



Contractor



DRAGADOS | AMERICAN BRIDGE INTERNATIONAL
HOCHTIEF | MORRISON CONSTRUCTION

Project **FORTH REPLACEMENT CROSSING**

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CONSTRUCTION NOISE MONITORING REPORT: SEPTEMBER 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 September 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 September 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 September 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 September 2016
M1	Whinny Hill	Network	<ul style="list-style-type: none"> • Earth Works/Fill Placement • Park and Ride works • FT03 & FT04 Bridge Works • 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 S2 works • AVS rebar & concrete deck works
M7	Butlaw Fisheries	Crossing	<ul style="list-style-type: none"> • Pier S2 work • 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 S2 work • 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 • Excavating SUDS detention basin
M11	Linn Mill	Network (close proximity to Crossing)	<ul style="list-style-type: none"> • AVS rebar & concrete deck works • 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 • Excavating SUDS detention basin



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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 • Access track to AVS
M16	Scotstoun	Network	<ul style="list-style-type: none"> • Utility 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 •
M17	Dundas Home Farm	Network	<ul style="list-style-type: none"> • Utility works • Main carriageway roadworks • Gantry Erection • Pile removal • B800 roadworks
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, night 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.
 - It has been indicated on the graphs, where noise data is missing for day, evening or night-time, during which construction works were conducted.

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 September 2016. For evening and night time periods, there were exceedances of monthly average at Butlaw and Tigh-Na-Grian during the night-time period. There were also exceedances of Sunday averages at Butlaw and Tigh-Na-Grian 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 23rd September and Inchgarvie on the 11th and 13th September were caused by hammering from the AVS works. The relevant site team was contacted and asked to brief site staff on the requirements of working at night. The environmental team also carried out attended monitoring at night. Exceedances recorded on the Linn mill monitor during the daytime period on the 6th, 21st, 22nd, 26th and 27th September were caused by the excavation work nearby at the SUDs pond. Site teams were made aware of these exceedances.
- 2.10** A summary of the findings for exceedances occurring at each of the locations can be found in Table 2.

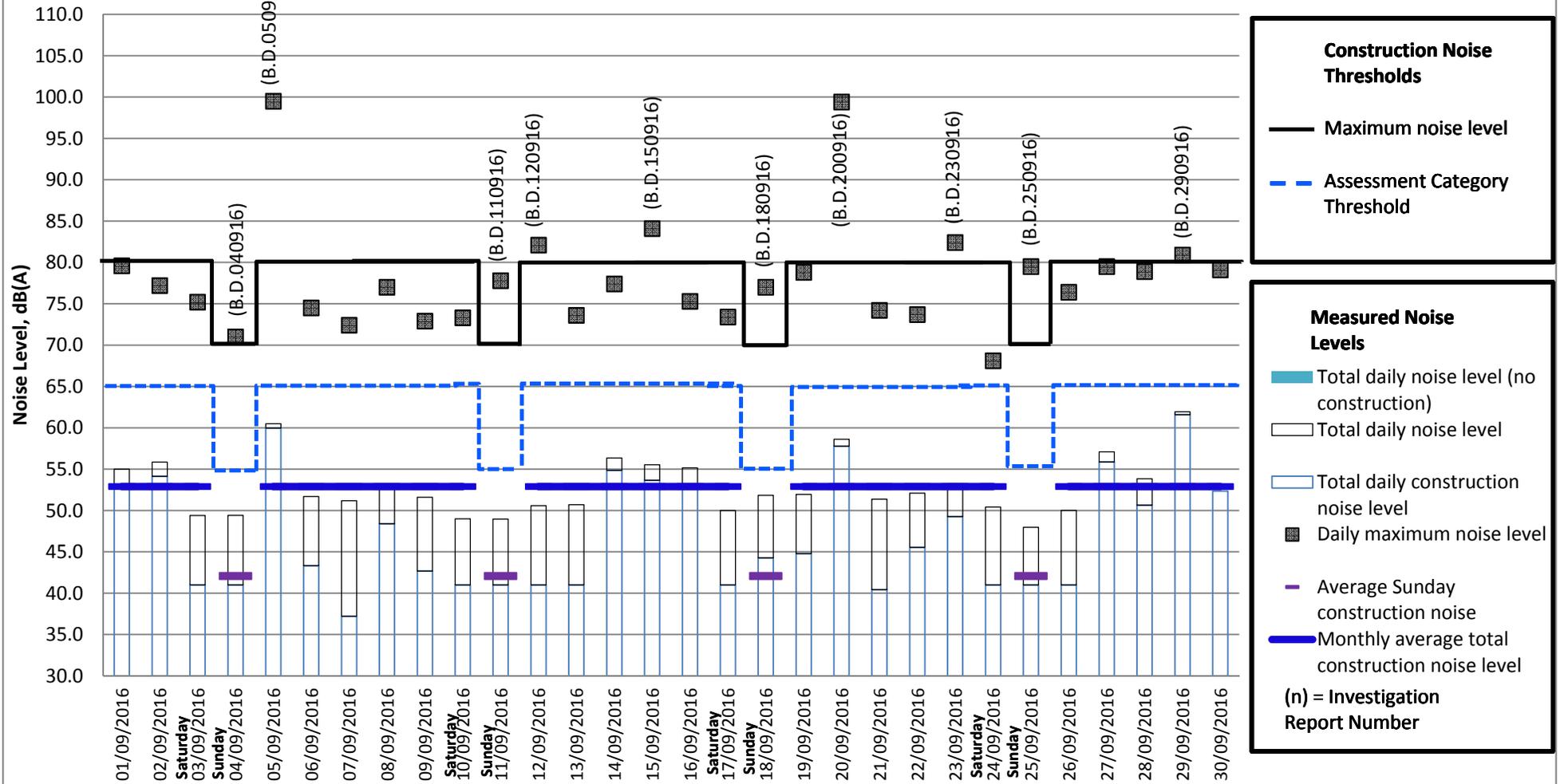
Table 2: Summary of Exceedances at Monitoring Locations

Monitoring Location	Summary of Exceedance Details
Butlaw Fisheries	During September the maximum noise threshold was exceeded on 48 occasions (10 day time, 10 evening and 28 night time). Most exceedances were attributed to non-construction factors, notably birdsong, waves and wind. 1 exceedance was related to construction work (see 2.9)
Clufflat Brae	During September the maximum noise threshold was exceeded on 40 occasions (11 daytime, 7 evening and 22 night time). Exceedances were mainly found to be due to birdsong and residents
Inchgarvie Lodge	During September the maximum noise threshold was exceeded on 57 occasions (16 day time, 12 evening and 29 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 and wind. There were two instances of construction noise exceeding the threshold (see 2.9)
Linn Mill	During September the maximum noise threshold was exceeded on 53 occasions (18 daytime, 10 evening and 25 night time). The majority of exceedances at this location were due to birdsong. There were five instances of construction noise exceeding the threshold (see 2.9)
Tigh-Na-Grian	During September the maximum noise threshold was exceeded on 58 occasions (19 daytime, 11 evening and 28 night time). Exceedances were mainly due to birdsong and wind.
Dundas Home Farm	During September the maximum noise threshold was exceeded on 15 occasions. The main exceedances were due to residents and birdsong.
Echline	During September 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 September the maximum noise threshold was exceeded on 19 occasions. These exceedances were due to local residents.
Scotstoun	During September the maximum noise threshold was exceeded on 30 occasions. These exceedances were attributed to general traffic noise on the adjacent road.
Whinny Hill	During September the maximum noise threshold was exceeded on 7 occasions during the daytime. No exceedances at this location were attributed to construction activities. Most exceedances were due to birdsong and residents
Newton	Recordings taken for data record purposes



APPENDIX A

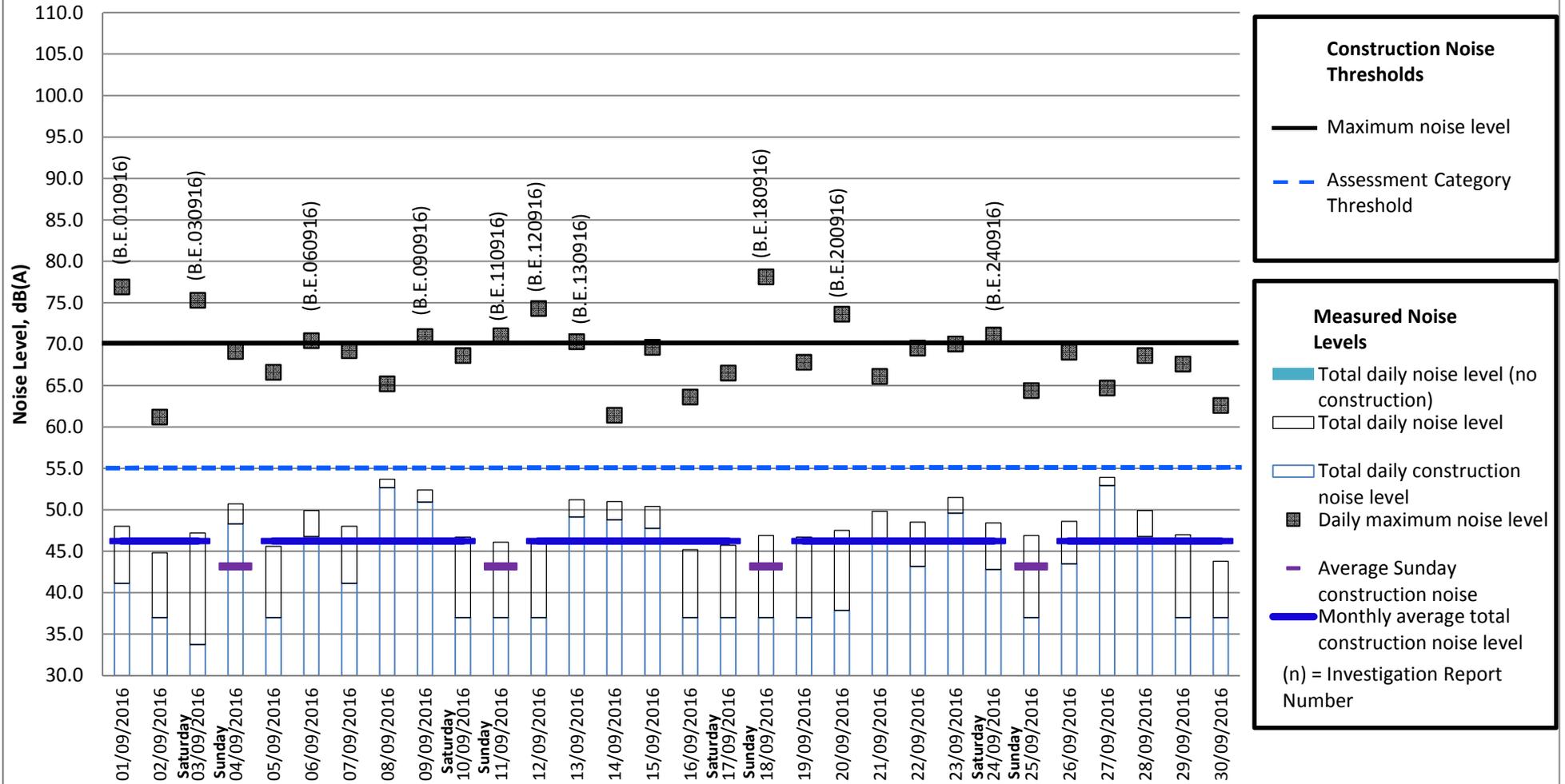
Measured Daytime Noise Levels at Butlaw Fisheries Measurement period: September 2016



