



Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

Project **FORTH REPLACEMENT CROSSING**

Document title

CONSTRUCTION NOISE MONITORING REPORT: JULY 2013

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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 July 2013. 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 July 2013.
- 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 July 2013, 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 February 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 July 2013. 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 July 2013
M1	Whinny Hill	Network	Band drains at King Malcolm Drive Breaking rock at Castlandhill Road and haulage to Ferrytoll N.B. No evening, night time or Sunday daytime construction in vicinity.
M3	Tigh-Na-Grian	Crossing	Works within Central Tower cofferdam North Tower airlifting works North Tower underwater concrete pour
M4	North Leg	Crossing	Works within Central Tower cofferdam North Tower airlifting works North Tower underwater concrete pour South Tower excavation & airlifting Pier S1 jet grouting works Pier S4 airlifting Pier S5 airlifting & concrete works Pier S6 cleaning and backfilling
M6	Port Edgar	Crossing	Works within Central Tower cofferdam South Tower excavation & airlifting Pier S1 jet grouting works Pier S4 airlifting Pier S5 airlifting & concrete works Pier S6 – backfilling Society Road embankment works
M7	Butlaw Fisheries	Crossing	Works within Central Tower cofferdam South Tower excavation & airlifting Pier S1 jet grouting works Pier S4 airlifting Pier S5 airlifting & concrete works Pier S6 – backfilling Society Road embankment works
M10	Inchgarvie Lodge	Crossing	South Tower excavation & airlifting Pier S1 jet grouting works Pier S4 airlifting Pier S5 airlifting & concrete works Launch – backfilling, blinding concrete for lay down area Abutment – curing of main crossing bearing plinths Scaffolding erection for piers Society road embankment works
M11	Linn Mill	Network (close proximity to Crossing)	Launch – backfilling, blinding concrete for lay down area Abutment – curing of main crossing bearing plinths Scaffolding erection for piers Pier trials

			Society road embankment works
M13	Clufflat Brae	Crossing	Launch – backfilling, blinding concrete for lay down area Abutment – curing of main crossing bearing plinths Pier trials
M14	Springfield	Network	Launch – backfilling, blinding concrete for lay down area Abutment – curing of main crossing bearing plinths Pier trials Gyratory – structures N.B. No evening, night time or Sunday daytime construction in vicinity.
M15	Echline Field	Network	Launch – backfilling, blinding concrete for lay down area Bulk excavation for mainline N.B. No evening, night time or Sunday daytime construction in vicinity.
M16	Scotstoun	Network	Bus link embankment works including import of fill N.B. No evening, night time or Sunday daytime construction in vicinity.
M17	Dundas Home Farm	Network	Utilities works Embankment works for mainline N.B. No evening, night time or Sunday daytime construction in vicinity.
M18	Newton	Network	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. A device error was encountered in July, resulting in loss of data for six days, at Newton. The error was resolved as soon as reasonably practicable.
- 3.3** Results demonstrate that the monthly average total construction noise results for daytime were within the threshold limits for all monitoring locations for July 2013, with the exception of Scotstoun. For the evening and night time periods, all monitoring locations, with the exception of Butlaw Fisheries, were within the threshold limits. With regard to the Sunday averages (for applicable monitoring locations), exceedances of the threshold were noted for the Sunday daytime and night time average at Butlaw Fisheries. All other locations not listed were found to be within the Sunday average threshold for all periods.
- 3.4** The exceedances at Butlaw are not thought to have been caused by increased noise levels due to construction. The evening average was found to be affected by high noise levels on 4 July which were caused by fireworks. When the impact of the fireworks is removed, the average level drops below the 55 dB threshold (53.4dB). The exceedance of the night time average is also considered to be due to non-construction related factors, particularly a period of elevated noise levels between 18 and 24 July, caused by early morning bird calls and waves on the shore. The Sunday averages are also not thought to be due to construction works. Though audio is not available for the Sunday periods, no construction works were on-going at the time which would have caused the elevated noise levels observed. However, it should also be noted that screening and distance attenuation should be considered as these factors result in a lowering of the noise levels to within the threshold level at the nearest sensitive receptors; attended monitoring has illustrated a drop of at least 5 – 10 dB from Butlaw Fisheries to the nearest sensitive receptors with respect to noise generated around the south shore area of the estuary. Furthermore, it should be noted that all the averages reported for evening, night time and Sunday periods, 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 July is consistent with that recorded in previous months.

- 3.6** During July 2013, 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** Investigations of the exceedances of the maximum noise level thresholds show the majority to have occurred as a result of non-construction related noise, notably due to bird calls, some periods of adverse weather and localised noises at nearby properties. At some locations, notably Scotstoun and Echline, existing traffic noise had an effect on maximum noise levels during the period covered in this report.
- 3.8** Where an exceedance due to construction works was identified, the works were investigated as soon as practicably reasonable and a detailed NVIR was completed, within which any additional mitigation measures were recognised and subsequently implemented where practicable.
- 3.9** The daytime L_{AFmax} threshold was exceeded on one occasion. This exceedance was recorded at Dundas and was found to be caused by an excavator loading a truck. This construction related exceedance was investigated and mitigation measures implemented where possible; the relevant NVIR provides more detail with regard to this exceedance.
- 3.10** A summary of the findings for exceedances occurring at each of the locations can be found in Table 2. All construction related exceedances are detailed in Table 3; further information on related remedial actions is detailed in the relevant NVIR.

Table 2: Summary of Exceedances at Monitoring Locations

Monitoring Location	Summary of Exceedance Details
Butlaw Fisheries	During July the maximum noise threshold was exceeded on 55 occasions (daytime, 15; evening, 10; night time, 30). All exceedances were attributed to a range of non-construction factors, but notably birds and waves.
Clufflat Brae	During July the maximum noise threshold was exceeded on 45 occasions (daytime, 10; evening, 12; night time, 23). No exceedances were attributable to construction works. Exceedances were found to be largely due to birds and residents at nearby properties.
Inchgarvie Lodge	During July the maximum noise threshold was exceeded on 56 occasions (daytime, 12; evening, 15; night time, 29). No exceedances were found to be due to construction works. However, investigations found residents at the property and birds to be the main contributing factors to the exceedances at this location.
Linn Mill	During July the maximum noise threshold was exceeded on 58 occasions (daytime, 15; evening, 12; night time, 31). No exceedances were due to works associated, with the majority of exceedances caused by birds and adverse weather.
Tigh-Na-Grian	During July the maximum noise threshold was exceeded on 58 occasions (daytime, 19; evening, 12; night time, 27). Exceedances were due to non-construction factors, notably birds.
Dundas Home Farm	During July the maximum noise threshold was exceeded on 6 occasions. One exceedance attributable to construction works (embankment works in close proximity to meter). Other exceedances were due to a gardening works at the property.
Echline	During July the maximum noise threshold was exceeded on 26 occasions. No exceedances at this location were due to construction activities. Exceedances were largely attributed to vehicles passing by on the adjacent roads.
Springfield	During July the maximum noise threshold was exceeded on 18 occasions. The exceedances were not caused by construction works at this location. The majority of exceedances were due to local residents.
Scotstoun	During July the maximum noise threshold was exceeded on 27 occasions. Exceedances were largely attributed to vehicles passing by on the adjacent road.
Whinny Hill	During July the maximum noise threshold was exceeded on 9 occasions. Exceedances were not due to construction activities. A range of factors were found to cause exceedances at this location, including birds, dogs barking, wind and trains/planes.

Table 3: Summary of Construction Exceedances at Monitoring Locations



Forth Crossing Bridge Constructors

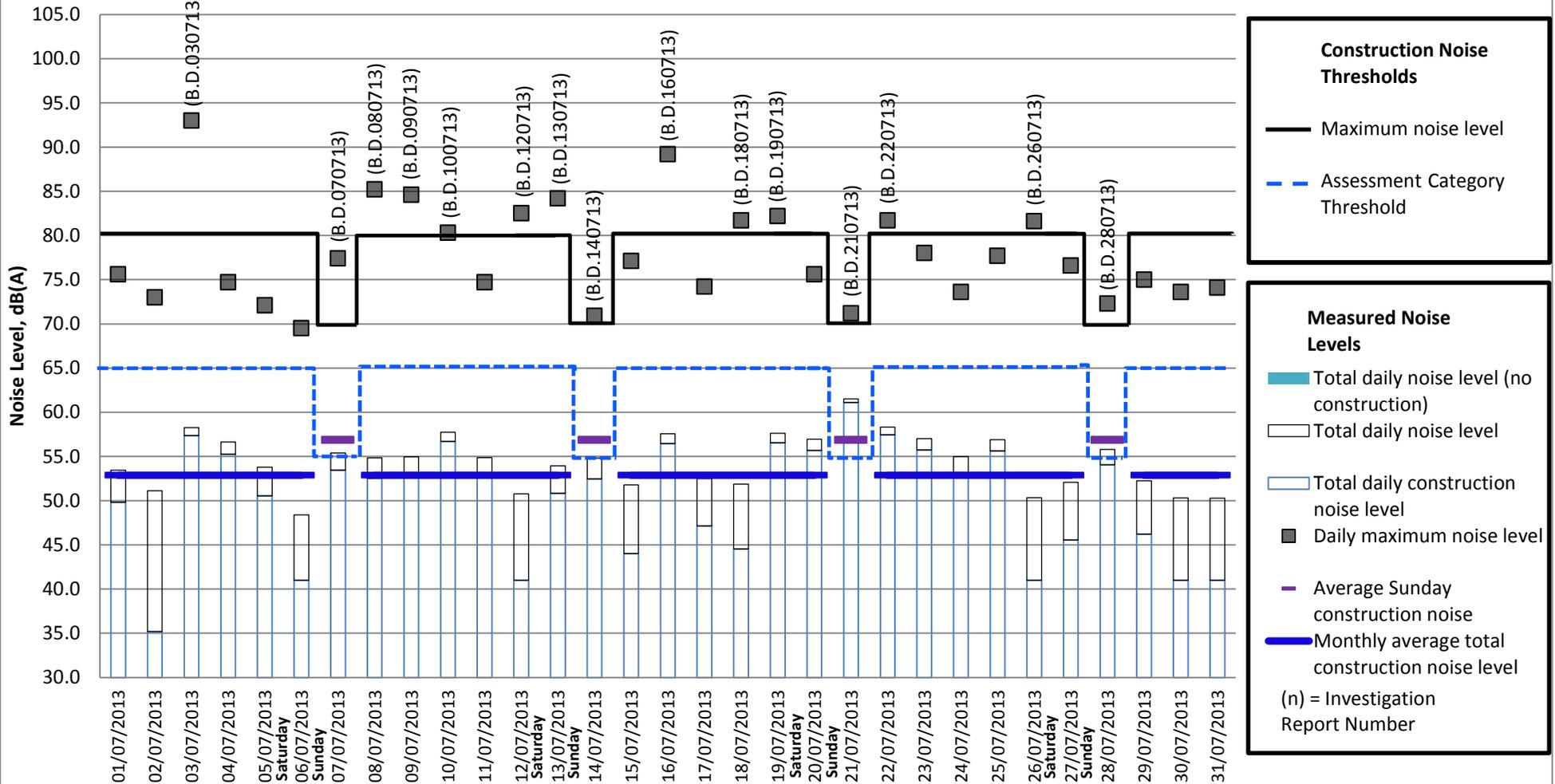
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Monitor	Date	Period	Description	NVIR No.
Dundas	15/07/13	Day	Embankment works	D.D.150713

