Fosterstown 110kV/20MW Distribution Substation Planning & Environmental Considerations Report (Appendices)

Submission to: An Coimisiún Pleanála

Date: 18 July 2025

Document No.: PE595-F2451-R451-007

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Appendix A – An Bord Pleanála SID Determination (October 2023)

Our Case Number: ABP-317654-23

An Bord Pleanála

The Electricity Supply Board (ESB)
c/o Brendan Allen, Planning Team Leader,
ESB Engineering and Major Projects (ESB EMP),
One Dublin Airport Central, Dublin Airport,
Cloghran,
Co. Dublin
K67 XF72

Date: 26 October 2023

Re: Proposed development of 110kV/MV distribution station.
Fosterstown, approximately 3 km south of Trim, County Meath.

Dear Sir / Madam,

Please be advised that following consultations under section 182E of the Planning and Development Act 2000, as amended, the Board hereby serves notice that it is of the opinion that the proposed development falls within the scope of section 182A of the Planning and Development Act 2000, as amended. Accordingly, the Board has decided that the proposed development would be strategic infrastructure within the meaning of section 182A of the Planning and Development Act 2000, as amended. Any application for approval for the proposed development must therefore be made directly to An Bord Pleanála under section 182A(1) of the Act.

Please also be informed that the Board considers that the pre-application consultation process in respect of this proposed development is now closed.

The following is a list of prescribed bodies to be notified of the application for the proposed development.

- Minister for Housing, Local Government and Heritage.
- Minister for Environment, Climate and Communications.
- Commission for Regulation of Utilities.
- Meath County Council

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• Transport Infrastructure Ireland

• The Heritage Council

• An Taisce

• Inland Fisheries Ireland

• Health and Safety Authority

Further notifications should also be made where deemed appropriate.

In accordance with section 146(5) of the Planning and Development Act 2000, as amended, the Board will make available for inspection and purchase at its offices the documents relating to the decision within 3 working days following its decision. This information is normally made available on the list of decided cases on the website on the Wednesday following the week in which the decision is made.

In accordance with the fees payable to the Board and where not more than one pre-application meeting is held in the determination of a case, a refund of €3,500 is payable to the person who submitted the pre-application consultation fee. As only one meeting was required in this case, a refund of 3,500 will be sent to you in due course.

The following contains information in relation to challenges to the validity of a decision of An Bord Pleanála under the provisions of the Planning and Development Act, 2000, as amended.

Judicial review of An Bord Pleanála decisions under the provisions of the Planning and Development Acts (as amended).

A person wishing to challenge the validity of a Board decision may do so by way of judicial review only. Sections 50, 50A and 50B of the Planning and Development Act 2000 (as substituted by section 13 of the Planning and Development (Strategic Infrastructure) Act 2006, as amended/substituted by sections 32 and 33 of the Planning and Development (Amendment) Act 2010 and as amended by sections 20 and 21 of the Environment (Miscellaneous Provisions) Act 2011) contain provisions in relation to challenges to the validity of a decision of the Board.

The validity of a decision taken by the Board may only be questioned by making an application for judicial review under Order 84 of The Rules of the Superior Courts (S.I. No. 15 of 1986). Sub-section 50(7) of the Planning and Development Act 2000 requires that subject to any extension to the time period which may be allowed by the High Court in accordance with subsection 50(8), any application for judicial review must be made within 8 weeks of the decision of the Board. It should be noted that any challenge taken under section 50 may question only the validity of the decision and the Courts do not adjudicate on the merits of the development from the perspectives of the proper planning and sustainable development of the area and/or effects on the environment. Section 50A states that leave for judicial review shall not be granted unless the Court is satisfied that there are substantial grounds for contending that the decision is invalid or ought to be quashed and that the applicant has a sufficient interest in the matter which is the subject of the application or in cases involving environmental impact assessment is a body complying with specified criteria.

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Section 50B contains provisions in relation to the cost of judicial review proceedings in the High Court relating to specified types of development (including proceedings relating to decisions or actions pursuant to a law of the state that gives effect to the public participation and access to justice provisions of Council Directive 85/337/EEC i.e. the EIA Directive and to the provisions of Directive 2001/12/EC i.e. Directive on the assessment of the effects on the environment of certain plans and programmes). The general provision contained in section 50B is that in such cases each party shall bear its own costs. The Court however may award costs against any party in specified circumstances. There is also provision for the Court to award the costs of proceedings or a portion of such costs to an applicant against a respondent or notice party where relief is obtained to the extent that the action or omission of the respondent or notice party contributed to the relief being obtained.

General information on judicial review procedures is contained on the following website, www.citizensinformation.ie.

Disclaimer: The above is intended for information purposes. It does not purport to be a legally binding interpretation of the relevant provisions and it would be advisable for persons contemplating legal action to seek legal advice.

If you have any queries in the meantime, please contact the undersigned officer of the Board or email sids@pleanala.ie quoting the above mentioned An Bord Pleanála reference number in any correspondence with the Board.

Yours faithfully,

PP EGM

Niamh Hickey
Executive Officer
Direct Line: 01-8737145

VC11A

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Appendix B - Engineering Services Report

Fosterstown 110 kV GIS Substation

ESB Networks

Engineering Services Report

Document No.: PE595-F2451-R451-005-000

Date: July 2025

Engineering and Major Projects, One Dublin Airport Central, Dublin Airport, Cloghran, Co. Dublin, K67 XF72, Ireland.

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File Reference:	PE595-F2451-R451-005-000	
Client / Recipient:	ESB Networks	
Project Title:	Fosterstown 110 kV Substation	
Report Title:	Engineering Services Report	
Report No.:	PE595-F2451-R451-005-000	
Revision No.:	000	
Prepared by:	Harry Griffin	Date: July 2025
Title:	Senior Team Lead, Water & Geospatial	
Verified by:	Deirdre Ryan	Date: July 2025
Title:	Senior Civil Engineer	
Approved by:	Sarah Donnelly	Date: July 2025
Title:	Project Manager	

Template Used: T-020-017-Engineering and Major Projects Report Template

Change History of Report

Date	New Revision	Author	Summary of Change

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1 Introduction

1.1 Project Background

In accordance with Section 182A of the Planning and Development Act 2000, as amended, the Electricity Supply Board (ESB) gives notice of its intention to make an application for approval to An Coimisiún Pleanála in relation to proposed development of c. 2.2 ha site on the R160, Carberstown, Trim, Co. Meath, described below.

The proposed development will consist of the construction of a 110 kV / 20MV electrical substation and will include the following elements:

1. Demolition of an agricultural hay shed;
2. Construction of:
   a) a substation compound (c. 4,340sq.m.) with c.2.6 m high palisade perimeter fencing;
   b) a seven bay 110 kV Gas Insulated Switchgear (GIS) building (c. 707sq.m.; c. 13m in height);
   c) two 110 kV Double Circuit Overhead Line End Masts (c. 16 m in height) and associated outdoor electrical equipment to facilitate underground cable connections between the existing transmission circuit and the proposed GIS building;
   d) two 110 kV transformers in transformer bays (c. 4.6 m in height) with associated electrical equipment;
   e) an internal access road (c. 6 m wide); and
   f) All other associated and ancillary site development works including the provision of site services; fencing; gates; lighting; temporary construction compound and temporary overhead line tower to facilitate line diversion; new access from the R160; drainage; and hedgerow removal.

The proposed development is illustrated on drawing No. PE492-D282-016-004-001 in Appendix A.

This Engineering Services Report (ESR) provides details on the foul and surface water drainage proposals in addition to the proposed water supply for the development.

1.2 Site of Proposed Development

1.2.1 Site Location

The Fosterstown 110 kV Substation is located in the Carberrystown area approx. 3 km southwest along the R160 from Trim, Co. Meath. The substation is accessed via an existing entrance gateway off a small laydown area, located adjacent to the R160.

The substation is immediately bound by rural agricultural land in every direction, five plots of private residential land lie opposite the site entrance to the southeast along the R160. The surrounding area is generally rural agricultural lands.

1.2.2 Site Topography

A topographical survey (see Appendix C: Topographic Survey) was undertaken in June 2023.

The site is relatively flat with a gentle slope west to east. The level at the centre of the site is approx. 61.81 mAOD (note all levels are to Ordnance Datum Malin Head. Site levels range from approx. 60.36 mAOD at the north-eastern boundary to 62.45 mAOD at the western side.

Figure 1-1: General Site Location

Figure 1-1: Proposed Site Boundary

2 Surface Water

2.1 Existing Surface Water Drainage

A site visit was undertaken in June 2023. The only drainage feature observed within the site boundary of the proposed development is 75 m to the southeast of the proposed compound boundary running perpendicular to the proposed access road. There is no existing surface water infrastructure located along the R160 fronting the site.

There are two established drainage ditches located to the north and east of the site as shown in Figure 2-1. These drainage ditches converge from the west and east before continuing south as a single drainage ditch. This drainage ditch flows into the Moynasboy stream before then discharging to the Knightsbrook river.

Figure 2-1: Map Showing Existing Watercourses

2.2 Proposed Surface Water Drainage

2.2.1 Surface Water Drainage Proposals

The surface water drainage proposals for the proposed electrical substation have been developed to mimic the natural drainage patterns of the site and in accordance with Sustainable Drainage Systems (SuDS). The surface water proposals replicate greenfield drainage conditions where possible.

In the absence of site investigations, desk study information from Geology Survey Ireland (GSI) suggests deep well drained mineral soil which is likely composed mainly of sand with silt and clay. A site investigation is to be undertaken prior to detailed design, which will include soakaway tests in accordance with BRE Digest 365. A soakaway is currently

proposed for the development. The use of a soakaway will be confirmed during detailed design following receipt of the site infiltration test results. Should the ground conditions be unsuitable for a soakaway, an alternative surface water drainage proposal will be developed. It is noted that there are existing ditches located to east and north of the main site boundary where the substation is proposed. These would provide a means for discharging surface water to greenfield conditions if a soakaway is not a feasible option.

Drainage from the proposed substation development will be collected on site in a dedicated drainage network and will discharge to the proposed soakaway. The soakaway will be located in the northeast corner of the proposed development site. The volume of the soakaway will be determined during detailed design upon completion of the site infiltration tests. The preliminary estimate of infiltration rate is $1x10^{-5}$ m/s assuming sandy soil with clay and silt. Rainfall data from Met Éireann has been supplemented by a 20% climate change allowance to provide preliminary sizing requirements for the soakaway.

The two bunded transformers will be drained by new surface water sewers which will convey the runoff to the soakaway. The transformer bunds will incorporate an Entexol SCS001 (or equivalent) oil sensitive bund dewatering system in addition to an Entexol SCS002 (or equivalent) integrated full retention oil separator.

The new access road within the site will drain to the adjacent compound stone. This will then either infiltrate to ground or will evaporate as it would on a greenfield site.

All runoff will pass through a catchpit before flowing through the proposed soakaway system to catch any fines and sediment.

The remainder of the compound area of the substation will comprise a permeable surface consisting of 50 mm single sized clean compound stone. The permeable compound stone will provide a means of attenuating runoff in these areas and will then either infiltrate to ground or will evaporate as it would on a greenfield site.

The surface water drainage proposals are illustrated on drawing No. PE492-D282-016-005-000 in Appendix B.

2.3 Water Quality

The quality of the surface water discharge from the site was considered during the development of the drainage proposals.

The Greater Dublin Regional Code of Practice V6, under the General Requirements for Bunding of Storage Tanks (Section 17.1.4) states that, "*Rainwater may only be removed from a bund by means of manual removal or a non-automatic pumping arrangement".* The proposed electrical transformers and oil tanks are oil filled equipment and as such are placed within impermeable bunds. In order to provide for treatment of surface water generated in the transformer bunds, it is proposed to install an Entexol SCS001 (or equal and approved) oil sensitive bund dewatering system. A 1 l/s low shear vortex pump with oil

separation detection will be fitted within each bund containing oil-filled equipment in accordance with the Greater Dublin Regional Code of Practice V6. This system will ensure only non-contaminated water enters the site drainage network.

The bund dewatering system will be fitted with a high oil level alarm and will be connected back to the station control panel which is connected to a manned control centre via the station's SCADA telecom relay system.

It should be noted that an oil leak from an electrical transformer is an extremely rare occurrence. Such a leak will result in an electrical fault which will be notified to the transmission system operator and attended to on site by trained operatives immediately.

3 Foul Water

3.1 Existing Foul Water Drainage

There are currently no foul water services within the boundary of the proposed site or in the adjacent public road.

3.2 Proposed Foul Water Drainage

It is proposed to discharge foul water generated by the welfare facilities in the substation building to an underground foul water holding tank. A new foul sewer is proposed to convey wastewater to the underground holding tank which is proposed to be located to the north-east of the site.

3.3 Foul Water Volumes

The foul drainage proposals must cater for the wastewater generated in the welfare facilities of the proposed development. These welfare facilities include for one toilet (WC) and one wash hand basin (WHB) in the north eastern side of the GIS substation building, In addition there are to be two eye wash stations, one in the control room and one in the entrance lobby in the west of the building.

The proposed development will generate small quantities of foul waste. The facility will typically be unmanned. As such, the quantities of foul waste generated will therefore be low.

There will be visits to the site for scheduled and unscheduled inspections, maintenance and repairs as necessary. A two-person crew visiting site for three days a week would be the most that would be expected on the site.

The calculated Population Equivalent (PE) for foul loading is estimated at 45 litres per day. This is consistent with the recommended wastewater loading for industrial sites that are part time, as per Uisce Éireann code of practice. This equates to 14,040 litres per annum. While such a consistently high visitation rate is unlikely, there is the possibility of increased numbers of staff being present on site for short durations of one to two weeks for the commissioning of electrical elements of the site from time to time. It is considered that these irregular occurrences would balance with the ordinary operation of the unmanned site to produce a maximum of 14,040 litres of foul waste per annum.

It is common for much lower usage of the facilities on unmanned facilities and therefore a much lower foul loading. A common problem on such unmanned stations is odours in the toilet areas due to the water trap in the WC drying out through evaporation from the lack of use. For this reason, it is proposed to use self-flushing toilets in the station, which would flush automatically twice per week. The station will include one 6 litre flush WC so a minimum weekly foul flow of 12 litres can be expected from this. The self-flushing WC together will therefore contribute 624 litres per annum.

