SOUND IMPACT ASSESSMENT AT ECOBAT SOLUTIONS

Crescent Works Industrial Park,
Darlaston,
West Midlands,
WS10 8JR

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ACRONYMS/TERMS USED IN THE TEXT

AMIOA	Associate Member of the Institute of Acoustics
BS	British Standard
dB	Decibel
EA	Environment Agency
Ecobat	Ecobat Solutions UK Limited
ECL	Environmental Compliance Limited
Ha	Hectares
HGV	Heavy Goods Vehicles
LCSS	Large Commercial Shredder and Separator
LBRU	Lithium Battery Recycling Unit
MPT	Mechanical Pre-treatment
NGR	National Grid Reference
OS	Ordnance Survey
SIA	Sound Impact Assessment
SLM	Sound Level Meter
SPL	Sound Pressure Level
SSR	Sound Sensitive Receptor
STC	Sound Transmission Class
the Site	Crescent Works Industrial Park, Darlaston, West Midlands, WS10 8JR

1. SYNOPSIS

1.1. Non-Technical Summary

1.1.1. Environmental Compliance Limited ("ECL") were commissioned by Ecobat Solutions UK Limited ("Ecobat") to undertake a desktop sound impact assessment ("SIA") for the installation of a Large Commercial Shredder and Separator ("LCSS"), for lithium batteries, at their facility at Crescent Works Industrial Park, Darlaston, West Midlands, WS10 8JR ("the Site"). It is anticipated that this SIA will form part of a permit application to be submitted to the Environment Agency ("EA").

1.1.2. The LCSS is comprised of the following components:

- controlled atmosphere/enclosed processing, comprised of;
  - primary shredding;
  - density separation;
  - secondary shredding;
  - dewatering; and
  - drying auger
- dry shed separation, comprised of;
  - vibratory shaker;
  - cross belt magnet;
  - turbo mill; and
  - dust collection

1.1.3. In September 2022, ambient sound monitoring was carried out in accordance with British Standard ("BS") 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound. Monitoring was performed during daytime periods, at four sound sensitive receptor ("SSR") locations whilst on-site activities were operating as normal.

1.1.4. This data has been used as the residual and background data to calculate the specific sound level of the LCSS at the SSR locations and the likelihood of complaints from the SSR's due to the operation of the LCSS at the Site.

1.1.5. From the details of the sound impact assessment data provided in Table 6, it is shown that the assessment result of impacts, with no building attenuation, at SSR1 indicate that the specific sound source from the LCSS machine will have an 'adverse impact' depending on the context. The assessment result of impacts at SSR2, SSR3 & SSR4 indicate that the specific sound source from the LCSS machine will have a 'significant adverse impact' depending on the context.

1.1.6. From the details of the noise impact assessment data provided in Table 7, it is shown that the assessment result of impacts, with building attenuation, at SSR1 indicate that the specific sound source from the LCSS machine will have a 'low impact' depending on the context. The assessment result of impacts at SSR2, SSR3 & SSR4 indicate that the specific sound source from the LCSS machine will have an 'adverse impact' depending on the context.

2. INTRODUCTION

2.1. Overview

2.1.1. ECL were commissioned by Ecobat to carry out a desktop sound impact assessment to determine the potential degree of disturbance the operation of an LCSS may cause to SSR locations in the vicinity of the Site.

2.1.2. At the time of preparing this report, ECL are not aware of any historical or existing unwanted sound complaints made by residents at the SSR locations or other members of the public related to production activities at the Site.

2.2. Onsite Activities

2.2.1. The Site operates as a lithium battery recycling unit ("LBRU"). The external sound generating operational activities identified at the Site are:

- heavy goods vehicle ("HGV") movements to and from the Site;
- fork lift truck movements onsite;
- tipping scrap material into waste skips; and
- operation of building extract fans.

