



**Environmental Noise Assessment Associated With  
A Proposed Truck Stop And Roadside Services At  
The A16 / James Road Roundabout, Crowland**

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## **SUMMARY**

An environmental noise assessment has been carried out associated with a proposed truck stop and roadside services at the A16 / James Road roundabout, Crowland. The assessment was carried out in accordance with British Standard 4142 and other relevant noise standards and guidance.

It includes attended noise monitoring, predictive noise modelling, assessment of the results and noise control recommendations where required.

The assessment carried out shows that provided that the recommendations in this report are implemented, the noise impact on the nearest noise sensitive receptors are likely to be at the “*Observed Adverse Effect*” level using terminology from the Noise Policy Statement for England (NPSE) and the National Policy Planning Guidance (NPPG).

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## **1 OBJECTIVES**

- 1.1** To carry out an environmental noise assessment associated with a proposed truck stop and roadside services at A16 / James Road roundabout, Crowland, in accordance with British Standard 4142 (BS 4142 – Reference 5), the National Policy Planning Framework (NPPF – Reference 1), the Noise Policy Statement for England (NPSE – Reference 2), the National Policy Planning Guidance (NPPG – Reference 3) and the World Health Organisation Guidelines (WHO Reference 4).
- 1.2** To recommend solutions to any problems identified by the assessment.

## **2 CONCLUSIONS**

- 2.1** The assessment in accordance with BS 4142 when assessed outside the nearest residential premises are indicative of specific noise emissions from the proposed site having an “*adverse impact*” during the daytime period and a “significant adverse impact” during the night-time period. However in this assessment context plays a key role, as the site and the nearby residential dwellings are situated in close proximity to James Road and the A16 and therefore noise emissions from road traffic (including large numbers of HGV’s) are the dominant contributors to the existing ambient noise climate during both the daytime and night-time periods. The main contributors to noise emissions from the proposed site are related to the movement of HGV’s on and off the site as well as potentially noise emissions from refrigeration units (reefers). Noise emissions associated with the movements of vehicles on and off the site are unlikely to be significantly out of character with the existing ambient noise climate. When taking this into account, along with the proposed sites ability to achieve acceptable internal and external noise levels in accordance with BS 8233 and the WHO Guidelines (provided windows are closed, which again given the context of the site they would need to be anyway due to the existing ambient noise climate), then this is deemed to be an acceptable noise situation.
- 2.2** Provided recommendations within this report are followed, an acceptable daytime and night-time noise situation in accordance with the WHO Guidelines and BS 8233 should occur within living rooms and bedrooms of the nearest residential properties under conditions where windows are in the closed position and trickle vents are open to provide background ventilation.
- 2.3** Overall, using the noise impact criteria from the Noise Policy Statement for England (NPSE) and the National Policy Planning Guidance (NPPG), the assessment carried out shows that provided the recommendations in this report are followed, then the noise impact on the nearest noise sensitive receptors is likely to be at the “*Observed Adverse Effect Level*”. Noise emission from the proposed site will be audible outside the nearest residential receptors, however given the existing ambient noise climate which is dominated by vehicles movements on James Road and the A16, this is unlikely to affect the acoustic character of the area such that there is a perceived change in the quality of life will occur for nearby residents. This is deemed to be an acceptable noise situation.

### **3 RECOMMENDATIONS**

- 3.1** This report should be used in support of the planning application for the proposed new truck stop and roadside services at A16 / James Road roundabout, Crowland.
- 3.2** Noise emissions from refrigeration units (reefers) using the proposed site will be one of the dominant noise sources emanating from the site. In order to minimise their impact, any refrigerated vehicle using the proposed site should be located in the south-eastern corner of the lorry park to maximise the distance between the vehicles and the nearest residential receptors on James Road. The client has also indicated that users of the facility will be instructed to set there refrigerated units to low noise emissions modes and this will be a regulatory requirement of entry, adhering to this is essential in order to achieve the noise levels predicted within this report.

**\* See Appendix 1 for a glossary of terms**

### **4 BACKGROUND**

Planning permission is being sought for a proposed truck stop and roadside services at A16 / James Road roundabout, Crowland. South Holland District Council have requested that noise emissions from the proposed scheme be assessed to ensure that noise emissions emanating from the site do not have an unacceptable impact on residents of nearby residential premises. Acoustic Associates (Peterborough) were asked to undertake an environmental noise assessment associated with the proposed usage of the site and this report documents the findings of that assessment. The location of the proposed site in relation to the nearest residential receptors is shown in Figure 1 and a proposed layout plan is shown in Figure 2.

### **5 POLICY, GUIDANCE AND STANDARDS**

#### **5.1 National Policy Planning Framework**

The National Planning Policy Framework (Reference 1) states the following with respect to noise (para 180).

*“180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into 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 impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life<sup>60</sup>;*
- 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.”*

The footnote 60 in section a) refers to the Noise Policy Statement for England (NPSE – Reference 2) in order to explain what it means by “adverse impact”.

