FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

# APPENDIX 8.1

## Baseline Noise Measurements

## Baseline Noise Measurements

Baseline noise monitoring was undertaken at 12 locations, locations N1 to N12, to establish the existing background noise levels at these locations. These locations represent the nearest residential receptors to the north, south, east and west of the proposed wind farm.

### Selection of Monitoring Locations

Section 2.2.5 of the Institute of Acoustics', *A Good Practice Guide to the Application of ETUS-R-97 for the Assessment at Rating of Wind Turbine Noise* (2013) regarding use of proxy locations states "*When choosing a location that will serve as a proxy for others, the basis for selection is that it can reasonably be claimed, from inspection and observation, to be representative of the non-surveyed locations, in line with the criteria of Section 2.5. Measurement locations outside a property's curtilage (such as an adjacent field) may be used when access to a representative property cannot be obtained, provided that such a location can be justified as being representative. No general guidance can therefore be given on the number of measurement locations as this will be site-specific*." Section 2.5 of the GPG is summarised in Table 7.1.1 with the applicability of the proxy locations selected for Shancloon Wind Farm.

**Table 7.1.1: IOA GPG Section 2.5 Criteria and Applicability to Shancloon Wind Farm Monitoring Locations**

| Requirements of Section 2.5 | Shancloon Wind Farm Monitoring Locations |
|---|---|
| 2.5.1 *Where possible, measurements should be made in the vicinity of a dwelling in an area frequently used for rest and recreation.* | This was adhered to at all locations, so far as practicable. All measurements were in the vicinity of dwellings, representative of areas used for rest and recreation. |
| 2.5.2 *Equipment should be placed at outdoor positions where noise levels are representative of typical 'low' levels likely to be experienced in the vicinity of a dwelling (or group of dwellings if the measurements are intended to be applied to more than one dwelling). The overriding consideration is that it can reasonably be claimed, from inspection and observation, that there are no other suitable noise-sensitive locations, in the vicinity of any selected location and close to a dwelling, where background noise levels would be expected to be consistently lower than the levels at the selected position.* | This was adhered to at all locations. |
| 2.5.3 *Ideally the position should be one which would be exposed to noise from the wind turbines whilst being best-screened from other noise sources such as nearby roads or vegetation.* | The locations were in open areas or within the curtilage of a property, set back from local roads and vegetation/forestry, so far as practicable, and in the direction of the proposed windfarm. |
| 2.5.4 *The background surveys provide the basis for setting both daytime and night-time noise limits: the measurement position must therefore reasonably represent external areas (for daytime noise) and also building façades containing windows (for night-time noise).* | The locations being used to derive limits are representative of external areas and façade locations. |

| Requirements of Section 2.5 | Shancloon Wind Farm Monitoring Locations |
|---|---|
| 2.5.5 *In most locations, background noise levels will be determined by wind in trees and vegetation and noise sources external to the property such as traffic noise. The presence of local noise sources such as boiler flues, garden fountains, domestic drains, watercourses and farm equipment should be identified.* | There were some local noise sources described below.<br><br>Locations N3, N4, N6, N7 are on or near working farms. |
| 2.5.6 *Where it is not possible to exclude the influence of variable local noise sources by selection of monitoring position, it is generally possible to identify such data from inspection of noise level time histories and therefore to exclude it from the data set used to derive noise limits* | Attendance at the monitoring location during installation, battery changes and equipment collection did not identify any variable noise sources. Atypical data was removed during data analysis. |
| 2.5.7 *In all cases, microphones should be supported at a height of 1.2 – 1.5 metres above the ground and no closer than 3.5 metres to any significant reflecting surface (such as a building or fence), except the ground. The position should be within 20 metres of the dwelling unless there are particular reasons for measuring at a more distant position (such as the presence of vegetation or denial of access); if so, the reasons should be explained.* | The microphones were mounted on tripods at approximate height of 1.5 m and at least 3.5 m from any significant reflecting surface other than the ground. Where possible the noise monitors were located within 20 m. When the noise monitors were located at more distant locations this was due to either the refusal of access or presence of vegetation/reflective surfaces. |
| 2.5.8 *A resident at a selected property may request that measurements are made at a position which is considered inappropriate; perhaps because the preferred location(s) are inconvenient (it might obstruct lawn mowing, for example). In this situation the consultant should explain clearly the reasons why the measurements could be compromised; if no agreement can be reached, an alternative property or location should be sought. The assistance of the EHO may help to resolve these situations.* | This was not an issue. |

## Monitoring Locations

Twelve noise monitoring locations were selected for obtaining a detailed representation of the background noise levels in the area. The chosen noise monitoring locations were representative of the different noise environments in the vicinity of the proposed Shancloon Wind Farm development as well as being located at some of the closest dwellings (or their representative proxies) to the proposed wind farm development. Details of the noise monitoring locations are provided in Table 8.1.2. The position of the monitoring locations are shown in Figure A8.1.

**Table 8.1.2: Details on the Noise Monitoring Locations**

| Location ID | Easting | Northing | Description | Photograph | Representative Properties |
|---|---|---|---|---|---|
| N1 | 533526 | 756517 | Located north of proposed wind farm in front garden of dwelling adjacent to local road. | Plate 8.1-1 | Properties north and centre of proposed windfarm, on outskirts of Tobberoe townland.<br><br>R210, R212 |
| N2 | 534984 | 756026 | Located in rear garden of dwelling adjoining agricultural lands. North-east of proposed wind farm. | Plate 8.1-2 | Small group of properties north east of proposed windfarm, along road at Cloonteen Townland.<br><br>R226, R239, R 243, R244 |
| N3 | 535647 | 754932 | Located east of proposed wind farm, within curtilage of dwelling adjoining agricultural lands and stables. | Plate 8.1-3 | Group of three properties east of proposed windfarm on Cloonaglasha Road.<br><br>R215, R253, R263 |
| N4 | 534240 | 753750 | Located southeast of proposed windfarm in agricultural field approximately 20m from farm dwelling. Positioned away from trees and agricultural machinery/sheds. | Plate 8.1-4 | Group of properties at Dalgan Park, Beagh More Townland south east of proposed windfarm.<br><br>R198,R199, R201, R203, R204, R205, R214, R219 |
| N5 | 532749 | 753685 | Located south of proposed windfarm, in side garden of dwelling set back approximately 10m from local road. | Plate 8.1-5 | Group of properties south of proposed windfarm, along Demense Cottages, Beagh More Townland<br><br>R1, R66, R187, R193, R195, R200, R211,R213, R223, R224, R240, R250, R270, R282, R287 |
| N6 | 532083 | 753732 | Positioned in agricultural field approximately 10m from façade of landowner dwelling on working farm. | Plate 8.1-6 | Represents single property at centre of Windfarm (Landowner property), Shancloon townland, R183. |

| Location ID | Easting | Northing | Description | Photograph | Representative Properties |
|---|---|---|---|---|---|
| N7 | 532179 | 752681 | Located south of proposed windfarm on raised garden within curtilage of dwelling of working farm. | Plate 8.1-7 | Represents three properties south of proposed windfarm, Beag More Townland.<br><br>R217,R220, R181. |
| N8 | 530831 | 753314 | Southwest of proposed windfarm on grass area/side garden of dwelling approximately 20m from dwelling façade. | Plate 8.1-8 | Group of properties to west of proposed windfarm, along road at Derrymore townland<br><br>R144, R222, R228, R230, R233, R234, R237, R238, R241, R246, R252.<br><br>Also properties farther south at Corrilaun Townland |
| N9 | 533030 | 754906 | At edge of gravel driveway approximately 15m from dwelling, adjacent to agricultural fields and set back from public road with clear line of site to proposed turbines. | Plate 8.1-9 | Group of properties North and centre of proposed windfarm, at Cloonbar Townland<br><br>R184, R185, R186, R188, R189, R190, R191,R192, R194. |
| N10 | 532159 | 755038 | Northwest of proposed windfarm positioned within rear garden of farm dwelling with mature treeline present. Approximately 15m from dwelling and set back from trees. | Plate 8.1-10 | Properties north and centre of proposed windfarm at Cloonsheen Townland.<br><br>R196, R197, R206, R208, R209. |
| N11 | 532362 | 755760 | Located northwest of proposed windfarm in rear garden of farm dwelling adjacent to working farm | Plate 8.1-11 | North and centre of proposed windfarm, along road through Cloonsheen Townland<br><br>R2, R202, R207, R216, R227, R229, R235, R236,<br>Also properties farther north of location above. |

| Location ID | Easting | Northing | Description | Photograph | Representative Properties |
|---|---|---|---|---|---|
| N12 | 532959 | 756712 | North of proposed windfarm within curtilage of dwelling approximately 20m from façade and adjacent to public road. | Plate 8.1-12 | Properties north and centre of proposed windfarm, at Tobberoe Townland<br><br>R218, R225, R231, R232, R242, R245, R248, R251 |

**Location N1**

Location N1 is north of the proposed wind farm. The noise monitor was placed in the front garden of dwelling adjacent to local road, in the direction of the proposed windfarm.

Noise sources noted during deployment and collection of the noise monitoring equipment included agricultural activities, livestock on neighbouring farm and birdsong.

Plate A8.1-1: Monitoring Location N1

**Location N2**

Location N2 is north-east of the proposed wind farm. The noise monitor was placed in the rear garden of dwelling adjoining agricultural lands.

During the deployment and collection of the noise monitoring equipment, noted noise sources included traffic movements audible on local road network and birdsong.

Plate A8.1-2: Monitoring Location N2

**Location N3**

Location N3 is east of the proposed wind farm. The noise monitor was placed within the curtilage of dwelling adjoining agricultural lands and stables. This was also the location of the rain gauge.

Noise sources noted during setting up of equipment included noise from farm activities and livestock (horses).

Plate A8.1-3: Monitoring Location N3

**Location N4**

Location N4 is southeast of the proposed windfarm. The noise monitor was placed in an agricultural field agricultural field approximately 20m from farm dwelling. The noise monitor was positioned away from trees and agricultural machinery/sheds.

Noise sources noted during deployment and collection of equipment included wind noise in nearby trees, , birdsong and farm machinery operating.

Plate A8.1-4: Monitoring Location N4

**Location N5**

Location 5 is located south of the proposed windfarm. The noise monitor was set up in the garden to the side the dwelling set back approximately 10m from local road.

During deployment and collection of the noise monitor, noise sources noted included an excavator operating in a nearby field and local traffic movements.


Plate A8.1-5: Monitoring Location N5

**Location N6**

Location N6 was positioned in an agricultural field approximately 10m from the façade of the landowner dwelling. The noise monitoring location was on working farm.

Noise sources noted during deployment and collection of equipment include farm machinery operating and birdsong.


Plate A8.1-6: Monitoring Location N6

**Location N7**

Location N7 was located south of the proposed windfarm. The noise monitor was set up on raised garden within curtilage of the dwelling. The noise monitoring location is next to a working farm.

Noise sources noted during equipment set up and deployment include farm machinery noise and wind noise in nearby trees.


Plate A8.1-7: Monitoring Location N7

**Location N8**

Location N8 is located southwwest of proposed windfarm. The noise monitor was set up on a grass area to the side garden of the dwelling, approximately 20m from dwelling façade.

Noise sources noted during the equipment deployment and collection included dogs barking at the residence and birdsong.

**Plate A8.1-8: Monitoring Location N8**

**Location N9**

Location N9 is at the centre/north of the proposed windfarm. The noise monitor was deployed at the edge of the gravel driveway approximately 15m from dwelling, adjacent to agricultural fields and set back from public road with a clear line of site to the proposed turbines.

Noise sources noted during deployment and collection of equipment included Local traffic movements and birdsong.

**Plate A8.1-9: Monitoring Location N9**

**Location N10**

Location N10 is northwest of the proposed windfarm. The noise monitoring equipment was positioned within the rear garden/paddock of the farm dwelling. There is a mature treeline in the vicinity of the property. The noise monitoring location is approximately 15m from dwelling and set back from trees.

Noise sources noted during deployment and collection of equipment included wind induced noise from nearby trees and birdsong.


Plate A8.1-10: Monitoring Location N10

**Location N11**

Location N11 is located northwest of the proposed windfarm. The noise monitor was placed in the rear garden of the farm dwelling. This location is next to a working farm. The noise monitoring location has a clear line of sight to proposed turbines.

Noise sources noted during equipment deployment and collection included farm machinery operating and livestock.


Plate A8.1-11: Monitoring Location N11

**Location N12**

Location N12 is north of the proposed windfarm. The noise monitor was set up within the curtilage of the dwelling approximately 20m from façade and adjacent to public road.

Noise sources noted during equipment deployment and collection include local traffic movements and birdsong.


Plate A8.1-12: Monitoring Location N12

### *Measurement Periods*

The IOA GPG states "*The duration of a background noise survey is determined only by the need to acquire sufficient valid data over the range of wind speeds. It is unlikely that this requirement can be met in less than 2 weeks.*" If insufficient wind data is collected after two weeks, the monitoring period will be extended subject to acquiring sufficient valid data over the range of wind speeds. Sufficient data was captured at all monitoring locations with between 2-4 weeks worth of data captured at all monitoring locations. Noise monitoring was conducted in three lots, summarised in Table 8.1.3 below.

### *Definition of Time Periods*

The 2006 DoEHLG Wind Energy Development Guidelines do not provide the specific periods which are represented by daytime and night-time hours, therefore the definitions from ETSU-R-97 are taken as 07:00 to 23:00 hrs for daytime and 23:00 to 07:00 hrs for night-time. The following periods were analysed for this report:

| | |
|---|---|
| Daytime hours | 07:00 – 23:00 Monday to Sunday |
| Night-time hours | 23:00 – 07:00 |

## Monitoring Equipment

Baseline noise monitoring was carried out using Svantek Svan 977 and Svan 959, Larson Davis and Svantek 307 Class 1 sound level meters. Details of the noise monitoring equipment are presented in Table 8.1.3. The sound level meters were fitted with 1/2" microphones. The microphones connected to the Svantek sound level meters were fitted with open-pored polyurethane foam with a minimum diameter of 130mm. The Larson Davis noise microphones also have a secondary windshield. Calibration certificates for each sound level meter are provided in Appendix 8.2.

| Monitoring Location | Lot No |
|---|---|
| N1 | 1 |
| N2 | 1, 2 |
| N3 | 1, 3 |
| N4 | 1, 2 |
| N5 | 1, 2 |
| N6 | 1, 2 |
| N7 | 1, 2 |
| N8 | 1, 2 |
| N9 | 1, 2 |
| N10 | 2 |
| N11 | 1 |
| N12 | 1, 2 |
| Lot 1: 7/12/22 to 21/12/22<br>Lot 2: 16/01/23 to 01/02/23<br>Lot 3: 01/02/23 to 13/02/23 | |

**Table 8.1.3: Details of Noise Monitoring Equipment**

| Monitoring Location | Lot No: Meter Type | Serial Number |
|---|---|---|
| N1 | 1. Larson Davis Lxt | 4665 |
| N2 | 1: Svantek 977<br>2: Larson Davis Lxt | 69552<br>5122 |
| N3 | 1: Svantek 977<br>3: Svantek 977 | 34876<br>69556? |
| N4 | 1: Svantek 977<br>2: Larson Davis Lxt | 69556<br>4665 |
| N5 | 1: Svantek 307<br>2: Larson Davis Lxt | 104985<br>5977 |
| N6 | 1: Larson Davis Lxt<br>2: Larson Davis Lxt | 5122<br>6031 |
| N7 | 1: Svantek 307<br>2: Larson Davis Lxt | 104990<br>6862 |
| N8 | 1: Svantek 959<br>2: Larson Davis Lxt | 14775<br>5043 |
| N9 | 1: : Larson Davis Lxt<br>2: Svantek 977 | 6862<br>69552 |
| N10 | 2: Larson Davis Lxt | 5612 |
| N11 | 1: Larson Davis Lxt | 6031 |
| N12 | 1: Larson Davis Lxt<br>2: Svantek 977 | 4632<br>69556 |

A CR300 Series data logger was used to record rainfall (ARG 100) and this was located at two locations: N6 during Lot 1 and N6 during Lot 2, and N3 during Lot 3. This meteorological data was acquired every 10 minutes simultaneously with noise data.

## Monitoring Protocol

Baseline noise measurements were undertaken at 12 locations surrounding the proposed wind farm. Equipment was installed in three lots.

1) Lot 1: 7th to 21st December 2022
2) Lot 2: 16th January 2022 to 19th January 2023
3) Lot 3 1st to 13th February 2023

The following monitoring protocol was carried out at each of the monitoring locations:

1. The sound level meters were calibrated on-site and set to log $L_{A90}$ statistics on a fast time weighted response every ten minutes.
2. Each sound level meter microphone was mounted at 1.5 m above ground level and fitted with an enhanced windshield. Each microphone was placed at least 3.5 m from reflecting surfaces to obtain 'free field' conditions.
3. Wind speed and wind direction measurements were taken from permanent mast installed on site. Wind speed was measured at a range of heights and data from anemometers at 96 m and 103 m were used to extrapolate the wind speed data up to a hub height of 105 m.

   The standardised 10 m wind speed was obtained from the turbine hub height wind speed by correcting it to 10 m height using a ground roughness factor of 0.05 m. Roughness length (or logarithmic) shear profile:

$$U_1 = U_2 \frac{ln\left({}^{H_1}/_{z}\right)}{ln\left({}^{H_2}/_{z}\right)}$$

   where $U_1$ is the wind speed to be calculated, $U_2$ is the measured wind speed, $H_1$ is the height of the measured wind speed to be calculated (10m), $H_2$ is the height of the measured wind speed and $z$ is the ground roughness length (m). A roughness length of 0.05m is used to standardise hub height wind speeds to 10m height in the IEC 61400-11:2012 standard.
4. The $L_{A90}$ statistic measurements were synchronised with the 10 m standardised wind speeds derived from the on-site meteorological mast data.
5. A logging rain gauge was also installed (at Monitoring Locations N3 and N6) and similarly logged rainfall events over successive 10-minute intervals, also synchronised to the noise level and wind speed measurements.
6. After the monitoring was completed, the noise meters were re-tested using the calibration noise source to ensure that the meters had not drifted.

## Analysis of the Baseline Data

Following collection of the site data, the following protocol was used to analyse the baseline data:

1. The raw baseline $L_{A90}$ noise data was reviewed to determine whether there are any periods of non-consistent noise level due to equipment malfunction.
2. The raw noise level data was then correlated with the time synchronised wind speed and rainfall data. Preliminary data analysis was used to remove datasets ($L_{A90}$, wind speed and occurrence of rainfall event) which contain a rainfall event as these data sets are required to be removed from further analysis in line with best practice as outlined in the IOA Good Practice Guide and Supplementary Guidance Note 2 on Data Processing.
3. The prevailing background noise during for daytime periods 07:00 to 23:00. The prevailing background noise during night-time periods excludes early morning periods to remove the dawn chorus which is not prevalent through that whole year, with data recorded between 04:00 and 07:00 was removed from further analysis.

4. Once the rainfall events have been accounted for, the remaining data was graphed using a wind speed based plot to establish whether there are any remaining data outliers, representing atypical noise sources or events.
5. Once the remaining data sets were found to be representative of the noise environment, they were analysed to ensure that sufficient data remained to provide sufficient data coverage over the necessary wind speeds. The prevailing background noise trend was not extended beyond the range covered by adequate data sets. See Section 'Data Available for Determination of Prevailing Background Noise Levels' for details.
6. A 'best fit' trend (not higher than a fourth order polynomial) was then derived to present the assumed prevailing background noise level at each monitoring location. See Section 'Results' for details.

## Data Available for Determination of Prevailing Background Noise Levels

The requirement for the survey duration is dictated by the range of wind speeds to be collected. The IOA Good Practice Guide to the Application of ETSU-R-97[1] for the Assessment and Rating of Wind Turbine Noise, (May 2013) states that "*As a guideline, no fewer than 200 data points should be recorded in each of the amenity hours and night-time periods with no fewer than 5 data points in any 1 m/s wind speed bin.*"

The Wind Energy Development Guidelines (Department of Environment, Heritage and Local Government, 2006) do not provide the specific periods which are represented by daytime and night-time hours, therefore the definitions from ETSU-R-97 are taken as 07:00 to 23:00 hrs for daytime and 23:00 to 07:00 hrs for night-time.

Prevailing background noise levels were derived for daytime periods. The number of datasets at each integer wind speed are shown in Tables 8.1.4.

[1] Department of Trade and Industry (1996), The Assessment and Rating of Noise from Wind Farms Report ETSU-R-97

**Table 8.1.4: Number of Valid Datasets: Noise Monitoring Locations N1-N12– Daytime**

| Wind Speed (at standardised 10 m height), m/s | Valid Datasets | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N1 | N2 | N3 | N4 | N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 |
| 0 | 0 | 16 | 0 | 18 | 18 | 18 | 18 | 89 | 16 | 18 | 0 | 18 |
| 1 | 16 | 86 | 36 | 91 | 91 | 87 | 83 | 218 | 81 | 65 | 15 | 82 |
| 2 | 73 | 233 | 103 | 234 | 231 | 213 | 218 | 379 | 231 | 159 | 73 | 222 |
| 3 | 166 | 379 | 199 | 390 | 394 | 387 | 380 | 401 | 388 | 228 | 162 | 393 |
| 4 | 173 | 413 | 286 | 416 | 418 | 409 | 410 | 409 | 415 | 248 | 172 | 420 |
| 5 | 203 | 402 | 433 | 410 | 410 | 397 | 394 | 247 | 411 | 205 | 204 | 408 |
| 6 | 98 | 249 | 338 | 249 | 249 | 246 | 245 | 245 | 249 | 147 | 98 | 248 |
| 7 | 78 | 245 | 253 | 243 | 243 | 242 | 244 | 166 | 245 | 165 | 83 | 245 |
| 8 | 64 | 164 | 180 | 159 | 161 | 162 | 164 | 113 | 166 | 104 | 63 | 158 |
| 9 | 66 | 114 | 130 | 113 | 113 | 113 | 113 | 101 | 114 | 50 | 66 | 114 |
| 10 | 91 | 101 | 132 | 100 | 100 | 101 | 101 | 25 | 101 | 10 | 91 | 101 |
| 11 | 25 | 25 | 42 | 25 | 25 | 25 | 25 | 5 | 25 | 0 | 25 | 25 |
| 12 | 5 | 5 | 11 | 5 | 5 | 5 | 5 | 0 | 5 | 0 | 5 | 5 |
| Total Number of Data Points | 1058 | 2432 | 2143 | 2453 | 2458 | 2405 | 2400 | 2398 | 2447 | 1399 | 1057 | 2439 |

**Table 8.1.4: Number of Valid Datasets: Noise Monitoring Locations N1-N12– Nighttime**

| Wind Speed (at standardised 10 m height), m/s | Valid Datasets | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N1 | N2 | N3 | N4 | N5 | N6 | N7 | N8 | N9 | N10 | N11 | N12 |
| 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 2 | 27 | 10 | 27 | 27 | 27 | 27 | 27 | 27 | 25 | 27 | 27 |
| 2 | 20 | 56 | 42 | 56 | 56 | 56 | 56 | 56 | 56 | 36 | 56 | 56 |
| 3 | 41 | 71 | 48 | 72 | 72 | 72 | 72 | 72 | 72 | 31 | 72 | 72 |
| 4 | 78 | 162 | 109 | 165 | 165 | 165 | 165 | 165 | 165 | 87 | 165 | 165 |
| 5 | 52 | 110 | 109 | 110 | 110 | 110 | 110 | 110 | 110 | 58 | 110 | 109 |
| 6 | 17 | 74 | 91 | 74 | 74 | 74 | 74 | 74 | 74 | 57 | 74 | 71 |
| 7 | 23 | 66 | 97 | 66 | 66 | 66 | 66 | 66 | 66 | 43 | 66 | 62 |
| 8 | 32 | 80 | 92 | 80 | 80 | 80 | 80 | 80 | 80 | 48 | 80 | 78 |
| 9 | 27 | 45 | 39 | 45 | 45 | 45 | 45 | 45 | 45 | 18 | 45 | 45 |
| 10 | 22 | 28 | 22 | 28 | 28 | 28 | 28 | 28 | 28 | 6 | 28 | 28 |
| 11 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 0 | 9 | 9 |
| 12 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 0 | 5 | 5 |
| Total Number of Data Points | 329 | 735 | 674 | 739 | 739 | 739 | 739 | 739 | 739 | 410 | 739 | 729 |

## Results

In this section, the prevailing background noise level in dB $L_{A90}$ relative to standardised 10 m height wind speeds are provided for each monitoring location as per the requirements of the survey. The prevailing background noise level is plotted as a solid line for each daytime and night-time periods at each monitoring location. In all cases, the highest order of polynomial used is a fourth order polynomials provided lines of best fit to the scatter data.

The prevailing night time noise for locations N2 and N9 at low windspeeds are determined by the noise floor of the equipment type which was different for lots 1 and 2. This has no effect on the night noise limit at these locations.

