HARTCLIFFE WAY HRRC

Noise Impact Assessment

Prepared for: Bristol Waste Company

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1.0 Introduction

1.1 Background

SLR Consulting Limited (SLR) has been appointed by Bristol Waste Company (BWC) to undertake a Noise Impact Assessment to support the planning application for the construction and operation of a new Household Recycling and Reuse Centre (HRRC) (the 'Proposed Development') at the Bristol Waste Deport (the 'Site'), 83 Hartcliffe Way, Bristol, BS3 5RN.

1.2 Scope of Report

The purpose of this report is to assess the risk of adverse impact from noise 'pollution' generated by the Proposed Development of the Site on noise-sensitive receptors in the surrounding area. This is with respect to the noise generated by the Proposed Development once it has been constructed and is operational.

Where (or if) considered necessary, mitigation measures have been suggested to reduce the risk of adverse impact.

Whilst reasonable effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, a glossary of terminology is provided in **Appendix 01**.

1.3 Requirements, Guidelines, and Standards

In producing this report, SLR has had consideration of Government Planning Policies including the National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE) and the Planning Practice Guidance on Noise (PPG-N), which outline the purpose and long-term vision of planning policy with respect to noise.

The assessment of the impact on local residential properties from noise generated by the Proposed Development during its operational phase has been undertaken with reference to BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*', which assesses the potential adverse impact of noise pollution from a sound source (or sources) of a commercial or industrial nature (i.e. mechanical plant, mobile machinery and other operational noise associated with the development).

The assessment of off-site vehicle movements has been undertaken with reference to the '*Guidelines for Environmental Noise Impact Assessment'* produced by the Institute of Environment Management & Assessment (IEMA), which considers the impact of an increase/change in average ambient sound levels.

2.0 Development Description

2.1 Existing Site

The Site is located on the eastern side of Hartcliffe Way (A4174) in Filwood, in the south of Bristol. Hartcliffe Way runs towards Bedminster to the north where it merges into the A38 (Bedminster Road), and towards Hengrove Way to the south. There is currently one access into the site which is achieved via an existing bridge which is wide enough to accommodate two small vehicles passing one another.

The Site is within a Principal Industrial and Warehouse Area (PIWA) and is within a wider area of land with the same allocation. The site is enclosed:

- To the west by Pigeonhouse stream beyond which is Hartcliffe Way;
- To the east by land at Novers Hill;
- To the north by industrial and warehousing units; and
- To the south by unmanaged green space.

2.2 Proposed Development

A detailed description of the Proposed Development is included within Section 3-0 of the Planning Design and Access Statement, though a relevant selection of drawings and Site layout plans are presented in **Appendix 02** of this report.

In summary, the development proposed is for:

"Construction and Operation of a split level Household Recycling (with Canopy) and Re-Use Centre, with retention of existing office and welfare facilities; vehicle parking and manoeuvring area; drainage and water management system, perimeter fencing, lighting, retaining walls, tree planting, 2no new vehicle bridges, separate pedestrian access, temporary construction haul road with ancillary off-site highway improvement works to facilitate new access and egress points at 83 Hartcliffe Way"

2.3 Noise-Sensitive Receptors (NSRs)

In assessing noise pollution from a site, the 'worst case' noise-sensitive receptors (NSRs) must be considered. This is typically the nearest noise-sensitive building(s), or other nearby receptors which may be considered more sensitive or more exposed to noise than closer receptors, due to differences in the landscape or the presence of other buildings (which provide acoustic 'screening').

An NSR is typically a residential property or other sensitive building, such as a school, hospital, care home, community facility or designated external area (i.e. a park or public right of way). BS 4142:2014+A1:2014 relates specifically to *"people who might be inside or outside a dwelling or premises used for residential purposes"*, though it is also commonly used for the aforementioned building types as well.

For the purposes of this assessment, the closest residential receptors have been considered, namely:

- **NSR1** – a series of residential properties approximately 80m to the west of the Site, on Headley Lane; and
- **NSR2** – a series of residential properties approximately 160m to the east of the Site, on Novers Hill.

These NSRs are shown in Figure 03-1 in **Appendix 03** in relation to the Site.

2.4 Operations

2.4.1 Operating Hours

The HRRC is open all year round, including bank holidays, with the exception of the Christmas and New Year holidays. The Site is open for a longer duration during the warmer season. The current opening times are shown in Table 2-1.

Table 2-1
Site opening times

<table>
<tr><th>Months</th><th>Days</th><th>Opening Times</th><th>Additional Information</th></tr>
<tr><td>Summer
26th March 2018 – 21st October 2018</td><td rowspan="2">Monday - Sunday</td><td>08:00 – 18:45</td><td rowspan="2">Hire van and trailer access Tue, Wed, Thu & Sat;

Closed 25th, 26th December & 1st January</td></tr>
<tr><td>Winter
22nd October 2018 – 24th March 2019</td><td>08:00 – 16:15</td></tr>
</table>

2.4.2 Vehicular Traffic

It is understood that the change in two-way vehicle flows on Hartcliffe Way is as per Table 2-2.

