



Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

Project **FORTH REPLACEMENT CROSSING**

Document title

CONSTRUCTION NOISE MONITORING REPORT: DECEMBER 2014

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1 Introduction

- 1.1** Monitoring of construction noise is being undertaken by FCBC during the construction of the new Forth Crossing and the associated road network. This report covers the month of December 2014. The objective of this report is to detail the monitoring that has been undertaken across the site during this period and to present the construction noise monitoring results acquired for December 2014.
- 1.2** Monitoring of construction noise has been undertaken in accordance with the Code of Construction Practice (CoCP) and the Noise and Vibration Management Plan (NVMP).

2 Noise Monitoring Locations

- 2.1** During December 2014, construction noise was monitored using permanent, continuous noise monitoring devices at the locations listed in Table 1. The majority of the monitors were installed throughout November and December 2011, with additional monitors installed at Scotstoun Park (Arup's Office) and Newton during March 2012 and a further sound level meter installed at Whinny Hill during March 2012.
- 2.2** At some monitoring locations, the noise monitoring devices are accompanied by associated weather stations. Weather stations are present at Echline Field, Tigh-Na-Grian, Clufflat Brae, Dundas Home Farm, Butlaw Fisheries, Linn Mill and Whinny Hill.
- 2.3** Various construction works were undertaken across the site during December 2014. The main construction activities undertaken in the locality of each of the noise meters during the period have been listed in Table 1.

Table 1: Monitoring Locations

Ref.	Monitoring Location	Crossing or Network	Main Construction Activities During December 2014
M1	Whinny Hill	Network	<ul style="list-style-type: none"> • Verge filling • Rock excavation • CMC works
M3	Tigh-Na-Grian	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork, concreting works deck table installation works • North Tower rebar, formwork, concreting works deck table installation works • Pier N1 rebar formwork & concrete works
M4	North Leg	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork, concreting works deck table installation works • North Tower rebar, formwork, concreting works deck table installation works • Pier N1 rebar formwork & concrete works
M6	Port Edgar	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork, concreting works deck table installation works • South Tower rebar, formwork, concreting works deck table installation works • Pier S1 de-stressing wells work • Pier S2 excavation • Pier S3 foundation works, rebar, formwork & concreting works including hydro demolition. • Bearing fitting at Piers S4
M7	Butlaw Fisheries	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork, concreting works deck table installation works • South Tower rebar, formwork, concreting works deck table installation works • Pier S1 de-stressing wells work • Pier S2 excavation • Pier S3 foundation works, rebar, formwork & concreting works including hydro demolition. • Bearing fitting at Piers S4 •
M10	Inchgarvie Lodge	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork, concreting works deck table installation works • South Tower rebar, formwork, concreting works deck table installation works • Pier S1 foundation works • Pier S2 excavation • Pier S3 foundation works, rebar, formwork & concreting works including hydro demolition. • Bearing fitting at Piers S4 • Launch – install plates to props, king post works and structural steel works
M11	Linn Mill	Network (close proximity to)	<ul style="list-style-type: none"> • Launch – install plates to props, king post works and structural steel works • Bearing fitting at Piers S4

		Crossing)	<ul style="list-style-type: none"> • N.B. No night time or Sunday daytime construction in vicinity.
M13	Clufflat Brae	Crossing	<ul style="list-style-type: none"> • Launch – install plates to props, king post works and structural steel works • N.B. No night time or Sunday daytime construction in vicinity.
M14	Springfield	Network	<ul style="list-style-type: none"> • Launch – install plates to props, king post works and structural steel works <p>N.B. No night time or Sunday daytime construction in vicinity.</p>
M15	Echline Field	Network	<ul style="list-style-type: none"> • Launch – install plates to props, king post works and structural steel works • A904 tie in road works, including verge fill, kerbing and placing/trimming of type 1 sub-base for footpath
M16	Scotstoun	Network	<ul style="list-style-type: none"> • Utilities works • Structure works • Gantry installation • Safety Barrier installation • ESQ04 Construction • B800 North road works including duct crossings etc
M17	Dundas Home Farm	Network	<ul style="list-style-type: none"> • Utility works • Fill south bund/landscape • BP Speciality works • ESQ04 Construction
M18	Newton	Network	<ul style="list-style-type: none"> • No works

3 Noise Monitoring Results

3.1 All noise monitoring results for construction days have been presented in charts using the template provided in the Construction Noise Monitoring Information Note, as available on the project website (http://www.transportscotland.gov.uk/files/documents/projects/forth-replacement/FRC_Construction_Noise_Monitoring_Information_Note_2_.pdf). All charts can be found in the appendices of this report.

3.2 With regard to the noise monitoring results charts, the following should be noted:

- All locations are considered as either 'Main Crossing' or 'Network Connections', as set out in Table 1. Main Crossing works are undertaken during the day, evening and night time periods. Network connection works, however, are undertaken during the daytime only. The inclusion of data in the graphs reflects this. Although Linn Mill is considered as a network location, the potential for marine works near the south shore to be heard has been recognised. As a result, evening and night time data has been included for this location although no network connection construction activities have been undertaken during these periods.
- Noise data for days, evening and nights on which no construction works were conducted have been excluded from the monthly average results presented in the graph. Additionally, no investigations into the L_{AFmax} exceedances during these periods have been made as they would have been caused by non-construction related factors. However, noise results (L_{Aeq} and L_{AFmax}) for any days, evenings and nights on which no construction works have been conducted have been presented in the graphs in greyed out areas.
- An average for Sunday construction noise data has been included on the graphs where applicable; in locations where no Sunday works have been undertaken no average is shown.
- As set out in the CoCP, the assessment time for evening, nights and Sunday daytime is 1 hour periods. To present the construction noise results for these periods, therefore, the maximum L_{AFmax} (fast time response) and maximum L_{Aeq} within the overall evening/night time period has been taken. It should be noted, therefore, that the average shown for these periods is an average of only the highest L_{Aeq} results.

- Where noise data is missing for days, evening or nights during which construction works were conducted, this has been indicated. Results for Northleg are unavailable due to inaccessibility of the location. Springfield location were temporarily down due to logistical difficulties and will be reinstated imminently.
- 3.3** Results demonstrate that the monthly average total construction noise results for daytime were within the threshold levels for all monitoring locations for December 2014, with the exception of Scotstoun. For the evening period, all monitoring locations were within the threshold levels. For the night time periods, there were exceedances at location; Butlaw Fisheries. With regard to the Sunday averages (for applicable monitoring locations), there were exceedances of Sunday averages at Butlaw Fisheries.
- 3.4** The exceedances noted are not thought to have been caused by increased noise levels due to construction. Each of the exceedances of the averages and Sunday averages, with the exception of the daytime averages at Scotstoun, were found to be affected by increased noise levels due to traffic. Audio demonstrates that the increased levels were caused by waves and birds at Butlaw Fisheries and raindrops at Linn Mill have also contributing to increased levels at these locations. Inchgarvie Lodge had a number of exceedances due to residential activity. With regard to the averages reported for evening, night time and Sunday periods, it should be noted that these averages are based only on the highest L_{Aeq} levels for 1 hour periods which can affect the averages.
- 3.5** The exceedance of the daytime average at Scotstoun is due to increased background noise levels due to the location of the meter directly adjacent to the road. The average for December is consistent with levels for previous months.
- 3.6** During December 2014, some exceedances of the maximum noise thresholds also occurred. Each exceedance of the threshold was investigated using triggered audio recordings, records of construction works (i.e. site programmes and diaries and daily marine reports) and analysis of weather station data, where required. A Noise and Vibration Investigative Report (NVIR) spread sheet has been produced detailing the results of the investigation for each exceedance. Where the exceedances are due to construction works, a detailed NVIR has been completed which details the results of the investigation in addition to any additional mitigation measures required.
- 3.7** The majority of exceedances at all locations were caused by factors including periods localised noises at nearby properties and bird calls. At some locations, notably Scotstoun and Echline, existing traffic noise had an effect on maximum noise levels during the period covered in this report. Butlaw Fisheries also records a high number of waves against the shore during times of high tide.

3.8 A summary of the findings for exceedances occurring at each of the locations can be found in Table 2.

3.9 Table 2: Summary of Exceedances at Monitoring Locations

Monitoring Location	Summary of Exceedance Details
Butlaw Fisheries	During December the maximum noise threshold was exceeded on 24 occasions (daytime, 5; evening, 4; night time, 15) The majority of exceedances were attributed to non-construction factors, including waves, planes, cars and birds.
Clufflat Brae	During December the maximum noise threshold was exceeded on 40 occasions (daytime, 12; evening, 12; night time, 16). No exceedances were found to be due to construction works. Exceedances were found to be largely due to birds and residential activity.
Inchgarvie Lodge	During December the maximum noise threshold was exceeded on 29 occasions (daytime, 11; evening, 5; night time, 13). No exceedances were attributed to construction works. Investigations found residential activities and birds to be the main contributing factors to the exceedances at this location.
Linn Mill	During December the maximum noise threshold was exceeded on 45 occasions (daytime, 13; evening, 12; night time, 20). 1 construction related exceedance was recorded at this location during the day time due to movement of material opposite the monitor and concrete wagon movement through Echline Compound. However, the exceedances at this location were largely due to birds.
Tigh-Na-Grian	During December the maximum noise threshold was exceeded on 21 occasions (daytime, 5; evening, 7; night time, 9). Exceedances were due to non-construction factors, mainly birds.
Dundas Home Farm	During December the maximum noise threshold was exceeded on 2 occasions. These exceedances were not caused by the works. The exceedances were due to lawnmowers, airplanes, and residents.
Echline	During December the maximum noise threshold was exceeded on 16 occasions. Exceedances were largely attributed to vehicles passing by on the adjacent roads and local residents. 6 exceedances were due to A904 East works within very close proximity to the monitor which include movement of plant, stihl saw etc
Scotstoun	During December the maximum noise threshold was exceeded on 18 occasions. No exceedances were due to construction. Exceedances were largely attributed to vehicles passing by on the adjacent road.
Whinny Hill	During December the maximum noise threshold was exceeded on 11 occasions. Exceedances were not due to construction activities. Exceedances were due to a range of factors such as different vehicles of transportation and birds.
Northleg	Temporarily down: To be reinstated imminently.
Springfield	