## 5.2 Noise Policy Statement for England and National Policy Planning Guidance

The NPSE has stated that the impact of noise be classified according to an “effect level” (shown in column 3 below). The National Policy Planning Guidance (NPPG – Reference 3) has clarified what this effect level below means in terms of its perception by people at receptors and what action should be taken (columns 1 and 4 in Table 1 below).

| Perception                                | Examples of Outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Increasing Effect Level             | Action                           |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------|
| Not noticeable                            | No Effect                                                                                                                                                                                                                                                                                                                                                                                                                                                            | No Observed Effect                  | No specific measures required    |
| Noticeable and not intrusive              | Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.                                                                                                                                                                                                                                                             | No Observed Adverse Effect          | No specific measures required    |
| Lowest Observed Adverse Effect Level      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |                                  |
| Noticeable and intrusive                  | Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life.                                                          | Observed Adverse Effect             | Mitigate and reduce to a minimum |
| Significant Observed Adverse Effect Level |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |                                  |
| Noticeable and disruptive                 | The noise causes a material change in behaviour and/or attitude, 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                            |
| Noticeable and very disruptive            | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory                                                                                                                                                                               | Unacceptable Adverse Effect         | Prevent                          |

**Table 1 - National Policy Planning Guidance noise exposure hierarchy**

### 5.3 World Health Organisation Guidance

5.3.1 The World Health Organisation (WHO) has published guidelines for community noise, as shown in Table 2 (Reference 4). This WHO document gives guidance for the levels of noise both inside and outside of dwellings.

| Specific Environment | Critical Health Effect(s)                                          | L <sub>Aeq</sub> (dB) | Time Base (hours) | L <sub>Amax, fast</sub> (dB) |
|----------------------|--------------------------------------------------------------------|-----------------------|-------------------|------------------------------|
| Outdoor living area  | Serious annoyance, daytime and evening                             | 55                    | 16                | -                            |
|                      | Moderate annoyance, daytime and evening                            | 50                    | 16                | -                            |
| Dwelling, indoors    | Speech intelligibility and moderate annoyance, daytime and evening | 35                    | 16                | -                            |
| Inside bedrooms      | Sleep disturbance, night-time                                      | 30                    | 8                 | 45                           |
| Outside bedrooms     | Sleep disturbance, window open (outdoor values)                    | 45                    | 8                 | 60                           |

*Note: The 'daytime' and 'night-time' periods are generally referred to as 0700 to 2300 and 2300 to 0700 hours respectively.*

**Table 2 - World Health Organisation Noise Guidance Levels**

### 5.4 British Standard BS 8233:2014

British Standard (BS) 8233 (Reference 8) also gives guidance on indoor ambient noise levels, as shown in Table 3.

| Activity | Location         | Noise criteria                |                              |
|----------|------------------|-------------------------------|------------------------------|
|          |                  | 07:00 to 23:00                | 23:00 to 07:00               |
| Resting  | Living room      | 35 dB L <sub>Aeq,16hour</sub> | -                            |
| Dining   | Dining room/area | 40 dB L <sub>Aeq,16hour</sub> | -                            |
| Sleeping | Bedroom          | 35 dB L <sub>Aeq,16hour</sub> | 30 dB L <sub>Aeq,8hour</sub> |

**Table 3 - BS 8233: 2014 - Indoor ambient noise levels for dwellings**

### 5.5 British Standard BS 4142:2014

5.5.1 BS 4142 (Reference 5) is a standard which describes a method for assessing whether the 'specific noise' from an industrial source is likely to give rise to complaints from residents of the adjacent dwellings. The 'specific noise' levels are determined outside dwellings. The specific noise level is determined for reference time periods of 1-hour for the daytime (7am to 11pm) and 15 minutes for the night time. Tonal or impulsive characteristics of a noise are likely to increase the scope for complaints and this is taken into account by adding a value to the

specific noise source level to obtain the 'rating level'. The value may be between 0 and 15 dB depending on objective and subjective measures detailed in the standard. The following table detail the values added for the subjective method (which is the method used for this assessment).

| Characteristics of noise                                                                                                           | Noise at receptor                                                            | Value to add to specific noise level for rating level |
|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------|
| Noise has tonal characteristics                                                                                                    | Just perceptible                                                             | +2 dB                                                 |
|                                                                                                                                    | Clearly perceptible                                                          | +4 dB                                                 |
|                                                                                                                                    | Highly perceptible                                                           | +6 dB                                                 |
| Noise has impulsive characteristics                                                                                                | Just perceptible                                                             | +3 dB                                                 |
|                                                                                                                                    | Clearly perceptible                                                          | +6 dB                                                 |
|                                                                                                                                    | Highly perceptible                                                           | +9 dB                                                 |
| Other - characteristics that are neither tonal nor impulsive but are readily distinctive against the residual acoustic environment | -                                                                            | + 3 dB                                                |
| Intermittency                                                                                                                      | If intermittency is readily distinctive in the residual acoustic environment | +3 dB                                                 |

**Table 4 – BS 4142 – Corrections to noise to calculate rating level – subjective method**

5.5.2 BS 4142 requires that the rating Level of a noise is compared with the existing background noise ( $L_{A90,T}$ ). Guidance given in the standard states the following regarding the difference between the rating Level and the background noise.

- A difference of 0 dB is indicative of a “*minor impact*”;
- A difference of +5 dB is indicative of an “*adverse impact*”;
- A difference of +10 dB is indicative of a “*significant adverse impact*”.

## 5.6 Criteria for this assessment

This assessment uses BS 4142 to assess the industrial noise impact at the location of the nearest noise sensitive receptors. WHO Guidance and BS 8233 are used to assess noise inside dwellings whilst the WHO Guidance is also used to assess noise within outdoor amenity areas during the daytime period. The overall noise impact is classified according to criteria given in the NPSE and the NPPG.

