



4193

## **Rating Industrial Noise affecting Mixed Industrial and Residential Areas**

British Standard 4142:1997

Site Name: Lovedean Lane Exp

Site Address: Green Dragon Public House,  
Lovedean Lane, Waterloooville,  
PO8 9RJ.

Customer Name: Tesco Stores Ltd

Customer Address: Tesco House, Delamare Road,  
Cheshunt, Hertfordshire,  
EN8 9SL.



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## 1 EXECUTIVE SUMMARY

### 1.1 Introduction

KR Associates (UK) Ltd ("KRA") have been instructed by Tesco Stores Ltd to undertake an environmental noise assessment at Green Dragon Public House, Lovedean Lane, Waterloooville, to determine if noise from the proposed plant will adversely affect nearby residential properties using the assessment method set out in section 9 of BS4142:1997.

### 1.2 Scope of Report

The report details the method used as defined in BS 4142:1997 for rating the noise of an industrial nature from an existing or proposed source. This is based on the margin by which it exceeds a background noise level with an appropriate allowance for the acoustic features present in the noise, determining if complaints are likely to be received.

### 1.3 Summary of Results

#### 1.3.1 Rating Levels

| BS4142:1997 - Section 8<br>Rating Noise Levels | 07:00 – 23:00                  | 23:00 – 07:00                    |
|------------------------------------------------|--------------------------------|----------------------------------|
|                                                | L <sub>Aeq,1 hours</sub> 42 dB | L <sub>Aeq,5 minutes</sub> 31 dB |

#### 1.3.2 Background Noise Levels

| BS4142:1997 - Section 7<br>Background Noise Levels | 07:00 – 23:00                   | 23:00 – 07:00                  |
|----------------------------------------------------|---------------------------------|--------------------------------|
|                                                    | L <sub>A90,16 hours</sub> 45 dB | L <sub>A90,8 hours</sub> 29 dB |

#### 1.3.3 BS4142:1997 Assessment

| BS4142:1997 - Section 9<br>Assessment<br>Likelihood of Complaints | 07:00 – 23:00                 | 23:00 – 07:00                 |
|-------------------------------------------------------------------|-------------------------------|-------------------------------|
|                                                                   | -3 dB                         | +2 dB                         |
|                                                                   | below 'Marginal Significance' | below 'Marginal Significance' |

### 1.4 Recommendations

This report is based on the recommendation that acoustic absorption panels should be installed behind the Condenser and AC Units to reduce the reflections from the walls the plant is located adjacent to.

## **1.5 Conclusions**

The impact on nearby residential properties from the noise generated by the plant is assessed, in accordance with section 9 of BS4142:1997, as below 'Marginal Significance' in the day (07:00 – 23:00) and below 'Marginal Significance' at night (23:00 – 07:00).

## **2 TEST PROCEDURE**

### **2.1 Scope**

This report is based on the test procedure which sets out the method for determining the level of a noise of an industrial nature, and assessing whether or not it is likely to give rise to complaints from persons living in the vicinity in accordance with BS 4142:1997. The procedure is concerned with the rating of a noise of an industrial nature, based on the margin by which it exceeds the background noise levels with an appropriate allowance for the acoustic features present in the noise. As this margin increases, so does the likelihood of complaints.

### **2.2 Test Procedure**

The tests were undertaken in accordance with the appropriate KR Associates (UK) Ltd test procedure and the appropriate test data recorded.

#### **2.2.1 Key Positions**

##### **2.2.1.1 Source Position**

The location of the source is established i.e. the position where the existing or proposed source is to be located.

##### **2.2.1.2 Assessment Position**

The assessment position is established as the position at which the assessment under BS4142:1997 is to be carried out which is always external and usually adjacent to the nearest residential facade.

#### **2.2.2 Background Noise Levels**

The background levels are measured where possible at the assessment position or at an equivalent position which is representative of the assessment position.

#### **2.2.3 Specific Noise Levels**

The specific noise levels are measured on the parallelepiped measurement surface 1m from the units to establish the sound power levels of the combined compressor condenser unit. The specific noise levels at the assessment position were then calculated using ISO 9613:1996.

#### **2.2.4 Character Correction**

Where suitable a character correction of +5 dB is included within the calculation of the Rating Level if the source has certain characteristics.

#### 2.2.5 Rating Level

The Rating Level is calculated by adding the Specific Noise Level to the Character Correction where appropriate.

#### 2.2.6 Assessment Level

An assessment level is calculated by subtracting the numerical value of the background noise levels from the rating level.

#### 2.2.7 Conclusion

Section 9 of BS4142:1997 details the likelihood of complaints from a range of assessment level where the greater the assessment level the greater the chance that complaints will be received.

*“Complaint Likely – Assessment of around +10 dB*

*Complaints Marginal – Assessment of around +5 dB*

*Complaints Unlikely – Assessment of around -10 dB or less”*

### 3 CALCULATION OF LEVELS AT ASSESSMENT POSITION

#### 3.1 Source Directivity ( $D_c$ )

A correction is made to account for the location of the source and the effect of additional reflective surfaces excluding the ground and is contained within section 6 of ISO 9613-Part 2:1996.

| Number of Surfaces     | Correction in dB ( $D_c$ ) |
|------------------------|----------------------------|
| No Reflective Surfaces | +0 dB                      |
| 1 Reflective Surface   | +3 dB                      |
| 2 Reflective Surfaces  | +6 dB                      |
| 3 Reflective Surfaces  | +9 dB                      |

| Unit Description              | Correction in dB ( $D_c$ ) |
|-------------------------------|----------------------------|
| Searle - MGA124 EC            | +0 dB                      |
| Mitsubishi Heavy - FDC 100 VN | +0 dB                      |
| Mitsubishi Heavy - FDC 100 VN | +0 dB                      |
| Mitsubishi Heavy - SRK 25 ZG  | +0 dB                      |
| Extract Fan – Jet-flow SJ200B | +0 dB                      |

#### 3.2 Geometric Divergence ( $A_{div}$ )

A correction for the distance between the source and assessment position using the following formula defined in section 7.1 of ISO 9613-Part 2:1996.

| Formula                                     | Symbols                                                                                                                                 |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| $A_{div} = 20 \cdot \log_{10} (d/d_0) + 11$ | $A_{div}$ = Reduction due to Geometric Divergence (dB)<br>$d$ = Distance from source to receiver (m)<br>$d_0$ = reference distance (1m) |

| Unit Description              | Correction in dB ( $A_{div}$ ) |
|-------------------------------|--------------------------------|
| Searle - MGA124 EC            | -28 dB (7.0 m)                 |
| Mitsubishi Heavy - FDC 100 VN | -25 dB (5.1 m)                 |
| Mitsubishi Heavy - FDC 100 VN | -25 dB (5.1 m)                 |
| Mitsubishi Heavy - SRK 25 ZG  | -25 dB (5.2 m)                 |
| Extract Fan – Jet-flow SJ200B | -31 dB (10.0 m)                |

### 3.3 Ground Absorption ( $A_{gr}$ )

A correction is made for the effect of the ground between the source and receiver depending on whether it is considered hard or soft ground.

| Type of ground | Correction in dB ( $A_{gr}$ ) |
|----------------|-------------------------------|
| Hard Ground    | + 3 dB                        |
| Soft Ground    | + 0 dB                        |

| Unit Description                | Correction in dB ( $A_{gr}$ ) |
|---------------------------------|-------------------------------|
| Searle - MGA124 EC              | +3 dB                         |
| Mitsubishi Heavy - FDC 100 VN   | +3 dB                         |
| Mitsubishi Heavy - FDC 100 VN   | +3 dB                         |
| Mitsubishi Heavy - SRK 25 ZG    | +3 dB                         |
| Extract Fan – Jet-flow SJ200B   | +3 dB                         |
| Ground Absorption $A_{gr}$ (dB) |                               |

### 3.4 Atmospheric Absorption ( $A_{atm}$ )

As the source was less than 100m from the receiver position (assessment position) no correction was made for atmospheric absorption.