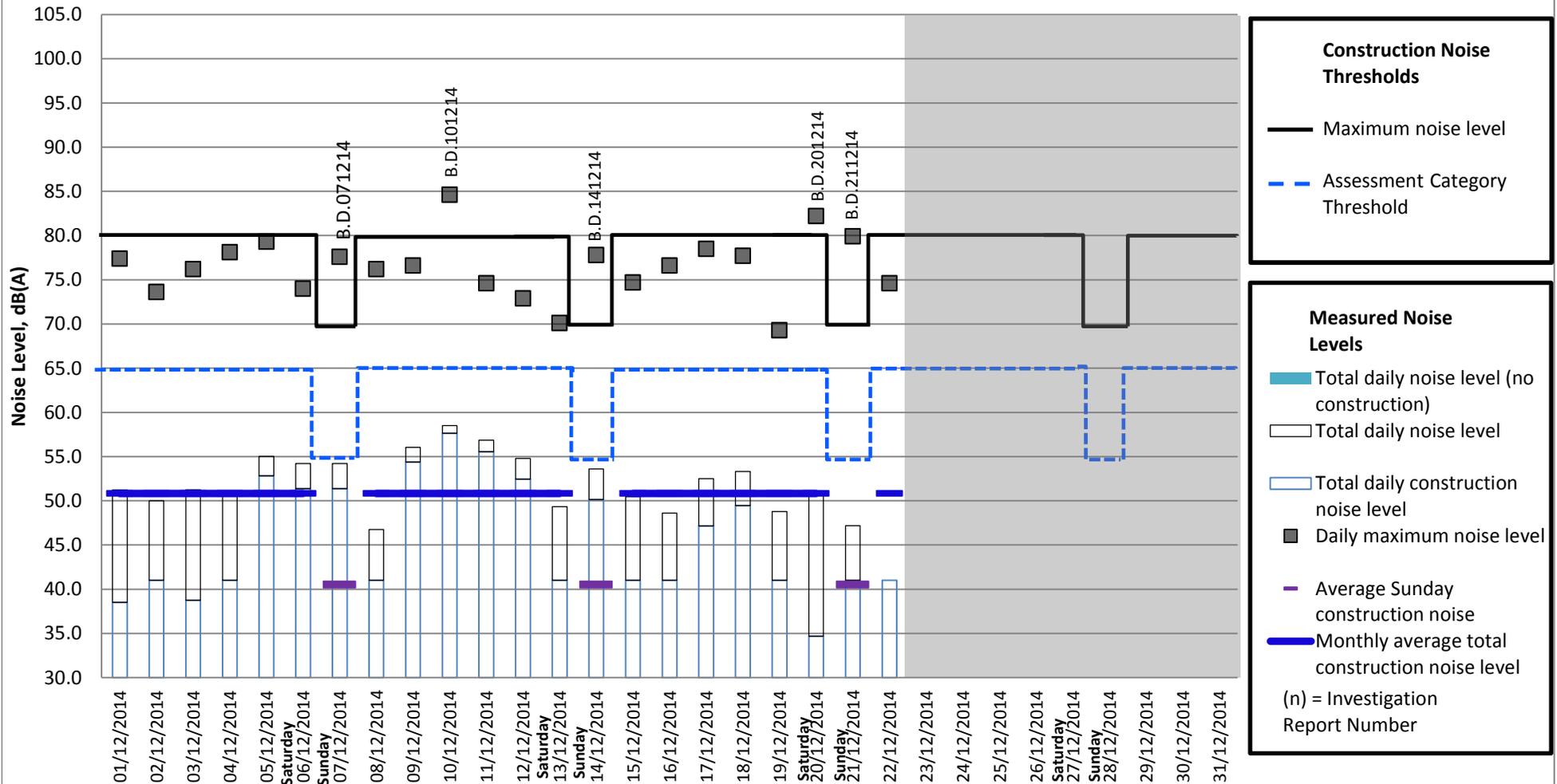


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APPENDIX A

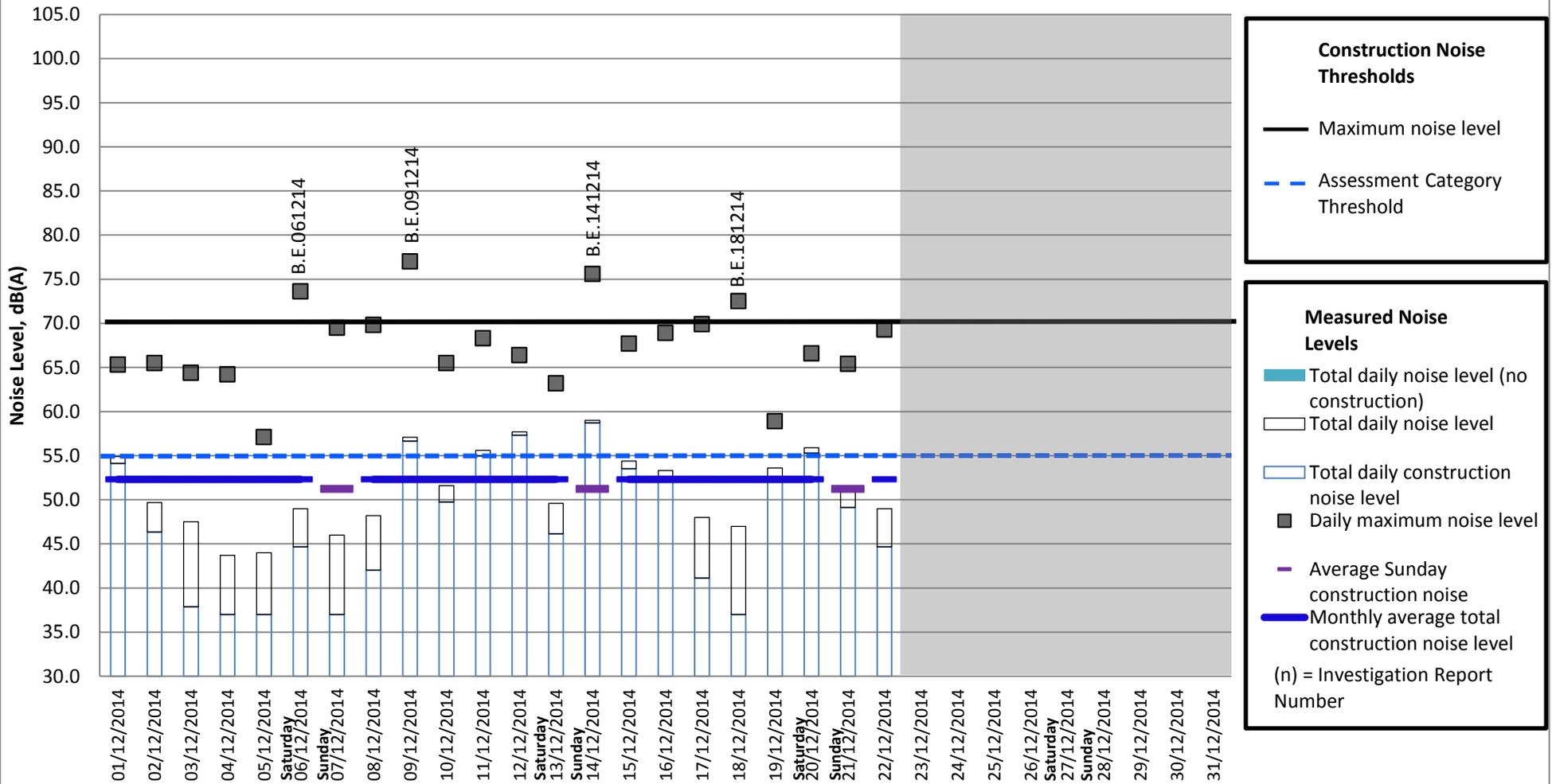
Measured Daytime Noise Levels at Butlaw Fisheries Measurement period: December 2014



Note: The grey areas of the chart represent days on which no construction works have been conducted; no night works were conducted over the Christmas period (23/12/14 to 05/01/15).

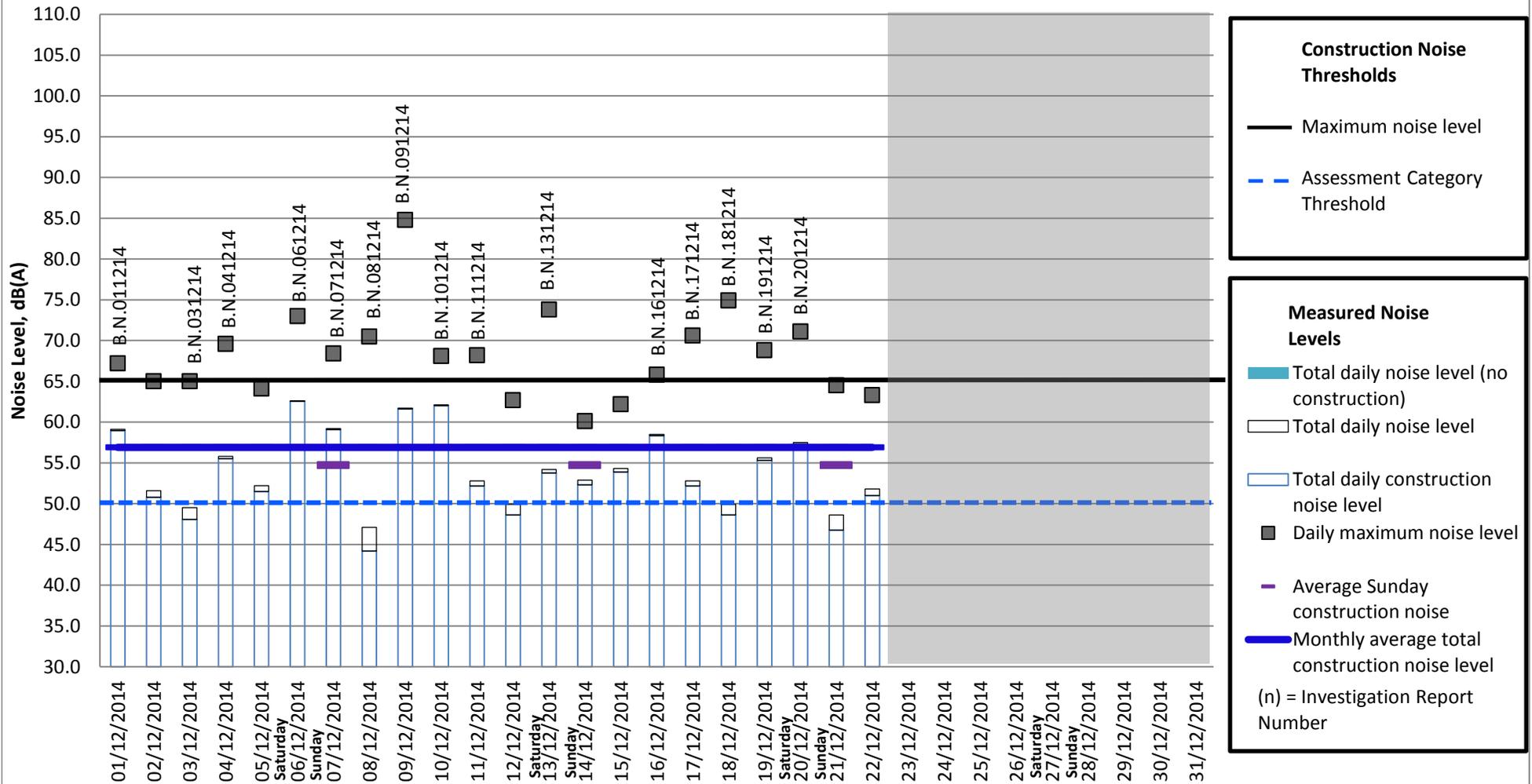
Measured Evening Noise Levels at Butlaw Fisheries

