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ACOUSTIC CONSULTANTS

Drumdowney Substation & Grid Connection

Noise Impact Assessment
11 December 2025

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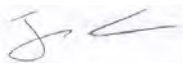
A	Issued	Noise Impact Assessment	 Sean Rocks	 James Cousins	11/12/2025

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Executive Summary

Wave Dynamics were engaged by Drumdowney Solar Farm Limited to undertake a noise impact assessment for the proposed Drumdowney Substation & Grid Connection, Co Kilkenny.

The proposed development comprises of:

1. A 110kV Gas Insulated Switchgear (GIS) electricity substation with two-storey GIS substation building, single-storey Independent Power Producer (IPP) control room building, High Voltage (HV) electrical equipment and associated infrastructure (to include transformer, lightning protection masts, back-up diesel generator, fire/blast wall, telecoms pole, perimeter security fencing, security lighting, water and drainage infrastructure, and temporary construction compound) to connect to and serve solar farm development;
2. Associated loop-in / loop out grid connection infrastructure to connect into an existing 110kV overhead transmission line (including underground 110kV cabling, 2 No. new interface towers and decommissioning of ca. 15m of existing 110kV overhead line);
3. Construction and operational access from the public road L34142;
4. All ancillary site development, landscaping and earthworks. The development subject to this application forms part of grid connection and access arrangements which will facilitate the connection of the proposed Drumdowney Solar Farm (Kilkenny County Council Reference 25/60391) to the national grid.

A Natura Impact Statement (NIS) has been prepared in respect of the proposed development. The NIS includes consideration of the proposed Drumdowney Solar Farm which is located in the townlands of Atateemore or Blackneys, Ballyhobuck, Ballyrahan, Carriganurra, Charlestown, Davidstown, Drumdowney Lower, Drumdowney Upper, Gorteens, Grogan, Kilmurry, Nicholastown, Rathpatrick, Scartnamoe, Tinvaucoosh and Treanaree in County Kilkenny.

The operational lifetime of the solar farms is assumed to be 40 years. However, following the decommissioning of the solar farm, it is envisaged that the substation (and underground cable grid connection) will remain in situ as a valuable functioning and operational part of the electricity transmission network managed by the Transmission Systems Operator, EirGrid.

This report outlines the project assessment criteria, survey results, assessment, and general guidance recommendations for:

- Construction noise and vibration from the construction of the proposed substation, grid connection and nearby Drumdowney solar farm.
- Operational noise from operation of the proposed substation, grid connection and nearby Drumdowney solar farm.

Based on the operational hours of the development there is potential for noise impact in both the day and night-time, therefore an assessment for both has been conducted. The noise impact assessment included attended and unattended noise measurements on the proposed development lands. This included measurements of background noise at the noise sensitive locations. Appendix A outlines a glossary of the acoustic terminology used in this report.

Construction Noise and Vibration

The construction noise and vibration from the development have been predicted to the nearest noise sensitive (NSLs) receptors of the substation, grid connection and adjacent solar farm. The construction predictions were based on the procedures outlined in BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise. The construction noise from the development will be of a short-term nature. The works have been assessed on the basis that they will be sequential.

Consideration was given to the construction of the substation, grid connection and associated solar farm as well as cumulative noise and vibration impacts. **Based on the assessment outlined in this report it is predicted that the construction noise and vibration from the proposed substation, grid connection and associated solar farm will comply with the recognised best practice standards typically adopted for such projects in Ireland.**

Operational Noise

The noise levels from the substation and grid connection were assessed using criteria set out by EPA NG4 and BS4142 2014 A1+ 2019 Methods for rating and assessing industrial and commercial sound, which predicted that there is no predicted adverse noise impact at all noise sensitive receptors for the daytime, evening and night-time periods.

Based on the assessment outlined in this report it is predicted that the operational noise levels from the proposed substation, grid connection and associated solar farm will comply with the project criteria and not produce a negative noise impact. The cumulative noise impact from the development in combination with other nearby proposed developments has also been assessed and is predicted to comply with the project criteria.

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1 Introduction

Wave Dynamics were engaged by Drumdowney Solar Farm Limited to undertake a noise impact assessment for the proposed Drumdowney Substation & Grid Connection, Co Kilkenny.

General

The proposed development comprises of

1. A 110kV Gas Insulated Switchgear (GIS) electricity substation with two-storey GIS substation building, single-storey Independent Power Producer (IPP) control room building, High Voltage (HV) electrical equipment and associated infrastructure (to include transformer, lightning protection masts, back-up diesel generator, fire/blast wall, telecoms pole, perimeter security fencing, security lighting, water and drainage infrastructure, and temporary construction compound) to connect to and serve solar farm development;
2. Associated loop-in / loop out grid connection infrastructure to connect into an existing 110kV overhead transmission line (including underground 110kV cabling, 2 No. new interface towers and decommissioning of ca. 15m of existing 110kV overhead line);
3. Construction and operational access from the public road L34142;
4. All ancillary site development, landscaping and earthworks. The development subject to this application forms part of grid connection and access arrangements which will facilitate the connection of the proposed Drumdowney Solar Farm (Kilkenny County Council Reference 25/60391) to the national grid.

The operational lifetime of the solar farms is assumed to be 40 years. However, following the decommissioning of the solar farm, it is envisaged that the substation (and grid connection) will remain in situ as a valuable functioning and operational part of the electricity transmission network managed by the Transmission Systems Operator, EirGrid.

Substation

The substation will be based on EirGrid design specifications. The substation compound will consist of a two-storey GIS substation building, single-storey IPP Control Room building, HV electrical equipment and associated infrastructure including palisade fences and concrete post and rail fences. The installation of HV electrical equipment will include a transformer with associated equipment along with:

- Lightning Masts (LM);
- Back-Up Diesel Generator;
- Harmonic filters if required by EirGrid;
- Capacitor Bank if required by EirGrid;
- Fire/Blast Wall;
- Telecoms Pole.

The substation compound has a total area of 5,335m^2. Earthworks will be undertaken so the compound is level, with a finish compound level of 91.65m.

Site Access

The site will be accessed for both the construction and operational phases by means of a single entrance from the L34142. This existing entrance will be subject to some upgrades, including removal of existing roadside sod and stone ditch to provide new gate as presented under Kilkenny County Council Reference 25/60391. The entrance will be suitably splayed and has been subject to sight line and autotrack analysis, with the latter including modelling of abnormal load delivery for the transformer. Operational sightlines will be maintained by trimming back hedgerows with all necessary land within ownership.

A 4.5 metre wide compacted access track will extend from the entrance to the substation compound. The design includes a temporary construction track to cater for deliveries, which will be decommissioned post the

construction phase (and land reinstated), as well as an operational access track. The track will include a geotextile base and filter membrane and 200 mm of Clause 804 sub-base.

Connection to National Grid

In order to connect to the transmission network, it is proposed to connect the 110kV substation into the national grid via a 'loop-in / loop-out' underground 110kV cable grid connection which will connect into the existing 110kV Great Island to Waterford overhead line.

Two new steel lattice interface towers of approximately 16 m in height will form part of the existing overhead line and both towers will connect to the proposed 110kV substation via underground 110kV cables. The interface towers are approximately 15 metres apart, therefore the same length of the existing 110kV Whitegate – Cow's Cross overhead line will need to be decommissioned. The underground cable is comprised of 3 no. power ducts, 2 no. telecom ducts and 1 no. earth continuity duct. The cables to each interface tower are 68 and 83 metres in length.

This connection method will constitute a new node of the transmission network, connecting the proposed substation and associated solar farm generation to the national electricity grid. The construction method for the interface towers and decommissioning of 110kV overhead lines is set out in the Drumdowney Substation & Grid Connection Construction Methodology prepared by Drumdowney Solar Farm Limited.

All works will be carried out in accordance with international best practice and full compliance with health and safety requirements.

Temporary Construction Compounds

As outlined in the submitted site layout plans, it is proposed to provide a temporary construction compound west of the proposed substation, accessed from the entrance from the L34142. The temporary compound will include the following facilities at a minimum:

- Adequate canteen space to allow for all workers during the peak period;
- Office space with lighting, heating and internet facilities;
- Toilets and adequate welfare facilities for construction staff in accordance with the relevant statutory Health & Welfare guidelines;
- Parking space for both light and heavy vehicles;

Designated skips and temporary storage areas.

Surace Water Drainage and Water Services

Surface water drainage proposals for the development have been developed to mimic the natural drainage patterns of the site and thereby be in accordance with the best management practices of Sustainable Drainage Systems (SuDS) including those set out in the SuDS Manual (C753) published by CIRIA in 2015. Specifically, this includes the following:

- The compound construction is formed with permeable stone thus mimicking a soakaway scenario. ESB compound stone is single sized for the first 150mm for safety purposes. It then changes to a graded 6F2 material.
- The main areas to be drained includes the roofs and the compound road. These equate to approximately 2359m². The compound road will be drained via series of road gullies.
- Assuming even the most basic of infiltration rates down through the permeable compound stone, the existing greenfield situation is easily maintained.

The surface water generated in the hardstanding and bunded areas will discharge to the soakaway via a Class 1 Full Retention Oil Separator. The electrical transformer in the substation is oil filled equipment and, as such, is protected with impermeable bunds. Surface water generated in this bund will be pumped out by an oil sensitive pump ensuring that only non-contaminated water enters the site drainage network.

In relation to wastewater, a 5m^3 foul holding tank is proposed as part of the operational development. These tanks are normally used in ESB substations. It will be emptied periodically, with the capacity in excess of modelled holding requirements.

It is proposed to provide the required potable water demand of the station with a bored well on site. The potable water demand within the site will be low as the proposed station is to be unmanned. To avoid issues like stagnation in the water supply line and problems resulting from this, there will be a continual water demand of 24 litres per week from automatically flushing WCs within the station.

Site Restoration and Landscaping

This will involve the reinstatement of all other excavated materials and associated landscaping works. It will include the replacement of topsoil in disturbed ground areas such as access tracks and the removal of the construction compound and other temporary work areas.

The proposed landscaping provides for the removal of c.87 metres of hedgerow to facilitate the proposed development. Approximately 531 metres of existing hedgerow will be bolstered (Type 1) as part of the development, with an additional 287 linear metres of new hedgerow planting (Type 2) as per the submitted Landscape Mitigation Plan.

Other Planned Works

Kilkenny County Council Reference 25/60391

It is intended that the proposed 110kV substation and grid connection will service the Drumdowney Solar Farm, which is currently the subject of a planning application to Kilkenny County Council. At the time of writing, the solar farm application is undetermined.

The proposed solar farm will consist of solar panels on ground mounted frames, 27 no. single storey electrical inverter/transformer stations, 5 no. single storey spare parts containers, 3 no. Ring Main Units, 5 no. weather stations, underground electrical ducting and cabling within the development site, private lands and within the L3429, L7523, L7563, L7469, L3407, L3414, L34144, L7466, L3406, L7483, L3415, N25 and N29 public roads to connect solar farm field parcels, security fencing, CCTV, access tracks, 7 no. watercourse/drain deck crossings and 4 no. horizontal directional drill crossings (under the N25 and N29 public roads and the Luffany River), temporary construction compounds, landscaping and all associated ancillary development and drainage works. Construction and operational access will be via 7 no. existing entrances from the L3429, L7469, L7466, L4783 and L34142 which will be subject to entrance upgrade works. Separate construction phase access options are proposed for Parcel 4 via Port of Waterford and the L4783. The operational lifespan of the solar farm will be 40 years.

The solar farm will contribute directly to a carbon dioxide emission reduction of 41,647 tonnes per annum or the equivalent of approximately 1,665,917 tonnes of CO2 over the 40 year lifetime of the project.

