NORTH LONDON WASTE AUTHORITY

NORTH LONDON HEAT AND POWER PROJECT

ENVIRONMENTAL STATEMENT: VOLUME 2 APPENDICES 8.1 TO 8.4

AD06 . 02

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NORTH LONDON HEAT AND POWER PROJECT

ENVIRONMENTAL STATEMENT: VOLUME 2 APPENDIX 8.1 NOISE AND VIBRATION ASSESSMENT METHODOLOGY

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Environmental Statement Volume 2 Appendix 8.1 Noise and Vibration Assessment Methodology

AD06.02

The Planning Act 2008 The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5 (2)(a)

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1 Noise and Vibration Assessment Methodology

1.1 Introduction

1.1.1 This appendix sets out the methodology for assessing the likely significant effects of the Project on noise and vibration.

1.1.2 The term "sound" describes the acoustic conditions which people experience as a part of their everyday lives. The assessment considers how these conditions change through time and how sound levels would be likely to be modified by the Project. Noise is defined as unwanted sound and hence adverse effects and mitigation refers to noise mitigation e.g. 'noise' barriers. For simplicity, the term noise is used throughout this Environmental Statement (ES) as a descriptor. 'Vibration' is defined as the oscillation of solid objects. Vibration from certain activities can be experienced by direct transmission through the ground, known as ground borne vibration.

1.1.3 The need for the noise and vibration assessment has resulted from the potential for the Project to generate impact on:

a. people, primarily where they live ('residential receptors'); on an individual dwelling basis; and on a community basis, including any shared community open areas;

b. community facilities such as schools, hospitals, places of worship, commercial properties (collectively described as 'non-residential receptors'); and

c. ecological receptors such as those in the Lee Valley Regional Park, Epping Forest Special Area of Conservation, Walthamstow Site of Special Scientific Interest, Chingford Reservoir Site of Special Scientific Interest and Lee Valley Regional Park Site of Metropolitan Importance for Nature Conservation.

1.1.4 In this assessment, significant noise or vibration effects may be:

a. adverse due to an increase in noise levels or beneficial due to a decrease in noise levels caused by the Project;

b. temporary from construction or permanent from the operation of the Project; or

c. direct, resulting from the construction or operation of the Project, and/or indirect, e.g. resulting from changes in traffic patterns on existing roads caused by the construction or operation of the Project.

1.1.5 It is important to differentiate between impacts and effects. Based on the Institute of Environmental Management and Assessment Guidelines for Environmental Noise Impact Assessment[1] the following definitions are adopted for this assessment:

[1] Institute of Environmental Management and Assessment (2014) Guidelines for Environmental Noise Impact Assessment, October 2014.

a. noise impact: the difference in the acoustic environment before and after the implementation of the proposals (also known as the magnitude of change).

b. noise effect: the consequences of the noise impact. This may be in the form of a change in the annoyance caused, a change in the degree of intrusion or disturbance caused by the acoustic environment, or the potential for the change to alter the character of an area such that there is a perceived change in quality of life. This will be dependent on the receptor and its sensitivity.

1.1.6 Therefore it follows that:

a. an impact is a change in the environment.

b. an effect is what results from an impact on a receptor and is dependent on the receptor and its sensitivity.

c. as an impact increases in level, so the effect may increase either in terms of magnitude (e.g. noise change) or in terms of the number of receptors adversely affected (or both), to a point where either the level of exposure or the number of receptors exposed reach a point where the assessment needs to report the outcome as a likely significant effect consistent with the Environmental Impact Assessment (EIA) Regulations.

1.1.7 The elements of the Project identified for assessment within the noise and vibration assessment are as follows:

a. construction: includes an assessment of construction traffic, construction noise associated with activities in the Temporary Laydown Area and construction vibration.

b. operation: includes an assessment of operational traffic and will include acoustic mitigation measures in the design of operational plant to achieve compliance with noise policy and Environmental Permitting requirements. This will ensure no significant effects in EIA terms.

1.1.8 The Project can be split into four development stages, all of which are considered in the noise and vibration assessment. The construction assessment considers Stages 1, 2 and 3 while the operational assessment covers Stages 1, 2, 3 and 4. Additionally the effects of decommissioning the proposed Energy Recovery Facility (ERF) are assessed.

1.1.9 This appendix is divided into the following parts:

a. engagement: describing a summary of comments included in the Scoping Opinion and received on the Preliminary Environmental Information Report (PEIR) and through further stakeholder engagement and how these comments have been addressed;

b. legislation and guidance: detailing requirements of the relevant National Policy Statements (NPS), how these have been addressed and additional guidance relevant to the assessment;

c. methodology for establishing baseline conditions; and

d. methodology for the assessment of construction, operation decommissioning and cumulative effects.

1.2 Engagement

1.2.1 The Scoping Report recommended that construction noise and vibration be scoped out from the assessment. However, the Scoping Opinion included comments from London Borough of (LB) Enfield advising that vibration from construction activities should be scoped in, which following further discussion with LB Enfield, was identified as being due to justified complaints about vibration being received at considerable distances from construction vibration sources in the borough. On this basis it was agreed with LB Enfield to undertake a qualitative assessment of construction vibration. Although initially agreed with LB Enfield to scope out construction noise on the basis of the distance of the closest sensitive receptors to the Application Site, the Application Site boundary then changed to include the Temporary Laydown Area to the east of the main site. Given this brings construction works closer to sensitive receptors on Lower Hall Lane to the east, it was considered appropriate to scope construction noise from the Temporary Laydown Area back into the assessment.

1.2.2 In addition to engagement with LB Enfield, engagement has also been undertaken with the Environment Agency (EA) with regard to Environmental Permitting and in particular suitability of baseline noise measurements and operational plant noise criteria. Engagement with the EA is ongoing and to date has been subject to two position papers which are included in Volume 2 Appendix 8.3 for information.

1.2.3 Vol 2 Appendix 8.1 Table 1 sets out all the noise and vibration specific engagement and comments received relating to the EIA including responses to each of those comments setting out how the comment is addressed in the ES. This includes the comments in the Scoping Opinion on noise and vibration from the Secretary of State.

Vol 2 Appendix 8.1 Table 1: Noise and vibration engagement – comments and responses

No	Organisation (date)	Comment	Response
1	LB Enfield (February 2013)	Engagement on baseline survey location proposals and protocol.	Protocol accepted and locations for monitoring agreed.
2	Scoping response: Secretary of State (November 2014)	Noise and Vibration: "*The assessment of noise and vibration from construction/demolition plant and works is proposed to be scoped out due to the distance from ecological/residential receptors (at approximately 600m from the site). The Scoping Report also states that mitigation measures will be proposed to minimise noise and*	The British Standard (BS) 5228-1[2] states that "*at distances over 300m construction noise predictions have to be treated with caution, because of the increasing importance of meteorological effects*". At distances beyond 600m air absorption and ground attenuation would give rise to reductions of at least 70dB, as explained further in the response to

[2] BS5228 -1:2009 +A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.

No	Organisation (date)	Comment	Response
		vibration impacts. The Secretary of State does not agree to scope these aspects out as there is insufficient information on the location/characteristics/sensitivity of receptors or the characteristics/effectiveness of the mitigation measures in the Scoping Report." (para 3.11 bullet iv)	Scoping Opinion para 3.43 below. It is therefore considered that there are unlikely to be any significant effects from construction/demolition works associated with the Project. Mitigation measures to minimise noise and vibration impacts during construction are contained within the Code of Construction (CoCP) (Vol 1 Appendix 3.1). Further engagement was undertaken with LB Enfield in February 2015 and agreement was reached to scope out construction noise. However, since agreement was reached in February 2015, the Application site boundary of the Project has changed to incorporate a Temporary Laydown Area to the east. This area is within 300m of sensitive receivers so construction noise assessment is now to be undertaken for construction activities occurring on the Temporary Laydown Area.
3		Noise and Vibration: "*The baseline conditions for the assessment should be accurate and based on reliable and up to date data. Attention is drawn to the comments from the EA which state that the noise data gathered to date is inadequate. The ES should demonstrate that noise monitoring has been carried out to the relevant British Standards guidelines (e.g. BS7445)."* (para 3.39)	It is considered that data collected is adequate to assess for EIA purposes the impact of the development on its surroundings as the measurements were taken at locations around the Application Site which represent sensitive receiver locations either now or for future committed development. Further engagement is currently being undertaken with the EA to discuss comments raised within regard to survey data.
4		Noise and Vibration: "*Paragraph 9.3.7 of the Scoping Report states that the potential direct effects are considered to be those arising from construction or operation within 300m of the site. A justification to support this distance (e.g. in terms of the pathways for potential effects) is not provided. The Secretary of State recommends that the methodology and choice of receptors should be fully explained in the ES and agreed with the relevant Environmental Health Department of the Council and with the EA.*" (para 3.40)	As above for the response to para 3.11 bullet iv of the Scoping Opinion - at distances over 300m construction noise predictions have to be treated with caution. Further engagement with LB Enfield, has been undertaken to gain acceptance/agreement of the methodology and receptor locations.
5		Noise and Vibration: "*Paragraph 9.3.16 explains that appropriate noise targets will be identified and*	LB Enfield have confirmed a requirement to limit operational noise to 10dB below the background noise

No	Organisation (date)	Comment	Response
		incorporated into the project design to ensure that it does not have an unacceptable impact on the surrounding area. The targets are proposed to be described in the Design and Access Statement which will accompany the application. However, the Secretary of State considers that all assumptions used to inform the assessment should be identified in the ES. This should also include the type and number of vehicles and plant used during both the construction and operational phases." (para 3.41)	level. The noise criteria are currently being discussed and agreement is expected post submission of this ES. Therefore for the purposes of the ES, where necessary, acoustic mitigation will be incorporated in the design to achieve compliance with the criteria agreed with LB Enfield and the EA. This will ensure non-significance in EIA and noise policy terms. The number of vehicles and type of plant used during the Project development stages is set out in Volume 1 of the ES.
6		Noise and Vibration: "*The noise and vibration assessments should take account of the traffic movements along access routes, especially during the construction phase. The results from the noise and vibration assessments will also provide information to inform the ecological assessments therefore the ES should cross-reference to relevant chapters/appendices as appropriate*." (para 3.42)	The noise and vibration assessment takes account of traffic movements along access routes during both construction and operational phases. The noise and vibration effects on ecological receptors is contained in Vol 2 Section 5 (Ecology). A cross-reference is provided from the noise and vibration assessment.
7	Scoping response: Secretary of State, LB Enfield (November 2014)	Noise and Vibration: "*The Secretary of State notes that the Scoping Report refers to the potential use of piling techniques to construct the foundations. The potential noise and vibration effects of this activity should be assessed.*" (para 3.43) LB Enfield- "*It is considered that with regard Noise & Vibration the issue of potential noise from construction should be scoped in, with particular reference to any potential noise from piling activities*". (Appendix 2)	With receivers at distances beyond 600m, air absorption and ground attenuation would give rise to reductions of at least 70dB meaning that noise levels at the receiver (from piling) could be reduced from 127dB to 57dB. This would be below the threshold set out in guidance (BS5228 category A[2]) for potential significant effects. Typical measured baseline noise levels at locations around the Application Site range between 53 – 79dBL_{Aeq}. It is therefore considered unlikely that there would be significant effects from piling and no additional mitigation will be necessary. Further engagement was undertaken with LB Enfield in February 2015 when it was agreed that it is unlikely that there would be significant effects from piling and therefore assessment is not required and no additional mitigation is necessary. However, since agreement was reached in February 2015, the Application Site boundary of the Project has changed to incorporate a Temporary Laydown Area to the east. This area is within

No	Organisation (date)	Comment	Response
			300m of sensitive receivers so a construction noise assessment is now undertaken for construction activities occurring on the Temporary Laydown Area.
8	Scoping response: Secretary of State (November 2014)	Noise and Vibration: "*The ES should describe clearly the proposals for mitigating any potentially significant adverse effects. This should include consideration of how noise generated during construction and operation could be monitored.*" (para 3.44)	The CoCP (Vol 1 Appendix 3.1) details mitigation measures including noise and vibration monitoring to control construction and demolition noise to ensure there are no significant effects.
9	EA (February 2015)	The EA raised the following additional comment at a meeting on 18 February 2015: • Adequacy of data is questioned as surveys were undertaken whilst the current site was operational. The EA stated that in order to understand noise levels for the operational phase the baseline data should be collected without the existing site noise levels (i.e. without the site being operational). The EA recommended that reference be made to BS4142 (2014)[6] to identify an approach for measuring/calculating what the noise levels would be like without the existing facility. The EA also queried whether the baseline data that would be used for the EIA would also be used for the environmental permit.	The Applicant is satisfied that the survey data contained in the Scoping Report is compliant with previous and current guidance in terms of noise monitoring protocol and scope (i.e. British Standards and H3 Horizontal Guidance). Both surveys were undertaken following BS7445:2003[3] and BS4142:1997[4] guidance which represented the relevant and correct guidance at the time of the surveys. They also comply with the new BS4142:2014[5]. The noise surveys in June/July 2013 also encompass the survey requirements set out in the Environmental Permitting Regulations: Integrated Pollution Prevention and Control H3 Horizontal Guidance for Noise Part 2 (2004)[6]. All noise surveys were carried out while the existing EfW facility was operating, as it is a long-established 24-hour operation and is considered to contribute to the existing background noise climate in this urban environment. The noise surveys showed that the noise climate in the vicinity of the Application Site is dominated by road traffic noise associated with the North Circular Road (A406). The background noise data provided is therefore considered valid. Two position papers have been produced

[3] BS 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures.
[4] BS 4142:1997 Method for rating industrial noise affecting mixed residential and industrial areas.
[5] BS 4142:2014 Methods for rating and assessing industrial and commercial sound.
[6] Horizontal Guidance Note H3 (part 2) - Integrated Pollution Prevention and Control Horizontal Guidance for Noise Part 2 – Noise Assessment and Control.

No	Organisation (date)	Comment	Response
			since the PEIR with meetings conducted with the EA to discuss each position paper. The two position papers are included in Volume 2 Appendix 8.3 for information. Engagement is continuing with the EA to further discuss the issues raised.
10	Phase 2 Consultation response: LB Enfield (June 2015)	LB Enfield advises that the Councils standard requirement is that noise from any plant must be 10dB below the lowest measured background level during operational hours.	The noise criteria are currently being discussed and agreement is expected post submission of this ES. Therefore for the purposes of the ES where necessary, acoustic mitigation will be incorporated in the design to achieve compliance with the criteria agreed with LB Enfield and the EA. This will ensure non-significance in EIA and noise policy terms.
11	Phase 2 Consultation response: Secretary of State (June 2015)	The Planning Inspectorate considers that the cooling systems associated with the ERF have the potential to emit noise which needs to be assessed.	Operational plant noise including cooling systems will be designed with acoustic mitigation incorporated into the design to achieve compliance with the criteria agreed with LB Enfield and the EA. This will ensure non-significance in EIA and noise policy terms

1.3 Legislation and guidance

General

1.3.1 The National Planning Policy Framework[7] took effect in 2012 to define the Government's planning policies for England. This is directly applicable to development consent applications. In the case of environmental noise, the National Planning Policy Framework planning objectives are addressed through the Noise Policy Statement for England (NPSE)[8]. The NPSE states the following aims:

> "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
>
> - *avoid significant adverse health 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."*

[7] Department for Communities and Local Government (2012); National Planning Policy Framework http://www.communities.gov.uk/publications/planningandbuilding/nppf (accessed July 2015)
[8] Department for Environment Food and Rural Affairs (2010), Noise Policy Statement for England.

1.3.2 Within these aims, the NPSE uses the key phrases 'significant adverse' and 'adverse'. In clarifying what these mean the NPSE notes that:

> *"There are two established concepts from toxicology that are currently being applied to noise effects, for example, by the World Health Organization. They are:*
>
> a. *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.*
>
> b. *LOAEL – Lowest Observed Adverse Effect Level*
> *This is the level above which adverse effects on health and quality of life can be detected.*"

1.3.3 The Policy extends these concepts to include:

> c. *"SOAEL – Significant Observed Adverse Effect Level*
> *This is the level above which significant adverse health effects on health and quality of life occur*."

1.3.4 These terms are adopted in the Government's Noise Planning Practice Guidance (NPPG) [9], which presents example outcomes to help characterise these effects. In general terms an observed adverse effect (i.e. above the LOAEL threshold) is characterised in the NPPG as perceived as *"noticeable and intrusive"*. In terms of an example outcome, it states:

> *"Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life."*

1.3.5 The NPSE states that these effects should be mitigated and reduced to a minimum.

1.3.6 The NPPG characterises SOAEL as perceived as *"noticeable and disruptive"*. In terms of an example outcome, it states:

> *"The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area."*

1.3.7 The NPSE states that these effects should be avoided.

[9] Department for Communities and Local Government (2012) National Planning Practice Guidance – Noise, http://planningguidance.planningportal.gov.uk/blog/guidance/noise/noise-guidance/ (Revision date: 6 March 2014).

1.3.8 The NPPG describes a further level of effect: Unacceptable Adverse Effect Level (UAEL). The NPPG characterises UAEL as perceived as *"noticeable and very disruptive"*. In terms of an example outcome, it states:

> *"Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory"*

1.3.9 The NPSE states that these effects should be prevented.

1.3.10 The NPSE notes that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.

1.3.11 Under Government noise policy and practice guidance, it is clear that defining Project specific SOAELs for the noise sources under consideration in this assessment is a key step.

1.3.12 Any receptor forecast to experience an overall exposure from the Project that exceeds the relevant SOAELs is identified as being subject to significant adverse impact on health and quality of life (under Government noise policy) and hence identified as a likely significant adverse effect in this assessment. As these significant effects generally relate to disruption of activities indoors, off-site mitigation (e.g. noise insulation) can be used to avoid the significant effect, provided mitigation within the Project (e.g. alternative construction processes or noise barriers) has first been maximised as far as is sustainable.

1.3.13 Where outdoor space associated with the a dwelling is also significantly affected then, as set out in Planning Practice Guidance (PPG) - Noise this can be "*offset if the residents of those dwellings have access to:*

a. *a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;*

b. *a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or;*

c. *a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;*

d. *a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minute walking distance).*"

1.3.14 Where the noise level from the Project is between LOAEL and SOAEL, NPSE (Department for Environment, Food and Rural Affairs (Defra), 2010) states:

"*all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur*."

1.3.15 The EIA process requires that likely significant effects are identified along with the envisaged mitigation to avoid or reduce adverse significant effects. The EIA therefore has to define significance criteria that enable impacts that are 'adverse impacts' in Government policy terms to be identified, where necessary, as likely significant effects in the EIA. This aligns the triggering of mitigation under both the EIA process and government noise policy.

1.3.16 Where the effects are adverse in policy terms (i.e. not significant) then other factors such as the number of dwellings affected can result in the effects being reported as likely significant effects in the ES. The approach adopted is set out in greater detail later in this appendix. This approach has precedent in the assessment of other major infrastructure projects such as High Speed Two the Forth Replacement Crossing and the Thames Tideway Tunnel.

1.3.17 In addition to the above, the following policy and guidance has been considered in the development of the methodology for the assessment of construction noise and vibration for the Project:

a. British Standard 5228: 2009+A1:20142: provides guidance on the assessment of noise from construction operations and describes methods for evaluation of the significance of noise effects. Annex E describes the 'ABC' method of assessment, based upon which it is proposed to establish the threshold of potential significant effect at residential receptors. The Standard contains detailed information on noise reduction measures and promotes the 'best practicable means' approach to control noise and minimise the effect on local residents and construction workers.

b. The Control of Pollution Act 1974[10]: gives the Local Authority powers requiring the control of site noise under Section 60 of the Act. Under Section 61, the developer or contractor intending to carry out the works may apply in advance for a consent as to the methods by which the works are to be carried out. This may include specific controls to restrict certain activities identified as causing particular problems. Conditions regarding hours of operation will generally be specified and noise and vibration limits at certain locations may be applied in some cases. All requirements must adhere to established guidance and be consistent with best practicable means to control noise only as far as is necessary to prevent undue disturbance.

1.3.18 Operational noise from plant will be assessed using BS4142:2014[5] to achieve compliance with the criterion as defined in discussions with LB Enfield and the EA, taking into account:

[10] Control of Pollution Act, 1974, The Stationery Office.

a. the relative level (and character) of the operational industrial noise relative to the background noise level;

b. the absolute level of noise;

c. the character of noise from the proposed facility compared to that of the existing residual or ambient noise; and

d. the sensitivity of the receptor.

Nationally Significant Infrastructure Projects

1.3.19 Planning policy for Nationally Significant Infrastructure Projects (NSIPs), is contained in the NPS. The NPS provide the policy framework within which decisions on NSIPs are made.

1.3.20 There are two NPS' of direct relevance to the Project. These are:

a. EN-1 – Overarching National Policy Statement for Energy

b. EN-3 – National Policy Statement for Renewable Energy Infrastructure

1.3.21 Vol 2 Appendix 8.1 Table 2 details the requirements from EN-1 which are relevant to noise and vibration. How this requirement has been addressed and where further details on how the requirement has been addressed is also described.

Vol 2 Appendix 8.1 Table 2: Noise and vibration NPS EN-1 requirements

Requirements of NPS EN-1	How the requirement is addressed	Location of where to find further detail
Para 5.11.4 of this NPS notes that the applicant should include the following in the noise assessment: A description of the noise generating aspects of the development proposal leading to noise impacts, including the identification of any distinctive, tonal, impulsive or low frequency characteristics of the noise	Construction activities which might give rise to noise impacts are identified. Operational noise associated with loading and unloading, mobile plant and vehicles, industrial processes and fixed plant installations have been identified. Acoustic mitigation will be incorporated in the design to achieve compliance with the criteria agreed with LB Enfield and the EA. This will ensure non-significance in EIA and policy terms.	Construction noise - Vol 2 Section 8.7 Operational plant noise - Vol 2 Section 8.8
Para 5.11.4 of this NPS notes that the applicant should include the following in the noise assessment: Identification of noise sensitive premises and noise sensitive areas that may be affected;	The assessment area has been defined around the Application Site for both construction and operational effects and the potential sensitive receivers have been	Vol 2 Appendix 8.1 Plate 1 and Vol 2 Figure 8.1 (Measurement and receptor locations) Vol 2 Section 8.5 (Baseline) for receptor

Requirements of NPS EN-1	How the requirement is addressed	Location of where to find further detail
	identified.	locations.
Para 5.11.4 of this NPS notes that the applicant should include the following in the noise assessment: Description of the characteristics of the existing noise environment	The noise environment characteristics are described in Vol 2 Section 8.5 of the ES.	Vol 2 Section 8.5
Para 5.11.4 of this NPS notes that the applicant should include the following in the noise assessment: A prediction of how the noise environment will change with the proposed development in the shorter term such as during the construction period, at particular times of the day, evening and night as appropriate	The assessment of construction noise impacts is scoped out, with the exception of the assessment of construction activities to be undertaken in the Temporary Laydown Area, the assessment of which is contained in Vol 2 Section 8.7.	Vol 2 Section 8.7
Para 5.11.4 of this NPS notes that the applicant should include the following in the noise assessment: A prediction of how the noise environment will change in the longer term during the operating life of the infrastructure; at particular times of the day, evening and night as appropriate	The operational noise assessment predicts noise emissions throughout the operational life of the ERF and RRF. These emissions will be controlled, using acoustic mitigation measures, where necessary, in the design, to achieve compliance with the criteria agreed with LB Enfield and the EA, which are applicable throughout the operating life of the infrastructure, at all times of day. This will ensure non-significance in EIA and policy terms. It is not possible to include a detailed assessment in the ES but it can be concluded that effects from operational noise would be not significant on the basis of the noise criteria imposed through the ES.	Vol 2 Section 8.8
Para 5.11.4 of this NPS notes that the applicant should include the following in the noise assessment: An assessment of the effect of predicted changes in the noise	As above	Vol 2 Section 8.8.

