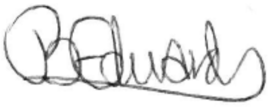
Report for:

CampbellReith

Innovation Park Medway

Noise and Vibration Assessment

Status: Final **Date: 11.09.2018**

Author	 Rebecca Edwards Acoustic Consultant
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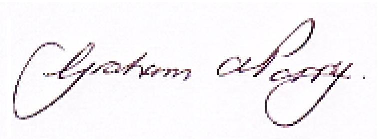
Approved By	 Graham Parry Managing Director
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1. INTRODUCTION

1.1. Background

ACCON UK Limited (ACCON) has been commissioned by CampbellReith Consulting Engineers (CampbellReith) to undertake a noise impact assessment for the Proposed Development at Innovation Park Medway, Rochester, Kent.

1.2. Site Description

The site is located within the administrative boundary of Medway Council (MC) and Tonbridge and Malling Borough Council (TMBC).

The site comprises two separate areas, to the north and the south of the existing airfield site. The site location is identified in **Figure 1.1** below.

The Northern Area is bounded to the north by BAE Systems, to the north and west by Rochester Airport Industrial Estate, and to the south and east by Rochester Airport. The Southern Area is bounded to the north by Rochester Airport and the existing Innovation Centre, owned by MC, to the west by the B2097 Rochester Road and M2 motorway, to the east by the A229 Maidstone Road and to the south by residential dwellings.

The nearest noise sensitive residential receptors are located to the north (Warren Wood), east (Horsted Park, Davis Estate) and south (Maidstone Road, Rochester Road) of the Proposed Development sites. Other sensitive receptors include some uses within the existing industrial estate and the Medway Town's Gurdwara Sabha on Lankester Parker Road.

1.2.1. Rochester Airport

Rochester Airport currently operates two grass runways (runway 02/20 and runway 16/34) and at least two helipads located to the south of the runways and two to the east of the runways. As a result of the Proposed Development, the airport would be reduced to one runway, runway 02/20. The airport cannot fully operate throughout the year due to the limitations of grass runways during in wet weather conditions.

Currently, runway 02/20 carries approximately 70% of the annual aircraft traffic with runway 16/34 carrying the remaining 30% of annual traffic. With only runway 02/20 operating, the volume of flights would remain unchanged from the present formation, however, 100% of the movements (one movement is equivalent to one take-off or landing) would occur on the remaining runway.

The airport operates between 0830 hrs and 1730 hrs seven days a week. Individuals who own aircraft which are stored at the airport ("home based aircraft") are allowed to fly between 0730 hrs and 2030 hrs, light permitting. It is understood that there are typically six movements a day outside of the standard operating hours when flying conditions are suitable. The air ambulance, police helicopter and military aircraft are permitted to use the airport at any time of the day throughout the entire year.

It is understood that, on a typical day, the airport will experience approximately 120 to 130 movements. On the busiest days, up to 350 movements could occur.

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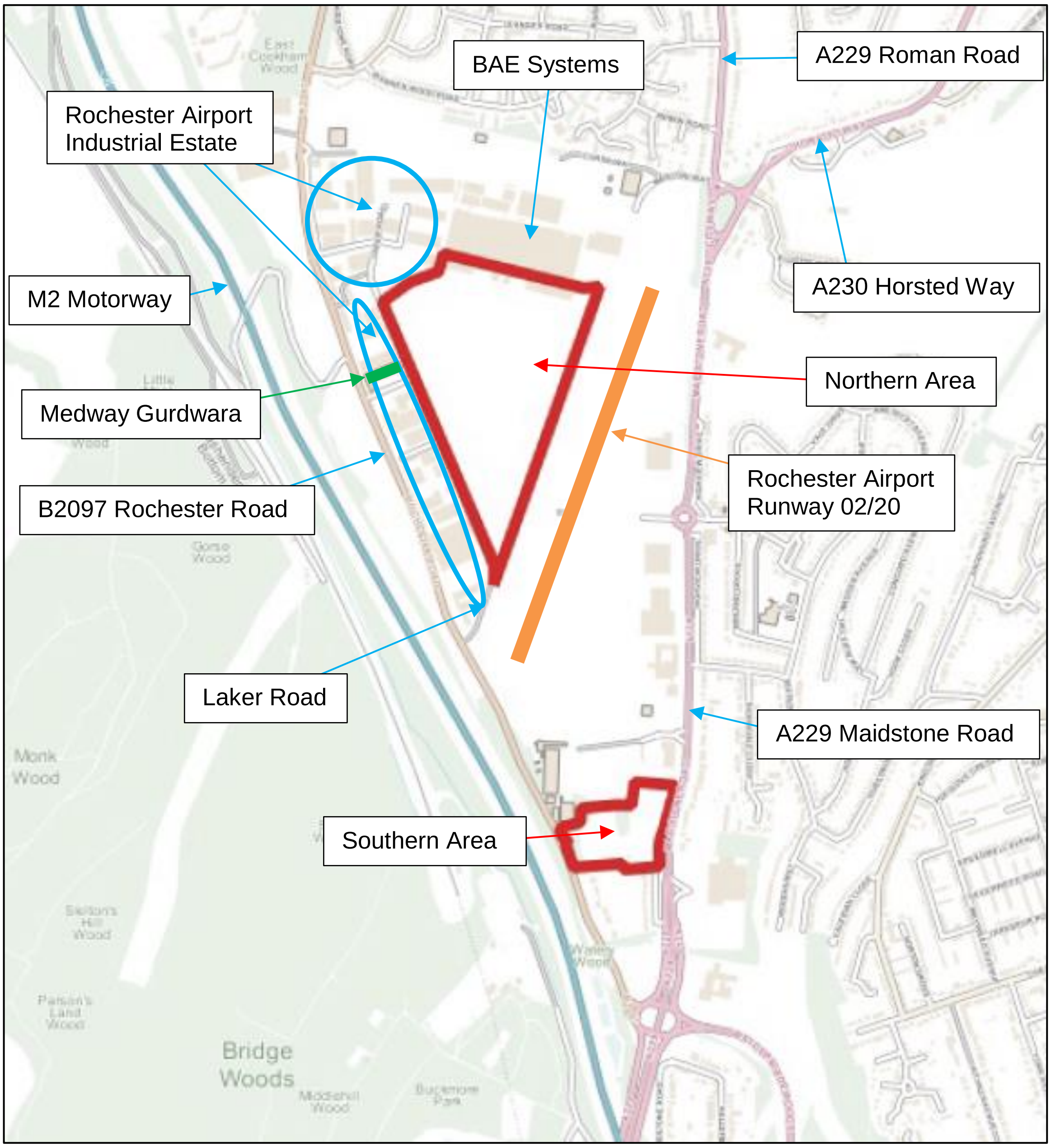
Figure 1.1: Site Location Plan



Obtained from: CampbellReith Figure 1.1 Site Location Plan, Job No 12841, Drawing No GIS002-A, Dated 03/05/2018

1.3. Scheme Description

The Innovation Park Medway Masterplan allows for the erection of up to 101,000 square metres of Business (Use Class B1) and General Industrial (Use Class B2) floor space with associated means of access, distributor and service roads, multi-storey parking facilities, footpaths and cycle ways, sustainable drainage systems and landscaping.

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2. THE NATURE, MEASUREMENT AND EFFECT OF NOISE

2.1. Noise

Noise is often defined as sound that is undesired by the recipient. Whilst it is impossible to measure nuisance caused by noise directly, it is possible to characterise the loudness of that noise. 'Loudness' is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitudes of the numbers involved, a logarithmic scale of decibels (dB) is normally used, based on a reference level of the lowest audible sound.

The response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequencies to approximate the human response. The resulting 'A' weighted decibel, dB (A), has been shown to correlate closely to the subjective human response.

When related to changes in noise, a change of ten decibels, for example, from 60 dB (A) to 70 dB (A), would represent a doubling in 'loudness'. Similarly, a decrease in noise, for example, from 70 dB (A) to 60 dB (A), would represent a halving in 'loudness'. A change of 3 dB (A) is generally considered to be just perceptible[1]. **Table 2.1** details typical noise levels.

Table 2.1: Typical Noise Levels

Approximate Noise Level (dB(A))	Example
0	Limit of hearing
30	Rural area at night
40	Library
50	Quiet office
60	Normal conversation at 1 m
70	In car noise without radio
80	Household vacuum cleaner at 1 m
100	Pneumatic drill at 1 m
120	Threshold of pain

2.2. Vibration

When two objects come into contact through movement (such as a piling rig driving a pile with repetitive impacts), the mechanical energy from the movement causes vibrations in the vicinity of the two objects. Vibrations in the air cause sound, but some vibration can be felt

[1] Institute of Environmental Management and Assessment (2014). Guidelines for environmental noise impact assessment.

