APPENDIX 12-1

CONSTRUCTION NOISE REPORT

A specialist energy consultancy

Technical Appendix 12.1

Construction Noise Report

Cooloo Wind Farm

Neoen

IE015-009-R1
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COMMERCIAL IN CONFIDENCE

NEOEN

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TNEI Services Ltd
Company Registration Number: 03891836 **VAT Registration Number: 239 0146 20**

Registered Address 5th Floor 10 Chapel Walks, Manchester, M2 1HL Tel: +44 (0)161 233 4800	7th Floor West One Forth Banks Newcastle upon Tyne NE1 3PA Tel: +44 (0)191 211 1400	6th and 7th Floor 80 St. Vincent Street Glasgow G2 5UB Tel: +44 (0)141 428 3180

TNEI Ireland Ltd
Registered: 104 Lower Baggot Street, Dublin 2, DO2 Y940
Company Registration Number: 662195 **VAT Registration Number: 3662952IH**

Unit S12, Synergy Centre
TU Dublin Tallaght Campus
Tallaght
D24 A386
Tel: +353 (0)190 36445

TNEI Africa (Pty) Ltd
Registered: Mazars House, Rialto Rd, Grand Moorings Precinct,7441 Century City, South Africa
Company Number: 2016/088929/07

Unit 514 Tyger Lake
Niagara Rd & Tyger Falls Blvd
Bellville, Cape Town
South Africa, 7530

TNEI Inc.
Registered Address: 9319 Robert D/ Snyder Rd. PORTAL Building Mecklenburg County
Charlotte, NC 228223-0001 USA
Certification Number: C202305805696-1

Unit 216 PORTAL Building,
9319 Robert D. Snyder Road
Charlotte, Mecklenburg County,
North Carolina 28223
Tel: +1 (980) 245-4024

Executive Summary

TNEI Services Limited (TNEI) was commissioned by MKO on behalf of Neoen (the Applicant) to undertake predictions of noise levels associated with the construction of the proposed Cooloo Wind Farm (hereinafter referred to using the following terminology as outlined in Section 1.1.1 of Chapter 1: 'the Proposed Project', 'the Proposed Wind Farm', the Proposed Grid Connection', 'Site'). The noise predictions were used to assess the potential impact of noise attributable to the construction of the Proposed Project on the occupiers of nearby noise sensitive receptors.

The noise impact assessment was undertaken using guidance contained in BS 5228: Part 1 2009+A1:2014 *'Noise and vibration control on construction and open sites- Noise'* and the calculation methodology in *ISO 9613 2:2024 Acoustics - Attenuation of sound during propagation outdoors: Engineering method for the prediction of sound pressure levels outdoors*, together with noise data for appropriate construction plant.

A total of 439 buildings (potential noise sensitive receptors/houses) were identified within 2.5 km search area of the Proposed Wind Farm site. Predictions have been made at all identified noise sensitive receptors assuming that all items of plant were operating continually to provide a precautionary scenario. In addition, the noise model assumed that noise sources would be located within the most likely activity areas closest to the receptors, whereas in reality plant would move around the Proposed Wind Farm site and only a proportion of the plant may be operating at any one time. As such, the predictions are inherently likely to over-predict the actual sound levels that are likely to be experienced.

The predicted levels for the construction of the Proposed Wind Farm (as opposed to the Proposed Grid Connection) are below the Category A Daytime Threshold Levels, as detailed within BS 5228:2009 during all modelled scenarios for all receptors.

There is potential for some construction activities to occur outside of the normal daytime working hours (Mon-Fri 07:00 – 19:00 and Saturday 07:00 – 13:00). Predicted noise levels exceed the 55 dBA evening and weekend threshold level at CNAL11 and CNAL12 during Scenario 1 as a result of the construction and modification of new and existing roads to the Site. Although the duration of these activities will be short in nature and no significant effects are anticipated, construction activities should not be undertaken outside of the normal daytime working hours when close to these receptors. In the event that work during evening and weekend periods is necessary, appropriate mitigation measures should be taken to reduce the noise immissions below the BS 5228 threshold levels at these properties.

Accordingly, construction noise impacts are below the indicator for a potential significant effect. For some periods, it is unavoidable that construction activities and plant will be located directly outside a property. On these occasions, noise immission levels may be higher than predicted for a short time, resulting in instantaneous noise levels which may exceed 65 dB(A) for short periods of time. Nevertheless, noise levels will vary throughout the construction phase as activities, plant and locations vary and for much of the working day the noise associated with construction activities will be less than predicted - the assessment assumes all equipment is operating simultaneously, concurrently and at full power, whereas in practice, equipment load and location will vary throughout the day.

No significant effects resulting from construction noise are predicted, nevertheless, good practice during construction is recommended following guidance from BS 5228.

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1 Introduction

1.1 Brief

TNEI was commissioned by MKO to undertake a construction noise assessment for the proposed Cooloo Wind Farm (the Proposed Project) on behalf of Neoen ('the Applicant'). The following steps summarise the noise assessment process:

- Establish typical ambient noise levels at sensitive receptors located closest to the anticipated construction activities and derive appropriate noise threshold levels;
- Undertake predictions of activity noise throughout the construction period that that would be incident at the nearest sensitive receptors;
- Compare the predicted noise levels across the construction period with the derived threshold values; and,
- Identify any requirements for mitigation measures, if needed.

The following terms and definitions are used throughout this report;

- **Emission** refers to the sound level emitted from a sound source, expressed as either a sound power level or a sound pressure level;
- **Immission** refers to the sound pressure level received at a specific location from a noise source(s);
- **SWL** indicates the sound power level in decibels (dB);
- **SPL** indicates the sound pressure level in decibels (dB);
- **NSR** (Noise Sensitive Receptor) are identified receptors that are sensitive to noise;
- **NML** (Noise Monitoring Location) refers to any location where baseline or specific noise levels have been measured; and
- **CNAL** (Construction Noise Assessment Location) refers to any location where the noise immission levels are calculated and assessed.

Unless otherwise stated, all noise levels refer to free field levels i.e. noise levels without influence from any nearby reflective surfaces.

All coordinates refer to Ordnance Survey Irish National Grid using Eastings, Northings.

1.2 Site Description

The Proposed Project is located within a rural, agricultural setting in east Galway, approximately 12 km southeast of Tuam. Land use within the Site is predominately agricultural with some adjacent areas in the north of the Proposed Wind Farm site occupied by active raised blanket bog. Land-use in the wider landscape comprises a mix of pastoral agriculture, peat bogs and low density residential.

The Proposed Project would be accessed by new and existing local roads. Specifically, via new construction site entrance on the R332 and operational access from an existing track within the Proposed Wind Farm site and at two locations along the L6301 Local Road. Access and egress point will also be constructed to facilitate the crossing of the L6056 Local Road in the townland of Dangan Eighter.

Figure A1.1 in Appendix A shows details of the Site infrastructure.

1.3 Project Description

A detailed description of the Proposed Project and the construction requirements can be found in Chapter 4 of this EIAR.

Construction of the Proposed Project will require the establishment of construction compounds, the laying of new tracks from the construction site entrance up to the construction compound and across the site to the wind turbine locations, excavation of turbine foundations, construction of turbine bases, installation of turbines, installation of a substation and Battery Energy Storage System (BESS) and construction of underground grid connection to the existing Cloon Substation.

No concrete batching is proposed on site and all materials will be externally sourced, however, up to 5 Spoil Repository areas will be developed on site for the management of excess materials.

The construction period is anticipated to last for 18-24 months. Table 1.1 (overleaf), which presents an indicative construction timetable, is taken from Chapter 4 of the EIAR. Yellow coloured cells indicate construction activities that have been included in the construction noise assessment, whereas cells shaded grey indicate construction activities that would not typically generate high levels of noise, and as such are excluded from the assessment. Examples of such activities could include wiring of plant, activities using handheld tools, and turbine commissioning tests.

Construction activities are expected to be limited to the following hours;

- Monday – Saturday 07:00 – 19:00

Standard construction activities are not anticipated outside of the above times; however, it should be noted that some activity outside of the core hours could arise, under certain conditions. Examples include construction activities that cannot be stopped once they have begun, such as turbine erection or concrete pours; or where deliveries need to occur outside of standard working hours, for example, to receive Abnormal Indivisible Loads (AILs).

No night-time construction activities are expected, however, there may be requirement to run a small amount of fixed plant during the night-time, for example to provide power to site cabins or provide lighting for health and safety reasons. The assessment, therefore, considers the potential for night-time noise impacts.

