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7 NOISE AND VIBRATION

7.1 Introduction

7.1.1 This addendum chapter of the ES assesses the likely significant effects of the proposed development on the nearest Existing Sensitive Receptors (ESRs) taking into account the design changes to the buildings subject to the s73 application. Potential noise and vibration impacts are assessed for the construction and operational stages.

7.1.2 The baseline situation is considered prior to the likely environmental effects of the proposed development upon the current uses being identified (during the construction and operational phases), taking into account any cumulative effects. Mitigation measures to reduce any negative environmental effects are also identified, as appropriate, before the residual environmental effects are assessed. The construction work has commenced but the same baseline is used in the assessment.

7.1.3 The aims of this noise assessment are as follows:

- To identify noise criteria based on current guidance.
- To identify ESRs.
- To identify likely significant impacts.
- To propose mitigation measures should these be required.
- To assess residual impacts with mitigation measures in place.
- To assess potential cumulative impacts.

7.1.4 This noise and vibration assessment considers the layout for the creation of a maximum capacity 9 Gigawatt hour (GWh) per annum electrode and battery manufacturing facility. It should be noted that the previous IAMP ONE Phase Two Development planning application was approved in October 2021 and then in 2022 and this noise and vibration addendum assessment can be considered as a minor iteration compared to the previous assessment due to a change in the layout. The layout assessed in this chapter places the factory building smaller, and with additional stacks, compared to the previous noise assessment.

7.2 Consultation & Scope of the Assessment

7.2.1 Consultation was carried out with Sunderland City Council (SCC) as part of the preparation of the ES for the wider development and concluded that significant noise effects on ESRs were unlikely, but that an assessment would be required.

7.2.2 No significant sources of vibration have been identified as part of the operational phase of the development. The closest ESR to the process areas of the development was situated approximately at least 420m away and, as such, vibration impacts during the operational phase of the development would be Negligible and have not been considered further.

7.2.3 Construction noise and vibration effects have been considered in this chapter and are being managed by the Construction Environmental Management Plan, (CEMP).

7.2.4 Baseline noise levels were not updated as part of the previous assessment as it was considered that during the Covid-19 pandemic, noise levels would not be representative due to lower-than-normal traffic flows. It is recognised that some traffic had started to use International Drive, in association with the three newly constructed units, two of which are used by Nissan suppliers (i.e. Faltec and SNOP.). The third building was, previously fitted-out as a Nightingale Hospital, used as a temporary vaccination centre in response to the Covid-19 pandemic. This has now been closed. Since the construction works have commenced on site it was not possible to update the baseline any further.

7.2.5 The wider IAMP ONE site was granted outline planning approval, with baseline noise levels measured and presented in the IAMP ONE ES (Chapter E and appendices).

7.2.6 West Moor Farm has been demolished and North Moor Farm is no longer a residential receptor. As such, cumulative effects of noise from the demolition work have not been considered.

7.2.7 This chapter, therefore, considers the following aspects of noise and vibration:

- Existing noise levels at ESR1 – Hylton Bridge Farm and ESR2 - Rustica Trattoria & Inn
- Construction noise and vibration impacts at. ESR1 – Hylton Bridge Farm and ESR2 - Rustica Trattoria & Inn
- Operational noise impacts at. ESR1 – Hylton Bridge Farm and ESR2 - Rustica Trattoria & Inn
- Any noise mitigation measures that may be required.
- Residual impacts with mitigation measures in place.
- Any potential cumulative impacts.

7.3 Planning Policy & Guidance

7.3.1 This section provides a brief commentary on the noise policy, guidance and standards relevant to this assessment. The details on how these were applied for the assessment are included in the methodology section.

National Planning Policy Framework

7.3.2 The main national guidance document for Local Planning Authorities (LPAs) is the National Planning Policy Framework (NPPF). The NPPF came into force in 2012 and superseded Planning Policy Guidance Note 24: 'Planning and Noise' (PPG24). It was updated most recently in July 2021, being the current planning policy guidance within England.

7.3.3 Paragraph 185 of the NPPF states that:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking in account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development - and avoid noise giving rise to significant adverse impact on health and the quality of life;

b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

7.3.4 Paragraph 187 of the NPPF states that:

"Planning policies and decisions should ensure that new development can be integrated with existing business and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

7.3.5 With regard to 'adverse impacts', the NPPF refers to the 2010 'Noise Policy Statement

for England' (NPSE), which defines the following three categories:

- NOEL – No Observed Effect Level - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to noise.
- LOAEL – Lowest Observed Adverse Effect Level - This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level - This is the level above which significant adverse effects on health and quality of life occur.

7.3.6 NPSE has three aims, the first being that significant adverse effects on health and quality of life should be avoided. The second aim refers to the situation where the impact lies somewhere between LOAEL and SOAEL and it requires that all reasonable steps be taken to mitigate and minimise the adverse effects of noise. This does not mean, however, that such adverse effects cannot occur. The third aim seeks to contribute to the improvement of health and quality of life.

