



Contractor



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Project **FORTH REPLACEMENT CROSSING**

Document title

**CONSTRUCTION NOISE MONITORING REPORT: DECEMBER 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 December 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 December 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 December 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 December 2016  |
|------|---------------------|---------------------------------------|--|
| M1   | Whinny Hill         | Network                               | <ul style="list-style-type: none"> <li>• Earth Works/Fill Placement</li> <li>• Park and Ride works</li> <li>• FT03 &amp; FT04 Bridge Works</li> <li>• Main carriageway roadworks</li> <li>• Rock breaking / crushing</li> </ul>  |
| M3   | Tigh-Na-Grian       | Crossing                              | <ul style="list-style-type: none"> <li>• Central Tower stay cable installation works</li> <li>• North Tower stay cable installation works</li> <li>• AVN Rebar and concrete works</li> <li>• Bridge Deck works</li> </ul>  |
| M7   | Butlaw Fisheries    | Crossing                              | <ul style="list-style-type: none"> <li>• Central Tower stay cable installation works</li> <li>• South Tower deck section lifts and stay cable installation works</li> <li>• AVS rebar &amp; concrete deck works</li> <li>• Bridge Deck works</li> </ul>  |
| M10  | Inchgarvie Lodge    | Crossing                              | <ul style="list-style-type: none"> <li>• AVS rebar &amp; concrete deck works</li> <li>• Central Tower stay cable installation works.</li> <li>• South Tower deck section lifts and stay cable installation works.</li> <li>• Main carriageway roadworks</li> <li>• South Abutment works</li> <li>• Excavating SUDS detention basin</li> <li>• Bridge Deck works</li> </ul> |
| M11  | Linn Mill           | Network (close proximity to Crossing) | <ul style="list-style-type: none"> <li>• AVS rebar &amp; concrete deck works</li> <li>• Excavating SUDS detention basin</li> </ul>   |
| M13  | Clufflat Brae       | Crossing / Network                    | <ul style="list-style-type: none"> <li>• AVS rebar and concrete deck works</li> <li>• South Abutment works</li> <li>• Main carriageway roadworks</li> <li>• Excavating SUDS detention basin</li> <li>• Cycle footpath works</li> </ul>   |
| M14  | Springfield         | Network                               | <ul style="list-style-type: none"> <li>• AVS rebar and concrete deck works</li> <li>• South Abutment works</li> <li>• Main carriageway roadworks</li> <li>• Cycle footpath works</li> </ul>  |
| M15  | Echline             | Network                               | <ul style="list-style-type: none"> <li>• AVS rebar and concrete deck works</li> <li>• South Abutment works</li> </ul>  |



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|     |                  |         |  |
|-----|------------------|---------|--|
|     |                  |         | <ul style="list-style-type: none"> <li>• Main carriageway roadworks</li> </ul>                           |
| M16 | Scotstoun        | Network | <ul style="list-style-type: none"> <li>• B800 roadworks</li> <li>• Main carriageway roadworks</li> </ul> |
| M17 | Dundas Home Farm | Network | <ul style="list-style-type: none"> <li>• Main carriageway roadworks</li> <li>• B800 roadworks</li> </ul> |
| M18 | Newton           | Network | <ul style="list-style-type: none"> <li>• Outwith works area</li> </ul>                                   |

## 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](http://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.
  - Please note that site was closed for the Christmas break between 23<sup>rd</sup> December 2016 and January 3<sup>rd</sup> 2017.

## 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 December 2016. For Evening time periods, there were exceedances of monthly average at Tigh-Na-Grian. For night time periods, there were exceedances of monthly average at Butlaw and Tigh-Na-Grian. There were also exceedances of Sunday average for 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 and birdsong at Tigh-Na-Grian. With regard to the averages reported for 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 Linn mill monitor during the daytime period on the 1<sup>st</sup>, 2<sup>nd</sup>, 10<sup>th</sup> and 22<sup>nd</sup> December were caused by the excavation work nearby at the western 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 December the maximum noise threshold was exceeded on 34 occasions (10 day time, 6 evening and 18 night time). Exceedances were attributed to non-construction factors, notably birdsong and waves.   |
| Clufflat Brae       | During December the maximum noise threshold was exceeded on 26 occasions (7 daytime, 7 evening and 12 night time). Exceedances were mainly found to be due to birdsong and residents.   |
| Inchgarvie Lodge    | During December the maximum noise threshold was exceeded on 16 occasions (8 day time, 4 evening and 4 night time). Residential work to the property was found to be the main contributing factors to the exceedances in this location.                                  |
| Linn Mill           | During December the maximum noise threshold was exceeded on 28 occasions (13 daytime, 5 evening and 10 night time). The majority of exceedances at this location were due to birdsong. There were ten instances of construction noise exceeding the threshold (see 2.9) |
| Tigh-Na-Grian       | During December the maximum noise threshold was exceeded on 34 occasions (7 daytime, 9 evening and 18 night time). Exceedances were mainly due to birdsong.   |
| Dundas Home Farm    | During December the maximum noise threshold was exceeded on 11 occasions. The main exceedances were due to residents and birdsong.  |
| Echline             | During December the maximum noise threshold was exceeded on 22 occasions. Exceedances were attributed to vehicles passing by on the adjacent roads.   |
| Springfield         | During December the maximum noise threshold was exceeded on 9 occasions. These exceedances were due to local residents.   |
| Scotstoun           | During December the maximum noise threshold was exceeded on 23 occasions. These exceedances were attributed to general traffic noise on the adjacent road.  |
| Whinny Hill         | During December the maximum noise threshold was exceeded on 9 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   |

