

Development and Noise

7.78 Due to the urban nature of Crawley noise levels vary from relatively quiet areas within Crawley's large parks to much noisier areas close to the M23 and Gatwick Airport. Unacceptable levels of noise can be a cause of health and stress related problems, amenity issues, and can result in negative impacts on productivity and learning. For these reasons it is fundamental that the relationship between noise sources and noise sensitive development is effectively and appropriately managed through the Local Plan. Key to this approach will be a methodology for separating noise sensitive developments from noise generating sources.

Policy ENV11: Development and Noise

People's quality of life will be protected from unacceptable noise impacts by managing the relationship between noise sensitive development and noise sources. To achieve this, Policy ENV11 should be read in conjunction with the Local Plan Noise Annex.

A. Noise Sensitive Development

Residential and other noise sensitive development will be permitted where it can be demonstrated that users of the development will not be exposed to unacceptable noise disturbance from existing or future uses.

Noise sensitive uses proposed in areas that are exposed to significant noise from existing or future industrial, commercial or transport (air, road, rail and mixed) sources will be permitted where it can be demonstrated that appropriate mitigation, through careful planning, layout and design, will be undertaken to ensure that the noise impact for future users will be made acceptable. Proposals that would expose future users of the development to unacceptable noise levels will not be permitted. For transport sources, the Unacceptable Adverse Effect is considered to occur where noise exposure is above 66dB $L_{Aeq,16hr}$ (57dB $L_{Aeq,8hr}$ at night).

B. Noise Generating Development

Noise generating development will only be permitted where it can be demonstrated that nearby noise sensitive uses (as existing or planned) will not be exposed to noise impact that will adversely affect the amenity of existing and future users. Proposals will adhere to standards identified in the Local Plan Noise Annex to establish if the proposal is acceptable in noise impact terms, and will be required to appropriately mitigate noise impacts through careful planning, layout and design. Development that would expose users of noise sensitive uses to unacceptable noise levels will not be permitted.

C. Noise Impact Assessment

A Noise Impact Assessment will be required to support applications where noise sensitive uses are likely to be exposed to significant or unacceptable noise exposure. The Noise Impact Assessment will:

- i. assess the impact of the proposal as a noise receptor or generator as appropriate; and
- ii. demonstrate in full how the development will be designed, located, and controlled to mitigate the impact of noise on health and quality of life, neighbouring properties, and the surrounding area.

In preparing a Noise Impact Assessment, applicants will adhere to Planning Noise Advice Document: Sussex (2013) for further guidance.

D. Mitigating Noise Impact

Where proposals are identified as being subject to significant or unacceptable noise impact, either through noise exposure or generation, the best practical means must be employed to mitigate noise impact to an acceptable level.

Reasoned Justification

- 7.79 *To assist in the interpretation of Local Plan Policy, guidance is set out in the Local Plan Noise Annex to inform the use of Policy ENV11 in planning applications and decisions. Reference should also be made to the Local Plan Noise Annex, which delineates the estimated noise contours associated with a possible second wide-spaced runway at Gatwick Airport. The noise contours shown in the Local Plan Noise Annex reflect the latest published by the Civil Aviation Authority (CAA).*
- 7.80 *Crawley is one of 65 large urban areas in England to which the Environmental Noise Directive applies, and the Local Plan approach to managing noise has regard to Noise Action Plans produced by DEFRA to promote good health and good quality of life. Given Crawley's unique noise environment, it is considered that locally-specific guidance is needed to ensure that national objectives are met, whilst ensuring that an approach that is consistent with adjoining local planning authorities is progressed.*
- 7.81 *The NPPF requires that Local Plan policies and development management decisions aim to avoid noise giving rise to significant adverse impacts on health and quality of life as a result of new development, ensuring that, where conflict does arise, impacts are, as far as possible, mitigated against and reduced to a minimum. To ensure that the Local Plan appropriately manages and mitigates against issues of noise on a consistent basis, the policy approach draws on evidence base work.*
- 7.82 *Although Planning Practice Guidance: Noise provides broad policy guidelines, it is recognised that the revoking of PPG24 (Planning and Noise) has resulted in an absence of technical guidance relating to noise. Whilst PPG24 provided guidance in relation to situations in which the onset of noise impact becomes significant, Noise Planning Policy Statement for England (2010) – identified under the noise policy of the NPPF – outlines that the Significant Observed Adverse Effect Level (SOAEL), the noise level above which significant adverse effects on health and quality of life occur, will vary depending on the situation and source of noise. For this reason, there is currently not a recognised value for SOAEL. However, given the diverse range of noise sources in Crawley (including the airport, motorway, and Manor Royal) it is considered that detailed technical guidance will be required to facilitate the interpretation of Local Plan Policy ENV11.*
- 7.83 *Detailed technical guidance is required to fill the policy gap left by the revocation of PPG24 to provide locally specific clarity in interpreting an appropriate noise response according to source. The recently published Planning Practice Guidance: Noise¹ recommends that local planning authorities may produce locally specific noise guidance.*
- 7.84 *Technical guidance on noise impact is set out in the Local Plan Noise Annex. This draws upon evidence and the PPG24 Noise Exposure Categories as a technical starting point, to provide guidance in assessing the acceptability of development proposals in noise terms. As part of the Local Plan, the Noise*

