




Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

Project **FORTH REPLACEMENT CROSSING**

Document title

CONSTRUCTION NOISE MONITORING REPORT: JUNE 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 June 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 June 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 June 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 June 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 June 2014
M1	Whinny Hill	Network	<ul style="list-style-type: none"> • Verge filling • Rock excavation <p>N.B. No evening, night time or Sunday daytime construction in vicinity.</p>
M3	Tigh-Na-Grian	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork & concreting works • North Tower rebar, formwork & concreting works • Pier N1 rebar formwork & concrete works
M4	North Leg	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork & concreting works • North Tower rebar, formwork & concreting works • Pier rebar formwork & concrete works
M6	Port Edgar	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork & concreting works • South Tower rebar, formwork & concreting works • Pier S1 de-stressing wells work • Pier S2 cofferdam construction • Pier S3 excavation • Pier S5 rebar, formwork & concreting works • Pier S6 rebar, formwork & concreting works • Bearing fitting at Piers S7 and S8
M7	Butlaw Fisheries	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork & concreting works • South Tower rebar, formwork & concreting works • Pier S1 de-stressing wells work • Pier S2 cofferdam construction • Pier S3 excavation • Pier S5 rebar, formwork & concreting works • Pier S6 rebar, formwork & concreting works • Bearing fitting at Piers S7 and S8
M10	Inchgarvie Lodge	Crossing	<ul style="list-style-type: none"> • Central Tower rebar, formwork & concreting works • South Tower rebar, formwork & concreting works • Pier S1 de-stressing wells work • Pier S2 cofferdam construction • Pier S3 excavation • Pier S5 rebar, formwork & concreting works • Pier S6 rebar, formwork & concreting works • Bearing fitting at Piers S7 and S8 • Launch – install plates to props, king post works and structural steel works
M11	Linn Mill	Network (close proximity to Crossing)	<ul style="list-style-type: none"> • Launch – install plates to props, king post works and structural steel works • Pier S5 rebar, formwork & concreting works • Pier S6 rebar, formwork & concreting works • Bearing fitting at Piers S7 and S8 <p>• N.B. No night time or Sunday daytime</p>

			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 • Gyrotory – cut batters/shaping rock • A904 tie in road works, including verge fill, kerbing and placing/trimming of type 1 sub-base for footpath <p>N.B. No night time or Sunday daytime construction in vicinity.</p>
M16	Scotstoun	Network	<ul style="list-style-type: none"> • Utilities works • Structure works • Brash removal <p>N.B. No night time or Sunday daytime construction in vicinity.</p>
M17	Dundas Home Farm	Network	<ul style="list-style-type: none"> • Utility works • Fill south bund/landscape • Planting • BP Speciality works <p>N.B. No night time or Sunday daytime construction in vicinity.</p>
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 and power issues. Results for Port Edgar start 12th of June as this is when the monitor was reinstalled after sustaining significant damage due to adverse weather conditions. Due to device error and isolated power issues there a number of dates which have intermittent missing data. They are as follows: Tigh-Na-Grian: 1st – 3rd & 14th-15th June, Echline: 1st – 2nd June, Inch Garvie Lodge: 30th June, Linn Mill: 1st, 10th – 13th June, Butlaw: 30th June, Clufflat: 23rd – 30th June, Newton: 11th – 25th June, Port Edgar: 23rd & 28th – 30th June.

- 3.3** Results demonstrate that the monthly average total construction noise results for daytime were within the threshold levels for all monitoring locations for June 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 locations; Butlaw Fisheries and Inchgarvie. With regard to the Sunday averages (for applicable monitoring locations), there were exceedances of night time Sunday averages at Inchgarvie.
- 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 periods of adverse weather and traffic. Audio demonstrates that the increased levels were caused by waves and birds at Butlaw Fisheries and raindrops at Linn Mill and strong wind 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 June is consistent with levels for previous months.
- 3.6** During June 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 of adverse weather, 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.
- 3.8** 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 June the maximum noise threshold was exceeded on 48 occasions (daytime, 14; evening, 10; night time, 24). The majority of exceedances were attributed to non-construction factors, including waves, planes, cars and birds. Impact Piling also caused day time exceedances but the LAFmax threshold for impact piling is 96dB as set out in the CoCP. There were 3 isolated metallic bangs during the Night period most likely caused by excavation at S3. As the nearest sensitive receptor has shown to have a 5dB decrease it would not cause an exceedance.
Clufflat Brae	During June the maximum noise threshold was exceeded on 43 occasions (daytime, 8; evening, 16; night time, 19). 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 June the maximum noise threshold was exceeded on 61 occasions (daytime, 8; evening, 24; night time, 29). 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 June the maximum noise threshold was exceeded on 40 occasions (daytime, 10; evening, 7; night time, 23). 1 construction related exceedance was recorded at this location during the day time due to movement of material opposite the monitor. However, the exceedances at this location were largely due to birds.
Tigh-Na-Grian	During June the maximum noise threshold was exceeded on 23 occasions (daytime, 4; evening, 1; night time, 18). Exceedances were due to non-construction factors, mainly birds.
Dundas Home Farm	During June the maximum noise threshold was exceeded on 6 occasions. These exceedances were not caused by the works. The exceedances were due to lawnmowers, helicopters, airplanes, and residents.
Echline	During June the maximum noise threshold was exceeded on 23 occasions. No exceedances at this location were due to construction activities. Exceedances were largely attributed to vehicles passing by on the adjacent roads and local residents.
Scotstoun	During June the maximum noise threshold was exceeded on 21 occasions. No exceedances were due to construction. Exceedances were largely attributed to vehicles passing by on the adjacent road.
Whinny Hill	During June the maximum noise threshold was exceeded on 10 occasions. Exceedances were not due to construction activities. Exceedances were due to a range of factors such as different vehicles of transportation and birds.



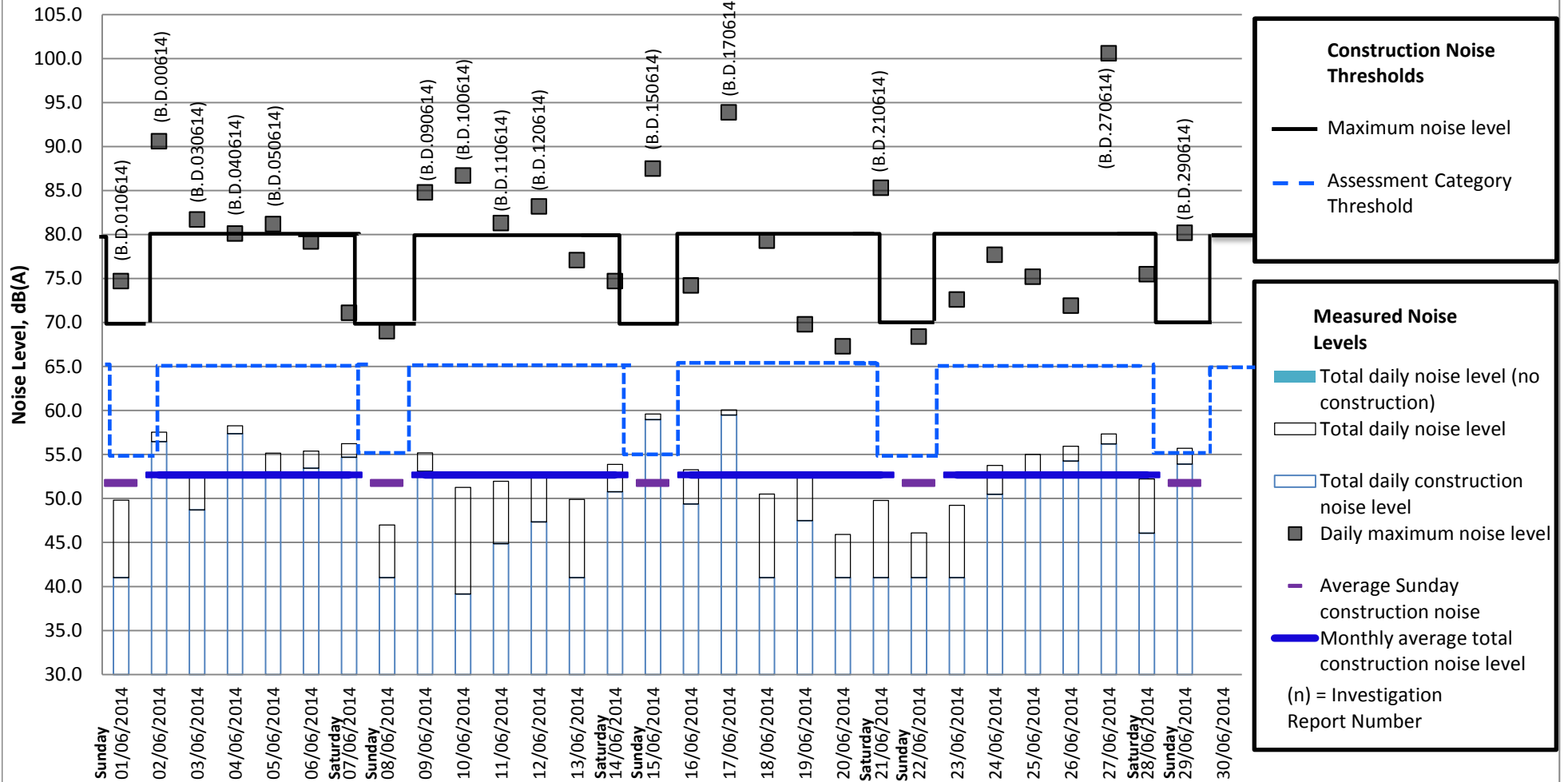
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APPENDIX A

Measured Daytime Noise Levels at Butlaw Fisheries

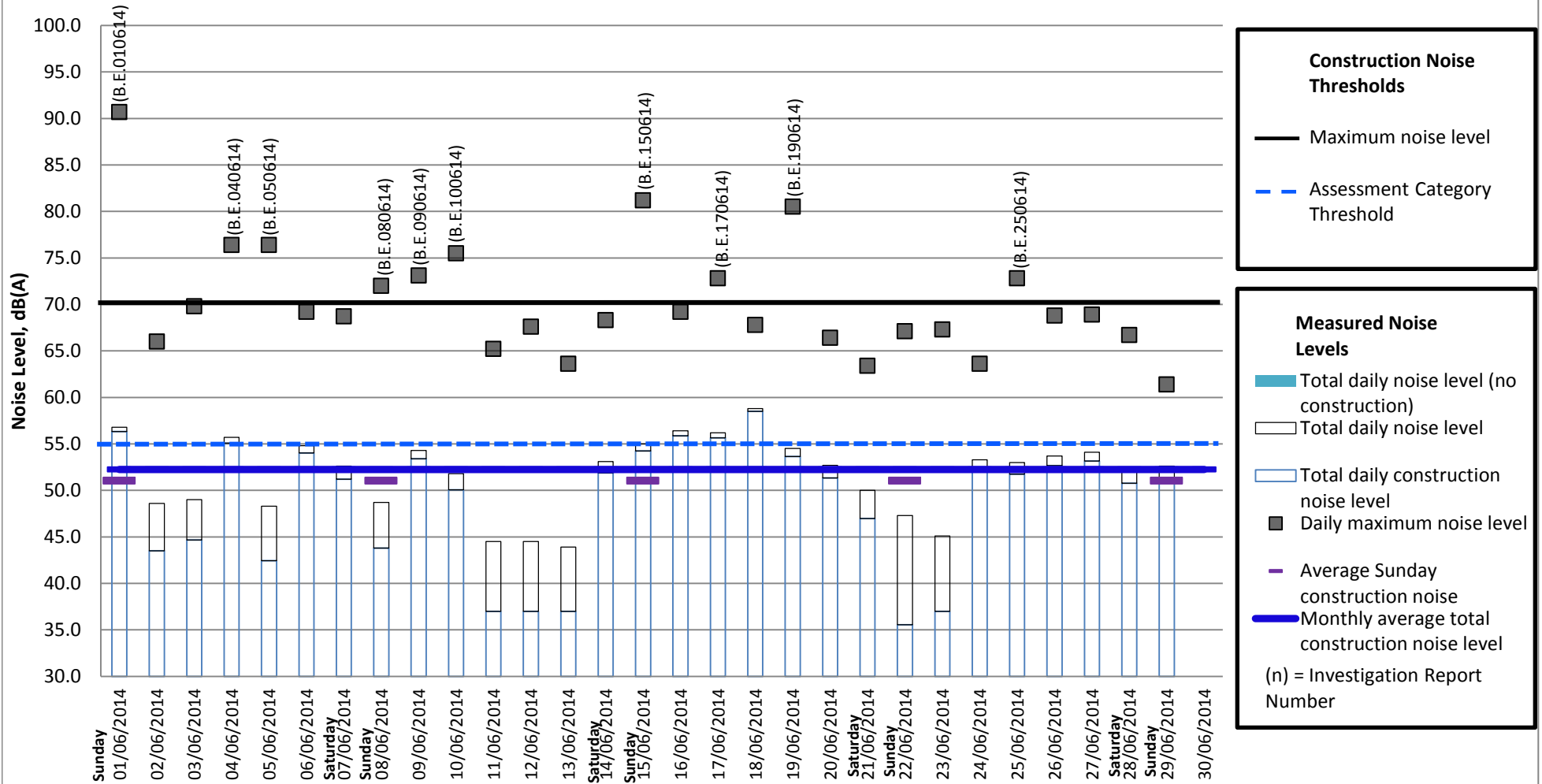
Measurement period: June 2014



Note: Data is missing from the 30/06/14 due to device error.