### 3.5 Barrier Effect ( $A_{bar}$ )

A correction is made for any barrier in the direct line of site between the source and the assessment position and is detailed in section 22 'Barriers' in 'Calculation of Road Traffic Noise' (chart 9 and 9a)

| Formula                                                                                                                                                                                     | Symbols                                                      |                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------|
| $A_{bar} = -15.4 - 8.26x - 2.787x^2 - 0.831x^3 - 0.198x^4 + 0.1539x^5 + 0.12248x^6 + 0.02175x^7$ <p>Valid for <math>-3 \leq x \leq 1.2</math>, where <math>x = \log_{10}(\delta)</math></p> | $\delta$ = Path difference (m)                               |                                                          |
| Notes:                                                                                                                                                                                      | Shadow Zone (No line of sight)                               | Illuminated Zone (Line of sight)                         |
|                                                                                                                                                                                             | For $x < -3$ $A_{bar} = -5$<br>For $x > 1.2$ $A_{bar} = -30$ | For $x < -4$ $A_{bar} = -5$<br>For $x > 0$ $A_{bar} = 0$ |

| Unit Description                  | Correction in dB (Adiv)    |
|-----------------------------------|----------------------------|
| Searle - MGA124 EC                | -3 dB ( $\delta = 0.4$ m)  |
| Mitsubishi Heavy - FDC 100 VN     | -12 dB ( $\delta = 0.3$ m) |
| Mitsubishi Heavy - FDC 100 VN     | -12 dB ( $\delta = 0.3$ m) |
| Mitsubishi Heavy - SRK 25 ZG      | -13 dB ( $\delta = 0.4$ m) |
| Extract Fan – Jet-flow SJ200B     | -5 dB ( $\delta = 0.0$ m)  |
| Barrier Correction $A_{bar}$ (dB) |                            |

### 3.6 Summary of Corrections

| Source                        | Period | Sound Power Level ( $L_w$ ) | Source Directivity ( $D_i$ ) | Geometric Divergence ( $A_{div}$ ) | Ground Absorption ( $A_{gr}$ ) | Barrier Correction ( $A_{bar}$ ) | Specific Noise Level Assessment Position |
|-------------------------------|--------|-----------------------------|------------------------------|------------------------------------|--------------------------------|----------------------------------|------------------------------------------|
| Searle - MGA124 EC            | Day    | 64.0 dB                     | +0 dB                        | -27.9 dB                           | +3 dB                          | -3.0 dB                          | 36.1 dB                                  |
|                               | Night  | 58.5 dB                     |                              |                                    |                                |                                  | 30.6 dB                                  |
| Mitsubishi Heavy - FDC 100 VN | Day    | 71.1 dB                     | +0 dB                        | -25.2 dB                           | +3 dB                          | -12.1 dB                         | 36.8 dB                                  |
|                               | Night  | -- dB                       |                              |                                    |                                |                                  | -- dB                                    |
| Mitsubishi Heavy - FDC 100 VN | Day    | 71.1 dB                     | +0 dB                        | -25.2 dB                           | +3 dB                          | -12.1 dB                         | 36.8 dB                                  |
|                               | Night  | -- dB                       |                              |                                    |                                |                                  | -- dB                                    |
| Mitsubishi Heavy - SRK 25 ZG  | Day    | 62.5 dB                     | +0 dB                        | -25.4 dB                           | +3 dB                          | -12.8 dB                         | 27.3 dB                                  |
|                               | Night  | -- dB                       |                              |                                    |                                |                                  | -- dB                                    |
| Extract Fan – Jet-flow SJ200B | Day    | 57.9 dB                     | +0 dB                        | -31.0 dB                           | +3 dB                          | -5 dB                            | 24.9 dB                                  |
|                               | Night  | --                          |                              |                                    |                                |                                  | -- dB                                    |

## 4 ASSESSMENTS

### 4.1 Day Time (07:00 to 23:00)

|                                                                                           |                                                                                                                                                                 |        |                                                                                                 |                                                                                                          |
|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <br>4193 | <h1>Rating Industrial Noise affecting<br/>Mixed Industrial and Residential Areas</h1> <p>British Standard 4142:1997 Day Time (07:00 – 23:00)</p>                |        |                                                                                                 | <br>Quietly confident |
| Source                                                                                    | Operating Times                                                                                                                                                 |        | Source Position                                                                                 |                                                                                                          |
| Searle - MGA124 EC                                                                        | Continuously                                                                                                                                                    |        | Within a dedicated area at the rear of the store                                                |                                                                                                          |
| Mitsubishi Heavy - FDC 100 VN                                                             | 07:00-23:00                                                                                                                                                     |        |                                                                                                 |                                                                                                          |
| Mitsubishi Heavy - FDC 100 VN                                                             | 07:00-23:00                                                                                                                                                     |        |                                                                                                 |                                                                                                          |
| Mitsubishi Heavy - SRK 25 ZG                                                              | 07:00-23:00                                                                                                                                                     |        |                                                                                                 |                                                                                                          |
| Extract - Jet-flow SJ200B                                                                 | 07:00-23:00                                                                                                                                                     |        | On the roof of the store                                                                        |                                                                                                          |
| Assessment Position                                                                       | 1m from the residential façade of the bungalow adjacent to the rear of the store.                                                                               |        |                                                                                                 |                                                                                                          |
| Background Position                                                                       | Woodcroft Lane to the front of the store.                                                                                                                       |        |                                                                                                 |                                                                                                          |
| Distance                                                                                  | 5 m from the edge of the source to the assessment position (direct line of site)                                                                                |        |                                                                                                 |                                                                                                          |
| Item                                                                                      | Calculation                                                                                                                                                     | Clause | Commentary                                                                                      |                                                                                                          |
| Specific Noise Level                                                                      | 42 dB                                                                                                                                                           | 6.3    | Specific noise level was calculated from measurements made at 1m ISO 9613:1996[3]               |                                                                                                          |
| Acoustic feature correction                                                               | +0 dB                                                                                                                                                           | 8.2.   | Reference section 8.2 of BS4142:1997.                                                           |                                                                                                          |
| Rating Level                                                                              | 42 dB                                                                                                                                                           | 8.3.   | The acoustic feature correction is added to the specific noise level to obtain the rating level |                                                                                                          |
| Background Noise Level                                                                    | 45 dB                                                                                                                                                           | 7.1.   | The background noise level was measured at an equivalent position.                              |                                                                                                          |
| Assessment Level                                                                          | -3 dB                                                                                                                                                           | 9      | The background level is subtracted from the rating level. (Numerical values)                    |                                                                                                          |
| Conclusion<br>BS 4142:1997[1]                                                             | Complaint Likely – Assessment of around +10 dB<br>Complaints Marginal – Assessment of around +5 dB<br>Complaints Unlikely – Assessment of around -10 dB or less |        |                                                                                                 |                                                                                                          |
| Assessment                                                                                | -3 dB                                                                                                                                                           |        |                                                                                                 |                                                                                                          |
| Conclusion                                                                                | The assessment level is below 'Marginal Significance'                                                                                                           |        |                                                                                                 |                                                                                                          |
| Test Laboratory:                                                                          | 4193                                                                                                                                                            |        |                                                                                                 |                                                                                                          |
| Report Reference:                                                                         | KR02489                                                                                                                                                         |        |                                                                                                 |                                                                                                          |
| Test Date:                                                                                | 18 January 2012                                                                                                                                                 |        |                                                                                                 |                                                                                                          |
| Approval Date:                                                                            | 23rd January 2013                                                                                                                                               |        |                                                                                                 |                                                                                                          |

## 4.2 Night Time (23:00 to 07:00)



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### Rating Industrial Noise affecting Mixed Industrial and Residential Areas

British Standard 4142:1997 Night Time (23:00 – 07:00)



| Source                                 | Operating Times                                                                                                                                                 |        | Source Position                                                                                 |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------|
| Searle - MGA124 EC                     | Continuously                                                                                                                                                    |        | Within a dedicated area at the rear of the store                                                |
| Mitsubishi Heavy - FDC 100 VN          | 07:00-23:00                                                                                                                                                     |        |                                                                                                 |
| Mitsubishi Heavy - FDC 100 VN          | 07:00-23:00                                                                                                                                                     |        |                                                                                                 |
| Mitsubishi Heavy - SRK 25 ZG           | 07:00-23:00                                                                                                                                                     |        |                                                                                                 |
| Extract - Jet-flow SJ200B              | 07:00-23:00                                                                                                                                                     |        | On the roof of the store                                                                        |
| Assessment Position                    | 1m from the residential façade of the bungalow adjacent to the rear of the store.                                                                               |        |                                                                                                 |
| Background Position                    | Woodcroft Lane to the front of the store.                                                                                                                       |        |                                                                                                 |
| Distance                               | 5 m from the edge of the source to the assessment position (direct line of site)                                                                                |        |                                                                                                 |
| Item                                   | Calculation                                                                                                                                                     | Clause | Commentary                                                                                      |
| Specific Noise Level                   | 31 dB                                                                                                                                                           | 6.3    | Specific noise level was calculated from measurements made at 1m ISO 9613:1996 <sub>[3]</sub>   |
| Acoustic feature correction            | +0 dB                                                                                                                                                           | 8.2.   | Reference section 8.2 of BS4142:1997.                                                           |
| Rating Level                           | 31 dB                                                                                                                                                           | 8.3.   | The acoustic feature correction is added to the specific noise level to obtain the rating level |
| Background Noise Level                 | 29 dB                                                                                                                                                           | 7.1.   | The background noise level was measured at an equivalent position.                              |
| Assessment Level                       | +2 dB                                                                                                                                                           | 9      | The background level is subtracted from the rating level. (Numerical values)                    |
| Conclusion BS 4142:1997 <sub>[1]</sub> | Complaint Likely – Assessment of around +10 dB<br>Complaints Marginal – Assessment of around +5 dB<br>Complaints Unlikely – Assessment of around -10 dB or less |        |                                                                                                 |
| Assessment                             | +2 dB                                                                                                                                                           |        |                                                                                                 |
| Conclusion                             | The assessment level is below 'Marginal Significance'                                                                                                           |        |                                                                                                 |
| Test Laboratory:                       | 4193                                                                                                                                                            |        |                                                                                                 |
| Report Reference:                      | KR02489                                                                                                                                                         |        |                                                                                                 |
| Test Date:                             | 18 January 2012                                                                                                                                                 |        |                                                                                                 |
| Approval Date:                         | 23rd January 2013                                                                                                                                               |        |                                                                                                 |

