Noise Impact Assessment

Tesla Superchargers, The Old Post Office, Huddersfield Road, Haigh, Barnsley, S75 4DE

Tesla Motors Ltd

CRM.3030.014.NO.R.001

'Experience and expertise working in union'

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Project:	Tesla Superchargers, The Old Post Office, Huddersfield Road, Haigh, Barnsley
For:	Tesla Motors Ltd
Status:	Final
Date:	May 2023
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Reviewer:	Mark Harrison BSc (Hons) MIOA

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Tables & Figures

1 Introduction

1.1 Project Introduction

1.1.1 Enzygo Limited (Enzygo) has been commissioned by Tesla Motors Ltd to undertake an environmental noise impact assessment to support a planning application for new Tesla Superchargers at The Old Post Office, Huddersfield Road, Haigh, Barnsley.

1.1.2 The assessment has been undertaken to assess compliance with the relevant standards at the nearest noise-sensitive receptors and to provide outline mitigation advice, where considered necessary.

1.1.3 Details of the assessment methodology employed and conclusions are presented within this report.

1.2 Site Description

1.2.1 The proposed superchargers and ancillary equipment enclosure would be located with the car park of The Old Post Office restaurant. The restaurant is located approximately 180m south of Junction 38 of the M1, which runs north to south 65m to the east of the restaurant.

1.2.2 The restaurant has a relatively large parking area for use by their patrons and is available for use 24/7.

1.2.3 The immediate area surrounding the proposed site would be described as follows:

- To the north of the site is the restaurant with a large hardstanding area and Junction 38 of the M1 beyond;
- To the east is the M1 motorway and slip roads to Junction 38 beyond which is the Hallam Line railway and open undulating countryside;
- To the south lies open undulating countryside adjacent to the A637 which continues south towards Kexbrough; and,
- To the west of the site is open countryside as far as Clayton West.

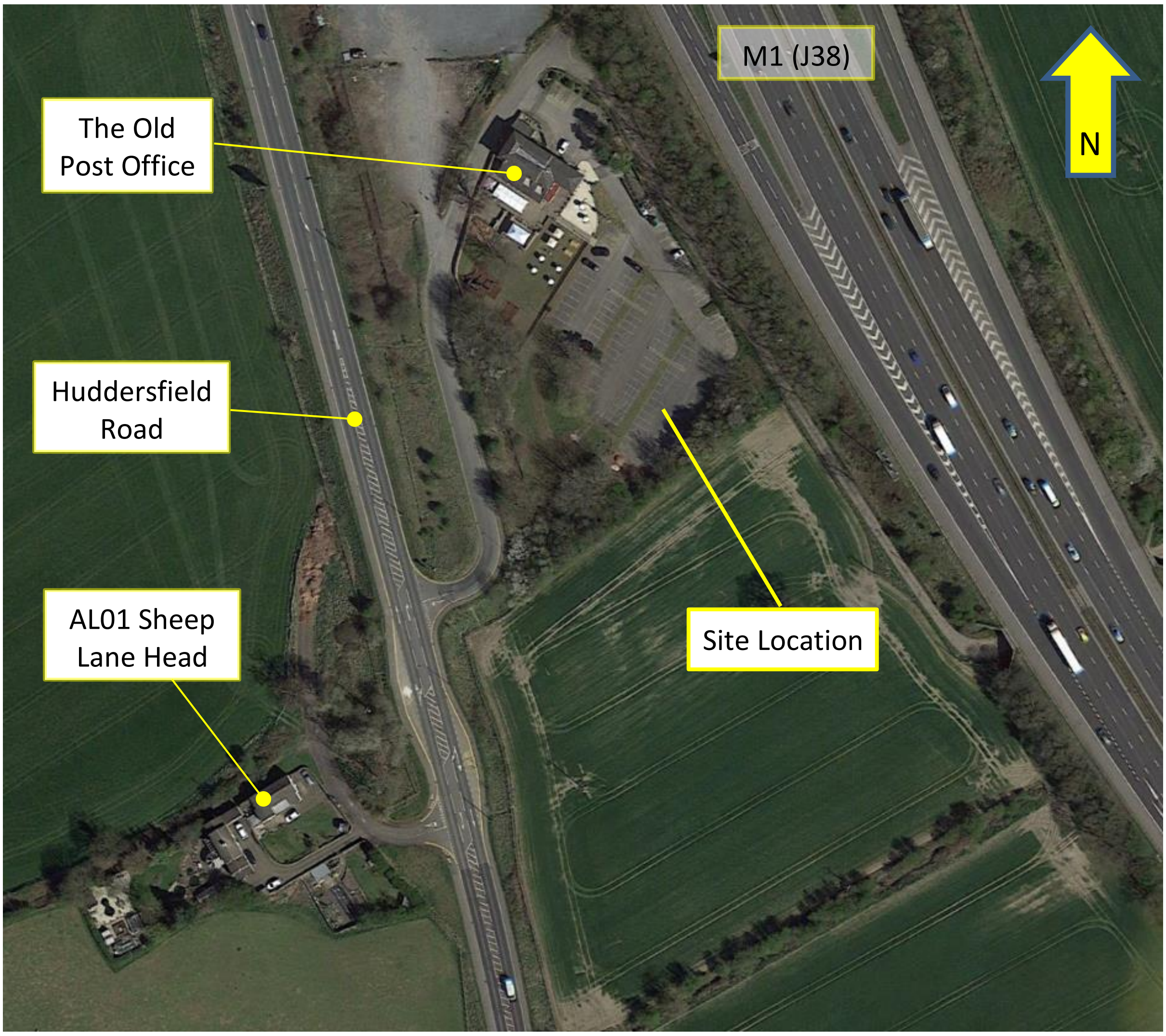
1.2.4 There are sporadic residential properties in all directions from the site, the closest of which is at Sheep Lane Head approximately 125m from the site. The area around the site is largely agricultural in nature which major roads, M1 and A637, and the Hallam Line railway. The nearest noise-sensitive receptor location is identified in Table 1-1 below:

Table 1-1: Noise Assessment Locations

Receptor Location	Approx. Distance from Site, m	OS Grid Co-ordinates	
		Easting	Northing
AL01 – Sheep Lane Head	125	429761	411466

1.2.5 The site and receptor locations are shown in Figure 1-1.

Figure 1-1: Site and Assessment Locations



Google ©

1.2.6 Publicly available noise mapping for the area[1] indicates that existing noise levels at the nearest receptor would fall within the range 65dB to 70dB $L_{Aeq,16hr}$ based on road traffic noise from the M1 motorway and the A637. This would subjectively be considered a high noise level.

1.3 Project Description

1.3.1 The site is to accommodate Tesla supercharger units and associated equipment in the southern portion of the car park. The latest iteration of the layout plan is presented in Figure 1-2 below.

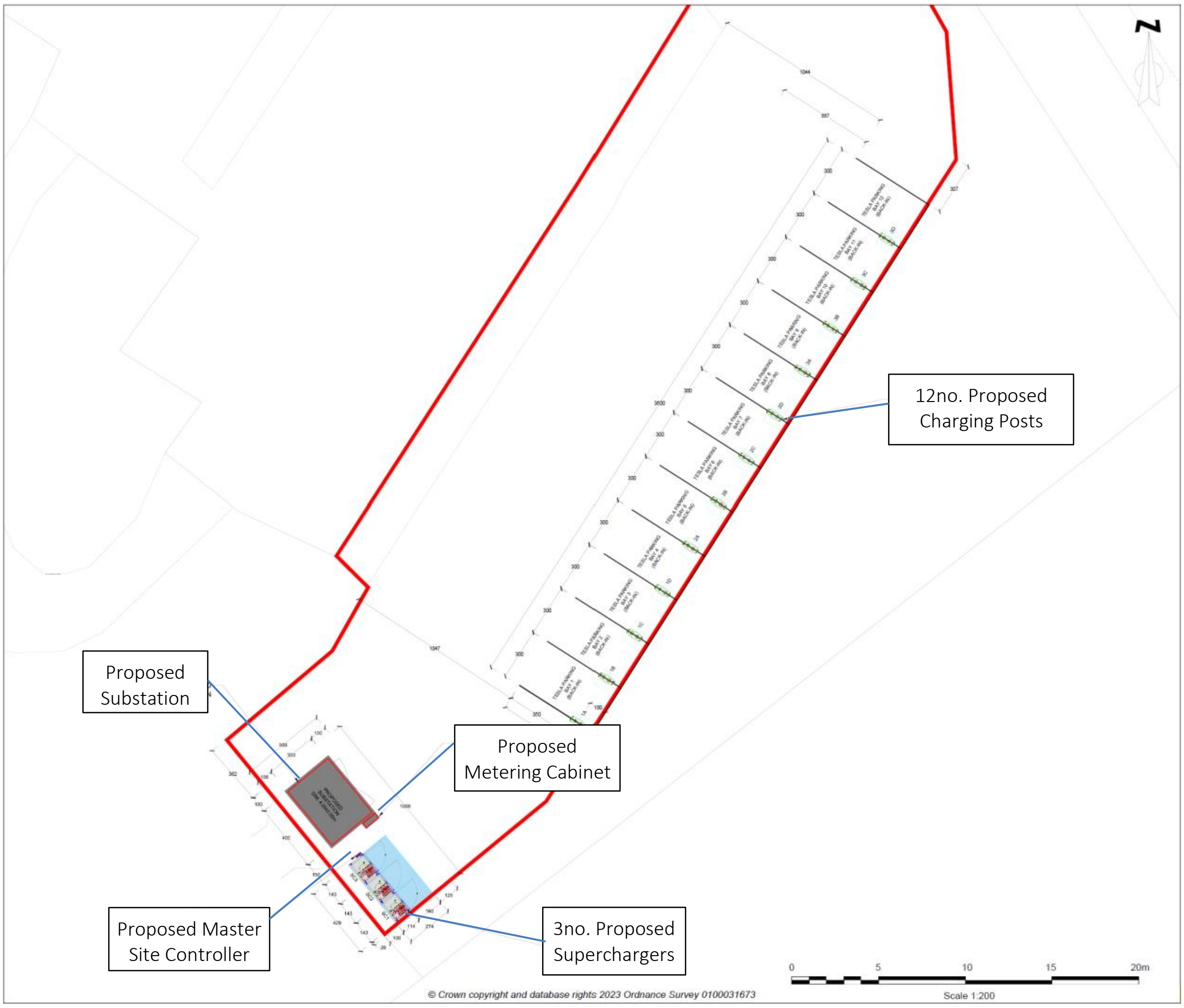
1.3.2 The site is to accommodate the following items:

- 12no. Tesla V3 Supercharger EV charging stalls;
- 3no. Tesla V3 Supercharger cabinets; and,
- Associated Substation.

[1] http://www.extrium.co.uk/noiseviewer.html

1.3.3 The equipment will be available to use 24-hours a day.

Figure 1-2: Site Plan – Rev A



2 Standards and Guidance

2.1 Introduction

2.1.1 The noise assessment has been conducted in accordance with the guidance contained within British Standard 4142:2014+A1:2019 '*Method for rating and assessing industrial and commercial sound*' (BS4142), and British Standard 8233:2014 *'Guidance on sound insulation and noise reduction for buildings'.*

2.1.2 Noise levels generated by the proposed development have been predicted to the nearest noise-sensitive receptors, using the calculation methodology outlined in ISO9613:1996 '*Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*' (ISO9613) using the proprietary noise modelling software CadnaA.

2.2 Planning Practice Guidance: Noise

2.2.1 The Planning Practice Guidance: Noise is the Government's online guidance on managing potential noise impacts from new developments.

2.2.2 The guidance includes a noise exposure hierarchy table which relates response to noise and example outcomes to effect levels. The hierarchy table also identifies actions required for each effect level.

2.2.3 Particularly relevant to this assessment are the No Observed Effect Level and the No Observed Adverse Effect Level (NOAEL) to which the guidance states:

Table 2-1: Noise Hierarchy Table Excerpt

Response	Example 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

2.3 British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound.*

2.3.1 BS4142 provides a methodology for rating and assessing sound associated with both industrial and commercial premises.

2.3.2 Typically, noise impacts from these facilities are derived from the numerical subtraction of the background noise level (not necessarily the lowest background level measured, but the typical background of the receptor) from the measured/calculated rating level of the specific sound under consideration. This comparison enables the impact of the sound to be concluded based upon the premise that typically "*the greater this difference, the greater the magnitude of the impact*".

2.3.3 The standard further 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 levels exceeds the background. This is especially true at night."*

2.3.4 The Standard quantifies the typical reference periods to be used in the assessment of noise, namely:

Typical Daytime	07:00 – 23:00	1-hr assessment period
Typical Night-time	23:00 – 07:00	15-min assessment period

2.3.5 The Standard outlines methods for defining appropriate "*character corrections*" within the rating levels to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency. These are a) the Subjective Method, b) the Objective Methods for tonality and c) the Reference Method. It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the specific level.

2.3.6 The Subjective Method is based on the following corrections:

Table 2-2: BS4142 Subjective Method Rating Corrections

Level of Perceptibility	Tonal Correction	Impulsivity Correction	Correction for "Other sound characteristics"	Intermittency Correction
No Perceptibility	+0 dB	+0 dB	Where neither tonal nor Impulsive but clearly identifiable +3 dB	If intermittency is readily identifiable +3 dB
Just Perceptible	+2 dB	+3 dB		
Clearly Perceptible	+4 dB	+6 dB		
Highly Perceptible	+6 dB	+9 dB		

2.4 British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings*

2.4.1 BS8233 provides guidance and recommendations for the control of noise from outside sources to maintain an internal acoustic environment appropriate for the intended use. The Standard suggests appropriate criteria and limits for differing situations which are, primarily, intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes to the external noise climate. However, it is considered that the guidance provides suitable criteria for the assessment of internal noise levels in this instance.

2.4.2 The Standard suggests suitable guidance values for residential dwellings shown in Table 2-3.

Table 2-3: BS8233 Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 Hours	23:00 to 07:00 Hours
Resting	Living room	35dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,8hr}$

2.4.3 Whilst it is considered desirable to achieve these internal noise levels with the windows open, it is not stipulated within the Standard which states:

"If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

2.4.4 The Standard suggests that the level of noise reduction provided by a partially open window would be approximately 15dB.