Table 1.1: Indicative Construction Timetable

Construction Activity	Year 1				Year 2	
	Q1	Q2	Q3	Q4	Q1	Q2
Site Health and Safety						
Grid Connection						
Site Compounds						
Site Roads						
Substation and Electrical Works						
Turbine Hardstands						
Turbine Foundations						
Backfilling and Landscaping						
Turbine Delivery and Erection						
Substation Commissioning						
Turbine Commissioning						

2 Noise Planning Policy and Guidance

2.1 Overview of Noise Planning Policy and Guidance

There is no published statutory Irish guidance that contains suggested noise limits for construction activities, other than a 2014 document published by the National Roads Authority (NRA), which relates to noise from road developments only. The Association of Acoustic Consultants of Ireland, however, have published Environmental Noise Guidance for Local Authority Planning & Enforcement Departments [(1)], which states; *"The chief guidance document applied in the assessment of construction phase noise impacts is British Standard BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites Part 1: Noise (2014)."* The assessment has therefore been undertaken in accordance with this standard, hereafter simply referred to as BS 5228.

2.2 Relevant Guidance

The BS 5228 [(2)] standard provides useful guidance on practical noise and vibration control. Part 1 provides recommendations for basic methods of noise control including sections on community relations, training, occupational noise effects, neighbourhood nuisance and project supervision. The annexes provide information on noise sources, noise calculation procedures, mitigation measures and their effectiveness.

Part 1 also contains sound power level data for a variety of construction plant. This data was obtained from field measurements of actual plant operating on multiple construction and open sites and is therefore appropriate to use as source level data for construction noise predictions.

3 Methodology

3.1 Considering the Potential for Noise Impacts

Noise levels from construction activities will vary continually over time, as activities and plant start and stop, and move around the Site. To assess the potential impacts of construction noise, a series of precautionary scenarios can be considered, where construction plant and activities are assumed to be working continually and in locations closest to the nearest sensitive receptors.

Conversely, however, it would not be appropriate to assume a particular item of mobile plant is located directly opposite a receptor for any prolonged period of time (under most circumstances). An example of this could be where an excavator is working along a line to dig a cable trench over a number of weeks, which passes close to a receptor for a few hours. Therefore, in the case of mobile plant, this can be modelled as a point source that moves along a defined path, averaging out the sound power level across the length of the line, rather than concentrating it in a single location next to the receptor. In such cases, the predicted noise level will represent an average level expected to be received for the majority of the activity period, however, it should be recognised that when directly opposite a receptor, noise levels would be higher than predicted for a short period of time.

Notwithstanding these discrete occasions, the overall noise level attributable to construction activities from the Site will tend to be higher in the assessment than what will actually occur for the majority of the time.

3.2 Study Area

Noise Sensitive Receptors (NSRs) are properties, people or fauna that are sensitive to noise and, therefore, may require protection from nearby noise sources. The Study Area for the construction noise assessment is defined through the identification of NSRs within 2.5 km of the Proposed Wind Farm Figure A1.1 (Annex A) details the location of the NSRs identified.

Of the NSRs identified, a representative sample of Construction Noise Assessment Locations (CNALs) have been chosen to represent the closest receptor or group of receptors. The CNALs were chosen on the assumption that if noise levels are within acceptable levels at the closest receptors then it is reasonable to assume they would also be acceptable at more distant locations. Nevertheless, noise level predictions for all identified NSRs in the Study Area are provided in Annex C for completeness.

Table 3.1 details the CNALs considered within the assessment and they're also shown on Figure A1.2 in Annex A.

Table 3.1: Construction Noise Assessment Locations (CNALs)

CNAL Name	Coordinates	
	Eastings	Northings
CNAL1	555155	751212
CNAL2	556364	750597
CNAL3	557539	749986
CNAL4	557106	748638
CNAL5	556373	747830
CNAL6	556008	747356
CNAL7	554905	746785
CNAL8	554571	747565
CNAL9	554846	748697
CNAL10	554950	749860
CNAL11	555580	746389
CNAL12	553611	747164
CNAL13	554565	748302

3.3 Methodology for the Prediction of Noise

To predict the noise immission levels attributable to the construction of the Proposed Project, a noise propagation model has been produced using the propriety noise modelling software CadnaA. Within the software, complex models can be used to simulate the propagation of noise according to a range of international calculation standards, including BS 5228 and *ISO 9613 2:2024 Acoustics - Attenuation of sound during propagation outdoors: Engineering method for the prediction of sound pressure levels outdoors.* [3]

For this assessment, noise modelling was undertaken using the ISO 9613 propagation model, which was chosen in preference to the calculation method presented in BS 5228, primarily because of some of the significant distances from source to receptor evident on this site. Specifically, BS 5228 notes in F 2.2.2.2, that at distances over 300 m noise predictions using the BS 5228 methodology should be treated with caution, especially where a soft ground correction factor has been applied, because of the increasing importance of meteorological effects; whereas ISO 9613-2 provides equations that have been validated up to greater distances.

The model uses the octave band sound power output of the proposed construction plant as its acoustic input data, and calculates on an octave band basis, attenuation due to geometric spreading, atmospheric absorption, topography and barriers and ground effects.

For the purposes of this assessment, all noise level predictions have been undertaken using a receiver height of 1.5 m above local ground level. Soft ground (G=1) attenuation has been assumed at all locations except for water bodies, construction compounds, turbine bases and similar areas of hardstanding, which have been modelled with a ground attenuation of G=0 (hard ground).

Air absorption based on a temperature of 10°C and 70 % relative humidity has been assumed.

3.4 Limitations of the Noise Model

The noise propagation models are intended to give a good approximation of the construction noise level and the contribution of each individual noise source. However, it is expected that actual levels are unlikely to be matched exactly with modelled values and the following limitations in the model should be considered:

- In accordance with ISO 9613-2, all assessment locations are modelled as downwind of all noise sources and propagation calculations are based on a moderate ground-based temperature inversion, such as commonly occurs at night;
- The predicted barrier attenuation provided by local topography, embankments, walls, buildings and other structures in the intervening ground between source and receiver can only be approximated and not all barrier attenuation will have been accounted for;
- Unless specifically stated, the modelled scenarios assume all noise sources are operating continuously and simultaneously, estimating a precautionary noise level; and
- All mobile plant assumed to be working on tracks (excavators, dozers, rollers etc) have been modelled as moving point sources along their anticipated movement paths and the sound power level of the source is effectively averaged out across the length of the entire line. This will give an approximation of the overall noise levels from mobile plant at receptor locations; however, in reality noise levels would fluctuate as construction plant and activities move around in their activity areas.

3.5 Methodology for the Assessment of Noise

Annex E, part E.3.2 of BS 5228-1, provides example methods for assessing the significance of construction noise effects and gives examples of acceptable limits for construction noise.

Table E.1 of BS 5228-1 (represented here as Table 3.2) contains an example of the significance criteria that can be used to assess construction noise for residential receptors.

Three categories of thresholds are provided for varying time periods. The appropriate category for any given receptor can be chosen after quantifying the existing ambient noise levels (rounded to the nearest 5 dB) at that location. BS 5228 provides the following advice regarding the thresholds:

- *"Note 1: A potential significant effect is indicated if the LAeq,T noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.*
- *Note 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total LAeq,T noise level for the period increases by more than 3 dB due to site noise.*
- *Note 3: Applied to residential receptors only."*

Therefore, the assessment of construction noise reflects a specific noise threshold for the locality for a particular period of the day, rather than an absolute noise level.

Table 3.2: Example of Threshold of Potential Significant Effect at Dwellings

Assessment Category and Threshold Value Period	Threshold Value $L_{Aeq,T}$ dB		
	Category A[(A)]	Category B[(B)]	Category C[(C)]
Night-Time (23:00 – 07:00)	45	50	55
Evenings and Weekends[(D)]	55	60	65
Daytime (07:00 – 19:00) & Saturdays (07:00 to 13:00)	65	70	75

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

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

(C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values;

(D) 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00 – 23:00 Sundays.

It should be noted that exceedance of the threshold does not in itself indicate a significant effect, rather, the standard states; *"If the site noise level exceeds the appropriate category value, then a potential significant effect is indicated. The assessor then needs to consider other project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect".*

3.6 Determining the Threshold Levels

A baseline noise survey was undertaken as part of the Proposed Project's operational noise assessment and this is reported in detailed in Appendix 12.2 of the EIAR.

Data from seven Noise Monitoring Locations (NMLs) has been used in order to set the appropriate BS 5228 threshold levels. The NMLs can be seen on Figure 1.1 (Appendix A).

Table 3.3 details the average $L_{Aeq(t)}$ noise level at each NML, after filtering for rainfall events and windspeeds of 5 m/s and above. The levels were calculated for each of the periods defined in BS 5228 for weekday and weekend daytime, evening and night-time. Only data from full measurement periods, or measurement periods with the majority of records present, have been used to derive the levels in Table 3.3 (i.e. if a period has had a substantial amount of data removed due to rainfall or wind speed, the entire period has been removed from the dataset).