Combining the automatic flush and maximum user demand figures would result in a maximum annual generation of 14,664 litres of foul water.
A 2,500-gallon (11.36 m^3) round Carlow Concrete foul water holding tank (or equal approved) is proposed for the development. This will be emptied at 6-month intervals by a licensed waste contractor. A high-level alarm shall be fitted to indicate when the tank is approaching capacity.

4 Water Supply

4.1 Existing Water Supply

There is currently no water supply within the site of the proposed development. There is a public water main in the main road to the southeast of the site.

4.2 Water Supply Proposals

The water supply servicing the WC will be provided via a rainwater harvesting storage tank system. Rainfall will be collected and brought to a storage holding tank. The system will include leaf filters, a pumped supply to the 110kV building as well as a water UV steriliser system before supplying the WC cisterns and wash hand basins.

The harvesting tank will be topped up using the rainfall collected from the 110kV building roof. A high-level inflow pipe to the 1000 l storage tank will be provided connecting to the storm water outfalls from the rainwater downpipes. The average annual rainfall for the area based on Met Eireann data is approximately 804 mm. Half the roof area of the 110kV building is 370 m^2. Allowing for a reduction of 20% due to water loss, this equates to a potential water supply of 370 x 0.804 x 0.8 x 1000 = 237,984 litres / year for the storage tank.

The estimated water demand will replicate the foul water volumes, i.e. 14,664 litres per year. Comparing this demand against the above calculated yield provides a potential supply of 16 times the demand for the buildings. However, as the system will not have any access to a mains water supply for top up, it is important that the system is oversized to ensure a supply is available all year round.

In the event of a drought period, the 1000 l storage tank will facilitate the conservatively estimated usage for a 3.5-week period (1000 l / 282l/wk). Note that just 3.4 mm rainfall across the roof space draining to the tank is all that would be required to replenish the tank when empty.

Appendix A: Proposed Development

- Drawing No. PE492-D282-016-004-(latest revision) Proposed Site Layout

Appendix B: Surface Water Drainage Proposals

- Drawing No. PE492-D282-016-005-(latest revision) Proposed Drainage Layout
- Drawing No. PE492-D282-016-013-(latest revision)Typical Drainage Details

Appendix C: Topographic Survey

• Drawing No. PE492-D282-016-003-002 – Existing Site Layout

Appendix C – Flood Risk Assessment

Fosterstown 110 kV Substation

Flood Risk Assessment

Document No.: PE595-F2451-R451-004-000

Date: July 2025

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File Reference:	PE595-F2304-R304	
Client / Recipient:	ESB Networks	
Project Title:	Fosterstown 110 kV Substation Flood Risk Assessment	
Report Title:	Flood Risk Assessment	
Report No.:	PE595-F2451-R451-005-000	
Revision No.:	000	
Prepared by:	Harry Griffin	Date: July 2025
Title:	Senior Team Lead, Water & Geospatial	
Verified by:	Deirdre Ryan	Date: July 2025
Title:	Senior Civil Engineer	
Approved by:	Sarah Donnelly	Date: July 2025
Title:	Project Manager	

Template Used: T-020-017-Engineering and Major Projects Report Template

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1 Introduction

This Flood Risk Assessment has been prepared to address the proposed works to construct a 110 kV Substation. The substation is to be constructed on a greenfield site and will be an asset owned by ESB.

The proposed development will consist of the construction of a 110 kV / 20MV electrical substation and will include the following elements:

1. Demolition of an agricultural hay shed;
2. Construction of:
    a. a substation compound (c. 4,340 sq.m.) with c.2.6 m high palisade perimeter fencing;
    b. a seven bay 110 kV Gas Insulated Switchgear (GIS) building (c. 707 sq.m.; c. 13 m in height);
    c. two 110 kV Double Circuit Overhead Line End Masts (c. 16 m in height) and associated outdoor electrical equipment to facilitate underground cable connections between the existing transmission circuit and the proposed GIS building;
    d. two 110 kV transformers in transformer bays (c. 4.6 m in height) with associated electrical equipment;
    e. an internal access road (c. 6 m wide); and
3. All other associated and ancillary site development works including the provision of site services; fencing; gates; lighting; temporary construction compound and temporary overhead line tower to facilitate line diversion; new access from the R160; drainage; and hedgerow removal.

Please refer to Proposed Site Layout Drawing (No. PE492-D282-016-004-001) in Appendix A for details. Note all levels are to Ordnance Datum Malin Head.

The substation site will be surfaced with a clean single sized stone with the exception of the new access road which will be a concrete surface. The substation will be bounded by a palisade fence and an outer post and rail fence.

This Flood Risk Assessment was prepared in accordance with *'The Planning System and Flood Risk Management - Guidelines for Planning Authorities*' issued by the Department of Environment, Heritage and Local Government in November 2009. Flood risk from fluvial, coastal, surface water and groundwater sources has been assessed based on existing available information.

1.1 Scope of Assessment

The scope of this assessment includes the following:

- Review of Office of Public Works (OPW) Preliminary Flood Risk Assessment Mapping;
- Review of OPW National Hazard Flood Mapping;
- Review of any historic flood information for the site;
- Review any relevant Catchment Flood Risk Assessment and Management Studies (CFRAMS);
- Review of Irish Coastal Wave and Water Level Monitoring Study; and
- Identify risk of:
    - Fluvial;
    - Tidal;
    - Pluvial; and
    - Groundwater flooding.

2 Proposed Development Site

The Fosterstown 110 kV Substation is located in the Carberrystown area approx. 3 km southwest along the R160 road from Trim, Co. Meath. The substation is accessed via an existing entrance gateway off a small laydown area, located adjacent the R160.

The substation is immediately bound by rural agricultural land in every direction, five plots of private residential land lie opposite the site entrance to the southeast along the R160. The surrounding area is generally rural agricultural lands. The redline boundary can be seen in figure 2-1 below.

Figure 2-1 - Fosterstown 110 kV Substation Site location.

2.1 Site Topography

A topographical survey was undertaken in June 2023 and is included in Appendix B.

The site is relatively flat with a gentle slope west to east. The level at the centre of the site is approx. 61.81 mAOD. Site levels range from approx. 60.36 mAOD at the north-eastern boundary to 62.45 mAOD (± 0.05 m) at the western side.

3 The Planning System & Flood Risk Management

In November 2009, the Department of Environment, Heritage, and Local Government issued a guideline document to Planning Authorities in relation to Flood Risk Management titled *"The Planning System and Flood Risk Management Guidelines"*.

These guidelines are issued under Section 28 of the Planning and Development Act 2000 which requires Local Planning Authorities and An Coimisiún Pleanála to implement these guidelines when assessing planning applications under the Planning Acts.

The guidelines also set out the policy on development and flood risk in Ireland and provide a framework for the integration of flood risk assessment into the planning process. The objective is to ensure that flood risk is considered at all stages in the planning process.

The core objectives of the Flood Risk Management Guidelines are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure the requirements of European Union and national law, in relation to the natural environment and nature conservation, are complied with at all stages of flood risk management.

These documents shall be referred to as the Guidelines throughout this report.

3.1 Definition of Flood Zones

Flood zones are defined in the Flood Risk Management Guidelines as *"geographical areas within which the likelihood of flooding is within a particular range".* There are three types of flood zones as noted below in Table 3-1.

Table 3-1 - Definition of Flood Zones

Flood Zone	Description
A	Probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding).
B	Probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 and 0.5% or 1 in 200 for coastal flooding)
C	Probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

3.2 Definition of Vulnerability Classes

The Flood Risk Management Guidelines grade types of development in accordance with how vulnerable they would be to flooding. Table 3-2 below outlines the typical developments under the three vulnerability classes.

Table 3-2 - Definition of Vulnerability Class

Class	Description
Highly Vulnerable (including essential infrastructure)	Includes: Garda, ambulance, fire stations, hospitals, schools, residential dwellings and institutions, essential infrastructure such as primary transport and utilities distribution including **electricity generating power stations and sub-stations**, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less Vulnerable	Includes: buildings for retail, leisure, warehousing, commercial, industrial and non-residential institutions, land and buildings for holiday, agriculture or forestry, waste treatment, mineral working and processing, local transport infrastructure.
Water Compatible Development	Includes: flood control infrastructure, docks, marinas, wharves, navigation facilities, ship building, fish processing, water-based recreation and tourism (excluding accommodation), lifeguard and coastguard stations, amenity open space and outdoor sports and recreational facilities.

As the proposed development is an electrical utility distribution substation, it is considered Highly Vulnerable (Essential Infrastructure) as identified in Table 3-2.

3.3 Appropriate Development and the Justification Test

The Planning System and Flood Risk Management Guidelines outline the types of development that would be considered appropriate to each flood zone as per Table 3-3. A justification test is required in instances where development is proposed in areas of moderate or high flood risk. The test is designed to rigorously assess the appropriateness or otherwise of these developments which would be at risk of flooding.

The development types and land uses which are classed as “Highly Vulnerable” must be subjected to a justification test for Flood Zones A and B. Similarly, the development types and land uses which are classed as “Less Vulnerable” must be subjected to a justification test for Flood Zone A.

It can be seen from Table 3-3 overleaf that highly vulnerable development is appropriate in Flood Zone C.

Table 3-3 Matrix of Vulnerability versus Flood Zones.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable Development (including essential infrastructure)	Justification Test	Justification Test	**Appropriate**
Less Vulnerable	Justification Test	Appropriate	Appropriate
Water Compatible Development	Appropriate	Appropriate	Appropriate

3.4 Staged Approach

The Guidelines set out a staged approach for the consideration of flood risk in relation to developments. This staged approach is as follows;

Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and LAP's or a proposed development site that may warrant further investigation at the appropriate lower-level plan or planning application levels.

Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped; and

Stage 3: Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

The level of FRA required is determined on a project specific basis with each stage building upon the previous stage.

4 Stage 1 – Flood Risk Identification

4.1 Available Information

The following sources of information were consulted in order to conduct this assessment as outlined in Table 4-1.

Table 4-1 Summary review of available information.

	Information Source	Coverage	Quality	Confidence	Identified Flood Risk(s)	Flood Risk Identified
Primary Data Sources & Modelled Data	OPW National Flood Hazard Mapping (www,floodinfo .ie)	National	High	High	Site is inland and is remote from any predicted flooding.	No
	Eastern CFRAM Study	Regional	High	High	Site is remote from any predicted flooding.	No
Secondary Data Sources	OPW Historic Flood Records	National	Varies	Varies	No historic flooding in the vicinity of the site.	No
	Site Walkover	Local	Moderate	Moderate	Substation is proposed in a greenfield site. No indication of any current flood issues	No

It can be seen from Table 4-1 that there are no immediate flood risks identified for the proposed site.

4.2 Historic information

A review of historic flooding was undertaken using the OPW website www.floodinfo.ie. The 'Past Flood Events' layer forms a record of all available flood records held by the OPW, all local authorities and other relevant state organisations such as the EPA and the Department of Communications, Climate Action and Environment. This website represents the current definitive database of historic flood information in Ireland.

There is one reported location of past flooding in the general locality of the Fosterstown site (see Figure 4-1). The location is 1.3 km west of the site at the Derrindaly bridge over the Boyne river. The OPW records two past fluvial flooding events at this location, in 1969 and 2002. Due to the distance to the site, these incidents are not considered to represent a risk to this project.

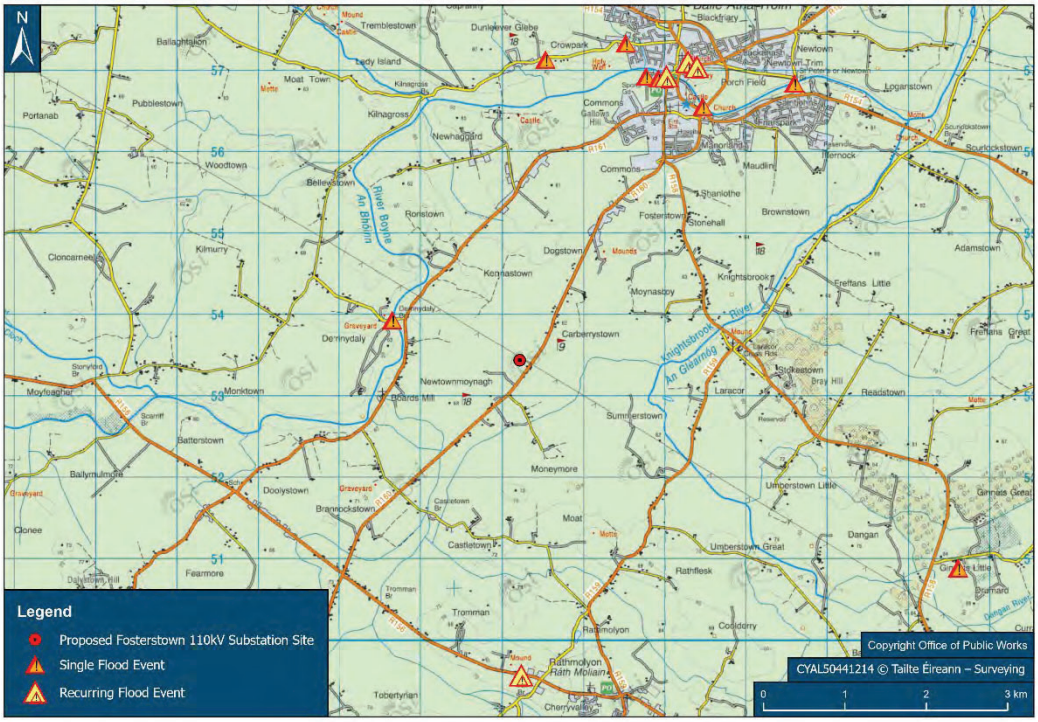


Figure 4-1 - Nearest Past flood event shown 1.3 km from Fosterstown 110 kV substation.

5 Flood Risk

5.1 Meath County Development Plan 2021-2027

A review of the Meath County Development Plan, Strategic Flood Risk Assessment (SFRA) for 2021-2027 which came into effect in November 2021 shows the Fosterstown ESB 110 kV substation outside flood zones A and B, and is therefore considered to be in Flood Zone C.