1.1 Statement of Competence

The attended and unattended measurements and report were completed by Wave Dynamics, an acoustic consultancy that specialises in noise and vibration. Our consultants have extensive experience in noise impact assessments.

The site survey was conducted by Daniel Cousins | Field Engineer, Daniel has on-site experience of numerous planning stage applications and construction stage sites.

This report was completed by Shannon Doherty, Senior Acoustics Consultant, Shannon is a senior acoustics consultant with over 12 years' experience in noise and vibration, including noise monitoring surveying, assessment and noise control. He has a BSc (Hons) in Music Technology from Queens University Belfast as well as a Post Graduate Diploma in Acoustics and Noise Control from the Institute of Acoustics. Shannon has

experience working on major residential, infrastructure, energy and brownfield/greenfield development projects in the UK and Ireland.

The peer review was completed by Sean Rocks, Director | Senior Consultant, Sean has experience of numerous planning stage assessments. Sean's qualifications include; BEng (Hons) in Mechanical and Manufacturing Engineering, Diploma in Acoustics and Noise Control (Institute of Acoustics), IOA Certificate of Competence in Environmental Noise Measurement and SITRI certified sound insulation tester. Sean is a member of both Engineers Ireland and the Institute of Acoustics.

2 Site Description

The substation, grid connection and solar farm developments are spread across the townlands of Atateemore or Blackneys, Ballyhobuck, Ballyrahan, Carriganurra, Charlestown, Davidstown, Drumdowney Lower, Drumdowney Upper, Gorteens, Grogan, Kilmurry, Nicholastown, Rathpatrick, Scartnamoe, Tinvaucoosh and Treanaree in County Kilkenny. The surrounding area consists mainly of agricultural farmland with the N25 passing between land parcels 1 and 2, and the River Suir and Barrow at the southern sites.

The substation will be located within land parcel 5 of the associated solar farm development as shown in Figure 1 and Figure 2 below.

Figure 1: Proposed S110kV substation site layout plan

Figure 1 illustrates the layout plan of the associated Drumdowney Solar Farm project.

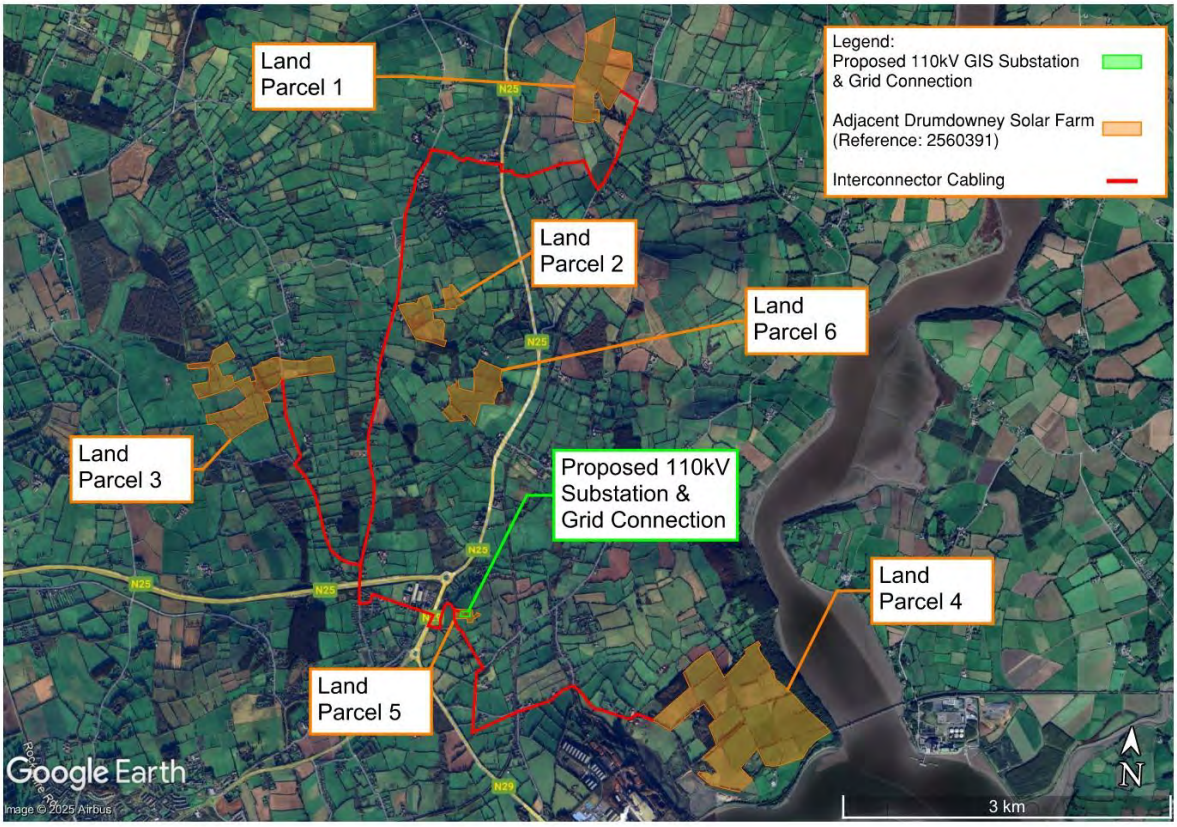


Figure 2: Drumdowney Solar Farm Layout

Table 1 below shows the respective approximate distances between the closest dwelling of each noise sensitive location (NSL) subgroup and the proposed substation. The noise sensitive locations are shown in Figure 3 and Figure 4 and represent those NSLsin proximity to the wider Drumdowney Solar Farm, including the proposed substation and grid connection site which is located in Parcel 5.

Table 1: Distance between NSLs and proposed substation.

Noise Sensitive Location	Approximate distance from closest façade of the NSL to the proposed substation and grid connection (m)
NSL1	3220
NSL2	3110
NSL3	3430
NSL4	1750
NSL5	1450
NSL6	2800
NSL7	4175
NSL8	5150
NSL9	553
NSL10	215

Noise Sensitive Location	Approximate distance from closest façade of the NSL to the proposed substation and grid connection (m)
NSL11	206
NSL12	1480

3 Project Criteria

The acoustic assessment criteria for the project is set out in this section, the purpose of the criteria is to ensure consideration of:

- Construction noise from the construction of the proposed substation, grid connection and nearby Drumdowney Solar Farm.
- Operational noise from operation of the proposed substation, grid connection and nearby Drumdowney Solar Farm.

The Drumdowney Solar Farm is located on nearby land parcels to the proposed substation and will be constructed and in operation at the same time. For that reason, this solar farm been assessed in this report alongside the substation and grid connection. This ensures a comprehensive whole project approach to the assessment has been completed.

There will be no predicted noise from the underground cable elements of the wider project including both the 110kV grid connection cabling and the 33kV interconnector cabling (which forms part of the solar farm planning application to Kilkenny County Council). Therefore operational noise from the underground cable has been screened out.

Based on our understanding of the project there are no relevant sources of vibration from the operational phase of the development. Therefore, Wave Dynamics have developed the project assessment criteria for:

- Operational noise and construction noise and vibration.

Acoustic Standards

The acoustic standards for assessing noise impact for the project have been developed from the following:

- ✓ Environmental Protection Agency (EPA) NG4: Guidance note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities
- ✓ BS4142 2014 A1+ 2019 Methods for rating and assessing industrial and commercial sound
- ✓ ISO 1996-1:2016 Acoustics — Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures
- ✓ British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise
- ✓ British Standard BS7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration, and;
- ✓ British Standard BS5228-2: 2009 + A1: 2014: Code of practice for noise and vibration control on construction and open sites – Vibration.
- ✓ Kilkenny County Council Noise Action Plan 2024-2028
- ✓ Previous experience on similar projects.

3.1 Noise Assessment Criteria

3.1.1 Construction Noise Assessment Criteria

There is currently no statutory Irish guidance for construction noise requirements from noise during the construction phase of a project.

In the absence of specific noise limits, the appropriate criteria for the allowable construction noise levels may be found in British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.

The standard (BS5228-1:2009+A1) provides examples of acceptable limits for construction and/or demolition noise in both subjective and objective form. For example, paragraph E.2 of the standard states:

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

Paragraph E.2 goes on to state:

> *"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:*
>
> - *70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;*
> - *75 decibels (dBA) in urban areas near main roads in heavy industrial areas".*

Typically, the planning authority refer to BS 5228 Part 1 as a method to control construction noise from sites on the local environment. This standard is therefore the de facto appropriate standard in the absence of regulatory guidance.

The criteria for this project will be based on the ABC method, the ABC method takes the background noise measured in the area and sets the appropriate construction noise limits for the project based on the background noise levels.

For the purpose of this assessment buildings other than dwellings which have a residential function will be considered for the lower noise limit, this includes Hotels, B&B's, Student Accommodation, Co-Living and Assisted Living Developments etc. This is in line with the guidance and definition of noise sensitive residences of EPA NG4. Table 2 below outlines the project criteria in tabular form.

Table 2: BS 5228: 1:2009+A1 threshold levels.

Assessment category and threshold value period	**Threshold value, in decibels (dB) (L_{Aeq})**		
	Category A[1]	**Category B [2]**	**Category C[3]**
Daytime (07:00 – 19:00) and Saturdays (07:00 – 14:00)	65	70	75
Evenings and weekends [4]	55	60	65
Night-time (23:00 to 07:00hrs)	45	50	55

1) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
2) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
3) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category B values.
4) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

3.1.2 Construction Vibration Criteria

Best practice guidance is taken from British Standard BS 5228:2009 + A1 2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 2 Vibration.

The standard recommends that for a soundly constructed residential property and similar structures (in good repair), the threshold for minor or cosmetic (i.e. non- structural) damage should be taken as a Peak Particle Velocity (PPV) (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:

Table 3: Likely Construction Noise Impact

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:			
Building Type	**Less than 15Hz**	**15 to 40Hz**	**40Hz and above**
Light framed structures/ residential buildings	15 mm/s	20 mm/s	50 mm/s

3.1.3 Operational Noise

Planning authorities can set noise limits from typical substation and solar farm developments pertaining to noise however there is currently no national policy for operational noise limits from either type of development for planning noise assessments. Noise limits for new developments are typically sought from the planning authority's Noise Action Plan, EPA NG4/BS 4142. On review of the Kilkenny County Council Noise Action Plan 2024-2028 no specific guidance has been outlined for noise limits from commercial premises and therefore the criteria from EPA NG4 and BS4142 have been adopted for the project.

EPA NG4

EPA NG4 outlines that noise attributable solely to onsite activities from a licenced premises should not exceed the following limits:

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

During daytime and evening periods rigorous efforts should be made to avoid clearly audible tones and impulsive noise at all sensitive locations. A penalty of 5dB for tonal and/or impulsive elements is to be applied to the daytime and evening measured $L_{Aeq,T}$ values to determine the appropriate rating level ($L_{Ar,T}$). In all cases, an assessment by a competent person will be required.

During the night-time period no tonal or impulsive noise from the facility should be clearly audible or measurable at any NSL.

BS 4142:2014+A1:2019

The standard describes a method for the assessment of commercial, industrial and background noise to quantify its impact on persons outside of a residential dwelling. BS 4142 has become the de facto standard for compliance investigation. In addition to the specified broadband noise levels the standards provide objective and subjective methods for the assessment of the impulsivity and tonality of the noise sources. This allows for a penalty/ correction to be applied to the measured noise level of the source (L_{Aeq}) to give the rating level ($L_{Ar,T}$).