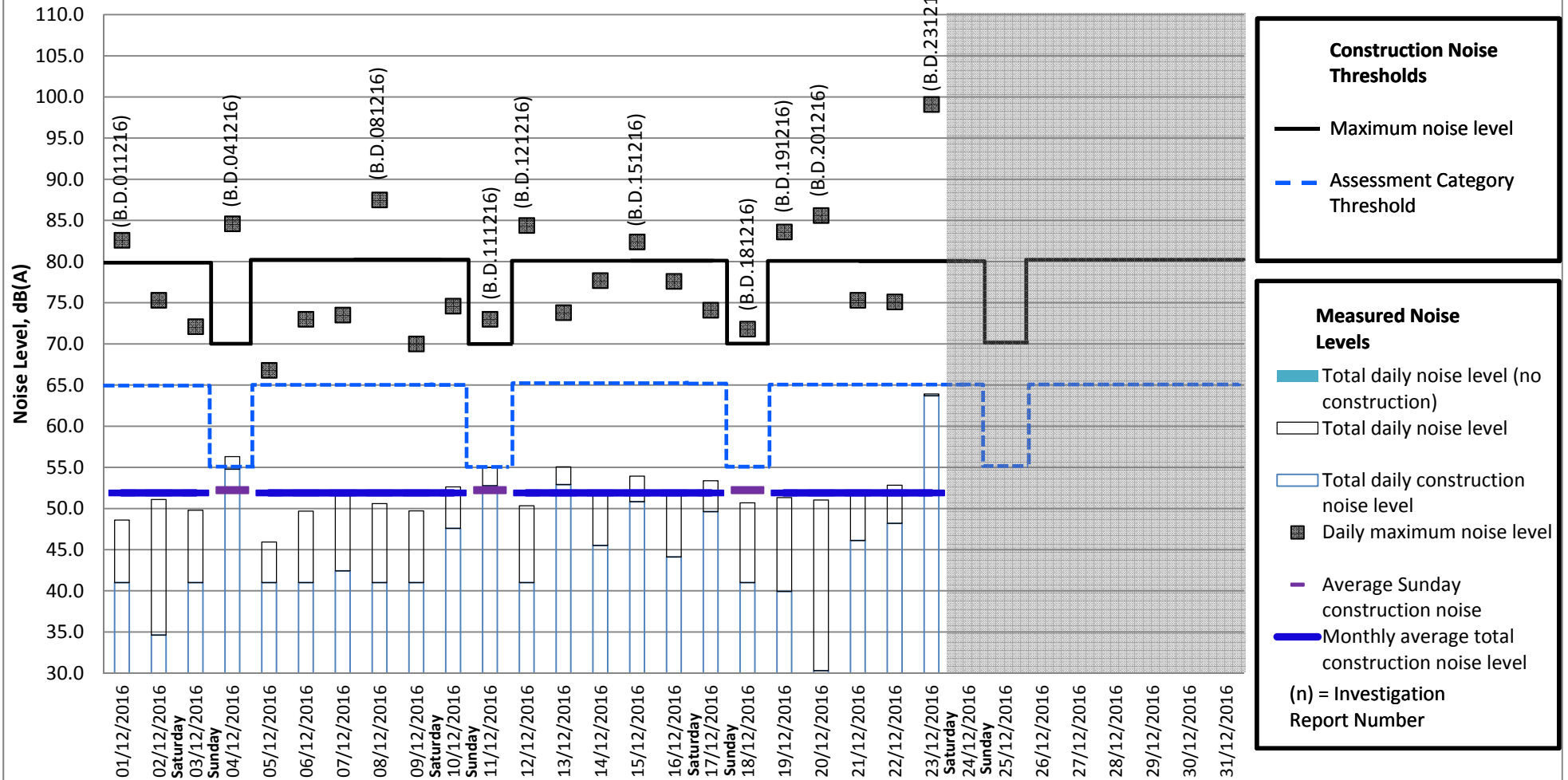


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## APPENDIX A

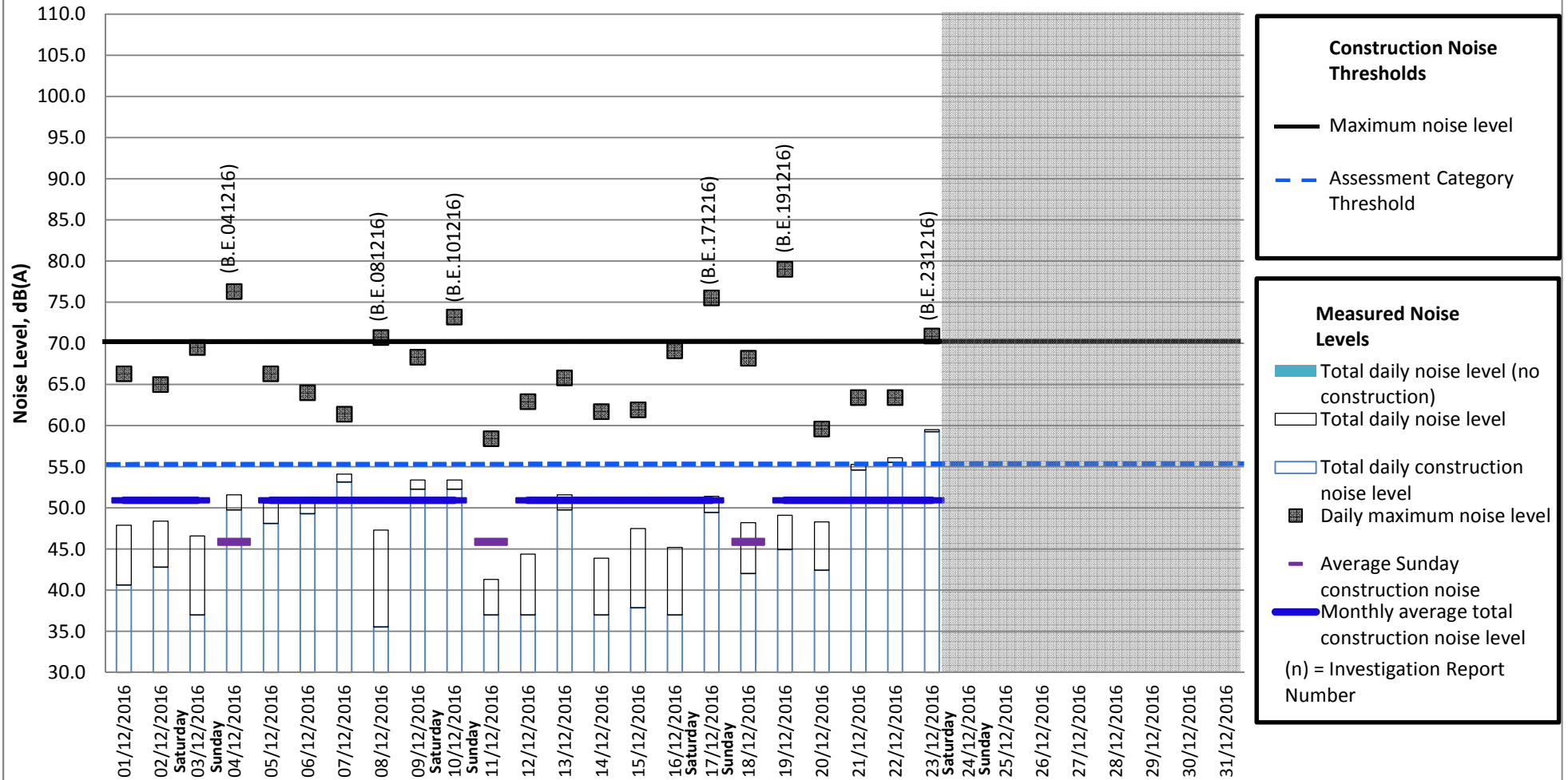
# Measured Daytime Noise Levels at Butlaw Fisheries