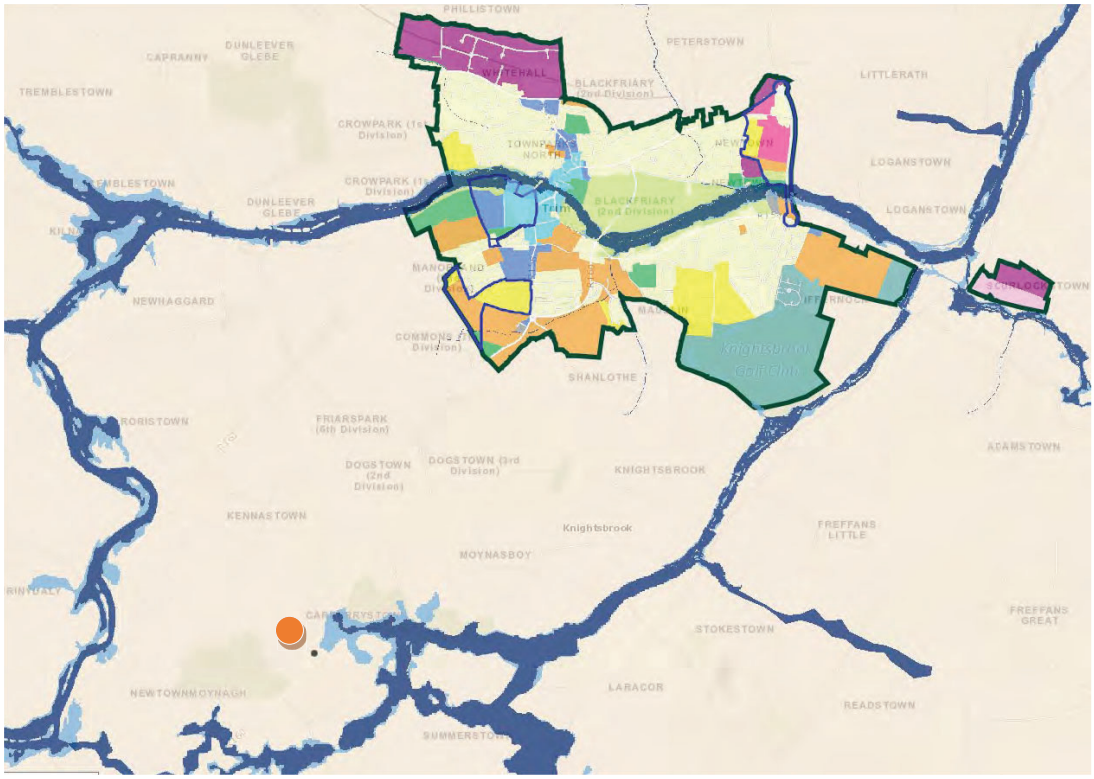


Figure 5-1 - Excerpt from Meath County Development plan 2021-2027 Strategic Flood Risk Assessment Online. Meath SFRA 2021-2027 Mapping - Accessed Feb 2024. Fosterstown 110 kV station location shown as red circle. Flood zones A & B shown in dark and light blue respectively

5.2 Fluvial Flood Risk

The Moynasboy, a small tributary of the Knightsbrook river, flows in a south to north direction as it passes the Fosterstown ESB 110 kV substation at is nearest point 0.7 km to the south-east.

The Boyne river flows south to north 1.35 km to the west of the subject site (see Figure 5-2).

Figure 5-2 - Watercourses Close to the Fosterstown 110 kV Substation.

5.2.1 Catchment Flood Risk Assessment Management Studies (CFRAMS)

As part of Ireland's obligations under the EU "Floods" Directive, the OPW is currently engaged in the generation of new mapping which will provide predictive estimates of the extent of floodplains as part of its CFRAMS. This programme is being undertaken on a River Basin District basis.

The Fosterstown ESB 110 kV substation is located within the Eastern CFRAM Study which was carried out between 2011 and 2016. The Eastern CFRAM Study covers approx. 6,300 km^2 of land and includes the Greater Dublin Area and its commuter belt. Fosterstown is located within the Unit of Management (UoM)/ Hydrometric Areas (HAs) area 07 (Boyne), commonly referenced as UoM/HA07-Boyne which covers an area of approx. 2,695 m^2. Finalised flood maps are available through floodinfo.ie.

5.2.1.1 CFRAMS Mapping

The CFRAMS maps present indicative extents of lands at risk of flooding, predicted flood depths and predicted water levels in watercourses. The mapping indicates the following in terms of Annual Exceedance Probability (AEP):

- Indicative extent of lands with 1-in-10 probability of flooding in any given year;
- Indicative extent of lands with 1-in-100 probability of flooding in any given year (generally corresponds with Flood Zone A as defined in Section 3 above); and
- Indicative extent of lands with 1-in-1000 probability of flooding in any given year (generally corresponds with Flood Zone B as defined in Section 3 above).

The Fosterstown 110 kV substation is located approximately 1.45 km from the 0.1% AEP flood event mapping extents (see Figure 5-4). This also places the site outside any current available CFRAMS flood risk mapping as shown in Figure 5-3. With relation to the CFRAM mapping, this site is classed as being located outside 0.1% AEP flood zone.

Figure 5-3 - Extents of CFRAM mapping with reference to the Fosterstown 110 kV substation.

Figure 5-4 - CFRAMS Present day fluvial flood risk

The lands adjacent to the eastern bank of the Boyne River is shown to have an elevation of 57 mAOD. The lowest point recorded at the Fosterstown 110 kV substation is 60.5 mAOD, which is 3.5 m above levels estimated in the lands adjacent the eastern bank of the Boyne River (source: Google Earth). This finding coupled with the distance to the Boyne river from the site (1.3 km) demonstrates, to an acceptable level of certainty, that the site is not at risk of fluvial flooding and that with respect to CFRAM mapping the site can be regarded as being outside the 0.1% AEP flood zone.

The www.floodinfo.ie maps 'National Indicative Fluvial Mapping' (NIFM) layer presents the modelled extents of fluvial flooding during a theoretical flood event with estimated probability occurrences of both 1.0% and 0.1% in contrast to information based on actual floods which have occurred historically.

This data has been produced for catchments greater than 5 km^2 in areas where CFRAM flood maps were not produced.

The Floodinfo.ie provides guidance notesfloodinfo.ie guidance notes (accessed 25/10/2023) on the use of NIFM to assess flood risk and states that,

"The maps only provide an indication of areas that may be prone to flooding. They are not necessarily locally accurate and should not be used as the sole basis for defining the Flood Zones nor for making decisions on planning applications."

When providing guidance on the accuracy of the NIFM, the floodinfo.ie guidance notes state that the NIFM is not as accurate as the CFRAMS mapping and should not be the only source of information for making planning decisions. However, this report does not solely refer to the NIFM and uses multiple sources of information.

The site is located approximately 0.605 km from NIFM present day 'low' flood risk associated the Moynasboy river. Due to the distance from the site this is not deemed a relevant flood risk for the site.

From considering the above guidance from Floodinfo.ie, reviewing the CFRAM mapping, assessing the NIFM mapping as referred to in Figure 5-5, reviewing climate change in section 5.6, we may assess the flood risk of the site.

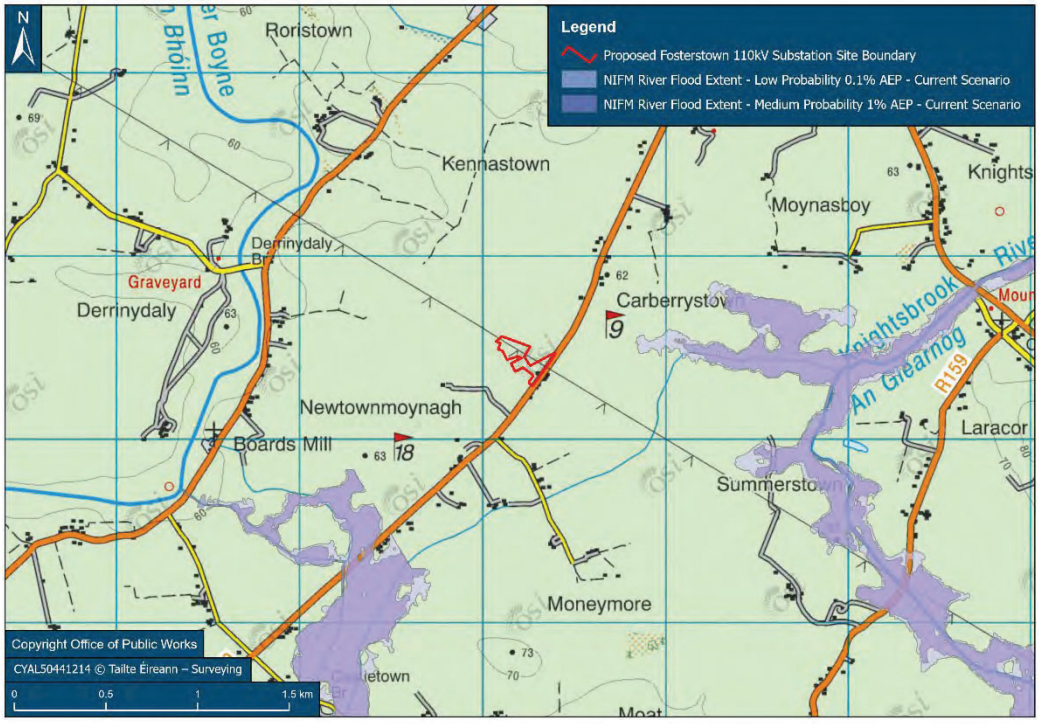


Figure 5-5 - NIFM Present day fluvial flood risk

5.2.2 Arterial Drainage Scheme Benefited Lands

Arterial Drainage Schemes (ADS) were carried out under the Arterial Drainage Act, 1945 to improve land for agriculture and to mitigate flooding. Rivers, lakes weirs and bridges were modified to enhance conveyance, embankments were built to control the movement of flood water and various other work was carried out under Part II of the Arterial Drainage Act, 1945.

The purpose of the schemes was to improve land for agriculture. To ensure that the 3 – year flood was retained in bank, this was achieved by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses known as callows. Flood protection in the benefiting lands was increased as a result of the Arterial Drainage Schemes. Under the Arterial Drainage Act, 1945, the OPW are required to maintain drainage works in proper repair and effective condition.

While drainage schemes were originally developed to provide drainage of agricultural land, they have significantly reduced the risk of flooding to the extent that many areas which historically had high risk of river flooding now have a low level of risk.

The Fosterstown 110 kV substation will be located within the Boyne ADS (C1) under the Eastern Region to which the works were completed between 1969 to 1986. The nearest OPW maintained arterial drainage network is located 150 m to the north of the station in the neighbouring field. Its branch reference number is: C1/25/2 (See Figure 5-6 for reference). There is no previous flood history associated with this drain as discussed in Section 4.2 previously. The proposed development will not have an impact on this drain.

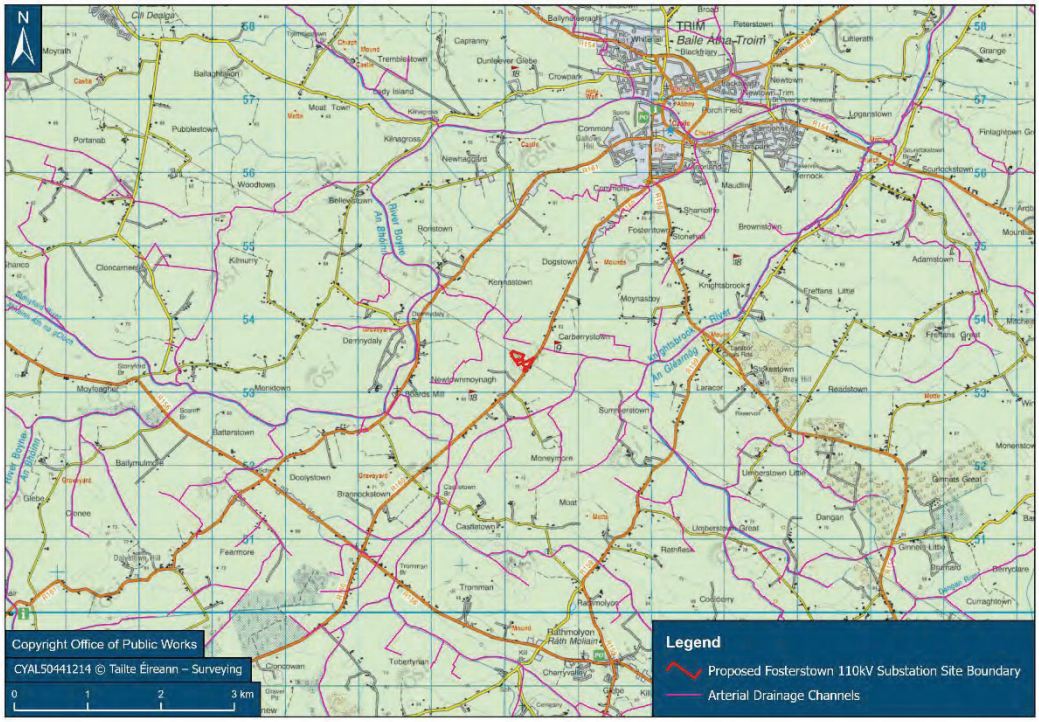


Figure 5-5 - Arterial Drainage Scheme

5.3 Coastal Flood Risk

The Fosterstown 110 kV Substation is located approximately 44 km inland. The nearest tidal estuary flows from the river Boyne to the Irish Sea at Drogheda 39 km away from the site to the east.

The predicted coastal flood extents for the 0.1% AEP are between Navan and Slane approximately 20 km away. The site is therefore not at risk to coastal flooding.