## 5 CONCLUSIONS

The impact on nearby residential properties from the noise generated by the plant is assessed, in accordance with section 9 of BS4142:1997:

- Day time (07:00 – 23:00) impact -3 dB gives an assessment of below 'Marginal Significance'
- Night time (23:00 – 07:00) impact +2 dB gives an assessment of below 'Marginal Significance'

## 6 APPENDIX A - REQUIRED INFORMATION SUMMARY

(BS 4142:1997 – Information to be Reported)

| Ref | Item                                                          | Description                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
|-----|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------|
| a)  | <u>Source Under Investigation</u>                             |                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
| 1)  | Description of Source                                         | Type                                                                                                                        | Manufacturer                                                                                                                                                                                                                                                                                                                                                                                           | Model             |              |
|     | Searle - MGA124 EC                                            | 2 Fan Condenser                                                                                                             | Searle                                                                                                                                                                                                                                                                                                                                                                                                 | MGA124 EC         |              |
|     | Mitsubishi Heavy - FDC 100 VN                                 | Sales Floor AC                                                                                                              | Mitsubishi Heavy                                                                                                                                                                                                                                                                                                                                                                                       | FDC 100 VN        |              |
|     | Mitsubishi Heavy - FDC 100 VN                                 | Sales Floor AC                                                                                                              | Mitsubishi Heavy                                                                                                                                                                                                                                                                                                                                                                                       | FDC 100 VN        |              |
|     | Mitsubishi Heavy - SRK 25 ZG                                  | Cash Office AC                                                                                                              | Mitsubishi Heavy                                                                                                                                                                                                                                                                                                                                                                                       | SRK 25 ZG         |              |
|     | Extract Fan                                                   | Fan in attenuated duct                                                                                                      | Jet-flow                                                                                                                                                                                                                                                                                                                                                                                               | SJ200B            |              |
| 2)  | Source                                                        | Source Location                                                                                                             | Hours of Operation                                                                                                                                                                                                                                                                                                                                                                                     | Mode of Operation |              |
|     | Searle - MGA124 EC                                            | Within a dedicated area at the rear of the store                                                                            | Continuously                                                                                                                                                                                                                                                                                                                                                                                           | Continuously      |              |
|     | Mitsubishi Heavy - FDC 100 VN                                 |                                                                                                                             | 07:00-23:00                                                                                                                                                                                                                                                                                                                                                                                            | Continuously      |              |
|     | Mitsubishi Heavy - FDC 100 VN                                 |                                                                                                                             | 07:00-23:00                                                                                                                                                                                                                                                                                                                                                                                            | Continuously      |              |
|     | Mitsubishi Heavy - SRK 25 ZG                                  |                                                                                                                             | 07:00-23:00                                                                                                                                                                                                                                                                                                                                                                                            | Continuously      |              |
|     | 3)                                                            | Extract Fan                                                                                                                 | On the roof of the store                                                                                                                                                                                                                                                                                                                                                                               | 07:00-23:00       | Continuously |
|     | 4)                                                            | Description of Premises                                                                                                     | The proposed store is a former public house. The building is two storey under a pitched roof, located on the corner of Lovedean Lane and Woodcroft Lane. The proposed plant is located at the rear of the building, with an additional extract duct located on the roof. The area is mainly residential with a school and some retail units in the vicinity. The roads are relatively busy in the day. |                   |              |
| b)  | <u>Subjective Impression of Source at Assessment Position</u> |                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
| 1)  | Dominance                                                     | The proposed sources will not be the dominant sources at the assessment position                                            |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
|     | Audibility                                                    | The proposed sources are unlikely to be audible or perceivable at the assessment position                                   |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
| 2)  | Residual Noise Sources                                        | Residual noise sources mainly comprise traffic noise on the surrounding roads.                                              |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
| c)  | <u>Relative Positions</u>                                     |                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
| 1)  | Assessment Position                                           | 1m from the residential façade of the bungalow adjacent to the rear of the store.                                           |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
| 2)  | Source Measurement                                            | Sound pressure levels measured on a parallelepiped measurement surface 1m from the unit                                     |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
|     | Justification                                                 | Source has yet to be installed                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
| 3)  | Background Measurement                                        | Measured within Woodcroft Lane to the front of the store.                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
|     | Justification                                                 | Access not available to the assessment position                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
| 4)  | Topography, reflective surfaces etc.                          | The area around the site is generally hard and flat.                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |
| 5)  | Relative Distances                                            | The windows of the adjacent bungalow are between 5m and 7m away from the items of proposed plant behind a solid 1.8m fence. |                                                                                                                                                                                                                                                                                                                                                                                                        |                   |              |

| Ref | Item                                                 | Description                                                                                                                                                           |                                |                |
|-----|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|
| d)  | Noise Measurement Equipment                          |                                                                                                                                                                       |                                |                |
|     |                                                      | Sound Level Meter                                                                                                                                                     | Microphone                     | Calibrator     |
| 1)  | Type                                                 | NL - 32                                                                                                                                                               | UC - 53A                       | NC - 74        |
| 2)  | Manufacturer                                         | Rion                                                                                                                                                                  | Rion                           | Rion           |
| 3)  | Serial Number                                        | 503252                                                                                                                                                                | 316657                         | 34304655       |
| 4)  | Verification Test Details<br>Calibration Certificate |                                                                                                                                                                       |                                |                |
|     |                                                      | 05395                                                                                                                                                                 | 05395                          | 05377          |
|     | Verification Date                                    | 17 August 2010                                                                                                                                                        | 17 August 2010                 | 20 July 2011   |
| e)  | Operational Test                                     |                                                                                                                                                                       |                                |                |
| 1)  | Ref. Level of Calibrator                             | 94 dB@1000Hz                                                                                                                                                          |                                |                |
| 2)  | Meter Reading Before                                 | 94 dB                                                                                                                                                                 |                                |                |
|     | Meter Reading After                                  | 94 dB                                                                                                                                                                 |                                |                |
| f)  | Weather Conditions                                   |                                                                                                                                                                       |                                |                |
| 1)  | Wind Speed                                           | 3.0 ms <sup>-1</sup>                                                                                                                                                  |                                |                |
|     | Wind Direction                                       | North Westerly                                                                                                                                                        |                                |                |
| 2)  | Temperature Inversion<br>(Calm Night / No cloud)     | none                                                                                                                                                                  |                                |                |
| 3)  | Precipitation                                        | No Precipitation                                                                                                                                                      |                                |                |
| 4)  | Fog                                                  | none                                                                                                                                                                  |                                |                |
| g)  | Date and Time of Measurements                        |                                                                                                                                                                       |                                |                |
| 1)  | Source Measurements                                  | 07:00 on 01 July 2008 to 08:00 on 01 July 2008                                                                                                                        |                                |                |
|     | Background Measurements                              | 17:00 on 18 January 2012 to 14:00 on 19 January 2012                                                                                                                  |                                |                |
| h)  | Specific Noise Levels                                |                                                                                                                                                                       |                                |                |
| 1)  | Measured Noise Levels                                | Day Time<br>(07:00 – 23:00)                                                                                                                                           | Night Time<br>(23:00 to 07:00) |                |
|     |                                                      | Not Applicable                                                                                                                                                        | Not Applicable                 |                |
| 2)  | Residual Noise Level                                 | Not Applicable                                                                                                                                                        | Not Applicable                 |                |
|     | Method of Determination                              | Not Applicable                                                                                                                                                        |                                |                |
| 3)  | Specific Noise Level                                 | LAeq,1 hour 42 dB                                                                                                                                                     | LAeq,5 minutes 31 dB           |                |
|     | Method of Determination                              | Calculated using the supplied manufacturers Sound Power Levels                                                                                                        |                                |                |
| 4)  | Justification of Methods                             | As the source has yet to be installed the Sound Power Levels supplied by the manufacturer were used to calculate the Specific Noise Levels at the assessment position |                                |                |
| 5)  | Correction Applied                                   | Not Applicable                                                                                                                                                        |                                | Not Applicable |