Planning Practice Guidance (PPG 2019)

7.3.7 The Planning Practice Guidance (PPG) provides further detail about how the effect levels can be recognised. Below the LOAEL noise can become noticeable, however it has no adverse effect as it does not cause any change in behaviour or attitude. Once noise crosses the LOAEL threshold it begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. Increasing noise exposure further might cause the SOAEL threshold to be crossed. If the exposure is above this level the planning process should be used to avoid the effect occurring by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused. At the highest extreme the situation should be prevented from occurring regardless of the benefits which might arise. Table 7.1~~Table 7.1~~ summarises the noise exposure hierarchy.

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Table 7.1: Existing noise exposure hierarchy			
Response	**Examples of Outcomes**	**Increasing Effect Level**	**Action**
No Observed Effect Level			
Not Present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response (e.g. turning up volume of television; speaking more loudly); where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response (e.g. avoiding certain activities during periods of intrusion); where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress (e.g. regular sleep deprivation/awakening); loss of appetite, significant, medically definable harm (e.g. auditory and non-auditory).	Unacceptable Adverse Effect	Prevent

7.3.8 In relation to noise, the PPG summarises the approach to be taken when assessing noise. It accepts that noise can override other planning concerns, but states that:

"Neither the Noise Policy Statement for England nor the NPPF (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separate from the economic, social and other environmental dimensions of proposed development".

British Standard 5228-1&2:2009 +A1:2014 (BS5228), Code of Practice for Noise & Vibration Control on Construction and Open Sites

7.3.9 Guidance on the prediction and assessment of noise and vibration from construction sites is provided in British Standard (BS) 5228 2009 +A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise and Part 2 Vibration. BS5228 provides recommended limits for noise and vibration from construction sites.

British Standard 4142:2014 +A1:2019 (BS4142), Methods for Rating & Assessing Industrial & Commercial Sound

7.3.10 BS4142 is used to rate and assess sound of an industrial and/or commercial nature, including the following:

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

7.3.11 The standard is applicable to the determination of the following levels at outdoor locations:

- Rating levels for sources of sound of an industrial and/or commercial nature.
  - Ambient, background and residual sound levels, for the purposes of:
    - Investigating complaints
    - Assessing sound from proposed, new, modified, or additional source(s) of sound of an industrial and/or commercial nature
    - Assessing sound at proposed new dwellings or premises used for residential purposes.

7.3.12 The purpose of the BS4142 assessment procedure is to assess the significance of sound of an industrial and/or commercial nature. BS4142 refers to noise from the industrial source as the 'specific noise' and this is the term used in this chapter to refer

to noise that is predicted to occur due to commercial activities. BS4142 assesses the significance of impacts by comparing the specific noise level to the background sound level (L_{A90}).

7.3.13 Certain acoustic features can increase the significance of impacts over that expected from a simple comparison between the specific noise level and the background sound level. In particular, BS4142 identifies that the absolute level of sound, the character, and the residual sound and the sensitivity of receptor should all be taken into consideration. BS4142 includes allowances for a rating penalty to be added if it is found that the specific noise source contains a tone, impulse and/or other characteristic, or is expected to be present. The specific sound level along with any applicable correction is referred to as the 'rating level'.

7.3.14 The rating level can be compared to the background sound level to establish the potential noise impact. However, any comparison of the rating level and background sound level should be considered in context.

BS8233 Guidance on Sound Insulation & Noise Reduction for Buildings

7.3.15 British Standard 8233 'Guidance on sound insulation and noise reduction for buildings' 2014 bases its advice on the WHO Guidelines, which recommends 35 dB $L_{Aeq,16hour}$ during the daytime period and 30 dB $L_{Aeq,8hour}$ during the night-time period. In addition, for internal noise levels it states that:

"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

7.3.16 Furthermore, with regard to external noise, the Standard states that:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guidance value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development

should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited."

7.4 Methodology

Identification of Existing Sensitive Receptors

7.4.1 Two existing sensitive receptors (ESR1 and ESR2) have been identified as the closest receptors to the proposed development. There locations are shown on Figure 7.1. The co-ordinates are listed in Table 7.2~~Table 7.2~~, below.

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Table 7.2: Existing sensitive receptor			
Existing Sensitive Receptor	**Co-ordinates**		**Distance to Proposed development**
	X	**Y**	
ESR1 – Hylton Bridge Farm	433351	559493	274 m to site boundary and 410 m to nearest noise source
ESR2 - Rustica Trattoria & Inn	433970	558870	486 m to site boundary and 520m to nearest noise source

Criteria for Significance of Impact

7.4.2 The potential noise impacts associated with the proposed development have been assessed in accordance with the guidance to determine whether noise effects occur at receptors. Where likely adverse effects are identified, appropriate mitigation measures are proposed to avoid, reduce or compensate for these.

7.4.3 The effect (and whether it is Significant or Not Significant) as a result of an impact is determined by both the sensitivity of the receptor and the magnitude of change (i.e. impact). The sensitivity of a receptor and the magnitude of change can be defined as shown in Table 7.3~~Table 7.3~~ and Table 7.4~~Table 7.4~~, below.