It considers the likelihood of complaints by considering the margin by which the noise in source the background noise level.

BS 4142 states that and exceedance of the noise source of the background noise by:

- +10 dB or more indicates that complaints are likely,

- + 5 dB is of marginal significance, and;
- The rating level is more than 10 dB below the measured background noise level, then this is a positive indication that complaints are unlikely.

BS4142 outlines guidance for penalty corrections to be applied to the noise sources in question should the noise source have one of the following characteristics:

- The noise contains a distinguishable, discreet, continuous tone (whine, or hum);
- The noise contains distinct impulses (i.e. bangs),
- The noise is intermittent or:
- The noise is irregular.

4 Baseline Noise Survey

4.1 Baseline Noise Survey

An attended and unattended baseline noise survey was conducted to assess the background noise levels and the typical noise sources in the area. Multiple locations were chosen to conduct the survey to establish the background noise across the full development. The attended measurements included measurements of background noise during both daytime (07:00hrs - 23:00hrs) and night-time hours (23:00hrs - 07:00hrs). The purpose of the attended and unattended measurements was to establish the background noise levels in the area, and to use these measurements for assessing the future noise impact from the substation, grid connection and associated solar farm.

4.1.1 Site Description and Measurement Locations

The substation, grid connection and wider solar farm development are spread across multiple townlands in County Kilkenny. There are residential properties located around the solar farm lands as shown below in Figure 2 and Figure 3. The solar farm is generally surrounded by agricultural farmland with the N25 passing between the solar farm sites.

The proposed development comprises of:

1) A 110kV Gas Insulated Switchgear (GIS) electricity substation with two-storey GIS substation building, single-storey Independent Power Producer (IPP) control room building, High Voltage (HV) electrical equipment and associated infrastructure (to include transformer, lightning protection masts, back-up diesel generator, fire/blast wall, telecoms pole, perimeter security fencing, security lighting, water and drainage infrastructure, and temporary construction compound) to connect to and serve solar farm development;
2) Associated loop-in / loop out grid connection infrastructure to connect into an existing 110kV overhead transmission line (including underground 110kV cabling, 2 No. new interface towers and decommissioning of ca. 15m of existing 110kV overhead line);
3) Construction and operational access from the public road L34142;
4) All ancillary site development, landscaping and earthworks. The development subject to this application forms part of grid connection and access arrangements which will facilitate the connection of the proposed Drumdowney Solar Farm (Kilkenny County Council Reference 25/60391) to the national grid.

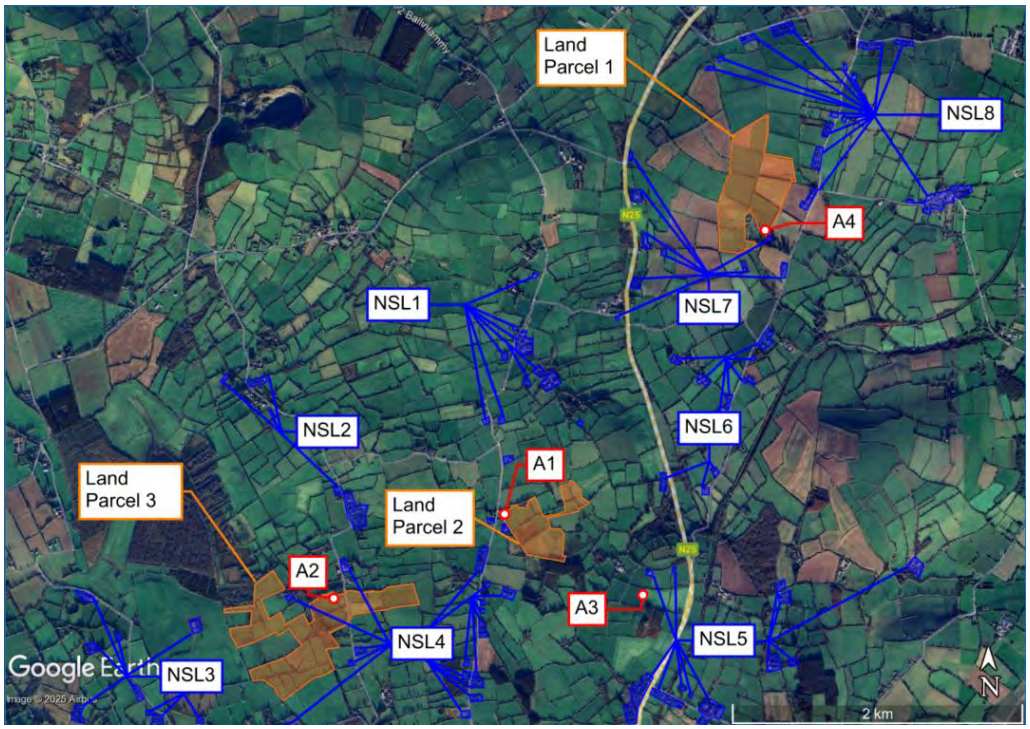


Figure 3: Part 1 of 2: Site location, NSL locations and measurement locations for northern part of project.

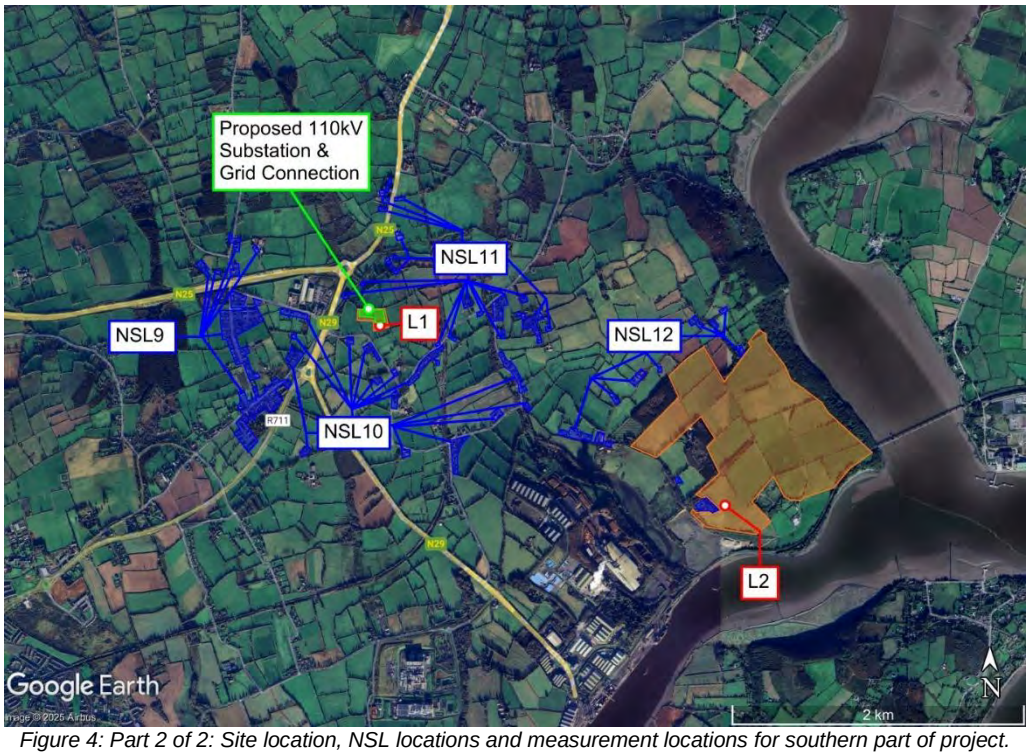


Figure 4: Part 2 of 2: Site location, NSL locations and measurement locations for southern part of project.

The noise monitoring locations undertaken for the survey of the entire Drumdowney Solar Fram including the 110kV substation and grid connection are shown in Figure 2 and Figure 3 above. The purpose of all measurements undertaken at the site was to assess the existing background noise levels in the area and at the noise sensitive locations prior to the solar farm development.

The background noise levels recorded are used to assess if the noise sensitive locations meet the EPA NG4 criteria for “areas of low background noise”, in order to set the project criteria. The full descriptive details of the monitoring locations are outlined below.

- L1: This represents the unattended noise logger at measurement location L1, which was located in a field within the site boundary of the proposed substation and grid connection. This is representative of the residual and background noise levels during the day, evening and nighttime periods at NSLs 9, 10 and 11. The measurements recorded at L1 were dominated by distant road traffic noise from the N25 and N29. L1 is considered to be the most representative monitoring location for the proposed substation and grid connection.

- L2: This represents the unattended noise logger at measurement location L2, which was located in a field within the site boundary of land parcel 4. This is representative of the residual and background noise levels during the day, evening and nighttime periods at NSLs 12. The measurements recorded at L2 were dominated by distant road traffic noise from the N29 and activity noise from nearby Belview Port. L2 is a monitoring location which is representative of the wider Drumdowney Solar Farm and enables a more comprehensive whole project assessment.

- A1: This represents attended measurement location A1 which was located in a field within the site boundary of land parcel 2 and is representative of the day and nighttime noise levels at NSLs 1 and 4. These measurements have been used to verify the noise logger measurements across the site. The dominant noise source at this location was distant road traffic noise. Other audible noise sources included birdsong. A1 is a monitoring location which is representative of the wider Drumdowney Solar Farm and enables a more comprehensive whole project assessment.

- A2: This represents attended measurement location A2, which was located in a field within the site boundary of land parcel 3. The measurements were representative of the day and nighttime noise levels at NSLs 2, 3 and 4. These measurements have been used to verify the noise logger measurements across the site. The dominant noise source at this location was distant road traffic noise. A2 is a monitoring location which is representative of the wider Drumdowney Solar Farm and enables a more comprehensive whole project assessment.

- A3: This represents attended measurement location A3. The measurements were representative of the day and nighttime noise levels at NSLs 5 and 6. These measurements have been used to verify the noise logger measurements across the site. The dominant noise source at this location was road traffic noise from the N25. A3 is a monitoring location which is representative of the wider Drumdowney Solar Farm and enables a more comprehensive whole project assessment.

- A4: This represents attended measurement location A4, which was located in a field within the site boundary of land parcel 1. The measurements were representative of the day and nighttime noise levels at NSLs 7 and 8. These measurements have been used to verify the noise logger measurements across the site. The dominant noise source at this location was distant road traffic noise and birdsong. A4 is a monitoring location which is representative of the wider Drumdowney Solar Farm and enables a more comprehensive whole project assessment.

4.1.2 Survey Methodology and Personnel

The attended and unattended surveys were completed by Daniel Cousins (Field Engineer).

Attended Noise Measurements

Noise measurements were undertaken in general accordance with ISO 1996-1:2016 using ISO Class 1 sound analysers. Attended measurements were taken for varying durations based on objective. Background noise measurements were taken over a 60-minute period for the daytime period and over 15 minutes for the night-time period. Care was taken to avoid any effect on the measurements, the sound level meter was positioned at approximately 1.2m above ground level.

Figure 5: Attended noise monitor setup.

Unattended Noise Measurements

Noise measurements were undertaken in general accordance with ISO 1996-1:2016 using ISO Class 1 sound analysers. An unattended noise survey was undertaken from the 4th of April 2024 at 15:45hrs to the 9th of April 2025 at 04:01hrs. Care was taken to avoid any effect on the measurements, the sound level meter was positioned at approximately 1.5m above ground level and securely anchored in place for the duration of the unattended survey. The data from the unattended measurements was filtered for adverse or undesirable weather conditions.

Figure 6: Unattended noise monitor setup.

4.1.3 Survey Period

The attended noise measurements were undertaken on the 4th and 9th of April 2025. The unattended survey was started on the 4th of April 2024 at 15:45hrs by Daniel Cousins (Field Engineer) and completed on the 9th of April 2025 at 04:01hrs.

