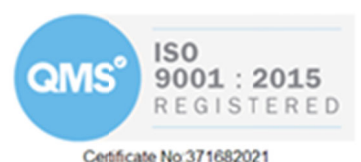


BRITON FERRY WHARF NOISE IMPACT ASSESSMENT

Prepared for: **Camplas Technology Ltd**

By: **Steve Owen**

Date: **March 2022**



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BRITON FERRY WHARF
NOISE IMPACT ASSESSMENT

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EXECUTIVE SUMMARY AND CONCLUSIONS

This document has been written to assess the impact of noise ‘pollution’ generated by the proposed development of a GRP Production Facility on land off of Wharf Road, Briton Ferry, Neath, SA11 2HZ (easting: 273387, northing: 193732).

The objective is to ensure that the risk of noise impact will be controlled sufficiently. This is based upon ensuring that the noise emissions from the development will not cause a significant increase in existing background noise levels outside noise-sensitive receptors (residential properties) in the surrounding area, once it is fully operational.

Therefore, the noise emissions from the proposed development have been assessed following a BS 4142:2014+A1:2019 methodology, based upon existing background noise levels determined by a baseline noise survey and subsequent predictions of the noise emissions using a detailed 3D noise model – based on an indicative worst-case scenario.

In summary, the assessment has been made against minimum background noise levels within the (assumed) potential operating hours of 06:00 – 21:00, a minimum value of 50 dB LA90,15min, a relatively high level as the site and surrounding area is affected by significant road traffic noise from the M4. The predicted rating level at the worst affected receptor is 53 dB, 3 dB above the representative background noise level.

Therefore, to bring the rating level below the background sound level, ExCAL has recommended that the applicant should install a 3m high fence/barrier along parts of the site boundary, as indicated in Section 5.5.

This action would reduce the rating level to 48 dB, that is, 2 dB below the background sound level. BS 4142:2014+A1:2019 indicates that “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.” Contextual factors (as explained in Section 5.5.2) should mean that the impact is acceptably low.

This is providing that the applicant installs the noise barrier as recommended, and the operational hours are limited to between 06:00 and 21:00.

A DMRB assessment (see Section 6.0) has also been conducted to look at the effect of traffic generated by the development on local roads, finding a negligible increase in ambient noise levels of 0.4 dB.

Nonetheless, ExCAL has recommended measures to ensure that noise emissions are kept at an acceptable level on an ongoing basis – that could be adopted by future occupants, as outlined in Section 7.0.

1.0 INTRODUCTION

ExCAL Limited has been instructed to undertake a Noise Impact Assessment (NIA) as part of the planning application for the development of a GRP Production Facility on land off of Wharf Road, Briton Ferry, Neath, SA11 2HZ (easting: 273387, northing: 193732).

1.1 Scope of Report

This NIA Report has been written to assess the impact of noise 'pollution' generated by the proposed development on noise-sensitive receptors (residential properties) in the surrounding area, once it is fully operational. The objective is to ensure that the risk of noise impact will be controlled sufficiently. This is based upon ensuring that the noise emissions from the development will not cause a significant increase in existing background noise levels outside nearby residential properties once operational.

Therefore, the purpose of this report is to determine what the existing ambient noise levels are at the site and surrounding residential receptors; set appropriate noise level criteria based upon these pre-existing levels and other recognised residential noise guidelines; and finally, demonstrate whether the development can be designed to mitigate noise levels to meet these noise level limits successfully – and if not, provide recommendations on how to mitigate the impact to an acceptable level.

Whilst every attempt has been made to ensure that this report communicates effectively to a reader who might not have much knowledge of acoustics, some parts are necessarily technical. A glossary of acoustic terminology and concepts is provided in Appendix A.

1.2 Regulations and Guidelines

The assessment has been made with reference to several guidelines, including: -

- TAN 11 - 'Technical Advice Notes (Wales) 11, Noise – October 1997';
- BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound', which assesses the risk of adverse impact of noise pollution from a sound source (or sources) of a commercial or industrial nature;
- BS 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings';
- the WHO Environmental Noise Guidelines for the European Region;
- the Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 7 'Noise and Vibration' – in assessing noise impacts from additional traffic on local roads.

These standards are commonly used across the UK to assess noise impacts on residential properties, and impacts arising from noise sources of a commercial/industrial nature.

2.0 SITE AND DEVELOPMENT DESCRIPTION

As shown in Figure 2.1, the proposed development site is located on land off of Wharf Road, Briton Ferry, Neath, SA11 2HZ (easting: 273387, northing: 193732).

The application site comprises an area of wharf within Briton Ferry Industrial Estate. The site comprises principally of hardstanding and a number of walls enclosing various stocking areas across the site. A small building and temporary storage containers are located within the centre of the site, whilst a concrete batching plant was located within the eastern confines of the site. The application site has been utilised as a wharf facility dating back prior to 1976.

The site is bound by the River Neath to the west, beyond which is a marina. A traveller's site and scrub land bound the site immediately to the north, beyond which are the M4 and A48. A scrap yard and a further traveller's site sit to the east. The wider area is characterised by a variety of industrial and employment uses.

The site is currently vacant greenfield land, bordered to the south by the A74(M), and the north by the B7076 public road. A domestic dwelling sits on the western boundary of the site, the closest noise-sensitive receptor.

Other receptors are located further along the B7076. The proposed access point to the site is some 150m southeast of the access point to the closest residential dwelling.

The indicative proposals at this stage are for a GRP Production Facility, houses within 2 no. warehouse style buildings with large sectional loading doors on the north and south elevations, with car parking on the west side, as shown in Figure 2.2 and Figure 2.3.

At this stage, the main noise emissions are expected to arise from external activities including vehicles in and out of the site, including regular cars and HGVs (i.e. a 4.6t box van), and forklift trucks. Noise will also arise from internal noise breaking out through the building envelope.

There is not any external plant at this stage of the design, hence it is expected that future occupants may be required to submit a further planning application (with noise assessment) as and when plant is installed.

Whilst the exact operational times are not known, it is anticipated that the site would most like operate anytime between 06:00 and 21:00.