Table 3.3: Typical Ambient Noise Levels, $L_{Aeq(t)}$ for each NML.

Noise Monitoring Location	Daytime M - F	Daytime Sat	Evenings	Weekend	Night-time
	Weekdays 07:00 - 19:00	Saturday 07:00 - 13:00	Weekdays 19:00 - 23:00	Saturday 13:00 – 23:00 Sunday 07:00 to 23:00	All days 23:00 - 07:00
NML01	40	41	34	39	31
NML02	58	58	52	56	32
NML03	40	40	35	38	27
NML04	45	44	40	43	37
NML05	45	44	36	43	31
NML06	47	49	42	44	35
NML07	53	48	41	47	33

With due regard to the ambient noise levels at NSRs around the Proposed Project, the BS 5228 Category A threshold levels have been adopted for all receptors and during all periods. It's noted that the ambient noise level measured at NML02 during the weekend period would result in the Category B threshold levels being used, however, as a cautious approach the predicted noise levels will be assessed against the lower Category A threshold levels.

Accordingly, the assessment is made against the following noise level limits for all CNALs;

- Daytime weekdays 07:00 – 19:00: 65 dB $L_{Aeq\ (12\ hours)}$
- Saturday 07:00 – 13:00: 65 dB $L_{Aeq\ (6\ hours)}$
- Evenings (weekdays) 19:00 – 23:00: 55 dB $L_{Aeq\ (4\ hours)}$
- Saturday 13:00 – 23:00: 55 dB $L_{Aeq\ (10\ hours)}$
- Sundays 07:00 – 23:00: 55 dB $L_{Aeq\ (16\ hours)}$
- Night time 23:00 – 07:00: 45 dB $L_{Aeq\ (8\ hours)}$

4 Noise Impact Assessment

4.1 Modelling of Individual Sound Sources

Noise immission levels would vary throughout the construction period as construction activities, plant and locations vary. For much of the working day the noise associated with construction activities would be less than predicted, as this assessment assumes all equipment is continually operating at full power and in locations closest to the NSRs, whereas in practice, equipment load and precise location may vary throughout the day. This approach has been adopted to represent a worst-case assessment.

At this stage a detailed plant list is not available, therefore, a generic plant list based upon experience of similar projects has been used. All modelled noise sources and associated sound power level (SWL) and sound pressure level (SPL) data is included in Annex B: Noise Model Data.

For tree felling activities broadband noise level data for a harvester, a forwarder and a skidder has been taken from *Noise Hazards in Forestry Operations and Selection of Personal Protective Equipment* [4] (Forestry Commission). No octave band data is available therefore modelling has been undertaken using the 500 Hz octave band data, as recommended in ISO 9613. Noise levels for the Harvester and Forwarder are given at the operator position inside a Q Cab. In order to estimate external levels 10 dB has been added to the quoted levels and the sound power level for each item of plant has been calculated within CadnaA assuming the quoted sound pressure levels (SPLs) have been measured at a distance of 1 m.

For all other construction activities source noise level data is taken from Annex C of BS 5228, which provides octave band SPL levels for a wide variety of construction plant and activities suitable for the estimation of noise immission levels.

Construction noise sources for any given activity will generally comprise a mix of both moving and static sources. Mobile sources include mobile construction plant and Heavy Goods Vehicles (HGVs), while static construction plant could include generators, lighting rigs and pumps. Static equipment is usually located at a fixed location for an extended period of time.

For both mobile and static plant, activity noise levels would be transient in nature due to changes in location, on/off periods, and fluctuations of load on any individual machine.

All static items of plant and activities have been modelled as single point sources. All mobile plant (excavators, dozers, dumpers etc.) have been modelled as either a moving point source (line source) along their anticipated movement paths or as a stationary point source located at the closest point of its anticipated work area to any given CNAL.

4.2 Modelling of Construction Activities

The assessment considers a number of construction scenarios based on the key construction activities detailed in Chapter 4: Description and the indicative timetable (Table 1.1 of this report).

Noise propagation modelling has been undertaken considering the key activities that are likely to occur throughout the construction period.

All construction activities have been modelled as occurring for the full duration of each quarter, however, in reality it is unlikely that this would be the case and many activities may only occur for a

number of weeks. As such, the assessment is likely to overpredict the noise level during each scenario. Details of the items of plant assumed to be operating in each modelled scenario, as well as noise data for each modelled noise source, are included in Annex B: Noise Model Data.

The modelled scenarios represent the following construction activities:

- Scenario 1 (Year 1: Q1) – New junction on the R332 is being constructed and access tracks are being established up to the proposed Substation and BESS. Modification of R332/N63 junction is occurring. Construction of construction compound is occurring.
- Scenario 2 (Year 1: Q2) – Construction of new R332 junction and site compound is complete. Modification of R332/N63 junction is complete. Construction compound is in operation. On-site substation and BESS compounds are being constructed. Access tracks up to T4 are being constructed. Turbine hardstandings and foundations are being constructed at T1 and T2. Deliveries of materials are being made to site.
- Scenario 3 (Year 1: Q3) – Construction compound is in operation On-site substation and BESS compounds are being constructed. Access tracks up to T9 are being constructed and felling is occurring. Turbine hardstandings and foundations are being constructed at T3 and T4. Deliveries of materials are being made to site.
- Scenario 4 (Year 1: Q4) – Construction compound is in operation. Construction of access tracks is complete. On-site substation and BESS compounds are being constructed. Turbine hardstandings and foundations are being constructed at T5 and T6. Deliveries of materials are being made to site. T1, T2 and T3 are being erected.
- Scenario 5 (Year 2: Q1) – Construction compound is in operation. Turbine hardstandings and foundations are being constructed at T7, T8 and T9. Deliveries of materials are being made to site. T4, T5 and T6 are being erected.
- Scenario 6 (Year 2: Q2) – Construction compound is in operation. Deliveries of materials are being made to site. T7, T8 and T9 are being erected.
- Scenario 7 (Night-time) – Diesel generators for lighting are operational in the site compounds.

4.3 Calculated Immission Levels

CNAL	Scenario 1 (Y1 Q1)	Scenario 2 (Y1 Q2)	Scenario 3 (Y1 Q3)	Scenario 4 (Y1 Q4)	Scenario 5 (Y2 Q1)	Scenario 6 (Y2 Q2)	Scenario 7 (Night-time)
CNAL01	24	30	36	33	39	38	9
CNAL02	25	32	44	37	43	42	10
CNAL03	24	32	40	34	42	42	10
CNAL04	29	37	42	39	43	41	15
CNAL05	32	41	42	41	41	36	20
CNAL06	39	44	41	44	40	38	26
CNAL07	47	47	46	47	46	46	35

CNAL	Scenario 1 (Y1 Q1)	Scenario 2 (Y1 Q2)	Scenario 3 (Y1 Q3)	Scenario 4 (Y1 Q4)	Scenario 5 (Y2 Q1)	Scenario 6 (Y2 Q2)	Scenario 7 (Night-time)
CNAL08	48	49	48	49	47	47	35
CNAL09	36	47	47	47	40	37	23
CNAL10	29	37	40	41	42	38	15
CNAL11	60	40	38	39	38	37	26
CNAL12	60	42	41	44	44	42	26
CNAL13	39	50	49	50	40	38	26

For all CNALs the predicted noise levels for all scenarios are below the weekday and Saturday daytime Category A threshold level of 65 dBA.

Predicted noise levels are also below the evening and weekend Category A threshold level of 55 dBA at all CNALs except for CNAL11 and CNAL12 during Scenario 1, where the predicted noise level is 60 dB(A) as a result of road construction and upgrades.

No construction activities are anticipated during the night-time, however, some generation plant or similar may operate during night-time hours within the construction compounds. The predicted noise levels for the modelled night-time scenario are below the night-time Category A threshold levels of 45 dBA.

To mitigate the effects of noise, construction of the new R332 access road and upgrades to the R332/N63 junction should only occur during the weekday daytime hours (07:00 - 19:00) and Saturday daytime hours (07:00 - 13:00) i.e. not during the evening and weekend periods.

4.4 Proposed Grid Connection

For the Proposed Grid Connection underground electrical cabling route, the amount of required plant is relatively small, typically being based around an excavator for trenching and backfill activities. As such, construction activities in any one location will be limited in duration and adverse noise effects are anticipated to be negligible. Section 4.8.6 in Chapter 4 of the EIAR describes the construction of the underground electrical cable trench in more detail.

