;
- Department of Environment, Community and Local Government (2018). Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018);
- Department of Trade & Industry (UK) Energy Technology Support Unit (ETSU) publication The Assessment and Rating of Noise from Wind Farms (Department of Trade & Industry (UK), 1996);
- Department of the Environment, Heritage and Local Government Wind Energy Development Guidelines (DoEHLG, 2006);
- Dublin City Council (DCC), Air Quality Monitoring and Noise Control Unit's Good Practice Guide for Construction and Demolition (DCC GPG) (DCC, 2019);
- DCC, Dublin City Development Plan 2022-2028 Strategic Environmental Assessment (SEA) Environmental Report (DCC, 2022);
- Environmental Protection Agency (EPA), Guidelines on the information to be contained in Environmental Impact Assessment Reports (hereafter referred to as EPA Guidelines) (EPA, 2022);
- EPA, Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (hereafter referred to as EPA NG4) (EPA, 2016);
- EPA, Advice notes on current practice in the preparation of Environmental Impact Statements (EPA, 2003);
- European Commission (2017). Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report; and
- EirGrid Evidence Based Environmental Studies Study 8: 'Literature review and evidence-based field study on the noise effects of high voltage transmission development' (Eirgrid, 2016);
- Institute of Acoustics (IoA) document A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (IOA, 2013);
- Institute of Environmental Management and Assessment (IEMA) Guidelines for environmental noise impact assessment (IEMA, 2014);
- International Organization for Standardization (ISO) 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation (hereafter referred to as ISO 9613 – 2) (ISO 1996);
- ISO 4866:2010 Mechanical vibration and shock — Vibration of fixed structures — Guidelines for the measurement of vibrations and evaluation of their effects on structures (hereafter referred to as ISO 4866);
- ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures (hereafter referred to as ISO 1996 – 1) (ISO 2016);
- ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels (hereafter referred to as ISO 1996 – 2) (ISO 2017);
- Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1 (hereafter referred to as the TII Noise Guidelines 2004) (TII 2004);
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability & Environmental Appraisal. Noise and Vibration Rev 2, (hereafter referred to as DMRB Noise and Vibration) (UKHA 2020); and
- World Health Organization (WHO) Environmental Noise Guidelines for the European Region (hereafter referred to as WHO Environmental Noise Guidelines) (WHO 2018).

24.4 Impact assessment methodology

21. **Chapter 5 EIA Methodology** provides a summary of the general impact assessment methodology applied to the CWP Project, which includes the approach to the assessment of transboundary and

inter-related effects. The approach to the assessment of cumulative impacts is provided in **Chapter 5**, **Appendix 5.1 CEA Methodology**.

22. The following sections confirm the methodology used to identify study areas, gather site-specific noise data and determine the noise and vibration thresholds and criteria for rating the significance of construction and O&M phase noise impacts.

23. Specific details on the methodologies used to calculate the predicted noise and vibration impacts during construction and O&M phases will be outlined in greater detail under the specific impact assessment, in **Section 24.9**.

24.4.1 Study area

24. The study area of the noise and vibration assessments has been divided into two separate areas:

- The array site; and
- OTI and OfTI (intertidal area).

25. Noise Sensitive Locations (NSLs) in the study area include areas where people spend significant periods of time and where concentration, sleep, and amenity are important considerations. Examples of these sensitive locations include residential dwellings, schools and other educational establishments, hospitals and nursing homes, hotels and other short-term accommodation buildings, buildings of religious sensitivity, recreational and noise-sensitive amenity areas, and offices.

26. The receptor sensitivity definitions for the purpose of the noise assessment are provided in **Table 24-2**. These align with the sensitivity definitions of other relevant large-scale projects in the area (such as MetroLink and the Dublin Luas).

Table 24-2 Criteria for determination of receptor sensitivity

Sensitivity	Criteria	Rationale
High	Residential properties, hospitals, nursing homes, hotels and hostels	Receptors where people sleep and rest during daytime and night-time periods.
High	Educational establishments, places of worship (churches and other religious buildings) and offices	Receptors which require reasonable speech, concentration and listening conditions but operate during daytime periods only
Medium	Commercial buildings and outdoor recreational areas	Locations that are only sensitive during the day but are less sensitive to noise than the categories above.
Low	Industrial warehouses and indoor recreational areas	Locations that are only sensitive during the day, receptors located indoors, but are less sensitive to noise than the categories above.

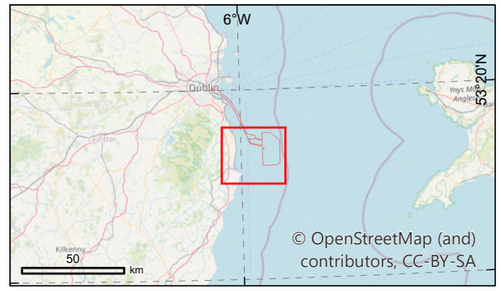
The Array Site

27. The array site study area for the noise and vibration impact assessment is focused on the areas potentially to be affected by the construction, O&M, and decommissioning phases of the WTG and OSSs.

28. The array site is located in the Irish Sea approximately 13–22 km off the east coast of Ireland, at County Wicklow. Greystones is situated approximately 15 km to the north west and Wicklow Town (at the harbour), approximately 13 km south west of the closest WTG.

29. During the monopile construction, piling, and decommissioning phases, noise could occur at any NSL along the eastern coastline between Greystones and Wicklow town. As a minimum, the array site study area for the construction phase will include any onshore area occupied by NSLs predicted as likely to experience noise levels exceeding 45 dB L_{Aeq}, i.e., the lowest construction night-time noise threshold set using the ABC method (discussed in further detail in **Section 24.4.3**)

30. The closest onshore NSL is WTG NSL01 is located approximately 13 km distance (Easting 733,317, Northing 690,867 ITM Ref.) to the closest WTG monopiling works (A12 in WTG Option B) (Easting 744,921, Northing 696,725 ITM Ref.), as shown in **Figure 24-1**.



Legend

- Planning application boundary
- × Wind turbine generator (WTG)
- Noise sensitive location (WTG NSL01)

codling wind park

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Figure 24.1
Location of closest WTG NSL to option B array site

CWP doc. number: CWP-TOB-ENG-08-01-MAP-1649

Internal descriptive code: WF - PAB..WTG.LO.60.L214 - CLOSEST.NOISE.SL - (EIAR.Vol.03.Ch.24.FIG.01)

Size: A3

Scale: 1:100,000

CRS: EPSG 2157

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/08/15	SP	DM/EA	ES

31. For the O&M phase, the study area should cover, at a minimum, the area predicted to exceed 35 dB L_{A90} from all proposed WTG, based on the 1996 ETSU publication *The Assessment and Rating of Noise from Wind Farms* (ETSU-R-97).

32. The Institute of Acoustics document Good Practice Guide To The Application Of ETSU-R-97 For The Assessment And Rating Of Wind Turbine Noise states, in section 2.2, in relation to the extent of the study area:

"The 'study area' for background noise surveys (and noise assessment) should, as a minimum, be the area within which noise levels from the proposed, consented and existing wind turbine(s) may exceed 35 dB L_{A90} at up to 10 m/s wind speed. (Note: unless stated, in this document the wind speed reference for noise data is the 10 metre standardised wind speed, derived from the wind speed at turbine hub height as explained in Section 2.6)."

33. If there were no other wind farms to be considered, the study area could be considered to be simply the 35 dB L_{A90} noise contour at maximum sound power level for the WTG, due to the proposed development only.

34. Details on the modelling methodology are outlined in full in Appendix 24.3 for Option A (75 WTG) or Option B (60 WTG).

The OTI and OfTI (intertidal area)

35. The study area for the noise and vibration impact assessment is focused on the areas potentially to be affected by the construction, O&M, and decommissioning phases of the OTI and construction works associated with the OfTI in the intertidal area.

36. NSLs within the location of the OTI and OfTI works in the intertidal area include the Coastguard Cottages, the wider Irishtown, Ringsend and Sandymount areas, and the planned residential development at the former Irish Glass Site. The nearest NSLs are highlighted in **Figure 24-2**.

37. During the construction phase, noise and vibration can occur at any location within the onshore development area and intertidal area.

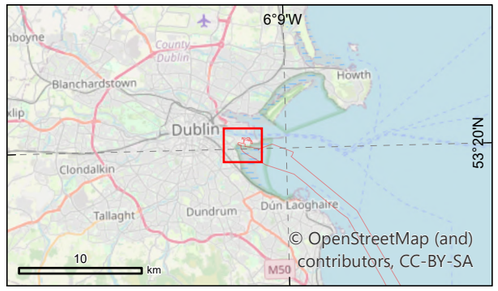
38. Noise could also occur at any NSL along public roads where there are increases in traffic associated with the CWP Project.

39. NSLs in proximity to specific construction sites have the most potential to experience noise and vibration impacts. Taking account of the works associated with the construction and decommissioning phases, the study area is based on the nearest NSLs to the working areas. These distances are confirmed in the relevant sections and are representative of the closest identified NSL or at defined set-back distances from proposed activity.

40. All impacts discussed in this chapter relate to human receptors. As the geographical residential receptors are generally at a considerable distance from the OTI and OfTI in the intertidal area, a 2 km study area will be applied from the edge of the landfall and indicative temporary works area and construction compounds. However, as there are hundreds of NSLs in the area, a representative sample of NSLs has been selected and included in the assessment. These NSLs are also representative of the NSLs adjacent to them.

The O&M onshore substation

41. Once operational, noise impacts from fixed plant will be limited to the operation of the onshore substation. A 2 km study area will also be applied from the edge of the onshore substation to the same residential NSLs identified in the construction phase.



Legend

- Planning application boundary
- Onshore substation boundary (operational)
- High water mark
- Noise sensitive locations

codling wind park

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Figure 24.2
Locations of OTI and OfTI (intertidal area) NSLs

CWP doc. number: CWP-TOB-ENG-08-01-MAP-1650

Internal descriptive code: PB - PAB..SS.PP.PL - NOISE.SLs..HWM - (EIAR.Vol.03.Ch.24.FIG.02)

Size: A3

Scale: 1:10,000

CRS: EPSG 2157

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/08/15	SP	DM/EA	ES

24.4.2 Data and information sources

Site-specific surveys

42. Due to the distance between the closest WTG and the nearest NSLs in the Greystones area (approximately 13 km) no site-specific noise surveys were carried out in the Greystones area. The WTG monopile construction, CNT, and WTG noise operational thresholds were set using the most conservative limits to assess noise and vibration impacts (see **Section 24.9.2** and **24.9.3**).

43. To provide OTI and OfTI (intertidal area) site-specific and up-to-date, information to inform the construction and O&M impact assessment, an environmental noise survey was conducted to characterise the existing noise levels on site and at a selection of representative NSLs. All surveys were carried out in accordance with ISO 1996 – 2 (ISO 2017). Full details of surveys and results are presented in **Section 24.5**, along with survey locations in **Figure 24-3**.

Desk study

44. In addition to the site-specific surveys, a comprehensive desk-based review has been undertaken to compliment the OTI and OfTI (intertidal area) baseline survey for noise and vibration. Key data sources used to inform the assessment are set out in **Table 24-3.**

Table 24-3 Data sources

Data	Source	Date	Notes
Existing noise maps of surrounding area	https://gis.epa.ie/EPAMaps/	07/02/24	EPA Round 4 noise maps were referred to for further analysis of the background noise levels in the study area.
Noise data in planning report for former Irish glass site	DCC planning ref: PWSDZ3406/22	19/12/2022	Noise data referred to for further analysis of background noise levels

24.4.3 Construction phase noise and vibration appraisal method for the assessment of impacts

45. **Chapter 5 EIA Methodology** provides a summary of the general impact assessment methodology applied to the CWP Project. The following sections confirm the methodology used to assess the potential impacts on construction phase noise and vibration.

46. The significance of impacts has been assessed in accordance with the EPA Guidelines (EPA 2022). The relevant definitions relating to quality, significance and duration of impacts are defined as per the EPA Guidelines and are set out in **Chapter 5 EIA Methodology** of this EIAR. These have been used to define the category of impacts throughout this chapter.

47. As the EPA Guidelines do not quantify the criteria for assessing impacts specifically for noise and vibration, reference has been made to relevant guidelines and standards relating to noise to further define significance ratings. These are discussed in the following sections, with the specific construction noise and vibration EIAR significance ratings presented under each of their respective headings below.

Predicting construction noise levels

48. A detailed noise model was created of the intertidal, landfall, and onshore development areas and the surrounding NSLs in order to predict the cumulative noise level associated with construction phase activities at the nearest NSLs.

49. Details on the modelling methodology are outlined in full in **Appendix 24.4**.

Determination of noise and vibration thresholds and criteria for rating construction phase noise impacts

50. There are no mandatory noise limits for construction noise in Ireland. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion. In general, higher noise levels are tolerated during the construction phase of a project compared to its long-term operational phase, as construction works are temporary to short term and vary over the course of the work duration.

51. The DCC GPG document outlines a risk assessment methodology directly applicable to the specific construction activities on the site. The construction phase works have been classed as a high-risk category site based on the DCC GPG risk assessment factors as detailed below:

- Duration of the works.
- Site operating hours.
- Location of works.
- Use of percussive methods.
- Intrusive noise activities, including vibration generating activities.

52. As the construction phase works are classed in the high-risk category, the monitoring section (S.6) of the DCC GPG document identifies that:

"The ABC Method detailed in Paragraph E.3.2 of BS 5228-1:2009 shall be used to determine acceptable noise levels for day, evening and night-time work."

Construction noise thresholds for NSLs- ABC method

53. DCC GPG refers to BS 5228–1 (BSI 2009 +A1 2014a) as appropriate criteria relating to permissible construction noise threshold levels for a development of this scale.

54. The approach outlined in BS 5228–1 (BSI 2009 +A1 2014a) calls for the designation of an NSL into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. Each category has a defined Construction Noise Threshold (CNT), as shown in **Table 24-4.**

Table 24-4 BS 5228-1 Example of thresholds of potential significant effect

Assessment category and threshold value period (L_{Aeq})	Construction noise threshold (CNT) (dB)		
	Category A [A]	Category B [B]	Category C [C]
Night-time (23:00–07:00hrs)	45	50	55
Evenings & Weekends [D]	55	60	65

Assessment category and threshold value period (L_{Aeq})	Construction noise threshold (CNT) (dB)		
	Category A [A]	Category B [B]	Category C [C]
Daytime (07:00–19:00hrs) and Saturdays (07:00–13:00hrs)	65	70	75

Note A: Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

Note B: Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

Note C: Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. if the ambient noise level exceeds the Category C threshold values given in the table (i.e., the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq, T}$ noise level for the period increases by more than 3 dB due to site noise.

Note D: 19:00–23:00 weekdays, 13:00–23:00 Saturdays and 07:00–23:00 Sundays.

55. BS 5228-1 states that: *"If the site noise level exceeds the appropriate category value* [the CNT], *then a potential significant effect is indicated. The assessor then needs to consider other project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect."*

56. For the purposes of the assessment, the CNTs have been applied at the façade of residential buildings, buildings in educational use, and health and / or community buildings that are noise sensitive. **Table 24-34** presents the CNT for each of the NSLs located in closest proximity to the construction works.

57. **Table 24-5** includes guidance as to the likely magnitude of impact associated with construction activities, relative to the CNT and background noise levels. This guidance is derived from Table 3.16 of DMRB Noise and Vibration (UKHA 2020) and adapted to include the relevant significance effects from the EPA Guidelines (EPA 2022).

Fixed construction noise thresholds for commercial receivers

58. BS 5228–1 (BSI 2009 +A1 2014a) gives several examples of acceptable limits for construction or demolition noise, the most simplistic being based upon the exceedance of fixed noise limits. For example, paragraph E.2 states:

"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut."

59. Paragraph E.2 goes on to state:

"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:

- *70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise; and*
- *75 decibels (dBA) in urban areas near main roads in heavy industrial areas".*

60. Based on the recommendations in BS 5228–1 (BSI 2009 +A1 2014a) the commercial and industrial receivers will have a 75 dB (A) CNT. **Table 24-34** presents the CNT for each of the commercial receivers located in closest proximity to the construction works.

61. Similarly, **Table 24-5** will be used as guidance as to the likely magnitude of impact associated with construction activities, relative to the CNT and background noise levels.

Magnitude of construction phase noise impact & EIAR significance of effect

62. The criteria for defining the magnitude of impact associated with a Construction Noise Level (CNL) and the EPA EIAR significant effects for the purpose of the construction noise assessment are provided in **Table 24-5**.

Table 24-5 Construction noise significance ratings

Guidelines for noise impact magnitude assessment of significance (DMRB)	CNL per assessment category and threshold value period	EPA EIAR significance effects	Determination of significance in EIAR terms
Negligible	Below or equal to baseline noise level	Not Significant	Not Significant
Minor	Above baseline noise level and below or equal to CNT	Slight to Moderate	CNLs at the upper end of this range will result in higher potential impacts, therefore this range is categorised as Slight to Moderate, acknowledging that values approaching the CNT are greater than Slight. In accordance with DMRB Noise and Vibration (UKHA 2020) and BS 5228-1 ((BSI 2009 +A1 2014a), noise levels below the CNT are deemed 'Not Significant'.
Moderate	Above CNT and below or equal to CNT +5dB	Moderate to Significant	Depending on CNT, duration and baseline noise level. In accordance with the DMRB Noise and Vibration (UKHA 2020), construction noise impacts shall constitute a significant effect where it is determined that a moderate or major magnitude of impact will occur for a duration exceeding: • Ten or more days or night in any 15 consecutive day or nights; and
Major	Above CNT +5 to +15 dB	Significant, to Very Significant	
	Above CNT +15 dB	Very Significant to Profound	

Guidelines for noise impact magnitude assessment of significance (DMRB)	CNL per assessment category and threshold value period	EPA EIAR significance effects	Determination of significance in EIAR terms
			• A total number of days exceeding 40 in any six consecutive months.

63. The adapted DMRB Noise and Vibration (UKHA 2020) guidance outlined is used to assess the predicted construction noise levels at NSLs and comment on the likely impacts during the construction stages.

WTG monopiling

64. **Table 24-6** shows that when assessing the temporary noise level at onshore NSLs associated with the WTG piling construction installation, the following has been considered:

Table 24-6 WTG monopile installation parameters

Details	WTG Layout Option A	WTG Layout Option B
No. of monopile foundations	75	60
Hammer energy (kJ)	440–4400	440–4400
Total hours of piling per monopile	3.5	3.5
Total no. of monopiles installed in 24hrs	1–2	1–2
Total no. of piling days	75	60
Number of piles being installed simultaneously at any one time	1	1

65. Noise predictions for construction noise falls outside the scope of the BS5228-1 (BSI 2014a) due to the large separation distances across reflective surfaces resulting in cylindrical spreading, e.g., the acoustic energy level decreases more slowly than with spherical spreading i.e. in cylindrical spreading there is a 3 dB reduction in sound levels per doubling of distance compared to spherical spreading where there is a 6 dB reduction in sound levels per doubling of distance.

66. Predictions of construction noise from the array have therefore been undertaken in accordance with the propagation models presented in the Danish regulation which include a correction for multiple reflections.

67. A paper was presented at the 10th International Conference on Wind Turbine Noise titled ‘High resolution analysis of measurements, and comparison of models for long distance noise propagation over water for an elevated height-adjustable sound source’. The study compared the results of a measurement campaign for downwind noise propagation over water for elevated sound sources with different relevant propagation models, namely Nord2000 model, WindSTAR-Pro, ISO 9613-2, and country-specific models, such as the models used in Denmark and Sweden. Based on the predicted and measured data, the paper concluded that the Danish method better captures the effect of possible multiple reflections in comparison to other noise models (Thysell et al., 2023).

68. The Danish method has been used in numerous offshore wind farm planning applications across Europe.

69. The propagation model can be summed as:

$$L_{pA} = L_{WA,ref} - 10\ Log_{10}\ (l^2+h^2) - 11 + \Delta L_g - \Delta L_a + \Delta L_m$$

Where:

- L_{pA} Predicted sound pressure level at receiver
- $L_{WA,ref}$ Sound power level from piling works / WTG at rated power (provided by manufacturer)
- l is the distance from the base of the turbine to the calculation point
- h is the height of the pile during noisiest activity / hub height of turbine
- 11 dB correction for distance 10 * log 4π
- ΔLg is correction for terrain (1.5 dB for onshore turbines and 3 dB for offshore turbines)
- ΔLa is air absorption
- ΔLm is correction for multiple reflections

Construction phase vibration

70. Construction phase works requiring the use of piling equipment, HDD drilling, and mechanical excavations have the potential to result in vibration impacts at vibration-sensitive receptors (VSRs) if sufficiently close to the respective receptor.

71. Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. With respect to the CWP Project, the range of relevant criteria used for building protection is expressed in terms of Peak Particle Velocity (PPV) in mm/s.

Cosmetic damage to buildings

72. Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- *BS 7385 – Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration (1993*); and
- *BS 5228 – Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (BSI 2009 +A1 2014b).*

73. BS 7385 – 2 (BSI 1993) states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies, rising to 20 mm/s at 15 Hz, and 50 mm/s at 40 Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

74. BS 5228-2 (BSI 2009 +A1 2014b) recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e., non-structural) damage should be taken as a peak particle velocity of 15 mm/s for transient vibration at frequencies below 15 Hz and 20 mm/s at frequencies above 15 Hz. Below these vibration magnitudes, minor damage is unlikely, although where there is existing damage, these limits may be reduced by up to 50%. In addition, where continuous vibration is such that resonances are excited within structures, the limits discussed above may need to be reduced by 50%.

75. **Table 24-77** sets out the limits as they apply to vibration frequencies below 4Hz where the most conservative limits are required. At higher frequencies, the limit values for transient vibration within Table B.2 of BS 5228-2 (BSI 2009 +A1 2014b) will apply, with similar reductions applied for continuous vibration and those for protected structures.

Table 24-7 Recommended construction vibration thresholds for buildings.

Structure type	Allowable vibration velocity (PPV) at the closest part of any sensitive property to the source of vibration, at a frequency of:	
	Transient vibration	Continuous vibration
Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s	25 mm/s
Unreinforced or light framed structures. Residential or light commercial-type buildings	15 mm/s	7.5 mm/s
Protected and Historic Buildings*	6 mm/s–15 mm/s	3 mm/s–7.5 mm/s
Identified Potentially Vulnerable Structures and Buildings with Low Vibration Threshold	3 mm/s	

Note * The relevant threshold value is to be determined on a case-by-case basis. Where sufficient structural information is unavailable at the time of assessment, the lower value within the range will be used.

76. The BS 5228-2 (BSI 2009+A1 2014b) vibration limits are proposed for all construction activities associated with the OTI and intertidal works including:

- Vibratory piling rigs in the intertidal area, landfall and onshore substation;
- Percussive piling rigs at the onshore substation;
- HDD drilling for ESBN network cable works; and
- Mechanical excavation at onshore substation and landfall.

77. Compliance with these vibration limits should ensure that there is little to no risk of cosmetic damage to buildings.

Human perception

78. Humans are sensitive to vibration stimuli, and perception of vibration at high magnitudes may cause concern to building occupants. BS5228-2 (BSI 2014b) notes that vibration typically becomes perceptible at around 0.15 to 0.3 mm/s and may become disturbing or annoying at higher magnitudes. Higher levels of vibration are typically tolerated for single events or events of short-term duration, particularly during construction projects and when the origin of vibration is known.

Magnitude of construction phase vibration impact & EIAR significance of effect

79. **Table 24-8** presents the significance table relating to potential impacts on building occupants during construction based on guidance from BS5228-2 (BSI 2014b), the DMRB noise and vibration (UKHA 2020) document and the associated EPA significance ratings.

Table 24-8 Guidance on effects of human response to PPV magnitudes

PPV range	BS 5228-2	DMRB impact magnitude	EPA significance ratings
≥ 10 mm/s PPV	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.	Very High	Very Significant
≥ 1 mm/s PPV	It is likely that vibration of this level in residential environments will cause complaints, but can be tolerated if prior warning and explanation have been given to residents	High	Moderate to Significant
≥ 0.3 mm/s PPV	Vibration might be just perceptible in residential environments.	Medium	Slight to Moderate
≥ 0.14 mm/s PPV	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Low	Not significant to Slight
<0.14 mm/s PPV	Not perceptible	Very low	Imperceptible to Not Significant

Construction phase: road traffic noise

80. Vehicular movement to and from the onshore development area will make use of the existing road network. **Section 24.9.1** provides the road traffic noise calculation and assessment methodology in full.

81. To assess the potential impact of additional traffic on the human perception of noise, the following two guidelines are referenced*:* DMRB Noise and Vibration (UKHA, 2020) and the EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022).

82. **Table 24-9** includes guidance as to the likely magnitude of impact associated with construction traffic noise, relative to the change in sound level. This guidance is derived from Table 3.17 of DMRB Noise and Vibration (UKHA 2020) and adapted to include the relevant significance effects from the EPA Guidelines (EPA 2022).