¹ Planning Practice Guidance: Noise (2014) DCLG

Annex will form a material planning consideration until such a time as its content is superseded by updated technical guidance from the government.

- 7.85 *Where a Noise Impact Assessment is required, consideration should be given to Planning Noise Advice Document, Sussex (2013) which has been produced on a joint basis by East and West Sussex local authorities. This has been produced to provide clear and consistent guidance as to the level of information that should be submitted with planning applications for noise generating developments or noise sensitive developments, including guidance on when it is appropriate to submit a noise report and the required contents of such a report.*

CRAWLEY LOCAL PLAN NOISE ANNEX

1.0 **Introduction**

- 1.1 Crawley is home to Britain's largest single-runway airport, a key sub-regional employment destination at Manor Royal Business District, and a major motorway (M23). Noise, therefore, represents an important planning consideration in the town.
- 1.2 The revocation of Planning Policy Guidance 24 (Planning and Noise) has resulted in an absence of detailed technical guidance at the national level to guide the relationship between development and noise. This Annex therefore draws upon evidence to provide policy context and establish locally specific guidance through which the approach of Local Plan Policy ENV11: Development and Noise should be applied.

2.0 **Planning Policy Context**

2.1 National Policy Objectives

- 2.1.1 The National Planning Policy Framework (NPPF) sets out the Government's key planning objectives, recognising the need to reduce pollution as one of its 12 key principles. It requires the planning system to prevent new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of pollution (Paragraph 109). Paragraph 123 provides more detail, outlining that local plan policies and development management decisions should aim to avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development. Where conflict does arise, impacts must as far as possible be mitigated against and reduced to a minimum.
- 2.1.2 The NPPF supersedes previous national level Government planning guidance. This included Planning Policy Guidance 24: Planning and Noise, which outlined measurable numeric noise categories through which the relationship between development and noise could be assessed.
- 2.1.3 With PPG24 having been revoked, the NPPF identifies the Explanatory Note of the Noise Policy Statement for England (DEFRA, 2010) as guidance for interpreting the level at which noise is considered to give rise to significant adverse impact. However, this does not identify measurable noise values to identify the 'Significant Observed Adverse Effect Level', the noise exposure level above which significant adverse effects on health and quality of life occur.
- 2.1.4 The Government has since published *Planning Practice Guidance: Noise* (DCLG, 2013). This outlines that local authorities should take account of the acoustic environment in plan making and decision taking, and in doing so should 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.
- 2.1.5 In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of noise exposure is, or would be, above or below the Significant Observed Adverse Effect Level

(SOAEL), and the Lowest Observed Adverse Effect Level for the given situation (LOAEL). The Planning Practice Guidance does not provide technical guidance to establish the levels at which SOAEL or LOAEL occur. It does, however, identify that local planning authorities may produce local plan specific noise standards to apply to various forms of proposed development and locations in their area.