2.4.5 BS8233 also sets out a design-criteria for external noise in external amenity spaces such as gardens and patios stating:

"it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments."

2.4.6 These guideline design-criteria values are meant for new residential development rather than for assessing new noisy development being introduced into a residential area. However, the guideline values provide good noise limits to attain in this instance.

2.5 ISO9613 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*

2.5.1 The noise levels generated by the operation of the proposed development have been predicted using the calculation methodology set out in ISO9613-2. The methodology considers the distance between the sources and the receptors and applies the amount of attenuation due to atmospheric absorption and other site-specific characteristics.

2.5.2 The methodology assumes downwind propagation, i.e., a wind direction that assists the propagation of noise from the source to all receptors.

2.6 Absolute Noise Level Assessment

2.6.1 Using the standards and guidance detailed above, absolute noise limits have been derived to assess the potential noise impact associated the development, irrespective of the existing background sound levels.

2.6.2 Noise limits for the daytime are based on the desirable design criteria for external amenity spaces outlined in BS8233.

2.6.3 Night-time noise limits are derived from the internal ambient noise level guidance outlined in BS8233 (ref. Table 2-3). The internal guidance level is used to estimate to external level with the addition of 15dB to approximate the attenuation afforded by a window left partially open for ventilation. This has then been adjusted by subtracting 10dB to ensure that predicted noise levels would not contribute to a cumulative rise in noise levels which would exceed the internal values.

2.6.4 Following this methodology, the following noise limits are derived below:

Table 2-4: Absolute Noise Level – Assessment Criteria

Period	Noise Limit, dB	Derived External Noise Limit, dB
Daytime (07:00 to 23:00)	-	50
Night-time (23:00 to 07:00)	30	35

2.6.5 The noise limits summarised above apply to a free field location outside an assumed internal sensitive space. While the limits are derived from BS8233, it is considered appropriate to include a weighting correction for identifiable characteristics as detailed in BS4142.

3 Noise Assessment

3.1 Introduction

3.1.1 Specific sound levels generated by the development proposals have been predicted to the site facing façade of the nearest noise-sensitive receptor identified using the calculation methodology outlined in ISO9613.

3.1.2 The resulting predicted specific sound levels have then been assessed in accordance with the external noise limits derived in section 2.6 above.

3.2 Noise Emissions

3.2.1 As described in Section 1, the proposed Tesla infrastructure would comprise 12no. Tesla charging stalls and the associated equipment. The noise data for the equipment, which was measured at an existing Tesla site, is shown in Table 3-1. It is understood that no other items of equipment generate any noise.

Table 3-1: Modelled Source Emissions

Plant Noise Source	No. of items	Sound Pressure Level at 1m dB $L_{Aeq,T}$	Notes
Tesla V3 Supercharger cabinet (cooling fan at 100% capacity)	3	69.9	Noise generated by fan at rear of unit(1)
Tesla vehicles charging	12	59.2	Noise generated by vehicle fan under bonnet(1)
Transformer	1	67.0	Library Data

Note 1 – Noise measurements have been made during the charging cycle of Tesla Model S, Model 3 and Model Y EVs.

3.2.2 The sound level for the supercharger unit is from the Enzygo noise library and was established from an existing, operational supercharging facility under typical load. Subjective notes from the measurements indicate that the primary noise source associated with the unit is the fan, located to the rear of the casing. The fan operates at a constant output, cooling the unit during a charging cycle. Analysis of the 1/3rd octave data from the measurements reveal no tonal content when analysed in accordance with the methodology detailed in Annex C of BS4142.

3.3 Operating Conditions/Characteristics

3.3.1 The Tesla Superchargers would be available for use 24-hours per day. It is understood that it typically takes around 30-minutes to charge a vehicle and that when not charging vehicles the equipment generates little or no noise.

3.3.2 It is considered that there will be periods when not all supercharger stalls are in use. However, for the purposes of this assessment, it is assumed that all supercharger stalls are operating simultaneously providing a worst-case situation.

3.4 Noise Modelling

3.4.1 The noise model was constructed using the proprietary noise modelling software package CadnaA. The potential noise impacts at the nearby noise-sensitive receptor have been predicted using the calculation methodology outlined in ISO9613.

3.4.1 The noise model was constructed using Google Maps geo-referenced 1:1 scaled aerial photography and noise source data presented in Table 3-1.

3.4.2 The following assumptions have been made during the modelling process:

- The ground absorption has been set to 0.5 to represent 50% soft ground between the site and the receptor and 0 for reflective (hard) ground at the parking area;
- Order of reflection is set to 2; and,
- A positive wind vector between the noise source and receptor locations.

3.5 Predicted Sound Levels

3.5.1 Noise levels generated by the superchargers and associated equipment have been predicted to the nearest outdoor amenity space at a height of 1.5m during the daytime and the nearest site facing façade at a height of 4m at night.