## 6 **NOISE ASSESSMENT**

### 6.1 **Ambient and Background Noise**

Attended daytime noise monitoring equipment was set up at Monitoring Locations A and B (see Figure 1) between 09:30 – 12:30 hours on Thursday 1<sup>st</sup> October 2020. The measurements taken at Monitoring Location A were used to establish typical daytime background noise levels. Night-time noise monitoring was also carried out at Monitoring Location C between 23:00 hours on Monday 19<sup>th</sup> October and 00:30 hours on Tuesday 20<sup>th</sup> October 2020. These measurements were used to establish typical night-time background noise levels. Monitoring Location A was approximately 8m from the roadside of James Road, Monitoring Location B was approximately 20m from the southern boundary of the site and Monitoring Location C was approximately 3m from the roadside of James Road.

Weather conditions during the daytime monitoring period were dry, cloudy, temperatures varied between approximately 10 to 12°C and wind speeds were typically <2m/s from a westerly direction. Weather conditions during the night-time monitoring period were dry, cloudy, temperatures varied between approximately 10 to 11°C and wind speeds were typically 3 – 4m/s from a south-easterly direction. Appendix 2 gives details of the noise instrumentation used.

### 6.2 **Specific Noise Sources**

The following noise sources have been considered as part of this assessment:

- **HGV Movements:** Analysis of data for an existing truck stop site at Sutterton showed that between 22<sup>nd</sup> July 2020 and 2<sup>nd</sup> December 2020, an average of 21 x HGV's entered the site during each 24 hour period. Based on the above for the purposes of the predictions for the Crowland site, it has been assumed that during a 1 hour daytime BS 4142 reference period, a single HGV would enter the site (assumed to be 2 minutes of activity) and a single HGV would exit the site (also assumed to be 2 minutes of activity). For the purposes of the night-time assessment it has been assumed that a single HGV could either enter or leave the site (assumed to be 2 minutes of activity) during a 15 minute night-time BS 4142 reference period. Based on measurements of HGV movements previously assessed by Acoustic Associates, a Sound Power Level ( $L_{WA}$ ) of 102.5 dB(A) has been assumed for HGV movements.
- **Refrigerated Units (Reefers):** Noise emissions from refrigerated units vary from model to model and also based on the speed they are operated at. Taking one example "The Vector 1850/1950" the manufacturer quotes low speed and high speed levels (Sound Power Levels ( $L_{WA}$ )) of 96.6 dB(A) and 103 dB(A) respectively. The client has stated that they can ensure that refrigerated units will only be operated at low speed and that this will be a regulatory requirement for users. Based on the above it has been assumed for predictions that a single refrigeration unit will be on site and running continuously throughout the daytime and night-time period and is assumed to be operating at a Sound Power Level ( $L_{WA}$ ) of 96.6 dB(A).

The client has confirmed that these vehicles will be instructed to park up in the south eastern corner of the site to maximise the distance between this noise source and the nearest residential receptors on James Road.

- **Roadside Services:** The application also includes proposals for roadside services. Noise emissions from the services are likely to predominantly consist of vehicles using the drive through facility, vehicles using the car park and roof mounted plant on top of the services building. Full details relating to these sources are not yet known, however for the purposes of this noise assessment, levels assumed from a previous Acoustic Associates survey of a proposed drive through takeaway facility have been used to estimate noise emissions from these sources. It has been assumed that the roadside services could be used during both the daytime and night-time period.

### 6.3 Computer noise model of the site and surrounding area

A computer noise model of the site and surrounding area (see Figure 3) was generated using iNoise Computer Noise Modelling Software (Reference 6) which uses the methods given in ISO 9613 –2 (Reference 7) to calculate noise levels across the proposed site and surrounding area. The noise sources detailed in Section 6.2 were input into the computer noise model, which has then been used to predict specific noise levels across the site.

## 7 **RESULTS**

### 7.1 Measured noise levels

The results from the noise monitoring at Monitoring Location A - C are shown below in Tables 5 - 7. The tables shows the 'energy average' noise level ( $L_{Aeq,T}$ ), maximum sound pressure level ( $L_{Amax,T}$ ) and the background noise level ( $L_{A90,T}$ ).

| Date       | Time (Hours)  | Ambient Noise Level<br>( $L_{Aeq,15mins}$ )<br>dB(A) | Background Noise Level<br>( $L_{A90,15mins}$ )<br>dB(A) | Maximum Noise Level<br>( $L_{Amax,15mins}$ )<br>dB(A) | Comments                                                                              |
|------------|---------------|------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------|
| 01/10/2020 | 09:30 – 09:45 | 62.7                                                 | 48.1                                                    | 83.5                                                  | Road traffic noise emissions from A16 and James Road were the dominant noise sources. |
|            | 09:45 – 10:00 | 61.6                                                 | 47.4                                                    | 80.4                                                  |                                                                                       |
|            | 10:00 – 10:15 | 61.8                                                 | 46.7                                                    | 75.1                                                  |                                                                                       |
|            | 10:15 – 10:30 | 61.8                                                 | 48.2                                                    | 77.2                                                  |                                                                                       |
|            | 10:30 – 10:45 | 60.8                                                 | 47.0                                                    | 76.3                                                  |                                                                                       |
|            | 10:45 – 11:00 | 61.6                                                 | 45.0                                                    | 78.1                                                  |                                                                                       |
|            | 11:00 – 11:15 | 61.4                                                 | 47.1                                                    | 76.6                                                  |                                                                                       |
|            | 11:15 – 11:30 | 61.7                                                 | 47.4                                                    | 75.8                                                  |                                                                                       |
|            | 11:30 – 11:45 | 61.0                                                 | 47.0                                                    | 73.0                                                  |                                                                                       |
|            | 11:45 – 12:00 | 60.5                                                 | 46.1                                                    | 77.2                                                  |                                                                                       |
|            | 12:00 – 12:15 | 63.2                                                 | 46.4                                                    | 86.5                                                  |                                                                                       |
|            | 12:15 – 12:30 | 61.5                                                 | 45.0                                                    | 75.8                                                  |                                                                                       |