## Measurement period: December 2016



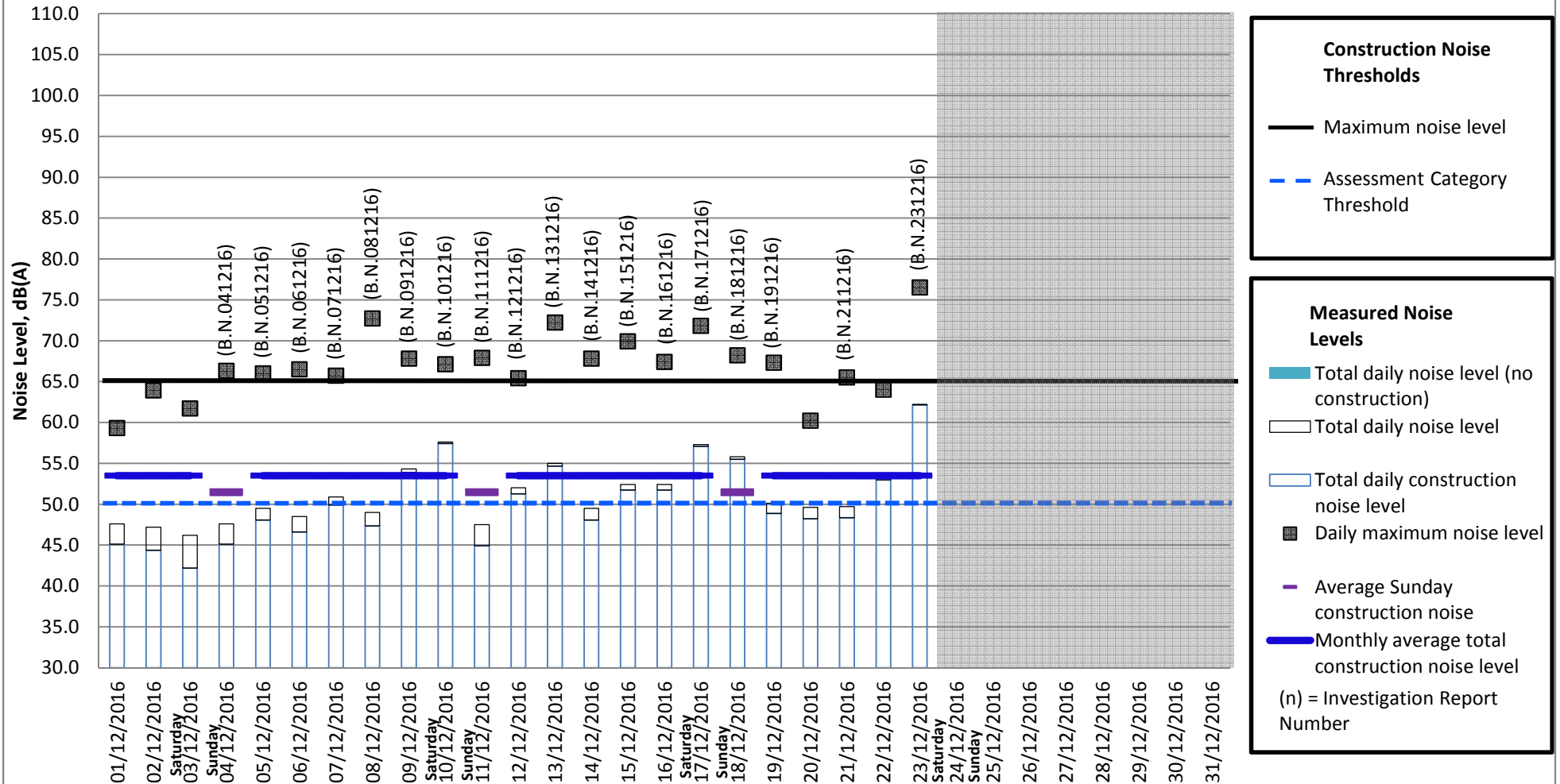
**Note:**

## Measured Evening Noise Levels at Butlaw Fisheries Measurement period: December 2016



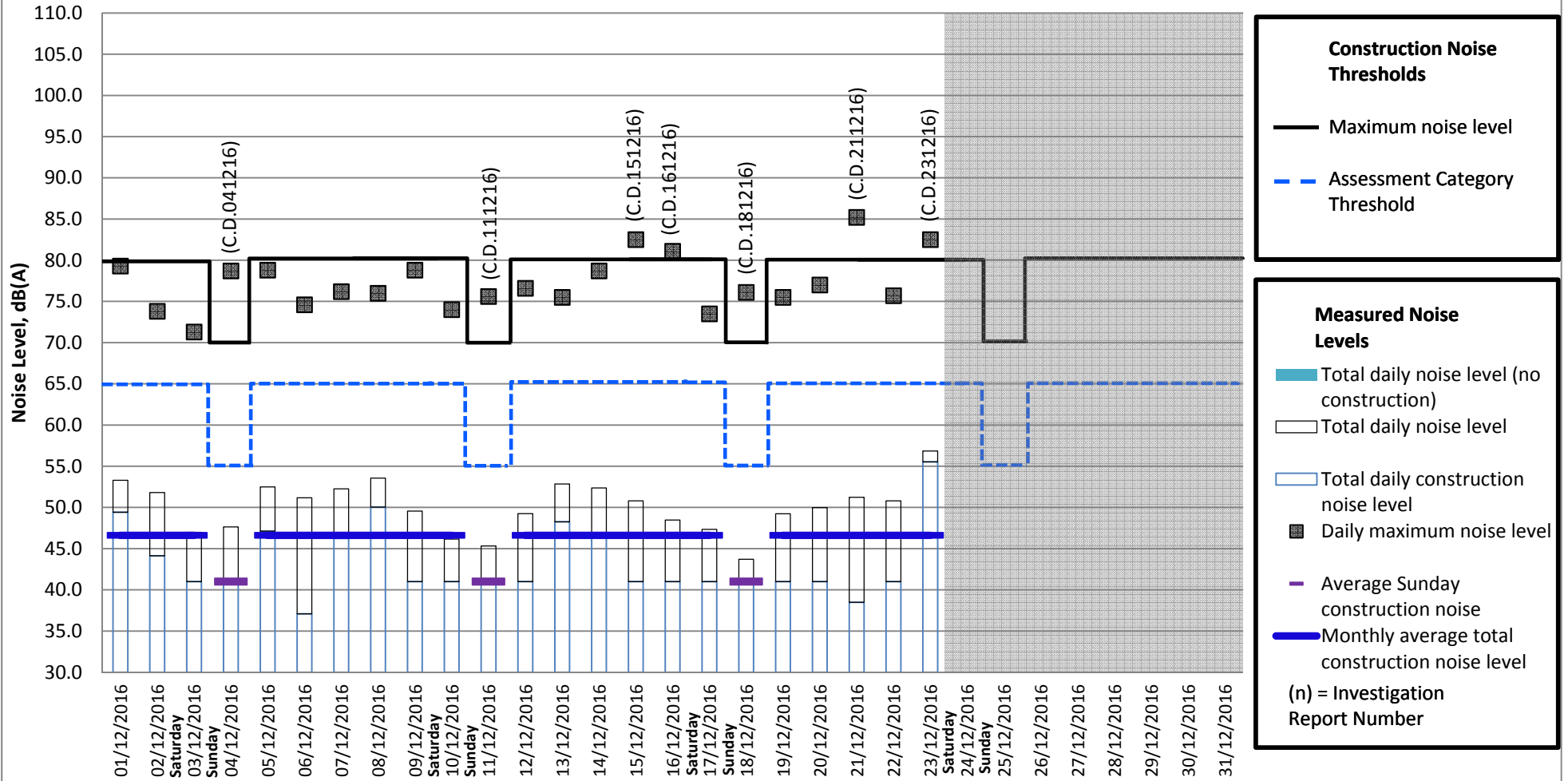
**Note:**

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



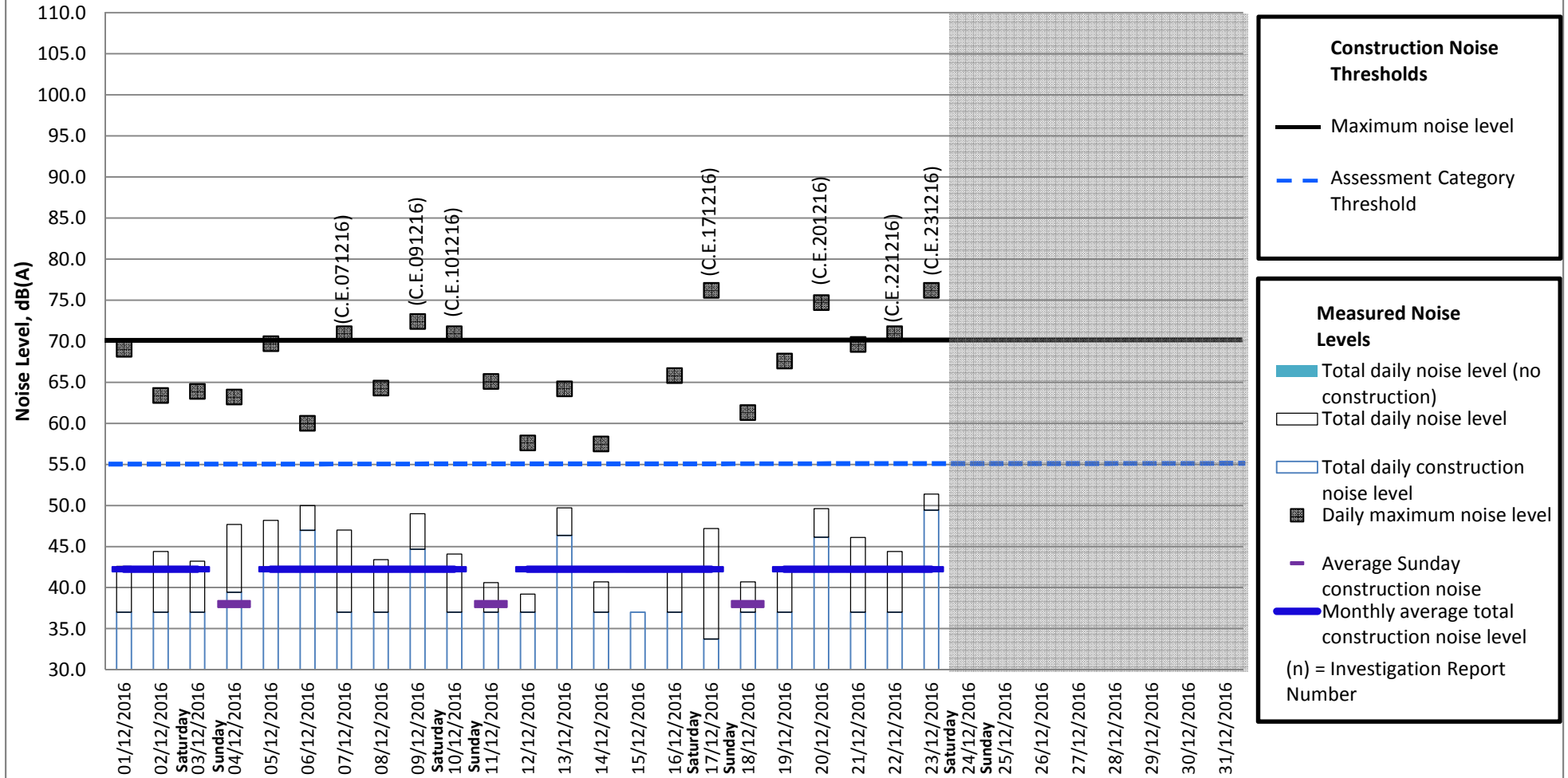
**Note:** After investigation, it was concluded that the exceedance of the LAeq 'Total Daily Construction' throughout the month were caused by birds and waves