2.2 Local Policy

2.2.1 The key objective of Local Plan Policy ENV11 is to guide the relationship between noise sensitive development and noise sources to ensure that a good quality of life is maintained for current and future residents.

2.2.2 This Local Plan Noise Annex identifies locally specific noise thresholds comprised of measurable value ranges through which noise impact from transport sources can be determined in order to support Policy ENV11. These are based on the noise exposure hierarchy set out in *Planning Practice Guidance: Noise* and are discussed in detail in Section 4.1 of this Annex.

2.2.3 This Annex also provides guidance where proposals for noise sensitive development may be affected by industrial/commercial noise sources (Section 4.2), and on Noise Generating Development (Section 4.3).

2.2.4 Local Plan Policy ENV11 also refers to the '*Planning Noise Advice Document: Sussex*' (2013), to assist in the preparation of Noise Impact Assessments. This document has been produced on a joint basis by East and West Sussex local planning authorities to provide clear and consistent guidance as to the level of information that should be submitted with planning applications for noise generating developments or noise sensitive developments, including guidance on when it is appropriate to submit a noise report and the required contents of such a report.

3.0 Understanding When Noise Could Become a Concern

3.1 *Planning Practice Guidance: Noise* identifies a noise exposure hierarchy which provides broad guidance on the levels at which noise exposure could become a concern.

3.2 At the lowest extreme, when noise is not noticeable, there is by definition no effect. As noise exposure increases, it crosses the **No Observed Effect Level**. This is the stage at which noise becomes noticeable, though it has no adverse effect as it does not cause any change in behaviour or attitude. If the noise is at this level, no specific measures are required to manage the acoustic environment.

3.3 As noise exposure increases it crosses the **Lowest Observed Adverse Effect Level**, and may reach the **Observed Adverse Effect Level**. At this level noise can start to cause small changes in behaviour and attitude. For example, this could cause people to turn up the volume on the television or needing to speak more loudly to be heard. The noise level starts to have an adverse effect where consideration needs to be given to mitigating and minimising those effects.

3.4 Continued increase in noise exposure will at some point cause the **Significant Observed Adverse Effect Level** to be crossed. Above this level, noise causes a material change in behaviour, for example necessitating that windows are

kept closed most of time. If noise exposure is above this level, the planning process should be used to prevent this effect from occurring, by use of appropriate mitigation, for example through design and layout.

- 3.5 At the highest extreme, the **Unacceptable Adverse Effect**, noise exposure would cause extensive and sustained changes in behaviour, without an ability to mitigate the effect of noise. At this level, the impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, the situation should be prevented from occurring.

4.0 Managing Noise in Crawley: Guidance to Support Local Plan Policy ENV11

4.1 Noise sensitive development affected by noise from transport sources

- 4.1.1 Local Plan Policy ENV11 outlines that noise sensitive uses will only be permitted where users of the development will not be exposed to unacceptable noise disturbance from existing or proposed uses.
- 4.1.2 This section provides guidance to determine the threshold at which noise exposure from transport-based sources (air, road, rail, and mixed sources) is considered to become significant or unacceptable in a Crawley context.
- 4.1.3 Building on the noise exposure hierarchy identified in *Planning Practice Guidance: Noise*, and using the previous guidance in PPG24 and evidence identified in Section 6, the Annex identifies measurable local values through which to determine the acceptability of noise sensitive proposals where noise exposure from transport is a factor.
- 4.1.4 In particular, it identifies a measurable threshold for the Significant Observed Adverse Effect Level (SOAEL), i.e. the noise level at which significant adverse effects on health and quality of life occur. It also outlines a measurable threshold to identify the level at which noise exposure is considered to become unacceptable.
- 4.1.5 In determining the acceptability of noise sensitive proposals where noise exposure from a transport source is a factor, the standards set out in Table 1 (below) will be applied.

NOISE ANNEX TABLE 1:
Standards for noise sensitive development affected by noise from transport sources².