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Table 7.3: Sensitivity of a receptor	
Sensitivity	**Description**
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character or is of international or national importance. Groups of 10 or more properties, schools, or SSSI.
Moderate	The receptor/resource has moderate capacity to absorb change without significantly altering its present character or is of high importance. Individual residential properties.
Low	The receptor/resource is tolerant of change without detriment to its character, is of low or local importance. Residential properties, where occupants have an interest in the development, commercial and business uses, and amenity.

Table 7.4: Magnitude of change (i.e. Impact)	
Magnitude	**Definition**
Major	Impact resulting in a considerable change in baseline environmental conditions predicted either to cause statutory objectives to be significantly exceeded or to result in severe undesirable consequences on the receiving environment.
Moderate	Impact resulting in a discernible change in baseline environmental conditions predicted either to cause statutory objectives to be exceeded or to result in undesirable consequences on the receiving environment.
Minor	Impact resulting in a discernible change in baseline environmental conditions with undesirable conditions that can be tolerated.
Negligible	No discernible change in the baseline environmental conditions, within margins of error of measurement.

7.4.4 An impact significance matrix uses may be used to combine the sensitivity and magnitude of change to establish the level of effect (see Table 7.5~~Table 7.5~~5). An effect that is equal to or below Moderate is considered to be Not Significant (in EIA terms) and an effect that is greater than Moderate is considered to be Significant (in EIA terms).

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Table 7.5: Level of effect				
Magnitude	**Sensitivity**			
	High	**Moderate**	**Low**	**Negligible**
Major	Substantial	Substantial	Moderate	Negligible
Moderate	Substantial	Moderate	Minor	Negligible
Minor	Moderate	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Methodology for Construction Noise and Vibration

7.4.5 The activities associated with the construction phase of the proposed development will have the potential to generate noise and vibration and create an impact on the surrounding area.

British Standard 5228:2009 +A1:2014 "Code of Practice for noise and vibration control on construction and open Sites – Part 1: Noise" (BS5228-1)

7.4.6 Guidance on the prediction and assessment of noise from development sites is set out in BS5228-1 (Noise).

7.4.7 Construction noise can have a disturbing impact on the surrounding neighbourhood. The effects are varied and are complicated further by the nature of the site works, which will be characterised by noise or vibration sources that will change location throughout the construction period. The duration of site operations is also an

important consideration. Higher noise and vibration levels may be acceptable if it is known that the levels will occur for a limited period.

7.4.8 Under Section 60 of the Control of Pollution Act (COPA) 1974, the local authority has the power to serve a notice that could impose requirements as to the way in which works are to be carried out. This may specify times of operation, maximum levels of noise that should be emitted and the type of plant which should or should not be used. This is a common way of enforcing reasonable levels of construction noise.

7.4.9 It may be preferable, however, for the chosen contractor to obtain prior consent under Section 61 of the COPA 1974, which enables anyone who intends to carry out works to apply to the local authority for consent. Under Section 61, local authorities and those responsible for construction work have an opportunity to resolve any matters relating to the potential noise prior to work commencing.

7.4.10 In addition to the COPA 1974, BS5228-1 provides guidance on significance criteria for assessing the potential noise impacts associated with the construction phase of large projects. For the purposes of this noise assessment, the noise likely to be generated by construction phase, has been assessed against significance criteria established, using the ABC Method from BS5228-1.

7.4.11 The ABC method for determining a threshold requires the ambient noise levels at the ESR to be determined. The ambient noise levels at the ESRs are then rounded to the nearest 5 dB(A) in order to determine the appropriate threshold value in accordance with the category value, A B or C, as detailed in Table 7.6~~Table 7.6~~.

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Table 7.6: Thresholds for construction noise at residential receptors (in Accordance with the ABC Method of BS5228-1)			
Assessment Category and Threshold Value Period (L_{Aeq})	**Threshold Value, in decibels (dB)**		
	Category A *	**Category B ****	**Category C *****
Daytime (07:00 to 19:00 hours) and Saturdays (07:00 to 13:00 hours)	**65**	**70**	**75**
* Category A: Threshold values to use when ambient noise levels (rounded to the nearest 5 dB) are less than this value.			
** Category B: Threshold values to use when ambient noise levels (rounded to the nearest 5 dB) are the same as Category A values.			
*** Category C: Threshold values to use when ambient noise levels (rounded to the nearest 5 dB) are higher than Category B values.			

7.4.12 As noted above, the ambient noise levels have been established during baseline surveys undertaken for the previous IAMP ONE planning application for reasons

outlined above. The ambient levels have then been used to set the category (either A, B or C) and compared to noise predictions for construction activities. The construction noise assessment considers BS5228 Part 1 and also sets out details of 'best practice' management and control measures to ensure that impacts are minimised as far as possible.