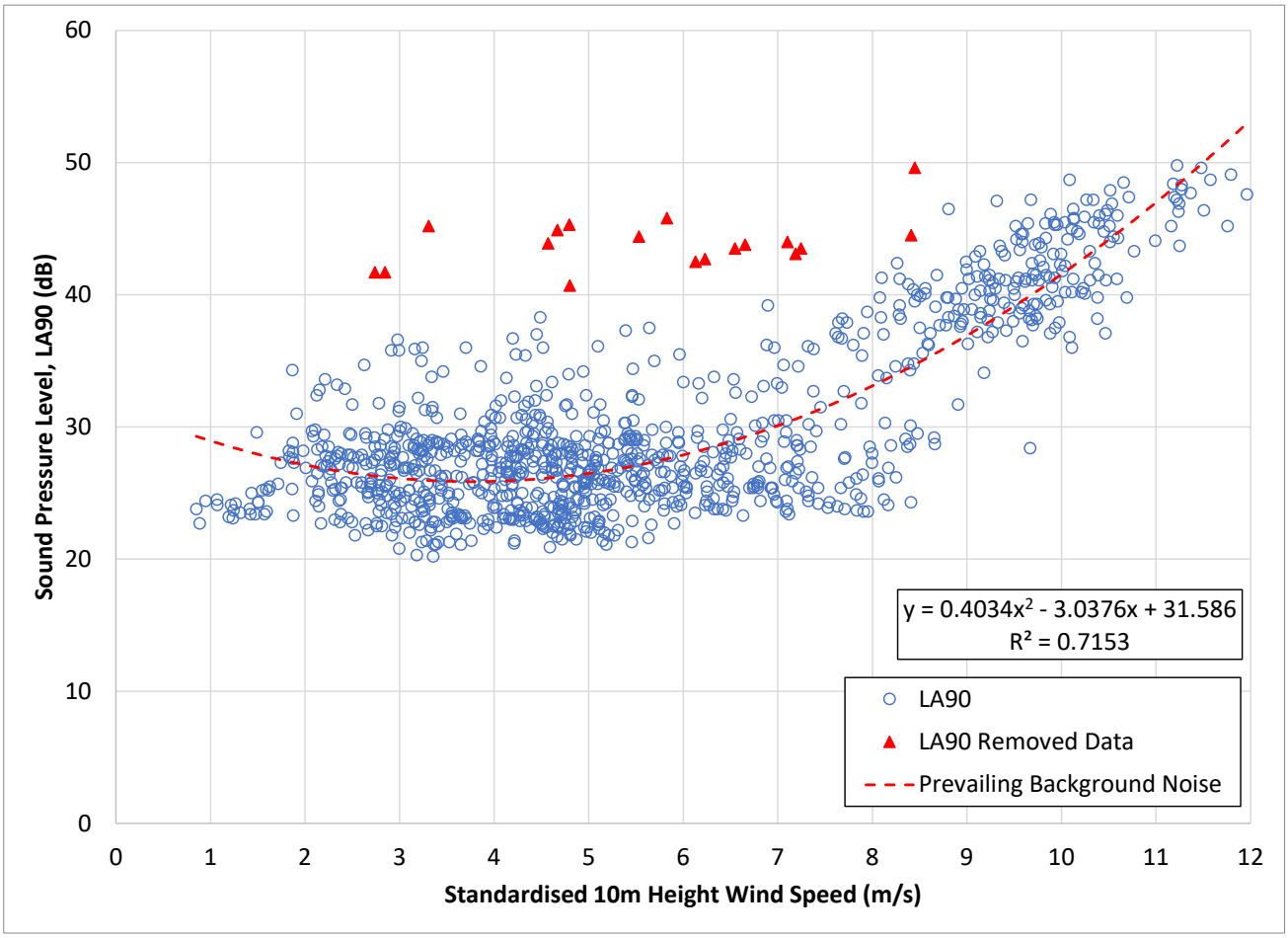



**Figure A8.2: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N1**

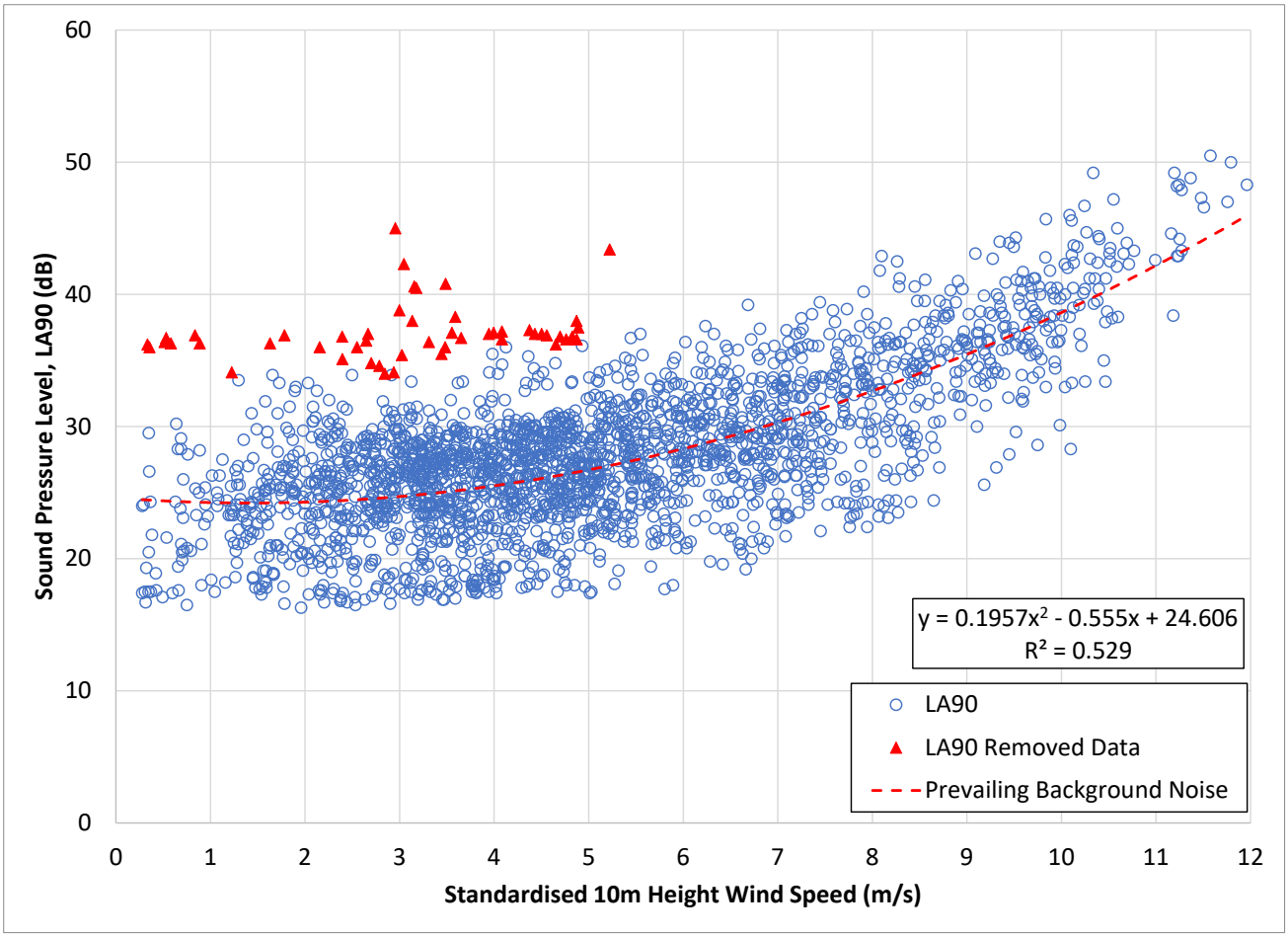



**Figure A8.3: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N2**

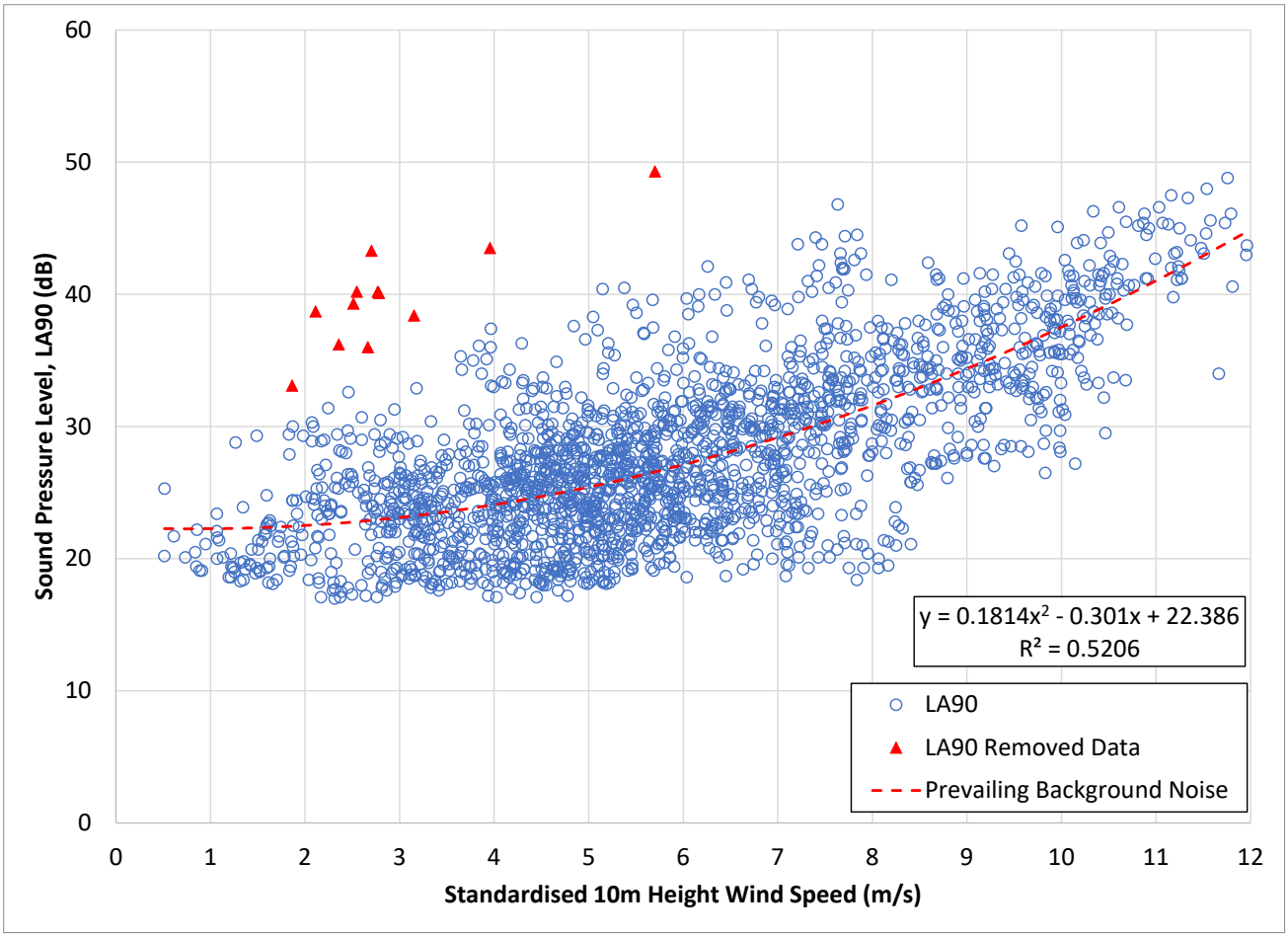



Figure A8.4: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N3

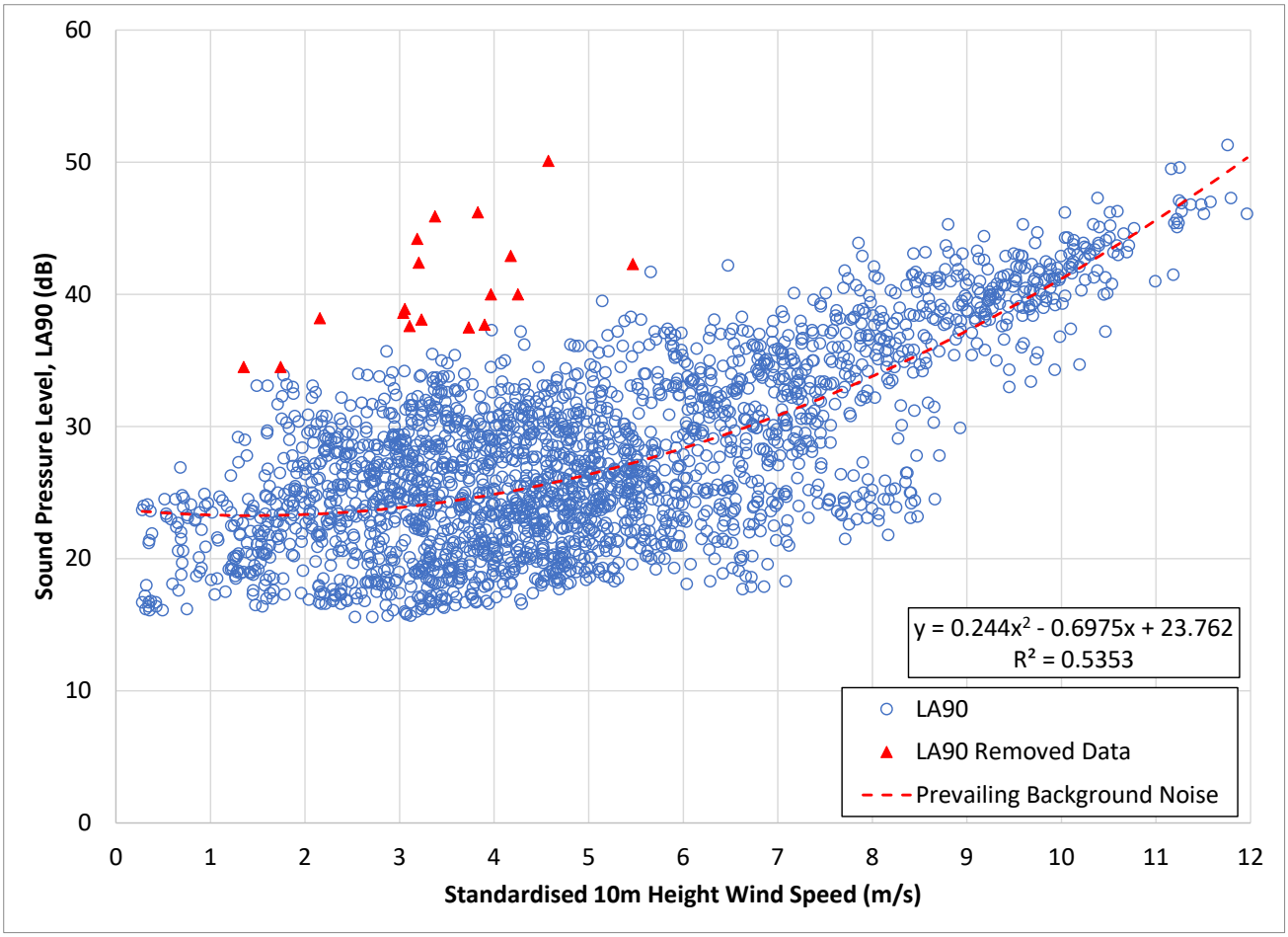



Figure A8.5: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N4

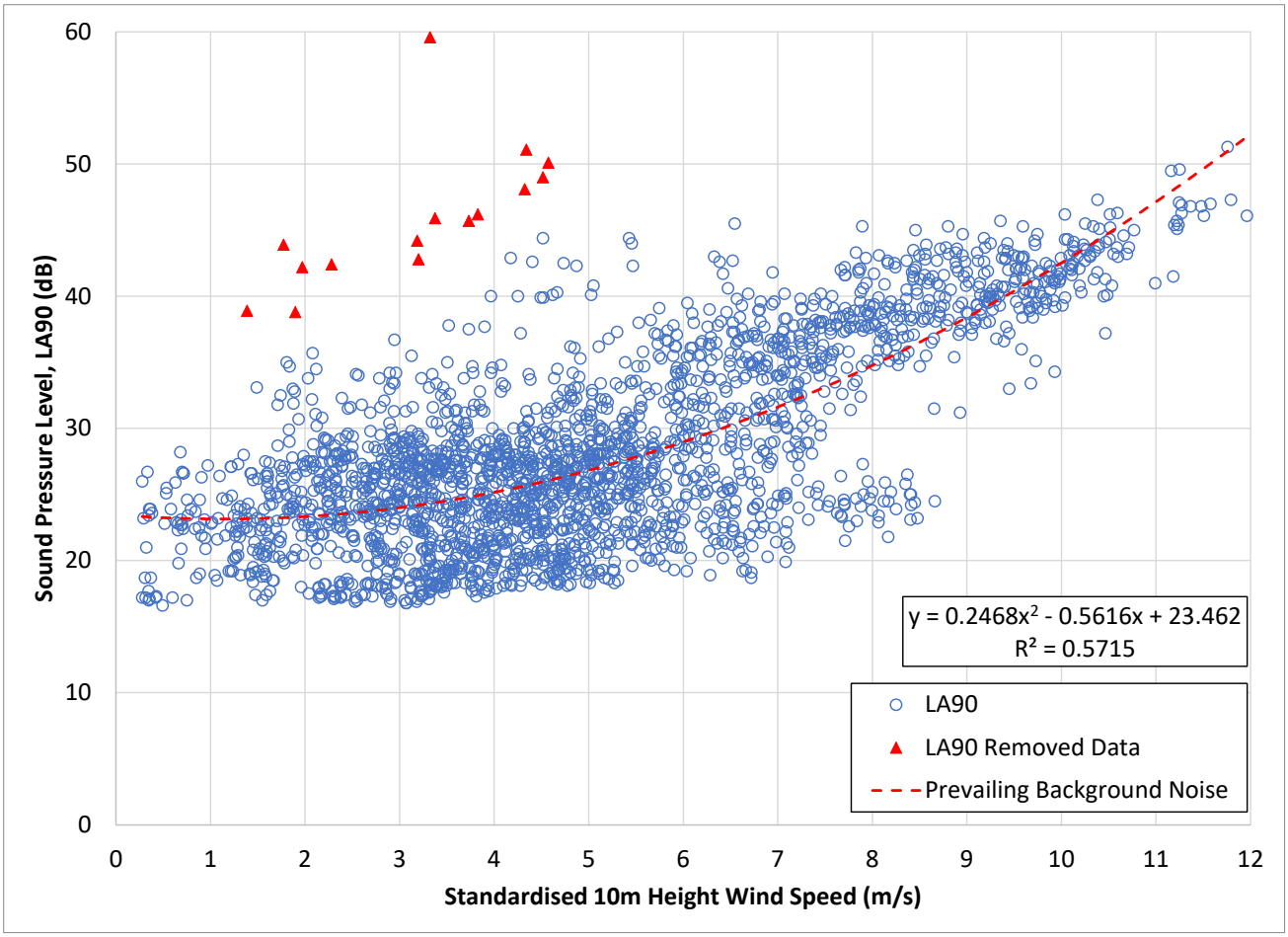



Figure A8.6: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N5

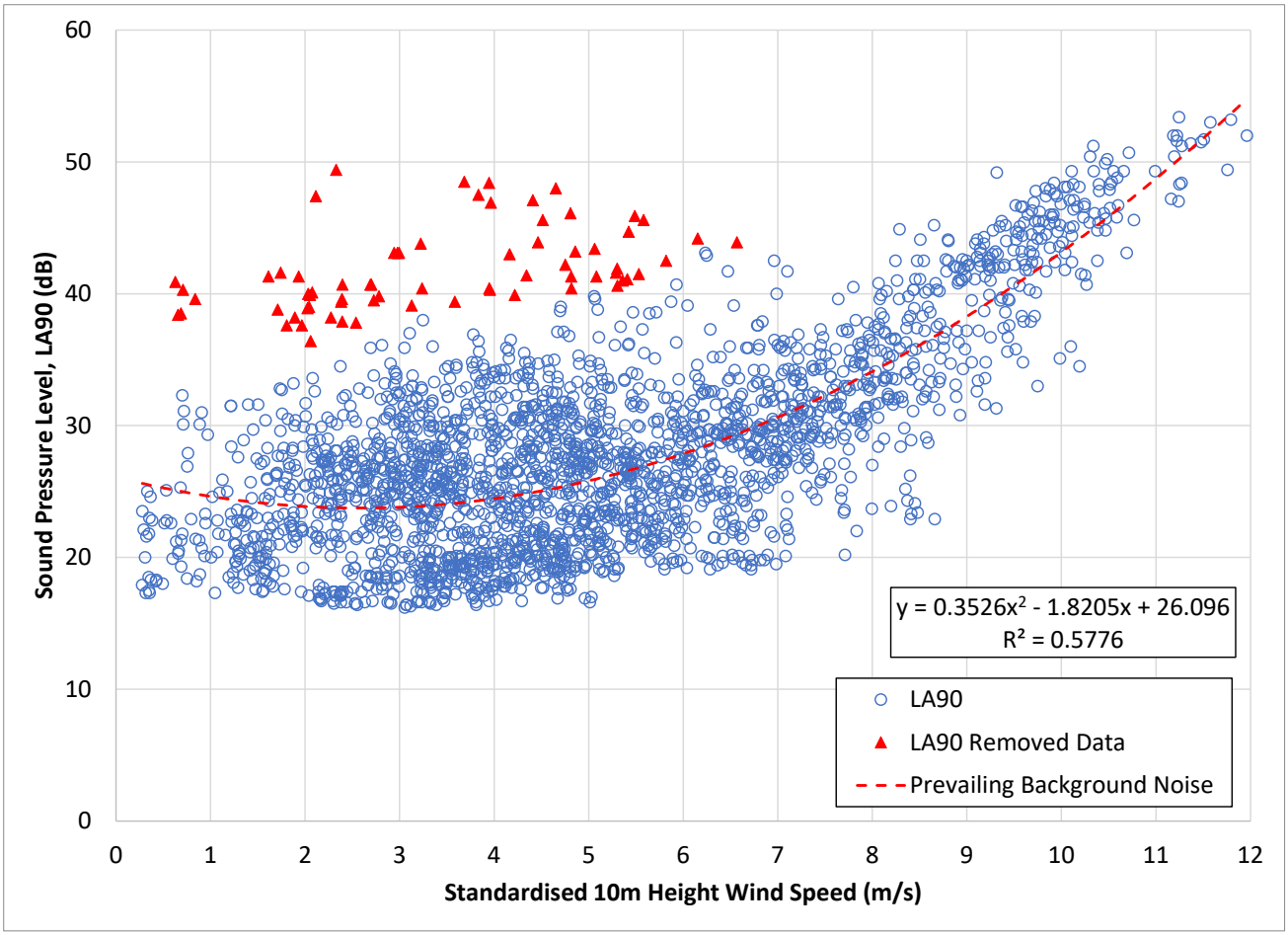



**Figure A8.7: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N6**

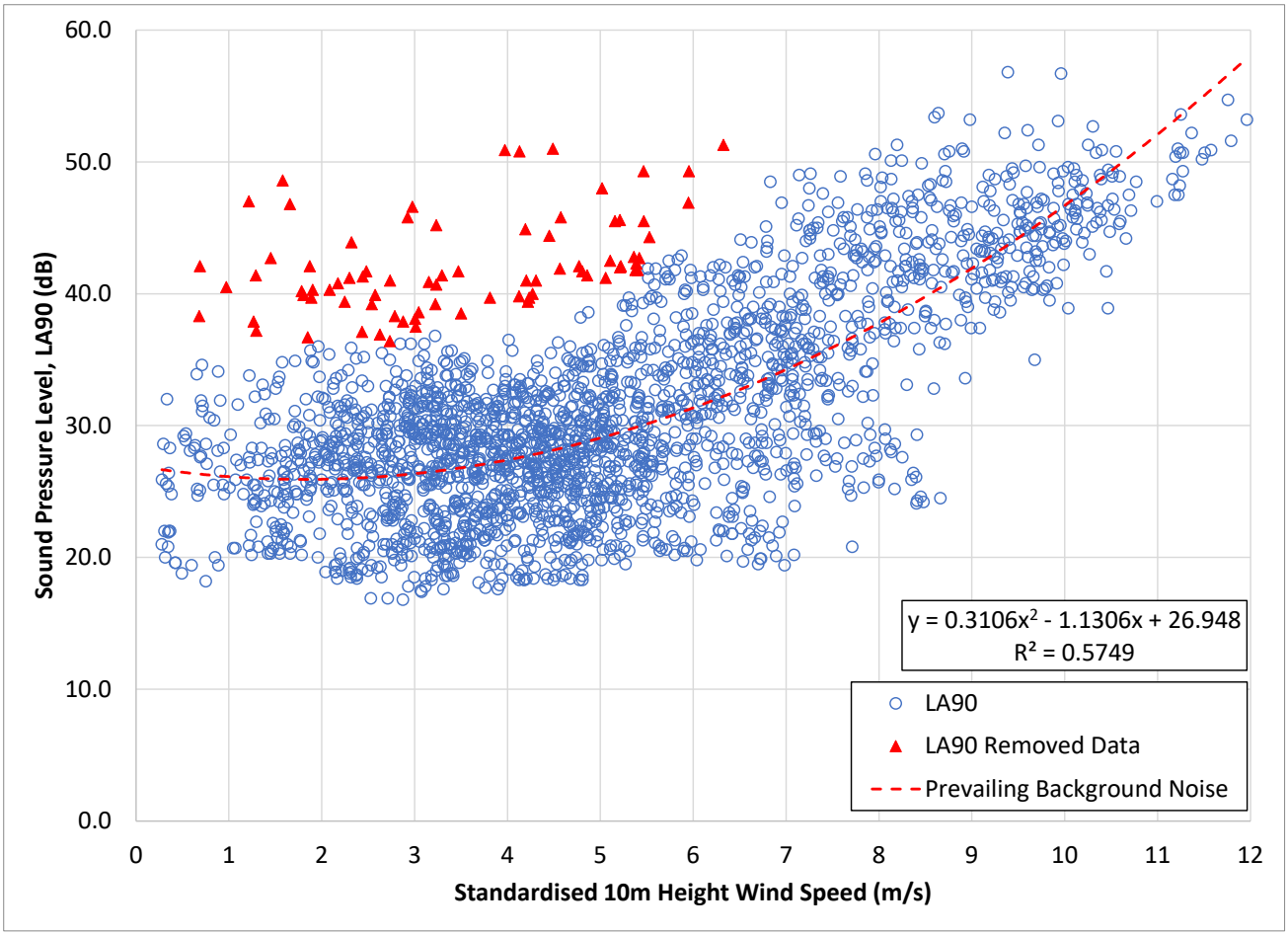



**Figure A8.8: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N7**

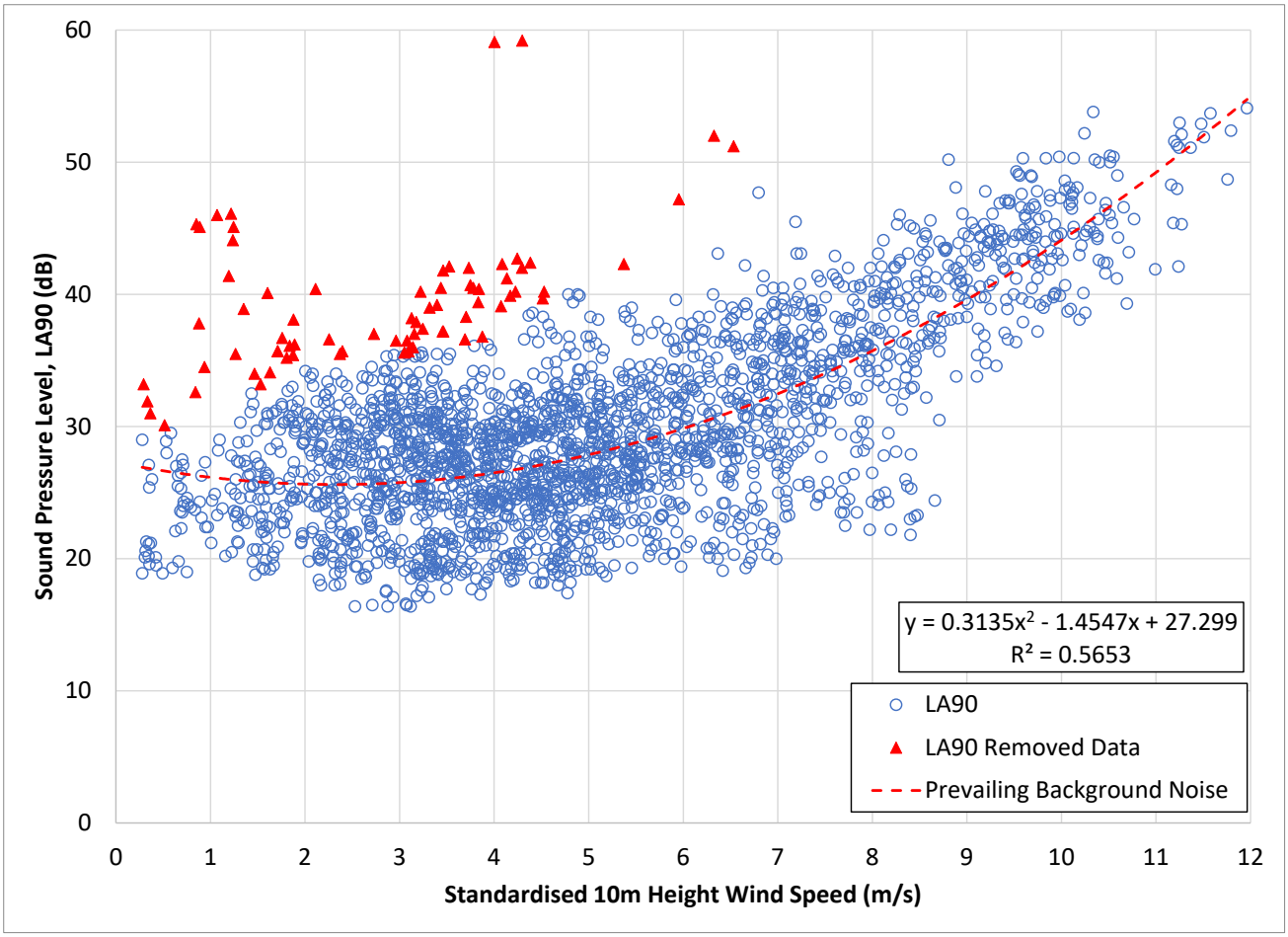



**Figure A8.9: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N8**

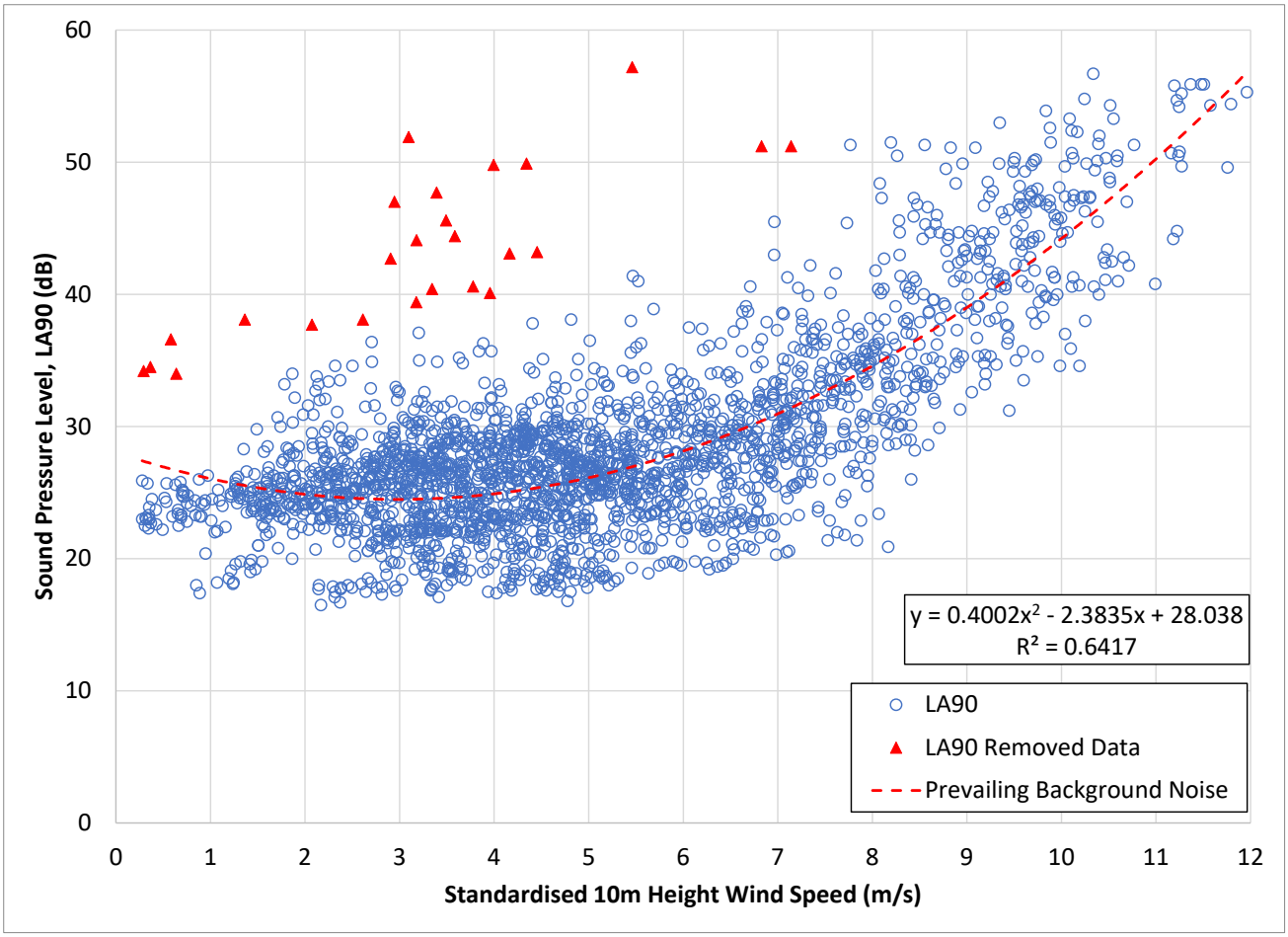



Figure A8.10: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N9