Requirements of NPS EN-1	How the requirement is addressed	Location of where to find further detail
environment on any noise sensitive premises and noise sensitive areas		
Para 5.11.4 of this NPS notes that the applicant should include the following in the noise assessment: Measures to be employed in mitigating noise	Embedded mitigation measures to control noise and vibration effects during construction are set out in the CoCP. The operational noise assessment determines the requirement for acoustic mitigation which will be implemented.	CoCP – Vol 1 Appendix 3.1 Vol 2 Section 8.8
Para 5.11.4 of this NPS notes that the applicant should include the following in the noise assessment: The nature and extent of the noise assessment should be proportionate to the likely noise impact.	Appropriate assessment areas and methodologies have been selected for the assessment of noise and vibration during construction and operation.	Vol 2 Appendix 8.1 Section 1.5 and 1.6 below.
Para 5.11.5 – The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should also be considered	The noise impact of increased road traffic movements have been considered in the assessment reported in the ES.	Project traffic assessment - Vol 2 Section 8.7. Cumulative traffic assessment – Vol 2 Section 8.12.
Para 5.11.6 – '*Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance.' Further information may be found in EN-3 and EN-5. 'For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies.*'	Construction noise has been assessed, the methodology for which is described in Section 1.5 below. This is in accordance with relevant British Standards and other noise guidance. A detailed assessment of operational noise is not included in the ES, however, acoustic mitigation measures will be incorporated in the design to achieve compliance with the criteria agreed with LB Enfield and the EA. This will ensure non-significance in EIA and policy terms. The assessment to inform the Environmental Permit will be undertaken in	Construction noise – Vol 2 Appendix 8.1 Section 1.5. Operational noise - Vol 2 Appendix 8.1 Section 1.6.

Requirements of NPS EN-1	How the requirement is addressed	Location of where to find further detail
	accordance with relevant British Standards and other noise guidance. The methodology for this is described in Section 1.6 below.	
Para 5.11.7 – *The applicant should consult the EA and Natural England as necessary and in particular regard to the assessment of noise on protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potential affected species in nearby sites may also need to be taken into account.*	Engagement is ongoing with the EA. Natural England are engaged with regard to the ecology assessment (Vol 2 Section 5), which includes consideration of noise effects on ecological receptors.	Engagement described in Vol 2 Section 8.2 (with regard to EA) and Vol 2 Section 5.2 (with regard to Natural England).
Para 5.11.8 –'*The project should demonstrate good design through selection of the quietest cost-effective plant available; containment of noise within buildings wherever possible, the use of landscaping, bunds or noise barriers to reduce noise transmission*.'	The selection of plant and mitigation for operation in the design would comply with the requirements of BS4142:2014 and requirements identified by the EA (through the Environmental Permitting process).	Vol 2 Section 8.8
Para 5.11.9 of this NPS notes that proposals should meet the following aims, and that the IPC should be satisfied that these have been met before they may grant development consent:		
'avoid significant adverse impacts on the health and quality of life from noise;'	The assessment included within the ES does not identify significant adverse impacts.	Vol 2 Sections 8.7, 8.8 and 8.9.
'mitigate and minimise other adverse impacts on health and quality of life from noise;'	The assessment included within the ES does not identify other adverse impacts.	Health information is contained in the Health Impact Assessment provided as part of the DCO submission.
'*where possible, contribute to improvements to health and quality of life through effective management and control of noise*.'	The assessment included within the ES does not identify significant adverse impacts.	Vol 2 Sections 8.7, 8.8 and 8.9. Health information is contained in the Health Impact Assessment provided as part of the DCO submission.
Para 5.11.10 – *measureable requirements or specified mitigation measurements may be required by the IPC when preparing the development consent order to*	The ES does not identify specific mitigation, however, it does acknowledge that the selection of	Vol 2 Section 8.8

Requirements of NPS EN-1	How the requirement is addressed	Location of where to find further detail
'ensure that noise levels do not exceed any limits specified in the development consent'	operational plant will need to provide appropriate levels of noise control to achieve compliance with the noise criteria, The criterion will be defined by the EA and LB Enfield discussions, post submission of this ES. This will ensure no significant noise effects.	
Para 5.11.11 *'The IPC should consider whether mitigation measurements are needed both for operational and construction noise over and above any which may form part of the project application.' In doing so requirements may be imposed. 'Any such requirement should take account of the guidance set out in Circular 11/95 or any successor to it*.'	No mitigation beyond that embedded within the Project design is identified as being required in the assessment.	N/A
Para 5.11.12 of this NPS notes mitigation measurements which may be required:		
'engineering: reduction of noise at point of generation and containment of noise generated;'	Noise is considered and managed within the Project design.	Vol 2 Section 8.8
'lay-out: adequate distance between source and noise-sensitive receptors; incorporating good design to minimise noise transmission through screening by natural barriers, or other buildings;'	Noise is considered and managed within the Project design.	Vol 2 Section 8.8
'*administrative: restricting activities allowed on the site; specifying acceptable noise limits; and taking into account seasonality of wildlife in nearby designated sites*.'	Noise mitigation measures will be incorporated to achieve compliance with the noise criteria, The criterion will be defined in discussion with the EA and LB Enfield, post submission of this ES. This will ensure no significant noise effects.	Vol 2 Section 8.8

1.3.22 Vol 2 Appendix 8.1 Table 3 details the requirements from EN-3 which are relevant to noise and vibration. How this requirement has been addressed and where further details on how the requirement has been addressed is also described.

Vol 2 Appendix 8.1 Table 3: Noise and vibration NPS EN-3 requirements

Requirements of NPS EN-3	How the requirement is addressed	Location of where to find further detail
Para 2.5.53 of this NPS notes '*specific considerations which apply to EfW [Energy-from-Waste] generating stations'* with sources of noise and vibration including: • delivery and movement of fuel and materials; • processing waste for fuel at EfW generating stations; • the gas and steam turbines that operation continuously during normal operation; • external noise sources such as externally-sited air-cooled condensers that operate continuously during normal operation.	The potential sources of operational noise associated with the Project are identified in Vol 2 Section 8. This includes incorporating acoustic mitigation measures in the design to achieve compliance with the noise criteria, The criterion will be defined, in discussion with the EA and LB Enfield, post submission of this ES.	Vol 2 Section 8.8
Para 2.5.54 – '*The ES should include a noise assessment of the impacts on amenity in case of excessive noise from the project as described in Section 5.11 in EN-1*.'	The effects on amenity has been considered in the ES with acoustic mitigation to achieve compliance with the noise criteria, The criterion will be defined in discussion with the EA and LB Enfield, post submission of this ES. This will ensure no significant noise effects.	Vol 2 Section 8.8
Para 2.5.57 – '*The primary mitigation for noise for EfW generating stations is through good design to enclose plant and machinery in noise-reducing buildings, wherever possible, and to minimise the potential for operations to create noise.*	Noise is considered and managed within the Project design. The operational noise section of this ES will incorporate acoustic mitigation measures in the design to achieve compliance with the noise criteria, The criterion will be defined in discussion with the EA and LB Enfield, post submission of this ES.	Vol 2 Section 8.8
Para 2.5.58 – '*Noise from features including sorting and transport of materials during operation of EfW generating stations is unavoidable. Similarly noise from apparatus external to the main generating station may be unavoidable. This can be mitigated though careful plant*	As above	As above

Requirements of NPS EN-3	How the requirement is addressed	Location of where to find further detail
selection.		

Local policy

1.3.23 Ongoing discussions are being held with the EA to reach agreement on operational noise criteria. These will inform the ES and form the basis of the discussions with LB Enfield.

1.3.24 In terms of the ES acoustic mitigation would be incorporated in the design of the Project such that compliance with the agreed criteria would be achieved. This will ensure that there are no significant effects in EIA or noise policy terms.

1.4 Baseline conditions

Current baseline

1.4.1 A noise survey has been undertaken to establish the baseline noise levels at a number of different types of noise sensitive receptors in the vicinity of the Application Site as shown in Vol 2 Appendix 8.1 Plate 1.

1.4.2 The noise survey locations were chosen to represent the nearest identified existing and future noise sensitive receptors (i.e. residential receivers) to the Application Site. Future receptors were identified from the development schedule provided in Vol 1 Appendix 5.2. A description of the receptors is provided in Vol 2 Appendix 8.1 Table 4.

1.4.3 Both attended and unattended baseline surveys were undertaken, the methodology for both is described below.

1.4.4 The noise assessment and monitoring locations were discussed and agreed with LB Enfield prior to undertaking the surveys.

Vol 2 Appendix 8.1 Plate 1: Measurement and receptor locations

Vol 2 Appendix 8.1 Table 4: Measurement and receptor locations

Measurement location no.	Description	Co-ordinates		Distance and direction from Application Site boundary
		X	Y	
1	Residential – representing sensitive receiver locations in Russell Road Both attended and unattended surveys at this location.	536548	192830	502m north-east
2	Residential – representing sensitive receiver locations on Lower Hall Lane Both attended and unattended surveys at this location.	536393	192540	150m east
3	Residential – representing future sensitive receiver locations in the Meridian Water Masterplan development. Both attended and unattended surveys at this location.	536050	192122	215m south
4	Residential – representing future sensitive receiver locations in the Meridian Water Masterplan	535610	192116	121m south-west

Measurement location no.	Description	Co-ordinates		Distance and direction from Application Site boundary
		X	Y	
	development. Attended measurements only at this location.			
5	Amenity - representing recreational users along the River Lee Navigation. Both attended and unattended surveys at this location.	535863	192457	Within Application Site boundary
6	Residential - representing future sensitive receiver locations in the Meridian Water Masterplan development. Both attended and unattended surveys at this location.	535092	192450	565m west
7	Residential - representing sensitive receiver locations on Zambezie Drive. Both attended and unattended surveys at this location	535413	193294	125m west

Attended surveys

1.4.5 The attended surveys were conducted by Arup at the following times:

a. 28 February 2013: between 14:07 and 17:34, and 20:10 and 22:09;

b. 1 March 2013: between 00:00 and 03:25, 12:29 and 16:11, and 20:00 and 21:46;

c. 23 June 2013: between 10:07 and 16:50;

d. 24 June 2013: between 00:59 and 03:59;

e. 27 June 2013: between 00:59 and 03:48, 11:24 and 15:22, and 20:02 and 23:15.

1.4.6 The sound level meter was set to record noise levels over 15 minute periods during the daytime between 10:00-17:00, ten minute periods during the evening between 20:00-22:00 and, five minute periods during the night between midnight and 03:00. For each noise measurement, the noise climate, wind speed and direction, and the measured noise levels, were all recorded and noted. The meter was set to automatically store the L_{Aeq}, L_{Amin}, L_{Amax}, L_{A10} and L_{A90} indices. Measurements were made with a fast (0.125s) time constant.

1.4.7 The measurements were made with the measurement microphone mounted using a tripod 1.2m-1.5m above ground level under acoustically free field conditions (i.e. at least 3.5m from any acoustically reflecting surface other than the ground). A windshield was fitted over the microphone at all times during the survey period to minimise the effects of any wind induced noise.

1.4.8 The weather conditions during all the survey periods comply with the requirements for undertaking noise surveys.

1.4.9 Windspeeds were recorded during each survey, with almost 50 per cent of the surveys recording no wind in the air to measure, i.e. still conditions. The remainder where wind speeds were recorded, at the maximum wind speed recorded, winds gusted to no greater than 4.5ms^{-1} and were generally from a northerly direction.

1.4.10 Measurements were carried out using equipment as detailed in Vol 2 Appendix 8.1 Table 5. The sound level meter and microphone are Type 1, conforming to BS EN 61672-1: 2013[11]. The calibration of the sound level meter, pre-amplifier and microphone chains were checked before and after use, to confirm that there was no significant drift in meter response at the calibrator frequency and level. All Arup's sound level meters are regularly calibrated and this calibration is traceable to international standards. The noise measurement surveys were carried out in accordance with the principles of BS7445-1:20033.

Vol 2 Appendix 8.1 Table 5: Noise survey equipment list

Measurement equipment	Manufacturer	Type number	Serial number
Precision grade noise logging sound level meter	Brüel & Kjær	2260	2370442
½" diameter pre-polarised condenser microphone	Brüel & Kjær	4189	1903808
Type 1 sound pressure calibrator	Brüel & Kjær	4231	2402714
Precision grade noise logging sound level meter	Norsonic	NOR 140	1403425; 1403431
½" diameter pre-polarised condenser microphone	Norsonic	NOR 1225	98510; 98540
Pre-amplifier	Norsonic	NOR 1209	12578; 12579
Type 1 sound pressure calibrator	Rion	NC74	35173565; 35015347; 35173564; 34336007; 34336008; 34773051; 34904968
Precision grade noise logging sound level meter	Rion	NL52	00620958; 00231670; 00231671
Precision grade noise logging sound level meter	Rion	NL32	00451285; 00493036

[11] BS EN 61672-1: 2013 Electroacoustics. Sound level meters. Specifications. BSI 2013.

Measurement equipment	Manufacturer	Type number	Serial number
Pre-amplifier	Rion	NH21	15278; 29978
Pre-amplifier	Rion	NH25	20999; 21614; 21615
½" diameter pre-polarised condenser microphone	Rion	UC53	308532; 315941
½" diameter pre-polarised condenser microphone	Rion	UC59	03876; 04715; 04716

Unattended surveys

Unattended survey periods

1.4.11 A number of unattended noise surveys were set up at the locations shown in Vol 2 Appendix 8.1 Plate 1. The logging meters were set to run over the following periods:

a. Location 1: between 28 February 2013 and 1st March 2013
b. Location 1: between 21 June 2013 and 28 June 2013
c. Location 2: between 21 June 2013 and 28 June 2013
d. Location 3: between 27 June 2013 and 2 July 2013
e. Location 5: between 21 June 2013 and 28 June 2013
f. Location 6: between 27 June 2013 and 2 July 2013
g. Location 7: between 27 June 2013 and 2 July 2013

1.4.12 It was not possible to install logging equipment at location 4 due to access and security issues.

Unattended survey methodology

1.4.13 The NL52, NOR140 and B & K2260 logging meters were set to record noise levels over 15-minute periods for 12 hours to cover three periods; the interpeak period (daytime), late evening period and night time. The meters were set to automatically store the L_{Aeq}, L_{A10}, L_{A90} and $L_{Amax,F}$ indices. Measurements were made with a fast (0.125s) time constant.

1.4.14 The measurements were made with the measurement microphone mounted using a tripod approximately 1.2m-1.5m above ground level under acoustically free field conditions (i.e. at least 3.5m from any acoustically reflecting surface other than the ground).

1.4.15 A windshield with bird spikes was fitted over the microphone at all times during the survey period to minimise the effects of any wind induced noise, and also to prevent birds from perching on the equipment.

1.4.16 The measurement locations were chosen to provide a representative indication of the typical ambient noise levels across the Project assessment area.

1.4.17 The weather conditions during all surveys were dry and variable with wind speeds less than 4ms^{-1} generally from the north-east, complying with the requirements for undertaking noise surveys.

Receptor identification and sensitivity

1.4.18 Receptor sensitivity is classified in the Institute of Environmental Management and Assessment 'Guidelines for Environmental Noise Impact Assessment'1. The guidance notes that residential dwellings would be considered sensitive but that other uses can also be considered similarly sensitive, and likely to be adversely affected by the Project.

1.4.19 It is considered for this assessment that people, primarily as residential receptors are highly sensitive receptors, as well as schools and hospital uses. Other non-residential receptors such as places of worship and commercial properties are considered to be medium sensitivity receptors.

1.4.20 Residential receptors for the noise and vibration assessment are the same as those identified for the monitoring locations as set out in Vol 2 Appendix 8.1 Plate 1 and Vol 2 Appendix 8.1 Table 4 above.

Future baseline

1.4.21 The future baseline for the Project has been taken as the existing baseline situation, i.e. the various noise sources and receivers which characterise the locality and are relevant to the assessment. The baseline noise measurement surveys are considered to represent the future baseline noise climate as no particular changes are expected.

1.4.22 In addition, information on developments in the area close to the Application Site that have extant planning permissions has been used to identify any additional future receptors for consideration in the baseline and assessment.

1.5 Construction effects

1.5.1 The construction assessment of noise and vibration covers the following aspects:

a. construction noise impacts – from Temporary Laydown Area construction activities only;

b. construction vibration impacts; and

c. road traffic impacts – assessing total generated flows during the project development stages (i.e. construction and operational generated flows).

1.5.2 The methodology for the assessment of each of these is contained in this section.

Assessment of Project stages

1.5.3 The construction noise assessment considers activities which take place in the Temporary Laydown Area only. These occur during Stages 1, 2 and 3. The assessment of construction noise arising from the Temporary Laydown Area begins in Stage 1b when it would be operational, following establishment of the area in Stage 1a.

1.5.4 Stage 2 construction activities are summarised as minor construction and landscaping works. During Stage 2 the Temporary Laydown Area is assumed to be in use and an assessment of noise impacts during this stage assumes that the same activities would be taking place, as for Stages 1b-1d.

1.5.5 During Stage 3 the existing EfW facility would be decommissioned and demolished. During Stage 3 the Temporary Laydown Area continues to be in use and an assessment of noise impacts during this stage assumes that the same activities would be taking place, as for Stages 1b-1d.

1.5.6 The qualitative construction vibration assessment considers activities across the Application Site during all development stages of construction i.e. Stages 1a, 1b, 1c, 1d, 2 and 3.

1.5.7 Road traffic noise levels have been predicted for the starting year for each Project stage, both with and without the development to determine the noise impact. All stages are assessed in the traffic noise assessment taking account of total generated flows in each stage (i.e. construction and operational generated traffic).

Assessment area

1.5.8 The assessment area is dependent upon the type of noise or vibration source being considered.

1.5.9 The assessment considers construction noise from the Temporary Laydown Area to receptors within approximately 300m of the Application Site boundary. Those receptors further away have been scoped out of the assessment.

1.5.10 The assessment also considers construction vibration from the Application Site to receptors within approximately 300m of the Application Site boundary. Again, those receptors further away have been scoped out of the assessment.

1.5.11 The assessment of traffic noise identifies the most sensitive receptors as those receptors closest to the roads used by traffic generated by the Project.

Assessment method

Construction noise

1.5.12 The assessment of construction noise effects is made by comparing predicted noise levels during construction against the future base case. The impact associated with change in noise level is evaluated along with

other parameters, such as the number of receivers and their sensitivity, to assess the significance of the effect.

1.5.13 The assessment process and rationale is provided below, but in summary the assessment is carried out in a step by step process as follows:

1. Identify relevant sensitive receptors for construction noise.
2. Determine typical ambient noise levels at or close to the receptors identified.
3. Identify the relevant construction areas and activities that are likely to take place in that area, as well as the embedded mitigation measures agreed for the Project construction processes.
4. Prediction of noise from construction activities using the BS5228 noise calculation method and assessment parameters.
5. Establish the threshold of potential significant effect at residential receptors, based on typical ambient noise levels, using the ABC method in Annex E of BS5228- 1:2009+A1:2014.
6. Determine the *potential* significance in EIA terms, of any exceedance of the threshold ABC category as identified.
7. Determine the final assessment of significance of construction noise based on a number of other factors and professional judgment.
8. Determine significance in Government policy terms, based on Project defined thresholds for SOAEL and LOAEL.

1.5.14 The above steps are used in this assessment, and the detail of this approach is as follows.

1.5.15 Step 1: First, the relevant sensitive receptors are identified by carrying out a desktop study of mapping information to establish which are the closest high sensitivity receptors to the Application boundary.

1.5.16 Step 2: The second step is to determine the typical ambient noise levels at or close to the receptors identified. The baseline ambient noise levels for this Project are determined from the baseline noise surveys and are identified and tabulated in Vol 2 Section 8.5.

1.5.17 Step 3: The third step is then to identify the relevant construction areas, and activities that are likely to take place in that area (in each stage), as well as the embedded mitigation measures agreed for the Project construction processes. The CoCP is provided in Vol 1 Appendix 3.1.

1.5.18 Vol 2 Appendix 8.1 Table 6 shows the list of assumed construction plant used for the calculation of the construction noise for the Temporary Laydown Area during each Project development stage of the Project. The list is compiled using professional judgement based on experience of similar works.

Vol 2 Appendix 8.1 Table 6: Assumed construction plant on the Temporary Laydown Area

Equipment	Number	% on-time	Source
Lorry with Lifting Boom	1	20	BS5228 Table C 4-53
Lorry	1	20	BS5228 Table C 11-4
Petrol Hand-held Circular Saw	1	5	BS5228 Table C 4-70
Compressor for Hand-held Pneumatic Breaker	1	50	BS5228 Table C 5-5
Generator for Welding	1	5	BS5228 Table C 3-32
Diesel Generator	1	100	BS5228 Table C 4-84
Hand-Held Welder (Welding Piles)	1	5	BS5228 Table C 3-31
Angle Grinder (Grinding Steel)	1	5	BS5228 Table C 4-93

1.5.19 The assessment assumes a ten hour working day, with no evening or night-time working, and that noise and vibration control measures detailed within the CoCP (Vol 1 Appendix 3.1) are implemented.

1.5.20 As part of these measures, it is assumed that there would be Application Site hoarding around the construction site area, which would give, as a minimum, partial noise screening of nearest sensitive receptors of 5dB.

1.5.21 Step 4: The fourth step is the prediction of noise from the construction activities in each Project development stage. Noise from construction activities has been calculated using the approach presented in BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites.

1.5.22 Step 5: The fifth step is to establish the threshold of potential significant effect at residential receptors using Annex E in BS5228- 1:2009+A1:2014 which describes the 'ABC' method of assessment, based upon which it is proposed to establish the threshold of potential significant effect at residential receptors.