Magnitude of construction phase road traffic noise impact & EIAR significance of effect

83. For construction traffic noise, due to the short-term period over which this impact occurs, the magnitude of impacts is assessed against the 'short term' period in accordance with the DMRB Noise and Vibration (UKHA 2020) document. **Table 24-9** relates changes in traffic noise levels to impact on human perception based on the guidance contained in these documents.

Table 24-9 Classification of magnitude of noise impacts in the short term.

Change in sound level (dB)	Subjective reaction	DMRB magnitude of impact (short-term)	EPA significance of effect
Less than 1	Inaudible	Negligible	Imperceptible
1 – 2.9	Barely Perceptible	Minor	Not Significant
3 – 4.9	Perceptible	Moderate	Slight, Moderate
≥ 5	Up to a doubling of loudness	Major	Significant

24.4.4 O&M phase: noise and vibration appraisal method for the assessment of impacts

84. The following sections confirm the methodology used to assess the potential noise and vibration impacts during the O&M phase.

85. As before, the significance of impacts has been assessed in accordance with the EPA Guidelines (EPA 2022) as set out in **Chapter 5 EIA Methodology of** this EIAR.

86. As the EPA Guidelines do not quantify the criteria for assessing impacts specifically for noise and vibration, reference has been made to relevant guidelines and standards relating to noise to further define significance ratings. These are discussed in the following sections, with the specific operational noise and vibration EIAR significance ratings presented under each of their respective headings below.

O&M phase: OWF

87. **Table 24-10** shows that when assessing the noise level at onshore NSLs associated with the WTG operation, the following has been considered:

Table 24-10 WTG parameters

Details	WTG Option A	WTG Option B
No. of WTG	75	60
Hub height above LAT (m)	163	176
Rated sound power (dB L_{WA})	115	120.9

Wind Energy Development Guidelines 2006

88. There is no Irish guidance specifically related to the noise assessment of OWFs; however, it is considered best practice and reasonable in its absence to refer to the guidance in relation to acceptable levels of noise from onshore wind farms, as contained in the document *"Wind Energy Development Guidelines"* published by the Department of the Environment, Heritage and Local Government in 2006, which addresses and outlines the appropriate noise criteria in relation to windfarm developments in Ireland. These guidelines are in turn based on detailed recommendations set out in the Department of Trade & Industry (UK) Energy Technology Support Unit (ETSU) publication *"The Assessment and Rating of Noise from Wind Farms" (*1996). The ETSU document has been used to supplement the guidance contained within the *"Wind Energy Development Guidelines"* publication where necessary.

89. Section 5.6 of the Wind Energy Development Guidelines published by the Department of the Environment, Heritage and Local Government (2006) addresses noise and outlines the appropriate noise criteria in relation to wind farm developments.

90. The following definition in relation to NSLs is of note:

"In the case of wind energy development, a noise sensitive location includes any occupied house, hostel, health building or place of worship and may include areas of particular scenic quality or special recreational importance. Noise limits should apply only to those areas frequently used for relaxation or activities for which a quiet environment is highly desirable. Noise limits should be applied to external locations and should reflect the variation in both turbine source noise and background noise with wind speed."

91. Note that the noise limits are defined in terms of the $L_{A90,10min}$ parameter.

92. In summary, the Wind Energy Development Guidelines outline the following guidance to identify appropriate wind turbine noise criteria curves at NSLs:

- An appropriate absolute limit level for quiet daytime environments of less than 30 dB $L_{A90,10min}$;
- 45 dB $L_{A90,10min}$ for daytime environments greater than 30 dB $L_{A90,10min}$ or a maximum increase of 5 dB above background noise (whichever is higher), and;
- 43 dB $L_{A90,10min}$ (as per current guidance) or a maximum increase of 5 dB above background noise (whichever is higher) for night-time periods (see Paragraph 93 for further detail) .

93. While the caveat of an increase of 5 dB above background noise for night-time operation is not explicit within the current guidance, it is commonly applied in noise assessments and is detailed in numerous examples of planning conditions issued by local authorities and An Bord Pleanála. Accordingly, for the purpose of this assessment, the approach has been to apply a limit of 43 dB $L_{A90,10min}$ or a maximum increase of 5 dB above background noise, whichever is higher, for night-time periods.

94. This set of criteria has been chosen as it is in line with the intent of the relevant Irish guidance i.e. it applies a 5 dB increase above background noise during the night-time period which is similar to the allowance in the daytime period. It is also comparable to noise planning conditions applied to similar onshore windfarm sites previously granted planning permission by An Bord Pleanála.

95. As stated previously, the core of the noise guidance contained within the Wind Energy Development Guidelines guidance document is based on the 1996 ETSU publication *The Assessment and Rating of Noise from Wind Farms (ETSU-R-97)*.

96. ETSU-R-97 calls for the control of wind turbine noise by the application of noise limits at the nearest NSLs. ETSU-R-97 considers that absolute noise limits, applied at all wind speeds, are not suited to wind turbine developments, and recommends that noise limits should be set relative to the existing background noise levels at NSLs. A critical aspect of the noise assessment of wind energy proposals relates to the identification of prevailing background noise levels through on-site noise surveys.

97. ETSU-R-97 states on page 58, *"…absolute noise limits and margins above background should relate to the cumulative effect of all wind turbines in the area which contribute to the noise received at the properties in question…".* Therefore, the noise contribution from all wind turbine development in the area should be included in the assessment.

Comment on future potential guidance changes for wind turbine noise

98. In December 2019, the Draft Revised Wind Energy Development Guidelines (2019 draft WEDGs) were published for consultation. At the time of writing this EIAR chapter, updated guidelines have yet to be published.

99. It is important to note that, during the public consultation, several concerns relating to the proposed approach of the 2019 draft WEDGs were expressed by various parties. Specific concerns expressed by a group of acoustic professionals working in the field are most relevant. The group was made up of acousticians who act for wind farm developers, Councils, Government bodies, and residents' groups (all of whom are members of the Institute of Acoustics, IOA). The group included several of the authors / contributors to ETSU-R-97, the IOA Good Practice Guide (IOA GPG), and the IOA Amplitude Modulation Working Group, which are all referenced extensively in the 2019 draft WEDGs.

100. A statement from the cross-party group can be reviewed at https://www.ioa.org.uk/wind-energy-development-guidelines-wedg-consultation-irish-department-housing-planning-community-and.

101. The following statement is of note from the response:

"a number of acousticians working in the field have raised serious concerns over the significant amount of technical errors, ambiguities and inconsistencies in the content of the draft WEDG and these were highlighted during the consultation process by a group of acousticians"

102. The following statements were submitted by the Minister for Housing, Local Government and Heritage during a Dail Eireann Debate on 13 June 2023:

"My Department is currently undertaking a focused review of the 2006 Wind Energy Development Guidelines. The review is addressing a number of key aspects including noise, setback distance, shadow flicker, community obligation, community dividend and grid connections.

Guidance on the noise aspect, which is highly technical in nature, is currently being finalised by my Department in conjunction with the Department of the Environment, Climate and Communications (DECC), which has primary responsibility for environmental noise matters. Both Departments are engaging on proposals regarding the measurement and assessment of noise from wind turbines to ensure they are robust and fit for purpose having regard to, inter alia, the revised 2030 target to generate up to 80% of our electricity from renewable sources.

In this connection, DECC has recently appointed an acoustic expert, who has commenced work to inform any amendments to the noise aspect of the Guidelines. My Department in conjunction with DECC will make any further changes to the draft Guidelines which are deemed necessary or appropriate in the wake of this work, with a view to bringing the review of the Guidelines to a conclusion. My Department will be in a better position to provide an update on the expected publication date of the revised Guidelines once this process has concluded.

It should be noted that Action EL/23/4 of the Climate Action Plan 2023 Annex of Actions contains a commitment to having new draft Guidelines prepared by the end of Q4 2023, with revised Guidelines to be published in 2024.

When finalised, the revised Guidelines will be issued under section 28 of the Planning and Development Act 2000, as amended. Planning authorities and, where applicable, An Bord Pleanála, must have regard to guidelines issued under section 28 in the performance of their functions generally

under the Planning Acts. In the meantime, the current 2006 Wind Energy Development Guidelines remain in force."

103. The assessment of wind turbine noise presented in this EIAR is based on the guidance outlined in the 2006 WEDGs and has been supplemented with best practice guidance from ESTU-R-97 and the IOA GPG.

104. If updated Wind Energy Development Guidelines are published during the application process for the CWP Project, it is anticipated that any relevant changes affecting noise will be addressed through an appropriate planning condition or, where a supplementary assessment is necessary, through provision of additional information.

WHO Environmental Noise Guidelines

105. The WHO Environmental Noise Guidelines (WHO 2018) provide guidance on protecting human health from exposure to environmental noise. They set health-based recommendations based on average environmental noise exposure of several sources of environmental noise, including wind turbine noise.

106. Recommendations are rated as either 'strong' or 'conditional'. A strong recommendation*, "can be adopted as policy in most situations"* whereas a conditional recommendation, *"requires a policy-making process with substantial debate and involvement of various stakeholders. There is less certainty of its efficacy owing to lower quality of evidence of a net benefit, opposing values and preferences of individuals and populations affected or the high resource implications of the recommendation, meaning there may be circumstances or settings in which it will not apply".*

107. The objective of the WHO Environmental Noise Guidelines (WHO 2018) is to provide recommendations for protecting human health from exposure to environmental noise from transportation, wind farm and leisure sources of noise. The guidelines present recommendations for road, rail, aircraft and windfarm noise in terms of L_{den} and L_{night} levels above which there is risk of adverse health risks.

108. In relation to wind turbine noise, the WHO Guideline Development Group (GDG) state the following:

"For average noise exposure, the GDG conditionally recommends reducing noise levels produced by wind turbines below 45 dB L_{den}, as wind turbine noise above this level is associated with adverse health effects.

No recommendation is made for average night noise exposure L_{night} of wind turbines. The quality of evidence of night-time exposure to wind turbine noise is too low to allow a recommendation.

To reduce health effects, the GDG conditionally recommends that policymakers implement suitable measures to reduce noise exposure from wind turbines in the population exposed to levels above the guideline values for average noise exposure. No evidence is available, however, to facilitate the recommendation of one particular type of intervention over another."

109. The quality of evidence used for the WHO research is stated as being 'Low', so the recommendations are therefore conditional. A conditional recommendation, before it becomes included in any legislative context, would require substantial debate by stakeholders, such as, but not limited to the public, government bodies, wind farm developers and operators, as well as turbine manufacturers. A conditional recommendation is based on low-quality evidence that this chosen noise level is effective. There is potential increased uncertainty due to the parameter used by the WHO for assessment of exposure (i.e., L_{den}), which, it is acknowledged, may be a poor characterisation of wind turbine noise and may limit the ability to observe associations between wind turbine noise and health outcomes, as stated below.

"Even though correlations between noise indicators tend to be high (especially between LAeq-like indicators) and conversions between indicators do not normally influence the correlations between the noise indicator and a particular health effect, important assumptions remain when exposure to wind turbine noise in Lden is converted from original sound pressure level values. The conversion requires, as variable, the statistical distribution of annual wind speed at a particular height, which depends on the type of wind turbine and meteorological conditions at a particular geographical location. Such input variables may not be directly applicable for use in other sites. They are sometimes used without specific validation for a particular area, however, because of practical limitations or lack of data and resources. This can lead to increased uncertainty in the assessment of the relationship between wind turbine noise exposure and health outcomes. Based on all these factors, it may be concluded that the acoustical description of wind turbine noise by means of Lden or Lnight may be a poor characterization of wind turbine noise and may limit the ability to observe associations between wind turbine noise and health outcomes…

…Further work is required to assess fully the benefits and harms of exposure to environmental noise from wind turbines and to clarify whether the potential benefits associated with reducing exposure to environmental noise for individuals living in the vicinity of wind turbines outweigh the impact on the development of renewable energy policies in the WHO European Region."

110. Based upon the review set out above, it is concluded that the conditional WHO recommended average noise exposure level (i.e., 45dB L_{den}) should not currently be applied as target noise criteria for an existing or proposed wind turbine development in Ireland.

O&M Phase: OSSs

111. The methodology and criteria outlined in the O&M phase onshore substation section below is also applicable to the OSSs.

O&M phase: onshore substation

112. For the onshore substation O&M phase, the following sets out the approach for categorising the significance associated with any change in the noise environment as a result of the project.

BS 8233

113. BS 8233 (BSI 2014) provides guideline values for internal noise levels within residential dwellings and office spaces. The guideline values for indoor noise levels are presented in **Table 24-11**.

Table 24-11 BS 8233 (BSI 2014) indoor noise levels

Receptor Type	Activity	Location	Daytime	Night-time
Residential	Resting	Living room	35 dB $L_{Aeq,16\ hour}$	-
	Dining	Dining room/area	40 dB $L_{Aeq,16\ hour}$	-
	Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\ hour}$	30 dB $L_{Aeq,\ 8\ hour}$

Receptor Type	Activity	Location	Daytime	Night-time
Places of worship	Listening	Churches	30–45 dB $L_{Aeq,16\ hour}$	-
Industrial buildings	Speech or telephone communications	Open plan office	45–50 dB $L_{Aeq,16\ hour}$	-
	Notes: Daytime assessment period – 07:00 to 23:00 hrs Night-time assessment period – 23:00 to 07:00 hrs			

114. Referring to the BS 8233 (BSI 2014), the following daytime and night-time internal noise thresholds have been identified for residential dwellings in the vicinity of operational phase plant items:

- 35 dB $L_{Aeq,\ 16\ hr}$ within living rooms and dining rooms during daytime periods (07:00hrs to 23:00hrs).
- 30 dB $L_{Aeq,\ 8\ hr}$ within bedrooms during the night-time period (23:00hrs to 07:00hrs).

115. Referring to the BS 8233 (BSI 2014), the following daytime internal noise thresholds have been identified for other receptors in the vicinity of operational phase plant items:

- 30 dB $L_{Aeq,\ 16\ hr}$ within places of worship during daytime periods (07:00hrs to 23:00hrs).
- 45 dB $L_{Aeq,\ 16\ hr}$ within offices during daytime periods (07:00hrs to 23:00hrs).

116. For the onshore substation it is appropriate to assess operational noise at external locations to ensure that noise emissions are controlled to an acceptable level at all NSLs. Based on the guidance for recommended internal noise guidance contained in BS8223 and the WHO Guidelines, an equivalent external level outside of the NSL can be derived by factoring in the degree of noise reduction afforded by a partially open window.

117. Annex G in BS 8233 (BSI 2014) comments that, '…*If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB*…' although it is also acknowledged that the level difference through a window partially open for ventilation can vary depending on window type and this is nominally deemed to fall in the range of 10 to 15 dB. Therefore, to provide a conservative assessment, an inside-to-outside level difference of 10 dB assuming an open window is used.

118. The equivalent external noise at a NSL should not exceed the following thresholds to ensure the internal recommended ambient noise levels for residential receivers are not exceeded:

- Daytime (07:00hrs to 23:00hrs): 45 dB $L_{Aeq,\ 16hr}$; and
- Night-time (23:00hrs to 07:00hrs): 40 dB $L_{Aeq,\ 8hr}$.

119. The equivalent external noise at a NSL should not exceed the following thresholds to ensure the internal recommended ambient noise levels for other receivers are not exceeded:

- Daytime (07:00hrs to 23:00hrs) for places of worship 40 dB $L_{Aeq,\ 16hr}$; and
- Daytime (07:00hrs to 23:00hrs) for industrial offices 55 dB $L_{Aeq,\ 16hr}$.

School Design Guide SDG-021-5

120. The School Design Guide SDG-021-5 Acoustic Performance in Schools provides guideline values for internal noise levels within educational establishments. The guideline values for indoor noise levels are presented in **Table 24-12**.

Table 24-12 School design guide for indoor noise levels

Location	Daytime	Night-time
Classroom, general teaching area	35 dB $L_{Aeq, 30min}$	-

121. The equivalent external noise at a NSL should not exceed the following thresholds to ensure the internal recommended ambient noise levels for educational receivers are not exceeded:

- Daytime (07:00hrs to 23:00hrs) for educational receivers 45 dB $L_{Aeq, 30min}$.

BS 4142

122. For fixed plant associated with the O&M phase, the predicted noise levels are assessed in accordance with the BS 4142 (BSI 2014 +A1 2019). This standard can be used to assess the impact of a new continuous source on a residential environment and is used commonly by local authorities in their standard planning conditions and in compliant investigations.

123. The method for assessing plant noise set out in BS 4142 (BSI 2014 +A1 2019) is based on the following definitions:

"Specific noise level, $L_{Aeq, T}$"	is the equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T;
"Rating level, $L_{Ar, T}$"	is the specific noise level plus adjustments for the character features of the sound (if any);
"Residual noise level, $L_{Aeq, T}$"	is the noise level produced by all sources excluding the sources of concern, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval, T;
"Background noise level, $L_{A90, T}$"	is the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T. This level is expressed using the L_{A90} parameter. These levels were measured as part of the baseline survey.

124. Adjustments to the rating level are appropriate where noise emissions are found to be tonal, impulsive in nature or irregular enough to attract attention. In these cases, penalties are applied of either an additional 2 dB, 4 dB or 6 dB depending on how perceptible the tone is at the noise receptor.

125. In relation to intermittency, BS 4142 (BSI 2014 +A1 2019) recommends that if the intermittency is readily distinguishable against the residual acoustic environment, a penalty of 3 dB can be applied.

126. A correction of up to an additional 9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity, which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

127. The background level should then be subtracted from the rating level. The greater this difference, the greater the magnitude of the impact will be, in general. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, while a difference of around +5 dB is likely to be an indication of an adverse impact (as referred to in BS 4142 (BSI 2014 +A1 2019)), depending on the context.

IEMA Guidelines for Environmental Noise Impact Assessment

128. The 'Guidelines for Environmental Noise Impact Assessment' produced by the Institute of Environmental Management and Assessment (IEMA, 2014) have been referenced in order to categorise the potential effect of changes in ambient noise levels during the operational phases of the project.

129. The guidelines state that for any assessment, the potential significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise. Due to varying factors which affect human response to environmental noise (prevailing environment, noise characteristics, time periods, duration, and level etc.), assigning a subjective response must take account of these factors.

Magnitude of O&M phase onshore substation noise impact & EIAR significance of effect

130. The scale adopted in this assessment is shown in **Table 24-13** and is based on an example scale within the IEMA guidelines. The corresponding significance of impact presented in the 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, 2022) is also presented.

Table 24-13 Noise impact scale – operational noise sources

Noise level change (dB)	Subjective response	Impact classification (IEMA)	EPA classification of effect
<0	No change	Negligible	Imperceptible
≥ 0 and < 3	Barely perceptible		Not Significant
≥ 3 and < 5	Noticeable	Minor	Slight Impact
≥ 5 and < 10	Up to a doubling or halving of loudness	Moderate	Moderate Impact
≥10	More than a doubling or halving of loudness	Major	Significant to Profound Impact

131. The significance table reflects the key benchmarks that relate to human perception of sound. A change of 3 dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10 dB(A) change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide greater definition to the assessment of changes in noise level.

132. A significant effect is distinguished as a change in noise level greater than 10 dB.

133. The IEMA document does not distinguish impacts beyond those categorised as 'Major'. For the purposes of distinguishing between Significant and Profound Impacts to align with EPA 2022

categorisation of effects, changes in noise levels greater than 20 dB are categorised as Profound. Between 10 and 20 dB, impacts are of increasing impact between Significant and Very Significant.

O&M phase: additional traffic on surrounding roads

134. The onshore substation will be generally unmanned during the O&M phase, with less than nine car parking spaces provided at the site. The traffic generated during this phase will be minimal, with a small number of trips for inspection, repairs, monitoring, and maintenance purposes (on average of c. 1 visit per week). It is not expected to generate any volumes of traffic that would be expected to significantly increase the existing traffic numbers in an already industrialised area. Vehicular movement to and from sites relating to the onshore substation will make use of the existing road network.

135. Consequently there will be no significant increase in traffic noise emissions from the O&M phase of the OTI. The consideration of road traffic noise impacts during the O&M phase has therefore been scoped out of the assessment (see **Section 24.6**)

O&M phase vibration

136. There will be no vibration emissions from the operation of the OTI. Consequently, the consideration of vibration impacts during the O&M phase has been scoped out of the assessment (see **Section 24.6**).

24.5 Existing environment

137. To establish the existing noise environment, baseline noise monitoring has been carried out in locations representative of the nearest NSLs to the OTI and intertidal works.

24.5.1 Survey locations

138. The noise measurement locations were selected to represent the noise environment at the nearest NSLs surrounding the OTI and intertidal works at the landfall. The selected locations are shown in **Table 24-14** and **Figure 24-3**. The locations are described below:

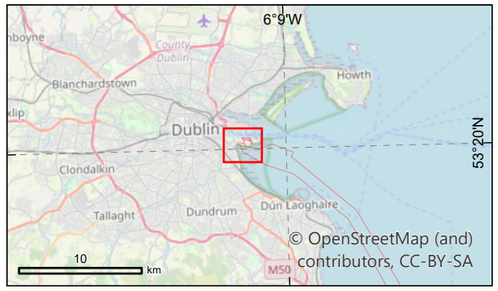
- UN1- Unattended noise measurements undertaken at the onshore substation to quantify the existing noise environment. These measurements were conducted over a 24 hour period using five-minute logging periods.
- UN2- Unattended noise measurements undertaken within the vicinity of the old Pigeon House Generating Station (Pigeon House Harbour) to quantify the existing noise environment. These measurements were conducted over a 24 hour period using five-minute logging periods.
- AT1- Attended noise measurements undertaken at the Coastguard Cottages, Pigeon House Road. These measurements were conducted during the Daytime (07:00-19:00), Evening (19:00-23:00) and Night-time (23:00-07:00) periods. These measurements were taken to determine the background levels at the residential locations to the west of the onshore development area;
- AT2- Attended noise measurements undertaken at South Bank Road. These measurements were conducted during the Daytime (07:00-19:00), Evening (19:00-23:00) and Night-time (23:00-07:00) periods. These measurements were taken to determine the background levels at the future residential location to the west of the onshore development area;
- AT3- Attended noise measurements undertaken at Pembroke Cove, west of the Irishtown nature park. These measurements were conducted during the Daytime periods (07:00-19:00). These

measurements were taken to determine the background levels at the public outdoor amenity space to the west of the onshore development area;

- AT4- Attended noise measurements undertaken at Sandymount Strand, Pigeon House Road (East of the Irishtown Nature Park). These measurements were conducted during the Daytime periods (07:00-19:00). These measurements were taken to determine the background levels at the public outdoor amenity space to the east of the onshore development area ;
- AT5- Attended noise measurements undertaken at Irishtown Nature Park. These measurements were conducted during the Daytime periods (07:00-19:00). These measurements were taken to determine the background levels at the public outdoor amenity space to the east of the onshore development area;
- AT6- Attended noise measurements undertaken at the Sandymount Educate Together, Beach Road, Dublin 4. These measurements were conducted during the Daytime periods (07:00-19:00). These measurements were taken to determine the external background levels at the education facility to the southwest of the onshore development area; and
- AT7- Attended noise measurements undertaken at Sandymount Strand Car Park 1. These measurements were conducted during the Daytime periods (07:00-19:00). These measurements were taken to determine the external background levels at the public outdoor amenity space to the south of the onshore development area.

Table 24-14 Noise survey locations ITM coordinates

Noise Survey Location	Easting	Northing
UN1 (Unattended)	720086.0455	5913946.3791
UN2 (Unattended)	720450.8004	733763.5689
AT1 (Attended)	719001.3175	733953.4350
AT2 (Attended)	719311.6993	733532.2952
AT3 (Attended)	719225.9294	733395.0053
AT4 (Attended)	720399.8606	733414.3785
AT5 (Attended)	720084.0487	733269.3979
AT6 (Attended)	719116.1383	732960.2440
AT7 (Attended)	719351.9936	732317.3684



Legend

- Planning application boundary
- Onshore substation boundary (operational)
- High water mark
- Unattended noise survey locations (UN), Attended noise survey locations (AT)

codling wind park

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Figure 24.3
Noise survey locations

CWP doc. number: CWP-TOB-ENG-08-01-MAP-1651

Internal descriptive code: PAB..SS.PP.PL..S.NOISE.LOCATIONS - HWM - (EIAR.Vol.03.Ch.24.FIG.03)

Size: A3

Scale: 1:10,000

CRS: EPSG 2157

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/08/15	SP	DM/EA	ES

24.5.2 Survey periods

139. Unattended measurements were conducted by AWN from 10:00 on 5 May 2022 to 10:20 on 6 May 2022. Over the duration of the measurements, the weather was dry and calm with temperatures in the region of 8 °C and wind speeds under 5 m/s.