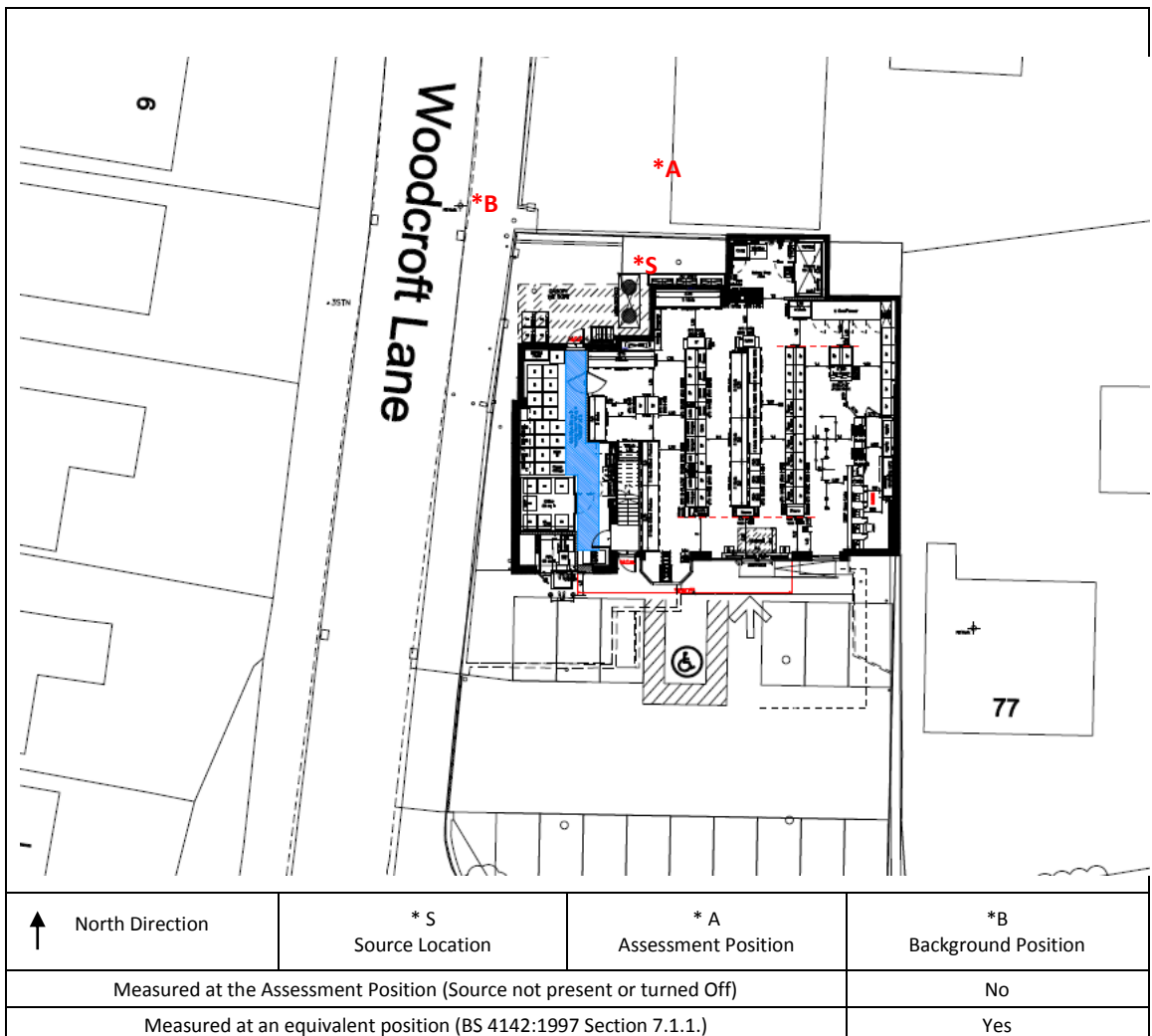
| Ref | Item                                             | Description                                                               |                                    |
|-----|--------------------------------------------------|---------------------------------------------------------------------------|------------------------------------|
| i)  | <u>Measurement Time Interval</u>                 |                                                                           |                                    |
| 1)  | Source Measurements                              | T <sub>m</sub> = In accordance with the requirements of BS ISO 13487:2003 |                                    |
|     | Background Measurements                          | Day Time<br>(07:00 – 23:00)                                               | Night Time<br>(23:00 to 07:00)     |
|     |                                                  | T = 16 hours<br>Quietest Measurement                                      | T= 8 hours<br>Quietest Measurement |
| j)  | <u>Reference Time Interval</u>                   |                                                                           |                                    |
|     |                                                  | T <sub>r</sub> = 1 hour                                                   | T <sub>r</sub> = 5 minutes         |
| k)  | <u>Rating Level</u>                              |                                                                           |                                    |
| 1)  | Specific Noise Level                             | L <sub>Aeq,1 hour</sub> 42 dB                                             | L <sub>Aeq,5 min</sub> 31 dB       |
| 2)  | Character Correction                             | +0 dB                                                                     | +0 dB                              |
|     | Justification                                    | Items of plant proposed do not exhibit any qualifying criteria            |                                    |
| 3)  | Rating Level                                     | L <sub>Aeq,1 hour</sub> 42 dB                                             | L <sub>Aeq,5 min</sub> 31 dB       |
| l)  | <u>Background Levels</u>                         |                                                                           |                                    |
|     |                                                  | L <sub>A90,16 hour</sub> 45 dB                                            | L <sub>A90, 8 hour</sub> 29 dB     |
| 2)  | Equivalent Measurement<br>Position Justification | Access not available to the assessment position                           |                                    |
| m)  | <u>Excess of Rating over Background Level</u>    |                                                                           |                                    |
| 1)  | Assessment                                       | -3 dB                                                                     | +2 dB                              |
| 2)  | Conclusion                                       | below 'Marginal Significance'                                             | below 'Marginal Significance'      |

