



Contractor



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Project **FORTH REPLACEMENT CROSSING**

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CONSTRUCTION NOISE MONITORING REPORT: AUGUST 2016

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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 August 2016. The objective of this report is to detail the monitoring that was undertaken across the site during this reporting period and to present the construction noise monitoring results.
- 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 August 2016, construction noise was monitored using permanent, continuous noise monitoring devices (01db DUOs) at locations listed in **Table 1**. These monitors were installed during November and December 2011, with additional monitors installed at Scotstoun Park (Arup's Office) and Newton during March 2012, a further sound level meter was installed at Whinny Hill during April 2012.
- 2.2 Weather stations accompany the noise monitors at Linn Mill and Whinny Hill.
- 2.3 Various construction works were undertaken across the site during August 2016. **Table 1** outlines the main construction activities in the location of each monitor.

Table 1: Monitoring Locations

Ref.	Monitoring Location	Crossing or Network	Main Construction Activities During August 2016
M1	Whinny Hill	Network	<ul style="list-style-type: none"> • Earth Works/Fill Placement • Hope Street roadworks • FT03 & FT04 Bridge Works • FT19 Works • FT10 Bridge Demolition • Main carriageway roadworks • Rock breaking / crushing
M3	Tigh-Na-Grian	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork, concreting works, deck lifting & stay cable installation works • North Tower rebar, formwork, concreting works, deck lifting and stay cable installation works • AVN Rebar and concrete works
M6	Port Edgar	• Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork, concreting works, deck section lifts and stay cable installation works • South Tower rebar, formwork, concreting works, deck section lifts and stay cable installation works. • Pier S3 Hydro demolition • Pier S2 works • Pier S1 works • AVS rebar & concrete deck works
M7	Butlaw Fisheries	Crossing	<ul style="list-style-type: none"> • Pier S1,works • Pier S2 work • Pier S3 Hydro demolition • Central Tower rebar, formwork, concreting works, deck section lifts and stay cable installation works • South Tower rebar, formwork, concreting works, deck section lifts and stay cable installation works • AVS rebar & concrete deck works
M10	Inchgarvie Lodge	Crossing	<ul style="list-style-type: none"> • AVS rebar & concrete deck works • Pier S1 works. • Pier S2 work • Pier S3 Hydro demolition • Central Tower rebar, formwork, concreting works , deck section lifts and stay cable installation works. • South Tower rebar, formwork, concreting works, deck section lifts and stay cable installation works. • Main carriageway roadworks • South Abutment works
M11	Linn Mill	Network	<ul style="list-style-type: none"> • AVS rebar & concrete deck works

		(close proximity to Crossing)	<ul style="list-style-type: none"> • Excavating SUDS detention basin
M13	Clufflat Brae	Crossing / Network	<ul style="list-style-type: none"> • AVS rebar and concrete deck works • South Abutment works • Main carriageway roadworks
M14	Springfield	Network	<ul style="list-style-type: none"> • AVS rebar and concrete deck works • South Abutment works • Main carriageway roadworks
M15	Echline	Network	<ul style="list-style-type: none"> • AVS rebar and concrete deck works • South Abutment works • Main carriageway roadworks
M16	Scotstoun	Network	<ul style="list-style-type: none"> • Footpath works • Utility works • ESQ11 works • B800 roadworks including bridge works (these works are directly in the location of the meter which sits within the construction boundary). • Main carriageway roadworks • Gantry Erection • Pile removal
M17	Dundas Home Farm	Network	<ul style="list-style-type: none"> • Utility works • ESQ11 works • B800 Roadworks • Main carriageway roadworks • Gantry Erection • Pile removal
M18	Newton	Network	<ul style="list-style-type: none"> • No works

Noise Monitoring Results

Overview

2.4 Noise monitoring results are presented in graphs (**Appendix A**) using the template provided in the *Construction Noise Monitoring Information Note* (www.transportscotland.gov.uk).

2.5 With regard to the noise monitoring graphs, 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 are generally undertaken during the daytime only.
- Linn Mill is considered as a network location which has the potential to receive noise from the marine works near the south shore. As a result, evening and night time data has been included for this location.
- Noise data for day, evening and night on which no construction works were conducted have been excluded from the monthly average results presented in the graph. L_{AFmax} exceedances during these periods would have been caused by non-construction related factors and do not require investigation. Noise results (L_{Aeq} and L_{AFmax}) for any day, evening and night on which no construction works have been conducted have been presented in the graphs as greyed out areas.
- An average for Sunday construction noise data has been included where applicable; in locations where no Sunday works were conducted no average is shown.
- As set out in the CoCP, the assessment time for evening, nights and Sunday daytime is in one 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.

Results

- 2.6** Results demonstrate that the monthly average total of construction noise results for daytime are within the threshold levels for all monitoring locations during August 2016. For evening and night time periods, there were exceedances of monthly average at Linn Mill during evening time and exceedances at Butlaw and Linn Mill during the night-time period. There were also exceedances of Sunday averages at Butlaw and Linn Mill during the night.
- 2.7** Most exceedances noted were not caused by construction activities. Each exceedance was found to be influenced by increased noise levels due to periods of adverse weather, traffic, residential noise or birdsong. Audio recordings demonstrate that the increased levels were caused by sea waves and birdsong at Butlaw Fisheries, birdsong and resident activity at Inchgarvie, and birdsong at Tigh-na-Grian. With regard to the averages reported for evening and night-time 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.
- 2.8** Each exceedance of the threshold was investigated using triggered audio recordings, records of construction works (i.e. site programmes, 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 construction exceedance. There were some exceedances this month that were due to construction work.

2.9 Construction related noise at Butlaw on the 6th August was from a loud speaker on a FCBC Multicat on the estuary. The relevant site team was contacted and asked to brief site staff on the requirements of working at night. Exceedances at Tigh-na-grian on the 16th and 27th August during the night were caused by hammering. The site teams were given a TBT to remind staff about night time work procedures and good practice to minimise noise from site activities at night. Exceedances recorded on the Linn mill monitor during the daytime period on the 8th 10th and 12th August were caused by the excavation work nearby at the Suds pond. Exceedances on the 12, 13, 23rd and 24th were caused by a sub-contractor leaving the water pump running overnight at the Suds. FCBC now have the key for the pump and will be controlled via our staff. Exceedances at Inchgarvie during the night time period on the 23rd, 24th and 30th were found to be hammering from site. As stated earlier, site teams have been given further TBT to remind them to follow approved procedures and good practice to minimise noise from site activities at night. The environmental team have undertaken attended monitoring of the area and are currently investigating alternative methods that will minimise the noise emanating from site activities.

2.10 Exceedances were recorded during the sheet pile removal next to the B800 bridge (ESQ11) on the Dundas monitor during the night time period on the 27th pm and 28th am. Site teams were made aware of these exceedances and were asked to find alternative methods to remove the piles without hammering. These measures were implemented during the second part of the works on the 3rd September with no exceedances recorded.

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

Table 2: Summary of Exceedances at Monitoring Locations

Monitoring Location	Summary of Exceedance Details
Butlaw Fisheries	During August the maximum noise threshold was exceeded on 56 occasions (16 day time, 12 evening and 28 night time). Exceedances were attributed to non-construction factors, notably birdsong and waves. 1 exceedance was related to construction work (see 2.9)
Clufflat Brae	During August the maximum noise threshold was exceeded on 38 occasions (10 daytime, 11 evening and 17 night time). Exceedances were mainly found to be due to birdsong and residents
Inchgarvie Lodge	During August the maximum noise threshold was exceeded on 49 occasions (13 day time, 14 evening and 22 night time). Residential work to the property was found to be the main contributing factors to the exceedances in this location. Other factors included birdsong. There were two instances of construction noise exceeding the threshold (see 2.9)
Linn Mill	During August the maximum noise threshold was exceeded on 51 occasions (20 daytime, 11 evening and 20 night time). The majority of exceedances at this location were due to birdsong. There were seven instances of construction noise exceeding the threshold (see 2.9)
Tigh-Na-Grian	During August the maximum noise threshold was exceeded on 49 occasions (15 daytime, 13 evening and 21 night time). Exceedances were mainly due to birdsong.
Dundas Home Farm	During August the maximum noise threshold was exceeded on 8 occasions. The main exceedances were due to residents and birdsong. There were three exceedances due to construction work (see 2.10)
Echline	During August the maximum noise threshold was exceeded on 28 occasions. No exceedances at this location were due to construction activities. Most exceedances were attributed to vehicles passing by on the adjacent roads and high wind conditions.
Springfield	During August the maximum noise threshold was exceeded on 13 occasions. These exceedances were due to local residents.
Scotstoun	During August the maximum noise threshold was exceeded on 31 occasions. These exceedances were attributed to general traffic noise on the adjacent road.
Whinny Hill	During August the maximum noise threshold was exceeded on 17 occasions during the daytime. No exceedances at this location were attributed to construction activities. Most exceedances were due to birdsong and trains.
Port Edgar	After consultation with the Noise Liaison Group and SNH it was agreed that this monitor is no longer required and has now been removed.
Newton	Recordings taken for data record purposes