140. Attended measurements were conducted by AWN from 10:53 to 13:59 on Tuesday 29 November 2022 and from 10:40 on Wednesday 7 December to 00:16 on Thursday 8 December 2022. Over the course of the survey, the weather was dry, calm, and cool. Temperatures were approximately 1–3°C and wind speeds were under 5 m/s on both days of the attended measurements.

24.5.3 Personnel and instrumentation

141. AWN carried out the attended noise survey. The following instrumentation was used to conduct the noise surveys.

Table 24-15 Instrumentation details

Equipment	Type	Serial number	Calibration date
Sound Level Meter	RION NL – 52	00764925	09/09/2021
Sound Level Meter	RION NL – 52	575782	12/07/2021
Sound Calibrator	Bruel and Kjaer 4231	2460007	03/05/2022

24.5.4 Measurement parameters

142. The noise survey results are presented in terms of the following parameters.

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{AFmax} is the instantaneous maximum sound level measured during the sample period using the 'Fast' time weighting.

L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

143. The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing, i.e., A weighting applied to compensate for the varying sensitivity of the human ear to sound at different frequencies. All sound levels in this report are expressed in terms of decibels (dB) relative to 2×10^{-5} Pa, i.e., the lowest sound pressure range to which the human ear is sensitive.

24.5.5 Noise survey results

144. Noise level measurements of 24 hours' duration with five-minute intervals were taken at location UN1 and UN2. The results are presented in **Table 24-16** and **Table 24-17**. It should be noted that a logarithmic average is used for the average L_{Aeq} parameter, while an arithmetic average is used for the

average L_{A10} and L_{A90} parameters. The methods of averaging the unattended noise data relate to the nature of the L_{Aeq} parameter (a logarithmic average of sound level) and the L_{A10} and L_{A90} parameters (statistical analysis of the sound level exceeded 10% or 90% of the measurement period).

145. Noise level measurements of 15-minute durations were taken at location AT1 to AT7. The results are presented in **Table 24-18** to **Table 24-24**. It should be noted that a logarithmic average is used for the average L_{Aeq} parameter, while an arithmetic average is used for the average L_{A10} and L_{A90} parameters.

Table 24-16 Summary of measurement results for location UN1

Period	Subjective impression of noise environment	Measured noise levels (dB re. $2x10^{-5}$ Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Day	Port and docking activities and intermittent bird noise.	58	81	59	55
Evening		58	71	58	55
Night		54	74	57	53

Table 24-17 Summary of measurement results for location UN2

Period	Subjective impression of noise environment	Measured noise levels (dB re. $2x10^{-5}$ Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Day	Factory chimney noise, noise from scrap metal recycling plant, and bird noise.	53	82	54	50
Evening		50	65	50	47
Night		48	69	48	45

Table 24-18 Summary of measurement results for location AT1

Time	Subjective impression of noise environment	Measured noise levels (dB re. $2x10^{-5}$ Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
10:53 (Day)	Operational noise from surrounding industrial activities, including the existing port	61	80	62	53
11:59 (Day)		59	78	62	54

Time	Subjective impression of noise environment	Measured noise levels (dB re. $2x10^{-5}$ Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
13:04 (Day)	activities were the dominant noise sources during the daytime period. Other contributing noise sources were road noise from Pigeon House Road and intermittent periods of distant piling. Occasional passing of traffic close to the measurement location was also noted.	61	83	63	55
Day Average		**60**	**-**	**62**	**54**
22:00 (Eve)	Operational noise from surrounding industrial activities, including the existing port activities were the dominant noise sources during the evening period with intermittent bangs and crashes noted. Very occasional passing of local traffic was also noted as a contributing noise source.	53	79	53	46
23:00 (Night)	Operational noise from surrounding industrial activities, including the existing port activities were the dominant noise source during the night-time period with intermittent chimney bursts noted. Very occasional passing of local traffic and distant sirens were also noted as contributing noise sources.	45	60	47	42
23:42 (Night)		53	72	54	46
Night average		**51**	**-**	**51**	**44**
Overall average	**-**	**58**	**-**	**57**	**49**

Table 24-19 Summary of measurement results for location AT2

Time	Subjective impression of noise environment	Measured noise levels (dB re. $2x10^{-5}$ Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
11:16 (Day)	Noise sources noted included road noise by the measurement position which largely consisted of HV's. Other noise sources included distant construction noise including piling and operational noise from the port.	67	84	69	51
12:22 (Day)		65	87	66	51
13:25 (Day)		64	83	65	47
Day Average		**66**	**-**	**67**	**50**
22:20 (Eve)	Noise sources included a distant alarm going off as well as distant bangs and crashes from the port. Another noted noise source was faint chimney / mechanical noise from within the port.	44	61	45	43
23:23 (Night)	Noise sources included birdsong from bushes close to the measurement point and occasional HV movements further up the road from the measurement position.	44	62	45	43
00:01 (Night)		45	65	47	43
Night Average		**44**	**-**	**46**	**43**
Overall Average	**-**	**63**	**-**	**56**	**46**

Table 24-20 Summary of measurement results for location AT3

Time	Subjective impression of noise environment	Measured noise levels (dB re. $2x10^{-5}$ Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
11:35	Noise sources included distant construction noise, including reverse alarms and intermittent piling. Other noise sources included birdsong and occasional noise from members of the public using the area.	46	72	47	43
12:41		49	61	51	48
13:44		51	70	52	49

Time	Subjective impression of noise environment	Measured noise levels (dB re. 2x10^{-5} Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Average		**49**	**-**	**50**	**47**

Table 24-21 Summary of measurement results for location AT4

Time	Subjective impression of noise environment	Measured noise levels (dB re. 2 x 10^{-5} Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
10:40	Noise sources included chimney and mechanical noise from Ringsend WWTP. Other noted noise sources included intermittent passing of aircraft overhead and distant construction noise.	49	59	50	48
11:23		50	75	51	47
12:06		50	65	52	47
Average		**50**	**-**	**51**	**47**

Table 24-22 Summary of measurement results for location AT5

Time	Subjective impression of noise environment	Measured noise levels (dB re. 2 x 10^{-5} Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
11:02	Noise sources included distant construction noise, occasional passing of pedestrians, and birdsong.	44	62	45	42
11:44		43	66	44	40
12:26		44	64	46	40
Average		**44**	**-**	**45**	**41**

Table 24-23 Summary of measurement results for location AT6

Time	Subjective impression of noise environment	Measured noise levels (dB re. 2 x 10^{-5} Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
13:35	The dominant noise source was road traffic noise from the Strand Road. Other noise sources included the passing of pedestrians and birdsong.	70	82	75	55
14:25		71	82	74	57
15:13		70	81	74	53
Average		**70**	**-**	**74**	**55**

Table 24-24 Summary of measurement results for location AT7

Time	Subjective impression of noise environment	Measured noise levels (dB re. 2 x 10^{-5} Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
14:00	The dominant noise source was road traffic noise from the Strand Road. Other noise sources consisted of road construction noise and pedestrians passing the measurement position.	57	71	59	50
14:49		57	72	59	49
15:37		59	78	61	51
Average		**58**	**-**	**60**	**50**

24.5.6 Desk-based study of published data

146. Reference has been made to the strategic noise maps produced by the EPA as part of the Round 4 noise mapping study in accordance with the requirements of the Environmental Noise Regulations (S.I. No. 549/2018) to review published data relating to noise sources in the area.

147. As part of the mapping round, roads are modelled and noise contours produced in terms of two noise indicators, L_{den} and L_{night}. These are defined as follows: -

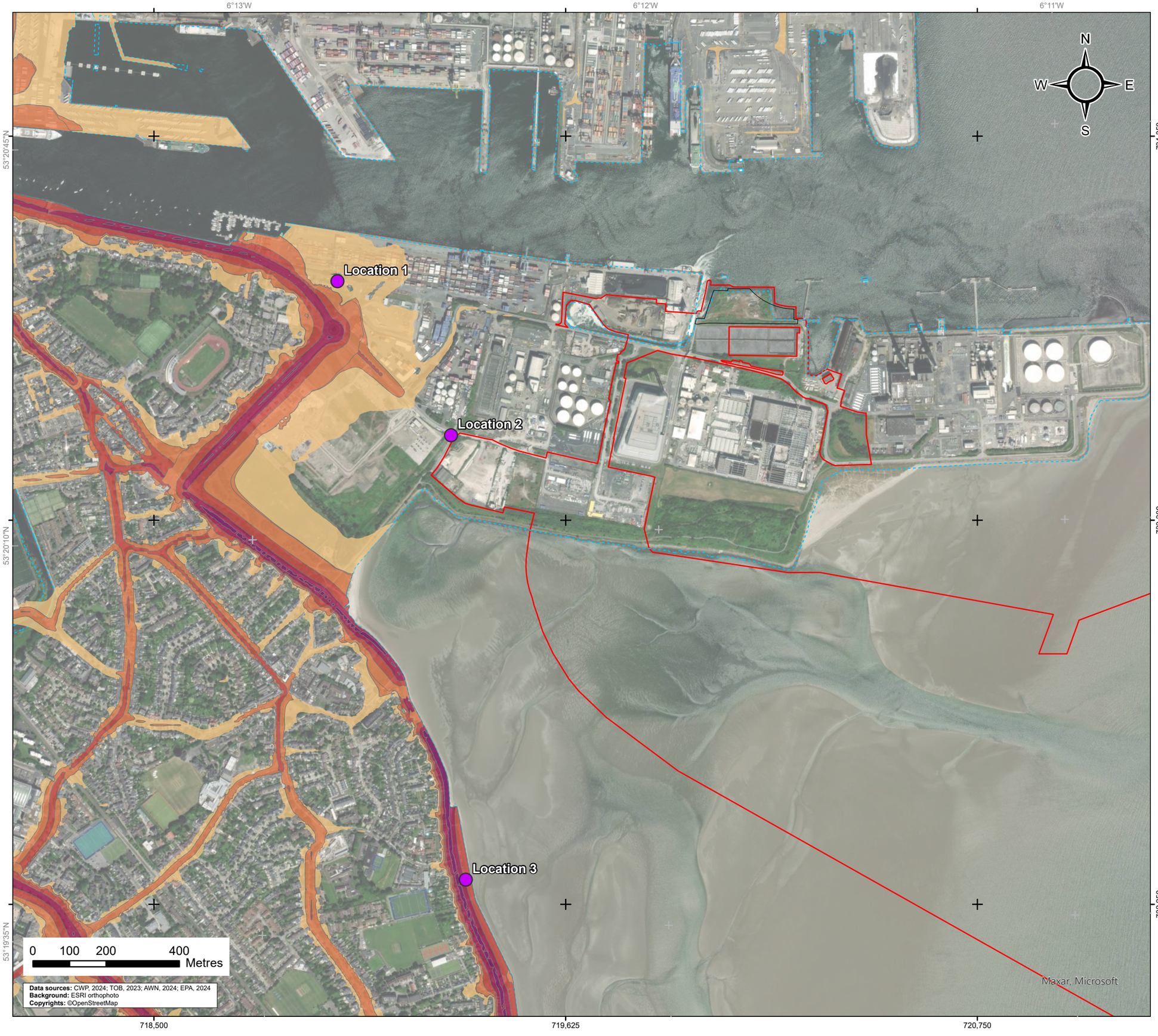
- L_{den} is the day-evening-night noise indicator based on year-long averages of the daytime (07:00–19:00), evening (19:00–23:00) and night-time (23:00–07:00) periods. It is weighted to account for extra annoyance during the evening and night periods.
- L_{night} is the night-time noise indicator during the night-time period (23:00–07:00hrs).

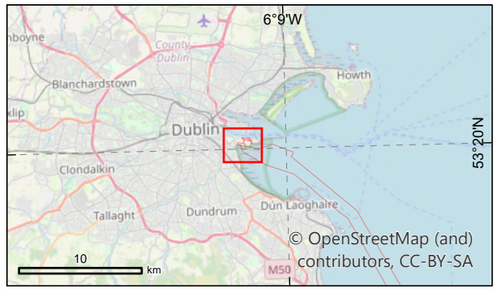
148. As part of this road traffic noise mapping process for the Round 4 study, the following roads have been modelled and mapped using traffic flow data for 2021: -

- Location 1: Pigeon House Road, comparable to survey location AT1;
- Location 2: South Bank Road, comparable to survey location AT2; and
- Location 3: R131 Strand Road, comparable to survey location AT7.

149. **Figure 24-4** presents the road noise mapping for the long-term day-evening-night (L_{den}) period in the vicinity of the OTI and OfTI (intertidal) study areas.

150. **Figure 24-5** presents the road noise mapping for the long-term night (L_{night}) period in the vicinity of the OTI and OfTI (intertidal) study areas.





Legend

- Planning application boundary
- Onshore substation boundary (operational)
- High water mark
- Noise survey locations

Noise round 4 – L_{den} (dB) contours

- 55-60
- 60-64
- 65-69
- 70-74
- 75-99

codling wind park

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Figure 24.4
Road traffic L_{den} noise contours

CWP doc. number: CWP-TOB-ENG-08-01-MAP-1652

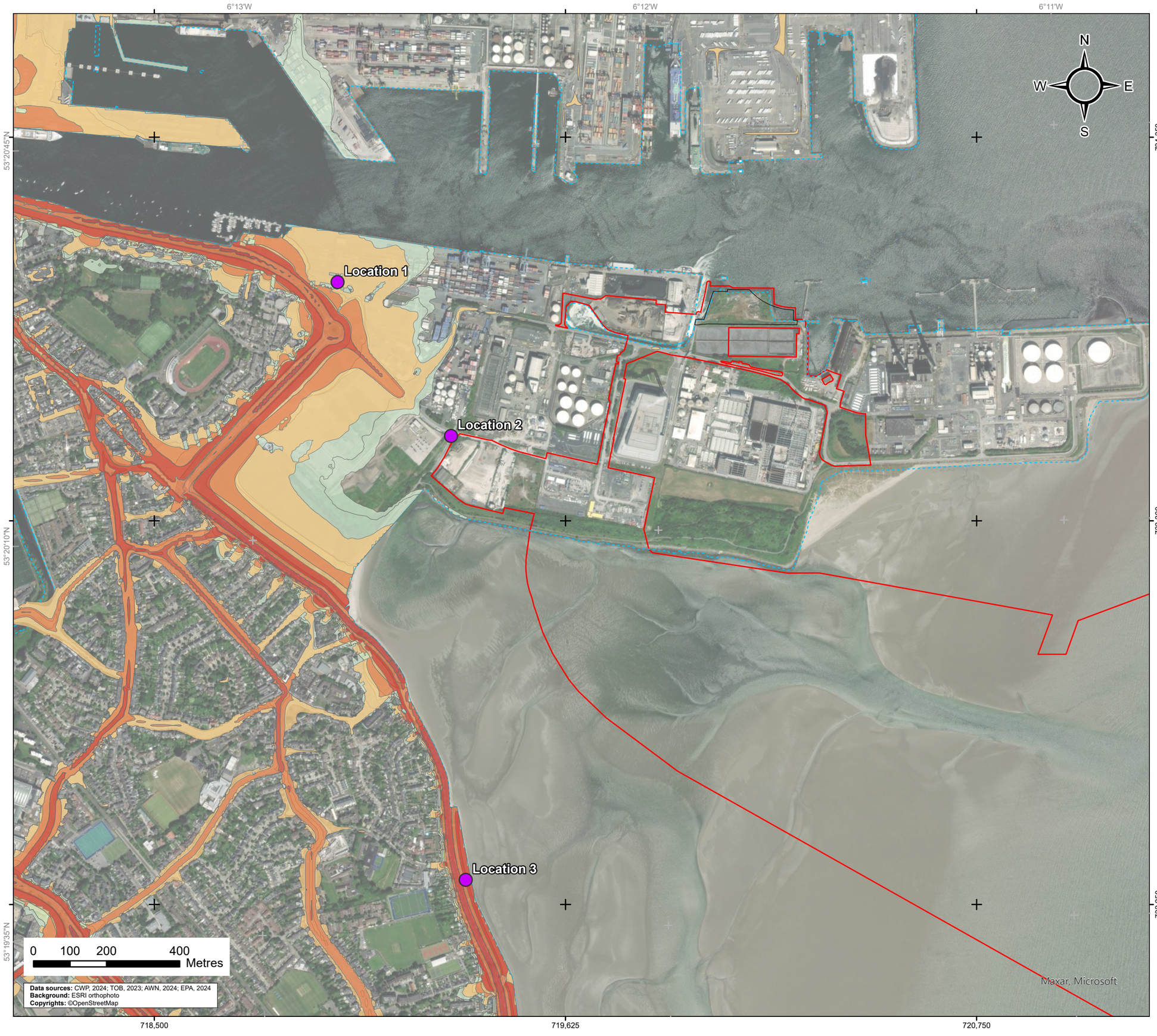
Internal descriptive code: PB - PAB..SS.PP.PL - ROAD.TRAFFIC.NOISE.SURV. LOCATIONS..DEN.MODEL..HWM - (EIAR.Vol.03.Ch.24.FIG.04)

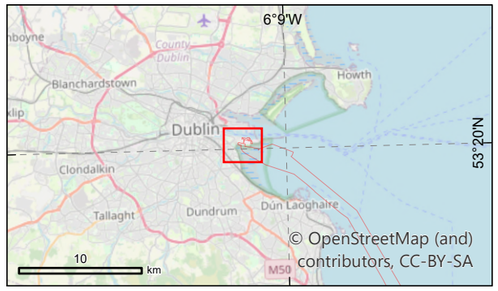
Size: A3

Scale: 1:10,000

CRS: EPSG 2157

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/08/15	SP	DM/EA	ES





Legend

- Planning application boundary
- Onshore substation boundary (operational)
- High water mark
- Noise survey locations

Noise round 4 – L_{night} (dB) contours

- 40-45
- 45-49
- 50-54
- 55-60
- 60-65
- 65-70
- Greater than 75

codling wind park

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Figure 24.5
Road traffic L_{night} noise contours

CWP doc. number: CWP-TOB-ENG-08-01-MAP-1653

Internal descriptive code: PAB..SS.PP.PL - ROAD.TRAFFIC.NOISE.SURV. LOCATIONS..NIGHT.MODEL..HWM - (EIAR.Vol.03.Ch.24.FIG.05)

Size: A3

Scale: 1:10,000

CRS: EPSG 2157

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/08/15	SP	DM/EA	ES

151. **Figure 24-4** indicates that road traffic noise across the study area is in the range of < 50 to 75 dB L_{den} with highest noise levels along the R131 Strand Road between 65 and 75 dB L_{den} (Location 3). The lowest noise values are mapped across Pigeon House Road as between 55 and 60 dB L_{den} (Location 1) and South Bank Road as between 50 and 55 dB L_{den} (Location 2) as the distance from the road traffic sources increases.

152. **Figure 24-5** presents the road traffic noise mapping for the night-time period (L_{night}) in the vicinity of the OTI study area. **Figure 24-5** indicates that road traffic noise across the study area is in the range of < 50 to 65 dB L_{night} with highest noise levels along the R131 Strand Road between 60 and 65 dB L_{night} (Location 3). The lowest noise values are mapped across Pigeon House Road as between 55 and 60 dB L_{night} (Location 1) and South Bank Road as between 50 and 55 dB L_{night} (Location 2).

24.5.7 Predicted future baseline

153. The existing baseline noise environment is typically dominated by road traffic noise; therefore, the future baseline noise environment is expected to remain broadly similar across the study area, in the absence of significant developments in the area. This is supported by the fact that future traffic flows would need to change by 25% to change traffic noise levels by 1 dB, and 100% to increase traffic noise levels by 3 dB.

24.5.8 Baseline noise survey limitations

154. No significant difficulties were encountered during the baseline noise survey section of the assessment.

155. The procedures to minimise the uncertainty regarding the baseline noise levels included:

- Measurements were taken at positions representative of the NSLs to the OTI, landfall, and OfTI (intertidal) works;
- The measurement positions were located away from reflecting surfaces and, as far as reasonably practicable, leafy vegetation;
- Measurements were carried out when weather was suitable, i.e., below 5 m/s windspeeds and in dry conditions;
- Suitable and calibrated SLM instrumentation according to BS EN 61672-1 was used for all measurement locations (BSI, 2013);
- No significant drifts in calibration were observed;

156. With reference to the above, it is therefore considered that the uncertainty and limitations regarding the baseline data were kept to a minimum as far as reasonably practicable.

157. The desktop-based assessment using EPA road traffic noise maps presents a slightly higher night-time noise environment than what was measured during the noise surveys at AT1 (desktop assessment is 4 dB L_{Aeq} higher) and AT2 (desktop assessment is 1 dB L_{Aeq} higher). To present the most conservative assessment, the lowest measured noise environments will be used to inform the evening and night-time construction impact assessment.

24.6 Scope of the assessment

158. An EIA Scoping Report for the OfTI was published on 6 January 2021 and for the OTI on 6 May 2021. The Scoping Reports were uploaded to the CWP Project website and shared with regulators, prescribed bodies, and other relevant consultees, inviting them to provide relevant information and to comment on the proposed approach being adopted by the Applicant in relation to the offshore and onshore elements of the EIA.

159. There were no responses with regard to noise and vibration to the Scoping Reports; however, subsequent consultation was undertaken with DCC who provided feedback on noise assessment.

160. Potential impacts on noise and vibration scoped into the assessment are listed below in **Table 24-25**.

Table 24-25 Potential impacts scoped into the assessment

Impact No.	Description of impact	Notes
Construction		
Impact 1	Temporary noise level at NSLs associated with the landfall cable duct installation	These will be assessed in conjunction with the thresholds listed in **Table 24-4** and **Table 24-5** in **Section 24.4.3**
Impact 2	Temporary noise level at NSLs associated with the landfall works	
Impact 3	Temporary noise level at NSLs associated with the intertidal works	
Impact 4	Temporary noise level at NSLs associated with the onshore export cable works	
Impact 5	Temporary noise level at NSLs associated with the onshore substation works	
Impact 6	Temporary noise level at NSLs associated with the ESBN network cable works	
Impact 7	Temporary vibration effects at VSRs associated with landfall works	These will be assessed in conjunction with the thresholds listed in **Table 24-77** and **Table 24-8** in **Section 24.4.3**.
Impact 8	Temporary vibration effects at VSRs associated with intertidal works	
Impact 9	Temporary vibration effects at VSRs associated with onshore export cable works	
Impact 10	Temporary vibration effects at VSRs associated with the onshore substation works	
Impact 11	Temporary vibration effects at VSRs associated with the ESBN network cable works	
Impact 12	Temporary road traffic noise level at NSLs due to construction traffic	This will be assessed in conjunction with the thresholds listed in **Table 24-9** in **Section 24.4.3**.

Impact No.	Description of impact	Notes
Impact 13	Temporary noise level at onshore NSLs associated with the WTG monopiling	These will be assessed in conjunction with the thresholds listed in **Table 24-4** in **Section 24.4.3**
Operation and maintenance		
Impact 14	Permanent noise level at onshore NSLs associated with the WTG.	This will be assessed in conjunction with the thresholds listed in Paragraph 92 in **Section 24.4.4**
Impact 15	Permanent noise level at NSLs associated with the onshore substation operational plant	This will be assessed in conjunction with the thresholds listed in Paragraph 119 **Section 24.4.4**
Decommissioning		
Impact 16	Temporary noise level at NSLs associated with the decommissioning works	Associated with the removal of all components of the CWP Project from within the onshore development area. Effects are likely to be similar to construction, but shorter in duration.
Impact 17	Temporary vibration effects at VSRs associated with the decommissioning works	
Impact 18	Temporary road traffic noise level at NSLs due to decommissioning traffic	

161. Further consultation and refinement of the CWP Project design, potential impacts on noise and vibration scoped out of the assessment are listed below in **Table 24-6**.

Table 24-26 Potential impacts scoped out of the assessment

Description of impact	Justification for scoping out
O&M Phase: OSS noise	Although the specific manufacturer, model, and sound power information of the OSS equipment is unknown at present, the sound emissions of OSSs are typically lower than those of the WTG. Therefore, OSS operational phase noise has been scoped out of this assessment.
O&M Phase: OTI noise (excluding onshore substation)	Once the construction phase is completed and the landfall and cable routes are reinstated, there will be minimal surface-level infrastructure. Therefore, the operational phase OTI noise has been limited to the assessment of the onshore substation infrastructure.
O&M Phase: additional traffic on surrounding roads	It is anticipated that due to a low number of service vehicles required to maintain the onshore substation plant items and as discussed in Paragraph 135 in **Section 24.4**, the O&M phase traffic has been scoped out of the assessment.

Description of impact	Justification for scoping out
O&M Phase: vibration	As discussed in Paragraph 136 in **Section 24.4**, O&M phase vibration has been scoped out of the assessment.

24.7 Assessment parameters

24.7.1 Background

162. 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.