APPENDIX A

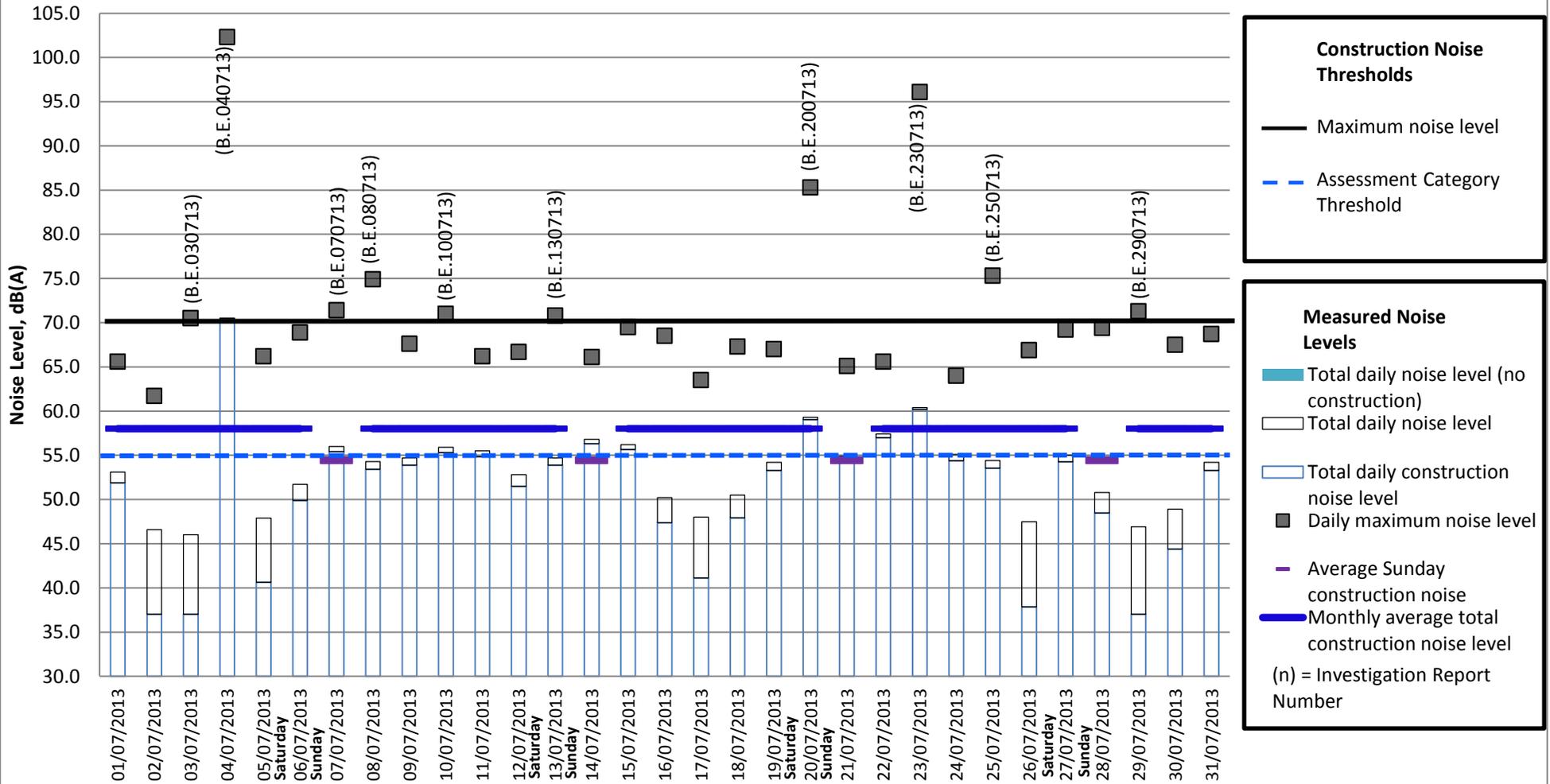
Measured Daytime Noise Levels at Butlaw Fisheries

Measurement period: July 2013



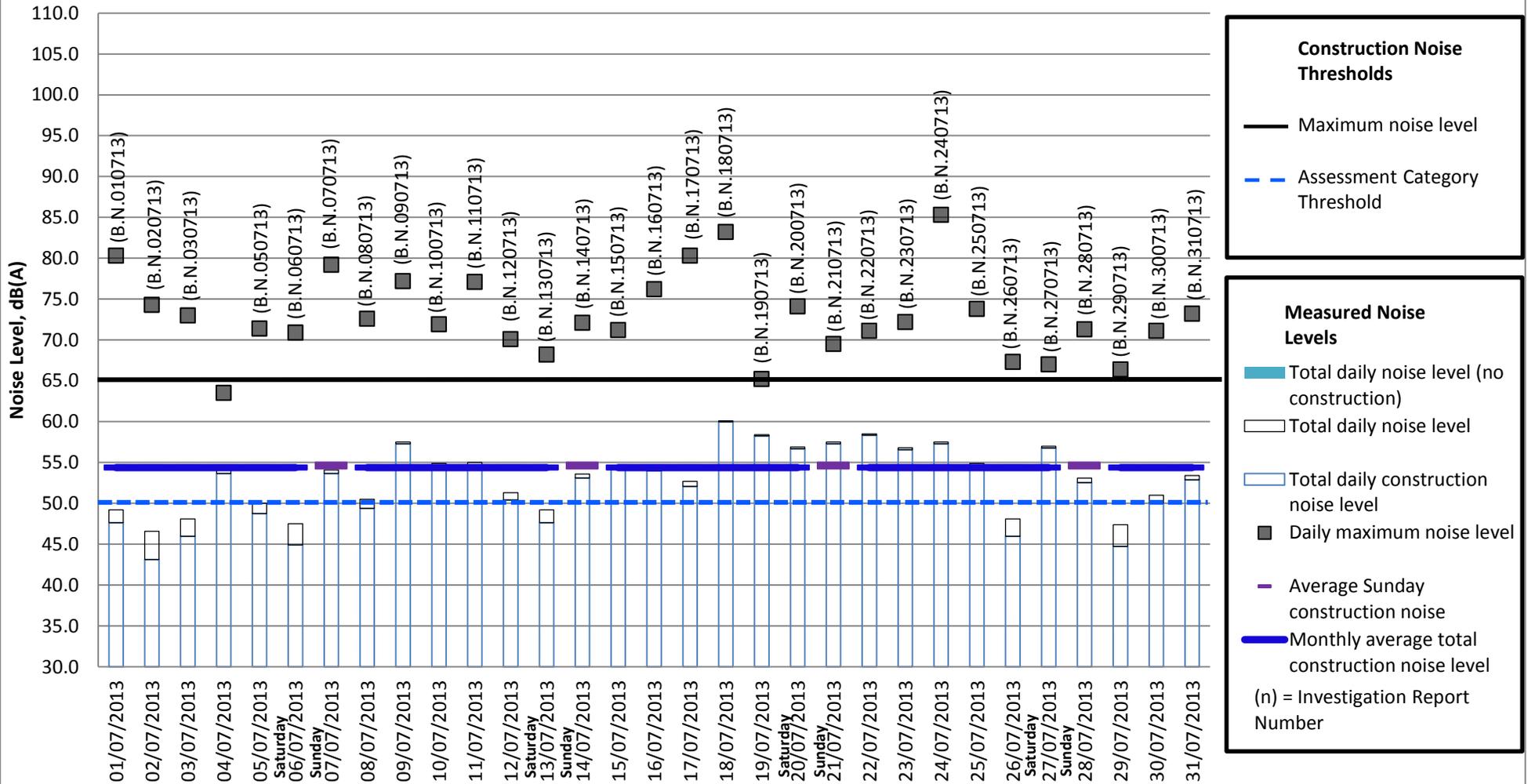
Measured Evening Noise Levels at Butlaw Fisheries

Measurement period: July 2013



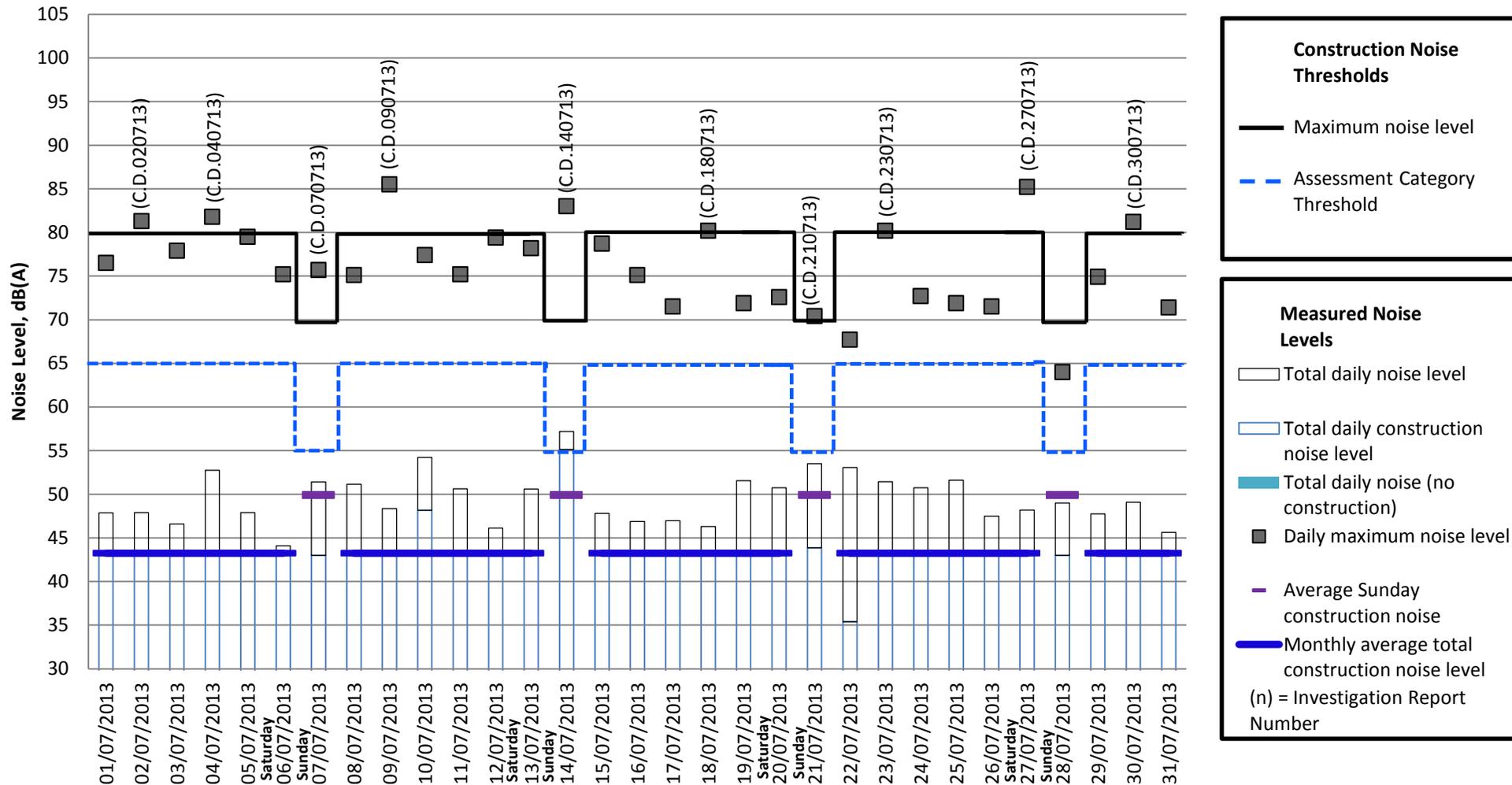
Measured Night time Noise Levels at Butlaw Fisheries