British Standard 5228:2009 +A1:2014 "Code of Practice for noise and vibration control on construction and open Sites – Part 2: Vibration" (BS5228-2)

7.4.13 Guidance on the assessment of vibration from development sites is given in British Standard 5228-2:2009 "Code of Practice for noise and vibration control on construction and open sites – Part 2: Vibration" (BS5228-2). BS5228-2:2009 indicates that vibration can have disturbing effects on the surrounding neighbourhood; especially where particularly sensitive operations may be taking place. The significance of vibration levels that may be experienced adjacent to a site is dependent upon the nature of the source.

7.4.14 BS5228-2 indicates that the threshold of perception is generally accepted to be between a peak particle velocity (PPV) of 0.14 and 0.3mm/sec. In an urban situation it is unlikely that such vibration levels would be noticed. BS5228 also indicates that it is likely that vibration of 1.0 mm/s in residential environments will cause complaint but can be tolerated if prior warning and explanation have been given to residents. The standard also identifies that 10 mm/s is likely to be intolerable for any more than a very brief exposure to this level.

7.4.15 The Highways Agency Research Report No. 53 "Ground Vibration caused by Civil Engineering Works" 1986 suggests that, when vibration levels from an unusual source exceed the human threshold of perception, complaints may occur. The onset of complaints due to continuous vibration is probable when the PPV exceeds 3mm/sec.

7.4.16 British Standard BS6472: 2008 "Guide to Evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting" (BS6472-1) suggests that adverse comments or complaints due to continuous vibration are rare in residential situations below a PPV of 0.8mm/sec. Continuous vibration is defined as "vibration which continues uninterrupted for either a daytime period of 16 hours or a night-time period of 8 hours". The proposed earthworks and construction works at the site will not cause continuous vibration as defined in BS6472-1.

7.4.17 BS5228-2 2009 suggests that the onset of cosmetic damage is 15 mm/sec (15 mm/s at

4 Hz increasing to 20 mm/s at 15 Hz for residential or light commercial type buildings).

Methodology for Operational Noise (Industrial Noise)

7.4.18 The operational phase of the proposed development will add new plant noise and vehicle movements in addition to the existing operational sources across IAMP ONE and, as such, has the potential to impact upon the ESR. An assessment has, therefore, been undertaken to compare the existing background sound levels with predicted operational sound levels in accordance with BS41442.

7.4.19 Baseline noise sound levels and limits at the ESRs from the previous IAMP ONE application have been used and predictions of potential noise from the proposed development have been undertaken for comparison with these limits.

7.5 Baseline Situation

7.5.1 Since the permission was issued West Moor Farm has been demolished and North Moor Farm is no longer occupied as a residential receptor.

Noise Survey

7.5.2 A noise survey was undertaken for the wider IAMP ONE application, the data from which has been used for this assessment. Baseline noise monitoring was undertaken in November 2017 at six locations surrounding the wider IAMP ONE site and included noise monitoring at ESR1.

7.5.3 At ESR1, road traffic on the A1290 was the dominant noise source. A low-level "whoosing" noise and reverse alarms associated with the Nissan plant were also audible. At ESR2, distant road traffic was the dominant noise source. Industrial noise from the Nissan plant was also audible. A summary of the measured levels at the ESRs is shown in Table 7.7~~Table 7.7~~, below.

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Table 7.7: Summary of measured baseline noise levels at ESRs (November 2017)

Location	Period	Measured Level, dB			
		$L_{Aeq,T}$	L_{Amax}	$L_{A10,T}$	$L_{A90,T}$
ESR1	Daytime (2 hours)	59	70	62	55
	Night-time (30 minutes)	49	63	51	45
ESR2	Daytime (2 hours)	57	79	58	43
	Night-time (30 minutes)	48	76	43	39

7.5.4 Whilst the baseline noise levels may now have changed slightly, it is considered that

the November 2017 baseline levels remain representative for the purpose of this assessment, as explained in Section 7.2 of this chapter.

7.6 Assessment of Effects

Assessment of Construction Noise

7.6.1 During the construction phase, any work carried out at the proposed development is likely to generate noise that may propagate beyond the proposed development boundary. Activities on the site that could give rise to construction noise impacts, if carried out, could include (but are not limited to) the following:

- Site preparation (e.g. ground excavation, levelling of ground, trenching, trench filling, unloading and levelling of hardcore and compacting filling).
- Construction of the buildings, including piling, fabrication processes (e.g. planning, sanding, routing, cutting, drilling and laying foundations).
- Installation of the process plant and erection of stack.

7.6.2 The above activities have the potential to generate short-term increases in noise levels, above those recommended in BS5228-1. The levels of noise received at the receptor closest to the proposed development phases would depend on the sound power levels of the machines used, the distance to the properties, the presence of screening or reflecting surfaces and the ability of the intervening ground to absorb the propagating noise.

7.6.3 Based on the ambient noise levels measured, the appropriate category value has been determined for each of the sensitive receptors, as detailed in Table 7.8.