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

164. **Chapter 4 Project Description** describes the design approach that has been taken for each component of the CWP Project. Wherever possible, the location and detailed parameters of the CWP Project components are identified and described in full within the EIAR. However, for the reasons outlined above, certain design decisions and installation methods will be confirmed post-consent, requiring a degree of flexibility in the planning consent.

165. Where necessary, flexibility is sought in terms of:

- Up to two options for certain permanent infrastructure details and layouts such as the WTG layouts,
- Dimensional flexibility; described as a limited parameter range i.e. upper and lower values for a given detail such as cable length.
- Locational flexibility of permanent infrastructure; described as Limit of Deviation (LoD) from a specific point or alignment.

166. The CWP Project had to procure an opinion from An Bord Pleanála to confirm that it was appropriate that this application be made and determined before certain details of the development were confirmed. An Bord Pleanála issued that opinion on 25th March 2024 (as amended in May 2024) and it confirms that the CWP Project could make an application for permission before the details of certain permanent infrastructure described in **Section 4.3** of **Chapter 4 Project Description** is confirmed.

167. In addition, the application for permission relies on the standard flexibility for the final choice of installation methods and O&M activities.

168. Notwithstanding the flexibility in design and methods, the EIAR identifies, describes and assesses all of the likely significant impacts of the CWP Project on the environment.

24.7.2 Options and dimensional flexibility

169. Where the application for permission seeks options or dimensional flexibility for infrastructure or installation methods, the impacts on the environment are assessed using a representative scenario

approach. A “representative scenario” is a combination of options and dimensional flexibility that has been selected by the author of this EIAR chapter to represent all of the likely significant effects of the project on the environment. Sometimes, the author will have to consider several representative scenarios to ensure all impacts are identified, described and assessed.

170. For noise and vibration associated with the offshore development this analysis is presented in **Appendix 24.2** which identifies one or more representative scenario 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.

171. **Table 24-27** and **24-29** presents a summarised version of **Appendix 24.2** to describe the representative scenarios on which the construction and O&M phase noise assessment has been based. Where options exist, for each receptor and potential impact, the table identifies the representative scenario and provides a justification for this.

172. For noise and vibration associated with the onshore development, the infrastructure design and installation techniques with potential to give rise to noise and vibration impacts have been confirmed in the planning application and consequently the assessment is confined to a single scenario for all construction and O&M phase impacts.

Table 24-27 Summary of representative scenario assessed for OWF construction and O&M

Impact	Scenario	Option A	Option B
Impact 13: Temporary noise level at onshore NSLs associated with the WTG monopiling	13	Both options assessed in representative scenario, see **Section 24.9.2**.	
Impact 14: Permanent noise level at onshore NSLs associated with the WTG	14a/14b	Both options assessed in representative scenario, see **Section 24.9.3**.	

24.7.3 Limit of deviation

173. Where the application for permission seeks locational flexibility for infrastructure, the impacts on the environment are assessed using a LoD. The LoD is the furthest distance at which a specified element of the CWP Project can be constructed.

174. This chapter assesses the specific preferred location for permanent infrastructure. However, **Appendix 24.2** 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.

175. For noise and vibration, this analysis is summarised in **Table 24-30**. **Table 24-30** confirms that the LoDs for the permanent infrastructure relevant to noise and vibration will not give rise to any new or materially different effects. The LoDs are therefore not considered further within this assessment.

Method used to identify modelled noise scenarios

176. In order to predict construction noise impacts, a detailed list of indicative construction plant, operational noise levels, and associated on-times for all construction activities have been provided. The full list of plant is included in **Appendix 24.4**.

177. Based on the plant list, a combined sound power (L_w) has been calculated for each construction activity, taking into account the number of plant and associated on-times for various plant items associated with each activity. The modelled sound power per activity is set out in **Table 24-28**.

Table 24-28 Combined sound power levels at landfall, intertidal and onshore works locations

Impact	Scenario	Highest construction noise activity	Combined sound power (L_w) dB (A)
Impact 1: Temporary noise level at NSLs associated with the landfall cable duct installation	1	Open cut excavation, including piling works at the temporary cofferdam.	120
Impact 2: Temporary noise level at NSLs associated with the landfall works	2	TJB piling works.	116
Impact 3: Temporary noise level at NSLs associated with the intertidal works	3	Tensioner platforms, rollers and raised equipment storage platform including piling works.	116
Impact 4: Temporary noise level at NSLs associated with the onshore export cable works	4	Tunnel, excavation of tunnel shafts – Launch &/Reception Shaft sites	113
Impact 5: Temporary noise level at NSLs associated with the onshore substation works	5	Onshore substation piling works with simultaneous excavator operating.	119
Impact 6: Temporary noise level at NSLs associated with the ESBN network cable works	6	HDD compound works with simultaneous reception compound general site activities	115

Table 24-29 Design parameters relevant to assessment of noise and vibration

Impact	Scenario	Design parameters	Rationale and notes
Construction			
Impact 1: Temporary noise level at NSLs associated with the landfall cable duct installation	1	**Construction works assessed** • Temporary cofferdam installation. ○ Piling rigs in operation at any one time: 1 no. • Open cut excavation works to install the onshore cable ducts. **General working hours** • 07:00–19:00 Monday to Friday • 07:00–14:00 Saturdays • No work on Sundays or bank holidays.	Scenario 1 accounts for open cut in the landfall area, which includes the removal of front and rear berms during these works. The cofferdam piling works have been assumed to be carried out simultaneously with the works for the installation of the onshore cable ducts. This scenario has been modelled using combined sound power levels detailed for landfall cable duct installation and detailed in **Appendix 24.4**. It assumes that one vibratory piling rig will be operating at its closest location to NSLs in the cofferdam piling locations. Some activities, such as piling works for the cofferdam, will be required to take place during the low tide cycle and work might be required outside the stated working hours. Scenario 1 will be assessed for day, evening and night-time works.
Impact 2: Temporary noise level at NSLs associated with the landfall works	2	**Construction works assessed** • Piling for the excavation of the TJBs. ○ Piling Rigs in operation at any one time: 1 no.	The sheet pile walls will be installed using an excavator-mounted vibratory piling tool. Work assumes reinstatement of the front berm prior to the commencement of these piling works.

Impact	Scenario	Design parameters	Rationale and notes
		Working hours • 07:00–19:00 Monday to Friday • 07:00–14:00 Saturdays • No work on Sundays or bank holidays.	This scenario assumes that one vibratory piling rig will be operating at its closest location to NSLs at TJB piling locations. It is anticipated that piling for each of the TJB excavations will take approximately one day to complete and three days in total.
Impact 3: Temporary noise level at NSLs associated with the intertidal works	3	**Construction works assessed** • Tensioner platforms, rollers and raised equipment storage platform including piling works. ○ Piling Rigs in operation at any one time: 1 no. **Working hours** • 07:00–19:00 Monday to Friday • 07:00–14:00 Saturdays • No work on Sundays or bank holidays.	Assessment assumes that intertidal piling for cofferdam and tensioner platforms do not occur simultaneously and the closest piling locations to residential receivers are modelled in all instances. Assumes one vibratory piling rig will be operating at its closest location to NSLs at tensioner piling locations. Scenario 3 models tensioner platform piling works closest to the NSLs to the south as an assessment of the highest noise level. Some activities, such as piling works for the tensioner platforms, will be required to take place during the low tide cycle and work may be required outside the stated working hours. Scenario 3 will be assessed for day, evening and night-time works.
Impact 4: Temporary noise level at NSLs associated with the onshore export cable works	4	**Construction works assessed** • Tunnel installation	This scenario has been modelled using combined sound power levels detailed for the onshore export cable: tunnel –

Impact	Scenario	Design parameters	Rationale and notes
		○ Excavation of tunnel shafts (Underground shafts – 2 launch shaft sites & 1 reception shaft site. **Working hours** • 07:00–19:00 Monday to Friday • 07:00–14:00 Saturdays • No work on Sundays or bank holidays.	underground shaft and detailed in **Appendix 24.4**. Assessment includes two launch shaft locations and one reception shaft location. Scenario 4 will be assessed for day, evening and night-time works.
Impact 5: Temporary noise level at NSLs associated with the onshore substation works	5	**Construction works assessed** • Piling activities for the site perimeter. ○ Piling rigs in operation at any one time: 3 no. ○ Impact pile driving undertaken using a 300Te crawler crane with vibratory hammer and impact hammer attachments. ○ Vibro-driving can also be used to drive tubular and sheet piles. **Working hours** • 07:00–19:00 Monday to Friday • 07:00–14:00 Saturdays • No work on Sundays or bank holidays.	At the onshore substation location, the combi wall will involve the installation of tubular steel piles, between which pairs of sheet piles will be installed. The combi wall will be secured to an anchor wall, formed of sheet piles. A sheet piled wall will also be installed along the toe of the new revetments along the north west and western boundary of the site. Typically, there is unlikely to be any more than eight hours per day of pile driving activity. An excavator will also be used to place material in this construction area. In Scenario 5, during onshore combi-wall piling works, calculations assume two impact piling rigs at the combi wall, one vibratory piling rig at the anchor wall and one excavator at the opposite end to piling works as a conservative assessment of the highest noise levels.

Impact	Scenario	Design parameters	Rationale and notes
Impact 6: Temporary noise level at NSLs associated with the ESBN network cable works	6	**Construction works assessed** • HDD ○ HDD Rigs in operation at any one time: 1 no. **Working hours** • 07:00–19:00 Monday to Friday • 07:00–14:00 Saturdays No work on Sundays or bank holidays.	This scenario has been modelled using combined sound power levels detailed for the onshore ESBN network cable: cable duct installation and detailed in **Appendix 24.4**. Assessment includes for the temporary HDD compound 1 (within Compound C) as the HDD launch compound and general plant in the temporary HDD compound 2 operating simultaneously. HDD plant to operate outside the stated working hours. Scenario 6 will be assessed for day, evening and night-time works.
Impact 7: Temporary vibration effects at VSRs associated with landfall works	7	**Construction works assessed** • Open cut excavation, including piling works at the temporary cofferdam. • TJB piling works. **Working hours** • 07:00–19:00 Monday to Friday • 07:00–14:00 Saturdays • No work on Sundays or bank holidays.	Due to the distance between the proposed works and the VSR common to both works areas, the closest plant will be the dominant vibration source to the VSR. Therefore it assumes that either the excavator or vibratory piling rig will be operating at its closest location to VSR at landfall or intertidal piling locations.
Impact 8: Temporary vibration effects at VSRs associated with intertidal works	8	**Construction works assessed** • Tensioner piling works. **Working hours** • 07:00–19:00 Monday to Friday • 07:00–14:00 Saturdays	Assumes that one vibratory piling rig will be operating at its closest location to the closest VSR at intertidal tensioner piling locations.

Impact	Scenario	Design parameters	Rationale and notes
		• No work on Sundays or bank holidays.	
Impact 9: Temporary vibration effects at VSRs associated with onshore export cable works	9	**Construction works assessed** • Tunnel installation ○ Excavation of tunnel shafts (Underground shafts – 2 launch shaft sites & 1 reception shaft site). **Working hours** • 07:00–19:00 Monday to Friday • 07:00–14:00 Saturdays • No work on Sundays or bank holidays.	Assessment assumes that the excavator will be positioned at the closest site boundary to the nearest VSR.

Impact 10: Temporary vibration effects at VSRs associated with the onshore substation works	10	**Construction works assessed**
		• Piling activities for the site perimeter and buildings
		  ○ Piling rigs in operation at any one time: 3 no.
		  ○ Impact pile driving undertaken using a 300Te crawler crane with vibratory hammer and impact hammer attachments.
		  ○ Vibro-driving can also be used to drive tubular and sheet piles.
		Working hours
		• 07:00–19:00 Monday to Friday
		• 07:00–14:00 Saturdays
		• No work on Sundays or bank holidays.
			During onshore combi-wall piling works, it is assumed that two impact piling rigs are at the combi wall, one vibratory piling rig at the anchor wall and one excavator at the opposite end to piling works.
			During the onshore substation and buildings construction, it is assumed that there will be three impact piling rigs operating simultaneously, one each positioned at the gas insulated switchgear (GIS) building, ESB GIS building, and the Statcom building.

Impact	Scenario	Design parameters	Rationale and notes
Impact 11: Temporary vibration effects at VSRs associated with the ESBN network cable works	11	**Construction works assessed** • HDD ○ HDD Rigs in operation at any one time: 1 no. **General working hours** • 07:00–19:00 Monday to Friday • 07:00–14:00 Saturdays No work on Sundays or bank holidays.	Due to the distance between the proposed works and the vibration-sensitive receiver (VSR) common to both temporary compounds, the closest plant will be the dominant vibration source to the VSR. Therefore, it will be assumed that the HDD at temporary tunnel compound 1 (within Compound C) will be operating at its closest location to the closest VSR.

Impact 12: Temporary road traffic noise level at NSLs due to construction traffic	12	**Construction traffic volumes**
		• Underground tunnelling
		  ○ HV: 5500 in Month 5
		  ○ LV: 1474 in Month 5
		• Average hourly calculation for construction traffic passing by closest NSLs using underground tunnelling traffic figures.
			HVs are the dominant noise source in comparison to LVs.
			Construction traffic access site compounds and work areas during normal working hours, unless otherwise noted.

Impact 13: Temporary noise level at onshore NSLs associated with the WTG monopiling	13	**Construction works assessed** • Monopiling ○ One Mono piling rig in operation at any one time: 1 no. **Working hours** Pile driving will take place 24 hours per day.	Modelled using a sound power level of 145 dB (A), which is applicable to Option A or Option B.
Operation and Maintenance			
Impact 14: Permanent noise level at onshore NSLs associated with the WTG	14a	The following inputs have been considered when assessing the potential impact from the operational WTG on the closest onshore NSL:	Taking account of the methodology outlined in Paragraph 69, the operational

<table>
<tr><th>Impact</th><th>Scenario</th><th>Design parameters</th><th>Rationale and notes</th></tr>
<tr><td></td><td></td><td><table><tr><th>Description</th><th>WTG Option A</th></tr><tr><td>No. of WTG</td><td>75</td></tr><tr><td>Hub height above LAT (m)</td><td>163</td></tr><tr><td>Rated sound power (dB L_{WA})</td><td>115</td></tr></table></td><td>noise levels have been calculated to the closest onshore NSL for both options.</td></tr>
<tr><td></td><td>14b</td><td>The following inputs have been considered when assessing the potential impact from the operational WTG on the closest onshore NSL:<table><tr><th>Description</th><th>WTG Option B</th></tr><tr><td>No. of WTG</td><td>60</td></tr><tr><td>Hub height above LAT (m)</td><td>176</td></tr><tr><td>Rated sound power (dB L_{WA})</td><td>120.9</td></tr></table></td><td></td></tr>
<tr><td>Impact 15: Permanent noise level at NSLs associated with the onshore substation operational plant</td><td>15</td><td>The onshore substation will be a GIS design, where the HV equipment is designed to be insulated and cooled by pressurised gas.
In summary, the noise-related elements of the substation will include:
3 no. Statcom transformers (incorporated within the Statcom buildings);
1 no. generator (incorporated within the GIS building);
3 no. Shunt reactors (partially externally located to south of GIS building);
3 no. Harmonic filters (externally located).</td><td>Predictions of operational noise have assumed that the associated substation plant is operating 100% of the time.
Noise modelling of detailed plant and site layout information to calculate noise levels for simultaneous plant operating.
Noise levels calculated to closest NSLs.</td></tr>
</table>

Impact	Scenario	Design parameters	Rationale and notes
Decommissioning			
Impact 16: Temporary noise level at NSLs associated with the decommissioning works	16	**Offshore** For the purposes of the EIA, at the end of the operational lifetime of the CWP Project, it is assumed that all offshore infrastructure will be removed where practical to do so. In this regard, for the purposes of an assessment scenario for decommissioning impacts, the following assumptions have been made: • The WTGs and OSS topsides shall be completely removed. • Following WTG and OSS topside decommissioning and removal, the monopile foundations will be cut below the seabed level to a depth that will ensure that the remaining foundation is unlikely to become exposed. This is likely to be approximately one metre below the seabed, although the exact depth will depend upon the seabed conditions and site characteristics at the time of decommissioning. • All cables and associated cable protection in the offshore environment shall be wholly removed. It is likely that equipment similar to that which is used to install the cables may be used to reverse the burial process and expose them. Therefore, the area of seabed impacted during the removal of the cables is anticipated to be the same as the area impacted during the installation of the cables. • Generally, decommissioning is anticipated to be a reverse of the construction and installation process for the CWP Project, and the assumptions around the number of vessels on site and vessel round trips are therefore the same as described for the construction phase of the offshore components. Given the above, it is anticipated that for the purposes of an assessment scenario, the impacts will be no greater than those identified for the construction phase. **Onshore** It is recognised that legislation and industry best practice change over time. However, for the purposes of the EIA, at the end of the operational lifetime of the CWP Project, it is assumed that all OTI will be removed where practical to do so. In this regard, for the purposes of an assessment scenario for decommissioning impacts, the following assumptions have been made:	
Impact 17: Temporary vibration effects at VSRs associated with the decommissioning works	17		
Impact 18: Temporary road traffic noise level at NSLs due to decommissioning traffic	18		

Impact	Scenario	Design parameters	Rationale and notes
		• The TJBs and onshore export cables (including the cable ducting) shall be completely removed. • The landfall cable ducts and associated cables shall be completely removed. • The underground tunnel, within which the onshore export cables will be installed shall be left in situ and may be re-used for the same or another purpose. • The onshore substation buildings and electrical infrastructure shall be completely removed. • The reclaimed land, substation platform, perimeter structures and the new access bridge at the onshore substation site will remain in situ and may re-used for the same or another purpose. • The ESBN network cables (including the cable ducting) shall be completely removed. The general sequence for decommissioning is likely to include: • Dismantling and removal of electrical equipment; • Removal of ducting and cabling, where practical to do so; • Removal and demolition of buildings, fences, and services equipment; and • Reinstatement and landscaping works. Closer to the time of decommissioning, it may be decided that removal of certain infrastructure, such as the TJBs, landfall cable ducts and associated cables, onshore export cables and ESBN networks cables, would lead to a greater environmental impact than leaving the components in situ. In this case it may be preferable not to remove these components at the end of their operational life. In any case, the final requirements for decommissioning of the OTI, including landfall infrastructure, will be agreed at the time with the relevant statutory consultees. It is anticipated that for the purposes of an assessment scenario, the impacts will be no greater than those identified for the construction phase.	

Table 24-30 Limit of deviation relevant to assessment of noise and vibration

Project component	Limit of deviation	LoD impact summary
WTGs / OSSs	100m from the centre point of each WTG and OSS location is proposed to allow for small adjustments to be made to the structure locations.	No potential for new or materially different effects
IACs / interconnector cables	100 m either side of the preferred alignment of each IAC and interconnector cable is proposed to allow for small adjustments to be made to the cable alignments.	No potential for new or materially different effects
Offshore export cables	The offshore export cable corridor (OECC)	No potential for new or materially different effects
TJBs	0.5 m either side (i.e., east / west) of the preferred TJB location	No potential for new or materially different effects
Landfall cable ducts (and associated offshore export cables within the ducts)	Defined LoD boundary	No potential for new or materially different effects
Intertidal cable ducts (and associated offshore export cables within the ducts)	The OECC	No potential for new or materially different effects
Intertidal offshore export cables (non-ducted sections)	The OECC	No potential for new or materially different effects
Location of onshore substation revetment perimeter structure	Defined LoD for sheet piling at toe of the revetement	No potential for new or materially different effects

24.8 Primary mitigation measures

178. Throughout the evolution of the CWP Project, measures have been adopted as part of the evolution of the project design and approach to construction, to avoid or otherwise reduce adverse impacts on the environment. These mitigation measures are referred to as 'primary mitigation'. They are an inherent part of the CWP Project and are effectively 'built in' to the impact assessment.

179. Primary mitigation measures relevant to the assessment of noise and vibration are set out in **Table 24-31.** Where additional mitigation measures are proposed, these are detailed in the impact assessment (**Section 24.9**). Additional mitigation includes measures that are not incorporated into the design of the CWP Project and require further activity to secure the required outcome of avoiding or reducing impact significance.

Table 24-31 Primary mitigation measures

Project Element	Description
Onshore substation site selection	The site selection and consideration of alternatives process for the CWP Project **(see EIAR Chapter 3 Site Selection and Consideration of Alternatives)** considered a number of alternative locations for the onshore substation site. The process evaluated alternative sites using a multi-criteria assessment, which included a consideration of likely environmental effects. The main reasons for selecting the preferred onshore substation site included its proximity to the grid connection point and within a heavily industrialised area. It is also located away from residential properties and areas of recreational amenity. The selection of the site is therefore considered a key driver for mitigation by avoidance.

24.9 Impact assessment

24.9.1 Construction phase associated with OTI and OfTI (intertidal area)

180. The potential construction environmental impacts arising from the construction of the CWP Project are listed in **Table 24-25** in **Section 24.6**.

181. **Table 24-32** below summarises the location and function of the onshore construction compounds that have been identified in the construction impact assessment.

Table 24-32 Summary of onshore construction compounds

Construction Compound A (Compound A)	Located at the landfall location. As well as serving the landfall works, Compound A will serve as a temporary construction compound for the construction works, including temporary tunnel compound 1 (launch shaft). The construction compound will be located on a c. 19,800 m^2 site, for a period of approximately 30 months. A detailed description of Compound A is described in **Section 4.8** of **Chapter 4**.

Construction Compounds B–D (Compounds B-D)	Please refer to **Section 4.8** of **Chapter 4** which confirms the location of Compounds B–D, including temporary tunnel compound 2 (Shellybanks Road reception shaft) and temporary tunnel compound 3 (onshore substation launch shaft).

182. The potential source of airborne noise from the various Compounds (A–D) relate to above-ground construction plant and construction traffic.

183. There are hundreds of NSLs in the study area within 2 km of the works and, accordingly, a representative sample of NSLs has been selected and included in the noise model.

184. All noise and vibration impacts will be assessed at the representative NSLs for the CWP Project. These NSLs are also representative of the NSLs adjacent to them but not included in the noise model. These nearest NSLs are identified in **Table 24-33**.

Table 24-33 Nearest NSLs from construction phases

Property reference	Nearest property	Receptor type and sensitivity
NSL01	Hammond Lane Metal Company	Industry - Low
NSL02	Celtic Anglian Water	Industry - Low
NSL03	City Analysts	Industry - Low
NSL04	Poolbeg AGI	Industry - Low
NSL05	Poolbeg Flexgen	Industry - Low
NSL06	Dublin Waste to Energy Facility	Industry - Low
NSL07	Hammond Lane Metal Company	Industry - Low
NSL08	Car Mechanics	Industry – Low
NSL09	ED&F Man Liquid	Industry – Low
NSL10	Marine Terminals Limited	Industry – Low
NSL11	1st Port of Dublin Ringsend Sea Scouts	Recreational - Low
NSL12	71-80 Pigeon House Road	Residential - High
NSL13	70 Pigeon House Road	Residential - High
NSL14	Poolbeg Quay Apartments	Residential - High
NSL15	Representative of Dwellings on Leukos Road	Residential - High
NSL16	Representative of Dwellings on Cymric Road	Residential - High
NSL17	Representative of Dwellings on Bremen Road	Residential - High
NSL18	Representative of Dwellings in Bremen Grove	Residential - High
NSL19	Clanna Gael Fontenoy GAA Club	Recreational- Medium
NSL20	Star of the Sea National School	Educational- High

Property reference	Nearest property	Receptor type and sensitivity
NSL21	Representative of Dwellings on R802 Beach Road Between R131 and Leahy's Terrace Junction	Residential - High
NSL22	Representative of Dwellings on R802 Beach Road Between Leahy's Terrace and Beach Drive Junction	Residential - High
NSL23	Representative of Dwellings on R802 Beach Road Between Beach Drive and Sandymount Court Junction	Residential - High
NSL24	Representative of Dwellings on R802 Beach Road Between Sandymount Court and Marine Drive Junction	Residential - High
NSL25	Representative of Dwellings on R802 Beach Road Between Marine Drive and Seafort Avenue Junction	Residential - High
NSL26	Sandymount Park Educate Together School	Educational - High
NSL27	Church	Place of worship - High
NSL28	Representative of Dwellings on R131 Strand Road	Residential - High
NSL29	Representative of Proposed Dwellings on Former Irish Glass Site	Residential - High

185. Due to the propagation of sound and vibration over distance, the highest predicted impacts calculated for each NSL are likely to be generated from the works area that is closest to that receiver. The exception to this statement is NSL29 at which the highest predicted noise impacts are associated with works occurring at a greater distance than Compound B. This is as a result of Compound B having no major construction works happening in this location, e.g., used for storage, car parking etc. As a result, the plant noise sources in Compound A are the dominant predicted noise levels at its closest NSL.