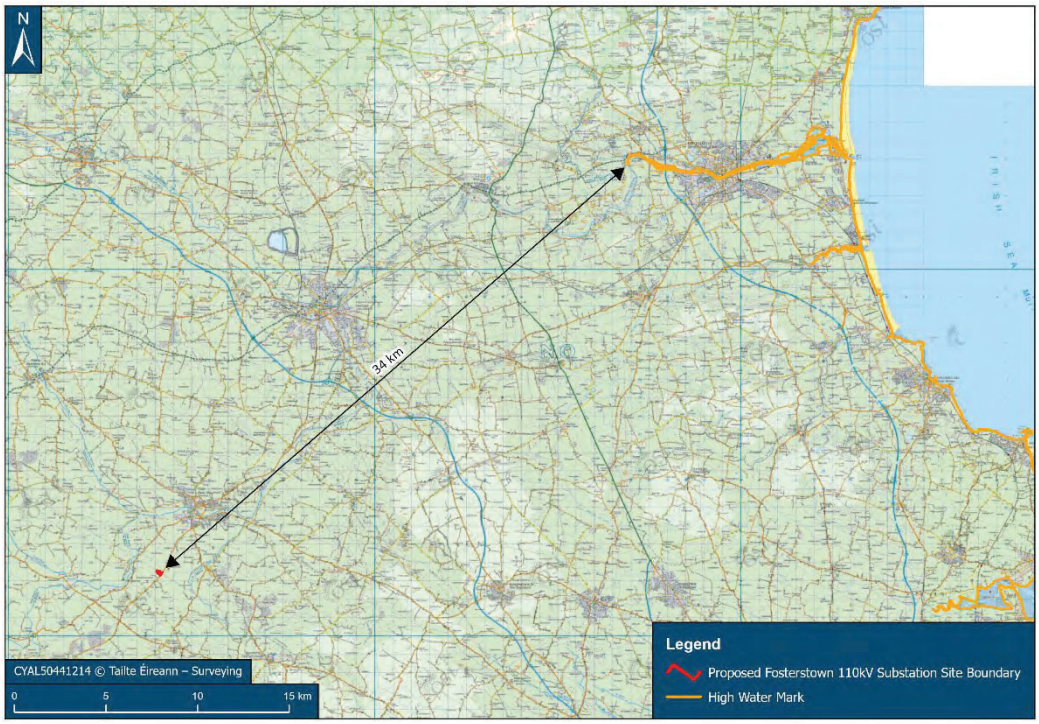


Figure 5-6 - Fosterstown 110 kV substation (marked with red '+')

5.4 Pluvial Flood Risk

The site of the proposed development is currently a greenfield site. The surface water proposals for the proposed works will be developed to mimic the natural drainage patterns of the site in accordance with the Best Management Practices (BMPs) of Sustainable Drainage Systems (SuDS). The surface water proposals will replicate the greenfield drainage conditions of the site where possible.

Storm water drainage systems, consistent with the criteria set out in the Greater Dublin Strategic Drainage Study (GDSDS) Code of Practice for Developers, will generally minimise the risk of flooding from pluvial sources and these measures are appropriately catered for by Meath County Council's design requirements under the planning application process. In view of this and given there are no known previous flood events at the site to suggest that the site is at risk to pluvial flooding, the site is not considered to be at risk to pluvial flooding.

5.5 Groundwater Flood Risk

The Geological Survey of Ireland (GSI) mapping indicates that the site is underlain by Lucan Formation. There are no karst features in the greater vicinity of the site, with the nearest being approx. 7 km away.

The Groundwater Flood Probability maps show less than 0.1% probability of ground water flooding, and there are no historic groundwater flood events in the locality.

It is therefore deemed that the proposed development is not at risk to groundwater flooding.

5.6 Climate Change

The OPW released a report on *"Implementing the National Flood Risk Policy*" in May 2018. The report summarises the measures put in place to manage Ireland's flood risk, provides a summary of the outputs of the national CFRAM Programme and outlines the arrangements for implementation of the proposed measures set out in the 29 No. Flood Risk Management Plans. The report states that climate change will impact the flood risk in Ireland, resulting in the rise of sea level, a projected increase in the number of heavy rainfall days per year and projected wetter winters.

The OPW recommends that a climate change factor of up to 20% be considered for river flows. The report states that *"While there is considerable uncertainty associated with most aspects of the potential impacts of climate change on flood risk (e.g., how fast sea levels will continue to rise into the future), the OPW considered that it was prudent to take the potential changes into account in the development of proposed measures in the Flood Risk Management Plans. Therefore, the OPW's appraisal of flood risk and the choice of the measures proposed for Flood Risk Management Plans considered the assessment of risk for two potential future scenarios, the:*

- *Mid-Range Future Scenario – increase in rainfall of 20% and sea level rise of 500mm (20 inches), and*
- *High-End Future Scenario – increase in rainfall of 30% and sea level rise of 1000mm (40 inches)".*

5.6.1 Meath SFRA

Each county council compiles their own strategic flood risk assessment based on the OPW's guidelines. Below are the provisions for future scenarios as set out in the Meath SFRA 2021-2027.

Table 5-1 - Allowances for Future Scenarios (100 Year Horizon)

Criteria	MRFS	HEFS
Extreme Rainfall Events	+20%	+30%
Flood Flows	+20%	+30%
Mean Sea Level Rise	+500 mm	+1000 mm

Figure 5-7 - Mid-Range Future Scenario Fluvial Flood Extents in relation to the Fosterstown 110 kV substation

Figure 5-8 - High-Range Future Scenario due to a 30% increase in annual rainfall in relation to the Fosterstown 110 kV substation

Figure 5-8 and Figure 5-9 illustrate the potential impact of climate change on the predicted fluvial flood extents under the Mid-Range Future Scenario (MRFS) and High-End Future Scenario (HEFS) respectively and illustrates that the site lies outside the predicted flood zone of flood extents of the Boyne river which is within the boundary of the nearest CFRAM mapping flood extents.

6 Impact of Development on Current Flood Regime in the Area

6.1 Impact of Site Surface Water Runoff

Surface water proposals for the proposed works will be developed to mimic the natural drainage patterns of the site in accordance with the BMPs of SuDS. The surface water proposals will replicate the greenfield drainage conditions of the site where possible.

Surface water storage up to the 1 in 100-year rainfall event will be provided on site for the proposed development as discussed in the Engineering Services Report included with the planning pack. Surface water will discharge to a soakaway located to the northeast of the site. Surface water runoff from the proposed development will be discharged at a controlled rate to replicate greenfield conditions.

It is therefore considered that the proposed development will not impact on the current flood regime in the area.

6.2 Loss of Floodplain

The proposed development will not result in loss of floodplain as the site is not near any areas which are vulnerable to fluvial flooding. Therefore, no compensatory floodplain storage is required to be provided as a result of the proposed development.

7 Application of Flood Risk Management Guidelines

7.1 Flood Zone & Vulnerability Class of the Site

As demonstrated in Sections 4 and 5 previously;

1. The development is classified as highly vulnerable development and is located within Flood Zone C;
2. The development is appropriate development in Flood Zone C and does not require a Justification Test to be carried out;
3. The site is not at risk from fluvial flooding;
4. The site is not at risk from coastal flooding;
5. The site is not considered at risk from pluvial flooding in its current state, or in the proposed scenario; and
6. The site is not considered to be at risk of groundwater flooding.

8 Conclusion

A flood risk assessment was carried out to establish if the proposed 110 kV GIS substation at Fosterstown, Co. Meath would be at risk to flooding.

Following the findings of this assessment, the construction of the Fosterstown 110 kV substation and associated works is not considered at risk to flooding.

The site is located in Flood Zone C as defined by the '*The Planning System and Flood Risk Management Guidelines*' summarised in Table 3-1 and found in Section 3.1. The proposed substation is classified as a highly vulnerable development which is permissible in Flood Zone C.

Surface water proposals for the proposed works will be developed to mimic the natural drainage patterns of the site in accordance with the Best Management Practices of SuDS. The surface water proposals will replicate the greenfield drainage conditions of the site where possible.

The proposed development will not increase the current flood risk in the catchment.

Appendix A – Proposed Layout

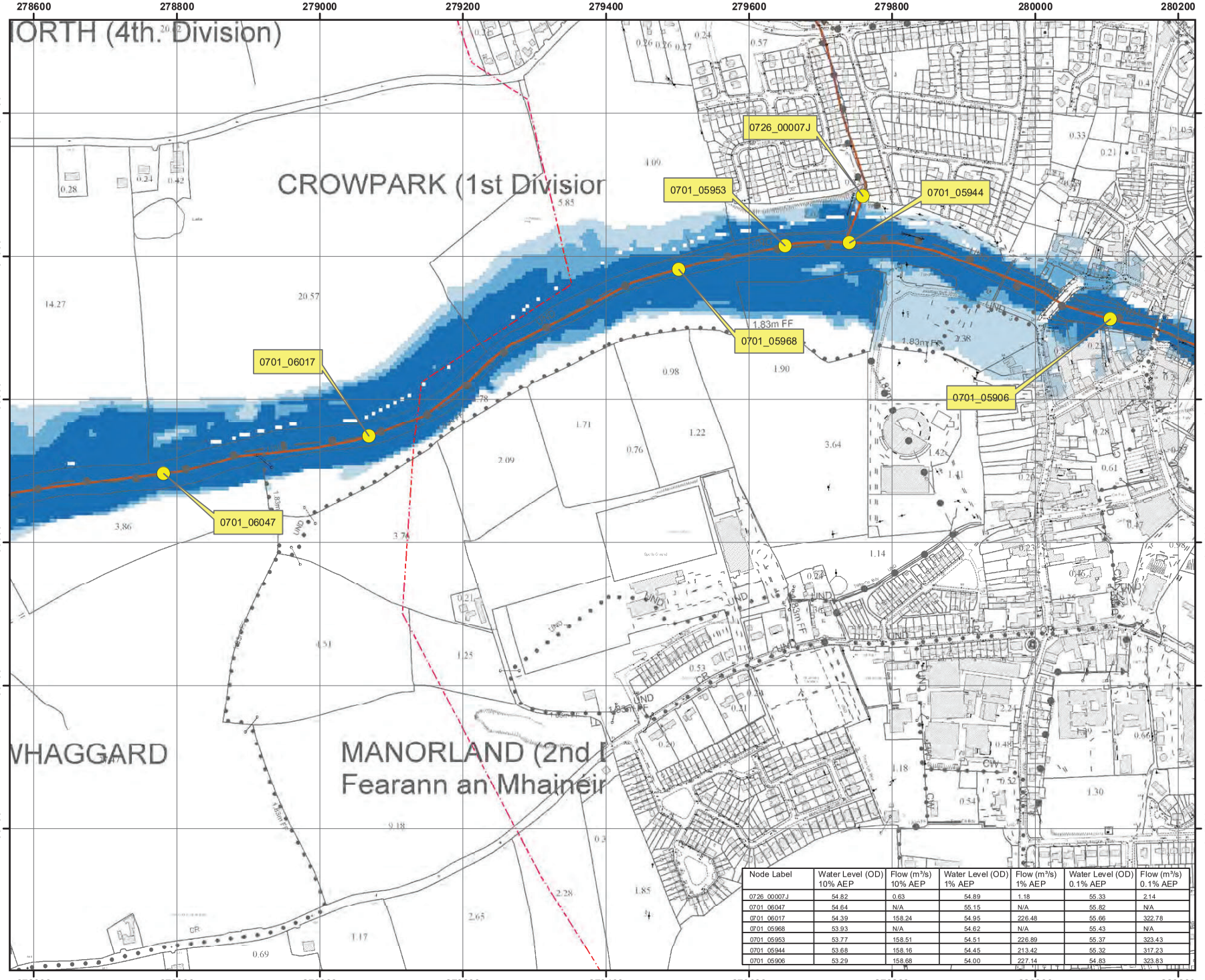
- Drawing No. PE492-D282-016-004-002– Proposed Substation Layout

Appendix B: Topographic Survey

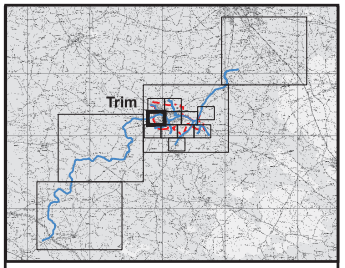
- Drawing No. PE492-D282-016-003-002 – Existing Site Layout

Appendix C – Eastern CFRAMS Map

- Eastern CRFAM Study – Boyne Fluvial Flood Extents: E07TRI_EXFCD_F0_05



Node Label	Water Level (OD) 10% AEP	Flow (m^3/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m^3/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m^3/s) 0.1% AEP
0726_00007J	54.82	0.63	54.89	1.18	55.33	2.14
0701_06047	54.64	N/A	55.15	N/A	55.82	N/A
0701_06017	54.39	158.24	54.95	226.48	55.66	322.78
0701_05968	53.93	N/A	54.62	N/A	55.43	N/A
0701_05953	53.77	158.51	54.51	226.89	55.37	323.43
0701_05944	53.68	158.16	54.45	213.42	55.32	317.23
0701_05906	53.29	158.68	54.00	227.14	54.83	323.83



IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

- 10% Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node ID Node Label

FINAL

REV:	NOTE:	DATE:

EASTERN CFRAM STUDY

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Map: Trim Fluvial Flood Extents

Map Type:	EXTENT
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By : F.M.C.	Date : 15 July 2016
Checked By : M.N.	Date : 15 July 2016
Approved By : S.P.	Date : 15 July 2016
Drawing No. :	E07TRI_EXFCD_F0_05
Map Series :	Page 5 of 15
Drawing Scale :	1:5,000 @ A3

Appendix D – Historic Flood Reports

- OPW Hydrometric Report November 1968 – January 1969
- Photos Flooding at Derrindaly Bridge Nov. 2002

Moy: Higher than average rainfall fell during December and January. In Ballina, 140 m.m. fell in December, much of it in the week before Christmas. In a 25 hour period on 10th/11th January 43 m.m. was recorded. There was no flooding in any part of the catchment where drainage has been carried out.

Inny: The rainfall during December and January was heavy but not exceptional. No major flooding was experienced in any part of the catchment.

Boyne: There was flooding in several areas, notably at Derrinadaly, near Trim and at Kilsaran, near Navan where public roads were flooded.

Deel: There was a lot of rain during December and January. There were particularly heavy falls about 11th-13th December (56 m.m.), 23-24th December (62 m.m), and 9th - 12th January (43 m.m.) On these three occasions there was flooding in the Deel Valley upstream of Rathkeale, at Deel Bridge, and on the latter two occasions, at Ballinlaka - Bunoke. The duration of flooding on all occasions was about 24 hours. Water levels are still high and the weather remains wet.

Feale: On 23-24th December 84 m.m. of rain was recorded at Listowel. No flooding was reported except minor flooding of back-drains.

Maine: There was slight flooding of back-drains.

Shannon Estuary: There was some flooding near Adare and minor flooding of back-drains.

Corrib: The rainfall was average for the time of year except for the 14th December, 24th December and 10th January on each occasion of which there was about 24 hours of continuous rain. The Corrib-Clare scheme performed well and there was no flooding except upstream of Tuam and at Culnacholla Bridge where small areas were flooded for a day or so. There was no flooding of those areas on the Headford in which our works have been completed. There was some flooding near Belclare and Turloughcor Turloughs. Some roads were flooded at Oughterard where our works have not yet reached.