Where construction activities occur directly besides a dwelling the noise levels at that location are likely to be in the region of 75 – 80 dBA for a short period of time. This noise level is deemed representative of any receptor that lies adjacent to the 20.9 km Proposed Grid Connection underground electrical cabling route. It should be noted, however, that this would only occur where construction activities are directly opposite a dwelling i.e. within approximately 20 m. To put this into context, trenching and backfill activities are anticipated to move along the underground electrical cabling route at approximately 150 m to 300 m a day, therefore, the length of time when construction activities will be occurring adjacent to any given receptor is only likely to be for a few hours. For the majority of the time, plant and equipment will be located at greater distances and noise levels will be lower.

Although noise levels from trenching and backfill operations may occasionally exceed the BS 5228 threshold levels during the daytime, this would only occur for a short period of time at any one location. Accordingly, the impact is not deemed significant.

There are nine identified watercourse crossings along the proposed cable route. The cable route will primarily seek to use culverts, however, if this is not suitable there may be a requirement for Directional Drilling (DD). DD typically requires the use of multiple items of plant including pumps, mud recyclers, drilling rigs and generators, however, due to the relatively small size of the watercourses the plant is anticipated to be a Vermeer D36 x 50 Directional Drill (or similar), which is much smaller than many DD rigs and requires less associated plant. Additionally, for small crossings, the work would likely be completed within 1 to 2 weeks, therefore is considered a short-term activity.

Calculations of the Vermeer DD rig, assuming a source noise level of 94 dBA at 1 m, and a tracked excavator (using data from BS5228), indicates that noise levels would be below the 65dBA threshold from a distance of approximately 40 m. One of the eight identified watercourse crossings have been identified as having a dwelling within 40 m, as such noise mitigation measures should be considered in line with the guidance presented in BS 5228 to lessen the impact. This could include the erection of temporary boarding alongside the drilling rig or use of 'acoustic blanket panels' to hang from temporary fencing ('Heras' or similar). This should be installed as close to the drilling rig as is practicable and fitted so as to interrupt any direct line of site between the drilling rig and the closest receptors. Examples of appropriate products include Echo Noise Defender and Soundex DeciBloc.

4.5 Good Practice Noise Control Measures

Whilst no significant effects resulting from construction noise and vibration are predicted, good practice during construction is recommended.

The core hours for the proposed works will be 07:00 to 19:00 Monday to Saturday. There will be no working on Sundays and Public Holidays, however, it should be noted that out of necessity some activity outside of the core hours could arise, from delivery and unloading of abnormal loads or health and safety requirements, or to ensure optimal use is made of fair weather windows for concrete deliveries, the erection of turbine blades and the erection and dismantling of cranes. If occasional work is undertaken outside of core hours, especially during construction of access tracks at the site entrance, this should be agreed in advance.

Additionally, construction activities close to residential dwellings will not be undertaken outside of the BS 5228 daytime hours (07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays).

Good onsite practices, both for construction of the Proposed Wind Farm and the Proposed Grid Connection will be implemented to minimise the likely effects. Particular care will be taken at watercourse crossings along the Proposed Grid Connection. Section 8 of BS 5228-1:2009+A1:2014 recommends a number of simple control measures as summarised below that will be employed onsite:

- Keep local residents informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and be subject to programmed maintenance;
- Select inherently quiet plant where appropriate - all major compressors will be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use;
- All ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines will be shut down between work periods (or when not in use) or throttled down to a minimum;

- Regularly maintain all equipment used onsite, including maintenance related to noise emissions;
- Vehicles will be loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and
- All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures will be provided.

5 Summary

The noise impact assessment has considered the existing noise environment at local residential receptors to determine appropriate noise threshold levels for construction activities.

Noise propagation modelling has been undertaken in accordance with ISO 9613-2:2024 and the anticipated noise immission levels presented for scenarios likely to occur throughout the construction period of the Proposed Project. The modelled scenarios consider the 'noisiest' activities that are likely to occur during the construction period and the modelling assumes that the construction activities are occurring at locations within the development site that are closest to the NSRs.

During construction of the Proposed Wind Farm (not including the Proposed Grid Connection), the predicted noise levels are below the Category A Threshold Levels for daytime periods, as detailed within BS 5228. Accordingly, construction noise impacts are below the indicator for a potential significant effect during the daytime period.

The predicted noise levels are also below the BS 5228 evening and weekend Threshold Levels at all CNALs, except for CNAL11 and CNAL12 during the initial period of construction when access road construction and modification is occurring. Accordingly, construction activities at these locations should be avoided during and evening and weekend periods.

During the night-time, predicted noise levels are below the Category A Threshold Levels at all CNALs in all scenarios.

During the construction of the Proposed Grid Connection there will be short periods of time where noise levels may exceed the BS 5228 threshold levels, however, this will only occur when associated activities occur directly opposite a residential property. The duration of such activities at any given receptor is anticipated to be short, therefore no significant impacts are anticipated. Where DD activities are required for watercourse crossings, temporary noise barriers, or similar, should be installed to reduce noise levels at the nearest dwellings and best practice mitigation measures should be employed in line with recommendations made in BS 5228.

Whilst no additional mitigation measures are required to lessen the impacts of construction noise, some additional good practice noise control measures have been recommended during the construction of the Proposed Wind Farm and Proposed Grid Connection. These are highlighted in Section 4.5, and will be presented in a Construction Environment Management Plan (CEMP) as part of Appendix 4-3 of the EIAR. The assessment concludes that construction noise levels would remain below the indicator for a potential significant effect at all dwellings.

6 References

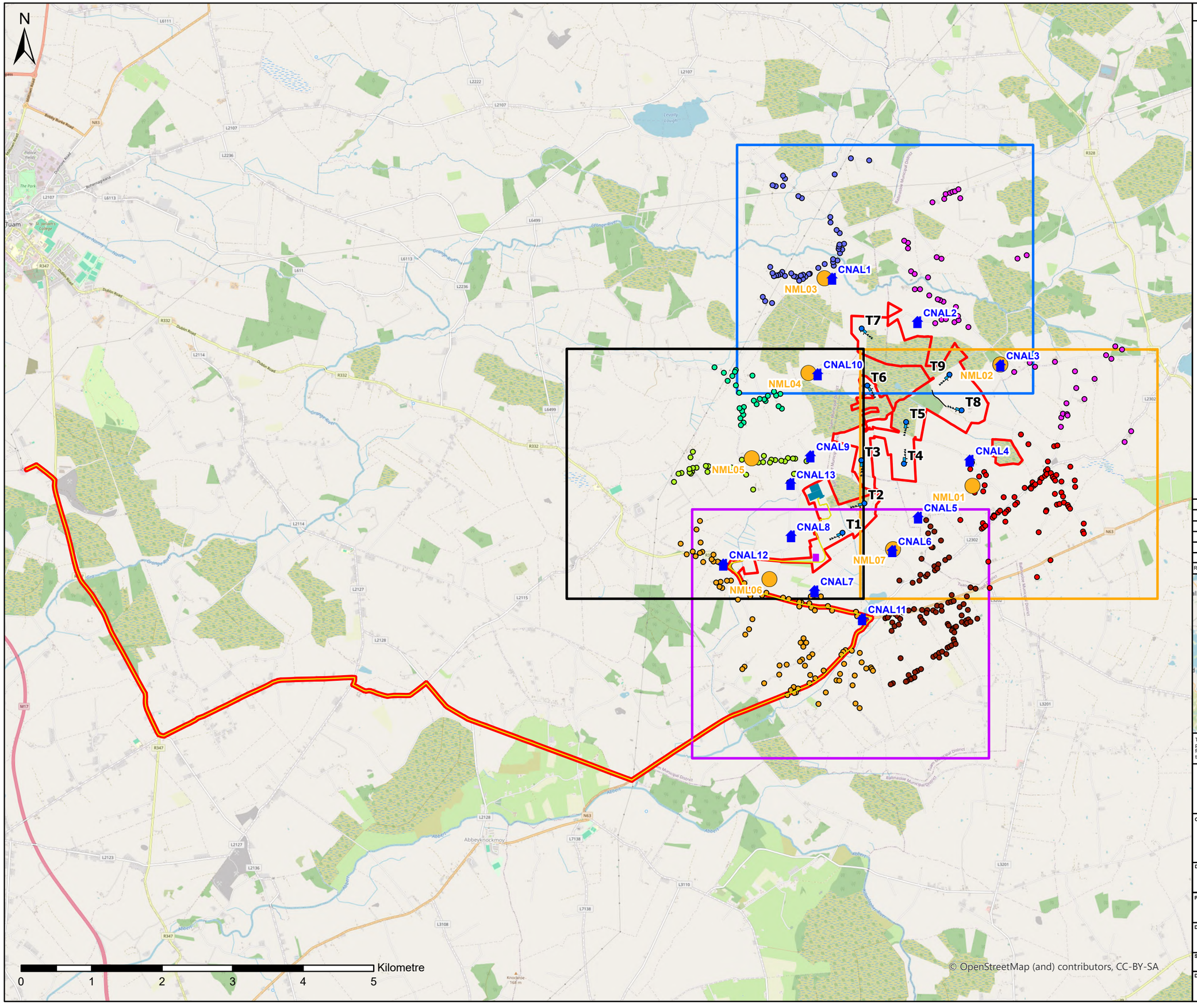
1. **Ireland, Association of Acoustic Consultants of.** *Association of Acoustic Consultants of Ireland.* [Online] 2021. [Cited: 06 June 2024.] http://aaci.ie/wp-content/uploads/2022/07/Noise-Guidelines-for-Local-Authorities-v1.pdf.