**Figure A8.11: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N10**

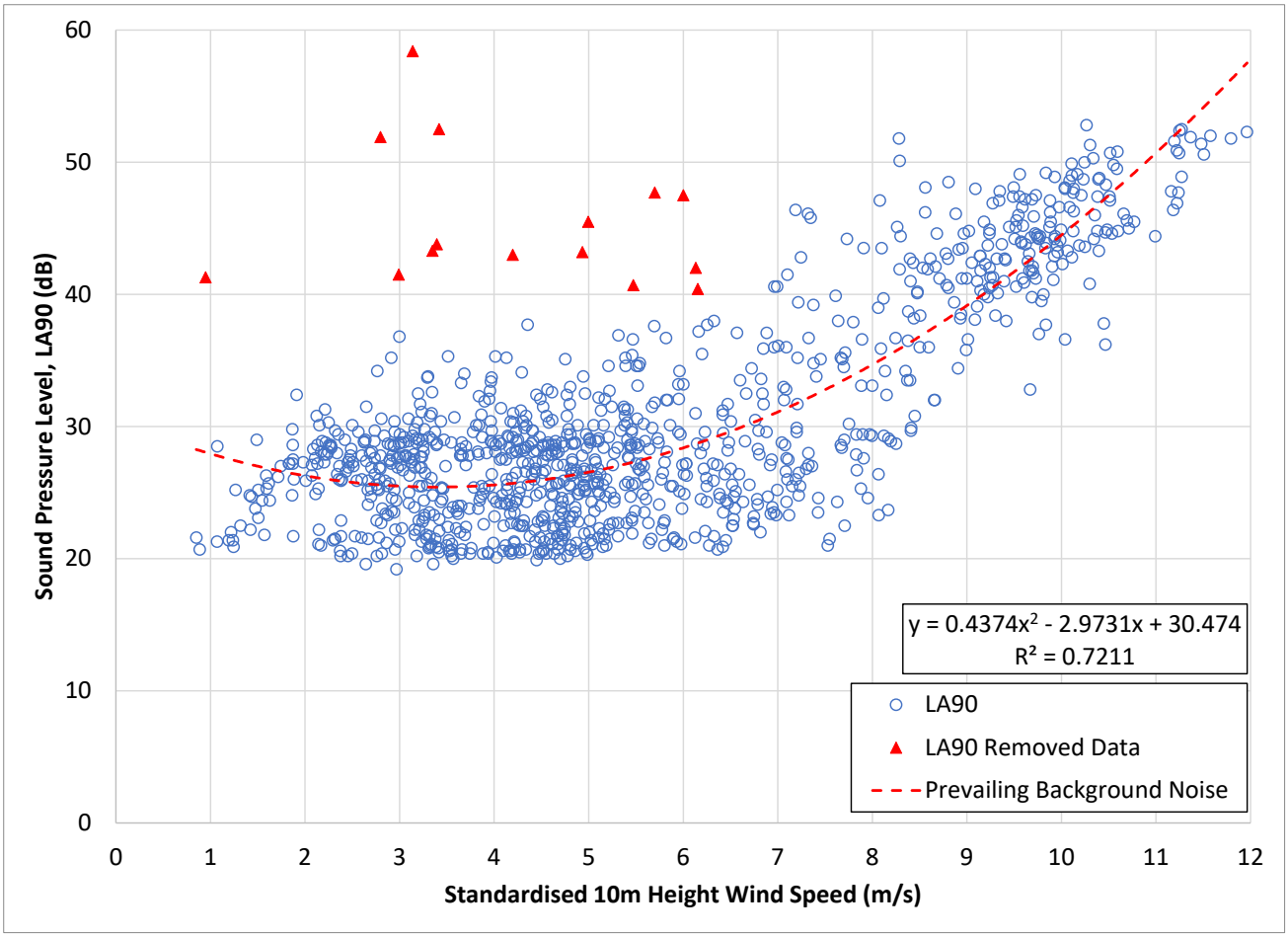



**Figure A8.12: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N11**

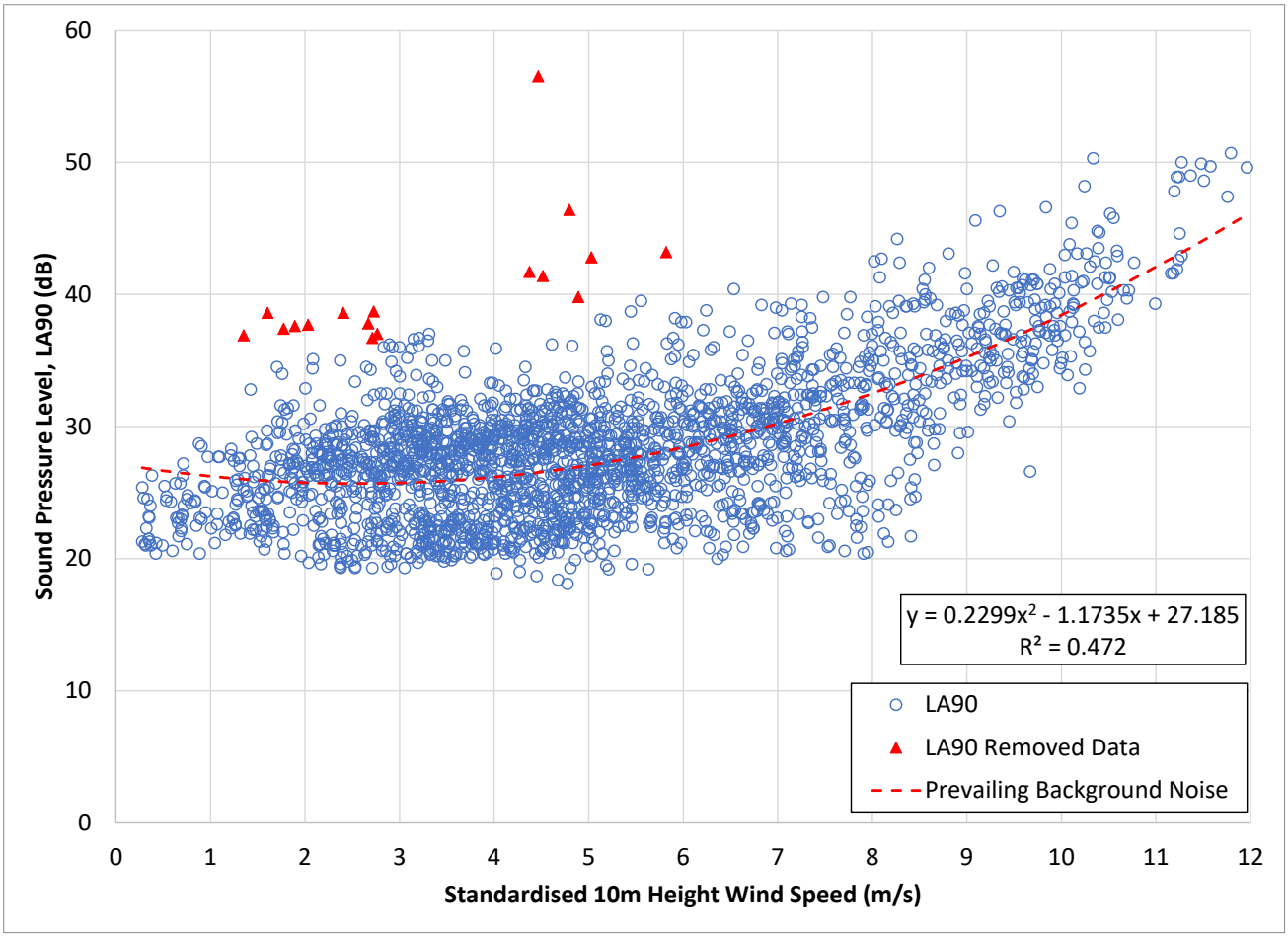



**Figure A8.13: Prevailing Daytime Background ($L_{A90}$) Noise Levels at N12**

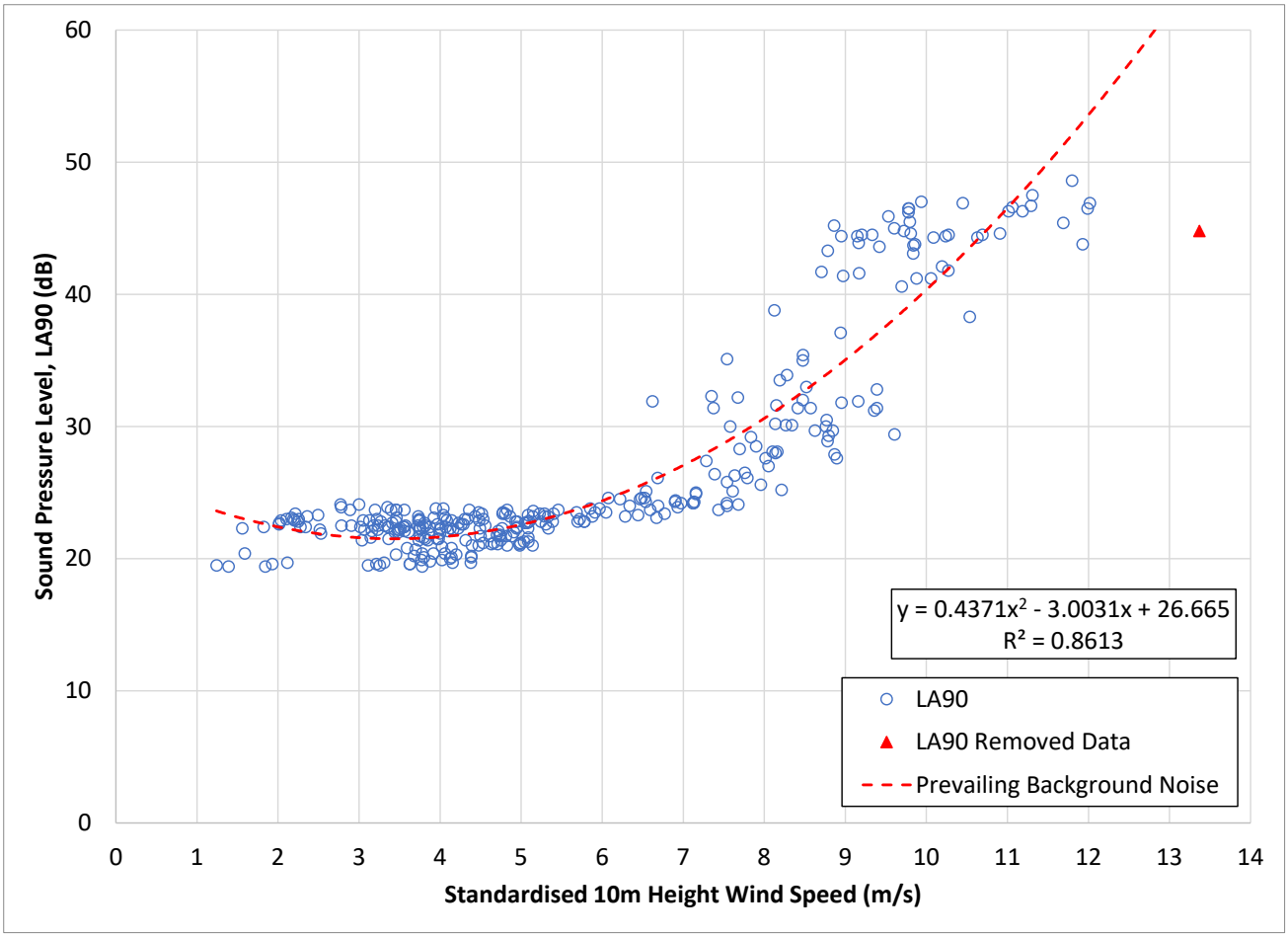



**Figure A8.14: Prevailing Night time Background ($L_{A90}$) Noise Levels at N1**

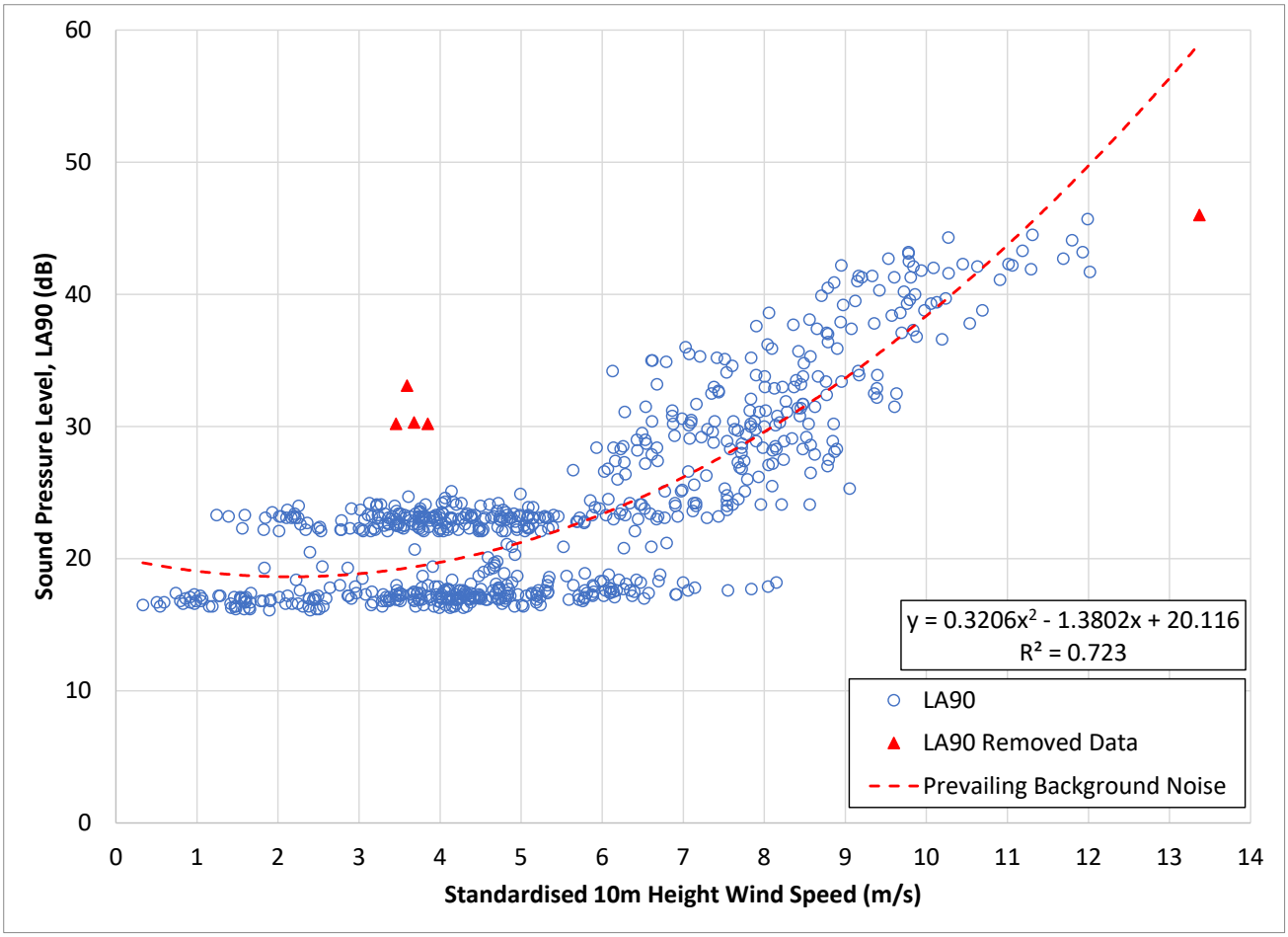



**Figure A8.15: Prevailing Night time Background ($L_{A90}$) Noise Levels at N2**

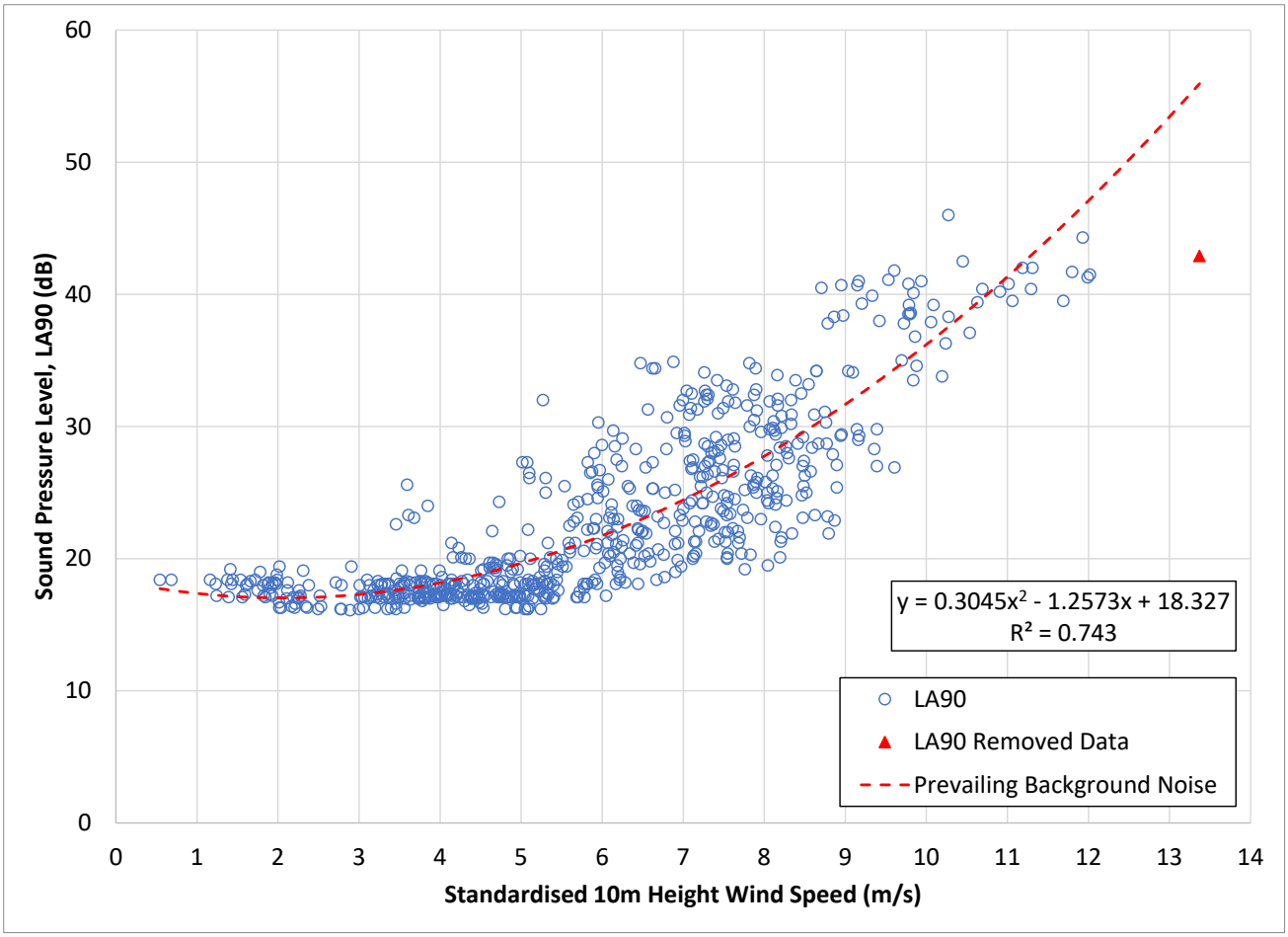



**Figure A8.16: Prevailing Night time Background ($L_{A90}$) Noise Levels at N3**

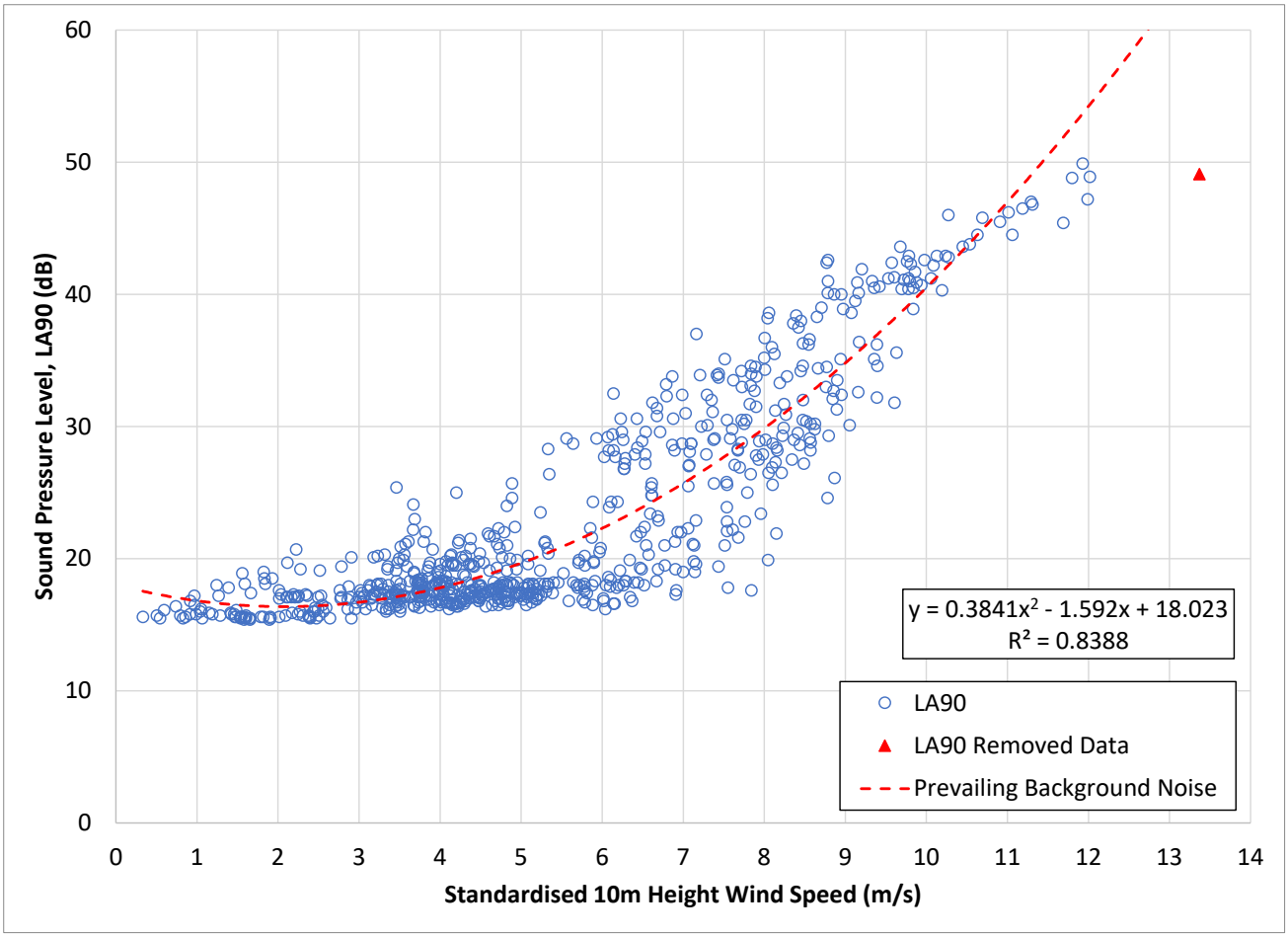



Figure A8.17: Prevailing Night time Background ($L_{A90}$) Noise Levels at N4

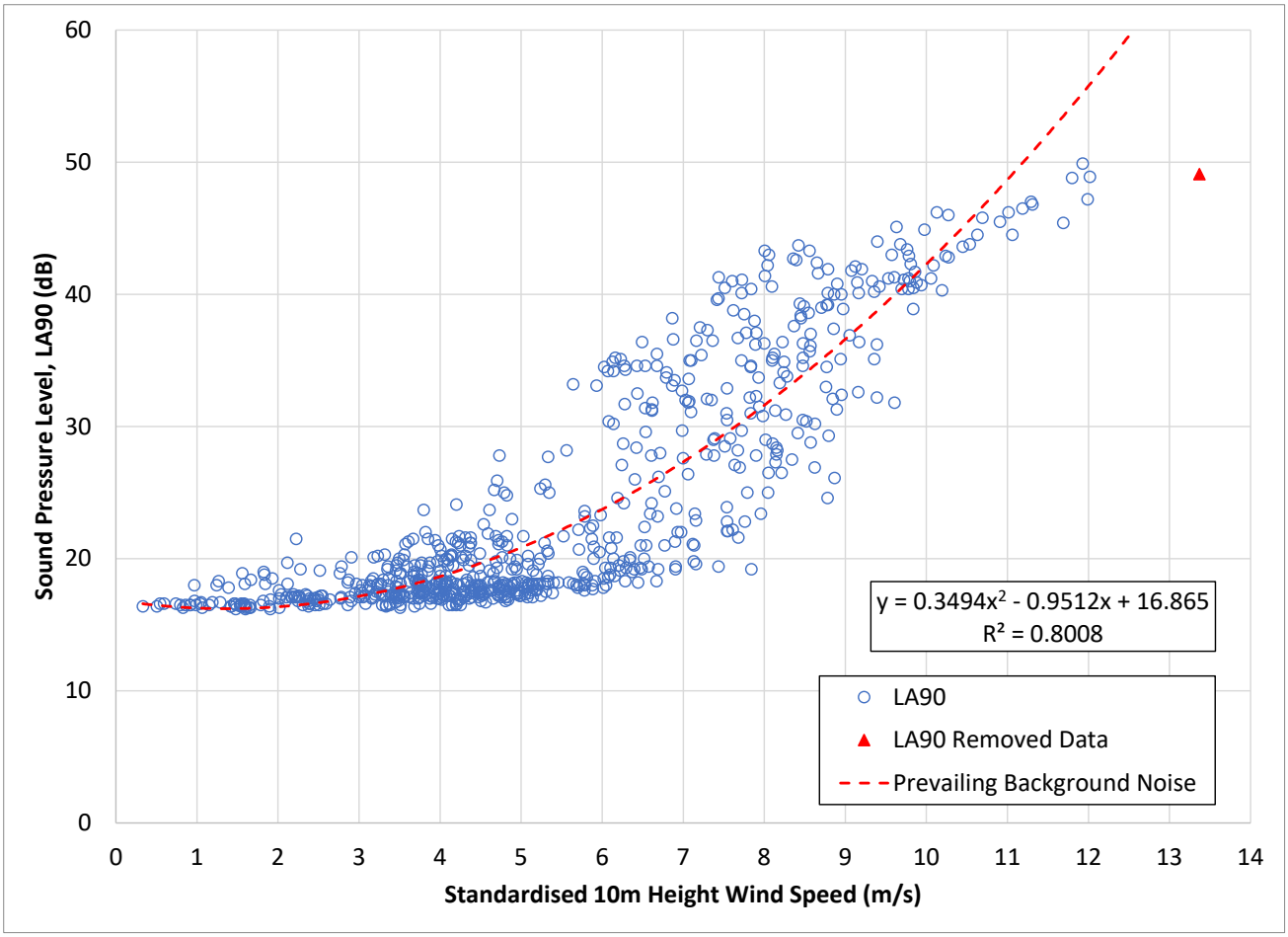



**Figure A8.18: Prevailing Night time Background ($L_{A90}$) Noise Levels at N5**

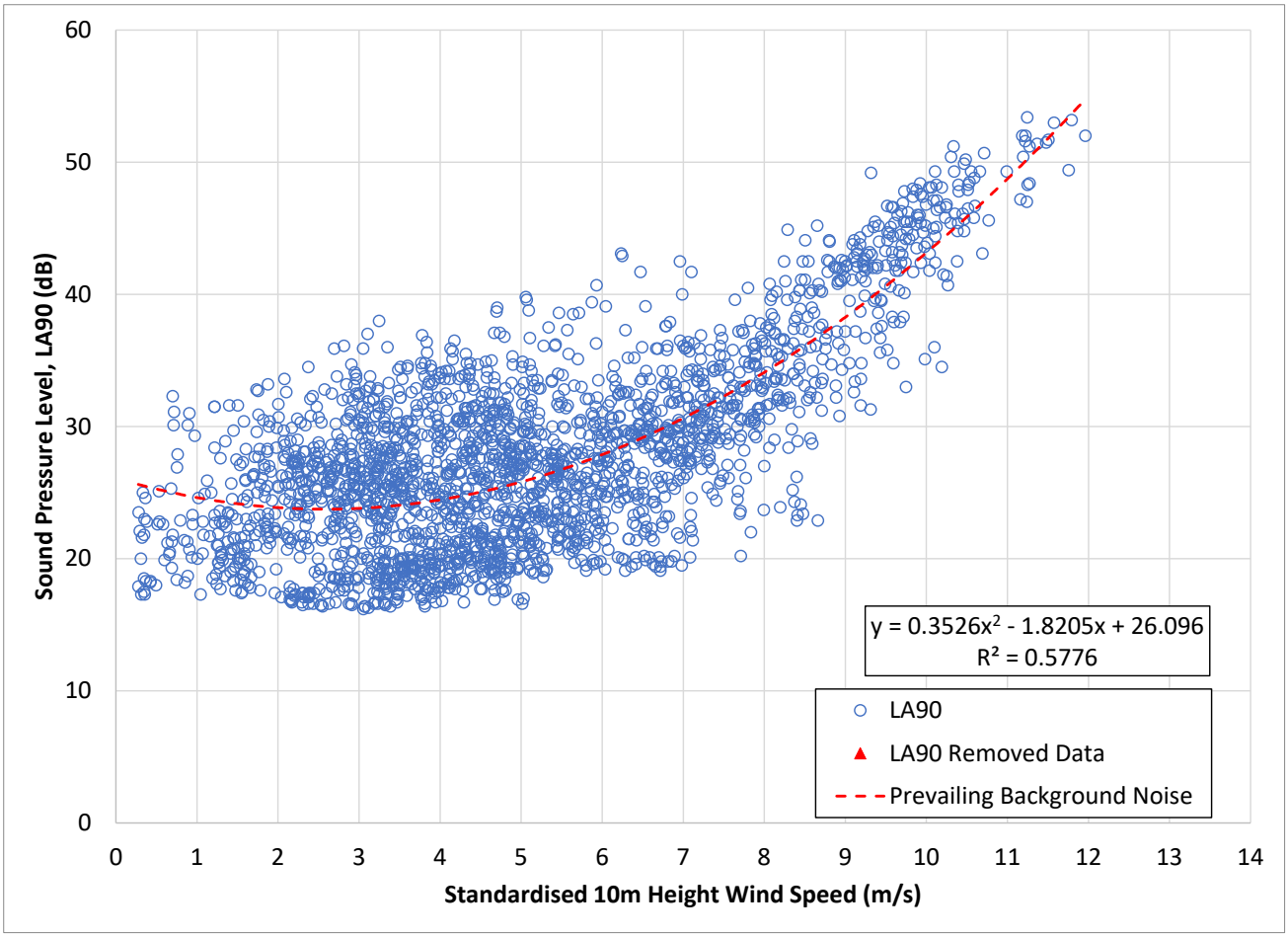