4.1.4 Noise Measurement Equipment

A Class 1 sound level meter/noise logger in general accordance with IEC 61672-1:2013 was used for the attended measurements. Calibration certs are available on request. Table 4 below summarises the measurement equipment used.

Table 4: Noise Measurement Equipment

Description	WD Asset Number	Model	Serial No.	Calibration Certificate No.	Calibration Due Date
Sound Level Meter	SLM2	Nor 140	1406532	UCRT25/2495	20/10/2027
Sound Level Meter	SLM7	Nor 140	1405924	U48184/ U47386	25/07/2026
Sound Level Meter	SLM8	Nor 140	1403345	SLM250258	09/05/2027
Calibrator	CAL3	Nor 1251	32096	AC250308	22/07/2026
Weather Enclosure (Mic in enclosure)	WE1	Nor1211	14155	48186	25/06/2026

4.1.5 Subjective Noise Environment

During the attended noise survey the following noise sources were identified:

- Traffic noise from the N25, N29 and other local roads (this was the most dominant source in the area)
- Birds chirping
- Wind blowing foliage

4.2 Noise Measurement Results

This section outlines the results of the attended noise measurements.

Attended Measurement Results

Table 5 outlines the results of the attended measurement survey.

Table 5: Attended Noise Measurement Results

Measurement				Measured Noise Levels (re 20µPa))		
Location	Date	Time (hrs)	Duration (mins)	L_{Aeq} dB	L_{AFmax} dB	L_{A90} dB
L1	04/04/2025	15:15	15:00	49	60	45
A1	04/04/2025	11:23	60:00	45	77	41
L2	04/04/2025	13:21	15:00	40	55	32
A1	09/04/2025	03:46	15:00	37	58	28
A1	09/04/2025	04:01	15:00	39	52	32
L1	09/04/2025	04:01	15:00	41	64	34

Measurement				Measured Noise Levels (re 20µPa))		
Location	Date	Time (hrs)	Duration (mins)	L_{Aeq} dB	L_{AFmax} dB	L_{A90} dB
A1	09/04/2025	04:16	15:00	37	50	29
A1	09/04/2025	04:31	15:00	38	48	29
A3	09/04/2025	04:44	15:00	47	73	31
A1	09/04/2025	04:46	15:00	39	50	32
A3	09/04/2025	04:59	15:00	48	61	37
A1	09/04/2025	05:01	15:00	41	51	36
L2	09/04/2025	05:09	15:00	38	59	34
A3	09/04/2025	05:14	15:00	48	59	36
A1	09/04/2025	05:16	15:00	42	53	31
A3	09/04/2025	05:29	15:00	48	63	35
A1	09/04/2025	05:31	15:00	42	52	35
A3	09/04/2025	05:44	15:00	49	60	42
A1	09/04/2025	05:46	15:00	48	62	43
A2	09/04/2025	05:54	15:00	51	79	41
A3	09/04/2025	05:59	15:00	50	63	44
A2	09/04/2025	06:09	15:00	56	70	41
A3	09/04/2025	06:14	15:00	51	60	47
A1	09/04/2025	06:19	15:00	48	67	39
A2	09/04/2025	06:24	15:00	51	70	39
A3	09/04/2025	06:29	15:00	54	68	47
A1	09/04/2025	06:34	15:00	46	60	38
A2	09/04/2025	06:39	15:00	46	65	38
A3	09/04/2025	06:44	15:00	58	94	48
A2	09/04/2025	06:54	15:00	52	74	38
A3	09/04/2025	06:59	15:00	55	67	50
A1	09/04/2025	07:00	60:00	50	74	42
A2	09/04/2025	07:09	15:00	56	81	39
A4	09/04/2025	07:40	60:00	51	79	41

Measurement				Measured Noise Levels (re 20µPa))		
Location	Date	Time (hrs)	Duration (mins)	L_{Aeq} dB	L_{AFmax} dB	L_{A90} dB
A4	09/04/2025	08:40	60:00	51	76	38

Unattended Measurement Results

This section contains the measurement results from the unattended measurements. Table 6 displays the measurements taken from the 4th of April 2025 to the 8th of April 2025 at location L1.

Table 6: Unattended measurement results at location L1

Start Date	$L_{Aeq,16hour}$ 07:00 - 23:00 dB	L_{night} ($L_{Aeq,8hour}$ 23:00 - 07:00) dB	L_{den} (00:00 - 00:00) dB	10th highest night-time L_{AFmax}	L_{A90} (23:00 - 07:00) dB	L_{A90} (07:00 - 19:00)	L_{A90} (19:00 – 23:00)
04/04/2025	51[1]	47	55[1]	61[1]	42	45[1]	43
05/04/2025	49	41	54	55	36	45	41
06/04/2025	44	43	48	56	37	38	37
07/04/2025	44	43	50	54	37	40	37
08/04/2025	49	47	51	60	35	40	40

(1) Shortened measurement duration.

(2) Where night-time period is referred to the date is the date the measurement commenced on at 23:00hrs and finished at 07:00hrs on the following calendar day.

(3) Arithmetic average of L_{AF90}.

Table 7 below displays the measurements taken from the 4th of April 2025 to the 8th of April 2025 at location L2.

Table 7: Unattended measurement results at Location L2

Start Date	$L_{Aeq,16hour}$ 07:00 - 23:00 dB	L_{night} ($L_{Aeq,8hour}$ 23:00 - 07:00) dB	L_{den} (00:00 - 00:00) dB	10th highest night-time L_{AFmax}	L_{A90} (23:00 - 07:00) dB	L_{A90} (07:00 - 19:00)	L_{A90} (19:00 – 23:00)
04/04/2025	42[1]	41	45[1]	55[1]	33	34[1]	33
05/04/2025	44	37	48	52	30	36	31
06/04/2025	45	36	46	52	33	34	32
07/04/2025	42	38	44	53	34	34	33
08/04/2025	43	35	46	48	32	35	37

(1) Shortened measurement duration.

Discussion of Measurement Results

The attended background measurements were taken on the weekend to establish the existing background noise levels. Additionally, two logger positions were selected to record continuous data to help establish the background noise levels across the site. Attended measurements were taken during the daytime (07:00-19:00), evening time (19:00-23:00) and night-time (23:00-07:00) hours.

EPA Quiet Area Screening

The development location does not meet the EPA definition of a “Quiet Area” as it is located < 5km from the N25 National Primary Route, and within 15km of Waterford Town, an urban area with a population >10,000 people.

EPA Areas of Low Background Noise

For all areas not identified as Quiet Areas, the existing background noise levels measured during the environmental noise survey should be examined to determine if they are located an area of low background noise, which would mean satisfying each of the following criteria:

- Average Daytime Background Noise Level ≤40dB L_{AF90}, and;
- Average Evening Background Noise Level ≤35dB L_{AF90}, and;
- Average Night-time Background Noise Level ≤30dB L_{AF90}.

If all three of the above criteria are satisfied for any of the measurement locations, then those locations are deemed to be in areas of low background noise, and reduced noise limit criteria would apply.

Unattended noise monitoring results from location L1 is considered to be representative of the existing background noise levels at the NSLs surrounding the proposed substation and grid connection site and therefore have been used to assess against the "Area of Low Background Noise" criteria. Table 7 outlines the average daytime, evening and night-time noise levels at monitoring location L1.

Table 8: Average Daytime, Evening and Night-time Noise Levels at Monitoring Location L1

Noise Monitoring Location	Average Daytime L_{AF90} (07:00 - 19:00)	Average Evening L_{AF90} (19:00 – 23:00)	Average Night-time L_{AF90} (23:00 - 07:00) dB
L1	42	40	37

Based on the noise measurement results from L1, it can be determined that the background noise levels do not meet the classification of "Area of Low Background Noise" according to EPA NG4 for daytime, evening and nighttime L_{AF90} measurements undertaken at the site. Therefore, the NG4 noise limit criteria for "All Other Areas" are applicable to the proposed development.

4.3 Weather Conditions for Monitoring Period

In general, good weather conditions were noted during the attended survey, with winds typically less than 5 m/s and no rain and clear skies. Noise measurements were filtered for any adverse weather conditions where required.

5 Noise Impact Assessment

5.1 Construction Noise Assessment

Based on the location of the site the following noise sensitive receptors have been identified. These noise sensitive receptors were chosen as they are the closest NSL's to the substation works and from each parcel land of the associated solar farm.

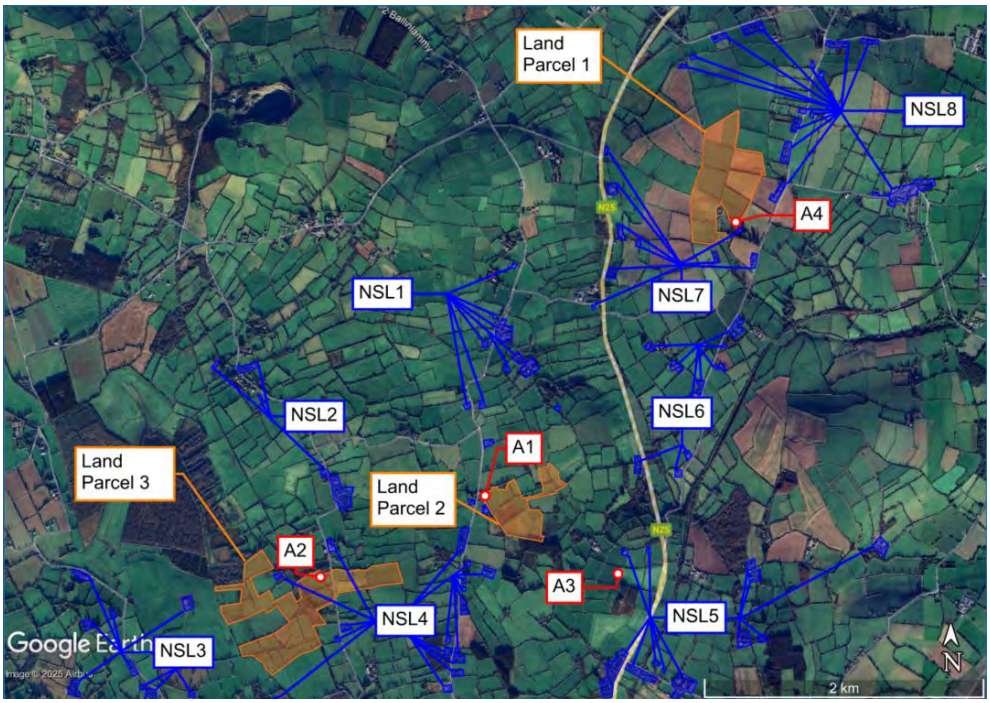


Figure 7: Part 1 of 2: Site location, measurement location, noise sensitive locations for northern part of project.