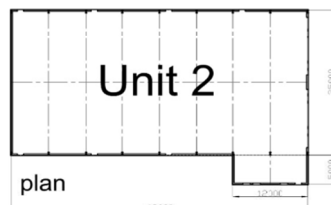
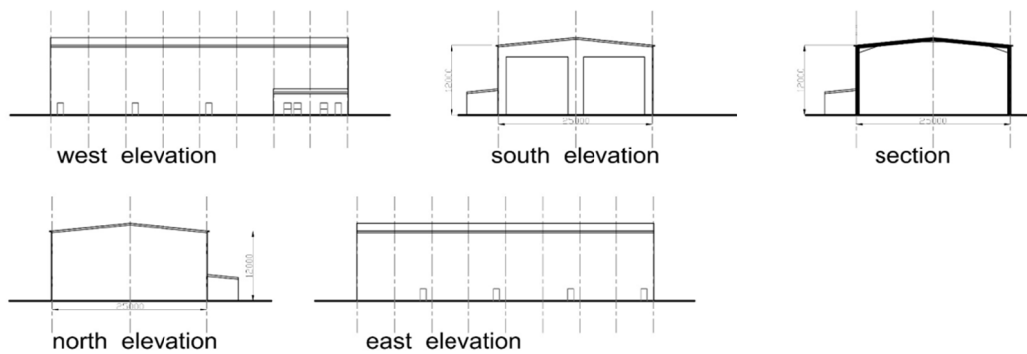
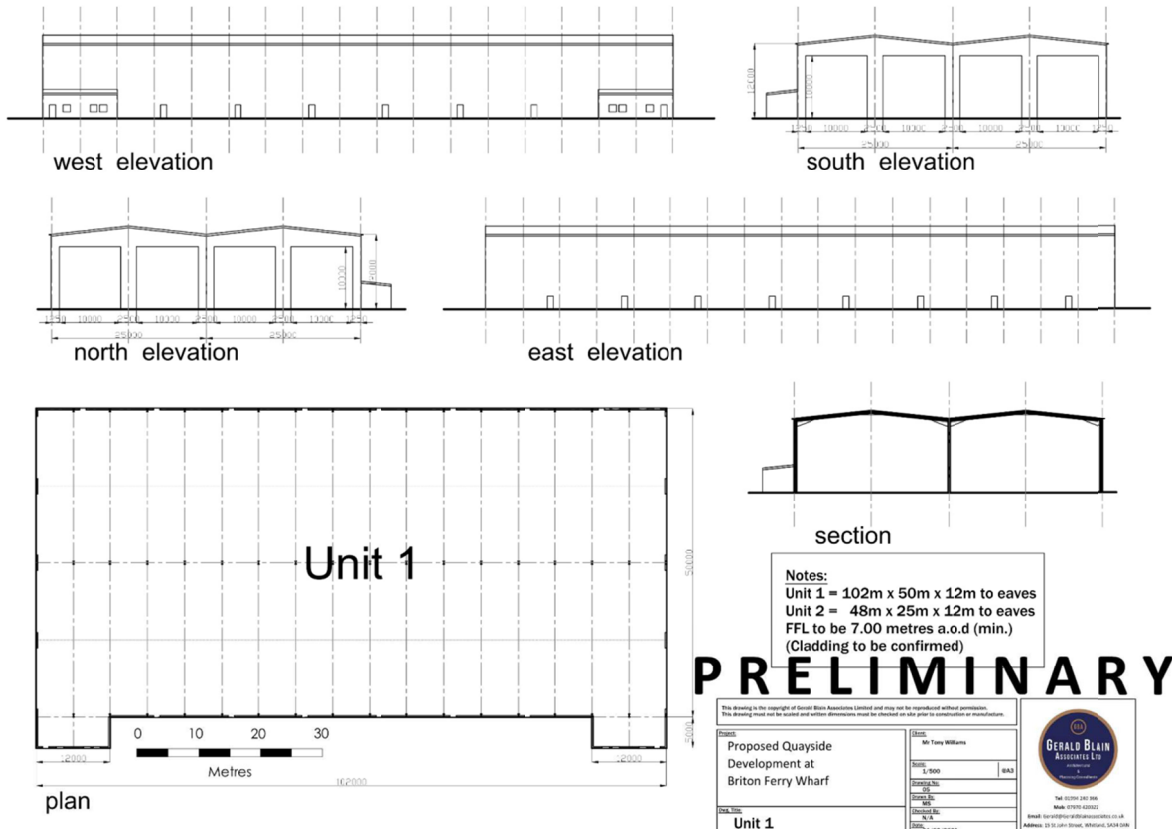
Figure 2.1 – Site location and surrounding area



Figure 2.2 – Preliminary block plan



Figure 2.3 – Proposed elevations of Unit 1 (top) and Unit 2 (bottom)



Notes:

- Unit 1 = 102m x 50m x 12m to eaves
- Unit 2 = 48m x 25m x 12m to eaves
- FFL to be 7.00 metres a.o.d (min.)
- (Cladding to be confirmed)

PRELIMINARY

This drawing is the copyright of Gerald Blain Associates Limited and may not be reproduced without permission. This drawing must not be scaled and written dimensions must be checked on site prior to construction or manufacture.

Proposed Quayside Development at Briton Ferry Wharf

Unit 2

Mr Terry Williams

Drawn: T. Williams
Scale: 1:500
Drawing No: B43
Date: 01/03/2022
Check: G. Blain
Date: 01/03/2022

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3.0 RELEVANT GUIDELINES

3.1 Technical Advice Note 11 (TAN 11)

'Technical Advice Notes (Wales) 11, Noise – October 1997' gives guidance on the control of noise to sensitive developments which may be affected by noise and vice versa. With regards to noise generation from industrial sites, it states: -

"B17. The likelihood of complaints about noise from industrial development can be assessed, where the Standard is appropriate, using guidance in BS 4142: 1990. Tonal or impulsive characteristics of the noise are likely to increase the scope for complaints and this is taken into account by the "rating level" defined in BS 4142. This "rating level" should be used when stipulating the level of noise that can be permitted. The likelihood of complaints is indicated by the difference between the noise from the new development (expressed in terms of the rating level) and the existing background noise.

The Standard states that, 'A difference of around 10 dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance'. Since background noise levels vary throughout a 24 hour period it will usually be necessary to assess the acceptability of noise levels for separate periods (e.g. day and night) chosen to suit the hours of operation of the proposed development. Similar considerations apply to developments that will emit significant noise at the weekend as well as during the week. In addition, general guidance on acceptable noise levels within buildings can be found in BS 8233:1987."

3.2 BS 4142:2014

BS 4142:2014 '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 (NSR) locations (i.e. residential windows) within the context of the existing sound environment.

The method is based upon assessing the predicted noise emissions from plant/equipment against the existing background sound levels at NSRs, the latter of which is determined by a noise survey conducted at the site.

The predicted noise emissions are termed as a 'rating level', which is the 'specific sound level' from plant (the actual measurable noise level), plus 'penalties' which account for whether the noise has distinguishing characteristics such as tonality, intermittency, impulsivity, or is generally distinguishable from the ambient noise environment. Such features may attract attention and be considered annoying, hence sounds with these qualities should be penalised over sounds at the same specific noise level which is less intrusive.

The general aim is for the 'rating level' (plant noise emissions) to not exceed the existing background sound levels outside of residential windows. BS 4142:2014 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."

Appendix B explains the methodology in further detail.

3.3 BS 8233:2014

BS 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' suggests appropriate criteria and limits for different situations. This includes internal noise criteria for residential developments. The limits with BS 8233:2014 are similar to those in the WHO's 'Guidelines for Community Noise and Night Noise Guidelines for Europe' document.

Table 4 of BS 8233:2014 provides internal ambient noise level (IANL) limits for dwellings from "steady external noise sources". These are summarised in Table 3.1 below.

Table 3.1 – BS 8233:2014 internal ambient noise level (IANL) upper limits

Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Resting	Living Room	35 dB LAeq,16hr	-
Dining	Dining Room/Area	40 dB LAeq,16hr	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq,16hr	30 dB LAeq,8hr

Annex G.1 of BS 8233:2014 suggests that “if partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB”. Therefore, a noise limit directly outside of the nearest residential windows could be set based upon the values above plus 15 dB.

Therefore, to meet internal noise targets in nearby residential dwellings, noise from the proposed plant should not exceed 50 dB LAeq during the daytime and 45 dB LAeq during the night-time when measured/calculated directly outside of a residential bedroom or living room window.

3.4 World Health Organisation (WHO) Environmental Noise Guidelines

The WHO document Guidelines for Community Noise 1999 has recently been superseded by the Environmental Noise Guidelines for the European Region. However, the updated guidance states that ‘all WHO guidelines for community noise (CNG) indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid’.

The document sets out guidance as to noise levels at which there will be an unacceptable impact on the local community. WHO guidelines state: -

- To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB LAeq for a steady, continuous noise;
- To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB LAeq.

3.5 Design Manual for Roads and Bridges (DMRB)

The Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 7 ‘Noise and Vibration’ should be considered for a development that may alter traffic noise levels on an existing road.