## Measured Daytime Noise Levels at Clufflat Measurement period: December 2016



**Note:**

## Measured Evening Noise Levels at Clufflat Measurement period: December 2016



**Construction Noise Thresholds**

- Maximum noise level
- Assessment Category Threshold

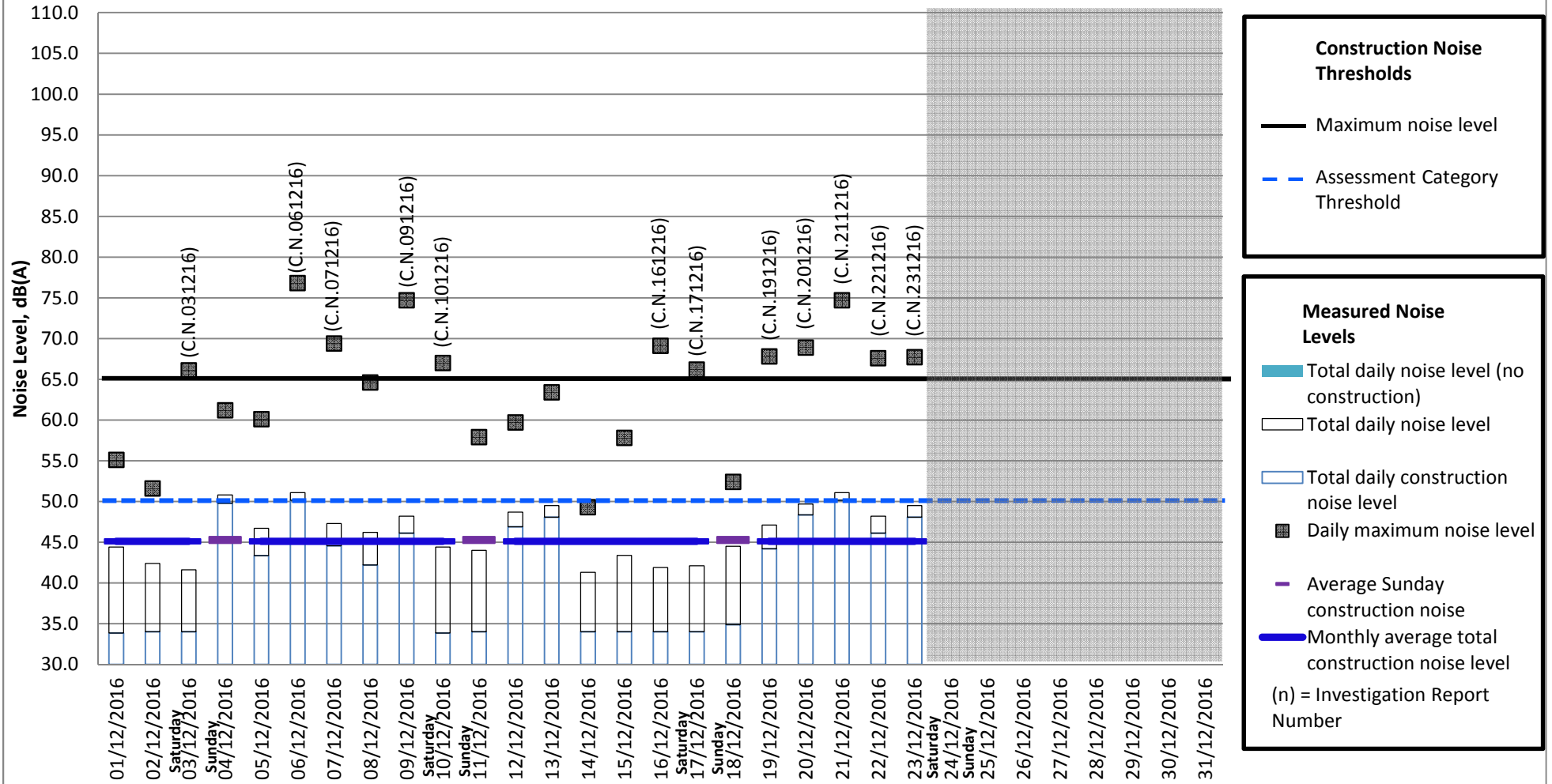
**Measured Noise Levels**

- 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

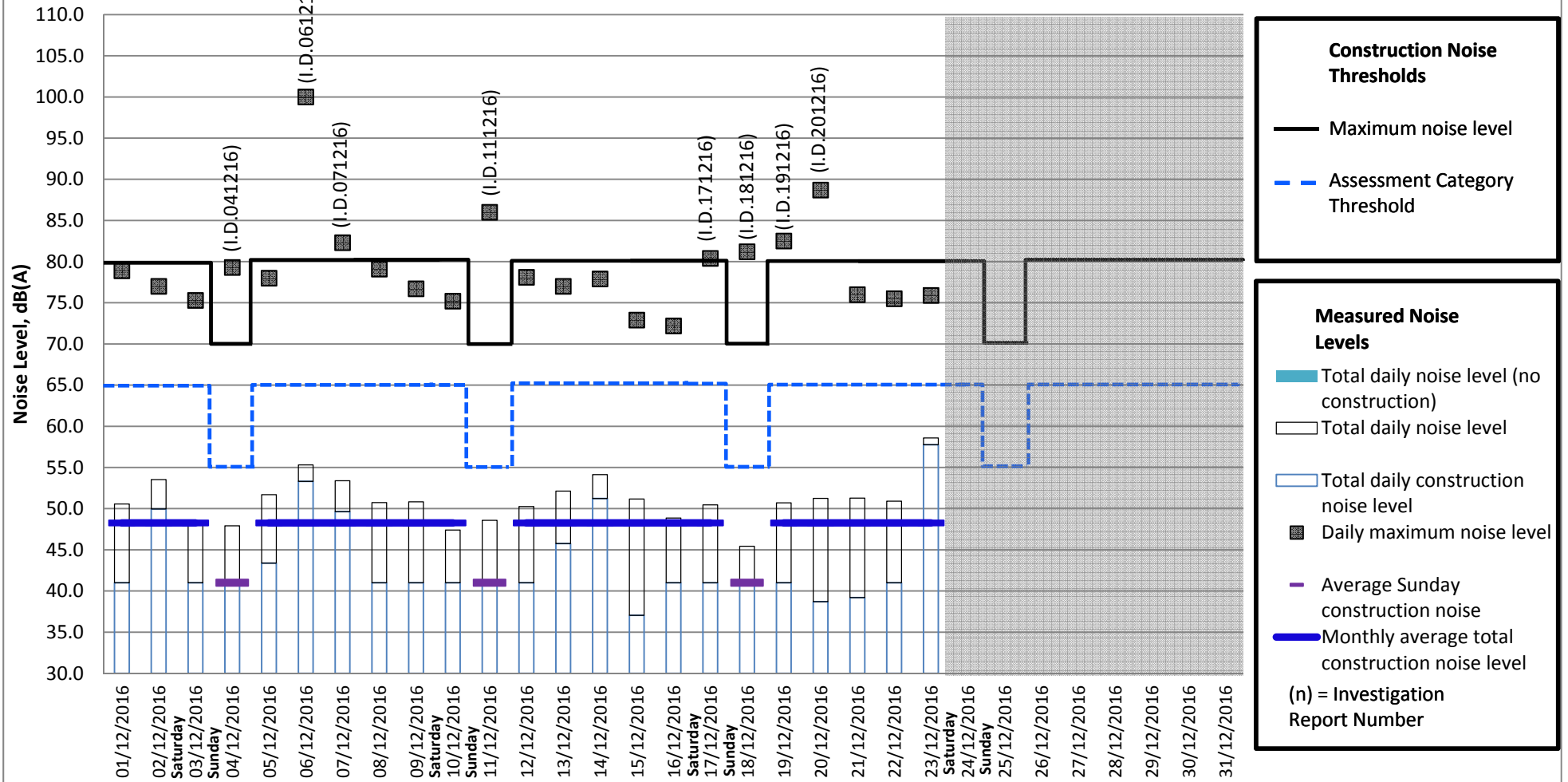
**Note:**

## Measured Night time Noise Levels at Clufflat Measurement period: December 2016



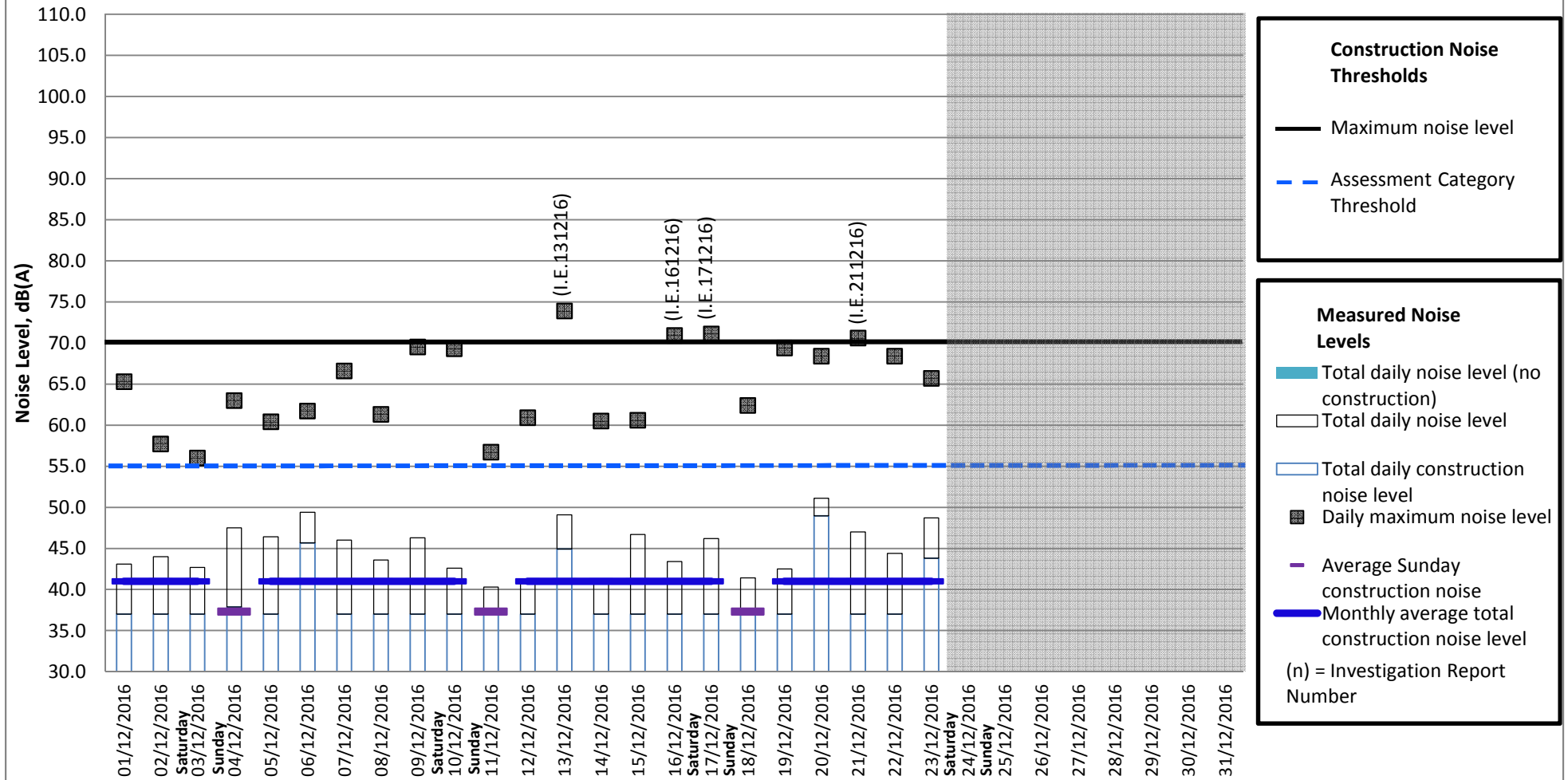


## Measured Daytime Noise Levels at Inchgarvie Measurement period: December 2016



**Note:**

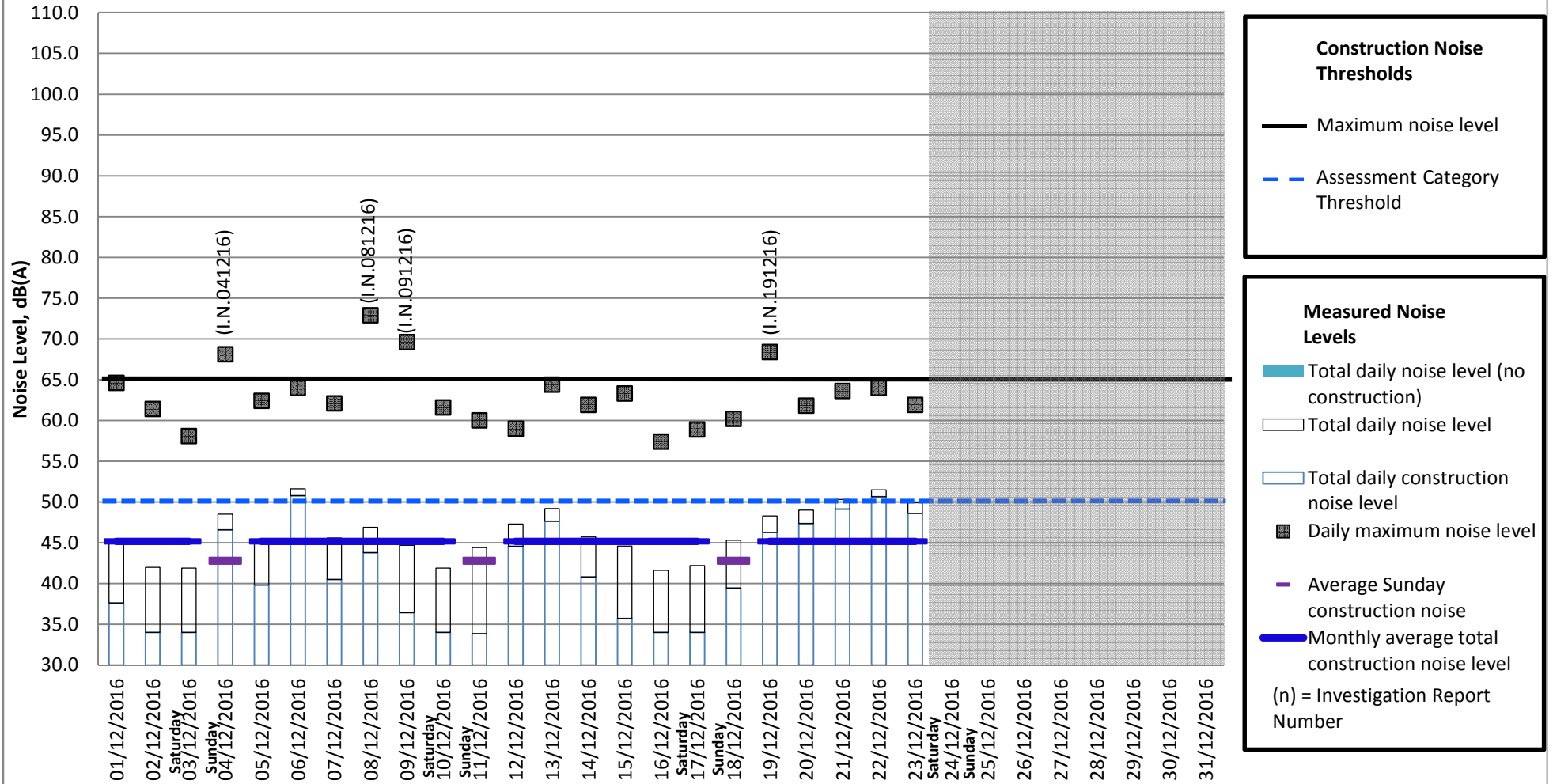
## Measured Evening Noise Levels at Inchgarvie Measurement period: December 2016



**Note:**

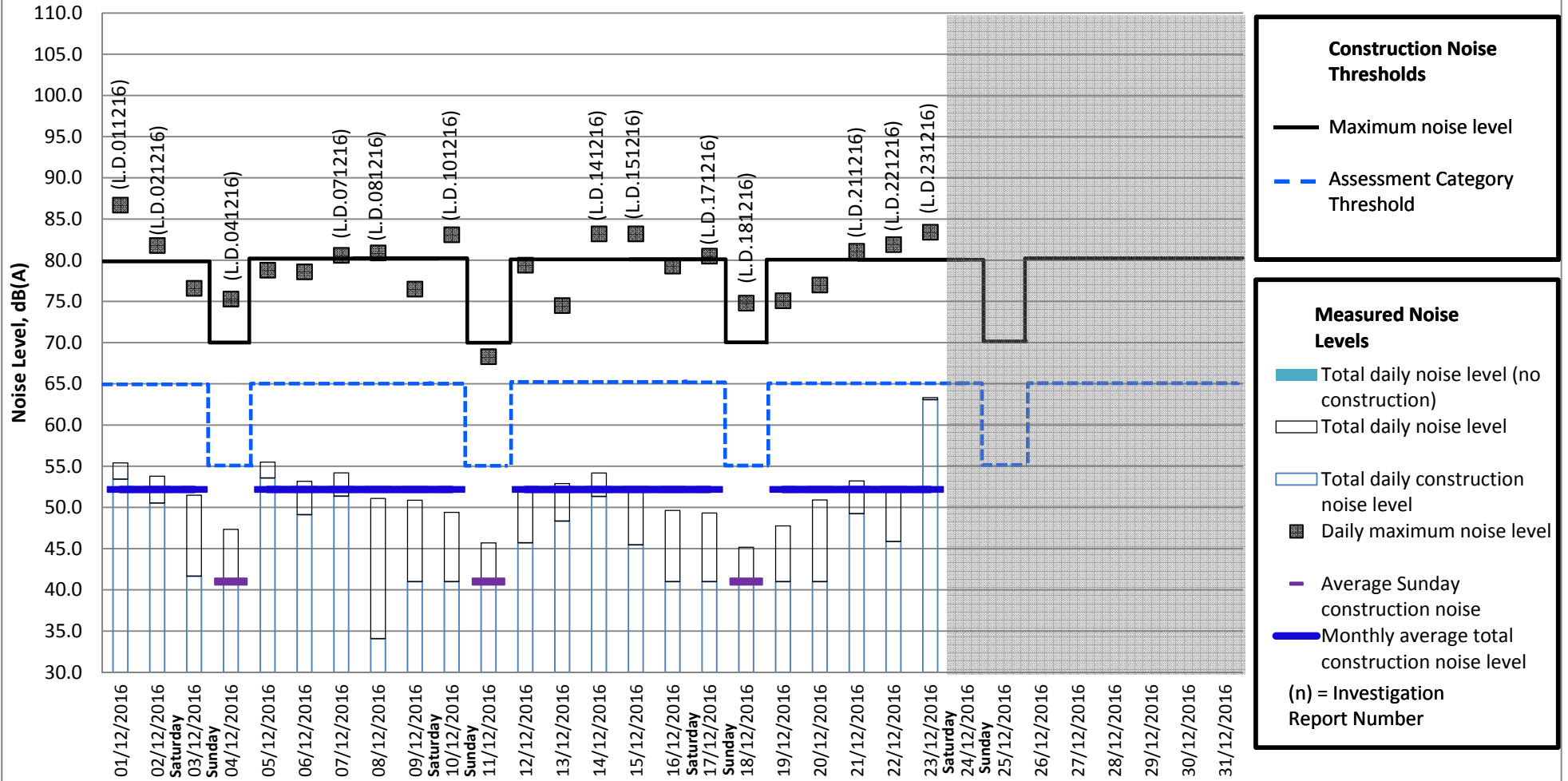
# Measured Night time Noise Levels at Inchgarvie