Killimor: There was prolonged heavy rain on 23rd-24th December which produced the highest recorded post drainage flows in both the Killimor and the Cappagh rivers. There was, however, no flooding except some minor flooding of back drains in the embanked area.

Carrigahorig: Heavy rainfall for 22nd-24th December was recorded at Birdhill (72 m.m.) Killaloe (79 m.m.) and Portumna 42 m.m. All the low lying lands in the Catchment are flooded but our works so far have relieved the annual flooding of the Carrigahorig - Portumna road.

Nenagh: Rainfall there was similar. At Clarianna bridge, where the design flow is 1800 c.f.s. the discharge at peak was of the order of 3000 c.f.s., a considerable area of land was under water for about 24 hours. There was flooding also at Ballyartella where the road and a mill were flooded, at Islandbawn the Nenagh-Dublin road, a dwellinghouse and a shop were flooded for 12 hours. The flat land adjoining Nenagh was flooded for 24 hours. There was some flooding also in the embankment section where the capacity of the pumps was exceeded by the inflow.

Abbey & Duff: These schemes worked well.

Swilly: There was heavy rain (approximately 50 m.m. in 24 hours) in early November as a result of which a partly completed embankment on the Skeogo was breached and a large area of land flooded. At about the same time there was minor flooding of back-drains on the Blanket Nook. All the other Swilly schemes worked well and no flooding was reported.

Deale & Swillybums: The scheme worked well. There was minor flooding near back-drains.

Brosna: There has been a lot of rain since mid-December, the heaviest fall being on the 24th when it rained continuously for about 18 hours particularly in the south of the catchment. The highest flow of the post-drainage period was recorded at Mahan on the Clodiagh River. There was some flooding of farmland upstream of Tullamore and at Pollagh and Ballycumber on the main channel. This flooding lasted only one day and, despite further heavy rain, it has not been repeated.

Clyde & Dee: The heaviest rain of the winter occurred towards the end of November. Continuous rainy weather since then has kept the River Clyde high but no flooding has been reported. There has been some flooding on the Dee downstream of Ardee on one or two occasions but it has not persisted more than a day or two.

Broadmeadow & Ward, Matt: There has been a lot of rain since the beginning of December, the heaviest being on 24th. The flood which followed this was contained within the channels in all cases and no flooding has been reported.

7th February, 1969

Appendix D – Noise Impact Assessment

ALIVE ENVIRONMENTAL LTD

Noise Impact Assessment Report

Fosterstown 110kV Substation

Energy for generations

APRIL 2024

Contents

1. INTRODUCTION

This report has been prepared as supporting information for the application seeking full planning permission for a 110kV substation at Fosterstown, County Meath. This report has been prepared by Stephen Cleary (BA[Mod] MSc MIOA MIEMA CEnv) of Alive Environmental Ltd, who has over 20 years experience in the area of Noise Impact Assessment.

Section 2 of the report provides a description of the existing site and the proposed development to provide context of the site and its surroundings in the context of the proposed development. Section 3 provides a summary of existing noise guidance documents relevant to this report. A description of the methodology and results from the noise monitoring survey are provided in Section 4 of the report. Sections 5 and 6 contain a detailed impact assessment for the proposed development during construction and operational phases, while Section 7 includes an outline of relevant mitigation measures.

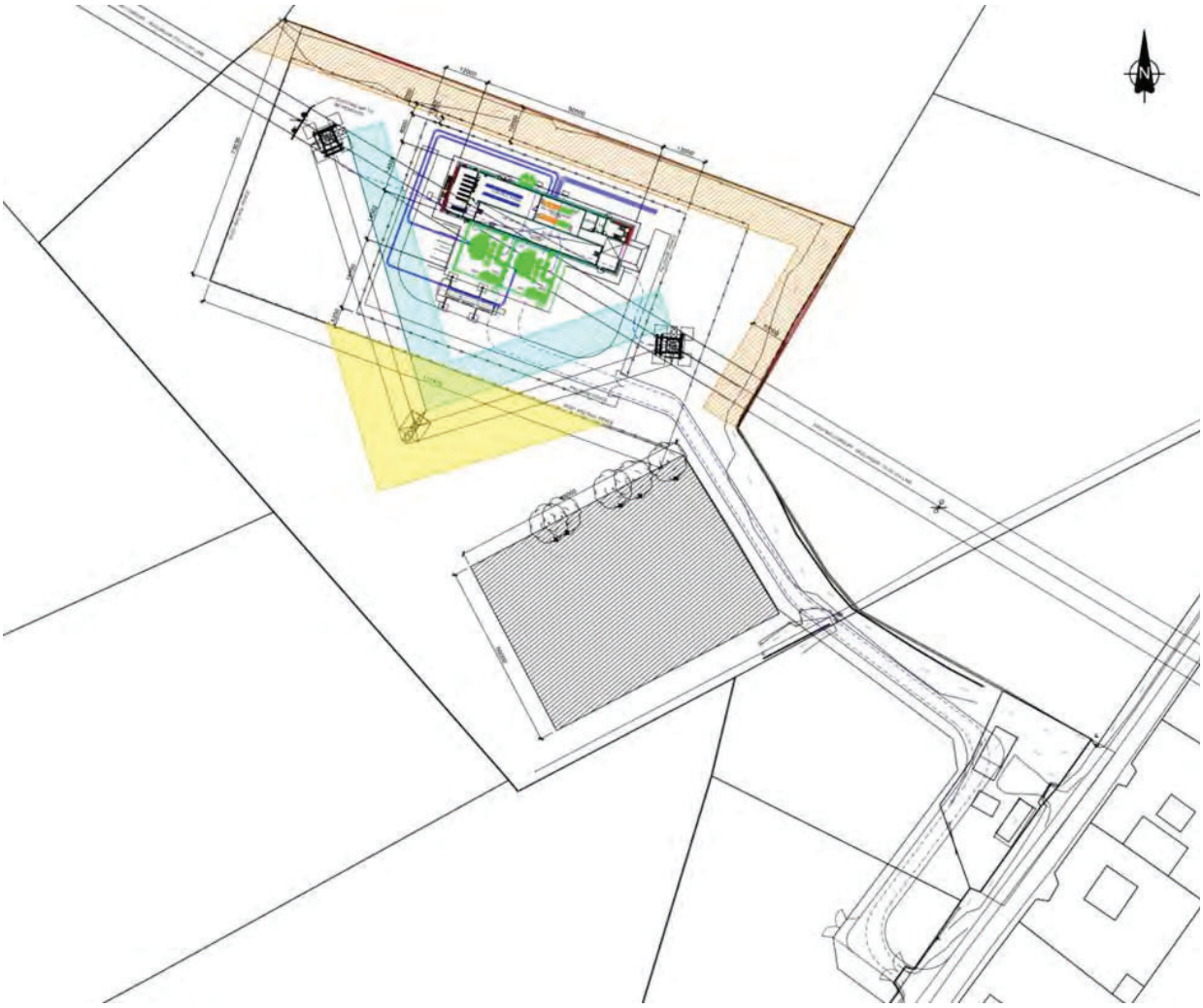
The report should be read in conjunction with Appendix 1 which includes calibration certificates for the noise monitoring equipment used during the survey.

2. SITE DESCRIPTION

The proposed site is located on lands adjacent to the R160 route, approximately 3km south-west of the town of Trim. The study area consists of agricultural lands, while two golf courses are present approximately 300m south-west and 300m north-east of the proposed site. A row of five residential properties is located off the R160 directly across the road to the proposed site.

Figure 2.1 illustrates the layout of the proposed 110kV substation.

Figure 2.1: Layout of Proposed 110kV Substation



3. RELEVANT NOISE GUIDANCE DOCUMENTS

3.1 Environmental Protection Agency (EPA) Office of Environmental Enforcement (OEE) - Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)

This document relates primarily to noise surveys and assessments for EPA licensed facilities but in the absence of any other directly applicable guidance documents, it provides useful reference material for the purposes of completing the noise assessment for the proposed development.

The EPA published two earlier documents in relation to the survey, assessment and management of noise emissions from licensed facilities, namely the *Environmental Noise Survey Guidance Document* (commonly referred to as NG1) and *Guidance Note for Noise in Relation to Scheduled Activities - 2nd Edition* (commonly referred to as NG2). These two documents have been withdrawn with the publication of NG4.

NG4 provides detailed consideration of a range of noise related issues including basic background to noise issues, various noise assessment criteria and procedures, noise reduction measures, Best Available Techniques (BAT) and the detailed requirements for noise surveys. NG4 provides typical limit values for noise from licensed sites, namely:

- Daytime (07:00 - 19:00) - 55dB $L_{Ar,T}$;
- Evening (19:00 - 23:00) - 50dB $L_{Ar,T}$:
- Night-time (23:00 - 07:00) - 45dB $L_{Aeq,T}$.

In the description of the limits above, the $L_{Aeq,T}$ is the equivalent continuous sound level over the measurement period and $L_{Ar,T}$ is equal to the L_{Aeq} but includes an additional penalty of 5dB(A) to account for any tonal or impulsive characteristics to the noise source.

The threshold limits presented above are used in the general context of the noise impact assessment included in this report.

Other EPA guidelines such as *Guidelines on the Information to be Contained in Environmental Impact Statements [2022]* and *Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements) [2003]* have been considered also in the preparation of this Noise and Vibration Chapter.

3.2 World Health Organisation (WHO) Guidelines

In the World Health Organisation (WHO) Guidelines for Community Noise (1999), a LAeq threshold daytime noise limit of 55 dB is suggested for outdoor living areas to protect most people from being seriously annoyed. A second daytime limit of 50 dB is also given as a threshold limit for moderate annoyance.

The guidelines suggest that an internal LAeq not greater than 30 dB for continuous noise is needed to prevent negative effects on sleep. This is equivalent to a façade level of 45 dB LAeq, assuming open windows or a free-field level of about 42 dB LAeq. If the noise is not continuous, then the internal level required to prevent negative effects on sleep is a LAmax,fast of 45 dB. Therefore, for sleep disturbance, the continuous level as well as the number of noisy events should be considered.

The WHO Night Noise Guidelines for Europe was published in 2009 on the back of extensive research completed by a WHO working group. Considering the scientific evidence on the threshold of night noise exposure indicated by Lnight,outside as defined in the Environmental Noise Directive [2002/49/EC], a Lnight,outside of 40dB should be the target of the night noise guideline (NNG) to protect public, including the most vulnerable groups such as children, the chronically ill and the elderly. An interim target of 55dB is recommended where the NNG cannot be achieved. These guidelines are applicable to Member States of the European Region and may be considered as an extension to the previous WHO Guidelines for Community Noise (1999).

In 2011, the WHO published the Methodological Guidance for Estimating the Burden of Disease from Environmental Noise. This document outlines the principles of quantitative assessment of the burden of disease from environmental noise, describes the status in terms of the implementation of the European Noise Directive and reviews evidence on exposure-response relationships between noise and cardiovascular diseases.

In 2018, the WHO Regional Office for Europe has developed guidelines, based on the growing understanding of health impacts of exposure to environmental noise. The main purpose of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway, and aircraft) noise, wind turbine noise and leisure noise. Leisure noise in this context refers to all noise sources that people are exposed to due to leisure activities, such as attending nightclubs, pubs, fitness classes, live sporting events, concerts or live music venues and listening to loud music through personal listening devices.

The 2018 guidelines are published by the WHO Regional Office for Europe. In terms of their health implications, the recommended exposure levels can be considered applicable in other regions and suitable for a global audience.

3.3 British Standard BS8233:2014 – Guidance on sound insulation and noise reduction for buildings

BS8233:2014 provides guidance values for a range of ambient noise levels within residential properties as shown in Table 3.1 below.

Table 3.1: Internal Ambient Noise Levels

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	35 dB $L_{Aeq16hr}$	
Dining	Dining Room/Area	40 dB $L_{Aeq16hr}$	
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq16hr}$	30 dB $L_{Aeq16hr}$

The standard allows for a further relaxation in standards of up to 5dB where "development is considered necessary or desirable". In relation to external amenity areas such as gardens and patios, the standard states that it is desirable that external noise does not exceed 50 dB LAeq,T with an upper guideline value of 55 dB LAeq,T.

3.4 British Standard BS 7445-1:2003 Description and measurement of environmental noise – Part 1: Guide to quantities and procedures (BS, 7445-1)

BS 7445 provides the framework within which environmental noise should be quantified. Part 1 of the standard provides guidance to quantities and procedures in relation to environmental noise monitoring. Meteorological conditions are not prescribed but it is recommended that wind speed should not exceed 5 m /s at height of 3-11m above ground, any temperature inversions near ground, or heavy precipitation.

3.5 British Standard BS4142:2014+A1:2019 – Method for rating and assessing industrial and commercial sound

BS4142:2014 describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- sound from industrial and manufacturing processes;
- sound from fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

BS 4142 also provides procedures in determining if the noise in question is likely to give rise to complaints from residents in the vicinity.

BS 4142 states that one should 'obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and consider the following:

a) Typically, the greater this difference, the greater the magnitude of the impact.
b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c) A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.
d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

The rating level is based upon the specific noise level of the noise source in question. A correction should be applied to the specific noise level to obtain an increased rating level if 'a tone, impulse or other characteristic occurs, or is expected to be present, for new or modified sound sources.

To summarise, BS4142 section 9.2 advises the following regarding corrections for acoustic characteristics:

- Tonality – for sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.
- Impulsivity – A correction of up to +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.
- Other sound characteristics – Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.
- Intermittency – When the specific sound has identifiable on/off conditions, if the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

3.6 British Standard BS5228:2009+A1:2014 Noise and Vibration Control on Construction and Open Sites

This British standard consists of two parts and covers the need for protection against noise and vibration of persons living and working in the vicinity of construction and open sites. The standard recommends procedures for noise and vibration control in respect of construction operations and aims to assist architects, contractors and site operatives, designers, developers, engineers, local authority environmental health officers and planners.

Part 1 of the standard provides a method of calculating noise from construction plant, including:

- Tables of source noise levels;
- Methods for summing up contributions from intermittently operating plant;
- A procedure for calculating noise propagation;
- A method for calculating noise screening effects; and
- A way of predicting noise from mobile plant, such as haul roads.