Table 7.8 Construction noise assessment criteria

Monitoring Location	Existing Sensitive Receptor Location	Average Measured Daytime Noise Levels dB $L_{Aeq,t}$	Ambient Noise Level Rounded to the nearest 5dB $L_{Aeq,t}$	Appropriate Category Value A, B or C in accordance with BS5228-1	Noise Level above which activities of the Construction Phase may cause a significant impact at the Receptor dB $L_{Aeq,t}$
ESR1	Hylton Bridge Farm	59	60	A	65
ESR2	Rustica Trattoria & Inn	57	60	A	65

7.6.4 Noise generated by the earthworks and construction phases of the development may have a short-term, adverse impact at the above sensitive receptors. However, due to

the distances between the development and the receptors, it is considered unlikely that the construction activities will generate noise levels in excess of the significant impact level in Table 7.8 for any prolonged periods.

7.6.5 The affected sensitive receptors are of medium sensitivity, in accordance with Table 7.8. It is considered that the magnitude will be negligible due to the distance of sensitive receptor from the source. Therefore, it is considered that the impact of construction noise will be negligible and **Not Significant**, in accordance with Table 7.5.

7.6.6 To minimise the potential levels of noise generated by the construction works, best working practice will be put in place as part of the CEMP. Details can be found in Section 7.7 of this chapter.

Vibration from Construction Phase Activities

7.6.7 Human perception of vibration is extremely sensitive. People can detect and be annoyed by vibration before there is any risk of structural damage. Cases where damage to a building have been attributed to the effects of vibration alone are extremely rare; even when vibration has been considered to be intolerable by the occupants.

7.6.8 It is not possible to establish exact vibration damage thresholds that may be applied in all situations. The likelihood of vibration induced damage or nuisance will depend upon the nature of the source, the characteristics of the intervening solid and drift geology and the response pattern of the structures around the site. Most of these variables are too complex to quantify accurately and thresholds of damage or nuisance are, therefore, conservative estimates based on a knowledge of engineering.

7.6.9 Where ground vibration is of a relatively continuous nature, there is a greater likelihood of structural damage occurring, compared to transient vibration. For example, that caused by transiting vehicles.

7.6.10 BS5228-2 suggests that the onset of cosmetic damage is 15 mm/sec (15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz for residential or light commercial type buildings).

7.6.11 WA's archives contain field trial measurements of ground vibration associated with types of machinery likely to be used during the construction of the proposed development. The representative measured levels made by WA using a Vibrock B801 Digital Seismograph are set out in Table 7.9.

Table 7.9: Measured vibration levels of plant under normal operating conditions

Plant Type	Distance from Source		
	10 m (mm/s)	20 m (mm/s)	30 m (mm/s)
25-30 tonne excavator	0.175	0.075	Background
25 tonne dumptruck (Volvo A25)			
Loaded	1.000	0.150	Background
Empty	0.225	0.050	Background
Dozer	1.050	0.400	Background
Vibrating roller Drum			
Vibrator on	4.470	3.270	2.350
Vibrator off	0.500	0.150	0.050
Loading shovel	1.025	0.150	Background

7.6.12 Vibration generated by the earthworks and construction phases of the development may have a short-term, adverse impact at ESR1. Owing to the distances between the development and ESR1, however, it is considered unlikely that the construction activities will generate vibration levels in excess of those detailed in Table 7.10.

7.6.13 The affected sensitive receptor is medium sensitivity and it is considered that the magnitude will be Negligible due to the distance of sensitive receptor. The impact of construction vibration will, therefore, be negligible and **Not Significant**, in accordance with Table 7.15. To minimise the potential levels of vibration generated by the construction works, however, best working practice will be put in place as part of a CEMP.

Assessment of Operational Noise (Industrial Noise)

7.6.14 To support this assessment, noise predictions have been carried out that consider the potential noise sources onsite. The predictions are based upon indicative values of sound power levels for the size and type of plant to be used. The noise predictions have been undertaken using SoundPLAN version 8.2, which calculates the propagation of noise to the procedures contained in International Standard ISO 9613-2 'Acoustics – Attenuation of sound during propagation outdoors' for construction and operational phases.

7.6.15 The SoundPLAN model calculates the propagation of noise from source to receptor and accurately calculates the amount of attenuation provided by acoustic barriers, such as buildings and the intervening topography. The site model has been created using site topographical survey data together with the proposed site layout for the (up to) 9 GW capacity battery manufacturing facility. Table 7.10 below, identifies the

items of plant modelled and associated source type and sound power levels.