	Examples of Outcomes	Daytime (07:00 – 23:00) Threshold	Night time (23:00 – 07:00) Threshold
No Observed Adverse Effect Level (NOAEL)	Noticeable but not intrusive: Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area, but not such that there is a perceived change in the quality of life.	<45dB $L_{Aeq,16hr}$ <70dB $L_{A_{max}} (1)$	<40dB $L_{Aeq,8hr}$ <55dB $L_{A_{max}} (1)$
Lowest Observed Adverse Effect Level (LOAEL)		45dB $L_{Aeq,16hr}$ 70dB $L_{A_{max}} (1)$	40dB $L_{Aeq,8hr}$ 55dB $L_{A_{max}} (1)$
Observed Effect Level	Noticeable and intrusive: Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Between 45dB and 55dB $L_{Aeq,16hr}$ (45 to 57dB for Air Traffic) > 70dB $L_{A_{max}} (1)$	Between 40dB and 45dB $L_{Aeq,8hr}$ (40 to 48dB for Air Traffic) > 55dB $L_{A_{max}} (1)$
Significant Observed Adverse Effect Level (SOAEL)	Noticeable and disruptive: Noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening, and difficulty getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Between 55dB and 66dB $L_{Aeq,16hr}$. (57dB to 66dB for Air Traffic) > 70dB $L_{A_{max}} (1)$	Between 45dB and 57dB $L_{Aeq,8hr}$. (48 to 57dB for Air Traffic) 58dB to 82dB $L_{A_{max}} (1)$
Unacceptable Adverse Effect	Noticeable and very disruptive Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening, loss of appetite, significant medically definable harm.	greater than 66dB $L_{Aeq,16hr}$	greater than 57dB $L_{Aeq,8hr}$ > 82dB $L_{A_{max}} (1)$

4.1.6 All the above levels would include the predicted noise from any proposed or required changes in transportation noise including the potential 2nd wide spaced runway at Gatwick Airport as set out in the 2003 White Paper and any

² $L_{A_{max}}$ applies for 2+ events per hour during the night (23:00 – 07:00). All above levels are external free-field levels.

forthcoming replacement policy document. Details of the predicted noise contours associated with a possible wide-spaced second runway at Gatwick Airport are set out in Figure 1 of this Noise Annex, which draws upon the noise contours published by the Civil Aviation Authority (CAA) in their report: ERCD report 0308. Figure 1 of the Noise Annex will be updated should these contours be superseded by subsequent noise contours published by the CAA.

- 4.1.7 In interpreting the categories for the purposes of Local Plan Policy ENV11, noise exposure is considered to be acceptable where the internal noise climate achieves standards set in BS8233 or replacement guidance.
 - 4.1.8 Noise exposure is considered to be significant at the Significant Observed Effect Level (SOAEL) of between 57dB $L_{Aeq,16hr}$ and 66dB $L_{Aeq,16hr}$ and between 45dB and 57dB $L_{Aeq,8hr}$ at night.
 - 4.1.9 Unacceptable Adverse Effect is considered to occur where noise exposure is above 66dB $L_{Aeq,16hr}$ (57dB $L_{Aeq,8hr}$ at night).
 - 4.1.10 For private amenity areas (private and communal gardens), Unacceptable Adverse Effect is considered to occur at 63dB $L_{Aeq,16hr}$ for Roads, and 66dB $L_{Aeq,16hr}$ for Aircraft and Rail noise. This is so that they can be enjoyed as intended.
 - 4.1.11 The 66dB $L_{Aeq,16hr}$ threshold for noise sensitive development, particularly residential, is identified in light of the Inspector's decision relating to development at the North East Sector (Forge Wood), where it was found that development up to the 66dB $L_{Aeq,16hr}$ contour would not be unacceptable with mitigation. This also corresponds to the 66dB $L_{Aeq,16hr}$ upper limit for private and communal outdoor space which is an important element of residential development. This upper limit is further justified by increasing evidence of the long term impacts of noise on health, as identified in the *Technical Appendix: Supporting Evidence in Relation to Noise from Transport Sources*.
 - 4.1.12 Where noise exposure is likely to be significant, a Noise Impact Assessment will be required in support of planning applications to demonstrate how noise impact will be made acceptable. For further information on the requirements of a Noise Impact Assessment, please see Section 5 of this Annex, and *Planning Noise Advice Document: Sussex* (2013).
- 4.2 *Noise sensitive development affected by industrial or commercial noise sources*
- 4.2.1 Local Plan Policy ENV11 outlines that noise sensitive uses proposed in areas that are exposed to noise from existing or planned industrial or commercial sources, will only be permitted where future users will not be exposed to an unacceptable noise impact that would result in creation of a statutory nuisance.
 - 4.2.2 This is based on the recognition that to introduce new noise sensitive receptors into locations where they may be affected by noise from established businesses can create conflict between those two uses and may prejudice the existing industrial or commercial operations.
 - 4.2.3 NPPF paragraph 123 (bullet point 3) expands, recognising that development will often create some noise, and outlining that existing businesses wanting to

develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.

- 4.2.4 It is also recognised that some industrial or commercial uses may be planned, in the sense that they are subject to an extant planning permission, or have been identified for economic use through the Local Plan. For this reason, the policy approach also has regard to future planned developments.
- 4.2.5 To ensure that proposed noise sensitive uses do not conflict with existing or planned industrial/commercial uses, noise sensitive development will only be considered acceptable where future users would not be exposed to noise impact that would result in a statutory nuisance.
- 4.2.6 To ensure that proposals are acceptable in noise terms, an assessment should be made using BS4142 *Method for Rating industrial noise, affecting mixed residential and industrial areas*, or any replacement guidance.
- 4.2.7 Where there is risk that noise sensitive proposals would be affected by statutory nuisance, a Noise Impact Assessment will be required in support of planning applications to demonstrate how noise impact will be made acceptable. For further information on the requirements of a Noise Impact Assessment, please see Section 5 of this Annex, and *Planning Noise Advice Document: Sussex* (2013).
- 4.2.8 If it cannot be demonstrated that appropriate mitigation will be provided to manage significant or unacceptable noise impacts to an acceptable level, the proposal will be refused.
- 4.3 *Noise generating development*
 - 4.3.1 Local Plan Policy ENV11 outlines that noise generating development will be permitted where it can be demonstrated that any nearby noise sensitive uses (as existing or planned), will not be exposed to noise impact that will adversely affect the amenity of users of surrounding noise sensitive premises.
 - 4.3.2 To ensure that proposals are acceptable in noise terms, development should comply with BS4142 *Method for Rating industrial noise, affecting mixed residential and industrial areas*, or any replacement guidance.
 - 4.3.3 Around the Town Centre, Neighbourhood Parades and mixed use commercial/residential areas, the high density of industrial plant and air-handling units (including kitchen extracts, air-condition units and refrigeration plant) has a cumulative effect of increasing the overall background noise level. To prevent this level continually increasing to the detriment of the local residential amenity in those locations there will be an expectation that all new noise sources would be expected to operate at a Rating Level (BS4142) of 10dB below the background noise level measured as a L_{A90} .
 - 4.3.4 Where there is risk that development would adversely affect the amenity of users in surrounding noise sensitive premises, a Noise Impact Assessment will be required in support of planning applications, to demonstrate how noise impact will be made acceptable. For further information on the requirements of a Noise Impact Assessment, please see Section 5 of this Annex, and *Planning Noise Advice Document: Sussex* (2013).

- 4.3.5 If it cannot be demonstrated that appropriate mitigation will be provided to manage noise impact to an acceptable level, the proposal will be refused.

5.0 Noise Impact Assessment

- 5.1 As identified in Part C of Local Plan Policy ENV11, a Noise Impact Assessment will be required to support applications where noise sensitive uses are likely to be exposed to significant or unacceptable noise exposure.
- 5.2 The Noise Impact Assessment will be required to assess the impact of the proposal as a noise generator or receptor, as appropriate.
- 5.3 It will also be required to demonstrate in full how the development will be designed, located, and controlled to mitigate (as appropriate) the impact of noise on health and quality of life, neighbouring properties, and the surrounding area.
- 5.4 In all cases, the best practical means of mitigation will be required to mitigate noise impact to an appropriate level, and in liaison with Crawley Borough Council Environmental Health.
- 5.5 If it cannot be demonstrated that appropriate mitigation will be provided to manage significant or unacceptable noise impacts to an acceptable level, the proposal will be refused.
- 5.6 In preparing a Noise Impact Assessment, applicants should adhere to *Planning Noise Advice Document: Sussex (2013)*, which supports Local Plan Policy ENV11 and this accompanying Annex.