Table 5 - Noise monitoring at Monitoring Location A

| Date       | Time (Hours)  | Ambient Noise Level<br>( $L_{Aeq,15mins}$ )<br>dB(A) | Background Noise Level<br>( $L_{A90,15mins}$ )<br>dB(A) | Maximum Noise Level<br>( $L_{Amax,15mins}$ )<br>dB(A) | Comments                                                                             |
|------------|---------------|------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------|
| 01/10/2020 | 09:45 – 10:00 | 60.4                                                 | 54.2                                                    | 70.3                                                  | Road traffic noise emanating for A16 was the dominant noise source at this location. |
|            | 10:00 – 10:15 | 59.9                                                 | 54.3                                                    | 72.1                                                  |                                                                                      |
|            | 10:15 – 10:30 | 61.2                                                 | 55.1                                                    | 72.3                                                  |                                                                                      |
|            | 10:30 – 10:45 | 61.4                                                 | 53.3                                                    | 75.0                                                  |                                                                                      |
|            | 10:45 – 11:00 | 59.2                                                 | 50.3                                                    | 70.7                                                  |                                                                                      |
|            | 11:00 – 11:15 | 61.4                                                 | 55.0                                                    | 71.7                                                  |                                                                                      |
|            | 11:15 – 11:30 | 60.2                                                 | 52.5                                                    | 76.7                                                  |                                                                                      |
|            | 11:30 – 11:45 | 60.6                                                 | 54.2                                                    | 67.5                                                  |                                                                                      |
|            | 11:45 – 12:00 | 60.8                                                 | 54.1                                                    | 70.0                                                  |                                                                                      |
|            | 12:00 – 12:15 | 61.3                                                 | 53.4                                                    | 73.0                                                  |                                                                                      |

Table 6 - Noise monitoring at Monitoring Location B

| Date       | Time (Hours)  | Ambient Noise Level<br>( $L_{Aeq,15mins}$ )<br>dB(A) | Background Noise Level<br>( $L_{A90,15mins}$ )<br>dB(A) | Maximum Noise Level<br>( $L_{Amax,15mins}$ )<br>dB(A) | Comments                                                                              |
|------------|---------------|------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------|
| 19/10/2020 | 23:00 – 23:15 | 60.9                                                 | 47.0                                                    | 80.9                                                  | Road traffic noise emissions from A16 and James Road were the dominant noise sources. |
|            | 23:15 – 23:30 | 58.3                                                 | 48.6                                                    | 77.0                                                  |                                                                                       |
|            | 23:30 – 23:45 | 58.5                                                 | 45.9                                                    | 79.5                                                  |                                                                                       |
|            | 23:45 – 00:00 | 58.7                                                 | 46.2                                                    | 81.5                                                  |                                                                                       |
| 20/10/2020 | 00:00 – 00:15 | 59.2                                                 | 49.2                                                    | 77.9                                                  |                                                                                       |
|            | 00:15 – 00:30 | 57.1                                                 | 44.7                                                    | 77.7                                                  |                                                                                       |

Table 7 - Noise monitoring at Monitoring Location C

## 7.2 Background noise levels

Analysis of the measured noise levels shows that the modal value from Table 5 for the background noise levels ( $L_{A90,T}$ ) during the daytime period was 47 dB(A), whilst the modal value from Table 7 for the background noise levels ( $L_{A90,T}$ ) during the night-time period was 46 dB(A). These levels have been used for the assessment in accordance with BS 4142.

## 7.3 Predicted specific noise levels at the nearest dwelling

Noise predictions were carried out at Assessment Location 1, approximately 3.5m from the worst affected façade of the nearest residential properties to the immediate west of the proposed site on James Road. The daytime assessment location was set at a height of 1.5m above the ground, whilst the night-time assessment location was set at a height of 4.5m above the ground. Computer model noise contours are also shown in Figures 4 and 5 for what is anticipated to be a realistic 1 hour daytime and 15 minute night-time BS 4142 reference period as detailed in Section 6.2.

| Assessment Period | Assessment Location (see Figure 1) | Predicted Specific Noise Level ( $L_{Aeq,T}$ )<br>At The Nearest Residential Premises<br>dB(A) |
|-------------------|------------------------------------|------------------------------------------------------------------------------------------------|
| Daytime Period    | Assessment Location 1              | 51                                                                                             |
| Night-Time Period |                                    | 52                                                                                             |

Table 8 –Predicted Specific Noise Levels

#### **7.4 Predicted specific noise levels within outdoor amenity areas**

The daytime predicted specific noise level 3.5m from the worst affected façade of the nearest residential dwelling is 51 dB(A) ( $L_{Aeq,1hour}$ ). Given the extra distance between the proposed site and the outdoor amenity areas of the nearest residential dwellings and also considering the barrier effect provided by garden fencing surrounding these gardens, it is predicted that specific noise emissions from the proposed site will be below a level ( $L_{Aeq,1hour}$ ) of 50 dB(A), which is below the level where “moderate annoyance” should be avoided in accordance with the World Health Organisation Guidelines. This is deemed to be an acceptable noise situation.