1.5.23 Under this approach, the adverse impact threshold is determined at an existing residential dwelling using the existing ambient noise level, rounded to the nearest 5dB and evaluated in relation to the thresholds set out in Vol 2 Appendix 8.1 Table 7.

Vol 2 Appendix 8.1 Table 7: Potential significant effects at dwellings from on-site noise sources (from BS 5228-1:2009+A1:2014)

Assessment category and threshold value period	Threshold values in decibels (dB), $L_{Aeq,T}$		
	Category A LOAEL	Category B LOAEL	Category C SOAEL
Night-time (23:00 – 07:00)	45	50	55
Daytime (07:00 – 19:00) Saturdays (07:00 – 13:00)	65	70	75
Other: Weekday evenings (19:00 – 23:00) Saturdays (13:00 – 23:00) Sundays* (07:00 – 23:00)	55	60	65

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

1.5.24 Step 6: The sixth step is then to determine the *potential* significance of construction noise in EIA terms, of any exceedance of the appropriate ABC threshold (established in Step 5). A potential significant effect is indicated where the construction site noise (L_{Aeq}) level exceeds the relevant threshold level for the ABC category appropriate to the ambient noise level at each sensitive receptor location. If the ambient noise level exceeds the highest threshold values (i.e. the ambient noise level is higher than the Category C values), then a potential significant effect is deemed to occur if the construction site noise (L_{Aeq}) level for the period is greater than the ambient noise level.

1.5.25 Step 7: The seventh step is to determine the final assessment of EIA significance. Having established if there is a *potentially* significant effect using the ABC method, the final assessment of EIA significance is made using professional judgement. This is evaluated by considering various other factors such as the number of properties affected, and any potential longer term benefits that may arise due to short-term disturbance. This is detailed further below.

1.5.26 The assessment of adverse effects has been undertaken at assessment locations that are representative of groups of residential receptors and any open space that they share[12], defined, wherever practicable, at the receptor in the group which is closest to the Project (i.e. worst affected).

1.5.27 For residential receptors the factors which are taken into account to determine final significance are:

a. the magnitude of the impact and effect identified (based on overall noise level and noise change);
b. the number and grouping of adversely affected dwellings and shared open areas;
c. the level and character of the existing noise environment;
d. any unique features of the source or receiving environment in the local area;
e. combined exposure to noise and vibration;
f. duration of impact and effect (for construction); and
g. the effectiveness of mitigation measures that could avoid or reduce the adverse effects.

1.5.28 Step 8: Finally, to determine significance in Government policy terms, (refer to paragraphs 1.3.1-1.3.18) for daytime, the widely used threshold

[12] As defined in Planning Practice Guidance – Noise (DCLG, 2014)

of 75dBL_{pAeq} (category C) being exceeded for one month or more has been taken to be the SOAEL for construction noise. The threshold was originally set to avoid interference with normal speech indoors, with windows closed (Wilson Committee Report[13]). Windows and their sound insulation properties have improved substantially since the Wilson Report; the 75dBL_{pAeq} SOAEL is therefore likely to be precautionary for modern properties.

1.5.29 The daytime SOAEL assumed for construction is, as is the norm, higher than the SOAEL for operational noise. This reflects that construction noise is temporary and that higher levels of noise generally only occur for part of the construction programme.

1.5.30 For night-time, the Night Noise Guidelines for Europe (World Health Organisation (WHO)[14]) introduced an interim target of 55dB$L_{pAeq,8hr}$ measured outdoors as an annual average. Exceeding this noise threshold (category 'C' of the ABC impact criteria) for one month or longer has been adopted as the SOAEL for night-time construction noise. The Night Noise Guidelines for Europe[14] are based on evidence gathered for long-term exposure to primarily road and aircraft noise. There is no evidence of short-term construction noise leading to significant health effects. The WHO's interim target of 55dBL_{pAeq} is therefore applied to construction on a precautionary basis.

1.5.31 For the evening, the SOAEL is set 10dB lower than the daytime SOAEL (i.e. 65dBL_{pAeq}), consistent with the 'ABC criteria'2) and the accepted criteria that date back to the Advisory Leaflet 72 - Noise Control on Building Sites[15].

1.5.32 No noisy outdoor construction activities (i.e. audible at the Application Site boundary) are foreseen during night-time or evening periods. However, should it become necessary by exception to undertake construction activities which could give rise to noise impacts during these periods, they would be managed through the Section 61 application and variation process in conjunction with LB Enfield to manage noise.

1.5.33 Noise exposure between LOAEL and SOAEL is, in Government policy terms, an adverse observed effect but not a significant observed effect. Such adverse effects relate to people's response to changes in local acoustic character particularly outdoors and to a lesser extent indoors. Noise insulation cannot change outdoor noise levels, and hence minimising adverse effects is centred on maximising on-site mitigation in accordance with best practicable means and not by providing off-site mitigation. Adverse observed effects are identified in the EIA for community areas where categories A or B apply and the forecast construction noise exceeds the relevant category but is below category C. This provides a simplified method for considering adverse effects from noise increases caused by construction. Such observed adverse effects

[13] Wilson,A. (1963) Noise; Final Report. Presented to the Parliament July 1963, Committee On the Problem of Noise, London.
[14] World Health Organisation (2009), Night Noise Guidelines for Europe, World Health Organisation.
[15] The Department of the Environment (DoE) Advisory Leaflet 72 (AL72) (1976) Noise Control on Building Sites.

under policy may be reported as likely significant effects in the EIA following the consideration of the other significance criteria set out in this appendix (see Steps 6 and 7 above).

1.5.34 Section E.4 of BS5228-12 provides guidance on thresholds used to determine eligibility for noise insulation and temporary rehousing. For this assessment, a simplified form of the temporary re-housing thresholds set out in BS5228-1 has been adopted as UAELs as defined by PPG-Noise. These are set 10dB above the category C values for the same time periods and days of the week. This approach has been adopted because PPG – Noise[16] (Department for Communities and Local Government (DCLG), 2014) states that exposure above a UAEL should be 'prevented'. When all other mitigation is exhausted then temporary rehousing is the only means to 'prevent' the exposure.

Construction vibration

1.5.35 Only a small number of specific types of construction activities give rise to significant levels of vibration from works and then only where they are employed close to sensitive receptors.

1.5.36 The assessment process and rationale is provided below, but in summary the assessment of construction vibration is undertaken step by step, as outlined below:

1. Identify nearest sensitive receptors to the relevant construction areas and activities and embedded mitigation.
2. Identify typical construction activities that might give rise to significant levels of vibration.
3. Determine potential significance of construction vibration effects.
4. Final assessment of significance of construction vibration based on other parameters and professional judgement.
5. Further assessment of significance in Government terms based on Project defined thresholds for SOAEL and LOAEL.

1.5.37 This assessment is carried out using these steps and detail of this approach is as follows:

1.5.38 Step 1: The first step is to identify the nearest sensitive receptors to the main construction activity site to determine if there are any within 300m.

1.5.39 Step 2: A review of all of the proposed Project construction activities is then undertaken to determine if there are any construction activities that have the potential to give rise to significant vibration effects, for example, piling.

1.5.40 Step 3: Considering the distance of receptors to the construction site activity area (that have activities with the potential to give rise to significant vibration effects), and taking account of embedded mitigation measures (i.e. in the CoCP (Vol 1 Appendix 3.1)), the potential significance of construction vibration effects at these receptors can be

[16] Planning Practice Guidance – Noise DCLG, 2014.

assessed. This is done qualitatively using empirical data to establish the likelihood of compliance with criteria accounting for distance.

1.5.41 Criteria are determined using the impact criteria for building damage (as detailed in Vol 2 Appendix 8.1 Table 8 and the impact criteria for human exposure (as detailed in Vol 2 Appendix 8.1 Table 9).

1.5.42 When determining the applicable criteria for cosmetic damage consideration has to be given to the type of vibration produced by the activity, for example, is it continuous vibration as produced by a road roller vibro-piling or is it transient vibration as may be produced by impact driving where the vibratory occurrence consists of discrete impulses. The type of activity has to be further considered in terms of the likely sensitivity of the building structure where typically older listed buildings may be more susceptible to cosmetic damage from vibration than a modern commercial building.

Vol 2 Appendix 8.1 Table 8: Impact criteria for buildings (conservative criteria below which there is no risk of cosmetic damage).

Category of building	Peak particle velocity (PPV) at building foundation	
	Transient vibration [17]	Continuous vibration[18]
Potentially vulnerable buildings[19]	≥6 mm/s	≥3 mm/s
Structurally sound buildings	≥12 mm/s	≥6 mm/s

1.5.43 Guidance on the impact of vibration on people in buildings is presented in British Standard 6472-1[22]. Part 1 of this standard assesses the impact of vibration using the vibration dose value (VDV). This indicator takes into account how people respond to vibration in terms of frequency content, vibration magnitude and the number and duration of vibration events during an assessment period. For dwellings, vibration from construction is assessed using the criteria presented in Vol 2 Appendix 8.1 Table 9.

Vol 2 Appendix 8.1 Table 9: Impact criteria of human exposure to vibration in buildings

Threshold (residential)	Impact classification	Vibration exposure*	
		VDV daytime (07:00-23:00) ($m/s^{1.75}$)	VDV night time (23:00-07:00) ($m/s^{1.75}$)
NOAEL	Negligible	<0.2	<0.1
LOAEL	Minor	0.2	0.1
-	Moderate	0.4	0.2
SOAEL	Major	0.8	0.4
* Determined at the worst location on a normally loaded floor (usually the centre of the floor)			

[17] Transient vibration relative to building response such as impulsive vibration from percussive piling.
[18] Continuous vibration relative to building response such as vibrating rollers.
[19] BS7385-2 highlights that the criteria for aged buildings may need to be lower if the buildings are structurally unsound. The standard also notes that criteria should not be set lower simply because a building is important or historic (listed). Where information about these structures is not currently known, the significance criteria for these receptors has been set at a lower level on a precautionary basis.

1.5.44 Step 4: Having established if there is a *potentially* significant effect, the final assessment of EIA significance is made using professional judgement. This is evaluated by considering various other factors such as the number of properties affected, and any potential longer term benefits that may arise due to short-term disturbance. Factors which would be considered are listed in paragraph 1.5.27.

1.5.45 Step 5: Finally, to determine significance in Government policy terms, (refer to paragraphs 1.3.1 -1.3.18) empirical data used to inform the qualitative assessment of vibration is referenced against criteria shown in Vol 2 Appendix 8.1 Table 9 which defines the no observed adverse effect levels for groundborne vibration with regard to risk of building damage. These criteria are derived from British Standard BS7385, Part 2 Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration[20] and ensures there is no risk of the lowest damage category ('cosmetic') being exceeded, as defined in BS ISO 4866:2010 Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures[21].

1.5.46 The LOAEL values, corresponding to the threshold for a minor adverse impact in EIA terms, exceeded for a month or more are taken as the lower end of the range of values for which BS6472-1 [22] indicates a 'low probability of adverse comment'. The SOAEL values are taken where a major adverse impact is indicated for more than a month, a level of exposure that is the lower value for 'adverse comment probable' in BS6472-1.

Road traffic noise

1.5.47 Temporary indirect noise effects can arise at receptors along existing roads that are not directly affected by the Project but where the Project causes changes in traffic flows (associated with both construction and operation, i.e. total generated flows). The traffic noise effects of the Project considered in the assessment of the Project development stages are:

a. trips generated by construction vehicles and construction workers;

b. trips generated by existing operational vehicles and operational employees (for the existing facilities which are operational during different Project development stages); and

c. changes to the highway network to facilitate construction (such as the new access on Lee Park Way).

[20] BS7385, Part 2 Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration (BSI, 1993).
[21] BS ISO 4866:2010 Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures (BSI, 2010).
[22] BS6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting (BSI, 2008).

1.5.48 The assessment process and rationale is provided below, but in summary the assessment of road traffic noise is carried out using the following steps for each Project stage:

1. Identify the potentially affected road links by using a noise change screening criteria of ≥1dB change (between future baseline 'do minimum scenario' and the Project 'do something' scenarios).
2. Following above screening exercise, quantify noise impacts alongside road links potentially subject to change of ≥1dB.
3. Assess potential significant effects based on established noise change criteria.
4. Final assessment of significance, based on other parameters and professional judgement.
5. Further assessment of significance in Government policy terms based on Project defined thresholds for SOAEL and LOAEL.

1.5.49 Step 1: Traffic routes, diversion or road closures as a result of the construction works and operational activities which result in changes to traffic flows have been considered within the assessment and road traffic noise is assessed only where any of the following criteria apply:

a. the flow changes are estimated to be greater than +25 per cent or -20 per cent;
b. HGV composition could change by +/-5 per cent; or
c. mean speeds could change by 10kmh.

1.5.50 These change thresholds relate to the potential for traffic to cause traffic noise level changes of at least 1dB. Changes below these thresholds would be considered negligible.

1.5.51 Step 2: Where roads are identified as requiring assessment, changes in traffic flows on the existing roads have been used to calculate changes, at source, in noise levels ($L_{pA10,18hr}$ or $L_{pAeq,16hr)}$. Department of Transport Memorandum: Calculation of Road Traffic Noise (CRTN) 1988[23] presents a procedure for the prediction of road traffic noise. The relevant parts of this procedure have been used to predict, for a given road at a reference distance, the change in noise level resulting from the change in road traffic between the future baseline (do minimum) and project scenarios (do something).

1.5.52 Eighteen hour road traffic noise levels would be predicted for roads identified through Step 1 as meeting criteria for assessment. Data would be analysed for each Project stage both with and without the Project.

1.5.53 Step 3: The change in road traffic noise between the base and development cases has been rated as an impact and potentially significant effect where the change is greater than +/- 3dB. Based on conventions used in road traffic noise assessment, a semantic scale has been applied to define the scale of the impact for the mixed traffic (i.e.

[23] Department of Transport Welsh Office (1988) Calculation of Road Traffic Noise, HMSO.

construction and operational) which is presented in Vol 2 Appendix 8.1 Table 10.

1.5.54 DMRB, HD213/11 (Highways Agency et al., 2011) provides a basis for evaluating the magnitude of the impact and effect caused by noise change both in the short-term and long-term. This assessment has focused on the long-term change as this is the likely worst case considering traffic growth. This is also consistent with (DMRB, HD213/11) (Highways Agency et al., 2011) that notes:

> *"In terms of permanent impacts… In the long-term, a 3dB(A) change is considered perceptible. Such increases in noise should be mitigated if possible".*

1.5.55 The focus on long-term effects also relates to the evidence that underpins DMRB, HD213/11 (Highways Agency et al., 2011). This evidence shows that the reported sensitivity to small changes in noise levels (less than 3dB(A)) may be coloured by factors other than noise.

1.5.56 Where the overall noise level with the Project in operation is between the lowest (LOAEL) and the significant observed adverse effect levels (SOAEL), the magnitude of the impact and effect caused can be indicated by the change in noise levels attributable to the Project. The DMRB method for evaluating the magnitude of impact and effects associated with the change has been evaluated using Vol 2 Appendix 8.1 Table 10.

Vol 2 Appendix 8.1 Table 10: Classification of magnitude of noise impact and effect on residential communities in the long-term under DMRB, where the level of overall exposure is between LOAEL and SOAEL

Noise change (dB(A)) – decrease or increase	**Magnitude of impact in the long term**
0	no change
0.1 – 2.9	negligible
3.0 – 4.9	minor
5.0 – 9.9	moderate
10.0 +	major

1.5.57 A minor impact (3dB or greater) is taken as an indicator of a potential significant effect unless the area being considered is currently exposed to high levels of sound. Where areas in the noise assessment area are already exposed to high levels of road traffic noise, it is considered appropriate to give greater weight to noise change where the existing baseline noise level in excess of the SOAEL in the absence of the Project. In which case a smaller impact (1dB or greater) has been taken as an indicator of potential significance. This is to reflect the consideration of likely health effects. In this case the magnitude of impact and effect has been evaluated using Vol 2 Appendix 8.1 Table 11.

Vol 2 Appendix 8.1 Table 11: Classification of magnitude of noise impact and effect on residential communities in the long-term under DMRB, where baseline noise level is greater than SOAEL

Noise change (dB(A)) – decrease or increase	**Magnitude of impact in the long term**
0	no change
0.1 – 0.9	negligible
1.0 – 2.9	minor
3.0 – 4.9	moderate
5.0 +	major

1.5.58 Step 4: The final assessments of likely significant permanent indirect effects have been evaluated with respect to the impacts, taking other factors into consideration, such as the magnitude of the impact and effect identified (based on overall noise level and noise change), the number and grouping of adversely affected dwellings and shared open areas; the level and character of the existing noise environment; any unique features of the source or receiving environment in the local area; combined exposure to noise and vibration; and the effectiveness of mitigation measures that could avoid or reduce the adverse effects.

1.5.59 Step 5: Finally, with regard to overall noise levels due to the Project and with the Project in operation permanently, the Government's noise policy (refer to paragraphs 1.3.1-1.3.18) provides the basis for evaluating the magnitude of the effect. In this assessment, residential receptors (dwellings) are forecast to experience a likely significant observed adverse noise effect from operation of the Project if noise outside dwellings from the Project only is:

a. 68dB$L_{pA10,18h}$ (equivalent to 63dB$L_{pAeq,16h\ free\text{-}field}$) or greater during the day; or

b. 55dB$L_{pAeq,8h}$ (i.e. 23:00-07:00) or greater during the night.

1.5.60 The rationale for this is as follows:

a. During the daytime the level of 68dB$L_{pA10,18h}$ is considered a SOAEL (equivalent to 63dB$L_{pAeq,16h\ free\text{-}field}$). This is consistent with the daytime trigger level in the Noise Insulation (Amendment) Regulations 1988. Aligning the SOAEL with noise insulation trigger thresholds is consistent with the advice in PPG – Noise (DCLG, 2014) that notes as an example of the consequence of noise exposure above the SOAEL is that people start.

b. "*avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise*".

1.5.61 This is relevant as the provision of noise insulation includes additional ventilation where necessary to enable windows to be kept closed. Therefore, the provision of noise insulation avoids the significant effect inside a dwelling that would otherwise occur. The difference in daytime

SOAEL values for operation and construction is on the basis that operational noise is permanent.

1.5.62 The alignment of noise insulation, or other mitigation measures outside the Application Site, trigger values and SOAELs:

a. enables significant observed adverse effects that would otherwise remain taking account of all sustainable mitigation on-site to be avoided (in line with the first aim of Government noise policy);

b. is consistent with other major transport and infrastructure projects such as High Speed 2 Phase 1 (that has been subject to published expert peer review) and Thames Tideway Tunnel (where the Development Consent Order decision letter notes compliance with the three aims of Government noise policy);

c. is consistent with the framing of the earlier Planning Policy Guidance 24[24] (whilst Policy Planning Guidance 24 has been dis-applied there is no evidence from the Appraisals of Sustainability published alongside Government noise policy and NPS etc that Government intended any material tightening of noise policy or increase in mitigation provided in response to policy).

1.5.63 The Night Noise Guidelines for Europe (WHO, 2009) sets an interim target of 55dB$L_{pAeq,8hr}$ outdoors. This has been taken to be a SOAEL for night- time traffic noise.

1.5.64 In this assessment residential receptors (dwellings) are forecast to experience an adverse observed effect in policy terms where noise from the operation of the Project outside dwellings is:

a. 50dB$L_{pAeq,16h}$ or greater during the day; and

b. 40dB$L_{pAeq,8h}$ or greater at night.

1.5.65 These are the LOAELs adopted for operational traffic noise in this assessment.

1.5.66 For the daytime LOAEL:

a. the Guidelines for Community Noise[25] (WHO, 1999) identify that 50 to 55dBL_{pAeq} (outdoor noise level), represents: “day-time levels below which a majority of the adult population will be protected from becoming moderately or seriously annoyed, respectively.”;

b. the 1995 version of the WHO Guidelines for Community Noise, that provides further detail and supporting evidence for the final 1999 version, confirms that the ‘majority’ referred to in the 1999 Guidelines is 95 per cent of the population;

c. the superseded Policy Planning Guidance 24, 50dBL_{pAeq} 0700-2300 for daytime falls into Noise Exposure Category ‘A’ (defined as <55dB). The description for Noise Exposure Category A is as follows “*Noise need not be considered as a determining factor in granting planning permission*”; and

[24] Planning Policy Guidance 24 (1994) Planning and Noise.
[25] World Health Organisation (1999Guidelines for Community Noise, World Health Organisation

d. is consistent with other major transport and infrastructure projects such as High Speed 2 (that has been subject to published expert peer review) and Thames Tideway Tunnel (where the Development Consent Order decision letter notes compliance with the three aims of Government noise policy).

1.5.67 In the Night Noise Guidelines for Europe (WHO, 2009), the night noise guideline of 40dBL_{night}, outside is set explicitly as a lowest observable adverse effect level (LOAEL). This is an annual average level measured over the 8hr night-time period from 23:00 to 07:00.

1.5.68 The thresholds of 50dB$L_{pAeq,8hr}$ and 40dB$L_{pAeq,8hr}$ therefore represent the onset of the lowest observed community noise effects during the day (annoyance) and night (potential for some reported sleep disturbance) consistent with guidance such as the Night Noise Guidelines for Europe, (WHO, 2009), Guidelines for Community Noise (WHO, 1999) and PPG – Noise (DCLG, 2014). No adverse effects are therefore generally likely below these absolute levels of sound exposure.

1.5.69 For this assessment an UAEL for traffic noise has been set at 76dB$L_{pA10,18hr}$ (approximately 74dB$L_{pAeq,16hr}$) in line with PPG - Noise (DCLG, 2014). This is with reference to Defra's 2014 Noise Action Plan[26] for major roads (Defra, 2014), which links back to the methodology used in the first round of action plans that set this threshold as the basis for defining first priority locations. PPG - Noise (DCLG, 2014) identifies that exposures above the UAEL should be 'prevented' and that this is not in the context of sustainable development. Unacceptable levels ultimately should be defined inside a property in order to stop noise being 'very disruptive' as set out in PPG- Noise. Setting UAELs based on outdoor noise levels is likely to err on the side of caution.

1.5.70 Forecast operational traffic noise levels from the Project of between 50dBL_{pAeq} and 68dB$L_{pA10,18h}$ (equivalent to 63dB$L_{pAeq,16h\ free\text{-}field}$), or 40dB$L_{pAeq,8h}$ and 55dB$L_{pAeq,8h}$ night-time (i.e. between the respective LOAELs and SOAELs) are adverse effects with regard to noise policy. They are not significant levels of exposure in policy terms. Any change in noise levels brought about as a consequence of the new noise from the Project may be perceived by communities as a change in quality of life resulting from a perceived change out doors in the acoustic character of an area. When considered collectively for groups of dwellings and their shared community open areas, such effects may be considered significant in terms of the EIA because of the change in noise and the number of dwellings exposed to the change.