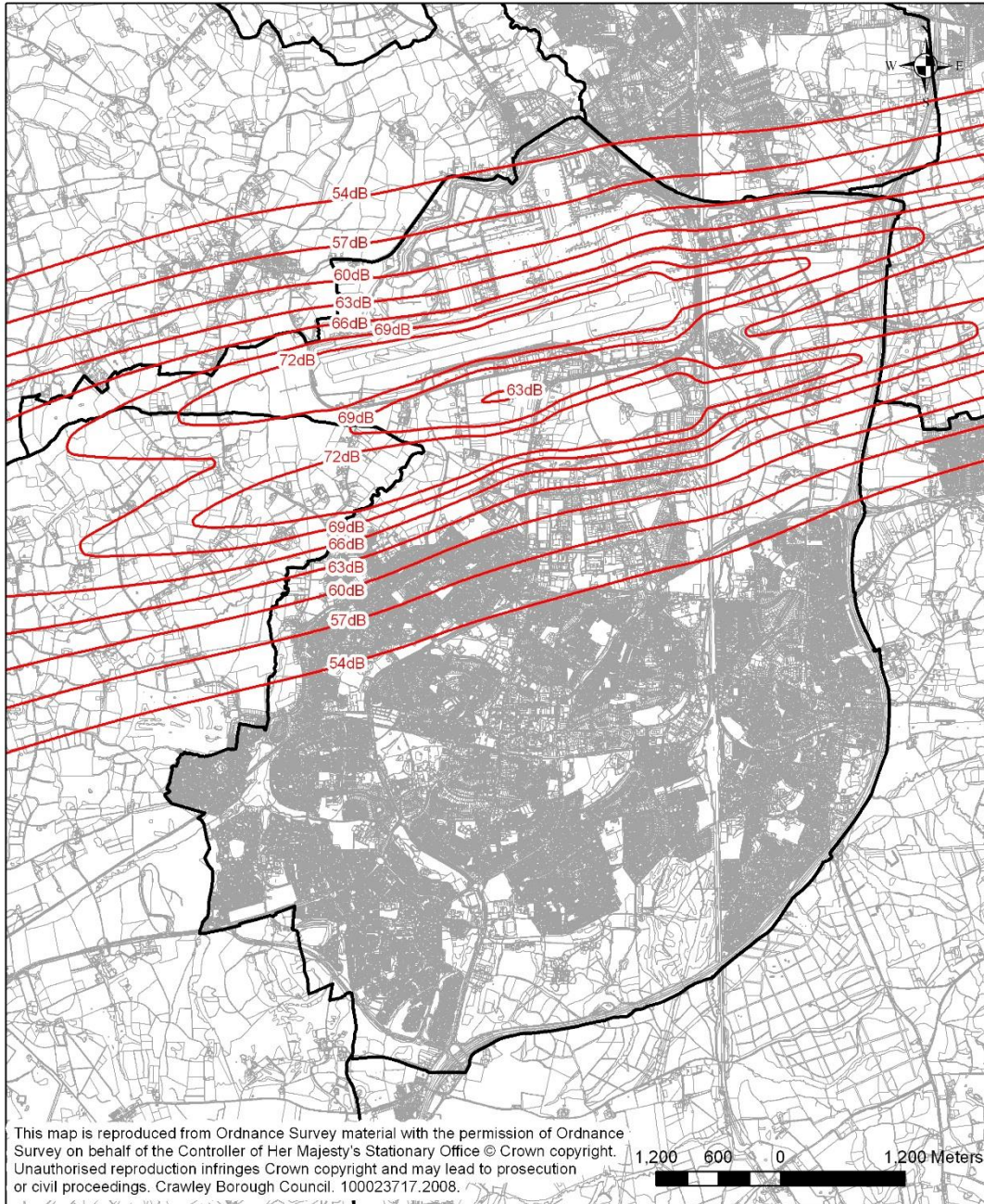
6.0 Further Reference

- 6.1 Where development proposals are likely to be affected by noise, either as a source or receptor, applicants are strongly encouraged to liaise with Crawley Borough Council Environmental Health prior to submitting an application.
- 6.2 To contact Environmental Health please email environmentalservices@ Crawley.gov.uk or call (01293) 438247.