#### **7.5 BS 4142 assessment**

During the daytime and night-time periods noise emissions emanating from the proposed site are likely to be audible outside the nearest noise sensitive dwellings. The predicted daytime and night-time specific noise levels have been used to assess the potential impact of the site against the guidance values in BS 4142. The results are shown below in Tables 9 and 10.

| Daytime BS 4142 Assessment                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Comments                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Predicted specific sound level at Assessment Location 1, 1.5m above the ground (see Figure 1) | $L_{Aeq,1hour} = 51 \text{ dB(A)}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Predicted specific sound levels calculated using the computer noise model.                                                                                                                                                                                                                                |
| Background sound level                                                                        | $L_{A90,T} = 47 \text{ dB(A)}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | The modal daytime background sound level ( $L_{A90,15mins}$ ) measured at Monitoring Location A is deemed to be a reasonable level to use for the daytime assessment.                                                                                                                                     |
| Assessment made during the daytime, so the reference time interval is 1 hour                  | 1 hour                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | It has been assumed that a single refrigeration units (reefer) will be operating continuously, one HGV will enter site and one HGV will also leave site, the drive through will be operating and the plant on the roof of the service building will be running continuously.                              |
| Acoustic feature correction                                                                   | +4 dB to +5dB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | It is assumed that the tonality of noise emissions from the refrigeration unit could be “clearly perceptible” outside the residential receptor (+4dB correction). All other sources have been corrected for tonality and impulsivity that are both “just perceptible” at the residential receptor (+5dB). |
| Rating Level                                                                                  | 55 dB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Specific sound level + Acoustic feature correction.                                                                                                                                                                                                                                                       |
| Excess of rating level over the background sound level                                        | $55 - 47 = +8 \text{ dB}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | The Rating Level is 8 dB above the background sound level which is likely to be an indication of a “adverse impact”.                                                                                                                                                                                      |
| Assessment when taking account of context                                                     | <p>The main contributors to noise emissions from the proposed site are related to the movement of HGV's on and off the site as well as potentially noise emissions from refrigeration units (reefers). Noise emissions associated with the movements of vehicles on and off the site are unlikely to be significantly out of character with the existing ambient noise climate which is dominated by road traffic movements on A16 and James Road.</p> <p>When taking this into account, along with the proposed sites ability to achieve acceptable internal and external noise levels for nearby residents in accordance with BS 8233 and the WHO Guidelines (provided windows are closed, which again given the context of the site they would need to be anyway due to the existing ambient noise climate), then this is deemed to be an acceptable noise situation.</p> |                                                                                                                                                                                                                                                                                                           |

Table 9 – Daytime BS 4142 Assessment

| Night-Time BS 4142 Assessment                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Comments                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Predicted specific sound level at Assessment Location 1, 4.5m above the ground (see Figure 1) | $L_{Aeq,15mins} = 52 \text{ dB(A)}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Predicted specific sound levels calculated using the computer noise model.                                                                                                                                                                                                                                       |
| Background sound level                                                                        | $L_{A90,T} = 46 \text{ dB(A)}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | The modal night-time background sound level ( $L_{A90,15mins}$ ) measured at Monitoring Location C is deemed to be a reasonable level to use for the daytime assessment.                                                                                                                                         |
| Assessment made during the night-time, so the reference time interval is 15 minutes           | 15 minutes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | It has been assumed that a single refrigeration unit will be operating continuously, one HGV will enter the site, the drive through will be operating and the plant on the roof of the service building will be running continuously.                                                                            |
| Acoustic feature correction                                                                   | +4 dB to +5dB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | It is assumed that the tonality of noise emissions from the refrigeration unit could be “clearly perceptible” outside the residential receptor (+4dB correction). All other source have been corrected for tonality and impulsivity that are both “just perceptible” at the nearest residential receptor (+5dB). |
| Rating Level                                                                                  | 57 dB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Specific sound level + Acoustic feature correction.                                                                                                                                                                                                                                                              |
| Excess of rating level over the background sound level                                        | $57 - 46 = +11 \text{ dB}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The Rating Level is 11 dB above the background sound level which is likely to be an indication of a “significant adverse impact”.                                                                                                                                                                                |
| Assessment when taking account of context                                                     | <p>The main contributors to noise emissions from the proposed site are related to the movement of HGV's on and off the site as well as potentially noise emissions from refrigeration units (reefers). Noise emissions associated with the movements of vehicles on and off the site are unlikely to be significantly out of character with the existing ambient noise climate, which is dominated by road traffic on A16 and James Road. When taking this into account, along with the proposed sites ability to achieve acceptable internal noise levels for nearby residents in accordance with BS 8233 and the WHO Guidelines (provided windows are closed, which again given the context of the site they would need to be anyway due to the existing ambient noise climate), then this is deemed to be an acceptable noise situation.</p> |                                                                                                                                                                                                                                                                                                                  |

Table 10 – Night-Time BS 4142 Assessment

When assessed at the nearest residential receptor, the predicted rated level over the background sound level is +8 dB during the assumed daytime operating conditions and + 11dB during the assumed night-time operating conditions. When taking into account context, as detailed in Tables 9 and 10, this is deemed to be an acceptable noise situation.