1.6 Operational effects

Assessment of Project stages

1.6.1 The operational noise assessment considers compliance with operational plant noise criteria in all Project stages involving the operation of the

[26] Department for Environment Food and Rural Affairs Noise Action Plan :Roads (including Major Roads) Environmental Noise (England) Regulations 2006, as amended. DEFRA Jan 2014.

proposed ERF (i.e. Stage 2 onwards) through the incorporation of acoustic mitigation measures within the design of the Project.

1.6.2 Operational road traffic is included in the combined construction and operational traffic noise assessment, the methodology for which is described in paragraphs 1.5.47- 1.5.70 above. No further assessment is therefore required for operational noise road traffic effects.

Operational industrial noise

1.6.3 Operational effects from operational industrial noise will be assessed in accordance with the assessment method in BS4142:20145 and, in particular, consideration of the following factors:

a. The difference between the 'background noise level' the 'rating level' of the industrial noise at the receiver location.

b. The absolute level of noise.

c. The character of the new industrial noise compared to the character of the existing residual or ambient noise.

d. The sensitivity of the receptor.

1.6.4 The 'background level' ($L_{A90,T}$) is the noise existing in the absence of the 'specific noise level' at the receiver location. The 'specific noise level' ($L_{Aeq,Tr}$) from the proposed ERF can be subject to corrections where it displays an identifiable feature or a combination of features (such as tonality, and /or impulsiveness or intermittency) to provide a 'rating level' ($L_{Ar,Tr}$).

1.6.5 BS4142[5] section 11 provides guidance on determination of significant effects, however it is noted that determination is context dependent and the final criteria will be established in discussions with the EA and LB Enfield.

1.6.6 Noise control measures will be included on all sources of industrial noise as part of the design process to limit noise to within appropriate noise levels and to avoid significant effects.

1.6.7 LB Enfield has advised that it requires plant noise emissions to be limited to 10dB below the lowest background noise level.

1.6.8 Ongoing discussions to determine operation plant noise emission limits are being held with the EA and will also be discussed with LB Enfield. Agreement is expected post submission of this ES.

1.6.9 The Project will provide acoustic mitigation measures in the design to achieve compliance with the noise criteria,

1.6.10 It is considered that it will be practical to control noise emissions to within appropriate noise limits to prevent significant effects.

1.7 Decommissioning effects

1.7.1 Noise and vibration for the ERF decommissioning phase would be less intensive than the Stage 3 construction and demolition activities (when the existing EfW facility is decommissioned and demolished), therefore the

effects have been assessed to be no worse than those for Stage 3 construction and demolition activities.

1.7.2 It is assumed that the decommissioning and demolition of the proposed ERF would use conventional measures, including the implementation of control measures like those set out within the CoCP (Vol 1 Appendix 3.1).

1.7.3 It is also assumed that traffic associated with the decommissioning and demolition of the Project would travel to and from the Application Site either via the southern site access on Advent Way, eastern access off Lee Park Way or the northern access from Deephams Farm Road/Ardra Road.

1.7.4 A Decommissioning and Demolition Method Statement is expected to be produced and agreed with the EA as part of the environmental permitting process.

1.8 Cumulative effects

1.8.1 The assessment of cumulative effects for noise and vibration considers other committed developments within a 600m area of the Project.

1.8.2 Those developments that will potentially be under construction at the same time as the Project will be included in a qualitative construction noise and vibration assessment. This determines if the assessment of significance is elevated by the consideration of other committed developments in the vicinity of the Project.

1.8.3 The developments that will potentially be operational at the same time as the Project will be included in a qualitative assessment of cumulative operational noise. Again, this includes determining if consideration of other committed developments elevates the significance level of effects identified in the core assessment.

1.8.4 A cumulative traffic flow assessment is also undertaken that takes account of the traffic flows associated with the committed developments (as set out in Vol 1 Appendix 5.2) combined with Project traffic flows (including both construction and operational traffic). This is undertaken using the same methodology to determine if the significance of effects would be different to those identified for the core assessment.

NORTH LONDON WASTE AUTHORITY

NORTH LONDON HEAT AND POWER PROJECT

ENVIRONMENTAL STATEMENT: VOLUME 2 APPENDIX 8.2 NOISE SURVEY RESULTS

AD06 . 02

nlwa
north london waste authority

North London Waste Authority

North London Heat and Power Project

Environmental Statement Volume 2 Appendix 8.2 Noise Survey Results

AD06.02

The Planning Act 2008 The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5 (2)(a)

Issue

October 2015

Arup

ARUP

nlwa
north london waste authority

Noise Survey Results

Vol 2 Appendix 8.2 Table 1: Unattended measurement results at location 1 (15min samples from meter at 1hour intervals)

Date	Time		Noise Level, dB (A)				Comments
	Start	Finish	L_{90}	L_{10}	L_{max}	L_{eq}	
27.02.13	14:07	14:22	54.5	58.6	66.5	56.8	----------Unattended measurement----------
27.02.13	14:22	14:37	55.6	61.9	73.8	59.3	
27.02.13	14:37	14:52	56.8	62.5	77.8	61.4	
27.02.13	14:52	15:07	55.8	60.4	73.0	58.5	
27.02.13	15:07	15:22	57.5	63.3	73.9	60.9	
27.02.13	15:22	15:37	57.8	62.8	80.6	61.1	
27.02.13	15:37	15:52	57	62.1	80.5	60.2	
27.02.13	15:52	16:07	55.4	61.2	75.2	58.9	
27.02.13	16.07	16:22	55.5	61.1	73.9	58.7	
27.02.13	16.22	16.37	56.0	61.2	75.2	59.2	
27.02.13	16.37	16.52	53.5	58.0	70.8	56.2	
27.02.13	16.52	17.07	53.6	57.4	63.8	55.7	
27.02.13	17.07	17.22	53.2	56.8	65.7	55.2	
27.02.13	17.22	17.37	53.1	57.7	65.7	55.6	
27.02.13	17.37	17.52	52.4	58.5	78.0	57.8	
27.02.13	17.52	18.07	52.3	56.5	69.4	54.7	
27.02.13	18.07	18.22	52.3	55.8	67.5	54.2	----------Unattended measurement----------
27.02.13	18.22	18.37	52.1	54.9	66.0	53.6	

Date	Time		Noise Level, dB (A)				Comments
	Start	Finish	L_{90}	L_{10}	L_{max}	L_{eq}	
27.02.13	18.37	18.52	53.0	56.4	79.1	58.5	
27.02.13	18.52	19.07	52.6	56.0	70.0	54.5	
27.02.13	19.07	19.22	52.2	57.2	70.4	55.1	
27.02.13	19.22	19.37	52.0	55.2	64.2	53.8	
27.02.13	19.37	19.52	53.2	56.7	78.4	56.3	
27.02.13	19.52	20.07	53.7	56.7	68.5	55.4	
27.02.13	20.07	20:22	54.1	57.4	74.5	56.1	
27.02.13	20:22	20:37	53.7	56.5	62.8	55.2	
27.02.13	20:37	20.52	53.6	56.6	62.9	55.1	
27.02.13	20.52	21.07	53.7	56.9	65.7	55.4	
27.02.13	21.07	21.22	53.9	57.0	67.4	55.6	
27.02.13	21.22	21.37	53.7	57.1	76.5	56.1	
27.02.13	21.37	21.52	52.9	56.6	63.1	54.9	
27.02.13	21.52	22.07	52.7	55.6	63.0	54.2	
27.02.13	22.07	22.22	52.8	56.1	69.1	54.8	
27.02.13	22.22	22.37	53.3	57.5	72.1	55.9	----------Unattended measurement----------
27.02.13	22.37	22.52	52.6	56.4	64.4	54.8	
27.02.13	22.52	23.07	52.4	55.7	64.6	54.2	
27.02.13	23.07	23.22	52.6	55.5	79.5	57.7	
27.02.13	23.22	23.37	52.3	55.4	62.7	54.0	

Date	Time		Noise Level, dB (A)				Comments
	Start	Finish	L_{90}	L_{10}	L_{max}	L_{eq}	
27.02.13	23.37	23.52	52.0	54.9	65.5	53.5	
27.02.13	23.52	00.07	52.1	54.5	61.8	53.3	
28.02.13	00.07	00.22	51.9	54.4	60.4	53.3	
28.02.13	00.22	00.37	51.5	54.0	57.8	52.8	
28.02.13	00.37	00.52	51.7	54.3	59.7	53.0	
28.02.13	00.52	01.07	52.3	54.9	60.4	53.7	
28.02.13	01.07	01.22	52.0	54.0	59.7	53.0	
28.02.13	01.22	01.37	52.4	54.5	61.9	53.5	
28.02.13	01.37	01.52	52.7	55.1	64.3	54.0	
28.02.13	01.52	02.07	53.3	55.4	60.7	54.4	
28.02.13	02.07	2.22	53.0	55.1	59.1	54.1	
28.02.13	2.22	2.37	52.5	54.8	58.2	53.7	
28.02.13	2.37	2.52	51.8	54.7	66.9	53.7	----------Unattended measurement----------
28.02.13	2.52	3.07	51.8	59.1	70.5	56.4	
28.02.13	3.07	3.22	51.8	54.2	61.9	53.1	
28.02.13	3.22	3.37	51.9	54.3	63.7	53.3	
28.02.13	3.37	3.52	52.4	64.7	88.8	64.6	
28.02.13	21:22	21:37	53.7	57.1	76.5	56.1	
28.02.13	23:52	00:07	52.1	54.5	61.8	53.3	
29.02.13	00:52	01:07	52.3	54.9	60.4	53.7	

Date	Time		Noise Level, dB (A)				Comments
	Start	Finish	L_{90}	L_{10}	L_{max}	L_{eq}	
29.02.13	01:52	02:07	53.3	55.4	60.7	54.4	

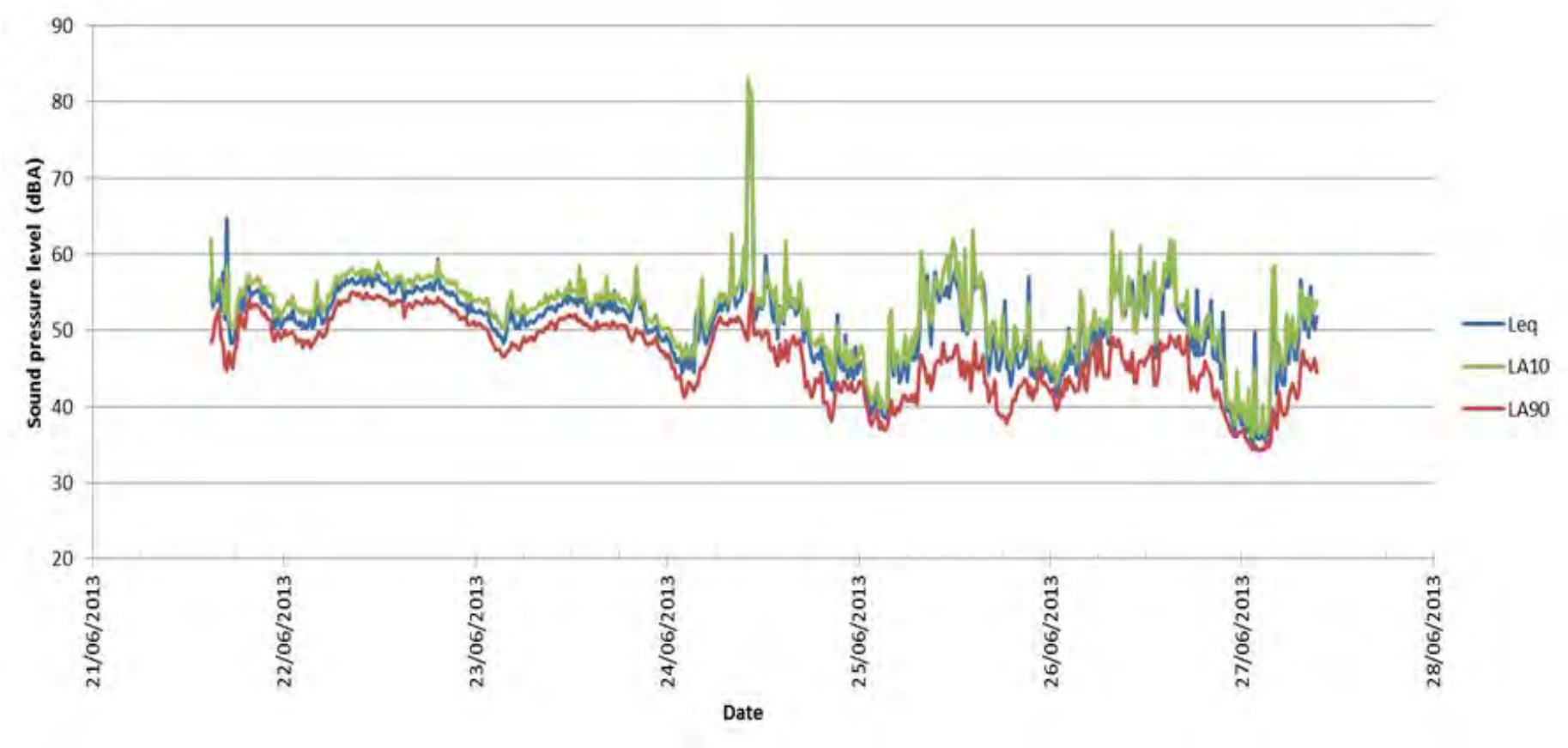

Figure A1 Unattended measurement results at location 1

Vol 2 Appendix 8.2 Table 2: Attended measurement results at location 1

Date	Time		Wind Speed		Noise Level. dB (A)				Comments
	Start	End	Speed (ms^{-1})	Direction	L_{A90}	L_{10}	L_{max}	L_{eq}	
27.02.13	13:52	14:07	1.9 m/s	N	54.9	60.4	93.5	63.0	Large plant machines at work to north of site
27.06.13	20:42	20:52	0.5m/s	S	40.9	53.8	76.0	52.6	Traffic can be heard on A103 and trains can be heard in distance when wind changes direction. Background is dominated by roads to west of location. No pass traffic on Russell Road
27.06.13	01:37	01:42	0.2m/s	S	37.1	39.8	76.5	48.8	Now traffic is lighter water movement can be heard above distant road noise. Quiet location at back of house on Russell road, rural bungalows and 1930s bay window houses. Water noise is on par with road noise in distance. Russell road no traffic during measurement
27.06.13	03:08	03:13	0.3m/s	SW	46.6	49.0	69.2	44.3	Distance you can hear the A406 to the south, but when the background levels have dropped you now can clearly hear running water from this location
27.06.13	11:49	12:01			50.7	54.5	72.6	53.0	No roads can be heard above heavy plant working s/w of location (Thames Water). All type of earth movers are on site, quiet location apart from this background
27.06.13	13:21	13:36	0.5m/s	N	47.1	52.1	67.6	50.1	Plant on site not running, so A406 can now be heard plus 747 over flying location

Vol 2 Appendix 8.2 Table 3: Further attended measurement results at location 1

Date	Time		Wind Speed	Noise Level. dB (A)				Comments
	Start	End		L_{A90}	L_{10}	L_{max}	L_{eq}	
23.06.13	10:07	10:17	Windspeed 2-3 m/s increased to ~5 m/s gusts in middle of measurement.	52	55	66	54	Constant high speed road traffic - distant but dominant noise source. 3 no. aircraft passbys. Plants/grass rustling in wind and rattling against fence. Birdsong.
23.06.13	11:33	11:43	Wind ~3 m/s.	52	56	74	56	Low helicopter - passby for 2 minutes. 2 no. distant aircraft. Very light rain in last 2 minutes of measurement. Occasional distant bangs from direction of Edmonton EcoPark.
23.06.13	12:58	13:13	Low windspeed	53	56	64	55	Constant road traffic. Motorcycle acceleration 3 times in measurement on distant road. 1 no. aircraft passby.
24.06.13	00:59	01:04	Low wind speed <2 m/s.	47	50	62	49	Distant road traffic - Walthamstow Ave and closer Waltham Way. Constant traffic flow, but less heavy flow than daytime.
24.06.13	02:34	02:39	Low windspeed.	44	48	51	46	Traffic less consistent flow than previous measurements. Some distant, quiet industrial banging sounds from direction of Edmonton EcoPark, possibly from Lower Hall pumping station.

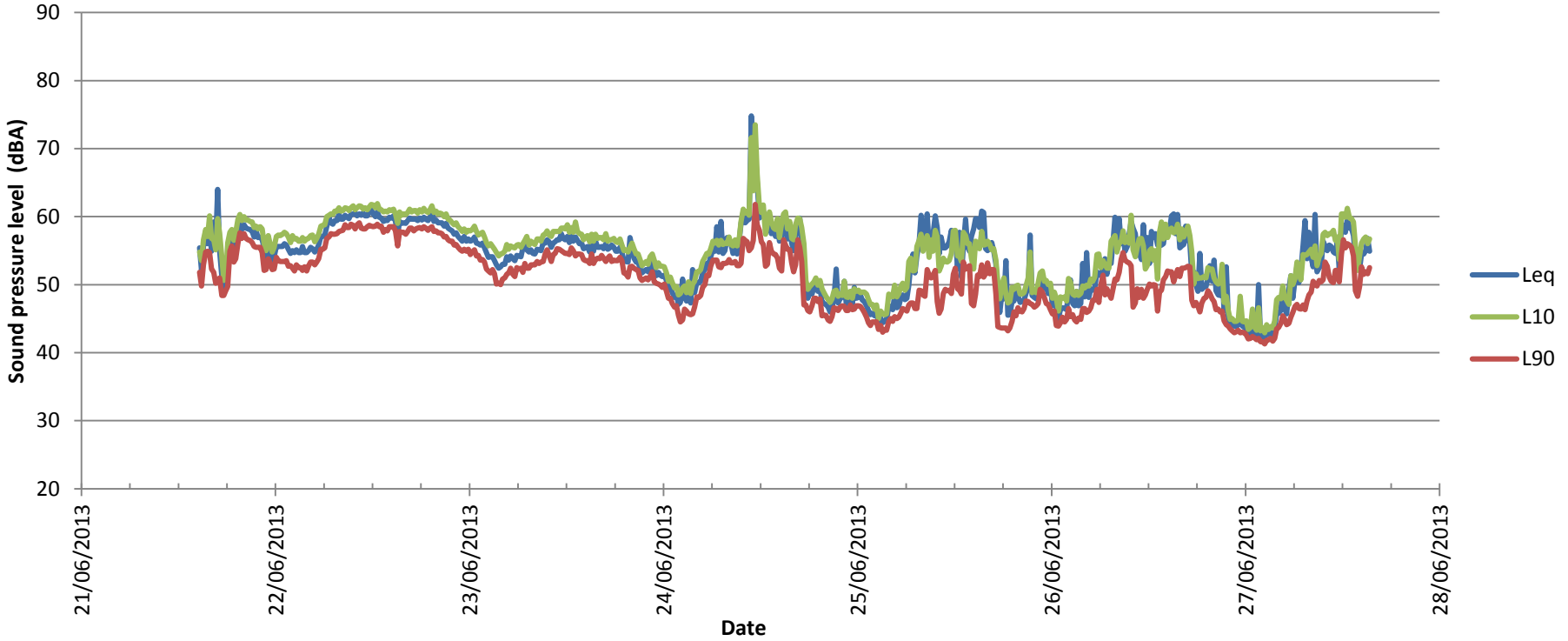

Figure A2 : Unattended measurement results at location 1

Vol 2 Appendix 8.2 Table 4 Attended measurement results at location 2

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
28.02.13	14:07	14:22	1.8 m/s	N	48.5	57.2	70.9	53.9	Residential traffic movements passing location parking and leaving flats on lower hall lane and (A406) road noise levels can be heard to south.
28.02.13	15:30	15:45	1.9 m/s	N/E	50.0	54.6	71.2	53.0	No roads can be heard above heavy plant working NW of location (Thames Water). All type of earth movers are on site, quiet location apart from this background Earth moves at work on site
28.02.13	16:37	16:52	1.4m/s	N	50.1	54.5	75.2	53.1	Large plant machines at work to north of site (Thames water)
28.02.13	20:36	20:46	1.8 m/s	N	45.4	47.9	59.4	46.7	Road traffic from Walthamstow Ave and other nearby busy roads. Some low noise coming from Lower Hall Pumping Station. Vehicle movements on nearby residential road - car door slams.
28.02.13	21:27	21:37	0.9m/s	N	44.4	47.6	56.1	46.0	Road traffic from Walthamstow Ave and other nearby busy roads. Occasional vehicle movements around residential estate.
01.03.13	00:00	00:05	0.0m/s	N/A	41.3	44.9	64.7	44.3	Traffic in distance to N/W from (A1009) and road noise (A406) to south of location. Apart from this background, no other noise can be heard
01.03.13	01:17	01:23	0.1m/s	N	40.7	43.2	55.1	42.2	Road noise is all coming from the (A406) north circular. Two cars passbys during measurement on lower hall lane turning around and dead end of lane.
01.03.13	02:25	02:30	0.3m/s	NE	41.6	45.3	52.6	43.6	Background noise from Eco Park can now be heard. Traffic on A406 is lighter than before, also traffic is audible north west of location.
27.06.13	20:58	21:08	0.2m/s	S	43.8	46.4	62.3	45.3	Quiet, no through road, no passing traffic during measurement. Background dominated by A406 to south of location. Some noise from open windows in flats voices can be heard.
27.06.13	22:33	22:43	0.8m/s	S	42.8	46.0	76.6	47.4	Road noise in distance to N/W and road noise south of location. Apart from this background, no other noise can be heard.