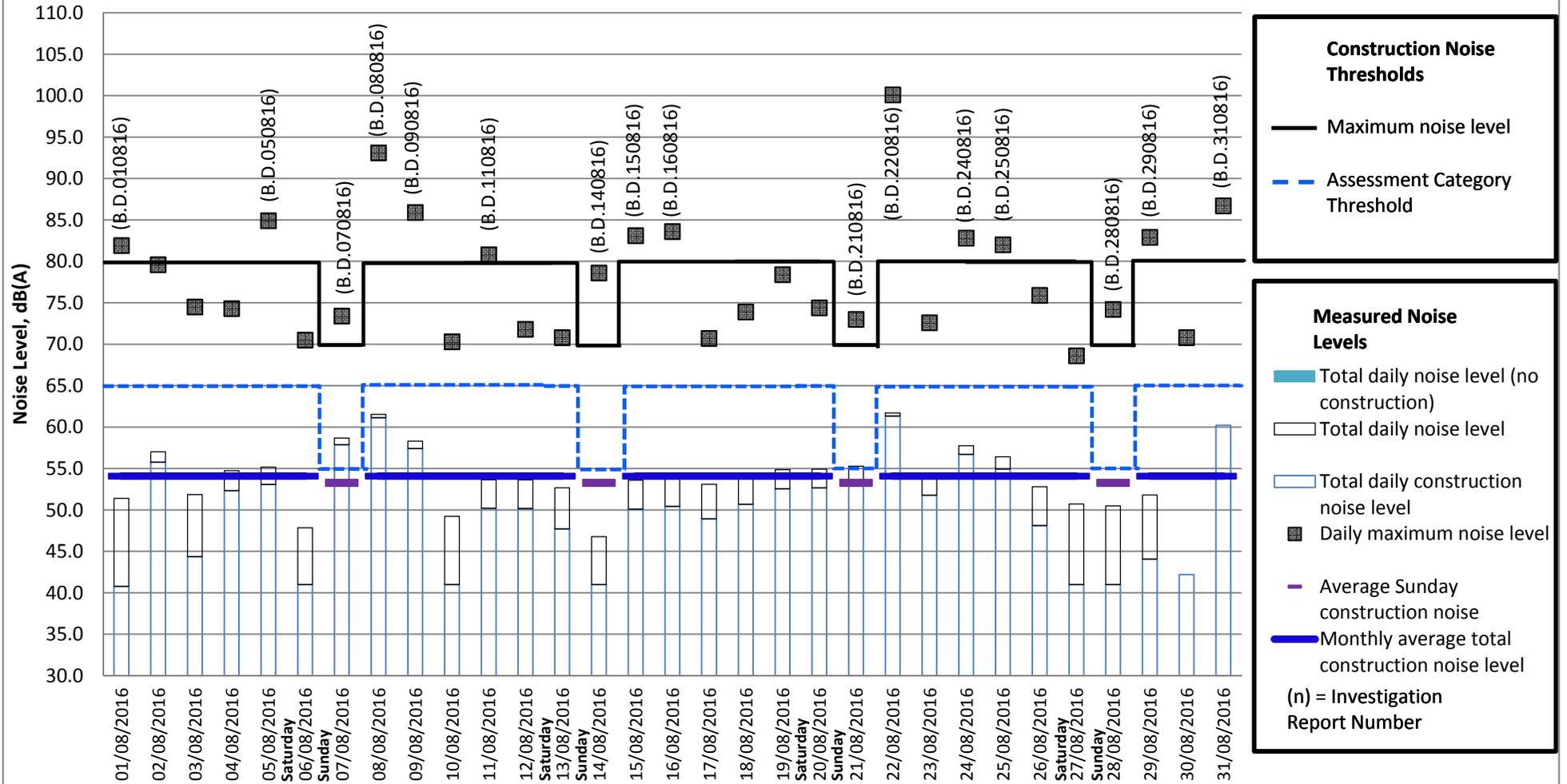


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APPENDIX A

Measured Daytime Noise Levels at Butlaw Fisheries

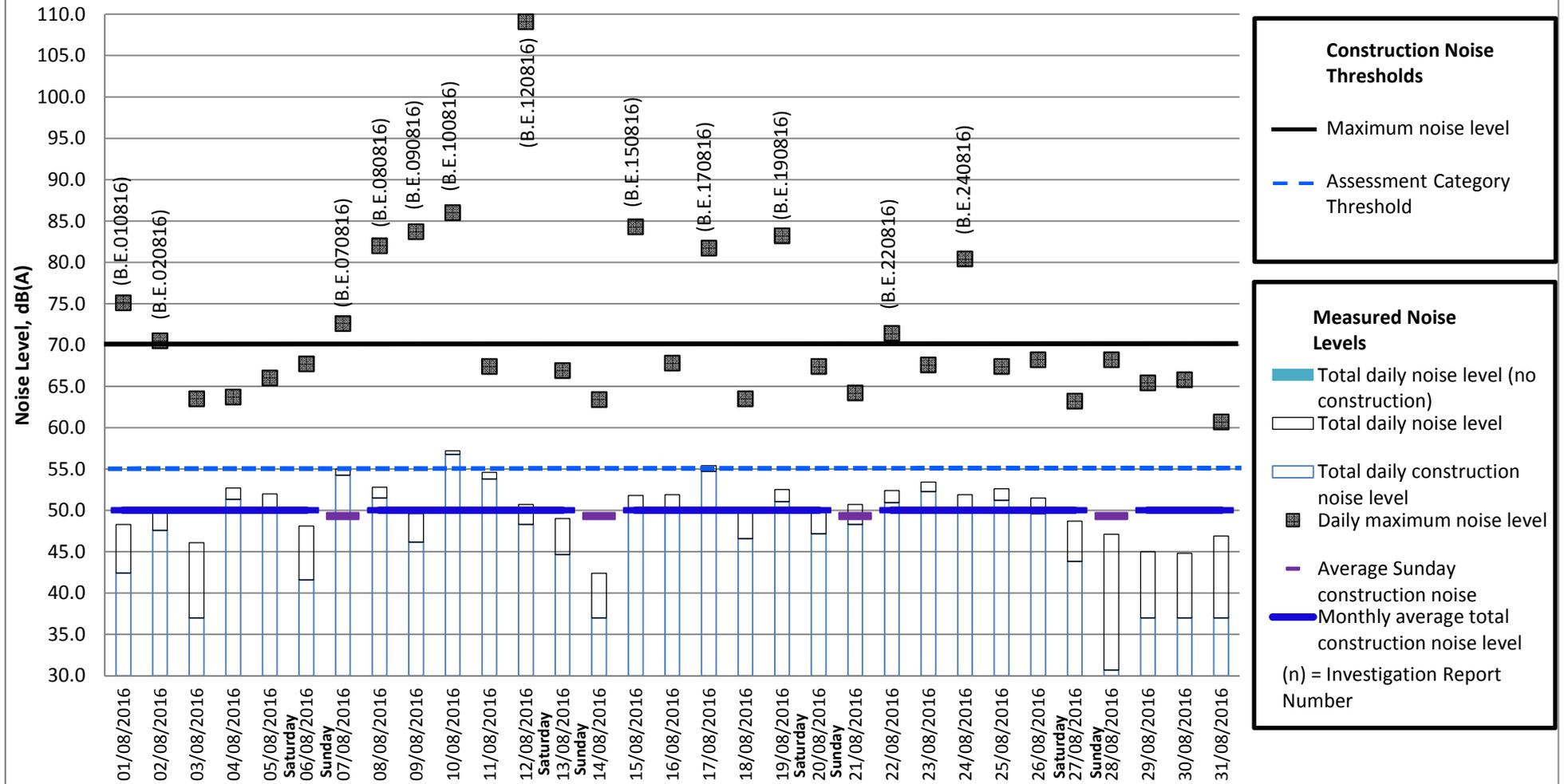
Measurement period: August 2016



Note:

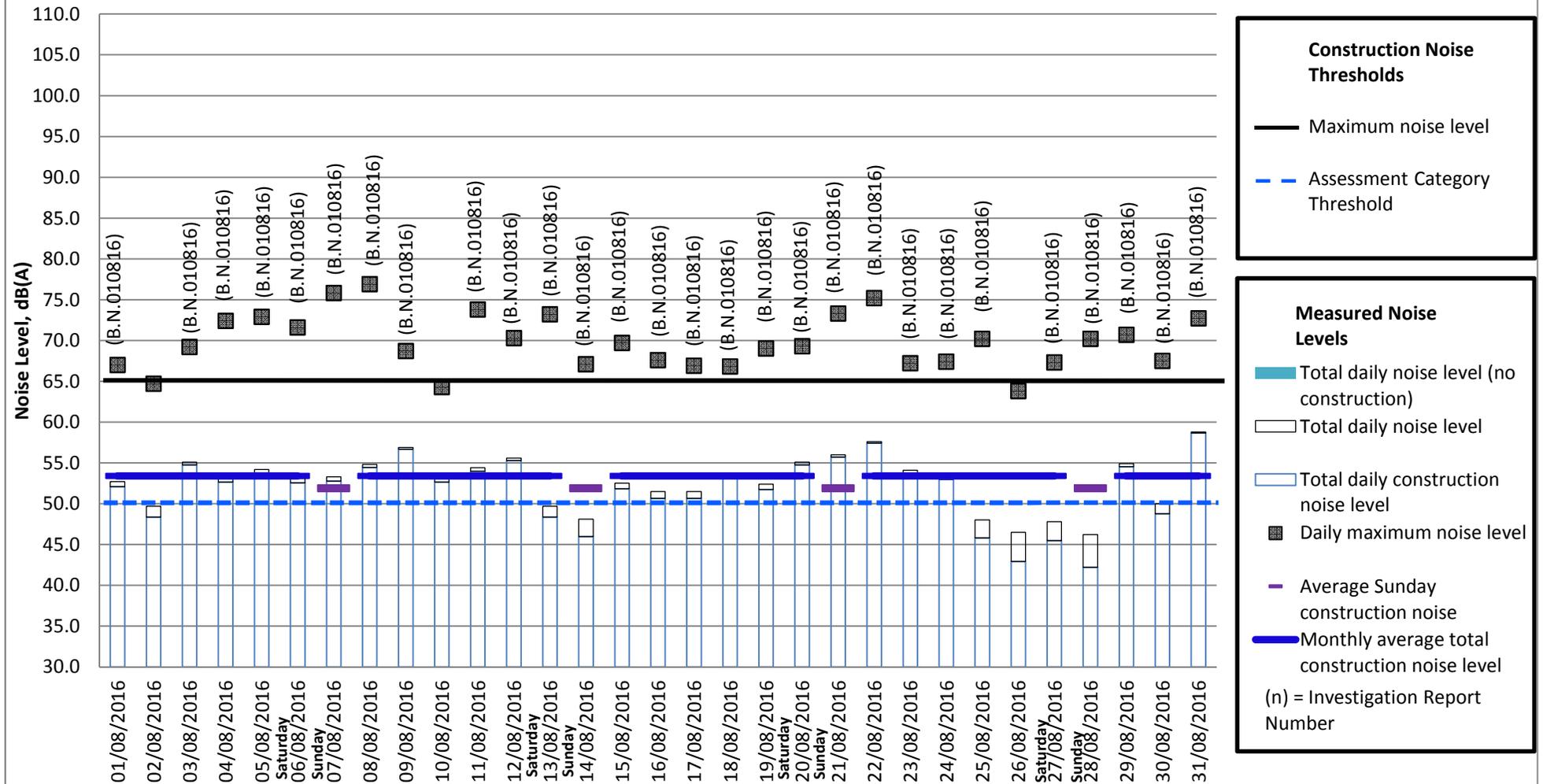
Measured Evening Noise Levels at Butlaw Fisheries

Measurement period: August 2016



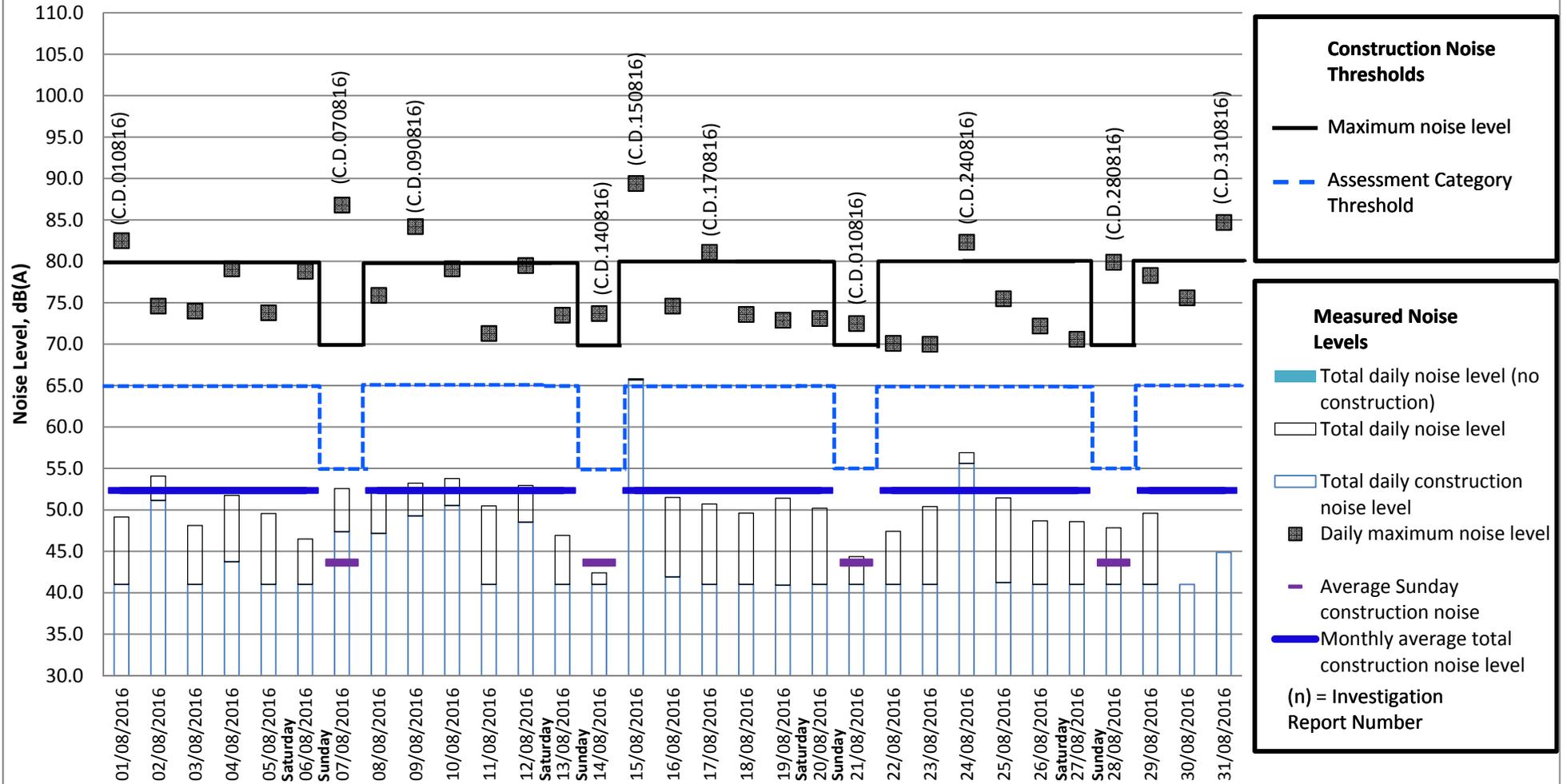
Note:

Measured Night time Noise Levels at Butlaw Fisheries Measurement period: August 2016



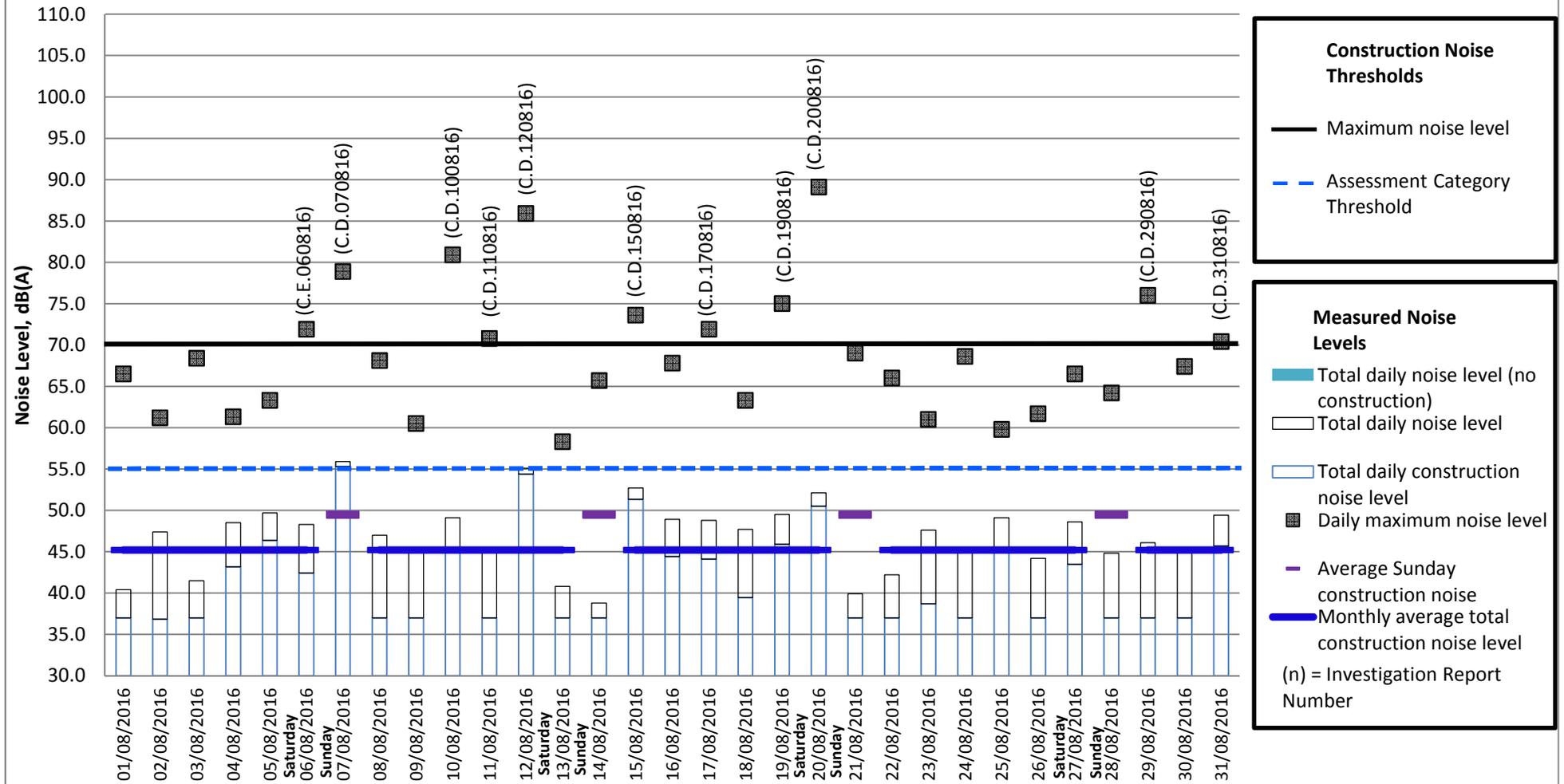
Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' throughout the month were caused by birds and waves