Note:

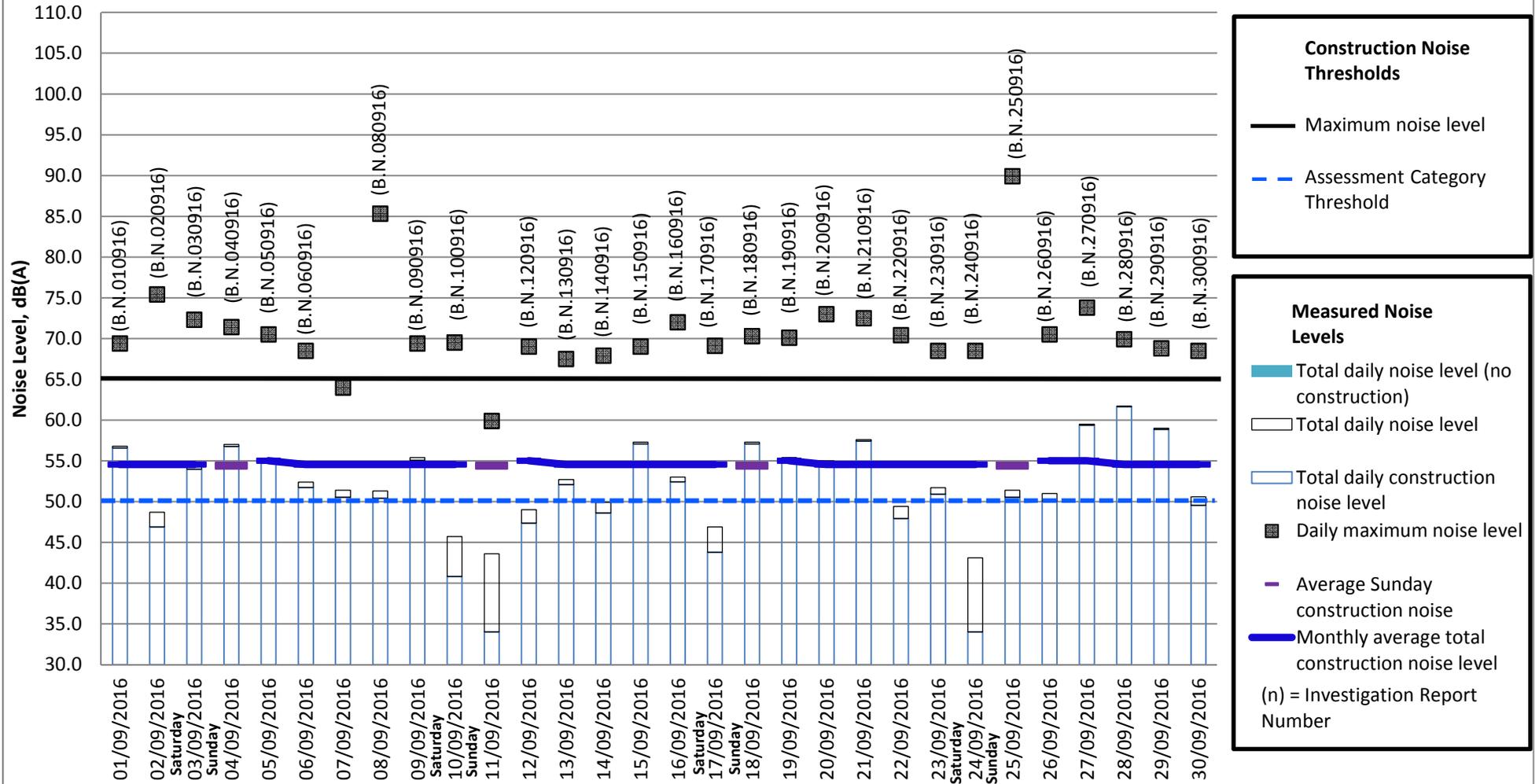
Measured Evening Noise Levels at Butlaw Fisheries

Measurement period: September 2016



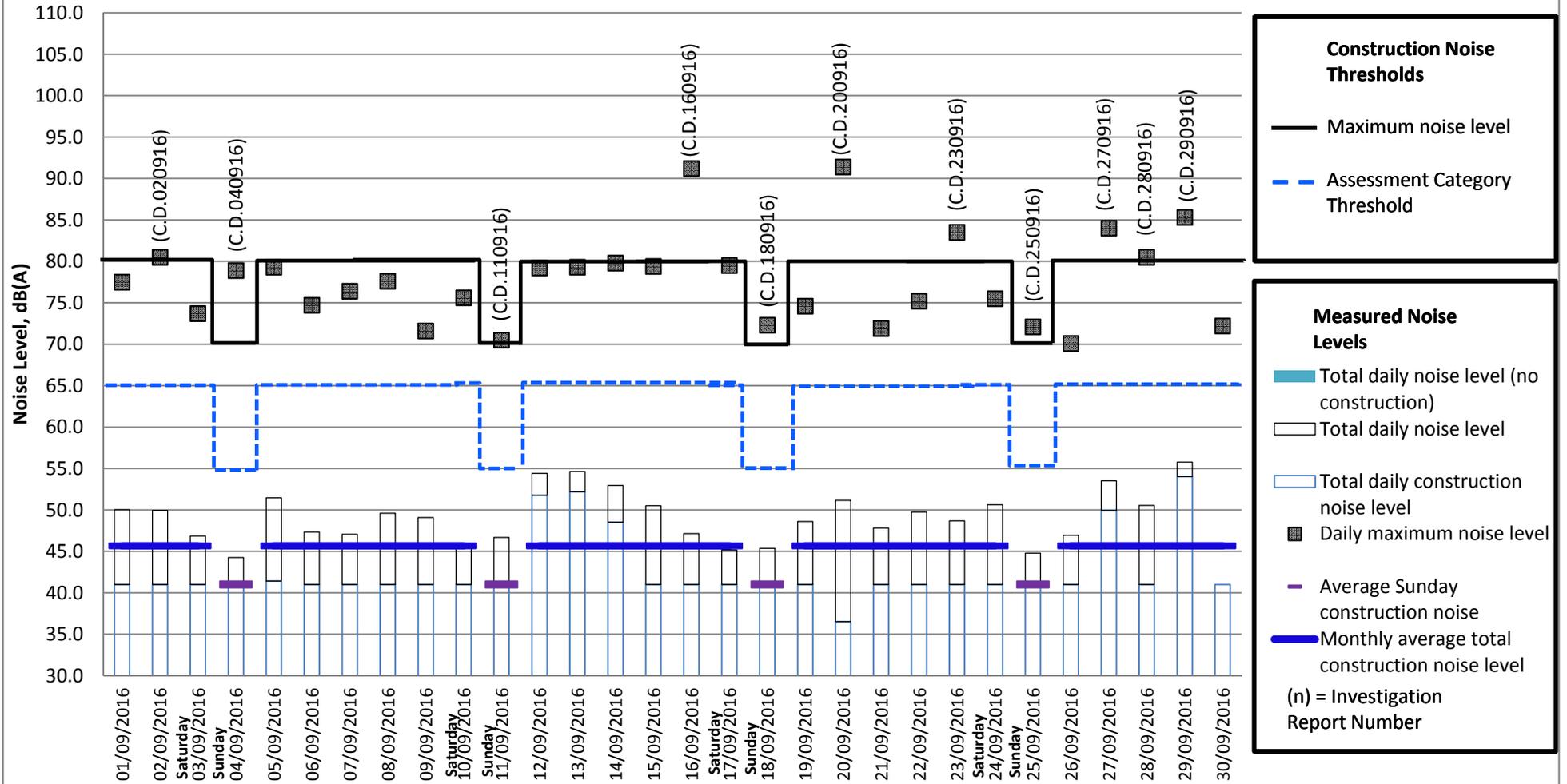
Note:

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



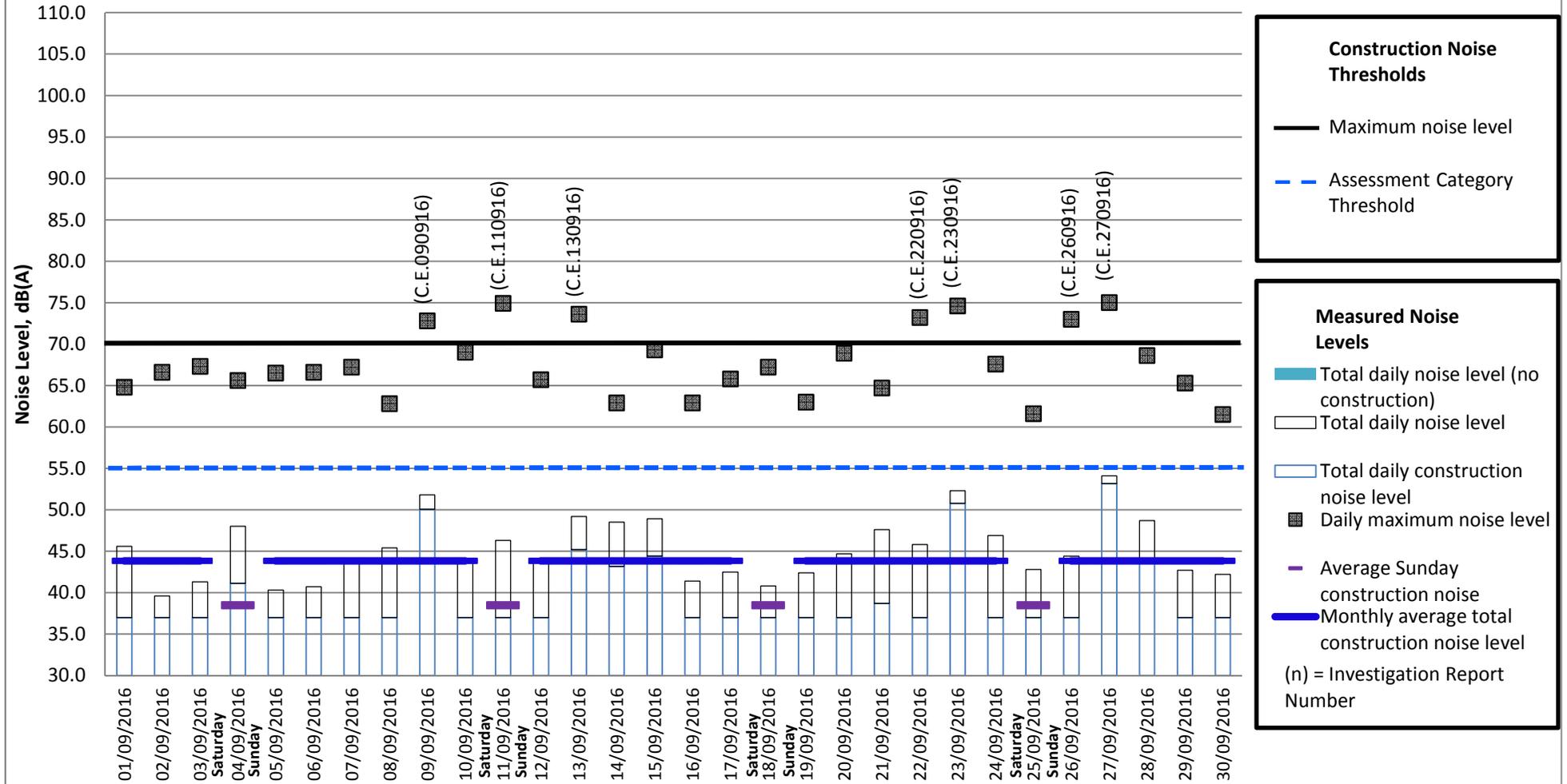
Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' throughout the month were caused by birds, waves and wind