For a change in road traffic noise to be audible, an increase or decrease of 3 dB is typically required. Table 3.2 details the magnitude of noise impacts both in the short term (weeks and months) and the long term (years) as published in DMRB 11.3.7.

Table 3.2 - Magnitude of Impact from Increased Traffic Noise Levels

Noise Change LA10,18hr dB	Short Term Magnitude of Impact
0.0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor Adverse
3.0 – 4.9	Moderate Adverse
5.0+	Major Adverse
Noise Change LA10,18hr dB	Long Term Magnitude of Impact
0.0	No change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor Adverse
5.0 - 9.9	Moderate Adverse
10.0+	Major Adverse

4.0 BASELINE NOISE SURVEY

4.1 Methodology

ExCAL has attended the site and surrounding area to conduct a baseline noise survey between Thursday the 17th of February and Wednesday the 23rd of February 2022.

The results have been used to determine a representative background sound level (LA90) in accordance with BS 4142:2014, and typical ambient noise levels (LAeq) for assessment against other relevant standards - at a position representative of the background sound levels at the boundary of nearest/worst-affected residential property.

A single monitoring position was employed with a sound level meter installed close to the boundary of the site towards the nearest residential properties (the traveller's site to the east) – the location of which is shown in Figure 21 (Section 2.0). The microphone was positioned at a height of approximately 1.5m.

The sound level meter was set to log noise levels over continuous 15-minute averaging periods with a 1-second time history rate. 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 meter. The following noise indices were recorded (amongst others): -

- LAeq,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 ambient sound level;
- LAFmax,T : The maximum A-weighted noise level during the measurement period T and the best representation of short high noise levels 'events' – i.e. emergency services sirens;
- LA90,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 noise level – or noise levels from continuous noise sources such as plant; and
- LA10,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 a good representation of traffic noise contributions.

Appendix C contains further information on the methodology of the survey including photographs taken from site and the equipment used.

4.2 Results

A graph of the measured noise levels across the entire monitoring period is given in Figure 4.1 overleaf. The noiseclimate at the site is dominated by road traffic along the M4.

Table 4.1 provides a summary of the noise levels measured during the daytime (07:00 – 23:00), night-time (23:00 –07:00), and potential operational hours (06:00 – 21:00).

It is noted that wind speeds were exceptionally high for large periods during the first few days of the survey in particular and that ambient noise levels during this period were generally not representative. However, the length of the survey ensured that representative levels could be captured during periods of lesser/normal wind speeds. As the assessment is based upon the minimum background sound levels (the lowest LA90,15min value across the entire survey), the adverse weather conditions/inflated noise levels during the first few days can be ignored.

The most relevant parameter in terms of the 'representative background sound level' referenced in BS 4142:2014 is the LA90,15min. Figure 4.2 presents histograms of the LA90,15min values during the periods referenced in the table below, showing modal values of 59 dB (day), 48 dB (night) and 59 dB (operational hours) respectively, and minimum values of 48 dB, 39 dB and 50 dB.

Table 4.1 – Summary of measured noise levels at the monitoring position

Period	Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
Daytime (07:00 – 23:00)	LAeq,15min (dB)	75	51	64	60	61	61
	LAFMax,15min (dB)	92	56	N/A	72	66	70
	LA10,15min (dB)	79	52	N/A	62	63	63
	LA90,15min (dB)	68	48	N/A	57	59	57
Night-time (23:00 – 07:00)	LAeq,15min (dB)	67	47	56	54	54	53
	LAFMax,15min (dB)	88	55	N/A	66	60	65
	LA10,15min (dB)	71	50	N/A	56	52	56
	LA90,15min (dB)	60	39	N/A	49	48	49
Potential operational hours (06:00 – 21:00)	LAeq,15min (dB)	75	53	64	61	61	61
	LAFMax,15min (dB)	92	59	N/A	72	67	72
	LA10,15min (dB)	79	54	N/A	63	63	63
	LA90,15min (dB)	68	50	N/A	57	59	58