## 7.6 Calculated specific noise levels within nearby living rooms and bedrooms

The nearest residential dwellings to the west of the proposed site are all modern houses and from site observations appeared to be fitted with double glazing and a single window mounted trickle vent to each bedroom and living room. Based on some basic assumptions (e.g: living room volumes of 38.4 m<sup>3</sup>, bedroom volumes of 28.8m<sup>3</sup>, double glazed window area of 2m<sup>2</sup>, a single standard (non acoustic) trickle vent serving each room and reverberation times of 0.5 seconds) specific internal noise levels attributable to the proposed site can be calculated assuming closed windows and trickle vents in the open position. The predicted daytime and night-time specific noise levels calculated outside the worst affected residential dwelling are 51 and 52 dB(A) respectively (see Table 8). Under a scenario where windows are in the closed position and trickle vents in the open position the predicted specific noise level inside living rooms and bedrooms during the daytime and night-time period respectively is likely to be approximately 24 and 26 dB(A). The WHO / BS 8233 guidance values on acceptable daytime and night-time noise levels inside dwellings are given as 35 and 30 dB(A) during the daytime and night-time periods. The predicted specific noise levels emanating from the proposed truck stop and roadside services achieve these guidance levels. This is therefore deemed to be an acceptable noise situation.

## 7.7 NPSE & NPPG Assessment

Using the noise impact criteria from the Noise Policy Statement for England (NPSE) and the National Policy Planning Guidance (NPPG), the assessment carried out shows that provided the recommendations within this report are followed, the noise impact on the nearest noise sensitive receptors is likely to be at the “*Observed Adverse Effect*”. Noise emission from the proposed site will be audible outside the nearest residential properties, however given the existing ambient noise climate which is dominated by vehicles movements on the A16 and James Road, this is unlikely to affect the acoustic character of the area such that there is a perceived change in the quality of life will occur for nearby residents. This is deemed to be an acceptable noise situation.

## 8 **UNCERTAINTIES**

- Computer predictions to ISO 9613-2 carry an uncertainty of +/- 3 dB.
- Background noise levels have been measured over a reasonable time period given the insecure open nature of the proposed site. This minimises uncertainties relating to the background noise levels assumed for the BS 4142 assessment.
- Specific noise levels assumed for the various noise sources likely to be present on the proposed site have been based on a combination of manufacturers quoted values and levels assumed for similar activities on other sites for which Acoustic Associates have carried out environmental noise assessments. This does create some uncertainties, although these are common in assessments of this nature, where the sources are not yet present on site to be measured.
- The client has also indicated that users of the facility will be instructed to set there refrigerated units to low noise emission modes and this will be a regulatory requirement of entry. It is important that this is implemented as without this control measure in place noise emissions from refrigerated units are likely to be around 6 – 7 dB(A) higher than predicted.

## **REFERENCES**

1. National Policy Planning Framework; DCLG, 2012.
2. Noise Policy Statement for England; DEFRA, 2010.
3. National Policy Planning Guidance, 2014, DEFRA.
4. World Health Organisation Guidance, Guidelines for Community Noise; WHO, 1999.
5. British Standard BS 4142:2014, Methods of rating and assessing industrial and commercial sound; BSI, 2014.
6. iNoise Computer Noise Modelling Software.
7. ISO 9613-2 Acoustics of sound during propagation outdoors, Part 2: General method of calculation; ISO, 1996.
8. British Standard BS 8233, Guidance on sound insulation and noise reduction for buildings; BSI, 2014.

## **Appendix 1 – Glossary of terms**

|                                             |                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sound Pressure</b>                       | The variation of ambient pressure that is detected by the ear as sound.                                                                                                                                                                                                                                                                 |
| <b>Noise</b>                                | Unwanted sound                                                                                                                                                                                                                                                                                                                          |
| <b>decibel (dB)</b>                         | Ten times the logarithm of the square of the ratio of the Sound Pressure to a reference pressure (20 micro-Pascal's).                                                                                                                                                                                                                   |
| <b>Sound Pressure Level (L<sub>p</sub>)</b> | The decibel version of the Sound Pressure.                                                                                                                                                                                                                                                                                              |
| <b>A-Weighting</b>                          | A frequency weighting which simulates the response of the ear.<br>An A-Weighted Sound Pressure Level is denoted by L <sub>pA</sub> and has units of dB(A)                                                                                                                                                                               |
| <b>L<sub>Aeq,T</sub></b>                    | The value of the A-weighted sound pressure level, in decibels [dB(A)], of a continuous steady sound that within a specified time interval (T), for example 16 hours, has the same mean-square sound pressure as a sound that varies with time.<br>Therefore, the average over a 16 hour period would be denoted as L <sub>Aeq,16h</sub> |
| <b>L<sub>Amax,T</sub></b>                   | The maximum A-Weighted sound pressure level that was encountered during the measurement period.                                                                                                                                                                                                                                         |
| <b>L<sub>A90,T</sub></b>                    | The A-Weighted sound pressure level that is exceeded for 90% of the time (T). This is usually used a measure of background noise.                                                                                                                                                                                                       |
| <b>Free Field</b>                           | Where noise can propagate freely without any reflections from buildings etc.                                                                                                                                                                                                                                                            |
| <b>Octave Band</b>                          | A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000                                                                                                                                                                                  |
| <b>NPSE Criteria</b>                        |                                                                                                                                                                                                                                                                                                                                         |
| <b>NOEL</b>                                 | No Observed Effect Level                                                                                                                                                                                                                                                                                                                |
| <b>LOAEL</b>                                | Lowest Observed Adverse Effect Level                                                                                                                                                                                                                                                                                                    |
| <b>SOAEL</b>                                | Significant Observed Adverse Effect Level                                                                                                                                                                                                                                                                                               |