3.5.2 All equipment has been modelled with 100% on-time when in operation with the cooling fans operating at 100% duty.

Table 3-2: Predicted Specific Sound Levels at the Noise-Sensitive Receptors

Location	Period	Assessment Height, m	Specific Sound Level, dB
AL01 – Sheep Lane Head	Daytime (07:00 – 23:00 hrs)	1.5	30
	Night-time (23:00 – 07:00 hrs)	4.0	32

3.6 Derived Sound Rating Levels

3.6.1 The site and nearby receptors are likely exposed to relatively high levels of road traffic noise from the M1 and A637. As such, noise associated with vehicles accessing the charging stations is not dissimilar the prevailing noise climate in the area.

3.6.2 The library data for the Tesla Superchargers indicates no significant tonal content within the sound spectrum.

3.6.3 Given the above, no corrections have been applied in the derivation of the rating noise levels in the assessment below.

3.7 Noise Impact Assessment

3.7.1 The assessments presented in Table 3-3 below have been undertaken against the noise limits derived in Section 2.6 above. It is reiterated that the noise limits assume an internal bedroom space at the nearest receptor, with windows open for ventilation.

3.7.2 Further to this, the assessment reflects a worst-case situation when all charging stalls are occupied and are charging throughout the assessment period with the cooling fans operating at 100% duty.

Table 3-3: Assessment against Derived Noise Limits

AL01 Sheep Lane Head	Predicted Rating Level dB $L_{Aeq,T}$	Derived Noise Limits, dB	Difference, dB
Daytime (07:00 – 23:00 hrs)	30	50	-20
Night-time (23:00 – 07:00 hrs)	32	35	-3

3.7.3 Table 3-3 demonstrates that the predicted sound rating levels fall well below the derived noise limits during both the daytime and the night-time periods.

3.8 Context

3.8.1 For reference, BS4142 states that where the initial estimate of impact needs to be modified due to the context, all pertinent factors should be taken into consideration.

Sensitivity of the Receptors

3.8.2 The receptor considered in this study is understood to be residential with no particular links to the proposed development. Therefore, it is considered sensitive to potential changes in noise levels arising from the proposals. However, the property is located close to the M1 motorway and is already exposed to daytime noise levels of between 65dB and 70dB $L_{Aeq,16hr}$.

The Absolute Level of Sound

3.8.3 Overall, the predicted noise levels from the facility, assuming all stations are operational at any one time, are relatively low and would fall well below the levels at which disturbance would occur.

3.8.4 When vehicles are not charging the equipment would make no noise.

Summary of Context

3.8.5 The context of the setting would not affect the outcome of the impact assessment presented in Table 3-3 above.

4 Conclusion

4.1 Background

4.1.1 Enzygo Limited (Enzygo) has been commissioned by Tesla Motors Ltd to undertake an environmental noise impact assessment to support a planning application for new Tesla Superchargers at The Old Post Office, Huddersfield Road, Haigh, Barnsley.

4.1.2 The assessment has been undertaken to assess the potential noise impact associated with the installation of 12no. electric vehicle charging stations and associated equipment on a portion of the existing car park.

4.1.3 The assessment is based on the results of a series of noise predictions undertaken in accordance with the calculation methodology contained in ISO9613 '*Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*'. The noise impact at the nearest noise-sensitive receptors has been established against absolute noise limits derived from guidance detailed in BS8233:2014.

4.2 Noise Assessment

4.2.1 Sound levels generated by the Tesla infrastructure have been predicted using the proprietary noise modelling software CadnaA.

4.2.2 The sound levels have been assessed against absolute noise limits derived from guideline values detailed in BS8233:2014.

4.2.3 The assessment demonstrates that noise from the Tesla facility, when operating at 100% of its capacity, would fall well below the derived noise limits. Furthermore, the predicted levels are sufficiently low as to ensure no cumulative rise in noise levels which would exceed the guideline values from BS8233 would occur.

4.2.4 Given the above, it is concluded that noise from the proposed development would not result in adverse noise impacts on any of the receptors in the vicinity of the development. As such, there are no reasons, on noise grounds, why planning consent for the charging stations cannot be granted.

Glossary of Terminology

Noise is defined as unwanted sound. The range of audible sound is known to be from 0dB (threshold of hearing) to 140dB (threshold of pain). Examples of typical noise levels relating to 'everyday' occurrences are given in Table G-1 below.