**Figure A8.19: Prevailing Night time Background ($L_{A90}$) Noise Levels at N6**

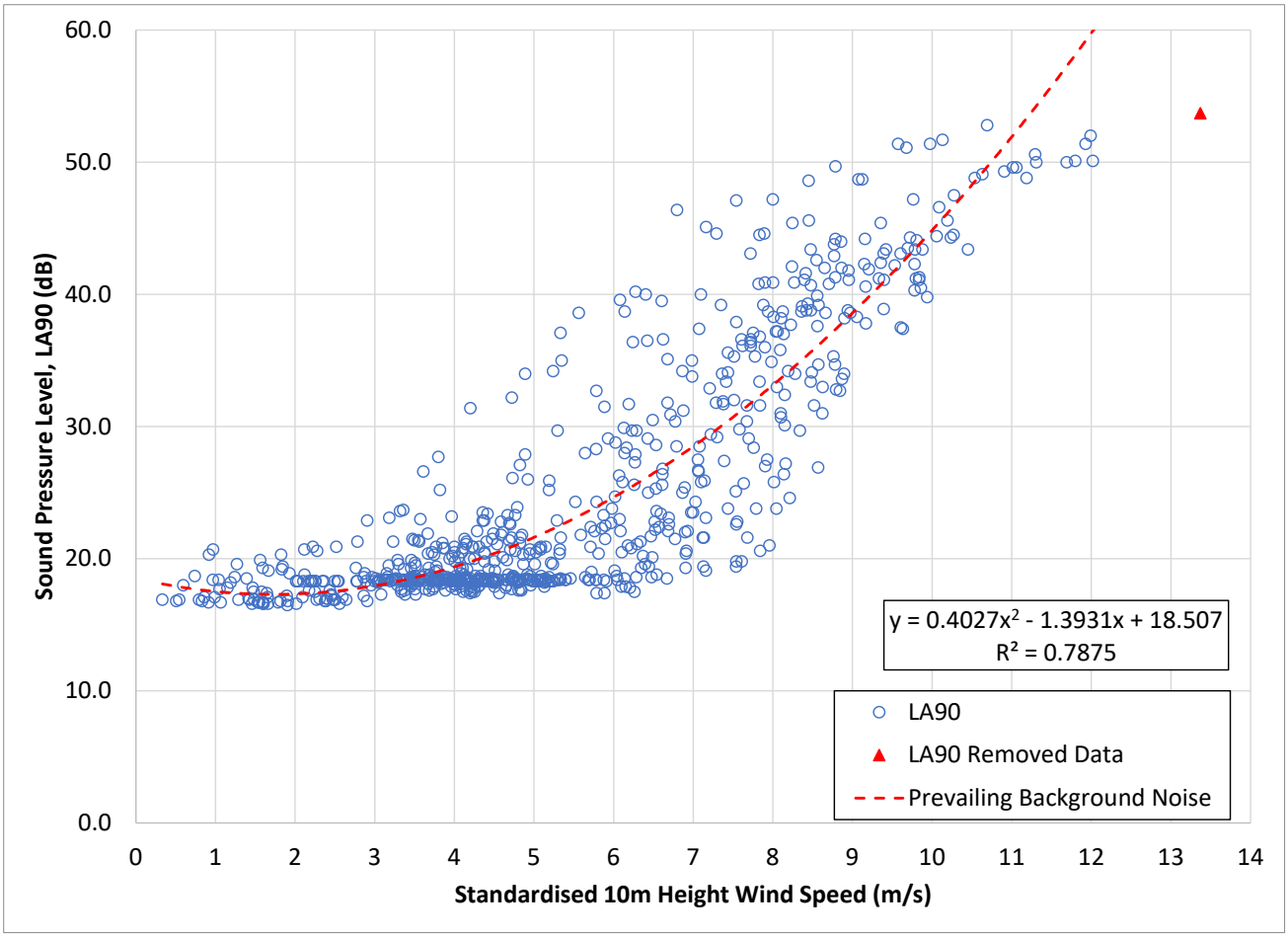



**Figure A8.20: Prevailing Night time Background ($L_{A90}$) Noise Levels at N7**

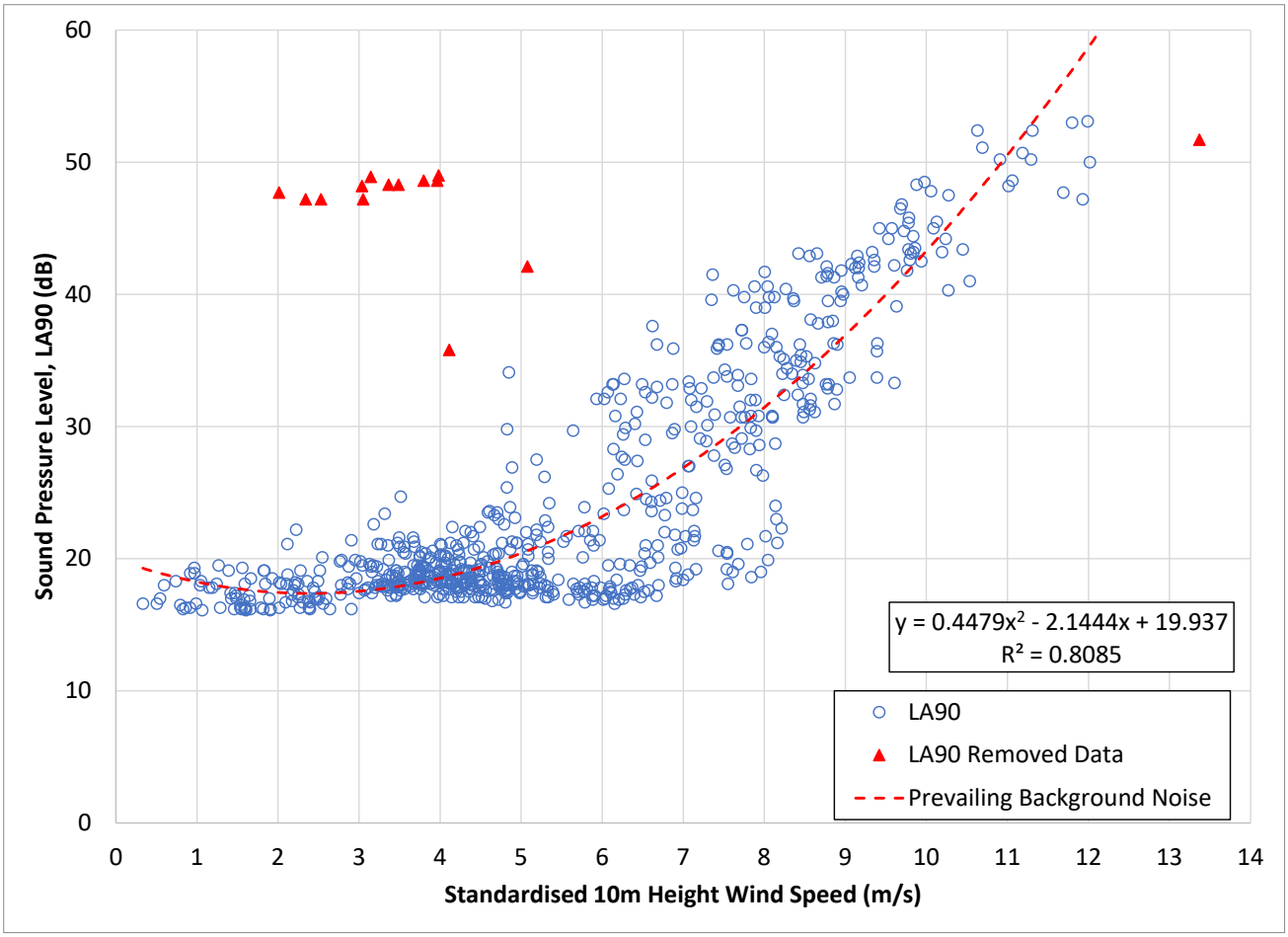



Figure A8.21: Prevailing Night time Background ($L_{A90}$) Noise Levels at N8

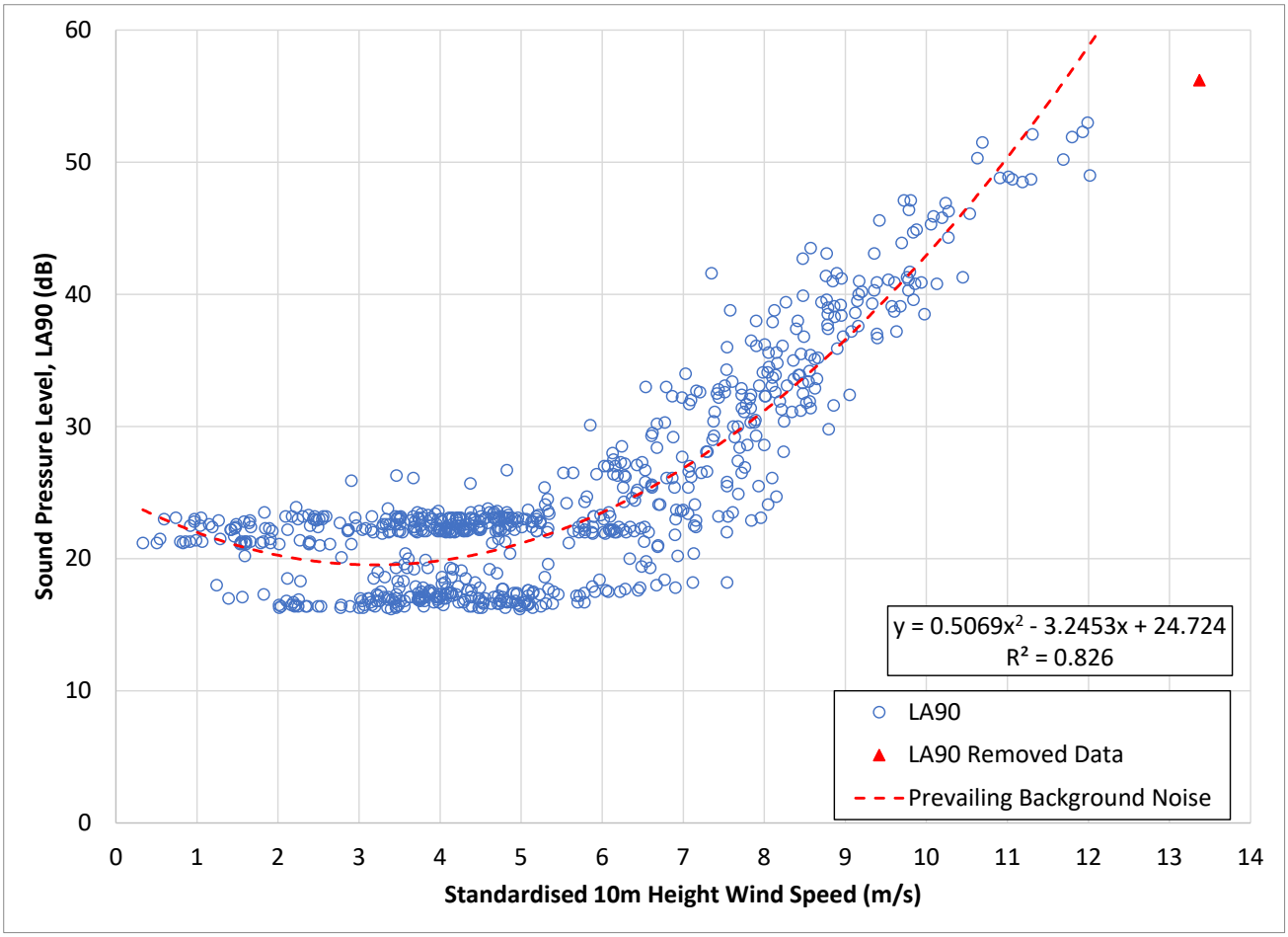



**Figure A8.22: Prevailing Night time Background ($L_{A90}$) Noise Levels at N9**

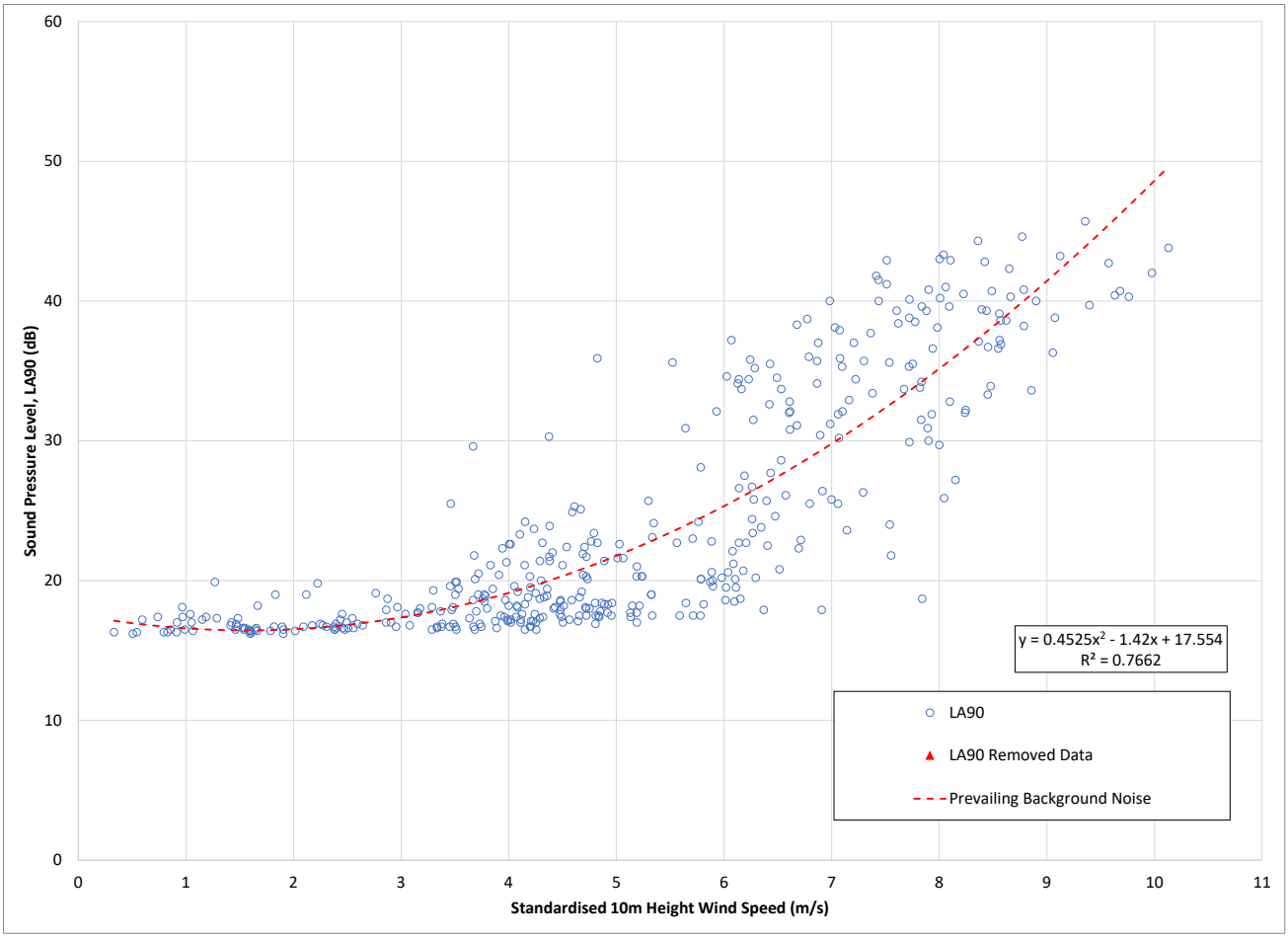



**Figure A8.23: Prevailing Night time Background ($L_{A90}$) Noise Levels at N10**

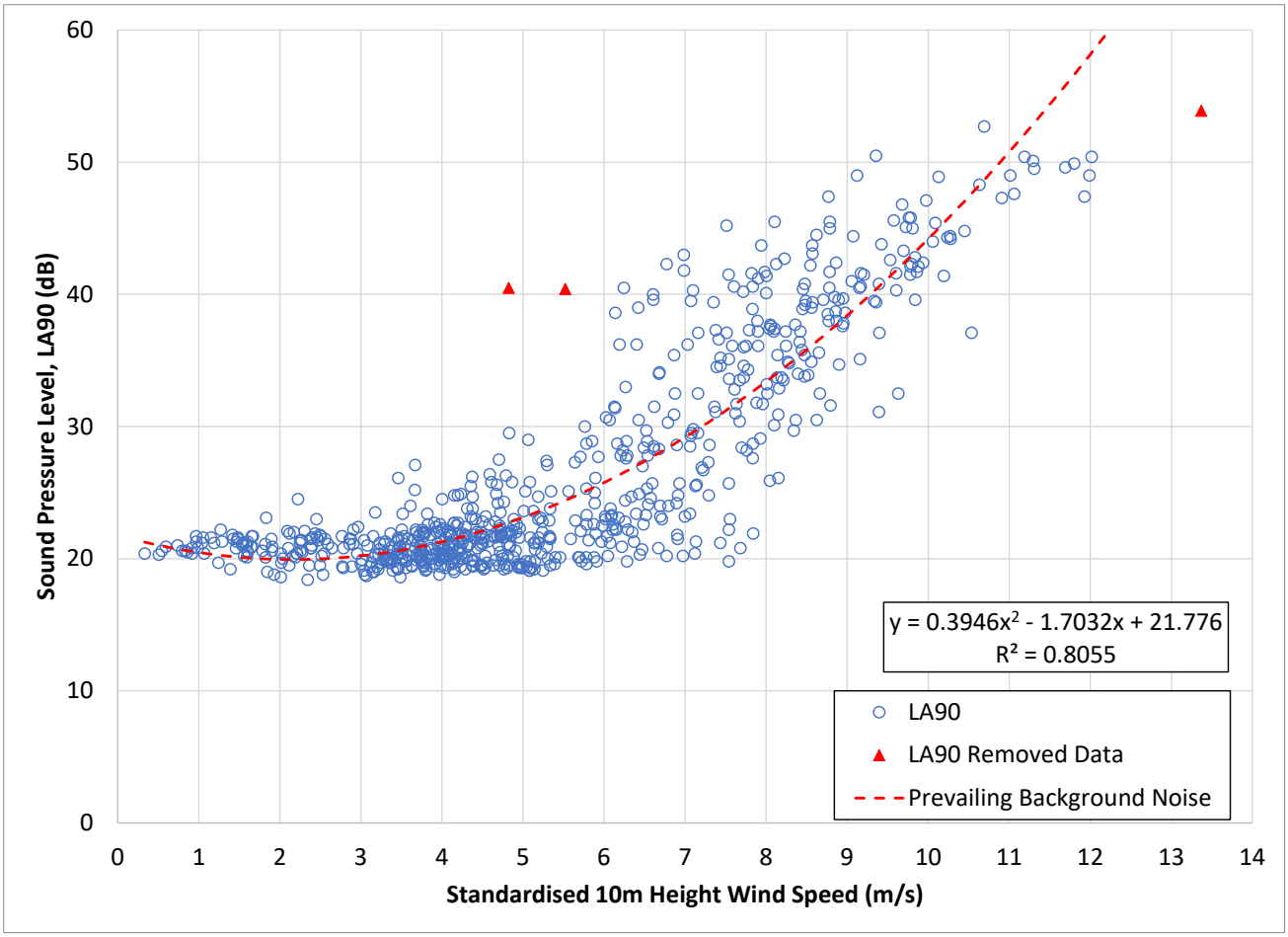



**Figure A8.24: Prevailing Night time Background ($L_{A90}$) Noise Levels at N11**

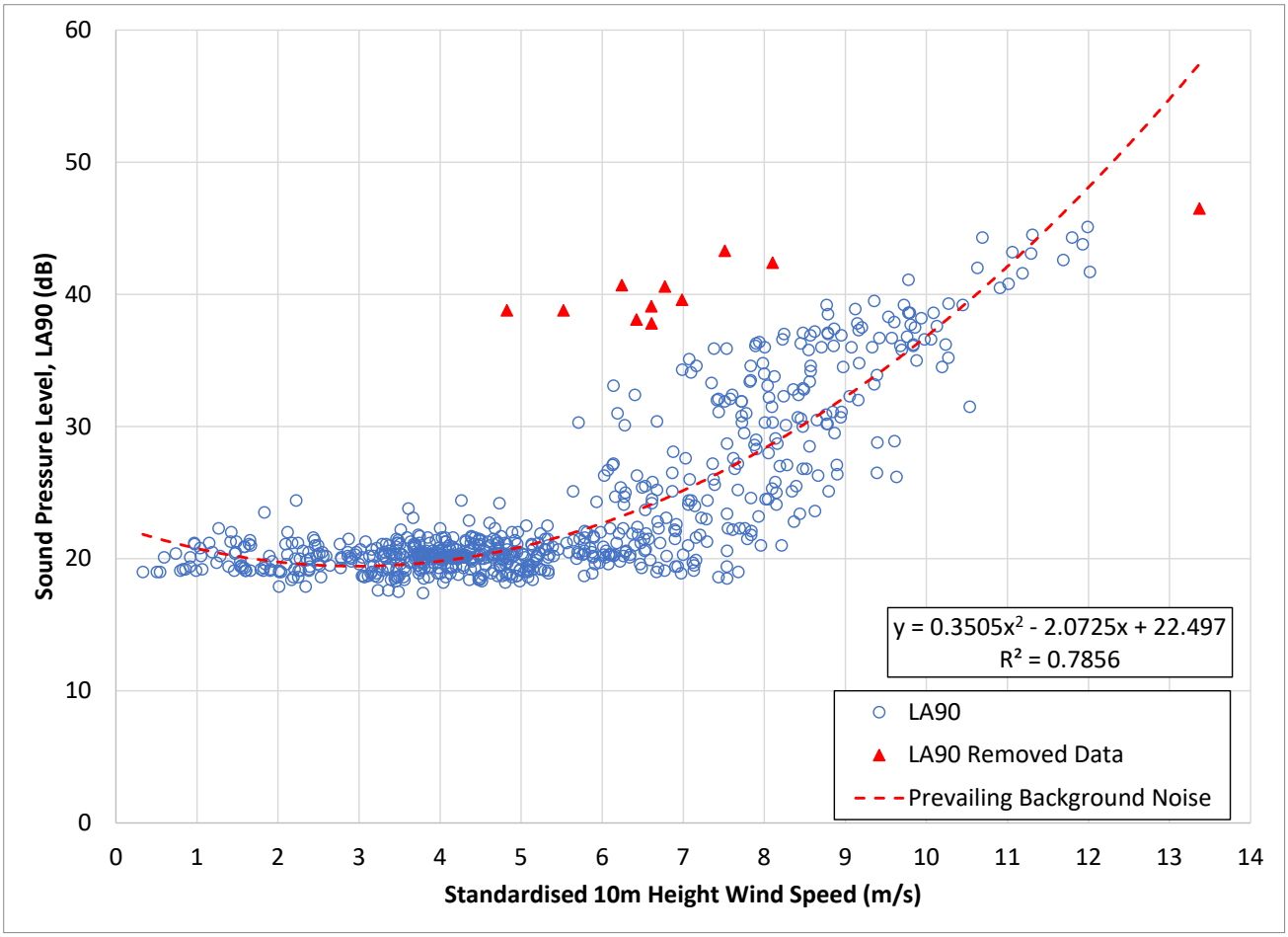



**Figure A8.25: Prevailing Night time Background ($L_{A90}$) Noise Levels at N12**

The assumed prevailing daytime and night time noise levels at the 12 noise monitoring locations is presented in Tables 8.1.7 and 8.1.8.