Measurement period: December 2014



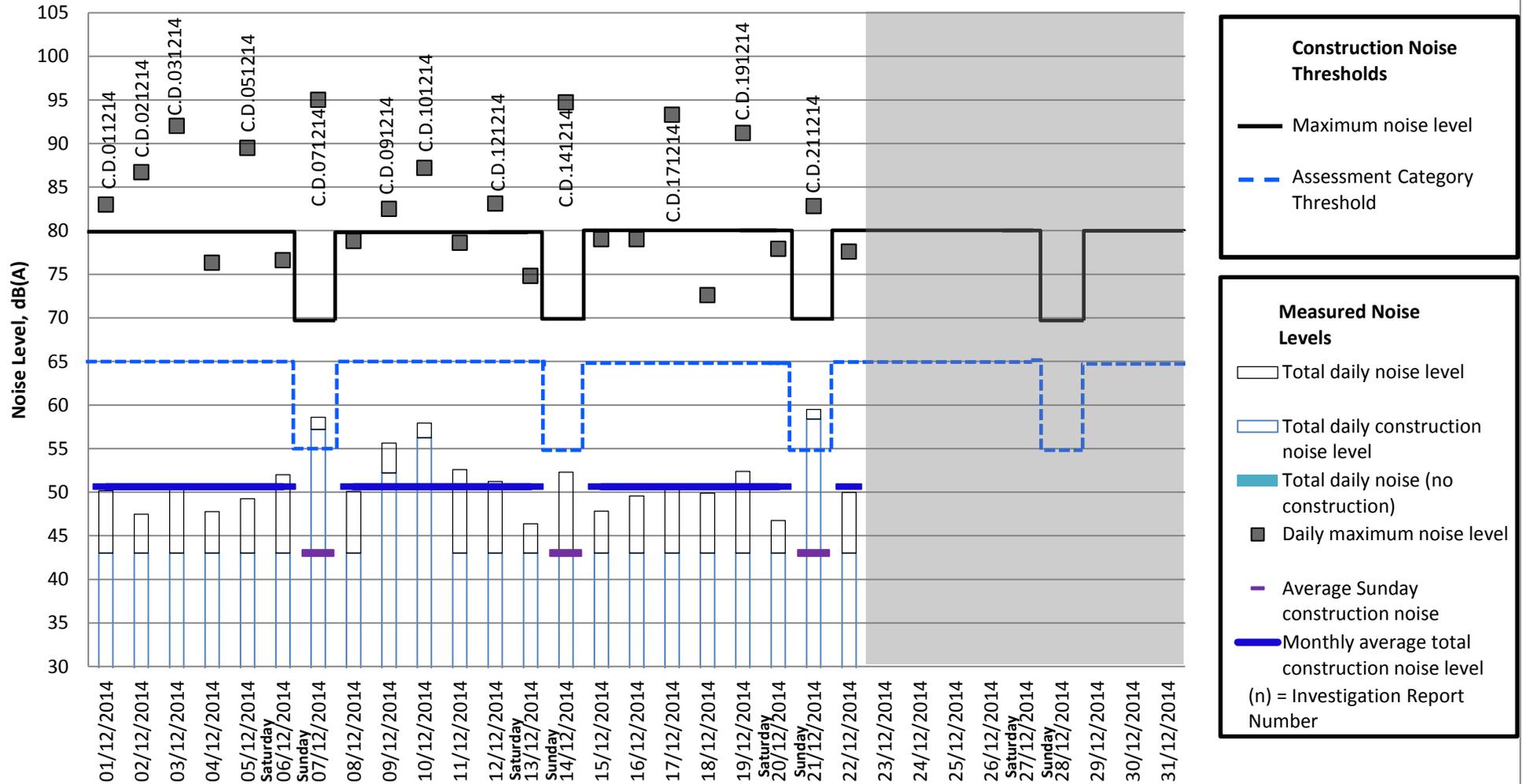
Note: The grey areas of the chart represent days on which no construction works have been conducted; no night works were conducted over the Christmas period (23/12/14 to 05/01/15).

Measured Night time Noise Levels at Butlaw Fisheries Measurement period: December 2014



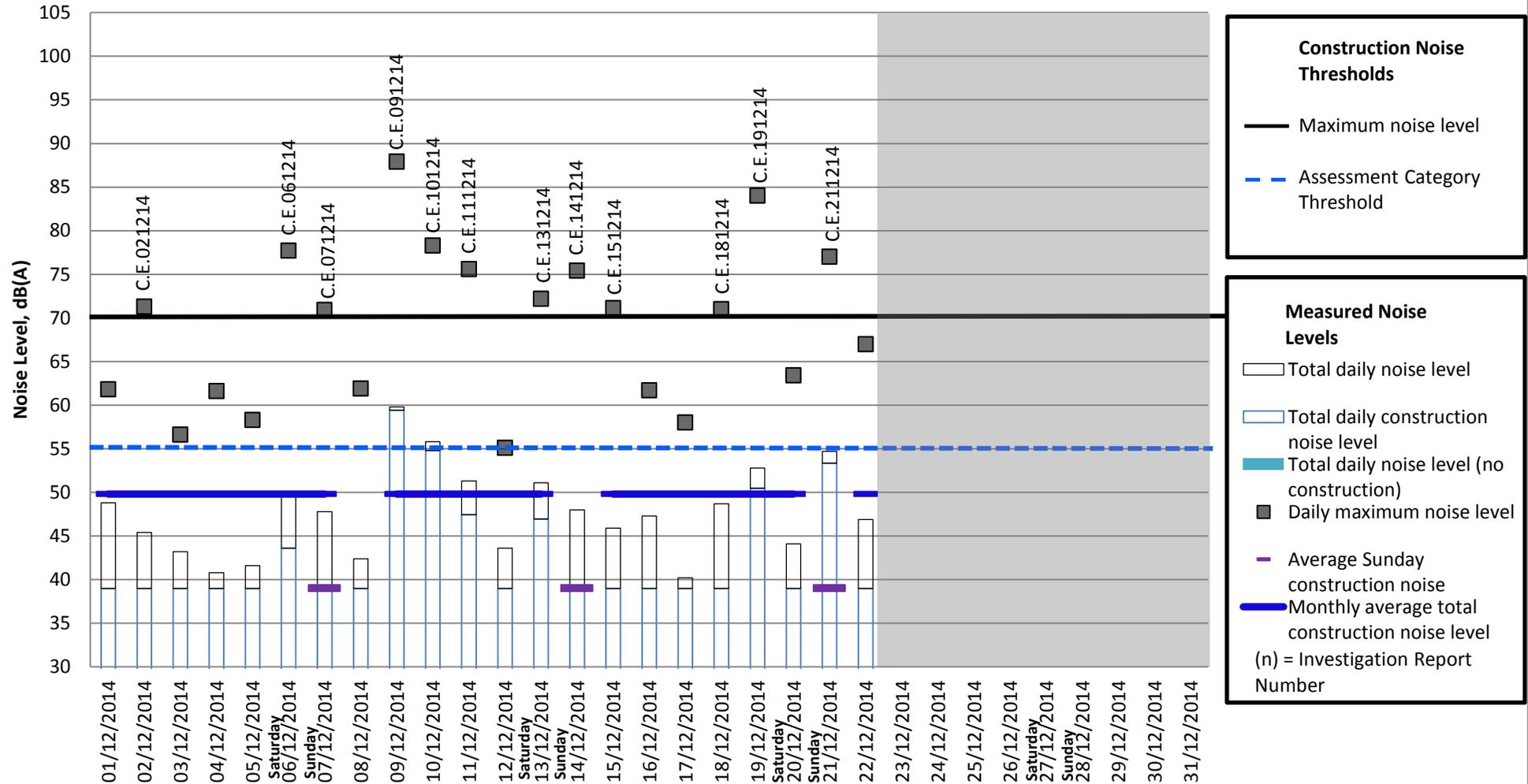
Note: The grey areas of the chart represent days on which no construction works have been conducted; no night works were conducted over the Christmas period (23/12/14 to 05/01/15).

Measured Daytime Noise Levels at Clufflat Brae Measurement period: December 2014



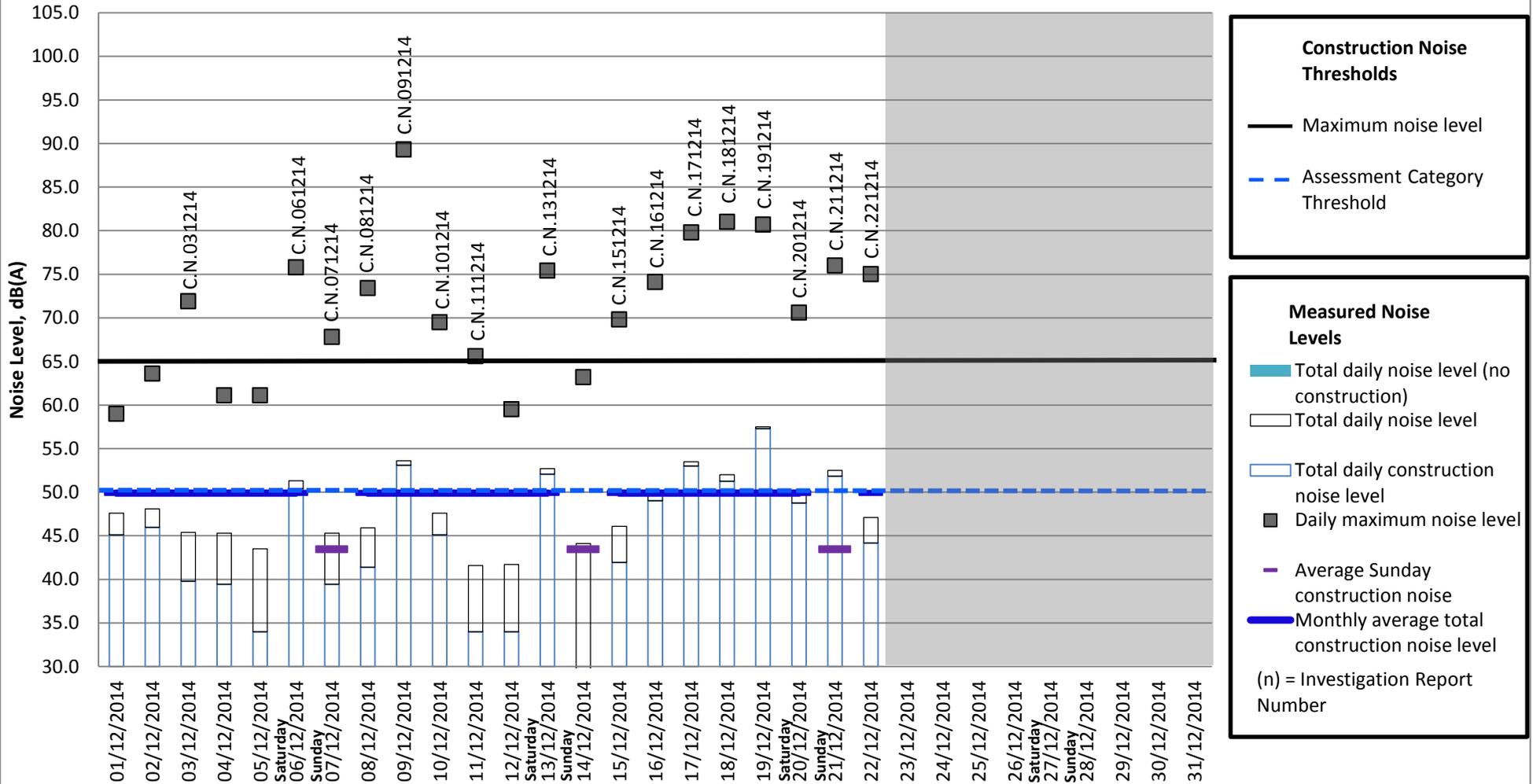
Note: The grey areas of the chart represent days on which no construction works have been conducted; no night works were conducted over the Christmas period (23/12/14 to 05/01/15).