Measurement period: July 2013



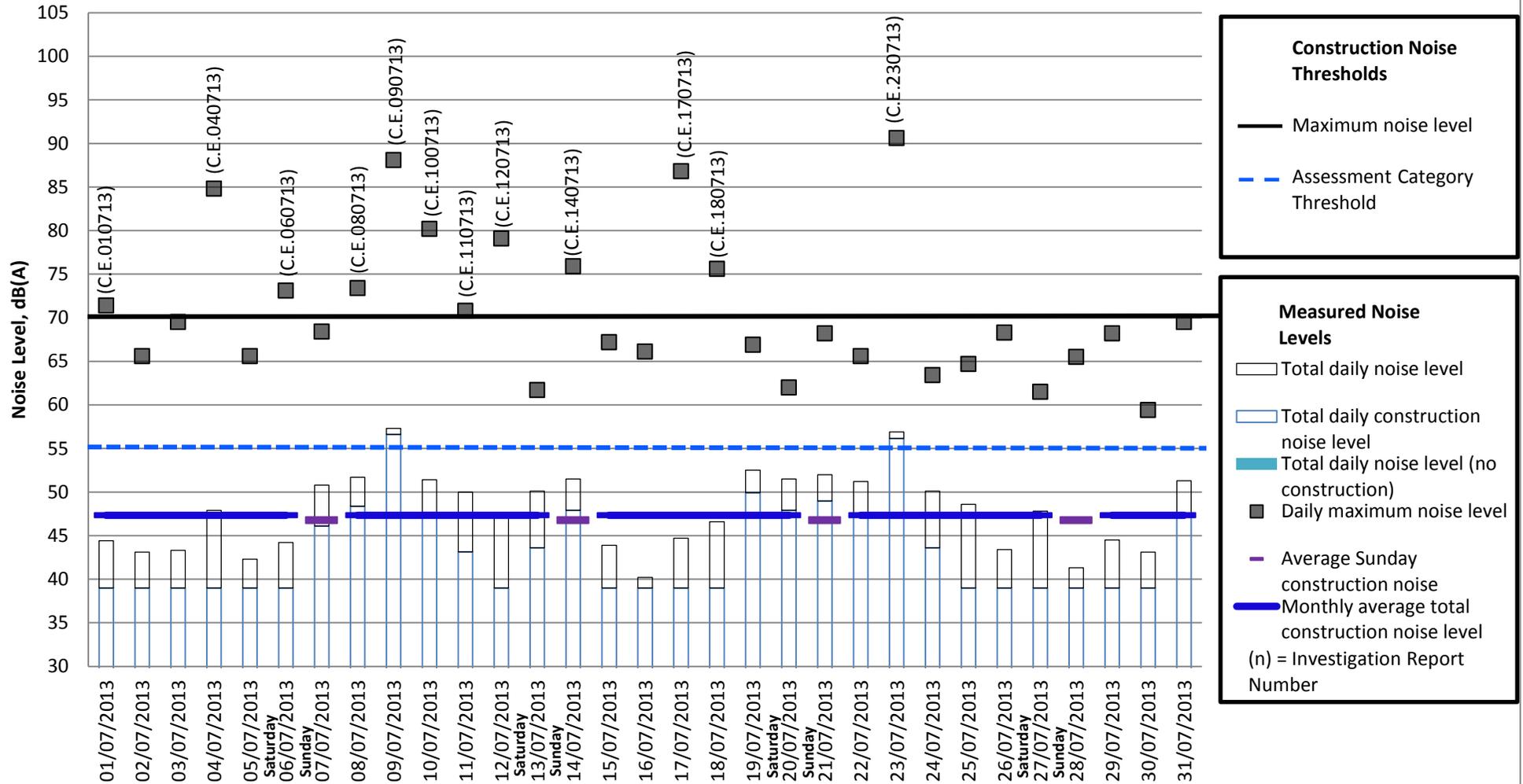
Measured Daytime Noise Levels at Clufflat Brae

Measurement period: July 2013



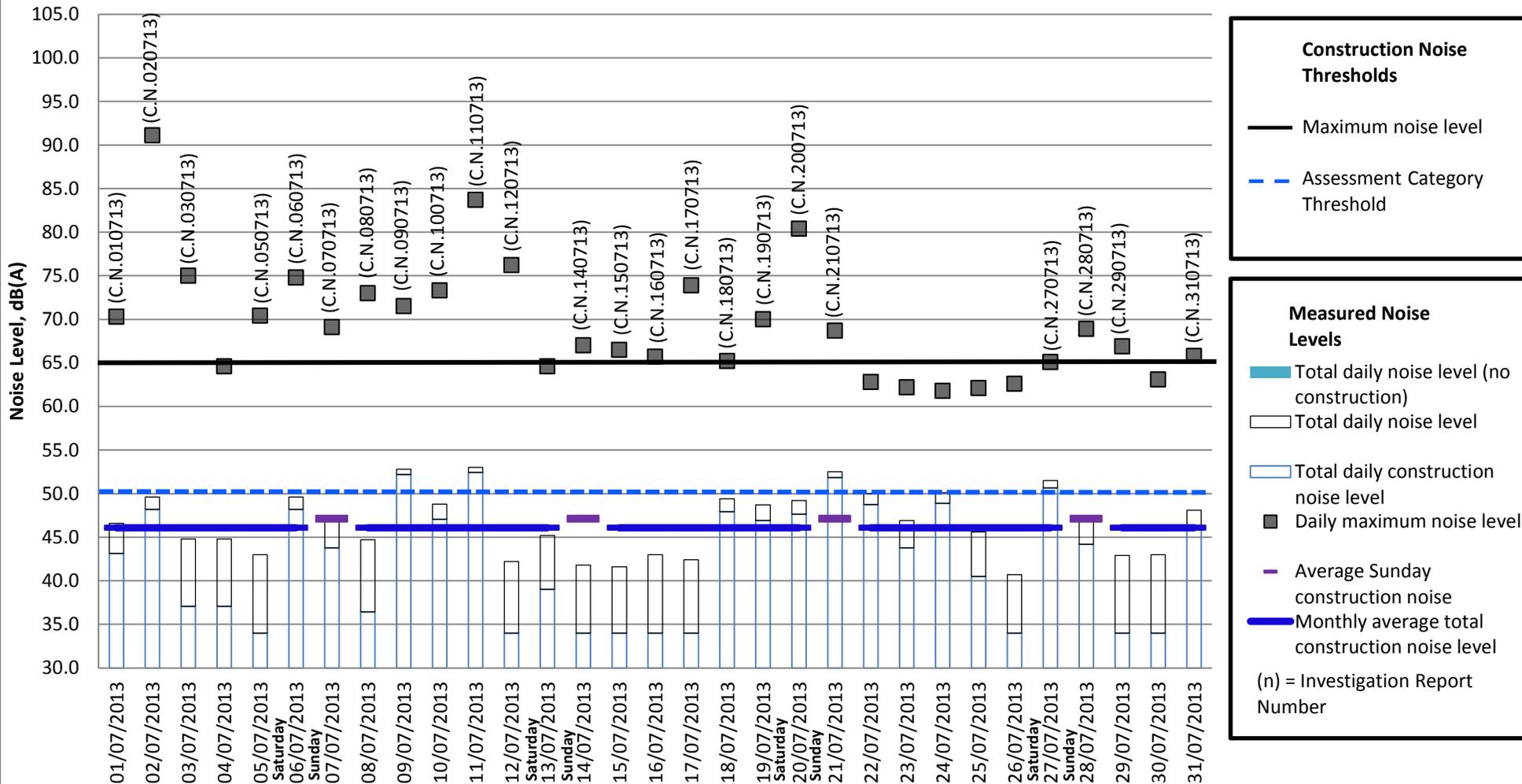
Measured Evening Noise Levels at Clufflat Brae

Measurement period: July 2013

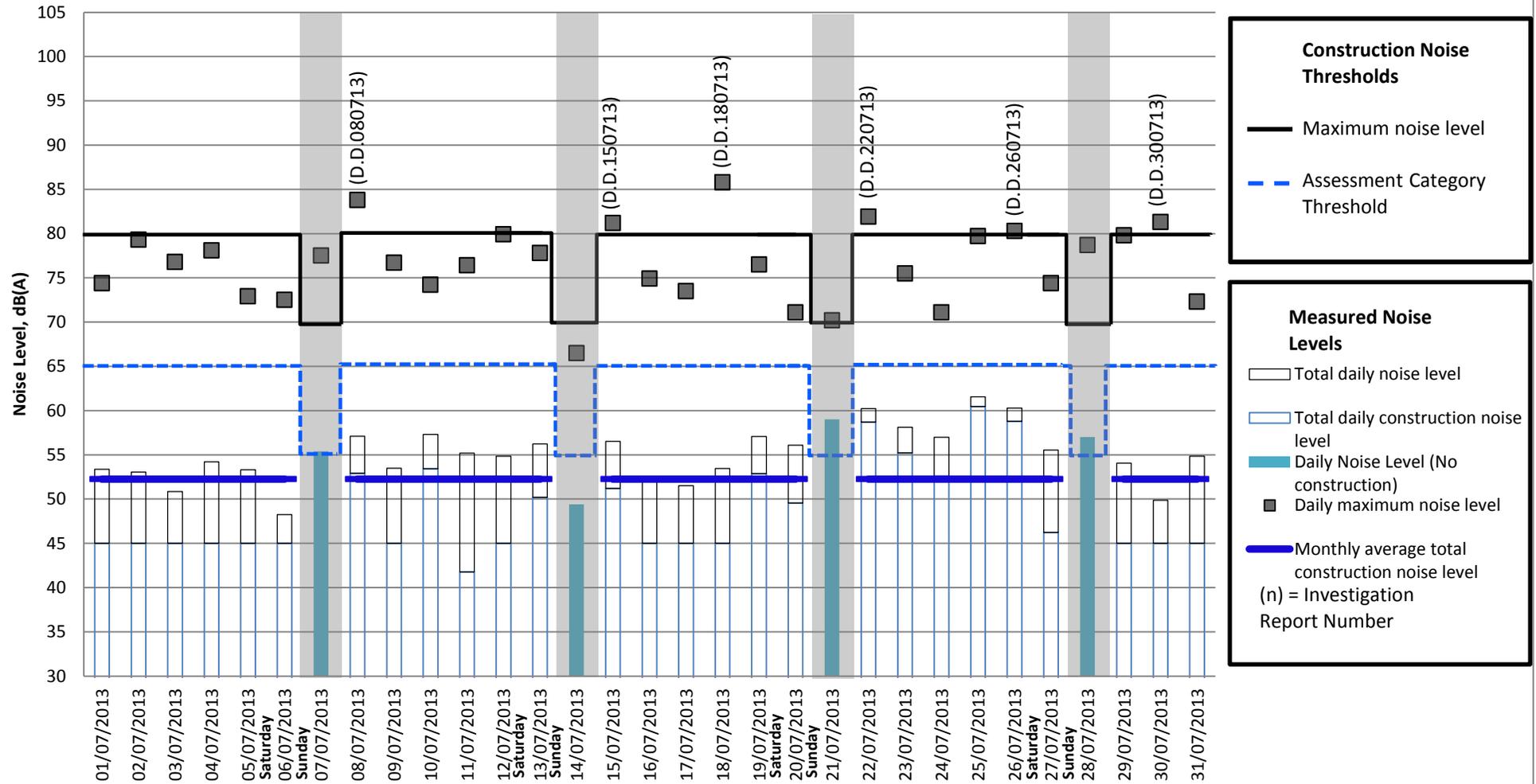


Measured Night-time Noise Levels at Clufflat Brae

Measurement period: July 2013



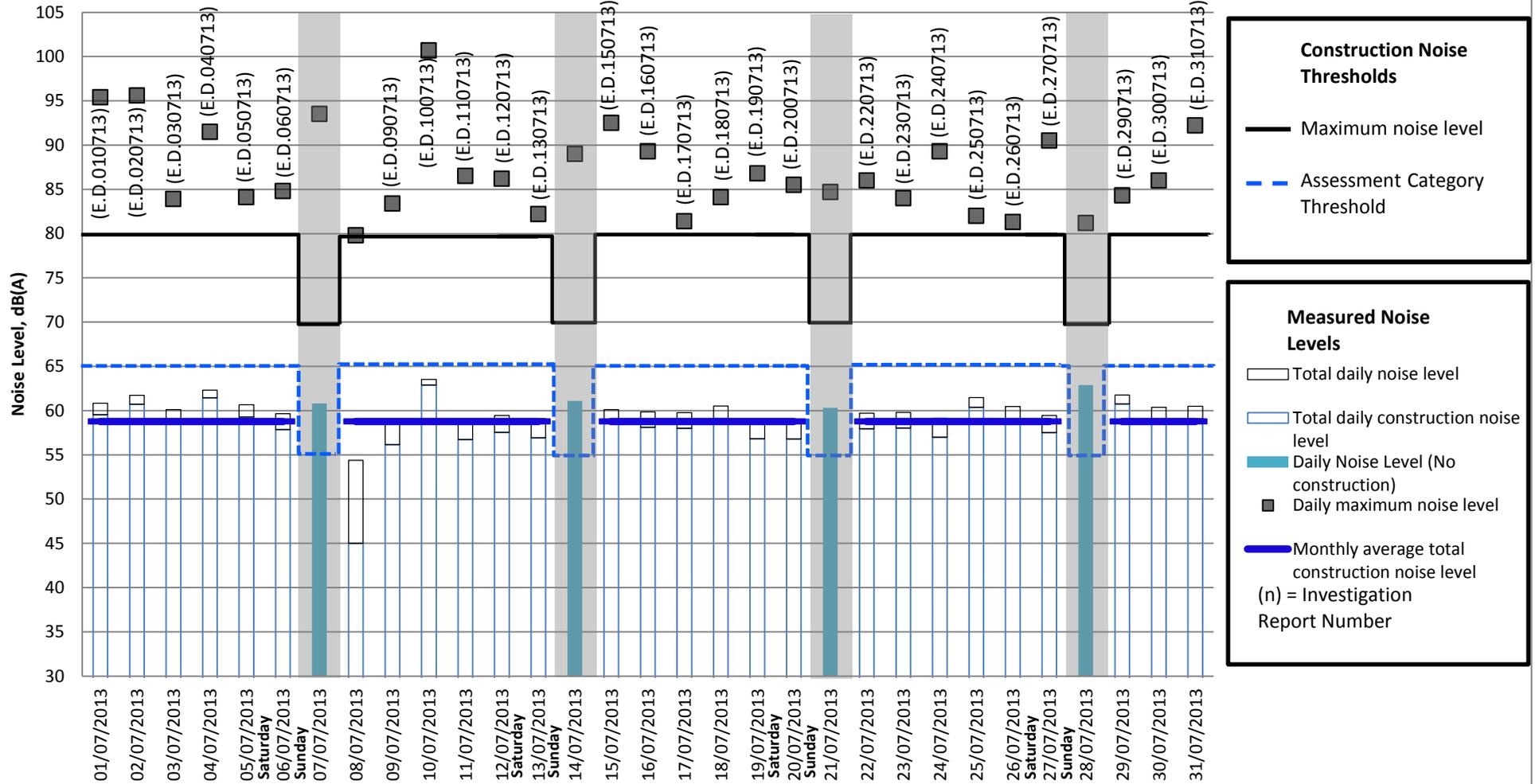
Measured Daytime Noise Levels at Dundas Home Farm Measurement period: July 2013