## 7 APPENDIX B – SITE LAYOUT / PHOTOGRAPHS

### 7.1 Photographs



### 7.2 Location Map



## 8 APPENDIX C - BACKGROUND NOISE LEVELS

### 8.1 17:00 Wednesday 18<sup>th</sup> January 2012 to 07:00 Thursday 19<sup>th</sup> January 2012

| Time                                                                                | L <sub>Max</sub> | Minimum 5 minute     |                    |                    | 1 Hour             |                    |                    | Day and Night                                                     |                    |                    |
|-------------------------------------------------------------------------------------|------------------|----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------------------------------------------------------|--------------------|--------------------|
|                                                                                     |                  | L <sub>Aeq,t</sub>   | L <sub>A10,t</sub> | L <sub>A90,t</sub> | L <sub>Aeq,t</sub> | L <sub>A10,t</sub> | L <sub>A90,t</sub> | L <sub>Aeq,t</sub>                                                | L <sub>A10,t</sub> | L <sub>A90,t</sub> |
| 07:00 – 08:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  | -                                                                 | -                  | -                  |
| 08:00 – 09:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 09:00 – 10:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 10:00 – 11:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 11:00 – 12:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 12:00 – 13:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 13:00 – 14:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 14:00 – 15:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 15:00 – 16:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 16:00 – 17:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 17:00 – 18:00                                                                       | 97.8             | 65.6                 | 66.6               | 57.5               | 69.7               | 67.5               | 59.7               |                                                                   |                    |                    |
| 18:00 – 19:00                                                                       | 82.2             | 63.6                 | 65.8               | 54.6               | 65.7               | 66.9               | 57.4               |                                                                   |                    |                    |
| 19:00 – 20:00                                                                       | 81.9             | 62.0                 | 64.6               | 51.1               | 64.0               | 66.1               | 53.7               |                                                                   |                    |                    |
| 20:00 – 21:00                                                                       | 82.1             | 60.5                 | 63.7               | 44.5               | 62.3               | 64.9               | 49.8               |                                                                   |                    |                    |
| 21:00 – 22:00                                                                       | 80.0             | 58.4                 | 62.6               | 40.4               | 61.4               | 64.4               | 43.6               |                                                                   |                    |                    |
| 22:00 – 23:00                                                                       | 72.6             | 55.5                 | 59.1               | 34.3               | 59.2               | 62.9               | 40.6               |                                                                   |                    |                    |
| 23:00 – 00:00                                                                       | 74.9             | 46.2                 | 41.5               | 27.6               | 55.2               | 58.8               | 30.2               |                                                                   |                    |                    |
| 00:00 – 01:00                                                                       | 80.1             | 46.7                 | 44.4               | 25.6               | 54.1               | 54.8               | 27.3               |                                                                   |                    |                    |
| 01:00 – 02:00                                                                       | 80.0             | 30.0                 | 28.4               | 24.8               | 51.3               | 41.4               | 25.6               |                                                                   |                    |                    |
| 02:00 – 03:00                                                                       | 66.3             | 36.1                 | 37.9               | 27.7               | 45.7               | 45.1               | 31.3               |                                                                   |                    |                    |
| 03:00 – 04:00                                                                       | 69.6             | 42.1                 | 43.0               | 36.0               | 49.9               | 51.8               | 37.9               |                                                                   |                    |                    |
| 04:00 – 05:00                                                                       | 66.3             | 44.1                 | 46.6               | 38.3               | 50.2               | 52.7               | 39.4               |                                                                   |                    |                    |
| 05:00 – 06:00                                                                       | 70.7             | 50.6                 | 51.1               | 37.2               | 56.8               | 59.9               | 40.0               |                                                                   |                    |                    |
| 06:00 – 07:00                                                                       | 78.6             | 58.4                 | 61.5               | 44.2               | 62.0               | 64.8               | 48.0               |                                                                   |                    |                    |
|                                                                                     | dB<br>t = 1 hr   | dB,<br>t = 5 minutes |                    |                    | dB,<br>t = 1 hour  |                    |                    | dB, 07:00 – 23:00<br>t = 16 hours<br>23:00 – 07:00<br>t = 8 hours |                    |                    |
| Sound Pressure Levels, dB. Reference level of 2 x 10 <sup>-5</sup> Nm <sup>-2</sup> |                  |                      |                    |                    |                    |                    |                    |                                                                   |                    |                    |

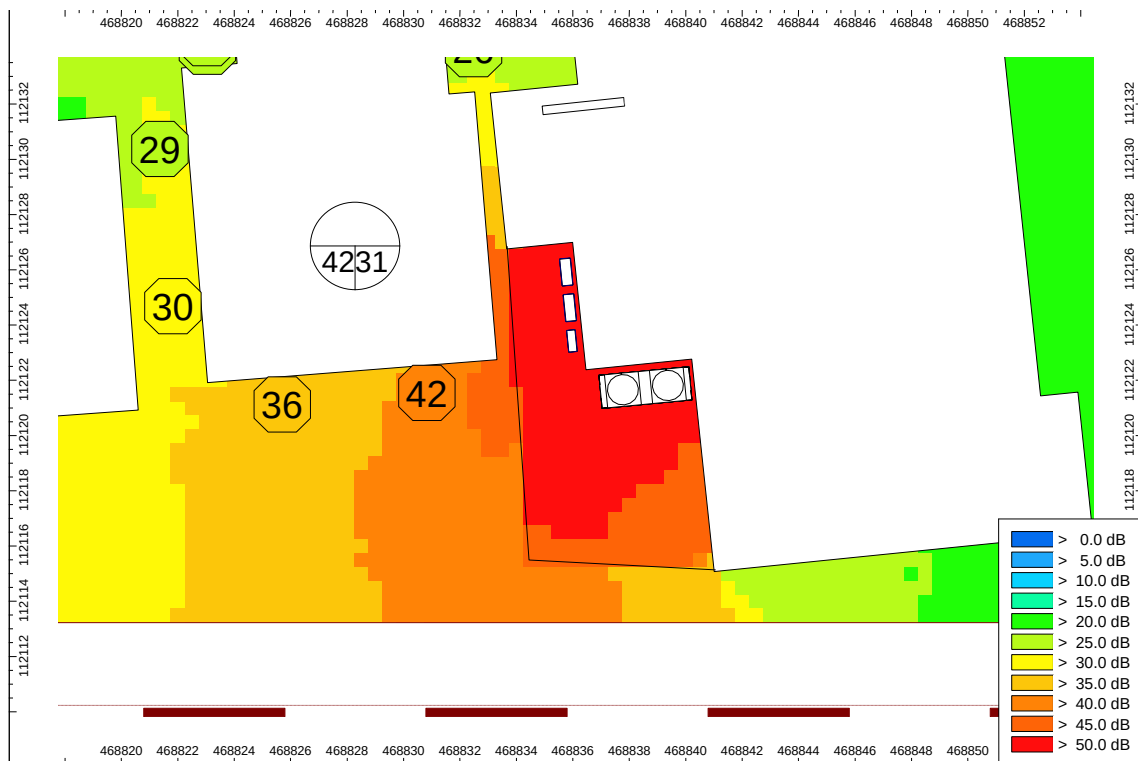
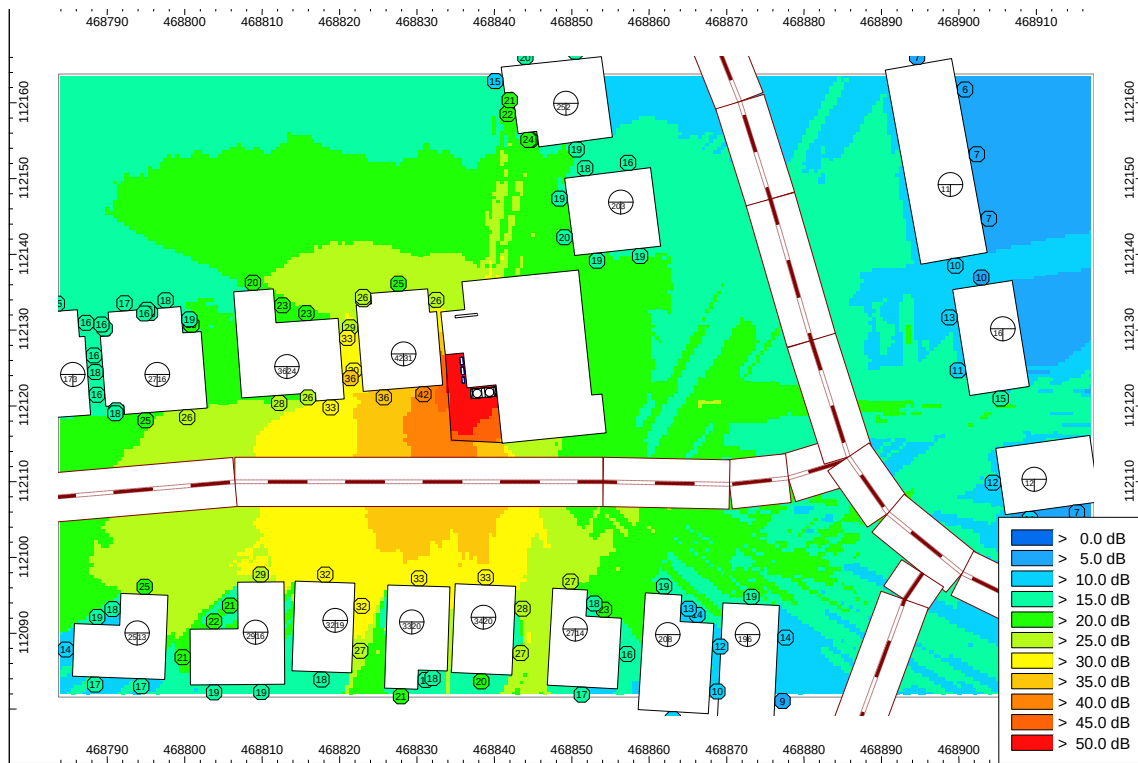
## 8.2 07:00 Thursday 19<sup>th</sup> January 2012 to 14:00 Thursday 19<sup>th</sup> January 2012