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through the ground or through structures, especially when a large amount of energy is exerted, such as the passing of heavy good vehicles over an uneven surface.

Groundborne vibration, especially within structures, has a number of effects both on people and to the structures themselves.

The effects of groundborne vibration on buildings are dependent upon a range of factors, not least the magnitude and duration of the vibration, the structure of the soil, the properties and quality of the building materials, the design of the structure, as well as the general condition and age of the structure. In extreme cases, vibration can cause sever structural damage, but most vibration damage manifests itself in minor cosmetic damage such as cracks in rendering or roof tiles slipping. Groundborne vibration on buildings is generally measured using the Peak Particle Velocity (PPV, expressed in mm/s). This is the maximum instantaneous velocity of a particle at a point during a given time interval.

Human exposure to vibration can cause annoyance, disruption to activity and discomfort. In the most extreme cases, prolonged exposure to vibration can harm health. Humans are known to be very sensitive to vibration, with a threshold of perception typically in the particle velocity range of 0.14 mm/s to 0.3 mm/s at frequencies between 1 Hz and 80 Hz. Human exposure to vibration is measured and assessed using a Vibration Dose Value (VDV expressed in $m/s^{1.75}$). This measures the overall exposure to vibration that a person might receive over a given time period within a building.

It should be noted that the threshold levels at which vibration becomes perceptible to humans is significantly lower than the levels of vibration which would need to be achieved in order to cause cosmetic damage to buildings (approximately 15 mm/s to 20 mm/s between 4 Hz and 15 Hz for a residential or light commercial building[2]).

A Glossary of Acoustic Terminology is provided in **Appendix 1**.

[2] British Standard 5228-2: 2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration

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3. LEGISLATIVE/POLICY BACKGROUND

3.1. National Planning Policy Framework

The revised National Planning Policy Framework (NPPF) was released in July 2018 and supersedes the 2012 version of the NPPF. The purpose of the planning system is to contribute to the achievement of sustainable development. There are three dimensions to sustainable development: economic, social and environmental. The environmental role is to contribute to protecting and enhancing our natural, built and historic environment; and as part of this, make effective use of land, help to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate to adapt to climate change including moving to a low carbon economy.

One of the core planning principles is to contribute to conserving and enhancing the natural environment and reducing pollution. Allocations of land for development should prefer land of lesser value, where consistent with other policies in the Framework. The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

Paragraph 180 of the NPPF states:

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

a) *Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life (see Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food and Rural Affairs, 2010));*

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

Additionally, Paragraph 182 states:

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

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3.2. Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) aims to "*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;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life*".

Based on concepts from toxicology, it introduces three 'Effect Levels' relevant to the assessment of noise. These are:

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

3.3. Planning Practice Guidance

The Planning Practice Guidance for Noise (PPG-N) was published in March 2014 and updated in December 2014. The PPG-N provides the following advice on how to manage potential noise impacts in new development:

"Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy."

The document goes on to acknowledge the levels of noise exposure at which an effect may occur as provided in the NPSE and introduces a fourth level:

- UAEL: Unacceptable Adverse Effect Level: This is the level at which extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise lead to psychological stress or physiological effects.

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It is important to understand that as the PPG-N does not provide any advice with respect to specific noise levels/ limits for different sources of noise, it is appropriate to consider other sources of advice and guidance documents when considering whether new developments would be sensitive to the prevailing acoustic environment.

3.4. Medway Council

3.4.1. Local Planning Policy

The Medway Council Local Plan 2003 includes two policies which relate to noise and development. These are Policies BNE2 and BNE3.

Policy BNE2: Amenity Protection states:

"*All development should secure the amenities of its future occupants, and protect those amenities enjoyed by nearby and adjacent properties. The design of development should have regard to:*

(i) *Privacy, daylight and sunlight; and*

(ii) *Noise, vibration, light, heat, smell and airborne emissions consisting of fumes, smoke, soot, ash, dust and grit; and*

(iii) *Activity levels and traffic generation.*"

Paragraph 3.4.18 of the supporting notes to BNE2 states:

"*Where new noisy industrial or similar development is proposed, it is necessary to ensure that it does not cause an unacceptable degree of disturbance to the amenity of existing uses in the locality. Proposals for such development near existing residential, or other noise sensitive receptors, will need to be assessed in accordance with the advice in PPG24. Where appropriate, however, the technical demonstration of impact will need to be couched in terms set out in British Standard 4142:1997.*"

ACCON note that PPG24 was revoked in 2012 and that British Standard 4142 was revised in 2014. The current version of BS 4142 will be utilised to assess the impacts of commercial and industrial noise where appropriate.

Policy BNE3: Noise Standards states, in relation to noise generating development:

"*Noise-generating development should be located and designed so as not to have a significant adverse noise impact on any nearby noise sensitive uses (including offices, hospitals, schools and, in respect of noise emanating from non-transport related sources, housing).*"

3.5. Tonbridge and Malling Borough Council

Whilst the land is owned by Medway Council, small parts of both the Northern Area and Southern Area is located within Tonbridge and Malling Borough Council (TMBC).

3.5.1. Core Strategy 2007

The Core Strategy was adopted in 2007. Item (f) of Aim 3 of the strategy states that:

"*Aim 3: To ensure that new development and other actions result in a high quality environment. This will be achieved by:…*

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(f) Ensuring a high quality living environment, safe from crime and the fear of crime and free from the risks of flooding, land contamination, noise and air pollution."

3.5.2. Managing Development and the Environment Development Planning Document 2010

The *Managing Development and the Environment Development Planning Document* (MDE DPD) adopted in April 2010 identifies that "*excessive or inappropriate noise can have a significant impact on the quality of life if it is not appropriately controlled*". However, there are no policies specific to the introduction of potentially noise-generating development.

3.6. Noise Guidance

3.6.1. Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment

The IEMA guidelines address the key principles of noise impact assessment and are applicable where noise effects are likely to occur. The guidelines provide specific guidance for noise impact assessment as part of the EIA process.

The guidelines provide a generic relationship between noise impact and noise effect, including the evaluation of effect significance. The guidelines adopt a similar, although more detailed approach, to those identified in paragraph 005 of PPG-N.

3.6.2. Calculation of Road Traffic Noise

The Technical Memorandum *Calculation of Road Traffic Noise* (CRTN) produced by the Department of Transport in 1988, sets out standard procedures for calculating noise levels from road traffic. The calculation method uses a number of input variables, including traffic flow volume, average vehicle speed, percentage of heavy goods vehicles and type of road surface to predict the $L_{A10,18hr}$ noise level for any receptor point at a given distance from the road.

CRTN also describes measurement procedures for measuring $L_{A10,18hr}$ noise levels due to road traffic. The $L_{A10,18hr}$ noise level due to road traffic can be measured over the entire 18-hour period (0600 hrs to 0000 hrs). Alternatively, the shortened measurement procedure, described in paragraph 43 of CRTN, can be utilised. The shortened measurement procedure requires that measurements of L_{A10} are made over three consecutive hours between 1000 hrs and 1700 hrs. From the arithmetic mean of the three measured hourly L_{A10} noise levels, the $L_{A10,18hr}$ noise level can be determined by subtracting 1 dB(A) from the $L_{A10,3hr}$ noise level.

3.6.3. The Design Manual for Roads and Bridges

The Design Manual for Roads and Bridges (DMRB) provides methods for quantifying the noise and vibration impacts generated by changes in road traffic.

3.6.4. British Standard 4142:2014

BS 4142:2014 *Methods for rating and assessing industrial and commercial sound* provides a method for the measurement and rating of industrial or commercial type noise sources and background noise levels outside dwellings. The 'rating level' (defined in the BS) is used to rate the noise level of the source (this is defined as the 'specific sound level') outside residential dwellings.

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The rating level is determined by assessing the character of the noise and applying an acoustic feature correction, if appropriate, to the specific sound level. Corrections are applied for the tonality, impulsivity, intermittency or other distinctive characteristics of the noise source which can all increase the impact of noise.

The initial assessment described in BS 4142 to determine whether an adverse impact is likely is based on establishing the difference between the rating level and the background noise level outside the residential property of interest. The British Standard states that the following points should be considered:

- "*Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*"

3.6.5. British Standard 5228: 2009 + A1: 2014 Part 1

BS 5228 *Part 1: Noise* sets out methodologies for predicting noise levels from construction and related activities. Sound level data is provided within the Standard for a wide variety of site activities and mobile equipment used on construction and open sites. BS 5228 provides two informative methods for assessing the significance of construction noise effects using the change in noise levels: 'The ABC Method' and 'The 5 dB(A) Change Method'.

3.7. Vibration Guidance

3.7.1. British Standard 5228: 2009 + A1: 2014 Part 2

BS 5228 *Part 2: Vibration* provides similar guidance to Part 1 for vibration effects including vibration due to piling activities.

