

**SHEERWATER ACCESS IMPROVEMENTS  
MONUMENT WAY, WOKING**

**NOISE AND VIBRATION ASSESSMENT**

**MARCH 2012**

**SHEERWATER ACCESS IMPROVMENTS  
MONUMENT WAY, WOKING**

**NOISE ASSESSMENT**

**MARCH 2012**

<b>Project Code:</b>	WBCSHEERWATER.9
<b>Prepared by:</b>	Andrea Hughes
<b>Reviewed by:</b>	Stuart Aldridge
<b>Issue Date:</b>	MARCH 2012
<b>Status:</b>	FINAL REV B

**SHEERWATER LINK ROAD  
MONUMENT WAY, WOKING  
Noise and Vibration Assessment**

**Contents**

<b>1.</b>	<b>INTRODUCTION .....</b>	<b>1</b>
<b>2.</b>	<b>NATIONAL AND LOCAL POLICIES AND PRINCIPLES .....</b>	<b>3</b>
<b>3.</b>	<b>ASSESSMENT METHODOLOGY AND CRITERIA.....</b>	<b>7</b>
<b>4.</b>	<b>BASELINE CONDITIONS .....</b>	<b>18</b>
<b>5.</b>	<b>POTENTIAL IMPACTS .....</b>	<b>20</b>
<b>6.</b>	<b>MITIGATION MEASURES AND RESIDUAL IMPACTS .....</b>	<b>23</b>
<b>7.</b>	<b>CONCLUSIONS .....</b>	<b>26</b>

## **SHEERWATER LINK ROAD MONUMENT WAY, WOKING NOISE ASSESSMENT**

### **List of Figures**

- Figure 1. Site Location in Relation to Regional Highway Network
- Figure 2. Existing Site Layout
- Figure 3. Proposed Site Layout
- Figure 4. Noise Monitoring/Modelling Locations

### **List of Tables**

Table 1.	Modelled and Monitored Receptor Locations.....	12
Table 2.	Estimated Systematic Error.....	13
Table 3.	Semantic Descriptors for Vibration Impacts .....	15
Table 4.	Semantic Descriptors of Noise Impacts .....	16
Table 5.	Noise Survey Locations. ....	18
Table 6.	Summary of Noise Monitoring Results .....	19
Table 7.	Modelled 2017 Traffic Noise Impacts at Specified Receptor Locations. ....	21

### **Appendices**

- Appendix A            Glossary of Acoustic Terminology
- Appendix B            Instrumentation
- Appendix C            Noise Measurement Result Charts

## **1. INTRODUCTION**

- 1.1 Mayer Brown has been commissioned by Woking Borough Council (WBC) to undertake a noise and vibration assessment of potential traffic noise and vibration impacts associated with the proposed Sheerwater Link Road.
- 1.2 This road is proposed to link the commercial areas off Monument Way with Albert Drive and the Sheerwater Industrial Estate. It is considered by WBC that this will aid in the development of these business parks and improve the current environments in Arnold Drive and Eve Road.
- 1.3 The proposed development site is situated to the east of Woking town centre and is a primarily a residential area, incorporating a number of busy signalised, junctions and one way roads. The regional location of the proposed development site is illustrated in Figure 1: Site Location in Relation to Regional Highway Network.
- 1.4 The site itself is highly urbanised and is traversed north to south by one of the main routes into Woking, Monument Road and west to east by Monument Way West, Monument Way East, Eve Road, Arnold Road and Albert Drive. The existing site layout can be seen in Figure 2.
- 1.5 The submission is to extend Monument Way east along the back of the Eve Road properties in order to link it with Albert Drive. In this way through traffic can be removed from Eve Road and traffic flows on Arnold Road can be reduced. The proposed site layout can be seen in Figure 3.
- 1.6 The conditions currently existing on site have been established by an environmental noise monitoring survey undertaken between approximately 12:45 hours on Tuesday 21<sup>st</sup> February 2012 and 13:15 hours on Wednesday 22<sup>nd</sup> September 2012, by Hann Tucker Associates. The details of this survey are set out in Section 4.
- 1.7 Noise modelling to establish any change in traffic associated noise levels as a result of the development has been based upon existing and proposed traffic data provided by Mayer Brown Transport Consultants. Further details regarding the predicted traffic can also be seen in Section 4.
- 1.8 This assessment has been undertaken using the guidance and parameters set out in Section 2 and the scope of works undertaken has been agreed with WBC Environmental Health.

- 
- 1.9 This report contains references of a technical nature, a glossary of acoustic terminology has, therefore, been provided in Appendix A to assist with any interpretation.

## 2. NATIONAL AND LOCAL POLICIES AND PRINCIPLES

### National Planning Policy

#### Planning Policy Guidance 24 (PPG24): Planning and Noise<sup>1</sup>

- 2.1 This guidance provides advice on noise issues as they relate to planning. It aids in the determination of when noise can be considered a material consideration in planning applications and helps to avoid locating 'noisy' developments in previously quiet areas.
- 2.2 Development control is achieved by the application of the following principles:
- *Planning authorities must ensure that development does not cause an unacceptable degree of disturbance;*
  - *However, the planning system should not unjustifiably obstruct new development; and*
  - *Where intensification or change of use may influence noise from a development, Local Authorities may wish to impose conditions.*

#### The Noise Policy Statement for England (NPSE)<sup>2</sup>

- 2.3 This document aims to provide clarity regarding current policies and practices to facilitate noise management decisions and sets out the long term vision of Government noise policy.
- 2.4 The NPSE vision is to:  
"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."
- 2.5 This long term vision is supported by the following aims:  
"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:
- *Avoid significant adverse impacts on health and quality of life;*

---

<sup>1</sup> Department of the Environment. (1994) Planning Policy Guidance PPG24, Planning and Noise. HMSO, London

<sup>2</sup> Department for Environment, Food and Rural Affairs (2010) Noise Policy Statement for England. HMSO, London.

- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life.”*

2.6 The vision and aims of the NPSE should be read in conjunction with the set of ‘shared UK principles’ which make up the Government’s sustainable development strategy, which are listed in the NPSE as:

- *“Ensuring a Strong Healthy and Just Society – meeting the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion, and creating equal opportunity for all.*
- *Using Sound Science Responsibly – Ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values.*
- *Living Within Environmental Limits – Respecting the limits of the planet’s environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.*
- *Achieving a Sustainable Economy – Building a strong, stable and sustainable economy which provides prosperity and opportunities for all, and in which environmental and social costs fall on those who impose them (polluter pays), and efficient resource use is incentivised.*
- *Promoting Good Governance – Actively promoting effective, participative systems of governance in all levels of society – engaging people’s creativity, energy and diversity.”*

2.7 Through the introduction of the NPSE it is intended that:

*“By describing clear policy vision and aims the NPSE provides the necessary clarity and direction to enable decisions to be made regarding what is in an acceptable noise burden to place on society”*

## Regional Planning Policy

The South East Plan (Regional Spatial Strategy – RSS 9)

- 2.8 The South East Plan is the regional strategy for the South East. It sets out the overall scale of development for the region and includes borough housing targets for the Plan period, 2006-2026.
- 2.9 The South East Plan was published on 6 May 2009, it was then revoked by the coalition government on 6 July 2010. However a legal judgment on the 10 November 2010 re-established the South East Plan as part of the development plan.
- 2.10 The Government intends to invoke all regional strategies through the forthcoming Localism Bill.
- 2.11 Currently however, RSS cites noise within the 'Key Environmental Challenges' for the South East and provides Natural Resource Management Policy 10 which states:

*“Measures to address and reduce noise pollution will be developed at regional and local level through means such as:*

- i. locating new residential and other sensitive development away from existing sources of significant noise or away from planned new sources of noise;*
- ii. traffic management and requiring sound attenuation measures in major transport schemes:*
- iii. encouraging high levels of sound-proofing and screening as part of sustainable housing design and construction.”*

- 2.12 It can be seen that section ii has relevance for the Sheerwater Link Road.

## Local Planning Policy

- 2.13 The WBC website states that in September 2007 most of the policies of the Woking Borough Local Plan were 'saved' as part of the Local Development Framework, which means that they can continue to be used until they are replaced by new policies in the Local Development Framework.
- 2.14 A review has been undertaken of the saved policies and of these, only one makes reference to noise, see below.