**Table 8.1.7: Prevailing Background Noise – Daytime Periods**

| Location | Prevailing Background Noise $L_{A90,10min}$ (dB) at Standardised 10 m Height Wind Speed (m/s) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N1 | 25.9* | 25.9 | 25.9 | 26.5 | 27.9 | 30.1 | 33.1 | 36.9 | 41.6 | 47 | 53.2 |
| N2 | 24.3 | 24.7 | 25.5 | 26.7 | 28.3 | 30.3 | 32.7 | 35.5 | 38.6 | 42.2 | 46.1 |
| N3 | 22.5 | 23.1 | 24.1 | 25.4 | 27.1 | 29.2 | 31.6 | 34.4 | 37.5 | 41 | 44.9 |
| N4 | 23.3 | 23.9 | 24.9 | 26.4 | 28.4 | 30.8 | 33.8 | 37.2 | 41.2 | 45.6 | 50.5 |
| N5 | 23.3 | 24 | 25.2 | 26.8 | 29 | 31.6 | 34.8 | 38.4 | 42.5 | 47.1 | 52.3 |
| N6 | 23.8* | 23.8 | 24.5 | 25.8 | 27.9 | 30.6 | 34.1 | 38.3 | 43.2 | 48.7 | 55 |
| N7 | 25.9 | 26.4 | 27.4 | 29.1 | 31.3 | 34.3 | 37.8 | 41.9 | 46.7 | 52.1 | 58.1 |
| N8 | 25.6 | 25.8 | 26.5 | 27.9 | 29.9 | 32.5 | 35.7 | 39.6 | 44.1 | 49.2 | 49.2§ |
| N9 | 24.5* | 24.5 | 24.9 | 26.1 | 28.1 | 31 | 34.6 | 39 | 44.2 | 50.2 | 57.1 |
| N10 | 24.4 | 25.7 | 27.3 | 29.3 | 31.5 | 34 | 36.8 | 39.8 | 43.2 | 43.2§ | 43.2§ |
| N11 | 25.5* | 25.5 | 25.6 | 26.5 | 28.4 | 31.1 | 34.7 | 39.1 | 44.5 | 50.7 | 57.8 |
| N12 | 25.7* | 25.7 | 26.2 | 27.1 | 28.4 | 30.2 | 32.5 | 35.2 | 38.4 | 42.1 | 46.2 |

§ - noise level restricted to the highest derived point
* - noise level restricted to lowest derived point

**Table 8.1.7: Prevailing Background Noise – Night time Periods**

| Location | Prevailing Background Noise $L_{A90,10min}$ (dB) at Standardised 10 m Height Wind Speed (m/s) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N1 | 21.6* | 21.6 | 21.6 | 22.6 | 24.4 | 27.1 | 30.6 | 35.0 | 40.3 | 46.5 | 53.6 |
| N2 | 18.6 | 18.7 | 19.4 | 20.8 | 22.7 | 25.3 | 28.4 | 32.2 | 36.6 | 41.5 | 47.1 |
| N3 | 17.0 | 17.3 | 18.2 | 19.7 | 21.7 | 24.4 | 27.8 | 31.7 | 36.2 | 41.3 | 47.1 |
| N4 | 16.4 | 16.7 | 17.8 | 19.7 | 22.3 | 25.7 | 29.9 | 34.8 | 40.5 | 47.0 | 54.2 |
| N5 | 16.4 | 17.2 | 18.7 | 20.8 | 23.7 | 27.3 | 31.6 | 36.6 | 42.3 | 48.7 | 55.8 |
| N6 | 23.8* | 23.8 | 24.5 | 25.8 | 27.9 | 30.6 | 34.1 | 38.3 | 43.2 | 48.7 | 55.0 |
| N7 | 17.3 | 18.0 | 19.4 | 21.6 | 24.6 | 28.5 | 33.1 | 38.6 | 44.8 | 51.9 | 59.8 |
| N8 | 17.4 | 17.5 | 18.5 | 20.4 | 23.2 | 26.9 | 31.4 | 36.9 | 43.3 | 50.5 | 58.7 |
| N9 | 19.6* | 19.6 | 19.9 | 21.2 | 23.5 | 26.8 | 31.2 | 36.6 | 43.0 | 50.4 | 58.8 |
| N10 | 16.5 | 17.4 | 19.1 | 21.8 | 25.3 | 29.8 | 35.2 | 41.4 | 48.6 | 48.6§ | 48.6§ |
| N11 | 19.9 | 20.2 | 21.3 | 23.1 | 25.8 | 29.2 | 33.4 | 38.4 | 44.2 | 50.8 | 58.2 |
| N12 | 19.4* | 19.4 | 19.8 | 20.9 | 22.7 | 25.2 | 28.3 | 32.2 | 36.8 | 42.1 | 48.1 |

§ - noise level restricted to the highest derived point
* - noise level restricted to lowest derived point

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

# APPENDIX 8.2

## Equipment Calibration Certificates

MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
Billingham TS23 1LG,
England
Telephone: 01642 876 410

# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of Issue:** 22 April 2022 **Certificate Number:** 36882

## Sound Level Meter

## Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

*Client:* Environmental Measurements
Unit 12, Tallaght Business Centre
Whitestown Business Park
Co.Dublin 24, Ireland

*Instrument Make:* Larson Davis
*Instrument Model:* LxT1L
*Serial Number:* 0006031

| *Associated Equipment* | Make | Model | Serial number |
|---|---|---|---|
| *Preamplifier* | Larson Davis | PRMLxT1L | 069967 |
| *Microphone* | PCB | 377B02 | 322919 |
| *Calibrator* | Larson Davis | CAL200 | 9175 |
| *Calibrator supplied by* | MTS for this calibration | | |

**The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the items tested.**

**Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1**

**Test results summary, detailed results are shown on subsequent pages.**

| Tests performed | Section | Results of test | Page | Comments |
|---|---|---|---|---|
| Calibration Certificate | 22 | | 1 | |
| Additional information | | | 2 | |
| Indication with Calibrator Supplied | 10 | No Limit | 3 | |
| Self-Generated Noise | 11 | No Limit | 3 | |
| Frequency and Time-weightings at 1kHz | 14 | Complies | 3 | |
| Long term stability | 15 | Complies | 3 | |
| High stability | 21 | Complies | 3 | |
| Acoustic Tests | 12 | Complies | 4 | |
| Frequency Weighting A | 13 | Complies | 5 | |
| Frequency Weighting C | 13 | Complies | 6 | |
| Frequency Weighting Z | 13 | Complies | 7 | |
| Level Linearity | 16 | Complies | 8 | |
| Level Linearity Range Control | 17 | | n/a | SLM only has one range |
| Tone-burst Response | 18 | Complies | 9 | |
| Peak C sound level | 19 | Complies | 10 | |
| Overload indication | 20 | Complies | 11 | |

**The instrument was within the above specification as received - no modifications were made**

**The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013**

| Additional tests performed | Reference | |
|---|---|---|
| Microphone full frequency response | 36884 | See additional certificate |
| Filter calibration, third octave or octave | 36882F | See additional certificate |

MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
Billingham TS23 1LG,
England
Telephone: 01642 876 410

# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of Issue:** 01 June 2022 **Certificate Number:** 37032

## Sound Level Meter

## Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

*Client:* Environmental Measurements
Unit 12, Tallaght Business Centre
Whitestown Business Park
Co.Dublin 24, Ireland

*Instrument Make:* Larson Davis
*Instrument Model:* LxT1L
*Serial Number:* 0005977

| *Associated Equipment* | Make | Model | Serial number |
|---|---|---|---|
| *Preamplifier* | Larson Davis | PRMLxT1L | 055799 |
| *Microphone* | PCB | 377B02 | 314929 |
| *Calibrator* | Larson Davis | CAL200 | 9175 |
| *Calibrator supplied by* | MTS for this calibration | | |

The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the items tested.

**Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1**

**Test results summary, detailed results are shown on subsequent pages.**

| Tests performed | Section | Results of test | Page | Comments |
|---|---|---|---|---|
| Calibration Certificate | 22 | | 1 | |
| Additional information | | | 2 | |
| Indication with Calibrator Supplied | 10 | No Limit | 3 | |
| Self-Generated Noise | 11 | No Limit | 3 | |
| Frequency and Time-weightings at 1kHz | 14 | Complies | 3 | |
| Long term stability | 15 | Complies | 3 | |
| High stability | 21 | Complies | 3 | |
| Acoustic Tests | 12 | Complies | 4 | |
| Frequency Weighting A | 13 | Complies | 5 | |
| Frequency Weighting C | 13 | Complies | 6 | |
| Frequency Weighting Z | 13 | Complies | 7 | |
| Level Linearity | 16 | Complies | 8 | |
| Level Linearity Range Control | 17 | | n/a | SLM only has one range |
| Tone-burst Response | 18 | Complies | 9 | |
| Peak C sound level | 19 | Complies | 10 | |
| Overload indication | 20 | Complies | 11 | |

**The instrument was within the above specification as received - no modifications were made**

**The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013**

| Additional tests performed | Reference | |
|---|---|---|
| Microphone full frequency response | 37034 | See additional certificate |
| Filter calibration, third octave or octave | 37032F | See additional certificate |

MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
Billingham TS23 1LG,
England
Telephone: 01642 876 410

# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of Issue:** 23 August 2021 **Certificate Number:** 36181

## Sound Level Meter

## Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

*Client:* Environmental Measurements
Unit 12, Tallaght Business Centre
Whitestown Business Park
Co.Dublin 24, Ireland

*Instrument Make:* Larson Davis
*Instrument Model:* LxT1L
*Serial Number:* 0005122

| *Associated Equipment* | Make | Model | Serial number |
|---|---|---|---|
| *Preamplifier* | Larson Davis | PRMLxT1L | 042855 |
| *Microphone* | PCB | 377B02 | 174426 |
| *Calibrator* | Larson Davis | CAL200 | 9175 |
| *Calibrator supplied by* | the Client, with the SLM | | |

**Test results summary, detailed results are shown on subsequent pages.**

**Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1**

| Tests performed | Section | Results of test | Page | Comments |
|---|---|---|---|---|
| Calibration Certificate | 22 | | 1 | |
| Additional information | | | 2 | |
| Indication with Calibrator Supplied | 10 | **No Limit** | 3 | |
| Self-Generated Noise | 11 | **No Limit** | 3 | |
| Frequency and Time-weightings at 1kHz | 14 | **Complies** | 3 | |
| Long term stability | 15 | **Complies** | 3 | |
| High stability | 21 | **Complies** | 3 | |
| Acoustic Tests | 12 | **Complies** | 4 | |
| Frequency Weighting A | 13 | **Complies** | 5 | |
| Frequency Weighting C | 13 | **Complies** | 6 | |
| Frequency Weighting Z | 13 | **Complies** | 7 | |
| Level Linearity | 16 | **Complies** | 8 | |
| Level Linearity Range Control | 17 | | n/a | SLM only has one range |
| Tone-burst Response | 18 | **Complies** | 9 | |
| Peak C sound level | 19 | **Complies** | 10 | |
| Overload indication | 20 | **Complies** | 11 | |

**The instrument was within the above specification as received - no modifications were made**

**The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013**

| Additional tests performed | Reference | |
|---|---|---|
| Microphone full frequency response | 36183 | See additional certificate |
| Filter calibration, third octave or octave | 36181F | See additional certificate |

MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
Billingham TS23 1LG,
England
Telephone: 01642 876 410

# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of Issue:** 11 November 2022 **Certificate Number:** 37757

## Sound Level Meter

## Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

*Client:* Environmental Measurements
Unit 12, Tallaght Business Centre
Whitestown Business Park
Co.Dublin 24, Ireland

*Instrument Make:* Larson Davis
*Instrument Model:* LxT1L
*Serial Number:* 0004665

| *Associated Equipment* | Make | Model | Serial number |
|---|---|---|---|
| *Preamplifier* | PCB | PRMLxT1L | 042909 |
| *Microphone* | PCB | 377B02 | 175333 |
| *Calibrator* | Larson Davis | CAL200 | 9175 |
| *Calibrator supplied by* | MTS for this calibration | | |

The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the items tested.

**Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1**

**Test results summary, detailed results are shown on subsequent pages.**

| Tests performed | Section | Results of test | Page | Comments |
|---|---|---|---|---|
| Calibration Certificate | 22 | | 1 | |
| Additional information | | | 2 | |
| Indication with Calibrator Supplied | 10 | No Limit | 3 | |
| Self-Generated Noise | 11 | No Limit | 3 | |
| Frequency and Time-weightings at 1kHz | 14 | Complies | 3 | |
| Long term stability | 15 | Complies | 3 | |
| High stability | 21 | Complies | 3 | |
| Acoustic Tests | 12 | Complies | 4 | |
| Frequency Weighting A | 13 | Complies | 5 | |
| Frequency Weighting C | 13 | Complies | 6 | |
| Frequency Weighting Z | 13 | Complies | 7 | |
| Level Linearity | 16 | Complies | 8 | |
| Level Linearity Range Control | 17 | | n/a | SLM only has one range |
| Tone-burst Response | 18 | Complies | 9 | |
| Peak C sound level | 19 | Complies | 10 | |
| Overload indication | 20 | Complies | 11 | |

**The instrument was within the above specification as received - no modifications were made**

**The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013**

| Additional tests performed | Reference | |
|---|---|---|
| Microphone full frequency response | 37759 | See additional certificate |
| Filter calibration, third octave or octave | 37757F | See additional certificate |

# Calibration Certificate

***Certificate Number 2021013671***

***Customer:***

**Environmental Measurement**
**Unit 12 Tallaght Business Centre**
**Whitestown Business Park**
**Dublin, 24, Ireland**

| | | | | | |
|---|---|---|---|---|---|
| ***Model Number*** | LxT SE | | ***Procedure Number*** | D0001.8378 | |
| ***Serial Number*** | 0006862 | | ***Technician*** | Ron Harris | |
| ***Test Results*** | **Pass** | | ***Calibration Date*** | 25 Oct 2021 | |
| ***Initial Condition*** | As Manufactured | | ***Calibration Due*** | | |
| | | | ***Temperature*** | 23.45 °C | ± 0.25 °C |
| ***Description*** | Sound Expert LxT<br>Class 1 Sound Level Meter<br>Firmware Revision: 2.404 | | ***Humidity*** | 50.6 %RH | ± 2.0 %RH |
| | | | ***Static Pressure*** | 85.03 kPa | ± 0.13 kPa |

***Evaluation Method*** Tested electrically using Larson Davis PRMLxT1L S/N 070108 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 23.6 mV/Pa.

***Compliance Standards*** Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

| | |
|---|---|
| IEC 60651:2001 Type 1 | ANSI S1.4-2014 Class 1 |
| IEC 60804:2000 Type 1 | ANSI S1.4 (R2006) Type 1 |
| IEC 61252:2002 | ANSI S1.25 (R2007) |
| IEC 61672:2013 Class 1 | ANSI S1.43 (R2007) Type 1 |
| IEC 61260:2001 Class 1 | ANSI S1.11 (R2009) Class 1 |

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.



Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert Lxt, I770.01 Rev O Supporting Firmware Version 4.0.5, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

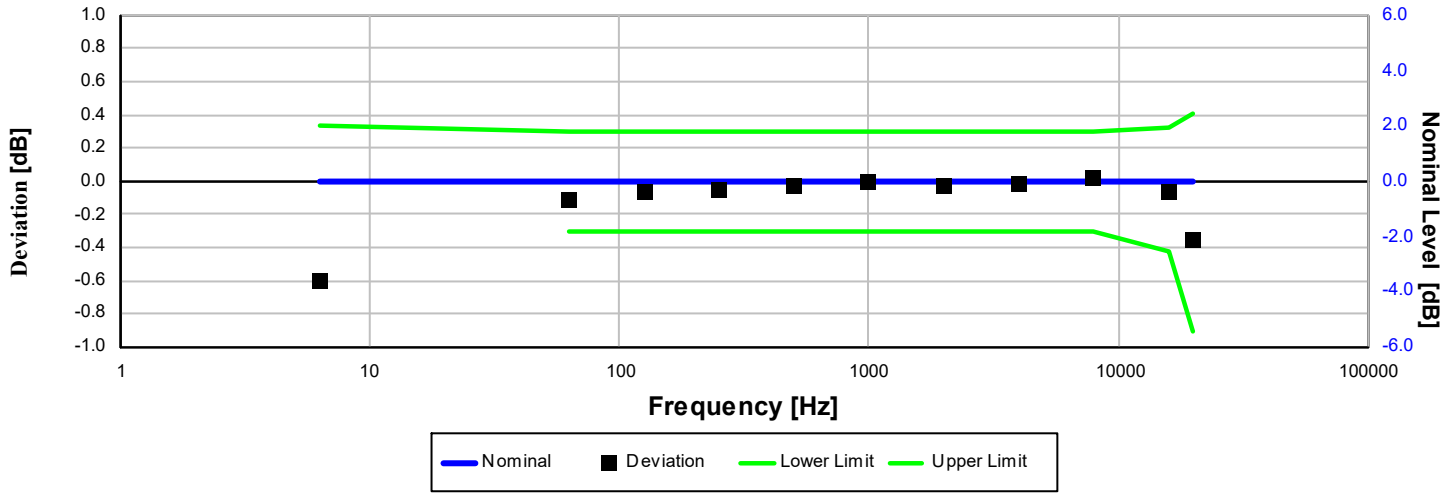
LARSON DAVIS - A PCB PIEZOTRONICS DIV.
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS A PCB DIVISION

| Standards Used | | | |
|---|---|---|---|
| **Description** | **Cal Date** | **Cal Due** | **Cal Standard** |
| Hart Scientific 2626-H Temperature Probe | 2021-02-04 | 2022-08-04 | 006767 |
| SRS DS360 Ultra Low Distortion Generator | 2021-01-05 | 2022-01-05 | 007118 |

## Z-weight Filter Response

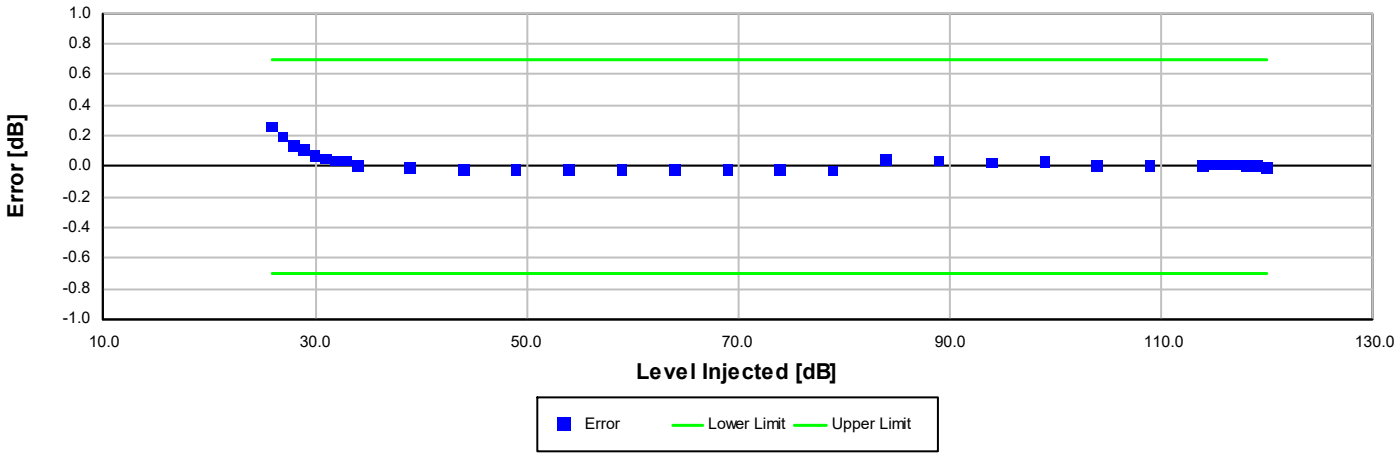



Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

| Frequency [Hz] | Test Result [dB] | Deviation [dB] | Lower limit [dB] | Upper limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|---|
| 6.31 | -0.61 | -0.61 | -1.11 | 0.33 | 0.15 | Pass |
| 63.10 | -0.11 | -0.11 | -0.30 | 0.30 | 0.15 | Pass |
| 125.89 | -0.07 | -0.07 | -0.30 | 0.30 | 0.15 | Pass |
| 251.19 | -0.05 | -0.05 | -0.30 | 0.30 | 0.15 | Pass |
| 501.19 | -0.03 | -0.03 | -0.30 | 0.30 | 0.15 | Pass |
| 1,000.00 | 0.00 | 0.00 | -0.30 | 0.30 | 0.15 | Pass |
| 1,995.26 | -0.02 | -0.02 | -0.30 | 0.30 | 0.15 | Pass |
| 3,981.07 | -0.01 | -0.01 | -0.30 | 0.30 | 0.15 | Pass |
| 7,943.28 | 0.02 | 0.02 | -0.30 | 0.30 | 0.15 | Pass |
| 15,848.93 | -0.06 | -0.06 | -0.42 | 0.32 | 0.15 | Pass |
| 19,952.62 | -0.35 | -0.35 | -0.91 | 0.41 | 0.15 | Pass |

**-- End of measurement results--**

## A-weighted Broadband Log Linearity: 8,000.00 Hz




Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

| Level [dB] | Error [dB] | Lower limit [dB] | Upper limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|
| 26.00 | 0.26 | -0.70 | 0.70 | 0.16 | Pass |
| 27.00 | 0.20 | -0.70 | 0.70 | 0.16 | Pass |
| 28.00 | 0.14 | -0.70 | 0.70 | 0.17 | Pass |
| 29.00 | 0.11 | -0.70 | 0.70 | 0.16 | Pass |
| 30.00 | 0.07 | -0.70 | 0.70 | 0.35 | Pass |
| 31.00 | 0.05 | -0.70 | 0.70 | 0.16 | Pass |
| 32.00 | 0.04 | -0.70 | 0.70 | 0.16 | Pass |
| 33.00 | 0.04 | -0.70 | 0.70 | 0.16 | Pass |
| 34.00 | 0.01 | -0.70 | 0.70 | 0.16 | Pass |
| 39.00 | 0.00 | -0.70 | 0.70 | 0.16 | Pass |
| 44.00 | -0.02 | -0.70 | 0.70 | 0.16 | Pass |
| 49.00 | -0.02 | -0.70 | 0.70 | 0.16 | Pass |
| 54.00 | -0.02 | -0.70 | 0.70 | 0.16 | Pass |
| 59.00 | -0.02 | -0.70 | 0.70 | 0.16 | Pass |
| 64.00 | -0.02 | -0.70 | 0.70 | 0.16 | Pass |
| 69.00 | -0.02 | -0.70 | 0.70 | 0.16 | Pass |
| 74.00 | -0.02 | -0.70 | 0.70 | 0.16 | Pass |
| 79.00 | -0.03 | -0.70 | 0.70 | 0.16 | Pass |
| 84.00 | 0.04 | -0.70 | 0.70 | 0.16 | Pass |
| 89.00 | 0.04 | -0.70 | 0.70 | 0.16 | Pass |
| 94.00 | 0.02 | -0.70 | 0.70 | 0.16 | Pass |
| 99.00 | 0.03 | -0.70 | 0.70 | 0.16 | Pass |
| 104.00 | 0.01 | -0.70 | 0.70 | 0.15 | Pass |
| 109.00 | 0.01 | -0.70 | 0.70 | 0.15 | Pass |
| 114.00 | 0.01 | -0.70 | 0.70 | 0.15 | Pass |
| 115.00 | 0.01 | -0.70 | 0.70 | 0.15 | Pass |
| 116.00 | 0.01 | -0.70 | 0.70 | 0.15 | Pass |
| 117.00 | 0.01 | -0.70 | 0.70 | 0.15 | Pass |
| 118.00 | 0.00 | -0.70 | 0.70 | 0.15 | Pass |
| 119.00 | 0.01 | -0.70 | 0.70 | 0.15 | Pass |
| 120.00 | -0.01 | -0.70 | 0.70 | 0.15 | Pass |