## BS 4142 Terms

|                                                                      |                                                                                                                                                                                        |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><math>T_r</math></b>                                              | The reference time interval over which an equivalent continuous A-weighted sound pressure is determined.<br>Day time = 1 hour<br>Night-time = 15 minutes                               |
| <b><math>T_m</math></b>                                              | The measurement time interval over which measurements are taken.                                                                                                                       |
| <b>Ambient Noise</b>                                                 | Total sound in a given situation at a given time.                                                                                                                                      |
| <b>Residual Noise</b>                                                | The ambient noise remaining at a given position in a given situation when the specific noise is suppressed to a degree such that it does not contribute to the ambient noise.          |
| <b>Specific Noise Level<br/>Rating Level <math>L_{Ar,T_r}</math></b> | The dB $L_{Aeq,T_r}$ of the noise sources being assessed at a site.<br>The specific noise level plus any correction (+5 dB) for the character of the noise, known as the Rating Level. |
| <b>Assessment Level</b>                                              | Difference between Rating Level ( $L_{Ar,T}$ ) and Background Noise ( $L_{A90,T}$ )                                                                                                    |
| <b>Sound Power Level (<math>L_{WA}</math>)</b>                       | The noise level from the source in terms of sound power, in dB(A).                                                                                                                     |

**Appendix 2 – Noise Instrumentation**

| Type     | Manufacturer | Description            | Serial Number | Last Calibration Date | Calibration Certificate No. |
|----------|--------------|------------------------|---------------|-----------------------|-----------------------------|
| Svan 957 | Svantek      | Sound level meter      | 27591         | 03/09/2020            | 1102905                     |
| Svan 957 | Svantek      | Sound level meter      | 23893         | 14/11/2019            | 194157                      |
| Svan 957 | Svantek      | Sound level meter      | 27517         | 21/02/2020            | 197033                      |
| GA 607   | Castle       | Sound level calibrator | 039873        | 27/01/2020            | 196161                      |

The calibration of the instrumentation was checked at the start and end of the tests and there was no significant drift.

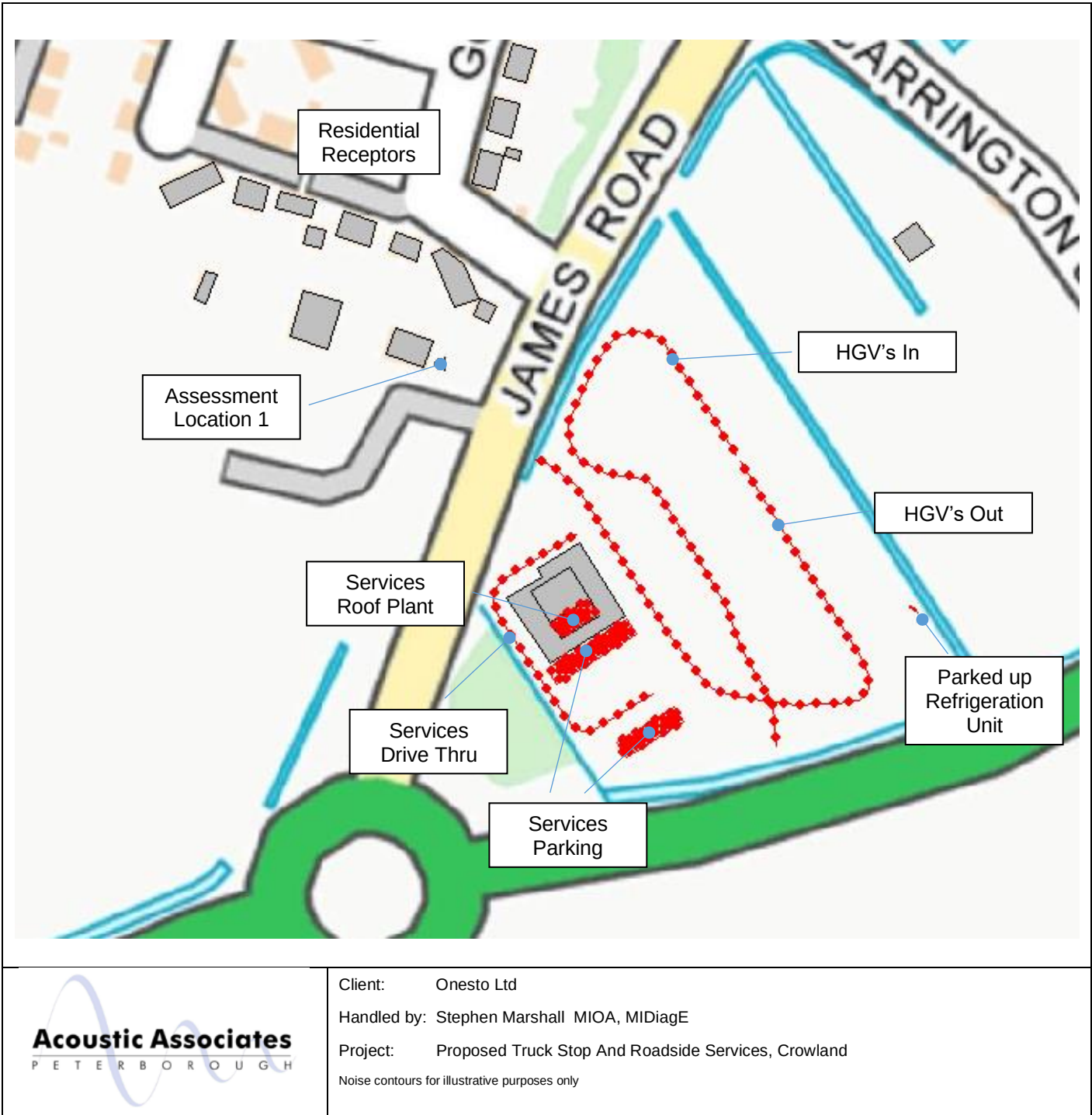
**Figure 1 - Location Plan Of The Proposed Site**