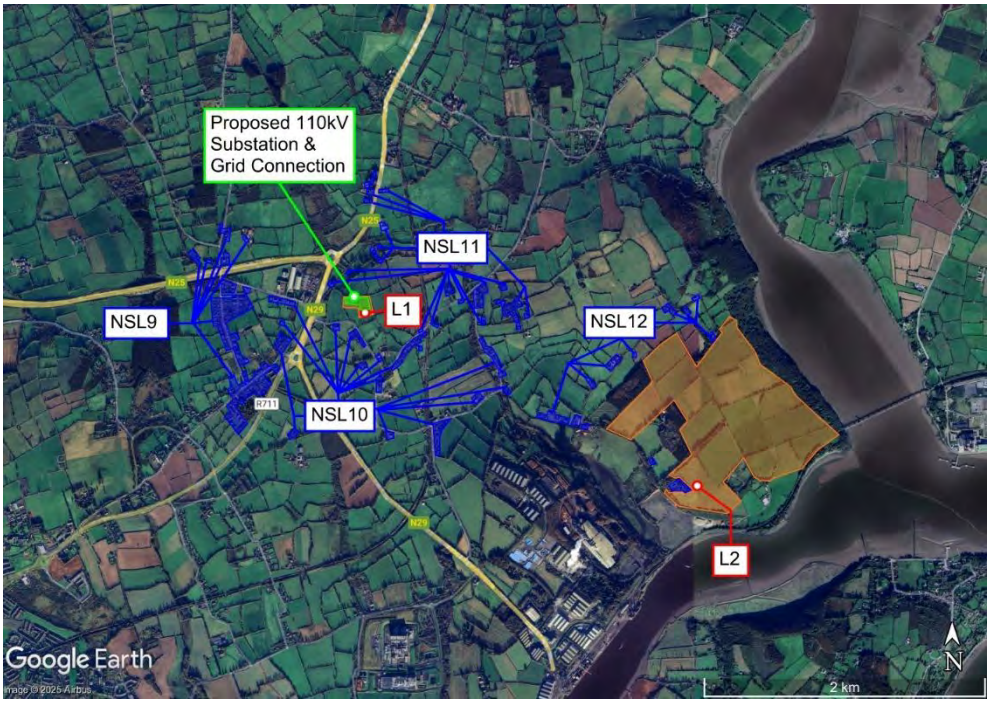


Figure 8: Part 2 of 2: Site location, measurement location, noise sensitive locations for southern part of project.

Noise Limits

The criteria for the project based on the criteria outlined in section 3 and the background noise in the area. The project criteria for construction noise is outlined below in Table 8. Reference to the baseline survey results and guidance contained in BS 5228 Part 1 for construction noise levels threshold for significance affect from construction activities is set as follows for the closest noise sensitive locations:

Table 9: Threshold of significant impact at dwellings

Assessment category and threshold Value Period (Laeq)	Threshold value in decibels (dB)		
	Category A	Category B	Category C
Night-time (23:00-07:00)	45	50	55
Evening and Weekends	55	60	65
Daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75

1) A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.
2) If the ambient noise level exceeds the threshold values given in the table (i.e, the ambient noise level is higher that the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.
3) Applied to residential receptors only.

For the appropriate assessment period (i.e. daytime in this instance) the ambient noise level is determined and rounded to the nearest 5dB. If the noise generated by construction activities exceeds the appropriate category value, then a significant effect is deemed to occur. The appropriate category value for this project has been determined as Category A with a 65dBA threshold.

5.1.1 Construction Noise Predictions

Construction noise for the development works has been predicted based on the information provided by HW Planning. A summary of the expected equipment, durations and operating times are provided for all works. The assessment has taken into consideration that the works are dynamic and will be conducted at different locations across the individual solar farm land parcels as well as the 110kV substation and grid connection site (in Parcel 5). The prediction methodology in BS5228 has been used to calculate the noise level over a typical day for each of the main construction stages.

These predictions include the construction traffic from the site. Table 9 outlines the plant used for the construction noise impact from all works. It should be noted that construction noise is considered for both the substation and grid connection and the wider Drumdowney Solar Farm as it is envisaged that construction activities for both developments will occur at the same time.

Table 10: Construction noise assessment for solar farm

Construction Phase	Item of Plant (BS 5228-1:2009+A1:2014 Ref)	Noise Level (L_{Aeq} at 10m dB(A))	On Time of 10 hr day
Enabling Works	Digger	77	3 hours
	Dump Truck	79	3 hours
	Power Tools	70	0.5 hours
	Road Lorry	76	1 hour

Construction Phase	Item of Plant (BS 5228-1:2009+A1:2014 Ref)	Noise Level (L_{Aeq} at 10m dB(A))	On Time of 10 hr day
Substructure (Substation Only)	Excavators	77	3 hours
	Power Tools	70	1 hour
	Tracked Mobile Crane	67	0.5 hour
	Road Lorry	76	1 hour
	Dumper	81	1 hour
	Cement Mixer (Discharging)	75	1 hour
	Telescopic Handler	71	3 hours
	Concrete Pump	78	1 hours
	Piling	63	2 Hours
Civil & Electrical	Road Lorry	76	1 Hour
	Power Tools	70	4 Hours
	Impact Steel	69	2 Hours
	Hammer	69	1 Hour
	Dumper	81	2 Hours
	Telescopic Handler	71	6 Hours
Superstructure (Substation Only)	Tracked Mobile Crane	67	0.5 Hour
	Power Tools	70	4 Hours
	Impact Steel	69	2 Hours
	Hammer	69	0.5 Hour
	Cement Mixer	75	1 Hour
	Telescopic Handler	71	5 Hours
	Road Lorry	76	1 Hour
External Finishes	Hand Tools	70	5 Hours
	Power Tools	70	2 Hours
	Road Lorry	76	1 Hour

The substation has also been considered in the context of the construction noise identified in Table 10. It is not expected based on the information assessed that any cable installation works or substation works will exceed the BS 5228-1 criteria for the project.

Predicted Construction Noise at NSL's

Table 11 summarises the predicted construction noise level at the noise sensitive locations. Examination of the results indicate the construction noise without mitigation is predicted to be within the noise limits set out by BS 5228-1.

The calculations set out below are based on assumed site construction works and a combination of the plant operating at the same time i.e. worst-case scenario.

Distances were calculated from the façade of the nearest residential property within each NSL grouping, to the centre of the closet proposed development site (land parcel).

Table 11: Predicted noise levels without mitigation for each stage.

NSL	Criteria L_{Aeq}, dB	Predicted noise level (construction noise + ambient) with no mitigation L_{Aeq}, dB				
		Enabling Works	Substructure	Civil & Electrical	Superstructure	External finishes
NSL1	65	53	-	51	-	49
NSL2	65	56	-	56	-	56
NSL3	65	56	-	56	-	56
NSL4	65	56	-	56	-	56
NSL5	65	56	-	55	-	55
NSL6	65	55	-	55	-	55
NSL7	65	52	-	55	-	51
NSL8	65	52	-	55	-	51
NSL9	65	46	46	45	47	45
NSL10	65	50	51	48	49	47
NSL11	65	50	51	48	49	47
NSL12	65	44	43	45	42	43

5.1.2 Predicted Cumulative Noise Impact

The predicted cumulative construction noise impact from other developments in the area where the proposed solar farm including the substation and grid connection has been considered.

Based on the information available and given the location of these other developments in relation to the NSLs for the proposed substation the cumulative noise impact is not expected to exceed the values outlined Table 11.

Table 12 below outlines the developments with planning in the area.

Table 12: Developments with existing planning within the wider area.

Ref. Number	Status	Description
ABP-321962	Live Application, Decision Due – 30/06/2025	Construction of an integrated plasterboard manufacturing facility and all associated works. Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) submitted with application.
25/60233	Granted permission	constructing 2 no. industrial warehouse blocks for bulk storage, with Block A housing 4 no. single storey storage units (floor area - 3,488.4m2) and Block B housing 4 no. single storey units (floor area - 8446.2m2), new weighbridge and cabin, new internal access roads, retaining walls and boundary fencing and all ancillary works
25/60208	Granted permission	for the renovation and extension of our existing administration offices together with a new security hut, altered entrance arrangement and all associated site works.

Ref. Number	Status	Description
25/60177	Granted permission	for the construction of a bulk store and associated site works. The store will be used to store port related products such as break bulk, bulk and unitised loads
25/60074	Granted permission	for the construction of a new wastewater treatment system and a proposed change to the site boundary situated
24/60304	Granted – 10/04/2025	The Phase 1 development includes 9 blocks with a total gross floor area (GFA) of 60579sqm (64953sqm including undercroft and basement car parks (4374sqm)). The development involves construction of a podium which establishes new ground/ street formation level which varies from c.4.6mOD to 8.4mOD which connects to the Sustainable Transport Bridge (by WCCC) at the Central Plaza. Provision is made for pedestrian connection from Central Plaza to Dock Road via the approved pedestrian bridge (by WCCC). A new riverside promenade / cycleway (part of Greenway) is proposed between the Sustainable Transport Bridge and the Eastern Access to the site.
24/60308	Granted – 13/03/2025	for the proposed erection of 14 number semi-detached two-storey and basement [three-stories overall] dwellinghouses together with all associated site development works [including removal of existing concrete bases and reduction of levels to original contour levels] in lieu of 10 number houses [No 17-26] previously permitted under Planning Reference 16/872
ABP-318204	Granted – 15/01/2025	Grid stability service development and associated site works.
ABP-318103	Granted – 13/11/2024	Development of a new electricity circuit. A Natura Impact Statement (NIS) was submitted with the application.
23/60426	Granted – 16/09/2024	for a 7-year planning permission for 3 No Bulk Stores, a marshalling yard and site works including earthworks, road works, entrance, gates and fencing, concrete paving, water services, drainage works, site lighting and landscaping. The stores will be used to store Port related products such as bulk goods, break bulk and unitised products.
23/60578	Granted – 05/08/2024	for the demolition of two existing shed buildings and removal of the remaining floor slab of a previous dwelling, the construction of 16 No. two storey houses (12 No. 3-bedroom & 04 No. 02-bedroom), a new site entrance from Abbey Road, new boundary treatments, and all associated site & development works

Ref. Number	Status	Description
24/60256	Granted – 23/07/2024	for the development of 2no. grain silos and associated site works
20240309	Granted – 12/06/2024	Permission for development consisting of construction of a Battery Energy Storage System (BESS)
ABP-318914	Granted – 05/06/2024	110kV substation and 110kV underground grid connection
23/60323	Granted – 08/04/2024	for the proposed erection of 4 number fully serviced 2 storey detached dwellings, 4 number detached single storey garages, 2 number proposed vehicular and pedestrian entrances, boundary treatments to include removal of existing stone wall to front of site to facilitate sightlines, landscaping, together with all associated site development works to include removal of adjoining section of farm building
20231294	Granted – 16/02/2024	Permission for development, consisting of: Construction of an electrical infrastructure installation and associated underground grid connection (UGC)
23/60536	Granted – 25/01/2024	for the demolition of the existing biofilter for odour abatement and the construction of a new biofilter, stack and all associated pipework and ducting
ABP-312631	Granted – 22/01/2024	Construction of two boreholes in milk processing plant. Natura Impact Statement submitted with the planning application. The Glanbia Ireland DAC facility has an Industrial Emissions Licence granted by the EPA
23/60504	Granted – 04/01/2024	for the provision of new effluent treatment system with associated percolation area including all site development works
23/60274	Granted – 02/11/2023	(1) New single storey warehouse, incorporating a 2 Storey office block; (2) Open sided covered goods in-take area from proposed warehouse to existing building; (3) New single storey storage building between proposed building and existing building; (4) Relocation of existing weigh-bridge and associated items; (5) Relocation of existing static water bladder tank; (6) Realignment of existing car parking area on site to include for additional spaces; (7) Realignment of internal site road, together with all associated site development works, all at Gorteens, Slieverue, Co. Kilkenny. This application is accompanied by a Natura Impact Statement (NIS).