Table 2-2
Summary of Existing and Future Hartcliffe Way Two-Way Flows

Period	Existing		Proposed	
	Total	HGVs	Total	HGVs
Weekday	1160	83	1316	85
Weekend	1469	31	1625	33

3.0 Requirements, Guidelines, and Standards

3.1 BS 4142:2014+A1:2019

BS 4142:2014+A1:2019 *'Methods for rating and assessing industrial and commercial sound'* is intended to be used to assess the potential adverse impact of sound of an industrial and/or commercial nature, at nearby noise-sensitive receptor locations within the context of the existing sound environment.

3.1.1 Definitions

BS 4142:2014+A1:2019 provides the following definitions which are relevant at this pre-construction stage of assessment:

- **Background Sound Level, $L_{A90,T}$:** A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given interval, T, measured using time weighting F and quoted to the nearest whole number of decibels (dB);
- **Rating Level, $L_{Ar,Tr}$:** Specific sound level plus any adjustment for the characteristic features of the sound;
- **Reference Time Interval, T_r:** Specified interval over which the specific sound level is determined. This is 60-minutes during the day (07:00 – 23:00) and 15-minutes at night (23:00 – 07:00);
- **Specific Sound Level, $L_s = L_{Aeq,Tr}$:** Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.; and
- **Specific Sound Source:** Sound source being assessed.

Note that although it is not explicitly defined in BS 4142:2014+A1:2019, the use of the term 'noise-sensitive receptor' (NSR) is also important.

3.1.2 Specific Sound Source

BS 4142:2014+A1:2019 defines sound of an industrial and/or commercial nature as:

- sound from industrial and manufacturing processes;
- sound from fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading/unloading of goods and materials at industrial and/or commercial premises; and
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from fork-lift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The scope of BS 4142:2014+A1:2019 is not intended for sound from the passage of vehicles on public roads and railway systems; recreational activities; music and entertainment; shooting grounds; construction and demolition; domestic animals; people; public address systems for speech; and 'other sources falling within the scopes of other standards or guidance'.

3.1.3 Specific Sound Level

The specific sound level L_s is the equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r, of 60-minutes during the day (07:00 – 23:00) and 15-minutes at night (23:00 – 07:00).

Note that the specific sound level L_s at the pre-construction stage of assessment is typically calculated through the summation of predicted sound levels from a source or source(s), based upon either sound power data supplied by the manufacturer; measurements of the unit(s) in-situ operation; or from typical noise levels from similar sources from guideline documents (including British Standards). This also accounts for the operational times of the specific sound source, i.e. the % of a defined (day or night) time period that it is operational for.

3.1.4 Rating Level

The rating level $L_{Ar,Tr}$ is the specific sound level L_s plus any 'penalties' which account for the characteristic features of the sound.

BS 4142:2014+A1:2019 provides the following with respect to the application of penalties to account for *"the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention".*

- ***Tonality*** *– "For sound ranging from not tonal to predominantly tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible;*
- ***Impulsivity –*** *A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible;*
- ***Intermittency*** *– When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied; and*
- ***Other Sound Characteristics*** *– Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."*

Note that SLR consider the word 'perceptible' to be important, and variable depending on the context of a site. For example at a site with a relatively high background sound level of 50 dB(A), an 'impulsive' sound source with a specific sound level of 30 dB(A) at a NSR is unlikely to be perceptible and should probably not be penalised. However the same source at a site with a lower background level of 30 dB(A) would be perceptible, and therefore a penalty of 3 or 6 dB could be applied to the rating level, with possibly a 9 dB penalty being applied if the specific sound level were to rise from 30 to 40 dB(A). Therefore the context is important in applying rating level penalties.

3.1.5 Background Sound Level

BS 4142:2014+A1:2019 states that *"in using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."*

BS 4142:2014 further states that *"a representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either minimum or modal value".*

Hence BS 4142:2014+A1:2019 does not provide a 'black and white' method of obtaining the assessment level for background sound $L_{A90,T}$.

Note that it is standard practice that the $L_{A90,T}$ is determinable from the results of a baseline sound survey conducted at positions representative of sound levels at the nearest or worst affected noise-sensitive receptors.

3.1.6 Assessment of Adverse Impact

The assessment of adverse impact contained in BS 4142:2014+A1:2019 is undertaken by comparing the rating level $L_{Ar,Tr}$, to the measured representative background sound level $L_{A90,T}$ outside the sensitive receptor location.

The significance of the impact of an industrial or commercial sound source depends on both the margin by which the rating level $L_{Ar,Tr}$ exceeds the background sound level $L_{A90,T}$ and the context in which the sound occurs. It is therefore essential to place the sound in context.

The impact can be quantified, where BS 4142:2014+A1:2019 states that one should *"obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and consider the following:*

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

BS 4142:2014 also notes that, *"adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact".*

3.2 IEMA Guidelines for Environmental Noise Impact Assessment

3.2.1 Scope

The Institute of Environmental Management and Assessment (IEMA) *'Guidelines for Environmental Noise Impact Assessment'*, Version 1.2 published in November 2014 addresses the key principles of a noise impact assessment and are applicable to *"all development proposals where noise effects are likely to occur"* and *"are relevant to all types of projects, regardless of size".*

The guidelines provide specific support on how noise impact assessments fit within the Environmental Impact Assessment (EIA) process but can also apply to developments which do not require an EIA. They cover:

- how to scope a noise assessment;
- issues to be considered when defining the baseline noise environment;
- prediction of changes in noise levels as a result of implementing development proposals; and
- definition and evaluation of the significance of the effect of changes in noise levels.