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	01:49	01:54	0.0m/s	N/A	42.4	44.7	62.0	43.8	Background noise is all coming from the A406 north circular. Small amount of traffic on Lower hall Lane turning around and dead end of lane.
27.06.13	03:20	03:25	0.0m/s	N/A	42.1	45.6	50.2	44.1	Plant noise from Eco Park can now be heard. Traffic on A406 is slightly lighter than before, also traffic is audible north west of location.
27.06.13	12:12	12:27	2.2m/s	S	58.3	42.0	69.7	60.3	Heavy plant can be seen to S/W of location working on Thames water site and dominating background noise. Quiet location apart from this.
27.06.13	13:52	14:07	0.0m/s	N/A	51.6	55.0	73.1	53.9	No plant running on Thames water site, so A406 becomes the dominant background noise for this location

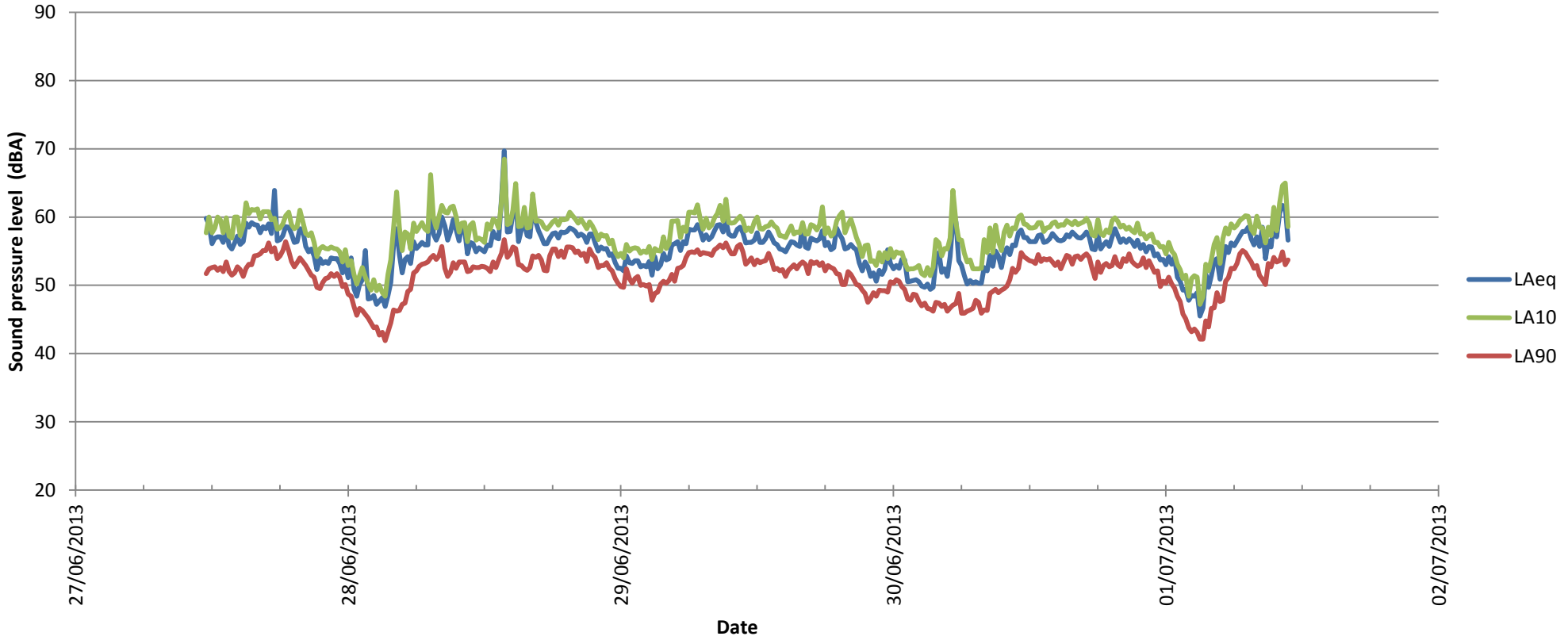

Figure A3 : Unattended measurement results at location 2

Vol 2 Appendix 8.2 Table 5 Further measurement results at location 2

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	10:31	10:46	Sheltered from wind - occasional low speed gusts.	56	59	71	58	Constant high speed (~50mph) road traffic from Walthamstow Ave and other nearby busy roads. Use of power tools or heavy plant from Lower Hall Pumping Station. Vehicle movements on nearby residential road - car door slams, low speed engine noise, horn around corner. 4x4 towing mini digger and unloading - banging sounds ~20m away.
23.06.13	11:47	12:02	Windspeed 3-4 m/s with faster bursts.	55	59	64	57	Constant high speed (~50mph) road traffic from Walthamstow Ave and other nearby busy roads. Banging from car park/scrap yard (?) at end of Lower Hall Ln. Distant plant movements from Lower Hall Pumping Station. Occasional vehicle movements around residential estate. Car playing loud music passed and parked - 30 sec. 2 no. distant light aircraft passbys.
23.06.13	13:19	13:34	-	55	59	70	58	Constant high speed (~50mph) road traffic from Walthamstow Ave and other nearby busy roads. Motorcycle acceleration on closer road. 2 no. aircraft passbys. 3 car movements nearby - parking, engine noise, door slams.
24.06.13	01:10	01:15	Minimal wind.	48	52	60	51	Distant road traffic - Walthamstow Ave. Lower traffic flow than daytime, but still constant and dominant noise source. One car movement on Mandeville Court (~10m away). Occasional traffic on Hall Ln.
24.06.13	02:48	02:53	Light wind.	48	53	59	51	Distant road traffic - Walthamstow Ave. Lower traffic flow than daytime, but still constant and dominant noise source. 1 no. distant train. 2 no. Cars on nearby residential roads.

Vol 2 Appendix 8.2 Table 6 Attended measurement results at location 3

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
28.02.13	14:34	14:49	3.8m/s	N	62.5	65.9	79.2	65.3	Helicopter fly over @4.2mins. Road noise from A406 is very high
28.02.13	15:55	16:10	2.0m/s	N/E	62.5	65.2	69.7	64.0	Background noise is all coming from the A406 north circular. Small amount of traffic on Harbet Road, which goes through industrial estate. Car movements at other end of car park
28.02.13	16:58	17:13	0.9m/s	N	62.0	64.5	69.8	63.3	Road noise levels mask any plant noise from ECO power plant. Traffic levels at A406 are still very high.
28.02.13	20:54	21:04	0.7m/s	N	60.2	63.1	67.2	61.8	Clear line of sight to A406 (north circular) traffic still is the dominant noise source at this location. No other noise can be heard
28.02.13	21:44	21:54	0.9m/s	N	59.0	63.3	67.1	61.5	No other background noise apart from constant road noise from A406
01.03.13	00:11	00:16	0.0m/s	N/A	56.0	61.1	64.8	59.0	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping.
01.03.13	01:28	01:33	0.1m/s	SW	49.0	59.1	62.8	56.4	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping but still the dominate background. Distant plant noise from retail units can be heard.
01.03.13	02:36	02:41	0.0m/s	N/A	51.4	58.9	62.4	56.3	Road noise levels are still masking any plant noise from ECO power plant. Traffic levels are A406 lighter but still constant.
27.06.13	21:23	21:33	0.1m/s	S	55.1	58.6	65.3	57.1	No other background noise apart from constant road noise from A406
27.06.13	22:49	22:59	0.2m/s	S	54.0	58.9	66.4	56.8	Background noise is all coming from the A406 north circular. Small amount of traffic on Harbet Road, which goes through industrial estate
27.06.13	02:04	02:09	0.1m/s	SW	50.5	57.0	62.4	54.3	Clear line of sight to A406 (north circular) traffic still is the dominant noise source at this location. No other noise can be heard
27.06.13	03:31	03:36	0.0m/s	N/A	47.5	58.3	70.7	55.1	Bird song in tress. Road noise from A406

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	12:35	12:50	2.5m/s	S/W	54.8	59.0	75.1	57.4	Local traffic on Harbet Road, local traffic/high flyovers by 747-400. Total dominated by A406. Car door shutting nearby.
27.06.13	14:04	14:19	0.1m/s	S	54.9	59.5	70.6	57.8	Bird song in trees and bushes. A406 still very busy, no other noise can be heard above Traffic noise, airbus 380 @12:30. Car movements at other end of car park.
27.06.13	14:46	15:01	0.1m/s	S	54.8	57.9	65.2	56.6	Bird song from trees, 747 overfly at 10,000ft @10:30 mins. A406 still dominating noise source

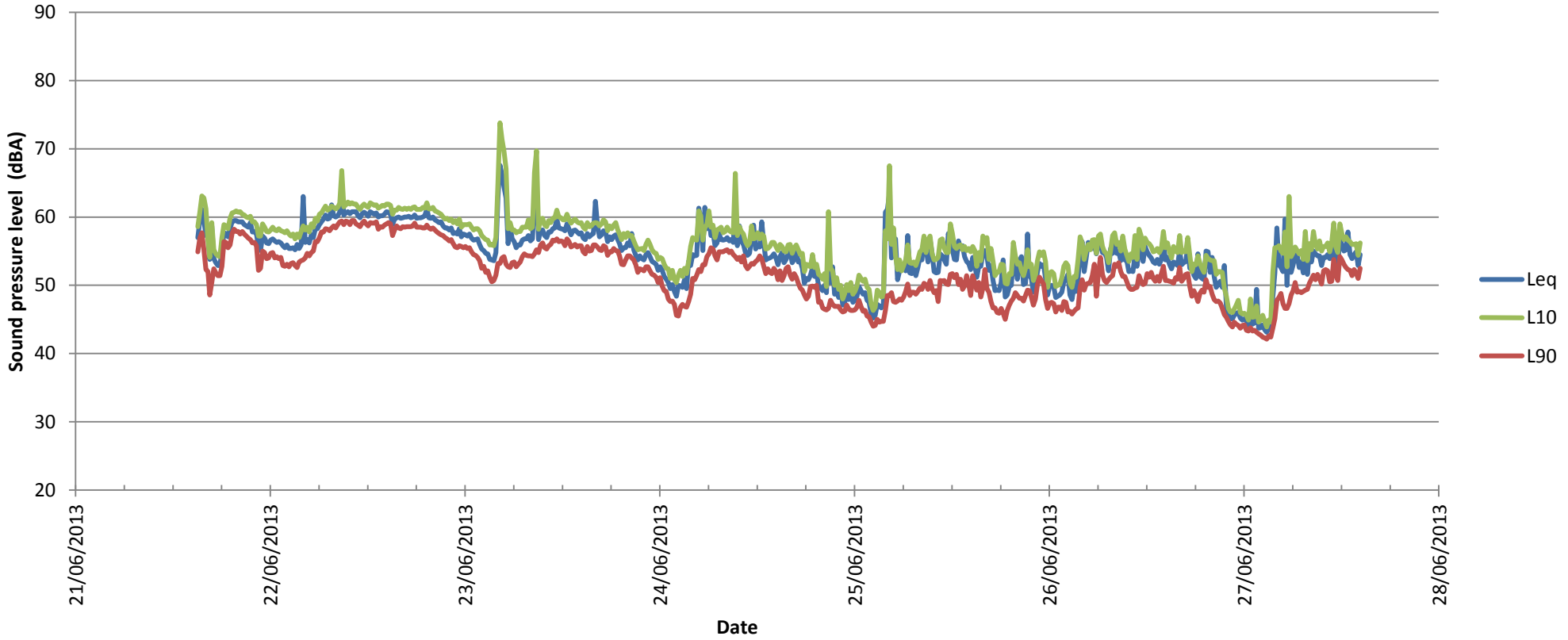

Figure A4 : Unattended measurement results at location 3

Vol 2 Appendix 8.2 Table 7 Further attended measurement results at location 3

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	10:52	11:02	Occasional gusts of strong wind (>6 m/s).	59	76	86	72	65 Vehicles in 10min measurement on Harbet Rd. Avg. speed ~25mph and accelerating. Gate rattling in wind 2m away. Flags outside shops flapping in wind. Constant road traffic noise from screened Walthamstow Way and other distant busy roads. Horn from passing car. 3 no. HGVs accessing carpark ~10m away. Trolley on Blackwood avenue approaching measurement position - 2 minutes of noise from wheels.
23.06.13	12:06	12:16	Brief gusts of wind causing gate to squeak/rattle (2m away).	59	75	83	70	72 vehicle passbys in 10 minute measurement. Avg. speed ~20mph, accelerating and braking at roundabout. Bangs from industrial estate opposite. Pedestrians talking nearby while passing. Very light rain at end of measurement.
23.06.13	13:41	13:56	-	61	75	88	72	85 vehicles passed - 5mph avg (slow moving queue). Car parked nearby - 3m away. 2 Door slams, engine idling. Pedestrians talking and walking by. Engine start near (3m). Queue of traffic from roundabout back to microphone position. Car alarm down the road - out of sight. Loud music from a car in the queue of traffic - 30 seconds.
23.06.13	19:35	-	-	56	67	84	66	Traffic noise from main road. 10 no. cars on Harbet Rd. Started raining. Noise from rain hitting boat/clipboard/puddles. Wet roads affecting high frequency measurement. Rain too heavy - abandoned measurements.
24.06.13	01:24	01:29	Minimal wind.	50	57	84	61	3 no. vehicles on Harbet Rd. Distant road traffic - lower traffic flow but consistent still. Motorbike accelerating on A406. HGV engine starting and idling for 2 minutes, 20m away (parked).
24.06.13	03:00	03:05	-	44	53	81	59	HGV with chiller on for 25 seconds of measurement. 2 no. cars on Harbet Rd. Distant road traffic - similar to previous measurement at this location.

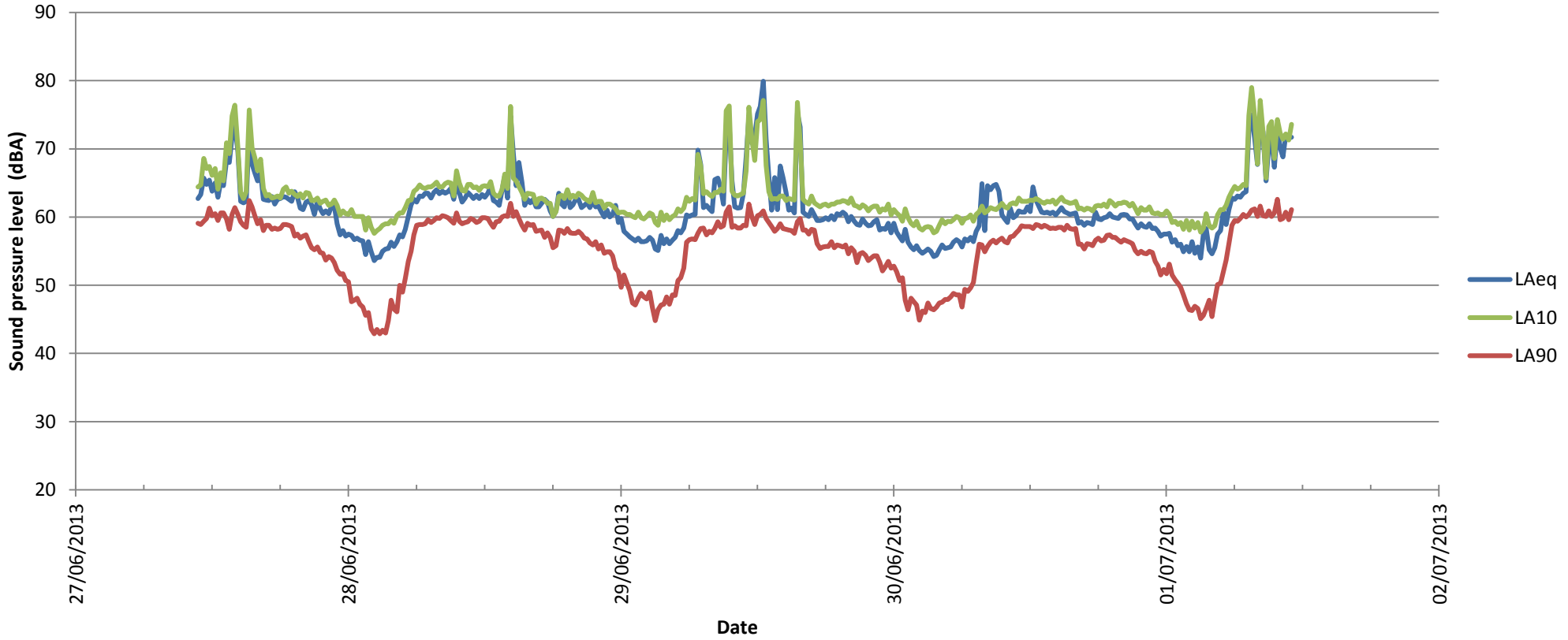

Figure A5 : Unattended measurement results at location 3

Vol 2 Appendix 8.2 Table 8 Attended measurement results at location 4

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
28.02.13	15:00	15:15	1.5m/s	N/E	75.9	80.2	84.3	78.4	Police car @02:45mins, police car at 09:40mins. Noise from A406 as before very high flow.
28.02.13	16:14	16:29	1.8m/s	N	76.7	80.1	85.8	78.7	Traffic passbys using retail outlets, but measurement level not affect because of high level of traffic noise from (A406).
28.02.13	17:19	17:34	0.9m/s	N	75.7	79.2	82.3	77.7	Local traffic movements passed location parking and leaving using Next and Argos shopping outlet and the (A406) road noise levels mask any plant noise. Road still very busy with traffic.
28.02.13	20:10	21:20	0.7m/s	N	73.6	79.6	84.3	77.4	Traffic flow on A406 very heavy, approx. 150 cars and HGV-LDV per min. No other noise sources can be heard above traffic drone
28.02.13	21:59	22:09	1.1 m/s	N	71.7	78.9	82.5	76.3	This location is totally dominated by A406, approx. 75 cars per min. No other noise can be heard above road noise.
01.03.13	00:21	00:26	0.0m/s	N/A	66.5	77.6	82.5	74.3	No plant noise can be heard from the retail shopping outlet and the road noise levels mask any plant noise from ECO power plant. Traffic levels on A406 are still very high.
01.03.13	01:40	01:45	0.1m/s	S	61.1	74.4	81.9	70.7	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping.
01.03.13	02:46	02:51	0.0m/s	N/A	61.9	74.3	81.4	70.7	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping but still the dominate background. So some plant noise from retail units can be heard.
27.06.13	21:38	21:48	0.1m/s	S	71.2	79.3	85.7	76.2	Location totally dominated by A406, approx. 60 cars per min. No other noise can be heard above road noise!!
27.06.13	23:05	23:15	0.1m/s	S	68.4	77.5	90.7	74.8	Location dominated by A406 (north circular road) levels are so high, no other sounds can be heard.

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	02:15	02:20	0.0m/s	N/A	60.9	74.5	82.7	70.8	No plant noise can be heard from the Next and Argos shopping outlet and the road noise levels mask any plant noise from ECO power plant. Road still very busy with traffic
27.06.13	03:43	03:48	0.0m/s	N/A	61.6	73.7	77.6	69.6	Traffic is building up on A406 and dust carts are starting to leave ECO park .Traffic flows on Angel Road and Walthamstow Avenue (A406) are starting to increase again.
27.06.13	11:24	11:39	0.1m/s	S	76.7	80.7	94.4	79.1	Location totally dominated by pass traffic on A406, six lane 50mph passing mixed vehicles car LGV-HGV, buses
27.06.13	12:56	13:11	0.2m/s	SE	76.0	80.4	89.7	78.8	Traffic flow on A406 very heavy, approx. 150 cars and HGV-LDV per min. No other noise sources can be heard above traffic drone
27.06.13	14:25	14:40	0.1m/s	S	75.0	79.4	89.9	77.7	Ambulance @04:00, A406 still running at full flow per minute. Police at @14:02 mins
27.06.13	15:07	15:22	0.0m/s	N/A	75.7	79.9	87.5	78.1	Police car @02:34mins, police car at @09:30mins. Noise from A406 as before

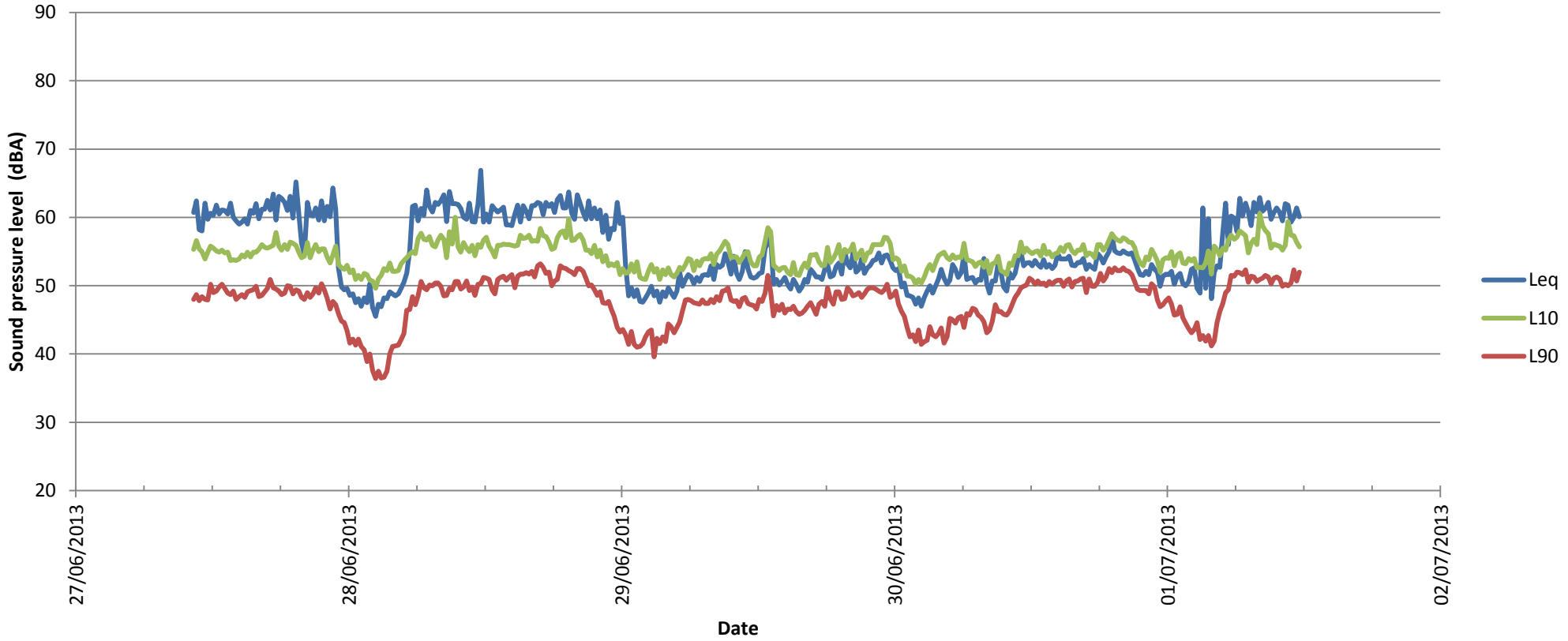

Figure A6 : Unattended measurement results at location 4

Vol 2 Appendix 8.2 Table 9 Further attended measurement results at location 4

Date	Time		Wind Speed	Statistical Indices				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	14:20	14:35	Light wind, generally <3m/s except occasional gusts	73	77	79	75	Argon Rd, A406 and Advent Way (10 lanes of traffic). Nearest lane ~15m away. Average speed of vehicles 50mph. Retail advertisement flags flapping in wind - metal on rope hitting the pole.
23.06.13	15:15	15:30	Constant wind 3-4m/s.	74	78	80	76	Busy Road dominant. Consistent flow of 115 vehicles per minute. Vehicle movements in car-park - door slams, engines idling. Quiet compared to busy roads.
23.06.13	16:35	16:50	Flags rattling in wind.	75	78	85	77	Traffic flow ~120 cars per minute over 10 lanes of traffic. Minimal car park movements - shops closed.
24.06.13	01:37	01:42	Flags still hitting poles in breeze.	62	76	80	72	~22 cars per minute on all lanes of traffic. Plant noise (?) from direction of Eco Park - just audible in absence of road traffic.
24.06.13	03:11	03:16	Very light breeze.	62	74	81	71	21 cars per minute. 1 no. aircraft - distant. Plant noise (?) from direction of Eco Park - just audible in absence of road traffic.