---

## Chapter 4 The Built Environment.

- 2.15 This chapter states within policy B4 - Environmental Pollution that:
- “Development will not be permitted which would have a significant adverse effect on the environment and cause demonstrable harm to general amenity resulting from noise, dust, vibration, light or other releases. Where appropriate the council will, in conjunction with other relevant authorities, require satisfactory control measures to be introduced and agreements as to maximum levels.”*

### Woking Local Development Framework

- 2.16 This will take the form of a portfolio of Local Development Documents (LDDs). The ones proposed to date have been reviewed and no reference to recommendations for noise issues has been found.

### Supplementary Planning Guides

- 2.17 Woking also produces a number of supplementary planning guides. However none of these have any relevance for potential noise or vibration impacts.

### 3. ASSESSMENT METHODOLOGY AND CRITERIA

#### Standards and Guidelines

- 3.1 Planning Policy Guidance 24 - Planning and Noise has been developed to enable planning decision makers to assess what is and is not acceptable within the planning system.
- 3.2 Regional Guidance and Local Development Frameworks put the assessment of noise into the context of the regional and local plans for the area.
- 3.3 Guidelines on Community Noise has been developed by the World Health Organisation in order to “...consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities...”
- 3.4 *BS5228: 2009: Code of practise for noise and vibration control on construction and open sites – Part 1: Noise*<sup>3</sup> gives recommendations for basic methods of noise control relating to construction and open sites. It applies to work activities and operations that generate significant noise levels. It also includes industry-specific guidance.
- 3.5 *BS5228: 2009: Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration*<sup>4</sup> gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels.
- 3.6 *British Standard 4142: Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas*<sup>5</sup> describes a method of determining the level of a noise of an industrial nature, together with procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity. The standard is intended to be used for assessing the measured or calculated noise levels from both existing premises and new or modified premises.

---

<sup>3</sup>British Standard Institute (2009) BS5228: Code of practise for noise and vibration control on construction and open sites – Part 1: Noise. BSI, London.

<sup>4</sup> British Standard Institute (2009) BS 5228. Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration. BSI, London.

<sup>5</sup> British Standard Institute (1997) BS 4142: Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas. BSI. London

- 3.7 BS8233: Sound Insulation and Noise Reduction for Buildings 1999<sup>6</sup> provides information on the design of buildings that have internal acoustic environments.
- 3.8 British Standard 6472: Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)<sup>7</sup> is used to calculate the levels at which groundborne vibration is perceived and the levels at which it becomes a significant impact and states:
- 3.9 British Standard 7385: Evaluation and Measurement for Vibration in Buildings: Guide to Vibration Damage Levels from Groundborne Vibration<sup>8</sup> provides advice on the levels of vibration likely to induce damage in buildings.

### **Background to Noise Legislation**

- 3.10 The band of the frequency response of the ear, that is, the audible range of the human ear, is usually taken to be from about 20 Hz to 20,000Hz. Since the auditory system is not equally sensitive throughout this frequency range (being less sensitive at low and high frequencies), this is taken into account when making acoustic measurements by the use of A-weighting, a weighting filter which has a frequency response similar to the human auditory system. All the measurement results referred to in this report are A-weighted.
- 3.11 For many types of noise, the noise level index Equivalent Continuous A-Weighted Sound Pressure Level ( $L_{Aeq,T}$ ) is used as the basis of determining community response. The  $L_{Aeq,T}$  is defined as the A-Weighted sound pressure level of the steady sound, which contains the same acoustic energy as the noise being assessed over a specific time period, T, and is used in this assessment as the unit of measurement for the average noise level throughout the survey period.
- 3.12 The procedures used in the Calculation of Road Traffic Noise<sup>9</sup>, which are used in this assessment, assume typical traffic and noise propagation

---

<sup>6</sup> British Standards Institute (1999) BS8233 Sound Insulation and Noise Reduction for Buildings. BSI, London

<sup>7</sup> British Standards Institute (2008) BS 6472: Guide to Evaluation of Human Exposure to Vibration in Buildings (1Hz – 80Hz), Parts 1 and 2. BSI, London.

<sup>8</sup> British Standards Institute (1993) BS 7385: Evaluation and Measurement for Vibration in Buildings, Part 2. BSI, London.

<sup>9</sup> Department of Transport. (1998) Calculation of Road Traffic Noise (CRTN). HMSO. London.

conditions, which are consistent with moderately adverse wind velocities and directions during the specified periods. All road noise levels expressed here are in terms of index L10 (18-hour) dB(A). This is the arithmetic average of the values of L10 hourly dB(A) for each of the eighteen one-hour periods between 06:00 to 24:00 hours.

- 3.13 All noise monitoring was undertaken in accordance with guidelines set out in the pertinent documents such as PPG24, BS 4142

### **The Potential Effects of Noise**

- 3.14 The WHO 'Guidelines for Community Noise' states that physically, there is no distinction between sound and noise. Sound is a sensory perception and the complex pattern of sound waves is labelled noise, music speech etc. Noise is thus defined as unwanted sound.
- 3.15 Sound in air can be considered as the propagation of energy through air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly, because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic.
- 3.16 The dynamic range of the auditory system is generally taken to be 0dB to 140dB. Generally, the addition of noise from two sources producing the same sound pressure level, will lead to an increase in sound pressure level of 3dB. A 3dB noise change is generally considered to be just noticeable, whilst a 5dB change is generally accepted as clearly perceptible. A 10dB change leads to the subjective impression of a doubling or halving of loudness.
- 3.17 The principal potential adverse effects of noise are:
- i) Activity disturbance;
  - ii) Annoyance; and
  - iii) Interference with processes or activities.

## Potential Effects of Vibration

- 3.18 Vibration can also be considered as the propagation of energy through air in the form of oscillatory changes in pressure. In all standards, the preferred parameter of measurement is 'peak particle velocity' (PPV) measured in millimetres per second (mm/s).
- 3.19 The definition of these units is set out in section 1.3.2. British Standard 5228 Noise Control on Construction and Open sites states that human beings are known to be very sensitive to vibration, the threshold of perception being typically in the peak particle velocity range of 0.15 mm/s to 0.3 mm/s at frequencies of 8Hz and 80Hz.
- 3.20 The human body is very sensitive to the onset of vibration albeit very poor at distinguishing relative magnitudes. BS 6472 points out that human response to vibration varies quantitatively according to the direction in which it is perceived. As a result generally, vibrations in the foot to head mode are more perceptible than those in the back to chest or side-to-side modes.
- 3.21 Vibration above these levels can result in the following effects:
- i) Activity Disturbance
  - ii) Discomfort
  - iii) Annoyance
  - iv) Interference with processes or activities; and
  - v) Concern about building damage
- 3.22 Generally the anxiety expressed at vibration levels above a perception threshold relate to the potential for building damage. An extensive review of vibration-induced building damage case studies was carried out during the development of British Standard 7385: Part 2. Very few cases of vibration-induced damage were found. People can feel levels of vibration, which are much lower than levels for which damage has been credibly demonstrated.

### Effects of Vibration upon Structures:

- 3.23 **Cosmetic or threshold damage**-the formation of hairline cracks or the growth of existing cracks in plaster, drywall surfaces or mortar joints.

**Minor Damage**- the formation of large cracks or loosening or falling of plaster on drywall surfaces or cracks through bricks/concrete blocks.

**Major or Structural Damage**- damage to structural elements of the building.

- 3.24 With regard to the potential for building damage, BS 7385: Part 2 suggests that the possibility of building damage tends to zero at a PPV of 12.5 mm/s. BS 5228: Part 4 advises that 'the threshold for minor or cosmetic (i.e. non-structural damage) should be taken as a PPV of 10 mm/s for intermittent vibration and 5 mm/s for continuous vibrations.'

### **Model Parameters**

#### **Noise**

- 3.25 The road noise levels associated with the proposed Link Road have been estimated from traffic flows derived from the Transport Assessment using the Noise Map 2000 Computer Model for Road Traffic Noise. This relies on the principles set out in the Department of Transport Calculation of Road Traffic Noise, (CRTN) procedure.

#### **Vibration**

- 3.26 Significant road traffic vibration impacts are not anticipated and have therefore not been modelled. Vibration impacts associated with construction activities are discussed in Section 5.

#### **Traffic Flows**

- 3.27 Mayer Brown transport consultants commissioned traffic surveys from K&M Traffic Surveys. These were undertaken on Tuesday 18<sup>th</sup> October from 0700-1000 and 1600-1900. These surveys covered the following junctions:

- *Monument Road / Maybury Road*
- *Monument Road / Walton Road / Eve Road*
- *Monument Road / Arnold Road*
- *Eve Road / Albert Drive / Arnold Road*
- *Monument Road / Monument Way East*
- *Boundary Road / Boundary Way*

- 3.28 The surveys were undertaken by manual classified counts, with vehicles divided into car, HGV, bus, motorcycle and pedal cycle.
- 3.29 The baseline traffic data was utilised to calculate an 18hr 2-way traffic flow for the highway network with reference to an existing 2011 assessment

scenario and a future 2017 scenario utilising growth factors obtained from TEMPRO.