3.2.2 Assessment of Adverse Impact

The IEMA guidelines provide a method of assessing the significance of a change in the equivalent continuous A-weighted sound pressure level $L_{Aeq,T}$, usually interpreted as the average ambient sound level across a time period (of 07:00 – 23:00 for daytime and 23:00 – 07:00 for night-time).

Table 3-1 (recreated from Table 7-14 of the IEMA guidelines) gives an example of how the impact arising from a change in sound levels could be evaluated.

Table 3-1
The significance of adverse impact from an increase change in ambient sound levels (Table 7-14 of the IEMA guidelines)

<table>
<tr><th>Long-term Impact Classification</th><th>Short-term Impact Classification</th><th>Sound level change dB $L_{Aeq,T}$
(positive or negative)
T = either 16 hr day or 8 hr night</th></tr>
<tr><td rowspan="2">Negligible</td><td>Negligible</td><td>≥ 0 dB and < 1 dB</td></tr>
<tr><td>Minor</td><td>≥ 1 dB and < 3 dB</td></tr>
<tr><td>Minor</td><td>Moderate</td><td>≥ 3 dB and < 5 dB</td></tr>
<tr><td>Moderate</td><td rowspan="2">Major</td><td>≥ 5 dB and < 10 dB</td></tr>
<tr><td>Major</td><td>≥ 10 dB</td></tr>
</table>

The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3 dB(A) is generally considered to be the smallest change in environmental sound that is perceptible to the human ear. A 10 dB(A) change in sound represents a doubling or halving of the sound level. The difference between the minimum perceptible change and the doubling or halving of the sound level is split to provide greater definition to the assessment of changes in sound level.

4.0 Baseline Sound Survey

SLR has attended the Site and surrounding area to conduct a Baseline Sound Survey at nearby NSRs as detailed below.

4.1 Methodology

4.1.1 Monitoring Locations

Two monitoring positions were employed with sound level meters installed at the following locations:

- **P1** – on the parcel of land to the west of Hartcliffe Way close to residential properties along Headley Lane, to represent expected environmental noise conditions at NSR1; and
- **P2** – on a parcel of land to the east of the Site close to residential properties along Novers Hill, to represent expected environmental noise conditions at NSR2.

These positions are also reflected within Figure 03-1 in relation to the Site in **Appendix 03**.

At both positions, the microphone was placed at 1.5m above the ground in 'free-field' conditions, i.e. at least 3.5m from the closest vertical reflecting surface.

4.1.2 Monitoring Periods

The sound level meter was installed to measure over the following period:

- **P1** – between 12:57 on Thursday 6th June to 08:17 on Friday 14th June 2019; and
- **P2** – between 13:45 on Thursday 6th June to 08:50 on Friday 14th June 2019.

The monitoring equipment was left unattended for the majority of the survey with the exception for a short period around the installation and collection of the sound level meters.

The sound level meters were set to log noise levels over continuous, synchronised 5-minute periods.

4.1.3 Noise Level Parameters

The following noise indices were recorded (amongst others):

- **$L_{A90,T}$** : The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level' and is therefore used in determining the 'representative background sound level' as defined by BS 4142:2014+A1:2019;
- **$L_{Aeq,T}$** : The A-weighted equivalent continuous noise level over the measurement period T. This parameter is typically considered as a good representation of the *'average'* noise level and is therefore used to determine the 'average ambient sound level' in accordance with IEMA guidelines;
- **$L_{A10,T}$** : The A-weighted noise level that is exceeded for 10% of the measurement period T. This parameter is often considered as the 'average maximum level'; and
- **$L_{AFmax,T}$** : The maximum A-weighted noise level during the measurement period T.

4.1.4 Equipment

The monitoring equipment used for the Baseline Sound Survey is detailed in Table 4-1. The sound level meters were calibrated before and after the survey, with no significant drifts of greater than 0.5 dB observed. The sound level meters have been calibrated to a traceable standard by UKAS-accredited laboratories within the 24 months preceding the survey, and the calibrators have been calibrated to a traceable standard by UKAS-accredited laboratories within the 12 months preceding the survey. The equipment complies with the standards of as BS EN 60942:2003 Class 1 device.

Table 4-1
Monitoring Equipment

Survey Location	Equipment	Serial Number
P1	Rion Sound Level Meter	331823
	Rion Acoustic Calibrator	34478298
P2	Cirrus CR:171B Type 1 Sound Level Meter	G061094
	Cirrus CR:515 Acoustic Calibrator	59336

4.1.5 Weather Conditions

During the survey, weather conditions were suitable for the measurement of environmental noise in accordance with BS 4142:2014 and BS 7445-1:2003 ‘*Description and Measurement of Environmental Noise’.*

4.2 Soundscape and Context

During the installation and collection of the survey, a note of all noise sources audible to the engineer was made, including the regularity and subjective magnitude of each. The following notes were made:

- **P1** – noise predominantly from road traffic along Hartcliffe Way; and
- **P2** – noise predominantly from road traffic along Novers Hill.

4.3 Results

4.3.1 P1

Table 4-2 and Table 4-3 provide a summary of the noise levels measured over the course of the survey at position P1, split into daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods respectively.

A graphic representation of the entire monitoring period is given in Figure 03-2 in **Appendix 03,** where the fluctuation in noise levels over time can be observed.