Note: The grey areas of the chart represent days on which no construction works have been conducted. The Sunday average has not been included as no Sunday works have been conducted at this location.

Measured Daytime Noise Levels at Echline

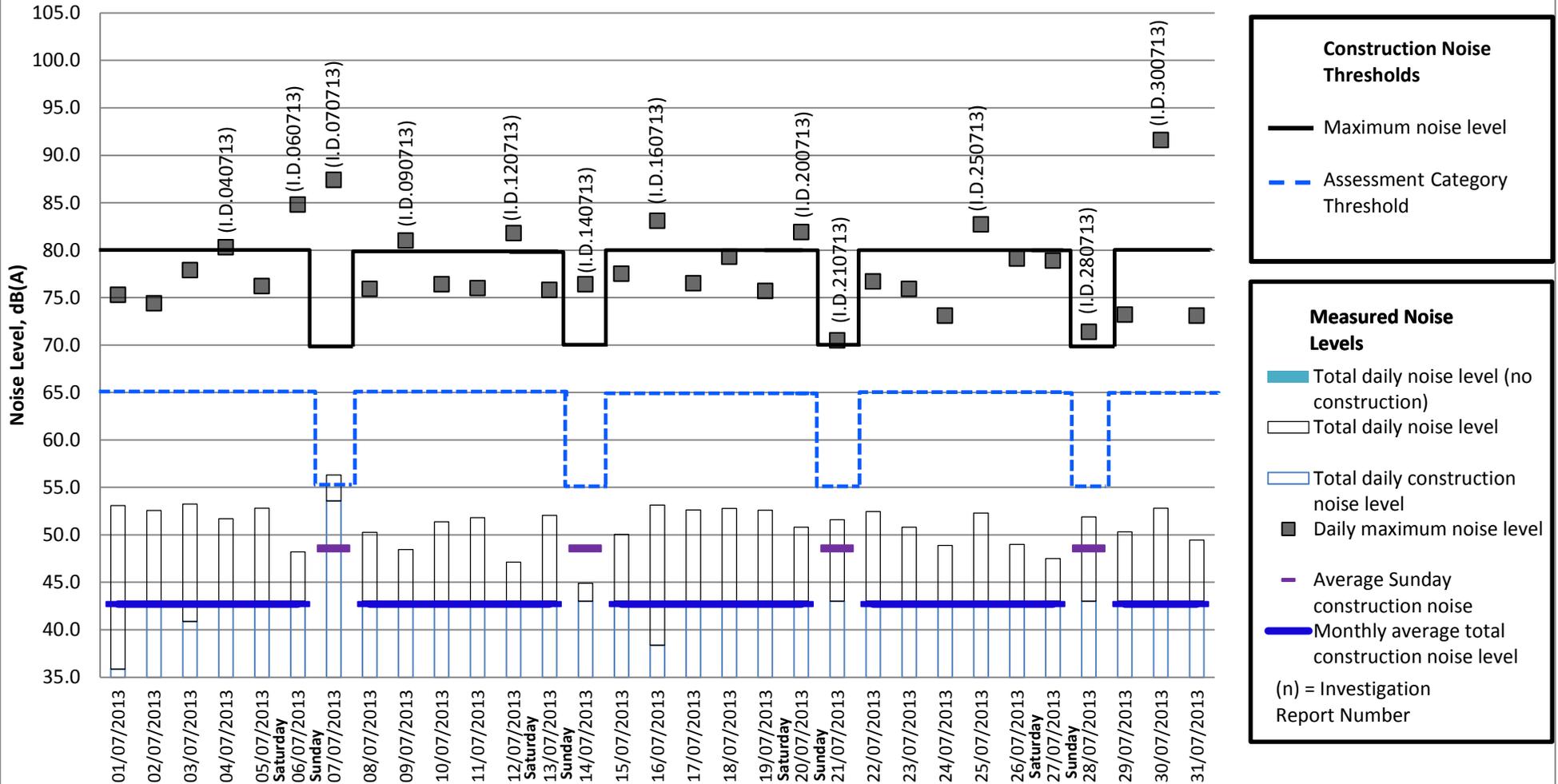
Measurement period: July 2013



Note: The grey areas of the chart represent days on which no construction works have been conducted. The Sunday average has not been included as no Sunday works have been conducted at this location.

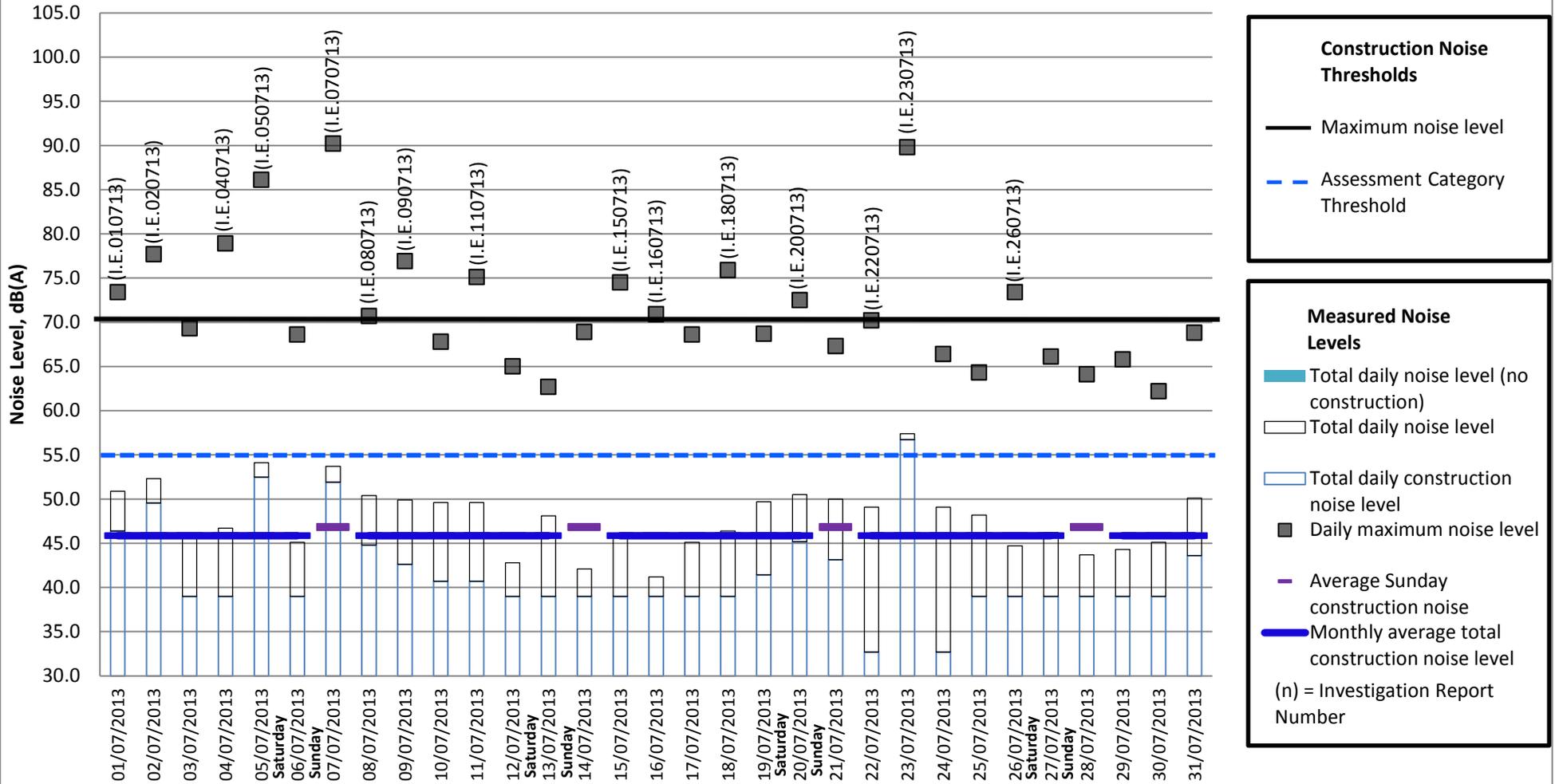
Measured Daytime Noise Levels at Inchgarvie

Measurement period: July 2013



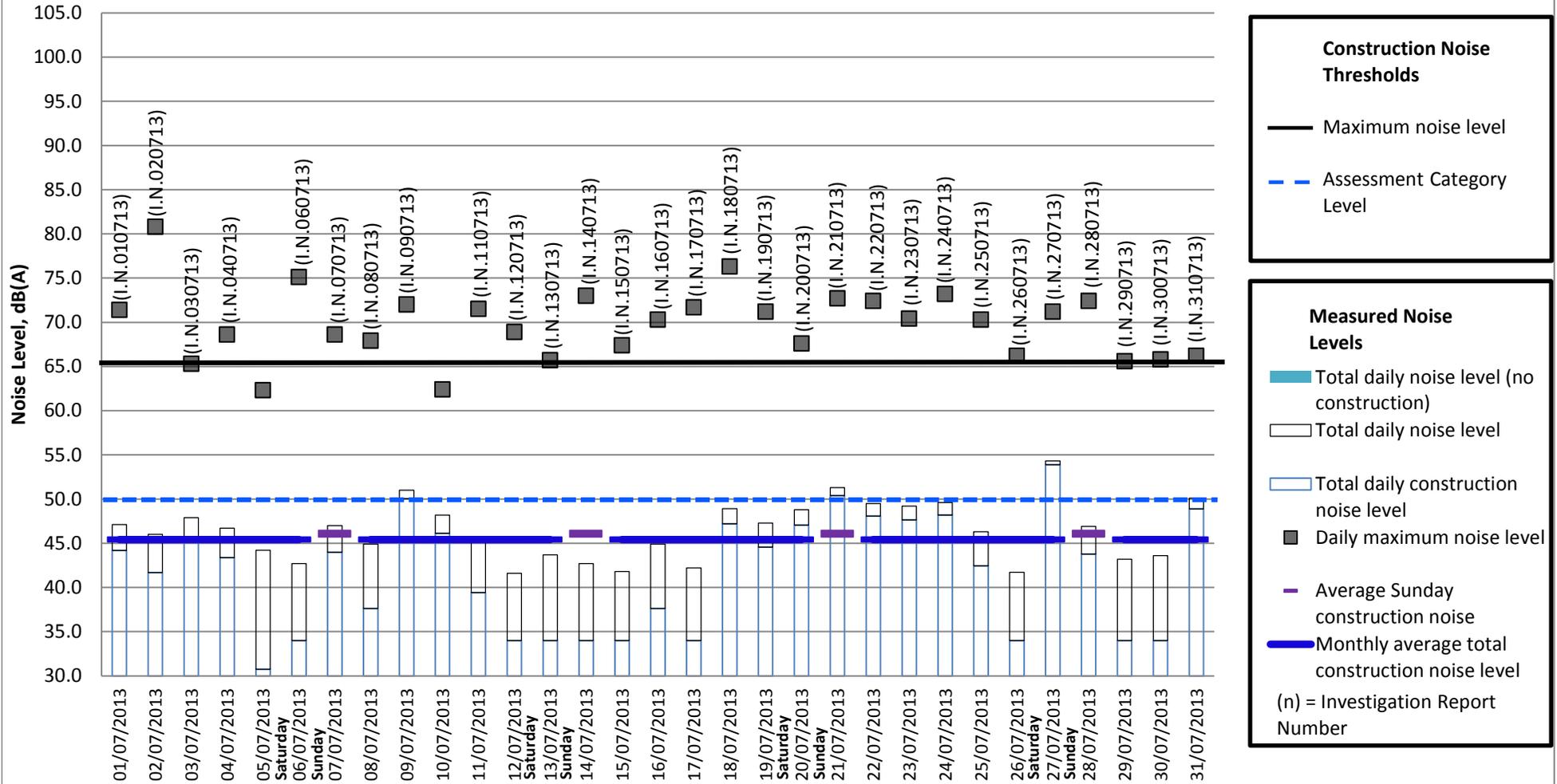
Measured Evening Noise Levels at Inchgarvie