Measured Daytime Noise Levels at CLufflat Measurement period: August 2016



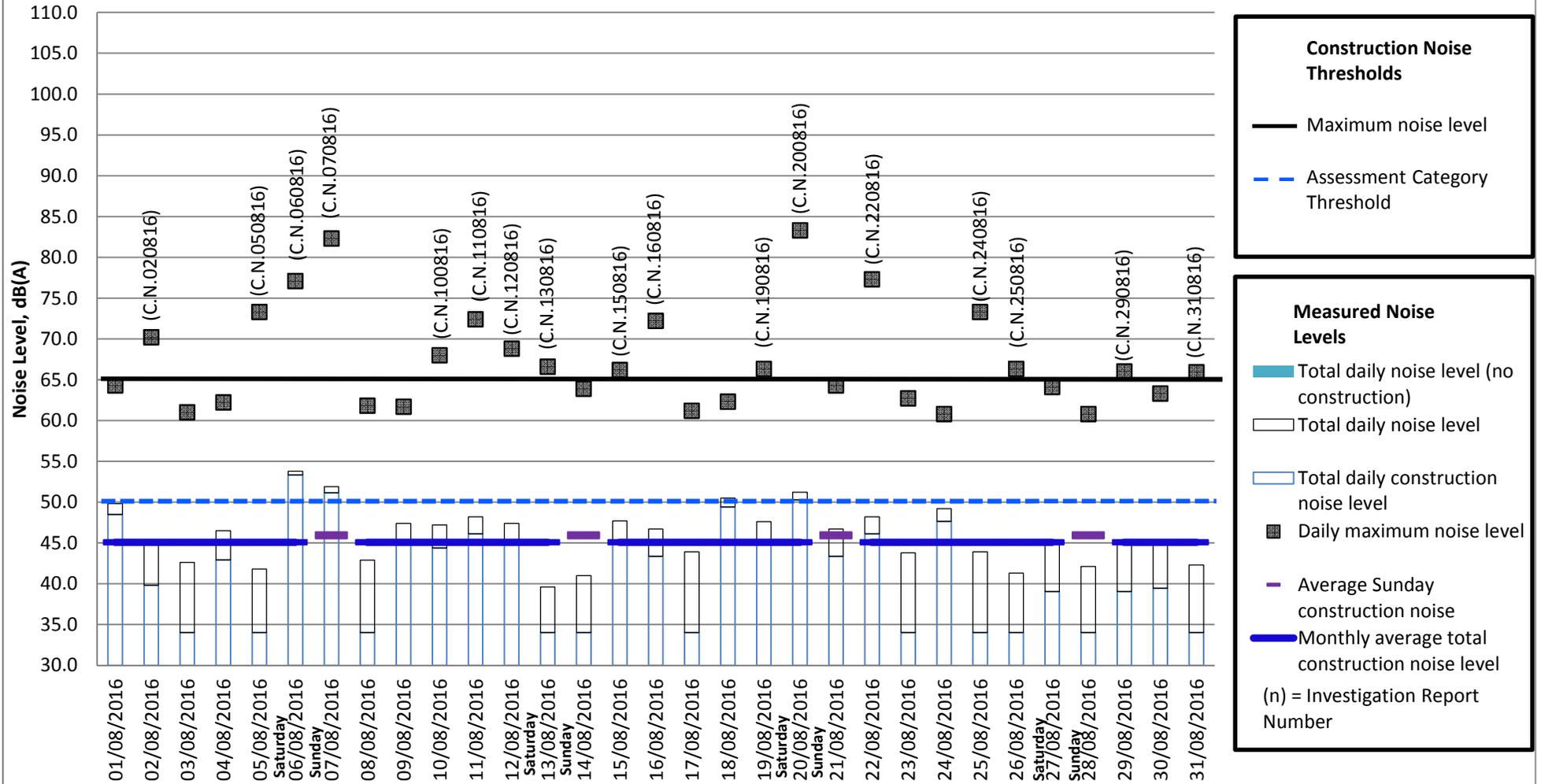
Note:

Measured Evening Noise Levels at Clufflat Measurement period: August 2016



Note:

Measured Night time Noise Levels at Clufflat Measurement period: August 2016



Construction Noise Thresholds

- Maximum noise level
- Assessment Category Threshold

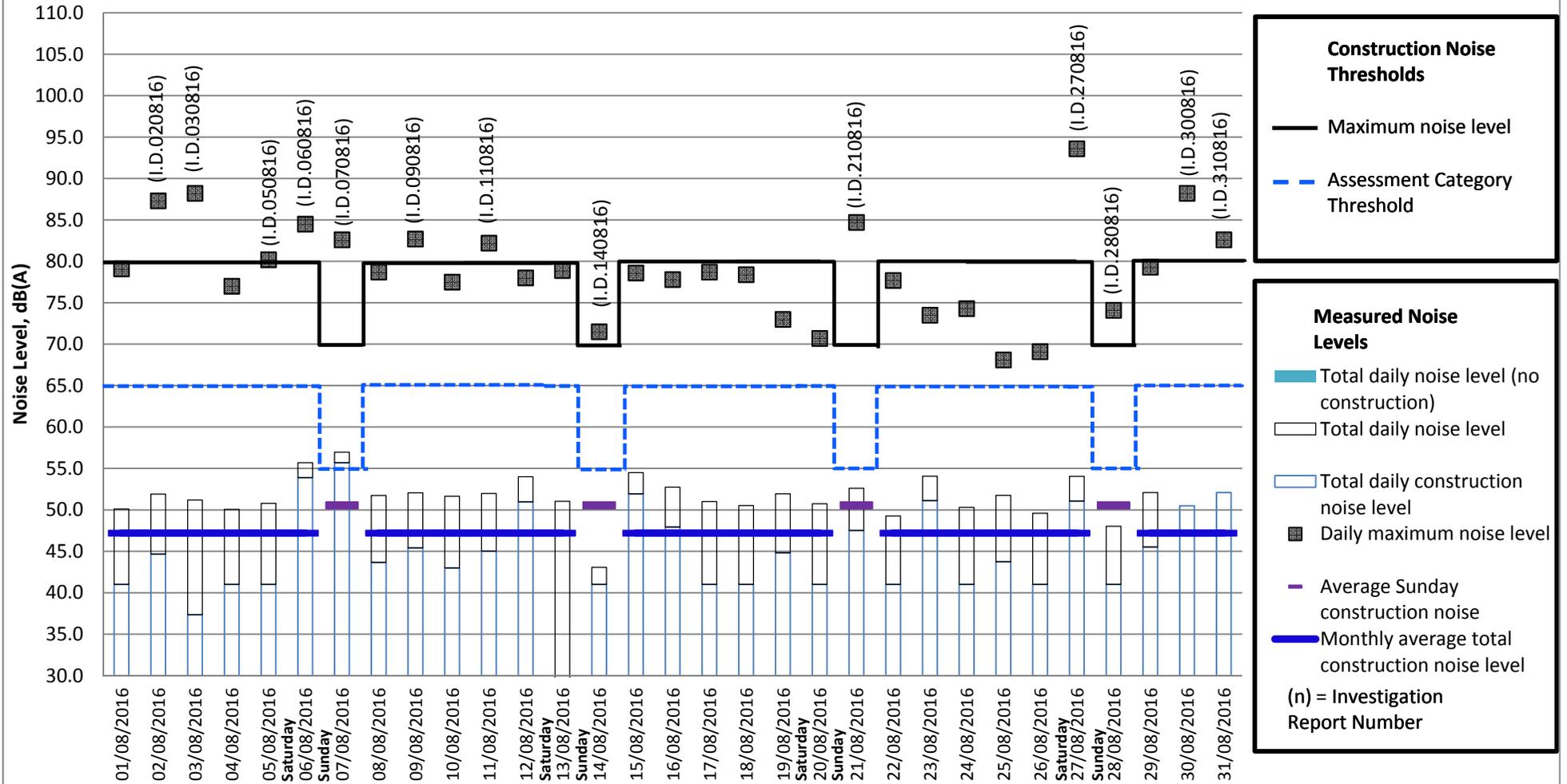
Measured Noise Levels

- 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

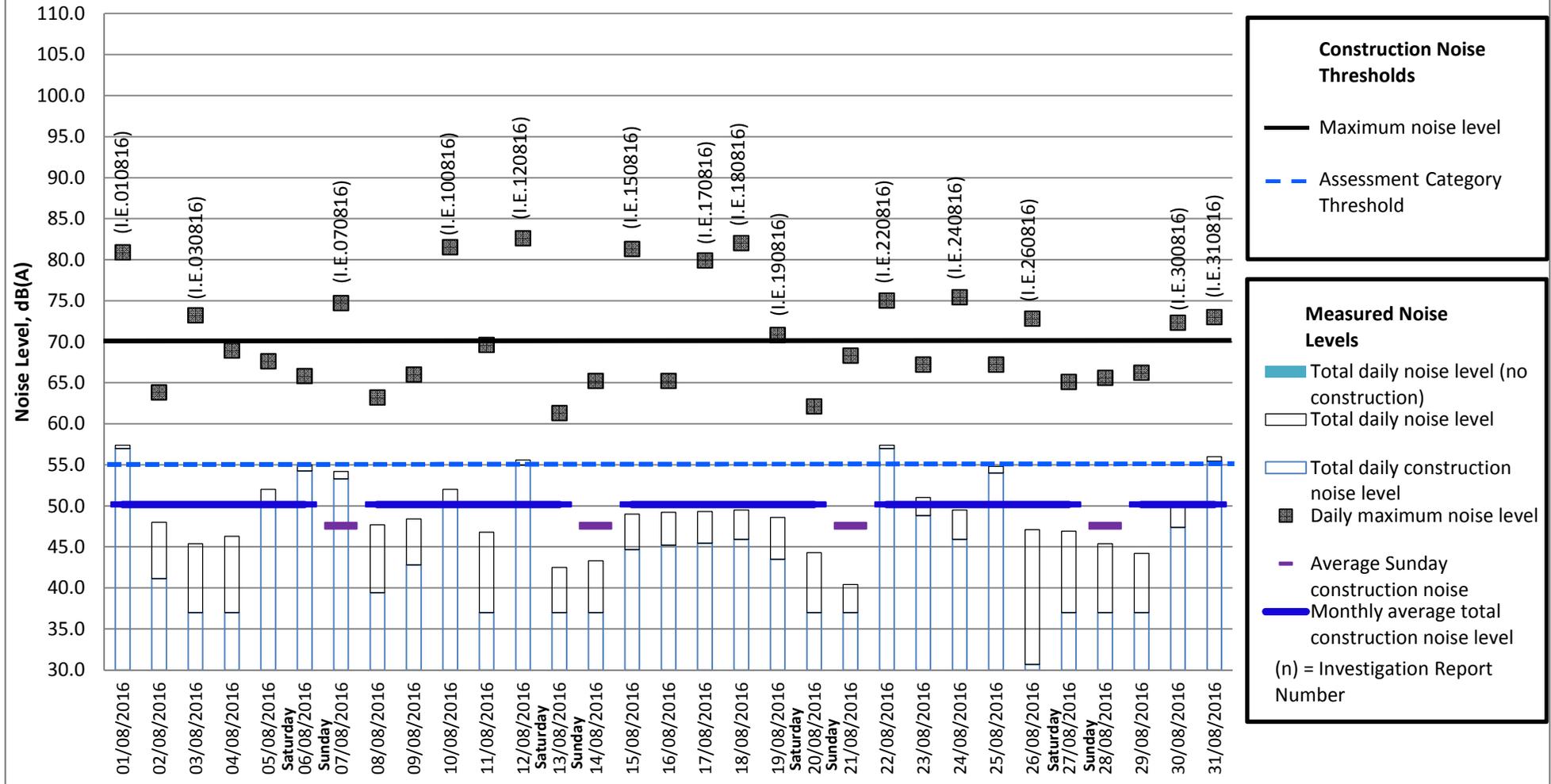
Note:

Measured Daytime Noise Levels at Inchgarvie Measurement period: August 2016



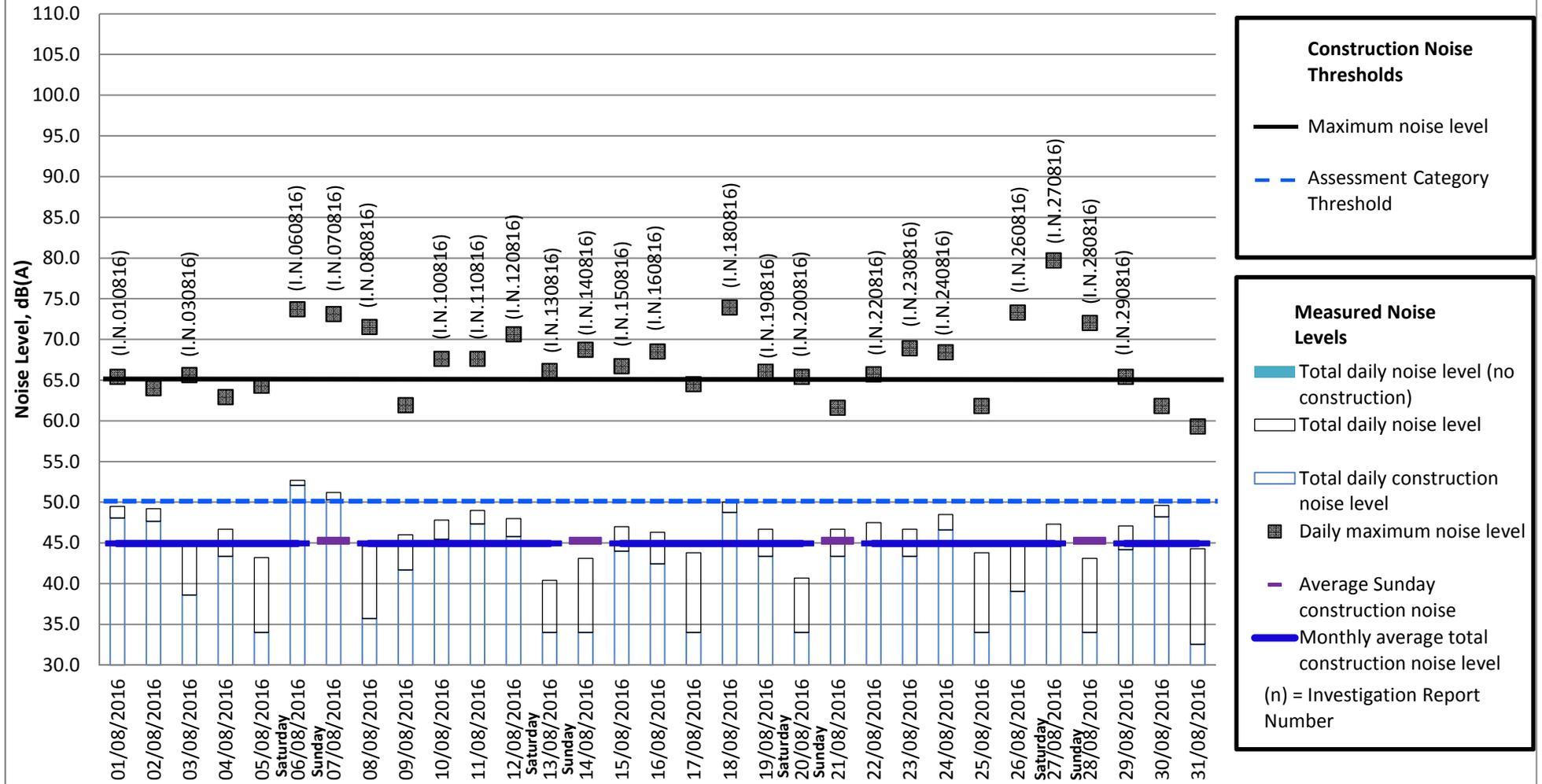
Note:

Measured Evening Noise Levels at Inchgarvie Measurement period: August 2016



Note:

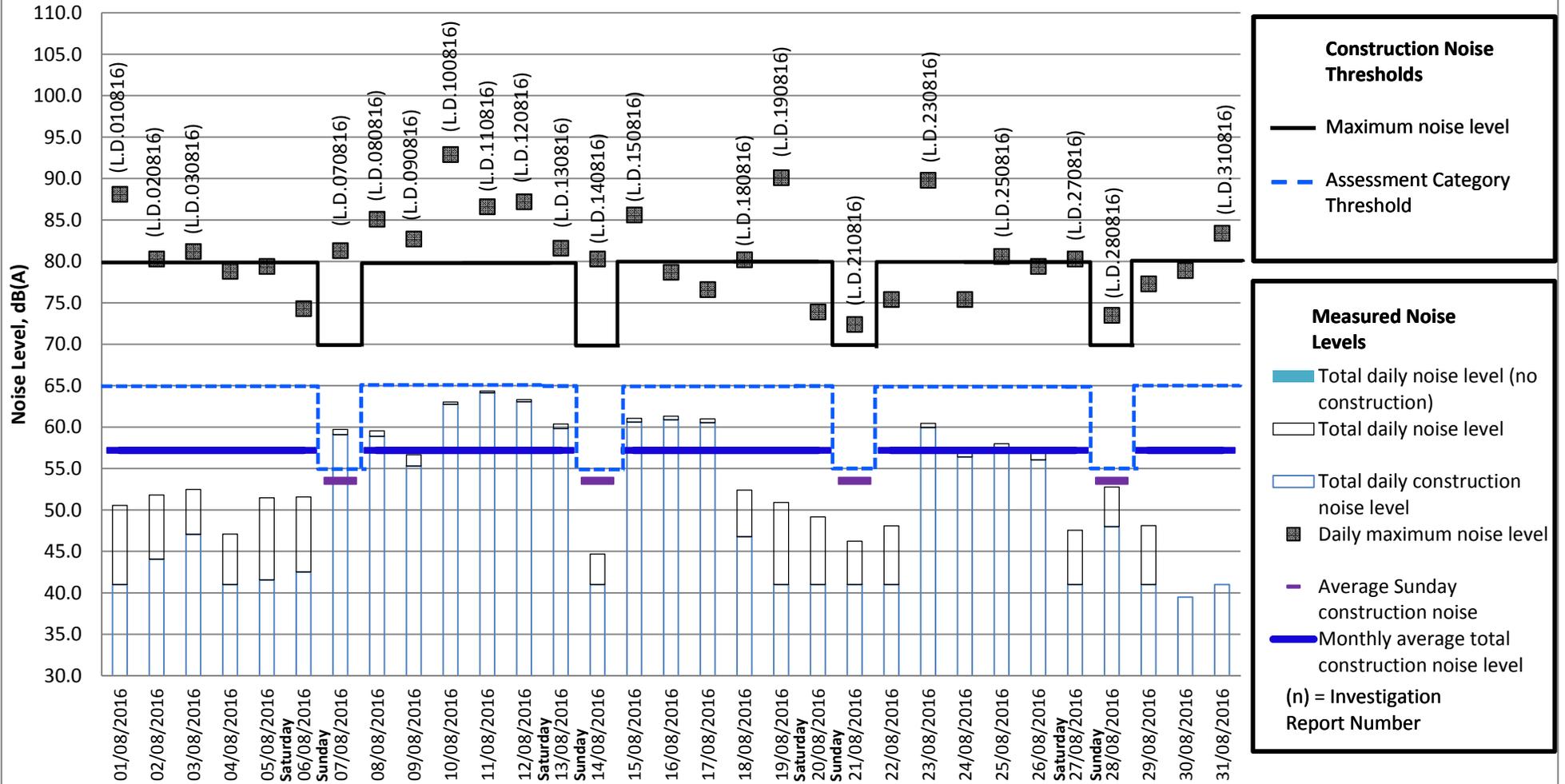
Measured Night time Noise Levels at Inchgarvie Measurement period: August 2016



Note:

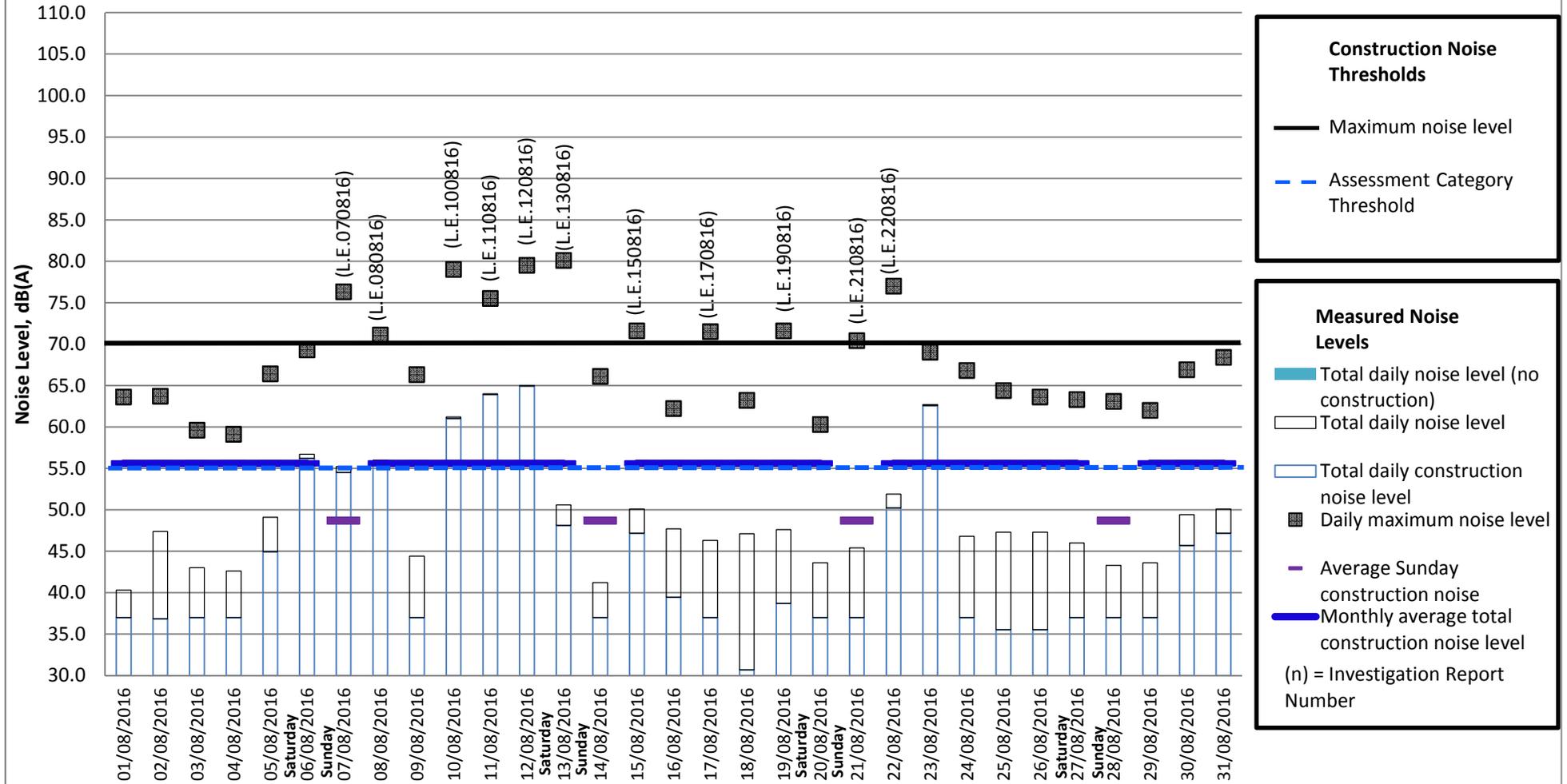
Measured Daytime Noise Levels at Linn Mill