Table G-1: Typical Noise Levels

Source	Sound Pressure Level in dB(A)	Subjective Level
Gun shot	160	Perforation of eardrum
Military Jet take-off	140	Threshold of pain
Jet Aircraft at 100m	120	Very Loud
Rock Concert, front seats	110	Threshold of Sensation
Pneumatic Drill at 5m	100	Very Loud
Heavy goods vehicle from pavement	90	
Traffic at kerb edge	70 – 85	Loud
Vacuum Cleaner, Hair Dryer	70	
Normal conversation at 1m	60	Moderate
Typical Office	50 – 60	
Residential area at night	40	Quiet
Rural area at night, still air	30	
Leaves Rustling	20	
Rubbing together of fingertips	10	
	0	Threshold of hearing

The frequency response of the human ear to noise is usually taken to be around 18Hz (number of oscillations per second) to 18,000Hz. However, the human ear does not respond equally to different frequencies at the same level; it is more sensitive in the mid-frequency range than lower and higher frequencies and, because of this, when undertaking the measurement of noise the low and high frequency components of any given sound are reduced in importance by applying a filtering (weighting) circuit to the noise measuring instrument. The weighting which is widely accepted to correlate best with the subjective nature of human response to noise and is most widely used to quantify this is the A-weighted filter set. This is an internationally accepted standard for noise measurement.

For variable noise sources within an area an increase of 3dB(A) would be the minimum perceptible to the human ear under normal conditions. It is generally accepted that an increase/decrease of 10dB(A) corresponds to a doubling or halving in perceived loudness. The 'loudness' of a noise is a purely subjective parameter, dependant not only upon the sound pressure of the event but also on the dynamics of the listener's ear, the time of the day and the general mood of the person.

With regard to environmental noise levels (in the open air), these are rarely steady but rise and fall according to the activities being undertaken within the surrounding area at any given time. In an attempt to produce a figure that relates this variable nature of noise to human subjective response, a number of statistical noise metrics have been developed. These and other useful terminology and descriptors are presented in Table G-2 below.

Table G-2: Terminology

Term	Definition
Sound	Pressure fluctuations in a fluid medium within the audible range of amplitudes and frequencies which stimulate the organs of hearing.
Noise	Unwanted sound emitted from a source and received by the sensitive receptor.
Decibel (dB)	Unit most often used to describe the sound pressure level. A logarithmic number, it correlates closely to the way in which humans perceive sound. Its wide range of values helps quantify sound pressures from a large variety of magnitudes.
A-Weighting (dB(A))	Human perception of sound is frequency dependant. A-weighting applies a range of corrections at each frequency to provide a 'human-averaged'. Can be frequency band or broadband values.
Frequency (Hz)	The number of cycles per second, for sound this is closely related (and often mistaken for) pitch.
Frequency Spectrum	A more detailed analysis of the frequency components that comprise a sound source.
$L_{A10,T}$	The 10th statistical percentile of a measurement period, i.e. the level that is exceeded for 10% of the measurement duration. Closely correlates with traffic sources, A-weighted.
$L_{A90,T}$	The 90th statistical percentile of a measurement period, i.e. the level that is exceeded for 90% of the measurement duration. Used to describe background sound levels, as this value is affected less by short, transient sound sources, A-weighted.
L_{Amax}	The root mean square (RMS) maximum sound pressure level within a measurement period, A-weighted.
Ambient Sound	The total sound climate of all sources incident at one location, both in the near- and far-field (*The ambient sound comprises the residual sound and the specific sound when present)*.
Ambient Sound Level $L_a = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound Level $L_{A90,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Equivalent Continuous A-weighted Sound Pressure Level $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

Term	Definition
	$$L_{Aeq,T} = 10lg_{10}\left\{\left(\frac{1}{T}\right)\int_{t1}^{t2}\left[p_A\frac{(t)^2}{{p_0}^2}\right]dt\right\}$$ Where p_0 is the reference sound pressure (20µPA); and P_A(t) is the instantaneous A-weighted sound pressure level at time t.
Measurement Time Interval T_m	Total time over which measurements are taken (*This may consist of the sum of a number of non-contiguous, short-term measurement time intervals)*
Rating level $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound, over a period of time, T.
Reference Time Interval, T_r	Specified interval over which the specific sound level is determined (This is 1hr during the day from 07:00 to 23:00 hours and a shorter period of 15-min at night from 23:00 to 07:00 hours).
Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level $L_r = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound in a given situation at the assessment location over a given time interval, T.
Sound Pressure Level	The level of fluctuation in air pressure, caused by airborne sound sources. Measured in Pascals (Pa).
Sound Power Level	The rate at which sound is radiated by a source. This parameter is useful as it describes sound energy before environmental or decay factors. Quantified in dB and notated usually as L_w or SWL.
Specific sound level $L_s = L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T.
Specific Sound Source	Sound source being assessed.

Statement of Uncertainty

This report is based upon a range of measurements, a system of calculations and noise predictions. As such, this report attempts to quantify fluctuations in air pressure and is subject to the effects of meteorology, physical and perceived anomalies, tolerances within the measuring and monitoring equipment and accuracy margins within the noise modelling software. In the interests of repeatability, this report must be considered as being affected by common factors involved in the measurement and calculation of noise propagation.