Figure 4.1 – Time history of measured noise levels

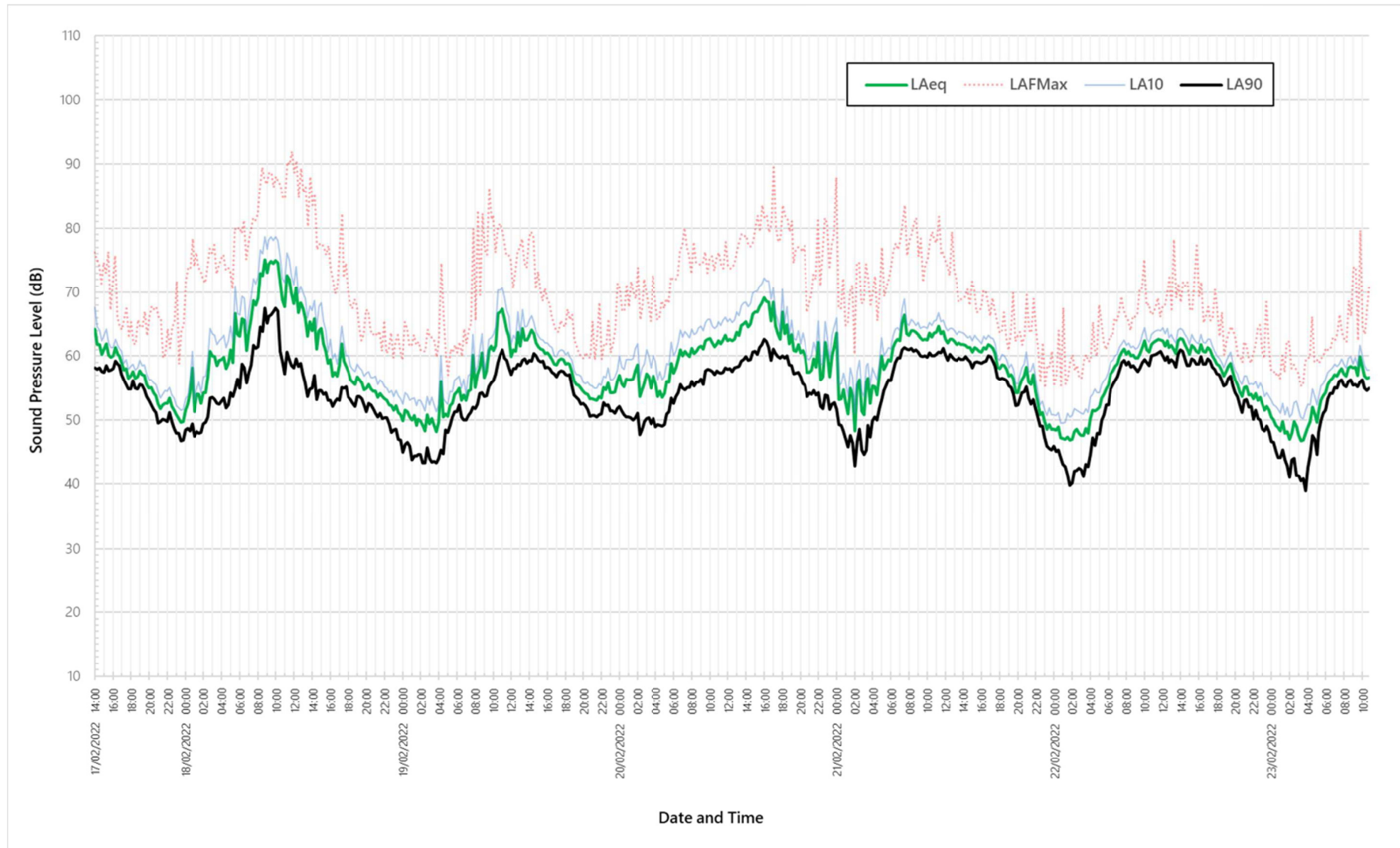
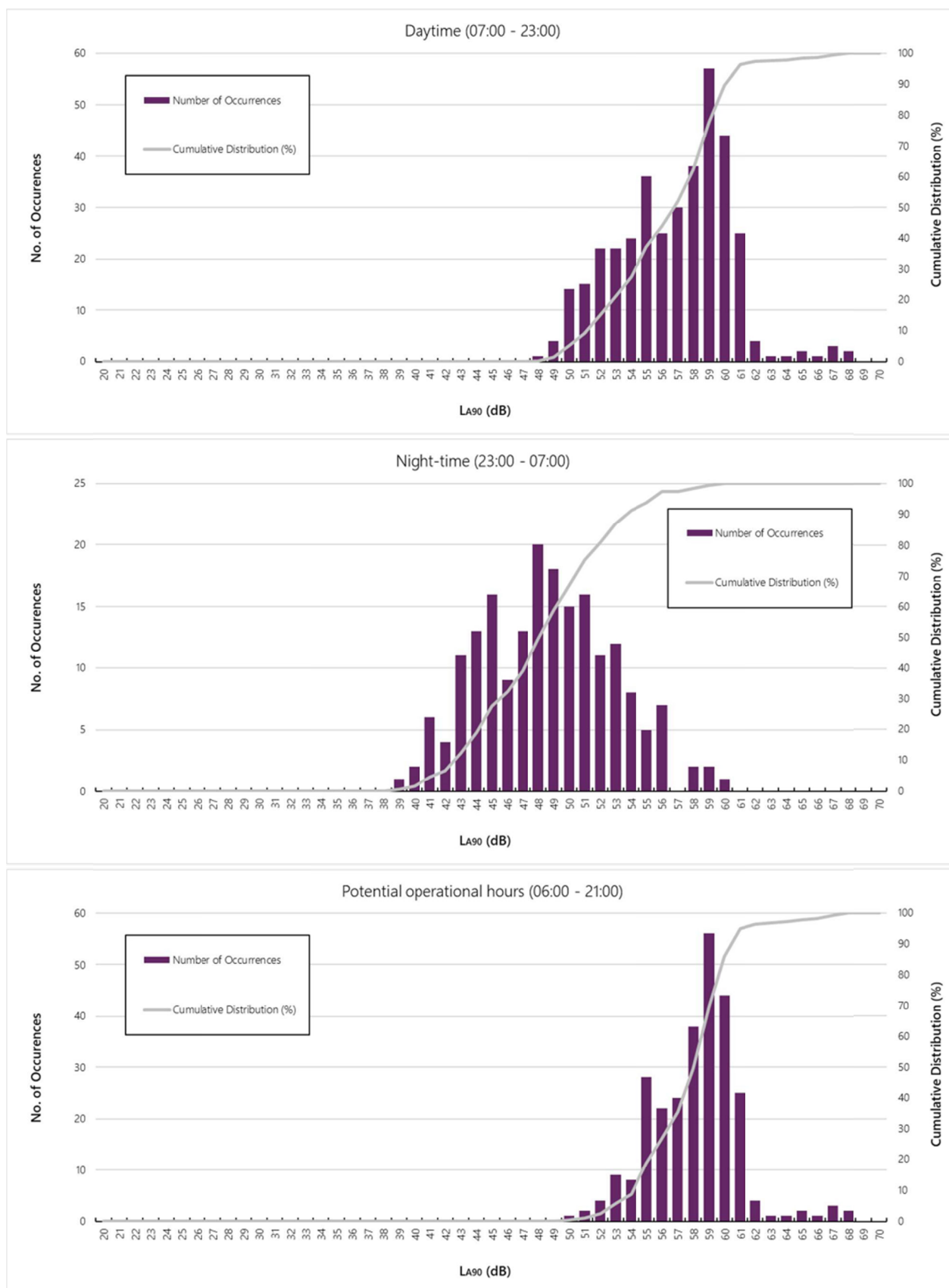


Figure 4.2 – Histograms of LA90,15min noise levels



5.0 NOISE GENERATED FROM ON-SITE ACTIVITIES

5.1 Methodology

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

- a representative background sound level $L_{A90,Tr}$ is determined based upon the results of the environmental noise survey for the daytime – in which the operational hours of the development are likely to occur within;
- the specific sound level L_S from operations at the development at 1m outside nearby residential windows are predicted by noise map calculations;
- 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;
- the predicted rating level $L_{Ar,Tr}$ is compared to the background sound level $L_{A90,Tr}$ to determine the likely level of impact in accordance with BS 4142:2014+A1:2019;
- the predicted specific noise levels are also compared against the guidelines of the WHO and BS 8233:2014 to provide further ‘context’ to the results (as referenced by BS 4142);
- if necessary, mitigation measures are recommended to reduce the noise emissions from the development.

5.2 Background Sound Level

In accordance with BS 4142:2014, 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 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”.

As a worst-case and robust assessment, ExCAL has used the absolute minimum values of $L_{A90,15min}$ as the representative background sound level.

Table 5.1 – Derived representative background sound level $L_{A90,T}$ at the nearest residential property

Noise-Sensitive Receptor (NSR)	Period	Representative Background Sound Level $L_{A90,15mins}$ (dB)
1m outside of all residential windows and 1.5m above ground level in external amenity areas (gardens, patios)	Daytime (07:00 – 23:00)	48
	Night-time (23:00 – 07:00)	39
	Potential operational hours (06:00 – 21:00)	50

5.3 Noise Sources

It is difficult to quantify exactly how noisy the units are likely to be at this early stage, without knowing the full list of equipment, activities, and plant that would be installed at the development. The expected usage of the development is as a GRP Production Facility; hence this would likely involve metal works inside the building, and noise from external vehicles such as HGVs.

5.3.1 Internal

Internal Noise Levels

ExCAL has conducted BS 4142 assessments and Noise at Work assessments for various types of light industrial/commercial use, i.e.: workshops including metal and timber processing; builders’ merchants; car servicing/MOT centres, food production facilities, manufacturing/processing facilities, and retail warehouses.

This includes assessments at various manufacturing facilities ¹ working with metal, i.e. using CNC machines, fettling equipment, heat treatment, welding, etc.

The Control of Noise at Work Regulations 2005¹ ('the NaW Regulations') provides guidance in addition to the general duties set out in the 'Health and Safety at Work etc. Act 1974', both produced and enforced by the Health and Safety Executive. The NaW Regulations set: -

- a Lower Exposure Action Value (LEAV) of 80 dB LEP,d – the point at which hearing protection should be supplied but worn at the employee's own discretion;
- an Upper Exposure Action Value (UEAV) of 85 dB LEP,d – the point at which the employee must wear hearing protection; and
- an Exposure Limit Action Value (ELV) of 87 dB LEP,d – a limit which cannot be exceeded after accounting for the effect of the hearing protection.

In ExCAL's experience, for a manufacturing facility working with metal this value is often around 80 - 85 dB when measured at the employees' ear. This is usually quieter when measured inside the external wall, inside the roof, inside the doors etc., rather than the employees' ear, which is typically right beside noisy processes (i.e. using hand tools). However, to form a worst-case assessment, ExCAL has assumed a worst-case level of 80 dB LAeq, 1 hrs on the interior of the building envelope, for both units.