2.2.2. The site operates from 7am to 7pm, Monday to Friday.

3. THE SITE

3.1. Site Location and Setting

3.1.1. The Site is located at Crescent Works Industrial Park, Darlaston, West Midlands, WS10 8JR and occupies an area of approximately 2.5 Hectares ("Ha").

3.1.2. The location of the Site and the approximate site boundary (outlined in red) is provided in Figure 1.

Figure 1: Site Location and Approximate Site Boundary

3.1.3. Four SSR locations have been identified and are provided in Table 1 and shown in Figure 2.

Table 1: Potential Sound Sensitive Receptors

ECL Ref.	Description	Easting	Northing	Distance from Site (m)[(a)]	Heading (degrees)
SSR1	Residential Property at Queen Street	397763	297830	192	198
SSR2	Residential Property at Windsor Walk	397618	297810	294	225
SSR3	Residential Property at Oberon Grove	398190	298027	362	89
SSR4	Residential Property at Riverbank Road	397668	298324	343	333

Notes to Table 1

(a) Distances are measured from the LCSS location on the Site to the SSR.

Figure 2: Identified Potential Sound Sensitive Receptor Locations

3.2. Ground Conditions and Geographical Context of the Area

3.2.1. The Site is located approximately 1km to the north of Darlaston, all roadways and walkways within the Site boundary are covered in tarmac or paved. The areas surrounding the Site are predominantly industrial and residential with a few parkland areas.

3.2.2. A photographic record of the sound level meter ("SLM") at each SSR monitoring location was taken whilst the monitoring was being performed during daytime periods in September 2022. These photographs are provided in Figures 3 to 6.

Figure 3: Photograph of Offsite Monitoring Location SSR1

Figure 4: Photograph of Offsite Monitoring Location SSR2

Figure 5: Photograph of Offsite Monitoring Location SSR3

Figure 6: Photograph of Offsite Monitoring Location SSR4

4. EQUIPMENT AND METEOROLOGY

4.1. Sound and Meteorological Monitoring Equipment

4.1.1. Details of the instrumentation used during September 2022 to measure sound levels and meteorological data are provided in Table 2.

Table 2: Sound and Meteorological Monitoring Equipment

Instrument	Make / Model	Serial Number	Accreditation	Date of Certificate
Sound Level Meter	Casella CEL-63X	0849946	Casella	22/04/2021
Microphone	Casella CEL-495	001779	Casella	22/04/2021
Calibrator	Casella CEL-120/1	0649773	Casella	23/05/2022
Anemometer	Airflow LCA301	0259042	ECL (internal)[a]	05/07/2022
Weather Station	Oregon Scientific BAA913HG	ECL/ID/204	ECL (Internal)[b]	07/05/2022

Notes to Table 2
(a) Unit calibrated against UKAS accredited master unit (ECL/ID/490).
(b) Unit calibrated against UKAS accredited Master Unit (ECL/ID/111).

4.2. Field Calibration Checks and Meteorological Conditions

4.2.1. Calibration of the SLM microphone was carried out before and after each measurement period. The calibrator was attached to the end of the microphone and calibrated at a level of 114dB @ 1000Hz. When the SLM detects a steady tone, it automatically switches to the calibration screen allowing the calibration button to be pressed which starts the calibration procedure. Upon completion of the calibration procedure the SLM would display the calibration result and calibration offset, if any.

4.2.2. The meteorological conditions of wind speed, wind direction, ambient temperature, relative humidity, and cloud cover were recorded during each measurement period. Wind speed and direction was measured using a hand-held rotating vane anemometer. The instrument was held approximately 1.5m above ground level and rotated until the highest wind speed was recorded, the direction in which the anemometer was facing was used to determine the direction from which the wind was blowing. Ambient temperature and relative humidity were obtained using a thermo-hygrometer weather station. The weather station was positioned at a level of 1.5m above ground level and left to stabilise during the monitoring period, when the readings had stabilised, they were recorded. Cloud cover was visually estimated using the okta scale, with the convention that:

- 0 oktas represent the complete absence of cloud;
- 1 okta represents a cloud amount of 1 eighth or less, but not zero;
- 7 oktas represent a cloud amount of 7 eighths or more, but not full cloud cover; and
- 8 oktas represent full cloud cover with no breaks.