All measurement values, outcomes and assumptions are subject to a margin of uncertainty. This has been quantified and assessed as follows:

- Rounding errors – systemic tolerance of ±1dB;
- Type 1 sound level meter – operational tolerance of ±1.1dB;
- Meteorology – allowance of ±1.9dB; and,
- CadnaA noise propagation modelling software – operational accuracy of ±2.1dB.

The most influential uncertainty factors for the assessment of noise are deemed to be equipment tolerances, meteorology and software accuracy. A root-sum-square statistical average has been used to provide an overall margin of uncertainty of ±3dB.

Statement of Competency

The report has been prepared by Mr. Darren Lafon-Anthony who is the Director of Acoustics at Enzygo Limited. Mr. Lafon-Anthony holds a Master of Science Degree in Applied Acoustics and has been a Corporate Member of the Institute of Acoustics since July 2004 having previously been an Associate Member of the institute since October 2001. Mr. Lafon-Anthony is also a Fellow of the Institute of Quarrying based on his contribution to minerals and mining noise assessment and mitigation, a qualification he has held since September 2014.

Mr. Lafon-Anthony has worked in acoustics since January 1981. Initially as an engineer designing and overseeing manufacture of noise control equipment for the water industry, standby power diesel generator and power generation markets for several noise control equipment manufacturers and, since February 2004, as an environmental noise consultant in various sectors, including mineral and mining sites, waste disposal and recycling sites, large industrial developments, energy supply projects (EfW, STOR and Battery Energy sites) and residential developments in the UK, Europe and sub-Saharan Africa.

The assessment has been reviewed by Mr Mark Harrison, Principal Acoustic Consultant at Enzygo Limited. Mr Harrison holds a Batchelor of Science degree in Music Technology and a post graduate Diploma in Acoustics and Noise Control.

Mr Harrison has worked in acoustic consultancy since 2007 and has worked on noise and vibration assessments in several sectors including industrial/commercial developments; power generation and distribution; residential developments; transport schemes; and mineral extraction and processing.