Measured Daytime Noise Levels at Clufflat Measurement period: September 2016



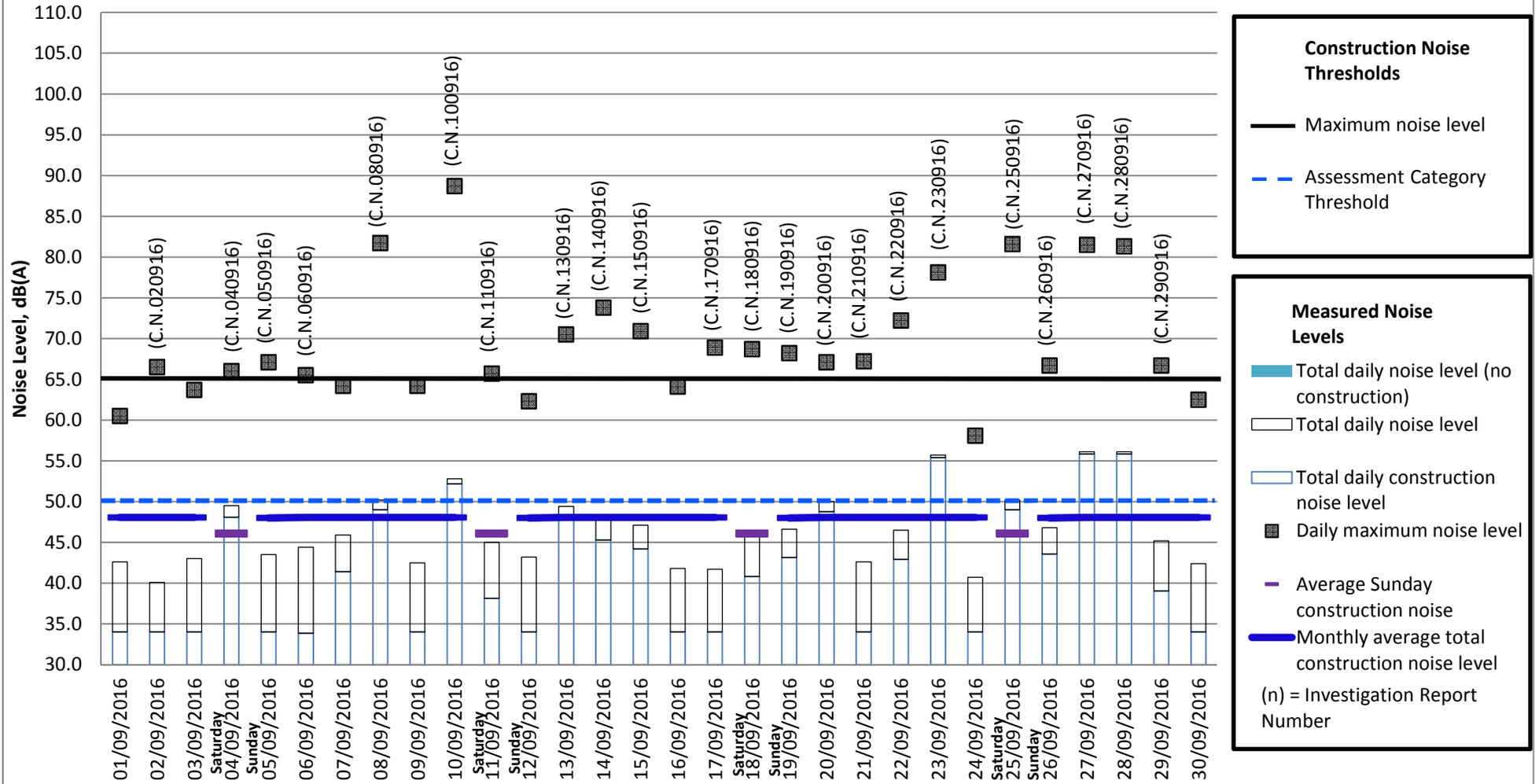
Note:

Measured Evening Noise Levels at Clufflat Measurement period: September 2016



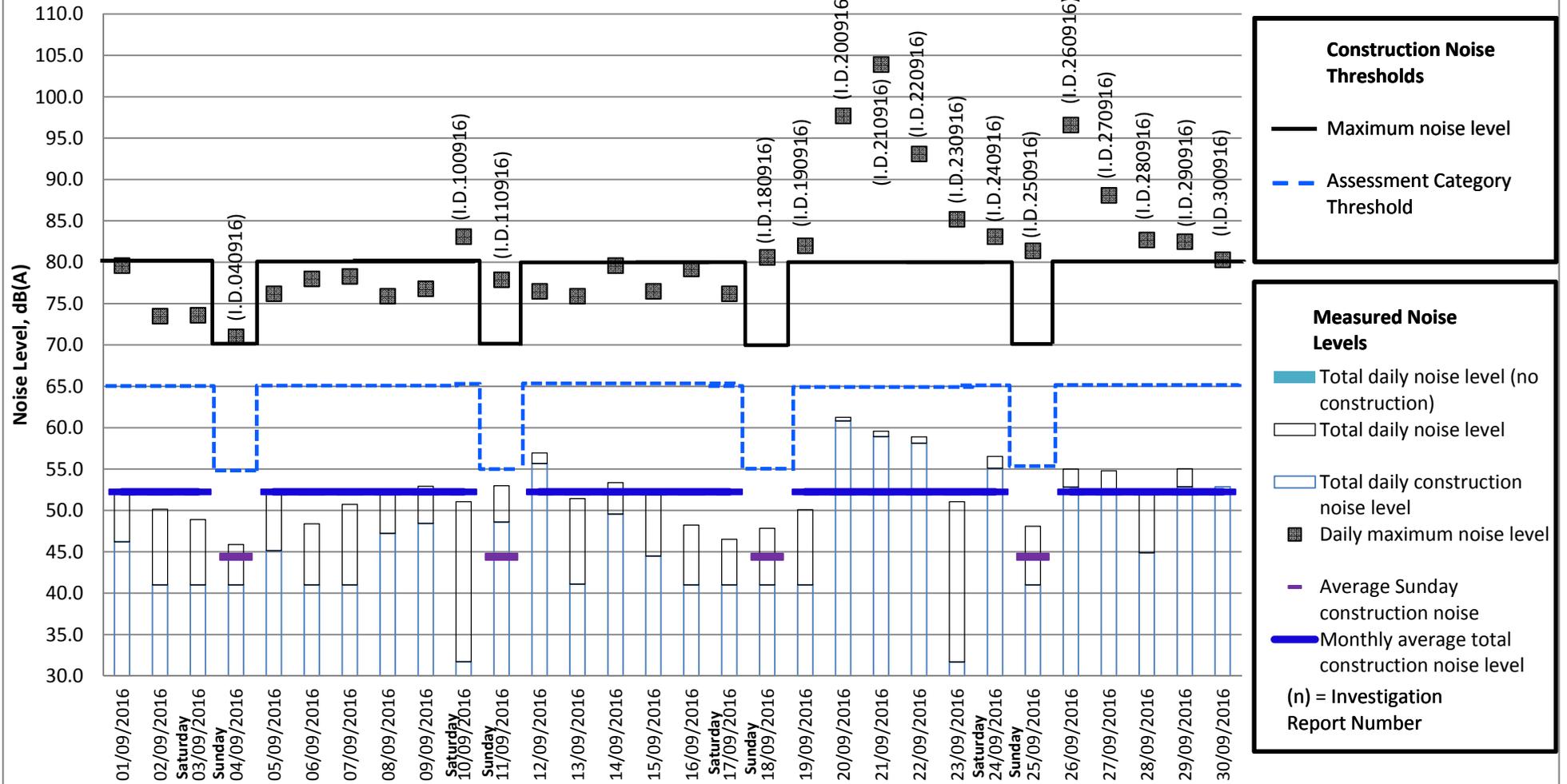
Note:

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



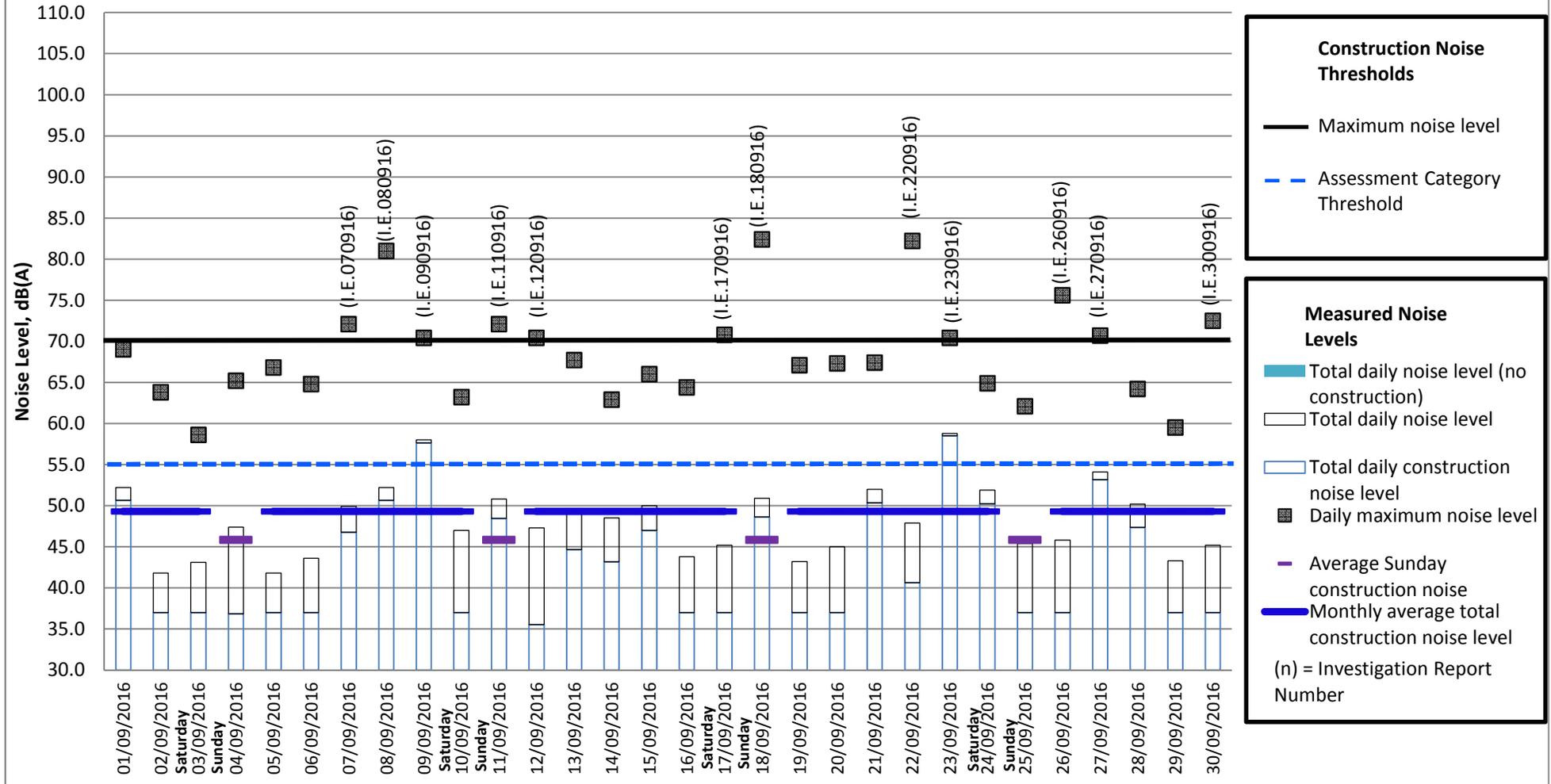
Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' on 23rd, 27th and 28th September were caused by wind

Measured Daytime Noise Levels at Inchgarvie Measurement period: September 2016



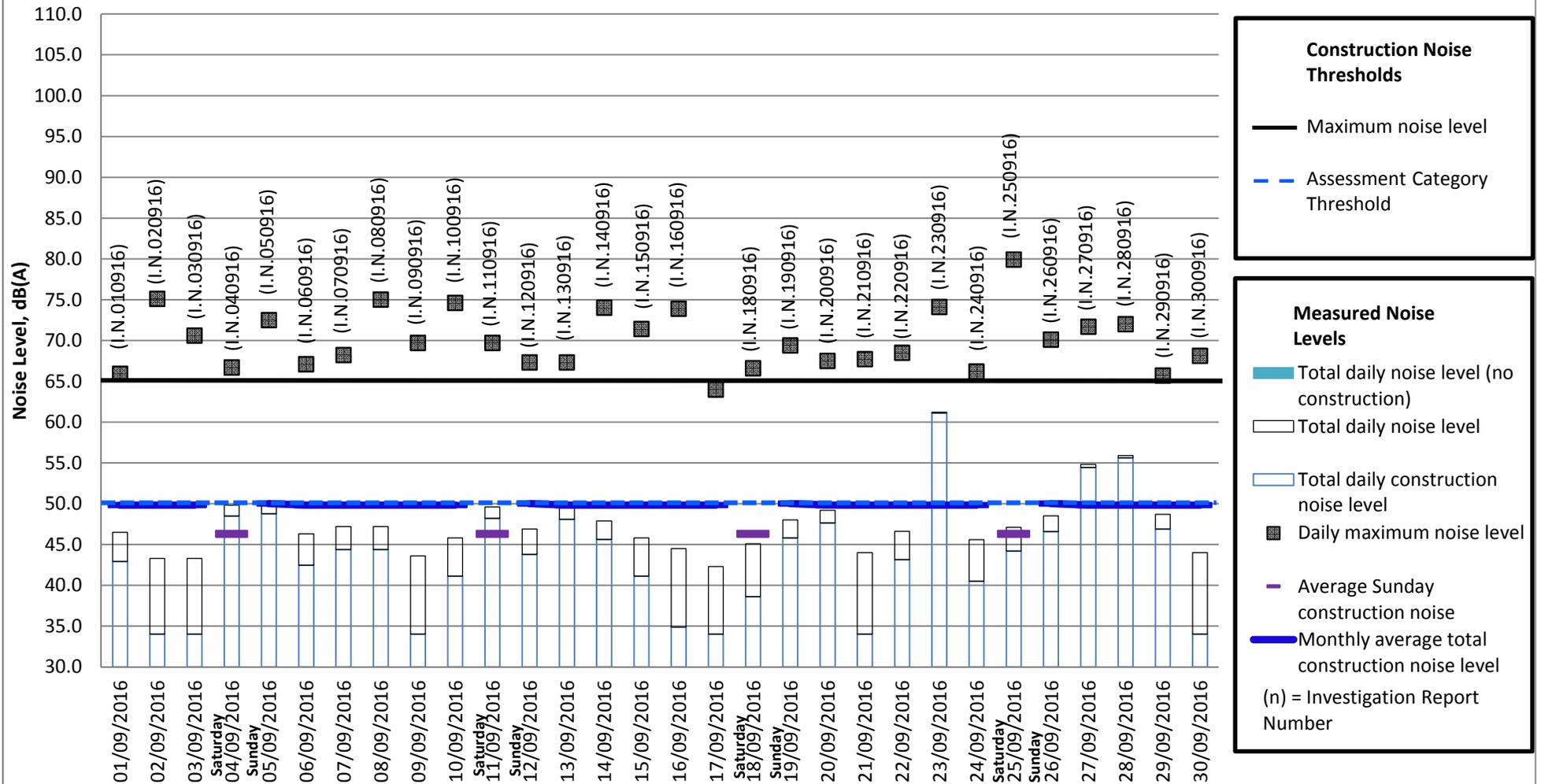
Note:

Measured Evening Noise Levels at Inchgarvie Measurement period: September 2016



Note:

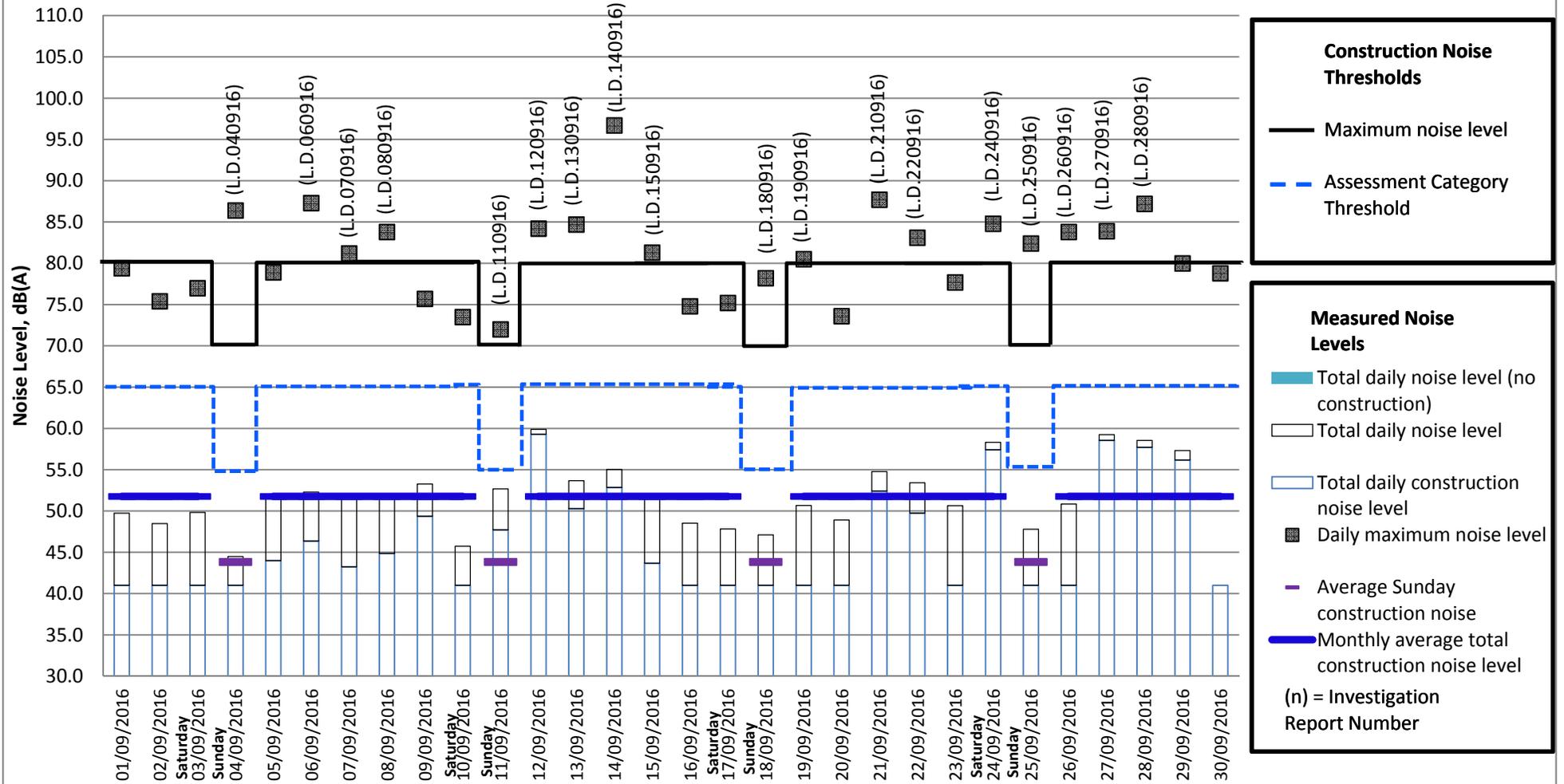
Measured Night time Noise Levels at Inchgarvie Measurement period: September 2016



Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' on 23rd, 27th and 28th September were caused by wind