Table 7.10: Operational phase plant assumptions			
Noise Source	**Quantity**	**L_w dB (A)**	**Comment**
Development Plot – Single Large Unit Building			
Noise break-out from inside of factory building	1	See comment	As per the previous IAMP ONE application, noise inside the building has been predicted at 85 dB, which is the equivalent to the Upper Exposure Action Value specified in the Control of Noise at Work Regulations. The upper exposure value has been used as a worst-case scenario, and it is likely that the internal noise level will be lower to protect workers. The walls and roof have been assumed to be composed of Kingspan AWP/60 with no lining (Rw=25dB) and the noise model calculates noise breaking out of the building. This, again, is a robust assumption and the specification of the building façade can be improved if required.
Substations	5	55	Noise measurements of similar plant have been used for the sound power level of the proposed substations. Assumed to be a reverberant level of 55dB(A) internally. Assumed to be clad with Kingspan AWP/60 with no lining (R_w=25dB). The noise model calculates noise breaking out of the substation units.
Development Plot – External Plant			
Boiler Stacks	6	96.5	Sound pressure levels have been supplied for the proposed boilers from Envision AESC.
Ammonia Purge Vent Stacks	8	70	No data was provided for the remainder of the proposed stacks, therefore a limit of 70dB L_W has been proposed for the remaining stacks.
VOC Stacks	40	70	No data was provided for the remainder of the proposed stacks, therefore a limit of 70dB L_W has been proposed for the remaining stacks.
Lab Exhaust Flue	4	70	No data was provided for the remainder of the proposed stacks, therefore a limit of 70dB L_W has been proposed for the remaining stacks. Assumed to be 19m high.
Smoke extract fan platforms and Flue	4	70	No data was provided for the remainder of the proposed stacks, therefore a limit of 70dB L_W has been proposed for the remaining stacks. Assumed to be 33m high (as with majority of stacks considered).
Chiller units	4	70.3	The exact model of the proposed chiller units has not yet been confirmed therefore historic measurements of similar chiller units have been used in the noise model. Positioned within the channel of the western building. Assumed to be open air, with louvre on eastern side of channel.

Table 7.10: Operational phase plant assumptions			
Noise Source	**Quantity**	**L_w dB (A)**	**Comment**
Car Park	725	102.74	SoundPLAN Carpark prediction calculations have been used to predict the noise level from the proposed carpark area. The carpark has a capacity of 725 carparking spaces. The areas source assumes 2 parking movements, for each bay, in the assessment periods (one vehicle leaving and one vehicle parking, per bay).
Development Plot – Vehicle Movements in Yard			
HGV	10 movements in and out per hour	84	Approximately 50 HGV per day are anticipated. For the purpose of noise modelling, 10 HGV movements per hour has been assumed with a speed of 5 km/h.
Primary DNO 66KV Substation	1	55	Noise measurements of similar plant have been used for the sound power level of the proposed substations. Assumed to be 55dB(A) (open air source).
HV substation compound - 66KV Substation	1	55	Noise measurements of similar plant have been used for the sound power level of the proposed substations. Assumed to be a reverberant level of 55dB(A) internally. Assumed to be clad with Kingspan AWP/60 with no lining (R_w = 25dB). The noise model calculates noise breaking out of the substation units.
HV substation compound - Transformers	3	98	No data was available for the transformers. The noise inside the transformer buildings has been predicted at 85 dB, which is the equivalent to the Upper Exposure Action Value specified in the Control of Noise at Work Regulations. The upper exposure value has been used as a worst-case scenario, and it is likely that the internal noise level will be lower to protect workers. The walls and roof have been assumed to be composed of Kingspan AWP/60 with no lining (R_w = 25dB) and the noise model calculates noise breaking out of the building. This, again, is a robust assumption and the specification of the building façade can be improved if required.

7.6.16 The above assumptions present a robust daytime scenario for predicted noise levels and the same predicted sound levels during the operational phases have been used for the daytime and night-time periods.

7.6.17 The predicted specific operational sound levels are summarised in Table 7.~~Table 7.7.~~ and illustrated by Figure 7.2.

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7.6.18 BS4142 includes guidance on the application of an additional weighting that should be applied to the specific sound level should the industrial noise be tonal, impulsive, intermittent or have any other characteristics that are readily distinctive against the

residual acoustic environment, as experienced at receptors.

7.6.19 During the detailed design phase, any distinctive characteristics (e.g. tonality and intermittency) can be designed-out via good acoustic design, mitigation and/or selection of plant. Noise from substations is typically tonal in nature, but due to the distance from the receptors, they are likely to be inaudible. Therefore, no penalties have been applied to the operational specific sound level from the development.

7.6.20 The predicted rating levels of operations from the proposed development have been compared to the background sound levels and the results are shown in Table 7.~~Table 7.~~1.

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Table 7.5: Comparison of rating noise levels and background sound levels

Item	ESR1		ESR2	
	Daytime 1 hour	Night-time 15 minute	Daytime 1 hour	Night-time 15 minute
Specific Sound Level (dB)	38	38	37	37
Acoustic Feature Correction	0	0	0	0
Proposed development Rating Noise Level (dB)	38	38	37	37
Background Sound Levels L_{A90} (dB)	55	45	43	39
Exceedance of Background Noise (dB)	-17	-7	-6	-2

7.6.21 The rating levels are predicted to be less than the background sound levels during the day and night-time periods. 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.