186. The noise levels for each impact have been predicted; however, only the highest predicted noise levels from the construction scenarios at each NSL are presented in the chapter. Consequently, the following sections of the construction phase assessment are presented as a summary of the following impacts:

- Construction noise impact 1 to impact 6;
- Construction vibration impact 7 to impact 11; and
- Construction traffic impact 12.

Impact 1 to Impact 6: Construction noise

187. It is important to note that calculation of specific construction noise levels during the construction phase is limited to information available at the EIAR stage. The phasing of works, location of activities, plant items and work sites have been progressed to detailed stages as part of this EIAR. However, the nature of the source is dynamic in nature and will vary over the course of the CWP Project at any one location subject to site conditions, work scheduling, contractor proposals, and potential updated technology and methodologies.

188. Construction noise levels will fluctuate at any one location over the full duration of the CWP Project given the variations in the items above on a week-to-week or month-to-month basis. The approach undertaken therefore is to review the likely significant effects across the CWP Project based on the information that is currently available. This includes prediction of construction noise levels associated with the key work stages using expected plant types and numbers, and site layout plans provided by

the Applicant's design team. It is important to note on the basis of the above that the construction noise calculations undertaken as part of the assessment are used to identify the likely significant effects and inform the requirement for noise mitigation and the approach for controlling and managing significant effects.

189. A detailed noise model was created of the intertidal, landfall and onshore areas, and the surrounding NSLs in order to predict the cumulative noise level associated with construction phase activities at the nearest NSLs. Details on the modelling methodology are outlined in full in **Appendix 24.4**.

190. Based on the highest noise levels at each location, a series of detailed noise predictions have been conducted in the vicinity of each of the key construction work areas using the approach discussed in **Table 24-29**. The assessments have been undertaken through detailed review of plant and vehicles, site compound layouts, proposed work phasing, operational on-time for plant and equipment, and operational hours provided by the Applicant's design team. Calculations have been performed at the NSLs identified within each study area with potential to experience significant construction impacts for each construction work site.

191. All construction noise calculations have been performed in accordance with to BS 5228–1 (BSI 2009 +A1 2014a) using the plant sound power level method. The calculations have been performed using a proprietary noise calculation package (SoftNoise Predictor), which implements the calculation method of BS 5228–1 (BSI 2009 +A1 2014a) for construction noise. The standard includes recommended methodologies for calculating construction noise levels and includes a range of best practice mitigation and management measures for the control of noise and vibration from construction sites.

192. In terms of calculation, this standard sets out sound power levels for a wide range of plant items encountered on construction sites, which in turn enables the prediction of indicative noise levels at distances from the works.

193. The model predicts noise levels, taking into account a range of factors affecting the propagation of sound, including:

- The magnitude of the noise source in terms of sound power;
- The percentage on-time of a source;
- The distance between the source and receiver;
- The presence of obstacles, such as buildings, screens or barriers in the propagation path taken from OS mapping, Google Earth imagery and site visits;
- The presence of reflecting surfaces; and
- The hardness of the ground between the source and receiver.

194. The following input data was used to develop the noise model for each modelled scenario:

- OS mapping;
- Construction activities and compound layout plans. Refer to **Chapter 4 Project Description**;
- Plant equipment list and numbers, operating on-time per period, plant noise levels provided by the Applicant's design team; and
- Sound power data (octave band) for items of plant to be used on site were sourced from BS 5228–1 (BSI 2009 +A1 2014a), from previous measurements carried out at other sites by AWN Consulting, and from source data obtained by the team on other large infrastructural projects of similar construction or design guides.

195. A detailed description of the construction works is presented in **Chapter 4 Project Description**. The modelled equipment and sound power data corresponding to each modelled construction scenario is presented in **Appendix 24.4**.

196. For each construction scenario assessed, receptor locations have been positioned at the closest NSLs to the construction work boundaries which have the potential to experience impacts. The study area

for each site is dependent on the site orientation and layout, proximity of NSLs, and the presence of surrounding buildings and structures which fully screen an NSL from a working area. For each receptor location, a calculation height representing each floor of the building with a noise sensitive façade is inputted into the noise model. All calculations are made to the receptor external façade. A façade correction is applied to all receptor locations.

197. The predicted noise levels for all construction impacts at the NSLs, including those not listed in **Table 24-34** are presented in **Appendix 24.5**.

Assessment periods

198. Noise levels have been assessed over daytime on week day (07:00–19:00 hrs) and Saturday morning (07:00–14:00 hrs) periods at all construction works areas, in accordance with the proposed construction working hours for the CWP Project (refer to **Chapter 4 Project Description**).

199. To ensure a safe working operation, installation of the temporary cofferdam and tensioner platforms will be required to take place during the low tide cycle (twice per day), which varies each day. Therefore, flexibility regarding the time of day at which this work takes place is required, with some days requiring working outside of core working hours because of the timing of the low tide cycle. This may include sheet piling works for the temporary cofferdam and tensioner platforms.

200. The use of tunnelling techniques will require 24-hour working at certain times due to the nature of the works, typically during tunnel shaft excavation and tunnel boring / pipe jacking.

201. The use of HDD plant for the installation of ESBN network cable works will require 24-hour working times due to the nature of the works.

202. The cofferdam piling, tensioner piling, pipe jacking ancillary activities for the tunnelling works for the installation of the onshore export cable and HDD for the installation of ESBN network cables occur at surface level. Noise levels over day, evening and night-time periods have therefore been assessed at these sites during this phase of the works.

Construction noise impact

203. For each construction scenario assessed, a CNL has been calculated at each receptor location. CNLs are calculated at each floor height. For buildings with multiple calculation points at varying floor heights, the highest CNLs has been extracted for the purpose of the impact assessment.

204. All results are expressed as $L_{Aeq, T}$ and include a façade correction. For daytime week-day periods, the T (time) value is expressed over a 12-hr period (07:00–19:00 hrs) and for Saturday mornings over a 6-hr period (07:00–14:00 hrs). Where evening and night-time calculations are made, these are expressed over a 4-hr period (19:00–23:00 hrs) and 8-hr period (23:00–07:00 hrs), respectively.

Daytime construction noise impact

205. **Table 24-34** illustrates the highest predicted construction noise levels (CNL) at each NSL during any of the construction phases. Not all impacts and scenarios had the highest CNL at a NSL, **Appendix 24.5** presents all predicted CNL during all scenarios for all NSLs.

206. In order to determine the noise impact associated with the predicted construction noise levels included in **Table 24-34**, the predicted noise levels have been compared to the derived threshold noise limits using the ABC Method from British Standard BS 5228–1 (BSI 2009 +A1 2014a) (see **Table 24-4**).

207. **Table 24-34** illustrates whether the predicted construction noise levels are within the respective noise threshold limits outlined in BS 5228–1 (BSI 2009 +A1 2014a).

208. CNLs above the baseline noise level and below or equal to CNT are described as slight to moderate in terms of EPA EIAR significance effects. However, in the determination of significance in EIAR terms, as outlined in **Table 24-5**, and in accordance with DMRB Noise and Vibration (UKHA 2020) and BS 5228-1 ((BSI 2009 +A1 2014a), noise levels below the CNT are deemed 'Not Significant'.

209. Therefore, any CNL described as slight or moderate in **Table 24-34** which is below the CNT is Not Significant'.

Table 24-34 Comparison of highest noise levels and the predicted CNL with noise threshold limits and predicted significance of effect

Receptor			CNT (BS 5228-1 ABC category or fixed limit)	CNL, dB $L_{Aeq,T}$	EPA EIAR significance of effects
ID	Description	Ambient daytime noise level (L_{Aeq})	Weekday day (07:00–19:00)		Weekday day (07:00–19:00)
Impact 1, Scenario 1: Temporary noise level at NSLs associated with the landfall cable duct installation (open cut and cofferdam piling)					
NSL09	ED&F Man Liquid	66	75 (fixed noise limit)	56	Not Significant
NSL10	Marine Terminals Limited	60	75 (fixed noise limit)	47	Not Significant
NSL14	Poolbeg Quay Apartments	60	65 (A)	47	Not Significant
NSL15	Representative of Dwellings on Leukos Road	60	65 (A)	48	Not Significant
NSL16	Representative of Dwellings on Cymric Road	60	65 (A)	49	Not Significant
NSL17	Representative of Dwellings on Bremen Road	60	65 (A)	47	Not Significant
NSL18	Representative of Dwellings in Bremen Grove	60	65 (A)	46	Not Significant
NSL19	Clanna Gael Fontenoy GAA Club	49	65 (A)	49	Not Significant
NSL20	Star of the Sea National School	58	65 (A)	48	Not Significant
NSL21	Representative of Dwellings on R802 Beach Road Between R131 and Leahy's Terrace Junction	58	65 (A)	47	Not Significant

Receptor			CNT (BS 5228-1 ABC category or fixed limit)	CNL, dB $L_{Aeq,T}$	EPA EIAR significance of effects
ID	Description	Ambient daytime noise level (L_{Aeq})	Weekday day (07:00–19:00)		Weekday day (07:00–19:00)
NSL22	Representative of Dwellings on R802 Beach Road Between Leahy's Terrace and Beach Drive Junction	58	65 (A)	50	Not Significant
NSL23	Representative of Dwellings on R802 Beach Road Between Beach Drive and Sandymount Court Junction	58	65 (A)	52	Not Significant
NSL24	Representative of Dwellings on R802 Beach Road Between Sandymount Court and Marine Drive Junction	58	65 (A)	54	Not Significant
NSL25	Representative of Dwellings on R802 Beach Road Between Marine Drive and Seafort Avenue Junction	58	65 (A)	55	Not Significant
NSL26	Sandymount Park Educate Together School	58	65 (A)	56	Not Significant
NSL27	Church	58	65 (A)	55	Not Significant
NSL28	Representative of Dwellings on R131 Strand Road	58	65 (A)	55	Not Significant

Receptor			CNT (BS 5228-1 ABC category or fixed limit)	CNL, dB $L_{Aeq,T}$	EPA EIAR significance of effects
ID	Description	Ambient daytime noise level (L_{Aeq})	Weekday day (07:00–19:00)		Weekday day (07:00–19:00)
NSL29	Representative of Proposed Dwellings on Former Irish Glass Site	66	70 (B)	52	Not Significant
Impact 3, Scenario 3: Temporary noise level at NSLs associated with the intertidal works (tensioner piling)					
NSL05	Poolbeg Flexgen	53	75 (Fixed noise limit)	56	Slight
Impact 4, Scenario 4.1: Temporary noise level at NSLs associated with the onshore export cable works (Tunnelling at Temporary Tunnel Compound 1 (Launch Shaft in Compound A)					
NSL06	Covanta Plant	44	75 (Fixed noise limit)	64	Moderate
NSL11	1st Port of Dublin Ringsend Sea Scouts	60	65 (A)	46	Not Significant
NSL12	71–80 Pigeon House Road	60	65 (A)	46	Not Significant
NSL13	70 Pigeon House Road	60	65 (A)	44	Not Significant
Impact 4, Scenario 4.2: Temporary noise level at NSLs associated with the onshore export cable works (tunnelling at temporary tunnel compound 2 (Shellybanks Road Reception Shaft)					
NSL07	Hammond Lane Metal	58	75 (Fixed noise limit)	55	Not Significant
NSL08	Car Mechanics	58	75 (Fixed noise limit)	67	Moderate

Receptor			CNT (BS 5228-1 ABC category or fixed limit)	CNL, dB $L_{Aeq,T}$	EPA EIAR significance of effects
ID	Description	Ambient daytime noise level (L_{Aeq})	Weekday day (07:00–19:00)		Weekday day (07:00–19:00)
Impact 4, Scenario 4.3: Temporary noise level at NSLs associated with the onshore export cable works (tunnelling at temporary tunnel compound 3 (Onshore Substation Launch Shaft)					
NSL02	Celtic Anglian Water	58	75 (Fixed noise limit)	64	Moderate
NSL03	City Analysts	58	75 (Fixed noise limit)	62	Slight
Impact 5, Scenario 5: Temporary noise level at NSLs associated with the onshore substation works					
NSL01	Hammond Lane Metal Recycling	58	75 (Fixed noise limit).	70	Moderate
Impact 6, Scenario 6: Temporary noise level at NSLs associated with the ESBN network cable works (HDD)					
NSL04	Poolbeg AGI	53	75 (Fixed noise limit).	60	Moderate

Evening and night-time construction noise impact

210. Due to potential 24-hour works taking place during Impact 1, Impact 3, Impact 4, and Impact 6, **Table 24-35** illustrates the highest predicted construction noise levels at the nearest residential NSLs during the atypical evening and night-time construction activities. Only Impact 1 and Impact 4 are presented in the table as they had the highest predicted construction noise levels in comparison to Impact 3 and Impact 6. **Appendix 24.5** presents all predicted CNL during all scenarios for all NSLs.

211. In order to determine the significance of effect associated with the predicted construction noise levels included in **Table 24-35,** the predicted noise levels have been compared to the derived threshold noise limits using the ABC Method from British Standard BS 5228–1 (BSI 2009 +A1 2014a) (see **Table 24-4**). **Table 24-35** illustrates whether the highest predicted construction noise levels are within the respective noise threshold limits outlined in BS 5228–1 (BSI 2009 +A1 2014a).

212. NSL29 has predicted construction noise levels that exceed the CNT in all night-time scenarios. **Table 24-35** also presents the CNL results and scenarios for the two night-time scenarios (Impact 1, Scenario 1 and Impact 4, Scenario 4.1) at NSL29.

Table 24-35 Comparison of predicted CNL during evening and night-time works with noise threshold limits and predicted significance of effect

Receptor				CNT (BS 5228-1 ABC Category)		CNL, dB $L_{Aeq,T}$	EPA EIAR significance of effects	
ID	Description	Ambient evening noise level (L_{Aeq})	Ambient night-time noise level (L_{Aeq})	Evening (19:00-23:00)	Night-time (23:00-07:00)		Evening (19:00-23:00)	Night-time (23:00-07:00)
Impact 1, Scenario 1: Temporary noise level at NSLs associated with the landfall cable duct installation (open cut and cofferdam piling)								
NSL14	Poolbeg Quay Apartments	53	51	60 (B)	55 (C)	47	Not Significant	Not Significant
NSL15	Representative of Dwellings on Leukos Road	53	51	60 (B)	55 (C)	48	Not Significant	Not Significant
NSL16	Representative of Dwellings on Cymric Road	53	51	60 (B)	55 (C)	49	Not Significant	Not Significant
NSL17	Representative of Dwellings on Bremen Road	53	51	60 (B)	55 (C)	47	Not Significant	Not Significant
NSL18	Representative of Dwellings in Bremen Grove	53	51	60 (B)	55 (C)	46	Not Significant	Not Significant
NSL21	Representative of Dwellings on R802 Beach Road Between R131 and Leahy's Terrace Junction	53	51	60 (B)	55 (C)	47	Not Significant	Not Significant

Receptor				CNT (BS 5228-1 ABC Category)		CNL, dB $L_{Aeq,T}$	EPA EIAR significance of effects	
ID	Description	Ambient evening noise level (L_{Aeq})	Ambient night-time noise level (L_{Aeq})	Evening (19:00-23:00)	Night-time (23:00-07:00)		Evening (19:00-23:00)	Night-time (23:00-07:00)
NSL22	Representative of Dwellings on R802 Beach Road Between Leahy's Terrace and Beach Drive Junction	53	51	60 (B)	55 (C)	50	Not Significant	Not Significant
NSL23	Representative of Dwellings on R802 Beach Road Between Beach Drive and Sandymount Court Junction	53	51	60 (B)	55 (C)	52	Not Significant	Slight
NSL24	Representative of Dwellings on R802 Beach Road Between Sandymount Court and Marine Drive Junction	53	51	60 (B)	55 (C)	54	Slight	Slight
NSL25	Representative of Dwellings on R802 Beach Road Between Marine Drive and Seafort Avenue Junction	53	51	60 (B)	55 (C)	55	Slight	Slight
NSL28	Representative of Dwellings on R131 Strand Road	53	51	60 (B)	55 (C)	55	Slight	Slight

Receptor				CNT (BS 5228-1 ABC Category)		CNL, dB $L_{Aeq,T}$	EPA EIAR significance of effects	
ID	Description	Ambient evening noise level (L_{Aeq})	Ambient night-time noise level (L_{Aeq})	Evening (19:00-23:00)	Night-time (23:00-07:00)		Evening (19:00-23:00)	Night-time (23:00-07:00)
NSL29	Representative of Proposed Dwellings on Former Irish Glass Site	44	44	55 (A)	50 (B)	52	Moderate	Significant
Impact 4, Scenario 4.1: Temporary noise level at NSLs associated with the onshore export cable works (Tunnelling at launch site)								
NSL12	71–80 Pigeon House Road	53	51	60 (B)	55 (C)	46	Not Significant	Not Significant
NSL13	70 Pigeon House Road	53	51	60 (B)	55 (C)	44	Not Significant	Not Significant
NSL29	Representative of Proposed Dwellings on Former Irish Glass Site	44	44	55 (A)	50 (B)	52	Moderate	Significant

213. As shown in **Table 24-34**, at the majority of residential, educational, places of worship and recreational receptors, the existing baseline is higher than the predicted daytime CNL. There is no significant effect at these receptors.

214. At the majority of commercial and industrial receptors, the existing baseline is lower than or equal to the predicted daytime CNL and CNT. There is no significant effect at these receptors.

215. Two of the industrial receptors (NSL3 and NSL5) have a predicted daytime CNL that is between 3 dB and 4 dB above the existing baseline noise level but below the CNT. There is a slight effect at these receptors.

216. Five of the industrial receptors (NSL1, NSL2, NSL4, NSL6, and NSL8) have a predicted daytime CNL that is at least 5 dB above the existing baseline noise level but below the CNT. There is a moderate effect at these receptors.

217. **Table 24-35** presents the highest predicted CNLs in the Impact 1, Scenario 1 (open cut and cofferdam piling), Impact 4, Scenario 4.1 (launch shaft in Compound A) evening and night-time works for residential receptors. Impact 3, Scenario 3 (tensioner piling) and Impact 6, Scenario 6 (HDD) are not presented in the table as they had lower predicted CNLs than Impact 1, Scenario 1 (open cut and cofferdam piling) and Impact 4, Scenario 4.1 (launch shaft in Compound A).

218. The predicted CNLs are equal to or below the existing evening and night-time baseline noise levels at the majority of residential NSL receptors. There is no significant effect at these during the evening or night-time periods at these receptors.

219. One residential receptor (NSL23) has a predicted night-time CNL that is 1 dB above the existing baseline noise level but below the CNT. There is a slight effect at this receptor.

220. Three residential receptors (NSL24, NSL25, and NSL28) have a predicted evening and night-time CNL that are between 1 dB and 4 dB above the existing baseline noise level but below the CNT. There is a slight effect at these receptors.

221. One residential receptor (NSL29) has predicted evening and night-time CNLs that are in the order of 8 dB above the existing baseline noise levels. During the evening period the CNL is below or equal to the CNT and, during the night-time period the CNL is above the CNT by 2 dB. There is a moderate to significant effect at this receptor.

Significance of the effect

222. The sensitivity of NSLs in the study area is considered to be high for residential and educational receptors and the effect is assessed as neutral, **Not Significant**, and temporary for all daytime construction activities, as per the criteria set out in **Table 24-5**. This is based on the highest predicted CNL being presented in **Table 24-34** for each location.

223. During the proposed evening and night-time works in Impact 1, Scenario 1 (pen cut and cofferdam piling), Impact 3, Scenario 3 (tensioner piling), Impact 4, Scenario 4.1 (launch shaft in Compound A), and Impact 6, Scenario 6 (HDD) the effect is assessed as negative, **Not Significant** to **Moderate**, and temporary at the closest residential receivers. The only exception to this statement is NSL29.

224. During the proposed evening and night-time works in Impact 1, Scenario 1 (open cut and cofferdam piling) and Impact 4, Scenario 4.1 (launch shaft in Compound A) the effect at NSL29 is assessed as negative, **Moderate** to **Significant**, and temporary. Therefore, additional mitigation is required during night-time construction activities. This is due to the sensitivity of the receptors and that the predicted night-time construction activities exceed the CNT by up to 8 dB at NSL29.

225. The sensitivity of NSLs in the study area is considered to be high for places of worship and low to medium for recreational spaces, and the effect is assessed as neutral, **Not Significant**, and temporary, as per the criteria set out in **Table 24-5**.

226. The sensitivity of NSLs in the study area is considered to be medium for commercial and low for industrial receptors and the effect is assessed as neutral to negative, **Not Significant** to **Moderate**, and temporary, as per the criteria set out in **Table 24-5**.

Additional mitigation

227. Where the CNT is not exceeded, no additional mitigation measures are required.

228. Specific noise mitigation measures in line with best practice will be required to control construction noise levels during all night-time construction activities (Impact 1, Scenario 1 (open cut and cofferdam piling) and 4.1). Refer to **Section 24.10** for the range of noise mitigation measures which will be adopted at specific working areas to reduce noise impacts at NSLs. Particular emphasis is given to localised screening around high noise level plant items.

229. During night-time works, additional mitigation measures in line with the DCC GPG for high-risk sites can be specified (and agreed with DCC through approval of the final CEMP), to further reduce the noise impact of the CWP Project.

Residual effect

230. With the adoption of the additional mitigation measures, the predicted CNL at NSL29 during the night-time period is in the range between 49 and 50 dB, which is above the baseline noise level but below the night-time CNT.

231. Therefore, the effects will be neutral to negative, **Not Significant** to **Moderate**, and temporary. The significance of the residual effect is therefore predicted to be not significant in EIAR terms, i.e., CNT will not be exceeded at any NSL during any assessment period or any scenario.

Impact 7 to Impact 11: Construction vibration

232. Accounting for the distance between the closest VSR and the assumed location of construction activities (at their closest approach), it is unlikely that the construction phase of the OTI and the intertidal works will give rise to significant vibration impacts as levels of vibration are known to decrease rapidly with distance.

233. Furthermore, ground level plant is not considered to generate significant levels of vibration, with levels below those which would be likely to cause cosmetic damage.

234. Some construction phase activities associated with the OTI and the intertidal works have the potential to result in vibration impacts at VSR if sufficiently close to the respective receptor. Activities included in the construction phase that have the potential to result in vibration impacts include:

- Vibratory piling rigs in the landfall (Impact 7, Scenario 7), intertidal area (Impact 8, Scenario 8), and onshore substation (Impact 10, Scenario 10);
- Impact piling rigs at the onshore substation (Impact 10, Scenario 10).
- HDD drilling for the ESBN network cables (Impact 11, Scenario 11); and
- Mechanical excavation at landfall (Impact 7, Scenario 7), for onshore cable duct installation (Impact 9, Scenario 9) and onshore substation (Impact 10, Scenario 10).

Piling vibration assessment

235. In terms of piling for the CWP Project, a combination of impact and vibratory methods are proposed. The closest VSRs are the industrial buildings located approximately 80m to the west of the onshore substation site (Scenario 10) where a combi wall and anchor wall sheet piles are proposed to be constructed at the perimeter of the site in addition to a sheet piled wall at the toe of the revetment on the western and north-western boundary of the onshore substation (see **Chapter 4 Project Description**). The closest residential receptors are approximately 610 m to the west of the cofferdam piling (Impact 7, Scenario 7).

236. Tensioner piling works occur at a greater distance than the TJB piling works to the closest residential VSRs and are not considered further in this assessment.

237. At the onshore substation, the combi wall construction may use vibro-driving to drive tubular piles through the softer upper layers of sediment at the seabed before deploying impact driving for the deeper firmer layers. Impact driving is also assumed to be used to install the sheet piles between the tubular piles and also for the anchor wall sheet piles, which are located behind the front combi wall.

238. There is no published vibration data provided in BS 5228–2 (BSI 2009 +A1 2014b) for the specific activity of vibro-driving tubular piles; however, it is understood that the dominant vibration source is the driving of the piles. Reference to Table D.10 of BS 5228–2 (BSI 2009 +A1 2014b) indicates that vibratory sheet steel pile drivers during driving or extracting into 4 m to 5 m soft saturated sand over soft to firm clay range between 2.6 mm/s^{-1} at 6 m to 2.2 mm/s^{-1} at 8 m.

239. For the impact driving, a hydraulic hammer will be used. No published vibration data is provided in BS 5228–2 (BSI 2009 +A1 2014b) for this specific activity; however, the sheet pile driven method will be the dominant vibration source. Reference to Table D.8 of BS 5228–2 (BSI 2009 +A1 2014b) indicates that hammer-driven piles using an air hammer into 4 m to 5 m soft saturated sand over soft to firm clay are 1.1 mm/s^{-1} at 6 m.

240. The distance between the areas where these activities are to occur and the nearest VSRs are such that all vibration transmission would be orders of magnitude below recommended guideline criteria (Refer to **Table 24-7**). For example the vibro-piling works would be below the lowest threshold criteria of 3 mm/s PPV at distances greater than 6 m from the works, which applies to potentially vulnerable structures and buildings with a low vibration threshold.