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4. METHOD OF ASSESSMENT

4.1. Noise Measurement Survey

A noise measurement survey has been carried out at the site in order to determine background sound levels at the existing noise sensitive receptors and to obtain road traffic noise levels for the calibration of the noise model (refer to **Section 4.2**).

4.1.1. Semi-Permanent Noise Monitoring

Semi-permanent noise measurements were carried out at two locations on the site in order to obtain representative 24-hour noise levels at the site. The noise measurements were carried out between 1220 hrs on Tuesday 10th July 2018 and 1300 hrs on Wednesday 11th July 2018.

Noise Monitoring Position 1 (MP1) was located approximately half way along the south-eastern boundary of the Northern Area, approximately 300 m to the west of the A229 Maidstone Road, approximately 280 m to the south of BAE Systems and approximately 250 m to the east of Laker Road. The microphone was located in a free-field position on a tripod at a height of 1.5 m above local ground level.

The dominant source of noise at MP1 was from aircraft movements. The grass on the airfield was being cut by a tractor during the noise measurement survey. However, due to the size of the airfield, the tractor was only in close proximity to the noise monitoring equipment for relatively short periods. It is understood that the grass cutting ceased at approximately 1730 hrs on Tuesday 10th July and work commenced the following morning at approximately 0830 hrs. On Wednesday 11th July, grass bailing activities were being carried out and had paused around mid-morning due to a breakdown. Grass bailing did not recommence before the end of the noise measurement survey. These periods have not been removed from the noise measurement results as it is not immediately clear (from the 5-minute measurement periods) which peaks are due to tractor movements and which are related to aircraft movements. There is not considered to be any significant impact on the noise measurement results from the grass cutting activities. Distant road traffic from the A229 Roman Road was audible between aircraft movements.

Noise Monitoring Position 2 (MP2) was located on the western boundary of the Northern Area, approximately 6.5 m to the east of Laker Road, approximately 650 m to the south of BAE Systems and approximately 350 m to the north of the airport buildings. The microphone was located in a free-field position on a tripod at a height of 1.5 m above local ground level.

The dominant source of noise at MP2 was from aircraft movements, vehicle movements including HGVs on Laker Road, intermittent activity noise within the industrial units on Laker Road and very occasional tractor movements.

The noise monitoring positions are identified in **Figure F.1**.

The noise measurements utilised two Svantek 971 Class 1 Sound Level Meters which have current certificates of calibration. Before and after the measurement period, the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits (±0.5 dB).

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The weather conditions recorded during the daytime on Tuesday 10th July 2018 were dry with approximately 80% cloud cover, a northerly wind of up to 3.5 m/s and a temperature of approximately 20°C. The weather conditions recorded during the night-time on Wednesday 11th July were dry with approximately 100% cloud cover, a northerly wind of up to 1 m/s and a temperature of approximately 15°C. The weather conditions recorded during the daytime on Wednesday 11th July were dry with approximately 100% cloud cover, a northerly wind of up to 2 m/s and a temperature of approximately 20°C. These weather conditions are considered to be suitable for the noise measurement survey.

4.1.2. Satellite Noise Monitoring

Short-term attended satellite noise monitoring was also carried out at five locations in the vicinity of the site. The noise measurements utilised Rion NL-52 and Norsonic 118 Class 1 Sound Level Meters which have current certificates of calibration. Before and after the measurement period, the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits (±0.5 dB). At all noise monitoring positions, the microphones were mounted on a tripod at a height of 1.5 m above local ground level.

A three-hour noise measurement was carried out at noise Monitoring Position 3 (MP3) in accordance with the CRTN shortened measurement procedure described in **Section 3.6.2**. MP3 was located approximately 4.3 m from the edge of the carriageway of the A229 Maidstone Road and road traffic noise was the dominant noise source. A number of discontinuities were noted along the road which the majority of cars were unable to avoid resulting in increased noise levels. It was not possible to identify a suitable location which was not affected by noise from vehicles passing over these discontinuities. Occasionally, noise from aircraft movements was audible.

Noise Measurement Position 4 (MP4) was located on Exeter Walk within the Warren Wood residential area to the north of the BAE Systems facilities. During the daytime, the noise climate was dominated by distant road traffic, distance use of power tools within a neighbourhood garden, aircraft movements and local bus movements. During the night-time, the noise climate was dominated by a noticeable hum, which was believed to be emanating from the BAE Systems buildings, and vegetation moving in the slight breeze.

Noise Measurement Position 5 (MP5) was located approximately 6.5 m to the east of the edge of the carriageway of the A229 Roman Road and adjacent to the new dwellings at Horsted Park. Road traffic noise dominated the noise climate at these receptors during the daytime and night-time. Occasionally, aircraft movements were audible during the daytime.

Noise Measurement Position 6 (MP6) was located adjacent to the dwellings on Maidstone Road to the south of the Southern Parcel and approximately 25 m to the west of the A229 carriageway. The Asda service yard was located approximately 90 m to the east of MP6. During the daytime, the dominant noise source was road traffic noise with occasional aircraft coming into land at the airport directly overhead. During the night-time road traffic noise was the dominant noise source. Delivery activities within the Asda service yard were also clearly audible during the night-time.

Noise Measurement Position 7 (MP7) was located on Highview Drive approximately 13 m to the east the edge of the nearest carriageway of the A229 Maidstone Road and approximately 5 m from the façade of No 2 Highview Drive. This position was chosen as it was not possible

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to repeat a measurement at MP3 or MP5 on Wednesday 11th July due to construction activities at Horsted Park. The dominant source of noise during the daytime was road traffic on the A229 with occasional audible aircraft departure movements from the airport.

The daytime noise measurements at MP4 to MP7 were carried out over a 1-hour period and night-time measurements were carried out over a 15 minute period at MP4 and MP5. At MP6 the night-time measurement was extended to 30 minutes due to the service yard activities at Asda.

4.2. Noise Modelling

The CadnaA noise modelling software has been utilised to calculate the external noise levels from construction noise sources at the Proposed Development site. CadnaA is a three-dimensional noise model developed by DataKustik and has been extensively used by ACCON and others to develop noise models for a wide variety of situations and noise sources. CadnaA utilises the methodology in BS 5228-1 to predict the noise levels from construction noise sources.

4.3. Construction Noise Assessment

The magnitude of construction noise impacts can be predicted by considering noise emission data for typical construction equipment based on the expected methods of construction for each phase of work on each worksite. The prediction method follows that set out in BS 5228-1 which also includes two informative methods of guidance for assessing the significance of construction noise: 'The ABC Method' and 'The 5 dB(A) Change Method'. The ABC method is the preferred method as the threshold values are easier to control during construction works than individual noise limits for each receptor, which would be set by the 5 dB(A) Change Method. It is noted that the ABC method is only applicable for residential receptors and for all other noise sensitive receptors, the 5 dB(A) change method is utilised.

The ABC Method provides example threshold noise levels and arranges these threshold levels into the categories shown in **Table 4.1**.

Table 4.1: Example Noise Categories for ABC Method

Assessment category and threshold value period	Threshold value $L_{Aeq,T}$ (dB)		
	Category A[A]	Category B[B]	Category C[C]
Night-time (23:00-07:00)	45	50	55
Evenings and weekends[D]	55	60	65
Daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75
Note 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. Note 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential			

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significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.

Note 3: Applied to residential receptors only.

A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

D) 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays.

The 5 dB(A) Change Method suggests that noise from construction activities is significant if the total noise during construction (pre-construction ambient noise plus construction noise) is greater than the pre-construction ambient noise by 5 dB or more. This is subject to the following requirements:

- The construction noise alone must be greater than 65 dB $L_{Aeq,T}$ in the daytime, 55 dB $L_{Aeq,T}$ in the evening and 45 dB $L_{Aeq,T}$ in the night-time (minimum construction noise level);
- The duration of the construction activities would exceed a duration of one month unless works of a shorter duration are likely to result in a significant effect.

The 5 dB(A) change method is suitable for assessing noise at noise sensitive buildings such as residential dwellings, hotels, buildings in religious use, buildings in educational use and buildings in health and/or community use.

For the construction noise assessment for Innovation Park Medway, the ABC categories for the residential noise sensitive receptors have been identified and, for all other noise sensitive receptors, the 5 dB(A) change method has been utilised. However, until a detailed construction programme is available, a comprehensive construction noise assessment cannot be carried out. Appropriate assumptions based on our experience of similar construction sites in respect of typical construction methodologies have been utilised to prepare an indicative construction noise assessment in order to highlight potential significant construction noise effects.