Measured Evening Noise Levels at Clufflat Brae Measurement period: December 2014



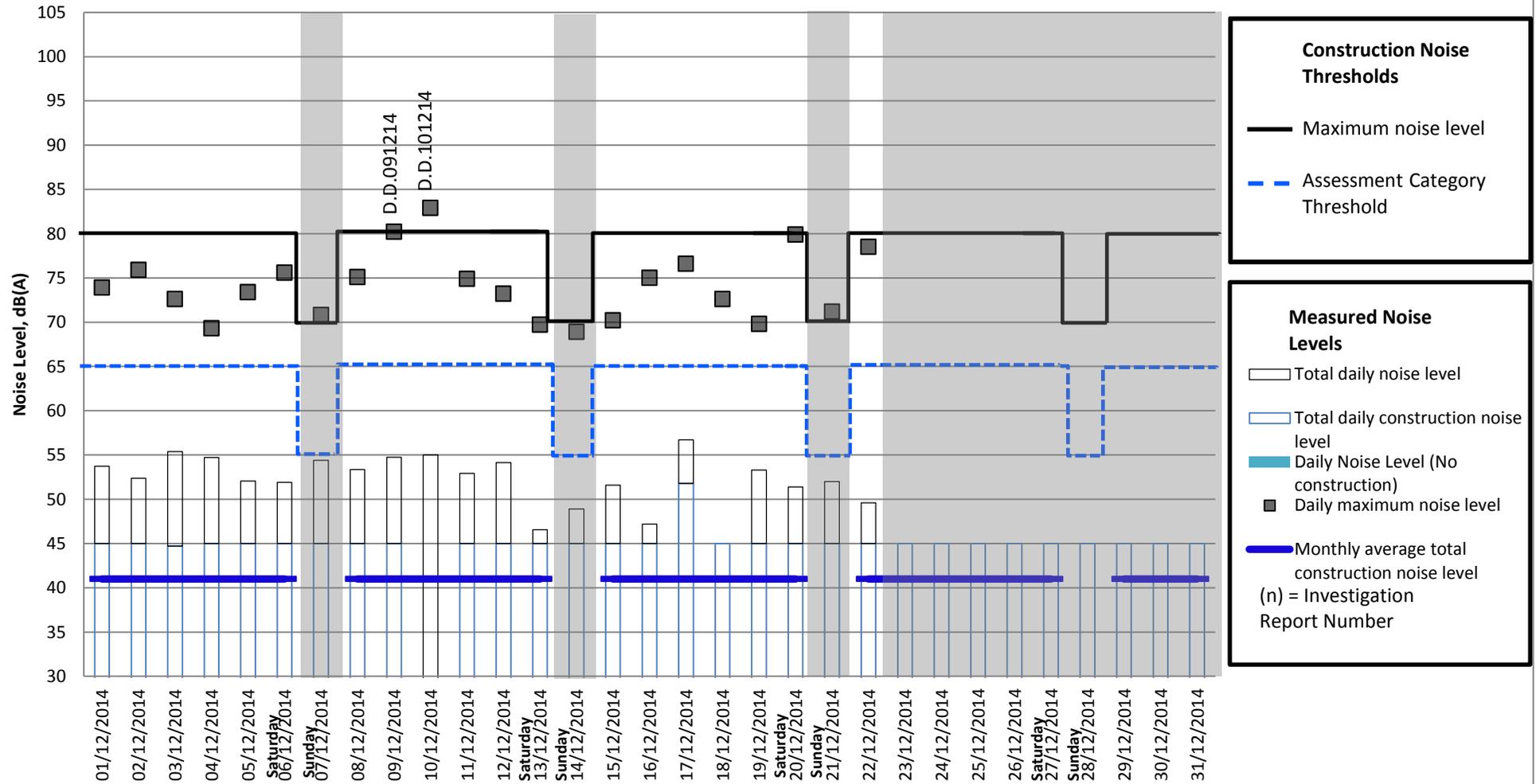
Note: The grey areas of the chart represent days on which no construction works have been conducted; no night works were conducted over the Christmas period (23/12/14 to 05/01/15).

Measured Night-time Noise Levels at Clufflat Brae Measurement period: December 2014



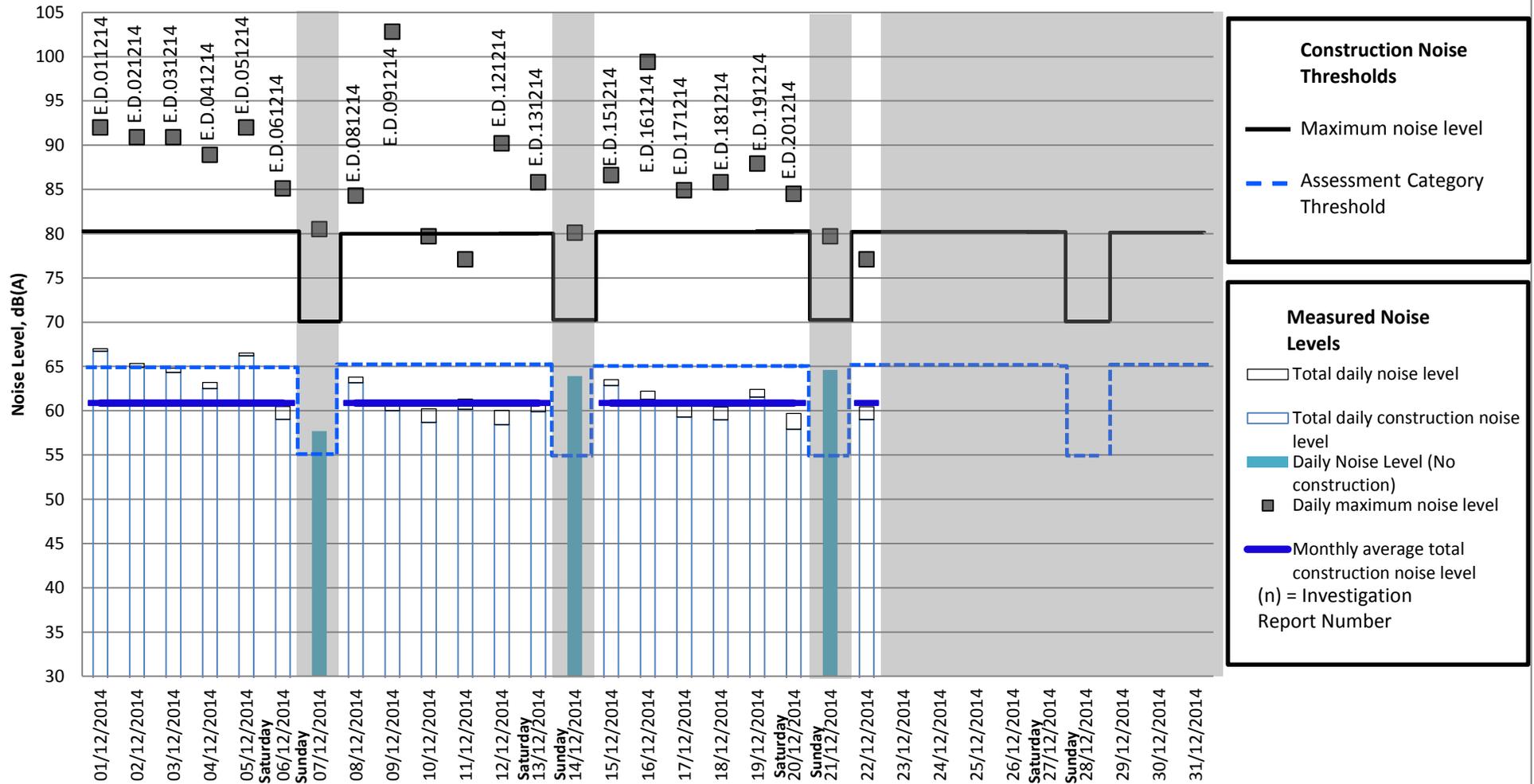
Note: The grey areas of the chart represent days on which no construction works have been conducted; no night works were conducted over the Christmas period (23/12/14 to 05/01/15).

Measured Daytime Noise Levels at Dundas Home Farm Measurement period: December 2014



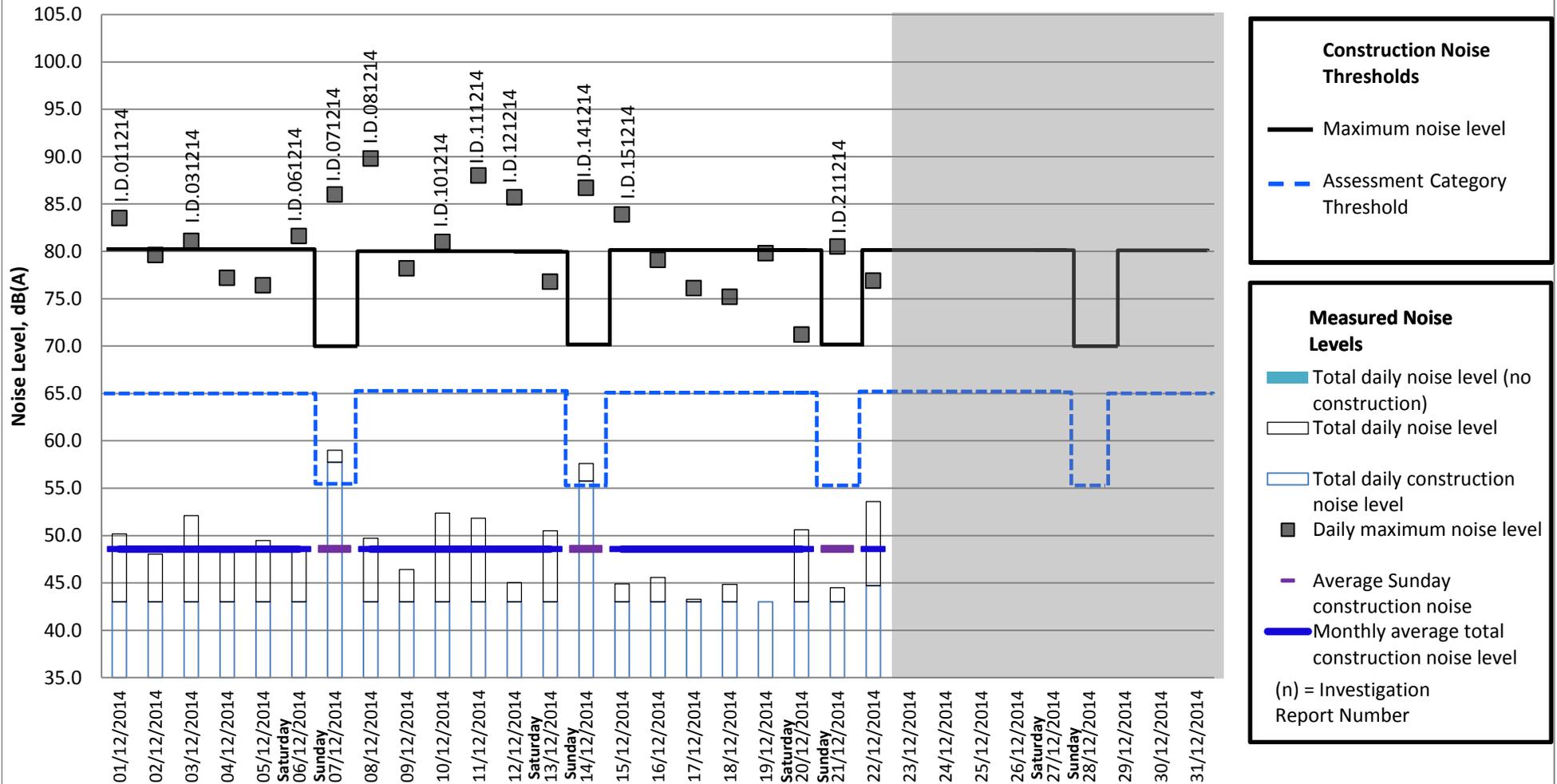
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (23/12/14 to 05/01/15). The Sunday average has not been included as no Sunday works have been conducted at this location.