1 - Including two sites for Aeromet International (manufacturer of metal components for aircraft), Croylek Limited and S&S Sheet Metal Limited (both working with sheet metals), Feorge Plant & Fabrications (steel fabrication and plant repair), Ashton Aluminium and Glazing, and Vestas (manufacturer of wind turbines).

Building Envelope

Table 5.2 presents the estimated sound reduction indices of the walls, roof, and doors, chosen to replicate a typical lightweight warehouse structure.

Table 5.2 – Façade sound reduction indices

Façade Element	Indicative Construction	Estimated Sound Reduction Index (dB R _w)
Wall	Insulated wall cladding system, i.e. Kingspan KS1000 RW panel – 100mm insulated metal panel	25
Roof	Insulated roof cladding system, i.e. Kingspan KS1000 RW panel – 100mm insulated metal panel	25
Roller doors	Insulated sectional loading door	24 ²

5.3.2 External

External noise is likely to be most significantly generated by: -

- HGVs in and out of site for supplies and deliveries. General engine noise from driving/idling briefly and reversing siren noise;
- Electric forklift trucks and electric side lifters that transport materials from the building to/from vehicles outside (although presumably with large sectional loading doors, loading/unloading would usually take place inside the building);
- Customer/staff vehicles.

The source noise data in Table 5.3 have been used with the noise calculations/modelling. This has been drawn from measurements that PJA has taken from similar sites.

The number of movements is estimated at this stage, based on a worst-case 1 hour period, and is likely to represent an overestimation. The vehicles are modelled as moving point sources from the site entrance to the sectional loading doors (HGVs) and the car park (staff cars).

² - Based upon reviewing data from several sources for insulated sectional overhead doors – typical acoustic performance is 24 – 26 dB R_w.

<https://stertil-dockproducts.co.uk/uploads/2016/10/stertil-d9615-industrial-doors.pdf>

<https://www.hvpshutters.co.uk/sectional-overhead-door.php>

<https://www.hag.co.uk/product/s-door/>

Table 5.3 – Source noise levels and operational times of external noise sources

Description	Sound PowerLevel LWA (dB)	Number of Vehicles	Movements per vehicle over a worst-case 1-hour reference daytime period	Data Source
HGV (driving)	98	10 (1 per sectional door)	1 movements at 15 km/h	PJA Measurements
HGV Reversing Alarms	90	10 (1 per sectional door)	1 movements at 5 km/h	PJA Measurements
Electric Forklift	87	3 (1 per set of sectional doors)	15 movements at 10 km/h	BS 5228-1:2009+A1:2014, Annex C, Table D.7 (93) 1
Cars	85	40	1 movement at 15 km/h	PJA Measurements

5.4 Predicted Noise Rating Levels

The noise predictions within this report have been undertaken using the proprietary software CadnaA® by DataKustik, a 3-D noise mapping package that implements a wide range of national and international standards, guidelines and calculation algorithms, including those set out in ISO 9613-2:1996, as detailed in Appendix D.

Noise break-out from the building has been represented by a series of 'area sources' placed on each element of the façade. The sound power levels of these sources are estimated by predicting the internal noise levels (80 dB) then accounting for the sound reduction indices of the various façade elements as outlined in Table 5.2.

'Moving point sources' following a defined line of travel has been used to model moving vehicles – based on the parameters in Table 5.3.

The noise model has been used to predict the resulting noise levels incident on nearby noise-sensitive receptors. 'Receiver' positions can be placed anywhere in the model to predict the noise emissions at any point, including directly outside the windows of residential dwellings.

Figure D.2 in Appendix D shows the predicted specific noise level LAeq,1hr during a worst-case 1-hour daytime period, accounting for all of the noise sources outlined in the previous section – predicting the specific noise level outside all facades of the nearby residential properties.

Table 5.4 summarises the result by showing the highest specific noise level at the worst affected residential façade. As per Section 3.2, a rating level penalty should be applied when assessing accordance with BS 4142:2014: -

- The noise could be classed as intermittent given the nature of noise from moving vehicles; therefore a 3 dB penalty has been applied;
- The noise is not expected to be impulsive in nature, any impulsive noise would likely occur inside the buildings and not be perceptible at the receptors;
- The noise may have a tonal quality associated with reversing sirens that is just perceptible at the receptors, resulting in a 2 dB penalty.

The total penalty applied is therefore 5 dB. Table 5.4 shows the worst-case rating level in comparison to the minimum background sound level during the potential operational hours.

BS 4142:2014+A1:2019 implies that a rating level that is above the background sound level is a potential indicator of a likely adverse impact. Therefore, mitigation will be required in PJA's opinion to reduce the rating level to at least below the background sound level.

Table 5.4 – BS 4142 assessment result

Period	Specific Noise Level at worst-case facade LAeq,T (dB)	Rating Level Penalties (dB)	Rating Level LA _r ,Tr (dB)	Representative Background Sound Level LA90 (dB)	Difference (dB)
Potential operational hours (06:00 – 21:00)	48	+5	53	50	+3

5.5 Mitigation

5.5.1 Noise Barrier/Fence

The most appropriate way to reduce noise emissions from the site as a whole would be to install a 3m high noise barrier/fence along parts of the eastern site boundary, as shown in Figure 5.1.

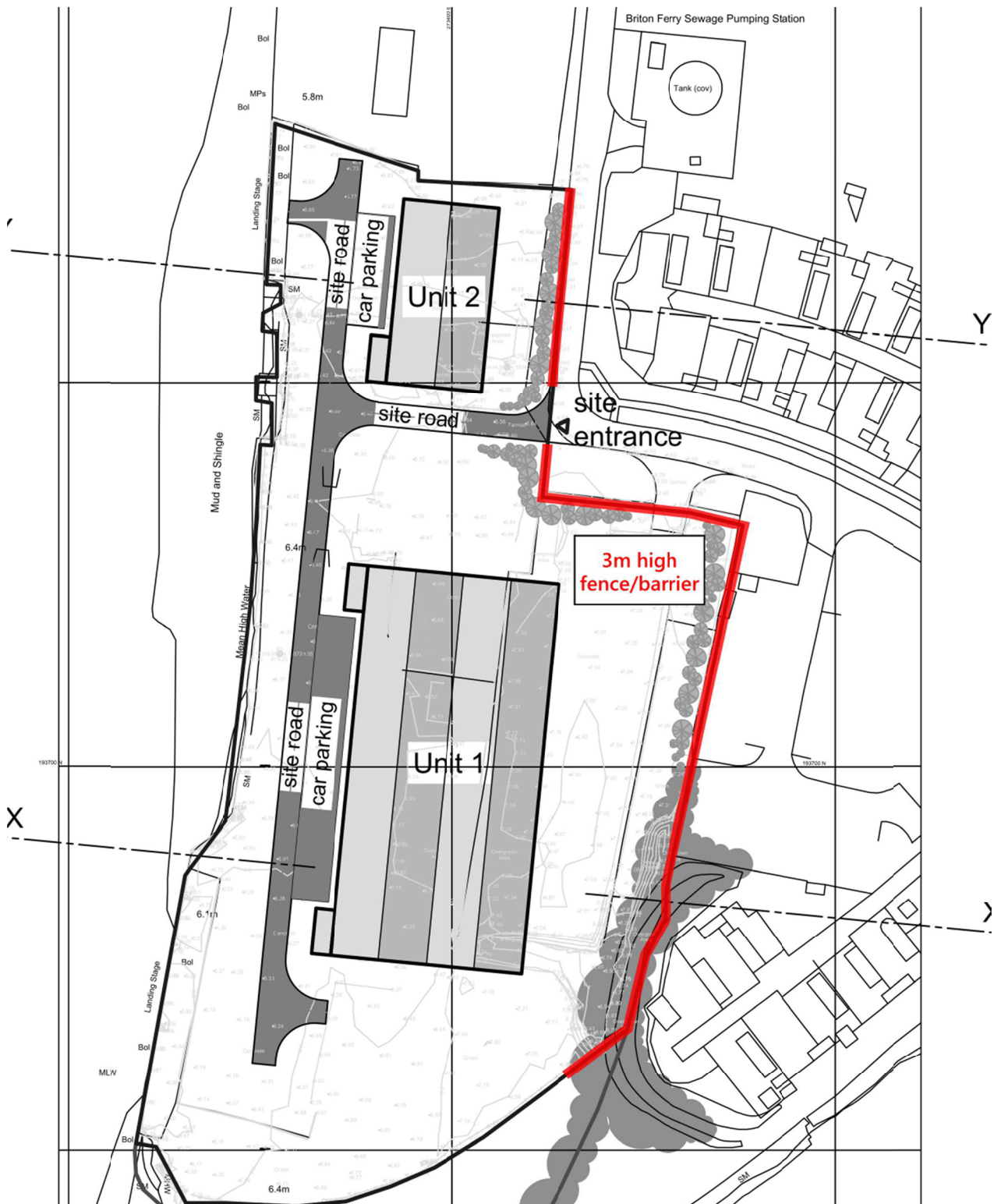
To be effective in acting as a noise barrier, the fences should have a minimum mass of 10 kg/m² and be close-boarded/imperforated with no air gaps either within the fence panel, underneath the fence, or between panel and post. For example, a 20mm thick timber fence would achieve this mass.