| Time                                                                                | L <sub>Max</sub> | Minimum 5 minute     |                    |                    | 1 Hour             |                    |                    | Day and Night                                                     |                    |                    |
|-------------------------------------------------------------------------------------|------------------|----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------------------------------------------------------|--------------------|--------------------|
|                                                                                     |                  | L <sub>Aeq,t</sub>   | L <sub>A10,t</sub> | L <sub>A90,t</sub> | L <sub>Aeq,t</sub> | L <sub>A10,t</sub> | L <sub>A90,t</sub> | L <sub>Aeq,t</sub>                                                | L <sub>A10,t</sub> | L <sub>A90,t</sub> |
| 07:00 – 08:00                                                                       | 94.0             | 63.4                 | 65.5               | 53.3               | 66.5               | 67.8               | 57.2               | -                                                                 | -                  | -                  |
| 08:00 – 09:00                                                                       | 80.2             | 66.4                 | 66.9               | 58.1               | 67.8               | 68.5               | 61.3               |                                                                   |                    |                    |
| 09:00 – 10:00                                                                       | 87.6             | 63.9                 | 66.1               | 54.1               | 65.2               | 66.8               | 57.4               |                                                                   |                    |                    |
| 10:00 – 11:00                                                                       | 82.2             | 65.5                 | 66.8               | 55.2               | 68.0               | 68.9               | 58.5               |                                                                   |                    |                    |
| 11:00 – 12:00                                                                       | 90.4             | 65.5                 | 67.5               | 57.8               | 69.3               | 68.8               | 59.6               |                                                                   |                    |                    |
| 12:00 – 13:00                                                                       | 80.2             | 64.2                 | 66.0               | 56.3               | 65.5               | 66.8               | 58.2               |                                                                   |                    |                    |
| 13:00 – 14:00                                                                       | 84.4             | 64.1                 | 66.0               | 56.5               | 67.1               | 67.7               | 60.0               |                                                                   |                    |                    |
| 14:00 – 15:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 15:00 – 16:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 16:00 – 17:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 17:00 – 18:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 18:00 – 19:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 19:00 – 20:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 20:00 – 21:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 21:00 – 22:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 22:00 – 23:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 23:00 – 00:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  | -                                                                 | -                  | -                  |
| 00:00 – 01:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 01:00 – 02:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 02:00 – 03:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 03:00 – 04:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 04:00 – 05:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 05:00 – 06:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
| 06:00 – 07:00                                                                       | -                | -                    | -                  | -                  | -                  | -                  | -                  |                                                                   |                    |                    |
|                                                                                     | dB<br>t = 1 hr   | dB,<br>t = 5 minutes |                    |                    | dB,<br>t = 1 hour  |                    |                    | dB, 07:00 – 23:00<br>t = 16 hours<br>23:00 – 07:00<br>t = 8 hours |                    |                    |
| Sound Pressure Levels, dB. Reference level of 2 x 10 <sup>-5</sup> Nm <sup>-2</sup> |                  |                      |                    |                    |                    |                    |                    |                                                                   |                    |                    |

## 8.3 Minimum Levels Table

| Time                                                                                | L <sub>Max</sub> | Minimum 5 minute   |                    | Minimum 1 hour     |                    | Minimum Day and Night                                       |                    |
|-------------------------------------------------------------------------------------|------------------|--------------------|--------------------|--------------------|--------------------|-------------------------------------------------------------|--------------------|
|                                                                                     |                  | L <sub>Aeq,t</sub> | L <sub>A90,t</sub> | L <sub>Aeq,t</sub> | L <sub>A90,t</sub> | L <sub>Aeq,t</sub>                                          | L <sub>A90,t</sub> |
| 07:00 – 23:00                                                                       | 97.8             | 55.5               | 34.3               | 59.2               | 40.6               | 62.4                                                        | 45.2               |
| 23:00 – 07:00                                                                       | 80.1             | 30.0               | 24.8               | 45.7               | 25.6               | 55.8                                                        | 28.8               |
|                                                                                     | dB<br>t = 1 hr   | dB, t = 5 minutes  |                    | dB, t = 1 hour     |                    | dB, 07:00 – 23:00 t = 16 hours<br>23:00 – 07:00 t = 8 hours |                    |
| Sound Pressure Levels, dB. Reference level of 2 x 10 <sup>-5</sup> Nm <sup>-2</sup> |                  |                    |                    |                    |                    |                                                             |                    |

## 9 APPENDIX D – NOISE MAPS



## 10 Appendix E – Source Sound Power Levels

### 10.1 Source 1 (Searle - MGA124 EC)

#### 10.1.1 Day Time Levels

| British Standard 13487:2003                         |    |    |     |     |     |                                                                                     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
|-----------------------------------------------------|----|----|-----|-----|-----|-------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| Day Time 07:00 – 23:00                              |    |    |     |     |     |                                                                                     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| Manufacturer/Model:                                 |    |    |     |     |     | Searle MGA124 EC                                                                    |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| 1/3 <sup>rd</sup> Octave Band Centre Frequency (Hz) |    |    |     |     |     |                                                                                     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| 50                                                  | 63 | 80 | 100 | 125 | 160 | 200                                                                                 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1650 | 2000 | 2500 | 3150 | 4000 | 5000 |
| 76                                                  | 71 | 69 | 66  | 66  | 62  | 60                                                                                  | 60  | 60  | 60  | 58  | 57  | 57  | 54   | 51   | 48   | 45   | 44   | 42   | 42   | 40   |
| 78                                                  |    |    | 70  |     |     | 65                                                                                  |     |     | 64  |     |     | 60  |      |      | 51   |      |      | 47   |      |      |
| Sound Power Level:<br>Grade 2 (Engineering Grade)   |    |    |     |     |     | L <sub>W(A)</sub> 64 dB<br><br>t = 10 minutes Reference 1 x 10 <sup>-12</sup> watts |     |     |     |     |     |     |      |      |      |      |      |      |      |      |

#### 10.1.2 Night Time Levels

| British Standard 13487:2003                         |    |    |     |     |                  |                                                                                     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |  |
|-----------------------------------------------------|----|----|-----|-----|------------------|-------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|--|
| Night Time 23:00 – 07:00                            |    |    |     |     |                  |                                                                                     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |  |
| Manufacturer/Model:                                 |    |    |     |     | Searle MGA124 EC |                                                                                     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |  |
| 1/3 <sup>rd</sup> Octave Band Centre Frequency (Hz) |    |    |     |     |                  |                                                                                     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |  |
| 50                                                  | 63 | 80 | 100 | 125 | 160              | 200                                                                                 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1650 | 2000 | 2500 | 3150 | 4000 | 5000 |  |
| 64                                                  | 62 | 64 | 63  | 58  | 56               | 55                                                                                  | 55  | 55  | 53  | 54  | 52  | 50  | 46   | 44   | 41   | 39   | 37   | 34   | 36   | 32   |  |
| 68                                                  |    |    | 65  |     |                  | 60                                                                                  |     |     | 58  |     |     | 52  |      |      | 44   |      |      | 39   |      |      |  |
| Sound Power Level:<br>Grade 2 (Engineering Grade)   |    |    |     |     |                  | L <sub>W(A)</sub> 59 dB<br><br>t = 10 minutes Reference 1 x 10 <sup>-12</sup> watts |     |     |     |     |     |     |      |      |      |      |      |      |      |      |  |

## 10.2 Source 2 (Mitsubishi Heavy - FDC 100 VN)

### 10.2.1 Day Time Levels

| British Standard 13487:2003                         |    |    |     |     |     |                                                      |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
|-----------------------------------------------------|----|----|-----|-----|-----|------------------------------------------------------|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| Day Time 07:00 – 23:00                              |    |    |     |     |     |                                                      |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| Manufacturer/Model:                                 |    |    |     |     |     | Mitsubishi Heavy FDC 100 VN                          |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| 1/3 <sup>rd</sup> Octave Band Centre Frequency (Hz) |    |    |     |     |     |                                                      |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| 50                                                  | 63 | 80 | 100 | 125 | 160 | 200                                                  | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1650 | 2000 | 2500 | 3150 | 4000 | 5000 |
| 84                                                  | 82 | 79 | 81  | 73  | 68  | 69                                                   | 62  | 63  | 61  | 58  | 58  | 63  | 62   | 60   | 59   | 63   | 61   | 56   | 56   | 55   |
| 85                                                  |    |    | 81  |     |     | 70                                                   |     |     | 63  |     |     | 65  |      |      | 63   |      |      | 58   |      |      |
| Sound Power Level:                                  |    |    |     |     |     | L <sub>W(A)</sub> 71 dB                              |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| Grade 2 (Engineering Grade)                         |    |    |     |     |     | t = 10 minutes Reference 1 x 10 <sup>-12</sup> watts |     |     |     |     |     |     |      |      |      |      |      |      |      |      |