**-- End of measurement results--**

## Peak Rise Time

Peak rise time performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

| Amplitude [dB] | Duration [µs] | | Test Result [dB] | Lower limit [dB] | Upper limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|---|---|
| 116.15 | 40 | Negative Pulse | 117.55 | 116.06 | 118.06 | 0.15 | Pass |
| | | Positive Pulse | 117.51 | 116.01 | 118.01 | 0.15 | Pass |
| | 30 | Negative Pulse | 116.59 | 116.06 | 118.06 | 0.15 | Pass |
| | | Positive Pulse | 116.56 | 116.01 | 118.01 | 0.15 | Pass |

**-- End of measurement results--**

## Positive Pulse Crest Factor

### 200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

| Amplitude [dB] | Crest Factor | Test Result [dB] | Limits [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|
| 114.15 | 3 | OVLD | ± 0.50 | 0.15 ‡ | Pass |
| | 5 | OVLD | ± 1.00 | 0.15 ‡ | Pass |
| | 10 | OVLD | ± 1.50 | 0.15 ‡ | Pass |
| 104.15 | 3 | -0.16 | ± 0.50 | 0.15 ‡ | Pass |
| | 5 | -0.17 | ± 1.00 | 0.16 ‡ | Pass |
| | 10 | OVLD | ± 1.50 | 0.15 ‡ | Pass |
| 94.15 | 3 | -0.13 | ± 0.50 | 0.15 ‡ | Pass |
| | 5 | -0.14 | ± 1.00 | 0.15 ‡ | Pass |
| | 10 | -0.19 | ± 1.50 | 0.15 ‡ | Pass |
| 84.15 | 3 | -0.14 | ± 0.50 | 0.15 ‡ | Pass |
| | 5 | -0.14 | ± 1.00 | 0.15 ‡ | Pass |
| | 10 | -0.26 | ± 1.50 | 0.15 ‡ | Pass |

**-- End of measurement results--**

## Negative Pulse Crest Factor

### 200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

| Amplitude [dB] | Crest Factor | Test Result [dB] | Limits [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|
| 114.15 | 3 | OVLD | ± 0.50 | 0.15 ‡ | Pass |
| | 5 | OVLD | ± 1.00 | 0.15 ‡ | Pass |
| | 10 | OVLD | ± 1.50 | 0.15 ‡ | Pass |
| 104.15 | 3 | -0.15 | ± 0.50 | 0.15 ‡ | Pass |
| | 5 | -0.12 | ± 1.00 | 0.15 ‡ | Pass |
| | 10 | OVLD | ± 1.50 | 0.15 ‡ | Pass |
| 94.15 | 3 | -0.14 | ± 0.50 | 0.15 ‡ | Pass |
| | 5 | -0.12 | ± 1.00 | 0.15 ‡ | Pass |
| | 10 | -0.16 | ± 1.50 | 0.15 ‡ | Pass |
| 84.15 | 3 | -0.14 | ± 0.50 | 0.15 ‡ | Pass |
| | 5 | -0.13 | ± 1.00 | 0.15 ‡ | Pass |
| | 10 | -0.23 | ± 1.50 | 0.15 ‡ | Pass |

**-- End of measurement results--**

## Gain

Gain measured according to IEC 61672-3:2013 17.3 and 17.4 and ANSI S1.4-2014 Part 3: 17.3 and 17.4

| Measurement | Test Result [dB] | Lower limit [dB] | Upper limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|
| 0 dB Gain | 84.02 | 83.90 | 84.10 | 0.15 | Pass |
| 0 dB Gain, Linearity | 21.32 | 20.30 | 21.70 | 0.16 | Pass |
| OBA Low Range | 84.00 | 83.90 | 84.10 | 0.15 | Pass |
| OBA Normal Range | 84.00 | 83.20 | 84.80 | 0.15 | Pass |

**-- End of measurement results--**

## Broadband Noise Floor

Self-generated noise measured according to IEC 61672-3:2013 11.2 and ANSI S1.4-2014 Part 3: 11.2

| Measurement | Test Result [dB] | Upper limit [dB] | Result |
|---|---|---|---|
| A-weight Noise Floor | 9.42 | 16.00 | Pass |
| C-weight Noise Floor | 13.34 | 18.00 | Pass |
| Z-weight Noise Floor | 20.03 | 25.00 | Pass |

**-- End of measurement results--**

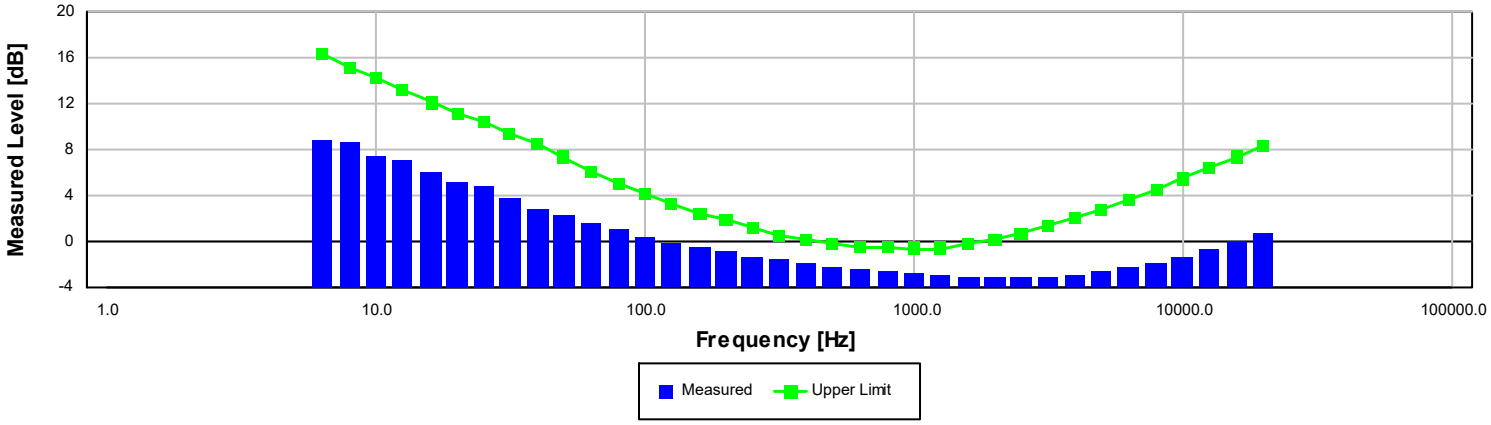
## Total Harmonic Distortion

Measured using 1/3-Octave filters

| Measurement | Test Result [dB] | Lower Limit [dB] | Upper Limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|
| 10 Hz Signal | 113.12 | 112.35 | 113.95 | 0.15 | Pass |
| THD | -57.00 | | -50.00 | 0.01 ‡ | Pass |
| THD+N | -55.46 | | -50.00 | 0.01 ‡ | Pass |

**-- End of measurement results--**

## 1/3-Octave Self-Generated Noise




The SLM is set to low range.

| Frequency [Hz] | Test Result [dB] | Upper limit [dB] | Result |
|---|---|---|---|
| 6.30 | 8.89 | 16.30 | Pass |
| 8.00 | 8.62 | 15.20 | Pass |
| 10.00 | 7.57 | 14.20 | Pass |
| 12.50 | 7.12 | 13.20 | Pass |
| 16.00 | 6.04 | 12.10 | Pass |
| 20.00 | 5.14 | 11.10 | Pass |
| 25.00 | 4.84 | 10.40 | Pass |
| 31.50 | 3.89 | 9.40 | Pass |
| 40.00 | 2.80 | 8.60 | Pass |
| 50.00 | 2.23 | 7.40 | Pass |
| 63.00 | 1.52 | 6.10 | Pass |
| 80.00 | 1.01 | 5.00 | Pass |
| 100.00 | 0.40 | 4.20 | Pass |
| 125.00 | -0.15 | 3.30 | Pass |
| 160.00 | -0.42 | 2.40 | Pass |
| 200.00 | -0.83 | 1.90 | Pass |
| 250.00 | -1.45 | 1.20 | Pass |
| 315.00 | -1.56 | 0.60 | Pass |
| 400.00 | -1.83 | 0.20 | Pass |
| 500.00 | -2.26 | -0.10 | Pass |
| 630.00 | -2.46 | -0.50 | Pass |
| 800.00 | -2.65 | -0.50 | Pass |
| 1,000.00 | -2.84 | -0.60 | Pass |
| 1,250.00 | -2.95 | -0.60 | Pass |
| 1,600.00 | -3.04 | -0.20 | Pass |
| 2,000.00 | -3.11 | 0.20 | Pass |
| 2,500.00 | -3.08 | 0.70 | Pass |
| 3,150.00 | -3.04 | 1.40 | Pass |
| 4,000.00 | -2.90 | 2.10 | Pass |
| 5,000.00 | -2.62 | 2.80 | Pass |
| 6,300.00 | -2.27 | 3.70 | Pass |
| 8,000.00 | -1.85 | 4.60 | Pass |
| 10,000.00 | -1.31 | 5.50 | Pass |
| 12,500.00 | -0.71 | 6.40 | Pass |
| 16,000.00 | -0.03 | 7.40 | Pass |
| 20,000.00 | 0.70 | 8.30 | Pass |

**-- End of measurement results--**

**-- End of Report--**

Signatory: Ron Harris

LARSON DAVIS - A PCB PIEZOTRONICS DIV.
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
Billingham TS23 1LG,
England
Telephone: 01642 876 410

# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of Issue:** 15 September 2022 **Certificate Number:** 37476

## Sound Level Meter

## Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

*Client:* Environmental Measurements
Unit 12, Tallaght Business Centre
Whitestown Business Park
Co.Dublin 24, Ireland

*Instrument Make:* Larson Davis
*Instrument Model:* LxT1L
*Serial Number:* 0005043

| *Associated Equipment* | Make | Model | Serial number |
|---|---|---|---|
| *Preamplifier* | Larson Davis | PRMLxT1L | 069969 |
| *Microphone* | PCB | 377B02 | 322959 |
| *Calibrator* | Larson Davis | CAL200 | 9175 |
| *Calibrator supplied by* | MTS for this calibration | | |

The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the items tested.

**Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1**

**Test results summary, detailed results are shown on subsequent pages.**

| Tests performed | Section | Results of test | Page | Comments |
|---|---|---|---|---|
| Calibration Certificate | 22 | | 1 | |
| Additional information | | | 2 | |
| Indication with Calibrator Supplied | 10 | No Limit | 3 | |
| Self-Generated Noise | 11 | No Limit | 3 | |
| Frequency and Time-weightings at 1kHz | 14 | Complies | 3 | |
| Long term stability | 15 | Complies | 3 | |
| High stability | 21 | Complies | 3 | |
| Acoustic Tests | 12 | Complies | 4 | |
| Frequency Weighting A | 13 | Complies | 5 | |
| Frequency Weighting C | 13 | Complies | 6 | |
| Frequency Weighting Z | 13 | Complies | 7 | |
| Level Linearity | 16 | Complies | 8 | |
| Level Linearity Range Control | 17 | | n/a | SLM only has one range |
| Tone-burst Response | 18 | Complies | 9 | |
| Peak C sound level | 19 | Complies | 10 | |
| Overload indication | 20 | Complies | 11 | |

**The instrument was within the above specification as received - no modifications were made**

**The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013**

| Additional tests performed | Reference | |
|---|---|---|
| Microphone full frequency response | 37478 | See additional certificate |
| Filter calibration, third octave or octave | 37376F | See additional certificate |

MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
Billingham TS23 1LG,
England
Telephone: 01642 876 410

# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of Issue:** 13 May 2022 **Certificate Number:** 36957

## Sound Level Meter

## Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

*Client:* Environmental Measurements
Unit 12, Tallaght Business Centre
Whitestown Business Park
Co.Dublin 24, Ireland

*Instrument Make:* Larson Davis
*Instrument Model:* LxT1L
*Serial Number:* 0005612

| *Associated Equipment* | Make | Model | Serial number |
|---|---|---|---|
| *Preamplifier* | Larson Davis | PRMLxT1L | 055648 |
| *Microphone* | PCB | 377B02 | 306361 |
| *Calibrator* | Larson Davis | CAL200 | 9175 |
| *Calibrator supplied by* | the Client, with the SLM | | |

The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the items tested.

**Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1**

**Test results summary, detailed results are shown on subsequent pages.**

| Tests performed | Section | Results of test | Page | Comments |
|---|---|---|---|---|
| Calibration Certificate | 22 | | 1 | |
| Additional information | | | 2 | |
| Indication with Calibrator Supplied | 10 | No Limit | 3 | |
| Self-Generated Noise | 11 | No Limit | 3 | |
| Frequency and Time-weightings at 1kHz | 14 | Complies | 3 | |
| Long term stability | 15 | Complies | 3 | |
| High stability | 21 | Complies | 3 | |
| Acoustic Tests | 12 | Complies | 4 | |
| Frequency Weighting A | 13 | Complies | 5 | |
| Frequency Weighting C | 13 | Complies | 6 | |
| Frequency Weighting Z | 13 | Complies | 7 | |
| Level Linearity | 16 | Complies | 8 | |
| Level Linearity Range Control | 17 | | n/a | SLM only has one range |
| Tone-burst Response | 18 | Complies | 9 | |
| Peak C sound level | 19 | Complies | 10 | |
| Overload indication | 20 | Complies | 11 | |

**The instrument was within the above specification as received - no modifications were made**

**The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013**

| Additional tests performed | Reference | |
|---|---|---|
| Microphone full frequency response | 36959 | See additional certificate |
| Filter calibration, third octave or octave | 36957F | See additional certificate |

MTS Calibration Ltd,
The Grange Business Centre,
Belasis Avenue,
Billingham TS23 1LG,
England
Telephone: 01642 876 410

# CERTIFICATE OF CALIBRATION



Approved Signatory:

Tony Sherris

**Issued by:** MTS Calibration Ltd

**Date of Issue:** 23 May 2022 **Certificate Number:** 36988

## Sound Level Meter

## Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1

*Client:* Environmental Measurements
Unit 12, Tallaght Business Centre
Whitestown Business Park
Co.Dublin 24, Ireland

*Instrument Make:* Larson Davis
*Instrument Model:* LxT1L
*Serial Number:* 0004632

| *Associated Equipment* | Make | Model | Serial number |
|---|---|---|---|
| *Preamplifier* | Larson Davis | PRMLxT1L | 036031 |
| *Microphone* | PCB | 377B02 | 157403 |
| *Calibrator* | Larson Davis | CAL200 | 9175 |
| *Calibrator supplied by* | the Client, with the SLM | | |

The measurements were performed at The Grange Business Centre, Belasis Avenue, TS23 1LD. The results only apply to the items tested.

**Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1**

**Test results summary, detailed results are shown on subsequent pages.**

| Tests performed | Section | Results of test | Page | Comments |
|---|---|---|---|---|
| Calibration Certificate | 22 | | 1 | |
| Additional information | | | 2 | |
| Indication with Calibrator Supplied | 10 | No Limit | 3 | |
| Self-Generated Noise | 11 | No Limit | 3 | |
| Frequency and Time-weightings at 1kHz | 14 | Complies | 3 | |
| Long term stability | 15 | Complies | 3 | |
| High stability | 21 | Complies | 3 | |
| Acoustic Tests | 12 | Complies | 4 | |
| Frequency Weighting A | 13 | Complies | 5 | |
| Frequency Weighting C | 13 | Complies | 6 | |
| Frequency Weighting Z | 13 | Complies | 7 | |
| Level Linearity | 16 | Complies | 8 | |
| Level Linearity Range Control | 17 | | n/a | SLM only has one range |
| Tone-burst Response | 18 | Complies | 9 | |
| Peak C sound level | 19 | Complies | 10 | |
| Overload indication | 20 | Complies | 11 | |

**The instrument was within the above specification as received - no modifications were made**

**The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3: 2013 for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2013, to demonstrate that the model of sound level meter fully conformed to the Class 1 specifications in IEC 61672-1: 2013, the sound level meter submitted for testing conforms to the Class 1 specifications of IEC 61672-1: 2013**

| Additional tests performed | Reference | |
|---|---|---|
| Microphone full frequency response | 36990 | See additional certificate |
| Filter calibration, third octave or octave | 36988F | See additional certificate |

NSAI

National Metrology Laboratory

# Certificate of Calibration

Issued to

Fehily Timoney & Company
J5 Plaza
North Park Business Park
North Road
Dublin 11

| | |
|---|---|
| **Certificate Number** | **242697** |
| **Item Calibrated** | Svantek SVAN 977 Sound Level Meter with ACO 7052E Microphone |
| **Serial Number** | 69552 (SLM) and 69543 (Microphone) |
| **ID Number** | None |
| **Order Number** | 7629 |
| **Date Received** | 10 Jun 2024 |
| **NML Procedure Number** | TFAP-NM-16 |
| **Method** | The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters.* This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003). |
| **Calibration Standards** | Norsonic 1504A Calibration System incorporating:<br>SR DS360 Signal Generator, No. 0735 [Cal Due Date: 01 Sep 2024]<br>Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 01 Sep 2024]<br>B&K 4180 Measuring Microphone, No. 1069 [Cal Due Date: 15 Sep 2025]<br>B&K 4228 Pistonphone, No. 0741 [Cal Due Date: 14 Sep 2025]<br>B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 04 Jan 2025] |

| | | | |
|---|---|---|---|
| **Calibrated by** | David Fleming | **Approved by** | Rory Hanrahan |
| **Date of Calibration** | 03 Jul 2024 | **Date of Issue** | 03 Jul 2024 |

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

NSAI
National Metrology Laboratory

# Certificate of Calibration

Issued to

Fehily Timoney & Company
J5 Plaza
North Park Business Park
North Road
Dublin 11

| | |
|---|---|
| **Certificate Number** | **242698** |
| **Item Calibrated** | Svantek SVAN 977 Sound Level Meter with ACO 7052E Microphone |
| **Serial Number** | 69556 (SLM) and 69608 (Microphone) |
| **ID Number** | None |
| **Order Number** | 7629 |
| **Date Received** | 10 Jun 2024 |
| **NML Procedure Number** | TFAP-NM-16 |
| **Method** | The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters.* This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003). |
| **Calibration Standards** | Norsonic 1504A Calibration System incorporating:<br>SR DS360 Signal Generator, No. 0735 [Cal Due Date: 01 Sep 2024]<br>Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 01 Sep 2024]<br>B&K 4180 Measuring Microphone, No. 1069 [Cal Due Date: 15 Sep 2025]<br>B&K 4228 Pistonphone, No. 0741 [Cal Due Date: 14 Sep 2025]<br>B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 04 Jan 2025] |

| | | | |
|---|---|---|---|
| **Calibrated by** | David Fleming | **Approved by** | Rory Hanrahan |
| **Date of Calibration** | 03 Jul 2024 | **Date of Issue** | 03 Jul 2024 |

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

NSAI
National Metrology Laboratory

# Certificate of Calibration

| | |
|---|---|
| Issued to | Fehily Timoney & Company<br>J5 Plaza<br>North Business Park<br>North Road<br>Dublin 11 |
| Attention of | Maureen Marsden |

| | |
|---|---|
| **Certificate Number** | 220035 |
| **Item Calibrated** | Svantek SVAN 977 Sound Level Meter with ACO 7052E Microphone |
| **Serial Number** | 34876 (SLM) and 56429 (Microphone) |
| **ID Number** | None |
| **Order Number** | 7018 |
| **Date Received** | 06 Jan 2022 |
| **NML Procedure Number** | AP-NM-09 |
| **Method** | The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters*. This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003). |
| **Calibration Standards** | Norsonic 1504A Calibration System incorporating:<br>SR DS360 Signal Generator, No. 0735 [Cal Due Date: 10 Jun 2022]<br>Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 10 Jun 2022]<br>B&K 4134 Measuring Microphone, No. 0744 [Cal Due Date: 03 Jun 2023]<br>B&K 4228 Pistonphone, No. 0740 [Cal Due Date: 04 Jun 2023]<br>B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 07 Oct 2022] |

| | | | |
|---|---|---|---|
| **Calibrated by** | David Fleming | **Approved by** | Paul Hetherington |
| **Date of Calibration** | 18 Jan 2022 | **Date of Issue** | 18 Jan 2022 |

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

NSAI
National Metrology Laboratory

# Certificate of Calibration

Issued to
Fehily Timoney & Company
J5 Plaza
North Business Park
North Road
Dublin 11

Attention of
Maureen Marsden

| | |
|---|---|
| **Certificate Number** | 220036 |
| **Item Calibrated** | Svantek SVAN 979 Sound Level Meter with GRAS 40AE Microphone |
| **Serial Number** | 14775 (SLM) and 106027 (Microphone) |
| **ID Number** | None |
| **Order Number** | 7018 |
| **Date Received** | 06 Jan 2022 |
| **NML Procedure Number** | AP-NM-09 |
| **Method** | The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), *Periodic tests, specification for the verification of sound level meters*. This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003). |
| **Calibration Standards** | Norsonic 1504A Calibration System incorporating:<br>SR DS360 Signal Generator, No. 0735 [Cal Due Date: 10 Jun 2022]<br>Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 10 Jun 2022]<br>B&K 4134 Measuring Microphone, No. 0744 [Cal Due Date: 03 Jun 2023]<br>B&K 4228 Pistonphone, No. 0740 [Cal Due Date: 04 Jun 2023]<br>B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 07 Oct 2022] |

| | | | |
|---|---|---|---|
| **Calibrated by** | David Fleming | **Approved by** | Paul Hetherington |
| **Date of Calibration** | 12 Jan 2022 | **Date of Issue** | 13 Jan 2022 |

CIPM MRA

This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

SVANTEK

ISO9001 certified

# FACTORY CALIBRATION DATA OF THE *SV 307 No. 104985*

**with microphone SVANTEK type ST30A No. 108881**

**IMEI: 355001092063493**

## 1. CALIBRATION (acoustical)

LEVEL METER function: Reference frequency: 1000Hz; Sound Pressure Level: 114.03 dB.

| Characteristic | Correct value [dB] | Indication [dB] | Error [dB] |
|---|---|---|---|
| Z | 114.03 | 114.09 | 0.06 |
| A | 114.03 | 114.09 | 0.06 |
| C | 114.03 | 114.09 | 0.06 |

Calibration measured with the microphone SVANTEK type ST30A No. 108881. Calibration factor: 0.00 dB.

## 2. LINEARITY TEST (electrical)

LEVEL METER function; Characteristic: A; $f_{str}$= 31.5 Hz

| Nominal result LEQ [dB] | 29.0 | 30.0 | 31.0 | 35.0 | 40.0 | 60.0 | 80.0 | 85.0 |
|---|---|---|---|---|---|---|---|---|
| Error [dB] | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

LEVEL METER function; Characteristic: A; $f_{str}$= 1000 Hz

| Nominal result LEQ [dB] | 29.0 | 30.0 | 31.0 | 35.0 | 40.0 | 60.0 | 80.0 | 100.0 | 120.0 | 125.0 |
|---|---|---|---|---|---|---|---|---|---|---|
| Error [dB] | 0.1 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | -0.0 | -0.0 | -0.0 | -0.0 |

LEVEL METER function; Characteristic: A; $f_{str}$= 8000 Hz

| Nominal result LEQ [dB] | 29.0 | 30.0 | 31.0 | 35.0 | 40.0 | 60.0 | 80.0 | 100.0 | 120.0 | 124.0 |
|---|---|---|---|---|---|---|---|---|---|---|
| Error [dB] | -0.0 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 | -0.0 |

## 3. TONE BURST RESPONSE

LEVEL METER function; Characteristic: A; $f_{str}$= 4000 Hz; Burst duration: 2s

Steady level nominal result = 122 dB

| Result | Detector | Duration [ms] | 1000 | 500 | 200 | 100 | 50 | 20 | 10 | 5 | 2 | 1 | 0.5 | 0.25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAX | Fast | Indication [dB] | 122.0 | 121.9 | 121.0 | 119.6 | 117.2 | 113.7 | 110.8 | 107.9 | 104.9 | 100.9 | 97.9 | 94.9 |
| | | Error [dB] | -0.0 | 0.0 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 | -0.0 | -0.1 | -0.1 |
| | Slow | Indication [dB] | 119.9 | 117.9 | 114.5 | 111.7 | 108.8 | 104.8 | 101.9 | 98.8 | 94.9 | - | - | - |
| | | Error [dB] | -0.1 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | - | - | - |
| SEL | - | Indication [dB] | 122.0 | 119.0 | 115.0 | 112.0 | 109.0 | 105.0 | 102.0 | 99.0 | 95.0 | 91.9 | 88.9 | 85.8 |
| | | Error [dB] | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | 0.0 | -0.0 | -0.0 | -0.0 | -0.1 | -0.1 | -0.1 |

Steady level nominal result = 62 dB

| Result | Detector | Duration [ms] | 1000 | 500 | 200 | 100 | 50 | 20 | 10 | 5 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MAX | Fast | Indication [dB] | 62.0 | 61.9 | 61.0 | 59.4 | 57.2 | 53.7 | 50.8 | 47.9 | 44.0 |
| | | Error [dB] | 0.0 | 0.0 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 |
| | Slow | Indication [dB] | 59.9 | 57.9 | 54.5 | 51.7 | 48.8 | 44.9 | 41.9 | 38.8 | 34.9 |
| | | Error [dB] | -0.1 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 |
| SEL | - | Indication [dB] | 62.0 | 59.0 | 55.0 | 52.0 | 49.0 | 45.0 | 42.0 | 39.0 | 35.0 |
| | | Error [dB] | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | 0.0 | -0.0 | -0.0 | 0.0 |

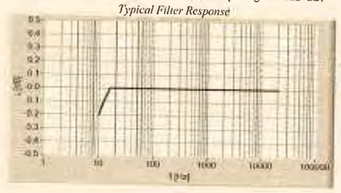
Steady level nominal result = 40 dB

| Result | Detector | Duration [ms] | 1000 | 500 | 200 |
|---|---|---|---|---|---|
| MAX | Fast | Indication [dB] | 40.0 | 39.9 | 39.0 |
| | | Error [dB] | 0.0 | 0.0 | 0.0 |
| | Slow | Indication [dB] | 37.9 | 35.9 | 32.6 |
| | | Error [dB] | -0.1 | -0.0 | 0.0 |
| SEL | - | Indication [dB] | 40.0 | 37.0 | 33.1 |
| | | Error [dB] | 0.0 | 0.0 | -0.1 |

## 4. FREQUENCY RESPONSE (electrical)

LEVEL METER function; Characteristic: Z; Input signal =122 dB;

*Typical Filter Response*




*Measured Filter Response*
*(f-frequency, L-level)*

| f [Hz] | L [dB] | f [Hz] | L [dB] | f [Hz] | L [dB] |
|---|---|---|---|---|---|
| 10 | -0.1 | 63 | -0.0 | 4000 | -0.0 |
| 12.5 | -0.0 | 125 | -0.0 | 8000 | -0.0 |
| 16 | 0.0 | 250 | -0.0 | 16000 | -0.0 |
| 20 | 0.0 | 500 | -0.0 | 20000 | -0.0 |
| 25 | 0.0 | 1000 | -0.0 | | |
| 31.5 | 0.0 | 2000 | -0.0 | | |

All frequencies are nominal center values for the 1/3 octave bands

## 5. FREQUENCY RESPONSE (acoustical)

LEVEL METER function: Characteristic: Z; Input: 90 dB;

| Frequency [Hz] | 20 | 31.5 | 63 | 125 | 250 | 500 | 800 | 1000 | 2000 |
|---|---|---|---|---|---|---|---|---|---|
| Pressure Response [dB] | 0.8 | 0.6 | 0.3 | 0.2 | 0.2 | 0.2 | 0.1 | 0.0 | -0.5 |
| Free Field Response [dB] | 0.8 | 0.6 | 0.3 | 0.2 | 0.2 | 0.2 | 0.1 | 0.0 | 0.0 |

| Frequency [Hz] | 3150 | 4000 | 5000 | 6300 | 8000 | 10000 | 12500 | 16000 |
|---|---|---|---|---|---|---|---|---|
| Pressure Response [dB] | -1.4 | -2.1 | -3.0 | -4.3 | -5.8 | -7.2 | -9.1 | -11.1 |
| Free Field Response [dB] | -0.1 | 0.4 | 0.2 | 0.0 | -0.1 | -0.3 | -1.7 | -4.0 |

## 6. INTERNAL NOISE LEVEL (electrical - compensated)

LEVEL METER function; Calibration factor: 0dB

| Characteristic | Z | A | C |
|---|---|---|---|
| Level [dB] | ≤23 | ≤15 | ≤15 |

## 7. INTERNAL NOISE LEVEL (acoustical - compensated)

LEVEL METER function; Characteristic: A;

| Indication [dB] | ≤23 |
|---|---|

Noise measured in special chamber, with reference microphone G.R.A.S type 40AN No. 73421

### ENVIRONMENTAL CONDITIONS

| Temperature | Relative humidity | Ambient pressure |
|---|---|---|
| 24 °C | 36% | 989 hPa |

### TEST EQUIPMENT

| Item | Manufacturer | Model | Serial no. | Description |
|---|---|---|---|---|
| 1. | SVANTEK | SVAN 401 | 100 | Signal generator |
| 2. | SVANTEK | SVAN 912A | 4369 | Sound & Vibration Analyser |
| 3. | RIGOL | DM3068 | DM3O155100773 | Digital multimeter |
| 4. | SVANTEK | SV33B | 93171 | Acoustic calibrator |
| 5. | G.R.A.S. | 51AB | 200368 | Sound Intensity Calibrator |
| 6. | G.R.A.S. | 40BP | 93296 | ¼" Pressure Microphone |
| 7. | G.R.A.S. | 40AN | 73421 | ½" Free Field Microphone |
| 8. | SVANTEK | SL307 | - | Microphone equivalent electrical impedance (18pF) |

### CONFORMITY & TEST DECLARATION

1. Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them.
2. The acoustic calibration was performed using the Sound Calibrator and is traceable to the GUM (Central Office of Measures) reference standard - sound level calibrator type 4231 No 2292773.
3. The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
4. This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Calibration specialist: Cezary Dardziński .....