Measurement period: July 2013



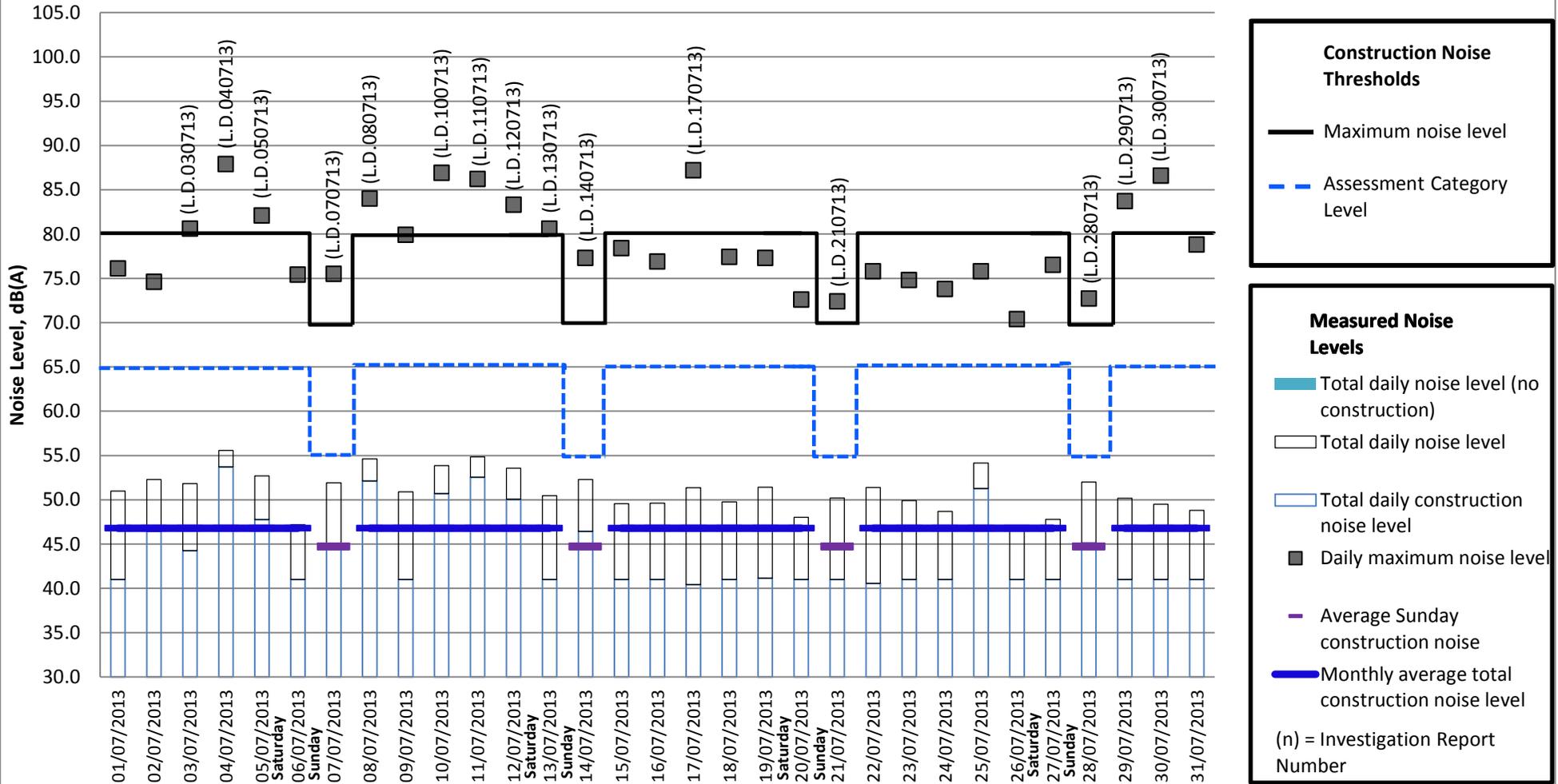
Measured Night-time Noise Levels at Inchgarvie

Measurement period: July 2013



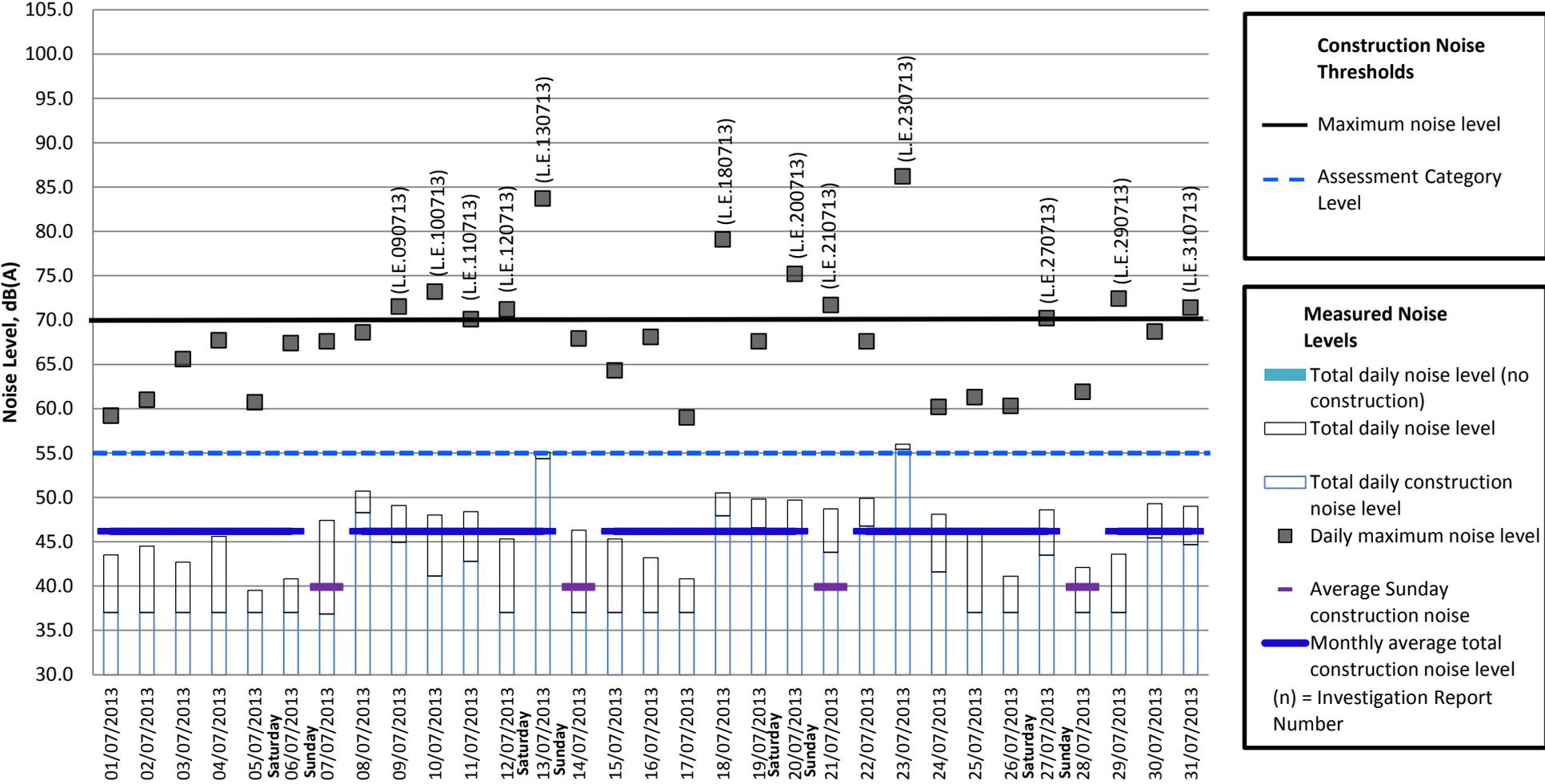
Measured Daytime Noise levels at Linn Mill