Heritage structure assessment

241. The perimeter wall for the reclaimed section at the onshore substation abuts the Pigeon House harbour wall, which has a heritage value (Impact 10). This requires impact and / or vibratory piling works to take place directly adjacent to the heritage structure.

242. Based on the figures presented above in Paragraphs 239 and 240, the highest vibration transmission is during vibro-piling works at distances within 6 m. As the heritage structure is directly adjacent to the works area for a given period of time there is a risk that the lowest recommended guideline vibration criteria (Refer to **Table 24-7**) would exceed 3 mm/s PPV. The structural integrity of the heritage structure is currently unknown and therefore the assessment has considered the most conservative vibration criteria (the 3 mm/s PPV) in this instance.

243. The heritage structure will be subject to a condition survey in advance of the commencement of construction works. The results of the condition survey will determine the classification of the structure and whether the upper value within the vibration range will be used, i.e., 7.5 mm/s.

244. Nonetheless, vibration monitoring will be required during the piling works directly adjacent to the heritage structure to ensure the recommended guideline vibration criteria (Refer to **Table 24-7**) is not exceeded.

HDD vibration assessment

245. HDD is proposed for the ESBN network cable works as a method to cross significant environmental and physical features, such as utilities and roads (Impact 11, Scenario 11). Considering the HDD activities, the closest VSRs are the industrial buildings located approximately 25 m to the north of HDD compound 1 (within Compound C).

246. Desktop predictions of ground-borne HDD vibration due to drilling works have been undertaken in accordance with calculation algorithms associated with the operations included in Table E.1 in BS 5228–2 (BSI 2009 +A1 2014b). The following ground-borne vibration formula has been applied:

$$Vres \leq \frac{180}{x^{1.3}}$$

Where:

V_{res} = resultant PPV, in millimetres per second ($mm \cdot s^{-1}$), and

x = distance measured along the ground surface, in metres (m)

247. Assuming HDD activities located in the temporary HDD compound 1 at a distance of 25 m to the closest industrial receptor, the calculated vibration levels are 2.7 $mm \cdot s^{-1}$.

248. The distance between the areas where these activities are to occur and the nearest VSRs are such that all vibration transmission would be below recommended guideline criteria (Refer to **Table 24-7**).

Mechanical excavation vibration assessment

249. During surface breaking and open cut activities (Impact 7, Scenario 7, Impact 9, Scenario 9, and Impact 10, Scenario 10), there is potential for vibration to be generated through the ground. Empirical data for this activity are not provided in BS 5228–2 (BSI 2009 +A1 2014b); however, the likely levels of vibration from this activity are expected to be significantly below the vibration criteria for building damage from experience at other sites. AWN Consulting have previously conducted vibration measurements under controlled conditions, during trial construction works on a sample site where concrete slab breaking was carried out. The trial construction works used the following plant and equipment when measured at various distances:

- 3-tonne hydraulic breaker on small CAT tracked excavator; and
- 6-tonne hydraulic breaker on large Liebherr tracked excavator.

250. Vibration measurements were conducted during various staged activities and at various distances.

251. Peak vibration levels during staged activities using the 3-tonne breaker ranged from 0.48 to 0.25 PPV (mm/s) at distances of 10 m to 50 m, respectively, from the breaking activities. Using a 6-tonne breaker, measured vibration levels ranged between 1.49 and 0.24 PPV (mm/s) at distances of 10 m to 50 m, respectively. Whilst these measurements relate to the breaking of a solid concrete slab, the range of values recorded provides some context in relation to typical ranges of vibration generated by construction breaking and open cut activity.

252. The distance between the areas where these activities are to occur and the nearest VSRs are such that all vibration transmission would be orders of magnitude below recommended guideline criteria for building response to vibration (Refer to **Table 24-7**).

Comment on cumulative assessment at closest VSLs

253. During Impact 7, Scenario 7, there are piling and excavation plant that may operate simultaneously; however, the closest residential VSR (NSL29) is more than 600 m from the site boundaries. Therefore, given the distance between the areas where these activities are to occur and the nearest VSRs, all vibration transmission would be orders of magnitude below recommended guideline criteria (Refer to **Table 24-7**).

254. During Impact 10, Scenario 10, there are piling and excavation plant that may operate simultaneously. The closest commercial VSR (NSL1) is at least 80 m from the site boundaries. Therefore, given the distance between the areas where these activities are to occur and the nearest VSRs, all vibration transmission would be orders of magnitude below recommended guideline criteria for building response to vibration (Refer to **Table 24-7**).

Significance of the effect

255. The nearest VSRs are such that all vibration transmission would be below recommended guideline criteria for building response to vibration and are neutral, **Not Significant**, and temporary (Refer to **Table 24-77**).

256. The only exception to the statement above is at the heritage structure during the onshore substation works (Impact 10, Scenario 10) where a combi wall and anchor wall sheet piles are proposed to be constructed using vibro-piling and impact driving methods. As the structural integrity of the structure is unknown at present, the significance of effects is based on the lowest recommended guideline vibration criteria, i.e., 3 mm/s PPV. Therefore, the heritage structure's response to vibration within 6 m of the works is negative, **Significant**, and temporary (Refer to **Table 24-77**).

257. The following statements refer to the human response to vibration only. Referring to the receptor sensitivity and vibration magnitudes in **Table 24-8**, the vibration effects for building occupants during construction activities are neutral, **Not Significant**, and temporary at the closest residential and industrial receptors.

258. An exception to the above statement is during the HDD works in Impact 11, Scenario 11 when the vibration effects during HDD construction activities are negative, **Slight** to **Moderate**, and temporary at the closest industrial receptors between 55 m and 125 m of the proposed HDD works.

259. The other exception is during the HDD works in Impact 11, Scenario 11 when the vibration effects during HDD construction activities are negative, **Moderate** to **Significant**, and temporary at the closest industrial receptors between 25 m and 55 m of the proposed HDD works.

Additional mitigation

260. The Pigeon House harbour wall heritage structure will be subject to condition surveys in advance of the construction works commencing at the onshore substation site.

261. Notwithstanding the above, any construction activities undertaken on the site will be required to operate below the recommended vibration criteria set out in **Table 24-7**. If the heritage structure is identified as potentially vulnerable to vibration due to significant structural defects, the most conservative criteria will be applied for transient vibration.

262. Any additional mitigation measures in line with the DCC GPG for high-risk sites can be specified (and agreed with DCC through approval of the final CEMP) to further reduce the vibration impact of the CWP Project with a focus on reducing the human response to vibration.

Residual effect

263. For the building and structure response to vibration, the significance of the residual effect is predicted to be neutral to negative, **Not Significant**, and temporary, which is not significant in EIA terms.

264. For the human response to vibration will be, the significance of the residual effect is predicted to be neutral to negative, **Not Significant** to **Significant**, and temporary, which is not significant in EIA terms.

Impact 12 - Temporary road traffic noise level at NSLs due to construction traffic

265. During the construction phase, there will be an increase in traffic flows primarily routed through the Dublin Tunnel, along the R131 and East Link Toll Bridge as plant / equipment and materials are delivered to and removed from the CWP Project.

266. The assessment has considered the peak traffic flow during the construction period. This would represent the greatest level of noise impact from construction traffic.

Receptor sensitivity

267. The DMRB Noise and Vibration (UKHA 2020), Volume 11, Section 3, Part 7) states that it takes a 25% increase or a 20% decrease in traffic flows in order to achieve a 1dB(A) change in traffic noise levels. Given that the construction traffic is likely to move along the existing local road network, construction phase traffic movements will be less than 25% on the Dublin Tunnel at all stages of the construction phase and considerably less than this on all other routes. On this basis, traffic noise levels associated with the construction phase will be significantly less than 1 dB(A).

268. It is generally accepted that it takes an approximate 3 dB(A) increase in noise levels to be perceptible to the average person (Ref: NRA Guidelines for the Treatment of Noise and Vibration in National Road Scheme, 2004 and the DMRB Table 3.16). Based on this reference, the likely effect of traffic noise increases on the local road network will be imperceptible.

269. An assessment of construction traffic at the closest NSL to the construction entrance has been carried out. As the construction traffic will pass along the South Bank Road to the north of the former Irish Glass Bottle site in order to access the site, it is possible to calculate the noise levels associated with the passing vehicles using the following formula.

$$L_{Aeq,T} = L_{AX} + 10Log_{10}(N) - 10Log_{10}(T) + 20Log_{10}\left(\frac{r_1}{r_2}\right) dB$$

where:

- $L_{Aeq,T}$ is the equivalent continuous sound level over the time period T (in seconds).
- L_{AX} is the "A-weighted" sound exposure level of the event considered (dB).
- N is the number of events over the course of time period T.
- r_1 is the distance at which L_{AX} is expressed.
- r_2 is the distance to the assessment location.

270. A calculation distance of 15 m from the road has been used to assess noise levels at the potentially closest buildings along the construction routes to the north of the former Irish Glass Bottle site. The mean value of sound exposure level for HV moving at low to moderate speeds (i.e., 15 to 45 km/hr) is in the order of 85 dB L_{AX} and for a LV is in the order of 68 dB L_{AX} at a distance of 10 m from the vehicles. This figure is based on a series of measurements conducted under controlled conditions.

271. Based on the information provided by the Applicant's design team, it is anticipated that for Impact 12, Scenario 12, the highest number of HV movements will be in Month 5 (5500 HV movements and 1474 LV movements over a one-month period). Assuming that the HV movements will be equal each day and hour, the hourly number of HVs and LVs arriving at the site will be approximately 23 no. and 6 no. respectively.

272. **Table 24-36** below summarises the calculated noise level associated with passing HVs and LVs at a 15 m distance for Impact 12, Scenario 12 – Underground Tunnel.

Table 24-36 Calculated construction traffic noise levels at edge of road

Impact	Scenario	Number of HV per hour	Number of LV per hour	Calculated noise level at edge of road (15 m), dB $L_{Aeq,1hr}$
Temporary road traffic noise level at NSLs due to construction traffic	12: construction phase of the OTI	23	6	60

273. As shown in **Table 24-36**, the predicted noise levels associated with the construction traffic assessment are in the order of 60 dB $L_{Aeq,1hr}$, which is below the construction noise criterion of 65 dB(A) for residential receptors and 75 dB(A) for commercial receptors.

274. The existing baseline noise levels in the vicinity of the proposed residential development at the former Irish Glass Bottle site are 6 dB above the predicted construction traffic noise levels. There is no more than a 1 dB increase in the noise environment, which would therefore be barely perceptible over the existing road traffic noise in the area.

275. The predicted noise levels are not expected to generate any significant impact along the routes on which construction traffic will travel.

Significance of the effect

276. The sensitivity of NSLs in the study area is considered to be high for residential receptors and the significance of effect is assessed as negative, **Not Significant**, and short-term as per the criteria set out in **Table 24-9**.

Additional mitigation

277. No construction traffic mitigation measures are therefore required in respect of temporary road traffic noise level at NSLs.

Residual effect

278. The significance of the residual effect is predicted to be negative, **Not Significant** and short-term, which is not significant in EIA terms.

24.9.2 Construction phase associated with WTG monopiling (Offshore)

279. An assessment has been made using the Danish methodology outlined in Paragraph 69 to determine whether noise emissions associated with the WTG monopiling construction works are likely to give rise to adverse impacts at the closest onshore residential NSL in Greystones.

Impact 13 - Temporary noise level at onshore NSLs associated with the WTG monopiling

280. The closest onshore NSL is WTG NSL01, is located approximately 13 km distance (Easting 733,317, Northing 690,867 ITM Ref.) to the closest WTG monopiling works (A12 in WTG Option B) (Easting 744,921, Northing 696,725 ITM Ref.), as shown previously in **Figure 24.1**.

281. Given that hammer energy is comparable for the WTG monopiling offshore works in Option A and Option B, the following inputs have been used to calculate the predicted CNL at the closest onshore NSL (WTG NSL 01), based on information provided by the CWP project team.

Table 24-37 Monopiling construction noise inputs

Description	WTG monopile construction noise inputs
$L_{WA,ref}$	145 dB (A)
l	13000
h	33
ΔLg	3

282. Based on the inputs above, the predicted WTG monopiling CNL is 32 dB (A).

283. Making reference to **Table 24-4** and applying the most conservative CNT of 45 dB $L_{Aeq,T}$ during the night-time period, then it is predicted that the CNL is more than 10 dB below the lowest night-time CNT.

Significance of the effect

284. The sensitivity of NSLs in the study area is considered to be high for residential receptors and the significance of effect is assessed as negative, **Not Significant**, and temporary, as per the criteria set out in **Table 24-5**.

285. **Appendix 24.1 Cumulative Effects Assessment** for noise will further consider the cumulative monopiling impact from CWP and other Phase 1 OWF projects.

Additional mitigation

286. No monopiling construction mitigation measures are therefore required in respect of temporary WTG monopiling noise level at onshore NSLs.

Residual effect

287. The significance of the residual effect is predicted to be negative, **Not Significant**, and temporary, which is not significant in EIA terms.

24.9.3 O&M associated with the WTGs

288. An assessment has been made using the Danish methodology outlined in Paragraph 69 to determine whether noise emissions associated with the WTG operation are likely to give rise to adverse impacts at the closest onshore residential NSL in Greystones.

289. Details of the noise model are provided in Appendix 24.3.

Impact 14 Scenario 14a - Permanent noise level at onshore NSLs associated with the WTG (Option A)

290. In Option A, 75 WTGs are proposed at 163 m hub height.

291. CWP provided the sound power level data as 115 dB (A) at rated power of 8 m/s. In accordance with the IOA GPG, sound power levels referred to wind speeds at standardised 10 m height. The WTG sound power level was provided by CWP in terms of the L_{Aeq} parameter.

292. **Table 24-38** presents details of the octave band sound power level data provided by CWP for the WTG unit that has been used for the operational WTG noise prediction modelling assessment in Option A.

Table 24-38 Option A WTG octave band sound power spectrum at rated power

Rated power wind speed	Octave band (Hz) sound power levels (dB re 10–12W)								dB (A)
	63	125	250	500	1k	2k	4k	8k	
8 m/s	94.3	99.9	105.9	110.1	110.6	106.3	96.7	75.0	115.0

293. As per best practice guidance in the IOA GPG, an allowance for uncertainty in the measurement of WTG source levels of +2 dB is applied in modelling to all WTG sound power levels in **Table 24-38**.

294. In Option A, the closest onshore NSL is WTG NSL01, is located approximately 13 km distance (Easting 733,317, Northing 690,867 ITM Ref.) to the closest WTG (A13 in WTG Option A) (Easting 744,935, Northing 696,720 ITM Ref.).

295. The operational criteria are couched in terms of an L_{A90} criterion. Best practice guidance in the IOA GPG states that "L_{A90} levels should be determined from calculated L_{Aeq} levels by subtraction of 2 dB". A 2 dB reduction has therefore been applied in the noise model calculations. All predicted noise levels presented below are presented in terms of the L_{A90} parameter, i.e., this reduction of 2 dB is applied in the noise prediction modelling.

296. Based on the inputs above, at rated power, the predicted WTG operational phase noise level at the closest onshore NSL is predicted as 27 dB L_{A90} in WTG Option A at WTG NSL01.

Impact 14 Scenario 14b - Permanent noise level at onshore NSLs associated with the WTGs (Option B)

297. In Option B, 60 WTGs are proposed at 176 m hub height.

298. CWP provided the sound power level data as 120.9 dB (A) at rated power of 8 m/s. In accordance with the IOA GPG, sound power levels referred to wind speeds at standardised 10 m height. The WTG sound power level was provided by CWP in terms of the L_{Aeq} parameter.

299. **Table 24-39** presents details of the octave band sound power level data provided by CWP for the WTG unit that has been used for the operational WTG noise prediction modelling assessment in Option B.

Table 24-39 Option B WTG octave band sound power spectrum at rated power

Rated power wind speed	Octave band (Hz) sound power levels (dB re 10–12W)								dB (A)
	63	125	250	500	1k	2k	4k	8k	
8 m/s	100.2	105.8	111.8	116.0	116.5	112.2	102.6	80.9	120.9

300. As per best practice guidance in the IOA GPG, an allowance for uncertainty in the measurement of WTG source levels of +2 dB is applied in modelling to all WTG sound power levels in **Table 24-39**.

301. In Option B, the closest onshore NSL is WTG NSL01, is located approximately 13 km distance (Easting 733,317, Northing 690,867 ITM Ref.) to the closest WTG (A12 in WTG Option B) (Easting 744,921, Northing 696,725 ITM Ref.).

302. All predicted noise levels presented below are presented in terms of the L_{A90} parameter, i.e., with 2 dB reduction applied as per IOA GPG.

303. Based on the inputs above, at rated power, the predicted WTG operational phase noise level at the closest onshore NSL is predicted as 31 dB L_{A90} in WTG Option B at WTG NSL01.

Significance of the effect (Option A and Option B)

304. From a noise perspective when following the guidance contained within the Institute of Acoustics (IoA) document, A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (2013) (IOA GPG), the definition of the study area is:

> *"2.2.1 The 'study area' for background noise surveys (and noise assessment) should, as a minimum, be the areas within which the noise levels from the proposed, consented and existing wind turbine(s) may exceed 35 dB L_{A90} at up to 10 m/s wind speed."*
>
> *"SB2: The study area should cover at least the area predicted to exceed 35 dB L_{A90} at up to 10 m/s wind speed from all existing and proposed turbines."*

305. As the predicted noise levels in either option are below the 35 dB L_{A90} threshold, there is no further consideration of operational noise from the WTGs.

306. The predicted operational WTG noise levels are conservative as they do not take account of screening due to buildings close to the NSL, i.e., no barrier corrections applied to reduce the noise levels further at the NSLs.

307. While the CWP WTG operational phase noise alone does not require further assessment in this chapter, it has been considered further in **Appendix 24.1 Cumulative Effects Assessment** for noise.

Additional mitigation

308. No WTG mitigation measures are required.

Residual effect

309. The significance of the residual effect is predicted to be negative, **Not Significant**, and long-term, which is not significant in EIA terms.

24.9.4 O&M associated with OTI

310. For the O&M phase of the OTI, the potential noise and vibration impacts associated with the operation of the onshore substation are assessed.

311. The primary sources of outward noise in the operational context are deemed long term and will involve:

- Plant noise from the onshore substation, including internal and externally located plant items.

312. These impacts are discussed in detail in the following sections, including details of the noise modelling undertaken.

Impact 15: Permanent noise level at NSLs associated with the onshore substation operational plant

313. An assessment has been made in accordance with the guidance contained in BS4142:2014+A1:2019 to determine whether noise emissions associated with the operation of the onshore substation is likely to give rise to adverse impacts at the closest residential NSLs.

314. A 3D computer-based prediction model has been prepared in order to quantify the noise level associated with the onshore substation to predict noise levels at high sensitivity residential NSLs, i.e., the most sensitive NSLs during the night-time period when the plant is operating during lowest background noise levels.

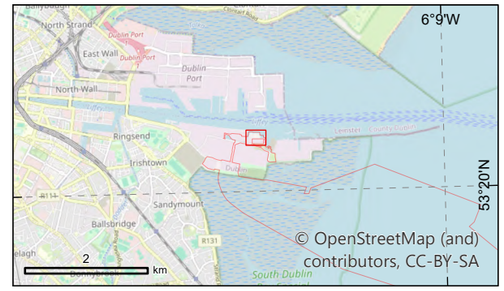
315. Details of the noise model are provided in **Appendix 24.6**.

316. The operational broadband sound power levels of the main plant units associated with the onshore substation have been provided by the Applicant and are shown in **Table 24-40**.

Table 24-40 Sound power (L_w) levels utilised in noise model

Source	Location	No. of plant items	Sound power dB (A)
Statcom Transformer	Internal	3	78
Shunt Reactor	External (partial)	3	84
Standby Generator	Internal	1	88
Harmonic Filter	External	3	80

317. **Figure 24-6** presents a 3D render of the developed site noise model.



Legend

- Planning application boundary
- Onshore substation boundary (operational)
- Harmonic filters location (external, modelled with vertical areas)
- ESB GIS building
- GIS building location (internal plant, modelled with emitting facades and roof)
- Shunt reactors (external)
- Statcom transformers location (internal plant, modelled with emitting facades and roof)
- Other buildings

codling wind park

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Figure 24.6
3D render of developed noise model – View of site

CWP doc. number: CWP-TOB-ENG-08-01-3DM-1654

Internal descriptive code: PB.PP - SS.PP.PL..SS.PP.LO.CIV - - (EIAR.Vol.03.Ch.24.FIG.06)

Size: A3

Scale: 1:600

CRS: EPSG 2157

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/08/15	SP	DM/EA	ES

Noise model results

318. The results of the noise model are presented in **Table 24-41**. The results are compared in the first instance against the adopted fixed external noise limits derived from BS8233 (BSI 2014) and School Design Guide SDG-021-5 (Department of Education and Skills, 2012).

Table 24-41 Predicted noise levels compared to adopted daytime and night-time criteria

Receptor		Predicted noise level dB $L_{Aeq, 16h}$	Adopted Criteria		Excess (dB)	
ID	Description		Daytime criterion, dB $L_{Aeq, 16h}$	Night-time criterion, dB $L_{Aeq, 8h}$	Daytime	Night-time
NSL01	Hammond Lane Metal Company	35	55	--		--
NSL02	Celtic Anglian Water	40	55	--		--
NSL03	City Analysts	38	55	--		--
NSL04	Poolbeg AGI	30	55	--		--
NSL05	Poolbeg Flexgen	27	55	--		--
NSL06	Dublin Waste to Energy Facility	33	55	--		--
NSL07	Hammond Lane Metal Company	25	55	--		--
NSL08	Car Mechanics	27	55	--		--
NSL09	ED&F Man Liquid	10	55	--		--
NSL10	Marine Terminals Limited	17	55	--		--
NSL11	1st Port of Dublin Ringsend Sea Scouts	14	55	--		--
NSL12	71-80 Pigeon House Road	15	45	40	--	--
NSL13	70 Pigeon House Road	12	45	40	--	--
NSL14	Poolbeg Quay Apartments	16	45	40	--	--
NSL15	Representative of Dwellings on Leukos Road	20	45	40	--	--
NSL16	Representative of Dwellings on Cymric Road	18	45	40	--	--
NSL17	Representative of Dwellings on Bremen Road	16	45	40	--	--
NSL18	Representative of Dwellings in Bremen Grove	14	45	40	--	--
NSL19	Clanna Gael Fontenoy GAA Club	15	55	--	--	--

Receptor		Predicted noise level dB $L_{Aeq, 16h}$	Adopted Criteria		Excess (dB)	
ID	Description		Daytime criterion, dB $L_{Aeq, 16h}$	Night-time criterion, dB $L_{Aeq, 8h}$	Daytime	Night-time
NSL20	Star of the Sea National School	14	45	--	--	--
NSL21	Representative of Dwellings on R802 Beach Road Between R131 and Leahy's Terrace Junction	14	45	40	--	--
NSL22	Representative of Dwellings on R802 Beach Road Between Leahy's Terrace and Beach Drive Junction	17	45	40	--	--
NSL23	Representative of Dwellings on R802 Beach Road Between Beach Drive and Sandymount Court Junction	15	45	40	--	--
NSL24	Representative of Dwellings on R802 Beach Road Between Sandymount Court and Marine Drive Junction	16	45	40	--	--
NSL25	Representative of Dwellings on R802 Beach Road Between Marine Drive and Seafort Avenue Junction	17	45	40	--	--
NSL26	Sandymount Park Educate Together School	17	45	--	--	--
NSL27	Church	16	40	--	--	--
NSL28	Representative of Dwellings on R131 Strand Road	15	45	40	--	--
NSL29	Representative of Proposed Dwellings on Former Irish Glass Site	17	45	40	--	--

319. In conjunction with BS4142: 2014+A1:2019, the acoustic character of the sound being generated by the source needs to be considered at the nearest NSLs, which requires corrections for tonal, impulsive or intermittent sounds to be added to the specific levels where required.

320. In the absence of octave band sound power data for the onshore substation, it is considered that a conservative +6 dB character correction would need to be added to the specific sound levels to account for the potential tonal aspects of the sound being generated. This is in line with the most conservative penalty for tonal sound characteristics outlined in BS 4142 (BSI 2014 +A1 2019) and discussed in **Section 24.4.4**.

321. It is considered that no further character corrections would apply as the sound being generated by the onshore substation plant is neither intermittent nor impulsive in nature. It is also considered that the noise being generated would not be distinguishable above the residual soundscape; therefore, the +3 dB penalty has not been applied.

322. Therefore, 6 dB has been added to the predicted specific sound level shown in **Table 24-41** to calculate the rating levels (L_{Ar}) at each residential NSL.

323. The rating levels have then been compared to the representative daytime and night-time representative background sound levels for the residential NSLs and assessed in accordance with BS4142:2014+A1:2019. The results of this assessment are shown in **Table 24-42**, where the predicted rating levels and background sound levels have been rounded to the nearest decibel.