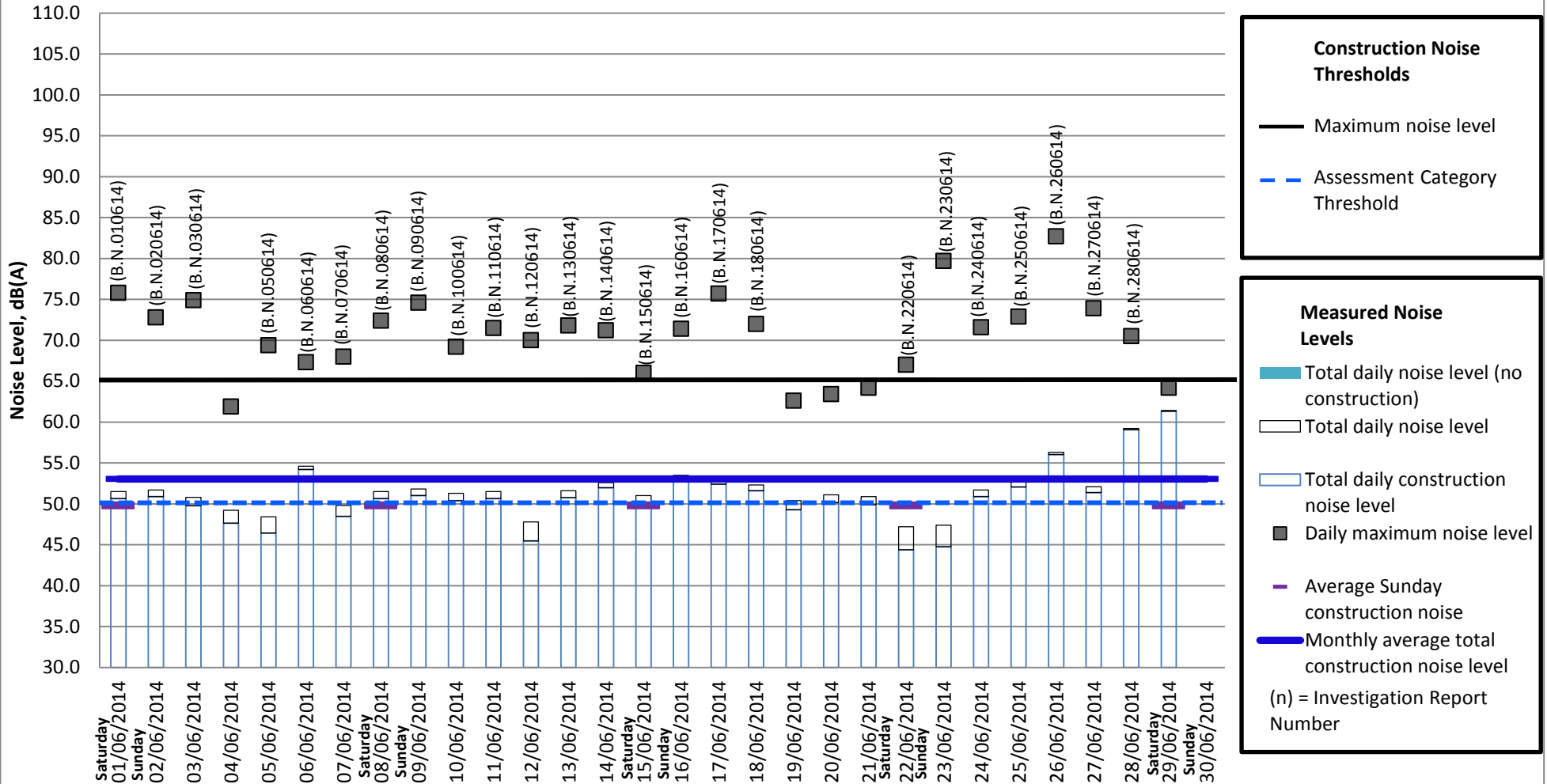
Measured Evening Noise Levels at Butlaw Fisheries

Measurement period: June 2014



Note: Data is missing from 30/06/14 due to device error.

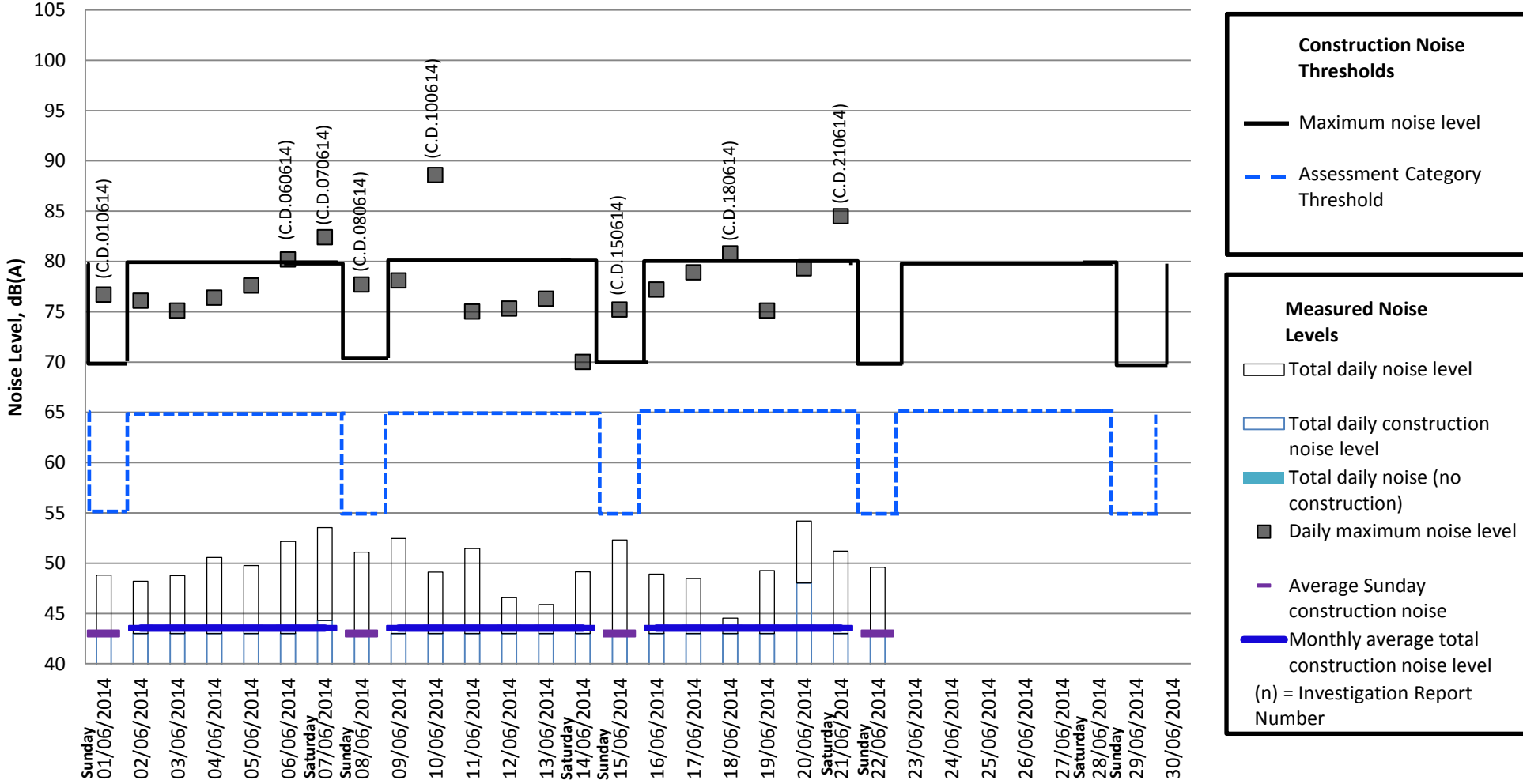
Measured Night time Noise Levels at Butlaw Fisheries Measurement period: June 2014



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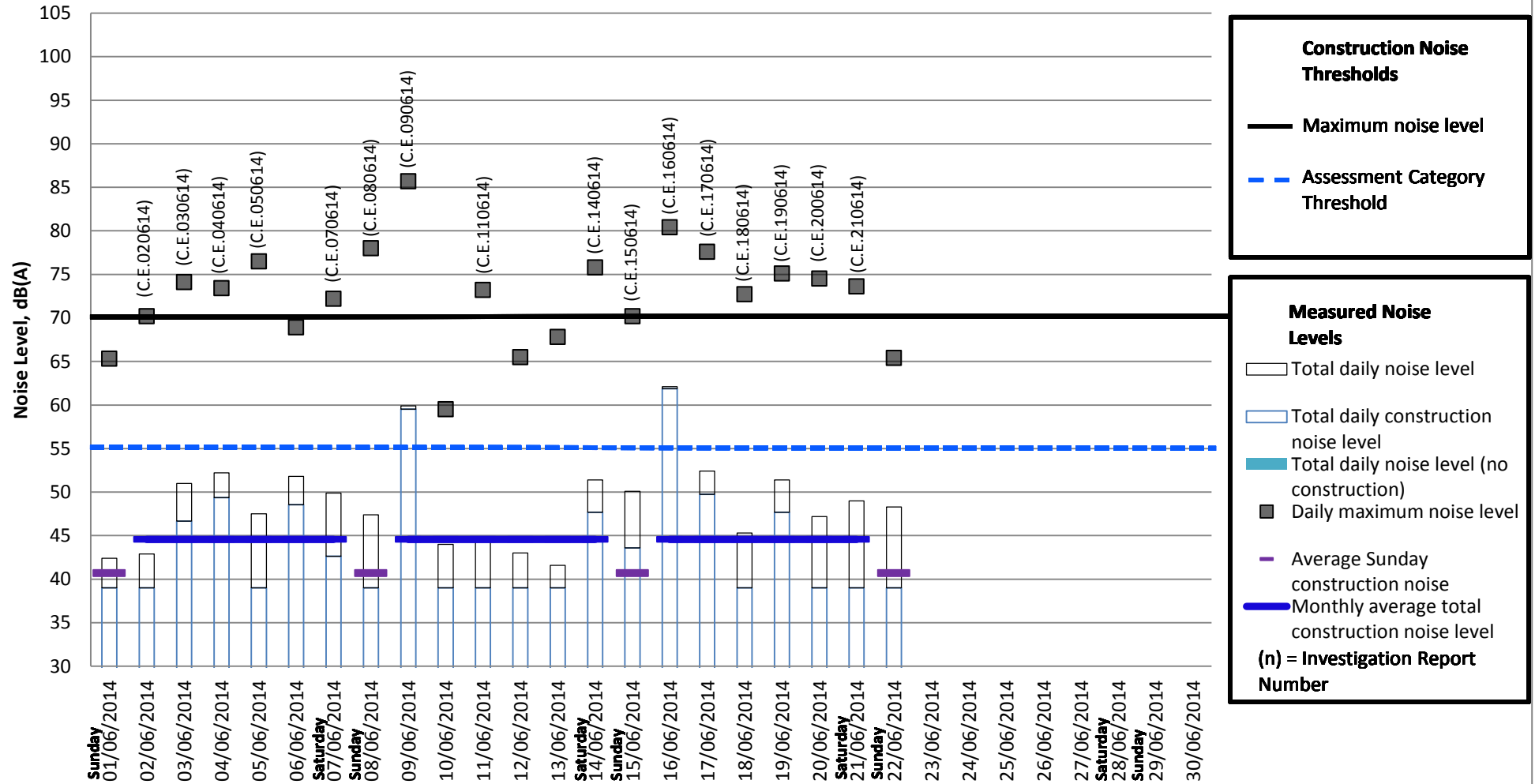
Measured Daytime Noise Levels at Clufflat Brae

Measurement period: June 2014



Note: Data is missing from 23/06/14 - 30/06/14 due to device error.