The standard also provides guidance on legislative background, community relations, training, nuisance, project supervision and control of noise and vibration.

The ABC method outlined in Section E3.2 has been used for the purposes of determining whether the predicted noise levels from the construction activities will result in any significant noise impact at the nearest noise sensitive properties.

Table 3.2 below outlines the applicable noise threshold limits that apply at the nearest noise sensitive receptors. The determination of what category to apply is dependent on the existing baseline ambient (LAeq) noise level (rounded to the nearest 5dB) at the nearest noise sensitive property. For daytime, if the ambient noise level is less than the Category A threshold limit, the Category A threshold limit (i.e. 65dB) applies. If the ambient noise level is the same as the Category A threshold limit, the Category B threshold limit (i.e. 70dB) applies. If the ambient noise level is more than the Category A threshold limit, the Category C threshold limit (i.e. 75dB) applies. The applicable limits that apply to each of the sensitive receptors are presented in Section 7 of this report.

Table 3.2: Noise Threshold Limits at Nearest Sensitive Receptors

	Threshold Limits [dB(A)]		
	Category A	**Category B**	**Category C**
Night-time (23:00 - 07:00)	45	50	55
Evening and Weekends (19:00 - 23:00 Weekdays, 13:00-23:00 Saturdays, 07:00-23:00 Sundays)	55	60	65
Weekday daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75

3.7 Vibration Guidance Documents

Limits of transient vibration, above which cosmetic damage could occur, are given numerically in Table 3.3 (Ref: BS5228-2:2009+A1:2014). Minor damage is possible at vibration magnitudes which are greater than twice those given in Table 3.3, and major damage to a building structure can occur at values greater than four times the tabulated values (definitions of the damage categories are presented in BS7385-1:1990, 9.9).

Table 3.3: Transient Vibration Guide Values for Cosmetic Damage (Ref BS5228-2:2009+A1:2014)

Type of Building	**Peak Particle Velocity (PPV) (mm/s) in Frequency Range of Predominant Pulse**	
	4 Hz to 15 Hz	**15 Hz and above**
Reinforced or framed structures. Industrial and heavy commercial buildings.	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
Unreinforced or light framed structures. Residential or light commercial buildings.	15 mm/s at 4 Hz increasing to 20 mm/S at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above.

4. NOISE SURVEY

4.1 Methodology

A baseline noise monitoring survey was completed between Thursday 15th and Monday 19th February 2024 at the proposed site. The survey period was chosen to include both weekday and weekend periods to characterise any difference between the weekday and weekend periods. The survey period was also selected to take place when there was no interference from weather conditions (i.e. no precipitation and no significant wind).

The following noise monitoring equipment was used (Calibration certificates for the equipment are contained in Appendix 1):

- Norsonic Nor140 Sound Level Meter (BS EN IEC 61672-1:2003 Class 1) [Serial No: 1402995]
- Norsonic Sound Calibrator 1251 [Serial No: 33739]

The microphone was placed at a height of 1.2 - 1.5m above ground level. The sound level meter was accurately calibrated before and after use with no drift observed.

The weather conditions during the noise monitoring survey were in accordance with the requirements of BS7445: Description and Measurement of Environmental Noise.

The following parameters were recorded during each monitoring period:

LAeq	The continuous equivalent A-weighted sound pressure level. This is an "average" of the sound pressure level.
LAmax	This is the maximum A-weighed sound level measured during the sample period.
LAmin	This is the minimum A-weighted sound level measured during the sample period.
LA10	This is the A-weighted sound level that is exceeded for noise for 10% of the sample period.
LA90	This is the A-weighted sound level that is exceeded for 90% of the sample period.

The noise monitoring location for the baseline survey is illustrated in Figure 4.1 and a view of the noise meter in-situ is included in Figures 4.2. The survey location was chosen so as to be approximately equidistant from the dominant noise source in the study area (i.e. road traffic noise from the R160) as the nearest noise sensitive properties.

Figure 4.1: Noise Monitoring Location for Baseline Survey

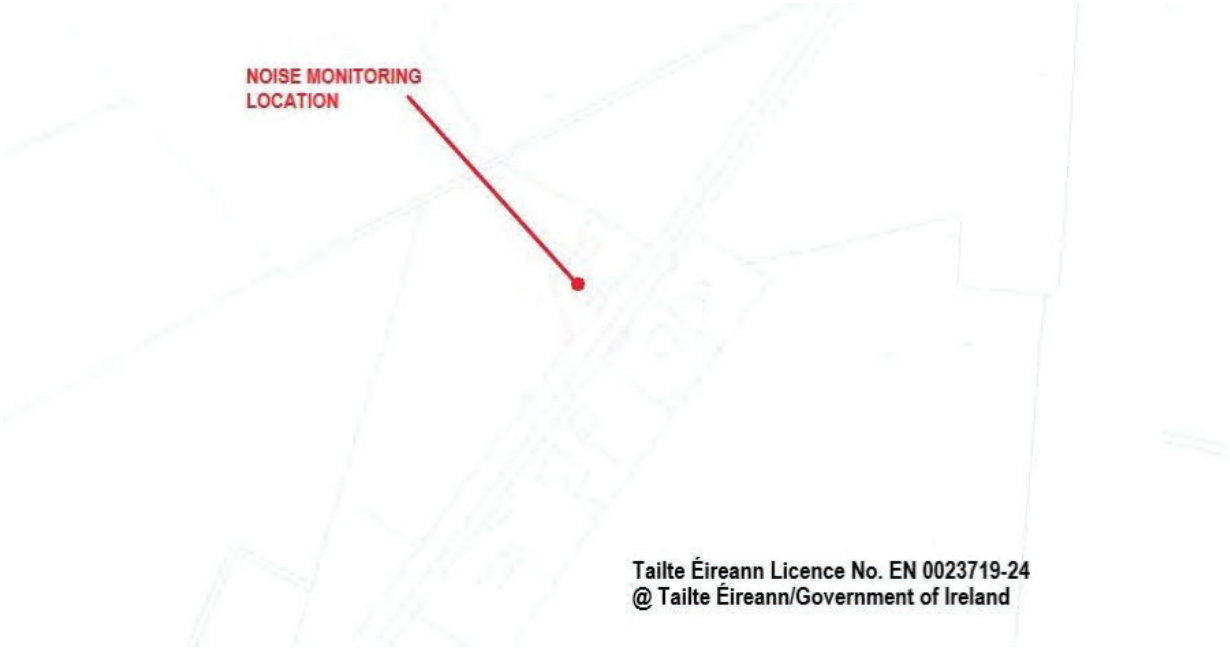
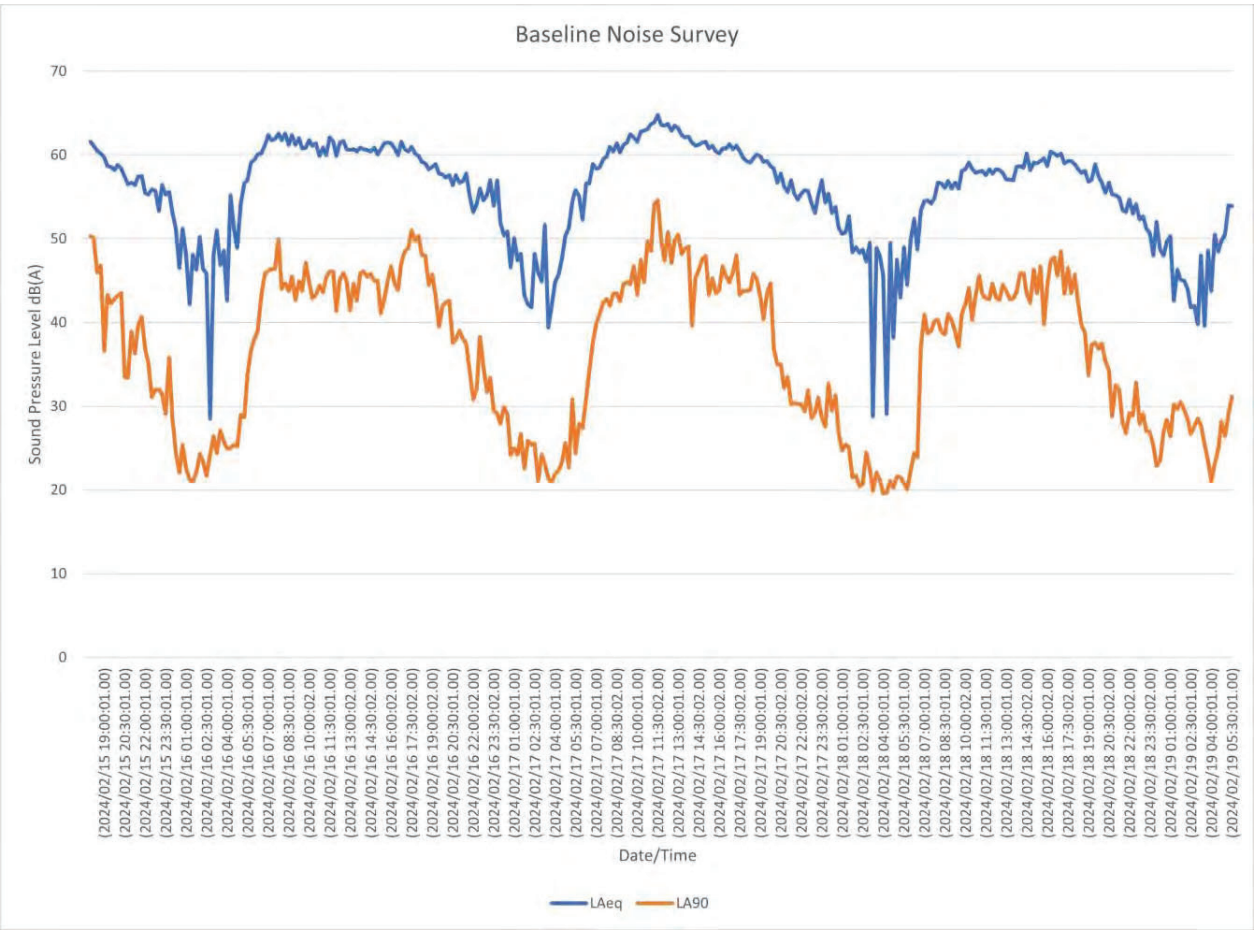


Figure 4.2: View of Noise Meter In-Situ During Baseline Survey

4.2 Noise Survey Results

Figure 4.3 illustrates the ambient noise level (L_{Aeq}) and background sound levels (L_{A90}) recorded during the noise monitoring survey. The noise monitoring data illustrates that there is a steady pattern for the ambient noise level (L_{Aeq}) and background sound levels (L_{A90}), with no significant difference between the weekday and weekend periods.

Figure 4.3: Noise Monitoring Survey Results



This assessment includes an assessment using the BS4142:2014 methodology as described in Section 3.5. The BS4142:2014 assessment methodology requires that appropriate and representative background sound levels (LA90) are determined for both day and night-time periods for the purposes of undertaking the BS4142 assessment. Under this methodology, the reference time period for daytime (07:00 – 23:00) is one hour, while the reference time period for night-time (23:00 – 07:00) is 15-minutes.

As detailed in Section 4.1, the baseline noise monitoring survey was completed over weekday and weekend periods and was completed during appropriate weather conditions so as to have no significant interference to measured noise levels from precipitation or wind.

Figures 4.4 and 4.5 present histograms illustrating the frequency distribution for daytime and night-time background sound levels (L_{A90}) at the noise monitoring location.

Figure 4.4: Frequency Distribution of Daytime Background Sound Levels (L_{A90})