## Measurement period: December 2016



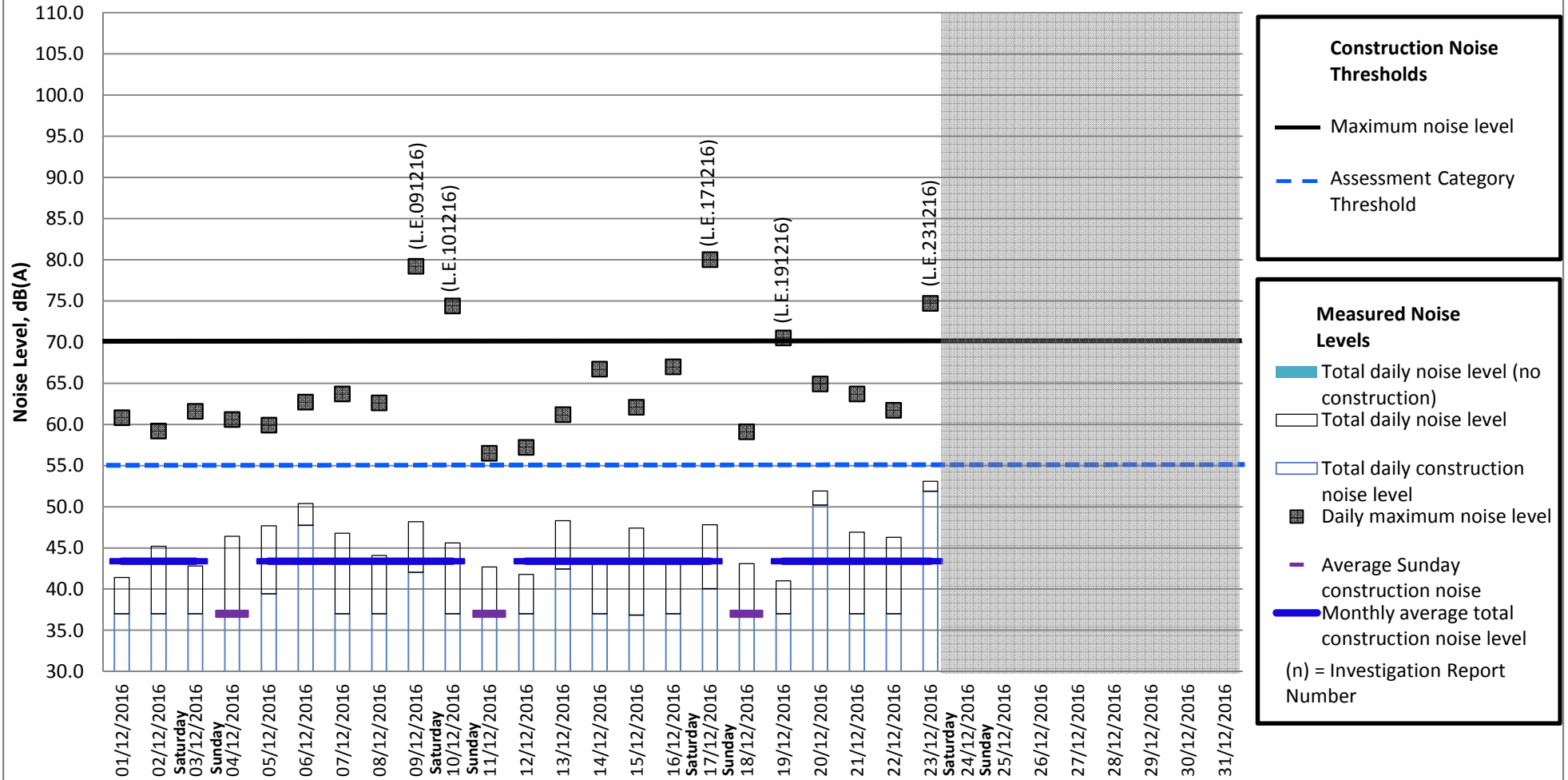
# Measured Daytime Noise Levels at Linn Mill

## Measurement period: December 2016



**Note:**

## Measured Evening Noise Levels at Linn Mill Measurement period: December 2016



**Note:**

**Construction Noise Thresholds**

- Maximum noise level
- Assessment Category Threshold

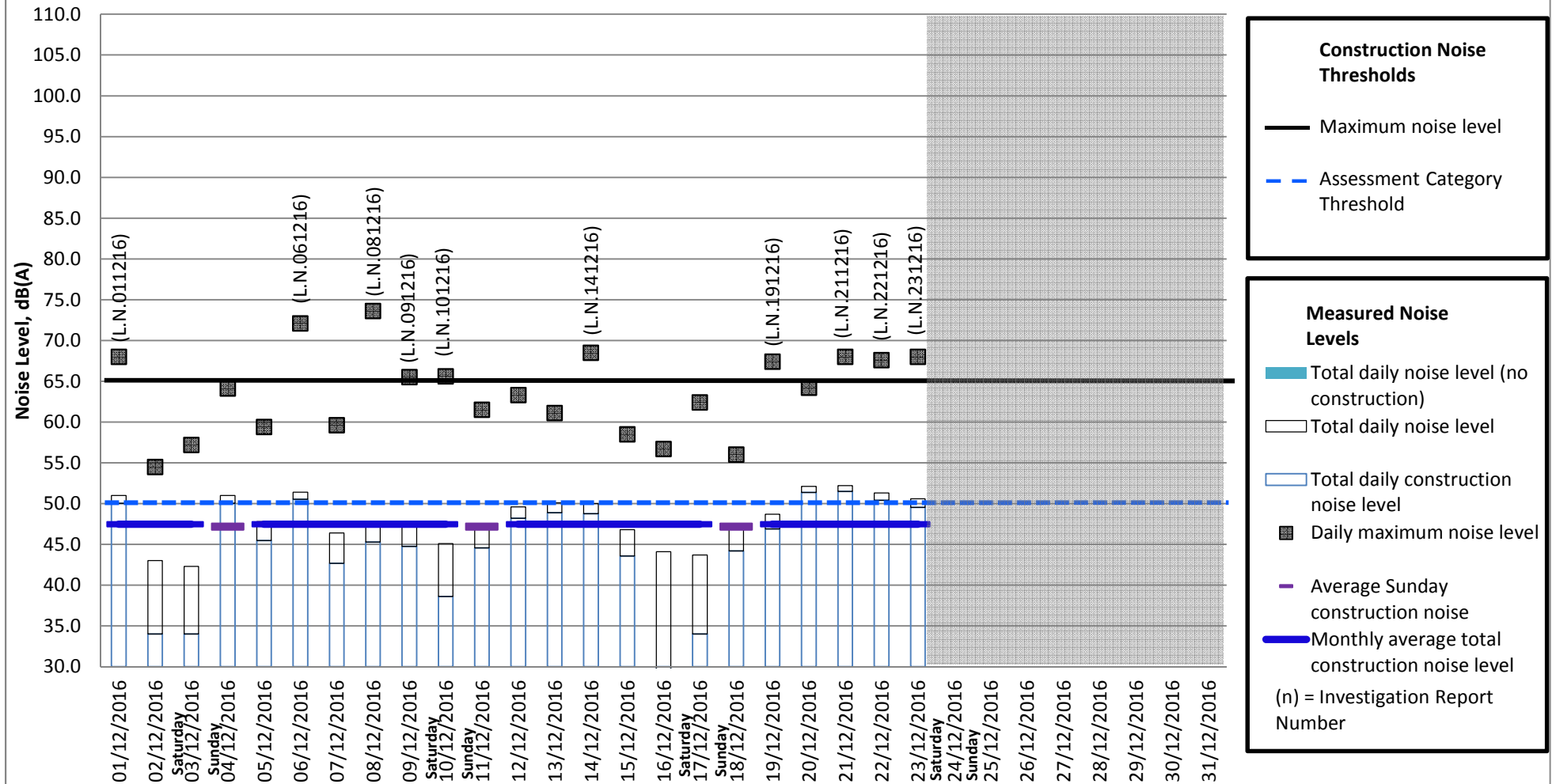
**Measured Noise Levels**

- 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

# Measured Night time Noise Levels at Linn Mill

## Measurement period: December 2016



**Construction Noise Thresholds**

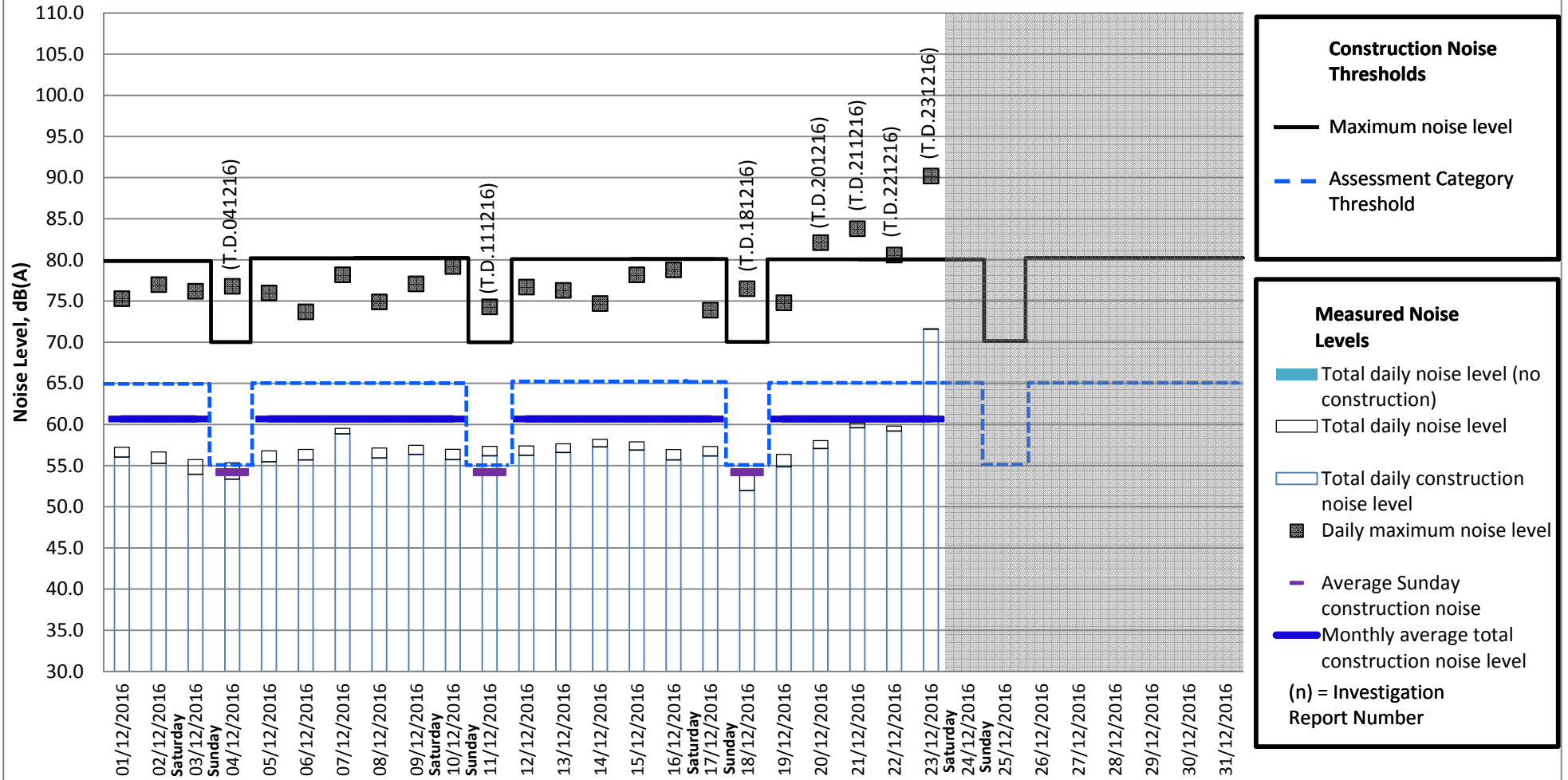
- Maximum noise level
- Assessment Category Threshold