**NOISE ANNEX FIGURE 1:
Gatwick Noise Contour 2 Runway Scenario (Policy GAT1 and ENV11)**

Gatwick Noise Contour 2 Runway Scenario
(Policy GAT1 & ENV11)

Based upon ERCD report 0308
published by CAA (2003)



TECHNICAL APPENDIX: SUPPORTING EVIDENCE IN RELATION TO NOISE FROM TRANSPORT SOURCES

1.0 Introduction

- 1.1 There is a growing amount of research relating to the health impacts of noise, and on the dose response (reaction to increasing noise exposure) relationship between noise and health.
- 1.2 Recent studies have identified a number of causal links between noise exposure and health impacts. These themes are drawn together in key two documents; The Health Protection Agency (HPA) summary document *Environment Noise and Health in the UK* (2010); and through the work of the Government-appointed Airports Commission in *Discussion Paper 5: Aviation Noise* (2013).
- 1.3 Through these documents, it is possible to identify three specific areas in which adverse effects of noise exposure can impact on populations and individuals; Amenity/Quality of Life, Health, and Learning.

2.0 Effects on Amenity and Quality of Life

- 2.1 This form of noise impact may typically affect people in two ways; annoyance, and sleep disturbance.
- 2.2 Annoyance is considered to manifest itself when noise impact disturbs a person's daily life, for example, through interrupting a conversation or causing distraction whilst resting (Airports Commission, 2013). As such, annoyance will typically increase as noise exposure increases, though changes in pitch and intermittency can also increase annoyance.
- 2.3 The *Aviation White Paper* (2003) found the onset of community annoyance to occur at 57dB LAeq16hr, a figure that originates from the 1982 Aircraft Noise Index Study (ANIS).
- 2.4 Over time individual aircraft have become quieter but have increased in number and *Attitudes to Noise from Aviation Sources in England* study (ANASE), DfT, 2007) demonstrated that the number of aircraft had a greater impact on annoyance than increasing average noise levels³. This suggests that the level for the onset of community annoyance may actually occur below 57dBA, and that the impact of higher levels of noise may be greater than previously thought. This follows research published by the European Commission with the Environmental Noise Directive (END) in 2002 which showed that equivalent levels of Aircraft Noise created greater annoyance than other modes of transport.
- 2.5 Sleep disturbance is one of the most common impacts described by people living with high levels of noise exposure. It can have a significant impact on quality of life, and people can typically feel a strong resentment where it is felt that their sleep has been disturbed.
- 2.6 The Airports Commission (2013) cited a well-established evidence base which has found noise-induced awakenings to have an adverse effect. It is however

³ Some aspects of the ANASE methodology have been questioned at peer review.

less clear as to what extent and level of noise exposure can result in a harmful loss of sleep, and whether lesser reactions to noise that do not involve awakening, can affect well-being. It does appear that even though some adaptation to night noise does occur, complete habituation does not occur, particularly for heart rate (See Physiological Health). It also appears that children are less likely to wake but their physiological reaction is greater.

3.0 Effects on Physical and Psychological Health

3.1 There are two significant ways in which this form of noise impact may affect people; hypertension, and mental health.

3.2 The links between noise and hypertension are fairly well established, with research finding that exposure to noise events can place the body under stress, even if there is no conscious reaction to the noise. When stressed, the body releases hormones that may to varying degrees increase heart rate and blood pressure, with the link between high blood pressure and cardiovascular diseases, strokes, chronic renal failure, and heart attack, already well-established. Acute noise exposure has also been linked to other forms of physiological activation including peripheral vasoconstriction with relative withdrawal of blood from the skin, and increased peripheral vascular resistance.