For construction noise, where the BS 5228 ABC method significant effect threshold is exceeded for a residential receptor, the effect is deemed ‘significant’. Where the significant effect threshold is not exceeded, the effect is considered to be ‘not significant’. For receptors which are assessed utilising the 5 dB(A) method, if the total noise level during construction exceeds the pre-construction ambient noise level (subject to the minimum construction noise levels and the duration of works) by more than 5 dB(A), the effect of construction noise is considered to be ‘significant’. Where the above thresholds and criteria are not exceeded, the effect is considered to be ‘not significant’. All construction noise effects are adverse effects.

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4.4. Construction Traffic

Construction traffic noise (for construction traffic on public roads) can be assessed by considering the short-term increase (an adverse effect) in traffic flows on public roads during construction works following the principles of CRTN and DMRB.

For construction traffic on public roads, the magnitude of the change in road traffic noise levels is considered using the criteria outlined in **Table 4.2** below. The relative levels are reproduced from the semantic scale for short-term changes in road traffic noise levels found in Table 3.1 of the DMRB guidance document.

Table 4.2: Scale of Magnitude Used in the Construction Traffic Noise Assessment

Magnitude of impact	Description
Large	Greater than 5 dB(A) change in sound level
Medium	3.0 dB(A) to 4.9 dB(A) change in sound level
Small	1.0 dB(A) to 2.9 dB(A) change in sound level
Negligible	0.9 dB(A) or less change in sound level

4.5. Construction Vibration Assessment

There are currently no British Standards that provide a methodology to predict levels of vibration from construction activities, other than those contained within BS 5228-2, which relate to a limited range of construction activities. BS 5228-2 identifies that whilst the human response to vibration is usually based on the Vibration Dose Value (VDV), in accordance with the guidance in BS 6472, it is considered more appropriate to provide guidance for construction vibration in terms of the Peak Particle Velocity (PPV) as this parameter is more likely to be measured during construction activities due to the usual concerns over potential building damage. Table B.1 from Annex B of BS 5228-2 provides guidance on the effects of vibration levels and has been reproduced in **Table 4.3**.

Table 4.3: Guidance on effects of vibration levels (from Table B.1, Annex B, BS 5228-2)

Vibration Level (A),(B),(C)	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situation for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

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Vibration Level (A),(B),(C)	Effect
(A) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient. (B) A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available. (C) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2 and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.	

Table 4.4 provides typical maximum distances at which certain activities may give rise to a 'just perceptible' level of vibration. These values are based on historical field measurements.

Table 4.4: Distances at which Construction Vibration may just be Perceptible

Construction Activity	Maximum distance from activity when vibration may just be perceptible (m)
Excavation	10-15
Vibratory Compaction	25-40 (depending on weight of drum and specific equipment used)
Heavy Vehicles (e.g. dump trucks)	5-15
Hydraulic Breaker	15-20
Auger Piling (e.g. Continuous Flight Auger Piling)	5-10
Vibratory Piling	30-40

A qualitative construction vibration assessment has been carried out, having regard to the distances between construction activities and the nearest sensitive receptors.

For construction vibration, adverse effects are determined using the qualitative assessment referred to above, and applying professional judgement.

4.6. Operational Road Traffic

The noise effects of the Proposed Development on existing receptors within the study area have been assessed by considering the changes in traffic flow which are predicted to occur on the existing and proposed road network due to the Proposed Development. Traffic flow data for the local road network has been obtained from the Department for Transport (DfT)

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Manual Traffic Count Points website[3]. Predicted 12-hour (0700 hrs to 1900 hrs) development traffic data for the Proposed Development has been supplied by CampbellReith. The predicted traffic data has only been provided for cars and motorbikes as an estimation of the potential HGV movements cannot be determined as this will be dependent upon the usage of the proposed units. The predicted 12-hour development traffic flows have been added to the DfT data in order to determine the increase in the daily road traffic volumes as a result of the Proposed Development. The likely low quantities of development traffic outside of this 12-hour period is unlikely to significantly alter the conclusions of this assessment.

The overall effect of a change in road traffic noise is determined using assessment criteria that take into account the magnitude of the noise impact and the sensitivity of the receptors. An increase in noise level results in an adverse effect whilst a decrease in noise level results in a beneficial effect.

Operational road traffic noise levels are considered using the magnitude of change criteria outlined in **Table 4.5**. The relative levels are reproduced from the semantic scale for long-term changes in road traffic noise levels found in Table 3.2 of the DMRB guidance document.

Table 4.5: Scale of Magnitude Used in the Operational Road Traffic Noise Assessment

Magnitude of impact	Description
Large	Greater than 10 dB(A) change in sound level
Medium	5.0 dB(A) to 9.9 dB(A) change in sound level
Small	3.0 dB(A) to 4.9 dB(A) change in sound level
Negligible	2.9 dB(A) or less change in sound level

4.7. Operational Industrial/Commercial Noise Assessment

At this stage, there is limited information available regarding the likely commercial and/or industrial noise sources which may be present within the Proposed Development. The precise uses of the units are unknown although it is anticipated that the majority of units would require fixed plant installations for air handling, heating and/or extract ventilation. The likelihood of deliveries cannot be identified, nor can any specific items of plant or machinery required by the future occupiers of the units be identified.

Therefore, the assessment of operational industrial and/or commercial noise sources has determined a maximum cumulative sound pressure level of all sources of industrial/commercial noise at the nearest site boundary to the respective noise sensitive receptors. These noise levels must not be exceeded in order to ensure a low impact is achieved in accordance with BS 4142 at the noise sensitive receptors.

[3] https://roadtraffic.dft.gov.uk/manualcountpoints retrieved 20th August 2018

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5. IDENTIFICATION OF KEY RECEPTORS

The key noise sensitive receptors in the vicinity of the Proposed Development are residential dwellings to the north, east and south of the site including:

- Residential dwellings in the area known as Warren Wood, approximately 270 m to the north of the Northern Area;
- Residential dwellings at Horsted Park, approximately 250 m to the east of the Northern Area;
- Residential dwellings within the Davis Estate, approximately 310 m to the east of the Northern Area;
- Residential receptors on Maidstone Road and Rochester Road, approximately 6 m to the south of the Southern Area.

All of these receptors are considered to be highly sensitive to noise and vibration effects.

Within the Rochester Airport Industrial Estate, the majority of the existing industrial/ commercial units are considered to be of low sensitivity to noise and vibration. BAE Systems and some other commercial premises may be of medium sensitivity to vibration.

The Medway Towns Gurdwara Sabha is located on Lankester Parker Road, approximately 15 m to the west of the Northern Area and is considered to be of medium sensitivity to noise and vibration.

The Kent Downs Area of Outstanding Natural Beauty (AONB) is located approximately 300 m from the boundaries of the Northern Area and Southern Area of the site. It is separated from the site by the M2 motorway and the HS1 railway line. The area of the AONB adjacent to Rochester Airport and the site is identified in the Kent Downs Management Plan 2014-2019[4] as having of medium to low tranquillity value due to its close proximity to the transportation noise sources of the M2 motorway, HS1 railway line and Rochester Airport. The CadnaA noise model (assuming road traffic noise only) predicts a daytime noise level of 66 dB $L_{Aeq,16hr}$ and night-time noise level of 60 dB $L_{Aeq,8hr}$ at a receptor position 150 m into the AONB (450 m from the Proposed Development) at a height of 1.5 m. AONB's are primarily designated for their landscape and visual amenity and, therefore, there are not considered to be any specific fauna which would otherwise be identified as a noise sensitive receptor within at least 500 m of the Proposed Development. Due to the high noise levels in this area of the AONB as a result of road traffic, railway movements and aircraft, it is not anticipated that noise from the construction or operational phases of the proposed development will significantly impact the AONB. Therefore, an assessment of noise on the AONB has been scoped out of this assessment.

[4] https://www.kentdowns.org.uk/landscape-management/management-plan/ Retrieved 11th September 2018

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6. BASELINE CONDITIONS

The daytime and night-time noise levels measured at the free-field semi-permanent noise measurement positions are summarised in **Table 6.1**. The detailed measurement results are presented in **Appendix 2**.

Table 6.1: Summary of Free-Field Noise Levels at MP1 and MP2

Measurement Position	Period (hours)	$L_{Aeq, T}$ (dB)	L_{AFmax} (dB)	Average $L_{A10, 5min}$ (dB)	Average $L_{A90, 5min}$ (dB)	Typical (Modal) $L_{A90,5min}$ (dB)
MP1	Daytime (0700 hrs – 2300 hrs)	57	73	53	44	43
	Night-time (2300 hrs – 0700 hrs)	44	59	45	36	30
MP2	Daytime (0700 hrs – 2300 hrs)	60	81	58	48	48
	Night-time (2300 hrs – 0700 hrs)	52	70	47	40	36

Note: The noise measurements were carried out over consecutive five minute logging periods. The $L_{Aeq,T}$ was logarithmically averaged over the time periods indicated in **Table 6.1**, the Average $L_{A10, 5min}$ and Average $L_{A90, 5min}$ provide the arithmetically averaged results over the time period and the L_{AFmax} is the arithmetic average of the highest measured noise level in each hourly time period.