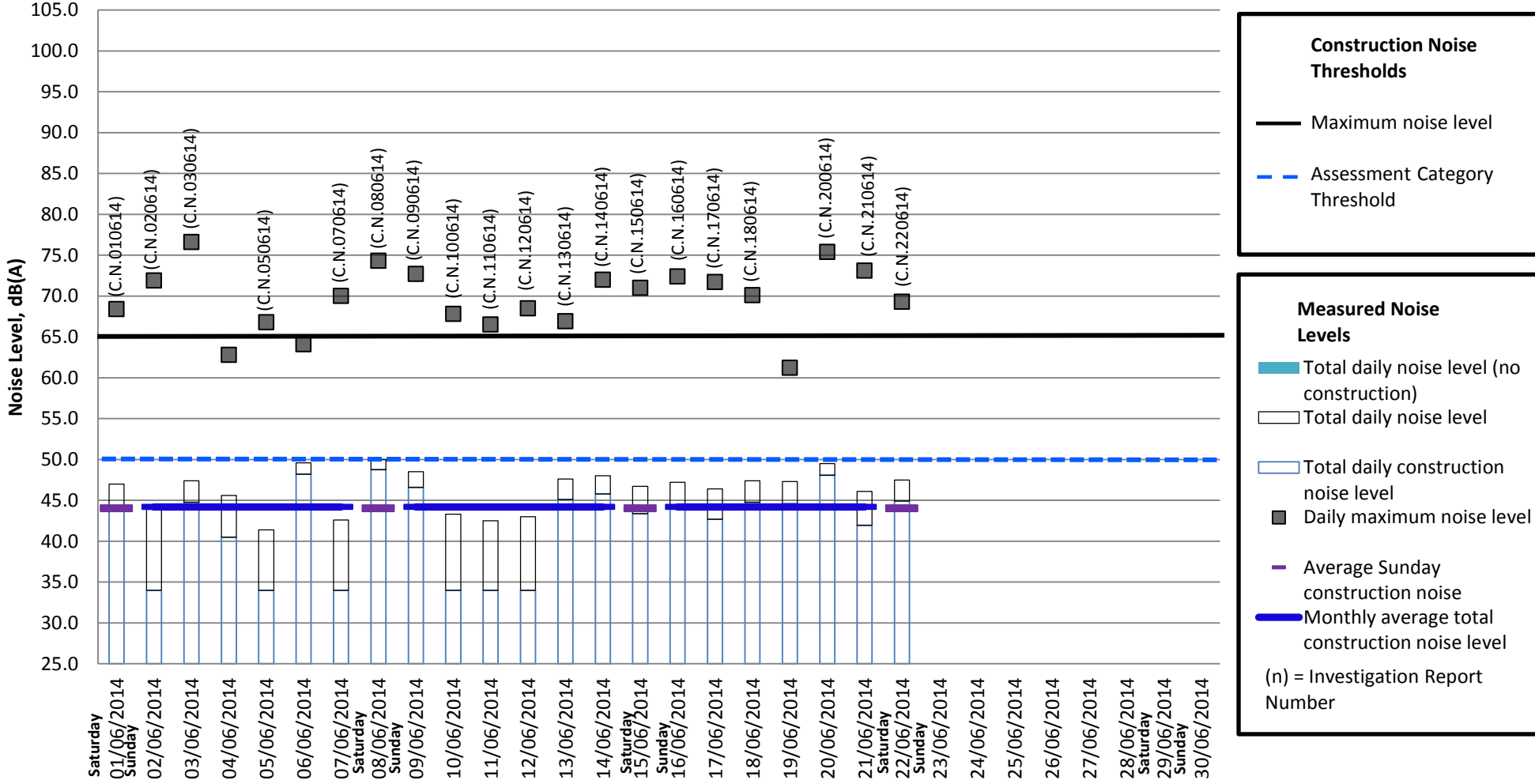
Measured Evening Noise Levels at Clufflat Brae Measurement period: June 2014



Note: Data is missing from 23/06/14 - 30/06/14 due to device error.

Measured Night-time Noise Levels at Clufflat Brae

Measurement period: June 2014



Construction Noise Thresholds

- Maximum noise level
- Assessment Category Threshold

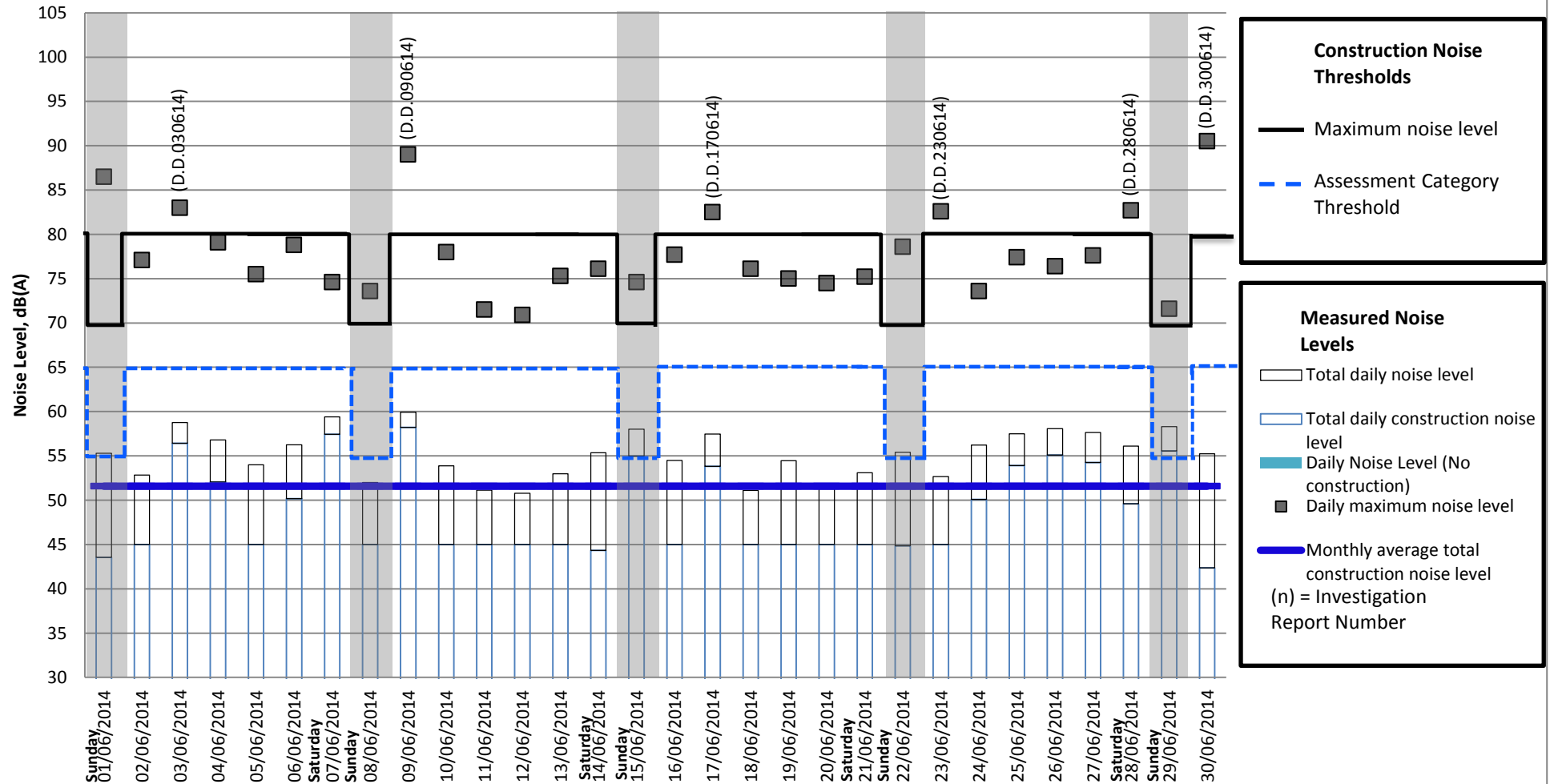
Measured Noise Levels

- 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: Data is missing from 23/06/14 - 30/06/14 due to device error.

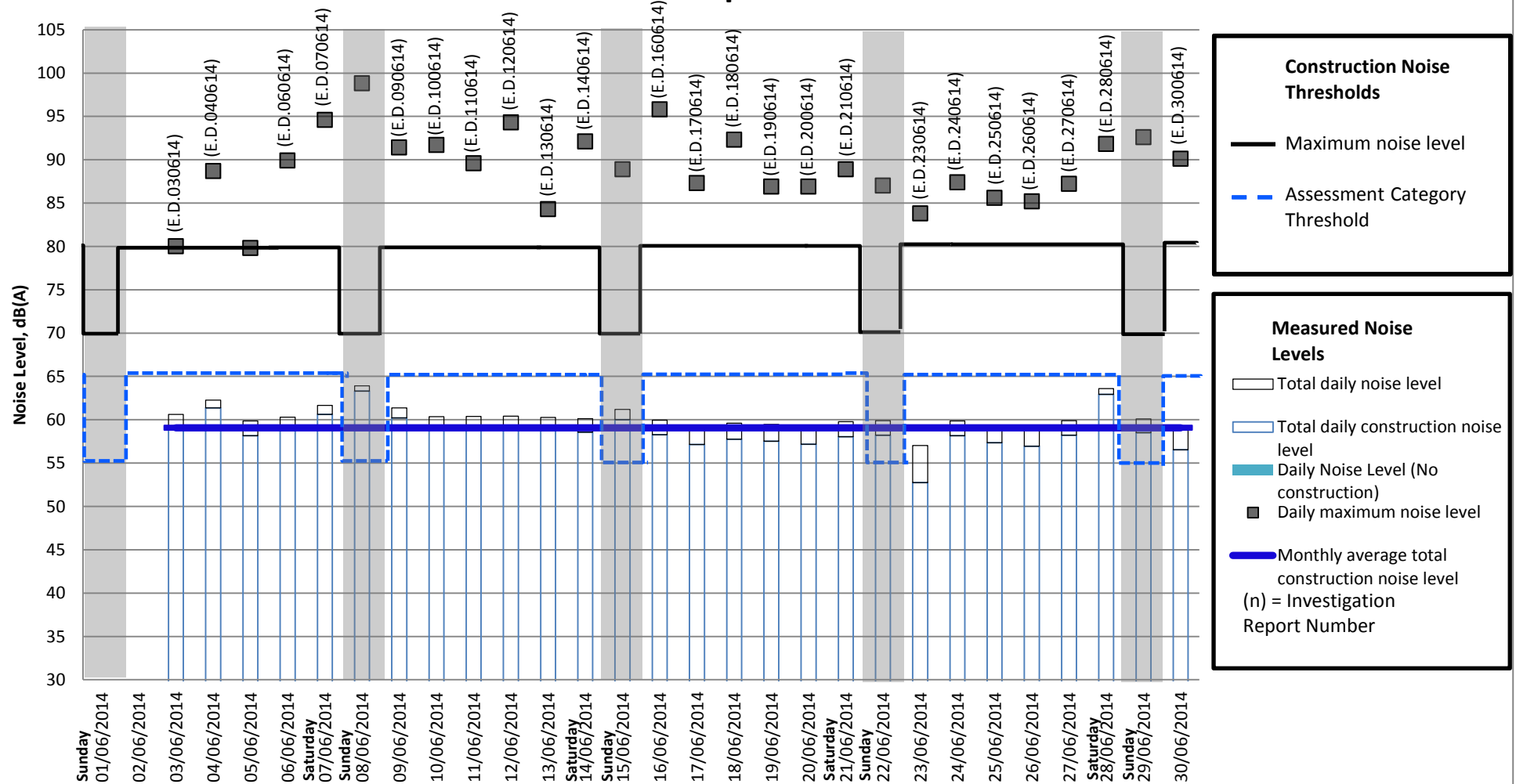
Measured Daytime Noise Levels at Dundas Home Farm Measurement period: June 2014