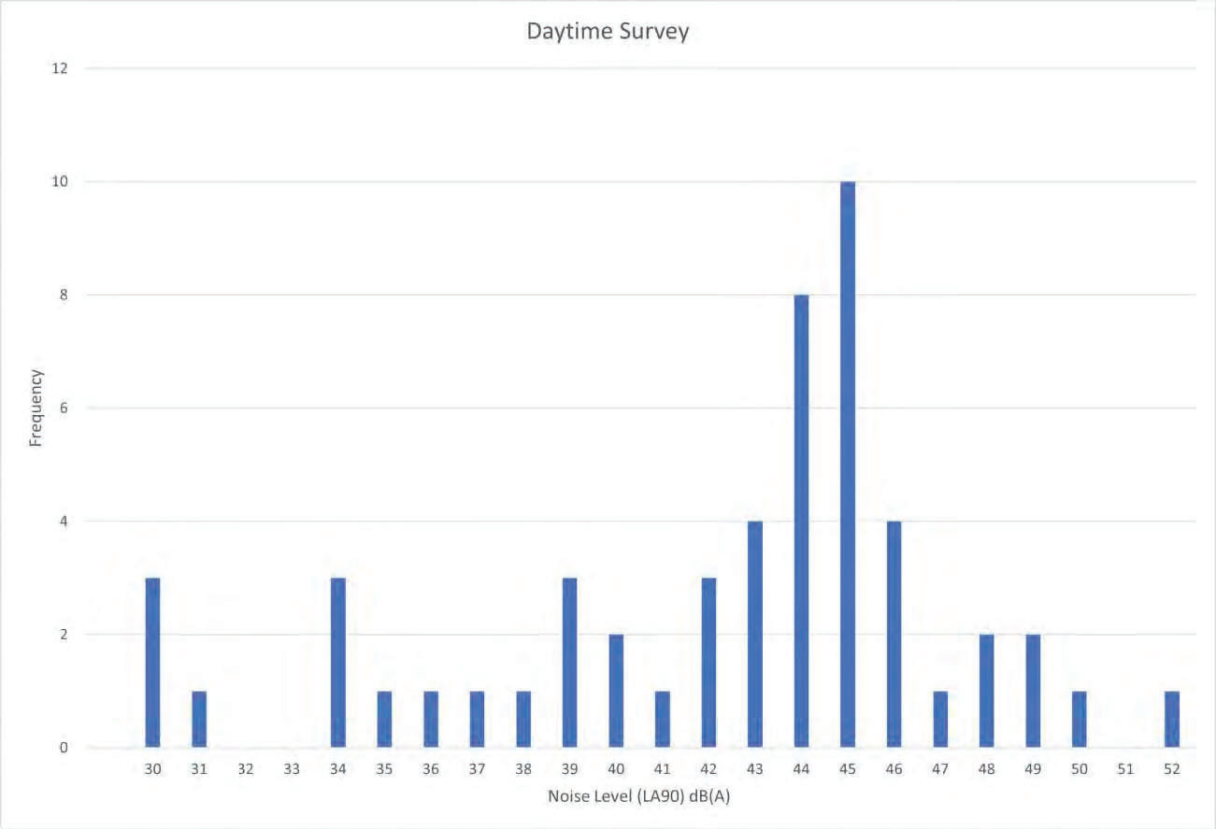
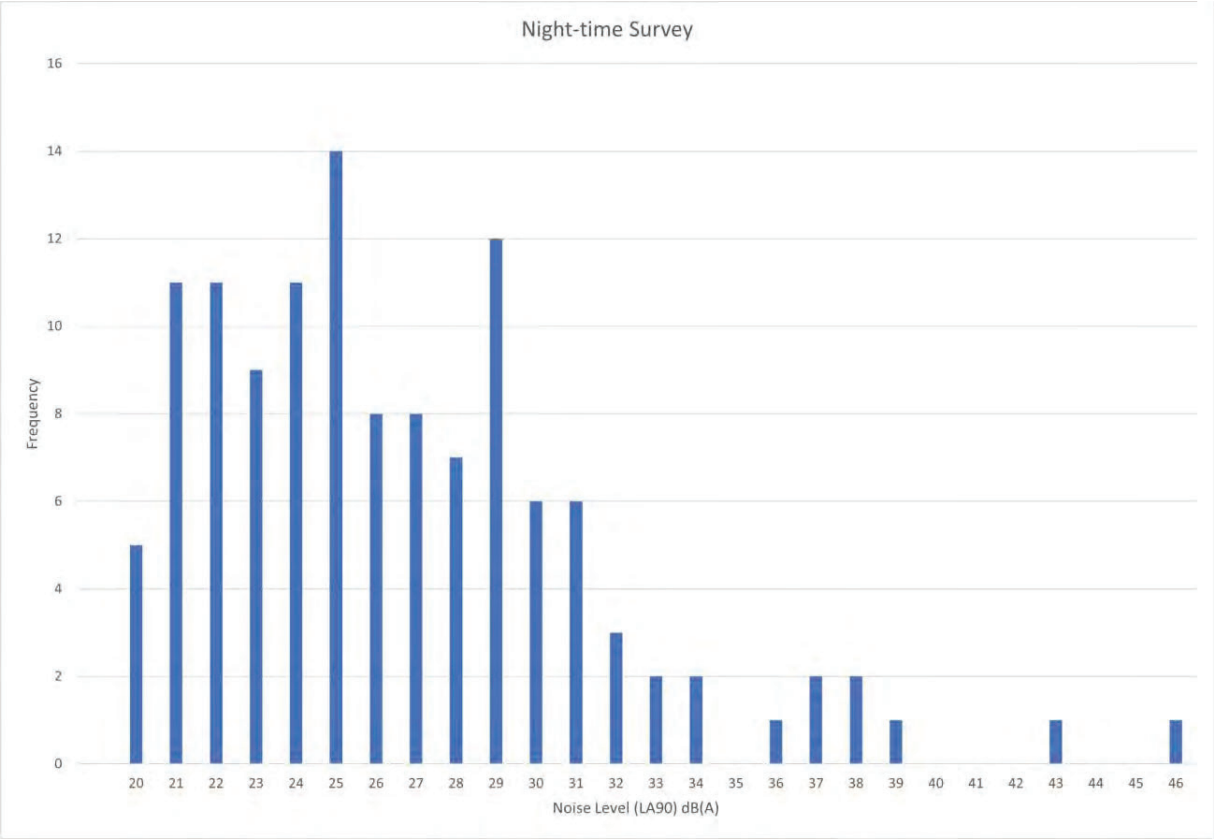


Figure 4.5: Frequency Distribution of Night-time Background Sound Levels (L_{A90})



On the basis of Figures 4.4 and 4.5, the typical background sound level (L_{A90}) for daytime and night-time periods is detailed below:

- Daytime – 45dB(A)
- Night-time – 25dB(A).

5. IMPACT ASSESSMENT – CONSTRUCTION PHASE

5.1 Description of Construction Process

Various aspects of the construction process for the proposed development are detailed in the bullet points below:

- Construction of site entrance;
- Construction of temporary site drainage works;
- Earthworks including levelling of site;
- Construction of entrance road;
- Construction of 110kV building, including foundation works and structural steelwork;
- Construction of transformer compounds;
- Construction of permanent foul and surface water drainage works;
- Construction of paving, fencing, landscaping and completion works.

Construction activities for the proposed development will take place on Monday to Fridays between 07:00 – 19:00 and on Saturdays between 08:00 – 13:00. It is not proposed that construction activities will take place outside of these hours.

Table 5.1 presents typical noise levels from various types of construction plant likely to be used during the construction process, while Table 5.2 shows typical combined construction noise levels for various construction phase activities at varying distances from the construction activities.

Table 5.1: Noise Levels for Construction Plant (Ref: BS 5228:2009+A1:2014)

Construction Phase	Plant (Reference from Annex C + D, BS5228:2009+A1:2014)	Reference from Annex C + D, BS5228	Plant Equivalent Continuous Sound Pressure Level L_{Aeq} at 10m (dB)
Site Preparation	Tracked excavator	C2.22	72
	Pneumatic breaker	D2.11	87
	Dump truck	C1.11	80
	Wheeled loader lorry	C2.26	79
	Dozer	C2.10	80
Foundations	Tracked excavator	C2.22	72
	Pneumatic breaker	D2.11	87
	Concrete pump	C3.25	78
	Compressor	C3.19	75
	Poker vibrator	C4.33	78
Steel Erection	Tower crane	C4.48	76
	Arcticulated lorry	C11.10	77
	Electric impact torque wrench		78
	Hand tools		81

General Construction	Pneumatic circular saw	D7.79	75
	Internal fit-out		70
Landscaping	Dozer	C2.10	80
	Dump truck	C1.11	80
	Surfacing	D8.25	68

Table 5.2: Typical Combined Construction Noise Levels

Activity	L_{Aeq} @ 10 m	L_{Aeq} @ 40 m	L_{Aeq} @ 80 m	L_{Aeq} @ 160 m	L_{Aeq} @ 320 m
Site Preparation	89	77	71	65	59
Foundations	88	76	68	62	56
Steel Erection	82	70	64	58	52
General Construction	82	70	64	58	52
Landscaping	83	71	65	59	53

5.2 Worst-Case Predicted Noise Impacts from Construction Process

Section 5.1 provides details on typical construction plant likely to be used during the construction process, while Table 5.2 provides typically combined noise levels from various plant operating simultaneously for different activities. A number of the items of plant included in Table 5.1 (e.g. tracked excavator, dump track) will be the same item of plant that will be used for different activities (e.g. dump truck used for site preparation and landscaping). The typical combined construction noise levels included in Table 5.2 are worst-case as they assume all items of plant acting simultaneously and continuously, however in reality plant activity will be more sporadic in nature with regular gaps in activity. Nevertheless, these typical combined construction noise levels are useful for the purposes of assessing the potential for worst-case construction noise impacts.

Section 3.6 includes a summary of the BS5228:2009+A1:2014 methodology, which includes relevant construction noise threshold limits based on the existing ambient noise levels at the nearest noise sensitive properties. On the basis of the existing ambient noise levels included in Figure 4.3 and the construction phase operating hours, the applicable BS5228 noise threshold limit at the nearest noise sensitive properties is the daytime Category A noise threshold limit of 65dB(A).

The majority of construction activities will take place in the area where the proposed 110kV substation building/plant and associated landscaping/paving/fencing will be located. These activities will take place at approximately 160-300m from the nearest noise sensitive properties. On the basis of the typical combined construction noise levels included in Table 5.2, worst-case construction noise levels from these activities will be in the mid-60s dB(A) or lower and within the relevant BS5228 noise threshold limit.

The site preparation and paving works associated with the entrance road from the site entrance to the 110kV substation will take place between 160-20m from the nearest noise sensitive properties. As these works come closer to the nearest noise sensitive properties and particularly at the closest point at the site entrance, there is potential for worst-case construction noise levels to increase to the high 70s / low 80s dB(A) under worst-case considerations.

It must be noted that these worst-case case construction noise predictions are an over-estimation of the likely construction noise levels that will actually be emitted from the proposed site as they assume every item of construction plant will be active simultaneously at the nearest portion of the proposed boundary to the respective sensitive receptor.

Nevertheless, these worst-case predicted noise levels serve as a useful tool in illustrating that there is potential for noise impacts during the construction phase from the activities nearest to R160. On the basis of the predicted worst-case construction noise levels from the proposed development, there will be a requirement for mitigation measures to be put in place in order to ensure that construction noise levels are reduced as much as practicable and do not significantly impact on the nearest noise sensitive receptors. Noise mitigation measures for construction activities are outlined in Section 7.

5.3 Vibration

Section 3.6 provides details on vibration threshold limits, whereby there is potential for damage to buildings. On account of the significant distance between the construction works for the proposed development and the nearest sensitive receptors, there is very limited opportunity for any significant vibration impact at these properties.

6. IMPACT ASSESSMENT – OPERATIONAL PHASE

This section contains a noise impact assessment of the operational phase of the proposed development. The primary noise source from the proposed development will be the external transformers located adjacent to the substation building.

6.1 Noise Source Data

Table 6.1 provides the primary noise source data used in the noise model. The only significant external noise source associated with the proposed substation will be two transformers. ESB have provided specification for the proposed transformers, taken from existing plant used by ESB on other sites. The station at Fosterstown is most likely to be a 110kV – 20kv Offload but this may be increased to a 110kv – 31.5 MVA. On this basis, the specification noise data for a 110kv – 31.5 MVA has been used for the purpose of completing a worst-case scenario.

Table 6.1: Noise Source Data (Transformer) Included in Noise Model

Transformer	Spectrum Data	Sound Power Level (dB) at Octave Band Centre Frequencies Z – Weighted (Hz)								Overall Sound Power (dBA)
		63	125	250	500	1k	2k	4k	8k	
31.5 MVA 110/20 kV DSO	Amplitudes Database	49	71	69	47	42	34	33	30	62

The data included in Table 6.1 was used for both transformers in the proposed development.

6.2 Predicted Noise Level from Proposed Substation

In order to predict plant noise levels from the proposed substation at the nearest noise sensitive properties, CadnaA noise modelling software was used to generate a detailed noise model of the hydrogen plant and its surrounding environment. The CadnaA noise modelling software package uses the ISO9613 prediction methodology along with a range of topographical and ordnance data collected on the surrounding area to build up a picture of the noise environment in the vicinity of sensitive receptors in the study area. The software was used to build a 3-dimensional model of all features which may affect the generation and propagation of noise in the study area.

Table 6.2 presents the predicted noise levels from the proposed Fosterstown 110kV Substation at the nearest noise sensitive properties. Figure 6.1 illustrated the noise contour map between the substation and these properties, including a reference number for each property included in Table 6.2. In Table 2, the properties have been modelled at ground floor (1.5m) for bungalows and at first floor (4m) for 2-storey properties.

Table 6.2: Predicted Noise Levels from Proposed Substation at Nearest Noise Sensitive Properties

Property Reference (See Figure 6.1)	Receptor Height	Predicted Noise Level dB(A)
1	1.5m	0.4
2	4m	3.5
3	1.5m	1.7
4	4m	2.9
5	1.5m	2.1

Figure 6.1: Noise Contour Drawing

6.3 BS4142:2014 Assessment

Sections 6.1 and 6.2 provide details on the noise modelling completed and the noise sources data included within the noise model. Noise level predictions were completed at the nearest noise sensitive properties to the proposed development. Figure 6.1 illustrates the nearest noise sensitive properties included within the noise model.

Table 6.1 presents the worst-case noise level predictions from the proposed development at the nearest noise sensitive properties. Properties have been modelled at ground floor level (1.5m) or first floor level (4m) depending on whether the property is a bungalow or two-storey property.

The predicted noise levels included in Table 6.2 have been used for the purposes of completing a BS4142 assessment. A worst-case tonal correction of +4dB has been added under the BS4142 assessment methodology on the basis of the distance between the noise sources and the relevant properties.

Tables 6.3 and 6.4 include a BS4142 assessment for day and night-time periods at the nearest noise sensitive properties to the proposed substation. Representative background sound levels derived for day and night-time periods as presented in Figures 4.4 and 4.5 have been used.

Table 6.3: Daytime BS4142 Assessment

Prop. Ref.	Predicted Noise Level dB(A)	Tonal Correction dB	Rating Level L_{AR}	Background Sound Level [L_{A90}] dB(A)	Excess of L_{AR} Above L_{A90}
1	0.4	+4	4.4	45	-41.6
2	3.5	+4	7.5	45	-37.5
3	1.7	+4	5.7	45	-39.3
4	2.9	+4	6.9	45	-38.1
5	2.1	+4	6.1	45	-38.9

Table 6.4: Night-time BS4142 Assessment

Prop. Ref.	Predicted Noise Level dB(A)	Tonal Correction dB	Rating Level L_{AR}	Background Sound Level [L_{A90}] dB(A)	Excess of L_{AR} Above L_{A90}
1	0.4	+4	4.4	25	-21.6
2	3.5	+4	7.5	25	-17.5
3	1.7	+4	5.7	25	-19.3
4	2.9	+4	6.9	25	-18.1
5	2.1	+4	6.1	25	-18.9

Table 6.2 indicates that all predicted noise levels with tonal correction are significantly below existing background sound levels at the nearest noise sensitive receptors for the daytime and night-time periods.

This assessment result would indicate that there is no likelihood of adverse noise impact during both the day and night-time periods.

Section 6.4 includes a further discussion on the predicted noise levels included in this section in the context of the surrounding site and other noise guidance documents.

6.4 Predicted Noise Levels and Other Noise Guidance Documents

As detailed in Section 3.1, the EPA NG4 guidance document relates primarily to noise surveys and assessments for EPA licensed facilities but provides useful reference material for the purposes of completing the noise assessment for the proposed development.

NG4 provides typical limit values for noise from licensed sites, namely:

- Daytime (07:00 - 19:00) - 55dB $L_{Ar,T}$;
- Evening (19:00 - 23:00) - 50dB $L_{Ar,T}$:
- Night-time (23:00 - 07:00) - 45dB $L_{Aeq,T}$.

The predicted noise levels from the proposed development are greater than 35dB below the worst-case night-time noise limit and will have no noise impact at these properties on the basis of the guidance provided in these documents.