The daytime and night-time noise levels measured at the free-field satellite noise measurement positions are summarised in **Table 6.2**.

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Table 6.2: Summary of Free-Field Satellite Noise Monitoring Results

Measurement Position	Date and Period (hours)	$L_{Aeq, T}$ (dB)	L_{AFmax} (dB)	Average $L_{A10, 5min}$ (dB)	Average $L_{A90, 5min}$ (dB)	Typical (Modal) $L_{A90,5min}$ (dB)
MP3	Tuesday 10th July 1311 hrs – 1611 hrs	74	88	77	66	66
MP4	Tuesday 10th July 1317 hrs – 1425 hrs(1)	51	72	53	43	43
	Wednesday 11th July 0128 hrs – 0143 hrs	32	54	34	30	30
MP5	Tuesday 10th July 1445 hrs – 1545 hrs	72	94	74	64	64
	Wednesday 11th July 0155 hrs – 0210 hrs	58	76	59	31	29
MP6	Wednesday 11th July 1024 hrs – 1109 hrs (2)	63	87	67	57	56
	Wednesday 11th July 0223 hrs – 0258 hrs	52	76	54	36	35
MP7	Wednesday 11th July 1134 hrs – 1234 hrs	69	83	72	61	61

Notes: The noise measurements were carried out over consecutive five minute logging periods. The $L_{Aeq,T}$ was logarithmically averaged over the time periods indicated in **Table 6.2**, the Average $L_{A10, 5min}$ and Average $L_{A90, 5min}$ provide the arithmetically averaged results over the time period and the L_{AFmax} is the average of the highest measured noise level in each period.

(1) The noise measurement was paused for approximately 8 minutes to allow a road sweeper to pass the measurement position, therefore the measurement period was extended.

(2) The noise measurement was stopped early as some construction workers needed to start a generator for their work at a nearby dwelling.

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7. NOISE AND VIBRATION ASSESSMENT

7.1. Construction Noise and Vibration

7.1.1. Construction Noise

Any major development will give rise to some noise disturbance for receptors within the vicinity of the site during the construction phase. Disruption due to construction is generally a more localised phenomenon than the effects of the Proposed Development after opening, and is temporary and short-term in nature.

The exact construction plant type, construction programme and phasing are unknown at this stage of the planning process. Until the exact types and numbers of machinery are known, along with the expected percentage on-times and locations of fixed plant, a detailed noise impact assessment cannot be completed. However, an initial assessment of the likely noise levels at the nearest existing noise sensitive receptors has been carried out utilising typical assumptions regarding construction plant items and an assumed construction programme.

To provide a reasonable worst case assessment it has been assumed that the proposed units would be at various stages of construction including enabling works, ground works, super-structure and fit-out. **Table 7.1** displays a list of the typical machinery which may be used for these construction phases along with their associated noise levels obtained from Annex C of BS 5228-1. A realistic on-time for each item of construction plant has been estimated using professional judgement and experience of typical activities on other construction sites.

Table 7.1: Indicative Construction Plant Noise Levels

Plant and Equipment	BS 5228 Reference	Sound Pressure Level $L_{Aeq,T}$ at 10 m (dB)	Percentage On-time (%) in a 10 hour day
Excavator Breaker	C.1.9	90	25
Tracked Excavator	C.2.14	79	25
Tracked Crusher	C.1.14	82	25
Mobile Crane	C.3.29	70	50
Mobile Lorry Mounted Concrete Pump	C.4.29	80	50
Poker Vibrator	C.4.33	78	20
Concrete Mixer Truck	C.4.20	80	50
Concrete Splitters/Saws	C.4.70	91	10
Mini Piling Rigs	C.3.17	76	75

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Plant and Equipment	BS 5228 Reference	Sound Pressure Level $L_{Aeq,T}$ at 10 m (dB)	Percentage On-time (%) in a 10 hour day
Water Pumps	C.4.88	68	75
Cutters, drills and small tools	C.4.73	84	10
Dumper	C.4.4	76	50
Fork Lift Truck	C.4.13	71	50
Tipper Lorry	C.8.20	79	25
Dozer	C.5.13	82	50

In order to demonstrate the potential impact of construction noise effects, the noise model assumes that all 15 of the plant items identified in **Table 7.1** are operating simultaneously at one worksite over the course of one day. Thirteen of these worksites have been modelled across the larger parcel and five of these worksites have been modelled across the smaller parcel. It is considered that this assessment provides a very worst case assessment based on the assumed plant utilisation and positions, as in practice these circumstances are unlikely to occur.

The daytime ambient noise levels in the vicinity of the nearest noise sensitive receptors to the Proposed Development and their associated ABC categories are presented in **Table 7.2**.

Table 7.2: Construction Noise Threshold of Significance Derivation

Receptor Area	Ambient Noise Level $L_{Aeq,T}$ (dB)	Rounded Ambient Noise Level (dB)	ABC Category	Significant Effect Threshold (dB)
Dwellings at Warren Wood	51	50	A	65
Dwellings at Horsted Park	72	70	C	75
Dwellings at David Estate	69	70	C	75
Dwellings on Maidstone Road/Rochester Road	63	65	B	70
Medway Gurdwara(1)	61	N/A	N/A	65

Notes: (1) This is a non-residential receptor.

Preliminary predictions have been completed for the above construction noise assumptions utilising the CadnaA noise modelling software. The noise modelling has been completed for the noise sensitive receptors identified in **Table 7.2**. **Table 7.3** presents the results of the construction noise modelling and compares the predicted noise levels against the criteria identified in **Table 7.2**.

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Table 7.3: Construction Noise Assessment

Receptor Area	Ambient Noise Level $L_{Aeq,T}$ (dB)	Predicted Construction Noise Level $L_{Aeq,T}$ (dB)	Total Noise Level $L_{Aeq,T}$ (dB)	Significant Effect Threshold (dB)	Noise Level below Threshold?
Dwellings at Warren Wood	51	46	N/A	65	✓
Dwellings at Horsted Park	72	49	N/A	75	✓
Dwellings at David Estate	69	50	N/A	75	✓
Dwellings on Maidstone Road/Rochester Road	63	62	N/A	70	✓
Medway Gurdwara	61	61	64	65	✓(1)

Notes: (1) In this scenario, the predicted construction noise level is below the minimum construction noise level of 65 dB $L_{Aeq,T}$ during the daytime. In any case, the difference between the total noise level and the pre-construction ambient noise level is less than 5 dB(A).

Table 7.3 demonstrates that, based on the above assessment assumptions, noise from construction is unlikely to cause a significant adverse effect at those receptors closest to the sites.

7.1.2. Construction Traffic

At this stage, detailed estimates of construction traffic flows are not available. However, it is assumed that the majority of construction traffic would travel along the B2097 Rochester Road to access the Northern Area with the remainder accessing the Southern Area from the A229 Maidstone Road.

Although construction traffic has the potential to generate noise, the number of vehicles is likely to be considerably less than 25% of the current day-to-day road traffic movements along the potential site access routes. The DfT traffic data for the B2097 Rochester Road suggests that the average daily volume of traffic is 16537 vehicles of which 2% are HGVs.

As a very worst-case example, 500 daily HGV movements associated with the construction phase of the Proposed Development have been added to the existing traffic volumes on the B2097 Rochester Road. This increases the daily volume of traffic to 17037 vehicles of which 4.9% are HGVs. Utilising the calculation methodology in CRTN, the change in noise level due to this increase in HGVs is +1.1 dB. With reference to **Table 4.2** an increase of this magnitude is a small impact on the residential receptors on Rochester Road. This impact would not be considered to be significant. It can be reasonably assumed from this worst-case assessment that the actual volume of construction traffic would not result in a significant adverse effect at the noise sensitive receptors.

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7.1.3. Construction Vibration

With respect to construction vibration, the nearest vibration sensitive receptors are the existing residential dwellings in the vicinity of the sites and Medway Gurdwara.

The nearest dwellings are generally located at a minimum distance of 250 m from the boundary of the Northern Area. A comparison with **Table 4.4** demonstrates that it is highly unlikely that construction vibration will cause an adverse impact at these dwellings due to the large distances between the potential sources of vibration and the receptors.

As the Medway Towns Gurdwara Sabha is located approximately 15 m from the boundary of the site it may be adversely affected by construction vibration depending precisely on the location of the vibration source and the mitigation measures implemented in order to minimise these effects. It is unlikely that hydraulic breakers would be required in the Northern Area close to the Gurdwara, however, piling activities or vibratory rollers may result in adverse effects.

At the Southern Area, the nearest dwellings are within a few metres of the site boundary. These dwellings are likely to be significantly adversely affected by any potential source of construction vibration depending precisely on the location of the vibration source and the mitigation measures implemented in order to minimise these effects.