Measurement period: August 2016



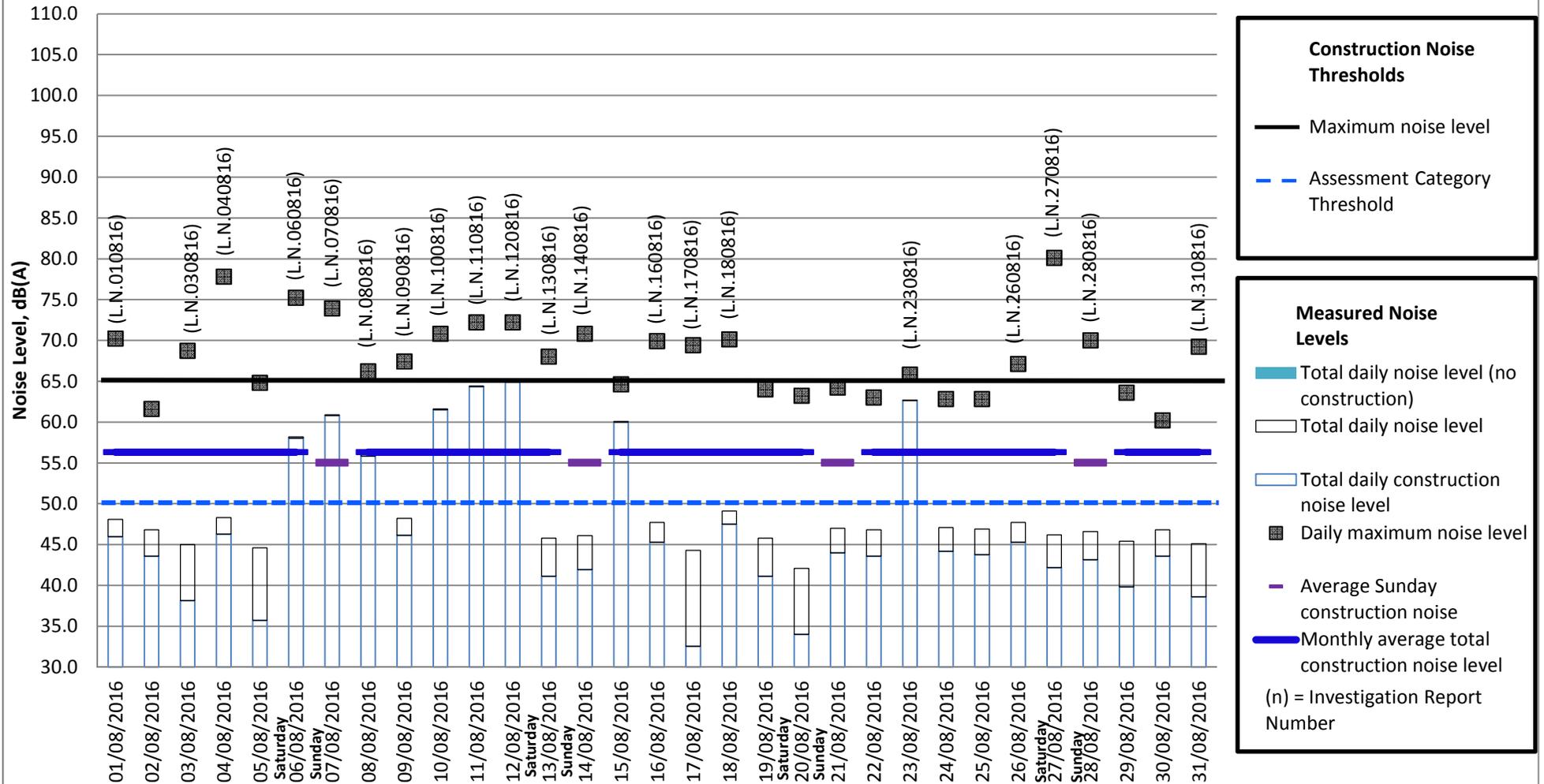
Note:

Measured Evening Noise Levels at Linn Mill Measurement period: August 2016



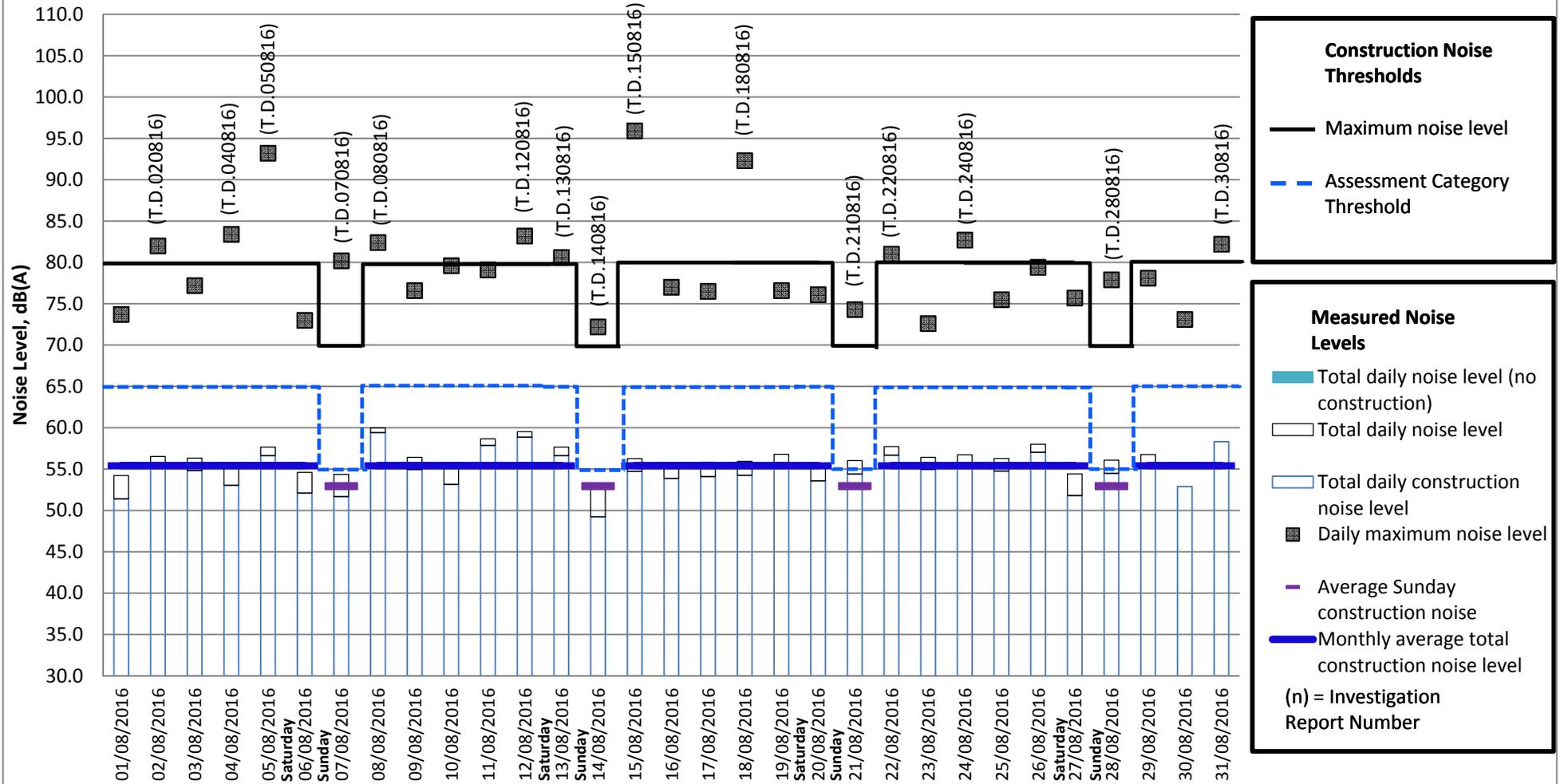
Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' on the 10th, 11th, 12th and 23rd were caused by a generator being left on in close proximity of the noise monitor (see 2.9 of report).

Measured Night time Noise Levels at Linn Mill Measurement period: August 2016



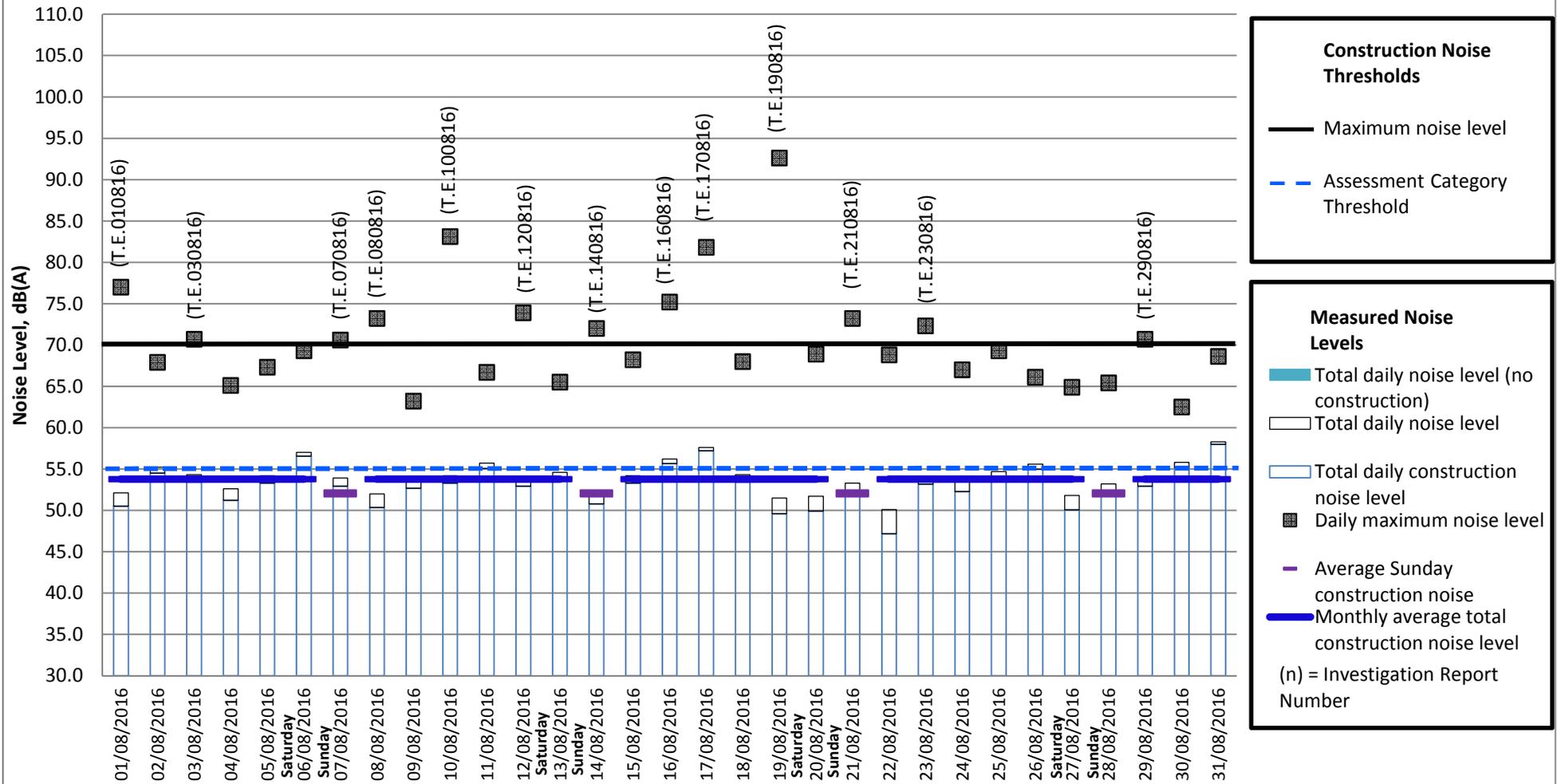
Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' on the 10th, 11th, 12th and 23rd were caused by a generator being left on in close proximity of the noise monitor (see 2.9 of report). Other exceedances were caused by birds.

Measured Daytime Noise Levels at Tigh-Na-Grian Measurement period: August 2016



Note:

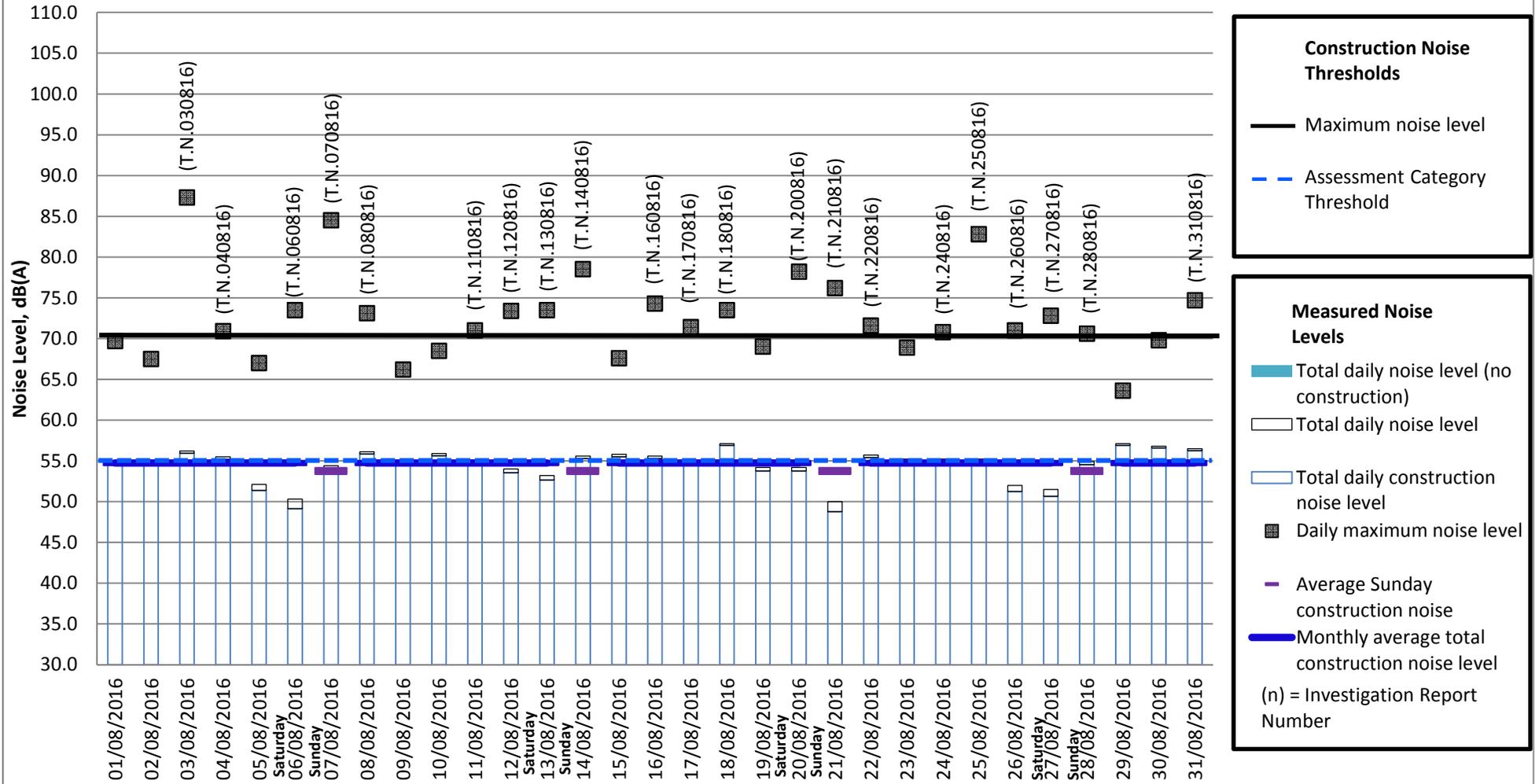
Measured Evening Noise Levels at Tigh-Na-Grian Measurement period: August 2016