**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

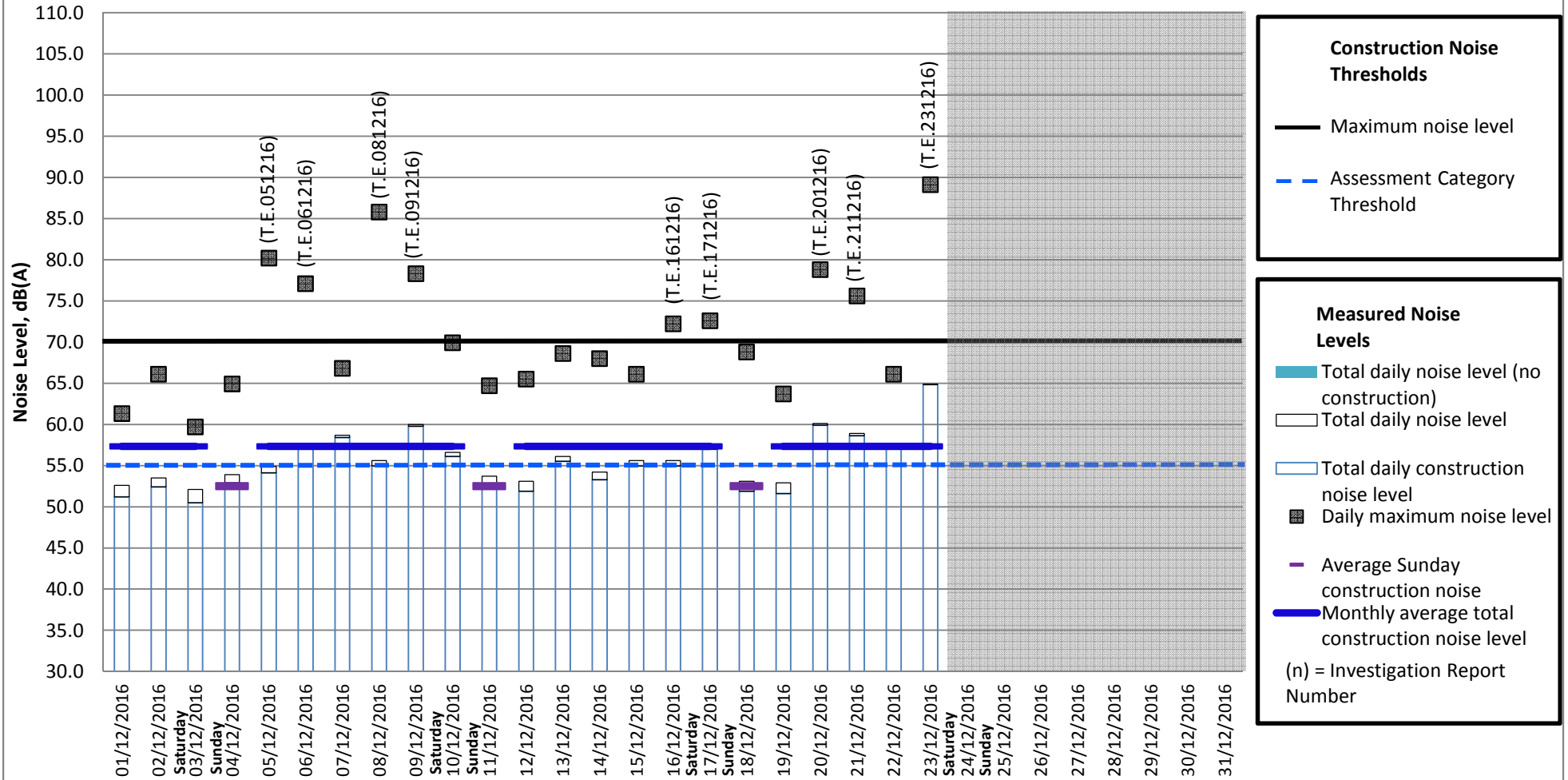
(n) = Investigation Report Number

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



**Note:**

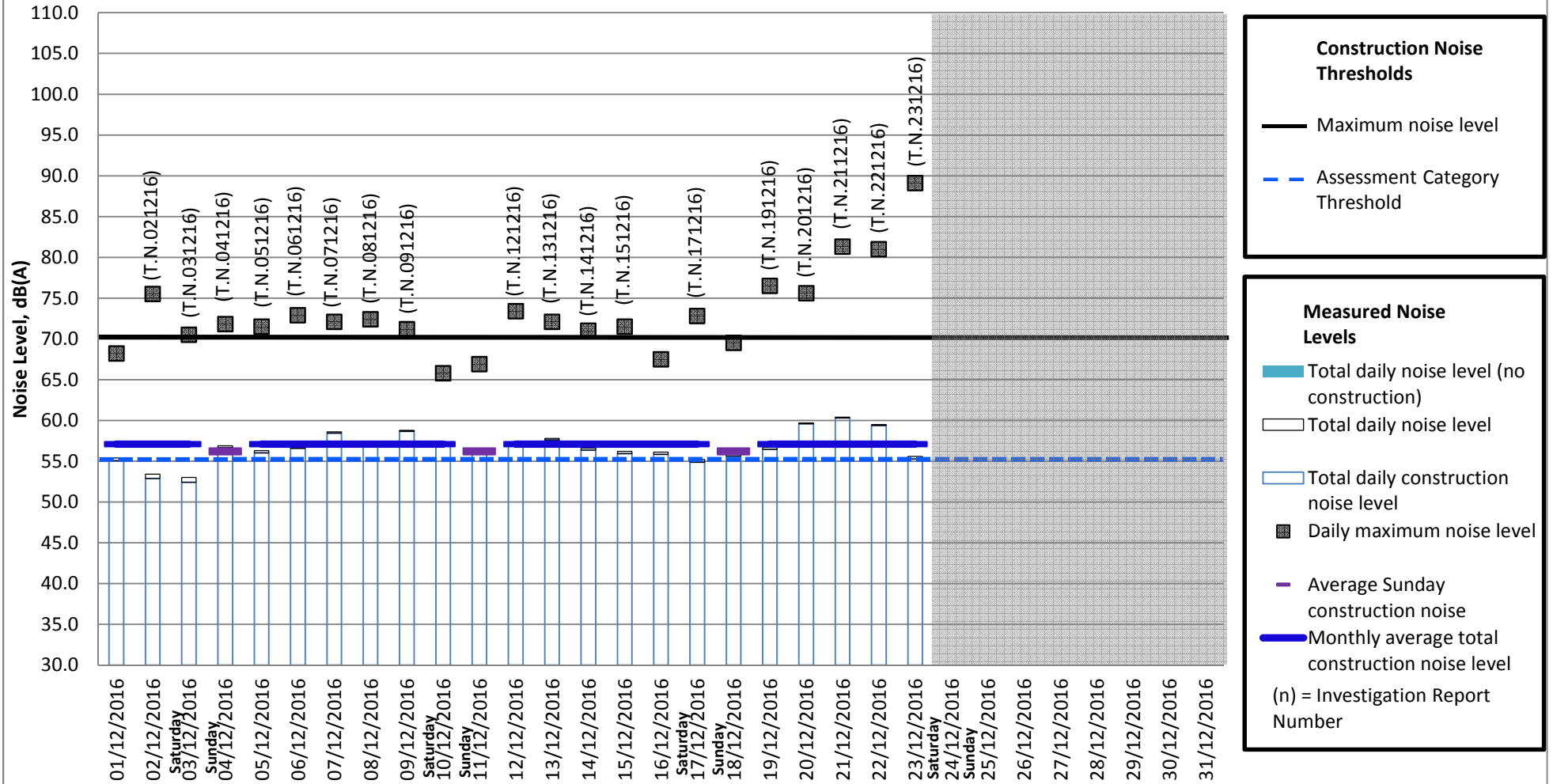
## Measured Evening Noise Levels at Tigh-Na-Grian Measurement period: December 2016