Test date: 2021-05-05

SVANTEK

ISO9001 certified

# FACTORY CALIBRATION DATA OF THE *SV 307 No. 104990*

**with microphone SVANTEK type ST30A No. 108889**

**IMEI: 355001097776701**

## 1. CALIBRATION (acoustical)

LEVEL METER function; Reference frequency: 1000Hz; Sound Pressure Level: 114.03 dB.

| Characteristic | Correct value [dB] | Indication [dB] | Error [dB] |
|---|---|---|---|
| Z | 114.03 | 114.07 | 0.04 |
| A | 114.03 | 114.07 | 0.04 |
| C | 114.03 | 114.07 | 0.04 |

Calibration measured with the microphone SVANTEK type ST30A No. 108889. Calibration factor: 0.00 dB.

## 2. LINEARITY TEST (electrical)

LEVEL METER function; Characteristic: A; $f_{nn}$= 31.5 Hz

| Nominal result LEQ [dB] | 29.0 | 30.0 | 31.0 | 35.0 | 40.0 | 60.0 | 80.0 | 85.0 |
|---|---|---|---|---|---|---|---|---|
| Error [dB] | 0.0 | 0.0 | 0.0 | -0.0 | 0.0 | 0.0 | 0.0 | -0.0 |

LEVEL METER function; Characteristic: A; $f_{nn}$= 1000 Hz

| Nominal result LEQ [dB] | 29.0 | 30.0 | 31.0 | 35.0 | 40.0 | 60.0 | 80.0 | 100.0 | 120.0 | 125.0 |
|---|---|---|---|---|---|---|---|---|---|---|
| Error [dB] | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | -0.0 |

LEVEL METER function; Characteristic: A; $f_{nn}$= 8000 Hz

| Nominal result LEQ [dB] | 29.0 | 30.0 | 31.0 | 35.0 | 40.0 | 60.0 | 80.0 | 100.0 | 120.0 | 124.0 |
|---|---|---|---|---|---|---|---|---|---|---|
| Error [dB] | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | -0.0 | 0.0 | 0.0 | -0.0 | -0.0 |

## 3. TONE BURST RESPONSE

LEVEL METER function: Characteristic: A; $f_{nn}$= 4000 Hz; Burst duration: 2s

Steady level nominal result = 122 dB

| Result | Detector | Duration [ms] | 1000 | 500 | 200 | 100 | 50 | 20 | 10 | 5 | 2 | 1 | 0.5 | 0.25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAX | Fast | Indication [dB] | 122.0 | 121.9 | 121.0 | 119.4 | 117.2 | 113.7 | 110.8 | 107.9 | 104.0 | 101.0 | 97.9 | 94.9 |
| | | Error [dB] | 0.0 | 0.0 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 | -0.0 | -0.1 | -0.1 |
| | Slow | Indication [dB] | 119.9 | 117.9 | 114.5 | 111.7 | 108.8 | 104.8 | 101.9 | 98.9 | 94.9 | - | - | - |
| | | Error [dB] | -0.0 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | - | - | - |
| SEL | - | Indication [dB] | 122.0 | 119.0 | 115.0 | 112.0 | 109.0 | 105.0 | 102.0 | 99.0 | 95.0 | 91.9 | 88.9 | 85.9 |
| | | Error [dB] | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | -0.1 | -0.1 |

Steady level nominal result = 62 dB

| Result | Detector | Duration [ms] | 1000 | 500 | 200 | 100 | 50 | 20 | 10 | 5 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MAX | Fast | Indication [dB] | 62.0 | 61.9 | 61.0 | 59.4 | 57.2 | 53.7 | 50.9 | 47.9 | 44.0 |
| | | Error [dB] | -0.0 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 |
| | Slow | Indication [dB] | 59.9 | 57.9 | 54.5 | 51.7 | 48.8 | 44.9 | 41.9 | 38.9 | 34.9 |
| | | Error [dB] | -0.1 | -0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 |
| SEL | - | Indication [dB] | 62.0 | 59.0 | 55.0 | 52.0 | 49.0 | 45.0 | 42.0 | 39.0 | 35.0 |
| | | Error [dB] | 0.0 | -0.0 | 0.0 | 0.0 | -0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

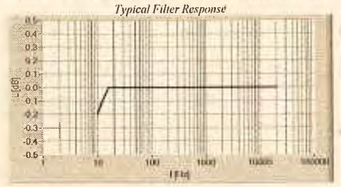
Steady level nominal result = 40 dB

| Result | Detector | Duration [ms] | 1000 | 500 | 200 |
|---|---|---|---|---|---|
| MAX | Fast | Indication [dB] | 40.0 | 39.9 | 39.0 |
| | | Error [dB] | 0.0 | 0.0 | 0.1 |
| | Slow | Indication [dB] | 38.0 | 35.9 | 32.5 |
| | | Error [dB] | -0.0 | 0.0 | -0.1 |
| SEL | - | Indication [dB] | 40.0 | 37.0 | 33.1 |
| | | Error [dB] | 0.0 | 0.0 | 0.1 |

## 4. FREQUENCY RESPONSE (electrical)

LEVEL METER function; Characteristic: Z; Input signal =122 dB;

*Typical Filter Response*




*Measured Filter Response*
*(f-frequency, L-level)*

| f [Hz] | L [dB] | f [Hz] | L [dB] | f [Hz] | L [dB] |
|---|---|---|---|---|---|
| 10 | -0.1 | 63 | 0.0 | 4000 | -0.0 |
| 12.5 | -0.0 | 125 | -0.0 | 8000 | -0.0 |
| 16 | 0.0 | 250 | 0.0 | 16000 | -0.0 |
| 20 | 0.0 | 500 | 0.0 | 20000 | -0.0 |
| 25 | 0.0 | 1000 | -0.0 | | |
| 31.5 | 0.0 | 2000 | -0.0 | | |

All frequencies are nominal center values for the 1/3 octave bands

## 5. FREQUENCY RESPONSE (acoustical)

LEVEL METER function; Characteristic: Z; Input: 90 dB;

| Frequency [Hz] | 20 | 31.5 | 63 | 125 | 250 | 500 | 800 | 1000 | 2000 |
|---|---|---|---|---|---|---|---|---|---|
| Pressure Response [dB] | 0.9 | 0.7 | 0.4 | 0.2 | 0.2 | 0.2 | 0.1 | 0.0 | -0.5 |
| Free Field Response [dB] | 0.9 | 0.7 | 0.4 | 0.2 | 0.2 | 0.2 | 0.1 | 0.0 | 0.0 |

| Frequency [Hz] | 3150 | 4000 | 5000 | 6300 | 8000 | 10000 | 12500 | 16000 |
|---|---|---|---|---|---|---|---|---|
| Pressure Response [dB] | -1.4 | -2.1 | -3.0 | -4.3 | -5.7 | -7.1 | -8.8 | -11.0 |
| Free Field Response [dB] | -0.1 | 0.4 | 0.2 | 0.1 | -0.0 | -0.4 | -1.4 | -3.5 |

## 6. INTERNAL NOISE LEVEL (electrical - compensated)

LEVEL METER function; Calibration factor: 0dB

| Characteristic | Z | A | C |
|---|---|---|---|
| Level [dB] | ≤23 | ≤15 | ≤15 |

## 7. INTERNAL NOISE LEVEL (acoustical - compensated)

LEVEL METER function; Characteristic: A;

| Indication [dB] | ≤23 |
|---|---|

Noise measured in special chamber, with reference microphone G.R.A.S type 40AN No. 73421

**ENVIRONMENTAL CONDITIONS**

| Temperature | Relative humidity | Ambient pressure |
|---|---|---|
| 22 °C | 40% | 989 hPa |

**TEST EQUIPMENT**

| Item | Manufacturer | Model | Serial no. | Description |
|---|---|---|---|---|
| 1. | SVANTEK | SVAN 401 | 100 | Signal generator |
| 2. | SVANTEK | SVAN 917A | 4369 | Sound & Vibration Analyser |
| 3. | RIGOL | DM3068 | DM3O155100273 | Digital multimeter |
| 4. | SVANTEK | SV33B | 93171 | Acoustic calibrator |
| 5. | G.R.A.S. | 51AB | 200368 | Sound Intensity Calibrator |
| 6. | G.R.A.S. | 40BP | 93796 | ½" Pressure Microphone |
| 7. | G.R.A.S. | 40AN | 73421 | ½" Free Field Microphone |
| 8. | SVANTEK | SL307 | - | Microphone equivalent electrical impedance (18pF) |

## CONFORMITY & TEST DECLARATION

1. Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them.
2. The acoustic calibration was performed using the Sound Calibrator and is traceable to the GUM (Central Office of Measures) reference standard - sound level calibrator type 4231 No 2292773.
3. The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
4. This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Calibration specialist: Cezary Dardziński .....

Test date: 2021-05-05

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

# APPENDIX 8.3

## Noise Sensitive Location Details

| Receptor ID | Description | Easting | Northing |
|---|---|---|---|
| 1 | Residential | 532659 | 753587 |
| 2 | Residential | 532173 | 755960 |
| 66 | Residential | 532929 | 753509 |
| 144 | Residential | 530451 | 753792 |
| 152 | Residential | 530590 | 752953 |
| 155 | Residential | 533979 | 752744 |
| 181 | Residential | 532272 | 752403 |
| 183 | Residential | 532074 | 753726 |
| 184 | Residential | 533012 | 754921 |
| 185 | Residential | 532873 | 754946 |
| 186 | Residential | 532797 | 754957 |
| 187 | Residential | 532753 | 753672 |
| 188 | Residential | 532715 | 755022 |
| 189 | Residential | 532630 | 755193 |
| 190 | Residential | 532630 | 755107 |
| 191 | Residential | 532614 | 755018 |
| 192 | Residential | 532563 | 755014 |
| 193 | Residential | 532829 | 753524 |
| 194 | Residential | 532536 | 755297 |
| 195 | Residential | 532849 | 753491 |
| 196 | Residential | 532061 | 755041 |
| 197 | Residential | 532165 | 755049 |
| 198 | Residential | 534218 | 753767 |
| 199 | Residential | 534292 | 753778 |
| 200 | Residential | 532906 | 753403 |
| 201 | Residential | 534190 | 753712 |
| 202 | Residential | 532377 | 755688 |
| 203 | Residential | 534017 | 753643 |
| 204 | Residential | 533962 | 753609 |
| 205 | Residential | 534061 | 753634 |
| 206 | Residential | 532203 | 755286 |
| 207 | Residential | 532347 | 755746 |
| 208 | Residential | 532272 | 755414 |
| 209 | Residential | 532236 | 755371 |
| 210 | Residential | 533542 | 756521 |
| 211 | Residential | 532990 | 753322 |
| 212 | Residential | 533486 | 756556 |
| 213 | Residential | 533041 | 753283 |
| 214 | Residential | 533881 | 753487 |
| 215 | Residential | 535653 | 754940 |
| 216 | Residential | 532232 | 755851 |
| 217 | Residential | 532194 | 752678 |
| 218 | Residential | 533239 | 756682 |
| 219 | Residential | 533984 | 753386 |
| 220 | Residential | 532214 | 752653 |
| 221 | Residential | 530810 | 755047 |
| 222 | Residential | 530833 | 753340 |
| 223 | Residential | 533075 | 753095 |
| 224 | Residential | 533012 | 753052 |
| 225 | Residential | 533326 | 756739 |
| 226 | Residential | 534979 | 756036 |
| 227 | Residential | 532165 | 756019 |
| 228 | Residential | 530520 | 753983 |
| 229 | Residential | 532128 | 755995 |
| 230 | Residential | 530733 | 753390 |
| 231 | Residential | 533106 | 756763 |
| 232 | Residential | 532965 | 756743 |
| 233 | Residential | 530631 | 753549 |
| 234 | Residential | 530568 | 753706 |
| 235 | Residential | 532099 | 756013 |
| 236 | Residential | 532078 | 755989 |
| 237 | Residential | 530632 | 753498 |
| 238 | Residential | 530676 | 753404 |
| 239 | Residential | 535027 | 756099 |
| 240 | Residential | 533059 | 752937 |
| 241 | Residential | 530453 | 753944 |
| 242 | Residential | 532939 | 756808 |
| 243 | Residential | 535114 | 756114 |
| 244 | Residential | 535161 | 756089 |
| 245 | Residential | 532877 | 756809 |
| 246 | Residential | 530461 | 753762 |
| 247 | Residential | 530676 | 755149 |
| 248 | Residential | 532868 | 756839 |
| 249 | Residential | 532160 | 756349 |
| 250 | Residential | 533067 | 752798 |
| 251 | Residential | 532922 | 756866 |
| 252 | Residential | 530364 | 753933 |
| 253 | Residential | 535950 | 755114 |
| 254 | Residential | 531809 | 756061 |
| 255 | Residential | 532162 | 756487 |
| 256 | Residential | 530575 | 755177 |
| 257 | Residential | 532494 | 756770 |
| 258 | Residential | 532426 | 756735 |
| 259 | Residential | 530587 | 755216 |
| 260 | Residential | 532642 | 756871 |
| 261 | Residential | 532166 | 756530 |
| 262 | Residential | 534029 | 752974 |
| 263 | Residential | 535987 | 755165 |

| Receptor ID | Description | Easting | Northing |
|---|---|---|---|
| 264 | Residential | 531728 | 756078 |
| 265 | Residential | 532583 | 756872 |
| 266 | Residential | 532607 | 756899 |
| 267 | Residential | 533895 | 752877 |
| 268 | Residential | 534001 | 752908 |
| 269 | Residential | 531603 | 756028 |
| 270 | Residential | 533105 | 752585 |
| 271 | Residential | 534074 | 752911 |
| 272 | Residential | 530589 | 753018 |
| 273 | Residential | 532636 | 756945 |
| 274 | Residential | 532648 | 756966 |
| 275 | Residential | 530535 | 753057 |
| 276 | Residential | 534019 | 752844 |
| 277 | Residential | 530533 | 753029 |
| 278 | Residential | 532885 | 757080 |
| 279 | Residential | 530398 | 755166 |
| 280 | Residential | 530528 | 753004 |
| 281 | Residential | 530533 | 752974 |
| 282 | Residential | 533102 | 752459 |
| 283 | Residential | 530528 | 752936 |
| 284 | Residential | 532775 | 757105 |
| 285 | Residential | 530559 | 752861 |
| 286 | Residential | 534613 | 756834 |
| 287 | Residential | 533195 | 752422 |
| 288 | Residential | 530514 | 752870 |

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# APPENDIX 8.4

## Sound Power Level Data For Wind Turbines

**Table 8.4.1: Wind Turbine (Nordex N149 5.7MW) - Sound Power Data standardised to 10m height, based on 105m hub height (with trailing edge serrations)**

| Turbine | Standardised 10 m Height Wind Speed (m/s) | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 to cut out |
| Nordex N149 5.7MW (105m Hub height)* | 94.0 | 95.2 | 99.8 | 104.2 | 105.6 | 105.6 |
| *The sound power at 105m was calculated as per the guidance in IOA supplementary guidance note 3: Sound Power Level Data, Section 5. | | | | | | |

**Table 8.4.2: Wind Turbine ((Nordex N149 5.7MW) – Typical 1/1 octave band spectrum for 63 Hz to 8 kHz, standardised to 10m height wind speeds based on 105m hub height (with trailing edge serrations),**

| 1/1 oct. band, center freq. | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|---|---|---|---|---|---|---|---|---|
| **3** | 77.1 | 83.7 | 86.6 | 87.6 | 88.0 | 86.2 | 80.5 | 71.3 |
| **4** | 78.3 | 84.9 | 87.8 | 88.8 | 89.2 | 87.4 | 81.7 | 72.5 |
| **5** | 81.1 | 87.7 | 91.4 | 93.5 | 94.8 | 92.9 | 83.3 | 75.4 |
| **6** | 85.5 | 92.1 | 95.8 | 97.9 | 99.2 | 97.3 | 87.7 | 79.8 |
| **7** | 86.9 | 93.5 | 97.2 | 99.3 | 100.6 | 98.7 | 89.1 | 81.2 |
| **8** | 87.3 | 93.5 | 97.2 | 99.8 | 100.5 | 98.0 | 90.4 | 82.4 |
| **9** | 87.3 | 93.5 | 97.2 | 99.8 | 100.5 | 98.0 | 90.4 | 82.4 |
| **10** | 87.3 | 93.5 | 97.2 | 99.8 | 100.5 | 98.0 | 90.4 | 82.4 |
| **11** | 87.3 | 93.5 | 97.2 | 99.8 | 100.5 | 98.0 | 90.4 | 82.4 |
| **12** | 87.3 | 93.5 | 97.2 | 99.8 | 100.5 | 98.0 | 90.4 | 82.4 |

**Table 8.4.3: Wind Turbine (Siemens Gamesa SG 6.6-155) - Sound Power Data standardised to 10m height, based on 105m hub height (with trailing edge serrations)**

| Turbine | | Standardised 10 m Height Wind Speed (m/s) | | | |
|---|---|---|---|---|---|
| | 4 | 5 | 6 | 7 | 8 to Cut Out |
| SG 6.6-155 | 98.8 | 102.7 | 105.0 | 105.0 | 105.0 |
| *The sound power at 105m was calculated as per the guidance in IOA supplementary guidance note 3: Sound Power Level Data, Section 5. | | | | | |

**Table 8.4.4: Wind Turbine (Siemens Gamesa SG155) – Typical 1/1 octave band spectrum for 63 Hz to 8 kHz, standardised to 10m height wind speeds based on 105m hub height (with trailing edge serrations),**

| 1/1 oct. band, center freq. | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|---|---|---|---|---|---|---|---|---|
| **4** | 78.4 | 85.8 | 90.4 | 92.7 | 92.5 | 92.8 | 86.2 | 71.2 |
| **5** | 82.3 | 89.7 | 94.3 | 96.6 | 96.4 | 96.7 | 90.1 | 75.1 |
| **6** | 83.9 | 91.4 | 96.9 | 98.6 | 99.3 | 98.6 | 92.6 | 77.1 |
| **7** | 83.9 | 91.2 | 97.0 | 98.4 | 99.6 | 98.5 | 92.7 | 76.8 |
| **8** | 86.1 | 92.3 | 97.3 | 97.6 | 99.3 | 98.9 | 93.0 | 76.1 |

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# APPENDIX 8.5

## Predicted Noise Levels From Proposed Shancloon Wind Farm at Nearby Sensitive Locations

**Results for Vestas N149**

Table 8.5.1 presents the predicted noise levels ($L_{A90}$) from wind turbines for the proposed Shancloon Wind Farm at noise sensitive locations for Standardised 10m height wind speeds of 3 m/s to 14 m/s. The numbering is not sequential as only the noise sensitive locations within the 35 dB $L_{A90}$ noise contour are presented. Commercial receptors, derelict and uninhabited dwellings were not considered.

**Table 8.5.1: Predicted noise levels ($L_{A90}$) from Shancloon Wind Farm at Noise Sensitive Locations for Standardised 10m Wind Speeds of 3 m/s to 8 m/s Nordex N149/5.7 turbine, unmitigated**

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 and above |
| 1 | 29.9 | 31.1 | 35.5 | 39.8 | 41.3 | 41.4 |
| 2 | 25.9 | 27.1 | 31.4 | 35.9 | 37.2 | 37.4 |
| 66 | 28.7 | 29.9 | 34.3 | 38.6 | 40.1 | 40.2 |
| 144 | 24.6 | 25.8 | 30.1 | 34.7 | 35.9 | 36.1 |
| 152 | 22.9 | 24.1 | 28.3 | 33 | 34.1 | 34.3 |
| 155 | 22.5 | 23.7 | 27.8 | 32.6 | 33.6 | 33.8 |
| 181 | 24 | 25.2 | 29.5 | 34.1 | 35.3 | 35.4 |
| 183 | 35.4 | 36.6 | 41.2 | 45.1 | 47 | 47.1 |
| 184 | 31 | 32.2 | 36.7 | 41 | 42.5 | 42.6 |
| 185 | 30.3 | 31.5 | 36 | 40.3 | 41.8 | 41.9 |
| 186 | 30 | 31.2 | 35.6 | 39.9 | 41.4 | 41.5 |
| 187 | 29.9 | 31.1 | 35.6 | 39.8 | 41.4 | 41.5 |
| 188 | 29.7 | 30.9 | 35.3 | 39.6 | 41.1 | 41.2 |
| 189 | 29.4 | 30.6 | 35 | 39.3 | 40.8 | 40.9 |
| 190 | 29.3 | 30.5 | 34.9 | 39.3 | 40.7 | 40.8 |
| 191 | 29.3 | 30.5 | 34.8 | 39.2 | 40.6 | 40.8 |
| 192 | 29.1 | 30.3 | 34.7 | 39.1 | 40.5 | 40.6 |
| 193 | 28.9 | 30.1 | 34.5 | 38.9 | 40.3 | 40.5 |
| 194 | 28.9 | 30.1 | 34.5 | 38.9 | 40.3 | 40.5 |
| 195 | 28.7 | 29.9 | 34.3 | 38.6 | 40.1 | 40.2 |
| 196 | 28.5 | 29.7 | 34 | 38.4 | 39.8 | 40 |
| 197 | 28.4 | 29.6 | 34 | 38.4 | 39.8 | 39.9 |
| 198 | 28.3 | 29.5 | 33.9 | 38.2 | 39.7 | 39.8 |
| 199 | 28.2 | 29.4 | 33.8 | 38.2 | 39.6 | 39.8 |
| 200 | 28.1 | 29.3 | 33.6 | 38 | 39.4 | 39.6 |
| 201 | 27.9 | 29.1 | 33.5 | 37.9 | 39.3 | 39.4 |

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 and above |
| 202 | 27.9 | 29.1 | 33.5 | 37.9 | 39.3 | 39.4 |
| 203 | 27.8 | 29 | 33.3 | 37.7 | 39.1 | 39.3 |
| 204 | 27.6 | 28.8 | 33.2 | 37.6 | 39 | 39.1 |
| 205 | 27.6 | 28.8 | 33.2 | 37.6 | 39 | 39.1 |
| 206 | 27.6 | 28.8 | 33.1 | 37.6 | 38.9 | 39.1 |
| 207 | 27.6 | 28.8 | 33.2 | 37.6 | 39 | 39.1 |
| 208 | 27.6 | 28.8 | 33.1 | 37.6 | 38.9 | 39.1 |
| 209 | 27.5 | 28.7 | 33 | 37.5 | 38.8 | 39 |
| 210 | 27.5 | 28.7 | 33.1 | 37.4 | 38.9 | 39 |
| 211 | 27.4 | 28.6 | 33 | 37.4 | 38.8 | 38.9 |
| 212 | 27.3 | 28.5 | 32.9 | 37.2 | 38.7 | 38.8 |
| 213 | 27.1 | 28.3 | 32.6 | 37.1 | 38.4 | 38.6 |
| 214 | 27 | 28.2 | 32.5 | 36.9 | 38.3 | 38.4 |
| 215 | 26.6 | 27.8 | 32.2 | 36.6 | 38 | 38.2 |
| 216 | 26.6 | 27.8 | 32.1 | 36.6 | 37.9 | 38 |
| 217 | 26.4 | 27.6 | 32 | 36.4 | 37.8 | 37.9 |
| 218 | 26.4 | 27.6 | 31.9 | 36.3 | 37.7 | 37.9 |
| 219 | 26 | 27.2 | 31.5 | 36 | 37.3 | 37.5 |
| 220 | 26.1 | 27.3 | 31.7 | 36.1 | 37.5 | 37.6 |
| 221 | 26.1 | 27.3 | 31.6 | 36 | 37.4 | 37.6 |
| 222 | 26 | 27.2 | 31.6 | 36 | 37.4 | 37.5 |
| 223 | 25.9 | 27.1 | 31.4 | 35.9 | 37.2 | 37.4 |
| 224 | 25.8 | 27 | 31.3 | 35.8 | 37.1 | 37.3 |
| 225 | 25.8 | 27 | 31.3 | 35.8 | 37.1 | 37.3 |
| 226 | 25.7 | 26.9 | 31.2 | 35.7 | 37 | 37.2 |
| 227 | 25.7 | 26.9 | 31.2 | 35.7 | 37 | 37.1 |
| 228 | 25.5 | 26.7 | 31.1 | 35.5 | 36.9 | 37 |
| 229 | 25.5 | 26.7 | 31 | 35.6 | 36.8 | 37 |
| 230 | 25.5 | 26.7 | 31.1 | 35.5 | 36.9 | 37 |
| 231 | 25.5 | 26.7 | 31.1 | 35.5 | 36.9 | 37 |
| 232 | 25.5 | 26.7 | 31 | 35.5 | 36.8 | 37 |
| 233 | 25.3 | 26.5 | 30.9 | 35.4 | 36.7 | 36.8 |
| 234 | 25.3 | 26.5 | 30.8 | 35.3 | 36.6 | 36.8 |
| 235 | 25.3 | 26.5 | 30.8 | 35.4 | 36.6 | 36.7 |
| 236 | 25.3 | 26.5 | 30.8 | 35.3 | 36.6 | 36.7 |
| 237 | 25.2 | 26.4 | 30.7 | 35.2 | 36.5 | 36.7 |