Ref. Number	Status	Description
ABP-314069	Granted – 27/10/2023	Construction of extension and all associated site works
23/60352	Granted – 25/09/2023	for a water storage tank, single storey pump house and all associated site works
22/318	Granted – 17/05/2023	for a laydown area for equipment and break bulk materials. The works will include earthworks, drainage, concrete paving, retaining walls and landscaping works. A Natura Impact Statement will accompany this application
22/549	Granted – 28/04/2023	for a single-storey extension to existing warehouse (BV2) to north of site, new storm water attenuation tank and the part realignment of existing concrete yard together with all associated site development works
23/29	Granted – 30/03/2023	for the construction of a slatted tank, cattle shed, alongside all associated site works
ABP-311746	Granted – 02/02/2023	Waterford City Public Infrastructure Project - Flood Defences West. Development of c.1.1km of flood protection measures.
22/480	Granted – 19/01/2023	for a Maintenance Building, roof mounted solar panels and associate site works at Belivew Port.
22/569	Granted – 12/01/2023	to construct 3No wood based, biomass storage bays an ash storage building and associated site works including road widening to an existing internal road and a new concrete yard area. A Natura Impact Statement will accompany the Application. Smartply Europe currently hold an Industrial Emission Licence issued by the EPA.
20221162	Granted – 16/12/2022	Permission to amend the design of the approved development (Planning Reference 20170330) which comprises consent for a Solar PV Energy Development. Proposed amendments include; (1) Change of location and increase in number of client substations, (2) Increase in number of storage rooms, (3) Decrease in number and size of transformer containers, (4) Deer fencing to decrease in size, (5) Number of CCTV cameras to be reduced, (6) Slight alteration to the access tracks, (7) Change in height and number of module racks and pile driven poles, (8) Change in height and angle of solar panels, and (9) Change in lifetime of the permission from 5 years to 10 years with an increase operational lifetime from 25 to 35 years

Ref. Number	Status	Description
20220628	Granted – 6/07/2022	Permission for development which will consist of grid connection infrastructure to connect the approved Ballyedock Solar Farm (PA Ref:20170330) to the existing Great Island Substation comprising the laying of underground cables, overhead lines, associated infrastructure and Horizontal Directional Drilling. The proposed development will also include upgrades to the substation (previously consented under planning application reference 20170330) to align with the connection route to the national grid. A Natura Impact Statement has been prepared in respect of the application for planning permission.
22/452	Granted – 22/11/2022	for the construction of a Livestock Underpass beneath the public road between the crossroads and existing farmyard alongside all associated site works
22/513	Granted – 27/09/2022	for the change of use of land to extend the service station carpark to enable the installation of a modular substation and ancillary site development works; to facilitate 2 no. shared electric vehicle charging units and 4 no. charging bays within a partially reconfigured parking area
22/81	Granted – 04/04/2022	for development. The development will consist of the installation of 5250 Solar PV panels over the roof of existing industrial buildings and all associated site works and services
21/1030	Granted – 14/02/2022	for the handling and temporary storage of zinc and lead ore at an existing bulk store, and loading of the ore from the store onto ships from an existing Wharf.
21/989	Granted – 03/02/2022	the installation of a Combined Heat and Power (CHP) unit including a 7.55m high stack, stack access ladder and platform, improvements to the internal estate road and ancillary site works at the permitted cheese manufacturing plant, planning permission reference no. 19/668 (APB-306136-19). An Industrial Emissions Licence is required for the cheese manufacturing plant and the proposed development. A Natura Impact Statement will also be submitted with the application.
21/551	Granted – 08/11/2021	for the construction of a terrace of 5 No. two bedroom bungalows designed for the elderly, together with proposed boundary treatments, landscaping, car parking, drainage connections and all associated site development works
21/586	Granted – 31/08/2021	for a 7 year planning permission for a bulk store and associated site works. The store will be used to store port related products such as break bulk, bulk and unitised loads
ABP-308906	Granted – 23/06/2021	Proposed development will form part of the Greenlink Interconnector and will consist of the development of a new converter station, tail station, MV substation and 23km of high voltage direct current (JVDC) electricity cables, 420m of high voltage alternating current (HVAC)

Ref. Number	Status	Description
		cables, 23.42km of fibre optic cable and all associated site works with an overall proposed development site area of 83.8ha.
20/845	Granted – 10/06/2021	for the following: a) change of use of the existing first floor area to residential use to provide 15 no. apartments, b) construct a new rooftop penthouse containing 8 no apartments (23 apartments in total) together with c) elevational modifications, and all associated site works
20/700	Granted – 05/03/2021	to develop a log yard and associated works. The log yard will extend the area available for stockpiling and handling of logs for use in SmartPly's oriented strand board mill which adjoins the site. A Natura Impact Statement will accompany the Application
20/453	Granted – 03/03/2021	the construction of 40 no. residential units

There is no predicted negative cumulative noise impact predicted from the development and other committed developments in the area.

Other Considerations

Additional traffic noise from the construction works is not expected to increase the traffic noise from the roads to any significant impact. The Design Manual for Roads and Bridges (DMRB) states that a 25% increase in traffic flows leads to a 1dBA increase in traffic noise levels. Construction traffic flow increases associated with the proposed development will be significantly less than 25% and therefore the noise levels from construction traffic will not increase the existing noise levels at the noise sensitive locations by more than 1dBA.

It is generally accepted that it takes an approximate 3dBA increase in noise levels to be perceptible to the average person (Ref: Planning Policy Guidance Note 24 [PPG24 - Planning & Noise). Construction traffic noise levels associated with the Proposed Development will not have a negative impact on nearby noise sensitive locations (NSLs).

5.1.3 General Recommendations

This section of the report sets out general recommendations for the control of noise from construction works. As stated in Section 5.1, no construction mitigation is required as all noise from construction works falls within the criteria set out by BS 5228-1. Notwithstanding, the following standard noise commitments will be adhered to.

Selection of Plant and Equipment

The noise impact of all plant and equipment should be assessed prior to selection of the plant for the project. Where an item of plant is identified as noisy with the potential to cause a negative noise impact it will be reviewed to check if there is an alternative quieter version of the same plant to undertake the same construction task.

Noise Control at Source

Where replacing a noisy item of plant is not viable or practical, consideration should be given to control that noise at source. This includes modifying the piece of plant or equipment to generate less noise, using dampening to control vibration induced noise or rattling. Example best practice mitigation measures to be considered are as follows:

- All plant and equipment to be switched off when idling.

- The use of white noise reversing alarms.
- Restriction on the dropping and loading of materials to less sensitive hours.
- The use of local screening for noisy activities or works with hand tools.
- Not dropping materials onto hard surfaces and using rubber mats etc for the dropping of materials.
- Ensure all plant and equipment is well maintained and cleaned, all lubrication should be in line with manufacturers guidelines.

Screening

Screening when used correctly can be an effective method of reducing the construction noise impact on the NSL's. The use of site hoarding and careful selection of areas for noise works, using buildings on the site, site offices and the building being constructed to screen noise from the works.

Local screening of noisy works with the use of temporary acoustic barriers, examples are provided below:

- https://ventac.com/acoustic-products/noisebreak-acoustic-barrier/
- https://echobarrier.com/

Figure 9: Temporary Construction Noise Barrier © Ventac

Construction Noise Monitoring

Construction noise monitoring will be undertaken at periodic sample periods on the boundary with the nearest noise sensitive receptors.

Noise monitoring will be conducted in accordance with the International Standard ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.

5.2 Construction Vibration

Prediction of vibration levels at receptors is complex and dependent on several variables including the nature of the used equipment, the properties of the subsoil, the heterogeneity of the soil deposit, the distance to the receptor and the dynamic characteristic of the adjacent structures. Therefore, limits or threshold criteria as set out in BS5228-2 are applied for buildings and humans.

Based on our understanding of the project and the distances to the receptors it is not anticipated that there will be any negative vibration impact from the construction works.

5.3 Operational Phase

Following the survey, a model of the proposed development using SoundPLAN 9.1 modelling software was developed to establish the noise levels from the proposed development in operation in a worst-case scenario. The software implements the algorithms contained in ISO 9613-1 and ISO 9613-2. The noise model considers:

- Distance attenuation,
- Source and receptor locations,
- Barrier effects (buildings, walls etc)
- Topographical elevations,
- Ground effects and absorption,
- Source sound power levels,
- Directivity and orientation of the source,
- Atmospheric attenuation and meteorological effects.

The SoundPLAN 9.1 predictive model uses methodology via a ray tracing method, in principle the modelling follows the general principles of the following formula outlined in ISO 9613 Part 1 and Part 2: *Acoustics - Attenuation of sound during propagation outdoors*:

$$Lp = Lw - 20\log_{10}(R) - 11 - A - B - G$$

Where:

- Lp is the sound pressure level at a particular point.
- Lw is the sound power level of the plant and equipment.
- R is the distance from the noise source at which the sound pressure level is predicted.
- 11 is a constant based on a noise source with omnidirectional directivity.
- A considers the correction reduction in noise levels via atmospheric conditions.
- B considers the correction reduction in noise levels due to noise barriers.
- G considers the correction reduction in noise levels due to ground absorption and topography.

The acoustic model for the proposed substation and associated solar farm development has been developed based on attended and unattended noise survey and the proposed site location and predicted noise sources. As the site has potential to create noise impact at both day and nighttime, a worst-case scenario has been developed for both predicting the noise impact at the nearest noise sensitive locations.

5.3.1 Operational Noise

From discussions with the design team, it has been confirmed that the external plant and equipment at the proposed substation and the wider Drumdowney solar farm with the potential to generate operational phase noise consists of the substation itself and inverter/transformer stations within the solar farm. A comprehensive whole project approach to the assessment has been completed.

Drumdowney Solar Farm Limited have provided the technical data for typical transformers/inverters. The noise levels from the substation have been assumed based on data from the WDA library.

Noise levels at the NSLs were assessed to the height of the worst-case façades (4m for two-storey NSLs), to predict the noise levels at the first-floor bedrooms of the nearest noise sensitive receptors. Noise levels were also checked at 2m to assess the external amenity noise levels on the NSLs, and grid noise contours have been provided in Figure 9 and Figure 10 at this height.

The sound power levels from the noise sources are based on the information from our library and previous planning applications for similar developments as outlined in Table 13. Equal or approved plant is suitable for the development.

Table 13: Assumed noise levels for plant and equipment proposed.

Item	Assumed Noise Level (L_{wA})	Reference Source
Substation Assumed (Equal or approved)	92 dB	WDA Library
Inverter/Transformer Operating at Daytime @ 90%	95 dB	Manufacturer Data
Inverter/Transformer Operating at Night-time @60%	85 dB	Manufacturer Data

The proposed substation will consist of a 110kV gas insulated switchgear (GIS) substation which will house most of the equipment internally. There will be an external transformer unit as part of the proposed substation. The GIS and IPP control buildings will provide noise screening from the external transformer.

5.3.2 Daytime Operations

As the substation, grid connection and associated solar farm has the potential to generate noise with different characteristics for both the day and night-time, a model has been undertaken for both the day and nighttime operations of the proposed development. This section outlines the operational noise assessment for the daytime scenario.

The daytime situation assumes the following noise sources:

- Substation operating at full capacity continuously as per Table 13.
- Inverters/transformers operating for daylight hours (7am-10pm).
- Assumed noise level in (L_{wA}) for inverter/transformers used in model as per Solar Farm application noise impact assessment (25/60391),
- Model calibrated using on-site measurements.
- Transformers/inverters operate at 90% during the daytime period as per client operational data.

The nearest noise sensitive receivers in each direction were taken as part of the assessment as identified in Figure 2 and Figure 3. This allows for a worst-case scenario assessment, NSLs further away from the development are expected to experience lower noise levels with typical conditions due to distance attenuation. NG4 recommends a daytime criteria of (07:00hrs – 19:00hrs) 55dB $L_{Ar,T}$, the predicted noise emissions from the substation, grid connection and solar farm at each NSL for a height of 4m (worst-case i.e first floor bedrooms) have been outlined in Table 14. All values refer to the free field façade noise levels.