4.2.3. Details of the pre and post calibrations and meteorological conditions during each measurement period from September 2022 are provided in Table 3. Upon completion of the monitoring, the data was downloaded into the Casella Insight Data Management software programme, Version 199.005.17.00, for analysis and interpretation.

Table 3: Calibration and Meteorological Conditions

Period	Site Condition	Location	Calibration Offset Pre / Post (dB)	General Weather Conditions	Wind Speed (max m/s) / Direction	Relative Humidity (%)	Ambient Temperature Pre / Post (ºC)	Cloud Cover (oktas)
Daytime Measurements	Normal Operations	SSR1	0.1 / -0.1	Dry, Light Breeze	3 / South	85	20 / 20	8
		SSR2	-0.1 / 0.0	Dry, Light Breeze	2 / South West	82	20 / 20	8
		SSR3	-0.1 / -0.1	Dry, Light Breeze	2 / North	88	12 / 13	7
		SSR4	0.0 / 0.1	Dry, Light Breeze	2 / North	82	14 / 14	6

5. METHODOLOGY

5.1. Sound Impact Assessment Monitoring Methodology

5.1.1. Sound level monitoring was performed at all SSR's during daytime periods, in accordance with BS 4142:2014+A1:2019.

5.1.2. Monitoring was performed using a Class 1 SLM, using fast time weighting, which conforms to the requirements of BS EN 61672-1. All measurements of the residual sound level and the background sound level were taken at heights of between 1.2m to 1.5m above ground level and under similar conditions. Measurements were taken at least 3.5m from any reflecting surface, other than the ground, to minimise the influence of reflections.

5.1.3. Weather conditions of wind speed and direction, relative humidity, ambient temperature, and cloud cover were recorded over each measurement period. Care was taken to avoid making measurements in poor weather conditions such as wind speeds greater than 5m/s. No monitoring was performed during periods of fog or precipitation.

5.1.4. Monitoring was performed as required at each SSR location during the daytime (07:00h to 23:00h), for a period of 1 hour.

5.1.5. A field calibration check of the SLM was performed at the beginning of every measurement by means of an externally calibrated sound calibrator, the calibration was repeated at the end of the measurement period to determine calibration drift over the monitoring period.

5.1.6. During each monitoring period a subjective record was made of the predominant sound source in the vicinity of the monitoring location; any sound that could be determined to emanate from the site and any off-site sound producing activities that may have affected the measurement results.

5.1.7. The specific sound level at the assessment location is calculated by correcting the ambient sound level to remove the contribution of the residual sound level using the following equation:

$$L_s = 10\text{Log}\,(10^{La/10} - 10^{Lr/10})$$

where: L_s is the Specific Sound Level
L_a is the Ambient Sound Level
L_r is the Residual Sound Level

5.1.8. The BS states that, where appropriate, a subjective rating penalty shall be applied correcting the specific sound level if a tone, impulse or other characteristic occurs as follows:

- tonality: a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible and 6dB where it is highly perceptible;
- impulsivity: a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible and 9dB where it is highly perceptible; and
- intermittency: a penalty of 3dB if the intermittency is readily distinctive against the residual acoustic environment.

In order to represent a worst-case scenario, a subjective rating penalty of +3dB for intermittency and +3dB for impulsivity has been applied to the specific sound level at each of the SSR locations.

5.1.9. The significance of the industrial sound from the operation of the LCSS was assessed depending upon the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

5.1.10. An initial estimate of the impact of the specific sound was obtained by subtracting the measured background sound level from the rating level, which is equivalent to the specific sound level if no subjective rating penalty is applied. Typically, the greater this difference the greater the magnitude of the impact:

- a difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- a difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and
- 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.