Rail and post fences, palisade/picket fencing, slatted fencing, lattice fencing, weave fencing, and hedges, are not suitable as a noise-attenuating fence.

A suitable example product would be a Jacksons Fencing 'Jakoustic' Environmental Reflective Noise Barrier ³ (or any similar performing acoustic barrier manufacturer that meets the build criteria outlined above).

³ - <https://www.jacksons-security.co.uk/acoustic-security-barriers/reflective-acoustic-barrier>

Figure 5.1 – Recommended areas for boundary fencing



5.5.2 Predicted Rating Levels

The noise model has been updated to reflect the addition of the fence as recommended above, with the predicted specific noise levels in Figure D.3 (Appendix D).

Table 5.5 shows the rating level outside the worst affected neighbouring windows in comparison to the background sound level – with the proposed mitigation in place.

Table 5.5 – BS 4142 assessment result – with mitigation

Period	Specific Noise Level at worst-case facade LAeq,T (dB)	Rating Level Penalties (dB)	Rating Level L _{Ar,Tr} (dB)	Representative Background Sound Level LA90 (dB)	Difference (dB)
Potential operational hours (06:00 – 21:00)	43	+5	48	50	-2

It is seen that the proposed mitigation would bring the rating level to below the minimum background sound level.

BS 4142:2014+A1:2019 indicates that “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.”

The context is that residual noise levels are already high at the site due to the M4 motorway. The assessment has been made against the minimum value of LA90,15mins (50 dB), a value which occurred once over a 6 day survey, and the mean average LA90 during the potential operational hours (06:00 – 21:00) was 57 dB.

The addition of a specific noise level of 43 dB to the existing mean average daytime LAeq of between 58 and 62 dB would result in a 0.1 dB increase, a negligible increase.

The site in question has also been previously used for industrial processes, with large concrete batching plant on site within the last 10 years. Other industrial facilities still remain in the area, with a scrap metal yard adjacent to site, and sewerage works on the north side of the travellers site, and a Tarmac site on the north side of the M4.

Annex G.1 of BS 8233:2014 suggests that “if partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB”. If assessing based on BS 8233:2014 and WHO guidelines, to exceed internal noise level targets (of 35 dB LAeq) within a bedroom/living room, based on an estimated sound reduction across an open window of 15 dB, specific noise levels would have to exceed 50 dB LAeq,16hr during the day when measured outside of the window. The specific noise level in this case is 43 dB LAeq,1hrs.

Therefore, in conclusion, the risk of adverse impact from noise is considered to be acceptably low, providing that the applicant follows recommendations regarding the installation of a 3m high fence/barrier along parts of the site boundary, as indicated in Section 5.5.

6.0 NOISE GENERATED BY HGV TRAFFIC ON LOCAL ROADS

The assessment of the risk of adverse impact from noise generated by off-site vehicle traffic on nearby noise sensitive receptors has been undertaken with reference to DMRB guidelines (see Section 3.5), which assesses the risk of adverse impact should the existing $L_{Aeq,T}$ at nearby noise receptors be increased as a result of new traffic associated with the development. Whilst the DMRB references the L_{A10} over an 18-hour period, the same principle is considered to be acceptable in assessing a worst-case 1-hour period in terms of L_{Aeq} .

PJA has modelled an indicative worst-case hour, with the noise data as per Table 6.1. The path of travel has been equally split from the site entrance heading northwards and eastwards.

Table 6.1 – Source noise data for vehicles off-site

Vehicle	Sound Power Level L _{WA} (dB)	Number of Vehicles in a worst-case hour	Movements per vehicle over a worst-case 1-hour reference daytime period
HGV	98	10	1 movement per vehicle at 15 km/h
Car	85	40	1 movement per vehicle at 15 km/h

Figure D.4 in Appendix D shows the predicted $L_{Aeq,1hr}$ noise levels in the area from the vehicle traffic associated with the development, in the absence of any other noise source. Table 6.2 summarises the results, with the predicted increase in traffic noise levels (over existing levels) shown.

In summary, the predicted increase is likely to be minimal (0.3 dB) – corresponding to a negligible impact when assessing against DMRB criteria (Table 3.2).

Table 6.2 – Predicted increase in traffic noise levels at nearby noise-sensitive receptors

Noise-sensitive Receptor	New Traffic Noise Levels $L_{Aeq,1hr}$ (dB)	Existing Traffic Noise Levels $L_{Aeq,1hr}$ (dB) 1	New + Existing Traffic Noise Levels $L_{Aeq,1hr}$ (dB)	Increase in $L_{Aeq,1hr}$ (dB)	Level of Impact (based on Table 3.2)
Worst-affected	47	57	57.4	0.4	Negligible
1 – Based on the mean $L_{Aeq,15min}$ measured between 06:00 and 21:00 on the quietest day of the survey as a worst-case					

7.0 NOISE MANAGEMENT

As alluded to in Section 5.0, based on the indicative worst-case scenario that PJA has modelled, PJA's recommendations are that the use of the units is restricted to the hours of 06:00 – 21:00, and that a 3m high noise barrier is installed along parts of the site boundary.