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

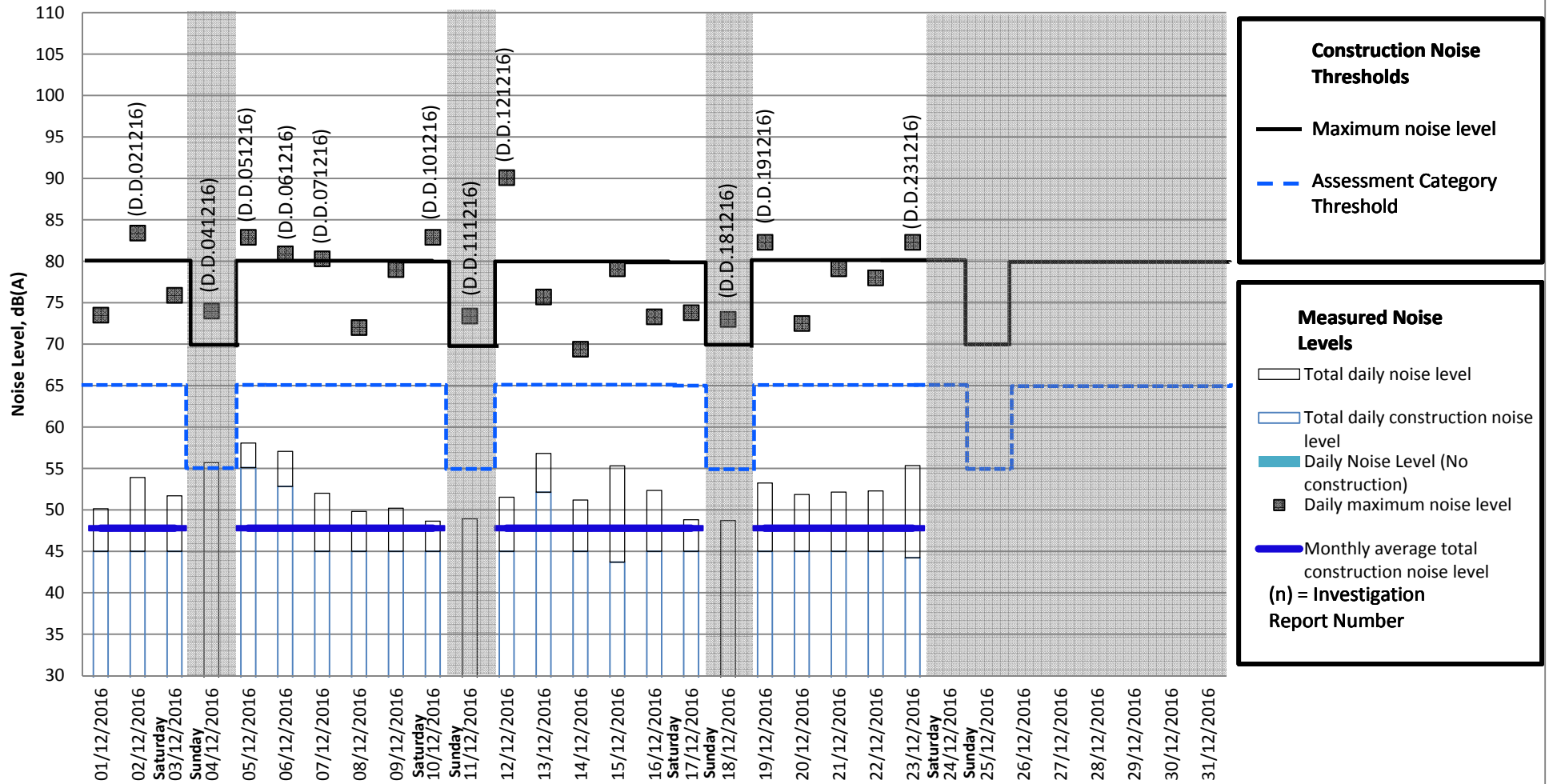


## Measured Night time Noise Levels at Tigh-Na-Grian Measurement period: December 2016



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

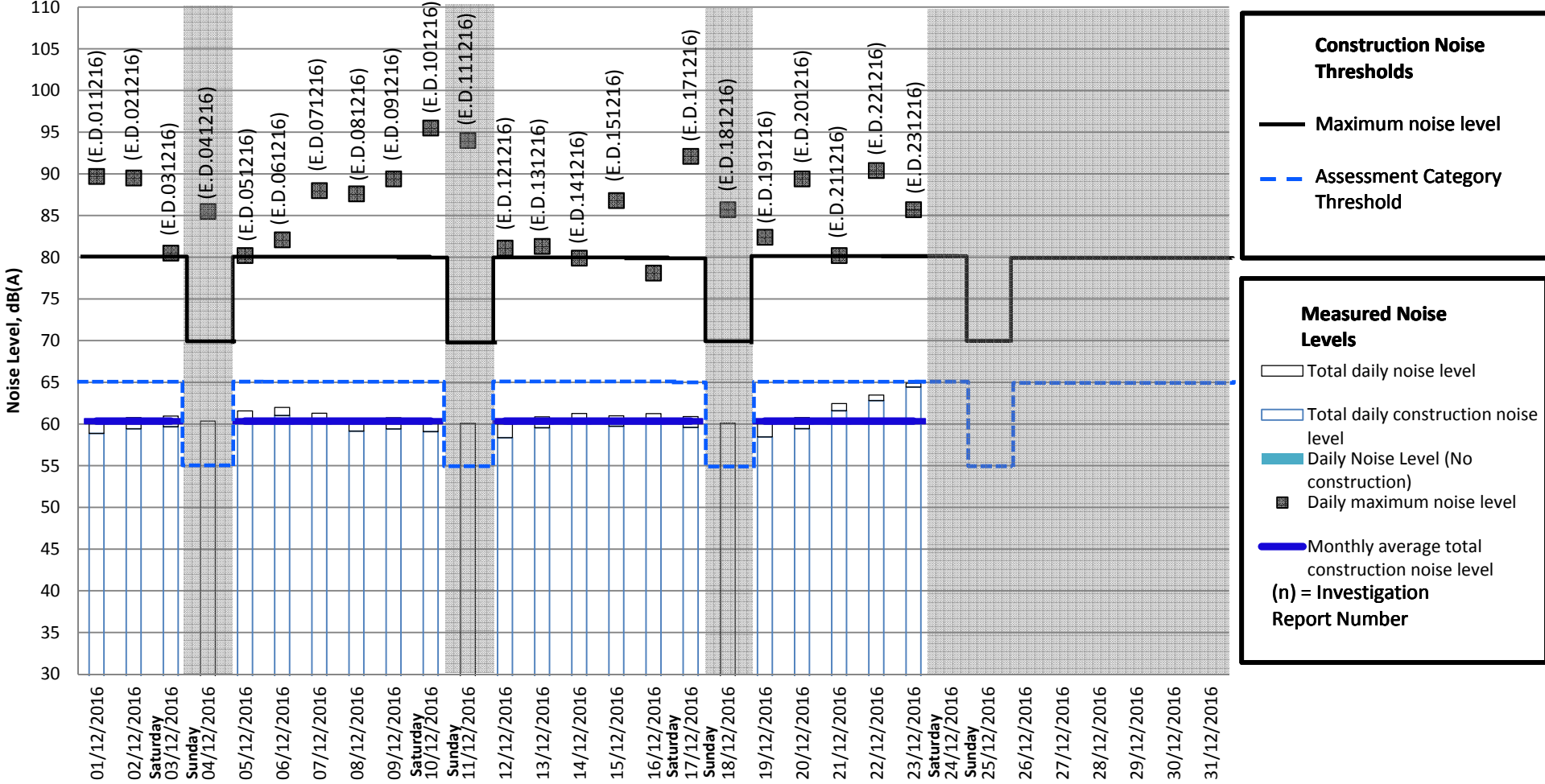
## Measured Daytime Noise Levels at Dundas Home Farm Measurement period: December 2016



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

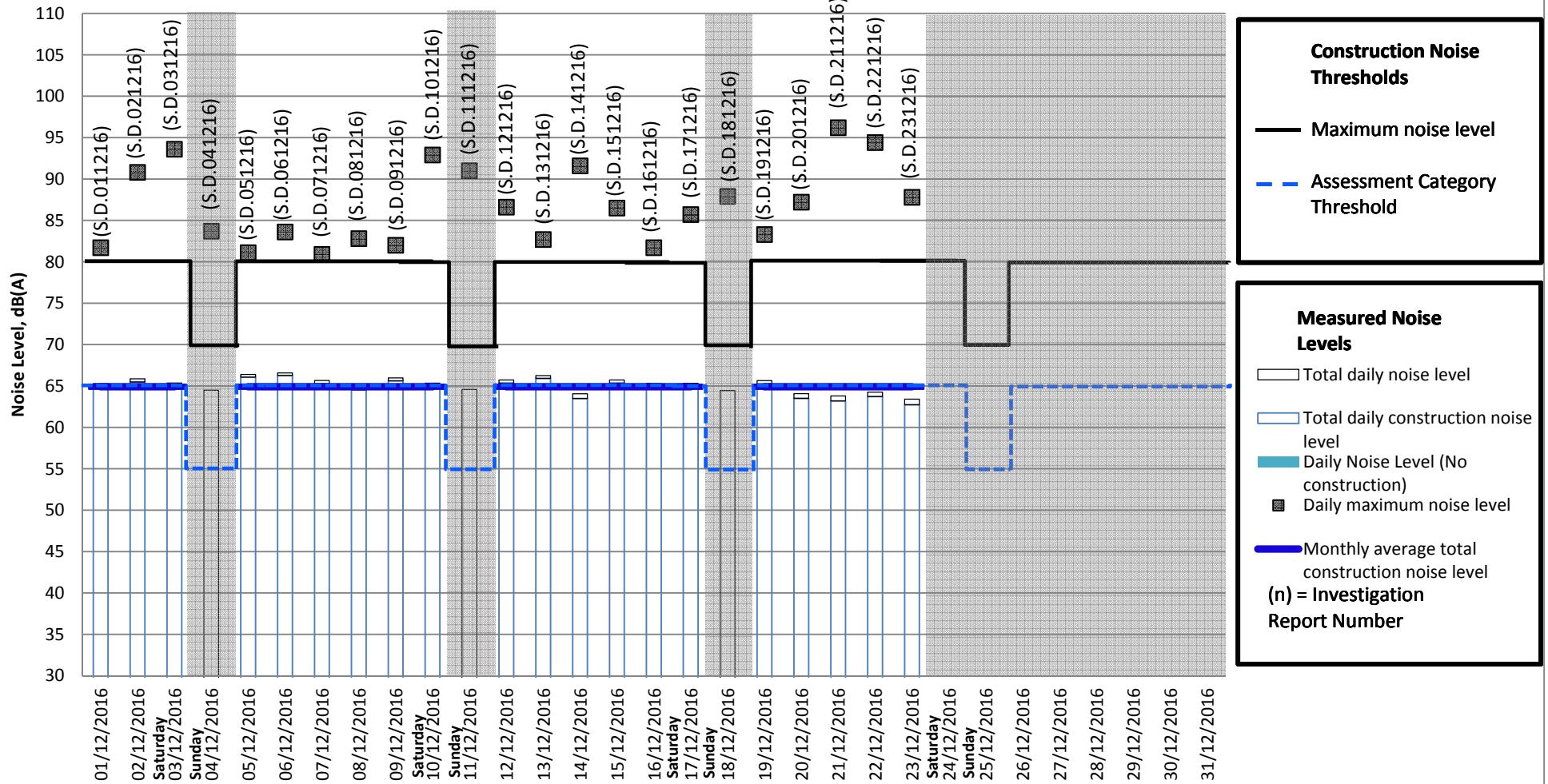
# Measured Daytime Noise Levels at Echline