5.1.11. Manufacturers data, provided by the Site, was used to calculate the accumulative sound level emitted by the equipment associated with the LCSS. Data provided by the site identified 52 individual sound sources with sound pressure levels (“SPL”) ranging from 62 to 85 dB(A). In order to represent the worst-case scenario, these SPL’s were added to provide an overall accumulative SPL of 92.4dB(A) from the LCSS measured at 5m distance.

5.1.12. To determine the potential sound contribution from the LCSS at each of the SSR locations, a distance attenuation calculation of the sound level at 5m from the LCSS was carried out. The distance attenuation calculation enables an analysis of how sound propagates in the air, the further away from the sound source the receptor location is, the lower the perceived sound intensity would be expected to be. The distance attenuation calculation was performed using the following formula:

$$L2 = L1 - \left[20 \log \left(\frac{r2}{r1}\right)\right].$$

where: L1 is the sound pressure level at point 1
L2 is the sound pressure level at point 2
r1 is the distance from the sound source to point 1
r2 is the distance from the sound source to point 2

5.1.13. The resulting SPL contribution from the LCSS at each of the SSR locations was then added to the ambient sound levels measured during monitoring performed in September 2022 to provide the calculated ambient SPL with the LCSS in operation at each of the SSR locations for use in the assessment. This date is provided in Table 4.

Table 4: Calculated Ambient SPL at SSR Locations

Location	Distance From LCSS (m)	Measured LCSS SPL dB(A) (measured at 5m)	Calculated LCSS SPL at SSR Locations dB(A)	Ambient SPL at SSR Locations (September 2022) dB(A)	Calculated Ambient SPL at SSR Locations dB(A)
SSR1	192	92.4	60.7	64.4	65.9
SSR2	294		57.0	55.4	59.3
SSR3	362		55.2	60.8	61.9
SSR4	343		55.7	45.4	56.1

6. SOUND MONITORING DATA AND PREDICTIONS

6.1. Off-site SSR Measurement Data

6.1.1. Sound level measurements were carried out at each SSR location during daytime periods on the 12th and 13th September 2022.

6.1.2. The data measured during the sound impact assessment is provided in Table 5 and assessment of the impacts at the SSR locations, based on the ambient sound levels after installation of the LCSS at the Site, is presented in Table 6.

6.1.3. However, these calculations do not take into account any sound attenuation provided by the building in which the LCSS will be housed. The LCSS will be housed in Unit 3 of the Site, upon refurbishment this building will be constructed with double skinned breeze block walls will insulation within the wall cavity. There will also be 3 fast action, auto closing, roller shutter doors installed for vehicle access to the building, the roof is currently constructed of corrugated sheeting with skylights and there are currently no plans to improve sound insulation of the building roof.

6.1.4. A typical single leaf block wall has a sound transmission class ("STC") rating of 40 to 55 dB and a correctly fitted roller shutter door may reduce sound transmission by as much as 80%.

6.1.5. Assuming all roller shutter doors in the building are closed, and the building has a minimum STC of 40dB, the sound impact assessment of the operation of the LCSS at the SSR locations has been recalculated and the results are presented in Table 7.

Table 5: SSR Locations dB Sound Monitoring Data, Daytime

Location	Date / Time	Site Condition	Residual Sound Level $L_{Aeq,T}$	Background Sound Level $L_{A90,T}$	Subjective Comment
SSR1	12th September 2022 / 14:53 to 15:53	Site activities operating normally	65.6	53.0	Dominant sound from traffic on Willenhall Road. Compressor and generator sound from industrial unit to the east. No discernible sound from the direction of the Site.
SSR2	12th September 2022 / 16:04 to 17:04		52.5	50.0	Vehicle reverse siren from industrial unit to the north east. Low traffic sound. Small aircraft passing overhead. No discernible sound from the direction of the Site.
SSR3	13th September 2022 / 08:29 to 09:29		59.4	53.5	Dominant sound from traffic on Bentley Road south and from the scrapyard to the south. Constant sound from metal being moved throughout the monitoring period. No discernible sound from the direction of the Site.
SSR4	13th September 2022 / 09:44 to 10:44		43.6	41.0	Low traffic sound in the distance. No discernible sound from direction of the Site.