Measured Daytime Noise Levels at Echline Measurement period: December 2014



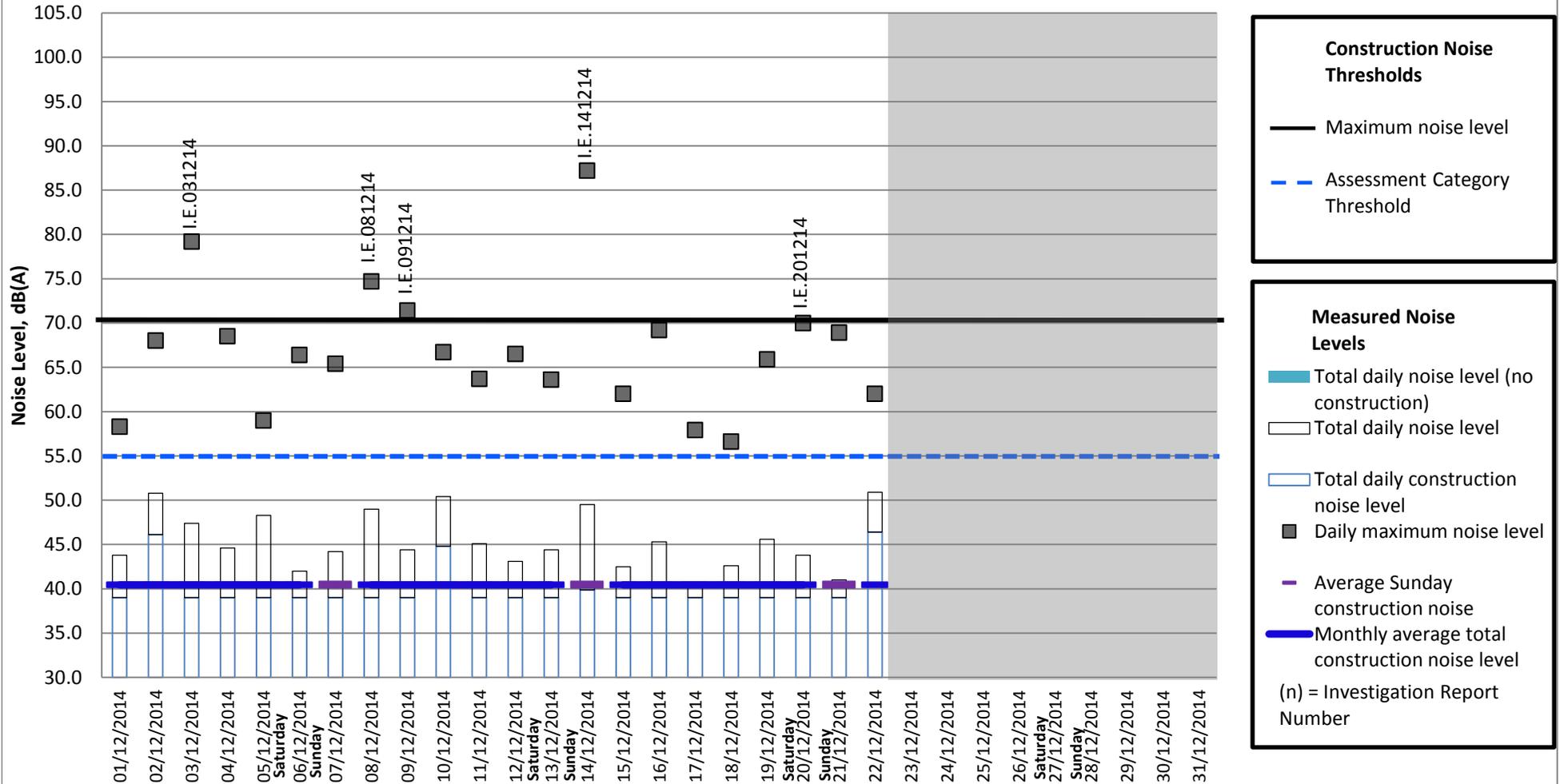
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were undertaken during the Christmas period (23/12/14 to 05/01/15). The Sunday average has not been included as no Sunday works have been conducted at this location.

Measured Daytime Noise Levels at Inchgarvie Measurement period: December 2014



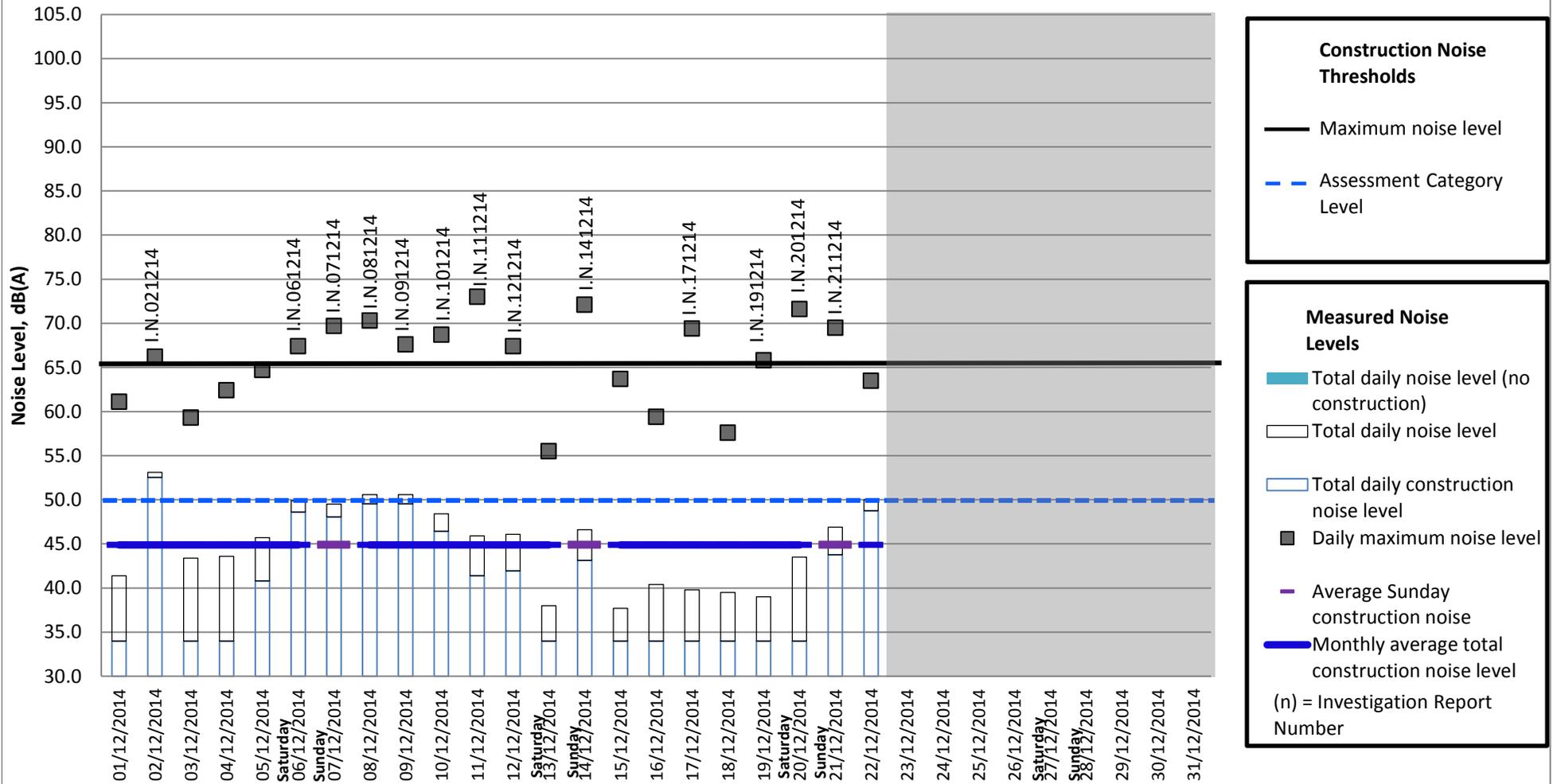
Note: The grey areas of the chart represent days on which no construction works have been conducted; no evening works were undertaken between 23/12/14 and 05/01/14.

Measured Evening Noise Levels at Inchgarvie Measurement period: December 2014



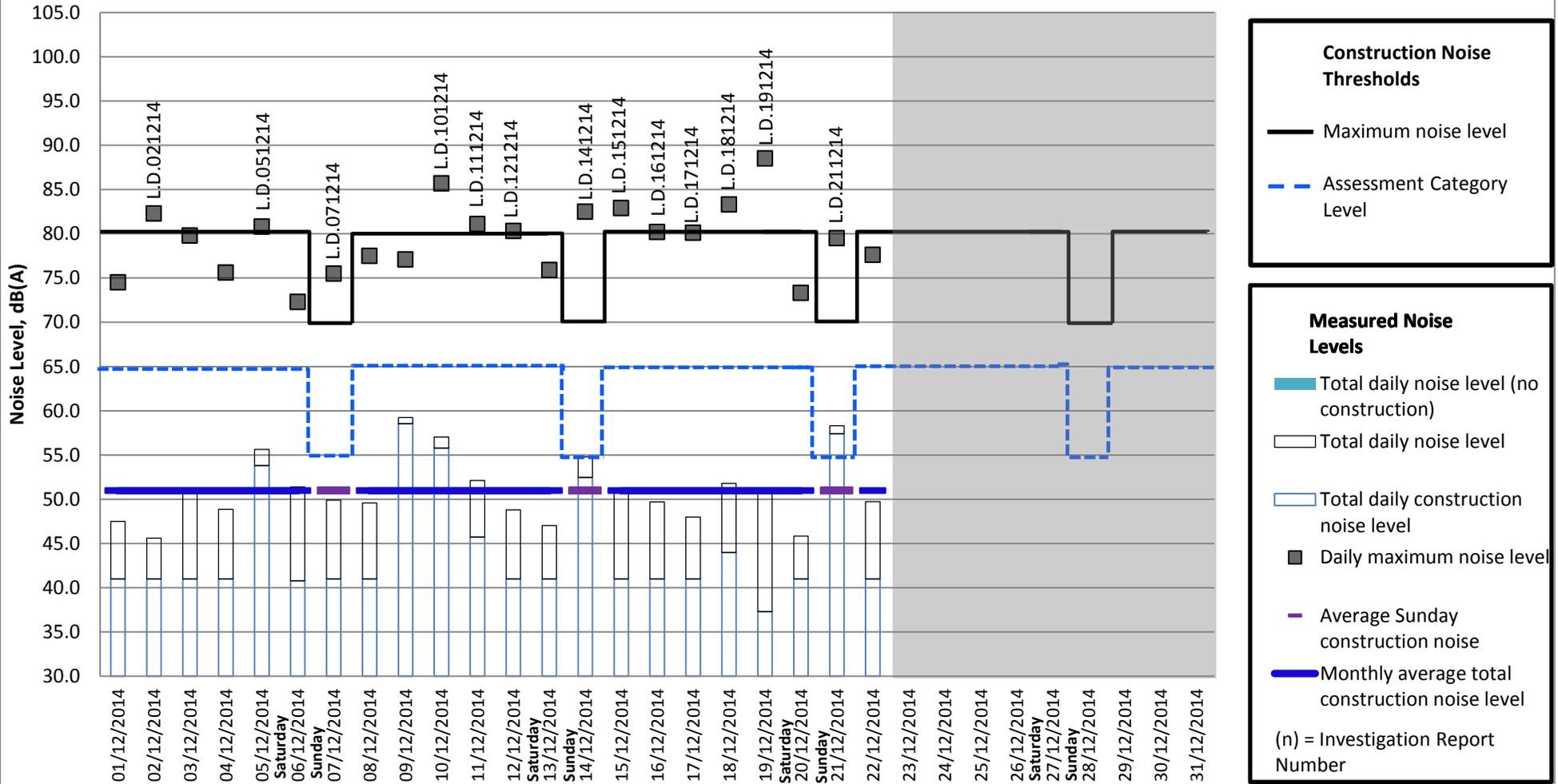
Note: The grey areas of the chart represent days on which no construction works have been conducted; no evening works were undertaken between 23/12/14 and 05/01/14.