## Measurement period: December 2016



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

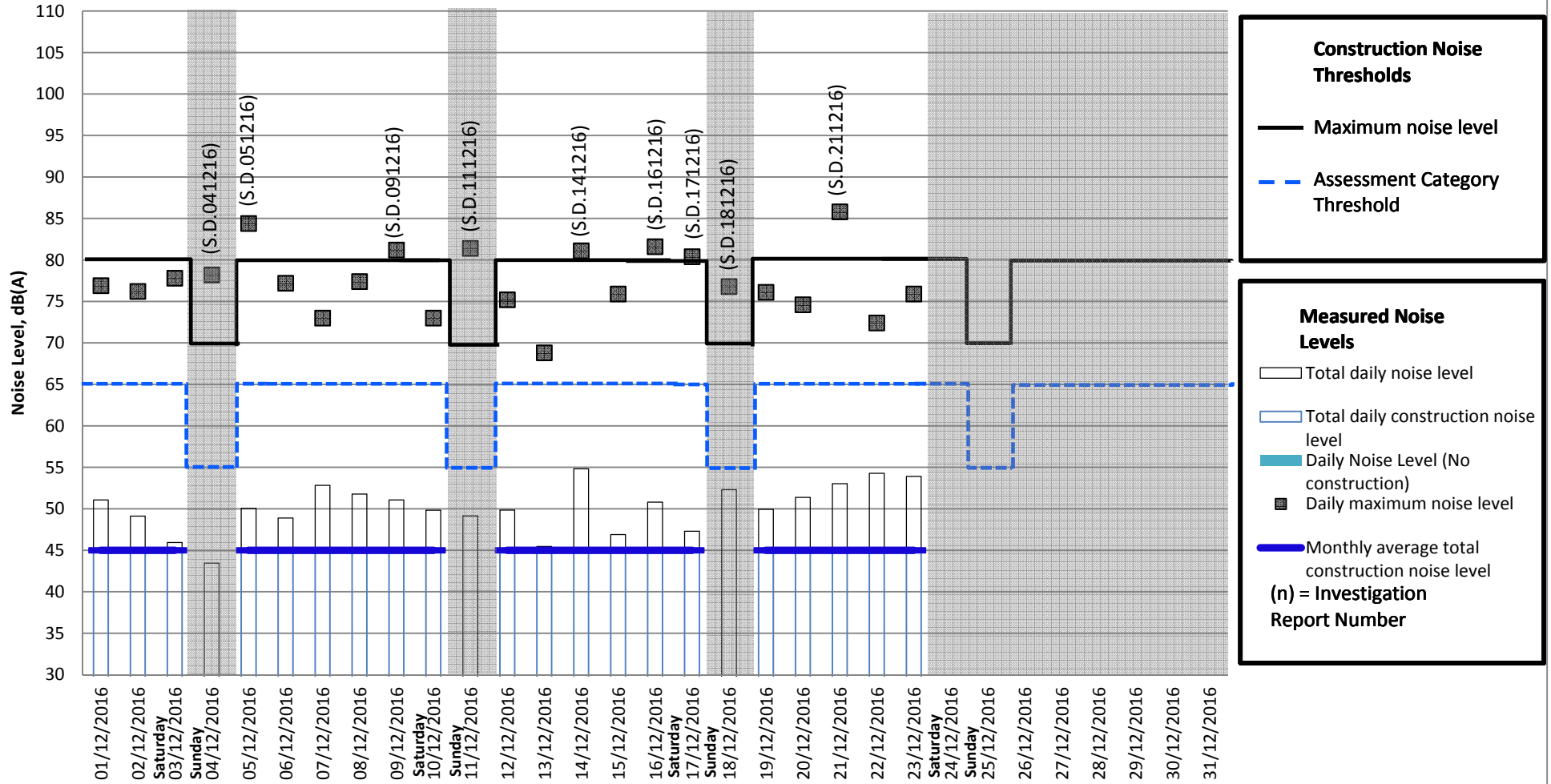
## Measured Daytime Noise Levels at Scotstoun Measurement period: December 2016



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

# Measured Daytime Noise Levels at Springfield

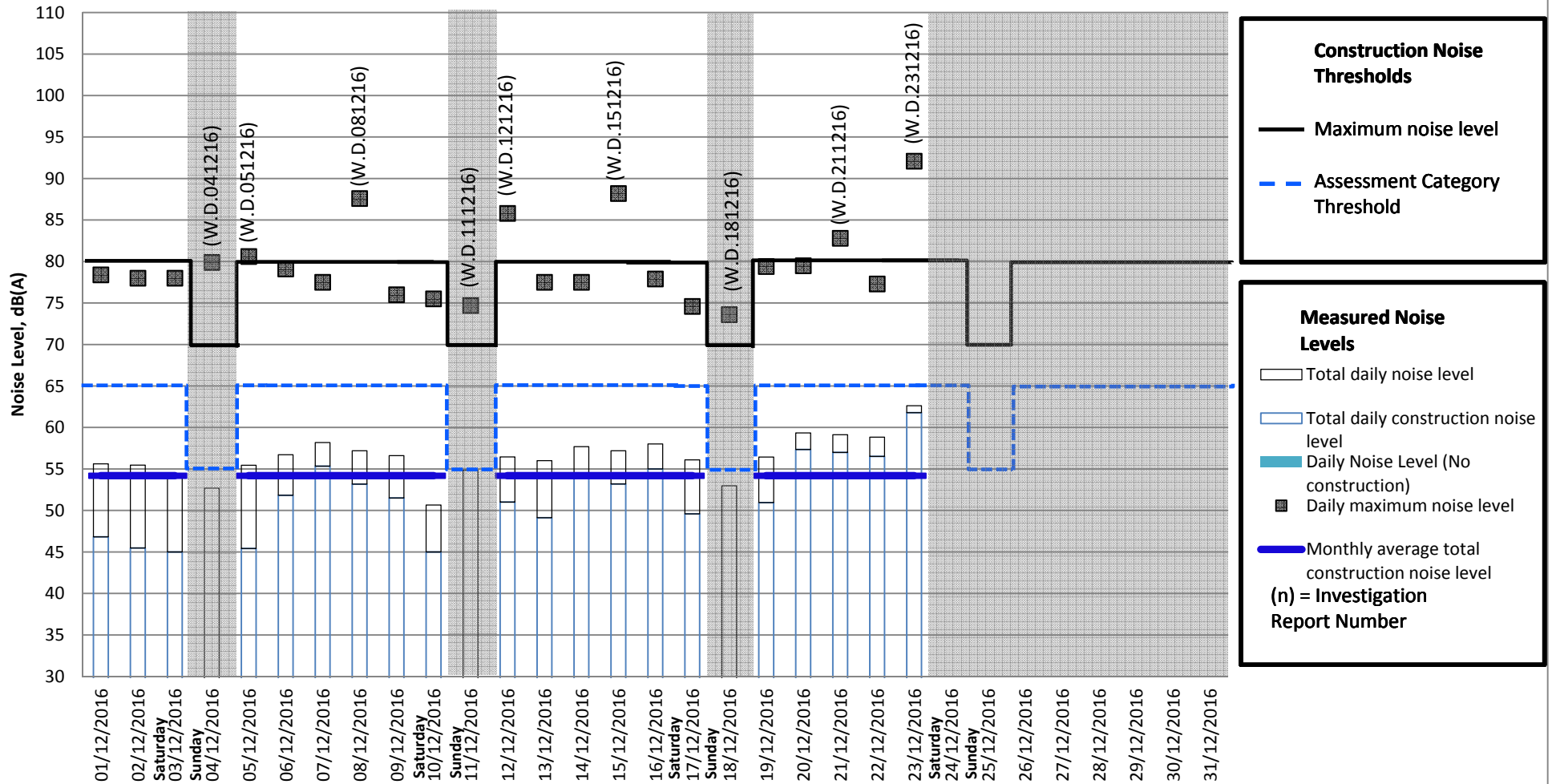
## Measurement period: December 2016



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

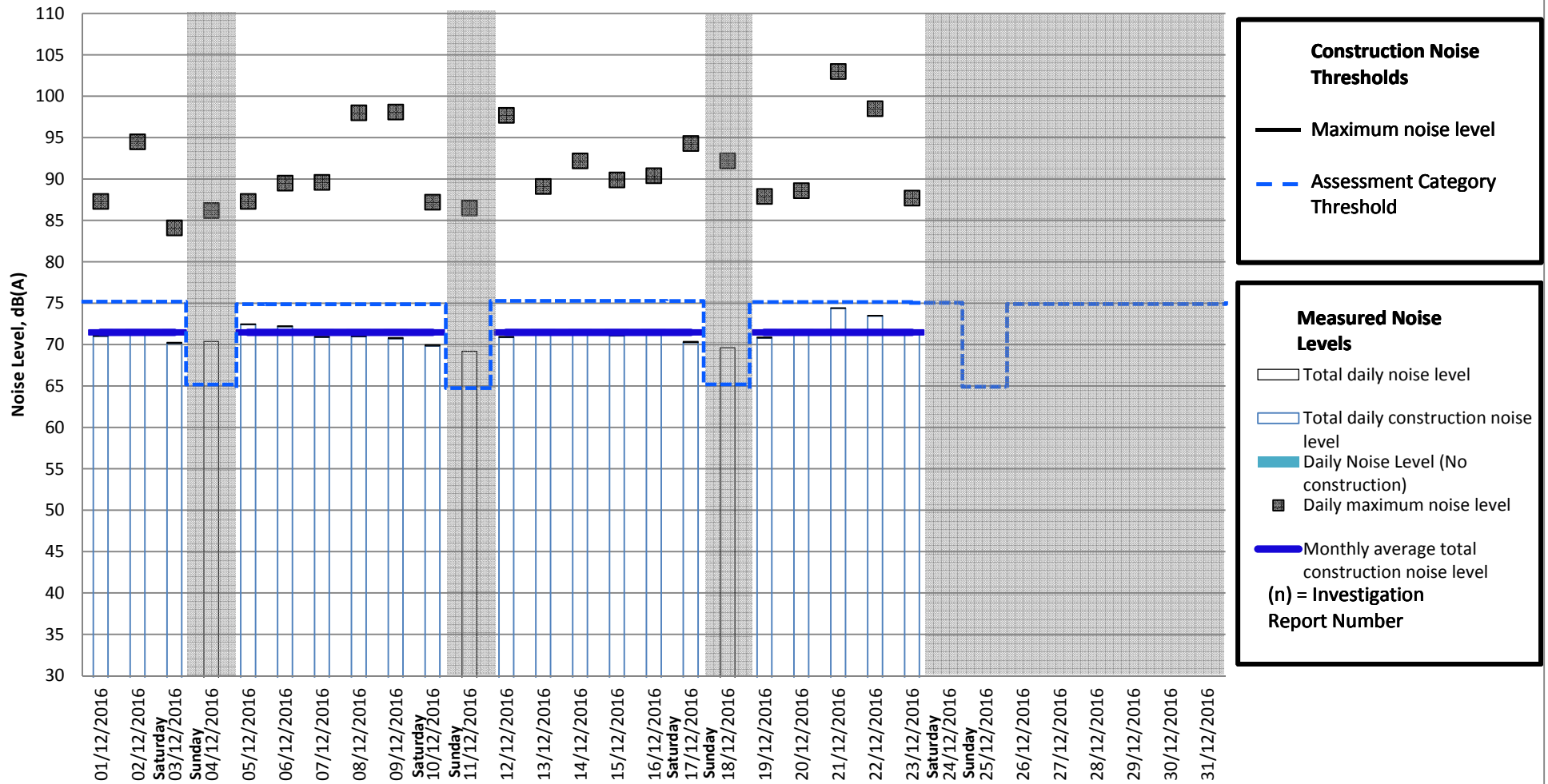
# Measured Daytime Noise Levels at Whinnyhill

## Measurement period: December 2016



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

## Measured Daytime Noise Levels at Newton Measurement period: December 2016



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