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 and above |
| 238 | 25.2 | 26.4 | 30.7 | 35.2 | 36.5 | 36.6 |
| 239 | 25.1 | 26.3 | 30.6 | 35.2 | 36.4 | 36.6 |
| 240 | 25.1 | 26.3 | 30.5 | 35.1 | 36.3 | 36.5 |
| 241 | 24.9 | 26.1 | 30.4 | 35 | 36.2 | 36.4 |
| 242 | 24.9 | 26.1 | 30.4 | 34.9 | 36.2 | 36.3 |
| 243 | 24.7 | 25.9 | 30.2 | 34.8 | 36 | 36.2 |
| 244 | 24.8 | 26 | 30.2 | 34.8 | 36 | 36.2 |
| 245 | 24.7 | 25.9 | 30.2 | 34.8 | 36 | 36.2 |
| 246 | 24.6 | 25.8 | 30.1 | 34.7 | 35.9 | 36.1 |
| 247 | 24.5 | 25.7 | 30 | 34.6 | 35.8 | 36 |
| 248 | 24.5 | 25.7 | 30 | 34.5 | 35.8 | 35.9 |
| 249 | 24.4 | 25.6 | 29.8 | 34.5 | 35.6 | 35.8 |
| 250 | 24.3 | 25.5 | 29.8 | 34.4 | 35.6 | 35.7 |
| 251 | 24.4 | 25.6 | 29.9 | 34.5 | 35.7 | 35.8 |
| 252 | 24.2 | 25.4 | 29.7 | 34.3 | 35.5 | 35.7 |
| 253 | 23.9 | 25.1 | 29.3 | 33.9 | 35.1 | 35.3 |
| 254 | 23.9 | 25.1 | 29.3 | 34 | 35.1 | 35.2 |
| 255 | 23.8 | 25 | 29.2 | 33.9 | 35 | 35.2 |
| 256 | 23.8 | 25 | 29.2 | 33.8 | 35 | 35.2 |
| 257 | 23.8 | 25 | 29.2 | 33.8 | 35 | 35.2 |
| 258 | 23.7 | 24.9 | 29.1 | 33.8 | 34.9 | 35.1 |
| 259 | 23.7 | 24.9 | 29.1 | 33.7 | 34.9 | 35.1 |
| 260 | 23.6 | 24.8 | 29.1 | 33.7 | 34.9 | 35 |
| 261 | 23.6 | 24.8 | 29 | 33.7 | 34.8 | 35 |
| 262 | 23.5 | 24.7 | 28.9 | 33.6 | 34.7 | 34.9 |
| 263 | 23.5 | 24.7 | 29 | 33.6 | 34.8 | 35 |
| 264 | 23.5 | 24.7 | 28.9 | 33.6 | 34.7 | 34.9 |
| 265 | 23.4 | 24.6 | 28.9 | 33.5 | 34.7 | 34.8 |
| 266 | 23.3 | 24.5 | 28.8 | 33.4 | 34.6 | 34.7 |
| 267 | 23.3 | 24.5 | 28.6 | 33.4 | 34.4 | 34.6 |
| 268 | 23.2 | 24.4 | 28.6 | 33.3 | 34.4 | 34.6 |
| 269 | 23.3 | 24.5 | 28.6 | 33.4 | 34.4 | 34.6 |
| 270 | 23.2 | 24.4 | 28.6 | 33.3 | 34.4 | 34.5 |
| 271 | 23.1 | 24.3 | 28.5 | 33.2 | 34.3 | 34.5 |
| 272 | 23.2 | 24.4 | 28.6 | 33.2 | 34.4 | 34.6 |
| 273 | 23.1 | 24.3 | 28.5 | 33.2 | 34.3 | 34.5 |

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 and above |
| 274 | 23 | 24.2 | 28.4 | 33.1 | 34.2 | 34.4 |
| 275 | 23 | 24.2 | 28.4 | 33.1 | 34.2 | 34.4 |
| 276 | 22.9 | 24.1 | 28.2 | 33 | 34 | 34.2 |
| 277 | 22.9 | 24.1 | 28.3 | 33 | 34.1 | 34.3 |
| 278 | 22.8 | 24 | 28.2 | 32.9 | 34 | 34.2 |
| 279 | 22.8 | 24 | 28.2 | 32.9 | 34 | 34.2 |
| 280 | 22.8 | 24 | 28.2 | 32.9 | 34 | 34.1 |
| 281 | 22.7 | 23.9 | 28.1 | 32.8 | 33.9 | 34.1 |
| 282 | 22.6 | 23.8 | 27.9 | 32.7 | 33.7 | 33.9 |
| 283 | 22.5 | 23.7 | 27.9 | 32.6 | 33.7 | 33.9 |
| 284 | 22.5 | 23.7 | 27.8 | 32.6 | 33.6 | 33.8 |
| 285 | 22.4 | 23.6 | 27.8 | 32.5 | 33.6 | 33.7 |
| 286 | 22.3 | 23.5 | 27.7 | 32.5 | 33.5 | 33.6 |
| 287 | 22.3 | 23.5 | 27.6 | 32.4 | 33.4 | 33.6 |
| 288 | 22.2 | 23.4 | 27.6 | 32.3 | 33.4 | 33.5 |

**Table 8.5.1: Predicted noise levels ($L_{A90}$) from Shancloon Wind Farm at Noise Sensitive Locations for Standardised 10m Wind Speeds of 3 m/s to 8 m/s Nordex 149/5.7 turbine, with mitigation at 6m/s**

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 and above |
| 1 | 29.9 | 31.1 | 35.5 | 39.1 | 41.3 | 41.4 |
| 2 | 25.9 | 27.1 | 31.4 | 35.2 | 37.2 | 37.4 |
| 66 | 28.7 | 29.9 | 34.3 | 37.4 | 40.1 | 40.2 |
| 144 | 24.6 | 25.8 | 30.1 | 34.5 | 35.9 | 36.1 |
| 152 | 22.9 | 24.1 | 28.3 | 32.8 | 34.1 | 34.3 |
| 155 | 22.5 | 23.7 | 27.8 | 31.6 | 33.6 | 33.8 |
| 181 | 24 | 25.2 | 29.5 | 33.7 | 35.3 | 35.4 |
| 183 | 35.4 | 36.6 | 41.2 | 45 | 47 | 47.1 |
| 184 | 31 | 32.2 | 36.7 | 39.4 | 42.5 | 42.6 |
| 185 | 30.3 | 31.5 | 36 | 38.8 | 41.8 | 41.9 |
| 186 | 30 | 31.2 | 35.6 | 38.6 | 41.4 | 41.5 |
| 187 | 29.9 | 31.1 | 35.6 | 38.9 | 41.4 | 41.5 |

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 and above |
| 188 | 29.7 | 30.9 | 35.3 | 38.4 | 41.1 | 41.2 |
| 189 | 29.4 | 30.6 | 35 | 38.2 | 40.8 | 40.9 |
| 190 | 29.3 | 30.5 | 34.9 | 38.2 | 40.7 | 40.8 |
| 191 | 29.3 | 30.5 | 34.8 | 38.1 | 40.6 | 40.8 |
| 192 | 29.1 | 30.3 | 34.7 | 38 | 40.5 | 40.6 |
| 193 | 28.9 | 30.1 | 34.5 | 37.9 | 40.3 | 40.5 |
| 194 | 28.9 | 30.1 | 34.5 | 37.9 | 40.3 | 40.5 |
| 195 | 28.7 | 29.9 | 34.3 | 37.6 | 40.1 | 40.2 |
| 196 | 28.5 | 29.7 | 34 | 37.9 | 39.8 | 40 |
| 197 | 28.4 | 29.6 | 34 | 37.8 | 39.8 | 39.9 |
| 198 | 28.3 | 29.5 | 33.9 | 37.4 | 39.7 | 39.8 |
| 199 | 28.2 | 29.4 | 33.8 | 37.4 | 39.6 | 39.8 |
| 200 | 28.1 | 29.3 | 33.6 | 37 | 39.4 | 39.6 |
| 201 | 27.9 | 29.1 | 33.5 | 37 | 39.3 | 39.4 |
| 202 | 27.9 | 29.1 | 33.5 | 37.1 | 39.3 | 39.4 |
| 203 | 27.8 | 29 | 33.3 | 36.6 | 39.1 | 39.3 |
| 204 | 27.6 | 28.8 | 33.2 | 36.4 | 39 | 39.1 |
| 205 | 27.6 | 28.8 | 33.2 | 36.5 | 39 | 39.1 |
| 206 | 27.6 | 28.8 | 33.1 | 36.9 | 38.9 | 39.1 |
| 207 | 27.6 | 28.8 | 33.2 | 36.8 | 39 | 39.1 |
| 208 | 27.6 | 28.8 | 33.1 | 36.8 | 38.9 | 39.1 |
| 209 | 27.5 | 28.7 | 33 | 36.7 | 38.8 | 39 |
| 210 | 27.5 | 28.7 | 33.1 | 36.5 | 38.9 | 39 |
| 211 | 27.4 | 28.6 | 33 | 36.3 | 38.8 | 38.9 |
| 212 | 27.3 | 28.5 | 32.9 | 36.3 | 38.7 | 38.8 |
| 213 | 27.1 | 28.3 | 32.6 | 36 | 38.4 | 38.6 |
| 214 | 27 | 28.2 | 32.5 | 35.7 | 38.3 | 38.4 |
| 215 | 26.6 | 27.8 | 32.2 | 36.3 | 38 | 38.2 |
| 216 | 26.6 | 27.8 | 32.1 | 35.8 | 37.9 | 38 |
| 217 | 26.4 | 27.6 | 32 | 36.1 | 37.8 | 37.9 |
| 218 | 26.4 | 27.6 | 31.9 | 35.5 | 37.7 | 37.9 |
| 219 | 26 | 27.2 | 31.5 | 34.9 | 37.3 | 37.5 |
| 220 | 26.1 | 27.3 | 31.7 | 35.8 | 37.5 | 37.6 |
| 221 | 26.1 | 27.3 | 31.6 | 35.9 | 37.4 | 37.6 |
| 222 | 26 | 27.2 | 31.6 | 35.9 | 37.4 | 37.5 |
| 223 | 25.9 | 27.1 | 31.4 | 35 | 37.2 | 37.4 |

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 and above |
| 224 | 25.8 | 27 | 31.3 | 35 | 37.1 | 37.3 |
| 225 | 25.8 | 27 | 31.3 | 34.9 | 37.1 | 37.3 |
| 226 | 25.7 | 26.9 | 31.2 | 35 | 37 | 37.2 |
| 227 | 25.7 | 26.9 | 31.2 | 34.9 | 37 | 37.1 |
| 228 | 25.5 | 26.7 | 31.1 | 35.4 | 36.9 | 37 |
| 229 | 25.5 | 26.7 | 31 | 34.8 | 36.8 | 37 |
| 230 | 25.5 | 26.7 | 31.1 | 35.4 | 36.9 | 37 |
| 231 | 25.5 | 26.7 | 31.1 | 34.7 | 36.9 | 37 |
| 232 | 25.5 | 26.7 | 31 | 34.7 | 36.8 | 37 |
| 233 | 25.3 | 26.5 | 30.9 | 35.2 | 36.7 | 36.8 |
| 234 | 25.3 | 26.5 | 30.8 | 35.2 | 36.6 | 36.8 |
| 235 | 25.3 | 26.5 | 30.8 | 34.6 | 36.6 | 36.7 |
| 236 | 25.3 | 26.5 | 30.8 | 34.6 | 36.6 | 36.7 |
| 237 | 25.2 | 26.4 | 30.7 | 35.1 | 36.5 | 36.7 |
| 238 | 25.2 | 26.4 | 30.7 | 35 | 36.5 | 36.6 |
| 239 | 25.1 | 26.3 | 30.6 | 34.5 | 36.4 | 36.6 |
| 240 | 25.1 | 26.3 | 30.5 | 34.3 | 36.3 | 36.5 |
| 241 | 24.9 | 26.1 | 30.4 | 34.8 | 36.2 | 36.4 |
| 242 | 24.9 | 26.1 | 30.4 | 34.1 | 36.2 | 36.3 |
| 243 | 24.7 | 25.9 | 30.2 | 34.1 | 36 | 36.2 |
| 244 | 24.8 | 26 | 30.2 | 34.1 | 36 | 36.2 |
| 245 | 24.7 | 25.9 | 30.2 | 33.9 | 36 | 36.2 |
| 246 | 24.6 | 25.8 | 30.1 | 34.5 | 35.9 | 36.1 |
| 247 | 24.5 | 25.7 | 30 | 34.3 | 35.8 | 36 |
| 248 | 24.5 | 25.7 | 30 | 33.7 | 35.8 | 35.9 |
| 249 | 24.4 | 25.6 | 29.8 | 33.7 | 35.6 | 35.8 |
| 250 | 24.3 | 25.5 | 29.8 | 33.6 | 35.6 | 35.7 |
| 251 | 24.4 | 25.6 | 29.9 | 33.6 | 35.7 | 35.8 |
| 252 | 24.2 | 25.4 | 29.7 | 34.1 | 35.5 | 35.7 |
| 253 | 23.9 | 25.1 | 29.3 | 33.5 | 35.1 | 35.3 |
| 254 | 23.9 | 25.1 | 29.3 | 33.3 | 35.1 | 35.2 |
| 255 | 23.8 | 25 | 29.2 | 33.1 | 35 | 35.2 |
| 256 | 23.8 | 25 | 29.2 | 33.6 | 35 | 35.2 |
| 257 | 23.8 | 25 | 29.2 | 33 | 35 | 35.2 |
| 258 | 23.7 | 24.9 | 29.1 | 32.9 | 34.9 | 35.1 |
| 259 | 23.7 | 24.9 | 29.1 | 33.5 | 34.9 | 35.1 |

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 and above |
| 260 | 23.6 | 24.8 | 29.1 | 32.9 | 34.9 | 35 |
| 261 | 23.6 | 24.8 | 29 | 32.9 | 34.8 | 35 |
| 262 | 23.5 | 24.7 | 28.9 | 32.6 | 34.7 | 34.9 |
| 263 | 23.5 | 24.7 | 29 | 33.2 | 34.8 | 35 |
| 264 | 23.5 | 24.7 | 28.9 | 32.9 | 34.7 | 34.9 |
| 265 | 23.4 | 24.6 | 28.9 | 32.7 | 34.7 | 34.8 |
| 266 | 23.3 | 24.5 | 28.8 | 32.6 | 34.6 | 34.7 |
| 267 | 23.3 | 24.5 | 28.6 | 32.3 | 34.4 | 34.6 |
| 268 | 23.2 | 24.4 | 28.6 | 32.3 | 34.4 | 34.6 |
| 269 | 23.3 | 24.5 | 28.6 | 32.8 | 34.4 | 34.6 |
| 270 | 23.2 | 24.4 | 28.6 | 32.5 | 34.4 | 34.5 |
| 271 | 23.1 | 24.3 | 28.5 | 32.2 | 34.3 | 34.5 |
| 272 | 23.2 | 24.4 | 28.6 | 33 | 34.4 | 34.6 |
| 273 | 23.1 | 24.3 | 28.5 | 32.4 | 34.3 | 34.5 |
| 274 | 23 | 24.2 | 28.4 | 32.3 | 34.2 | 34.4 |
| 275 | 23 | 24.2 | 28.4 | 32.9 | 34.2 | 34.4 |
| 276 | 22.9 | 24.1 | 28.2 | 32 | 34 | 34.2 |
| 277 | 22.9 | 24.1 | 28.3 | 32.8 | 34.1 | 34.3 |
| 278 | 22.8 | 24 | 28.2 | 32 | 34 | 34.2 |
| 279 | 22.8 | 24 | 28.2 | 32.6 | 34 | 34.2 |
| 280 | 22.8 | 24 | 28.2 | 32.7 | 34 | 34.1 |
| 281 | 22.7 | 23.9 | 28.1 | 32.6 | 33.9 | 34.1 |
| 282 | 22.6 | 23.8 | 27.9 | 32 | 33.7 | 33.9 |
| 283 | 22.5 | 23.7 | 27.9 | 32.4 | 33.7 | 33.9 |
| 284 | 22.5 | 23.7 | 27.8 | 31.7 | 33.6 | 33.8 |
| 285 | 22.4 | 23.6 | 27.8 | 32.3 | 33.6 | 33.7 |
| 286 | 22.3 | 23.5 | 27.7 | 31.4 | 33.5 | 33.6 |
| 287 | 22.3 | 23.5 | 27.6 | 31.6 | 33.4 | 33.6 |
| 288 | 22.2 | 23.4 | 27.6 | 32.1 | 33.4 | 33.5 |

**Table 8.5.2: Predicted noise levels ($L_{A90}$) from Shancloon Wind Farm at Noise Sensitive Locations for Standardised 10m Wind Speeds of 4 m/s to 8 m/s Siemens Gamesa SG155-6.6, 102.5m hub height, unmitigated**

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | |
|---|---|---|---|---|---|
| | 4 | 5 | 6 | 7 | 8 and above |
| 1 | 34.2 | 38.1 | 40.1 | 40.4 | 40.3 |
| 2 | 30 | 33.9 | 36.2 | 36.3 | 36.2 |
| 66 | 32.9 | 36.8 | 38.9 | 39.2 | 39.1 |
| 144 | 28.8 | 32.7 | 34.9 | 35 | 35 |
| 152 | 27 | 30.9 | 33.2 | 33.2 | 33.2 |
| 155 | 26.4 | 30.3 | 32.7 | 32.6 | 32.7 |
| 181 | 28.1 | 32 | 34.3 | 34.3 | 34.3 |
| 183 | 39.9 | 43.8 | 45.8 | 46.2 | 46.1 |
| 184 | 35.4 | 39.3 | 41.3 | 41.6 | 41.5 |
| 185 | 34.6 | 38.5 | 40.6 | 40.9 | 40.8 |
| 186 | 34.2 | 38.1 | 40.2 | 40.5 | 40.4 |
| 187 | 34.2 | 38.1 | 40.2 | 40.5 | 40.4 |
| 188 | 33.9 | 37.8 | 39.9 | 40.1 | 40.1 |
| 189 | 33.6 | 37.5 | 39.6 | 39.9 | 39.8 |
| 190 | 33.5 | 37.4 | 39.6 | 39.8 | 39.7 |
| 191 | 33.5 | 37.4 | 39.5 | 39.7 | 39.7 |
| 192 | 33.3 | 37.2 | 39.3 | 39.6 | 39.5 |
| 193 | 33.2 | 37.1 | 39.2 | 39.4 | 39.4 |
| 194 | 33.2 | 37.1 | 39.2 | 39.4 | 39.4 |
| 195 | 32.9 | 36.8 | 39 | 39.2 | 39.1 |
| 196 | 32.7 | 36.6 | 38.7 | 38.9 | 38.9 |
| 197 | 32.6 | 36.5 | 38.6 | 38.8 | 38.8 |
| 198 | 32.5 | 36.4 | 38.6 | 38.8 | 38.7 |
| 199 | 32.5 | 36.4 | 38.5 | 38.7 | 38.7 |
| 200 | 32.3 | 36.2 | 38.3 | 38.5 | 38.5 |
| 201 | 32.1 | 36 | 38.2 | 38.4 | 38.3 |
| 202 | 32.1 | 36 | 38.2 | 38.4 | 38.3 |
| 203 | 32 | 35.9 | 38 | 38.2 | 38.2 |
| 204 | 31.8 | 35.7 | 37.9 | 38.1 | 38 |
| 205 | 31.8 | 35.7 | 37.8 | 38 | 38 |
| 206 | 31.8 | 35.7 | 37.8 | 38 | 38 |
| 207 | 31.8 | 35.7 | 37.9 | 38 | 38 |
| 208 | 31.7 | 35.6 | 37.8 | 38 | 37.9 |

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | |
|---|---|---|---|---|---|
| | 4 | 5 | 6 | 7 | 8 and above |
| 209 | 31.7 | 35.6 | 37.7 | 37.9 | 37.9 |
| 210 | 31.7 | 35.6 | 37.7 | 38 | 37.9 |
| 211 | 31.6 | 35.5 | 37.7 | 37.8 | 37.8 |
| 212 | 31.5 | 35.4 | 37.5 | 37.8 | 37.7 |
| 213 | 31.2 | 35.1 | 37.3 | 37.5 | 37.4 |
| 214 | 31.1 | 35 | 37.2 | 37.4 | 37.3 |
| 215 | 30.9 | 34.8 | 36.9 | 37.1 | 37.1 |
| 216 | 30.7 | 34.6 | 36.8 | 37 | 36.9 |
| 217 | 30.6 | 34.5 | 36.7 | 36.9 | 36.8 |
| 218 | 30.6 | 34.5 | 36.6 | 36.8 | 36.8 |
| 219 | 30.2 | 34.1 | 36.3 | 36.4 | 36.4 |
| 220 | 30.3 | 34.2 | 36.4 | 36.6 | 36.5 |
| 221 | 30.3 | 34.2 | 36.3 | 36.5 | 36.5 |
| 222 | 30.2 | 34.1 | 36.3 | 36.5 | 36.4 |
| 223 | 30 | 33.9 | 36.2 | 36.3 | 36.2 |
| 224 | 29.9 | 33.8 | 36.1 | 36.2 | 36.1 |
| 225 | 30 | 33.9 | 36.1 | 36.2 | 36.2 |
| 226 | 29.9 | 33.8 | 36 | 36.1 | 36.1 |
| 227 | 29.8 | 33.7 | 35.9 | 36 | 36 |
| 228 | 29.7 | 33.6 | 35.8 | 35.9 | 35.9 |
| 229 | 29.7 | 33.6 | 35.8 | 35.9 | 35.8 |
| 230 | 29.7 | 33.6 | 35.8 | 35.9 | 35.9 |
| 231 | 29.7 | 33.6 | 35.8 | 35.9 | 35.9 |
| 232 | 29.7 | 33.6 | 35.7 | 35.9 | 35.8 |
| 233 | 29.5 | 33.4 | 35.6 | 35.7 | 35.7 |
| 234 | 29.5 | 33.4 | 35.6 | 35.7 | 35.7 |
| 235 | 29.4 | 33.3 | 35.6 | 35.6 | 35.6 |
| 236 | 29.4 | 33.3 | 35.5 | 35.6 | 35.6 |
| 237 | 29.3 | 33.2 | 35.4 | 35.6 | 35.5 |
| 238 | 29.3 | 33.2 | 35.4 | 35.5 | 35.5 |
| 239 | 29.3 | 33.2 | 35.4 | 35.5 | 35.5 |
| 240 | 29.2 | 33.1 | 35.3 | 35.4 | 35.4 |
| 241 | 29.1 | 33 | 35.2 | 35.3 | 35.3 |
| 242 | 29 | 32.9 | 35.1 | 35.2 | 35.2 |
| 243 | 28.9 | 32.8 | 35 | 35.1 | 35.1 |
| 244 | 28.9 | 32.8 | 35 | 35.1 | 35.1 |

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | |
|---|---|---|---|---|---|
| | 4 | 5 | 6 | 7 | 8 and above |
| 245 | 28.9 | 32.8 | 35 | 35.1 | 35.1 |
| 246 | 28.8 | 32.7 | 34.9 | 35 | 35 |
| 247 | 28.7 | 32.6 | 34.8 | 34.9 | 34.9 |
| 248 | 28.6 | 32.5 | 34.7 | 34.8 | 34.8 |
| 249 | 28.5 | 32.4 | 34.7 | 34.7 | 34.7 |
| 250 | 28.4 | 32.3 | 34.6 | 34.6 | 34.6 |
| 251 | 28.5 | 32.4 | 34.6 | 34.7 | 34.7 |
| 252 | 28.3 | 32.2 | 34.5 | 34.6 | 34.5 |
| 253 | 28 | 31.9 | 34.1 | 34.2 | 34.2 |
| 254 | 27.9 | 31.8 | 34.1 | 34.1 | 34.1 |
| 255 | 27.9 | 31.8 | 34.1 | 34.1 | 34.1 |
| 256 | 27.9 | 31.8 | 34 | 34.1 | 34.1 |
| 257 | 27.8 | 31.7 | 34 | 34 | 34 |
| 258 | 27.8 | 31.7 | 33.9 | 34 | 34 |
| 259 | 27.8 | 31.7 | 33.9 | 34 | 34 |
| 260 | 27.7 | 31.6 | 33.9 | 33.9 | 33.9 |
| 261 | 27.7 | 31.6 | 33.9 | 33.9 | 33.9 |
| 262 | 27.5 | 31.4 | 33.8 | 33.7 | 33.8 |
| 263 | 27.6 | 31.5 | 33.8 | 33.9 | 33.8 |
| 264 | 27.5 | 31.4 | 33.8 | 33.7 | 33.7 |
| 265 | 27.5 | 31.4 | 33.7 | 33.7 | 33.7 |
| 266 | 27.4 | 31.3 | 33.6 | 33.6 | 33.6 |
| 267 | 27.3 | 31.2 | 33.5 | 33.5 | 33.5 |
| 268 | 27.2 | 31.1 | 33.5 | 33.4 | 33.5 |
| 269 | 27.3 | 31.2 | 33.5 | 33.5 | 33.5 |
| 270 | 27.2 | 31.1 | 33.5 | 33.4 | 33.4 |
| 271 | 27.1 | 31 | 33.4 | 33.3 | 33.3 |
| 272 | 27.2 | 31.1 | 33.4 | 33.4 | 33.4 |
| 273 | 27.2 | 31.1 | 33.4 | 33.4 | 33.4 |
| 274 | 27.1 | 31 | 33.3 | 33.3 | 33.3 |
| 275 | 27.1 | 31 | 33.3 | 33.3 | 33.3 |
| 276 | 26.9 | 30.8 | 33.1 | 33.1 | 33.1 |
| 277 | 26.9 | 30.8 | 33.1 | 33.1 | 33.1 |
| 278 | 26.8 | 30.7 | 33.1 | 33 | 33.1 |
| 279 | 26.8 | 30.7 | 33.1 | 33 | 33 |
| 280 | 26.8 | 30.7 | 33 | 33 | 33 |

| Receptor ID | Predicted Noise Level (dB $L_{A90}$) at Standardised 10m Height Wind Speeds (m/s) | | | | |
|---|---|---|---|---|---|
| | 4 | 5 | 6 | 7 | 8 and above |
| 281 | 26.7 | 30.6 | 32.9 | 32.9 | 32.9 |
| 282 | 26.6 | 30.5 | 32.9 | 32.8 | 32.8 |
| 283 | 26.6 | 30.5 | 32.8 | 32.7 | 32.8 |
| 284 | 26.5 | 30.4 | 32.7 | 32.7 | 32.7 |
| 285 | 26.4 | 30.3 | 32.6 | 32.6 | 32.6 |
| 286 | 26.3 | 30.2 | 32.6 | 32.5 | 32.5 |
| 287 | 26.2 | 30.1 | 32.5 | 32.4 | 32.4 |
| 288 | 26.2 | 30.1 | 32.5 | 32.4 | 32.4 |