Measured Night-time Noise Levels at Inchgarvie Measurement period: December 2014



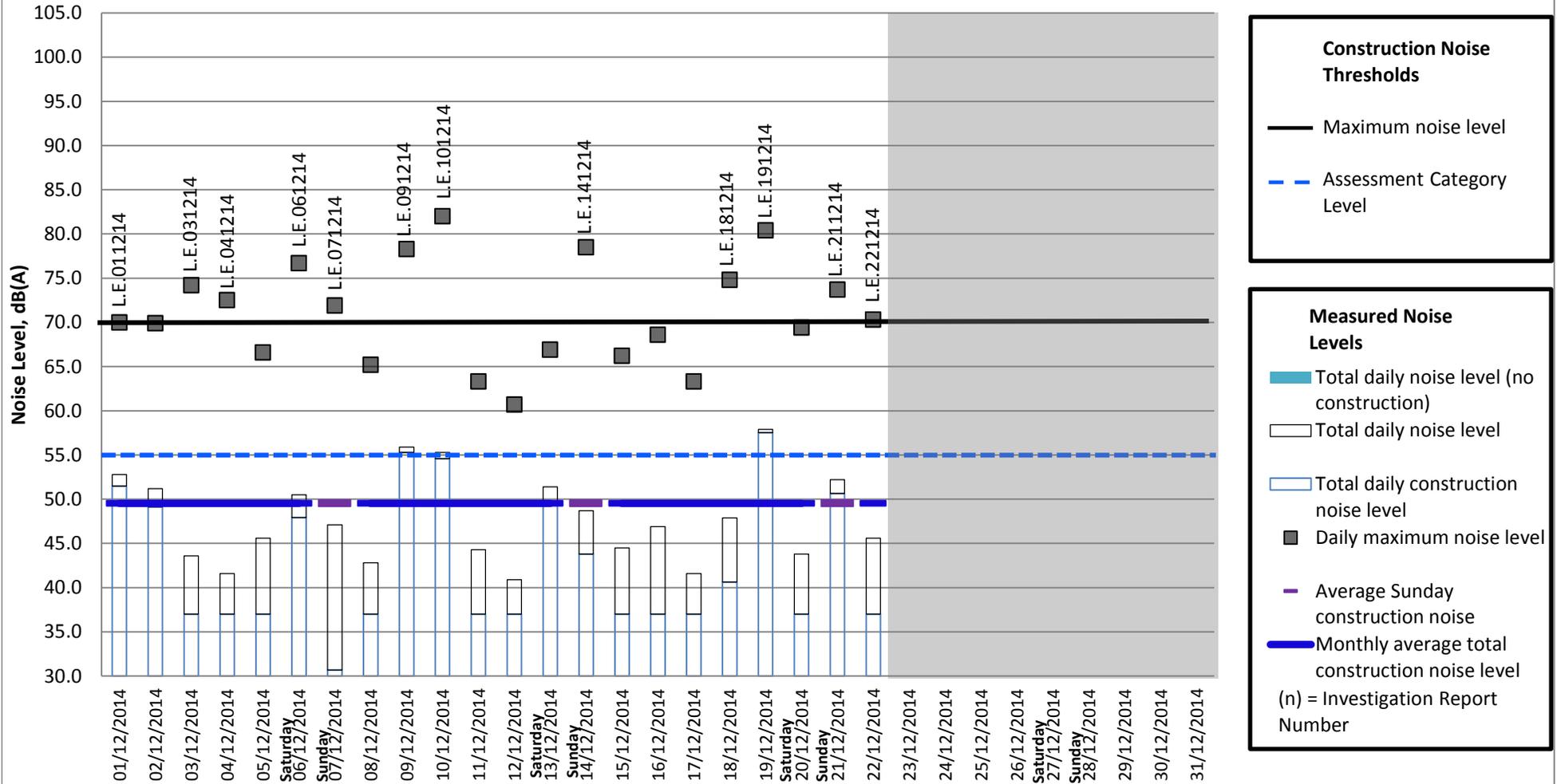
Note: The grey areas of the chart represent days on which no construction works have been conducted; no nighttime works were undertaken between 23/12/14 and 05/01/15.

Measured Daytime Noise levels at Linn Mill Measurement period: December 2014



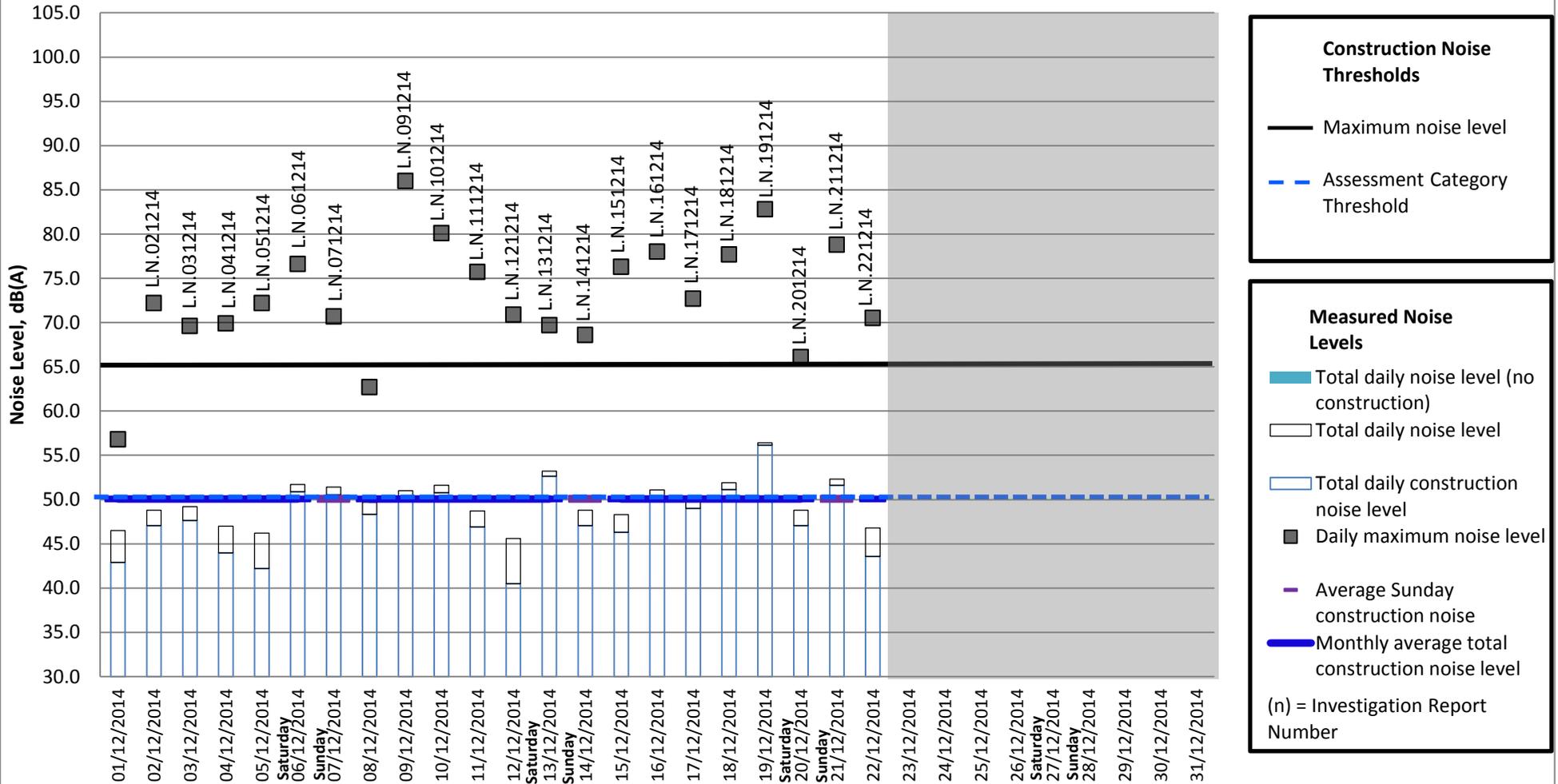
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were undertaken in the vicinity between 23/12/14 to 05/01/15.

Measured Evening Noise Levels at Linn Mill Measurement period: December 2014



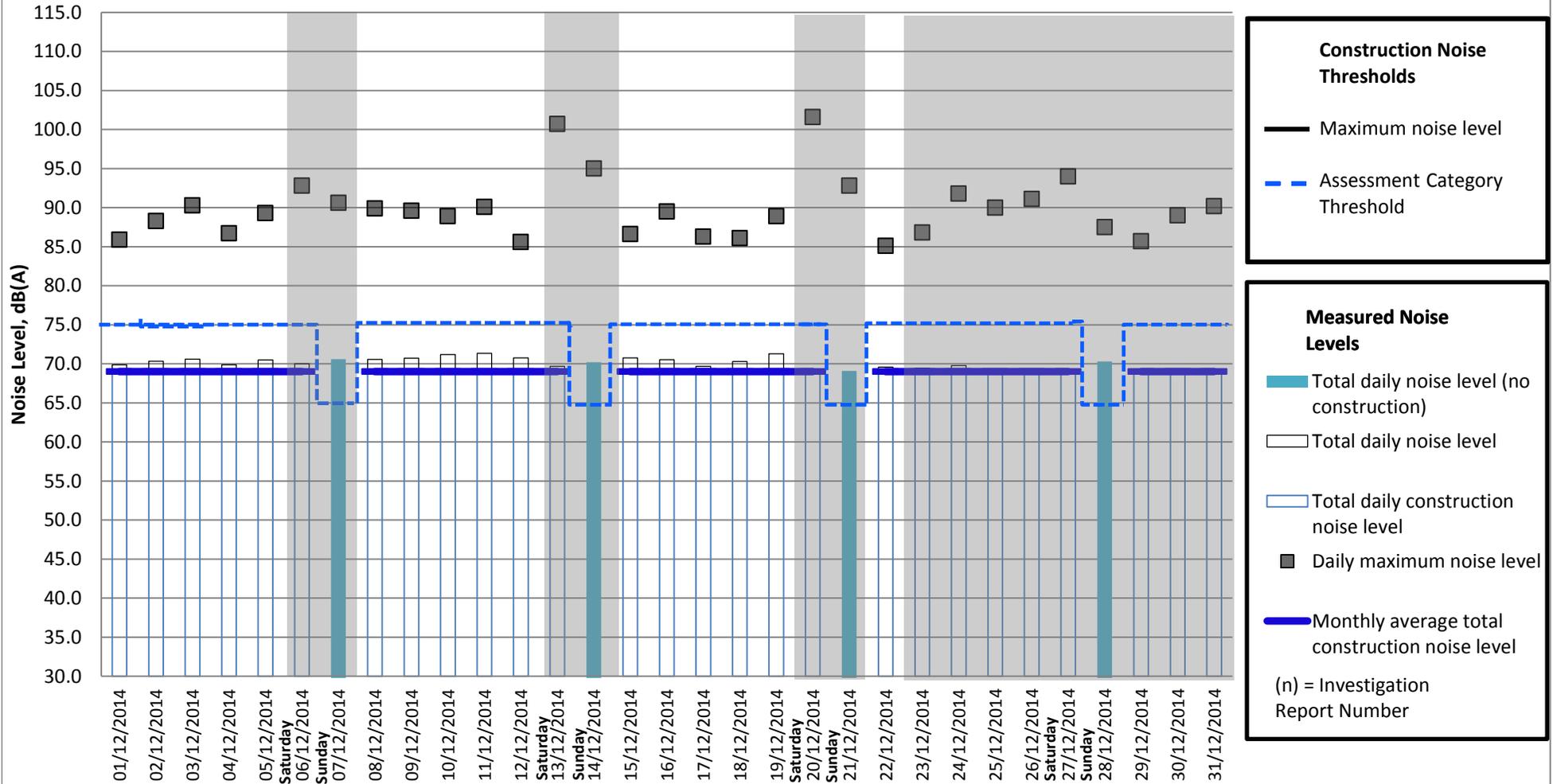
Note: The grey areas of the chart represent days on which no construction works have been conducted; no evening works were undertaken from 23/12/13 to 05/01/14.