Table 14: Model results for the noise impact from the solar farm and substation for daytime at 4m height.

NSL	Criteria dB L_{ArT}	Daytime Predicted Noise dB L_{ArT} (7:00hrs to 23:00hrs)	Compliant/Non-Compliant
NSL1	55	33	Compliant
NSL2	55	29	Compliant
NSL3	55	26	Compliant
NSL4	55	36	Compliant
NSL5	55	25	Compliant
NSL6	55	27	Compliant
NSL7	55	35	Compliant
NSL8	55	36	Compliant
NSL9	55	25	Compliant
NSL10	55	33	Compliant
NSL11	55	32	Compliant
NSL12	55	35	Compliant

Figure 9 outlines the daytime predicted noise emissions from the proposed substation and Drumdowney solar farm in operation for the daytime period at 2m height in the external amenity spaces. As noted from the noise map all residential receptors are outside of the 55 dBA contour for daytime and therefore compliant with the NG4 project criteria.

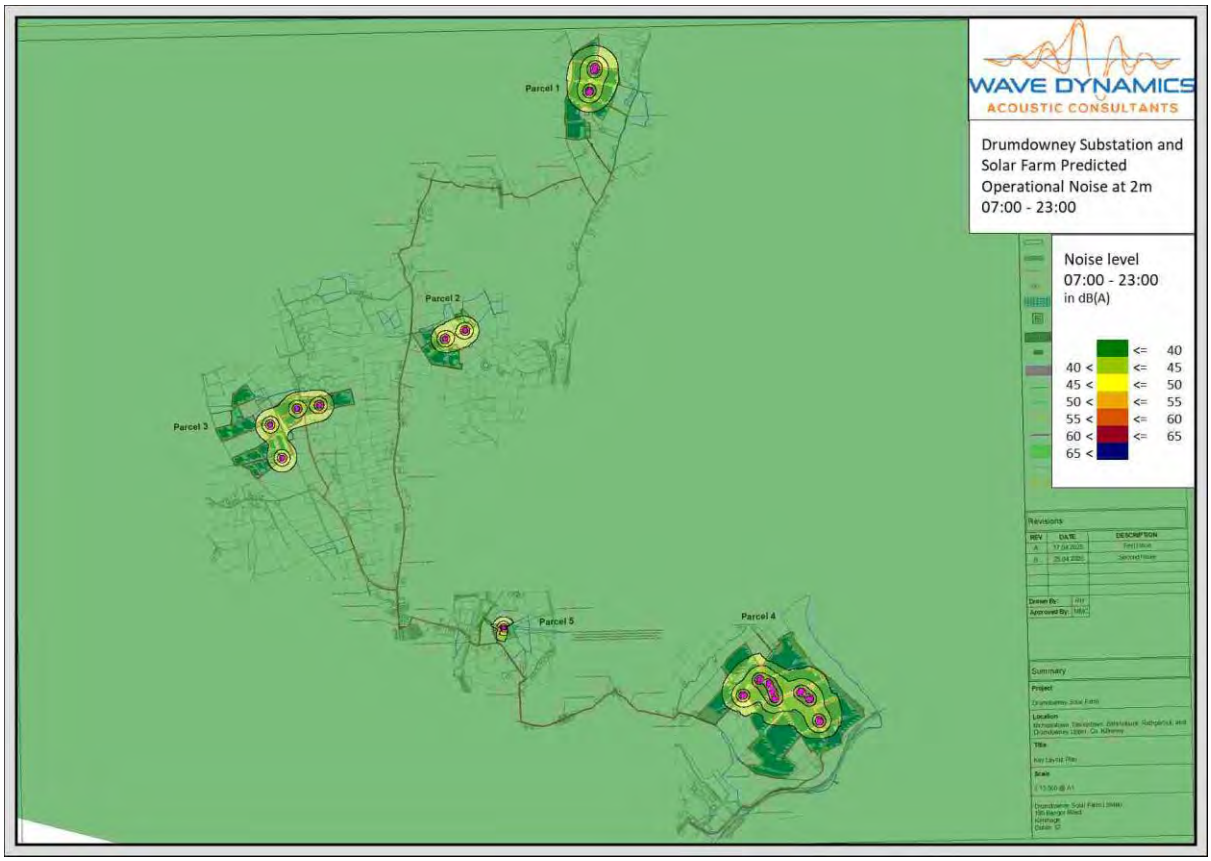


Figure 10: Noise contours for the daytime noise impact at 2m L_{Aeq} dB.

All predicted noise the levels are below the NG4 project criteria and therefore within the project requirements.

Evening Time Scenario

The noise levels for the evening time are predicted to be the same as the daytime noise levels however as per EPA NG4 criteria, a lower noise criteria of 50dB $L_{Ar,T}$ is applicable. Based on the predicted noise levels outlined in Table 14 and shown in Figure 9, the evening time criteria is predicted to be achieved. As the predicted specific sound is below the background noise therefore no perceptible noise impact from the proposed substation and associated solar farm operations is predicted for both the day and evening time periods.

Consideration was also given to the BS4142 requirements, as the specific sound is below the background noise in the area no negative noise impact is predicted in accordance with BS 4142.

5.3.3 Night-time Operations

The proposed substation is understood to be operational continuously throughout the night time. As solar panels produce power only when the sun is shining, inverters within the solar farm lands will be virtually silent for the hours of darkness at night. However, this assessment is based on a worst-case scenario to include summer months where the sunrise may happen pre 7am where inverters and transformers may begin noise generating activities in addition to noise from the substation transformer.

The night-time situation assumes the following noise sources:

- Substation operating at full capacity continuously as per Table 13.
- Two hours of inverter use from 5am-7am (worst case scenario -summer).
- Assumed noise level in (L_{wA}) for inverter/transformers used in model as per Solar Farm application noise impact assessment (25/60391),
- Model calibrated based off attended/unattended measurements.
- Transformers operate at a max operating capacity of 60% during the daytime hours of 5am-7am.

NG4

NG4 recommends a night-time criteria of 45dB $L_{Aeq,T}$, the predicted noise levels from the proposed substation and Drumdowney solar farm were compliant at all noise sensitive locations. All predicted values refer to the free field façade noise levels.

Table 15: Model results for night-time at the NSLs at a height of 4m.

NSL	Criteria dB L_{Aeq}	Nighttime Predicted Noise dB L_{Aeq} (23:00hrs to 07:00hrs)	Compliant/Non-Compliant
NSL1	45	17	Compliant
NSL2	45	13	Compliant
NSL3	45	10	Compliant
NSL4	45	20	Compliant
NSL5	45	13	Compliant
NSL6	45	12	Compliant
NSL7	45	19	Compliant
NSL8	45	19	Compliant
NSL9	45	25	Compliant
NSL10	45	33	Compliant
NSL11	45	32	Compliant
NSL12	45	22	Compliant

Figure 10 outlines the nighttime predicted noise emissions from the solar farm and substation in operation for the night-time period at 2m height.

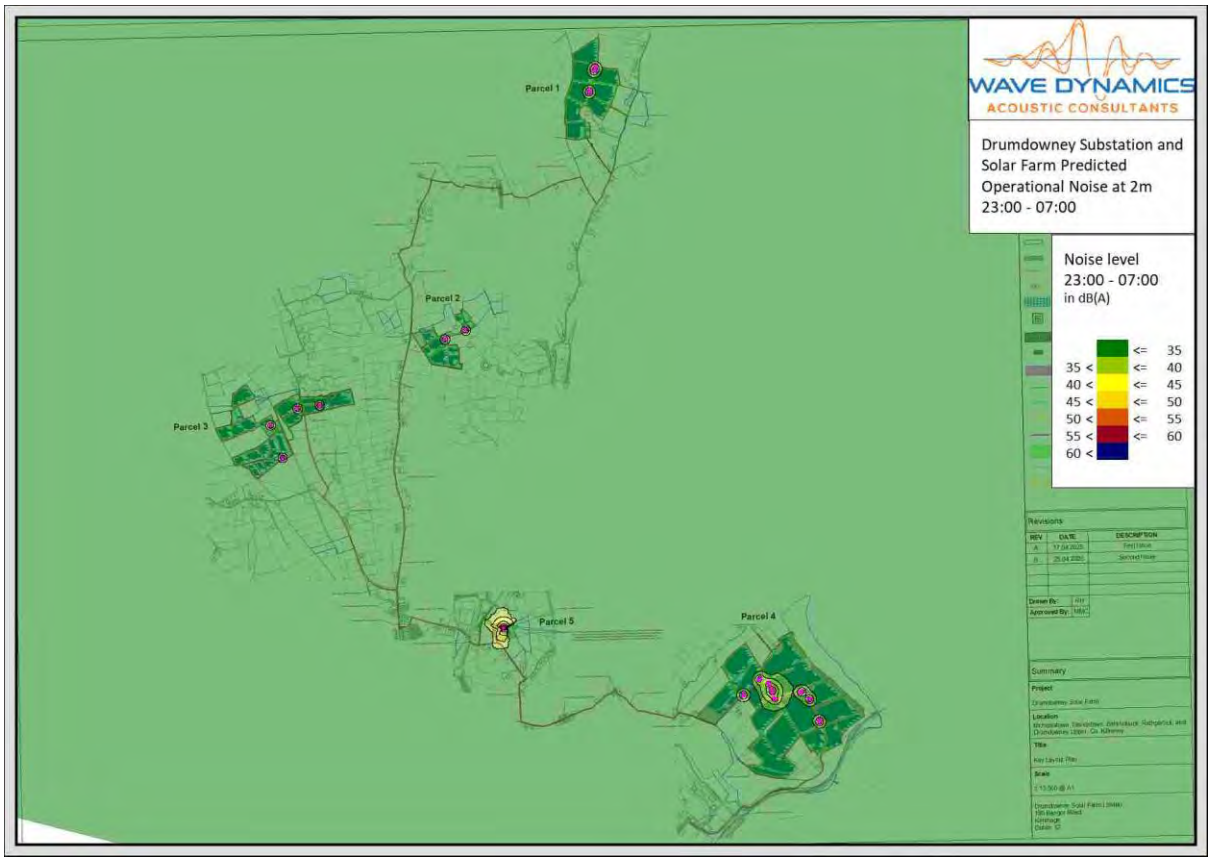


Figure 11: Noise contours for the night-time noise impact at 2m height L_{Aeq}.

As noted from the noise map and Table 15 all residential receptors are outside of the 45 dBA contour for night-time and therefore compliant with the NG4 project criteria. As the predicted specific sound is below the background noise therefore no negative noise impact from the proposed substation or solar farm operations is predicted. Consideration was also given to the BS4142 requirements, as the specific sound is below or in line with the background noise in the area no negative noise impact is predicted in accordance with BS 4142.

Modelling Assumptions

The following assumptions were made throughout the modelling and assessment:

- Assessment based on the noise measurements undertaken throughout April 2025.
- Noise source data for the assessment was based on the measurements undertaken onsite of the noise sources and information provided by the design team.
- Model assumes a worst-case operating scenario as outlined in Section 5 above.
- Modelling based on the drawings, layouts and information provided.
- Assessment based on proposed substation and solar farm.

5.3.4 BS4142 Operational Noise Assessment

In addition to the assessment outlined above in line with EPA NG4 criteria, the proposed substation, grid connection and solar farm have been assessed using BS4142 criteria. The operational noise levels from the full development are predicted to be in general below the background noise levels in the area and therefore it is likely there will be no adverse noise impact. Based on the information provided and the assumptions in this report it is predicted that the noise levels in general will not increase the background noise at the NSLs.