2. **British Standards Institute.** *5228 Part 1: Code of Practice for Noise and Vibration Control on Construction and Open Sites. Noise.* s.l. : BSI, 2014. BS 5228:2009 +A1:2014.

3. **(ISO), International Organisation for Standardisation.** *Acoustics – Attenuation of Sound During Propagation Outdoors: Part 2: Engineering method for the prediction of sound pressure levels outdoors.* Geneva : ISO, 2024. ISO 9613-2:2024.

4. **Forestry Commission.** *Noise Hazards in Forestry Operations and Selection of Personal Protective Equipment.* Edinburgh : The Crown, 2003.

Annex A – Figures



LEGEND

- EIAR Site Boundary
- Construction Noise Assessment Locations (CNALs)
- Cooloo Turbine Locations
- Noise Monitoring Locations (NMLs)
- Site Access Roads
- Junction Upgrades
- Turbine Hardstandings and Foundations
- Substation and BESS Compounds
- Construction Compound
- Proposed Grid Connection Route

Figure Locations

- Figure A1.2a
- Figure A1.2b
- Figure A1.2c
- Figure A1.2d

nsrs

Noise Sensitive Receptors (NSRs) Represented By:

- NML1
- NML2
- NML3
- NML4
- NML5
- NML6
- NML7

Rev.	Date	Amendment Details	Drawn	Approved
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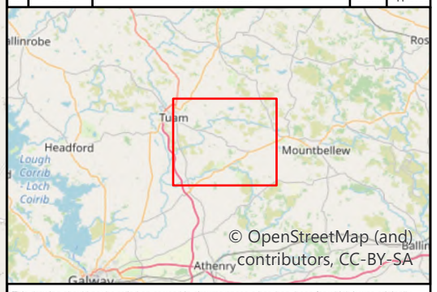
1	10/09/2025	UPDATED HOUSING LIST	FL	JB
0	17/07/2025	FIRST ISSUE	TS	MT



tnei

Client: MKO

Drawing Status: FOR PLANNING

Project Title: COOLOO WIND FARM

Drawing Title: FIGURE A1.1 - CONSTRUCTION NOISE ASSESSMENT - STUDY AREA

Scale:	Original Size:	Spatial Reference:
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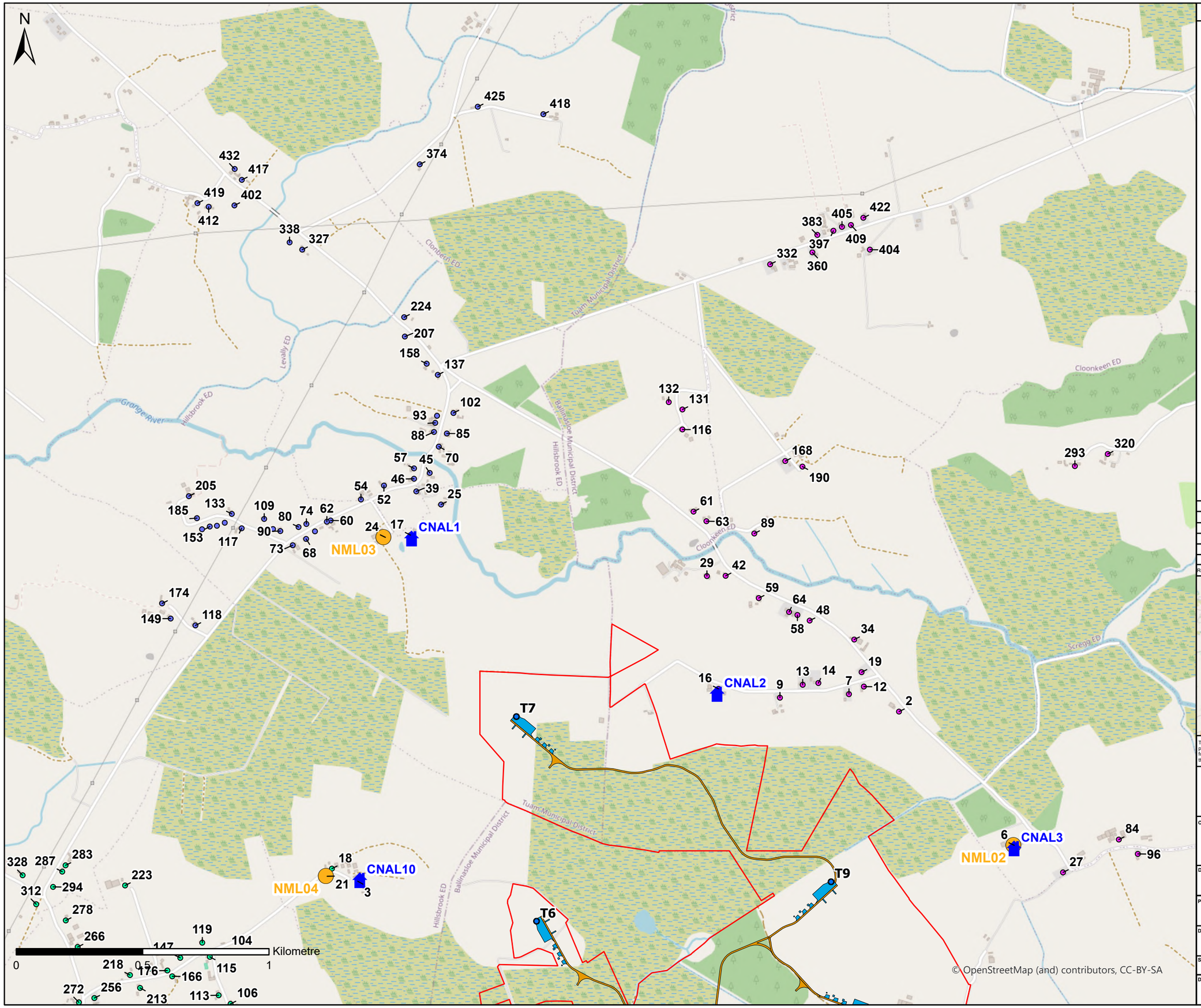
Drawing Number: IE00050-010



LEGEND

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- Noise Monitoring Locations (NMLs)
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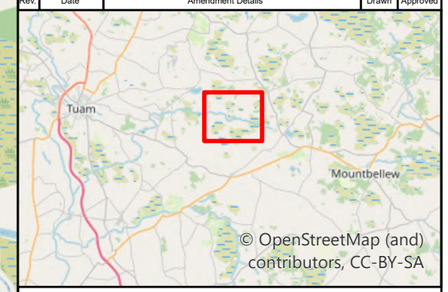
- Site Access Roads
- Turbine Hardstandings and Foundations
- Proposed Grid Connection Route

Noise Sensitive Receptors (NSRs) Represented By:

- NML2
- NML3
- NML4

Rev.	Date	Amendment Details	Drawn	Approved
2	15/09/2025	FIGURE EDITS	ST	JB
1	10/09/2025	UPDATED HOUSING LIST	FL	JB
0	17/07/2025	FIRST ISSUE	TS	MT



tnei

Client: MKO

Drawing Status: FOR PLANNING

Project Title: COOLOO WIND FARM

Drawing Title: FIGURE A1.2a- CONSTRUCTION NOISE ASSESSMENT LOCATIONS AND NOISE SENSITIVE RECEPTORS

Scale:	Original Size:	Spatial Reference:
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Drawing Number: IE00050-011

N

T9
T6
T8
T5
T3
T4
T2
CNAL3
NML02
CNAL4
NML01
CNAL5
CNAL6
NML07

Tuam Municipal District
Ballinasloe Municipal District
Derreen ED
Cooloo ED
Screggy ED
Scregg ED
Scregg EL...
R328
L2302
L2301
L3202
N63

Kilometre
0 0.5 1

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LEGEND

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Noise Sensitive Receptors (NSRs) Represented By:

- NML1
- NML2
- NML6
- NML7

Rev.	Date	Amendment Details	Drawn	Approved
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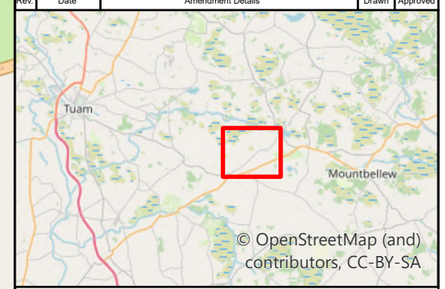
1	10/09/2025	UPDATED HOUSING LIST	FL	JB
0	17/07/2025	FIRST ISSUE	TS	MT



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Client: MKO

Drawing Status: FOR PLANNING

Project Title: COOLOO WIND FARM

Drawing Title: FIGURE A1.2b- CONSTRUCTION NOISE ASSESSMENT LOCATIONS AND NOISE SENSITIVE RECEPTORS

Scale:	Original Size:	Spatial Reference:
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Drawing Number: IE00050-011

N

T1

T2

CNAL5

CNAL6

CNAL7

CNAL8

CNAL11

CNAL12

NML06

NML07

Kilometre

0 0.5 1

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LEGEND

- EIAR Site Boundary
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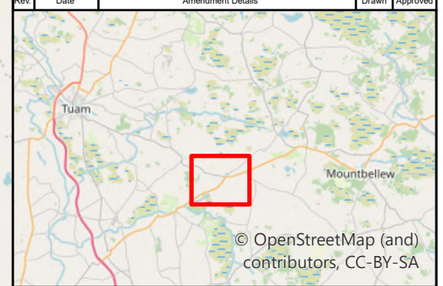
- Cooloo Turbine Locations
- Site Access Roads
- Junction Upgrades
- Turbine Hardstandings and Foundations
- Substation and BESS Compounds
- Construction Compound
- Proposed Grid Connection Route

Noise Sensitive Receptors (NSRs) Represented By:

- NML1
- NML6
- NML7

Rev.	Date	Amendment Details	Drawn	Approved
2	15/09/2025	FIGURE EDITS	ST	JB
1	10/09/2025	UPDATED HOUSING LIST	FL	JB
0	17/07/2025	FIRST ISSUE	TS	MT



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Client: MKO

Drawing Status: FOR PLANNING

Project Title: COOLOO WIND FARM

Drawing Title: FIGURE A1.2c- CONSTRUCTION NOISE ASSESSMENT LOCATIONS AND NOISE SENSITIVE RECEPTORS

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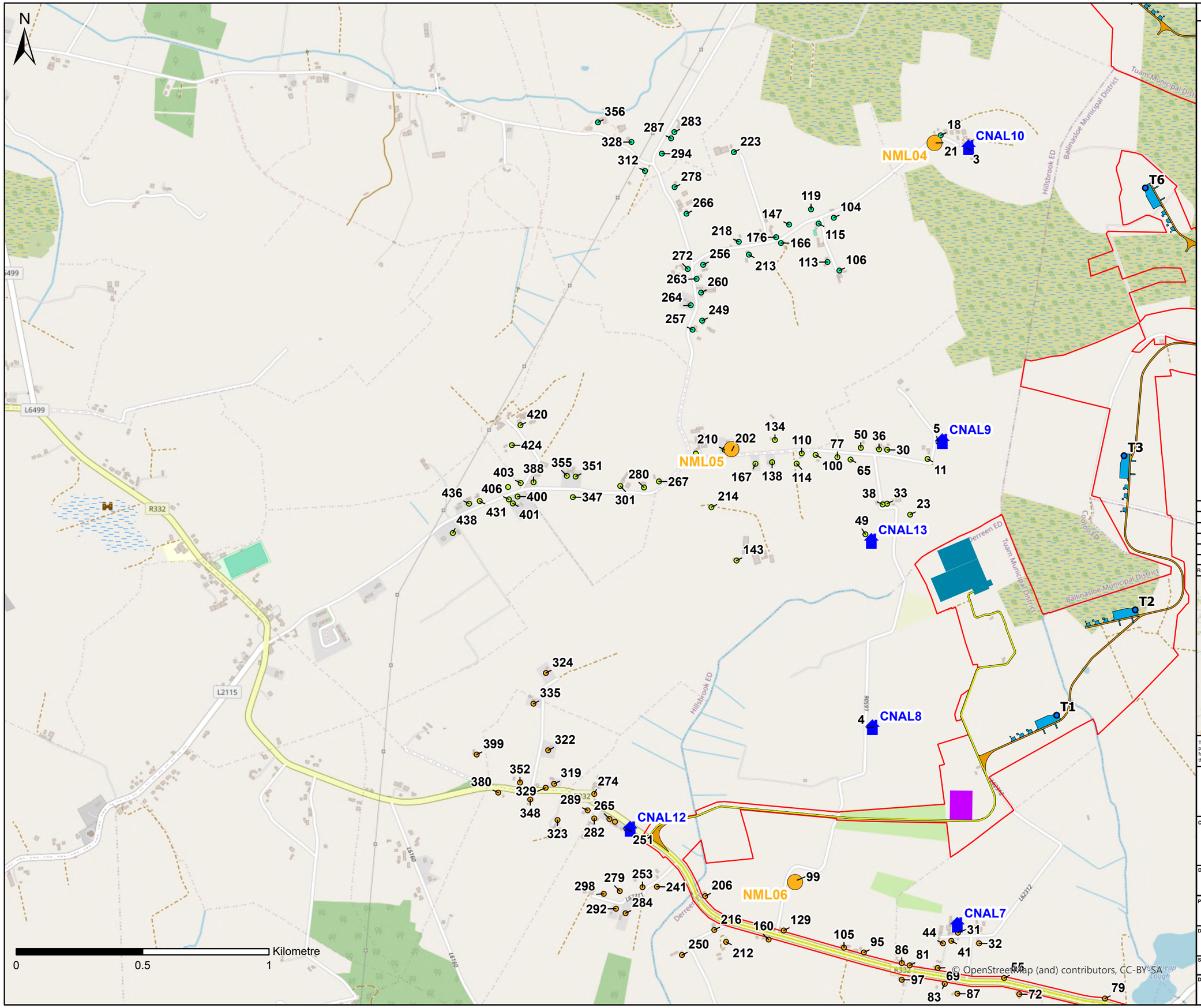

Rev.	Date	Amendment Details	Drawn	Approved
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1	10/09/2025	UPDATED HOUSING LIST	FL	JB
0	17/07/2025	FIRST ISSUE	TS	MT

Client: MKO

Drawing Status: FOR PLANNING

Project Title: COOLOO WIND FARM

Drawing Title: FIGURE A1. 2d- CONSTRUCTION NOISE ASSESSMENT LOCATIONS AND NOISE SENSITIVE RECEPTORS

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Drawing Number: IE00050-011

Annex B – Noise Model Data

Modelled Construction Noise Scenarios – Noise Sources

	Assumed working location	Plant (BS5228 Reference)	Data Source
Scenario 01			
Access track construction and junction upgrades	Access track from R332 to the construction and substation / BESS compounds (line source, 1 of) (point source, 2 of)	Dumper (C4.3) Dozer (C2.12) Tracked Excavator (C2.14) Vibratory roller (C5.20)	BS 5228-1:2009+A1:2014
Construction compound construction	Construction Compound (point source, 1of)	Dumper (C4.3) Dozer (C2.12) Tracked Excavator (C2.14) Vibratory roller (C5.20)	BS 5228-1:2009+A1:2014
	Construction Compound (point source, 1 of)	Diesel Generator (C.84) Diesel Generator (C.86)	BS 5228-1:2009+A1:2014
Scenario 02			
Access track construction	Access tracks to T1-4 (line source, 2 of)	Dumper (C4.3) Dozer (C2.12) Tracked Excavator (C2.14) Vibratory roller (C5.20)	BS 5228-1:2009+A1:2014
Construction compound operation	Construction Compound (point source, 1 of)	Diesel Generator (C.84) Diesel Generator (C.86)	BS 5228-1:2009+A1:2014
	Construction Compound (point source, 1 of)	Wheeled Excavator (C4.10)	BS 5228-1:2009+A1:2014
Deliveries to site	Along access track from R332 to the construction compounds and T1-2 (line source, 1 of)	Lorry (C11.14)	BS 5228-1:2009+A1:2014
Substation and BESS construction	On-site substation and BESS (point source, 1 of)	Dumper (C4.3) Dozer (C2.12) Tracked Excavator (C2.14) Vibratory roller (C5.20) Concrete mixer truck + truck mounted concrete pump + boom arm (C4.32)	BS 5228-1:2009+A1:2014
Turbine hardstandings and foundations	T1 and T2 (point source, 2 of)	Dumper (C4.3) Dozer (C2.12) Tracked Excavator (C2.14) Vibratory roller (C5.20) Concrete mixer truck + truck mounted concrete pump + boom arm (C4.32)	BS 5228-1:2009+A1:2014
Scenario 03			
Access track construction	Access tracks to T5-9 (line source, 4 of)	Dumper (C4.3) Dozer (C2.12) Tracked Excavator (C2.14) Vibratory roller (C5.20)	BS 5228-1:2009+A1:2014
Construction compound operation	Construction Compound (point source, 1 of)	Diesel Generator (C.84) Diesel Generator (C.86)	BS 5228-1:2009+A1:2014
	Construction Compound (point source, 1 of)	Wheeled Excavator (C4.10)	BS 5228-1:2009+A1:2014
Deliveries to site	Along access track from R332 to T3-4(line source, 1 of)	Lorry (C11.14)	BS 5228-1:2009+A1:2014
Substation and BESS construction	On-site substation and BESS (point source, 1 of)	Dumper (C4.3) Dozer (C2.12) Tracked Excavator (C2.14) Vibratory roller (C5.20) Concrete mixer truck + truck mounted concrete pump + boom arm (C4.32)	BS 5228-1:2009+A1:2014
Turbine hardstandings and foundations	T3 and T4 (point source, 2 of)	Dumper (C4.3) Dozer (C2.12) Tracked Excavator (C2.14)	BS 5228-1:2009+A1:2014