Measured Night-time Noise Levels at Linn Mill Measurement period: December 2014



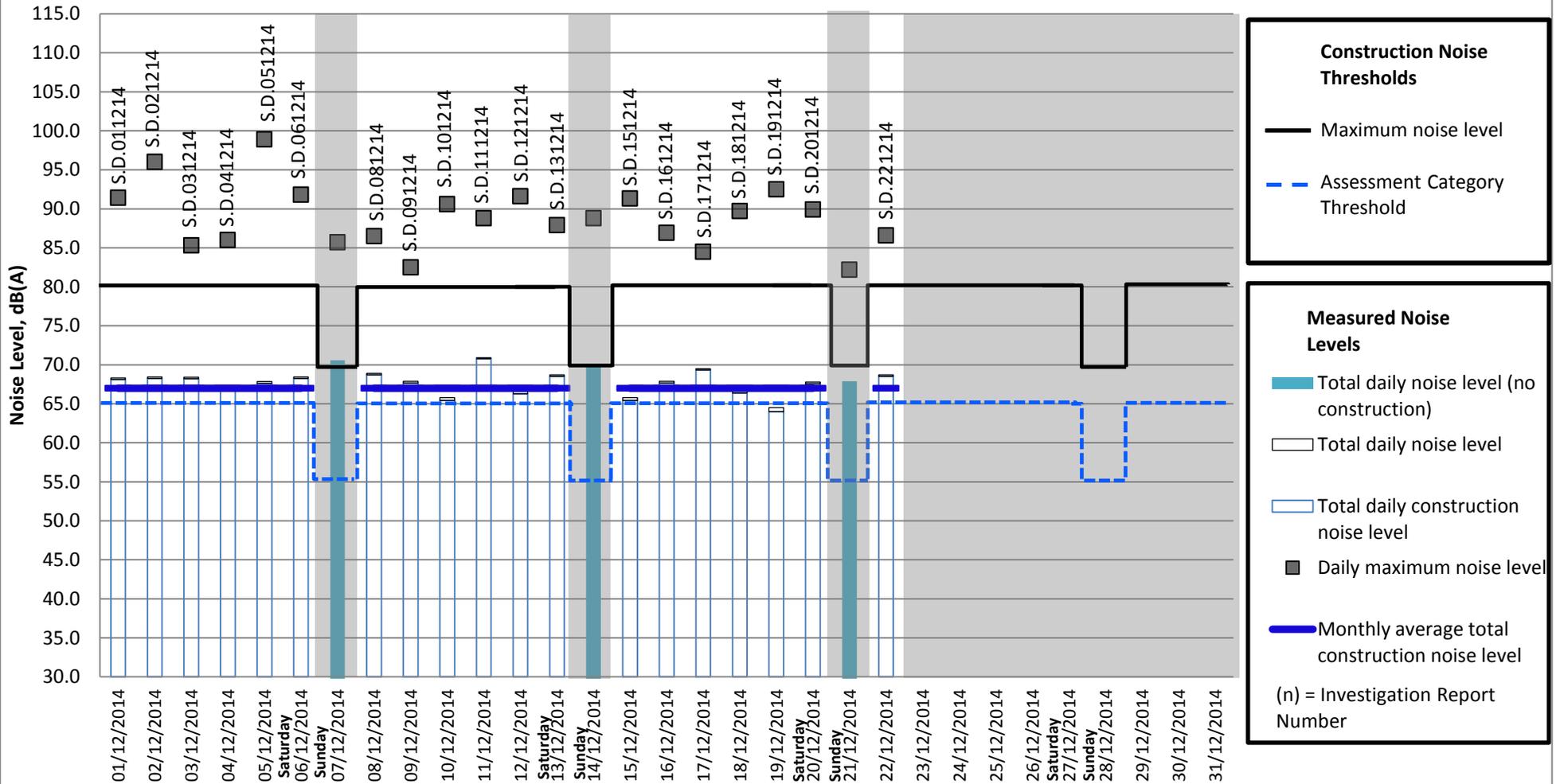
Note: The grey areas of the chart represent days on which no construction works have been conducted; no night time works were undertaken between 23/12/14 to 05/01/15.

Measured Daytime Noise Levels at Newton Measurement period: December 2014



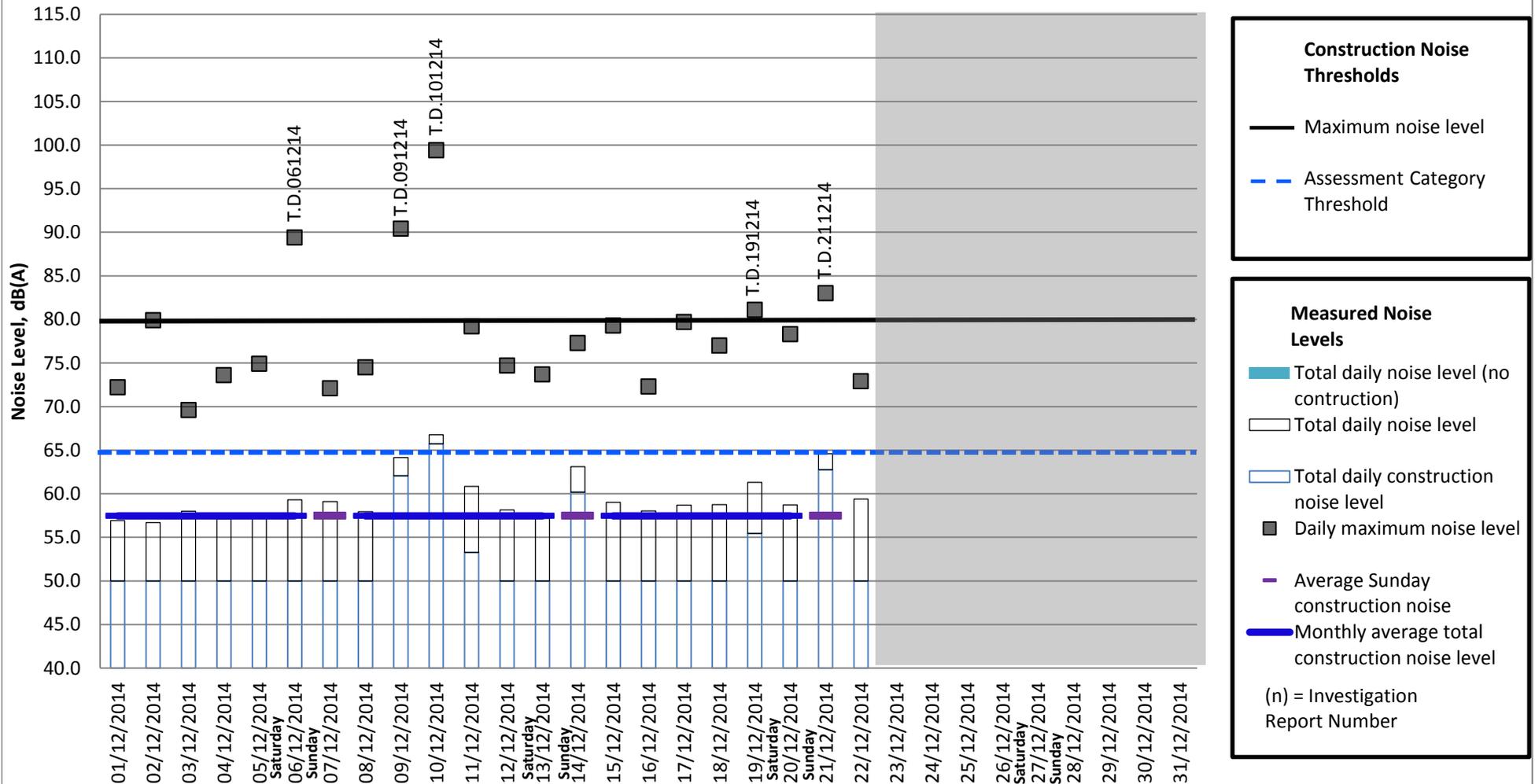
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (23/12/14 to 05/01/15). It should be noted that the measured noise levels Mon - Fri can not be attributed to construction works due to the considerable distance (1.75 kilometers) between this monitoring location and the closest construction works.