APPENDIX A – Noise Contour Plots

Figure A-1: Noise Contour Plot – Ground Floor (1.5m) Daytime

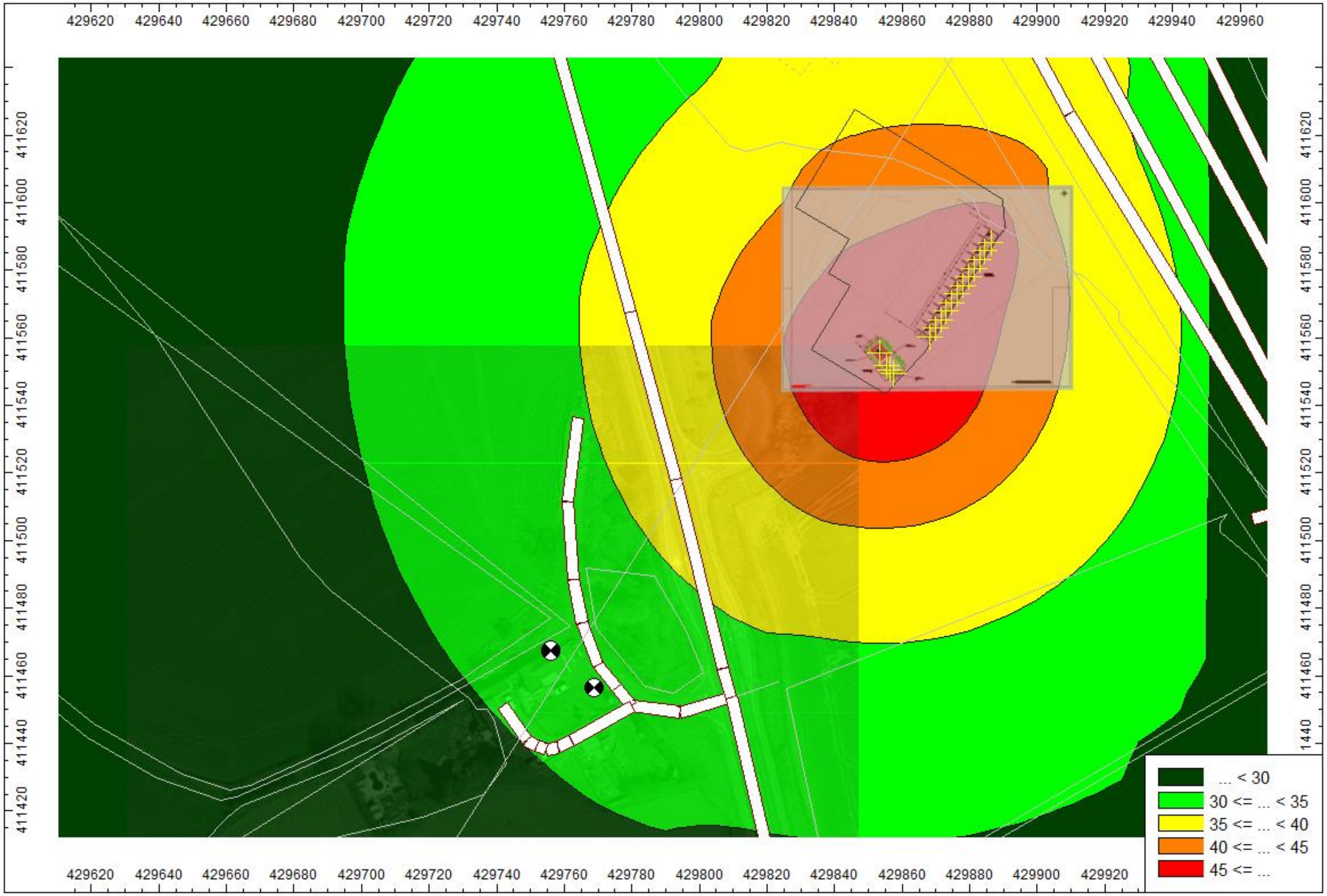
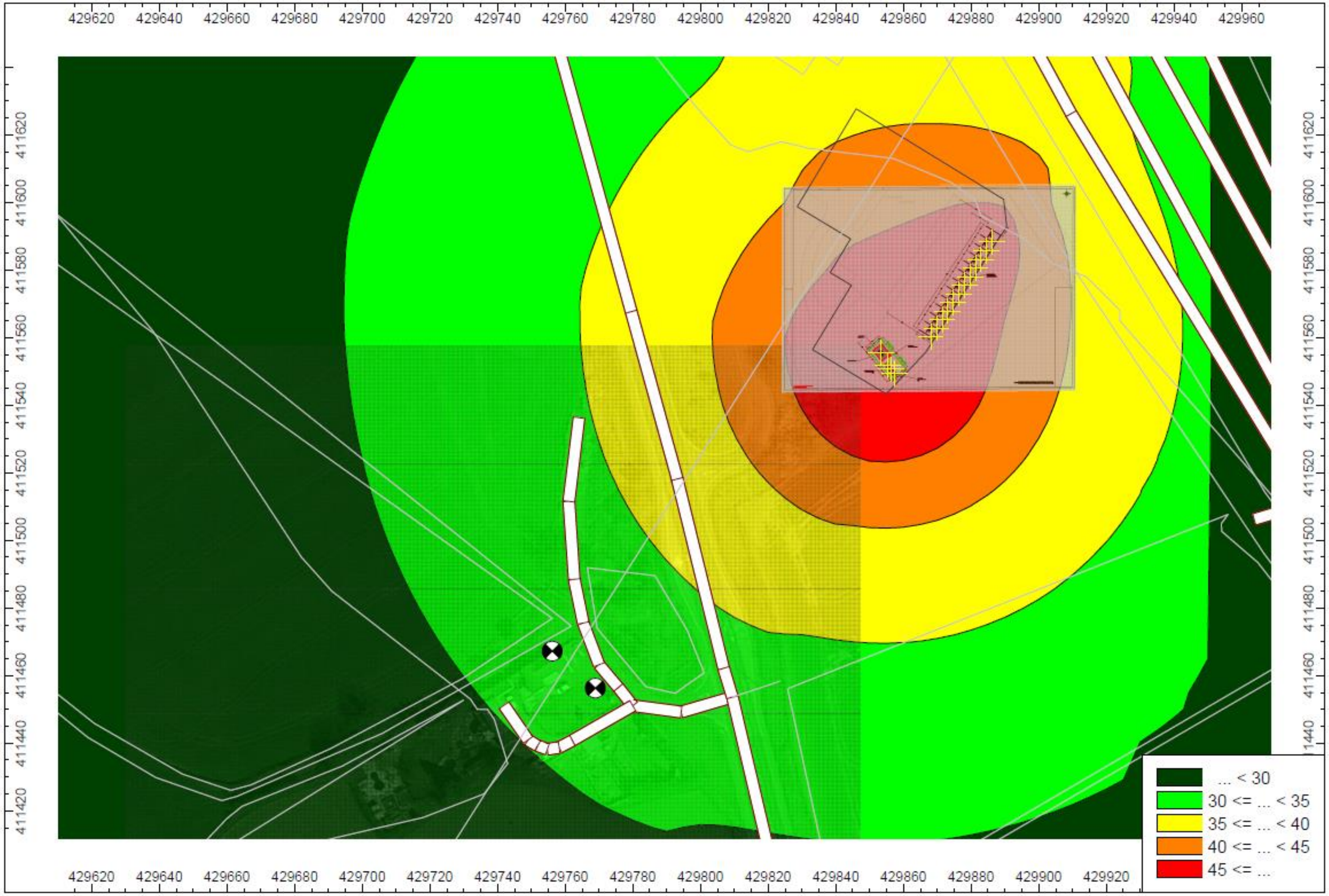


Figure A-2: Noise Contour Plot – First Floor (4m) Night-time



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