3.3 The European wide Hypertension and Exposure to Noise Near Airports study (HYENA, 2008) examined links between noise from aircraft and road traffic and Hypertension, finding there to be direct links between increased noise exposure and increased hypertension.

3.4 Other research has shown that increased noise may have an exacerbating effect on existing coronary heart disease conditions⁴. Dose-response relationship data has also found that risk of myocardial infarction increases above 60dBA and is significant at 70dBA, with an increased risk of coronary heart disease associated with sound levels above 65-70dBA.

3.5 Links between noise exposure annoyance and mental health have also been hypothesised, with studies identifying anxiety and depression as the most likely psychological symptoms⁵. However, it is acknowledged that further research is needed in this area.

4.0 Productivity and Learning Effects

4.1 Noise has been linked to impacts in two particular ways; cognitive impairment in children, and loss of productivity.

4.2 The most consistent observed effects of noise on children (particularly for children at primary school age) are recognised as being cognitive impairments.

4.3 Research has established a number of negative impacts in this regard, and tasks which involve central processing and language comprehension, such as

⁴ Noise: Babish, 2006; Smoking: Prescott et al. (1998); and lack of exercise: Hu et al. (2005) and Li et al. (2006).

⁵ Stansfeld, et al. (1993). Road traffic noise, noise sensitivity and psychological disorder; Hiramatsu, K., et al. (1997). A survey on health effects due to aircraft noise on residents living around Kadena airport in the Ryukyus; Hardoy, M.C., et al. (2005). Exposure to aircraft noise and risk of psychiatric disorders.

reading, attention, problem solving and memory appear to be most affected by noise exposure. Links between chronic noise exposure and children's cognition have also been suggested, including teacher and pupil frustration, learned helplessness, impaired attention, increased arousal, indiscriminate filtering out of noise during cognitive activities resulting in loss of attention, noise annoyance, and sleep disturbance⁶.

4.4 It has been shown that there is an association between high noise exposure and poor long-term memory and reading comprehension amongst children living around airports. Research has also suggested that the source of noise may be a factor, with the European RANCH study finding road traffic to have no observed effect of children's reading or memory, whilst observing impaired reading comprehension and recognition memory in children exposed to aircraft noise.

4.5 The Airports Commission (2013) notes that the productivity impacts of noise are more secondary in nature, and are linked to effects previously discussed, including sleep disturbance, health impact, links between academic performance and noise, and impacts in terms of workplace distraction.

5.0 Other Technical Guidance

Aircraft Noise

5.1 The Airports Commission (2013) observes that the metrics used to measure the long-term impact of aircraft noise has recently become a subject of some discussion. UK policy has historically identified $57_{Aeq,16h}$ as the threshold at which daytime noise marks the onset of significant community annoyance. However, it has been argued that the $57_{Aeq,16h}$ contour does not necessarily reflect the day-to-day experience of people living within the contour, who will tend to experience short bursts of intense sound, rather than a constant sound.

5.2 Further, it has been noted that significant annoyance may be experienced outside of the $57_{Aeq,16h}$ contour, as acknowledged in the Department of Transport's 2012 Draft Aviation Policy Framework (APF), although in responding to comments on the draft APF the Government has decided against using a lower value to mark the onset of significant community annoyance (Airports Commission, 2013).

5.3 With all forms of transportation in the UK, there are sound insulation schemes in place to help homes affected by noise. For aircraft noise, sound insulation schemes are triggered at $63dB L_{Aeq,16hr}$. Gatwick Airport also operate the Gatwick Home Relocation Scheme, which is designed to allow those affected by noise levels above $69dB L_{Aeq,16hr}$ to move home without losing money, as Gatwick Airport will cover all the costs, including the devaluation of the property price due to the increased noise.

Noise from Other Transport

5.4 Sound insulation grant schemes are in place in relation to other forms of transport. For Road Traffic Noise⁷, the grant is given when the façade level of road noise exceeds $68dB L_{A10,18hr}$ which is the equivalent to a free-field level of $63dB L_{Aeq,16hr}$. For Railway noise it is $66dB L_{Aeq,16hr}$.

⁶ Airports Commission (2013)

⁷ Noise Insulation Regulations, 1975: SI 1975:1763