In terms of further noise management techniques, any noise management plan will ultimately be the responsibility of the future occupants to produce and follow. However, PJA wish to point out some techniques that can be used to mitigate any potential noise impact: -

- Any large sectional doors/roller shutter doors should be kept closed as much as possible if noise levels inside of buildings reach high levels. Evidentially these will have to be open intermittently to let vehicles in and out – but the occupants should ensure that these are closed as much as possible and not left open when vehicles are stationary inside;
- Vehicles should be loaded/unloaded inside of buildings where possible, or at least reversed as close to the doors as possible, to reduce noise being generated in the car park;
- Electric forklifts/side lifts are much quieter than their petrol or diesel counterparts and should be used if these are frequently outside the buildings;
- Forklifts should be fitted with reversing sirens that emit a broadband noise, rather than a tonal beeping alarm (which would cause more annoyance). Ideally, HGVs will also be fitted with a broadband reversing alarm;
- Noisy fixed plant/equipment should be screened from residents as much as possible. This is achieved by breaking the line of sight between houses and the plant, hence a suitable location would for example be either inside the building, on the west site of the units;
- Plant should be maintained regularly (as old, worn, or unoiled components can generate more noise overtime);
- Plant and vehicles should avoid being left to idle when not in use;
- High impact activities should be carried out on/over rubber matting where possible, i.e. dropping loose materials on to a rubber mat is significantly quieter than the 'thud' or a 'clang' of dropping directly on to a concrete floor;
- Similar – materials dropped into skips/bins can also be a significant noise source, it is best to line the inside of large bins with a thin layer of rubber to absorb impact-generated noise;
- Staff should be aware and conscious of the noise impact they may have on others through a basic training programme (including the effect that noise can have on their own hearing).

Appendix A – Acoustic Terminology and Concepts

A.1 – Glossary

Table A.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 (2×10^{-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	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.
$L_{Aeq,T}$	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. This parameter is typically considered as a good representation of the 'average' overall noise level. It is referred to technically as the A-weighted equivalent continuous sound level and is a dB(A) as defined above.
$L_{A90,T}$	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'.
$L_{A10,T}$	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';
$L_{AFmax,T}$	The maximum A-weighted noise level during the measurement period T.

A.2 – Subjective Changes in Noise Level

Table A.2 – Subjective loudness from an increase or decrease in sound pressure level

Change in sound pressure level	Relative change in sound power energy (multiplier)		Change in apparent subjective loudness (for mid-frequency range)
	Decrease	Increase	
3 dB	1/2	2	'Just perceptible'
5 dB	1/3	3	'Clearly noticeable'
10 dB	1/10	10	'Half or twice as loud'
20 dB	1/100	100	'Much quieter, or louder'

Appendix B - BS 4142:2014

BS 4142:2014 '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 (NSR) locations within the context of the existing sound environment.

B.1 – Definitions

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

- Background Sound Level, $LA_{90,T}$: 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;
- Rating Level, LA_{r,T_r} : 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, $L_s = LA_{eq,T_r}$: 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 ;
- Specific Sound Source: Sound source being assessed.

The BS 4142:2014 definition of sound of an industrial and/or commercial nature includes “sound from fixed installations which comprise mechanical and electrical plant and equipment”. The scope of BS 4142:2014 is not intended for sound from the passage of vehicles on public roads; people; and ‘other sources falling within the scopes of other standards or guidance’.

B.2 – 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).

B.3 – Rating Level

The rating level LA_{r,T_r} is the specific sound level L_s plus any ‘penalties’ which account for the characteristic features of the sound.

BS 4142:2014 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.”

ExCAL 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 an 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.

B.4 - Background Sound Level

BS 4142:2014 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 does not provide a ‘black and white’ method of obtaining the assessment level for background sound $LA_{90,T}$.

B.5 - Assessment of Adverse Impact

The assessment of adverse impact contained in BS 4142:2014 is undertaken by comparing the rating level $L_{Ar,Tr}$ to the measured representative background sound level $LA_{90,T}$ 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 $LA_{90,T}$ and the context in which the sound occurs. It is therefore essential to place the sound in context. But in general “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.”

Appendix C – Noise Survey Details

C.1 – Survey Equipment

The monitoring equipment used for the baseline noise survey is detailed in the table below. The sound level meter was calibrated before and after the survey, with no significant drifts of greater than 0.5 dB observed. The sound level meter has been calibrated to a traceable standard within the 24 months preceding the survey and the calibrators have been calibrated to a traceable standard within the 12 months preceding the survey. The equipment complies with the standards of as BS EN 60942:2003 Class 1 device.

Table C.1 – Equipment used for the noise survey

Name	Serial Number	Last Calibrated	Next Calibration due
SVAN 949 Class 1 Sound Level Meter	9720	Nov-21	Nov-23
SV22 Class 1 Microphone	4012386	Nov-21	Nov-23
Cirrus CRL511E Class 1 Acoustic Calibrator	035235	Nov-21	Nov-23

C.2 – Photographs

Figure C.1 – Photographs of the noise monitoring position



Appendix D – Operational Noise Calculations

The noise predictions within this report have been undertaken using the proprietary software CadnaA® by DataKustik, a 3-D noise mapping package that implements a wide range of national and international standards, guidelines and calculation algorithms, including those set out in ISO 9613-2:1996.

All of the objects within the model (buildings, roads, barriers, foliage, etc.) have been imported from OpenStreetMap or drawn in manually where the OSM did not contain sufficient data. The heights of the buildings and roads have been based upon Google Earth Pro, using the 3D view to be able to measure the elevation heights at the tops of objects, and then inserting this manually into the model. Lastly, the scaled site plan, floor plan, and elevation for the proposed development have been accounted for in the model.

The noise model has assumed: -

- a ground absorption factor of 0 in all areas as a worst-case;
- a maximum reflection factor of two where buildings and barriers are assumed to have a 'smooth' reflective façade, as a worst-case;
- receptor heights on the façade of residential receptors at ground floor height (1.8m);
- the noise contour map plotted at a height of 1.8m (ground floor window height) – as are receptors away from the buildings;
- atmospheric sound absorption based upon a temperature of 10°C and a humidity level of 70%, as per Table 2 of ISO 9613-2:1996.

The noise model has been used to predict the resulting LAeq,1hr specific noise levels from a worst-case 1-hour period during the proposed daytime operational hours – outside of the facades of nearby residential buildings.

The images on the following pages contain screenshots from the mapping.