- 3.30 Development traffic was obtained with reference to the TRICS database, as set out within the Transport Assessment<sup>10</sup> and subsequent Addendum<sup>11</sup>, distributed on the basis of observed traffic movements throughout the network.

### Model Receptor Locations

- 3.31 It is considered that the main impacts of the change in traffic flows will occur upon Monument Way East, Arnold Road, Eve Road, Monument Road and and Albert Drive. Therefore the impacts of the proposed development traffic have been modelled for these locations. These locations are illustrated Figure 4 and set out in Table 1 below.

3.32

Position	Description
A	The receptor position was modelled at a height of 1.5m on Monument Way East in the south west corner of the car park at the Build Centre and approximately 8m from the road centreline. Monitoring also took place at this location.
B	The receptor position was modelled at a height of 1.5m on Monument Way East at the property boundary of the Council Depot and approximately 3.5m from the road centreline. Monitoring also took place at this location.
C	The receptor position was modelled at a height of 1.5m on Eve Road at a residential property boundary and approximately 5.5m from the road centreline Monitoring also took place at this location.
D	The receptor position was modelled at a height of 1.5m on Monument Road at a residential property boundary and approximately 2.5m from the road centreline
E	The receptor position was modelled at a height of 1.5m on Arnold Road at a residential property boundary and approximately 5m from the road centreline
F	The receptor position was modelled at a height of 1.5m on Albert Drive at a residential property boundary and approximately 5m from the road centreline.

**Table 1. Modelled and Monitored Receptor Locations**

### Model Validation and Verification

<sup>10</sup> Mayer Brown Ltd (2011) Sheerwater Access Improvements. Highways Design Report. MBL. Woking.

<sup>11</sup> Mayer Brown Ltd (2012) Sheerwater Access Improvements, Highways Design Report Addendum. MBL. Woking

- 3.33 The initial process of data validation has involved a first level screening of the input and output data by manual methods to ensure there are no obviously erroneous results.
- 3.34 Where the noise model has been used to assess the impact of road traffic, local monitored data has been used to verify the modelled results for systematic error by comparing the monitored and modelled data for the same locations. This has produced a ratio for monitored/modelled results.
- 3.35 The source of monitored data used in this exercise is discussed in Section 4. Table 2 below sets out the data used in this exercise:

Monitoring/Modelling Location	Modelled $L_{Aeq\ 18hr}$	Monitored $L_{Aeq\ 18hr}$	Difference
A/1	60.5	63.0	-2.5
B/2	56.8	57.0	-0.2
C/3	66.0	66.0	0.0

**Table 2. Estimated Systematic Error**

- 3.36 Table 2 indicates that the modelled locations B2 and C3 are generally within 1 dBA. Location A/1 is seen to be under estimating the monitored results by 2.5 dBA. Section 4 provide further detail on the monitoring data and notes that at position 1 the noise environment was influenced by a generator and adjacent building works. This explains the apparent model underestimation.
- 3.37 The above verification demonstrates that the model performs well and is suitable for this exercise with no adjustment necessary.

### Model Limitations and Uncertainties

- 3.38 It should be noted that the modelling process is dependant in the first instance upon projected traffic data. Where this data is subject to change this may affect the results of the modelling process.
- 3.39 Caution is advised in applying any modelled results outside of the context of this assessment. Where actual site noise levels are required, monitored site data should be referred to.
- 3.40 Due regard has been taken of all the above limitations in the following assessment.

### Noise Magnitude

- 3.41 The assessment of the magnitude of impacts has been undertaken by calculating the scale at which noise levels are expected to improve or deteriorate at specified locations as a result of the development.
- 3.42 The magnitude of an impact can be either neutral, adverse or beneficial and will be classified according to the following scale:
- *Negligible*
  - *Low*
  - *Medium*
  - *High*

### Vibration Magnitude

- 3.43 With regards to traffic associated vibration, it is extremely unlikely that a receptor would be affected by vibration from road traffic and not subject to a substantial level of road traffic noise. Consequently, in accordance with current general practice, vibration impacts from road traffic has been addressed by considering the potential for vibration impacts for receptors identified as being clearly subject to a road traffic noise impact. Further detail on potential building damage is set out below.
- 3.44 With regards to construction associated vibration, the assessment of vibration impacts is a necessarily complex process and is dependent upon factors such as the orientation of the receptor, the nature of the intervening ground, the point of measurement and excitation frequency of the vibration. However, for mitigation purposes, guideline values for the description of the magnitude of vibration impacts upon humans has been developed by Mayer Brown, using the criteria set out in BS5228 and BS 6472 and is set out in Table 4:
- 3.45 As previously noted, with regards to construction impacts upon buildings, BS 7385 also notes that building damage tends to zero at a ppv of 12.5 mm/s and that a ppv of 15mm/s at 4 Hz rising to 50 mm/s at 40 Hz is required before cosmetic damage (plaster cracking) is likely to occur. It notes that minor damage possible at double these vibration magnitudes with possible major building damage when the values are quadrupled. The control of the potential for building damage is set out in the mitigation section of this report.

Corresponding PPV in mm/s*	Impact Magnitude
<0.15	Negligible
0.3 – 0.6	Low
0.3 – 1.2	Medium
0.3 – 2.4	High

**Table 3. Semantic Descriptors for Vibration Impacts**

\*at frequencies of 8Hz to 80Hz

### Sensitivity

3.46 The sensitivity of a location will be determined by looking at the following criteria:

- *The number and activities of the population affected;*
- *The type of receptor.*

3.47 The significance of an impact can then be determined by looking at the following criteria:

- *Impact magnitude*
- *Sensitivity of location*

3.48 The sensitivity of an impact will then be classified according to the following scale:

- *Minor;*
- *Moderate;*
- *Major; or*
- *Severe*

3.49 The Equivalent Continuous A-Weighted Sound Pressure Level (LAeq,T) is the principal measurement index for environmental noise. Consequently, the magnitude of noise impacts will be principally evaluated upon the basis of a change in LAeq noise level. In order to facilitate the description of impacts, the semantic scale shown in Table 4 will be applied.

Predicted Change in $L_{Aeq, T}$	Nature of Impact	Impact Magnitude
Decrease of 3 dB or more	Beneficial	Low
Decrease of less than 3 dB	Beneficial	Negligible
Increase of less than 3 dB	Adverse	Negligible
Increase of 3 to < 5 dB	Adverse	Low
Increase of 5 to <10 dB	Adverse	Medium
Increase of 10 or more	Adverse	High

**Table 4. Semantic Descriptors of Noise Impacts**

3.50 The values in Table 5 are founded on the following principles:

- i) Department of the Environment advice, in PPG24 is that a 3 dB change is the minimum perceptible under normal conditions;
- ii) It is generally accepted that a 5 dB change is clearly perceptible; and
- iii) A 10 dB change corresponds roughly to the perception of a halving or doubling of loudness.

## Calculation Methodology

### Construction

3.51 Assessment of specific construction impacts is dependent upon a number of detailed construction design details which are not available at this stage. Therefore, the impact of construction activities should be controlled by the use of a detailed Construction Method Statement (CMS) which should include the use of noise and vibration 'Action Levels', to be set at the site boundary to ensure that residents and workers are not disturbed by site activities.

### Operation

3.52 It has been assumed for the purpose of this report that the link road will be completed in 2017. The assessment of operational traffic impacts has been based upon the operational traffic flows for this year. Worst case operational traffic impacts have been quantitatively modelled by assessing the worst-case traffic flows nearest the property boundaries.

- 3.53      Impacts have been calculated by subtracting the 2017 modelled 'baseline' from the 2017 'with development' scenario. The resultant changes in noise have then been assessed against the significance criteria given in Table 5.