Table 6: Sound Impact Assessment Monitoring Results, Without Building Attenuation

Location	Calculated Ambient Sound Level L_a	Residual Sound Level L_r	Specific Sound Level L_s	Rating Penalty dB	Rating Level dB	Background Sound Level $L_{A90,T}$	Excess of Rating Over Background Sound Level dB	Assessment Results
SSR1	65.9	65.6	54.8	6[(a)]	60.8	53.0	8	Indication of an adverse impact
SSR2	59.3	52.5	58.3	6[(a)]	64.3	50.0	14	Indication of a significant adverse impact
SSR3	61.9	59.4	58.2	6[(a)]	64.2	53.5	11	Indication of a significant adverse impact
SSR4	56.1	43.6	55.8	6[(a)]	61.8	41.0	21	Indication of a significant adverse impact

Notes to Table 6

(a) A +6dB penalty has been added to the specific sound level to represent a worst-case scenario.

Table 7: Sound Impact Assessment Monitoring Results, With Building Attenuation

Location	Calculated Ambient Sound Level	Residual Sound Level	Specific Sound Level	Rating Penalty	Rating Level	Background Sound Level	Excess of Rating Over Background Sound Level	Assessment Results
	L_a	L_r	L_s	dB	dB	$L_{A90,T}$	dB	
SSR1	64.4	65.6	0	6[(a)]	0	53.0	0	Indication of a low adverse impact
SSR2	55.4	52.5	52.3	6[(a)]	58.3	50.0	8	Indication of an adverse impact
SSR3	60.8	59.4	55.2	6[(a)]	61.2	53.5	8	Indication of an adverse impact
SSR4	45.4	43.6	40.7	6[(a)]	46.7	41.0	6	Indication of an adverse impact

Notes to Table 7

(a) A +6dB penalty has been added to the specific sound level to represent a worst-case scenario.

7. SOUND IMPACT ASSESSMENT

7.1. Determination of Degree of Impact of Site Activities on SSR Locations

7.1.1. In September 2022 sound level monitoring was performed at four locations identified as potential SSR locations that may be affected by sound generating activities carried out at the Site. The monitoring was performed in accordance with the requirements of the Reference Method BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.

7.1.2. The methods described in the BS use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside of a dwelling or premises used for residential purposes upon which sound is incident.

7.1.3. Monitoring was performed over two days during daytime periods whilst normal on-site activities were being performed. In accordance with the BS, monitoring was performed at each location, during each monitoring period, over an appropriate reference time interval of 1 hour during the day.

7.1.4. All monitoring was manned by a trained operator and a subjective record taken of the perceived dominant noise source at each location and any specific events that occurred during the monitoring periods that may affect the measured noise levels.

7.1.5. During each monitoring period at the SSR locations, the operator perceived that the predominant sound source was traffic on the roads or activities at nearby industrial units adjacent to the monitoring locations. Sound levels from the direction of the site could not be determined during any monitoring periods at any SSR locations.

7.1.6. The data collected in September 2022 was used in a desktop study to determine the degree of impact sound associated with the addition of an LCSS to the Site may have at the SSR locations.

7.1.7. The cumulative sound level of equipment associated with the LCSS was calculated and corrected for distance attenuation to each of the SSR locations. These figures where then added to the ambient sound levels measured during the monitoring in September 2022, to enable new ambient SPLs to be determined at each of the SSR locations.

7.1.8. This data was used to determine the potential impact at each of the SSR locations whilst the LCSS was operational without any sound attenuation provided by the building in which it would be housed, i.e. with building roller shutter doors open, and also with sound attenuation provided by the building in which the LCSS will be housed, i.e. roller shutter doors closed.