Note: The grey areas of the chart represent days on which no construction works have been undertaken at this location; no Sunday works have been undertaken at this location

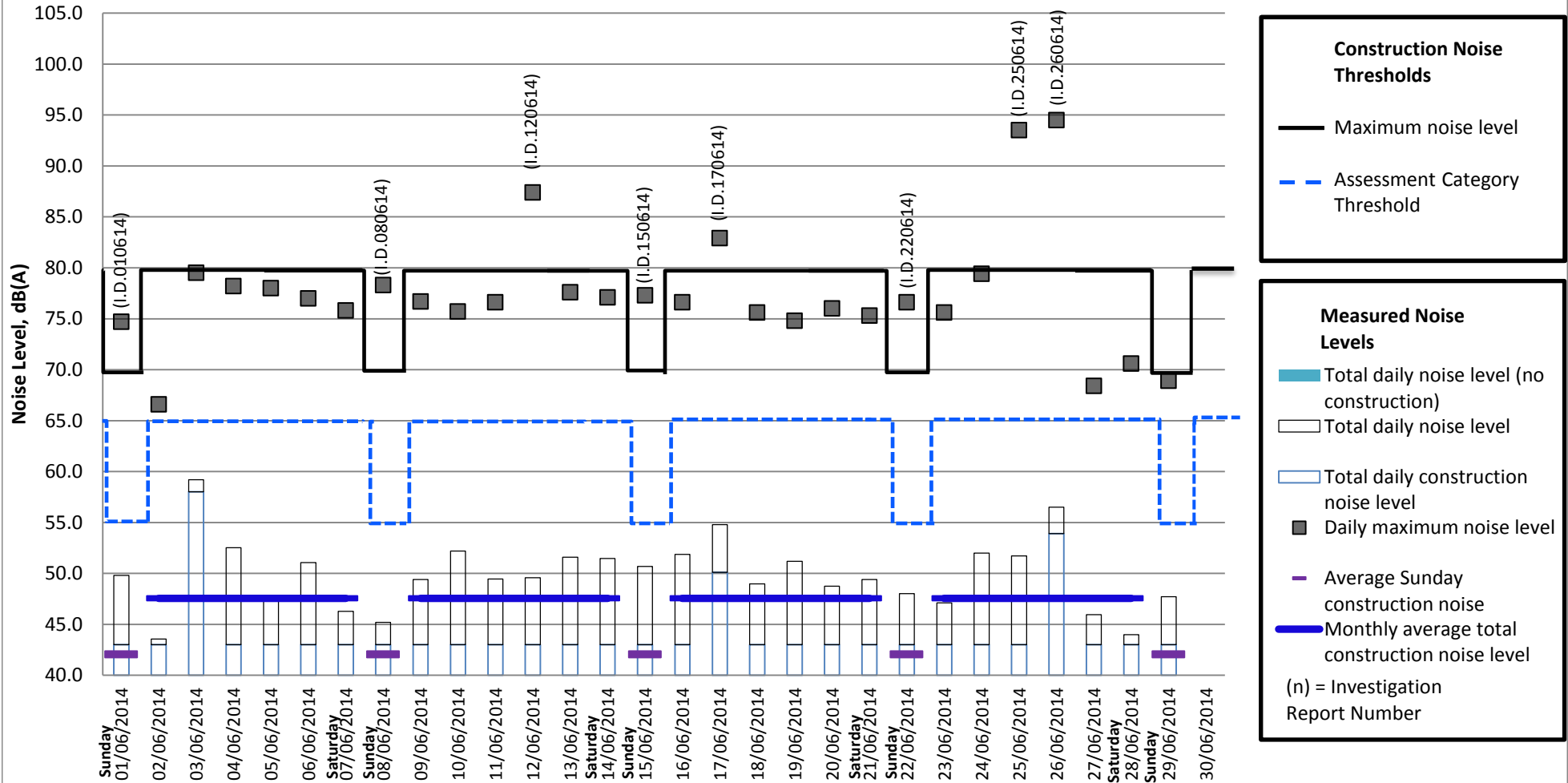
Measured Daytime Noise Levels at Echline

Measurement period: June 2014



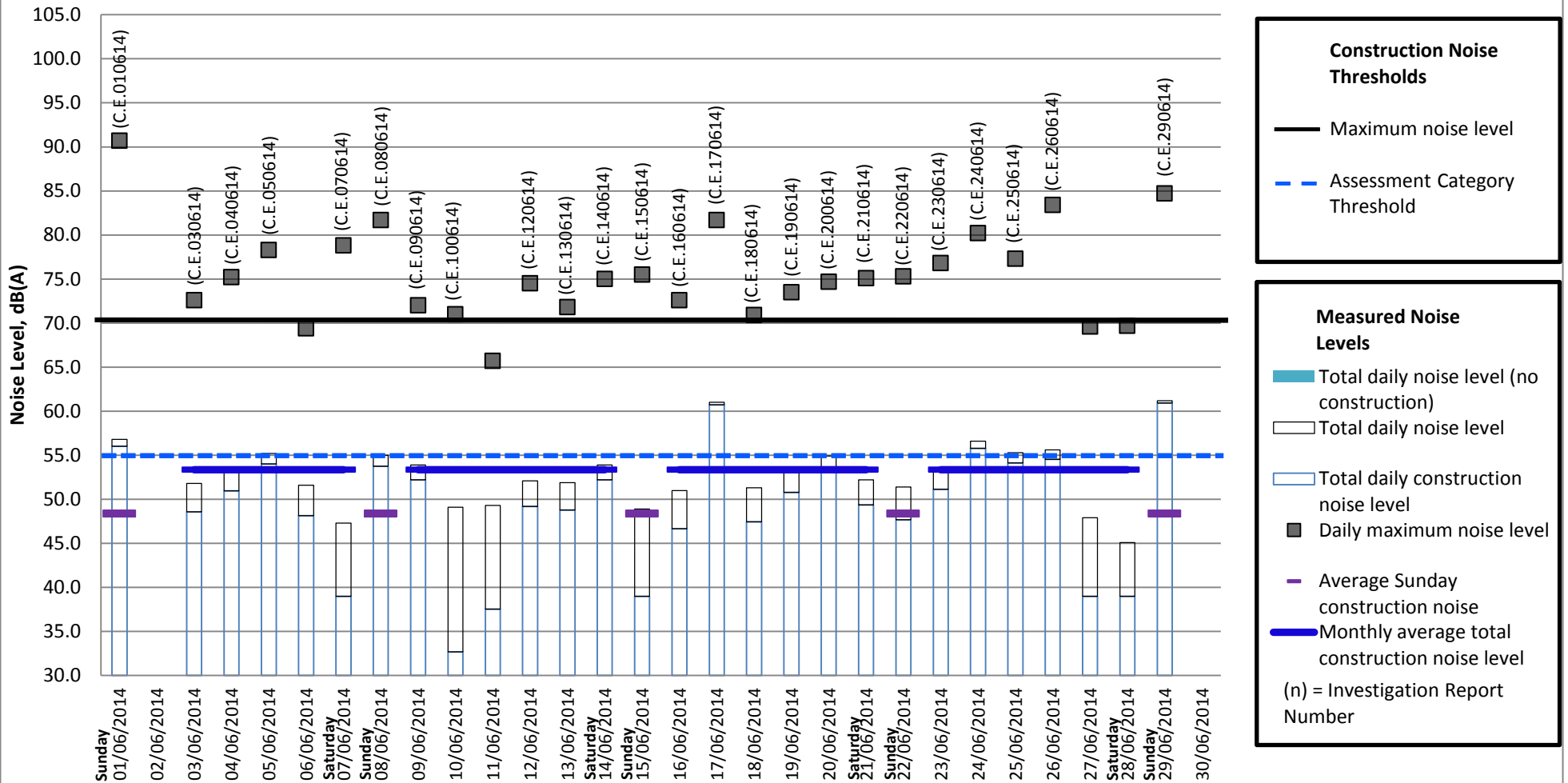
Note: The grey areas of the chart represent days on which no construction works have been conducted. The Sunday average has not been included as no Sunday works have been conducted at this location. Data is missing from 01/06/14 & 02/06/14 due to a device error.

Measured Daytime Noise Levels at Inchgarvie Measurement period: June 2014



Note: Data is missing from 30/06/14 due to device error.

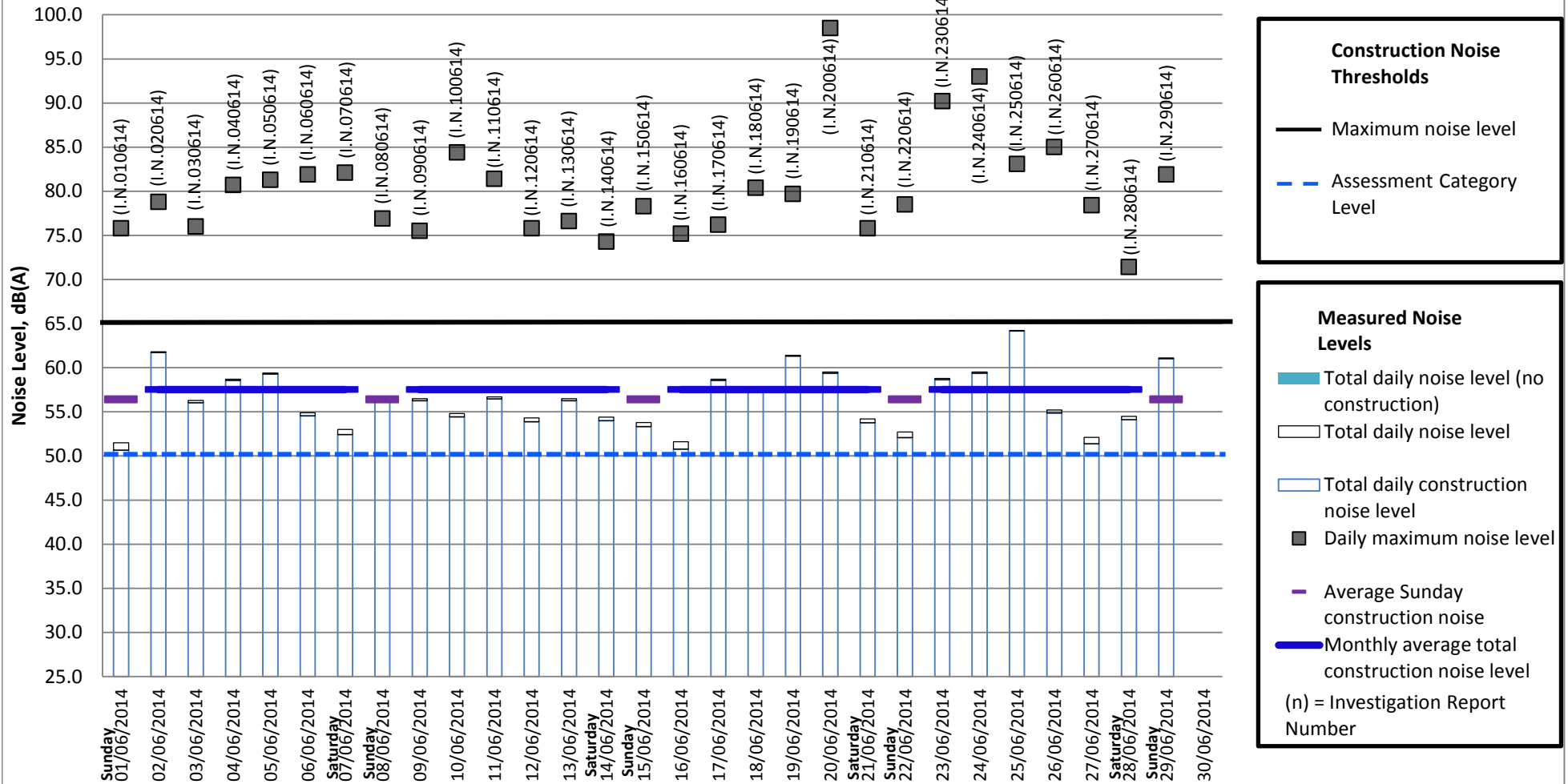
Measured Evening Noise Levels at Inchgarvie Measurement period: June 2014



Note: Data is missing from 02/06/14 & 30/06/14 due to device error.