Measurement period: July 2013

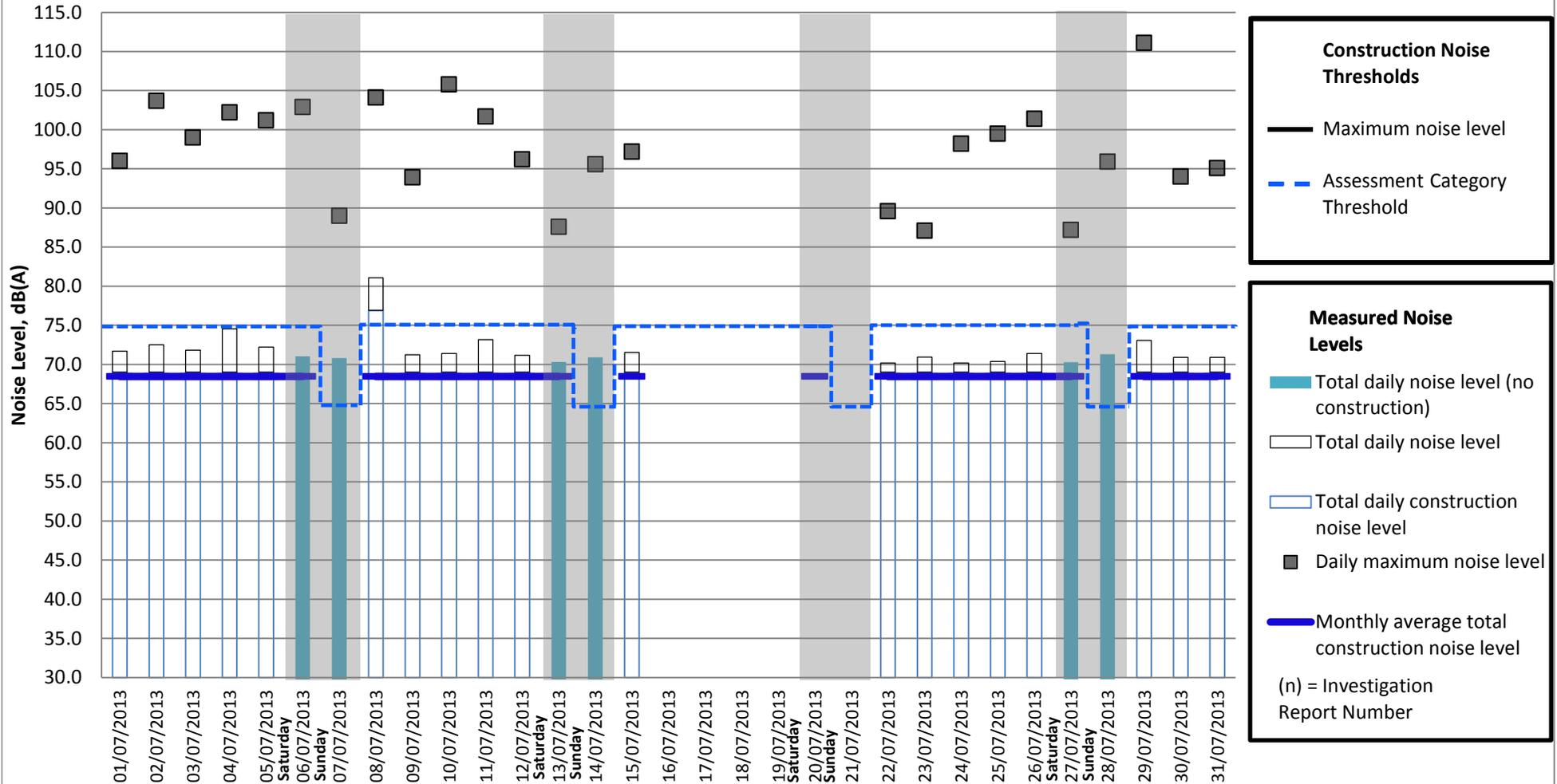


Measured Evening Noise Levels at Linn Mill

Measurement period: July 2013



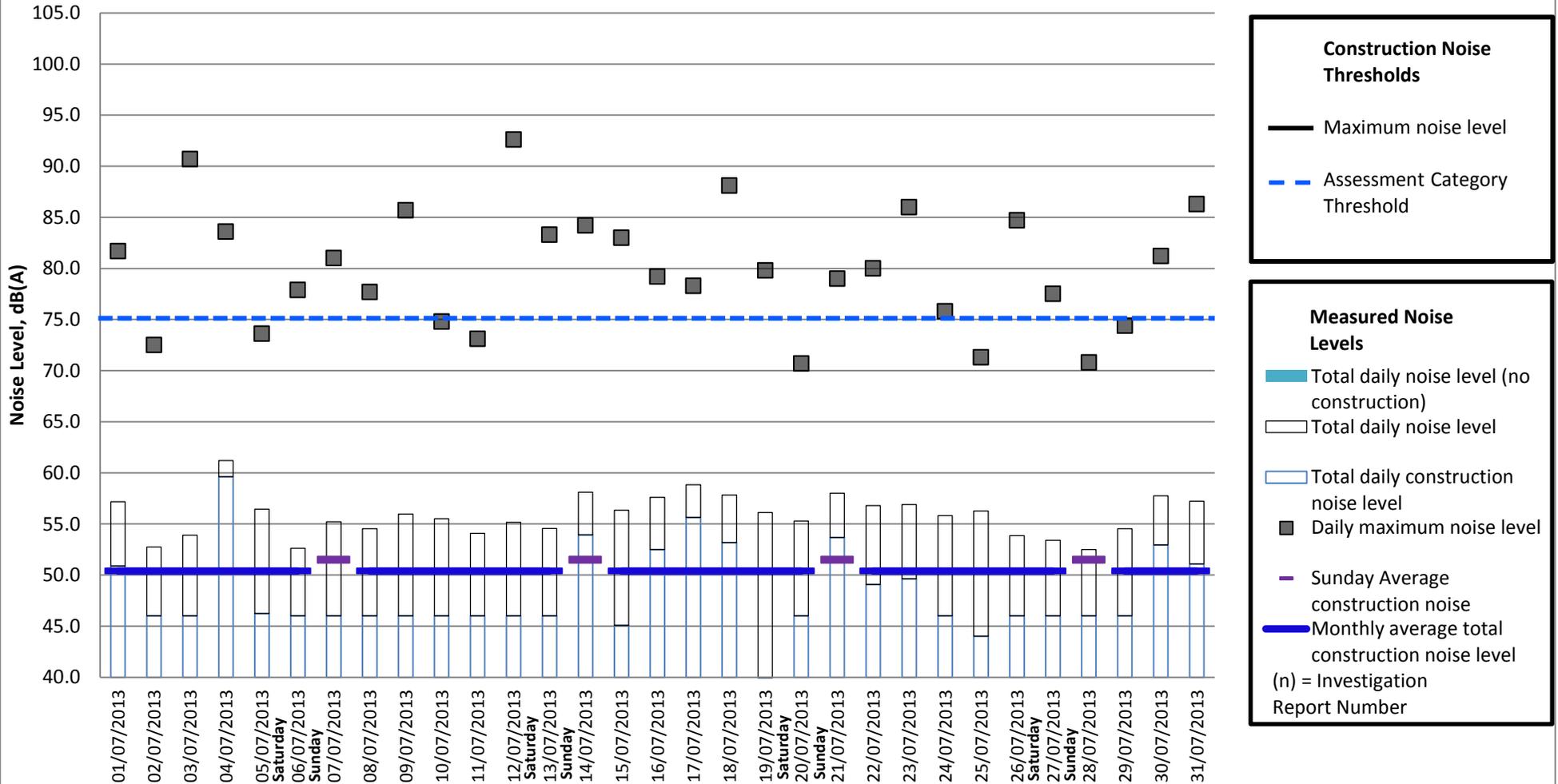
Measured Daytime Noise Levels at Newton Measurement period: July 2013



Note: The grey areas of the chart represent days on which no construction works have been conducted. 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. Data is missing between 16/07/13 to 21/07/13 due to device error.

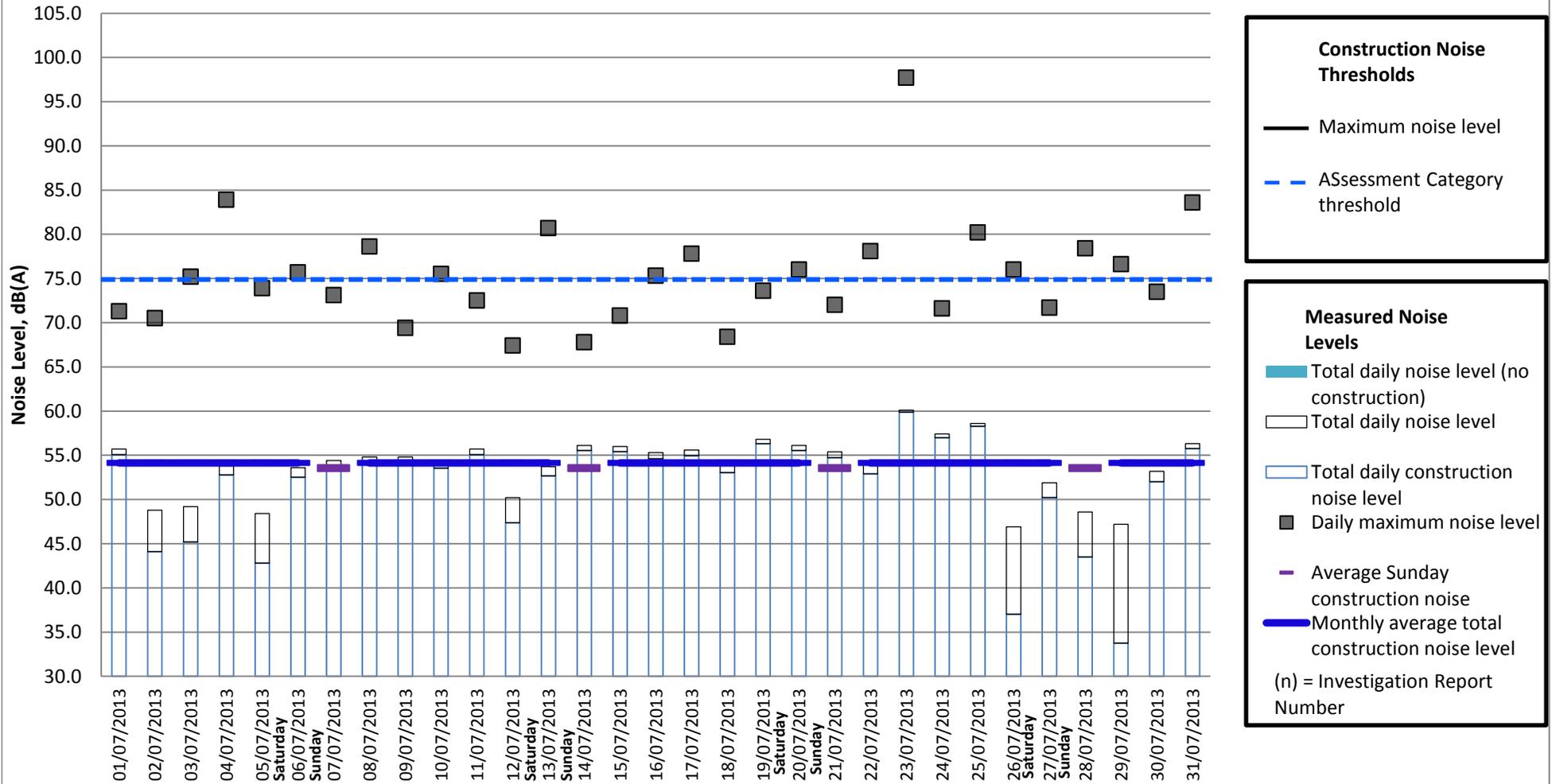
Measured Daytime Noise Levels at Port Edgar

Measurement period: July 2013



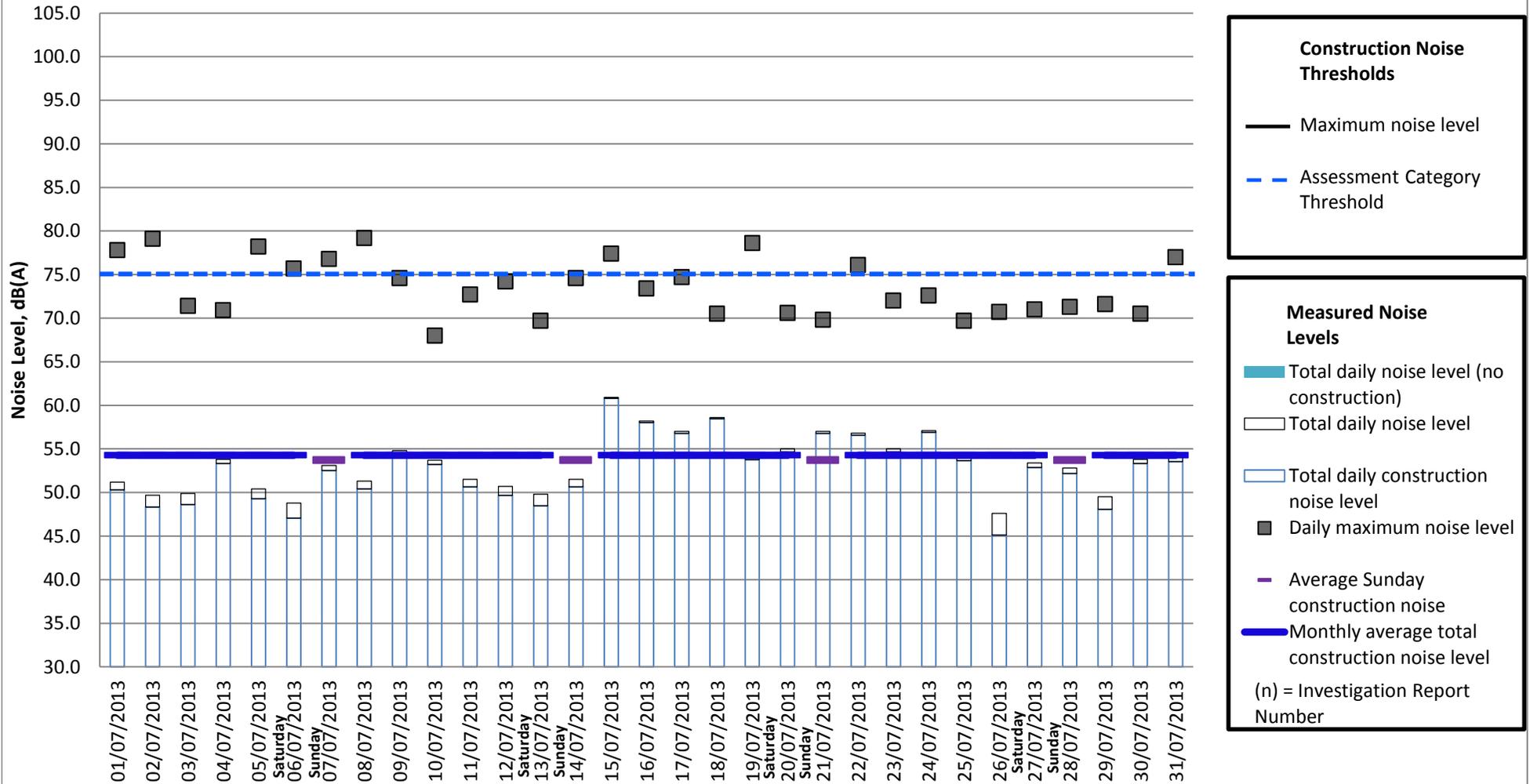
Measured Evening Noise Levels at Port Edgar