BS4142 Context Assessment

7.6.22 BS4142:2014 states "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs". The first requirement of this statement has been determined within the noise impact assessment section, above. To determine the context in which the industrial sound will reside, the following three factors must be considered:

- The absolute level of sound.
- The character and level of the residual sound compared to the character and level of the specific sound.
- The sensitivity of the receptor.

Absolute Level of Sound

7.6.23 To determine the first context test in BS4142, it is necessary to determine whether the residual and background sound levels are high or low. Section 11 of BS4142 states:

"*Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.*

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse."

7.6.24 As shown in Tables 7.12, the background sound levels and rating levels at the ESRs are moderate to low. In accordance with BS4142, therefore, the absolute level could be as (or more) relevant when establishing a potential impact.

7.6.25 In order to assess the proposed development in the context of its environment and that of the ESRs, the predicted specific sound level from the operational phase has been added to the measured average ambient noise levels to give the absolute level of noise at the receptor with the development operating. This future absolute noise level has been compared against the existing ambient noise level and the predicted change in noise has been stated.

7.6.26 The results at the ESRs during the daytime and night-time periods are detailed within Tables 7.12 and 7.13, respectively.

Table 7.12: Context Assessment at Existing Sensitive Receptors for Daytime Operations of the IAMP, between 07:00 and 23.00 hours Figures in dB L_{Aeq}

Receptor	ESR1	ESR2
Average Measured Ambient Noise Level (i.e. existing sound level without the proposed IAMP operations).	59	57
Predicted Specific Noise (i.e. operational noise level of the IAMP, only).	38	37
Total absolute level of sound (i.e. existing sound level plus ERP sound level).	59	57

Difference between existing ambient sound levels and predicted future sound levels.	±0	±0

Table 7.13: Context Assessment at Existing Sensitive Receptors for Night-time Operations of the IAMP, between 23:00 and 07:00 hours Figures in dB L_{Aeq}

Receptor	ESR1	ESR2
Average Measured Ambient Noise Level (i.e. existing sound level without the proposed IAMP operations).	49	48
Predicted Specific Noise (i.e. operational noise level of the IAMP, only).	38	37
Total absolute level of sound (i.e. existing sound level plus ERP sound level).	49	48
Difference between existing ambient sound levels and predicted future sound levels.	±0	±0

7.6.27 The assessment of the absolute level of noise shows that, based on the assumption made in this assessment, the proposed development will lead to a ±0 dB increase in the existing ambient noise levels at the ESRs during the daytime and night-time periods. Therefore, this is a positive indication the development is unlikely to be perceptible to the ESRs.

7.6.28 The potential noise impact is, therefore, consistent with the findings of Table 7.11.

Character and Level of Residual and Specific Sound

7.6.29 The character of the residual sound, which contains broadband noise from road traffic and industrial noise from the Nissan Plant to the south, as well as from SNOP and Faltec within IAMP ONE, and the character of the specific sound of the proposed development will be very similar. The proposed development is, therefore, considered to be in keeping with the immediate area.

7.6.30 The assessment shows that the average level of the residual sound and the calculated level of the specific sound are similar. In addition, they are both considered to be low. This is a positive indication that the noise impact from the proposed development would be equal to or less than is suggested by Table 7.11.

Sensitivity of Receptor and Existing Acoustic Conditions

7.6.31 With regards to pertinent factors to be taken into consideration, Section 11 of BS4142 states that the sensitivity of the receptor and whether dwellings or other premises

used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions (e.g. facade insulation treatments or acoustic screening). This is unlikely to be the case at the ESRs, as such, the noise impact presented in Table 7.11 remains unchanged.

Summary of BS4142 Context Assessment

7.6.32 The context assessment shows that the measured existing ambient sound level is very similar to the predicted ambient sound level with the development in place and that the character of the specific sound is very similar to the residual sound in the surrounding area. It can be concluded that the rating levels are predicted to be equal to or less than the background sound levels during the daytime and night-time periods. 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.

7.6.33 The context has identified that the potential impact is likely to be equal to or less than that stated within Table 7.11 and, therefore remains **Low**. In EIA terms the potential impact is negligible and **Not Significant**.

7.7 Mitigation measures

Mitigation for Construction Noise and Vibration

7.7.1 Whilst no mitigation measures are required, the use of best practice during construction should be employed to reduce the potential impact from noise and vibration.

Construction Noise

7.7.2 To reduce the impacts of noise levels generated by the construction phase of the development good working practice can be implemented during each phase of the earthworks and construction works at the site. This is set out within the CEMP, with the following measures put in place to minimise noise emissions:

- Adherence to any time limits imposed on noisy works by the local authority.
- Should earthworks and/or construction activities need to be carried out during night-time hours, such as concrete pours for the building floor slabs, advance notice will be provided in writing to the local planning authority and will provide details of the work.

- All machinery should be regularly maintained to control noise emissions, with particular emphasis on lubrication of bearings and the integrity of silencers.
- Site staff should be aware that they are working adjacent to a sensitive area and avoid all unnecessary activities due to misuse of tools and equipment, unnecessary shouting and radios.
- As far as possible, the avoidance of two noisy operations occurring simultaneously in close proximity to the same sensitive receptor.
- Ensure engines are turned-off whenever possible.