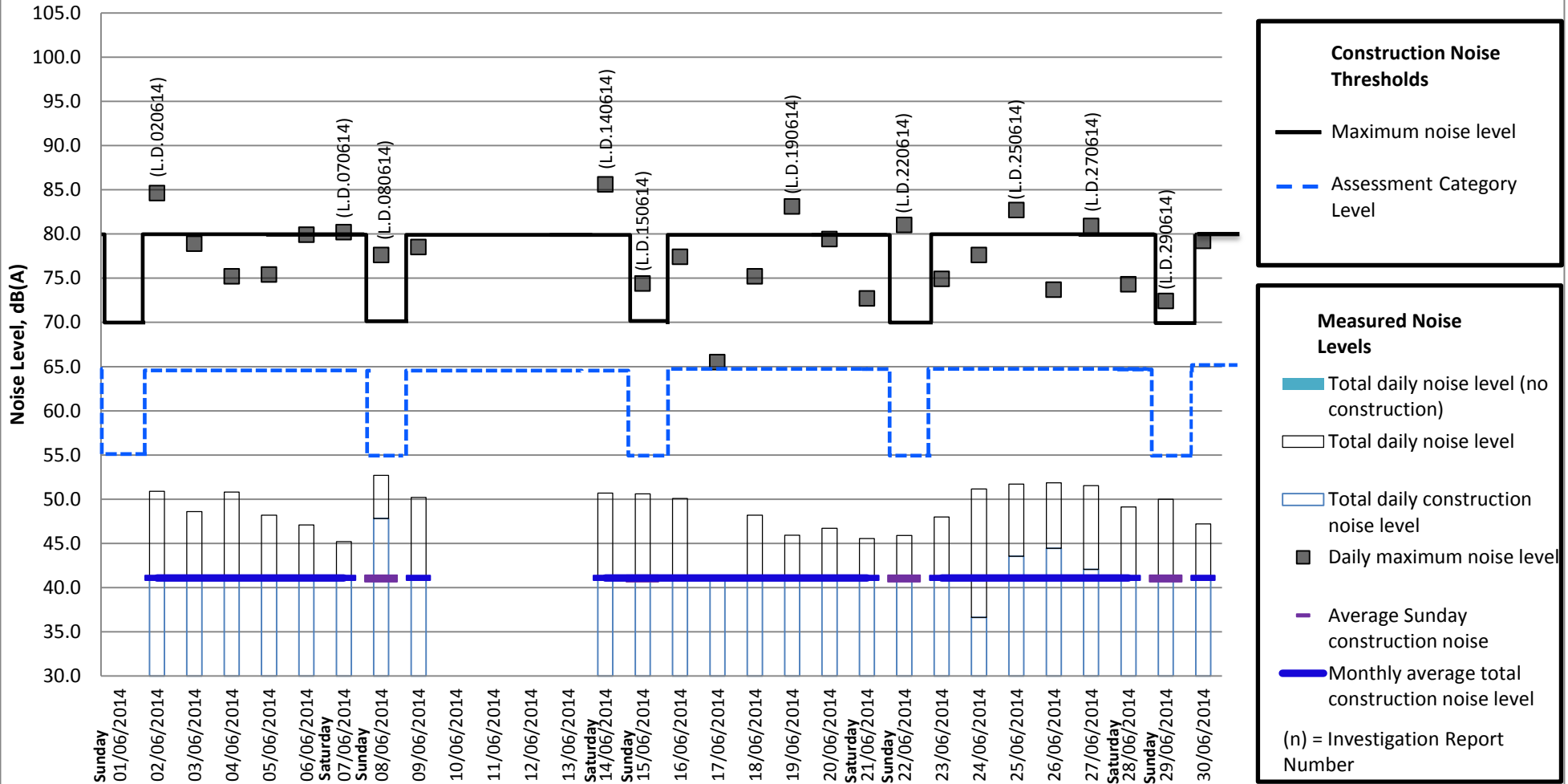
Measured Night-time Noise Levels at Inchgarvie

Measurement period: June 2014



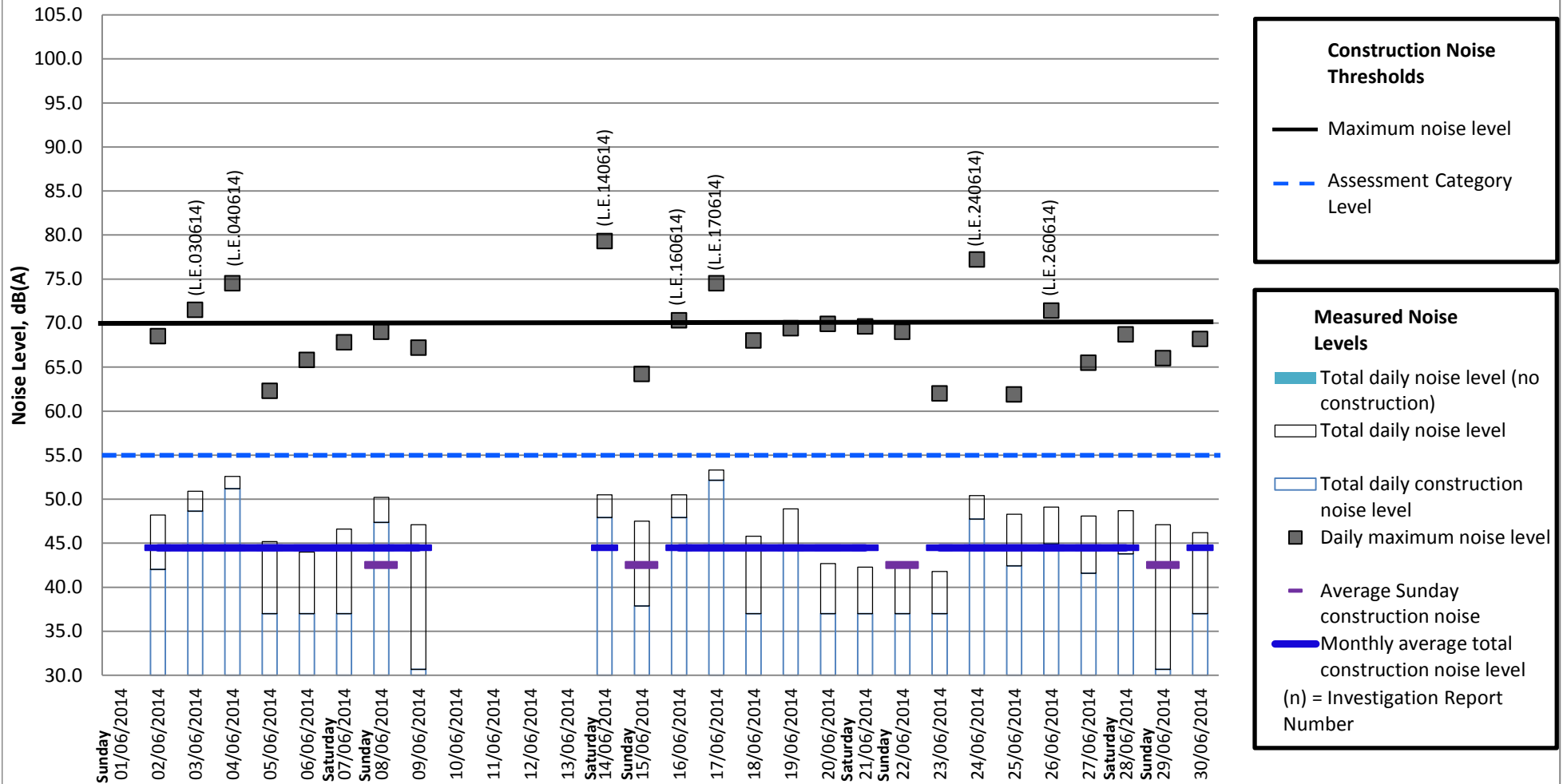
Note: Data is missing from 30/06/14 due to device error.

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



Note: Data is missing from 01/06/14 & 10/06/14 - 13/06/14 due to a device error

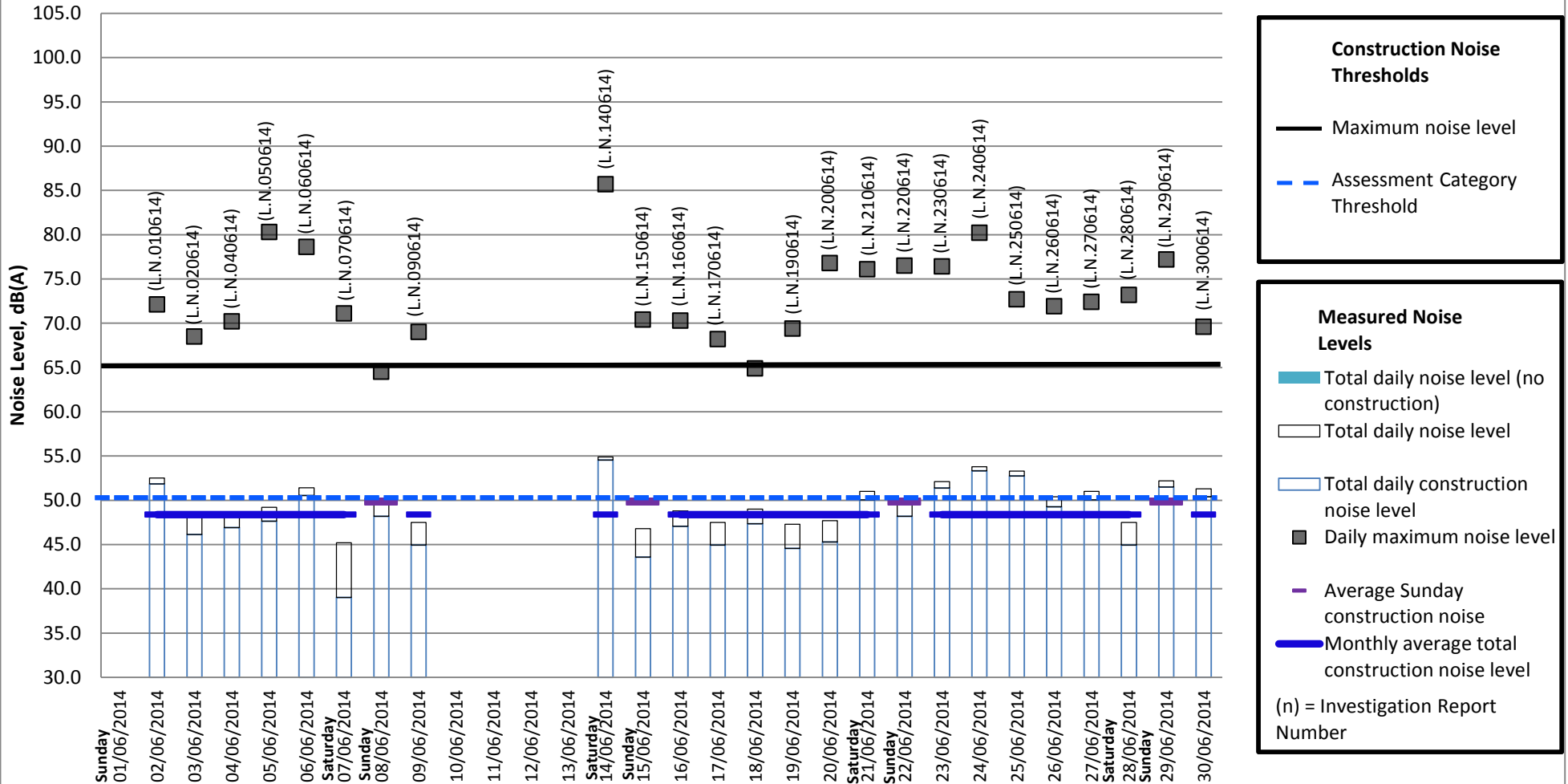
Measured Evening Noise Levels at Linn Mill Measurement period: June 2014