Measured Daytime Noise Levels at Scotstoun Measurement period: December 2014



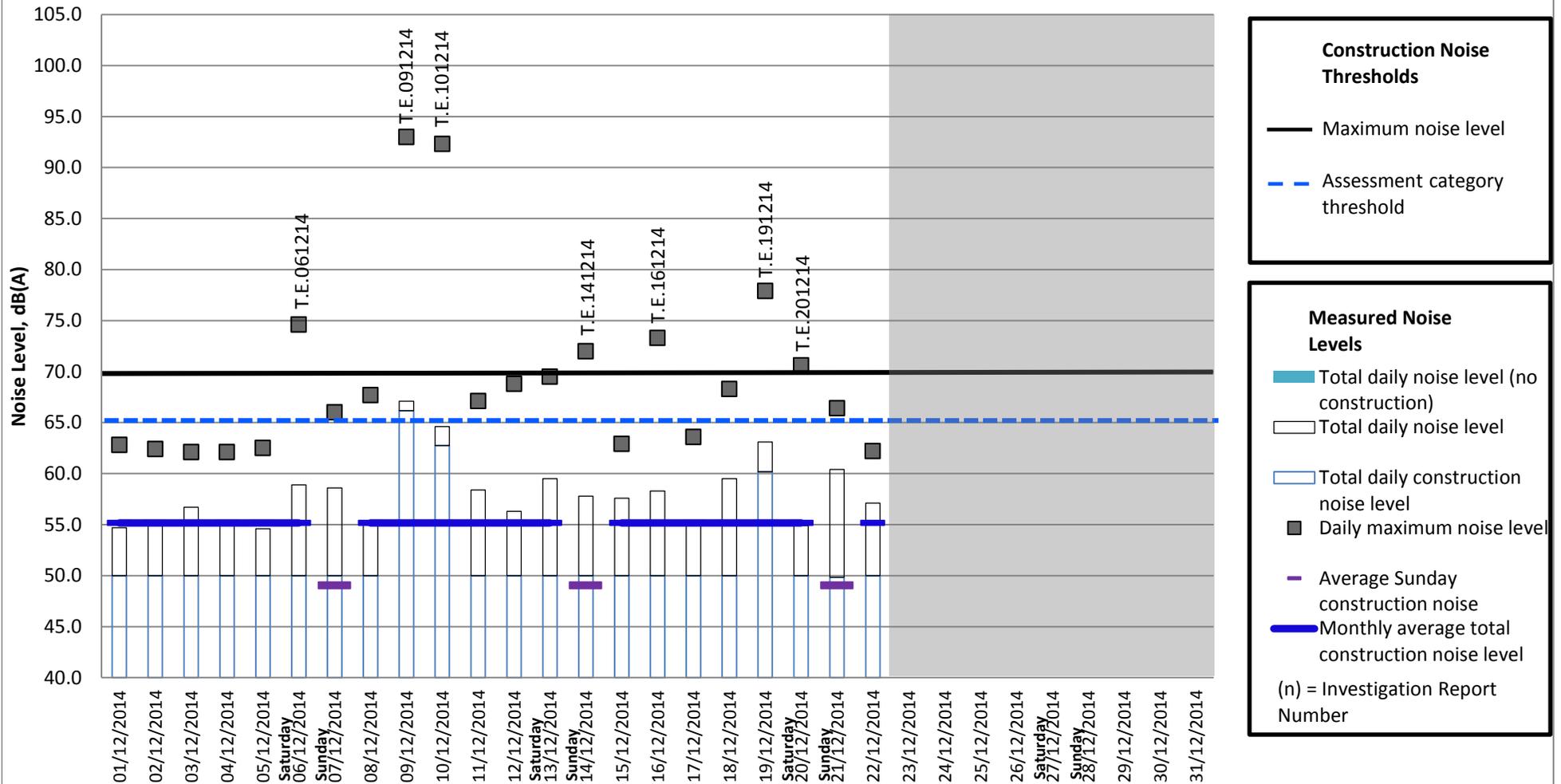
Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (23/12/14 to 05/01/15). The monthly average construction noise for Sunday has not been included as no Sunday works have been conducted at this location.

Measured Daytime Noise Levels at Tigh-Na-Grian Measurement period: December 2014



Note: The grey areas of the chart represent days on which no construction works have been conducted; no daytime works were conducted between 23/12/14 - 05/01/15.

Measured Evening Noise Levels at Tigh-Na-Grian Measurement period: December 2014



Construction Noise Thresholds

- Maximum noise level
- Assessment category threshold

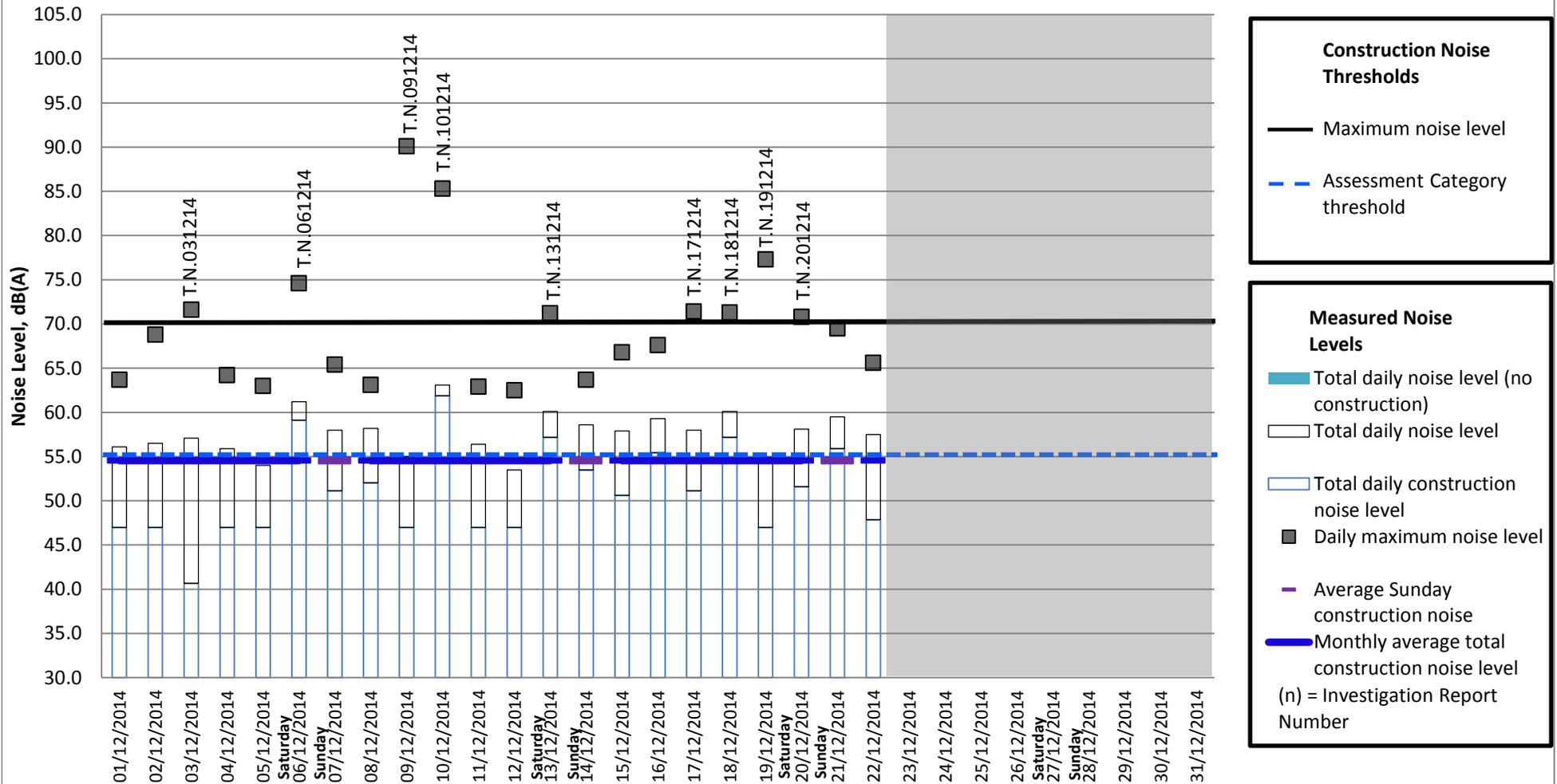
Measured Noise Levels

- Total daily noise level (no construction)
- Total daily noise level
- Total daily construction noise level
- Daily maximum noise level
- Average Sunday construction noise
- Monthly average total construction noise level

(n) = Investigation Report Number

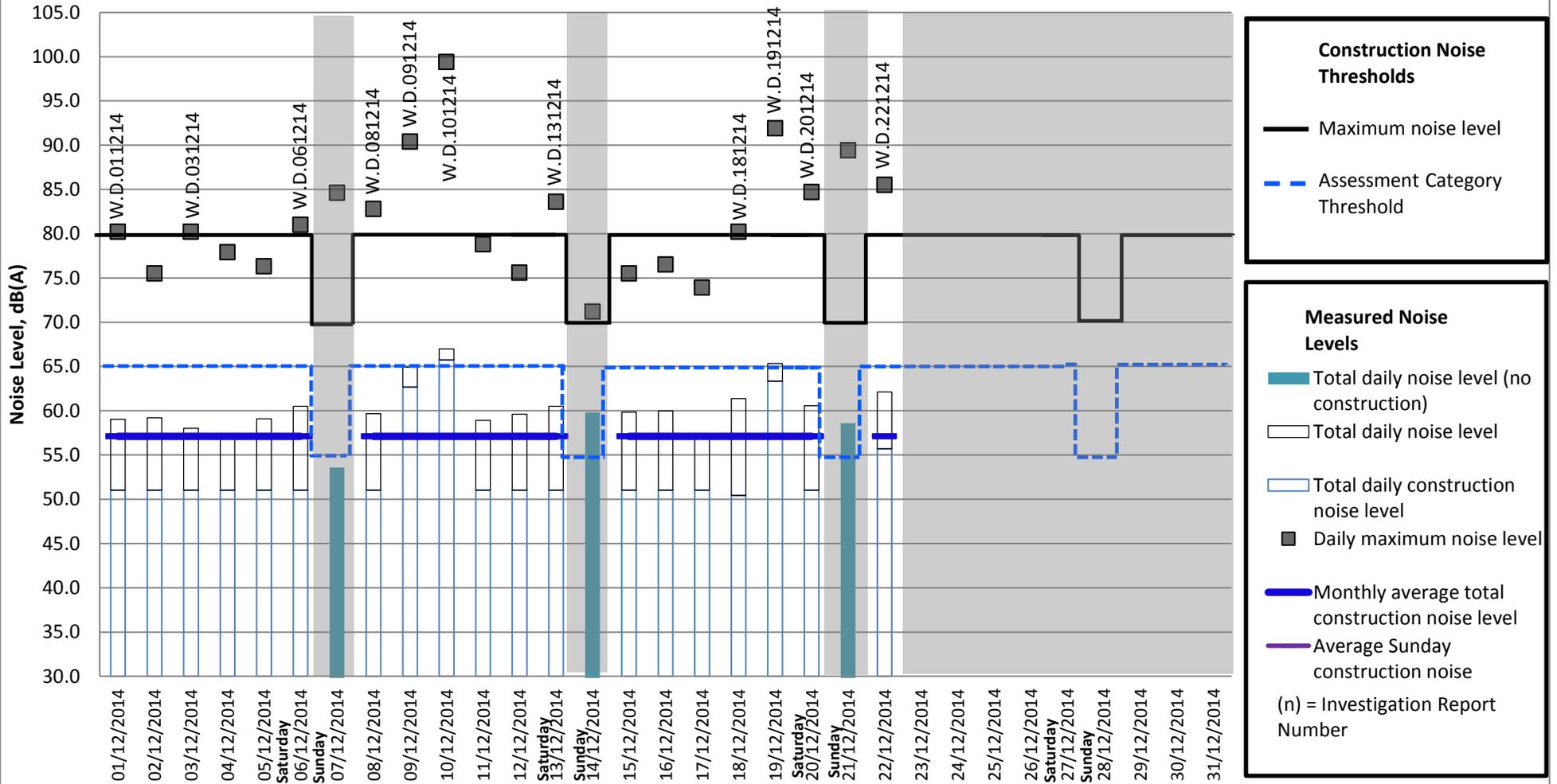
Note: The grey areas of the chart represent days on which no construction works have been conducted; no evening works were conducted between 23/12/14 - 05/01/15.

Measured Night-time Noise Levels at Tigh-Na-Grian Measurement period: December 2014



Note: The grey areas of the chart represent days on which no construction works have been conducted; no night time works were conducted between 23/12/14 - 05/01/15.

Measured Daytime Noise Levels at Whinny Hill Measurement period: December 2014



Note: The grey areas of the chart represent days on which no construction works have been conducted; no works were conducted over the Christmas period (23/12/14 to 05/01/15).