Table 4-2
Summary of measured daytime noise levels at P1 (only including periods between 07:00 and 23:00)

Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
L_{Aeq} (dB)	86	55	65	64	65	64
L_{AFmax} (dB)	100	65	80	75	71	73
L_{A10} (dB)	91	61	68	67	67	67
L_{A90} (dB)	64	33	57	55	58	56

Table 4-3
Summary of measured night-time noise levels at P1 (only including periods between 23:00 and 07:00)

Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
L_{Aeq} (dB)	76	34	61	58	55	57
L_{AFmax} (dB)	92	42	75	71	71	71
L_{A10} (dB)	81	36	65	61	60	61
L_{A90} (dB)	60	26	49	42	33	43

4.3.2 P2

Table 4-4 and Table 4-5 provide a summary of the noise levels measured over the course of the survey at position P2, split into daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods respectively.

A graphic representation of the entire monitoring period is given in Figure 03-3 in **Appendix 03,** where the fluctuation in noise levels over time can be observed.

Table 4-4
Summary of measured daytime noise levels at P2 (only including periods between 07:00 and 23:00)

Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
L_{Aeq} (dB)	68	37	51	49	48	49
L_{AFmax} (dB)	93	47	68	62	62	62
L_{A10} (dB)	67	39	54	52	51	51
L_{A90} (dB)	52	27	44	42	41	42

Table 4-5
Summary of measured night-time noise levels at P2 (only including periods between 23:00 and 07:00)

Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
L_{Aeq} (dB)	63	29	49	44	40	44
L_{AFmax} (dB)	92	36	69	58	64	58
L_{A10} (dB)	67	30	53	46	40	45
L_{A90} (dB)	48	25	39	37	36	36

5.0 Operational Noise Impact On-site Sources

5.1 Methodology

The assessment of the noise impact on nearby residential NSRs in relation to the likely levels of operational noise produced by the Proposed Development has been undertaken with reference to BS 4142:2014+A1:2019, which assesses the risk of adverse impact from new sound sources of an industrial nature.

5.1.1 Assessment Process

The following summarises the main steps of action in the assessment method:

- the background sound level $L_{A90,Tr}$ is determined for the operational period of the Proposed Development, based upon the results of the Baseline Sound Survey;
- the scope of sound sources associated with the Proposed Development is determined; including the sound power levels, locations and operating times of sources;
- the specific sound level L_s at the NSRs is predicted by noise map calculations which account for the Site layout including proposed buildings, the presence of buildings external to the Site in the vicinity of the NSR and the characteristics of the noise sources referenced above;
- the rating level $L_{Ar,Tr}$ is determined by the application of any 'penalties' which adjust for characteristic features of the sound which may be perceptible and potentially cause annoyance at the NSR;
- the rating level $L_{Ar,Tr}$ is compared to the background sound level $L_{A90,Tr}$, with the difference between the two levels indicating the likelihood of adverse impact at the NSR in accordance with a BS 4142:2014+A1:2019 assessment; and finally; and
- options for mitigation are explored if an adverse impact is still considered likely, with the rating level and risk of adverse impact re-evaluated for each option.

5.1.2 Noise Map Modelling

The noise predictions for the operational assessment within this report have been undertaken using the proprietary software CadnaA® by DataKustik, which predicts the propagation of noise levels through noise mapping and implements a wide range of national and international standards, guidelines and calculation algorithms, including those set out in ISO 9613-2:1996.

The noise map model has assumed:

- downwind propagation, i.e. a wind direction that assists the propagation of sound from source to receptor;
- a ground absorption factor of 0 within the boundaries of the Site and on any roads, car parks buildings and any tarmacked/concreted areas;
- a ground absorption factor of 1 on grassy areas outside of the Site boundaries;
- a maximum reflection factor of two;
- that noise sources do <u>not</u> have strong radiation patterns and therefore radiate equally in all directions;
- the use of single A-weighted sound power levels (in the absence of frequency sound power level data); and
- receptor heights of 4m to represent the height of a first-floor bedroom window.

5.1.3 Background Sound Levels

In accordance with BS 4142:2014+A1:2019, the predicted rating level should be assessed against a 'representative' background sound level. This is commonly determined through the results of a baseline sound survey, as has been done in this case.

BS 4142:2014+A1:2019 states that *"in using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."*

BS 4142:2014+A1:2019 further states that *"a representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either minimum or modal value".*

However, to form a robust assessment, SLR has chosen the lowest value of logarithmic, mean, modal and median average, the $L_{A90,15min}$ as the representative background sound level. This is reflected in Table 5-1. Note that only the daytime period is shown, as the operating hours of the Proposed Development fall within the daytime.

Table 5-1
Derived representative background sound level for NSR1

Noise-Sensitive Receptor(s)	Time Period	Background Sound Level $L_{A90,Tr}$ (dB)
NSR1	Daytime (07:00 to 23:00) **T_r = 60-minutes**	55
NSR1	Daytime (07:00 to 23:00) **T_r = 60-minutes**	41

5.2 On-site Sound Sources

5.2.1 Vehicles

With respect of HGVs, it is anticipated that there would be up to two movements per hour as detailed in Table 2-2.

Noise from reversing beepers on HGVs and fork-lift trucks has also been accounted for within the assessment.