#### 4. BASELINE CONDITIONS

##### Noise Monitoring

- 4.1 Fully automated environmental noise monitoring was undertaken between approximately 12:45 hours on Tuesday 21<sup>st</sup> February 2012 and 13:15 hours on Wednesday 22<sup>nd</sup> September 2012, by Hann Tucker Associates.
- 4.2 Due to the nature of the survey, i.e. unmanned, it is not possible to accurately comment on the weather conditions throughout the entire survey period. However, at the beginning and end of the survey period the wind conditions were calm and the sky was generally overcast. We understand that generally throughout the survey period the weather conditions were similar to these and were considered suitable for obtaining representative measurements.
- 4.3 Measurements were taken continuously of the A-weighted (dBA) L<sub>10</sub>, L<sub>90</sub>, L<sub>eq</sub> and L<sub>max</sub> sound pressure levels over 15 minute periods.
- 4.4 The noise level measurements were undertaken at the three locations described below and illustrated in Figure 5:

Position	Description
1	The microphone was located on a pole at a height of 1.5m on Monument Way East in the south west corner of the car park at the Build Centre. The noise environment here was influenced by a generator attached to a mobile food outlet and adjacent building works. The microphone was considered to be in a free field position.
2	The microphone was located on a lamp post at a height of 2.0m on Monument Way East at the property boundary of the Council Depot. Traffic noise was the dominant noise source. The microphone was considered to be in a free field position.
3	The microphone was located on a lamp post at a height of 2.0m on the north side of Eve Road, at a residential property boundary. Traffic noise was the dominant noise source. The microphone was considered to be in a free field position.

**Table 5. Noise Survey Locations.**

- 4.5 Details of the Instrumentation used is set out in Appendix B

## Results

- 4.6 The results have been plotted on Time History Graphs 18025/TH1.1 to 18025/TH1.6 in Appendix B presenting 15 minute A-weighted (dBA) L10, L90, Leq and Lmax levels at each measurement position throughout the duration of the survey.
- 4.7 A summary of the results of the noise survey are presented in Table 6 below.

Location	Day-time L <sub>Aeq</sub> 16hr dB(A) (7.00 – 23.00)	Night-Time L <sub>Aeq</sub> 8hr dB(A) (23.00 – 7.00)	L <sub>A,1018hr</sub> dB(A) (6.00 – 24.00)
1	63	57	63
2	57	46	57
3	66	58	66

**Table 6. Summary of Noise Monitoring Results**

## Vibration

- 4.8 Receptors which could be potentially affected by vibration associated with the proposals are not currently affected by sources of appreciable environmental vibration. A zero baseline has, therefore, been assumed.

## 5. POTENTIAL IMPACTS

- 5.1 The potential noise impacts of the development have been assessed as worst-case scenarios with no allowance for mitigation.

### **Construction Noise and Vibration**

- 5.2 As well as considering the effect of the operational noise and vibration on the local residents, consideration must also be given to the effects of short term construction noise and vibration upon the residents in the vicinity of the site.

- 5.3 Examples of possible sources of impact include:

- *Increased noise and vibration levels on-site due to construction activities, plant and road haulage vehicles;*
- *Increased noise and vibration levels caused by any ground treatment; and*
- *Increased noise and vibration levels off-site due to road haulage vehicles.*

- 5.4 Assessment of specific construction impacts is dependent upon a number of detailed building design details which are not available at this stage. Therefore, the impact of construction activities should be controlled by the use of a detailed Construction Method Statement (CMS) which should include the use of noise and vibration 'Action Levels', to be set at the site boundary to ensure that residents and workers are not disturbed by site activities.

### **Operational Traffic Noise**

- 5.5 The potential worst case, unmitigated noise impact of traffic from the completed link road, at the boundary of residential receptors, has been assessed based on the traffic flows anticipated, as advised in the Transport Assessment. The results of these assessments can be seen in Table 7 below.

Receptor	2017 L <sub>A10 18hr</sub>		
	Without Link Road	With Link Road	Impact
A	60.8	67.7	6.9
B	57.0	67.9	10.9
C	66.2	58.3	-7.9
D	69.9	69.1	-0.8
E	66.3	65.7	-0.6
F	68.9	66.5	-2.4

**Table 7. Modelled 2017 Traffic Noise Impacts at Specified Receptor Locations.**

- 5.6 Table 7 demonstrates that when the predicted 'With Link Road' traffic flows are compared to the predicted 'Without Link Road' traffic flows, it can be seen that the noise environment is considered to improve at the following locations, C Eve Road, D Monument Road, E Arnold Road and F Albert Drive. The most significant of these improvements is found at Eve Road.
- 5.7 Where these impacts are compared to the criteria in section 3 and Table 4, it can be seen that whilst the improvements on Monument Road, Arnold Road and Albert Drive are positive these are not considered significant.
- 5.8 However, the reductions in noise levels along Eve Road are considered to be medium magnitude and moderate significance, due to the number and proximity of the residents.
- 5.9 Conversely the increases in noise levels along the rear of these properties, in Monument Way East are found to be of Medium and High magnitude and potentially moderate to major significance. These noise levels are also seen to approach the 'specified' noise level of 68dBA L<sub>10 18hr</sub> at which noise insulation can be claimed for qualifying facades under the Noise Insulation Regulations<sup>12</sup>.
- 5.10 However, the 'qualifying facades for these properties are located at varying distances of between 10, and 35m from the proposed route of the Link Road. The Calculation of Road Traffic Noise<sup>8</sup> indicates that noise levels over these distances can reduce by between 0 and over 4 dBA depending on distance and height of the receptor.
- 5.11 Therefore there is a potential that some of the rear facades on Eve Road may qualify for noise insulation under the Noise Insulation Regulations.

<sup>12</sup> SI Building and Buildings. Noise Insulation Regulations (1975)

### **Garden Noise Levels**

- 5.12 The WHO guidelines on Community Noise note that:

*“to protect the majority of people from being seriously annoyed during daytime, the outdoor sound levels from steady continuous noise should not exceed 55 dB LAeq ....in outdoor living areas.”*

- 5.13 Given the highly urban local environment and busy network of surrounding roads, it is unlikely that all gardens on Eve Road currently experience the WHO criteria of less than 55 dB LAeq throughout their entire length. However it is accepted that the Link Road is likely to increase noise levels within garden boundaries.

### **Operational Traffic Vibration**

- 5.14 As noted in Section 3 it is extremely unlikely that a receptor would be affected by vibration from road traffic and not subject to a substantial level of road traffic noise. The above noise assessment indicates that there is a potential for significant noise impacts adjacent to the road. Therefore there is also the potential that receptors at this location may be subject to significant vibration impacts.

However, actual receptors will be located at between 10 and 35m from the proposed road location and as such it is unlikely that traffic associated vibration will result in impacts at this location. However, this will need to be confirmed at the time of construction.

## 6. MITIGATION MEASURES AND RESIDUAL IMPACTS

### Construction

- 6.1 Potentially significant impacts during the construction phase are associated with noise and vibration generating activities adjacent to potentially sensitive receptors. By employing appropriate site management practices, the potential for adverse impacts from construction vehicles and plant during the works will be minimised. A range of measures are suggested, which can form part of a site specific Construction Method Statement (CMS) within which all contractor activities will be undertaken. Woking Borough Council would expect a planning condition attached to any permission granted requiring the submission of a detailed CMS for approval prior to the commencement of the development.
- 6.2 Prior to any construction activity on site, a detailed CMS will be drawn up and agreed with the contractor to set out the appropriate site management practices to be adhered to.
- 6.3 The Construction Method Statement will cover the following matters:
- Methods and materials that should be used to ensure that the generation of noise and vibration is minimised;
  - Optimum site layout, so that where possible, noise and vibration generating activities are located away from sensitive receptors; and
  - Good housekeeping and management, i.e.
    - Review of plant and activities to ensure impact minimisation measures are in place and operating;
    - Public relations, e.g. provision of telephone numbers for complaints, pre-warning of noisy activities, sensitive working hours;
    - Controlling of site traffic and setting up of access routes away from sensitive receptors; and
    - Provision of noise and vibration monitoring during activities likely to affect sensitive receptors;

- 6.4 Woking Borough Council will be responsible for the execution of the CMS and will ensure that appropriate personnel understand their responsibilities in terms of the minimisation of impacts and the appropriate reporting and actioning of incidents. They will also be responsible for identifying and organising appropriate training.
- 6.5 Mitigation measures will include the following where possible:
- Regular monitoring where the potential for significant impact is identified;
  - Where possible, 'silenced' plant and equipment to be used;
  - Where vehicles are standing for a significant period of time, engines to be switched off;
  - Screening around those parts of the site at which activities are likely to generate noise;
  - Location of noise and vibration generating plant at a low level and as distant as possible from sensitive receptors;
  - Plant to operate at low speeds, where possible, and incorporate automatic low speed idling;
  - Location of site haul roads, entrances and exits to prevent the need for vehicles to reverse and also minimise impacts upon sensitive receptors;
  - all plant to be properly maintained (greased, blown silencers replaced, saws kept sharpened, teeth set and blades flat, worn bearings replaced, etc);
  - Consideration to be given to temporary screening or enclosures for static noisy plant to reduce noise emissions and plant should be certified to meet any relevant EC Directive standards; and
  - All contractors to be made familiar with the guidance in BS 5228 (Parts 1 and 2) which should form a pre-requisite of their appointment; and
  - Early and good public relations with the adjacent tenants and occupants of buildings will also reduce the likelihood of complaints.
- 6.6 Once the exact methods and plant to be employed are confirmed, the need for further mitigation measures can be determined and specified within the CMS.