As detailed in Section 3.2 and 3.3 of this report, both the WHO Guidelines and BS8233:2014 indicate a noise threshold limit of 30dB inside bedrooms for good sleeping conditions. This equates to an exterior façade noise level of 45dB(A), assuming an open window. The predicted noise levels included in Table 6.2 are greater than 35dB below the threshold for achieving good sleeping conditions in bedrooms, even assuming an open window.

As detailed in Sections 6.3 and 6.4, the predicted noise levels from the proposed substation are substantially below all relevant noise threshold limits presented in any relevant noise guidance documents. On this basis, there will be no requirement for mitigation measures during the operational phase.

7. NOISE MITIGATION

7.1 Construction Phase

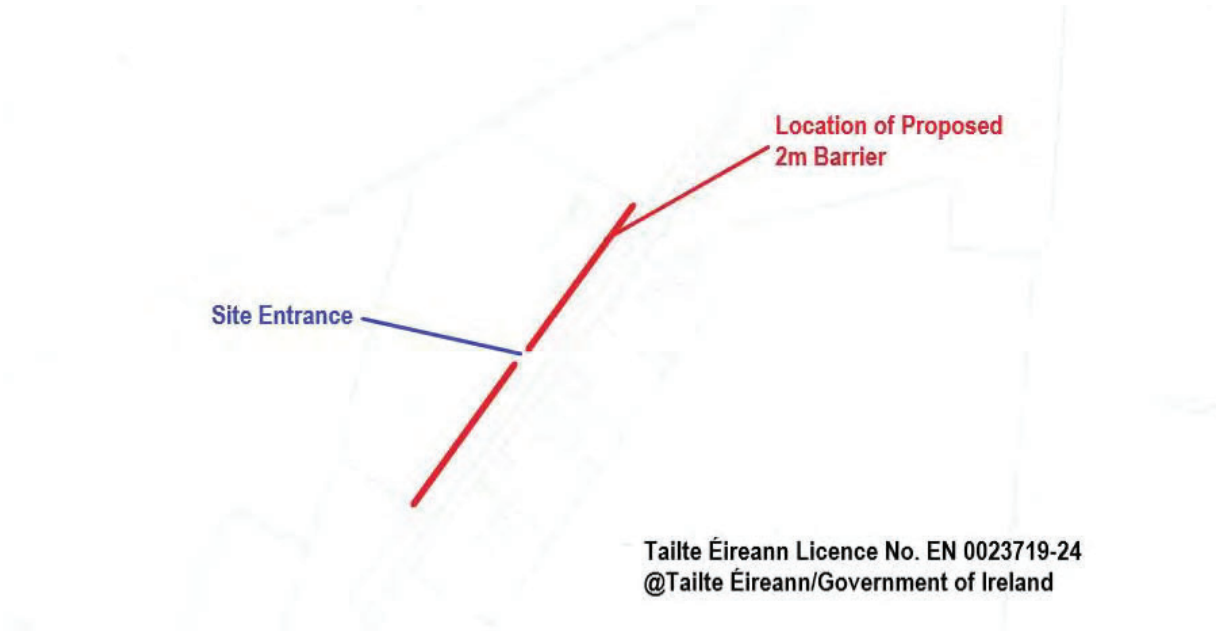
Where construction activity takes place for a development in the vicinity of residential properties, it is standard practice that the activities would operate between the hours of 07:00 and 18:00 on Monday to Fridays, between 08:00 and 13:00 on Saturdays and there will be no activity on Sundays or Bank Holidays.

As outlined in Section 5, there is potential for short-term noise impacts at the nearest noise sensitive properties if worst-case construction noise levels occur. Section 5.2 outlines worst-case predicted noise levels at the nearest noise sensitive properties and this indicates that there is potential for significant noise impacts at the nearest noise sensitive properties from the construction activities at the site entrance nearest to the nearest properties.

It must be noted that these worst-case predicted noise levels are very much an overestimation of the likely construction phase noise levels as they assume that all plant will be active simultaneously at the nearest portion of the site boundary to the proposed development. Nevertheless there is a clear need for appropriate mitigation measures to be in place during the construction phase.

It is proposed that a noise barrier in the form of site hoarding is erected at the site boundary with the R160 and directly across the road from the nearest noise sensitive properties. The location of this barrier is illustrated in Figure 7.1. It is proposed that this is a minimum of 2m height with no gaps in it, which will provide noise attenuation of approximately 10dB(A) in the direction of the nearest noise sensitive properties.

Figure 7.1: Proposed Construction Phase Noise Barrier



A detailed Construction Environmental Management Plan (CEMP) will be prepared and will include a range of measures aimed at reducing the potential construction noise impacts on the nearest receptors to the proposed development site. This plan will address the mode and timing of construction activity in close proximity to the site boundary with the nearest receptors, aiming to reduce the noisiest activities in the vicinity of the boundary of the proposed site. This should also include measures to communicate and coordinate construction phase activities at the nearest boundary to the most affected receptors so as to reduce these noise impacts to the lowest possible levels. The detailed CEMP will include the noise threshold limits included in Table 3.2 (BS5228:2009+A1:2014), which must be adhered to throughout the construction phase. On the basis of the noise monitoring survey completed, the lowest noise threshold limits included in this table (i.e. Category A) must be applied for all construction activities.

British Standard BS5228:2009+A1:2014 – Noise and vibration control on construction and open sites outlines a range of measures that can be used to reduce the impact of construction phase noise on the nearest noise sensitive receptors. These measures should be applied by the contractor where appropriate during the construction phase of the proposed development. Examples of some of the best practice measures included in BS5228 are listed below:

- ensuring that mechanical plant and equipment used for the purpose of the works are fitted with effective exhaust silencers and are maintained in good working order;
- careful selection of quiet plant and machinery to undertake the required work where available;
- all major compressors should be 'sound reduced' models fitted with properly lined and sealed acoustic covers which should be kept closed whenever the machines are in use;
- any ancillary pneumatic percussive tools should be fitted with mufflers or silencers of the type recommended by the manufacturers;
- machines in intermittent use should be shut down in the intervening periods between work;
- ancillary plant such as generators, compressors and pumps should be placed behind existing physical barriers, and the direction of noise emissions from plant including exhausts or engines should be placed away from sensitive locations, in order to cause minimum noise disturbance. Where possible, in potentially sensitive areas, acoustic barriers of enclosures should be utilised around noisy plant and equipment.
- Handling of all materials should take place in a manner which minimises noise emissions;
- Audible warning systems should be switched to the minimum setting required by the Health & Safety Executive;

A complaints procedure should be operated by the Contractor throughout the construction phase.

7.2 Operational Phase

As detailed in Section 6.4, there is no requirement for mitigation measures during the operational phase.

8. CONCLUSION

This report contains a detailed assessment of construction and operational phase noise levels from the proposed Fosterstown substation. The assessment has been conducted on the basis of worst-case assumptions for construction and operational phase noise.

The assessment has also been completed against a baseline noise dataset measured during weekday and weekend periods to determine existing ambient (L_{Aeq}) and background sound levels (L_{A90}) in the study area.

Subject to the appropriate mitigation measures being in place, the proposed development can be constructed and operated without generating any significant noise impact at the nearest sensitive properties.

During the construction phase, a Construction Environmental Management Plan will be prepared in advance of the commencement of works and will detail all measures and monitoring to ensure that construction noise levels are maintained below the Category A BS5228 noise threshold limits.

Operational phase noise levels from the proposed substation will be substantially below existing background sound levels at the nearest noise sensitive properties and will not generate any noise impact at these properties.

APPENDIX 1 – CALIBRATION CERTIFICATES

Laboratory Location:

Campbell Associates Ltd
Sb Chelmsford Road Industrial Estate
GREAT DUNMOW, Essex, GB-CM6 1HD
Phone 01371 871030

0759

Certificate of Calibration and Conformance

Certificate number: **U45454**

Test Object: **Sound Level Meter, BS EN IEC 61672-1:2003 Class 1**

Producer: **Norsonic AS.**
Type: **140**
Serial number: **1402995**
Customer: **Alive Environmental Ltd**
Address: **52 Drumman Heights, Armagh, Northern Ireland. BT61 9SL.**
Contact Person: **Stephen Cleary**
Order No: **AEL/2023/EQ-02**

Introduction:
Calibration has been performed as set out in CA Technical Procedures which are based on the procedures for periodic verification of sound level meters as per the **Test Object** listed above. Results and conformance statement are overleaf and detailed results, where appropriate, are provided in the attached Measurement Report.

Tested:	*Producer*	*Type*	*Serial No*	*Certificate No*
Microphone	Norsonic	1225	504164	45453
Calibrator*	Norsonic	1251	33739	U43087
Preamplifier	Norsonic	1209	12541	Included

* The calibrator was complete with any required nozzle for the microphone specified

Additional items that have also been submitted for verification:

Wind shield	Norsonic	Nor1451 (ø 60mm)
Attenuator	N/A	
Extension cable	Norsonic	Nor1408A/5M

These items have been taken into account wherever appropriate.

Instruction Manual: lm140_1Ed8R0En Firmware Version: v2.1.670 The test object is a single channel instrument.

Conditions	*Pressure kPa*	*Temperature °C*	*Humidity %RH*
Reference conditions:	101.325	23	50
Measurement conditions:	99.43 ±0.01	20.90 ±0.2	60.75 ±0.15

Calibration Dates:

Received date:	11/09/2023	Reviewed date:	22/09/2023
Calibration date:	22/09/2023	Issued date:	22/09/2023

Technicians: (Electronic certificate)

Calibrated by: *Palanivel Murugappan B.Eng (Hons), M.Sc*

Reviewed by: *Jenny Crawford*

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Doc ref: Non-Conf Master V3.07

Laboratory Location
Campbell Associates Ltd
5b Chelmsford Road Industrial Estate
GREAT DUNMOW, Essex, GB-CM6 1HD
Phone 01371 871030

CALIBRATION

Certificate of Calibration

Certificate number: **45453**

Test Object: **Measurement Microphone**

Producer: **Norsonic AS**
Type: **1225**
Serial number: **504184**
Customer: **Alive Environmental Ltd**
Address: **52 Drumman Heights, Armagh, Northern Ireland. BT61 9SL.**
Contact Person: **Stephen Cleary**
Order No: **AEL/2023/EQ-02**

Measurement Results	Sensitivity (dB re 1V/Pa)	Sensitivity (mV/Pa)	Capacitance (pF)
Measurement 1	-26.40	47.85	23.54
Measurement 2	-26.40	47.84	23.65
Measurement 3	-26.40	47.84	23.65
Result (Average)	**-26.40**	**47.84**	**23.61**
Expanded Uncertainty	0.10		2.00
Degree of Freedom	>100		>100
Coverage Factor	2		2

The stated sensitivity is the pressure sensitivity at 250Hz, S_{250}, and is valid at reference conditions. The following correction factors have been applied during the measurement:
Pressure:uncertainty dB/kPa Temperature:-0.005 dB/°C. Humidity:0 dB/%RH

Conditions	*Pressure kPa*	*Temperature °C*	*Humidity %RH*
Reference conditions	101.325	23	50
Measurement conditions	99.39 ± 0.040	21.3 ± 0.1	59.5 ± 0.7

The calibration test report shown on the next page gives details of the response at other frequencies relative to this 250 Hz reference sensitivity. Results ≥100 Hz are obtained using an electrostatic actuator as described in IEC 61094-6 and those below 100 Hz are obtained in a reference pressure chamber. Detailed results are available from the calibration laboratory upon request.

The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a coverage probability of approximately 95%. Where the degrees of freedom are insufficient to maintain this confidence level, the coverage factor is increased to maintain this confidence level.

Calibration Dates:

Received date:	11/09/2023	Reviewed date:	22/09/2023
Calibration date:	22/09/2023	Issued date:	22/09/2023

Technicians: (Electronic certificate)

Calibrated by: *Paluvinel Manappan BEng (Hons), MSc*
Reviewed by: *Jenny Crawford*

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Laboratory Location
Campbell Associates Ltd
5b Chelmsford Road Industrial Estate
GREAT DUNMOW, Essex, GB-CM6 1HD
Phone 01371 871030

0789

Certificate of Calibration and Conformance

Certificate number: **U46490**

Test Object: **Sound Calibrator**

Producer: **Norsonic AS.**
Type: **1251**
Serial number: **33739**
Customer: **Alive Environmental Ltd**
Address: **52 Drumman Heights, Armagh. BT61 9SL.**
Contact Person: **Stephen Cleary.**
Order No: **AEL/2024/EQ/01**

Measurement Results	Level dB	Level Stability dB	Frequency Hz	Distortion %
Measurement 1	114.04	0.04	1000.80	0.35
Measurement 2	114.04	0.04	1000.80	0.36
Measurement 3	114.05	0.05	1000.80	0.36
Result (Average):	**114.04**	**0.04**	**1000.80**	**0.36**
Expanded Uncertainty:	0.1	0.02	1	0.25
Degree of Freedom:	>100	>100	>100	>100
Coverage Factor:	2	2	2	2

The stated level is relative to 20µPa. The level is traceable to National Standards. The stated level is valid at reference conditions. The following correction factors have been applied during the measurement
Pres:0.0005 dB/kPa Temp:0.003 dB/°C Humi:0 dB/%RH Load volume: 0.0003 dB/mm3

Conditions	*Pressure kPa*	*Temperature °C*	*Humidity %RH*
Reference conditions	101.325	23	50
Measurement conditions	99.919 ±0.041	21.7 ±0.2	40.1 ±1.3

The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a level of confidence of approximately 95%. Where the degrees of freedom are insufficient to maintain this confidence level, the coverage factor is increased to maintain this confidence level. The uncertainty has been determined in accordance with UKAS requirements.

Records: K:\C A\Calibration\Nor-1504\Nor-1018 CalCal\Current Year\NOR1251_33739_M1.nmf

Preconditioning
The equipment was preconditioned for more than 4 hours in the specified calibration environment.

Method
Calibration has been performed as set out in the current version of CA Technical procedure TP01

Calibration Dates:

Received date:	17/01/2024	Reviewed date:	22/01/2024
Calibration date:	22/01/2024	Issued date:	22/01/2024

Technicians: (Electronic certificate)
Calibrated by: *Michael Tickner*
Reviewed by: *Jenny Crawford*

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Doc ref: Calb-Cert-Master-V3-06

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