Table 5-2 provides details of the vehicle sound sources used in the assessment. Noise levels have been determined from measurements that SLR has conducted on past projects of cars and HGVs at various speeds, or from an appropriate guideline document.

Table 5-2
Noise sources – vehicles

Sound Source		Sound Power Level L_{WA} (dB)	Number of Instances	Movements / On time over a worst case 60-minute reference daytime period	Data Source
Ref	Description				
S1	HGV (refuse vehicle)	91.0	1	2 movements at 10 km/h	SLR Measurements
S2	HGV reversing alarm	89.2	1	2 movements at 10 km/h	SLR Measurements
S3	HGV idling (whilst loading from a container)	87.5	1	20 minutes	SLR Measurements
S4	Fork-lift truck	99.0	1	20 minutes	BS 5228-1:2009+A1:2014, Annex C, Table D.7 (93)
S5	Fork-lift truck reversing alarm	89.2	1	5 minutes	SLR Measurements
S6	Visitor vehicles	84.0	1	178 movements at 10 km/h	SLR Measurements
S7	Visitor vehicles idling (queuing)	80.0	10	60 minutes	SLR Measurements
S8	Cars into staff carpark	84.0	1	10 movements at 10 km/h	SLR Measurements

5.2.2 Refuse Tipping/Loading

Within the plans for the Proposed Development, there are a number of recycling containers, including:

- 18 large open top containers which sit below/beside the proposed elevated platform;
- 4 smaller closed top containers with side holes for tipping glass, plastics and textiles/clothing; and
- a mix of other open skips and containers for recycling tyres, oil, batteries, gas, and other materials.

Based on the assessment of similar HRRCs conducted by SLR, it is anticipated the main noise sources would be from the large open top containers and the smaller closed top containers.

SLR has conducted measurements of noise levels producing from the tipping of various different materials into containers. With respect to the open top containers, the noisiest activity is typically from recycling wood. This can be around 5 – 7 dB louder than tipping general waste. However, whilst there are only two containers designated within the plan for tipping wood, as a worst-case assessment, SLR has modelled all open top containers as producing noise levels similar to that of wood tipping.

Table 5-3 provides details of the noise sources used in the assessment to represent noise from tipping and loading of material.

Table 5-3
Noise sources – refuse tipping/loading

Sound Source		Sound Power Level L_{WA} (dB)	Number of Instances	On time over a worst case 60-minute reference daytime period	Data Source
Ref	Description				
S9	Large open containers (tipping)	94.0	18	10%	SLR Measurements
S10	Small containers (tipping glass)	95.0	2	10%	SLR Measurements
S11	Small containers (tipping cans/plastic)	92.0	2	10%	SLR Measurements
S12	Small containers (tipping cardboard, textiles and others)	85.0	7	10%	SLR Measurements
S13	HGV loading	95.0	1	10%	SLR Measurements

5.3 Predicted Sound Levels and Assessment of Adverse Impact

Table 5-4 lists the predicted specific sound level and rating levels at NSR1 during the daytime period (07:00 – 23:00), corresponding to the worst-case 60-minute reference period which is based upon the busiest hour of the year (in terms of visitor numbers).

No rating level penalties have been applied, due to the specific sound level being exceptionally low in comparison to existing ambient sound levels and therefore likely being imperceptible to residents at the NSR locations.

The last column represents the background sound level minus the predicted rating level. BS 4142:2014+A1:2014 states that *“the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.”*

As the rating level is 25 dB below the background sound level, there is likely to be a negligible risk of adverse impact.

Table 5-4
Predicted specific sound levels and rating levels at the NSRs during the daytime (07:00 – 23:00)

Noise-Sensitive Receptor	Specific Sound Level $L_{Aeq,60min}$ (dB)	Rating Level Penalties (dB)	Rating Level $L_{Ar,60min}$ (dB)	Representative Background Sound Level $L_{A90,Tr}$ (dB)	Difference (dB)
NSR1	37	0	37	55	-18
NSR2	23	0	23	41	-18

6.0 Operational Noise Impact Off-Site Sources

6.1 Methodology

The assessment of the noise impact on nearby NSRs in relation to off-site traffic movements produced by the Proposed Development has been undertaken with reference to the IEMA guidelines.

6.1.1 Assessment Process

The following summarises the main steps of action in the assessment method:

- the Basic Noise Level (BNL) is calculated in accordance with the Calculation of Road Traffic Noise (CRTN) for the existing and proposed traffic flows along Hartcliffe Way;
- the BNL provides a noise level at a nominal receptor and enables a comparison as to the change in noise level expected as a result of the development; and
- the 'new' and existing BNL values are assessed in accordance with IEMA guidelines by referencing against Table 3-1, with the difference between the two levels indicating the likelihood of adverse impact at the NSRs.

6.2 Assessment of Adverse Impact

6.2.1 IEMA Guidelines for Environmental Noise Impact Assessment

The risk of adverse impact from noise levels generated by off-site vehicle movements as a result of the Proposed Development can be assessed by comparing the existing and proposed BNL levels, and assessing using the criteria outlined in Table 3-1.

This has been done and is summarised in Table 6-1.