Note: Data is missing from 01/06/14 & 10/06/14 - 13/06/14 due to a device error

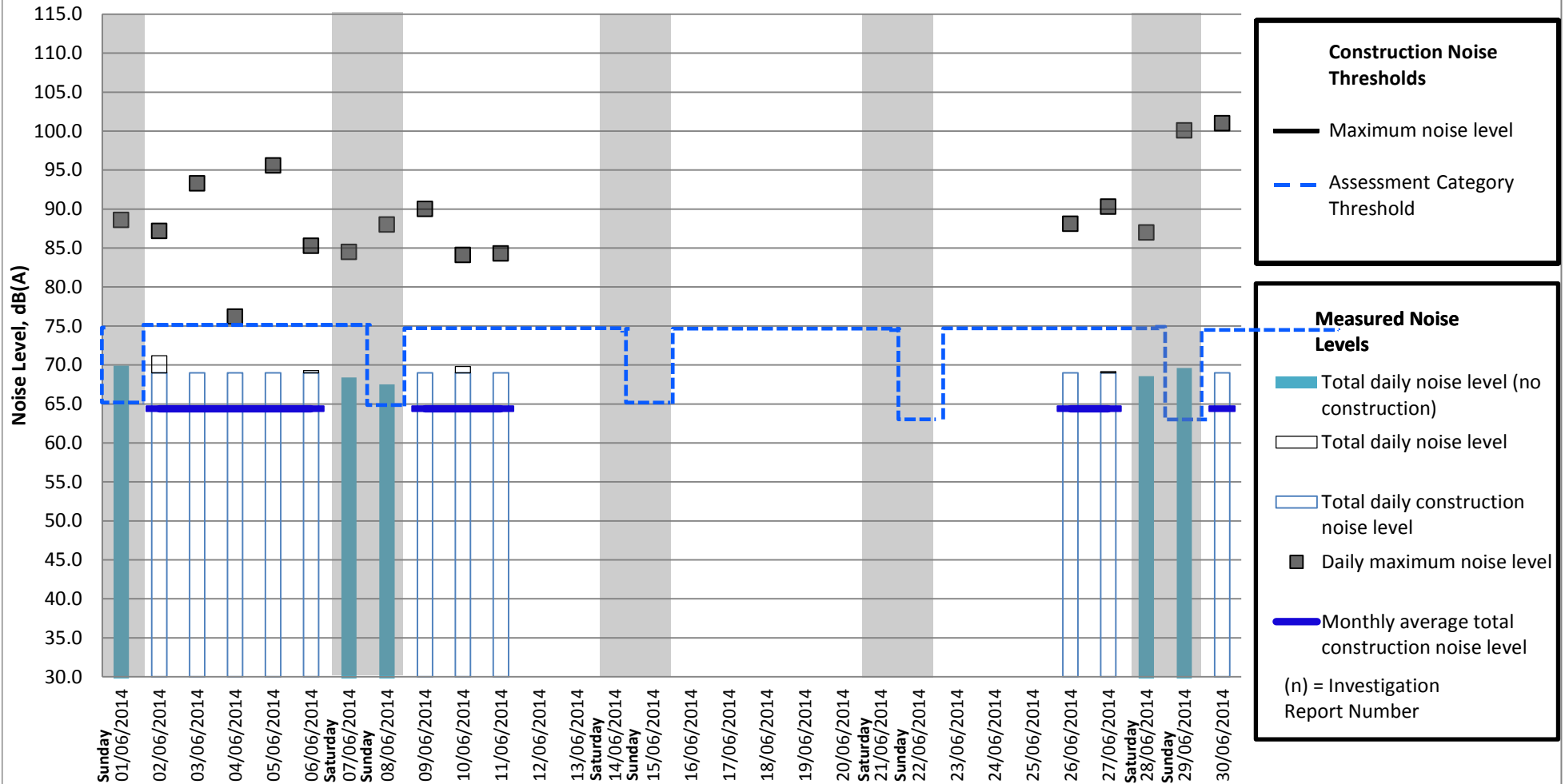
Measured Night-time Noise Levels at Linn Mill

Measurement period: June 2014



Note: Data is missing from 01/06/14 & 10/06/14 - 13/06/14 due to a device error

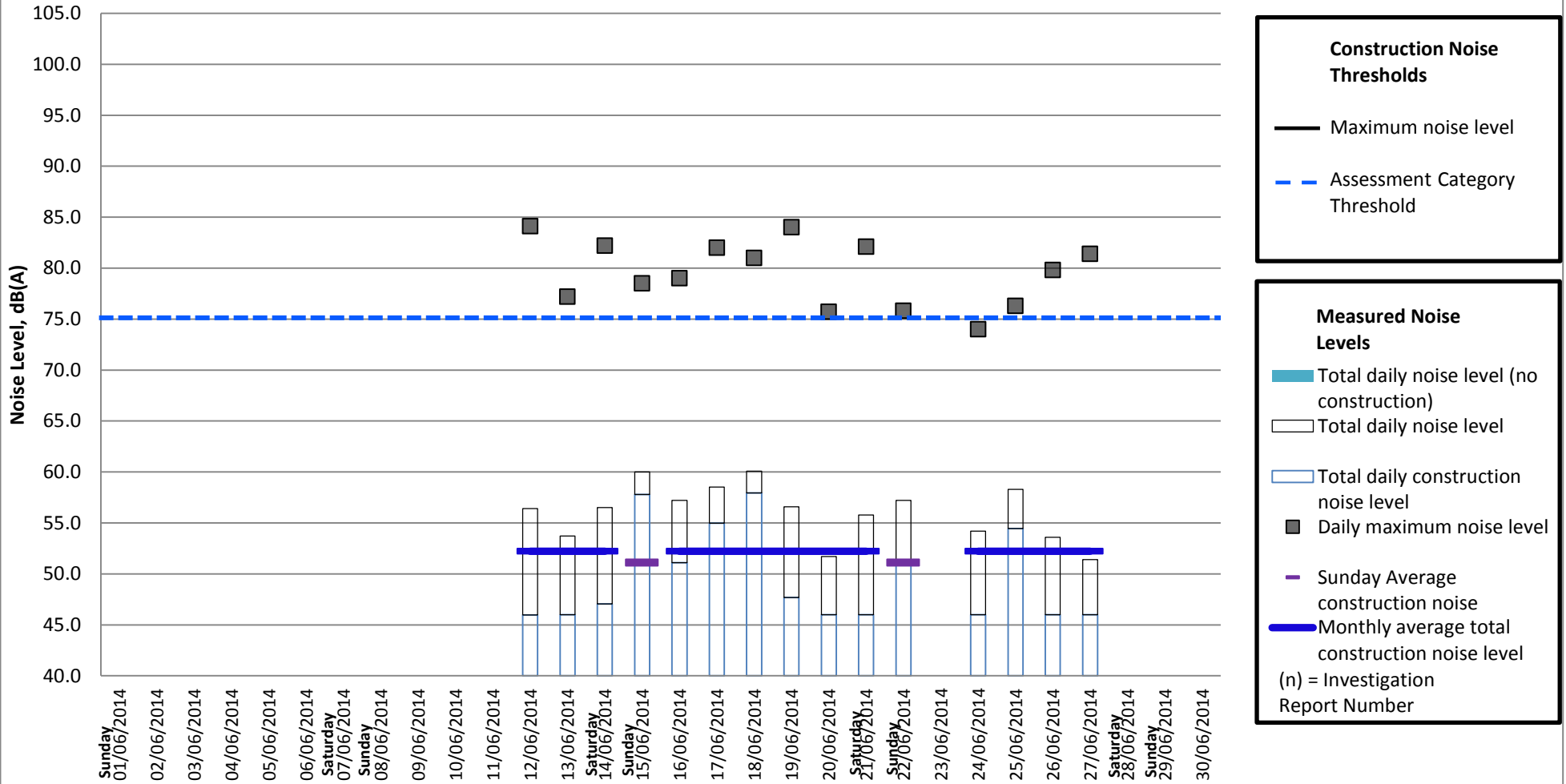
Measured Daytime Noise Levels at Newton Measurement period: June 2014



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 from 12/06/14 - 25/06/14 due to device error and inaccessibility to this device.

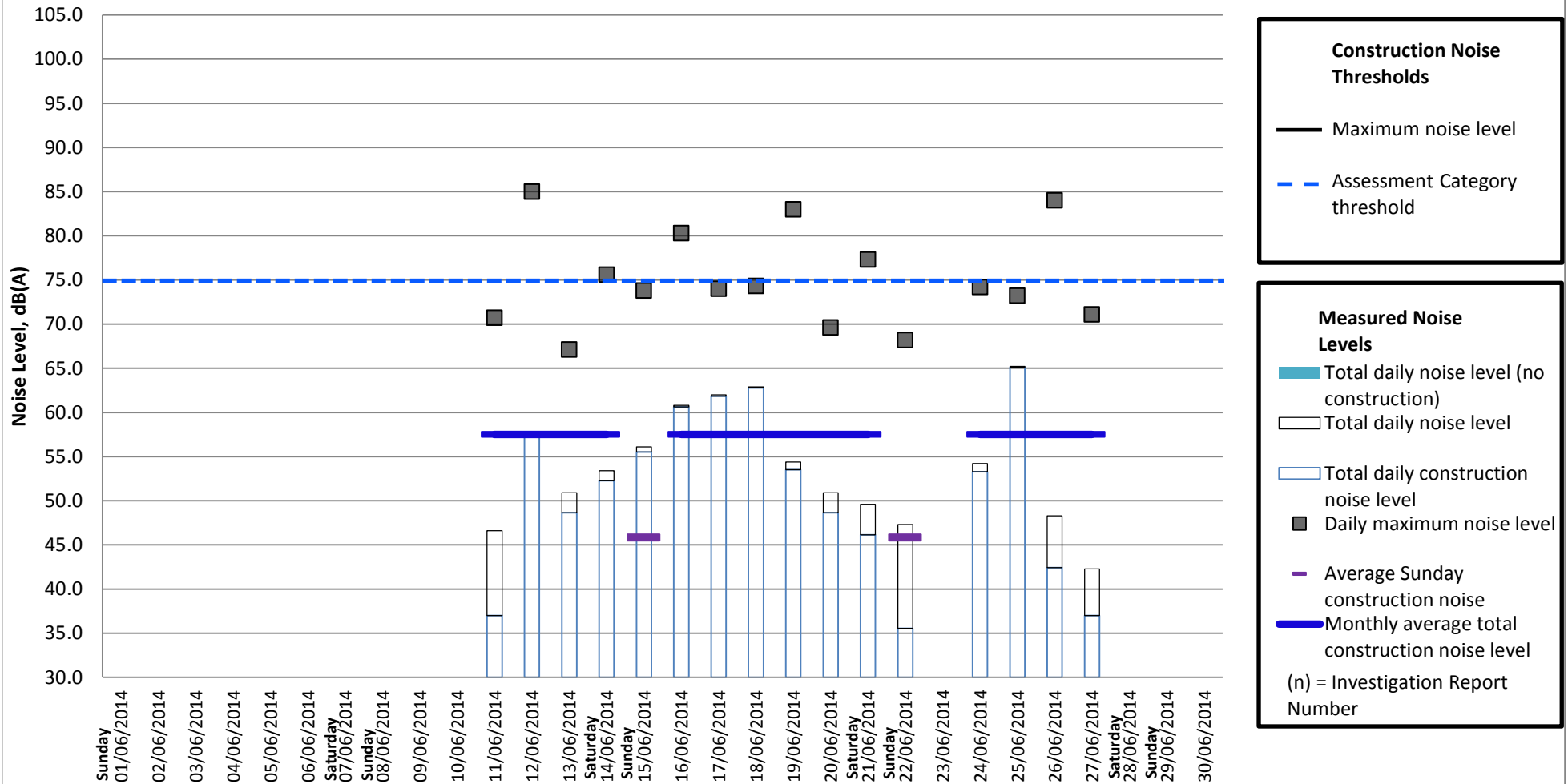
Measured Daytime Noise Levels at Port Edgar

Measurement period: June 2014



Note: This unit was re-installed on the 12/06/14 due to previously being damaged. Data is missing from 23/06/14, 28/06/14 - 30/06/14 due to power issues.