---

## Completed Development

- 6.7 Section 5 notes that there is the potential for Medium to High magnitude impacts of moderate to major significance to occur at the rear property boundaries along Eve Road. This is largely dependent upon their current noise environment e.g. adjacent to the trafficked portion of Monument Way East or adjacent to the track.
- 6.8 Woking Borough Council have committed to the provision of a noise fence to run along the rear of the Eve Road properties and accommodate the various access requirements. A number of acoustic fence construction materials are available which can include timber frames which incorporate an absorptive or reflective surfaces. When constructed adjacent to the road, a typical 2.5m fence can provide, noise attenuation of between 16.5 and 20 dBA.
- 6.9 This would ensure that the noise environment in gardens was within the WHO criteria for outdoor environments.
- 6.10 As previously discussed, there is a potential that some properties may qualify for noise insulation under the Noise Insulation Regulations. However, it is not possible to identify any potential qualifications at this stage. Woking Borough Council should expect a planning condition which requires that detailed noise modelling takes place, prior to construction which accounts for any proposed mitigation, such as a specified noise fence.
- 6.11 It is also advised that a post construction noise and vibration survey is also undertaken in order to quantify the actual impacts to the rear of the Eve Road properties and to ensure all required mitigations are in place.

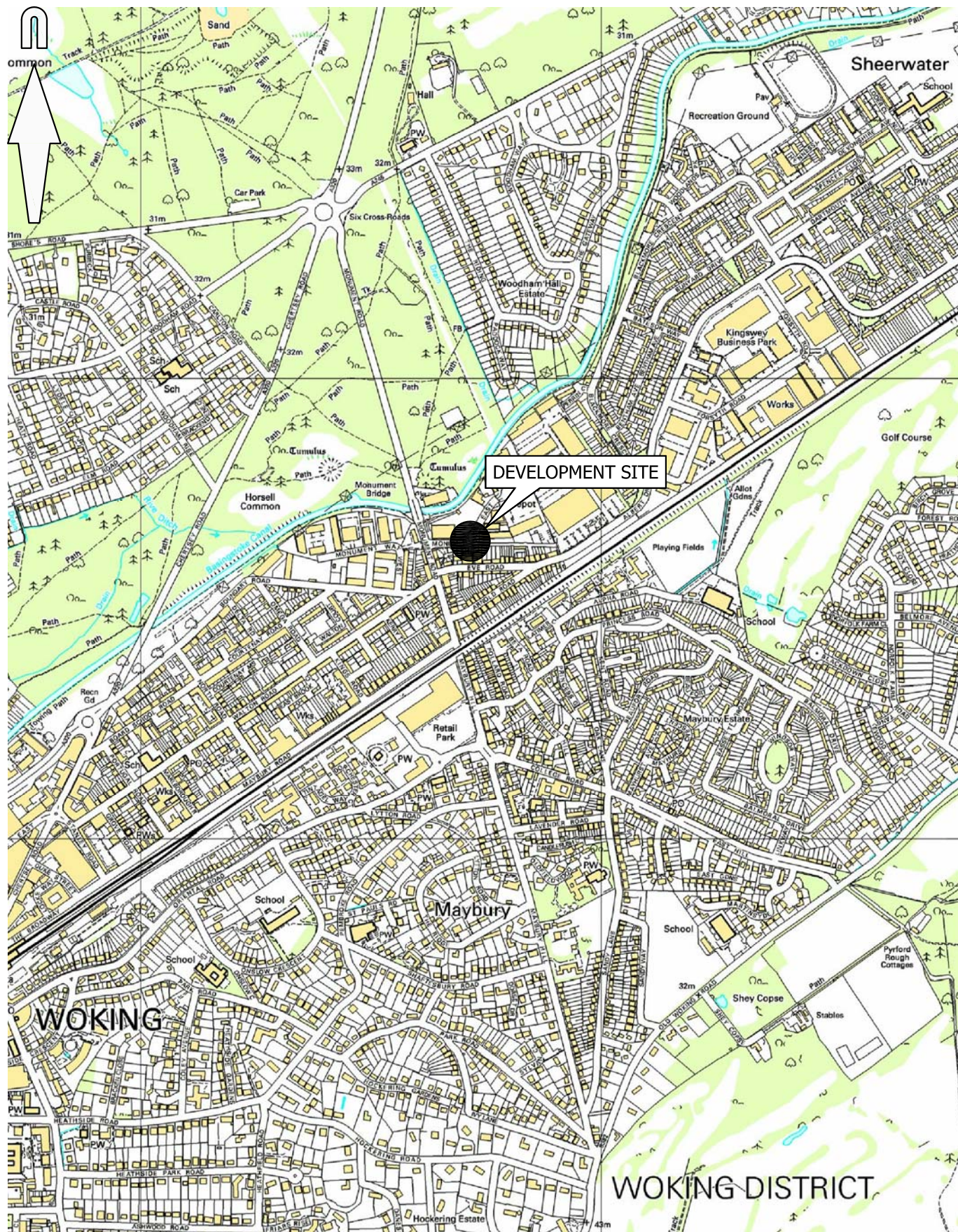
## **7. CONCLUSIONS**

### **Construction**

- 7.1 A site-specific Construction Method Statement will be prepared and implemented to assist in reducing potential noise and vibration impacts. This will include best practice to minimise construction impacts as specified in Section 5 of this report. The residual construction impacts are expected to be local, adverse but only temporary and of low to medium magnitude and of minor to moderate significance. These will be mitigated through the CMS.

### **Completed Development**

- 7.2 It has been predicted that in general the noise environment in the vicinity of the link Road will improve, with significant, medium magnitude and moderately significant improvements predicted for the front of the Eve Road properties.
- 7.3 However, it is also predicted that there is a potential for significant, adverse Medium to High magnitude and potentially moderate to major significant noise impacts to occur to the rear of the Eve Road property boundaries. It is anticipated that these can be ameliorated with the provision of a noise fence which maintains the access to the rear of these properties.
- 7.4 It is proposed that, prior to construction of the Link Road, a detailed noise assessment is undertaken to enable the optimum design of the noise fence and to assess the potential for any compensation under the Noise Insulation Regulations.
- 7.5 Further, it is proposed that a post construction noise and vibration survey is also undertaken in order to quantify the actual impacts to the rear of the Eve Road properties and to ensure all required mitigations are in place



This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Mayer Brown Ltd. Licence No - AL 100002189



## SITE IN RELATION TO REGIONAL HIGHWAY NETWORK

Scale NTS@A4

FIGURE 1



This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Mayer Brown Limited, Licence No - AL - 100002189



Mayer Brown Limited  
Lion House  
Oriental Road Woking Surrey GU22 8AR  
Telephone 01483 750 508 Fax 01483 750 437  
wokingoffice@mayerbrown.co.uk www.mayerbrown.co.uk