Table 6-1
Assessment of the risk of adverse impact at NSR2

Period	Basic Noise Level, L_{A10} (dB)			Long- term Risk of Adverse Impact
	Existing	Proposed	Change	
Daytime (07:00 to 23:00) **T = 60-minutes**	73.7	74.1	+0.4	Negligible

It is seen that there should be a 'negligible' impact as a result to changes in off-site traffic movements at nearby NSRs.

7.0 Summary and Conclusions

SLR has been appointed by BWC to undertake a Noise Impact Assessment to support the planning application for the construction and operation of a new Household Recycling and Reuse Centre (HRRC) (the 'Proposed Development') at the Bristol Waste Deport (the 'Site'), 83 Hartcliffe Way, Bristol, BS3 5RN.

The purpose of this report has been to assess the risk of adverse impact from noise 'pollution' generated by the Proposed Development on any residents in the surrounding area.

As part of the assessments, SLR has attended the existing Site to conduct a Baseline Sound Survey, using this to determine threshold noise levels to assess against.

The assessment of the impact on residential properties has been conducted in accordance with BS 4142:2014+A1:2019, whilst the IEMA '*Guidelines for Environmental Noise Impact Assessment*' have been used to assess the impact of off-site traffic movements.

The results of both assessments have concluded that there is a 'negligible' risk of adverse impact from noise generated by the Proposed Development.

Therefore, noise should not pose a material constraint to gaining planning consent for the Proposed Development.

APPENDIX 01

Acoustics Concepts and Terminology

01.1 Glossary of Acoustic Terminology

Table 01-1
Glossary of Acoustic Terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio of the root-mean-square pressure of the sound and a reference pressure (2x10-5 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Frequency Octave bands (and Third Octave bands)	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63 Hz to 4000 Hz (4 kHz). This is roughly equal to the range of frequencies on a piano. Frequency is often divided into ('first') octave bands for analysis, with the range above considered within 7 octave bands with centre frequencies at 63 Hz, 125 Hz, 250 Hz, 1 kHz, 2 kHz and 4 kHz. 'Third' octave bands split this further into smaller frequency bands. This is typically only referenced in assessment of tonality of a noise source by identifying peaks (tones) in the frequency spectrum, i.e. when applying a rating penalty for tonality within a BS 4142:2014 assessment.
L_{Aeq}	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{A10} & L_{A90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{A10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{A90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{A10} index to describe traffic noise. The 'A' in the notation indicates a single weighted figure using the 'A' weighting to compensate for the varying sensitivity of the human ear to sound at different frequencies.
L_{AFmax}	L_{AFmax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{AFmax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{Aeq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using a 'fast' response.
Sound pressure level (SPL)	Represents a noise level that can be measured directly, the result of pressure variations in the air achieved by the sound waves, on a dB scale.

01.2 Subjective Noise Levels

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

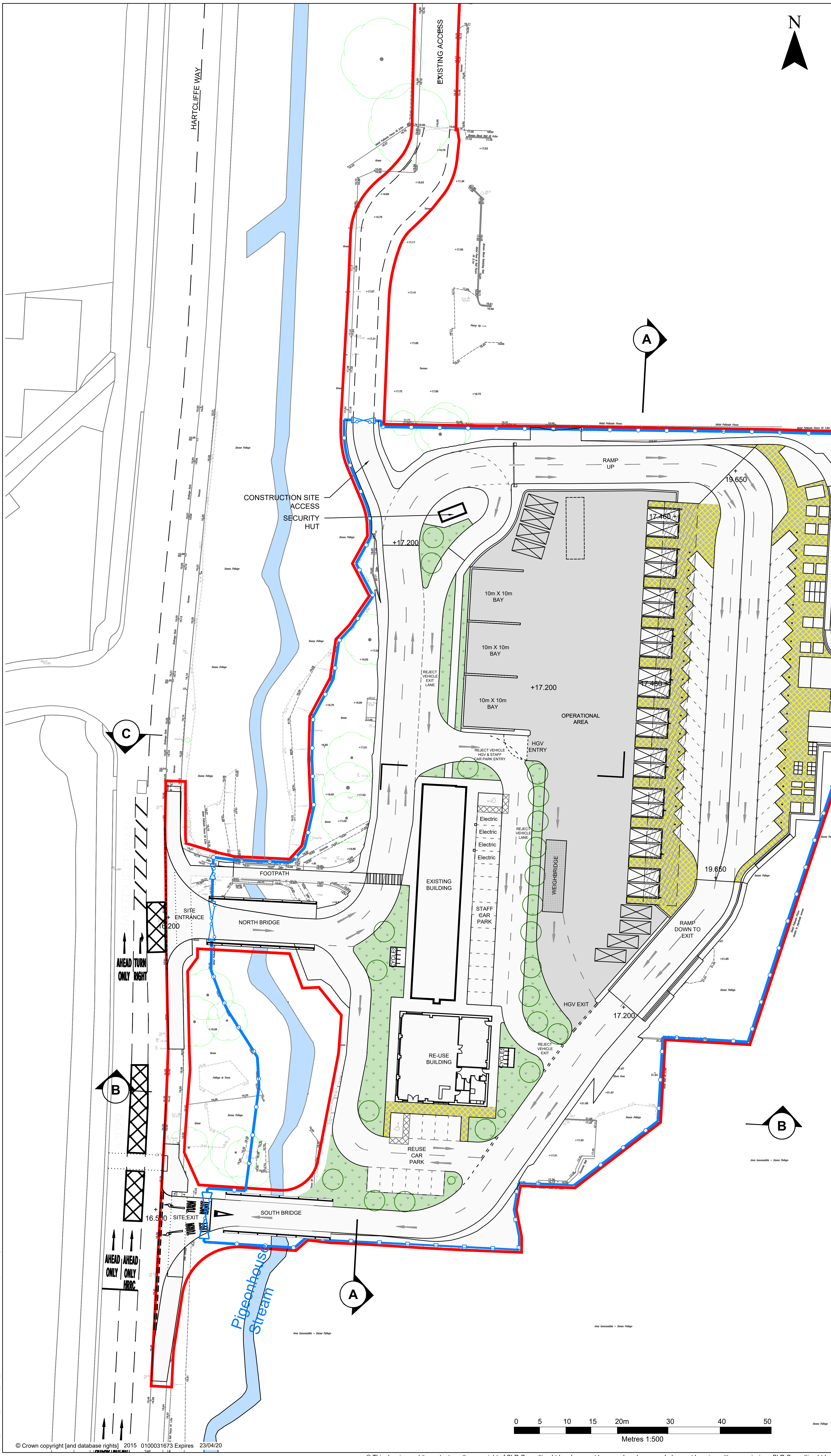
The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 01-2
Subjective examples of different noise levels