	Assumed working location	Plant (BS5228 Reference)	Data Source
		Vibratory roller (C5.20) Concrete mixer truck + truck mounted concrete pump + boom arm (C4.32)	
Felling	Forested area west of T8 (point source, 3 of)	Forwarder Harvester Skidder	Forestry Commission
Scenario 04			
Turbine Erection	Erection of T1, T2 and T3 (point source, 3 of)	Mobile telescopic crane (C4.45) Mobile telescopic crane (C4.45)	BS 5228-1:2009+A1:2014
	Lorry transporting turbines along tracks (line source, 3 of)	Lorry (C11.14)	BS 5228-1:2009+A1:2014
Deliveries to site	Along access track from R332 to T5-6 (line source, 3 of)	Lorry (C11.14)	BS 5228-1:2009+A1:2014
Substation and BESS construction	On-site substation and BESS (point source, 1 of)	Dumper (C4.3) Dozer (C2.12) Tracked Excavator (C2.14) Vibratory roller (C5.20) Concrete mixer truck + truck mounted concrete pump + boom arm (C4.32)	BS 5228-1:2009+A1:2014
Turbine hardstandings and foundations	T5 and T6 (point source, 2 of)	Dumper (C4.3) Dozer (C2.12) Tracked Excavator (C2.14) Vibratory roller (C5.20) Concrete mixer truck + truck mounted concrete pump + boom arm (C4.32)	BS 5228-1:2009+A1:2014
Construction compound operation	Construction Compound (point source, 1 of)	Diesel Generator (C.84) Diesel Generator (C.86)	BS 5228-1:2009+A1:2014
	Construction Compound (point source, 1 of)	Wheeled Excavator (C4.10)	BS 5228-1:2009+A1:2014
Scenario 05			
Turbine Erection	Erection of T4, T5and T6 (point source, 3 of)	Mobile telescopic crane (C4.45) Mobile telescopic crane (C4.45)	BS 5228-1:2009+A1:2014
	Lorry transporting turbines along tracks (line source, 2 of)	Lorry (C11.14)	BS 5228-1:2009+A1:2014
Turbine hardstandings and foundations	T7-9 (point source, 3 of)	Dumper (C4.3) Dozer (C2.12) Tracked Excavator (C2.14) Vibratory roller (C5.20) Concrete mixer truck + truck mounted concrete pump + boom arm (C4.32)	BS 5228-1:2009+A1:2014
Deliveries to site	Along access track from R332 to T7-9 (line source, 3 of)	Lorry (C11.14)	BS 5228-1:2009+A1:2014
Construction compound operation	Construction Compound (point source, 1 of)	Diesel Generator (C.84) Diesel Generator (C.86)	BS 5228-1:2009+A1:2014
	Construction Compound (point source, 1 of)	Wheeled Excavator (C4.10)	BS 5228-1:2009+A1:2014
Scenario 06			
Turbine Erection	Erection of T7, T8 and T9 (point source, 3 of)	Mobile telescopic crane (C4.45) Mobile telescopic crane (C4.45)	BS 5228-1:2009+A1:2014
	Lorry transporting turbines along tracks (line source, 3 of)	Lorry (C11.14)	BS 5228-1:2009+A1:2014
Deliveries to site	Along access track from R332 to compounds (line source, 3 of)	Lorry (C11.14)	BS 5228-1:2009+A1:2014
Construction compound operation	Construction Compound (point source, 1 of)	Diesel Generator (C.84) Diesel Generator (C.86)	BS 5228-1:2009+A1:2014
	Construction Compound (point source, 1 of)	Wheeled Excavator (C4.10)	BS 5228-1:2009+A1:2014
Scenario 07 (Night-time)			
Lighting for construction compounds	Construction compounds (point source, 2 of)	Diesel Generator (C.86) Diesel Generator (C.84)	BS 5228-1:2009+A1:2014

Noise Source Library – Sound Power Levels

Name	BS5228 Reference	31.5	63	125	250	500	1k	2k	4k	8k	A	lin	Source
Dozer	C2.12LAeq	28	113	102	104	101	100	106	90	84	108.7	114.8	BS 5228-1:2009+A1:2014
Tracked Excavator	C2.14LAeq		113	106	105	105	101	99	96	91	107	115.1	BS 5228-1:2009+A1:2014
Dumper	C4.3LAmax	28	112	109	102	101	100	96	89	81	104.3	114.5	BS 5228-1:2009+A1:2014
Wheeled Excavator	C4.10LAeq	28	92	88	91	92	90	85	79	73	93.9	98.1	BS 5228-1:2009+A1:2014
Concrete mixer truck + truck mounted concrete pump + boom arm	C4.32LAeq	28	101	101	105	104	100	98	93	90	105.8	110	BS 5228-1:2009+A1:2014
Mobile telescopic crane	C4.45LAeq	28	118	109	106	102	105	104	97	89	109.4	119.2	BS 5228-1:2009+A1:2014
Diesel generator	C4.84LAeq	28	103	100	104	98	97	93	84	75	101.7	108.3	BS 5228-1:2009+A1:2014
Diesel generator	C4.86LAeq	28	106	99	94	90	87	83	84	77	93.5	107.2	BS 5228-1:2009+A1:2014
Vibratory roller	C5.20LAeq	28	118	110	101	100	98	93	87	82	103	118.8	BS 5228-1:2009+A1:2014
Lorry	C11.14LAmax	28	121	107	104	102	101	100	97	94	106.9	121.4	BS 5228-1:2009+A1:2014
Forwarder	-					101					101		Noise Hazards in Forestry Operations and Selection of Personal Protective Equipment
Harvester	-					103					1.3		Noise Hazards in Forestry Operations and Selection of Personal Protective Equipment
Skidder	-					108					108		Noise Hazards in Forestry Operations and Selection of Personal Protective Equipment