Vol 2 Appendix 8.2 Table 10 Attended measurement results at location 5

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
01.03.13	00:31	00:36	0m/s	NE	53.5	56.9	67.2	55.6	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping, so plant noise from London waste Eco park is starting to dominate background.
01.03.13	01:48	01:53	0.1m/s	N	51.5	55.3	60.0	53.6	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping, so plant noise from London waste Eco park is starting to dominate background.
01.03.13	02:57	03:02	0.2 m/s	N	51.0	56.6	61.9	54.3	The plant noise on roof of London waste Eco park dominates Background noise above Angel Road (A406) to south of location. Very quiet to the east measurement location.
01.03.13	12:29	12:44	3.3m/s	NE	59.4	62.1	70.8	60.9	Plant machines at work on east of site and Angel Road (A406) to the south of measurement location. Fork lifts moving about and constant stream of dust cart going into plant building loading bay
01.03.13	13:45	14:00	4.3m/s	N	58.6	61.4	76.0	60.2	Road traffic from Angel Road (A406) / North Circular dominates background. Plant from Eco Park audible, affecting background. fork lifts- constant stream of dust cart going into plant building loading bay Some birdsong audible
01.03.13	15:03	15:08	3.5m/s	N	59.9	62.9	72.4	61.9	The plant noise on roof of London waste Eco park dominates Background noise above Angel Road (A406) to south of location. Heavy plant working east of location on Thames water site. All types of plant are on site.
01.03.13	20:00	20:10	0.2 m/s	N	57.8	60.4	64.1	59.2	Road traffic from Angel Road and Walthamstow Avenue (A406) dominates background. Roof top plant and intermittent dust cart engine noise from Edmonton EcoPark audible, affecting background.narrow boat pass by but quietly. Some birdsong audible.
01.03.13	20:59	21:09	0.1m/s	NE	55.7	60.1	67.2	58.3	Road traffic from North Circular dominates background.

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
									Plant and intermittent engine noise from Edmonton EcoPark audible, affecting background. Narrow boat engine running, but quietly. Some birdsong audible.
27.06.13	01:24	01:29	0.1m/s	S	48.2	50.5	68.2	49.8	Measurement location is equally dominated by A406/North and London Waste Eco Park. Noisy plant running on roof.
27.06.13	02:54	02:59	021m/s	S	38.6	44.5	62.3	48.1	The plant noise on roof of London waste Eco park dominates Background noise above Angel Road (A406) to south of location.

Vol 2 Appendix 8.2 Table 11 Further attended measurement results at location 5

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	11:10	11:25	High windspeeds. 3-6 m/s with stronger bursts - noticably affecting measurement below 100Hz.	60	63	70	62	High speed road traffic from A406 (screened, distant sounding). Whirring noise from Edmonton EcoPark - Road sweep on access ramp at high level. HGVs at plant area/carpark below measurement position.
23.06.13	12:26	12:41	Windspeed constant ~4 m/s with strong gusts of wind.	59	63	73	61	Canal boat engine on, idling at mooring location for entire measurement. A406 screened road traffic noise - 50mph. HGV in Edmonton EcoPark carpark below. No audible plant from Edmonton EcoPark this time.
23.06.13	12:38	12:53	Windspeed constant ~4 m/s with strong gusts of wind.	60	63	70	62	Repeat of last measurement. Similar conditions. Aircraft passby. Cyclist bells on canal towpath below. Distant siren on A406.
23.06.13	14:01	14:16	-	60	63	66	62	Plant noise from Eco Park - not visible and very low level (possibly behind). Road traffic as before.
24.06.13	01:50	01:55	Windspeed 2-3m/s, not constant.	52	55	59	54	Distant road traffic & constant plant noise from Eco Park determine background noise level. Occasional HGVs on road bridge down the canal (250m away)
24.06.13	03:26	03:31	-	50	56	60	53	Distant road traffic & constant plant noise from Eco Park determine background noise level. Additional whistling sound occasionally from the south - possibly from plant items.
24.06.13	03:32	03:37	-	52	56	61	54	Constant plant noise from Eco Park determines background noise level. Birds starting to sing. Plant noise and road traffic as previous.

Vol 2 Appendix 8.2 Table 12 Further attended measurement results at location 5

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	11:45	12:00	Wind: ~6m/s	56	61	72	59	Road traffic from North Circular dominates background. Plant from Edmonton EcoPark audible, affecting background. Some birdsong audible. 11:56 cyclist passes quietly. 11:59 cyclist passes quietly. 11:59 DIY rotary tool noise from nearby narrow boat.
27.06.13	12:54	13:09	Wind: ~6m/s	56	59	65	58	Road traffic from North Circular dominates background. Plant and intermittent engine noise from Edmonton EcoPark audible, affecting background. Engine running on narrow boat, but quietly. Some birdsong audible. 12:58 cyclist passby talking. 13:08 cyclist passes quietly.
27.06.13	14:04	14:19	Wind: ~6m/s	55	58	68	56	Road traffic from North Circular dominates background. Plant from Edmonton EcoPark audible, affecting background. Some birdsong audible. 14:07 cyclist passes, almost silently. 14:13 impulsive event from narrow boat. 14:19 four cyclists pass quietly.

Vol 2 Appendix 8.2 Table 13 Attended measurement results at location 6

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
01.03.13	00:50	00:55	0.1m/s	NNE	50.7	63.9	70.7	59.6	Road traffic from Conduit Lane dominates noise environment. Some background noise just audible from North Circular. Lorries occasionally passing on Kenninghall Road.
01.03.13	02:01	02:06	0.1m/s	NE	48.5	62.7	71.6	59.1	Road traffic from Conduit Lane dominates noise environment. Some Lorries occasionally passing on Kenninghall Road to park-up for the night. Occasional HGV doors closing up for the night. Occasional car horns causing the max level.
01.03.13	03:09	03:14	0.1m/s	NE	49.3	67.4	75.0	62.5	Bird song form trees overlooking location. Conduit Lane has lighter traffic flows now, but still dominated by HGV. Fewer cars, Traffic light at cross roads of Conduit Lane and Montague Road (B137) are not changing at the same frequency as before, due to traffic on Montague Road (B137) is very light, so no traffic is being stopped on Conduit Lane.
01.03.13	12:55	13:10	0.5m/s	N	59.3	68.1	85.8	65.2	Noise from Conduit Lane. Very heavy traffic and stop start at traffic lights south.
01.03.13	14:14	14:39	0.5m/s	NNE	63.0	71.4	79.7	68.2	Fridge lorry with chillier running at 20m from meter location. HGV's moving around location .Very heavy traffic and stop start at traffic lights south.
01.03.13	15:30	15:45	2.1m/s	NE	59.2	67.2	86.8	65.3	HGV's moving around location and parking up for the night. Noise from Conduit Lane. Very heavy traffic and stop start at traffic lights south.
01.03.13	20:19	20:29	0.1m/s	N	57.1	63.6	72.2	61.2	Traffic on Conduit Lane and the junction of Montague Road (B137), is constant. Cars and HGVs slowing at traffic lights and then accelerating away from junction. Mixed traffic LGV and cars.
01.03.13	21:17	21:27	0.1m/s	NNE	57.5	64.2	84.8	61.8	Location is totally dominated by traffic on Conduit Lane and the junction of Montague Road (B137), Traffic level has slightly eased from last measurement.

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	20:21	20:31	0.9m/s	S	55.3	64.2	71.6	61.0	Heavy traffic on Conduit Lane and junction of Montague Road (B137), approx. 225 car pass buy at 10min per cars and HGVs slowing at traffic lights and then accelerating away from junction. Mixed traffic LGV and cars.
27.06.13	22:15	22:25	0.1m/s	S	51.1	64.1	75.9	60.7	Location dominated by traffic starting and stopping at lights at Conduit Lane and the junction of Montague Road (B137). More HGV using Conduit Lane during this measurement.
27.06.13	01:10	01:15	0.2m/s	S	48.6	64.1	79.9	60.1	Road still dominates background, more HGV running on Conduit Lane, when break in traffic, large transformer next to Conduit Lane can be heard humming.
27.06.13	02:41	02:46	0.3m/s	S	44.5	59.1	66.7	55.4	Conduit Lane not too busy, but still dominated by HGV. Fewer cars, Traffic light at cross road, not changing as frequent as before, due to traffic on Montague Road (B137) is very light.

Vol 2 Appendix 8.2 Table 14 Further attended measurement results at location 6

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	14:39	14:54	-	59	63	70	61	Road traffic on Conduit Lane. Car Horns, accelerating traffic from traffic lights. Quiet while cars are stopped at lights. Vehicle movements from inside Edmonton Auto and movement/stacking of metal - very brief impact events. Tree knocking against metal fence in wind.
23.06.13	15:31	15:46	Occasional gusts of strong wind (>5m/s) - slightly affecting measurement below 100Hz.	58	63	71	61	Horns from junction nearby. Similar road traffic to previous measurement. Helicopter overhead for 30 seconds - low frequency engine sound and propeller noise.
23.06.13	16:16	16:31	Wind <5m/s with occasional strong gusts - did not noticably affect the measurement.	58	63	67	61	Loud engine idling & accelerating at traffic lights. Constant distant road traffic (not visible but from direction of North Circular/Angel Road - A406). HGVs at traffic lights accelerating & engine idling. 2 no. distant aircraft.
24.06.13	02:05	02:20	-	46	57	65	54	Distant HGVs, occasionally crossing junction with Kenninghall Rd, accelerating from lights. Periods of no traffic nearby, only very distant sounding road traffic. Vehicles on Conduit Lane/Montague Rd are mainly HGVs with a few small vehicles.
24.06.13	03:44	03:59	-	49	64	72	60	Loud acceleration from car at traffic lights. HGVs at lights. Road traffic becoming more noticeable (distant roads and some closer roads)

Vol 2 Appendix 8.2 Table 15 Further attended measurement results at location 6

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	12:10	12:25	Wind: ~1m/s	59	68	80	65	Road traffic from Conduit Lane dominates noise environment. Some background noise audible from North Circular. Lorries occasionally passing on Kenninghall Road. 12:12 car horns. 12:29 car/truck horns.
27.06.13	13:18	13:33	Wind: ~1m/s	59	68	75	65	Road traffic from Conduit Lane dominates noise environment. Some background noise audible from North Circular. Lorries occasionally passing on Kenninghall Road. Frequent impulsive 'clangs' from recycling yard. 13:30 car horn causing the max event.
27.06.13	14:42	14:57	Wind: ~1m/s	59	68	76	65	Road traffic from Conduit Lane dominates noise environment. Some background noise audible from North Circular. Lorries occasionally passing on Kenninghall Road. Occasional impulsive 'clangs' from recycling yard. Occasional car horns causing the max level.

Vol 2 Appendix 8.2 Table 16 Attended measurement results at location 7

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
01.03.13	01:02	01:07	0.1m/s	N	43.4	54.5	60.6	50.7	Trains are on overhead power lines, train passbys are relatively quiet due to road noise from Meridian way (A1055). No car passbys during measurement.
01.03.13	02|:11	02:16	0.0m/s	N/A	41.6	51.4	58.8	47.8	Background is dominated by general road traffic, particularly from Meridian way (A1055 and probably Montagu Road (B137). No car passbys during measurement
01.03.13	03:20	03:25	0.1m/s	N	43.6	56.0	61.7	51.7	Car passbys during measurement @3:30 mins Traffic on Meridian way (A1055) can be heard and dominates background levels
01.03.13	13:19	13:34	1m/s	N	53.2	60.3	85.2	62.2	Road noise from Meridian way (A1055)and construction breaker from North. Train pass @3:50 mins,@5:02mins,@8:32mins, @10:32 mins
01.03.13	14:36	14:51	4.4m/s	N	53.8	61.2	85.9	62.2	Car passbys during measurement @12:30 mins. Train @3:30 mins, @3:5 mins,@ 6:06 mins, @8:36 mins,@8:56 mins and @14:15mins
01.03.13	15:56	16:11	2.4m/s	NE	53.2	60.1	86.3	62.5	Train slow & quiet @13:33 mins, @14:54 mins. construction breaker noise. No car passbys during measurement.
01.03.13	20:39	20:49	0.1m/s	NE	49.5	60.0	85.5	63.6	Trains @30 secs, @2:19 mins,@3:48 mins,@4:48 mins, @6:48 mins quiet engine running for 3:45 mins, now is switched off.
01.03.13	21:36	21:46	0.1m/s	N	50.4	59.4	87.1	64.1	Train @3:09 mins, @3:45 mins, @6:35 mins, 8:10 mins, @8:48 mins. Plant noise from industrial park and earth land fill to the east of location.
27.06.13	20:02	20:12	1.1m/s	S	46.9	53.8	71.5	51.9	Traffic on Meridian way (A1055) can be heard and dominates background levels, no other roads can be heard to the north of location. Slow train @ 06:53mins and @08:35mins, helicopter at @9:45mins

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	21:59	22:09	0.1m/s	S	43.5	53.4	67.9	49.9	Dead end road. No house noise, background dominated by Meridian way (A1055), plane over fly @5:30mins No car passbys during measurement
27.06.13	00:59	01:04	0.7m/s	S	39.2	49.0	55.0	45.2	Road noise coming from N/E of location dominated by quite new build flats and town houses, Approx. construction date 2000. No car passbys during measurement.
27.06.13	02:30	02:35	0.2m/s	S	35.9	49.6	74.1	48.3	Traffic levels on Meridian way (A1055) to the N/E of location are now lighter, no trains running during measurement, bird song from trees. No car passbys during measurement

Vol 2 Appendix 8.2 Table 17 Further attended measurement results at location 7

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	14:56	15:06	-	50	54	70	53	Children shouting - playing on bikes ~20m down the road. Distant road traffic (Meridian Way, and more distant A406). 3 no. aircraft in 10 min measurement. 2 no. car movements on Zambezie Dr. Pedestrians and residents outside talking 15m away. Distant music from a house. Hoarding up all along road - possible screening that wasn't present in the last survey.
23.06.13	15:48	16:02	-	51	56	72	56	Infrequent road traffic on Zambezie Dr (2no. Cars total). Low flying light aircraft caused L_{max}. Residents opening/closing doors, taking bins out - not loud. Distant aircraft. Road traffic on Montagu Rd dominant. 3 minutes of minimal road traffic. Distant ice cream van.
23.06.13	15:59	16:14	-	51	57	92	66	5 no. cars on Zambezie Dr, 2 parking 10m away with quiet door open/close, car engine idling for 1 min. Car door slam 5m away. Ice cream van music on this road caused Lmax. Also engine idling 3m away for last 10 seconds of measurement.
24.06.13	02:16	02:21	-	40	45	50	43	Humming sound from other side of hoarding - quiet but constant. Occasional road traffic on Montagu Rd. Distant road traffic - not a consistent flow. 4 no. car door slams from around the corner - distant. 2 no. metal sliding/banging sounds - distant, not sure of the location of the source.
24.06.13	03:54	03:59	-	43	47	55	46	Humming sound from other side of hoarding. Less road traffic - 1 minurte with no obvious traffic noise. Empty passenger train passby at end of Zambezie Dr.

Vol 2 Appendix 8.2 Table 18 Further attended measurement results at location 7

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	12:31	12:46	Wind: ~5m/s	48	57	78	56	Background is dominated by general road traffic, particularly from Montague Road and probably Meridian Way, although this was not visible. Some continuous construction noise audible. 12:34 pedestrian passes. 12:36 nearby residents holding elevated conversation. 12:40 train. 12:41 light van passes and parks up. Reversing beeper causes max event. 12:42 train. 12:44 train (slow & quiet). 12:45 train.
27.06.13	13:38	13:53	Wind: ~5m/s	47	53	73	52	Background is dominated by general road traffic, particularly from Montague Road and probably Meridian Way, although this was not visible. Some continuous construction noise audible. 13:40 train. 13:41 resident moving refuse bin nearby. 13:42 train. 13:44 pedestrian passes. 13:45 train. 13:51 train.
27.06.13	15:02	15:17	Wind: ~5m/s	48	56	70	53	Background is dominated by general road traffic, particularly from Montague Road and probably Meridian Way, although this was not visible. Some continuous construction noise audible. 15:04 car door shutting. 15:06 car passes. 15:07 a quiet engine that had been running is switched off. 15:07 some DIY impulsive events from nearby. 15:09 train. 15:10 train (quiet). 15:13 pedestrian pass, children whistling. 15:14 fairly loud aeroplane passing overhead. 15:16 car passes.

NORTH LONDON WASTE AUTHORITY

NORTH LONDON HEAT AND POWER PROJECT

ENVIRONMENTAL STATEMENT: VOLUME 2 APPENDIX 8.3 NOISE POSITION PAPERS

AD06 . 02

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North London Waste Authority

North London Heat and Power Project

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The Planning Act 2008 The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5 (2)(a)

Issue

October 2015

Arup

ARUP

nlwa
north london waste authority

ARUP

Subject	EIA Noise Position Paper for the Environment Agency		
Date	11 June 2015	Job No/Ref	235271

Position Paper: Approach to Assessment of Noise for the North London Heat and Power Project

1 Purpose of note

The North London Heat and Power Project (NLHPP) would replace the existing EfW facility at the Edmonton EcoPark site with a new Energy Recovery Facility (ERF) and associated development. A description of the new facility is provided in Section 2 of this note.

The Environmental Impact Assessment (EIA) for the NLHPP includes an assessment of noise and vibration, the scope of which was set out in the EIA Scoping Report published in October 2014. A Scoping Opinion was subsequently published by the Planning Inspectorate in November 2014, which contained comments from the Environment Agency regarding the scope of the noise and vibration assessment. These comments related mainly to the adequacy of the baseline noise data gathered and how this should be applied for permitting agreements. Section 3 of this note describes the applicant's response to the Environment Agency comments, addressing each of the points raised to show how the gathered data is compliant for permitting purposes.

Section 4 then sets out a proposal as to how the latest revision of BS4142[1] should be applied to the setting of appropriate noise requirements for industrial noise from the development.

These proposals are intended to form the basis of discussions with the Environment Agency to reach an agreement of the noise requirements for inclusion in the permit. The Environment Agency are therefore requested to review and comment on the proposals set out in this note to inform further technical discussion on this matter.

This note does not consider noise from vehicle movements on local highways or within the boundary of the site as the noise from vehicle movements is not considered to represent an intrinsic part of the overall sound emanating from the new facility. Road traffic noise is considered separately as part of the EIA and the Development Control Order processes.

2 Description of the new facility

The Project would replace the existing EfW facility at Edmonton EcoPark, which is expected to cease operations in 2025, with a new and more efficient ERF which would produce energy from municipal waste, and associated development, including temporary works required to facilitate construction, demolition and commissioning. The new ERF would be constructed in the northernmost section of site currently occupied by the in-vessel composting facility, incinerator bottom ash reprocessing plant, bulky waste recycling facility and fuel preparation plant (all of which would be decommissioned).

[1] BSI(2014), BS 4142 Methods for rating and assessing industrial and commercial sound, British Standards Institution.

This comprises the ERF ('principal development') and developments that would be associated with the ERF ('associated development'). These developments would generate sounds from all of the following sources which meet the scope of BS4142:2104: Methods for rating and assessing industrial and commercial sound:

- sound from industrial processes;
- fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading and unloading of goods and materials; and
- sound from mobile plant and vehicles that is intrinsic to the overall sound emanating from premises or processes e.g. forklift trucks.

The main features of the Application Site layout once the new ERF is constructed and the old EfW facility is demolished are detailed below and are illustrated in Figure 1 below.

1. a northern area of the Edmonton EcoPark accommodating the proposed ERF;

2. a southern area of the Edmonton EcoPark accommodating the Resource Recovery Facility (RRF), a visitor and education centre with offices, and a base for the Edmonton Sea Cadets ('EcoPark House');

3. a central space, where the existing EfW facility is currently located that would be cleared; and

4. a new landscape area along the edge with the River Lee Navigation

Figure 1: Proposed Edmonton Eco Park site layout

The new facility is planned to operate 24 hours, seven days a week.

3 Response to scoping comments

3.1 Introduction

The Secretary of State issued a Scoping Opinion for the NLHPP EIA in November 2014. The Opinion included comments from statutory consultees[2] including the Environment Agency. This position paper provides the Arup response to the Environment Agency scoping comments on the noise and vibration assessment, including comments raised at a meeting with the Environment Agency on 18 February 2015.

It is proposed that this paper provides the basis for further discussion with the Environment Agency on the issues raised.

3.2 Environment Agency comments

The comments provided by the Environment Agency on the EIA Scoping Report related primarily to the scope of the noise and vibration assessment. However the comments also related to the environmental permit which will be required for the NLHPP.

The Environment Agency comments stated: *"The energy from waste plant will require an installations environmental permit. As such, it is appropriate to highlight issues relating to section 9.2. The time used to obtain the baseline noise data is considered inadequate. The reports states in section 9.2.2 that the Feb/March data set only gives a 12hr data set, and the June/July data set gives a complete 24hr data set. This is a poor data set i.e. too short. Ambient noise levels are reported as ranges in section 9.2.3, but there is no report of any LA90 levels. Confirmation should be provided to demonstrate that noise monitoring is carried out to any correct British Standards guidelines eg BS7445."*

The Environment Agency raised the following additional comments at a meeting on 18 February 2015:

- Adequacy of data is questioned as surveys were undertaken whilst the current site was operational.
- The Environment Agency stated that in order to understand noise levels for the operational phase the baseline data should be collected without the existing site noise levels (i.e. without the site being operational). Recommended that reference be made to BS4142 (2014) to identify an approach for measuring/calculating what the noise levels would be like without the existing facility.
- Environment Agency queried whether another site which operates at a similar level /capacity could be used as comparison for obtaining baseline details (i.e. the principle of Example 10 from BS4142).
- Environment Agency queried whether the baseline data that would be used for the EIA would also be used for the environmental permit.

[2]The Secretary of State undertook consultation under Regulation 8(6) of the EIA Regulations before adopting the Scoping Opinion

3.3 Arup response

The Scoping Report upon which the Environment Agency has provided comments contained a summary of the noise survey results. The noise survey report from which the summary was derived, is provided in Appendix A of this paper (please note that this full noise survey report was not included in the Scoping Report). This report contains the information required to fully respond to the Environment Agency comments.

The noise survey locations for the NLHPP (see Appendix A) were chosen to represent the nearest identified existing and future noise sensitive receptors (i.e. residential receptors) to the Application Site. A description of the noise survey locations are shown in Table 1 below and in Figure 2 in section 4.3.1.