7.1.9. From the details of the sound impact assessment data provided in Table 6, it is shown that the assessment result of impacts, with no building attenuation, at SSR1 indicate that the specific sound source from the LCSS machine will have an ‘adverse impact’ depending on the context. The assessment result of impacts at SSR2, SSR3 & SSR4 indicate that the specific sound source from the LCSS machine will have a ‘significant adverse impact’ depending on the context.

7.1.10. From the details of the noise impact assessment data provided in Table 7, it is shown that the assessment result of impacts, with building attenuation, at SSR1 indicate that the specific sound source from the LCSS machine will have a 'low impact' depending on the context. The assessment result of impacts at SSR2, SSR3 & SSR4 indicate that the specific sound source from the LCSS machine will have an 'adverse impact' depending on the context.

7.1.11. The latest edition of BS 4142:2014+A1:2019 recognises the importance of the context in which a sound occurs. To fully understand the context in which the sound from an industrial and/or commercial source is being assessed, the sources of sound which comprise the acoustic environment must be described and reported. In the subjective comments for each of the SSR locations provided in Table 5, it is shown that, for SSR1, SSR2 and SSR3, the dominant sound sources are road traffic and sound from industrial sources in the vicinity of the SSR's, whereas at locations SSR4 there is low sound from vehicle traffic and no sound from industrial sources. Therefore, given the context of the acoustic environments at each of the SSR locations, it is far more likely that the operation of the LCSS and associated equipment will have a significant adverse impact and be perceived as unwanted sound at location SSR4 than the other SSR locations.

8. UNWANTED SOUND CONTROL

8.1. Prevention or Control of Impact of Site Activities on SSR Locations

8.1.1. As described in Section 7 of this report, it is considered that, without sound attenuation provided by the building, the operation of the LCSS is likely to have an adverse and significant adverse impact at all of the SSR locations.

8.1.2. With sound attenuation provided by the building, the operation of the LCSS is likely to have no adverse impact as SSR1 and an adverse impact at locations SSR2, SSR3 and SSR4.

8.1.3. ECL would recommend that all exterior personnel and roller shutter doors remain closed whilst the LCSS is operational and consideration is given to increasing insulation of the building roof. ECL would also recommend that, once the LCSS is installed and operating, a full noise assessment is performed at each of the SSR locations to determine the actual adverse impact at each of the SSR locations in accordance with the BS.

8.1.4. ECL recommends the continued implementation of the documented periodic maintenance and repair schedule for all equipment on the Site. The documentation should include all scheduled maintenance and repairs carried out on all equipment in order to determine any decline in performance of the equipment over time.

8.1.5. ECL also recommend the Site perform periodic boundary sound monitoring to determine any changes in the intensity of the sound over time. ECL is not advising that the Client should invest in a fully compliant SLM and associated equipment as the monitoring would only be performed to provide an indication of change in the potential impact of the on-site sound generating activities. However, should the periodic monitoring suggest on-site sound levels are increasing, we would then recommend fully compliant monitoring of the sound generating activities on the Site and monitoring at the SSR locations is repeated to determine the potential degree of impact on the SSR's.

9. UNCERTAINTY

9.1. Description of Uncertainties

9.1.1. The level of uncertainty associated with the measurement of the sound level depends on a number of factors, including;

- the complexity of the sound source and the level of variability in sound emission from the source;
- the complexity and level of variability of the residual acoustic environment;
- the level of residual sound in the presence of the specific sound at the measurement location(s);
- the location(s) selected for taking the measurements;
- the distance between the sources of sound and the measurement location and intervening ground conditions;
- the number of measurements taken;
- the measurement time intervals;
- the range of times when the measurements have been taken;
- the measurement method and the variability between different practitioners in the way the method is applied;
- the level of rounding of each measurement recorded; and
- the instrumentation used.

9.1.2. Due to the number of individual sound sources that will comprise the LCSS, the complexity and variability of the sound can be considered to be high. Therefore, for this study, it was assumed that all sound generating sources would be emitting sound at the maximum levels provided in the manufacturers data at all times. In actuality, it is likely that all sound generating sources will be operational during all periods of operation of the LCSS.