Measured Evening Noise Levels at Port Edgar Measurement period: June 2014



Construction Noise Thresholds

- Maximum noise level
- - - Assessment Category threshold

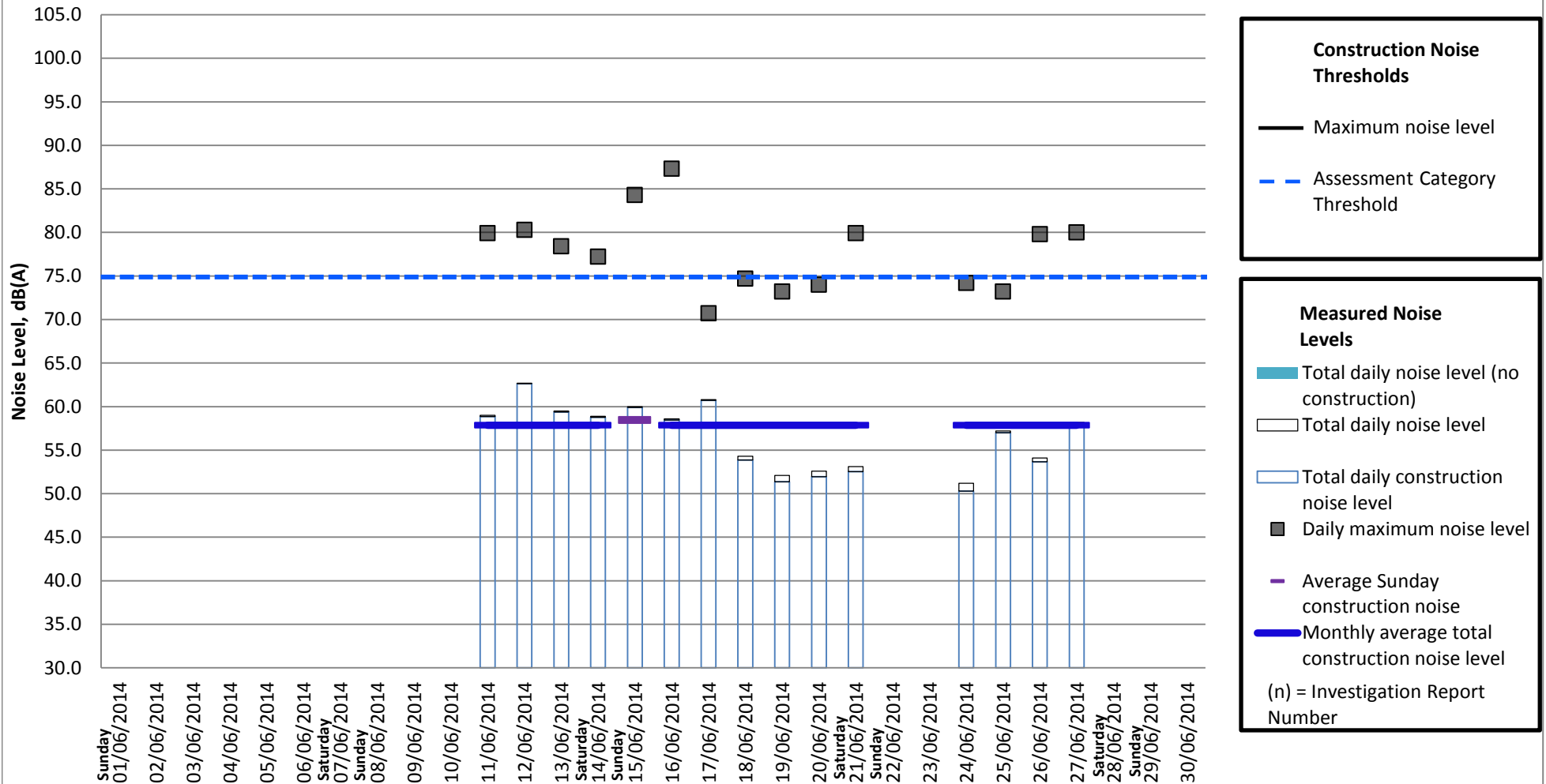
Measured Noise Levels

- 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

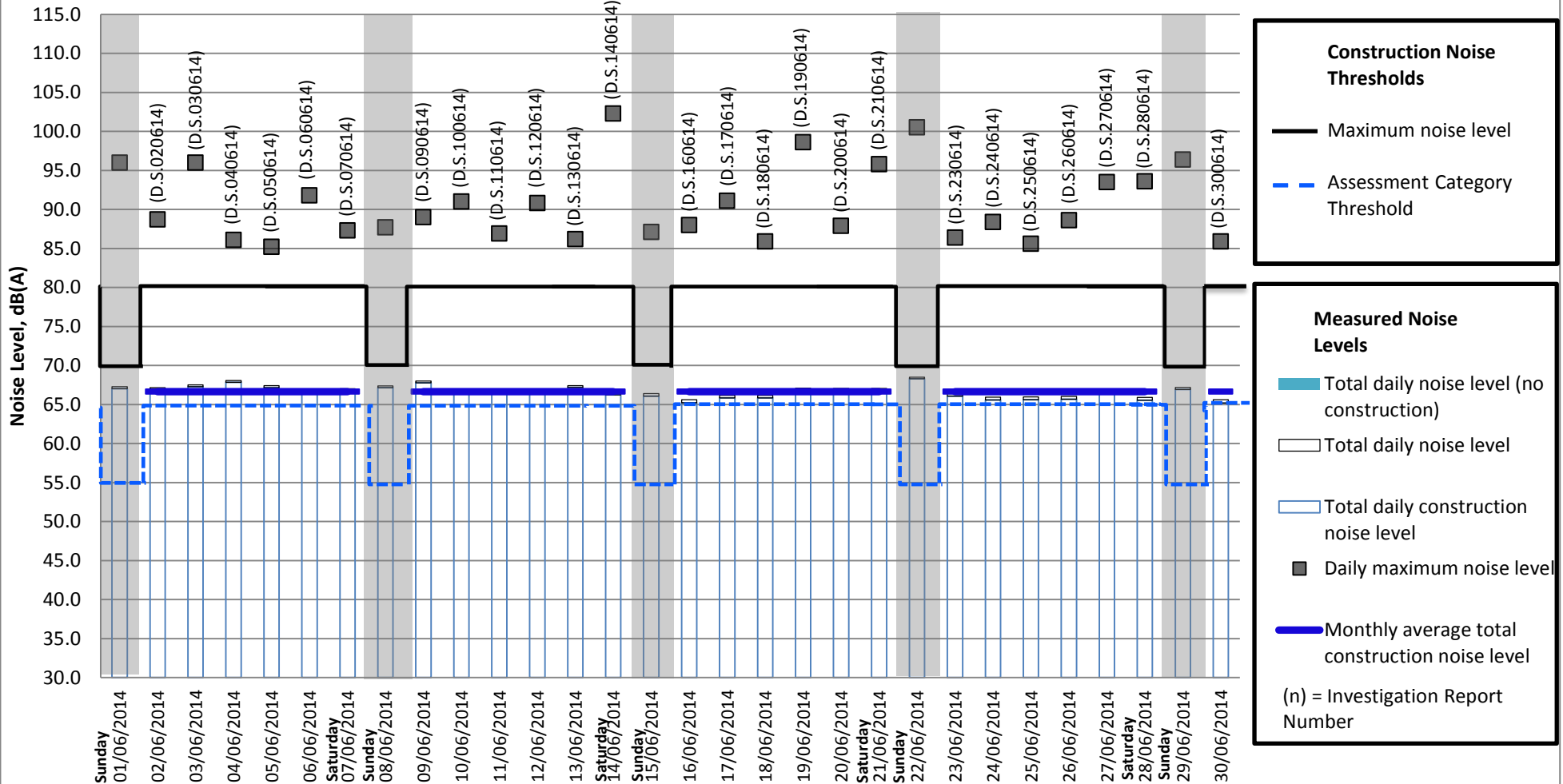
Note: This unit was re-installed on the 12/06/14 due to previously being damaged. Data is missing from 23/06/14, 28/06/14 - 30/06/14 due to power issues.

Measured Night-time Noise Levels at Port Edgar Measurement period: June 2014



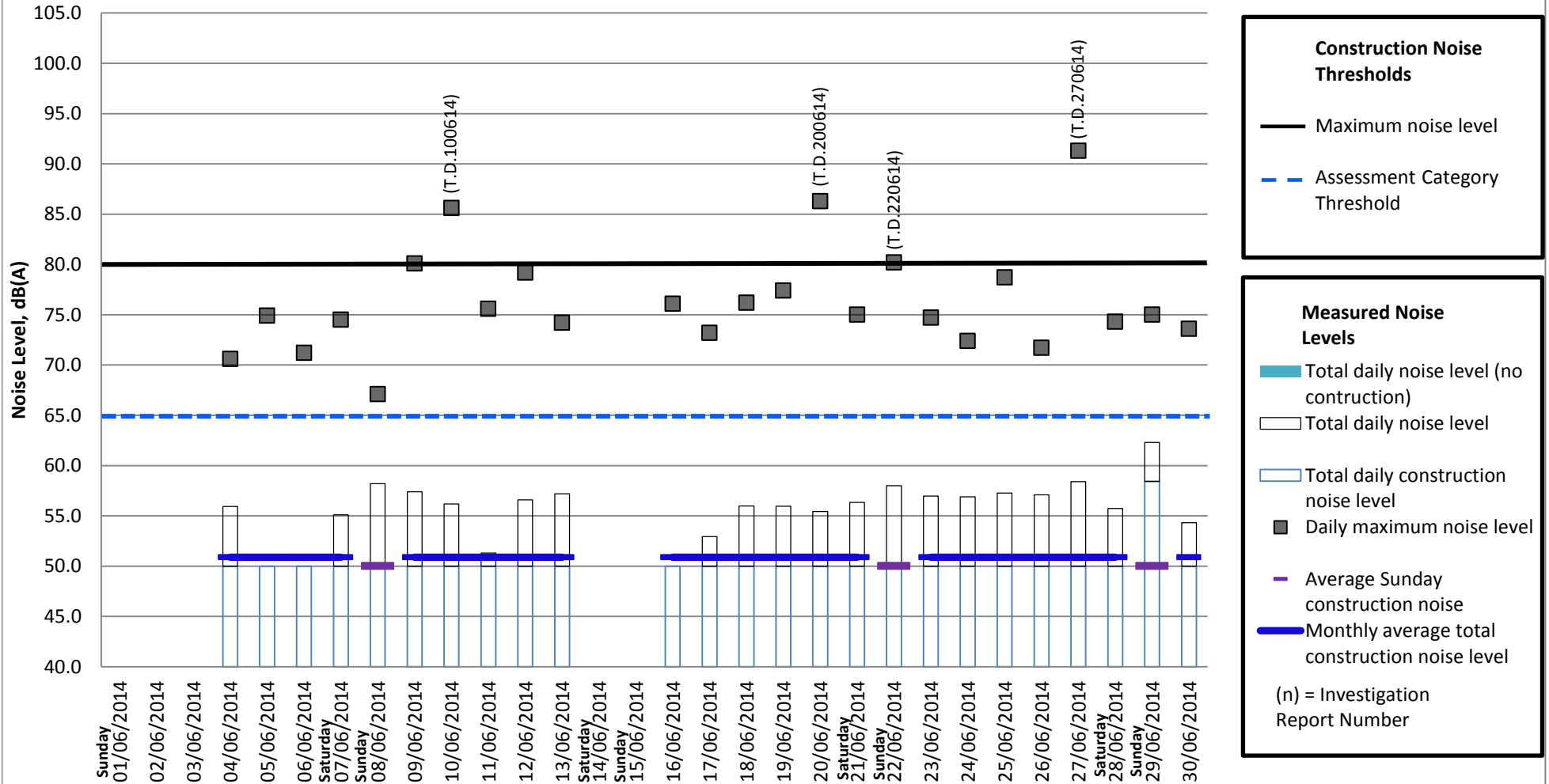
Note: This unit was re-installed on the 12/06/14 due to previously being damaged. Data is missing from 22/06/14, 23/06/14, 28/06/14 - 30/06/14 due to power issues.