Measurement location number	Description	Coordinates	
		X	Y
1	Residential – representing sensitive receiver locations in Russell Road	536548	192830
2	Residential – representing sensitive receiver locations on Lower Hall Lane	536393	192540
3	Residential – representing future sensitive receiver locations in the Meridian Water development.	536050	192122
4	Residential – representing future sensitive receiver locations in the Meridian Water development.	535610	192116
5	Amenity - representing recreational users along the River Lee Navigation.	535863	192457
6	Residential - representing future sensitive receiver locations in the Meridian Water development.	535092	192450
7	Residential - representing sensitive receiver locations on Zambezie Drive.	535413	193294

Table 1: Noise survey locations

The noise survey work was undertaken in February/March 2013 and June/July 2013. Both surveys were undertaken following British Standard (BS) 7445:2003[3]and BS4142:1997[4] guidance which represented the relevant and correct guidance at the time of the surveys. They also comply with the new BS4142:2014[1]. The Standards both describe the industry best practice protocols for carrying out noise monitoring surveys and are adhered to as standard practice by Arup.

The noise surveys in June/July 2013 were undertaken to also encompass the survey requirements set out in Environment Agency environmental permitting regulations: Integrated Pollution Prevention

[3] BSI (2003) BS 7445-1. Description and measurement of environmental noise. Guide to quantities and procedures
[4] BSI (1997) BS4142. Method for rating industrial noise affecting mixed residential and industrial areas

and Control (IPPC) H3 Horizontal Guidance for Noise Part 2 (2004)[5]. The specific requirements of relevance are those prescribing the duration of the surveys and time periods covered e.g. weekends as well as weekdays.

Part 2 of the H3 Guidance states that "*The time when measurements are made may affect the noise levels that are measured. If a survey is intended to establish background noise from which noise limits will be derived for a new facility, the following should apply:*

- *the survey should include noise measurements at all the likely operational times of the plant; day, evening, weekend and night, although in practice in the case of a 24hr operation the night–time levels will often be the limiting factor*
- *night–time measurements should normally be made between 01:00 to 04:00 hours, Sunday to Thursday (when traffic noise and other human activity is at its lowest)*

Measurements should be carried out over a sufficient period of time to establish representative noise levels, and if necessary, maximum noise levels, from the facility. It is good practice to repeat measurements in order to improve confidence in the results because of all the factors described above".

In order to fulfil the H3 measurement criteria above, the noise surveys were conducted by Arup at the following times (attended survey times):

- between 14:07 and 17:34, 20:10 and 22:09 on Thursday 28 February 2013
- between 00:00 and 03:25, 12:29 and 16:11, and 20:00 and 21:46 on Friday 1 March 2013
- between 10:07 and 16:50 on Sunday 23 June 2013
- between 00:59 and 03:59 on Monday 24 June 2013
- between 00:59 and 03:48, 11:24 and 15:22, and 20:02 and 23:15 on Saturday 27 June 2013.

Unattended noise surveys were also conducted by Arup, setting the logging meters to run over the following periods (see Appendix A for details of locations referred to below):

- between Thursday 28 February 2013 and Friday 1st March 2013 at location 1
- between Friday 21 June 2013 and Friday 28 June 2013 at location 1
- between Friday 21 June 2013 and Friday 28 June 2013 at location 2
- between Thursday 27 June 2013 and Tuesday 2 July 2013 at location 3
- between Friday 21 June 2013 and Friday 28 June 2013 at location 5
- between Thursday 27 June 2013 and Tuesday 2 July 2013 at location 6
- between Thursday 27 June 2013 and Tuesday 2 July 2013 at location 7

NB it was not possible to install logging equipment at location 4 due to access and security issues.

The sound level meter was set to automatically measure and store the L_{Aeq}, L_{Amin}, L_{Amax}, L_{A10} and L_{A90} indices for all measurements. The full survey dataset, including L_{A90} levels are contained in Appendix A and are analysed further in the following part of this note.

[5] Environment Agency (2004) Horizontal Guidance Note IPPC H3 Horizontal Guidance for Noise Part 2 – Noise Assessment and Control.

All noise surveys were carried out while the EfW facility was operating. However, noise from the existing facility was not audible at most of the measurement locations. Even when noise from the existing facility was audible it was not considered to be a significant contributor to the background sound level.

The Environment Agency suggested that an example contained within the BS4142:2014[1] could be used to identify an approach for measuring/calculating what the background noise levels would be like without the existing facility. Example 10 in Annex 8 of BS4142 sets out an example approach for investigating complaints, where it would be appropriate to consider the rating level of the noise by comparison of the background sound level free from the influence of the specific sound level of the source under investigation. Example 10 does not apply to new sources of sound of an industrial or commercial nature. That does not mean to say that the noise from the existing facility should not be considered as this forms part of the context for the assessment of the new facility. The establishment of representative background sound levels is considered further in the next part of this note as well as setting out our thoughts on the context for the assessment and, in particular, the relevance and importance of the absolute level of sound and the character and level of the residual sound.

3.4 Conclusions on response to scoping comments

The survey data contained in Appendix A is compliant with previous and current guidance in terms of monitoring protocol and scope (i.e. British Standards and H3 Horizontal Guidance). The survey data contained within Appendix A also includes the L_{A90} noise levels.

4 Proposed approach to setting design criteria for noise permitting

4.1 Introduction

This part of the note considers the impact of the operation of the new ERF, with reference to the assessment method described in BS4142:2014.

The following sections provide an overview of the principles of the BS4142 method as are relevant to this application. Based upon these principles, the proposed approach to setting noise requirements is discussed. This will form the starting point for discussions with the Environment Agency for agreement of permit conditions.

4.2 British Standard BS4142:2014- Methods for rating and assessing industrial and commercial sound – summary of key principles

Industrial noise is to be assessed using the British Standard (BS4142:2014). The assessment will form the basis for setting the acoustic design requirements for the Project.

The standard provides methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

a. sound from industrial and manufacturing processes;

b. sound from fixed installations which comprise mechanical and electrical plant and equipment;

c. sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and

d. sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The standard can be used for the purposes of:

1. investigating complaints;
2. assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and
3. assessing sound at proposed new dwellings or premises used for residential purposes.

Section 11 of the standard states: '*The significance of the sound of an industrial and/or commercial nature is assessed considering both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.'* The terminology used above to describe the various sound parameters is defined in Section 3 of the standard.

An initial estimate of the impact of the specific sound should be obtained by subtracting the measured background sound level from the rating level. The standard (Section 11) states that:

a. Typically, the greater this difference, the greater the magnitude of the impact.

b. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c. A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

d. *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.*

The standard then goes on to describe the factors to be considered as part of the context, as follows:

1. The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low. Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2. The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence

of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

NOTE 3 Consideration ought to be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available. A number of studies are listed in the "Effects on humans of industrial and commercial sound" portion of the "Further reading" list in the Bibliography.

3. *The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*
   i. *facade insulation treatment;*
   ii. *ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
   iii. *acoustic screening.*

4.2.1 Background sound level

The standard requires background sound levels to be established for different situations (Section 8.1.1), namely:

a. a new specific sound source is to be commissioned; or
b. a change or modification is to be made to an existing sound source; or
c. there is an existing specific sound source not operating continuously; or
d. there is an existing specific sound source operating continuously; or
e. a new noise-sensitive receptor is being introduced to an environment already experiencing, or that will at a future time experience, industrial and/or commercial sound.

Where possible the background sound level should be measured at the assessment location(s). However, if this is not possible then the background sound level should be measured at an alternative location where the residual sound is comparable to the assessment location(s).

The notes to the section on background sound levels (Section 8.1) usefully explain that:

"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.

Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes. Furthermore, in this general context it can also be necessary to separately assess weekends and weekday periods.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound."

For proposed, new, modified or additional specific sound source(s) the standard requires the background sound level to be measured at times when the specific sound source(s) is intended to be operated.

For an existing specific sound source(s) not operating continuously (Section 8.3) the background sound should be measured:

a. during a temporary shutdown of the specific sound source(s); or
b. during a period immediately before or after the specific sound source(s) operate(s); or
c. at times when the specific sound is absent but might otherwise be present over the period of interest.

Where an existing specific sound source(s) is operating continuously (Section 8.4) the background sound should be measured at a location which is not subject to the specific sound and where the residual sound is considered to be comparable to that of the assessment location. Justification for considering this should be reported.

4.2.2 Rating level

Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, a character correction should be added to the specific sound level to obtain the rating level. This can be approached using one of three different approaches (Section 9.1):

a. subjective method;
b. objective method for tonality;
c. reference method.

Tonality: the correction of between 0 dB and +6 dB should be applied for tonality. In particular, the following correction should be applied (Section 9.2):

a. 2 dB for a tone which is just perceptible at the noise receptor,
b. 4 dB where it is clearly perceptible, and
c. 6 dB where it is highly perceptible.

Corrections of up to +9 dB can be applied for sound that is highly impulsive. The following corrections should be applied for impulses with different levels of prominence:

a. 3 dB for impulsivity which is just perceptible at the noise receptor,
b. 6 dB where it is clearly perceptible, and
c. 9 dB where it is highly perceptible.

Further corrections of 3 dB can be applied where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment or when the specific sound is intermittent i.e. has identifiable on/off conditions.

Where a combination of tones and impulses are present in the specific sound within the same reference period the standard advises that two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features

are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

4.3 Application of BS4142:2014 to the Project

The operational noise criteria for the new ERF will be set by reference to the assessment method described in BS4142:2014. The following proposals are set out for consideration by the Environment Agency to inform a discussion regarding noise controls for inclusion in the operational permit.

The scope of the standard is appropriate for this type of development as it is intended for sound from industrial and manufacturing processes falling within the definition set out at Section 1.1 of the BS4142. This includes associated loading and unloading activities and mobile plant on the site, such as vehicle movements, where the sound from mobile plant represents an intrinsic part of the overall sound emanating from the facility.

4.3.1 Baseline monitoring locations

Baseline noise surveys were carried out in 2013 at locations representing sensitive receptors around the site. The survey locations are shown in Figure 2. Survey locations 1 and 2 represent residential receptors on Lower Hall Lane, to the east of the site, and survey location 7 represents the nearest sensitive residential receptors on Zambezie Drive to the west of the site. Survey locations 3, 4 and 6 represent future residential receptors as part of the allocated Meridian Water development. Location 5 represents receptors in the Lee Valley Regional Park.

At the survey location 1, measurements were made over consecutive 15 minute periods between 14:00 on 28 February and 04:00 on 1 March 2013, to give a full 12 hours dataset for that location. More recent logged surveys were carried out in June and July 2013 at six of the seven of the locations[6] to capture a complete 24 hour period noise dataset.

[6] It was not possible to take logged surveys at location 4 due to access and security constraints.

Figure 1: Survey measurement locations in relation to the Application Site

4.3.2 Descriptions of noise climate at monitoring locations

In all locations the noise survey reporting indicates that subjectively the background noise climate is dominated by road noise from the North Circular Road, and this is corroborated by discussions with the team who carried out the noise survey.

At location 1, it is reported that road noise dominates for most of the measurement period during both the February and June surveys. At midday during the June survey, plant noise was heard coming from the Thames Water site, and it is noted that traffic on the A406 North Circular was lighter than usual. It is not clear what activity the plant were engaged in. During the measurement at 13:21 the plant is not working.

At location 2 it is reported that road traffic noise dominates for most of the measurement period during both the February and June surveys. At midday during the June survey, plant noise was again heard coming from the Thames Water site, and it is noted in the 13:52 survey that no plant was operating, A406 North Circular Road noise was dominant. In the early hours of the morning roof-top plant noise from the EcoPark could be heard.

At location 5 during the daytime, rooftop plant noise from the EcoPark and distant North Circular Road noise in combination determined the background noise at this location. Plant noise was also heard from the Thames water site. At night and in the early hours of the morning, rooftop plant noise from the Eco Park occasionally dominates this location, only when noise from the North Circular Road is reduced.

At all other locations A406 road traffic noise is dominant.

4.3.3 Existing background, residual and ambient sound levels

As described in Section 4.2.1, the standard makes clear that it is important to establish what is a typical background sound level and not simply the lowest background sound level at an assessment location. To help establish this, the standard recommends that fluctuations in background sound level over the monitoring periods should be examined to determine the context of the underlying sound exposure. Based on the example distribution of background sound levels given in Figure 4 of the standard, an equivalent analysis has been carried out for the baseline data obtained around the NLHPP site.

Figures 1 to 12 in Appendix B show the distribution of measured background sound levels at monitoring locations 1 to 7 (excluding unused location 4) over the daytime (07:00 to 23:00hrs) and night-time (23:00 to 07:00hrs) measurement periods. The cumulative percentage is also displayed to consider the proportions of the collected data that fall below particular sound levels. Further to this, the accompanying Tables 2 to 13 (shown below) provide associated statistical data to help understand the mean averages and the variation within the data sets acquired at each location. These results also reflect the context of the local sound exposure.

4.3.3.1 Analysis of background sound levels

A statistical analysis has been performed on the complete datasets acquired at each of the noise assessment locations. The total survey period included several normal working week days as well as a complete weekend period. Analysis was performed on the complete datasets as a whole, which takes account of both the weekday and weekends combined. In addition to this, an analysis was also undertaken upon the weekend period only (excluding normal weekdays), so as to provide indicative information on how the background level might vary between normal working days and the weekend. These findings are also discussed below.

Location 1

For daytime, Figure 1 (Appendix B) shows a distribution of the background sound levels over a range of approximately 20dB, which is a typical range for many of the locations monitored during the day, the range was smaller for the weekend. The statistical analysis of the L_{A90} values are presented in Table 2 below. The results for the combined weekday and weekend data show that the mean value (rounded to the nearest whole number) is 49dBL_{A90}. One standard deviation (the standard expression describing the variation of the data set about the mean), is 4.3dBL_{A90}. The mode value (most frequently occurring background sound level) is above the mean in this case, at 54dBL_{A90}. The sound level exceeded for 25% of the sample data set is 45dBL_{A90}. The equivalent results for the weekend show that background sound levels were higher (or equivalent in the case of the mode).

Two options are proposed for discussion with the Environment Agency to set the background sound level for the assessment against the BS4142 rating level. Alternatively a noise level between these criteria might be agreed according to the characteristics and variability of the local background sound at a location. Both of these proposals are based on the combined weekday/weekend data set, which would result in lower, more conservative thresholds than the equivalent results for the weekend.

1. Set the background sound level criterion as the mode of the distribution (as per the example given in Section 8.1.4 of BS4142), this would be 54dBL_{A90} in this case.
2. Set the background sound level criterion as the 25% cumulative level, 45dBL_{A90} in this case.

The 25% cumulative level lies within -1 standard deviation of the mean value.

For night-time, Figure 2 shows that the range of background sound levels falls over approximately 20dB, the range was smaller for the weekend. For the combined weekday and weekend data the mean value is 44dBL_{A90}, and one standard deviation about the mean, is similar to the daytime results at 5.0dBL_{A90}. The mode occurs at two values, 43 and 49dBL_{A90}, as can be seen from the figure, which shows two separate distributions of the data corresponding to weekday and weekend measurements respectively. The sound level exceeded for 75% of the sample data set is 41dBL_{A90}. The equivalent results for the weekend show that background sound levels were higher.

As for the daytime, two options are proposed for discussion with the Environment Agency:

1. Set the background sound level criterion as the lower mode of the distribution, this would be 43dBL_{A90} in this case.
2. Set the background sound level criterion as the 25% cumulative level, 41dBL_{A90} in this case.

Both of the values lie within -1 standard deviation of the mean value.

Location 1 – Daytime (07:00 – 23:00hrs), L_{A90} level, dB		
L_{A90}	Combined week/weekend	Weekend only
Average	49	52
Mode	54	54
1 Standard Deviation	4.3	1.9
Average plus Standard Dev.	53	54
Average minus Standard Dev.	44	50
25% of Cumulative	45	51
75% of Cumulative	52	54

Table 2: Location 1 – L_{A90} statistical analysis, daytime

Location 1 – Night-time (23:00-07:00hrs), L_{A90} level, dB		
L_{A90}	Combined week/weekend	Weekend only
Average	44	49
Mode	43 / 49*	49
1 Standard Deviation	5.0	1.5
Average plus Standard Dev.	49	51
Average minus Standard Dev.	39	48
25% of Cumulative	41	49
75% of Cumulative	49	51

*The mode occurs at two values corresponding to weekday and weekend measurements respectively.

Table 3: Location 1 - L_{A90} statistical analysis, night-time

Location 2

Figures 3 and 4 (Appendix B) show that the range of background sound levels falls over approximately 20dB daytime and 15dB at night-time, the range was smaller for the weekend. The relationships between mean, standard deviation and the mode generally show a similar pattern to the results for Location 1. The equivalent results for the weekend show that background sound levels were higher.

Again, two options are proposed for discussion with the Environment Agency to set the background sound level for the assessment against the BS4142 rating level. Both of these proposal are based on the combined weekday/weekend data set (i.e. more conservative than the equivalent results for the weekend).

1. Set the background sound level criterion as the mode of the distribution (as per Section 8.1.4 of BS4142), this would be 54dBL_{A90} daytime and 47dBL_{A90} night time.
2. Set the background sound level criterion as the 25% cumulative level, 49dBL_{A90} daytime and 45dBL_{A90} night time.

The 25% cumulative levels lie within the -1 standard deviation of the mean value.

Location 2 – Daytime (07:00 – 23:00hrs), L_{A90} level, dB		
L_{A90}	Combined week/weekend	Weekend only
Average	52	56
Mode	54	59
1 Standard Deviation	4.2	2.5
Average plus Standard Dev.	56	58
Average minus Standard Dev.	48	53
25% of Cumulative	49	54
75% of Cumulative	55	58

Table 4 Location 2 – L_{A90} statistical analysis, daytime

Location 2 – Night-time (23:00 – 07:00hrs), L_{A90} level, dB		
L_{A90}	Combined week/weekend	Weekend only
Average	48	53
Mode	47	53
1 Standard Deviation	4.1	1.5
Average plus Standard Dev.	53	55
Average minus Standard Dev.	44	52
25% of Cumulative	45	52
75% of Cumulative	53	54

Table 5 Location 2 – L_{A90} statistical analysis, night time

Location 3

Figures 5 and 6 (Appendix B) show that the range of background sound levels lies within a range of approximately 10dB daytime and 15dB at night-time (these ranges are reversed for the weekend data). Table 6 and 7 also presents the statistical analysis results. The equivalent results for the weekend only show that daytime background sound levels were slightly lower, although the mean average level was the same. At night-time the weekend levels were the same or higher than the weekday/weekend data.

Two options are proposed to set the background sound level for the assessment. Both of these proposals are based on the combined weekday/weekend data set. Although the combined data results are slightly higher than the weekend only results for daytime in some cases, the combined data is considered to represent the more typical noise exposure condition for most of the time.

1. Set the background sound level criterion as the mode of the distribution, this would be 53dBL_{A90} daytime and 51dBL_{A90} night-time.
2. Set the background sound level criterion as the 25% cumulative level, 52dBL_{A90} daytime and 47dBL_{A90} night-time.

The 25% cumulative levels lie below -1 standard deviation of the mean value.

Location 3 – Daytime (07:00-23:00hrs), L_{A90} level, dB		
L_{A90}	Combined week/weekend	Weekend only
Average	53	53
Mode	53	49
1 Standard Deviation	1.9	1.4
Average plus Standard Dev.	55	55
Average minus Standard Dev.	51	52
25% of Cumulative	52	49
75% of Cumulative	54	51

Table 6: Location 3 – L_{A90} statistical analysis, daytime

Location 3 – Night-time (23:00-07:00hrs), L_{A90} level, dB		
L_{A90}	Combined week/weekend	Weekend only
Average	49	50
Mode	51	51
1 Standard Deviation	3.1	2.4
Average plus Standard Dev.	52	52
Average minus Standard Dev.	46	47
25% of Cumulative	47	48
75% of Cumulative	51	51

Table 7: Location 3 - L_{A90} statistical analysis, night-time

Location 5

Figures 7 and 8 (Appendix B) show that the range of background sound levels falls over approximately 15dB daytime and 15dB at night-time, the range was smaller for the weekend. Table 8 and 9 also presents the statistical analysis results. The equivalent results for the weekend show that background sound levels were higher.

Two options are proposed to set the background sound level for the assessment. Both of these proposal are based on the combined weekday/weekend data set. Although the combined data is slightly higher than the weekend only results for daytime, the combined data is considered to represent the more typical noise exposure condition for most of the time.

1. Set the background sound level criterion as the mode of the distribution, this would be 51dBL_{A90} daytime and 47dBL_{A90} night-time.
2. Set the background sound level criterion as the 25% cumulative level, 50dBL_{A90} daytime and 47dBL_{A90} night-time.

The 25% cumulative levels lie below -1 standard deviation of the mean value.

Location 5 – Daytime (07:00-23:00hrs), L_{A90} level, dB		
L_{A90}	Combined week/weekend	Weekend only
Average	53	57
Mode	51	59
1 Standard Deviation	3.8	2.1
Average plus Standard Dev.	57	59
Average minus Standard Dev.	49	55
25% of Cumulative	50	55
75% of Cumulative	56	59

Table 8: Location 5 – L_{A90} statistical analysis, daytime

Location 5 – Night-time (23:00-07:00hrs), L_{A90} level, dB		
L_{A90}	Combined week/weekend	Weekend only
Average	50	54
Mode	47	54
1 Standard Deviation	4.0	1.6
Average plus Standard Dev.	54	56
Average minus Standard Dev.	46	52
25% of Cumulative	47	53
75% of Cumulative	54	55

Table 9: Location 5 - L_{A90} statistical analysis, night-time

Location 6

Figures 9 and 10 (Appendix B) show that the range of background sound levels falls over approximately 10dB daytime and 15dB at night-time, the same applies to the weekend only data. The equivalent results for the weekend show that daytime background sound levels were 1dB lower in some cases, although the mode level was the same. At night-time the weekend levels were mostly equivalent to the weekday/weekend data.

Two options are proposed to set the background sound level for the assessment. Both of these proposal are based on the combined weekday/weekend data set (i.e. more conservative than the equivalent results for the weekend).

1. Set the background sound level criterion as the mode of the distribution, this would be 59dBL_{A90} daytime and 48dBL_{A90} night-time.
2. Set the background sound level criterion as the 25% cumulative level, 56dBL_{A90} daytime and 47dBL_{A90} night-time.

The 25% cumulative levels lie at the -1 standard deviation of the mean value for daytime, and below the -1 standard deviation for night.