Some of the activities and uses of the buildings associated with BAE Systems and other industrial/commercial premises at the Rochester Airport Industrial Estate may be sensitive to vibration. It is reasonably assumed that any vibration sensitive uses have incorporated measures to mitigate against vibration from existing sources such as road traffic or aircraft movements in close proximity to the units. However, construction vibration has the potential to adversely impact any sensitive operations at these units.

7.2. Operational Noise

7.2.1. Proposed Industrial Use

Operational Road Traffic

Table 7.4 presents the annual average daily road traffic data obtained from the DfT for the roads around the Proposed Development sites, the predicted 12-hour development traffic, the calculated percentage increase in road traffic volume as a result of the Proposed Developments and the calculated increase in road traffic noise level as a result of the Proposed Developments. The road traffic links referenced in **Table 7.4** are identified in **Figure F.2**.

Table 7.4: Predicted Road Traffic Volumes and Increase in Road Traffic Noise Level

ACCON Road Link Reference	Road Link	DfT Annual Average Daily Traffic (24 hour)(1)	Predicted Development Traffic (0700hrs to 1900 hrs)(1)	Increase in Road Traffic Volume (%)	Predicted Increase in Road Traffic Noise Level (dB)
1	A229 Maidstone Road	40739	1702	4%	+0.2

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ACCON Road Link Reference	Road Link	DfT Annual Average Daily Traffic (24 hour)(1)	Predicted Development Traffic (0700hrs to 1900 hrs)(1)	Increase in Road Traffic Volume (%)	Predicted Increase in Road Traffic Noise Level (dB)
2	A229 Maidstone Road North of Innovation Centre	40739	1995	5%	+0.2
3	A229 Maidstone Road South of Innovation Centre	40739	2014	5%	+0.2
4	A229 Maidstone Road Approaching M2	40739	349	1%	+0.1
5	A229 Link to M2	49654	634	1%	+0.1
6	A2045 Link to A229	N/A(2)	1385	-	-
7	A2045 Walderslade Road	19333	1107	6%	+0.2
8	B2097 Rochester Road South of Laker Road	16537	3672	22%	+0.9
9	B2097 Rochester Road North of Laker Road	16537	800	5%	+0.2
10	M2 Motorway	99296	N/A(3)	-	-
11	A230 Horsted Way	19968	N/A(3)	-	-
12	A229 Roman Road/City Way	15143	N/A(3)	-	-

Notes (1): Two-way traffic flows.
(2): DfT data unavailable for these links.
(3): Predicted development traffic is unavailable for these links, however, due to the current volume of traffic, it is unlikely that the increase in road traffic will result in a significant increase in noise level.

Table 7.4 indicates that the greatest increase in road traffic volume will be along the B2097 Rochester Road approaching Laker Road from the south as a result of an increase in vehicles travelling to and from the Northern Area. A 22% increase in road traffic volume may be experienced along Rochester Road which equates to approximately a 1 dB increase in road traffic noise level. For all of the road links identified in **Table 7.4**, the increase in road traffic noise is expected to result in a negligible impact.

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HGV traffic volumes have not been predicted as the precise requirements of the proposed units are unknown and therefore the requirement for heavy vehicle deliveries is also unknown. It is likely that the greatest increase in the quantity of HGVs would also occur on the B2097 Rochester Road approaching Laker Road from the south with the vehicles quickly dispersing onto the local road network. However, when the road traffic noise levels on Rochester Road are combined with the existing road traffic noise sources, including the M2 motorway, any change in noise level as a result of an increase in HGV movements is likely to be negligible at the residential receptors on Rochester Road.

Operational Commercial/Industrial Noise

Until the requirements of the tenants of the proposed commercial/industrial units are known, the precise sources of commercial and industrial noise will be unknown. The potential commercial and industrial noise sources which could result in an adverse impact at the noise sensitive receptors include, for example:

- The use of machinery or powered tools inside the proposed units;
- Delivery noise such as the use of fork lifts, rattling roll cages, the use of tail lifts or potentially tipping of materials, and vehicle reversing alarms;
- Externally fixed plant such as compressors, air handling units or air conditioning units etc.;
- Flues or other extract points for heating and ventilation systems;

In line with the guidance in BS 4142, noise generated at the proposed commercial and industrial uses should not exceed the background noise levels at the existing noise sensitive receptors in order to indicate a low impact of noise at the receptor.

Table 7.5 presents the typical background sound levels measured in the vicinity of the noise sensitive receptors and the approximate distances of the receptors from the site boundary.

Table 7.5: Typical Background Sound Levels and Distances of Receptors from Site Boundary

Receptor Area	Typical Background Sound Level (dB)		Approximate Distance to Site Boundary (m)
	Daytime $L_{A90,5mins}$	Night-time $L_{A90,5mins}$	
Dwellings at Warren Wood	43	30	300
Dwellings at Horsted Park	64	29	250
Dwellings at David Estate	61	29	290
Dwellings on Maidstone Road/Rochester Road	56	35	1
Medway Gurdwara	48	36	17

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It has been assumed that all potential sources of commercial/industrial noise can be modelled using standard point source assumptions. The maximum cumulative sound pressure levels due to commercial/industrial noise sources which would be permissible at the site boundary to ensure a low impact of noise at the nearest receptors are presented in **Table 7.6**. The sound pressure levels have been calculated using a basic point source distance correction.

Table 7.6: Calculation of Cumulative Sound Pressure Levels of Proposed Commercial/Industrial Noise Sources

Receptor Area	Typical Background Sound Level (dB)		Approximate Distance to Site Boundary (m)	Maximum Permissible Cumulative Sound Pressure Level at Site Boundary (dB)	
	Daytime $L_{A90,5mins}$	Night-time $L_{A90,5mins}$		Daytime L_{pA}	Night-time L_{pA}
Dwellings at Warren Wood	43	30	300	93	80
Dwellings at Horsted Park	64	29	250	112	77
Dwellings at Davis Estate	61	29	290	110	78
Dwellings on Maidstone Road/Rochester Road	56	35	1	56	35
Medway Gurdwara	48	36	17	73	61

The maximum permissible cumulative sound pressure levels calculated for the dwellings at Warren Wood, Horsted Park and Davis Estate are exceptionally high and in practice are very unlikely to occur. Accordingly, noise from the commercial/industrial uses would not result in an adverse impact at these residential receptors.

The dwellings on Maidstone Road/Rochester Road and the Medway Gurdwara are all located within a few metres of the Proposed Development and have the potential to be adversely affected by noise from the proposed commercial/industrial noise sources. There are unlikely to be any significant adverse effects due to commercial and industrial noise at these receptors subject to consideration and inclusion of appropriate mitigation measures as identified in **Section 8**.

7.3. Rochester Airport Single Runway Operation

Currently, Rochester Airport operates two grass runways. Runway 02/20 carries approximately 70% of the annual traffic with runway 16/34 carrying the remaining 30% of annual traffic. As a result of the Proposed Development, 100% of the air traffic movements would occur on runway 02/20.

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The volume of flights, operating hours, and typical annual usage patterns of the airport would remain unchanged from the present formation. It is noted that, subject to no significant changes to the wind direction during the daytime, there will already be a number of days (or consecutive days) each year during which all air traffic will utilise runway 02/20 for the entire day (or entirety of the consecutive days). The effect of operating 100% of the annual air traffic movements from a single runway would be restricted to an increase in the number of days during which aircraft movements will be audible to receptors along the flight path or close to the runway. This would not be expected to result in a significant adverse effect.

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8. MEASURES TO REDUCE EFFECTS

8.1. Construction Noise and Vibration

8.1.1. Construction Noise

Whilst the construction noise predictions suggest that significant effects may be unlikely as a result of the construction phase of the Proposed Development, the assessment assumes that construction activities have been mitigated using best practicable means in accordance with good practice.

As noise from construction activities will be audible at some of the noise sensitive receptors, best practicable means should be used to minimise construction noise through the implementation of the recommendations set out in BS 5228-1. In particular, the following noise mitigation measures should be implemented:

- All vehicles and mechanical plant will be fitted with effective exhaust silencers and will be maintained in good efficient order;
- Inherently quiet plant should be used where appropriate – all major compressors and generators will be “sound reduced” models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines in intermittent use will be shut down in the intervening periods between use or throttled down to a minimum;
- All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance, and where necessary, acoustic enclosures will be provided;
- Where practicable, the use of noisy plant will be limited to core daytime periods;
- Channels of communication will be established between the contractor/development, local authority and residents;
- A site representative will be appointed responsible for matters relating to noise;
- Typical levels of noise will be monitored during critical periods and at sensitive locations’
- Localised noise barriers will be erected as necessary around items such as generators or high duty compressors; and
- Construction compounds will be laid out so as to minimise noise impacts to neighbouring noise sensitive receptors, by location noisy operations well away from receptors and using on-site structures and materials to screen noise where practicable and necessary.