Sound Level	Location
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory
100 to 110 dB(A)	Burglar alarm at 1 m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(A)	Threshold of Pain

APPENDIX 02

Proposed Development Plan



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402_08721_00003_07_004.3 WIP - Proposed Site Layout.dwg

NOTES

FOR SECTIONAL ELEVATIONS SEE DRAWINGS 03 AND 06

LEGEND

- PLANNING SITE BOUNDARY ~~16,427~~ 16,461m²
- LINE OF PALISADE FENCING
- LOCATION OF GATE IN PALISADE FENCING
- LINE OF EXISTING FENCING
- CONCRETE SURFACE
- PUBLIC ACCESS AREAS
- INDICATIVE LANDSCAPING
- CANOPY AT UPPER LEVEL

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www.slrconsulting.com

HARTCLIFFE WAY HRRC

HRRC DEVELOPMENT

PROPOSED SITE LAYOUT & PLANNING BOUNDARY

004

Scale	Date
1:500 @ A2	OCTOBER 2019

APPENDIX 03

Baseline Sound Survey Details

Figure 03-1
Aerial view of the Site and the immediate surrounding area, including the Baseline Sound Survey monitoring positions and locations of nearby 'noise-sensitive' receptors (NSRs)

Figure 03-2
Graph of measured noise levels from the Baseline Sound Survey at monitoring position P1