## 10.3 Source 3 (Mitsubishi Heavy - FDC 100 VN)

### 10.3.1 Day Time Levels

| British Standard 13487:2003                         |    |    |     |     |     |                                                      |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
|-----------------------------------------------------|----|----|-----|-----|-----|------------------------------------------------------|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| Day Time 07:00 – 23:00                              |    |    |     |     |     |                                                      |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| Manufacturer/Model:                                 |    |    |     |     |     | Mitsubishi Heavy FDC 100 VN                          |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| 1/3 <sup>rd</sup> Octave Band Centre Frequency (Hz) |    |    |     |     |     |                                                      |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| 50                                                  | 63 | 80 | 100 | 125 | 160 | 200                                                  | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1650 | 2000 | 2500 | 3150 | 4000 | 5000 |
| 84                                                  | 82 | 79 | 81  | 73  | 68  | 69                                                   | 62  | 63  | 61  | 58  | 58  | 63  | 62   | 60   | 59   | 63   | 61   | 56   | 56   | 55   |
| 85                                                  |    |    | 81  |     |     | 70                                                   |     |     | 63  |     |     | 65  |      |      | 63   |      |      | 58   |      |      |
| Sound Power Level:                                  |    |    |     |     |     | L <sub>W(A)</sub> 71 dB                              |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| Grade 2 (Engineering Grade)                         |    |    |     |     |     | t = 10 minutes Reference 1 x 10 <sup>-12</sup> watts |     |     |     |     |     |     |      |      |      |      |      |      |      |      |

## 10.4 Source 4 (Mitsubishi Heavy - SRK 25 ZG)

### 10.4.1 Day Time Levels

| British Standard 13487:2003                         |    |    |     |     |     |                                                                                     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
|-----------------------------------------------------|----|----|-----|-----|-----|-------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
| Day Time 07:00 – 23:00                              |    |    |     |     |     |                                                                                     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| Manufacturer/Model:                                 |    |    |     |     |     | Mitsubishi Heavy SRK 25 ZG                                                          |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| 1/3 <sup>rd</sup> Octave Band Centre Frequency (Hz) |    |    |     |     |     |                                                                                     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |
| 50                                                  | 63 | 80 | 100 | 125 | 160 | 200                                                                                 | 250 | 315 | 400 | 500 | 630 | 800 | 1000 | 1250 | 1650 | 2000 | 2500 | 3150 | 4000 | 5000 |
| 77                                                  | 79 | 73 | 72  | 71  | 68  | 62                                                                                  | 57  | 56  | 54  | 50  | 50  | 53  | 54   | 51   | 50   | 51   | 49   | 48   | 47   | 45   |
| 78                                                  |    |    | 73  |     |     | 63                                                                                  |     |     | 55  |     |     | 55  |      |      | 53   |      |      | 50   |      |      |
| Sound Power Level:<br>Grade 2 (Engineering Grade)   |    |    |     |     |     | L <sub>W(A)</sub> 63 dB<br><br>t = 10 minutes Reference 1 x 10 <sup>-12</sup> watts |     |     |     |     |     |     |      |      |      |      |      |      |      |      |

## 10.5 Source 5 (Extract fan)

### 10.5.1 Day Time Levels

The following has been calculated using the details supplied by the manufacturer.

| Manufacturer/Model:               | Jet-flow SJ200B                                      |     |     |     |      |      |      |
|-----------------------------------|------------------------------------------------------|-----|-----|-----|------|------|------|
| Octave Band Centre Frequency (Hz) | 63                                                   | 125 | 250 | 500 | 1000 | 2000 | 4000 |
| In duct Lw (dB)                   | 60                                                   | 65  | 65  | 50  | 38   | 41   | 41   |
| Attenuator (dB)                   | -2                                                   | -4  | -6  | -20 | -30  | -24  | -22  |
| End Reflection Loss (dB)          | -3                                                   | -1  | 0   | 0   | 0    | 0    | 0    |
| Sound Power Level (dB)            | 60                                                   | 65  | 65  | 50  | 38   | 41   | 41   |
| Sound Power Level:                | <b>L<sub>W(A)</sub> 57.9 dB</b>                      |     |     |     |      |      |      |
|                                   | t = 10 minutes Reference 1 x 10 <sup>-12</sup> watts |     |     |     |      |      |      |

## 11 APPENDIX F – SITE SPECIFIC CRITERIA

### 11.1 Relative Criteria to Background Noise Levels

#### 11.1.1 Planning and Policy Guidance 24 (“PPG24”)

##### 11.1.1.1 Introduction

PPG24 guides local authorities in England on the use of their planning powers and states in its introduction that:

*“The aim of this guidance is to provide advice...to minimise the adverse impact of noise without unreasonable restrictions on development or adding unduly to the costs and administration burdens of business.”*

##### 11.1.1.2 Use of BS 4142

Paragraph 19 of Annex 3 of PPG 24 states that:

*“The likelihood of complaints about noise from industrial development can be assessed, where the standard is appropriate, using guidance in BS4142:1997”.*

##### 11.1.1.3 Glossary

The glossary of PPG 24 also provides some additional useful guidance.

*“A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of the sound.”*

##### 11.1.1.4 BS 4142 Scope

BS 4142 in section 6.3.6 recommends the following:

*“Determine the specific noise level by calculation alone...if the source is not yet in operation. In such cases, report the method of calculation in detail and give the reason for using it”*

##### 11.1.1.5 Integrated Pollution Prevention and Control (IPPC) – H3 Part 2

This document states in Section 2.5.1 ‘Methodology’ that:

*“For industrial noise it is preferable to use those principles of ISO 9613 -2 1996....”*

#### 11.1.1.6 *Relevance of Guidance*

It is therefore considered appropriate to calculate the resultant noise levels from the installation of the plant using the relevant methods defined in ISO 9613:Part 2 which states in the scope:

*“This part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources.”*

The standard uses well defined calculations to take account of a variety of influences including source location, distance from the source to the receiver, atmospheric absorption and the effect of the ground and barriers.

#### 11.1.2 *British Standard 4142*

This standard compares the proposed source levels against the underlying background noise levels and gives an indication on the likelihood of complaints.

##### 11.1.2.1 *Background Noise Levels*

These are established as the underlying noise levels against which the assessment of the specific source can be made and are measured at the assessment position or an equivalent position where it is not appropriate to measure the noise levels at the assessment position.

##### 11.1.2.2 *Assessment Position*

This is located externally at the nearest noise sensitive facade.

##### 11.1.2.3 *Rating Noise Level*

The Rating Noise Level is calculated at the assessment position using the source sound power levels and includes where necessary a character correction.

##### 11.1.2.4 *British Standard 7445 – Part 2*

Section 4.1.3 ‘Tonal Adjustment’ (note 1) provides some useful guidance regarding the addition of a tonal / character correction.

*“..a prominent tonal component may be detected in one third octave spectra if the level of a one-third octave band exceeds the level of the adjacent bands by more than 5 dB...”*

#### 11.1.2.5 BS4142 Conclusion

This establishes the difference between the specific noise level and the background noise level and gives an indication of the likelihood that the proposed plant will give rise to complaints. These are defined within three distinct categories.

*“Assess the likelihood of complaints by subtracting the measured background noise level from the rating level. The greater this difference the greater the likelihood of complaints.*

- *A difference of around +10 dB or more indicates that complaints are likely.*
- *A difference of around +5dB is of marginal significance.*
- *If the rating level is more than 10 dB below the measured background level then there is a positive indication that complaints are unlikely.”*

#### 11.1.2.6 BS4142 – Complaints Unlikely

Though a -10 dB criterion under BS4142 gives a conclusion of ‘complaints unlikely’, care needs to be taken when setting this criteria when the background noise level is very low as detailed in the scope of this standard.

*“The method is not suitable for assessing the noise....when the background and rating noise are both very low.*

*Note. For the purposes of this standard, background noise levels below 30dB and rating levels below 35 dB are considered to be very low.”*

#### 11.1.3 Criteria

With regard to the guidance within PPG24 and BS4142, it is considered the following are the appropriate criteria against which the plant noise emissions should be assessed to ensure they do not have an adverse effect on local amenity.

The criteria level is set at the level defined as ‘Complaints Marginal’ within BS4142. Considering the general guidance within PPG24, the criteria level has been set above the minimum perceptible change in level and well below the level which will have an adverse impact on amenity.

| Assessment Period                 | BS4142 <sub>[1]</sub> Assessment |
|-----------------------------------|----------------------------------|
| Day Time – 07:00 to 23:00 hours   | +5 dB                            |
| Night Time – 23:00 to 07:00 hours | +5 dB                            |

## 11.2 Absolute Criteria

### 11.2.1 Guidelines for Community Noise (WHO)

#### 11.2.1.1 World Health Organisation

At the beginning of the document published by the World Health Organisation entitled “Criteria for Community Noise” (“WHO”) there is the following statement.

*“This document is not a formal publication of the World Health Organisation and all rights are reserved by the Organisation. This document may, however, be freely reviewed, abstracted, reproduced or translated in part, but not for sale or for use in conjunction with commercial purposes.”*

The document goes onto state.