Construction Vibration

7.7.3 To reduce the impacts of vibration generated by the construction phase of the development, good working practice can be implemented during each phase of the earthworks and construction works at the Site. This is set out within the CEMP, with the following measures put in place to minimise vibration emissions:

- All construction activity will be undertaken in accordance with good practice as described by BS 5228: Code of practice for noise and vibration control on construction and open sites.
- Staff must show consideration to the sensitive receptors, including residential neighbours, and must not generate unnecessary noise when walking to and from the site, or when leaving and arriving at work.
- All complaints will be recorded and investigated, and any corrective actions implemented. Additionally, should any complaints arise regarding vibration they will be investigated, and monitoring measurements taken and analysed, with techniques modified where required.

Mitigation for Operational Noise (Industrial Noise)

7.7.4 The following mitigation measures will be adopted as part of the development design:

- External plant (e.g. fans, stacks and heating and ventilation units) can be specified to reduce noise levels. Where necessary, silencers may be applied to plant to attenuate tonal components. All stacks, with the exception of the boiler units, will be limited to 70dB L_w.
- Wherever possible, building access points (e.g. shutters and loading bay doors) should remain closed when not in use.

- White noise reversing alarms for movements within yards may be specified (if required).

7.8 Residual Effects

Construction Noise and Vibration

7.8.1 The sensitivity of the existing residential receptor at Hylton Bridge Farm and Rustica Trattoria & Inn is Moderate, the magnitude of change after mitigation (suggested as best practice) will be Negligible. The effect of noise and vibration during construction is considered to be Negligible and **Not Significant**.

Operational Noise (Industrial Noise)

7.8.2 It should be noted that, as there is no specific plant noise data available at this point in the application, the assessment has considered a robust operational scenario for the development. The sensitivity of the existing residential receptor at Hylton Bridge Farm and Rustica Trattoria & Inn is Moderate, the magnitude of change following mitigation will be Negligible. The effect of noise during operation would be Negligible and **Not Significant**.

7.9 Limitations of Study

7.9.1 The baseline levels are taken from those presented within the original IAMP ONE ES, and the same baseline noise levels were also used in the 2020 ES. These levels are a reference for the current consent, and therefore no new survey was undertaken.

7.9.2 Assumptions have been made for operational noise predictions. The assumptions are considered robust and allow for flexibility in the development design whilst protecting ESR 1.

7.10 Cumulative Impact Assessment

7.10.1 The development forms part of the wider IAMP ONE site, where other plots are already consented. The layout assessed in this chapter includes all operations on the proposed development. Mitigation measures will be included across the development to minimise the potential for the ambient noise level.

7.10.2 The development forms part of the wide IAMP ONE project and would not generate significant additional traffic on the local network when compared to the traffic flows anticipated in the outline planning approval for the wider IAMP site. It is anticipated that there will be the same vehicle movements for the proposed development which

is fewer than were previously assessed within the 2018 and 2020 assessments. Also, any development traffic would access from the A19; thereby only driving along a small section of the A1290 (with no ESRs immediately present on either side) linking the development to the A19. The proposed development would, therefore, not have a significant impact upon changes to road traffic noise at receptors along the road network and, as such, this is not considered further within this chapter.

7.10.3 Any intra-cumulative effects of noise during construction, from works occurring within more than one plot at the same time would be temporary are not expected to give rise to significant effects. Owing to the geographic location of all development plots and the fact that predicted noise levels are equal to background levels, no significant intra-cumulative are impacts predicted.

7.11 Summary & Conclusions

7.11.1 A noise assessment has been undertaken for the construction and operational phases of the proposed development to assess the potential impact at the nearest ESRs, and the following potential impacts have been assessed:

- Construction noise impact at the ESRs.
- Construction vibration impact at the ESRs.
- Operational noise impact at the ESRs.

7.11.2 The baseline noise levels at the ESRs have been taken from those identified within the 2018 IAMP ONE application. Baseline data was used to establish potential threshold for construction noise, and these were compared to predictions of construction noise levels.

7.11.3 The effects of noise and vibration during construction was found to be **Not Significant** and no specific mitigation measures are required. The use of best practice during construction should, however, be employed in order to reduce the level of effect of potential impacts and examples have been provided.

7.11.4 In the absence of detailed information, indicative noise predictions have been carried out for the potential noise sources during the operational phase. The predicted noise levels at the ESRs were compared to background levels. The effects of noise during operation are predicted to be at or below background sound levels (with mitigation in place) and **Not Significant**. Additional, indicative mitigation measures are also suggested that will be reviewed at the detailed design stage.

7.11.5 No cumulative noise impacts have been identified.

7.11.6 For this development, noise should not be a determining factor in granting detailed planning permission in accordance with the current guidance.

7.11.7 The assessment conclusions do not differ from those for permission 21/01764/HEA.