People are generally more tolerant of higher noise levels if they know that they are only going to be of a short duration. Therefore, it is important to maintain good communication with the local residents.

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The identified mitigation measures can be implemented through a Construction Environmental Management Plan (CEMP).

8.1.2. Construction Vibration

The qualitative assessment of construction vibration indicated that a potentially significant adverse effect could occur at those receptors within a few metres of the construction site, depending on the source of the vibration, the location of the vibration source within the site and the duration of the activity.

Best practicable means should be used to minimise construction vibration through the implementation of the recommendations set out in BS 5228-2. In particular, the following vibration mitigation measures should be implemented:

- Where reasonably practicable, plant and/or methods of work causing significant levels of vibration at sensitive receptors should be replaced by other, less intrusive plant and/or methods of working;
- Where vibration from stationary plant (e.g. generators, pumps, compressors) may cause disturbance to nearby sensitive receptors, equipment should be relocated or isolated using resilient mountings;
- Generally, vibration equipment should be located as far from sensitive receptors as possible;
- All reasonably practicable means should be employed to protect sensitive receptors from the detrimental effects of vibration generated by construction operations. The means employed could include vibration reducing measures for individual plant and machinery, reducing the duration of operation for specific items or plant, and/or the setting of vibration limits.

The identified mitigation measures can be implemented through the CEMP.

8.2. Operational Phase

8.2.1. Operational Road Traffic Noise

The increase in road traffic noise is predicted to result in a negligible impact at the noise sensitive receptors, therefore, no mitigation measures are proposed.

8.2.2. Operational Commercial/Industrial Noise

The distances to the majority of the existing residential noise sensitive receptors should inherently ensure that the impact of commercial/industrial noise sources from the Proposed Development is low.

However, care should be taken to select, site and mount any noise generating equipment to minimise any impacts on any of the nearby noise sensitive receptors. Acoustic enclosures, acoustic louvres and silencers should be selected and installed where necessary. This is especially important close to the dwellings on Maidstone Road/Rochester Road and the Medway Gurdwara, particularly where plant may be operational throughout the night when background levels are lower.

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9. LIKELY EFFECTS AFTER MITIGATION

9.1. Construction Noise and Vibration

9.1.1. Construction Noise

The effect of the best practicable means mitigation should reduce construction noise levels such that, applying professional judgement, the likely residual effects of construction noise are anticipated to be temporary, short-term, local, adverse and not considered to be significant.

9.1.2. Construction Vibration

In ACCON's professional judgement, the effect of the best practicable means mitigation should ensure that the likely significant residual effect of construction vibration is anticipated to be short-term, temporary, local, adverse and not considered to be significant.

9.2. Operational Noise

9.2.1. Operational Road Traffic

The effect of operational road traffic is predicted to be negligible at all noise sensitive receptors and is therefore not considered to be significant.

9.2.2. Operational Commercial/Industrial Noise

The effect of operational commercial/industrial noise after mitigation is not expected to be significant.

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10. CONCLUSIONS

An environmental noise measurement survey has been carried out at the Proposed Development site and surrounding environs in order to characterise the existing noise climate and to determine typical background noise levels at the existing noise sensitive receptors.

A construction noise and vibration assessment has indicated that there is unlikely to be any significant noise and vibration effects during the construction phase subject to the implementation of best practicable means mitigation.

The potential development road traffic volumes are unlikely to result in a significant increase in road traffic noise levels at the nearest noise sensitive receptors. No mitigation measures have been recommended as a result.

Commercial/industrial noise such as from deliveries, fixed plant installations or operations within the proposed units should not exceed the calculated sound pressure levels at the site boundary in order to ensure that there would not be significant adverse effects at the existing noise sensitive receptors. The identified mitigation measures, including the siting, orientation, enclosing and silencing of commercial/industrial noise sources, should be taken into consideration at the appropriate stage of the design.

As a result of the Proposed Development, Rochester Airport would only operate one runway. The effect of this change in operation would result in an increase of the number of days during which aircraft noise would be audible at a limited number of receptors in the vicinity of the airport. It is unlikely that this would result in a significant effect.

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ADDITIONAL FIGURES

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Figure F.1: Noise Monitoring Positions