Measured Daytime Noise Levels at Scotstoun Measurement period: June 2014



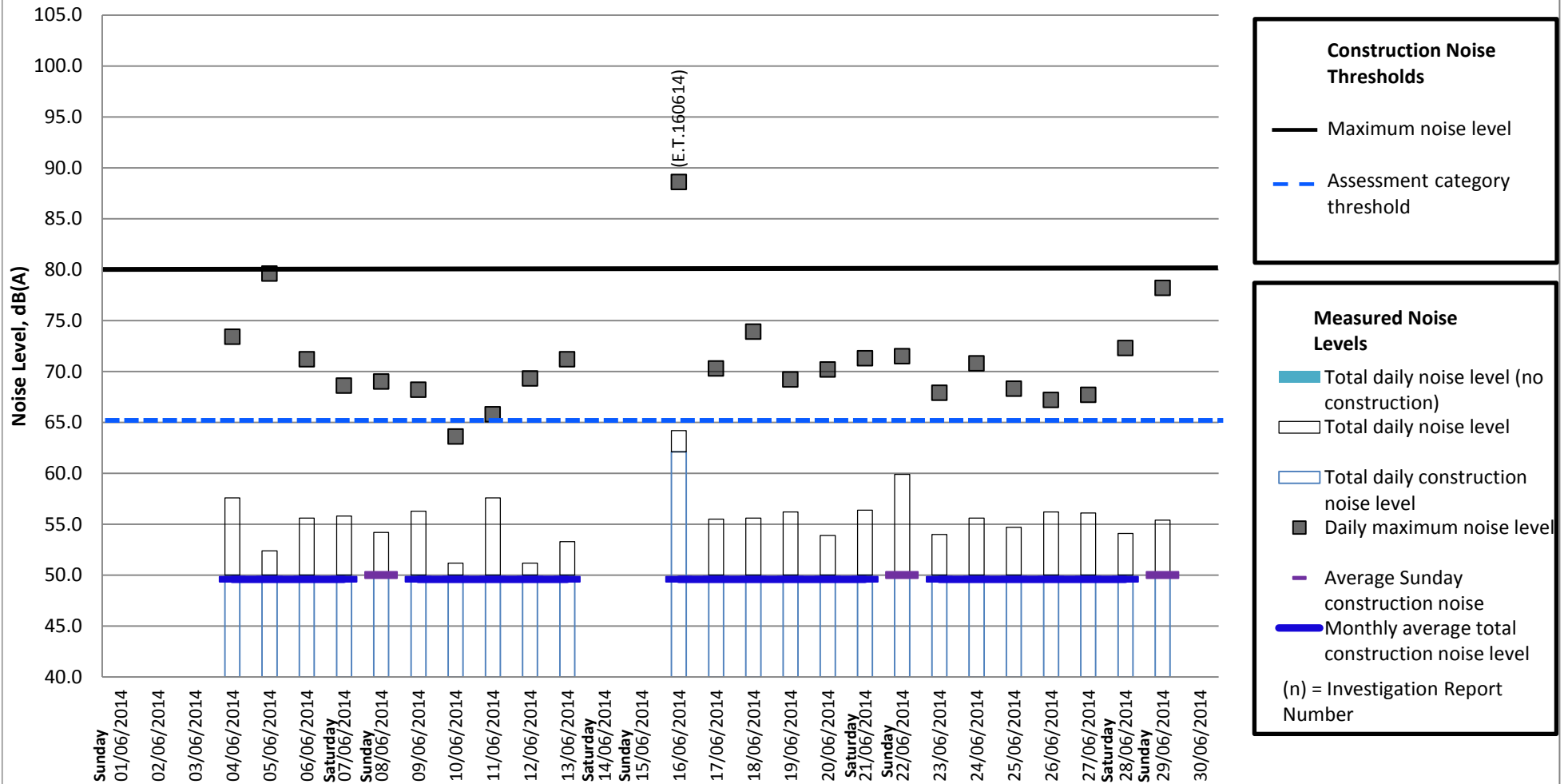
Note: The grey areas of the chart represent days on which no construction works have been conducted. The monthly average construction noise for Sunday has not been included as no Sunday works have been conducted at this location .

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



Note: Data is missing from 01/06/14-03/06/14, 14/06/14 & 15/06/14 due to device error.

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



Construction Noise Thresholds

- Maximum noise level
- - - Assessment category threshold

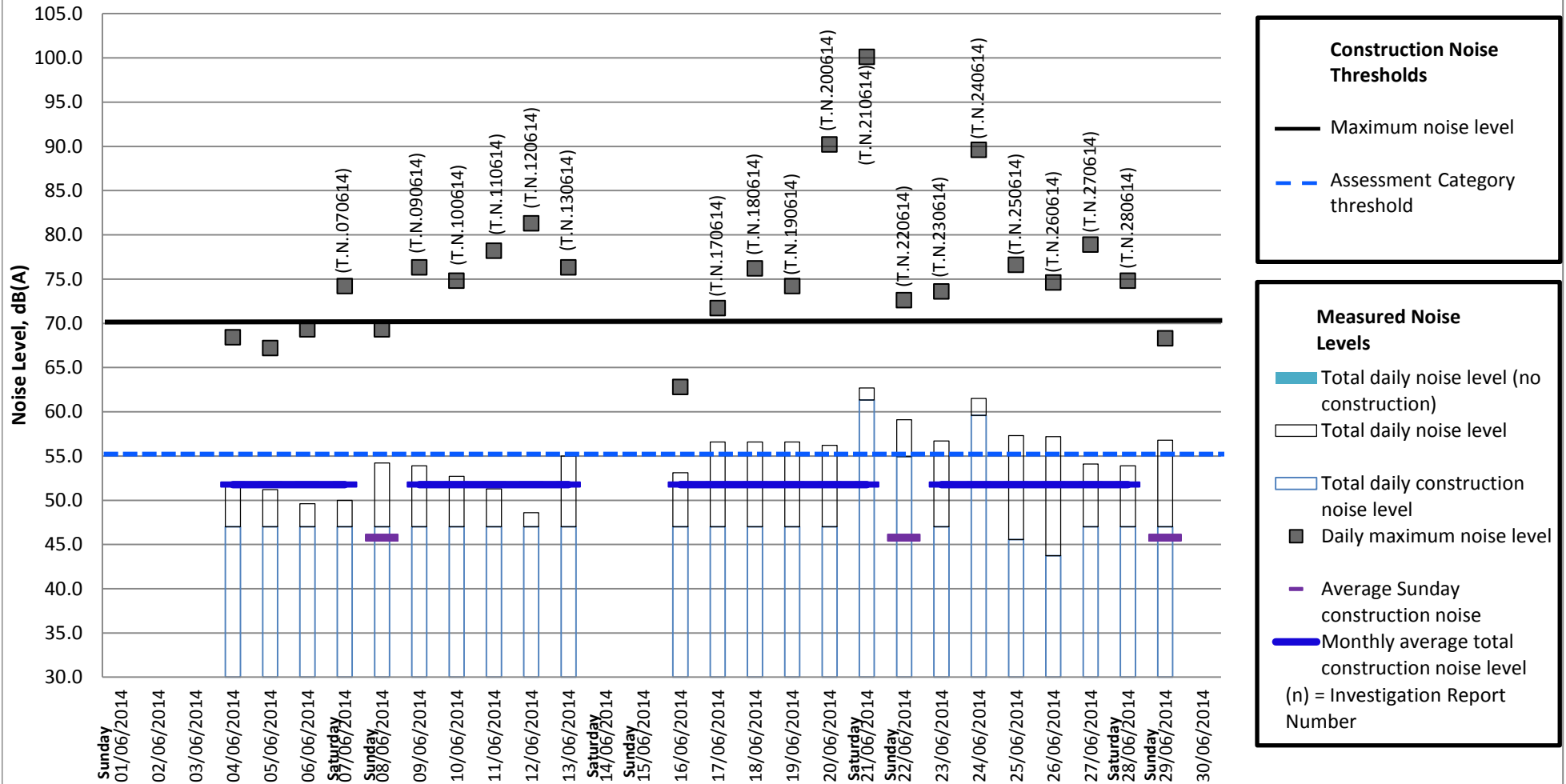
Measured Noise Levels

- █ 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: Data is missing from 01/06/14-03/06/14, 14/06/14 , 15/06/14 & 30/06/14 due to device error.

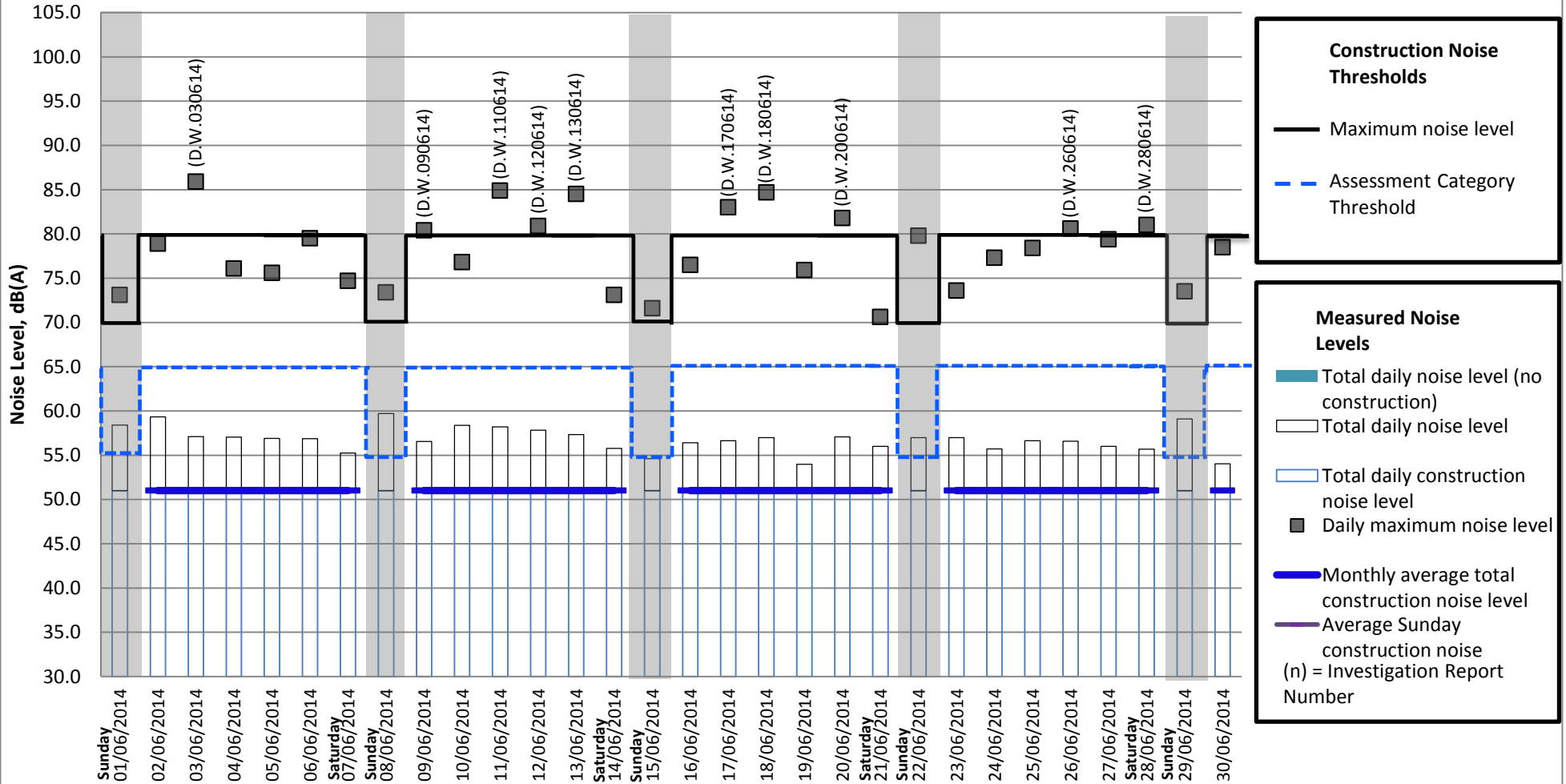
Measured Night-time Noise Levels at Tigh-Na-Grian Measurement period: June 2014



Note: Data is missing from 01/06/14-03/06/14, 14/06/14, 15/06/14 & 30/06/14 due to device error.

Measured Daytime Noise Levels at Whinny Hill

Measurement period: June 2014



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