Measured Daytime Noise Levels at Linn Mill

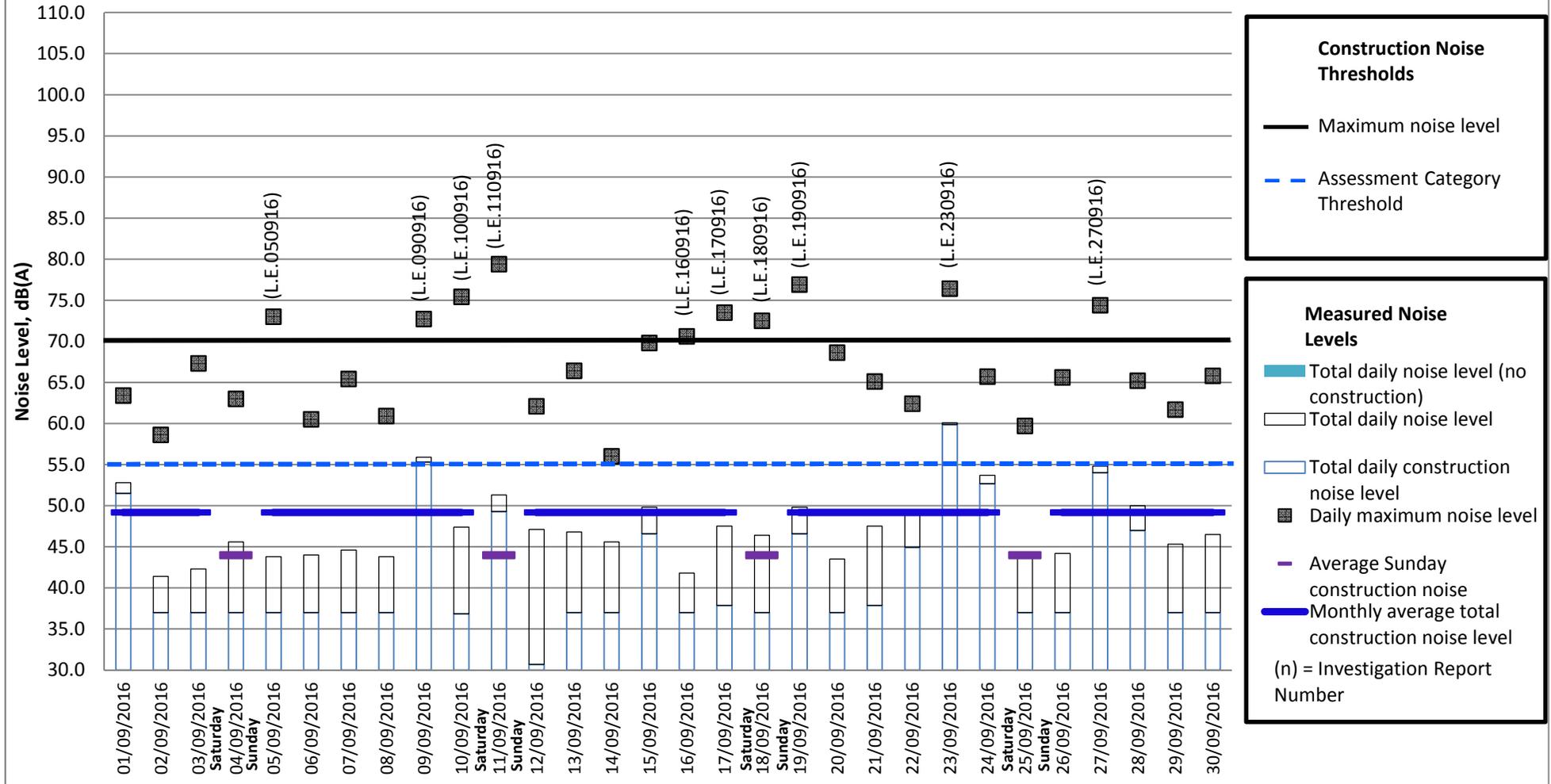
Measurement period: September 2016



Note:

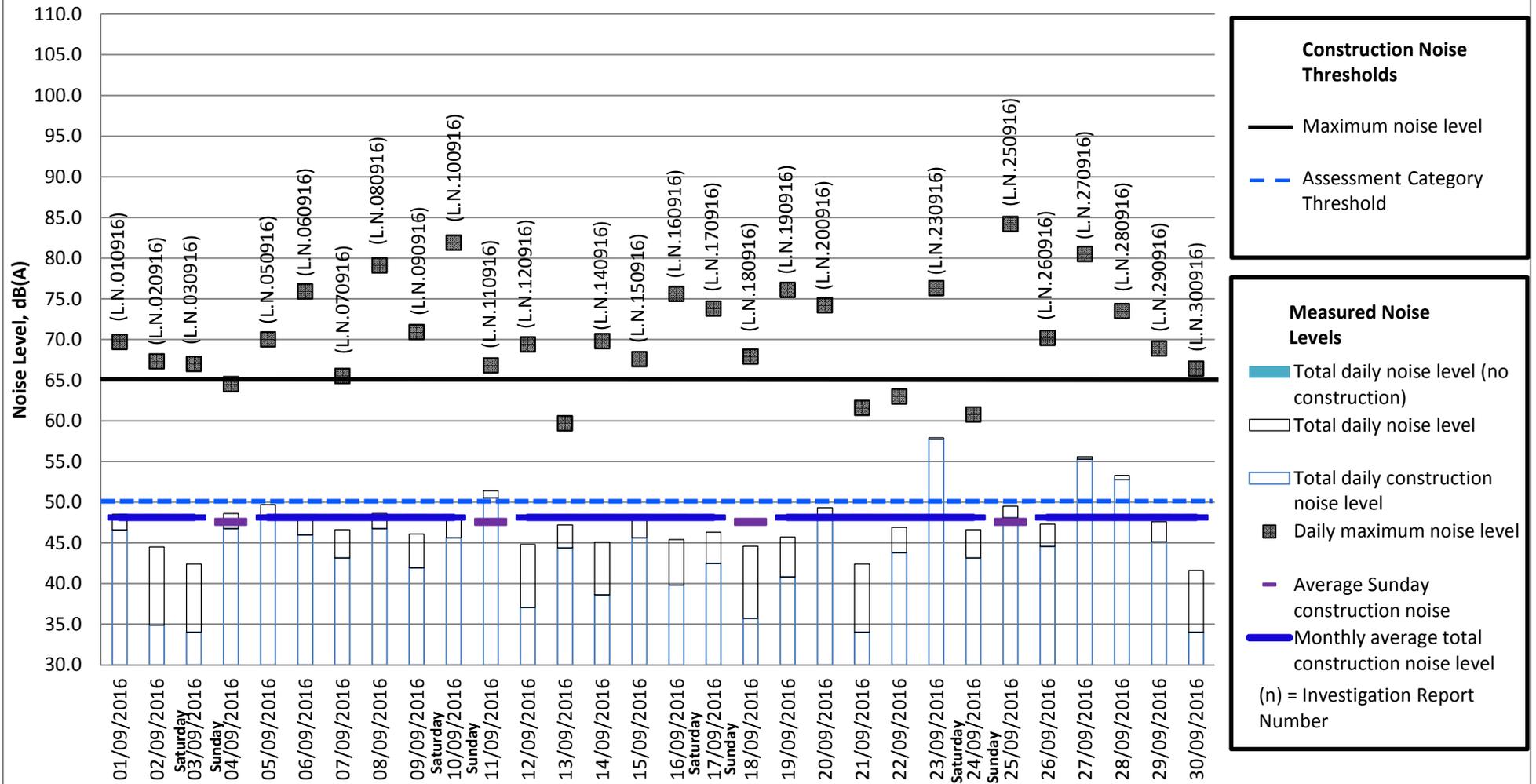
Measured Evening Noise Levels at Linn Mill

Measurement period: September 2016



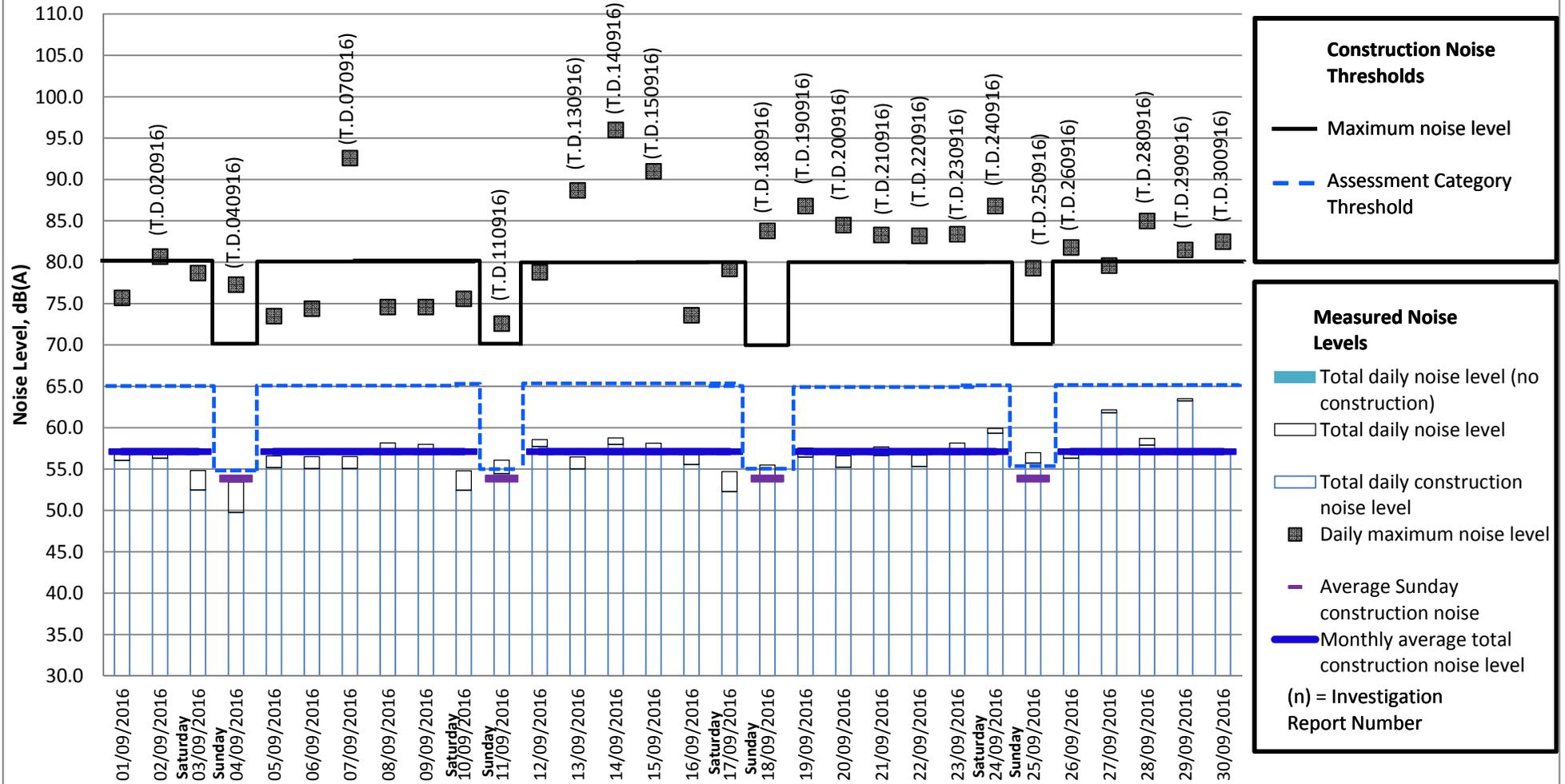
Note:

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



Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' on 23rd, 27th and 28th September were caused by wind

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



Construction Noise Thresholds

- Maximum noise level
- Assessment Category Threshold

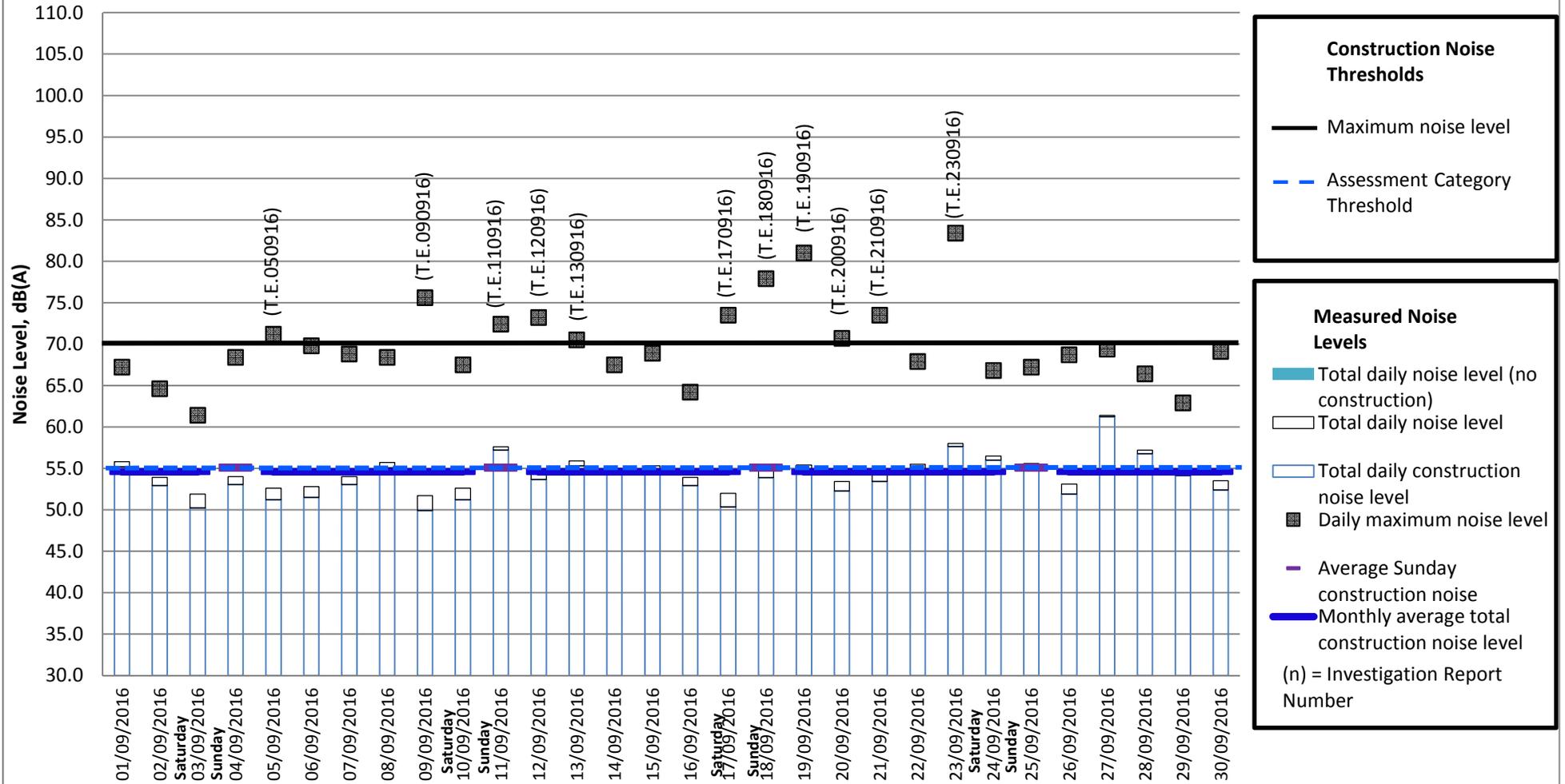
Measured Noise Levels

- 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

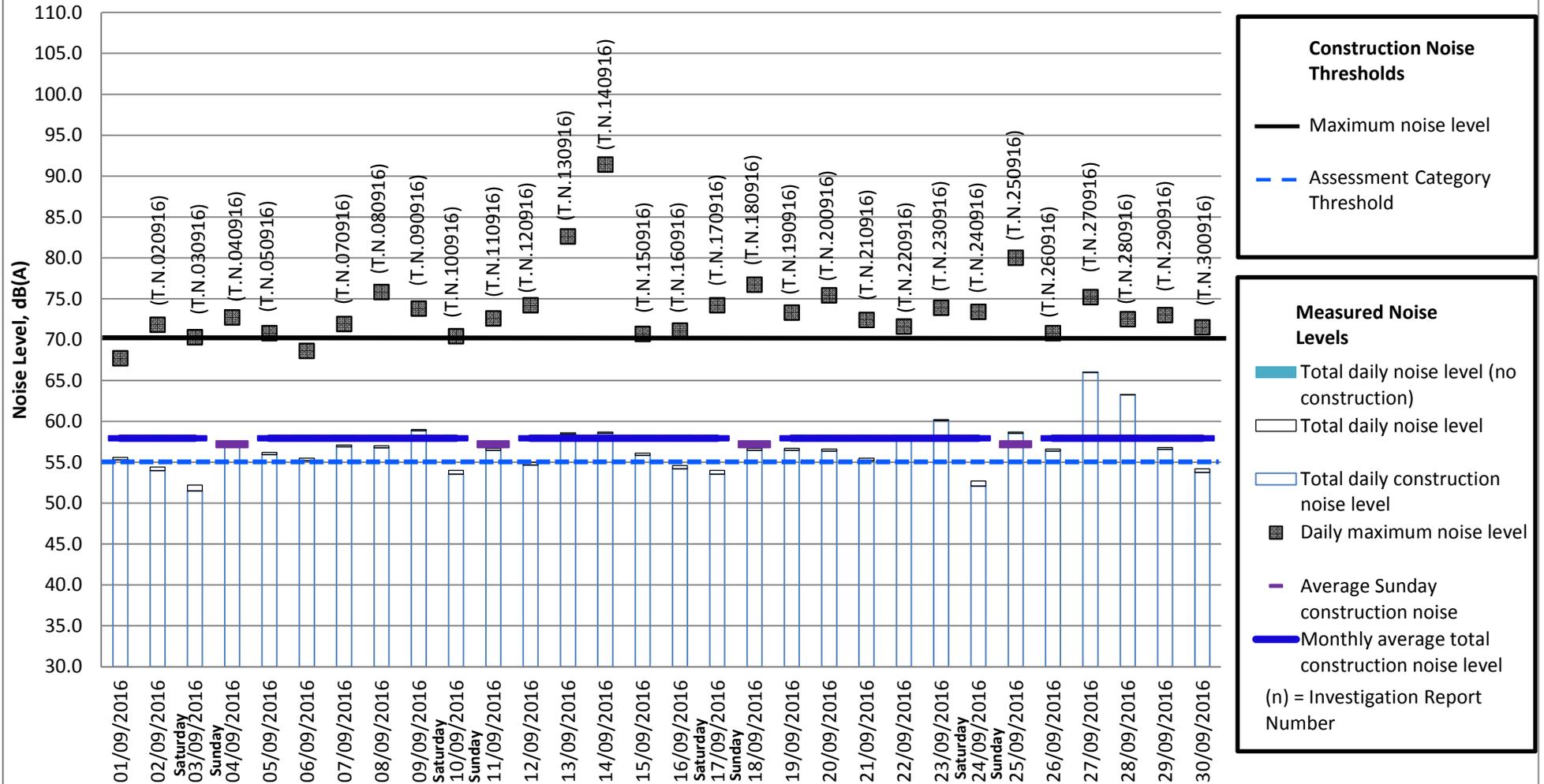
Note:

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



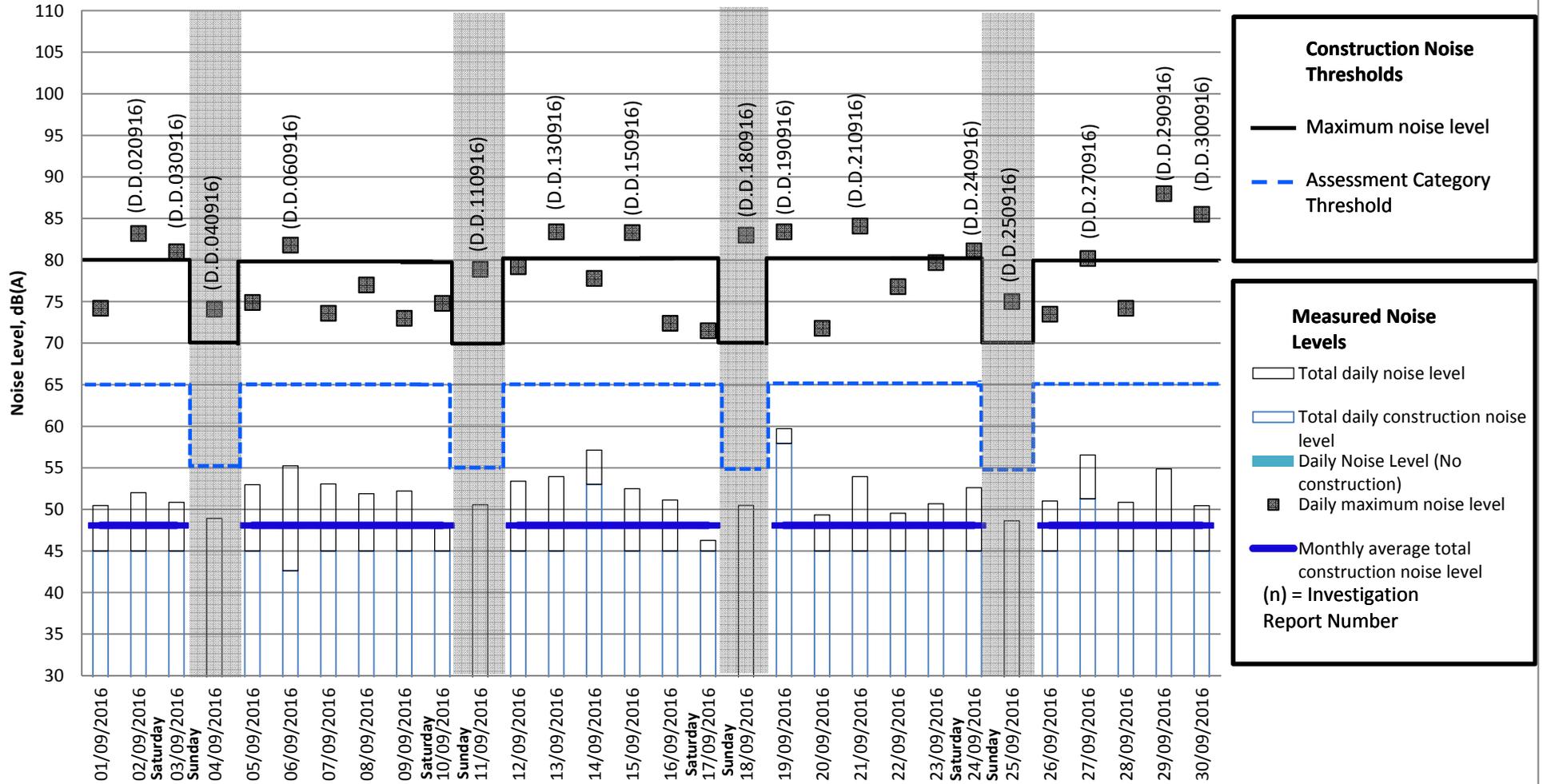
Note:

Measured Night time Noise Levels at Tigh-Na-Grian Measurement period: September 2016



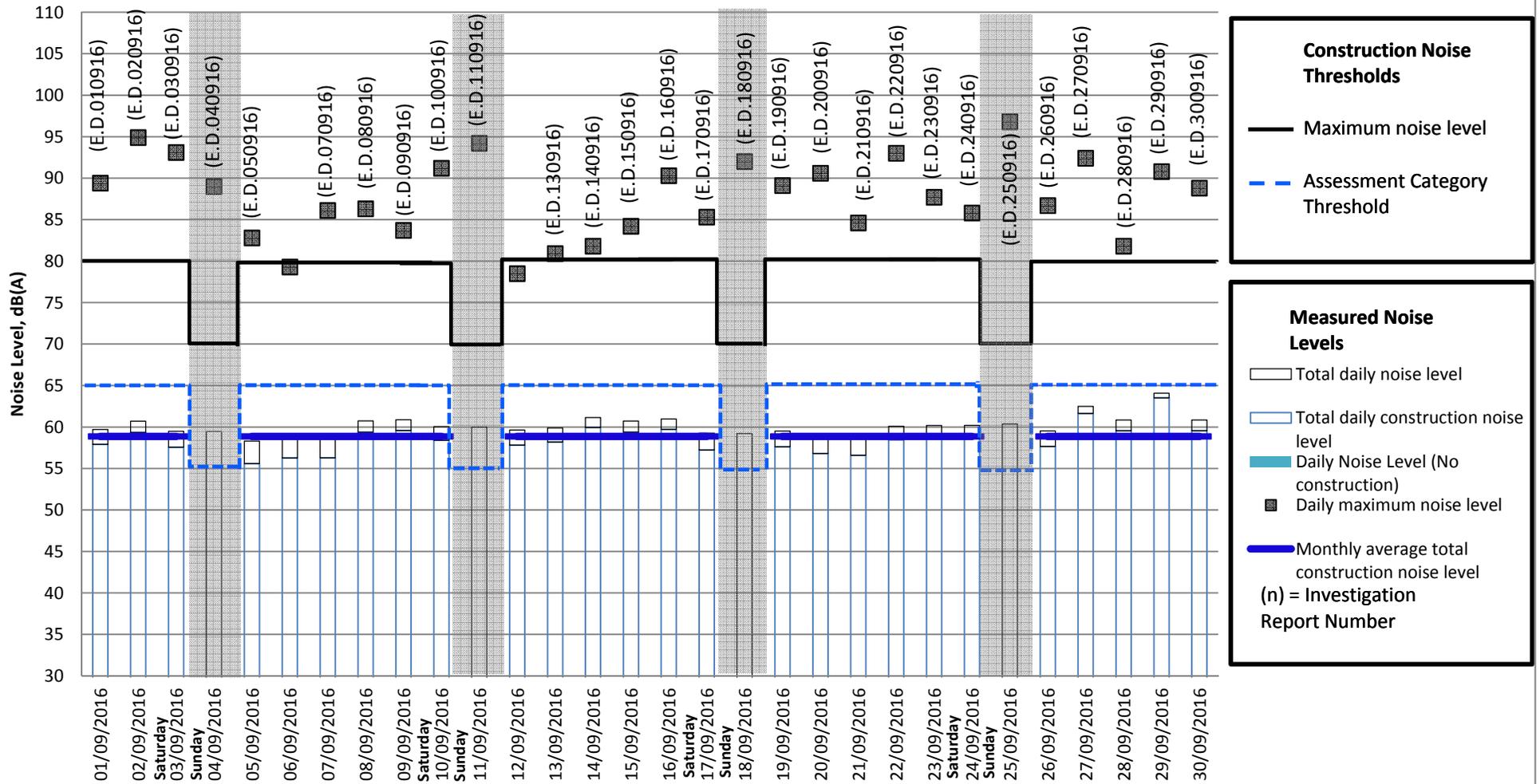
Note: After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' throughout the month were caused by birds and wind

Measured Daytime Noise Levels at Dundas Home Farm Measurement period: September 2016



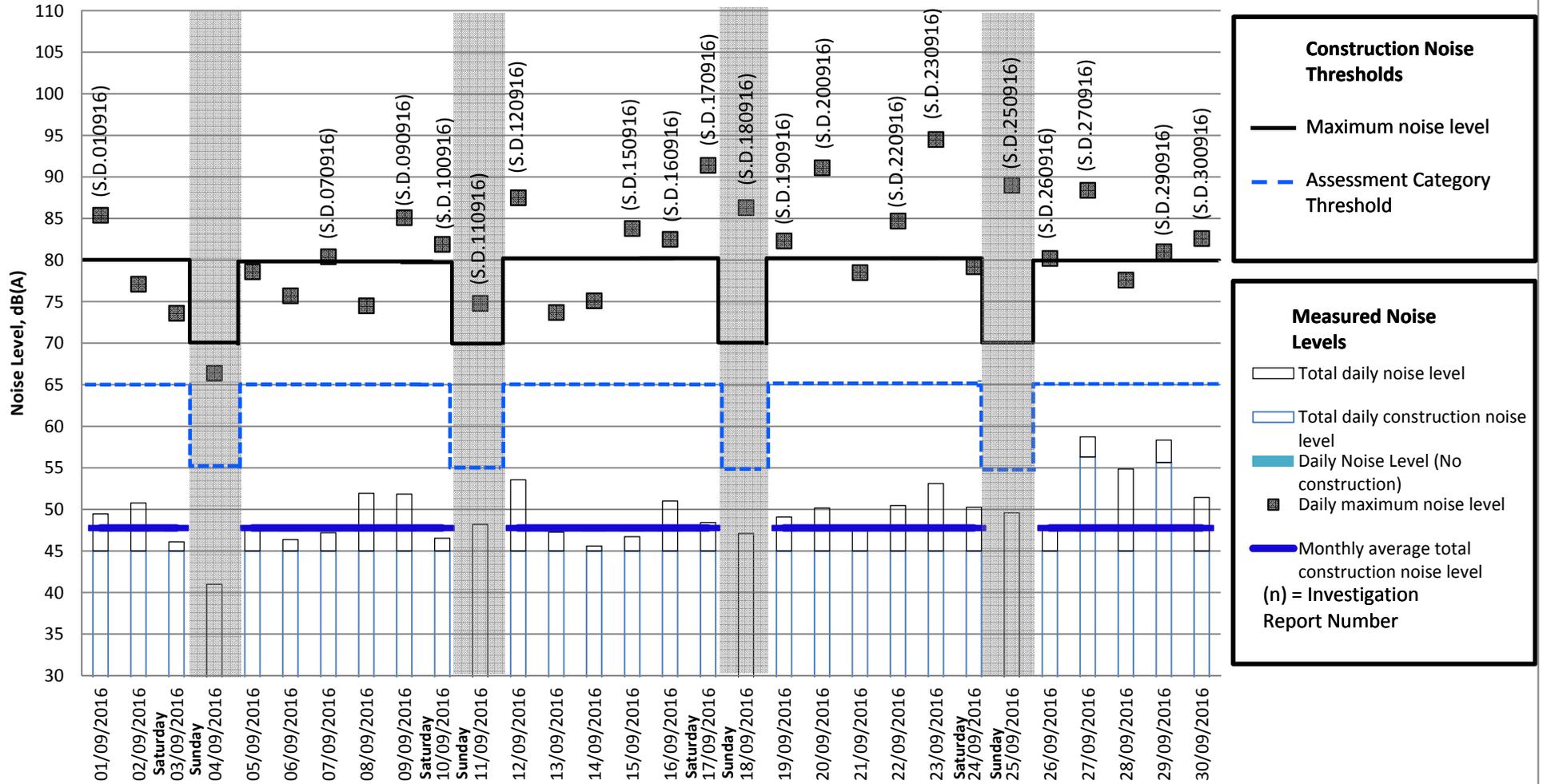
Note: The grey areas of the chart represent days on which no construction works have been conducted;