client  
WOKING BOROUGH COUNCIL

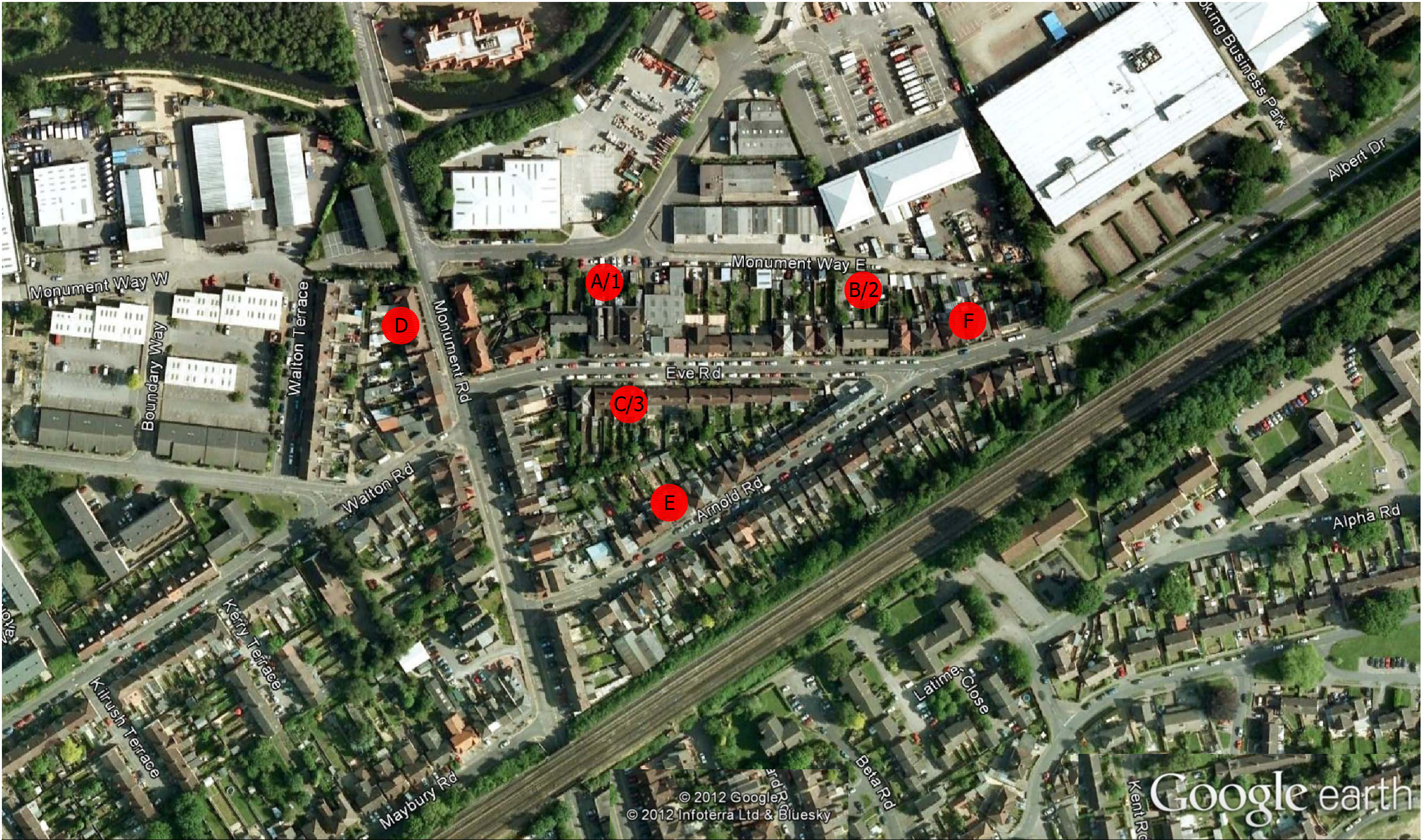
project  
SHEERWATER LINK ROAD

title  
EXISTING SITE LAYOUT

scale	NTS@A3	drawn by	PW	checked by	AH
date	FEBRUARY 2012	cad file	Figures 1-4.DWG		
drawing number					rev.

FIGURE 2





This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Mayer Brown Limited, Licence No - AL - 100002189



Mayer Brown Limited  
Lion House  
Oriental Road Woking Surrey GU22 8AR  
Telephone 01483 750 508 Fax 01483 750 437  
wokingoffice@mayerbrown.co.uk www.mayerbrown.co.uk

client  
WOKING BOROUGH COUNCIL

project  
SHEERWATER LINK ROAD

title  
MONITORING AND MODELLING LOCATIONS

scale	NTS@A3	drawn by	PW	checked by	AH
date	FEBRUARY 2012	cad file	Figures 1-4.DWG		
drawing number					rev.

FIGURE 4

## **APPENDIX A**

### **Glossary of Acoustic Terminology**

The acoustic terms used in this report are explained below:

**dB :** Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.

**dB(A) :** The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.

Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.

**L10 & L90:** If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The  $L_n$  indices are used for this purpose, and the term refers to the level exceeded for  $n\%$  of the time, hence L10 is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L90 is the average minimum level and is often used to describe the background noise.

It is common practice to use the L10 index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.

**Leq :** The concept of Leq (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.

Leq is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 1 hour).

The use of digital technology in sound level meters now makes the measurement of Leq very straightforward.

**Lmax :** Lmax is the maximum sound pressure level recorded over the period stated. Lmax is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the Leq noise level.

## **APPENDIX B**

### **Instrumentation**

### Un-manned Survey

Description	Manufacturer	Type	Serial Number	Latest Verification
<b>Position 1</b> Type 1 Data Logging Sound  Level Meter	Larson Davis	820	1227	LD calibration on 23/09/2011
<b>Position 1</b> Type 1 ½" Condenser  Microphone	Larson Davis	2541	5815	LD calibration on 23/09/2010
<b>Position 2</b> Type 1 Data Logging Sound  Level Meter	Larson Davis	824	3839	LD calibration on 09/05/2011
<b>Position 2</b> Type 1 ½" Condenser  Microphone	Larson Davis	377B02	123225	LD calibration on 09/05/2011
<b>Position 3</b> Type 1 Data Logging Sound  Level Meter	Larson Davis	824	3444	LD calibration on 09/05/2011
<b>Position 3</b> Type 1 ½" Condenser  Microphone	PCB	377B02	122885	LD calibration on 09/05/2011

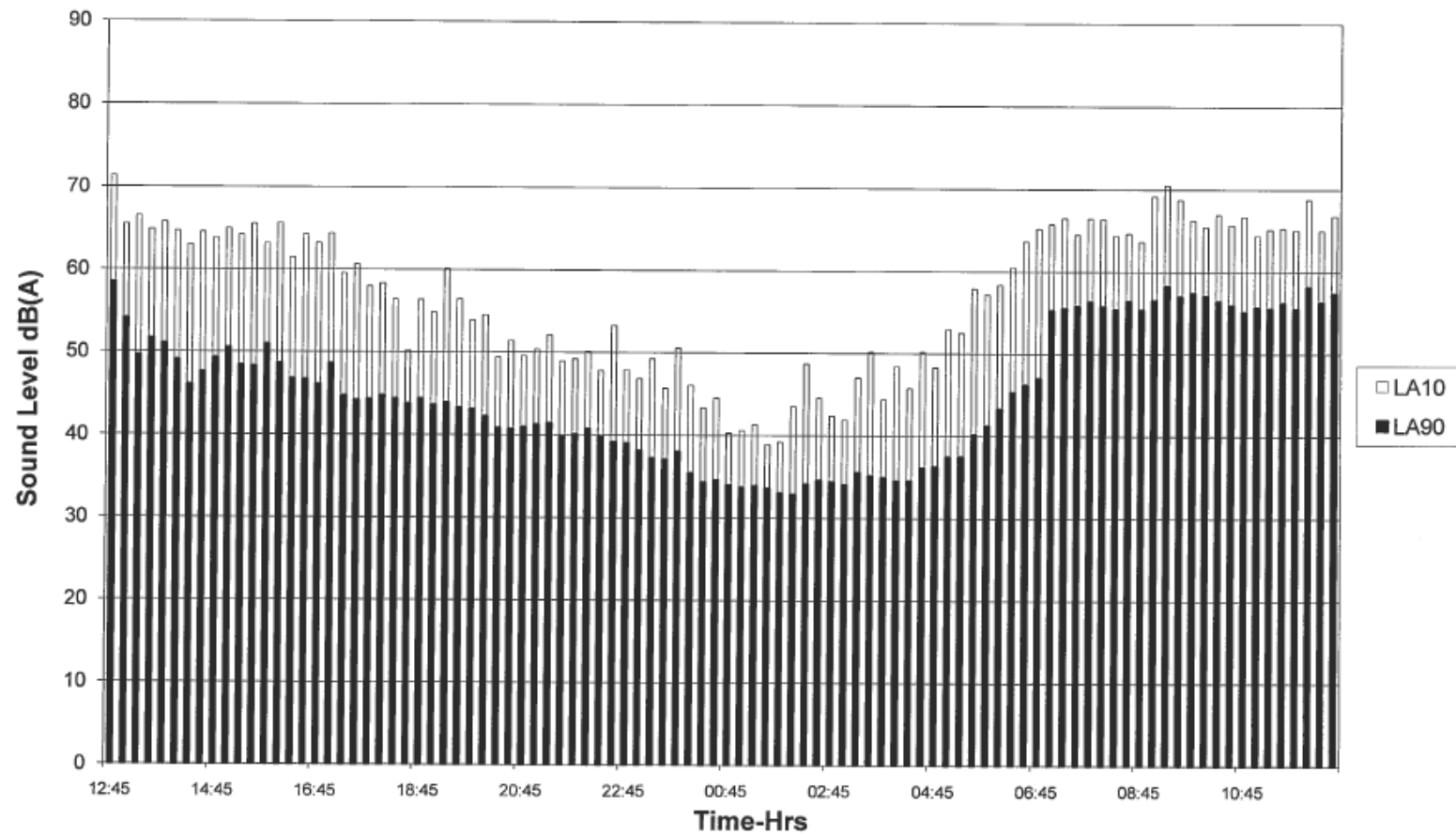
Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.1 dB).

Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. Each microphone was fitted with a Larson Davis windshield

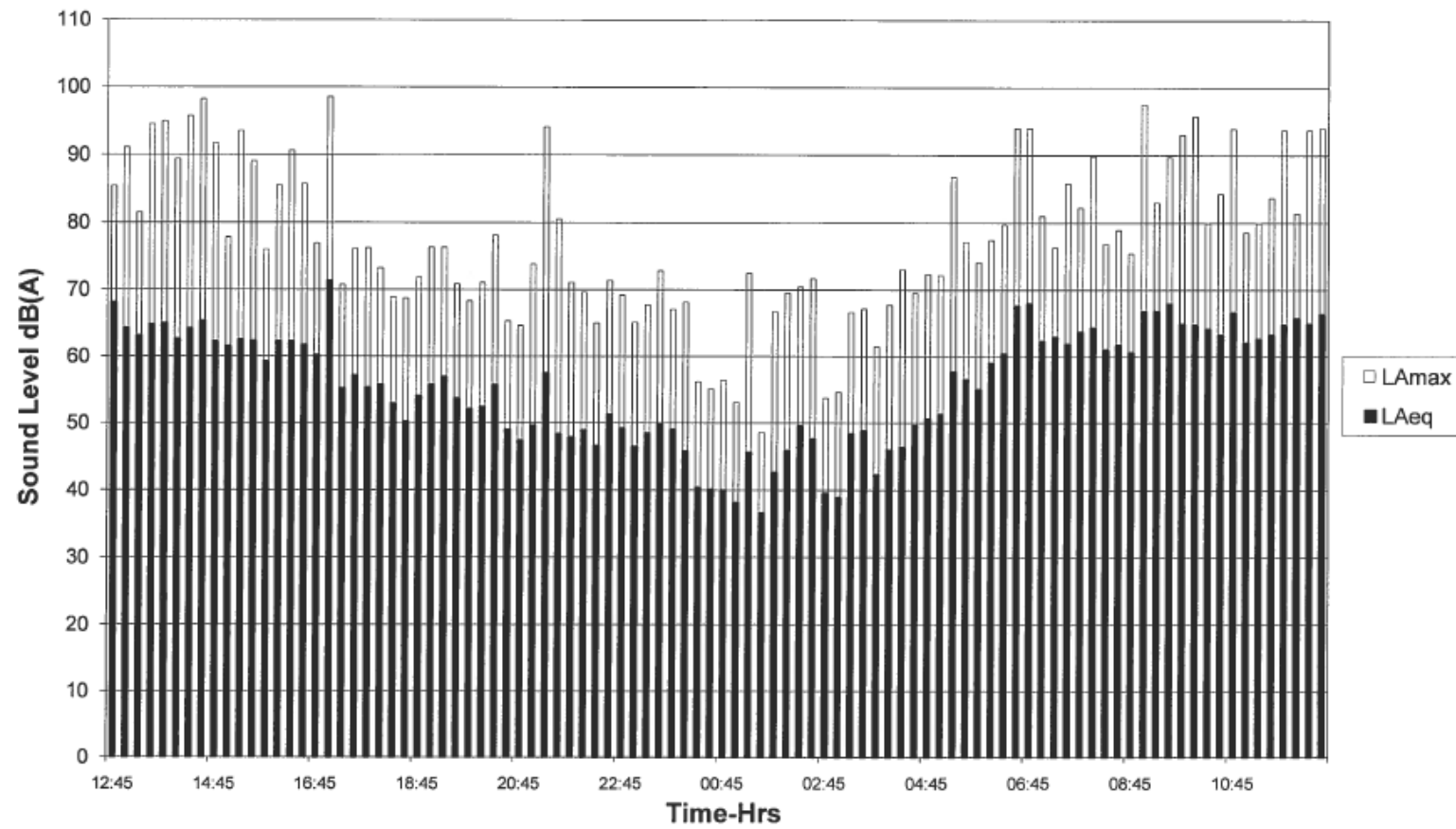
## **APPENDIX C**

### **Noise Measurement Results Charts**

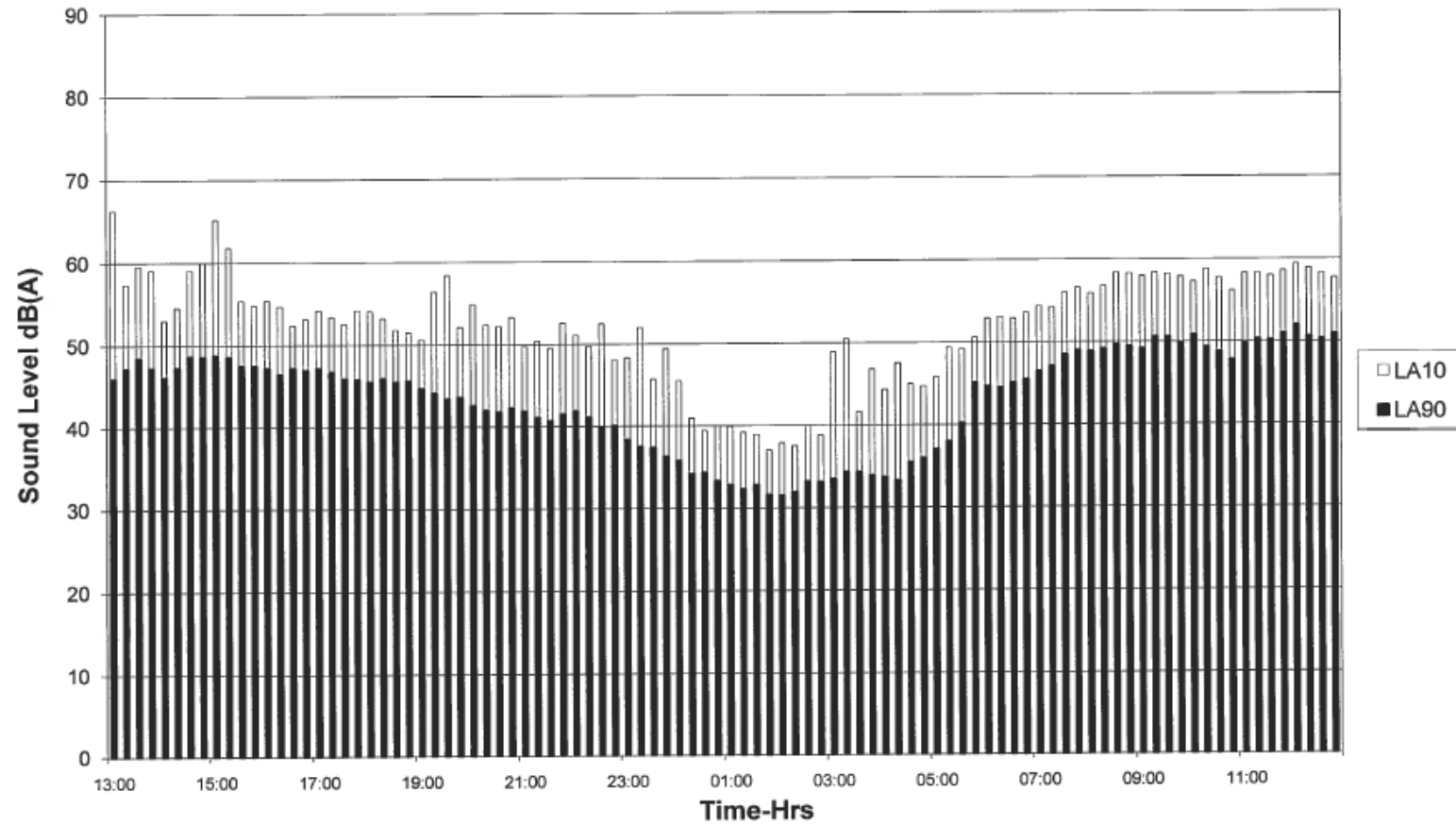
**Sheerwater Access Road**  
**Position 1**  
**L<sub>A10</sub> and L<sub>A90</sub> Noise Levels**  
**Tuesday 21/02/2012 - Wednesday 22/02/2012**