Note:

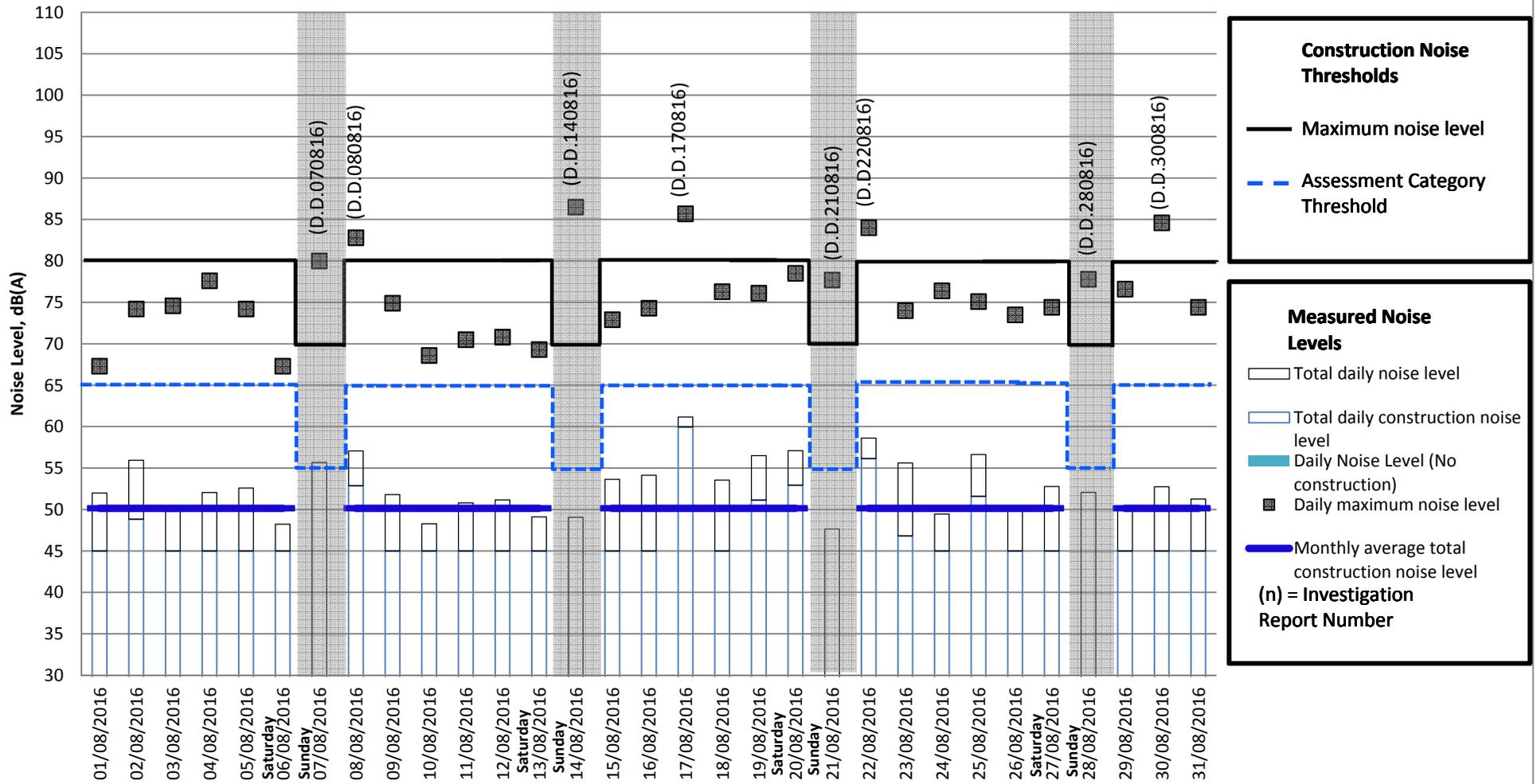
Measured Night time Noise Levels at Tigh-Na-Grian

Measurement period: August 2016



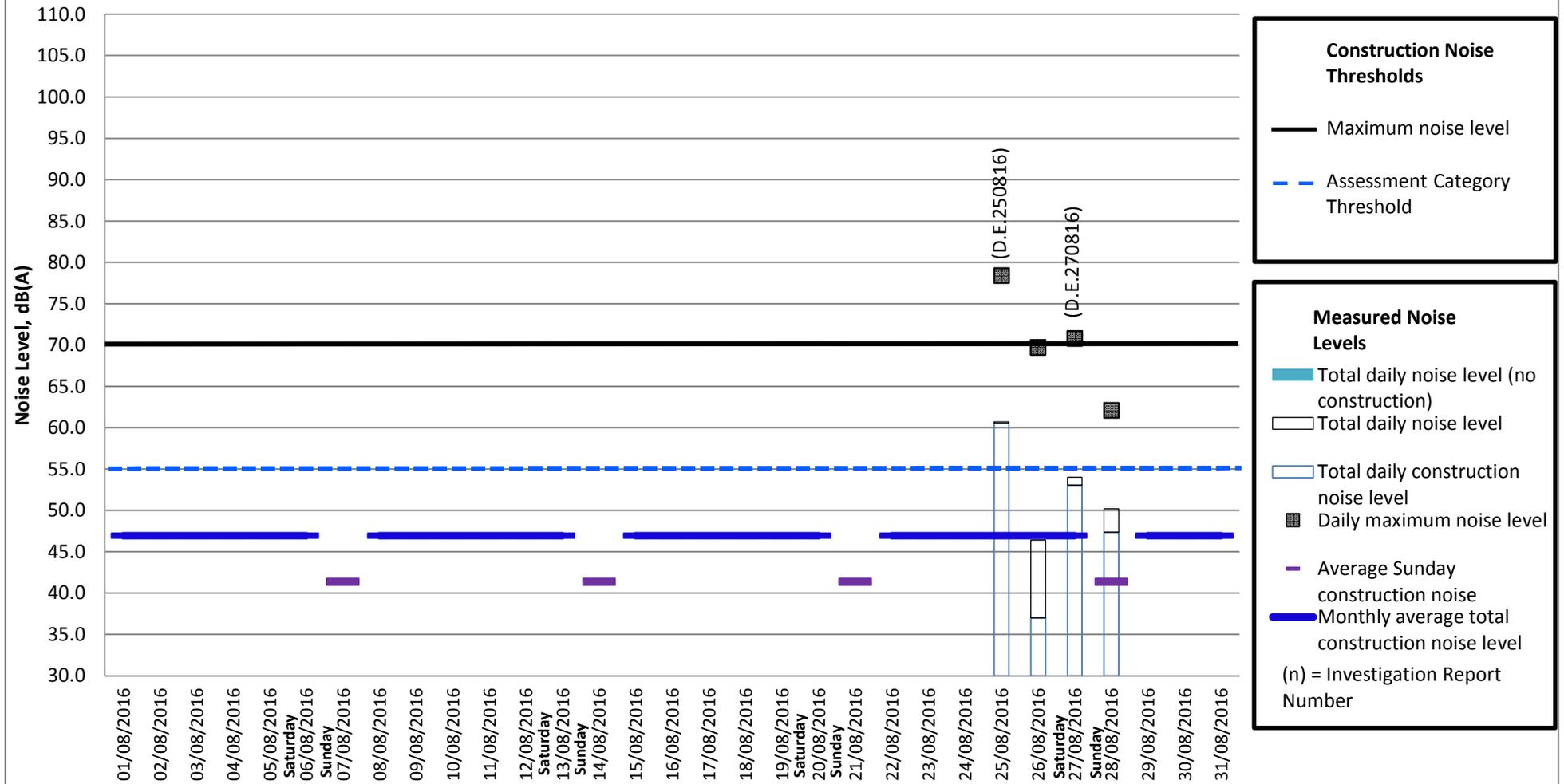
Measured Daytime Noise Levels at Dundas Home Farm

Measurement period: August 2016



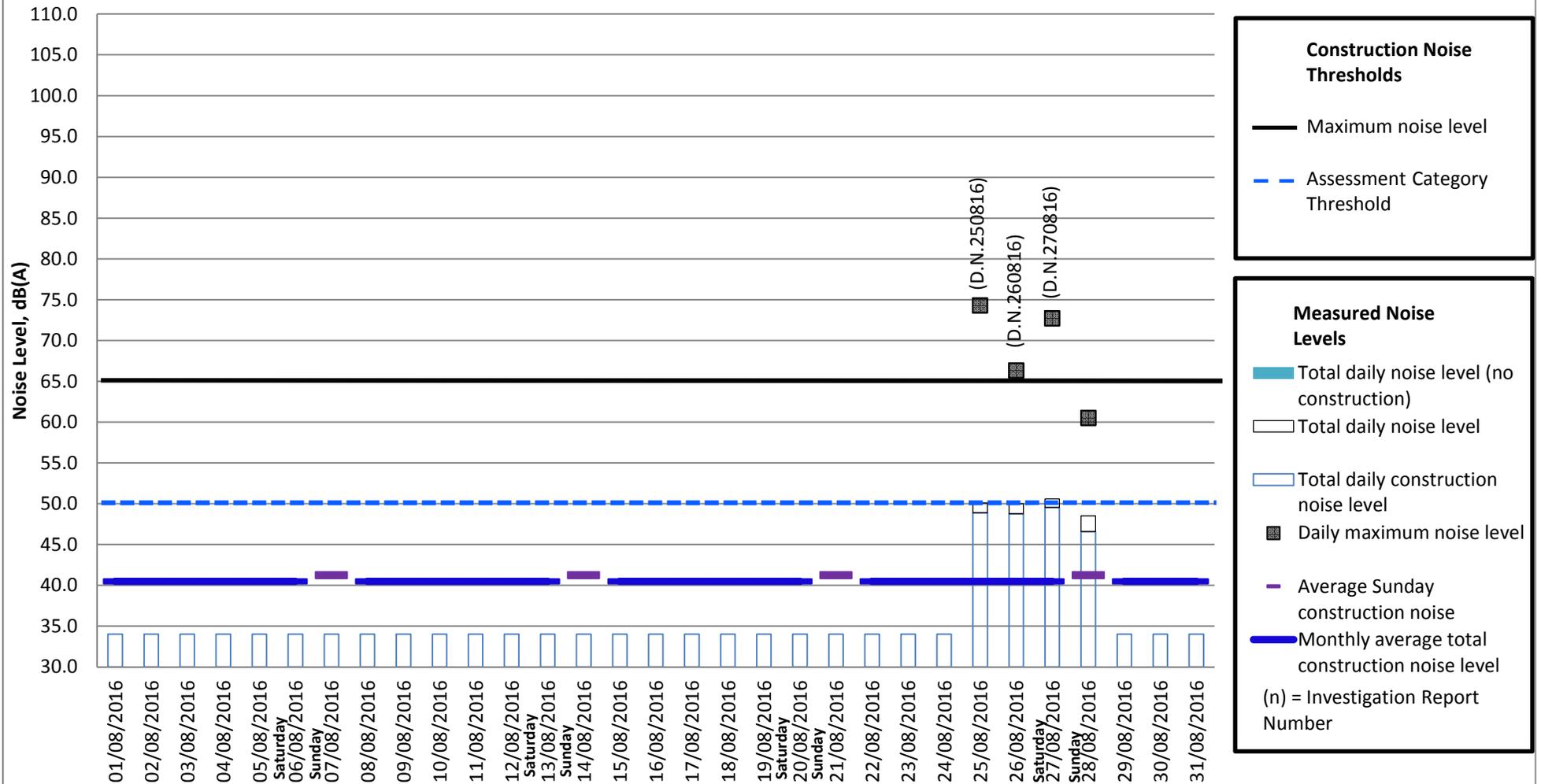
Note: The grey areas of the chart represent days on which no construction works have been conducted;

Measured Evening Noise Levels at Dundas Home Farm Measurement period: August 2016