Measured Daytime Noise Levels at Echline Measurement period: September 2016



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

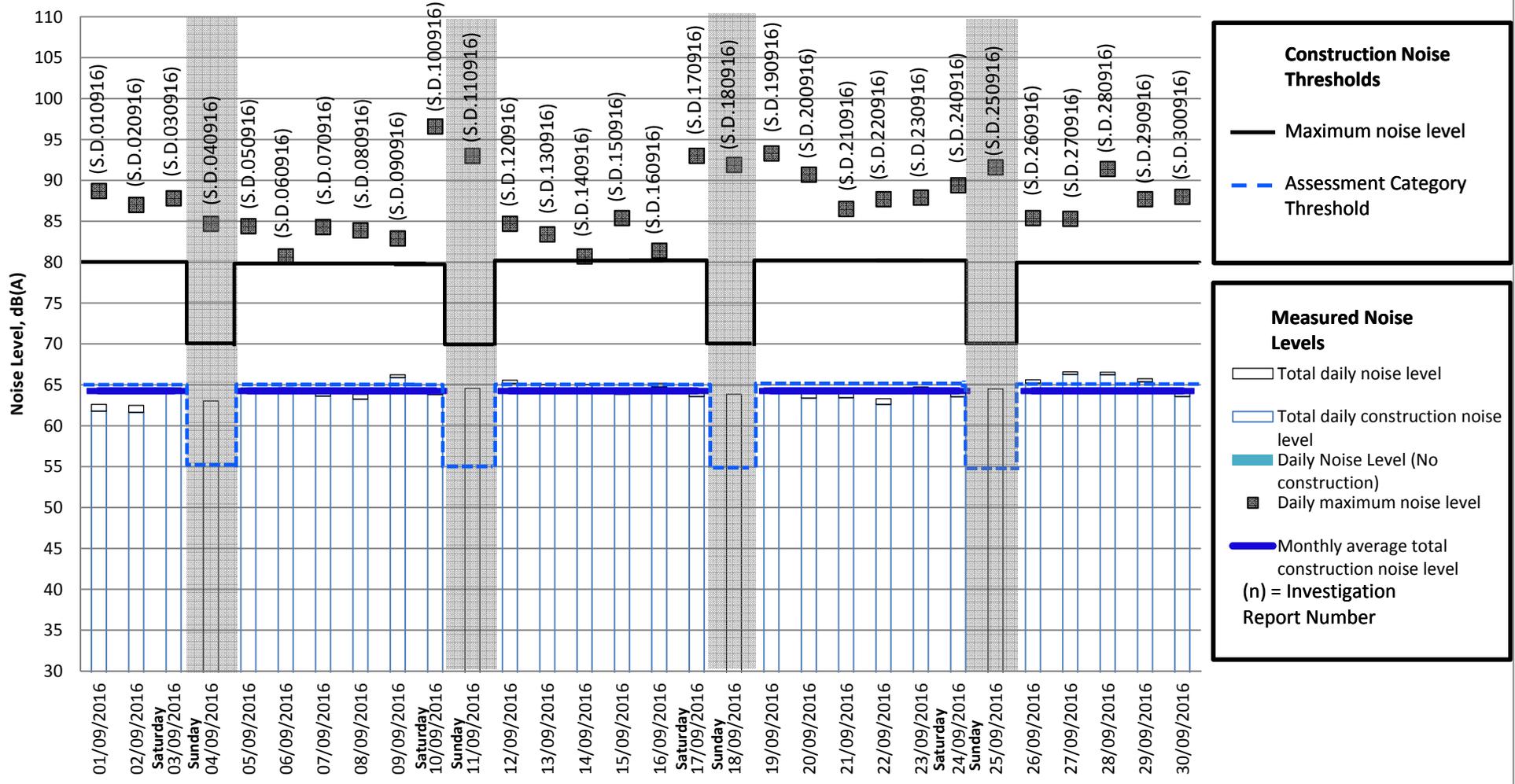
Measured Daytime Noise Levels at Springfield Measurement period: September 2016



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

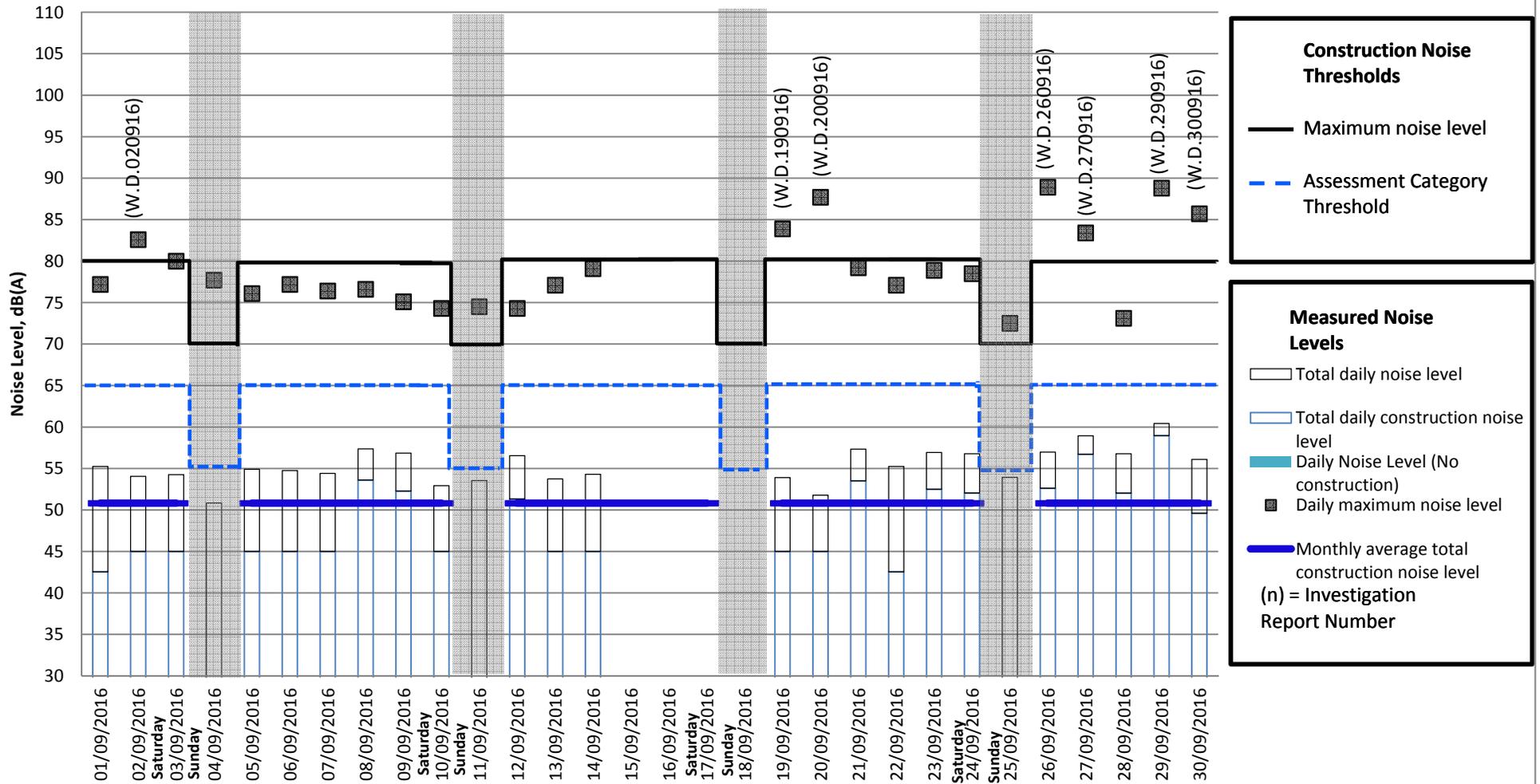
Measured Daytime Noise Levels at Scotstoun

Measurement period: September 2016



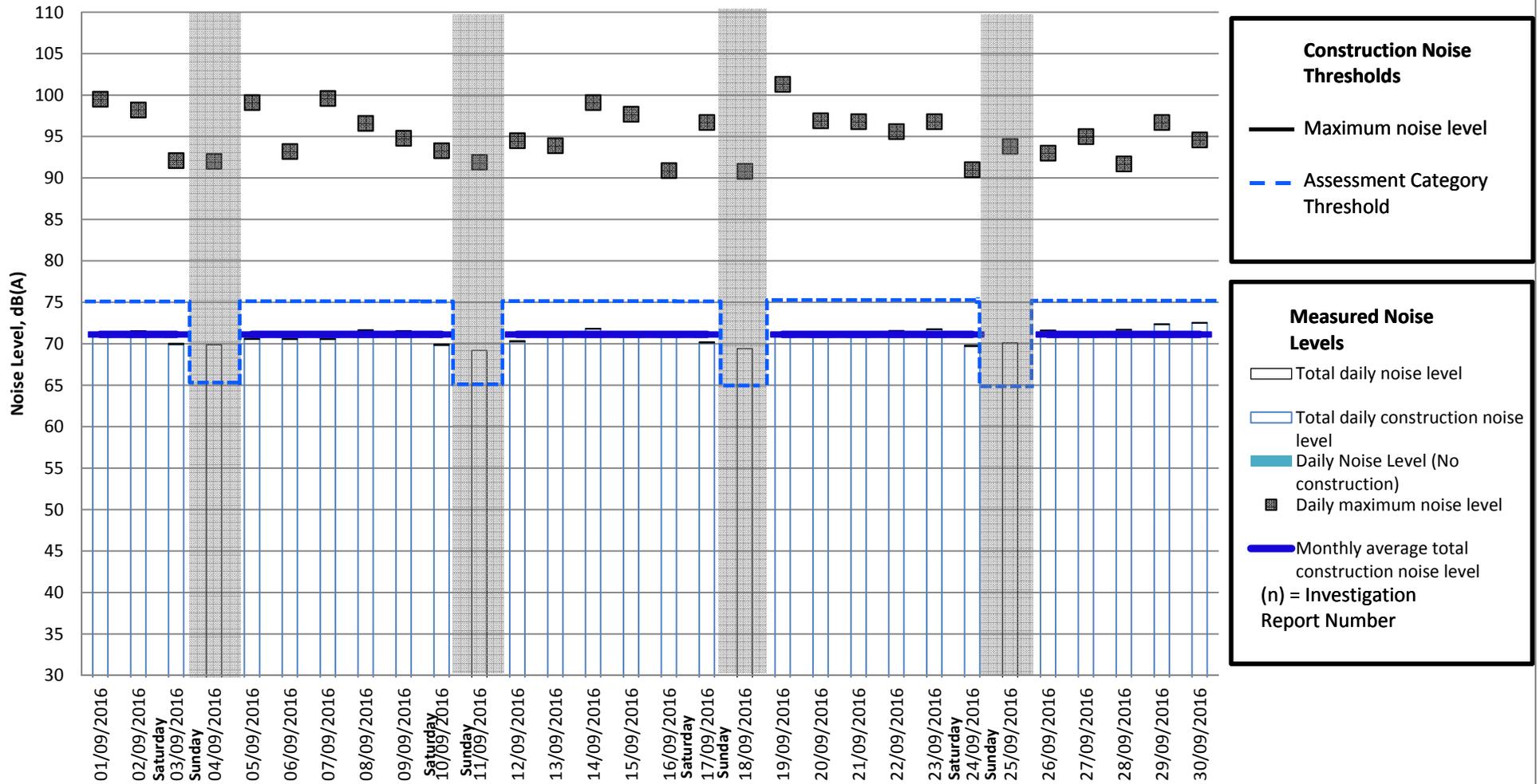
Note: The grey areas of the chart represent days on which no construction works have been conducted;

Measured Daytime Noise Levels at Whinnyhill Measurement period: September 2016



Note: The grey areas of the chart represent days on which no construction works have been conducted; There was no data recorded from the 15th - 18th September due to an electrical issue with the noise monitor

Measured Daytime Noise Levels at Newton Measurement period: September 2016



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