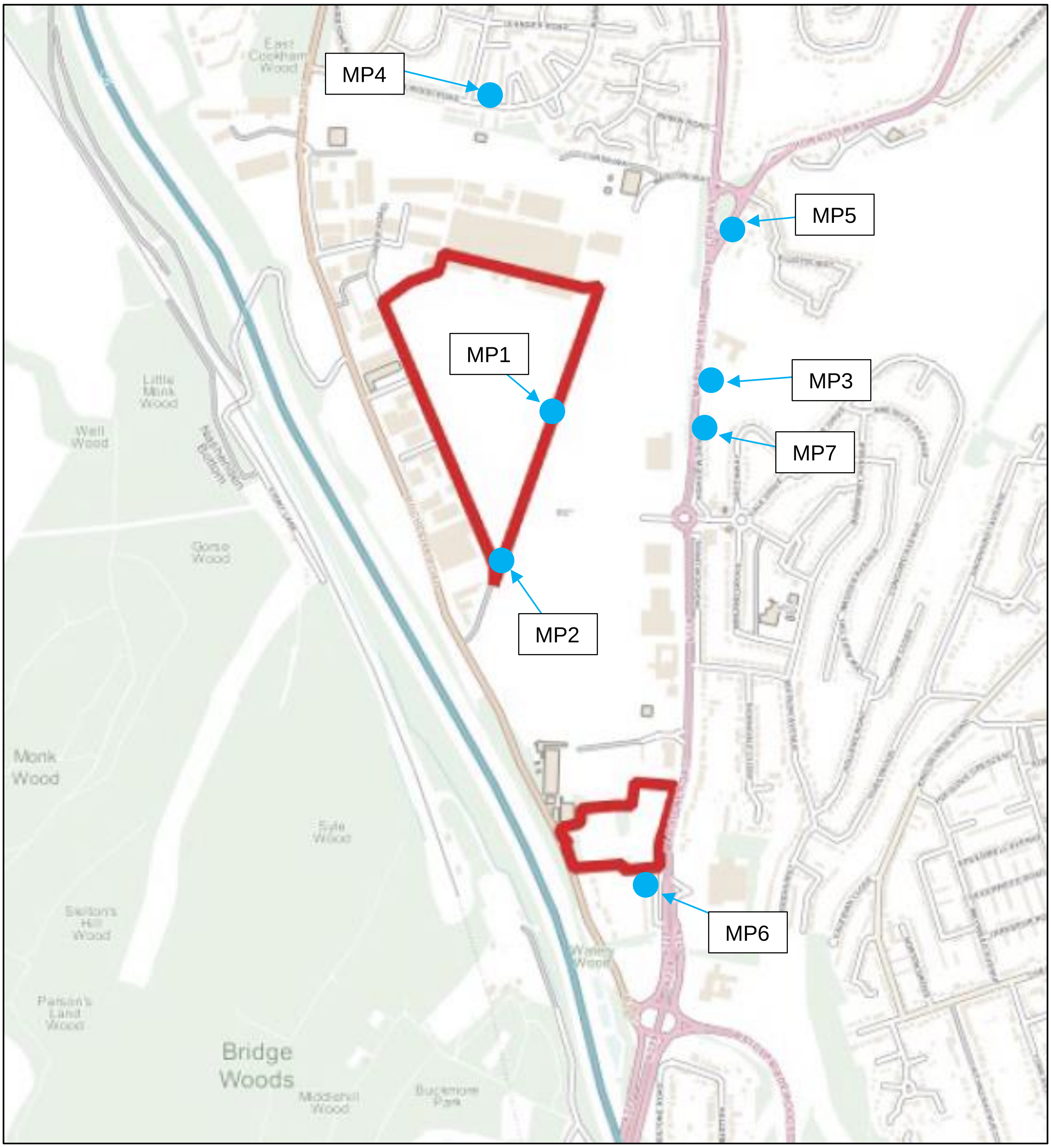

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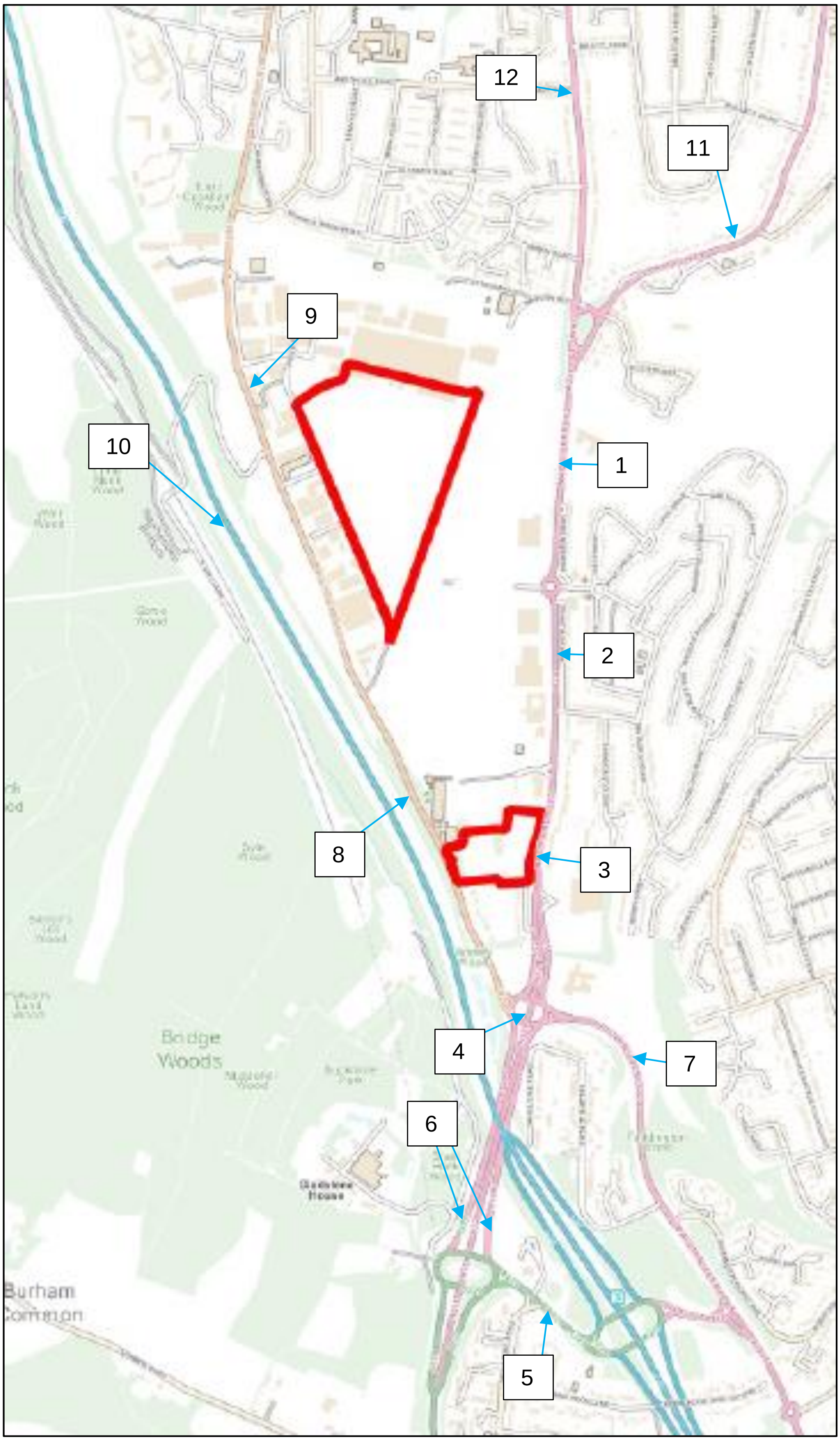
Figure F.2: Road Traffic Links



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APPENDICES

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Appendix 1
Glossary of Acoustic Terminology

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Term	Description
'A'-Weighting	*This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.*
Decibel (dB)	*This is a tenth (deci) of a bel. Decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.*
$L_{Aeq,T}$ *(Ambient/Period Sound Level)*	*The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location.* $L_{Aeq,T}$ *can be measured directly with an integrating sound level meter.*
$L_{A90,T}$ *(Background Sound Level)*	*The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time. The* $L_{A90,T}$ *is used to describe the background noise levels at a particular location.*
L_{Amax}	*The 'A'-weighted maximum sound pressure level measured over a measurement period. Typically measured with 'fast' weighting (125 ms) or 'slow' weighting (1 s).*
Sound Power Level L_W	*The sound power level,* L_W*, is the total amount of sound energy per unit of time generated by a particular sound source independent of the acoustic environment that it is in.*
Rating Level, $L_{Ar,Tr}$	*The specific sound level plus any adjustment for the characteristic features of the sound.*
Residual Sound Level, $L_r = L_{Aeq,T}$	*Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.*
Specific Sound Level, $L_s = L_{Aeq,Tr}$	*The equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr.*

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Appendix 2
Noise Measurement Results

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HOURLY NOISE MEASUREMENT RESULTS AT MP1

Time	$L_{Aeq,T}$ (dB)	L_{Amax} (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
07:00-08:00	49.4	62.4	51.2	47.0
08:00-09:00	48.5	64.5	49.9	44.9
09:00-10:00	54.8	77.9	51.7	44.5
10:00-11:00	59.0	78.3	55.7	44.4
11:00-12:00	55.4	76.3	55.3	43.1
12:00-13:00	58.8	83.3	56.1	45.1
13:00-14:00	65.7	89.6	61.8	44.1
14:00-15:00	58.4	82.6	57.1	43.9
15:00-16:00	57.4	82.1	57.8	43.5
16:00-17:00	55.9	78.4	54.3	44.4
17:00-18:00	52.7	76.2	51.7	45.1
18:00-19:00	47.7	62.8	49.5	44.2
19:00-20:00	46.8	65.9	49.2	42.7
20:00-21:00	46.4	67.7	48.3	42.1
21:00-22:00	46.6	64.1	48.8	42.3
22:00-23:00	45.3	56.9	47.6	41.6
23:00-00:00	44.1	61.4	46.7	38.4
00:00-01:00	41.8	53.6	45.0	34.3
01:00-02:00	39.9	61.2	42.6	31.8
02:00-03:00	39.0	54.5	42.7	30.5
03:00-04:00	39.2	54.5	42.8	31.7
04:00-05:00	41.4	57.1	44.4	34.9
05:00-06:00	46.0	66.5	48.0	41.8
06:00-07:00	49.0	66.1	50.4	45.8
Daytime (07:00 – 23:00)	**57.0**	**73.1**	**52.9**	**43.9**
Night-time (23:00 – 07:00)	**44.0**	**59.4**	**45.3**	**36.1**

Notes: The noise measurements were carried out over consecutive 5-minute periods. The $L_{Aeq,T}$ noise levels were logarithmically averaged over the stated periods, the L_{AFmax} noise levels are the highest maximum noise levels in each period with an average of the highest maximum levels provided in the summary period. The $L_{A10,T}$ and $L_{A90,T}$ noise levels were arithmetically averaged over the stated periods.

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HOURLY NOISE MEASUREMENT RESULTS AT MP2

Time	$L_{Aeq,T}$ (dB)	L_{Amax} (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
07:00-08:00	56.4	78.4	58.9	48.4
08:00-09:00	56.7	78.7	59.8	49.3
09:00-10:00	63.3	85.9	63.8	48.4
10:00-11:00	59.0	84.4	60.3	47.5
11:00-12:00	64.3	87.7	62.3	49.7
12:00-13:00	59.6	93.1	61.2	48.6
13:00-14:00	61.9	93.2	59.7	49.2
14:00-15:00	64.0	87.9	63.6	48.9
15:00-16:00	60.7	84.6	60.3	48.2
16:00-17:00	60.7	83.9	61.1	49.0
17:00-18:00	55.6	81.3	57.1	46.6
18:00-19:00	51.8	75.8	53.2	47.0
19:00-20:00	52.4	71.7	54.8	47.1
20:00-21:00	50.2	66.5	52.5	44.9
21:00-22:00	48.8	70.5	50.6	44.3
22:00-23:00	47.5	66.4	49.1	43.5
23:00-00:00	45.8	64.2	47.0	41.2
00:00-01:00	42.9	70.2	43.5	37.6
01:00-02:00	40.8	60.0	43.1	36.6
02:00-03:00	44.8	72.5	43.9	36.4
03:00-04:00	40.9	61.0	42.2	36.5
04:00-05:00	49.4	70.5	49.1	39.1
05:00-06:00	49.7	67.5	51.7	44.2
06:00-07:00	59.4	97.1	55.2	47.2
Daytime (07:00 – 23:00)	**59.7**	**80.6**	**58.0**	**47.5**
Night-time (23:00 – 07:00)	**51.6**	**70.4**	**46.9**	**39.8**

Notes: The noise measurements were carried out over consecutive 5-minute periods. The $L_{Aeq,T}$ noise levels were logarithmically averaged over the stated periods, the L_{AFmax} noise levels are the highest maximum noise levels in each period with an average of the highest maximum levels provided in the summary period. The $L_{A10,T}$ and $L_{A90,T}$ noise levels were arithmetically averaged over the stated periods.

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