Table 24-42 BS4142 onshore substation operational assessment for residential NSLs

Receptor			Background sound level dB (L_{A90})	Rating level dB $L_{AR,T}$	Excess of rating over background sound level (dB)
ID	Description	Period			
NSL12	71–80 Pigeon House Road	Day	54	21	-33
		Night	44	21	-23
NSL13	70 Pigeon House Road	Day	54	18	-36
		Night	44	18	-26
NSL14	Poolbeg Quay Apartments	Day	54	22	-32
		Night	44	22	-22
NSL15	Representative of Dwellings on Leukos Road	Day	54	26	-28
		Night	44	26	-18
NSL16	Representative of Dwellings on Cymric Road	Day	54	24	-30
		Night	44	24	-20
NSL17	Representative of Dwellings on Bremen Road	Day	54	22	-32
		Night	44	22	-22
NSL18	Representative of Dwellings in Bremen Grove	Day	54	20	-34
		Night	44	20	-24
NSL21	Representative of Dwellings on R802 Beach Road Between R131 and Leahy's Terrace Junction	Day	50	20	-30
		Night	40	20	-20
NSL22	Representative of Dwellings on R802 Beach Road Between Leahy's Terrace and Beach Drive Junction	Day	50	23	-28
		Night	40	23	-18

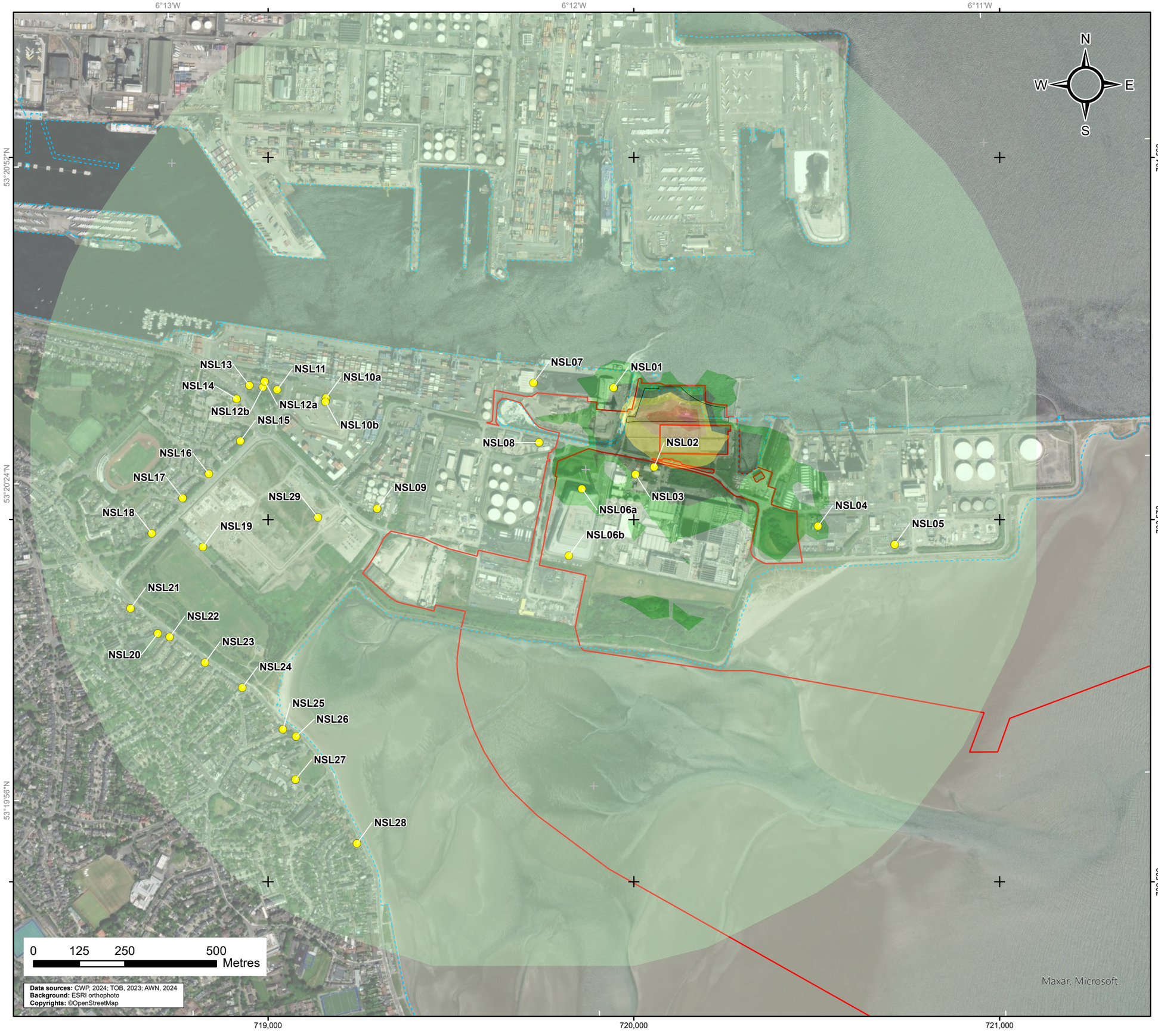
Receptor			Background sound level dB (L_{A90})	Rating level dB $L_{AR,T}$	Excess of rating over background sound level (dB)
ID	Description	Period			
NSL23	Representative of Dwellings on R802 Beach Road Between Beach Drive and Sandymount Court Junction	Day	50	21	-29
		Night	40	21	-19
NSL24	Representative of Dwellings on R802 Beach Road Between Sandymount Court and Marine Drive Junction	Day	50	22	-28
		Night	40	22	-18
NSL25	Representative of Dwellings on R802 Beach Road Between Marine Drive and Seafort Avenue Junction	Day	50	23	-27
		Night	40	23	-17
NSL28	Representative of Dwellings on R131 Strand Road	Day	50	21	-29
		Night	40	21	-19
NSL29	Representative of Proposed Dwellings on Former Irish Glass Site	Day	50	23	-27
		Night	43	23	-20

324. Based on the inputs and assumptions above, the environmental modelling indicates that the predicted noise levels from the site are within the relevant adopted criteria at all residential NSLs.

325. As shown in **Table 24-42**, the rating level is significantly below the background sound level at any of the closest residential NSLs. During the daytime period the excess over the rating level ranges between -27dB and -36 dB and during the night-time period the excess over the rating level ranges between -17 dB and -26 dB.

326. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact. The BS4142 assessment indicates a low impact from the onshore substation plant noise at the closest residential NSLs.

327. **Figure 24-7** presents the predicted operational noise contours for the development.



Legend

- Planning application boundary
- High water mark
- Onshore substation boundary (operational)
- Noise sensitive locations

Noise contours (dB)

- 0.00 - 30.0
- 30.0 - 35.0
- 35.0 - 40.0
- 40.0 - 45.0
- 45.0 - 50.0
- 50.0 - 55.0
- 55.0 - 60.0
- 60.0 - 65.0
- 65.0 - 70.0
- 70.0 - 75.0

codling wind park

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Figure 24.7
Onshore substation operational noise contours for the operational & maintenance phase

CWP doc. number: CWP-TOB-ENG-08-01-MAP-1655

Internal descriptive code:
PB - PAB..SS.PP.PL..SS.PP.OPERATION.NOISE.
MODEL - NOISE.SLs..HWM -
(EIAR.Vol.03.Ch.24.FIG.07)

Size: A3
Scale: 1:10,000

CRS: EPSG 2157

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/08/15	SP	DM/EA	ES

Significance of effect

328. The resultant effect is neutral, **Imperceptible**, and long-term (as per the matrix in **Table 24-13**).

329. It should be noted that for the BS4142 assessment, a maximum tonal penalty of + 6 dB was considered as a conservative figure in the absence of octave band data. During the detailed design stage, when the exact sound power specification is known for the plant items, a revised model and prediction can be carried out to demonstrate that the noise criteria set in **Table 24-11** and **Table 24-12** are not exceeded.

Additional mitigation

330. In order to ensure that the predicted operational noise levels at the nearest NSLs are achieved, the following mitigation measures will be employed during the detailed design stage.

331. During the detailed design of the onshore substation, the selection and location of mechanical and electrical plant will be undertaken in order to ensure the noise emission limits will be designed / attenuated to meet the relevant BS 4142 noise criteria for daytime and night-time periods, as set out in this assessment.

332. Further detail on mitigation measures are outlined in **Section 24.10.2**.

Residual effect

333. The significance of the residual effect is predicted to be neutral, **Imperceptible**, and long-term, which is not significant in EIA terms.

24.9.5 Decommissioning phase

334. It is recognised that legislation and industry best practice change over time.

Offshore

335. For the purposes of the EIA, at the end of the operational lifetime of the CWP Project, it is assumed that all offshore infrastructure will be removed where practical to do so.

336. In this regard, for the purposes of an assessment scenario for decommissioning impacts, the following assumptions have been made:

- The WTGs and OSS topsides shall be completely removed.
- Following WTG and OSS topside decommissioning and removal, the monopile foundations will be cut below the seabed level to a depth that will ensure that the remaining foundation is unlikely to become exposed. This is likely to be approximately one metre below the seabed, although the exact depth will depend upon the seabed conditions and site characteristics at the time of decommissioning.
- All cables and associated cable protection in the offshore environment shall be wholly removed. It is likely that equipment similar to that which is used to install the cables may be used to reverse the burial process and expose them. Therefore, the area of seabed impacted during the removal of the cables is anticipated to be the same as the area impacted during the installation of the cables.

- Generally, decommissioning is anticipated to be a reverse of the construction and installation process for the CWP Project, and the assumptions around the number of vessels on site and vessel round trips are therefore the same as described for the construction phase of the offshore components.

337. Given the above, it is anticipated that for the purposes of an assessment scenario, the impacts will be no greater than those identified for the construction phase.

Onshore

338. For the purposes of the EIA, at the end of the operational lifetime of the CWP Project, it is assumed that all OTI will be removed where practical to do so. In this regard, for the purposes of an assessment scenario for decommissioning impacts, the following assumptions have been made:

- The TJBs and onshore export cables (including the cable ducting) shall be completely removed.
- The landfall cable ducts and associated cables shall be completely removed.
- The underground tunnel, within which the onshore export cables will be installed shall be left in situ and may be re-used for the same or another purpose.
- The onshore substation buildings and electrical infrastructure shall be completely removed.
- The reclaimed land, substation platform, perimeter structures and the new access bridge at the onshore substation site will remain in situ and may re-used for the same or another purpose.
- The ESBN network cables (including the cable ducting) shall be completely removed.

339. The general sequence for decommissioning is likely to include:

- Dismantling and removal of electrical equipment;
- Removal of ducting and cabling, where practical to do so;
- Removal and demolition of buildings, fences, and services equipment; and
- Reinstatement and landscaping works.

340. Closer to the time of decommissioning, it may be decided that removal of certain infrastructure, such as the TJBs, landfall cable ducts and associated cables, onshore export cables and ESBN networks cables, would lead to a greater environmental impact than leaving the components in situ. In this case it may be preferable not to remove these components at the end of their operational life. In any case, the final requirements for decommissioning of the OTI, including landfall infrastructure, will be agreed at the time with the relevant statutory consultees.

341. It is anticipated that for the purposes of an assessment scenario, the impacts will be no greater than those identified for the construction phase.

24.10 Mitigation measures

24.10.1 Construction phase

342. Construction noise will be managed in accordance with British Standard BS 5228 1:2009 ‘Code of Practice for Noise and Vibration Control on Construction and Open Sites –Part 1: Noise and Part 2: Vibration’ (BSI 2009 +A1 2014a). The appointed contractor will put in place the most appropriate noise control measures to ensure that the works in each area comply with the limits detailed in **Chapter 24 Noise and Vibration** and so that minimisation of noise is achieved by the best means practicable. Measures to control noise from construction activities are described in **Chapter 24 Noise and Vibration** and the **Construction Environmental Management Plan (CEMP)**.

Noise mitigation measures

343. The appointed contractor will be required to take specific noise abatement measures to the extent required and comply with the recommendations of BS 5228–1 (BSI 2009 +A1 2014a) and European Communities Noise Emissions by Equipment for Use Outdoors (Amendment) Regulations 2006 (S.I. No 241/2006). The mitigation measures outlined below for the construction phase are also recorded within the **CEMP**.

344. BS 5228–1 (BSI 2014a) includes guidance on several aspects of construction site practices, which include, but are not limited to:

- Noise control at source, specifically for piling rigs during Impact 1, Scenario 1 (open cut and cofferdam piling);
- Site compound hoarding;
- Hours of work;
- Liaison with the public; and
- Monitoring.

345. Further details of these items are provided in the following paragraphs. The contractor will put in place the most appropriate noise control measures depending on the level of noise reduction required at individual working areas. These measures will ensure that:

- During the construction phase, the appointed contractor will be required to manage the works to comply with the limits detailed in **Chapter 24 Noise and Vibration** using methods outlined in BS 5228–1 (BSI 2009 +A1 2014a); and
- Minimisation of noise is achieved by best means practicable, including proper maintenance of plant and equipment.

346. The mitigation measures proposed are in line with the DCC GPG for high-risk sites, as presented in **Appendix 24.7** of **Chapter 24 Noise and Vibration.**

347. Reference to Paragraphs 228 and 228 indicates that intrusive night-time works occurring within close proximity to NSL29 to the west will need specific noise control measures to reduce impacts.

Noise control at source – (noise control mitigation)

348. The following measures will be implemented by the contractor to control noise at source in order to remain below the threshold values for noise set out in **Table 24-4**, which relates to specific vibratory piling site considerations in Impact 1, Scenario 1 (open cut and cofferdam piling):

- On typical piling sites, the major sources of noise are essentially mobile, and the noise received at any control points will therefore vary from day to day as work proceeds. The duration of piling works is usually short in relation to the length of construction work as a whole, and the amount of time spent working near to noise-sensitive areas can represent only a part of the piling period.
- Piling programmes should be arranged so as to control the amount of disturbance in noise- and vibration-sensitive areas at times that are considered of greatest sensitivity. If piling works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme should be phased so as to prevent unacceptable disturbance at any time.
- The piling contractor should evaluate any practicable, less impactful alternatives that would, in the given ground conditions, achieve equivalent results.
- A decision regarding the type of pile to be used on a site will normally be governed by such criteria as loads to be carried, strata to be penetrated, and the economics of the system, for example, the time it will take to complete the installation and other associated operations, such as soil removal. It may not be possible for technical reasons to replace a noisy process by one of the ‘quieter piling’

alternatives. Even if it is possible, the adoption of a quieter method may prolong the piling operation; the net result being that the overall disturbance to the community will not necessarily be reduced.

- Noise reduction can be achieved by enclosing the driving system in an acoustic shroud. For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover.
- Screening by barriers and hoardings is less effective than total enclosure but can be a useful adjunct to other noise control measures. For maximum benefit, screens should be close either to the source of noise (as with stationary plant) or to the listener. Removal of a direct line of sight between source and listener can be advantageous both physically and psychologically. In certain types of piling works there will be ancillary mechanical plant and equipment that may be stationary, in which case, care should be taken regarding the location, also having due regard for access routes. When appropriate, screens or enclosures should be provided for such equipment.
- Contributions to the total site noise can also be anticipated from mobile ancillary equipment, such as handling cranes, dumpers, front-end loaders etc. These machines may only have to work intermittently and, when safety permits, their engines should be switched off (or during short breaks from duty reduced to idling speed) when not in use.
- All mechanical plant should be well maintained throughout the duration of the piling works.

Site compound hoarding (noise control mitigation)

349. The contractor will provide a site hoarding of a minimum of 2.4m height along noise-sensitive boundaries to the west of Compound A where piling or tunnelling activities occur. The length of the screen should in practice be at least five times the height; however, if shorter sections are necessary then the ends of the screen will be wrapped around the source.

350. In most practical situations, the effectiveness of the screen is limited by the sound transmission over the top of the barrier rather than the transmission through the barrier itself. In practice, screens constructed of materials with a mass per unit of surface area greater than 10 kg/m^2 will give adequate sound insulation performance. The use of a standard 2.4 m high construction site hoarding will provide a sufficient level of noise screening once it is installed at a suitable position between the source and receiver.

351. In addition, careful planning of the construction site layout will also be considered. Within the construction compound, the placement of site buildings, such as offices and stores, between the site and NSLs can provide a good level of noise screening.

Hours of work (noise control mitigation)

352. Construction activity will mostly take place during daytime hours, Monday to Friday, and a half day on Saturdays. In the event of it being deemed necessary to undertake works outside these times, it will be necessary to obtain prior written approval from Dublin City Council.

353. Evening, night-time, and Sunday working will be required during certain periods to facilitate piling works at low tide, tunnelling, and HDD activities. The planning of such works will take consideration of sensitive receptors, in particular any nearby residential areas.

354. Construction activities will be scheduled in a manner that reflects the location of the site and the nature of neighbouring properties. Construction activities / plant items will be considered with respect to their potential to exceed CNTs at NSLs and will be scheduled according to their noise level, proximity to NSLs, and possible options for noise control. In situations where an activity with the potential to exceed

CNT is scheduled, other construction activities will be scheduled to not result in significant cumulative noise levels.

Liaison with the public (noise control mitigation)

355. For the CWP Project, the major sources of noise are essentially mobile, and the noise received at any NSL will therefore vary from day to day as the work proceeds. The duration of piling and excavation at one location is usually short in relation to the length of construction work as a whole, and the amount of time spent working near to sensitive areas can represent only a part of the overall period.

356. For night-time works, the residents at NSL29 will be notified of planned works in advance of the work commencement. The notification will include a description of the works, the expected duration of activities likely to generate noise that is potentially significant, as set out in **Chapter 24 Noise and Vibration**, and details of how to contact the contractor to log complaints.

Noise monitoring (noise control mitigation)

357. During the construction phase, the appointed contractor will monitor noise at representative NSLs to evaluate and inform the requirement and / or implementation of noise management measures. Noise will be monitored in accordance with ISO 1996–1 (ISO 2016) and ISO 1996–2 (ISO 2017).

358. The selection of monitoring locations will be based on the closest NSLs to the proposed works which have the potential to exceed the CNT, i.e., at NSL29 to the west of construction compound A.

359. Any Noise Monitoring Terminal (NMT) (number and locations to be agreed post-consent with DCC), to be installed will have the following specifications (or similar approved):

- Logging of two concurrent periods, e.g., 15-minute & hourly.
- Daily automated Charge Injection Calibration (CIC).
- E-mail alert on threshold exceedance.
- E-mail alert on low battery and low memory.
- Remote access to measured data.
- Live display of noise levels.

360. In addition, it is recommended that spot-check noise measurements are conducted on a monthly basis. These spot checks can be organised to coincide with works that have the potential to generate high levels of noise on site in order to confirm the potential extent of effects.

361. A monthly noise-monitoring report should be prepared by the contractor. Reports should identify any exceedances above nominal limit values and attempts to clarify the causes. Where remedial measures are required and identifiable, these should also be clearly stated.

Summary of construction noise impacts post-mitigation

362. A conservative reduction of 5 dB has been applied to construction noise sources to account for the level of noise reduction available by applying by the various noise mitigation measured outlined in the section above.

363. Post-mitigation, none of the daytime, evening or night-time period CNTs are exceeded at the closest NSLs.

364. At the closest residential properties impacted by the works at night (NSL29), the prevailing night-time baseline noise level is 44 dB $L_{Aeq,8\ hr}$.

365. The highest impact at NSL29 during the night-time period will be associated with the onshore export cable works in Impact 4, Scenario 4.1 (launch shaft in Compound A) where the prevailing baseline is more than 5 dB below the mitigated CNL of 50 dB $L_{Aeq,T}$.

366. During Impact 1, Scenario 1 (open cut and cofferdam piling) night-time piling works, the baseline noise environment at NSL29 is 5 dB below the mitigated CNL of 49 dB $L_{Aeq,T}$.

Vibration mitigation measures

367. After review of the likely vibration levels associated with construction activities, it is considered that the construction of the CWP Project is not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or cosmetic damage to buildings.

368. The only exception to the statement above is during the piling works in Impact 10, Scenario 10 where the perimeter wall for the reclaimed section at the onshore substation abuts the Pigeon House harbour wall. This structure will be subject to condition surveys in advance of the construction works commencing at the onshore substation. The results of the condition surveys will determine whether the structure is classed as “vulnerable”, otherwise, the upper value within the range will be used, e.g., 7.5 mm/s.

369. Vibration from construction activities will be limited to the values set out in **Chapter 24 Noise and Vibration** to avoid any form of potential cosmetic damage to buildings and structures.

370. For vibration levels giving rise to human discomfort, in order to minimise such impacts, the following measures shall be implemented during the construction period:

- A clear communication programme will be established by the client to inform adjacent building occupants in advance of any potential intrusive works which may give rise to vibration levels likely to result in significant effects. The nature and duration of the works will be clearly set out in all communication circulars as necessary;
- Activities capable of generating significant vibration effects with respect to human response will be restricted to daytime hours only, as far as practicable; and
- Appropriate vibration isolation shall be applied to plant (such as resilient mounts to pumps and generators), where required and where feasible.

371. Where the piling works take place within 10 m of the Pigeon House harbour wall heritage structure (Impact 10, Scenario 10 of Chapter 24 Noise and Vibration) or any HDD vibration works are proposed within 50_m of vibration-sensitive locations (VSLs) (Impact 11, Scenario 11 of **Chapter 24 Noise and Vibration**), vibration monitoring shall be installed, with the number and locations to be agreed with DCC.

372. Vibration monitoring stations should continually log vibration levels using the Peak Particle Velocity parameter (PPV, mm/s) in the X, Y and Z directions, in accordance with ISO 4866: 2010: Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures.

373. The mounting of the transducer to the vibrating structure will need to comply with BS ISO 5348: 2021: Mechanical vibration and shock – Mechanical mounting of accelerometers.

374. In summary, the following ideal mounting conditions apply:

- The transducer and its mountings should be as rigid as possible;
- The mounting surfaces should be as clean and flat as possible;
- Simple symmetric mountings are best;
- The mass of the mounting should be small in comparison to that of the structure under test;
- The monitoring equipment should be set to monitor vibration in 5-minute periods;

- E-mail alert on threshold exceedance;
- E-mail alert on low battery and low memory;
- Remote access to measured data;
- Live display of vibration levels.

375. In addition, it is recommended that spot-check vibration measurements are conducted on a monthly basis. These spot checks can be organised to coincide with works that have potential to generate high levels of vibration on site in order to confirm the potential extent of effects.

376. A monthly vibration monitoring report should be prepared by the contractor. Reports should identify any exceedances above nominal limit values and attempts to clarify the causes. Where remedial measures are required and identifiable, these should also be clearly stated.

24.10.2 Operational phase

377. Mitigation measures for the O&M phase are set out to ensure that operational noise sources associated with the onshore substation will operate within the relevant noise criteria so that there is no resultant negative impact on nearby NSLs.

Noise mitigation measures

378. During the detailed design of the onshore substation, the selection and location of mechanical and electrical plant will be undertaken in order to ensure the relevant noise emission limits set out in **Chapter 24 Noise and Vibration** are not exceeded.

379. Based on the baseline noise data collected, the limit set is 45 dB $L_{Aeq,15min}$ during daytime periods and 40 dB $L_{Aeq,15min}$ at night at the nearest NSLs, which is also aligned with BS 8233 criteria, outlined in **Table 24-11**. This limit is set in order to achieve acceptable internal noise levels within NSLs based on prevailing noise levels in the area.

380. In addition to selecting plant with suitable noise levels, the following best practice measures are recommended for all plant items in order to minimise potential noise disturbance for adjacent buildings:

- Where ventilation is required for plant rooms, consideration will be given to acoustic louvres or attenuated acoustic vents, where required to reduce noise breakout.
- Ventilation plant serving plant rooms will be fitted with effective acoustic attenuators to reduce noise emissions to the external environment.
- Attenuators or silencers will be installed on external air-handling plant.
- All mechanical plant items, e.g., fans, pumps etc., shall be regularly maintained to ensure that excessive noise generated by any worn or rattling components is minimised.
- Any new or replacement mechanical plant items, including plant located inside new or existing buildings, shall be designed so that all noise emissions from the site do not exceed the noise limits outlined in this document.
- Installed plant will have no tonal or impulsive characteristics when in operation.

381. The maximum tonal penalty of + 6 dB, applied in line with the BS4142 assessment was considered a conservative figure in the absence of octave band data for the onshore substation. During the detailed design stage, when the exact sound power specification is known for the plant items, a revised model and prediction can be carried out to demonstrate that the noise criteria set in the operational phase assessment are not exceeded.

24.11 Cumulative impacts

382. A fundamental component of the EIA is to consider and assess the potential for cumulative effects of the CWP Project with other projects, plans and activities (hereafter referred to as 'other development').