Figure D.1 – 3D views of the noise model setup

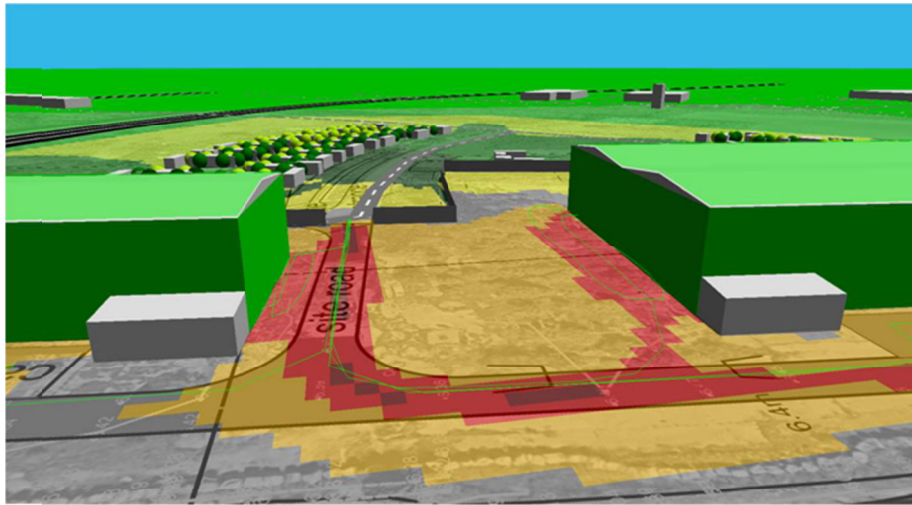


Figure D.2 – Predicted specific noise levels (dB LAeq,1hr) – On-site activities

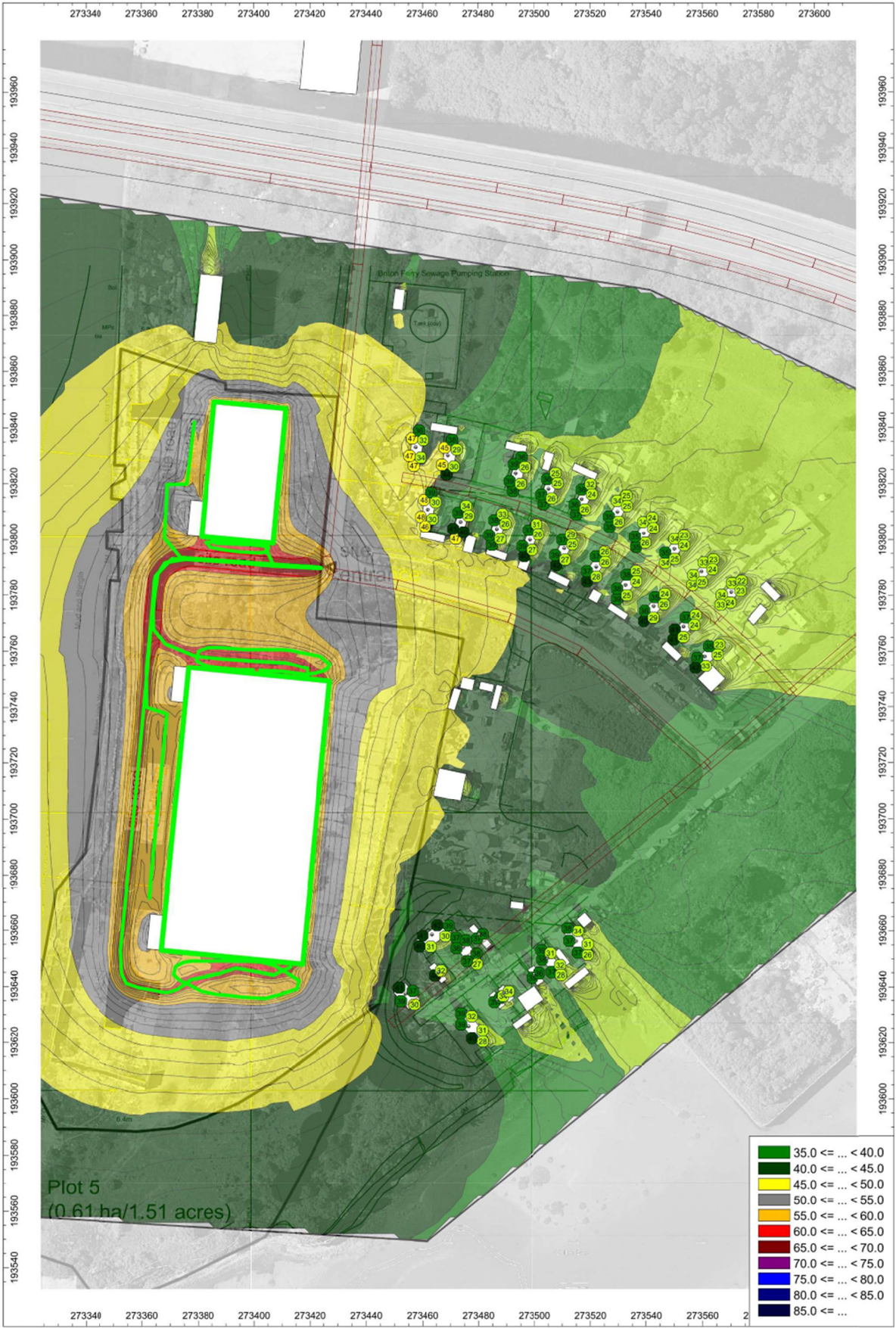


Figure D.3 – Predicted specific noise levels (dB LAeq,1hr) – On-site activities – with 3m high site boundary barrier

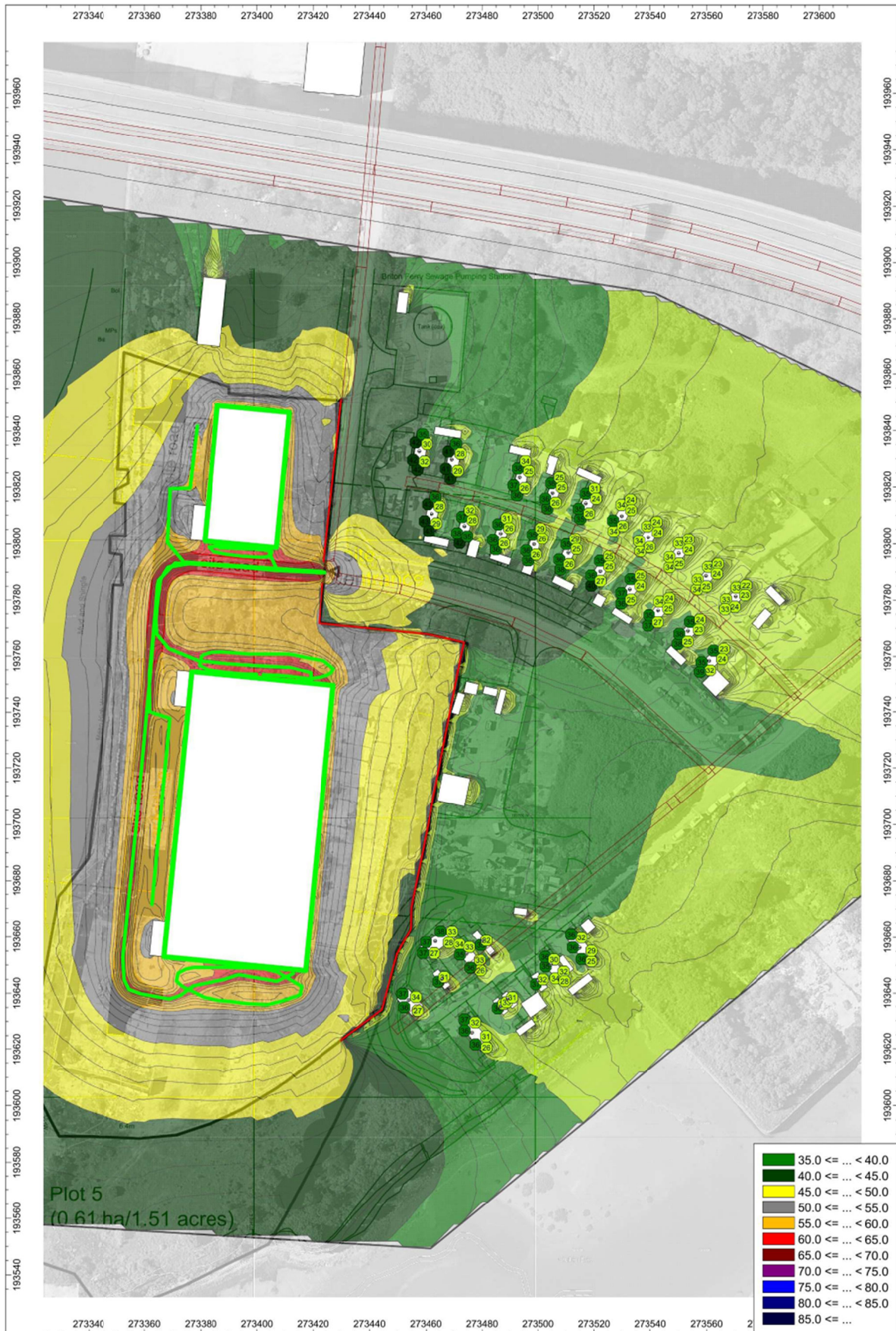


Figure D.4 – Predicted specific noise levels (dB LAeq,1hr) – off-site traffic on local roads