Measurement period: July 2013



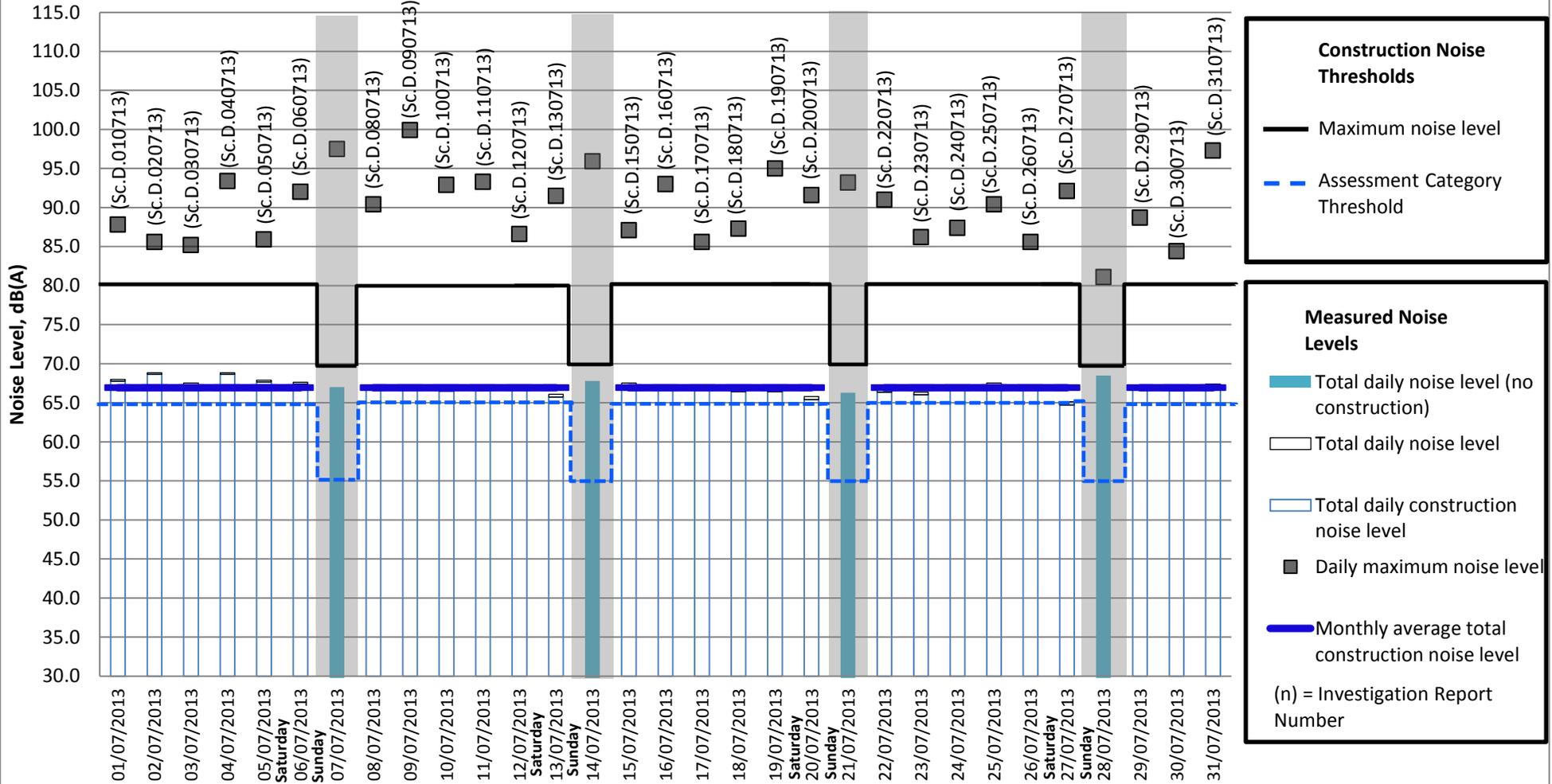
Measured Night-time Noise Levels at Port Edgar

Measurement period: July 2013



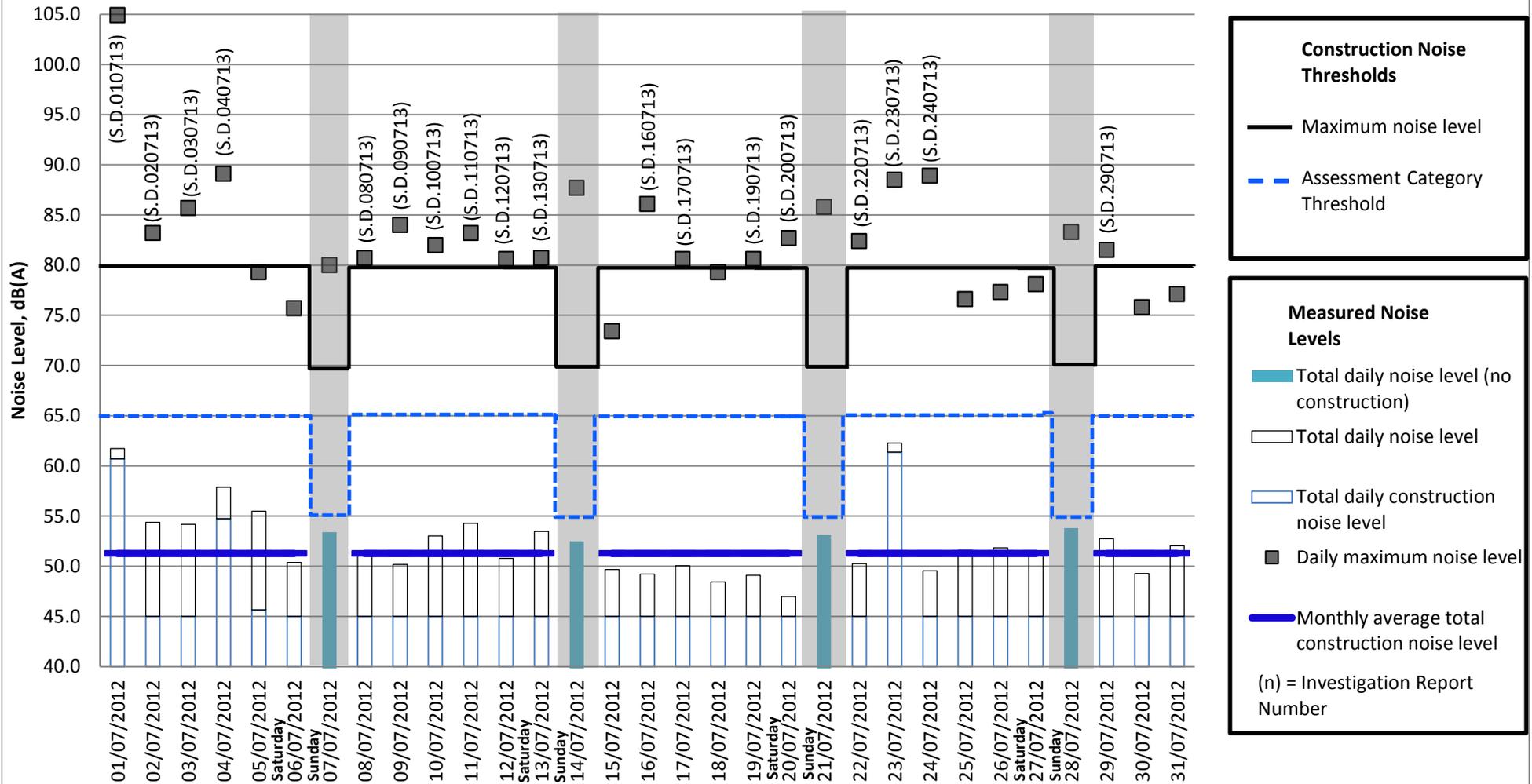
Measured Daytime Noise Levels at Scotstoun

Measurement period: July 2013



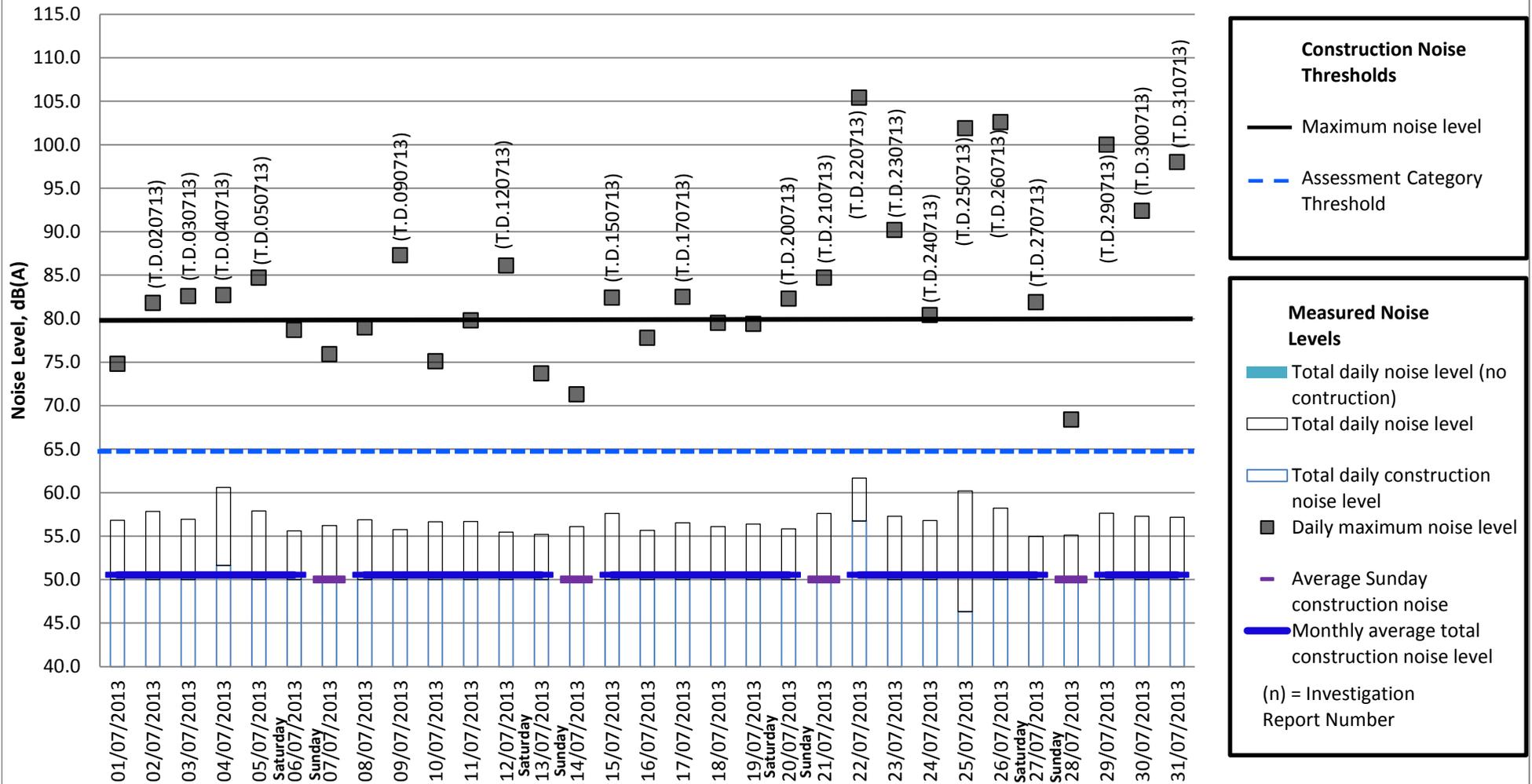
Note: The grey areas of the chart represent days on which no construction works have been conducted. The monthly average construction noise for Sunday has not been included as no Sunday works have been conducted at this location .