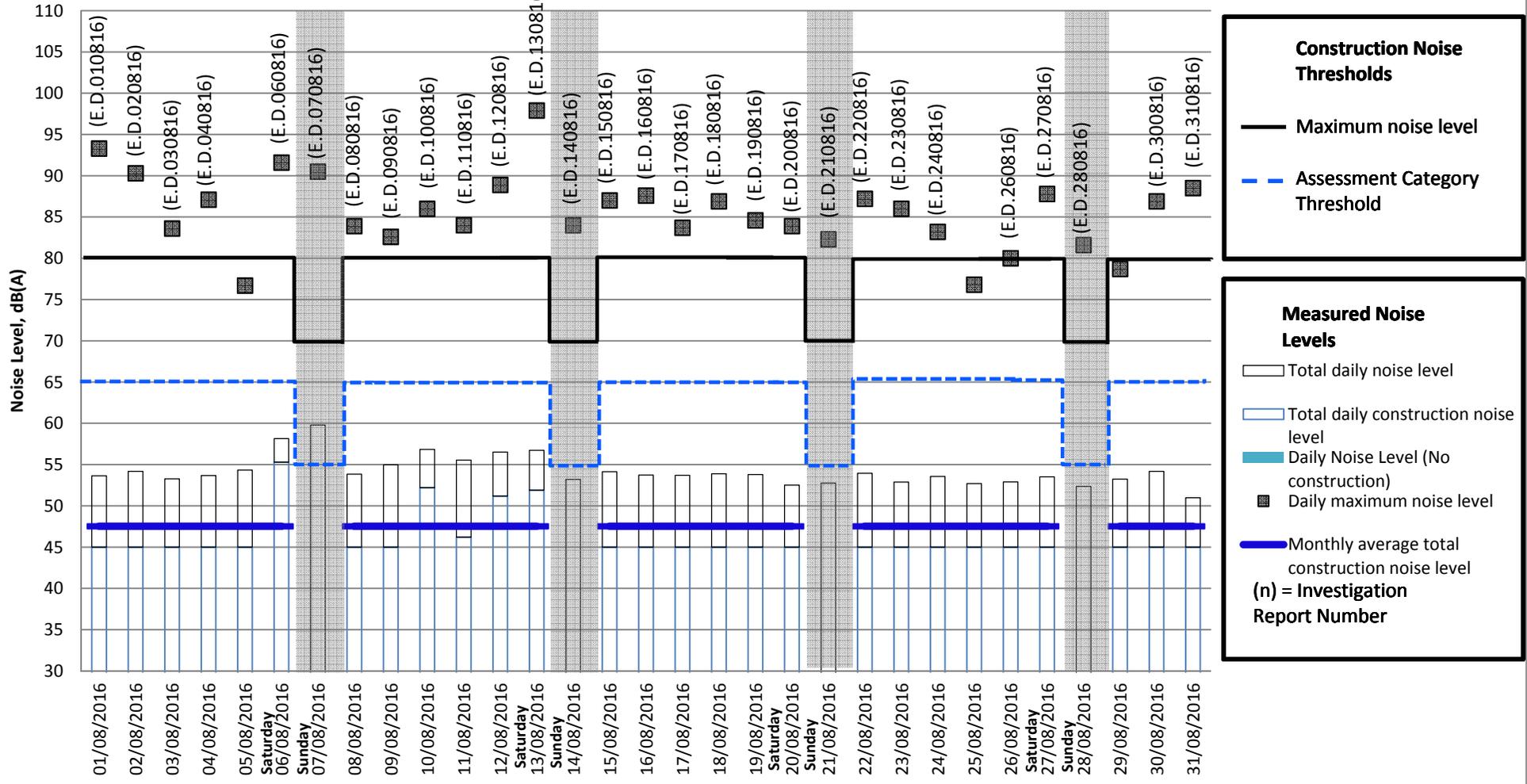
Note: Gantry erection and removal of piles took place during evening and nighttime periods on the Saturday 27th August. Some exceedances noted were caused by construction work (see 2.10 of report).

Measured Night time Noise Levels at Dundas Home Farm Measurement period: August 2016



Note: Gantry erection and removal of piles took place during evening and nighttime periods on the Saturday 27th August. Some exceedances noted were caused by construction work (see 2.10 of report).

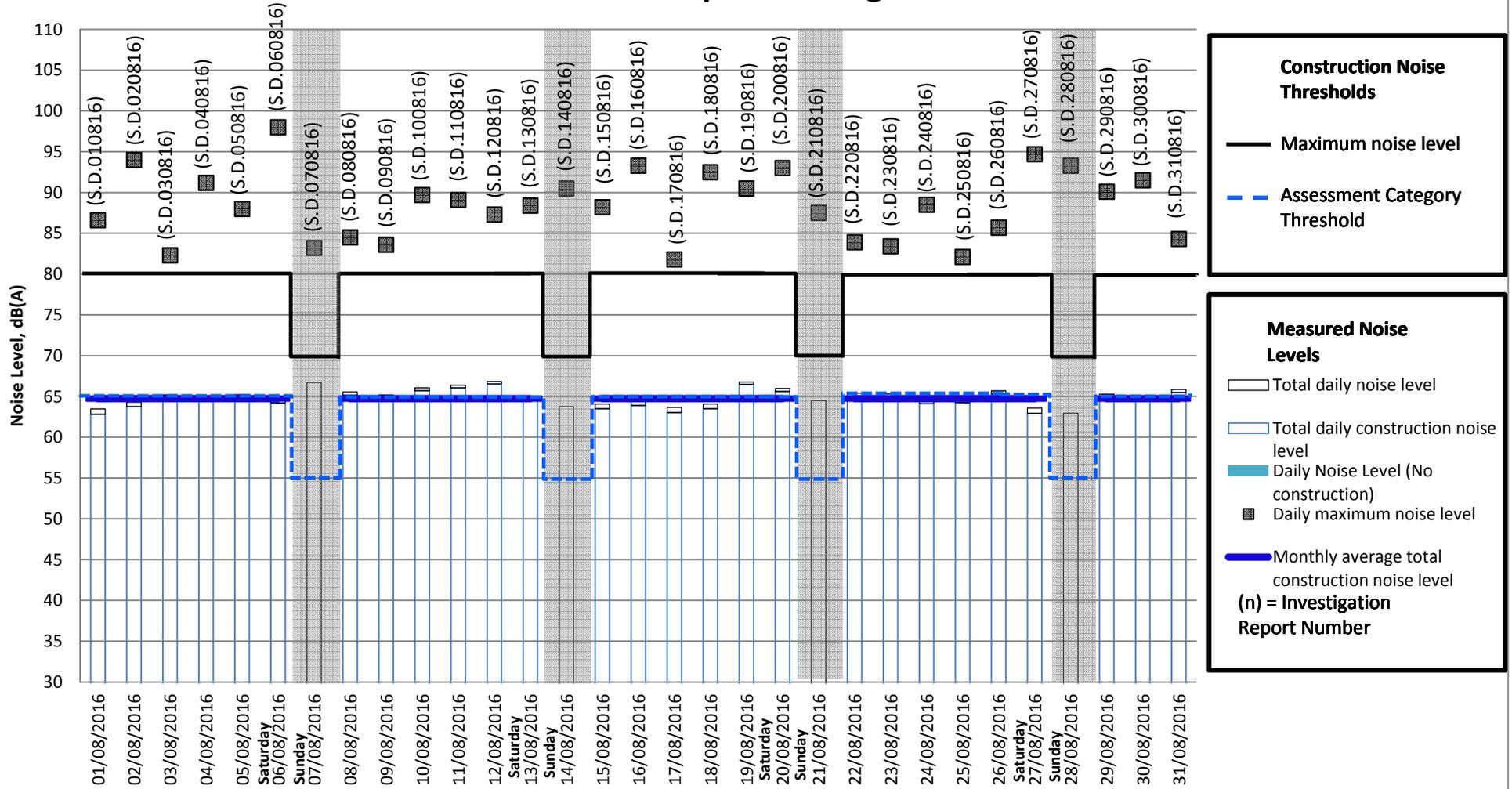
Measured Daytime Noise Levels at Echline Measurement period: August 2016



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

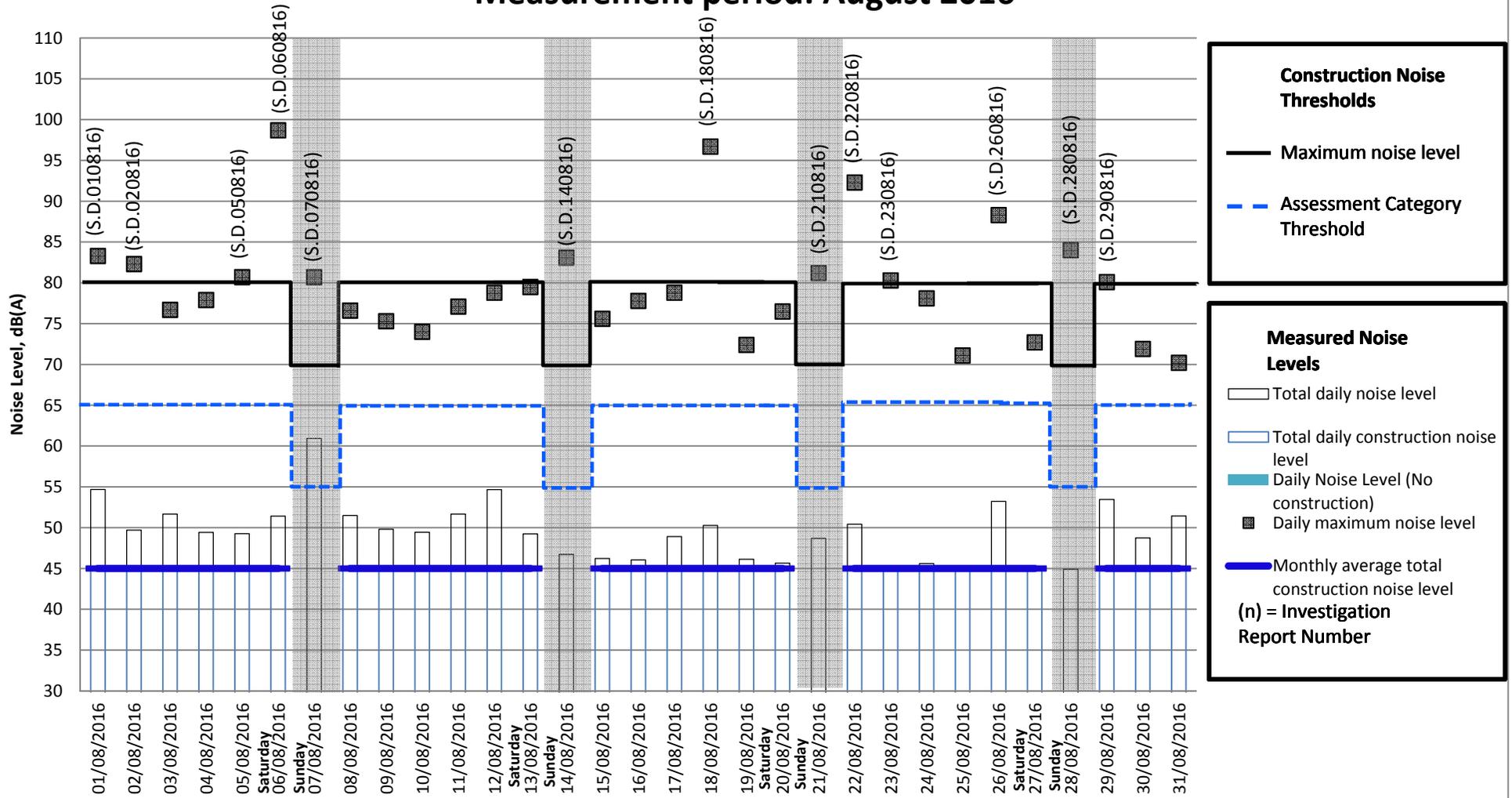
Measured Daytime Noise Levels at Scotstoun

Measurement period: August 2016



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

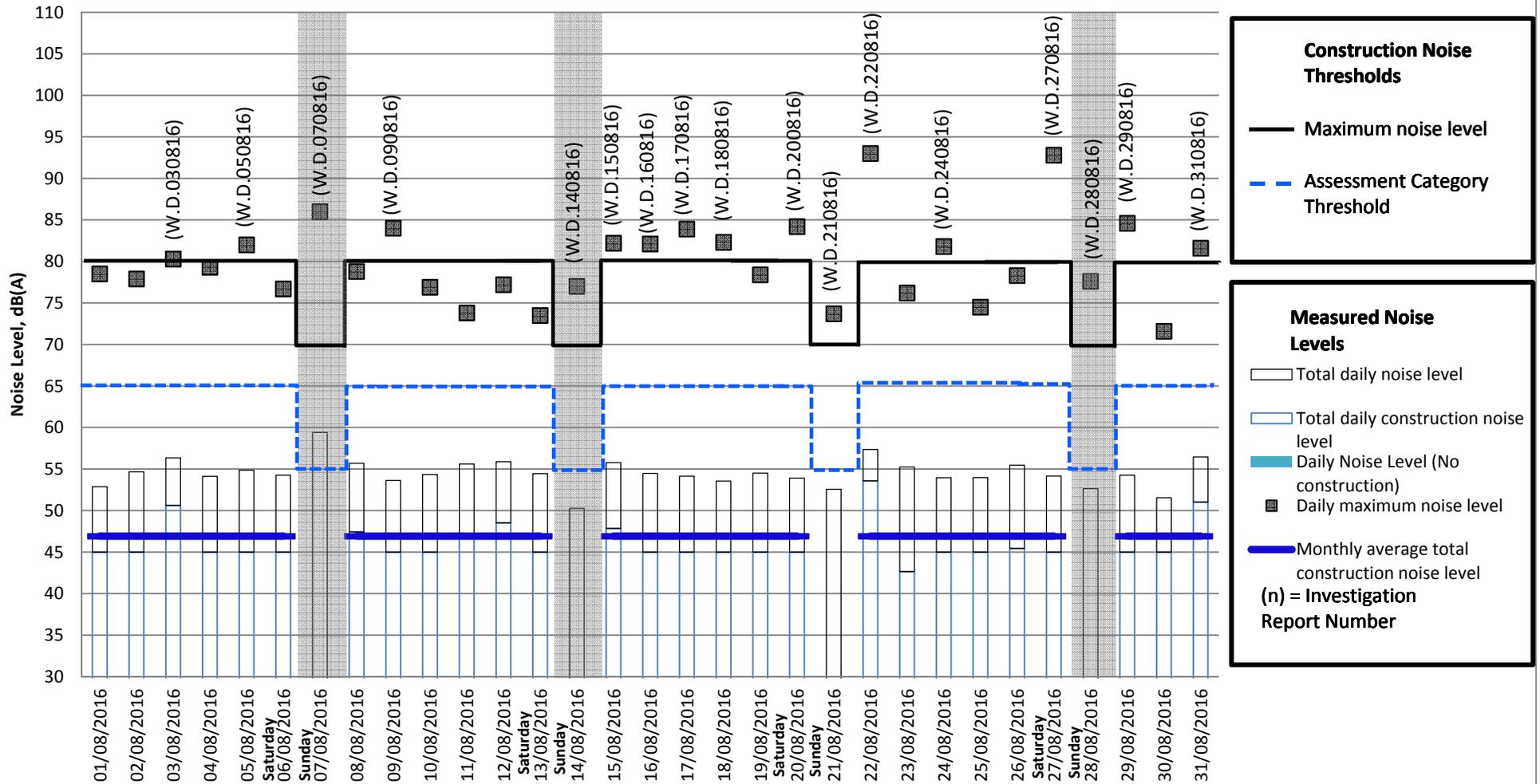
Measured Daytime Noise Levels at Springfield Measurement period: August 2016