9.1.3. At each of the SSR locations, it was determined that the residual acoustic environment was complex and composed of many sources in the local area, including vehicle traffic on the surrounding road networks, activities from other commercial properties and activities at residential properties. Monitoring at each of the SSR locations was performed during weekdays, over daytime periods, whilst the site was operational. However, the complexity of the residual acoustic environment did not affect the complexity of the sound emitted from the site and therefore the uncertainty associated with the measurement of the sound level from the Site at each of the SSR locations is considered to be low.

9.1.4. The level of uncertainty associated with the measurement of the sound level with regards to the level of residual sound in the presence of the specific sound at each of the measurement locations is considered to be low. It is not considered that the level of the residual sound will vary significantly whether the specific sound is present or not.

9.1.5. The level of uncertainty associated with the measurement of the sound level with regards to the locations selected for taking the measurements is considered to be low. The SSR locations were chosen as they are the nearest residential areas to the Site and are representative of the type of residential accommodation within the local area.

9.1.6. The level of uncertainty associated with the distance between the sound source and the measurement locations and intervening ground conditions can be considered to be low. All measurements were carried out as close to the identified SSR locations as possible, ground conditions between the SSR's and the Site are considered to be representative of the surrounding area, being comprised of residential/commercial areas or open ground.

9.1.7. The level of uncertainty associated with the number of measurements taken is considered to be low. Measurements were taken during the normal operating time of the site, on week days between 7am and 7pm. During each of the monitoring periods it was determined that activities taking place at each of the SSR locations were representative of the general activities that could be expected in the residential areas.

9.1.8. The level of uncertainty associated with the measurement time intervals is considered to be low. Measurements were taken in accordance with the requirements of the BS, that is, 1 hour measurements during daytime periods (07:00hrs to 23:00 hrs). Measurements were taken during periods when sound generating activities were occurring at the Site as normal and are considered as representative.

9.1.9. The level of uncertainty associated with the weather conditions when measurements were taken is considered as low. All measurements were taken during periods of acceptable weather conditions, that is, with wind speeds of less than 5m/s and no precipitation.

9.1.10. The level of uncertainty associated with the measurement method and variability between different practitioners in the way the method is applied is considered to be low. All sound level measurements followed the methodology detailed in Section 5 of this report and the same ECL operator, Andy Parks, carried out the measurements. Therefore, the application of the method and identification and classification of sound events in the acoustic environment can be considered to be consistent.

9.1.11. The level of uncertainty associated with the rounding of each measurement recorded is considered to be low. All measurement data was recorded from the SLM either immediately upon completion of the monitoring period or after completion of the monitoring periods and subsequent data download of the instrument. All of the measurement data was put into Microsoft Excel spreadsheets to one decimal place, as recoded from the instrument or data download, and all rounding of figures was performed using the Microsoft Excel spreadsheet. Therefore, the rounding of each measurement recorded can be considered to be consistent.

9.1.12. The level of uncertainty associated with the instrumentation is considered to be low. Monitoring was performed using instrumentation which conforms to BS EN 61672-1, Class 1, for free-field application. The measurement time interval and range of times when measurements were taken were in accordance with the requirements of BS 4142:2014+A1:2019.

10. CONCLUSIONS

10.1. Conclusions and Next Steps

10.1.1. The sound impact assessment determined that sound generating activities associated with the operation of the LCSS at the Site were likely to have any adverse impact at the SSR locations.

10.1.2. Therefore, the sound generating activity of operating the LCSS at the Site is considered to be potentially significant, and further monitoring is likely to be required once the LCSS is installed and operational.

10.1.3. Although the information provided for use in this study is limited, further consideration needs to be given to the level of sound abatement provided by the building in which the LCSS will be housed to reduce the likelihood of an adverse impact at the SSR locations to acceptable levels.