Measured Daytime Noise Levels at Springfield Measurement period: July 2013



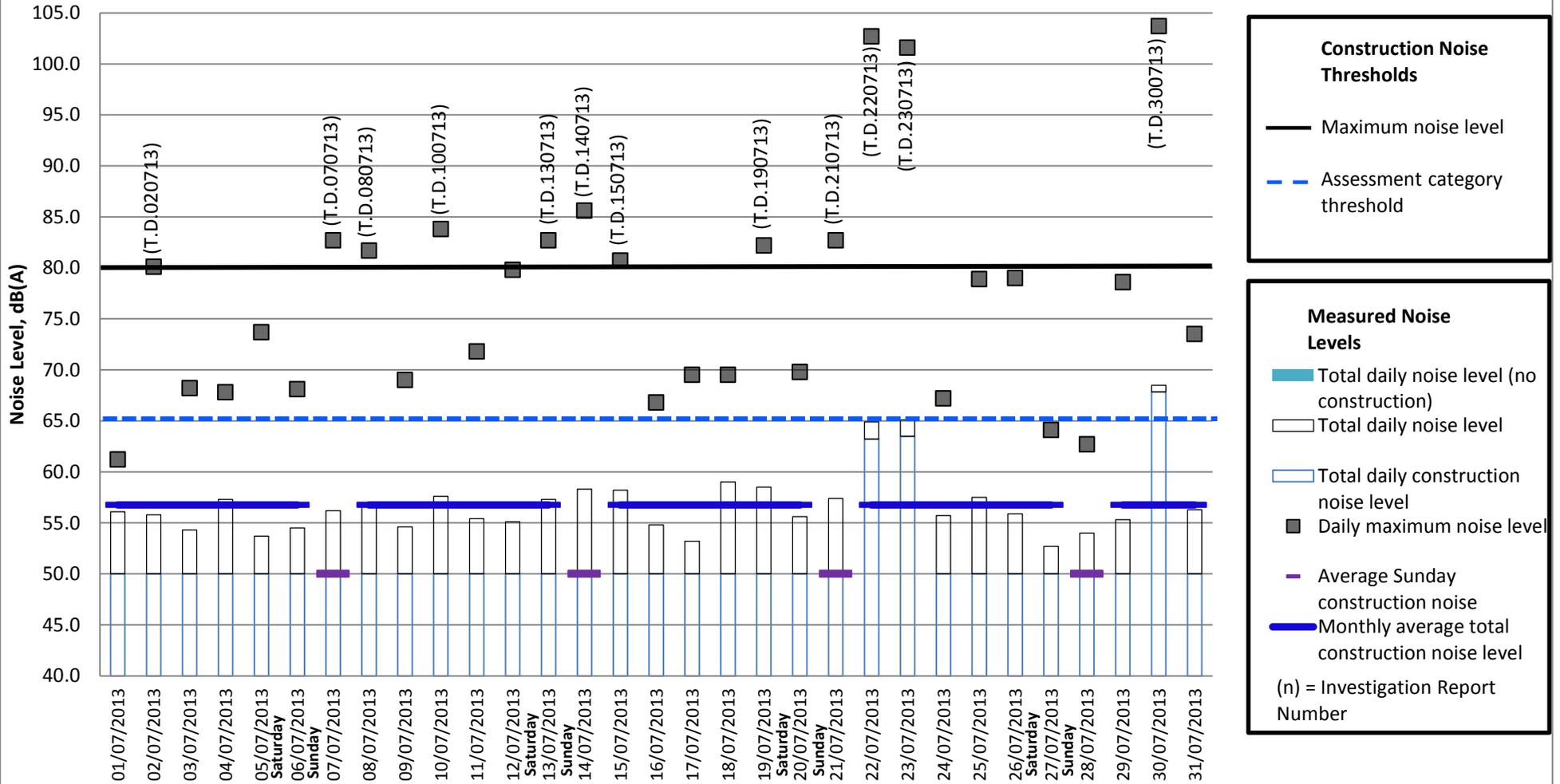
Note: The grey areas of the chart represent days on which no construction works have been conducted. The monthly average construction noise for Sunday has not been included as no Sunday works have been conducted at this location.

Measured Daytime Noise Levels at Tigh-Na-Grian Measurement period: July 2013



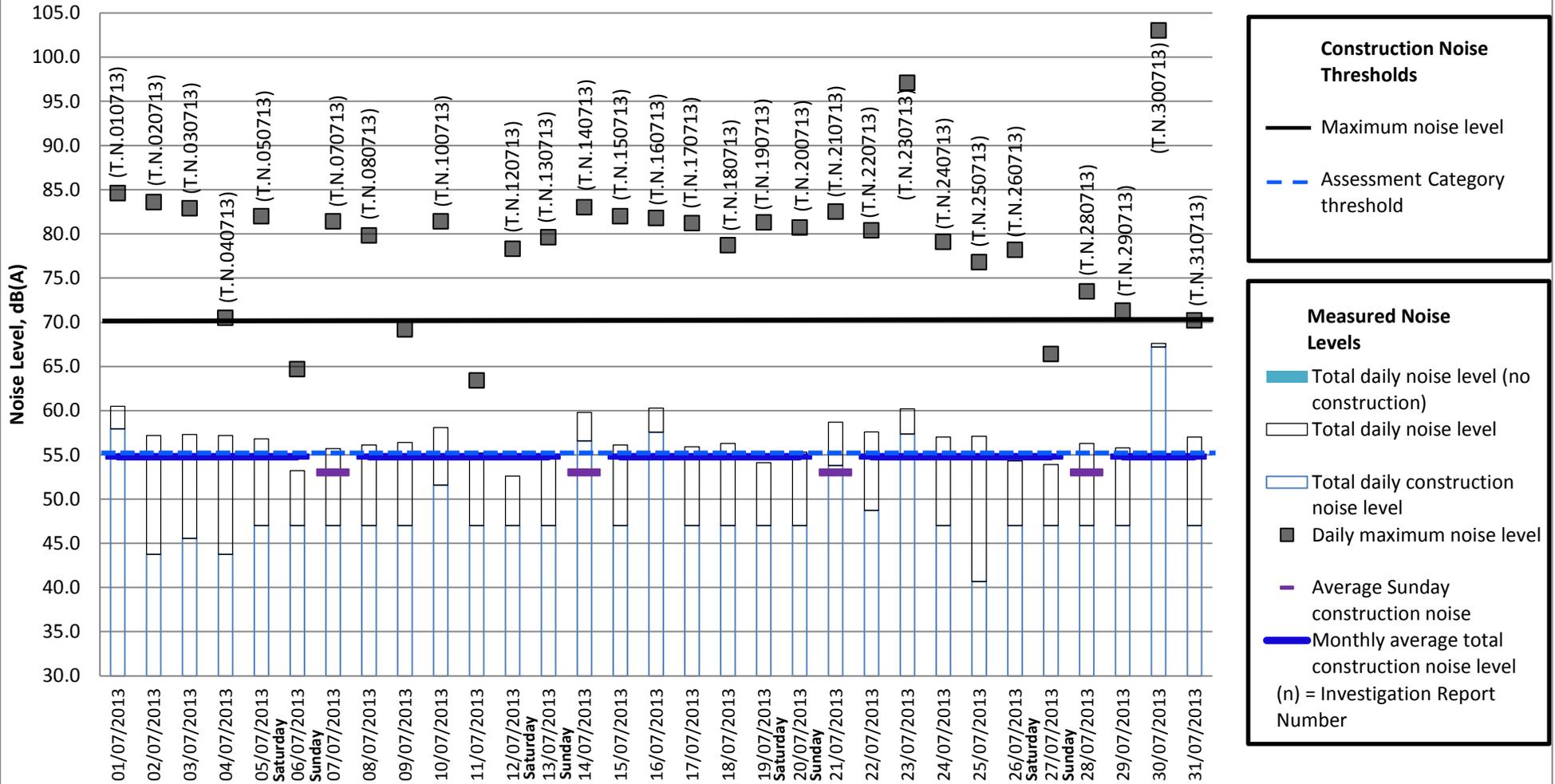
Measured Evening Noise Levels at Tigh-Na-Grian

Measurement period: July 2013



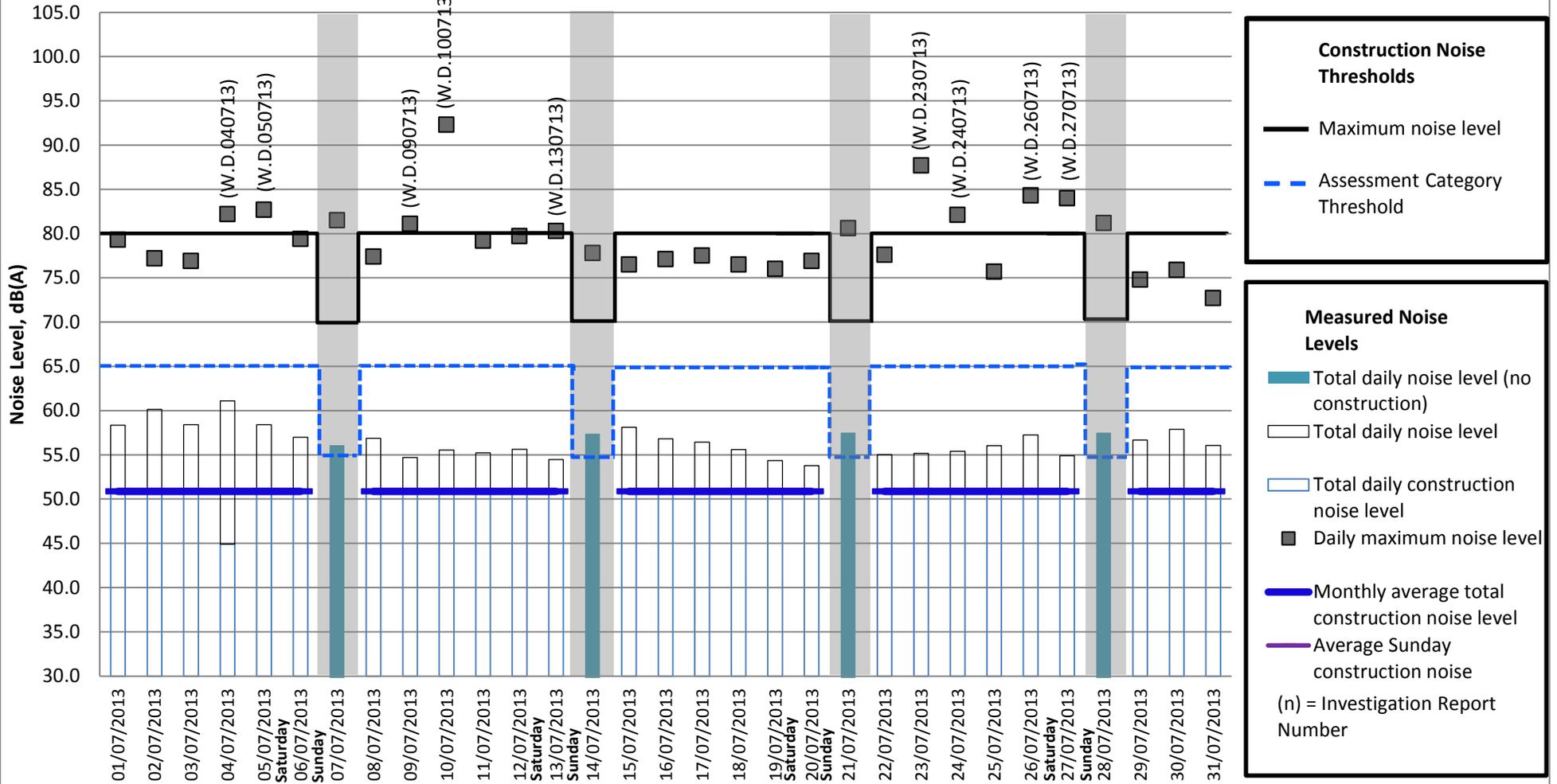
Measured Night-time Noise Levels at Tigh-Na-Grian

Measurement period: July 2013



Measured Daytime Noise Levels at Whinny Hill

Measurement period: July 2013



Note: The grey areas of the chart represent days on which no construction works have been conducted.