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

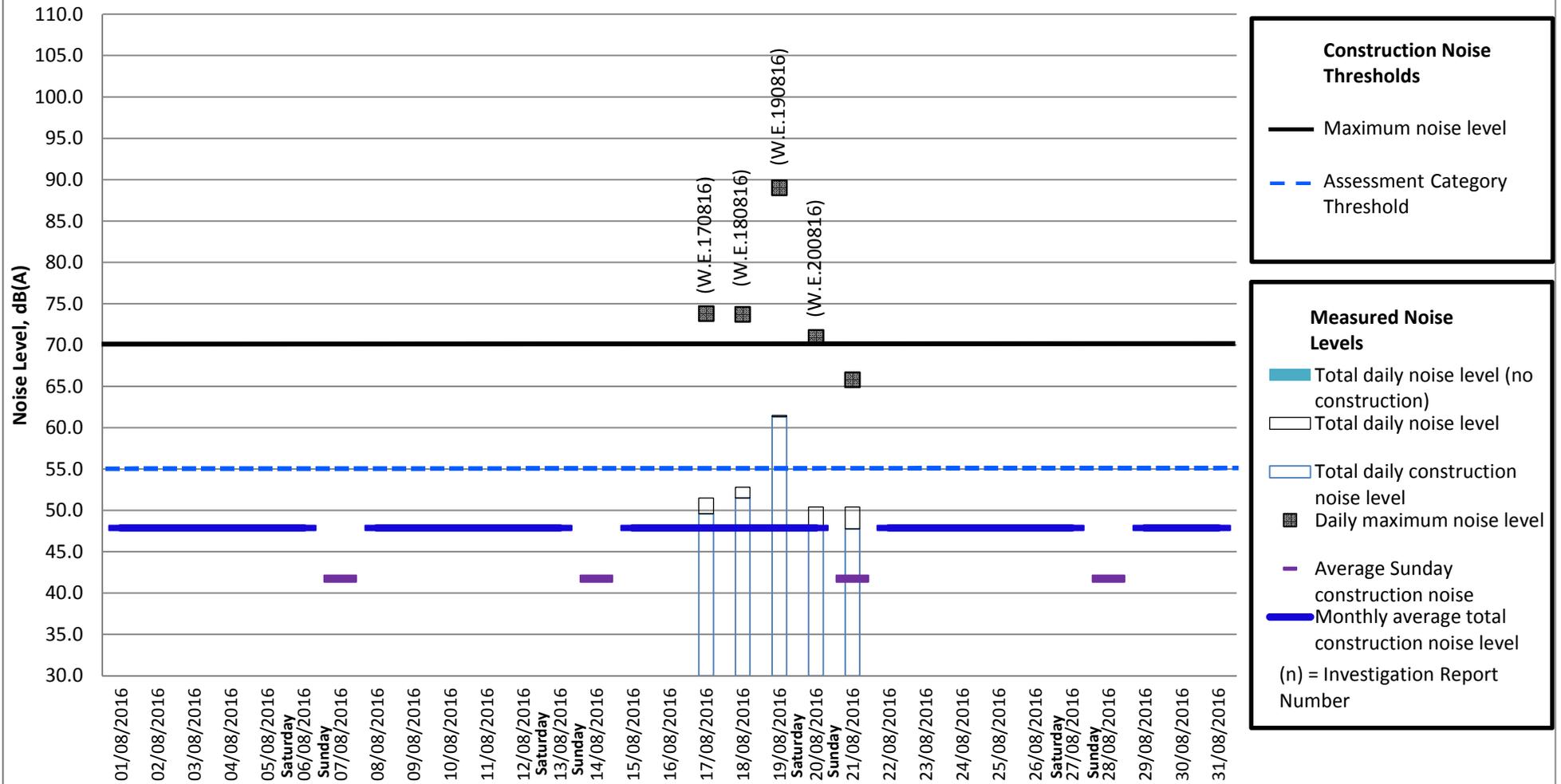
Measured Daytime Noise Levels at Whinnyhill

Measurement period: August 2016



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

Measured Evening Noise Levels at Whinnyhill Measurement period: August 2016



Construction Noise Thresholds

- Maximum noise level
- Assessment Category Threshold

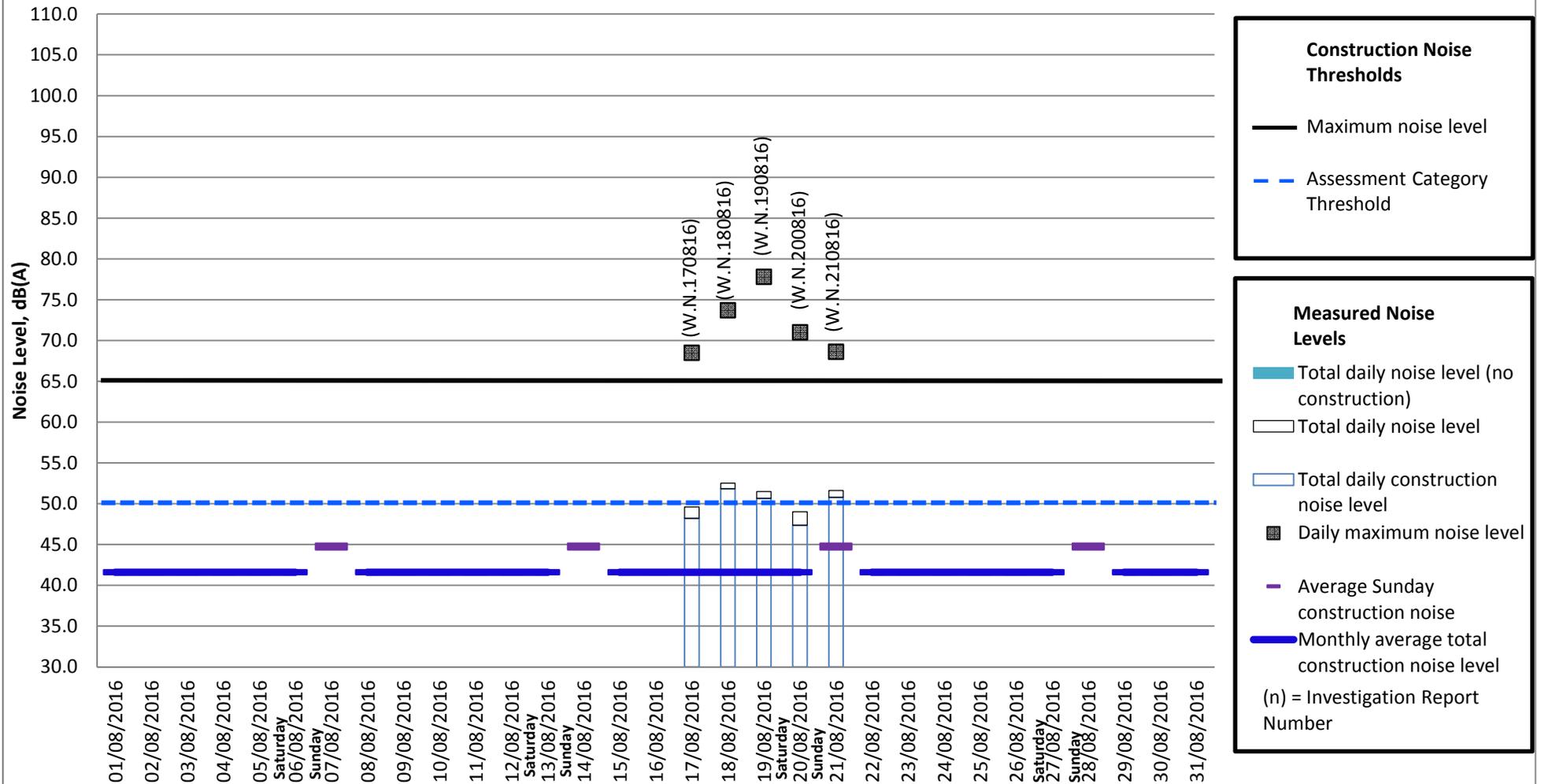
Measured Noise Levels

- 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

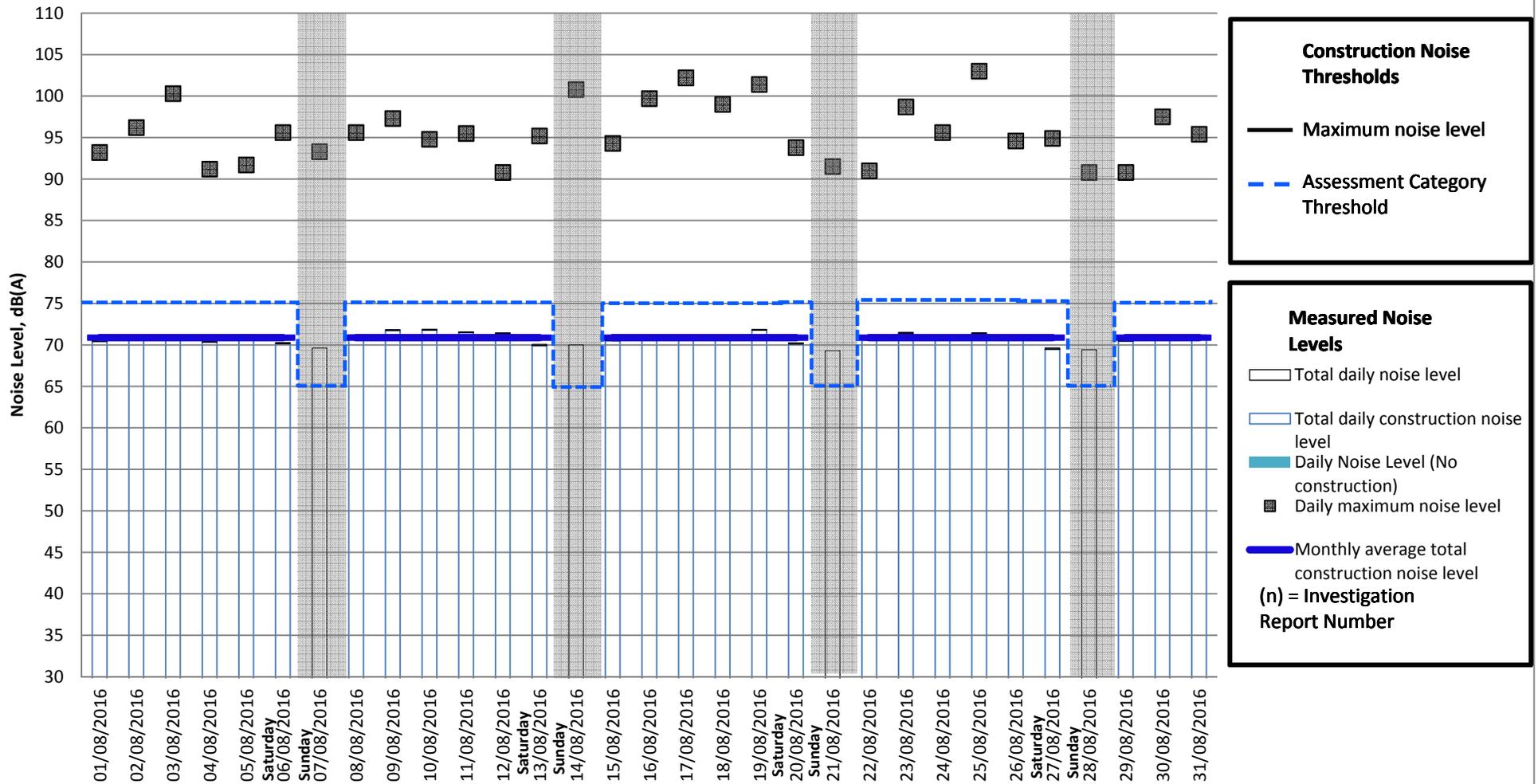
Note: surfacing works took place on the A90 Southbound diverge during evening and nighttime periods on the Thursday 18th August. Exceedances noted were caused by birds

Measured Night time Noise Levels at Whinnyhill Measurement period: August 2016



Note: surfacing works took place on the A90 Southbound diverge during evening and nighttime periods on the Thursday 18th August. Exceedances noted were caused by birds and trains.

Measured Daytime Noise Levels at Newton Measurement period: August 2016



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