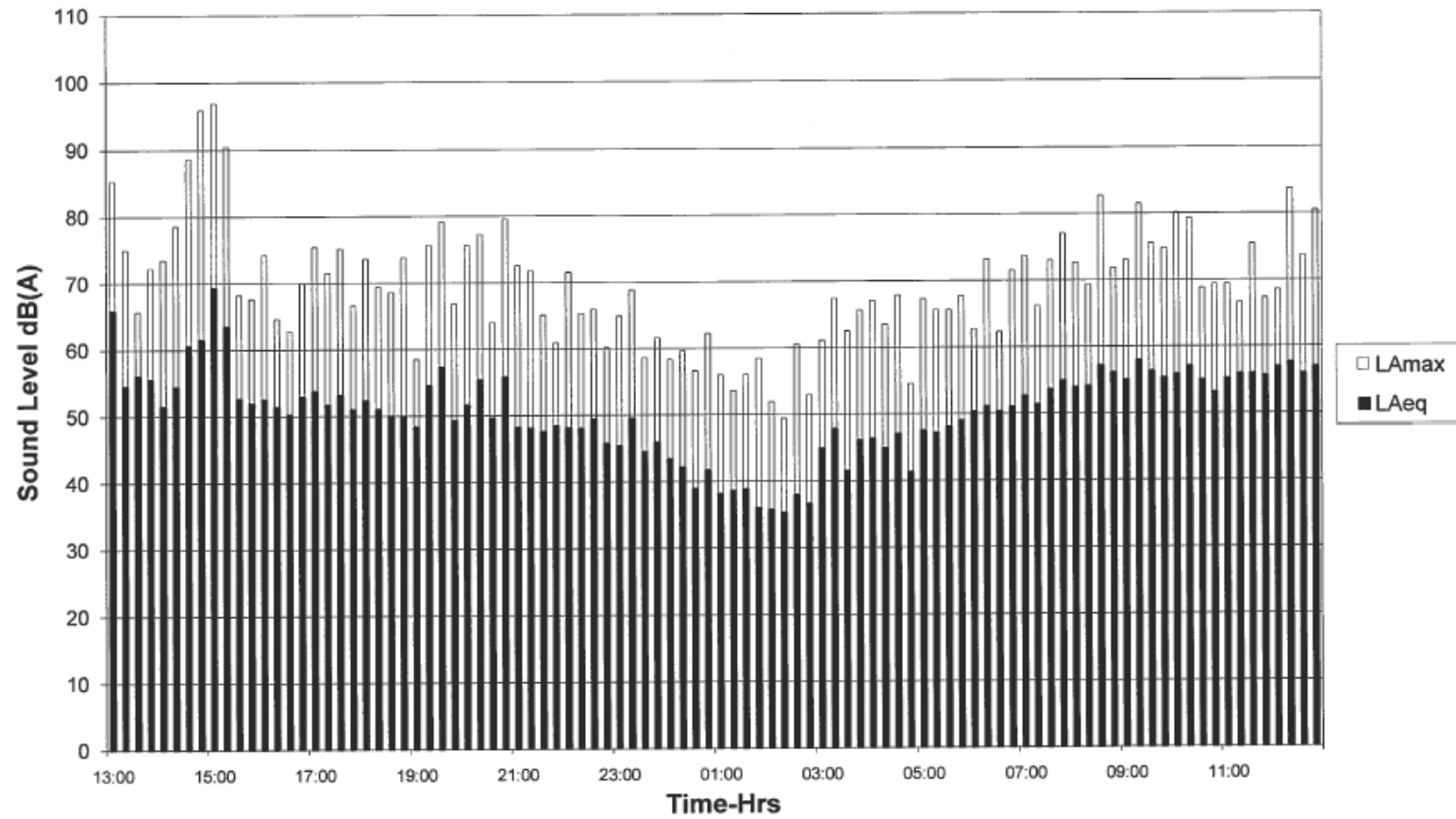
**Sheerwater Access Road**  
**Position 1**  
 **$L_{Aeq}$  and  $L_{Amax}$  Noise Levels**  
**Tuesday 21/02/2012 - Wednesday 22/02/2012**



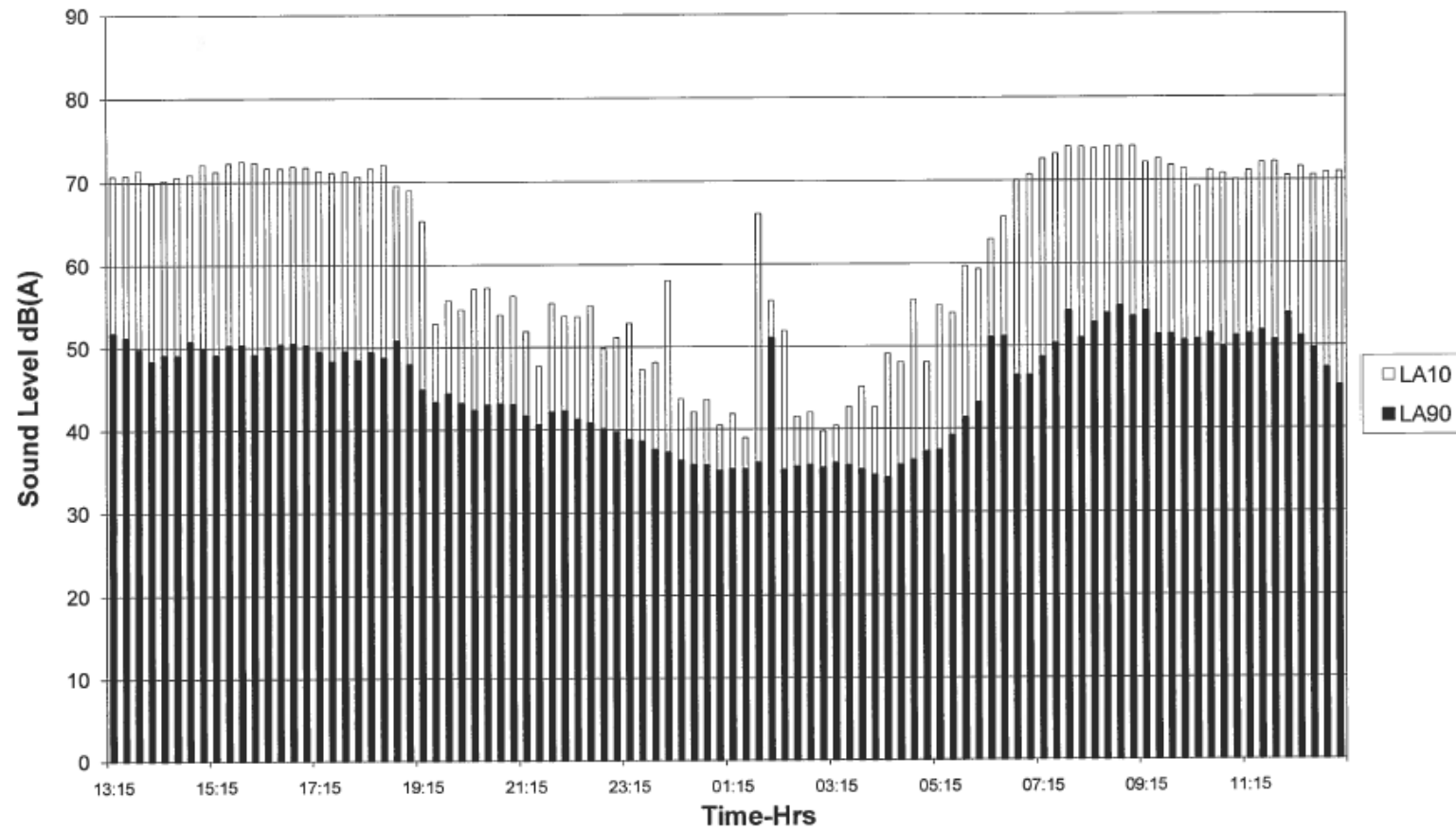
**Sheerwater Access Road**  
**Position 2**  
**L<sub>A10</sub> and L<sub>A90</sub> Noise Levels**  
**Tuesday 21/02/2012 - Wednesday 22/02/2012**



**Sheerwater Access Road**  
**Position 2**  
 **$L_{Aeq}$  and  $L_{Amax}$  Noise Levels**  
**Tuesday 21/02/2012 - Wednesday 22/02/2012**



**Sheerwater Access Road**  
**Position 3**  
**L<sub>A10</sub> and L<sub>A90</sub> Noise Levels**  
**Tuesday 21/02/2012 - Wednesday 22/02/2012**



**Sheerwater Access Road**  
**Position 3**  
 **$L_{Aeq}$  and  $L_{Amax}$  Noise Levels**  
**Tuesday 21/02/2012 - Wednesday 22/02/2012**