Annex C – Noise Sensitive Receptor Results

Table C1 - Predicted Construction Noise Immission Levels, dB $L_{Aeq(t)}$

NSR	ITM X	ITM Y	Noise Immission Level, dB(A)						
			S1	S2	S3	S4	S5	S6	S7 (Night)
1	557118	748640	29	37	42	39	43	41	15
2	557082	750528	24	31	41	35	41	41	9
3	554940	749857	29	37	40	41	42	38	15
4	554571	747565	48	49	48	49	47	47	35
5	554829	748694	37	47	47	47	40	37	23
6	557538	749999	24	32	40	34	42	41	10
7	556884	750597	24	31	41	35	41	41	9
8	557132	748609	29	37	42	39	43	40	15
9	556611	750583	24	32	43	36	42	42	10
10	556020	747382	39	45	41	44	40	38	25
11	554786	748627	37	48	48	48	40	37	23
12	556943	750627	24	31	41	35	41	40	9
13	556701	750634	24	32	42	36	42	41	9
14	556763	750641	24	31	42	35	41	41	9
15	556385	747820	34	43	42	42	41	37	21
16	556368	750618	25	32	44	37	43	42	10
17	555149	751226	24	30	35	33	39	38	9
18	554838	749907	28	36	39	40	41	38	15
19	556934	750684	24	31	40	34	41	40	9
20	557108	748515	29	37	42	39	42	39	15
21	554819	749877	29	36	39	40	41	38	15
22	556483	747792	34	42	41	41	41	36	21
23	554717	748407	39	52	52	52	40	38	25
24	555050	751217	24	30	35	33	38	38	9
25	555270	751347	24	30	35	33	38	38	9
26	557827	749006	26	32	38	34	39	38	11
27	557731	749892	24	31	39	34	40	40	9
28	557306	748474	28	36	40	37	40	38	14
29	556322	751064	24	30	39	34	40	39	9
30	554626	748663	36	46	46	46	39	36	22
31	554906	746753	46	46	46	46	46	45	34
32	554990	746711	46	46	45	45	45	44	34
33	554626	748450	38	49	49	49	39	37	24
34	556905	750813	24	30	39	34	40	39	9
35	556544	747703	34	41	40	41	40	36	20
36	554594	748665	36	45	45	46	39	36	22
37	557234	748410	29	36	40	37	41	38	15
38	554608	748447	38	49	49	49	39	37	24
39	555172	751399	23	29	35	32	37	37	8
40	557331	748431	28	36	40	37	40	38	14
41	554880	746721	45	46	45	46	45	45	34
42	556396	751065	24	30	38	34	39	38	9
43	556511	747605	34	41	40	41	39	36	21
44	554847	746711	45	45	45	45	45	44	34
45	555225	751472	23	29	34	32	37	36	8
46	555163	751449	23	29	34	32	37	36	8
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49	554540	748329	39	49	48	49	39	38	25
50	554522	748671	36	45	44	45	39	36	22
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52	555044	751422	23	29	34	32	37	36	8
53	556599	747630	34	40	40	40	39	35	20
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62	554818	751279	24	30	34	32	36	35	9
63	556320	751281	23	30	37	33	38	37	8
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65	554481	748624	36	45	45	45	38	36	22
66	554771	751241	24	30	34	33	36	36	9
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68	554736	751211	24	30	34	33	36	35	9
69	554826	746614	44	44	43	44	43	43	32
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71	557312	748286	29	36	39	37	39	37	15
72	555149	746510	45	42	41	42	41	40	30
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74	554737	751270	24	30	34	32	36	35	9
75	556417	747244	36	40	38	40	38	35	22
76	556967	747794	31	38	39	38	39	35	17
77	554429	748634	36	44	44	44	38	36	22
78	556559	747410	35	40	38	40	38	35	21
79	555488	746493	53	41	39	41	39	38	27
80	554706	751258	24	30	34	32	36	35	9
81	554715	746624	43	44	43	43	43	42	31
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84	557952	750022	23	30	37	32	38	37	8
85	555293	751628	23	29	34	32	36	35	8
86	554684	746633	43	44	43	43	43	42	31
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88	555242	751634	23	29	34	31	36	35	8
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91	557292	748200	29	36	39	37	39	36	15
92	555505	746429	55	40	39	40	38	38	27
93	555247	751670	23	29	33	31	35	35	8
94	556693	747503	33	39	38	39	38	35	20
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97	554684	746567	43	43	42	43	42	41	30
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103	555254	751698	23	28	33	31	35	34	7
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108	555568	746387	59	40	38	39	38	37	26
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113	554390	749406	31	38	39	39	38	34	17
114	554268	748608	35	43	42	43	37	35	22
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116	556225	751644	22	28	34	31	36	35	7
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122	556503	747024	36	39	37	38	37	34	21
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125	556655	747166	34	38	37	38	37	34	20
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128	556041	746461	45	38	36	38	36	35	23
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133	554442	751310	24	29	33	32	34	33	9
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136	556641	747106	35	38	37	38	36	34	20
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138	554171	748614	35	42	41	42	37	35	21
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141	554383	751263	24	29	33	32	34	33	9
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143	554030	748225	38	42	41	42	37	36	23
144	556075	746432	45	38	36	38	36	34	23
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146	558399	749246	24	30	35	31	35	34	9
147	554238	749554	30	36	37	38	37	34	16
148	556154	746484	43	38	36	37	36	34	22
149	554200	750896	25	30	33	33	35	33	10
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152	558393	749114	24	30	35	32	35	34	9
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154	557991	748328	26	32	35	33	36	34	12
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156	557271	747671	30	36	37	36	37	33	16
157	557735	748119	27	33	36	34	36	34	13
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159	557293	747687	30	35	37	36	37	33	16
160	554157	746726	43	40	40	41	40	39	28
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164	557321	747712	30	35	37	36	37	33	16
165	556003	746341	46	38	36	37	36	34	23
166	554206	749481	30	37	37	38	37	33	16
167	554105	748608	35	41	41	41	37	34	21
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169	557981	748268	26	32	35	33	36	34	12
170	557962	748250	26	32	35	33	36	34	12
171	556115	746392	44	37	36	37	35	34	22
172	558181	748490	25	31	35	32	35	34	11
173	557444	747860	29	35	37	35	37	34	15
174	554166	750956	25	30	33	32	34	33	10
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176	554187	749504	30	36	37	38	36	33	16
177	558204	748515	25	31	35	32	35	34	11
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186	558472	749448	23	29	34	31	35	34	8
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199	554123	749510	30	36	37	37	36	33	16
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253	553658	746933	53	38	38	40	39	38	24
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258	556845	746730	34	36	35	35	34	32	18
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261	556795	746623	34	35	34	35	34	32	18
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372	556882	746070	33	33	32	33	32	30	16
373	556813	745998	33	33	32	33	32	30	16
374	555186	752693	21	26	29	28	30	29	5
375	556842	746015	33	33	32	33	32	30	16
376	556234	745596	33	33	32	33	32	30	17
377	556359	745656	33	33	32	33	32	30	17
378	556324	745637	33	33	32	33	32	30	17
379	556410	745681	34	33	32	33	32	30	17
380	553087	747307	41	35	34	35	34	32	19
381	556668	745844	34	33	32	33	32	30	17
382	559109	750079	21	27	31	28	32	30	6
383	556759	752413	20	26	31	28	31	30	5
384	556900	746036	33	33	32	33	32	30	16
385	556011	745479	33	33	32	33	32	30	18
386	555980	745464	33	33	32	33	32	30	18
387	556769	745894	33	33	32	33	32	30	16
388	553227	748535	33	35	35	35	33	31	17
389	557208	746395	31	33	32	33	32	30	16
390	555060	745349	33	33	32	33	32	31	19
391	556290	745551	33	33	32	33	31	30	17
392	556317	745563	33	33	32	33	31	30	17
393	556263	745535	33	33	32	33	31	30	17
394	556215	745512	33	33	32	33	31	30	17
395	556195	745503	33	33	32	33	31	30	17
396	554604	745426	33	33	32	33	32	31	19
397	556822	752430	20	26	31	28	31	30	5
398	554666	745405	33	33	32	33	32	31	19
399	553002	747458	39	34	34	35	33	32	19
400	553164	748478	33	35	34	35	33	31	17
401	553145	748451	33	35	34	35	33	31	17
402	554452	752530	21	26	29	28	30	28	5
403	553176	748532	32	35	34	35	33	31	17
404	556967	752355	20	26	31	28	31	30	5
405	556856	752445	20	26	30	28	31	30	4

406	553129	748467	33	34	34	35	33	31	17
407	554563	745382	33	33	32	33	32	31	19
408	553126	748516	32	34	34	35	33	31	17
409	556892	752453	20	26	30	28	31	29	4
410	553907	745714	34	33	32	33	32	31	19
411	559297	748900	22	27	31	29	31	29	7
412	554350	752525	21	26	29	28	30	28	5
413	554636	745349	33	33	32	33	32	30	19
414	559165	750255	21	26	31	28	31	30	5
415	558717	747743	25	29	31	30	32	29	9
416	554612	745342	33	33	32	33	32	30	19
417	554482	752631	21	26	29	28	30	28	5
418	555675	752891	20	25	29	27	30	28	4
419	554306	752539	21	26	29	28	30	28	5
420	553175	748760	31	34	34	35	33	31	16
421	553876	745680	34	33	32	33	32	31	19
422	556941	752481	20	26	30	28	31	29	4
423	554185	745480	33	33	32	33	32	31	19
424	553141	748681	32	34	34	35	33	31	16
425	555415	752920	20	25	29	27	30	28	4
426	559390	749052	22	27	30	28	31	29	6
427	555481	745192	33	32	31	32	31	30	17
428	558707	747631	25	29	31	30	31	29	10
429	554514	745311	33	33	32	33	31	30	18
430	559260	750210	21	26	30	28	31	29	5
431	553014	748460	32	34	34	34	32	30	17
432	554453	752674	21	26	29	27	30	28	5
433	554956	745186	33	32	31	32	31	30	18
434	558719	747602	25	29	31	30	31	29	9
435	558246	747223	26	31	32	31	32	29	11
436	552971	748450	32	34	33	34	32	30	16
437	558055	746985	27	31	32	31	32	29	12
438	552908	748334	31	33	33	34	32	30	16
439	555540	745127	33	32	31	32	31	29	17