5.3.5 Tonality & Impulsivity

Based on the noise levels at all of the noise sensitive locations, it is predicted there will be no audible tonal or impulsive characteristics to the noise levels. The operational noise of the proposed substation and solar farm will consist of mechanical plant and equipment noise from the inverter / transformer units in continuous operation during sunlight hours in addition to the continuous operation of the substation. The operation of the development does not include activity that could create impulsive noise. It will be ensured that the selected equipment will not have any impulsive characteristics. Plant and equipment shall be maintained to ensure it operates in its normal capacity.

A prediction of the one third octave band noise levels from the inverter / transformer units and the substation has been undertaken based on the proposed development which indicated no tonal characteristics of the noise. The predicted noise levels from the development were generally lower than the existing daytime ambient noise levels (L_{Aeq}) measured at the site. The predicted nighttime noise levels from the development are generally lower than the background noise levels (L_{A90}) measured across the site. Table 16 below highlights the predicted octave band noise levels at the worst-case noise sensitive location (NSL10) based on distance to the proposed substation during the daytime period. This shows that there is no predicted tonality from the proposed development.

Table 16: Predicted daytime octave band noise levels

Location	Predicted Daytime (07:00hrs – 23:00hrs) Octave Band Noise Levels (Leq dBA)						
	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
NSL 10	23	27	28	24	28	19	4

Based on the predicted noise levels at the noise sensitive locations from the proposed development in addition to the submitted noise impact assessments for the other developments in the area, no audible tonality is predicted at the noise sensitive locations. Context has also been considered given the existing residual sound level and predicted noise impact. As the predicted noise levels are considerably below the residual sound (L_{Aeq}) no tones would be audible.

5.3.6 Operational Phase Conclusion

Based on the information provided, the site survey and the worst-case scenario predictions **it is predicted that noise emanating from the development will achieve the NG4 and BS4142 project criteria. In general, the predicted noise levels are well below the project criteria.**

6 Conclusion

Wave Dynamics were engaged by Drumdowney Solar Farm Limited to undertake a noise impact assessment for the proposed Drumdowney Substation & Grid Connection, Co Kilkenny.

The proposed development comprises of:

5. A 110kV Gas Insulated Switchgear (GIS) electricity substation with two-storey GIS substation building, single-storey Independent Power Producer (IPP) control room building, High Voltage (HV) electrical equipment and associated infrastructure (to include transformer, lightning protection masts, back-up diesel generator, fire/blast wall, telecoms pole, perimeter security fencing, security lighting, water and drainage infrastructure, and temporary construction compound) to connect to and serve solar farm development;
6. Associated loop-in / loop out grid connection infrastructure to connect into an existing 110kV overhead transmission line (including underground 110kV cabling, 2 No. new interface towers and decommissioning of ca. 15m of existing 110kV overhead line);
7. Construction and operational access from the public road L34142;
8. All ancillary site development, landscaping and earthworks. The development subject to this application forms part of grid connection and access arrangements which will facilitate the connection of the proposed Drumdowney Solar Farm (Kilkenny County Council Reference 25/60391) to the national grid.

A Natura Impact Statement (NIS) has been prepared in respect of the proposed development. The NIS includes consideration of the proposed Drumdowney Solar Farm which is located in the townlands of Ataeemore or Blackneys, Ballyhobuck, Ballyrahan, Carriganurra, Charlestown, Davidstown, Drumdowney Lower, Drumdowney Upper, Gorteens, Grogan, Kilmurry, Nicholastown, Rathpatrick, Scartnamoe, Tinvaucoosh and Treanaree in County Kilkenny.

The operational lifetime of the solar farms is assumed to be 40 years. However, following the decommissioning of the solar farm, it is envisaged that the substation (and underground cable grid connection) will remain in situ as a valuable functioning and operational part of the electricity transmission network managed by the Transmission Systems Operator, EirGrid.

This report outlines the project assessment criteria, survey results, assessment, and general guidance recommendations for:

- Construction noise and vibration from the construction of the proposed substation, grid connection and nearby Drumdowney solar farm.
- Operational noise from operation of the proposed substation, grid connection and nearby Drumdowney solar farm.

Based on the operational hours of the development there is potential for noise impact in both the day and night-time, therefore an assessment for both has been conducted. The noise impact assessment included attended and unattended noise measurements on the proposed development lands. This included measurements of background noise at the noise sensitive locations. Appendix A outlines a glossary of the acoustic terminology used in this report.

Construction Noise and Vibration

The construction noise and vibration from the development have been predicted to the nearest noise sensitive (NSLs) receptors of the substation, grid connection and adjacent solar farm. The construction predictions were based on the procedures outlined in BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise. The construction noise from the development will be of a short-term nature. The works have been assessed on the basis that they will be sequential.

Consideration was given to the construction of the substation, grid connection and associated solar farm as well as cumulative noise and vibration impacts. **Based on the assessment outlined in this report it is predicted that the construction noise and vibration from the proposed substation, grid connection and associated solar farm will comply with the recognised best practice standards typically adopted for such projects in Ireland.**

Operational Noise

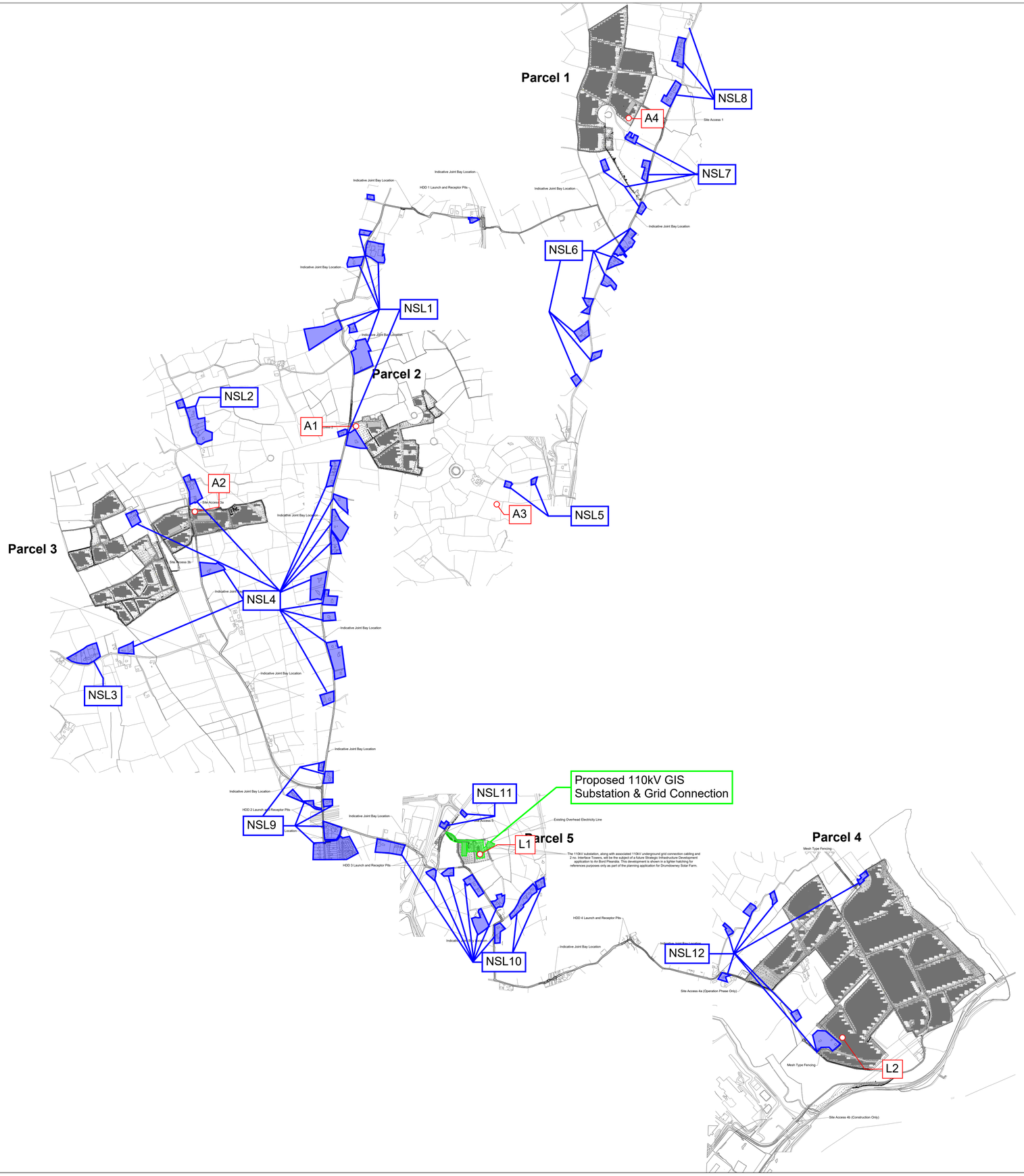
The noise levels from the substation and grid connection were assessed using criteria set out by EPA NG4 and BS4142 2014 A1+ 2019 Methods for rating and assessing industrial and commercial sound, which predicted that there is no predicted adverse noise impact at all noise sensitive receptors for the daytime, evening and night-time periods.

Based on the assessment outlined in this report it is predicted that the operational noise levels from the proposed substation, grid connection and associated solar farm will comply with the project criteria and not produce a negative noise impact. The cumulative noise impact from the development in combination with other nearby proposed developments has also been assessed and is predicted to comply with the project criteria.

Appendix A- Glossary of Terms

Ambient Noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from all the noise sources in the area.
Background Noise	The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).
dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μPa).
dB(A)	An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Hertz	The unit of sound frequency in cycles per second.
L_{A90}	A-weighted, sound level just exceeded for 90% of the measurement period and calculated by statistical analysis. See also the background noise level.
L_{Aeq}	A-weighted, equivalent continuous sound level.
L_{AFmax}	A-weighted, maximum, sound level measured with a fast time-constant - maximum is not peak
R_W	Weighted sound reduction index - a single number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies, based on laboratory measurements

Appendix B- Scaled Map



Notes

All dimensions in meters unless otherwise noted.

Do not scale from drawings, use figured dimensions only.

Drawings based on OSI digital vector mapping for the area. License No: CYAL50408714

Site Location Reference: 664329, 615575 (ITM)

Legend

- Development Boundary
- Ownership Boundary
- 4m Wide Access Track
- Temporary Access Track (Substation)
- Temporary Access Track (Solar Farm)
- Combined Inverter & Transformer Station
- Spare Parts Container
- Perimeter Fence
- CCTV
- PV Table
- Weather Station
- Solar Farm Construction Compound
- Ring Main Unit (RMU)
- Stream and Drain Deck Crossing
- Interconnector 1 (1 x 33kV Circuit)
- Interconnector 2 (1 x 33kV Circuit)
- Interconnector 3 (1 x 33kV Circuits)
- Interconnector 4 (3 x 33kV Circuits)
- HDD Launch/Receptor Pit Areas
- HDD Borelines
- Hedgerow Removal Zone

Revisions

REV	DATE	DESCRIPTION
A	17.04.2025	First Issue
B	25.04.2025	Second Issue
C	28.05.2025	Third Issue
D	04.06.2025	Fourth Issue

Drawn By:	RH
Approved By:	MMC

Summary

Project

Drumdowney Solar Farm

Location

Nicholastown, Davidstown, Ballyhobuck, Rathpartick, and Drumdowney Upper, Co. Kilkenny.

Title

Key Layout Plan

Scale

1:13,500 @ A1

Scale as shown at A1
Scale as half at A3

Drumdowney Solar Farm Limited
186 Bangor Road
Kimmage
Dublin 12