383. **Appendix 24.1** presents the findings of the Cumulative Effects Assessment (CEA) for noise and vibration, which considers the residual effects presented in **Section 24.15** alongside the potential effects of other proposed and reasonably foreseeable other development.

384. A summary of the CEA for noise and vibration is presented below.

24.11.1 Construction phase

385. For the purpose of the cumulative assessment, two scenarios have been considered. The first scenario is a review of the cumulative construction impacts from the CWP Project. The second scenario is a review of approved and proposed developments in the local area which are external to the onshore development area, as summarised in **Appendix 24.1**.

Cumulative CWP noise effects (Impact 1, Scenario 1 and Impact 4, Scenario 4.1)

386. In order to assess the cumulative construction impacts, it has been assumed that Impact 1, Scenario 1 (open cut and cofferdam piling) and Impact 4, Scenario 4.1 (launch shaft in Compound A), operate simultaneously. A list of plant items included in this assessment is presented in **Appendix 24.4**.

387. The predicted cumulative construction noise levels and significance of impact are presented in **Table 24-43** below at each of the closest NSLs.

Table 24-43 Comparison of cumulative predicted construction noise levels with noise threshold limits and predicted significance of effect - (Impact 1, Scenario 1 (open cut and cofferdam piling) and Impact 4, Scenario 4.1 (launch shaft in Compound A)

Receptor			CNT	EPA EIAR significance of effect	
ID	Description	Ambient daytime noise level (dB L_{Aeq})	Weekday day (07:00–19:00)	CNL, dB $L_{Aeq,T}$	Weekday day (07:00–19:00)
NSL01	Hammond Lane Metal Recycling	58	75	50	Not Significant
NSL02	Celtic Anglian Water	58	75	37	Not Significant
NSL03	City Analysts	58	75	40	Not Significant
NSL04	Poolbeg AGI	53	75	49	Not Significant
NSL05	Poolbeg Flexgen	53	75	47	Not Significant
NSL06	Covanta Plant	44	75	66	Moderate
NSL07	Hammond Lane Metal	58	75	51	Not Significant
NSL08	Car Mechanics	58	75	52	Not Significant

Receptor			CNT	EPA EIAR significance of effect	
ID	Description	Ambient daytime noise level (dB L_{Aeq})	Weekday day (07:00–19:00)	CNL, dB $L_{Aeq,T}$	Weekday day (07:00–19:00)
NSL09	ED&F Man Liquid	66	75	59	Not Significant
NSL10	Marine Terminals Limited	60	75	49	Not Significant
NSL11	1st Port of Dublin Ringsend Sea Scouts	60	65	49	Not Significant
NSL12	71-80 Pigeon House Road	60	65	48	Not Significant
NSL13	70 Pigeon House Road	60	65	47	Not Significant
NSL14	Poolbeg Quay Apartments	60	65	49	Not Significant
NSL15	Representative of Dwellings on Leukos Road	60	65	51	Not Significant
NSL16	Representative of Dwellings on Cymric Road	60	65	51	Not Significant
NSL17	Representative of Dwellings on Bremen Road	60	65	50	Not Significant
NSL18	Representative of Dwellings in Bremen Grove	60	65	47	Not Significant
NSL19	Clanna Gael Fontenoy GAA Club	49	65	51	Slight
NSL20	Star of the Sea National School	58	65	50	Not Significant
NSL21	Representative of Dwellings on R802 Beach Road Between R131 and Leahy's Terrace Junction	58	65	49	Not Significant
NSL22	Representative of Dwellings on R802 Beach Road Between Leahy's Terrace and Beach Drive Junction	58	65	52	Not Significant
NSL23	Representative of Dwellings on R802	58	65	53	Not Significant

Receptor			CNT	EPA EIAR significance of effect	
ID	Description	Ambient daytime noise level (dB L_{Aeq})	Weekday day (07:00–19:00)	CNL, dB $L_{Aeq,T}$	Weekday day (07:00–19:00)
	Beach Road Between Beach Drive and Sandymount Court Junction				
NSL24	Representative of Dwellings on R802 Beach Road Between Sandymount Court and Marine Drive Junction	58	65	55	Not Significant
NSL25	Representative of Dwellings on R802 Beach Road Between Marine Drive and Seafort Avenue Junction	58	65	56	Not Significant
NSL26	Sandymount Park Educate Together School	58	65	56	Not Significant
NSL27	Church	58	65	55	Not Significant
NSL28	Representative of Dwellings on R131 Strand Road	58	65	55	Not Significant
NSL29	Representative of Proposed Dwellings on Former Irish Glass Site	66	65	55	Not Significant

388. Considering the cumulative predicted construction noise levels, which included the simultaneous operation of all plant during Impact 1, Scenario 1 (open cut and cofferdam piling) and Impact 4, Scenario 4.1 (launch shaft in Compound A) none of the receivers exceeded the CNT.

389. All residential, educational, places of worship, and recreational receptors with existing baseline noise levels were at least 3 dB higher than the predicted cumulative construction daytime noise levels. The only exception is NSL19 Clanna Gael Fontenoy GAA Club, where the CNL exceeds the baseline noise levels; however, the CNT is not exceeded at NSL19.

Significance of the effect

390. The sensitivity of NSLs in the study area is considered to be high for residential and educational receptors and, as the cumulative CNL does not exceed the CNT, the effect is assessed as neutral, **Not Significant**, and temporary daytime cumulative construction activities, as per the criteria set out in **Table 24-5**.

391. The sensitivity of NSLs in the study area is considered to be high for places of worship and low to medium for recreational spaces and, as the cumulative CNL does not exceed the CNT, the effect is assessed as neutral to negative, **Not Significant** to **Slight**, and temporary for daytime cumulative construction activities, as per the criteria set out in **Table 24-5**. In EIAR terms the effect is not significant as the CNT is not exceeded.

392. The sensitivity of NSLs in the study area is considered to be medium for commercial and low for industrial receptors and, as the cumulative CNL does not exceed the CNT but is above the background daytime noise levels, the effect is assessed as neutral to negative, **Not Significant** to **Moderate**, and temporary daytime cumulative construction activities, as per the criteria set out in **Table 24-5**. In EIAR terms the effect is not significant as the CNT is not exceeded.

393. Based on the predicted level of effect, it is concluded that no additional mitigation is required beyond the additional mitigation described in **Section 24.10.1** due to the sensitivity of the receptors and considering that all predicted construction activities are below the CNT at all NSLs.

Additional mitigation

394. No additional mitigation measures are required.

Residual effect

395. The effects will be neutral to negative, **Not Significant** to **Moderate**, and temporary. The significance of the residual effect is therefore predicted to be not significant in EIA terms, i.e., CNT will not be exceeded.

Developments in the local area (Impact 1 to 6)

396. In order to assess the cumulative impacts, it has been assumed that there would be an increase in predicted construction noise levels by no more than 3 dB when compared to the CNL values presented in **Table 24-34** and **Table 24-43** previously. While a 3 dB increase is a doubling of sound energy, subjectively, any change in noise level below 3 dB would be barely perceptible.

397. Taking a review of the local development in the area (detailed further in **Appendix 24.1**), a 3 dB increase (maximum doubling of plant items) is based on the practical number of plant and equipment items that could be reasonably assumed at the closest boundaries of the works to the NSLs. The construction activities at the closest site to the NSL will be the dominant noise source, with very little contribution from sites at greater distances from the NSL, i.e., where the contribution from the specific phase is more than 10 dB below noise contribution from the closest phase to the NSL.

398. Given the explanation above, due to the distance between the proposed development and the granted / proposed developments in the local area, it is not anticipated that there will be any significant cumulative impacts on noise and vibration at nearby NSLs during the construction phase of the developments. Further details of the cumulative assessment are presented in **Appendix 24.1**.

Significance of the effect

399. With the doubling of construction noise levels by 3 dB, the closest NSLs remain below the daytime CNT.

400. The sensitivity of NSLs in the study area is considered to be high for residential receptors and educational receptors. As the cumulative CNL does not exceed the CNT, the effect is assessed as neutral, **Not Significant**, and temporary for daytime cumulative construction activities, as per the criteria set out in **Table 24-5**.

401. The sensitivity of NSLs in the study area is considered to be high for places of worship and low to medium for recreational spaces and, as the cumulative CNL does not exceed the CNT, the effect is assessed as neutral to negative, **Not Significant** to **Slight**, and temporary for daytime cumulative construction activities, as per the criteria set out in **Table 24-5**. In EIAR terms, the effect is not significant as the CNT is not exceeded.

402. The sensitivity of NSLs in the study area is considered to be medium for commercial and low for industrial receptors and, as the cumulative CNL does not exceed the CNT but is above the background daytime noise levels, the effect is assessed as neutral to negative, **Not Significant** to **Moderate**, and temporary for daytime cumulative construction activities, as per the criteria set out in **Table 24-5**. In EIAR terms, the impact is not significant as the CNT is not exceeded.

Additional mitigation

403. No additional mitigation measures are required. Nonetheless, it is recommended that liaison between construction sites is on-going for the duration of the construction phase. Contractors should schedule work in a co-operative effort to limit the duration and magnitude of potential cumulative impacts on nearby NSLs.

Residual effect

404. The effects will be neutral to negative, **Not Significant** to **Moderate**, and temporary. The significance of the residual effect is therefore predicted to be not significant in EIA terms, i.e., CNT will not be exceeded.

24.11.2 O&M phase (Impact 14a / 14b)

405. In **Section 24.9.3** the CWP WTG (Option A / Option B) predicted that noise levels at the closest NSL to the array site would be below the 35 dB L_{A90} study area for background noise surveys.

406. Based on a CWP WTG Option B operational phase noise level of 31 dB L_{A90}, any predicted noise level above 32 dB L_{A90}, due to any other OWF in its own right, could theoretically and cumulatively result in a noise level above 35 dB L_{A90} when considered in conjunction with the proposed CWP OWF development.

407. From a review of the two other OWF developments in the area (detailed further in **Appendix 24.1**) further consideration of the cumulative effect of both windfarms is outlined in the sections below.

Cumulative Assessment of CWP WTG with Dublin Array (DA) WTG (CEA-0037)

408. The closest common receiver to the CWP OWF and DA OWF is CWP/DA WTG NSL01 (Easting 729,717, Northing 712,544 ITM Ref.)

409. As per the Danish methodology outlined in Paragraph 69 and assuming downwind conditions at rated power for both OWF, the predicted cumulative WTG operational phase noise level at the common onshore NSL is predicted to be 34 dB L_{A90} at CWP/DA WTG NSL01.

410. Further details of the cumulative assessment are presented in **Appendix 24.1**.

Significance of the effect

411. As the predicted noise levels for either option remain below the 35 dB L_{A90} threshold, there is no change in the CWP and DA WTGs cumulative assessment in comparison to the effects presented in **Section 24.9.3**.

Additional mitigation

412. No WTG mitigation measures are required.

Residual effect

413. The cumulative magnitude of effect will be negative, **Not Significant**, and long-term. The significance of the residual effect is therefore predicted to be not significant in EIA terms.

Cumulative Assessment of CWP WTG with Arklow Bank (AB) WTG (CEA-0004)

414. The closest common receiver to the CWP WTGs and AB WTGs is CWP/AB WTG NSL01 (Easting 733,317, Northing 690,867 ITM Ref.)

415. As per the Danish methodology outlined in Paragraph 69 and assuming downwind conditions at rated power for both OWF, the predicted cumulative WTG operational phase noise level at the common onshore NSL is predicted to be 34 dB L_{A90} at CWP/AB WTG NSL01.

416. Further details of the cumulative assessment are presented in **Appendix 24.1**.

Significance of the effect

417. As the predicted noise levels for either option remain below the 35 dB L_{A90} threshold, there is no change in the CWP and AB WTGs cumulative assessment in comparison to the effects presented in **Section 24.9.3**.

Additional mitigation

418. No WTG mitigation measures are required.

419. The WTG eventually selected for installation on site will not give rise to noise levels of greater significance than those used for the purposes of this cumulative assessment, to ensure the findings of this assessment remain valid.

Residual effect

420. The cumulative magnitude of effect will be negative, **Slight** to **Moderate**, and long-term. The significance of the residual effect is therefore predicted to be not significant in EIA terms.

24.11.3 O&M phase (Impact 15)

421. For the onshore substation, the closest predicted rating levels and background sound levels from the O&M activities were at NSL25, where the rating level was 23 dB $L_{AR,T}$ and the background sound level at night-time was 40 dB L_{A90} (as shown in **Table 24-42**).

422. Taking a review of the local development in the area (detailed further in **Appendix 24.1**) and given that the propagation of sound over distance at each of the developments is at least 250 m from NSL25, it has been calculated that each of the other developments will have a noise contribution at NSL25 that does not exceed 30 dB $L_{AR,T}$.

423. The predicted cumulative rated noise level is 37 dB $L_{AR,T}$ at NSL25 during the night-time period, which is below the background sound level at night-time of 40 dB L_{A90}.

424. Further details of the cumulative assessment are presented in **Appendix 24.1**.

Significance of the effect

425. With the addition of the local developments in the area, the closest NSLs cumulative rated noise levels will still remain below the background noise levels presented in **Table 24-42**.

426. The resultant cumulative effect is neutral, **Imperceptible**, and long-term (as per the matrix in **Table 24-13**).

427. It should be noted that for the BS4142 assessment, a maximum tonal penalty of + 6 dB was considered as a conservative figure in the absence of octave band data. During the detailed design stage, when the exact sound power specification is known for the plant items, a revised model and prediction can be carried out to demonstrate that the noise criteria set in **Table 24-11** and **Table 24-12** are not exceeded.

Additional mitigation

428. In order to ensure that the predicted operational noise levels at the nearest NSLs are achieved, the following mitigation measures will be employed during the detailed design stage.

429. During the detailed design of the onshore substation, the mechanical and electrical plant will be selected and located in order to ensure that the noise emission limits will be designed / attenuated to meet the relevant BS 4142 noise criteria for daytime and night-time periods as set out in this assessment.

430. Further detail on mitigation measures are outlined in **Section 24.10.2**.

Residual effect

431. The significance of the residual effect is therefore predicted to be neutral, **Imperceptible**, and long-term, which is not significant in EIA terms.

24.12 Transboundary impacts

432. There are no transboundary impacts with regard to noise and vibration as the onshore development area would not be sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of this assessment and are not considered further.

24.13 Inter-relationships

433. The inter-related effects assessment considers the potential for all relevant effects across multiple topics to interact, spatially and temporally, to create inter-related effects on a receptor group. This includes incorporating the findings of the individual assessment chapters to describe potential additional effects that may be of greater significance when compared to individual effects acting on a receptor group

434. The term 'receptor group' is used to highlight the fact that the proposed approach to the inter-relationship assessment has not assessed every individual receptor considered in this chapter, but instead focuses on groups of receptors that may be sensitive to inter-related effects.

435. **Chapter 5 EIA Methodology** provides a matrix to show at a broad level where, across the EIAR, interactions between effects on different receptor groups have been identified.

436. The potential inter-related effects that could arise in relation to noise and vibration are presented in **Table 24-44.**

Table 24-44 Inter-related effects (phase) assessment for noise and vibration

Impact / receptor	Related chapter	Phase assessment
Impact due to construction, O&M, and decommissioning road traffic emissions.	**Chapter 27 Traffic and Transport**	Increased traffic movements during the construction, operational, and decommissioning phases have the potential to increase existing ambient noise levels. A detailed assessment of these impacts has been presented for construction traffic in **Section 24.9.1** and no significant effects on NSLs are predicted. O&M and decommissioning traffic has been scoped out, as per **Section 24.6.** Therefore, it is not anticipated that any inter-related effects on ambient noise levels from traffic and transport will be produced that are of greater significance than those already identified.

24.14 Potential monitoring requirements

437. No monitoring is required in relation to noise and vibration.

24.15 Impact assessment summary

438. This chapter of the EIAR has assessed the potential environmental impacts on noise and vibration from the construction, O&M, and decommissioning phases of the CWP Project. Where significant

impacts have been identified, additional mitigation has been considered and incorporated into the assessment.

439. This section, including **Table 24-45**, summarises the impact assessment undertaken and confirms the significance of any residual effects, following the application of additional mitigation.

24.15.1 Construction phase impact summary

440. The onshore construction noise (Impacts 1 to 6) are assessed as negative, **Not Significant** to **Moderate**, and temporary for all construction activities. This is based on the highest predicted CNL being presented in **Table 24-34** and **Table 24-35** for each NSL. The only exception to this statement is NSL29.

441. During the proposed evening and night-time works in Impact 1, Scenario 1 (open cut and cofferdam piling) and Impact 4, Scenario 4.1 (launch shaft in Compound A), the effect at NSL29 is assessed as negative, **Moderate** to **Significant**, and temporary. Therefore, additional mitigation is required during night-time construction activities. Particular emphasis is given to localised screening around high noise level plant items.

442. With the adoption of the additional mitigation measures, the predicted CNL at NSL29 is below the CNT. Therefore, the residual effects will be neutral to negative, **Not Significant** to **Moderate**, and temporary.

443. The onshore construction vibration risks of cosmetic damage to buildings (Impacts 7 to 11) are assessed as neutral, **Not Significant**, and temporary for all construction activities. The only exception to this statement is the Pigeon House harbour wall heritage structure in Impact 10, Scenario 10, in which piling works are taking place directly adjacent to the structure.

444. As the structural condition of the heritage structure is currently unknown, the most conservative vibration criteria of 3 mm/s PPV has been selected for the purpose of impact assessment. Within 6 m of the heritage structure, the effects are negative, **Significant**, and temporary.

445. With the addition of additional mitigation measures, including a condition survey and monitoring, the magnitude of effect will be negative, **Not Significant**, and temporary at the heritage structure, provided the piling works operate below all applicable thresholds for cosmetic damage to buildings.

446. The vibration effects for building occupants during construction activities are neutral, not significant, and temporary at the closest residential and industrial receptors. The exceptions to this statement are during the ESBN cable HDD works between 55m and 125m of the closest industrial receptors, which are negative, **Slight** to **Moderate**, and temporary and between 25m to 55m of the closest industrial receptors, which are negative, moderate to significant, and temporary.

447. With the adoption of the additional mitigation measures, the magnitude of effect will be neutral to negative, **Not Significant** to **Moderate**, and temporary based on human response to vibration. The construction vibration risks of cosmetic damage to buildings are below all applicable thresholds for cosmetic damage to buildings.

448. The construction traffic noise (Impact 12, Scenario 12) is below the CNT for all NSLs. The significance of effect is assessed as negative, **Not Significant**, and short term. No mitigation measures are required.

449. During the WTG monopiling construction (Impact 13), the significance of effect is assessed as negative, **Not Significant**, and temporary. This is determined as the predicted WTG monopiling CNL, at the closest onshore NSL, is more than 10 dB below the most conservative CNT, as per the criteria set out in **Table 24-4**. No monopiling construction mitigation measures are therefore required.

24.15.2 O&M phase impact summary

450. Operational noise from WTGs (Impact 14a and 14b) are predicted to be below 35 dB L_{A90} at the closest onshore NSL. Based on IOA guidance, the predicted noise levels are below the minimum study area and no further assessment is required. No WTG mitigation measures are required.

451. Operational noise from the onshore substation plant is predicted to be within the BS8233 adopted criteria at all residential NSLs. For the BS4142 assessment, the rating level is significantly below the existing background noise levels during all periods at the closest residential NSLs. The resultant effect is neutral, **Imperceptible**, and long term.

452. During the detailed design of the onshore substation, the mechanical and electrical plant will be selected and located in order to ensure that the noise emission limits will be designed / attenuated to meet the relevant BS 4142 noise criteria for daytime and night-time periods as set out in this assessment. With the adoption of the additional mitigation measures, the magnitude of effect will be neutral, **Imperceptible**, and long term.

24.15.3 Decommissioning phase impact summary

453. Decommissioning activities are not anticipated to exceed the construction phase representative scenario and have been summarised in **Section 24.15.1**.

Table 24-45 Summary of potential impacts and residual effects

Potential impact	Receptor	Receptor sensitivity	Significance of effect	Additional mitigation	Residual effect
Construction phase					
Impact 1 to 6: Construction noise associated with OTI and OfTI (intertidal area)	NSLs	Low to high	Negative, **Not Significant** to **Significant**, and temporary (ranges from Not Significant - Significant)	In line with DCC GPG mitigation measures	Neutral to negative, **Not Significant** to **Moderate**, and temporary (Not Significant)
Impact 7 to 11: Construction vibration associated with OTI and OfTI (intertidal area)	VSRs (cosmetic damage to buildings)	Low to high	Neutral to negative**, Not Significant** to **Significant**, and temporary (ranges from Not Significant - Significant)	Condition survey on Pigeon House harbour wall heritage structure. In line with DCC GPG mitigation measures.	Neutral to negative, **Not Significant**, and temporary (Not Significant)
	VSRs (Human response to vibration)	Low to high	Neutral to negative, **Not Significant** to **Significant**, and temporary (ranges from Not Significant - Significant)	In line with DCC GPG mitigation measures.	Neutral to negative, **Not Significant** to **Moderate**, and temporary (Not Significant)
Impact 12: Temporary road traffic noise level at NSLs due to construction traffic	NSLs	Low to high	Negative, **Not Significant**, and short term (Not Significant)	None required	Negative, **Not Significant**, and short term (Not Significant)

Potential impact	Receptor	Receptor sensitivity	Significance of effect	Additional mitigation	Residual effect
Impact 13: Temporary noise level at onshore NSLs associated with the WTG monopiling	NSLs	Low to high	Negative, **Not Significant**, and temporary (Not Significant)	None required	Negative, **Not Significant**, and temporary (Not Significant)
Operation and Maintenance					
Impact 14a: Permanent noise level at onshore NSLs associated with the WTG (Option A)	NSLs	Low to high	As the predicted noise levels for either option are below the 35 dB L_{A90} threshold, there is no further consideration of operational noise from the WTGs. (Not Significant)		
Impact 14b: Permanent noise level at onshore NSLs associated with the WTG (Option B)	NSLs	Low to high			
Impact 15: Permanent noise level at NSLs associated with the onshore substation operational plant	NSLs	Low to high	Neutral, **Imperceptible** and long-term (Not Significant)	During the detailed design of the development, the mechanical and electrical plant will be selected and located in order to ensure the noise emission limits set out above are not exceeded.	Neutral, **Imperceptible**, and long term (Not Significant)
Decommissioning					

Potential impact	Receptor	Receptor sensitivity	Significance of effect	Additional mitigation	Residual effect
Impact 16 to 18: Decommissioning activities	Decommissioning activities are not anticipated to exceed the construction and O&M phases, which have been assessed above. (Not Significant)				

24.16 References

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455. BS 5228 (2009 +A1 2014) Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (hereafter referred to as BS 5228 – 2) (BSI 2009 +A1 2014b);

456. BS 7385 (1993) Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (hereafter referred to as BS 7385 – 2). (BSI 1993);

457. BS 6472 (2008) Guide to Evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting (hereafter referred to as BS 6472 – 1). (BSI 2008);

458. BS 8233:2014 Sound Insulation and Noise Reduction for Buildings (hereafter referred to as BS 8233 (BSI 2014);

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460. BS ISO 5348: 2021 Mechanical vibration and shock. Mechanical mounting of accelerometers.

461. Department of Trade & Industry (UK) Energy Technology Support Unit (ETSU) publication The Assessment and Rating of Noise from Wind Farms (Department of Trade & Industry (UK), 1996);

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468. Environmental Protection Agency (EPA), Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (hereafter referred to as EPA NG4) (EPA, 2016);

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470. Institute of Acoustics (IoA) document A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (IOA, 2013);

471. Institute of Environmental Management and Assessment (IEMA) Guidelines for environmental noise impact assessment (IEMA, 2014);

472. International Organization for Standardization (ISO) 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation (hereafter referred to as ISO 9613 – 2) (ISO 1996);

473. ISO 4866:2010 Mechanical vibration and shock — Vibration of fixed structures — Guidelines for the measurement of vibrations and evaluation of their effects on structures (hereafter referred to as ISO 4866) (ISO, 2010);

474. ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures (hereafter referred to as ISO 1996 – 1) (ISO 2016);

475. ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels (hereafter referred to as ISO 1996 – 2) (ISO 2017);

476. Thysell, E., Egedal, R., Søndergaard, L.S., Thomsen, C., Sørensen, T., Bertagnolio, F, Fischer, A., 2023. High resolution analysis of measurements, and comparison of models for long distance noise propagation over water for an elevated height-adjustable sound source. In the Proceedings of INCE Europe Wind Turbine Noise 2023 conference, Trinity College Dublin, Ireland.

477. Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1 (hereafter referred to as the TII Noise Guidelines 2004) (TII 2004); and

478. World Health Organization (WHO) Environmental Noise Guidelines for the European Region (hereafter referred to as WHO Environmental Noise Guidelines) (WHO 2018).