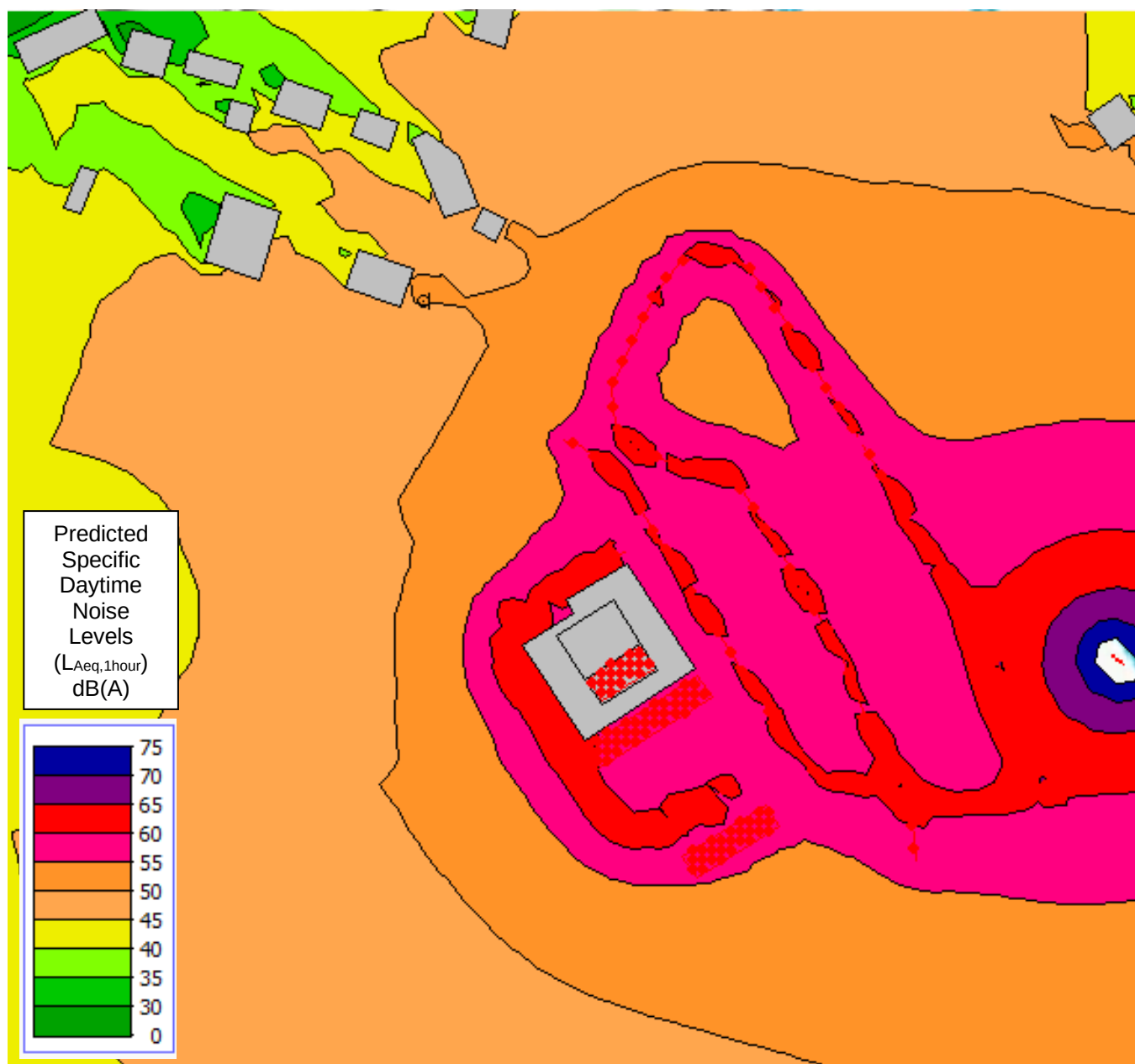
**Figure 2 – Proposed Site Layout Plan**



**Figure 3 – Computer Noise Model**



**Figure 4 – Daytime Specific Noise Emission Contours ( $L_{Aeq,1hour}$ ) - 1.5m Above The Ground**



**Figure 5 – Night-Time Specific Noise Emission Contours ( $L_{Aeq,15mins}$ ) - 4.5m Above The Ground**