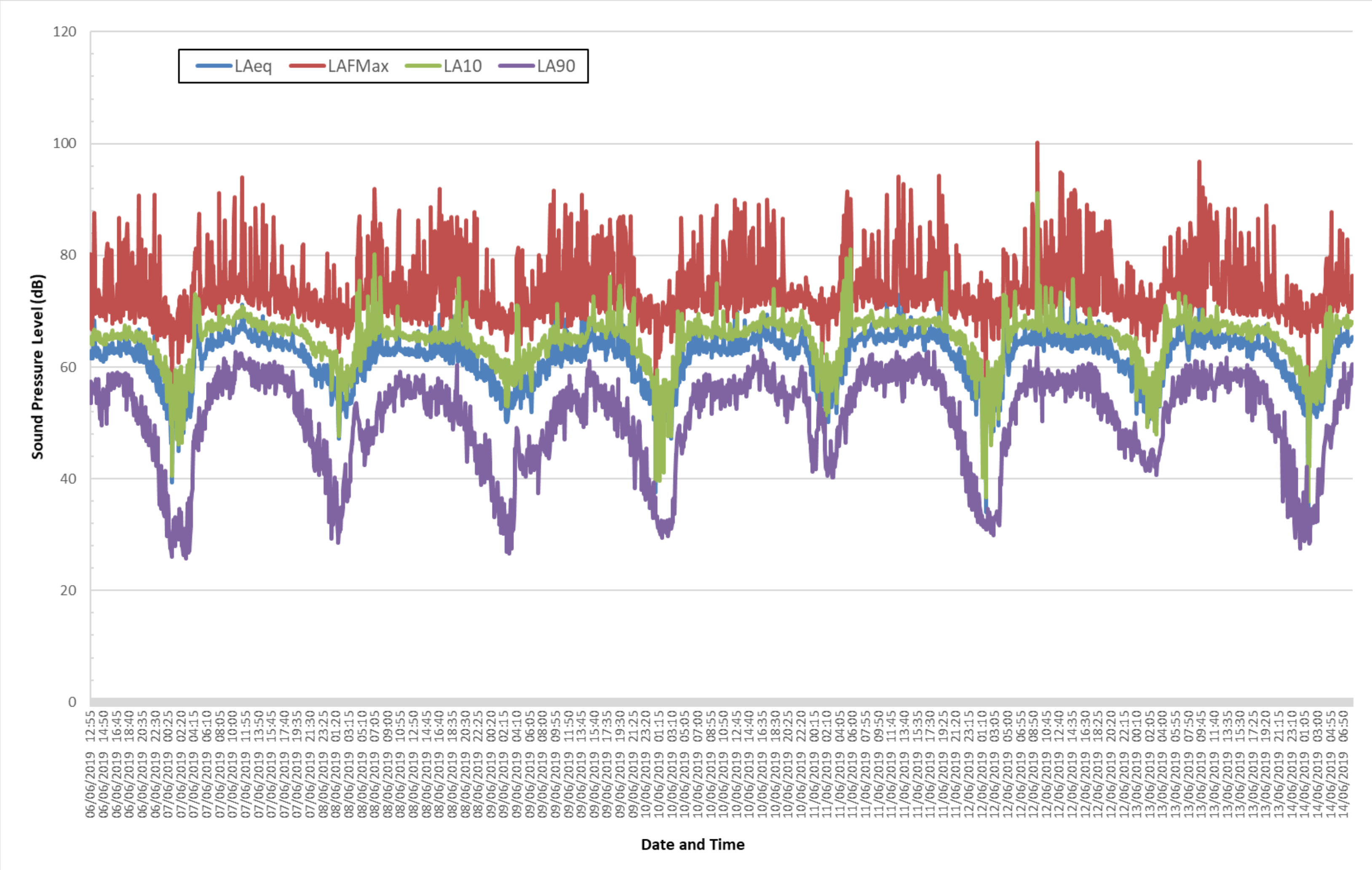
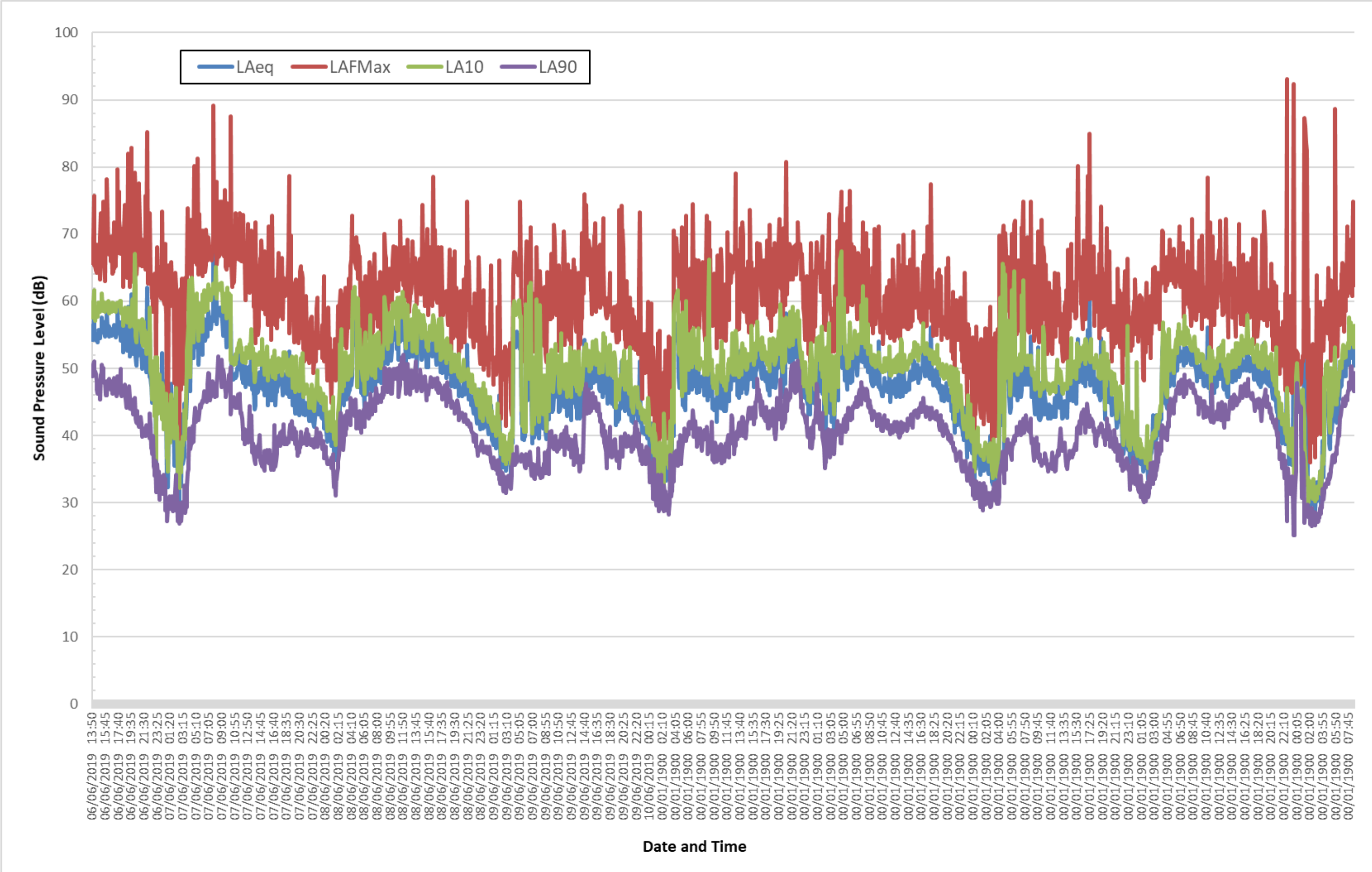


Figure 03-3
Graph of measured noise levels from the Baseline Sound Survey at monitoring position P2



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