*“The authors alone are responsible for the views expressed in this document.”*

It is important to understand, that the ‘WHO document’ does not represent the views of the WHO itself. Moreover, the document makes clear that the guideline values it contains are targets to be achieved in the long term, and are not to be applied as standards in decision-making on individual development proposals (see e.g. Executive Summary, page xviii “Implementation third bullet point; page 38 final paragraph of section 4.1; and page 67 final two paragraphs).

#### 11.2.1.2 Table of Levels

| Specific Environment | Critical health effect(s)                                             | L <sub>Aeq</sub><br>(dB) | Time Base<br>(Hours) | L <sub>AMax, fast</sub><br>(dB) |
|----------------------|-----------------------------------------------------------------------|--------------------------|----------------------|---------------------------------|
| Outdoor living Area  | Serious Annoyance,<br>daytime and evening                             | 55                       | 16                   | -                               |
| Outside Bedrooms     | Sleep disturbance,<br>window open (Outdoor Values)                    | 45                       | 8                    | 60                              |
| Dwelling, indoors    | Speech intelligibility and moderate<br>annoyance, daytime and evening | 35                       | 16                   | -                               |
| Inside Bedrooms      | Sleep disturbance,<br>night time                                      | 30                       | 8                    | 45                              |

## 11.2.2 Night Noise Guidelines (WHO/EU)

### 11.2.2.1 Scope of Document

The work of the original WHO document detailed above was extended by a joint report published in 2007 by the World Health Organisation and the European Union.

*“The goal of the NNGL project was to provide and expand scientific advice to the European Commission and its Member States in developing future legislation in the area of night noise exposure, control and surveillance. The key objective of the project was to reach a consensus of experts and key stakeholders on the following subjects:*

- a) Guideline values for night noise to protect the public from adverse health effects.....”*

Section 7 of the final implementation report details the levels for which there are no observed effects:

*“...the observed effects thresholds are provided: the level above which an effect starts to occur or shows itself to be dependent on the exposure level.”*

### 11.2.2.2 Table of Levels

|                    | Effect                                                                                        | Indicator                  | Threshold , dB |
|--------------------|-----------------------------------------------------------------------------------------------|----------------------------|----------------|
| Biological Effects | EEG awakening                                                                                 | L <sub>Amax,inside</sub>   | 35             |
|                    | Motility, onset of motility                                                                   | L <sub>Amax,inside</sub>   | 32             |
|                    | Changes in duration of various stages of sleep, in sleep structure and fragmentation of sleep | L <sub>Amax,inside</sub>   | 35             |
| Sleep Quality      | Waking up in the night and/or too early in the morning                                        | L <sub>Amax,inside</sub>   | 42             |
|                    | Increased average motility when sleeping                                                      | L <sub>Night,outside</sub> | 42             |
| Well Being         | Self-reported sleep disturbance                                                               | L <sub>Night,outside</sub> | 42             |
|                    | Use of somnifacient drugs                                                                     | L <sub>Night,outside</sub> | 40             |
| Medical Conditions | Environmental insomnia                                                                        | L <sub>Night,outside</sub> | 42             |

## 12 APPENDIX G - OTHER ASSESSMENTS (NONE UKAS)

The following assessments are undertaken in line with the other site specific criteria detailed within appendix F above and do not fall within the UKAS scope of accreditation for KR Associates (UK) Ltd.

### 12.1 Absolute Assessment – Criteria for Community Noise

#### 12.1.1 07:00 to 23:00 – Day Time

| Searle - MGA124 EC                                 |                                                                                   |                               |                                                                                                             |
|----------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------|
| Mitsubishi Heavy - FDC 100 VN                      |                                                                                   |                               |                                                                                                             |
| Mitsubishi Heavy - FDC 100 VN                      |                                                                                   |                               |                                                                                                             |
| Mitsubishi Heavy - SRK 25 ZG                       |                                                                                   |                               |                                                                                                             |
| Extract fan – Jet-flow SJ200B                      |                                                                                   |                               |                                                                                                             |
| Assessment Position                                | 1m from the residential façade of the bungalow adjacent to the rear of the store. |                               |                                                                                                             |
| Item                                               | L <sub>Aeq,16 hours</sub>                                                         |                               | Commentary                                                                                                  |
| Sound Pressure Level<br>1m from residential facade | 42 dB                                                                             |                               | Noise levels calculated at a position 1m from the nearest residential façade.                               |
| Outdoor Living Area<br>Serious Annoyance           | 45 dB                                                                             | --                            | Absolute Criteria.                                                                                          |
| Dwellings, Indoors                                 | --                                                                                | 50 dB                         | Absolute External Criteria. Criteria converted from internal to external i.e. +15 dB                        |
| Compliance with Criteria                           | Yes                                                                               | Yes                           | The calculated levels fall below the absolute criteria levels contained within Criteria for Community Noise |
| <b>Conclusion</b>                                  |                                                                                   | <b>Complies With Criteria</b> |                                                                                                             |

#### 12.1.2 23:00 to 07:00 – Night Time

| Searle - MGA124 EC                                 |                                                                                   |                               |                                                                                                             |
|----------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------|
| Mitsubishi Heavy - FDC 100 VN                      |                                                                                   |                               |                                                                                                             |
| Mitsubishi Heavy - FDC 100 VN                      |                                                                                   |                               |                                                                                                             |
| Mitsubishi Heavy - SRK 25 ZG                       |                                                                                   |                               |                                                                                                             |
| Extract fan – Jet-flow SJ200B                      |                                                                                   |                               |                                                                                                             |
| Assessment Position                                | 1m from the residential façade of the bungalow adjacent to the rear of the store. |                               |                                                                                                             |
| Item                                               | L <sub>Aeq,8 hours</sub>                                                          | L <sub>AMax,fast</sub>        | Commentary                                                                                                  |
| Sound Pressure Level<br>1m from residential facade | 31 dB                                                                             | 46 dB                         | Noise levels calculated at a position 1m from the nearest residential façade.                               |
| Sleep disturbance windows open<br>(Outdoor Values) | 45 dB                                                                             | 60 dB                         | Absolute Criteria.                                                                                          |
| Compliance with Criteria                           | Yes                                                                               | Yes                           | The calculated levels fall below the absolute criteria levels contained within Criteria for Community Noise |
| <b>Conclusion</b>                                  |                                                                                   | <b>Complies With Criteria</b> |                                                                                                             |

## 12.2 Absolute Assessment – Night Noise Guidelines

### 12.2.1 23:00 to 07:00 – Night Time

| Searle - MGA124 EC                                 |                                                                                   |                               |                                                                                                       |
|----------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------|
| Mitsubishi Heavy - FDC 100 VN                      |                                                                                   |                               |                                                                                                       |
| Mitsubishi Heavy - FDC 100 VN                      |                                                                                   |                               |                                                                                                       |
| Mitsubishi Heavy - SRK 25 ZG                       |                                                                                   |                               |                                                                                                       |
| Extract fan – Jet-flow SJ200B                      |                                                                                   |                               |                                                                                                       |
| Assessment Position                                | 1m from the residential façade of the bungalow adjacent to the rear of the store. |                               |                                                                                                       |
| Item                                               | L <sub>Aeq,8 hours</sub>                                                          | L <sub>Amax,fast</sub>        | Commentary                                                                                            |
| Sound Pressure Level<br>1m from residential facade | 31 dB                                                                             | 36 dB                         | Noise levels calculated at a position 1m from the nearest residential façade.                         |
| Well Being (Lowest)                                | 40 dB                                                                             | --                            | Absolute Criteria.<br>Use of somnifacient drugs                                                       |
| Biological Effects (Lowest)                        | --                                                                                | 47                            | Absolute Criteria.<br>Motility, onset of Motility.<br>Corrected to External criteria +15 dB           |
| Compliance with Criteria                           | Yes                                                                               | Yes                           | The calculated levels fall below the absolute criteria levels contained within Night Noise Guidelines |
| <b>Conclusion</b>                                  |                                                                                   | <b>Complies With Criteria</b> |                                                                                                       |

## **13 REFERENCES**

### **13.1 BS 4142:1997**

Method for rating industrial noise affecting mixed residential and industrial areas

### **13.2 BS ISO 13487:2003**

Heat Exchangers – Forced air convection air cooled refrigerant condensers and dry coolers – Sound measurement

### **13.3 BS ISO 9613 – Part 1:1993**

Acoustics – Attenuation of sound propagation outdoors.

Part 1 - Part 1: Calculation of the absorption of sound by the atmosphere

### **13.4 ISO 9613 – Part 2:1996**

Acoustics – Attenuation of sound during propagation outdoors.

Part 2 – General method of calculation

### **13.5 Calculation of Road Traffic Noise**

Procedures for calculating noise from road traffic

**\*End of Report \***