Location 6 – Daytime (07:00-23:00hrs), L_{A90} level, dB		
L_{A90}	Combined week/weekend	Weekend only
Average	58	57
Mode	59	59
1 Standard Deviation	2.0	1.9
Average plus Standard Dev.	60	59
Average minus Standard Dev.	56	55
25% of Cumulative	56	56
75% of Cumulative	59	59

Table 10: Location 6 – L_{A90} statistical analysis, daytime

Location 6 – Night-time (23:00-07:00hrs), L_{A90} level, dB		
L_{A90}	Combined week/weekend	Weekend only
Average	50	50
Mode	48	48
1 Standard Deviation	4.1	3.1
Average plus Standard Dev.	54	53
Average minus Standard Dev.	46	47
25% of Cumulative	47	47
75% of Cumulative	52	52

Table 11: Location 6 - L_{A90} statistical analysis, night-time

Location 7

Figures 11 and 12 (Appendix B) show that the range of background sound levels falls over approximately 10dB daytime and 15dB at night-time, the range was smaller for the weekend. Table 12 and 13 also presents the statistical analysis results. The equivalent results for the weekend show that daytime background sound levels were 1dB lower in some cases, although the mean average and mode levels were the same. At night-time, the weekend levels were mostly equivalent to the weekday/weekend data.

Two options are proposed to set the background sound level for the assessment. Both of these proposals are based on the combined weekday/weekend data set. Although the combined data results are slightly higher than the weekend only results for daytime in some cases, the combined data is considered to represent the more typical noise exposure condition for most of the time.

1. Set the background sound level criterion as the mode of the distribution, this would be 50dBL_{A90} daytime and 42dBL_{A90} night-time.
2. Set the background sound level criterion as the 25% cumulative level, 48dBL_{A90} daytime and 42dBL_{A90} night-time.

The 25% cumulative levels lie at the -1 standard deviation of the mean value for daytime, and below the -1 standard deviation for night.

Location 7 – Daytime (07:00-23:00hrs), L_{A90} level, dB		
L_{A90}	**Combined week/weekend**	**Weekend only**
Average	49	49
Mode	50	50
1 Standard Deviation	1.9	2.0
Average plus Standard Dev.	51	51
Average minus Standard Dev.	48	47
25% of Cumulative	48	47
75% of Cumulative	51	50

Table 12: Location 7 – L_{A90} statistical analysis, daytime

Location 7 – Night-time (23:00-07:00hrs), L_{A90} level, dB		
L_{A90}	Combined week/weekend	Weekend only
Average	44	44
Mode	42	44
1 Standard Deviation	3.4	2.4
Average plus Standard Dev.	48	47
Average minus Standard Dev.	41	42
25% of Cumulative	42	42
75% of Cumulative	47	46

Table 13: Location 7 - L_{A90} statistical analysis, night-time

Repeatability of survey results - variability in measured data recorded at the same locations during different surveys

The analysis of noise data has been performed solely upon the 'long-term' data acquired during June/July 2013 (as described above). However, this data has also been compared against earlier 'short-term' survey data undertaken between 28th February and 1st March 2013. The details of this analysis are provided below, which compares the daytime and night-time periods, thus enabling a broad understanding of how stable the background sound climate is around the study area, and establishing the level of variability in the data being considered.

A summary of the analysed L_{A90} Daytime and Night-time 'long-term' June noise data alongside the 'short-term' February data, is provided in Appendix C.

Location 1
Daytime period: the range of L_{A90} noise levels recorded during the February survey lies between 54-56dB. The average L_{A90} level measured during the June survey was 49dB, whilst the mode was 54dB, with a standard deviation of 4dB. It is considered that the variance in sound level between the two survey periods is significant, and that the lower values obtained from the long-term June data should be used for the benchmark values.

Night-time period: the range of L_{A90} noise levels recorded during the February survey lies between 52-53dB. The average L_{A90} level measured during the June survey was 44dB, whilst the mode lies between 43 and 49dB, with a standard deviation of 5dB. It is considered that the variance in noise level between the two survey periods is significant, and that the lower values obtained from the long-term June data should be used as the benchmark values.

Location 2
Daytime period: the range of L_{A90} noise levels recorded during the February survey lies between 54-56dB. The average L_{A90} level measured during the June survey was 52dB, whilst the mode was 54dB, with a standard deviation of 4dB. The variance in noise level between the two survey periods is well within the Standard deviation, and the noise climate appears very stable during daytime periods within a significant time frame.

Night-time period: the range of L_{A90} noise levels recorded during the February survey was 41dB. The average L_{A90} level measured during the June survey was 48dB, whilst the mode was 47dB, with a standard deviation of 4dB. It is considered that the variance in noise level between the two survey periods is significant, and that the lower values obtained from the long-term June data should be used as the benchmark values.

Location 3
Daytime period: the range of L_{A90} noise levels recorded during the February survey lies between 62-63dB. The average L_{A90} level measured during the June survey was 53dB, whilst the mode was 53dB, with a standard deviation of 2dB. It is considered that the variance in noise level between the two survey periods is significant, and that the lower values obtained from the long-term June data should be taken as the benchmark values.

Night-time period: the range of L_{A90} noise levels recorded during the February survey lies between 49-56dB. This large variation in the background noise level is considered unusual, and likely to be due to non-typical noise sources at the time of the survey. The average L_{A90} level measured during the June survey was 49dB, whilst the mode was 51dB, with a standard deviation of 3dB. The variance in noise level between both survey periods ties up well with respect to the lowest noise levels. It is considered that the higher level recorded in February is abnormally high, and should be disregarded.

Location 5

Daytime period: the range of L_{A90} noise levels recorded during the February survey lies between 59-60dB. The average L_{A90} level measured during the June survey was 53dB, whilst the mode was 51dB, with a standard deviation of 4dB. It is considered that the variance in noise level between the two survey periods is significant, and that the lower values obtained from the long-term June data should be used as the benchmark values.

Night-time period: the range of L_{A90} noise levels recorded during the February survey lies between 51-54dB. The average L_{A90} level measured during the June survey was 50dB, whilst the mode was 47dB, with a standard deviation of 4dB. It is considered that the variance in noise level between the two survey periods suggest that the noise climate appears very stable during night-time periods over a significant time frame.

Location 6

Daytime period: the range of L_{A90} noise levels recorded during the February survey lies between 59-63dB. The average L_{A90} level measured during the June survey was 58dB, whilst the mode was 59dB, with a standard deviation of 2dB. It is considered that the variance in noise level between the two survey periods suggest that the noise climate appears reasonably stable during night-time periods over a significant time frame.

Night-time period: the range of L_{A90} noise levels recorded during the February survey lies between 49-51dB. The average L_{A90} level measured during the June survey was 50dB, whilst the mode was 48dB, with a standard deviation of 4dB. It is considered that the variance in noise level between the two survey periods suggest that the noise climate is very stable during night-time periods over a significant time frame.

Location 7

Daytime period: the range of L_{A90} noise levels recorded during the February survey lies between 53-54dB. The average L_{A90} level measured during the June survey was 49dB, whilst the mode was 50dB, with a standard deviation of 2dB. It is considered that the variance in noise level between the two survey periods suggest that the noise climate appears reasonably stable during night-time periods over a significant time frame.

Night-time period: the range of L_{A90} noise levels recorded during the February survey lies between 42-43dB. The average L_{A90} level measured during the June survey was 44dB, whilst the mode was 42dB, with a standard deviation of 3dB. It is considered that the variance in noise level between the two survey periods suggest that the noise climate appears very stable during night-time periods over a significant time frame.

Summary of rationale for setting the background sound level for the assessment

Two criteria have been proposed above for determining the background sound level for each location against which the BS4142 rating level is to be set: the mode value of the data set, or the 25% cumulative sound level. The values from these two criteria define what is considered to be a reasonable range within which to select the appropriate background sound level (see Table 14 below). A noise level between these criteria might be agreed according to the characteristics of the local background sound at a location.

Background noise levels were also analysed specifically for weekends and found to be typically greater than or equivalent to the corresponding combined data over weekdays and weekends. It is considered reasonable, therefore, to set the background sound level criteria on the combined data set (i.e. typically a lower, more conservative criteria than the weekend-only sound levels).

The range of L_{A90} background sound levels to be considered so as to establish typical and representative background sound levels for each assessment location are given in Table 14.

Assessment location	Proposed dBL_{A90} background sound level range for BS4142 assessment			
	Day (07:00-23:00)		Night (23:00-07:00)	
	Mode	25% cumulative	Mode	25% cumulative
1	54	45	43	41
2	54	49	47	45
3	53	52	51	47
5	51	50	47	47
6	59	56	48	47
7	50	48	42	42

Table 4: Proposed range of dBL_{A90} background sound level for purpose of setting BS4142 rating sounds levels

As reported above, the variability of the background noise levels have been considered from two separate survey periods. Whilst there was inevitably some variation in the survey data, the long-term data described above, upon which it is proposed to set the criteria for background sound levels, was the more conservative data set (which would result in lower background sound criteria than the alternative short-sampled data).

As part of the evaluation of the background sound, the influence of noise from the existing facility should be considered as this forms part of the context for the assessment of the new facility. It should be noted though that the facility was only audible at two locations (monitoring locations 2 and 5) and then only rarely audible. Noise from the existing facility was not therefore considered to be a significant contributor to the background sound level. This is demonstrated by the fact that the background sound levels at the two locations where noise from the existing facility was audible were either lower or consistent with the levels measured at the other locations where noise from the existing facility was not audible. A general description of the character of the existing sound environment is provided in Table 15 below.

4.3.3.2 Analysis of ambient sound levels

The L_{Aeq} ambient sound levels have been analysed in the same way to show the distribution of data over the day and night periods. These results are shown in Figures 25 to 36 and Tables 25 to 36 in

Appendix B. This provides additional data to compare against the background sound levels to describe the context and character of the existing local sound exposure. This may also be relevant to understand the potential impacts of other activities on the site associated with the new ERF, other than fixed plant noise.

In summary, the results show that the mean L_{Aeq} sound levels are generally relatively close to the corresponding mean L_{A90} sound levels for each location. The range of differences between L_{Aeq} and L_{A90} is between 2dB to 8dB for daytime, and 4dB to 10dB for night time (L_{Aeq} being higher than L_{A90}). From Arup's experience of surveying other urban or industrial sites, the differences are often of the order of 10dB or more. The L_{Aeq} scale is more sensitive to short-term noise events giving rise to rapid fluctuations in noise, hence the difference between the L_{Aeq} and L_{A90} results will be greater if the noise environment is characterised by these short-term acoustic events. The relatively small differences between these two measures for the locations around this site suggests that the noise environment is generally stable and dominated by relatively constant noise sources, such as traffic. This concurs with the subjective observations.

Table 16 describes the range of noise L_{Aeq} noise levels at each location. A description of the character of the existing sound environment is provided in Table 17 (Section 4.3.4.1). This information will be used to determine to what extent the 'specific' sound level from the new facility is likely to be incongruous or clearly distinguishable against the context of the existing sound environment. This approach is in accordance with the methodology in BS4142 (Section 11.2).

Assessment location	**Range of recorded dBL_{Aeq} sound levels during June 2013 survey**			
	Day (07:00-23:00)		Night (23:00-07:00)	
	Mean	Range	Mean	Range
1	59	38 to 79	50	35 to 57
2	58	44 to 75	53	42 to 60
3	57	50 to 70	54	46 to 60
5	57	45 to 65	56	43 to 68
6	66	56 to 80	59	54 to 70
7	59	49 to 57	54	46 to 64

Table 16: Ranges in measured L_{Aeq} noise levels recorded during June 2013 survey (free field)

4.3.4 Assessment of potential impact – recommended approach

Based on the methodology described in section **Error! Reference source not found.** above, representative typical background sound levels have been determined for the closest representative noise sensitive receivers surrounding the development site. These will form the basis against which the rating level of the Project will be assessed.

Due consideration to the proposed noise emissions from the proposed facility has been given to ascertain what, if any, elements of the development has the potential to generate significant noise levels at the nearest noise sensitive receivers.

4.3.4.1 Industrial noise

Section 11 of the BS4142:2014 states:

a. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

b. A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

c. 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.

However, from these initial assessment criteria, the context of the local noise environment at each location should be considered to establish the appropriate criteria. This will be based on consideration of the absolute levels of noise and the character of the existing ambient noise.

In order to apply this approach described in BS4142, consideration has been given to the context of the development in the existing environment to identify the extent of corrections that would be suitable for the specific noise when determining the rating level for assessment. The existing environment surrounding the Application Site is summarised in the following table based on subjective observations for each noise survey measurement location:

Survey Location	**Subjective Environmental Noise Observations**
1	The noise environment at this location is generally dominated by road traffic noise. During quieter periods of traffic occasional extraneous noise is audible from other sources such as construction activities from Thames water development site, water flow noise from nearby waterways, occasional aircraft overflights and industrial noise from surrounding industrial premises.
2	The noise environment at this location is generally dominated by road traffic noise. During quieter periods of traffic occasional extraneous noise is audible from other sources such as construction activities from Thames water development site, pumping station noise, and industrial noise from surrounding industrial premises including the scrap yard.
3	The noise environment at this location is dominated by road traffic noise. During quieter periods of traffic occasional extraneous noise is audible from other sources such as retail unit plant noise and industrial noise from the scrap yard.
4	The noise environment at this location is dominated by road traffic noise. During quieter periods of traffic occasional extraneous noise is audible from other sources such as retail unit plant noise and industrial noise from surrounding industrial premises.
5	The noise environment at this location is dominated by road traffic noise during peak traffic periods and industrial noise from the Eco Park during low traffic periods at night. Both sources were audible with dominance varying throughout

Survey Location	Subjective Environmental Noise Observations
	dependent on traffic volumes at the given time. No other significant sources of noise were noted.
6	The noise environment at this location is dominated by road traffic noise. During quieter periods of traffic occasional extraneous noise is audible from other sources such as transformer hum from a transformer located on Conduit Lane and some industrial noise in the form of material handling from the Edmonton Auto site and the scrap yard.
7	The noise environment at this location is dominated by road traffic noise and regular train movements. Occasional extraneous noise is audible from other sources such as plant noise from the industrial park and construction activities in the area, occasional high level aircraft overflights, industrial material handling noise and humming and some distant construction activities.

Table 17: Subjective observations regarding noise context at each location

The subjective observations of the noise environment obtained during the survey as presented in the table above show that road traffic noise is generally dominant at measurement locations within the area. However, periods of lesser traffic reveal audible mechanical, industrial and material handling noise, which suggests that the introduction of industrial noise from the proposed new facility would to some extent be in keeping with the existing noise environment, albeit not to the extent that it becomes dominant. This suggest that comparisons against the background sound levels alone would overestimate the level of impact from the new facility and that a difference between the rating level and the background sound level of +5dB would provide an indication of a low impact.

In the case of environmental noise, the NPPF planning objectives are addressed through the Noise Policy Statement for England (NPSE)[7]. The NPSE states the following aims:

> "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
>
> - *avoid significant adverse health 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."*

Within these aims, the NPSE uses the key phrases 'significant adverse' and 'adverse'. In clarifying what these mean the NPSE notes that:

> *"There are two established concepts from toxicology that are currently being applied to noise effects, for example, by the World Health Organization. They are:*
>
> 1. *NOEL – No Observed Effect Level*
> *This is the level below which no effect can be detected. In simple terms, below*

7 Department for Environment Food and Rural Affairs (2010), Noise Policy Statement for England

this level, there is no detectable effect on health and quality of life due to the noise.

2. *LOAEL – Lowest Observed Adverse Effect Level*
This is the level above which adverse effects on health and quality of life can be detected."

The Policy extends these concepts to include:

- *"SOAEL – Significant Observed Adverse Effect Level*
This is the level above which significant adverse health effects on health and quality of life occur."

The preliminary environmental statement[8] sets out the LOAELs and SOAELs for road traffic noise

Effect threshold (residential)	**Threshold value**
LOAEL	Day 50dB$L_{Aeq,16hr}$ Night 40dB$L_{Aeq,8hr}$
SOAEL	Day 63dB$L_{Aeq,16h}$ Night 55dB$L_{Aeq,8hr}$

Table 18: Thresholds of likely effects of operational noise (residential) (free-field)

Comparing the levels of existing ambient and residual noise (refer to Table 16) against the LOAELs and SOAELs would suggest that:

- existing daytime ambient noise levels are between LOAEL and SOAEL with the exception of the average level at Location 6, which is above the SOAEL.
- existing night time ambient noise levels are between LOAEL and SOAEL with the exception of the average level at Locations 5 and 6, which are above the SOAEL.

This suggests that the impact criteria set out in Section 11 of the BS4142:2014 could underestimate the level of impact at Locations 5 and 6.

The context has been considered in relation to the character of the existing ambient and residual noise and the absolute level of noise. Overall, it can be seen that these two factors balance against each other. It is therefore recommended that no adjustment or modification is made to the impact criteria contained in the standard, namely:

1) A difference of around +10 dB will represent a significant adverse impact,

2) A difference of around +5dB will represent an adverse impact, and.

3) Where the rating level does not exceed the background sound level will represent a low impact.

[8] NLWA (2015), Preliminary Environmental Information Report, Volume 2 Appendix 7.1 Noise and Vibration Assessment Methodology

4.3.4.2 Noise from the proposed facility (completed development)

Detailed noise data will be sought for the proposed plant associated with the new facility and incorporated into an industrial noise model developed in Soundplan noise modelling software. Where necessary this data will be supplemented using measurements of emission levels for specific activities at the existing facility. The BS4142 assessment will consider the activities associated with loading and unloading activities and mobile plant on the site. It is likely that this will be equivalent to current operations but will be quantified as part of the assessment.

The plant noise data will be reviewed for information on tonality and impulsivity.

The noise model will assume a flat topography for simplicity give the relatively flat terrain on the site to predict the industrial noise emissions at the nearest noise sensitive receivers.

Where predictions indicate that an impact would occur at a noise sensitive receiver, the noise model would be interrogated to identify the contributing plant noise elements giving rise to the impact and guidance sought from the designers of the plant as to feasible forms of attenuation that can be incorporated into the design. Attenuation measures would be incorporated into the noise model to create final revised noise predictions at the nearest noise sensitive receivers.

5 Next steps

This Position Paper has provided responses to points raised by the Environment Agency to show how the data gathered during a series of sound level surveys is compliant for permitting purposes. The principles of the recent BS4142 (2014) method for rating and assessing industrial and commercial sound[1] have then been summarised in Section 4.2 to set the framework of the assessment. Proposals as to how this guidance should be applied to the NLHPP facility have been described for each surrounding receptor location considering the background, ambient and residual sound levels in Section 4.3. The context of sound associated with the NLHPP has then been considered in relation to the character and absolute level of the existing noise environment. Based on this analysis of the data and the proposed application of the standard to the NLHPP, the following steps are proposed to progress towards a formal permitting submission.

1. The Environment Agency will require a review period to consider the data analysis and proposed approach described in this note to the selection of typical background sound levels and impact criteria.
2. The applicant would seek to meet with the Environment Agency to discuss any further points arising from the Environment Agency review and agree background sound level and impact criteria for each assessment location.
3. Information describing the operation of the facility and associated noise emissions will be gathered to construct a noise model from which to predict sound contributions arising from the facility at each assessment location. The prediction would also consider the activities associated with loading and unloading activities and mobile plant on the site. Any appropriate mitigation measures will be considered at this stage.
4. When sound levels arising from the facility have been quantified, the agreed assessment approach, based on the appropriate application of the standard for this site, will be applied in order to propose suitable sound emission levels for the permitting application.

5. A further meeting is proposed between the applicant and Environment Agency to agree the proposals and finalise any further details of the permitting application in terms of operational monitoring and reporting protocols.
6. Submission of permitting application.

Appendix A

Baseline Report

North London Waste Authority

Edmonton Eco Park

Background Noise Survey at Edmonton EcoPark

NLWA Report

Issue | 15 July 2013

Job number 230751-01

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Document Verification

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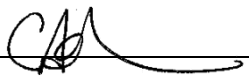
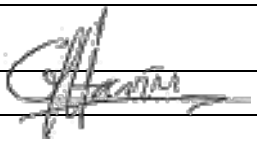
		Signature			
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Contents

Appendices

1 Noise measurement survey

1.1 Attended survey period

Attended noise surveys were carried out to establish the baseline noise levels at the locations shown in Figure 1. The surveys were conducted individually by Ray Houghton. Daniel Lurcock and Joe Hornby of Arup at the following times:

- between 14:07 and 17:34, 20:10 and 22:09 on 28 February 2013
- between 00:00 and 03:25, 12:29 and 16:11, and 20:00 and 21:46 on 1 March 2013
- between 10:07 and 16:50 on 23 June 2013
- between 00:59 and 03:59 on 24 June 2013
- between 00:59 and 03:48, 11:24 and 15:22, and 20:02 and 23:15 on 27 June 2013.

1.2 Attended survey methodology

The sound level meter was set to record noise levels over 15-minute periods during the daytime between 10:00-17:00, 10-minute periods during the evening between 20:00-22:00 and, 5-minute periods during the night between midnight and 03:00. For each noise measurement, the noise climate, wind speed and direction, and the measured noise levels, were all recorded and noted. The meter was set to automatically store the L_{Aeq}, L_{Amin}, L_{Amax}, L_{A10} and L_{A90} indices. Measurements were made with a fast (0.125s) time constant.

The measurements were made with the measurement microphone mounted using a tripod 1.2m-1.5m above ground level under acoustically free field conditions (i.e. at least 3.5m from any acoustically reflecting surface other than the ground).

The measurement locations were chosen to provide an indication of the typical ambient noise levels at representative noise sensitive receptors around the site of the proposed development.

The weather conditions during the survey were fine, but low cloud conditions on the night part of survey, with almost 50% of survey no wind record (max wind speed record, gusted no greater than 4.5ms^{-1} and generally from the north direction).

1.3 Measurement equipment

Measurements were carried out using equipment as detailed in Figure 1. The sound level meter and microphone are Type 1, conforming to BS EN 61672-1: 2003. The calibration of the sound level meter, pre-amplifier and microphone chains were checked before and after use, to confirm that there was no significant drift in meter response at the calibrator frequency and level. All Arup's sound level meters are regularly calibrated and this calibration is traceable to international standards.

Measurement Equipment	Manufacturer	Type Number	Serial Number
Precision grade noise logging sound level meter	Brüel & Kjær	2260	2370442
½" diameter pre-polarised condenser microphone	Brüel & Kjær	4189	1903808
Type 1 sound pressure calibrator	Brüel & Kjær	4231	2402714
Precision grade noise logging sound level meter	Norsonic	NOR 140	1403425; 1403431
½" diameter pre-polarised condenser microphone	Norsonic	NOR 1225	98510; 98540
Pre-amplifier	Norsonic	NOR 1209	12578; 12579
Type 1 sound pressure calibrator	Rion	NC74	35173565; 35015347; 35173564; 34336007; 34336008; 34773051; 34904968
Precision grade noise logging sound level meter	Rion	NL52	00620958; 00231670; 00231671
Precision grade noise logging sound level meter	Rion	NL32	00451285; 00493036
Pre-amplifier	Rion	NH21	15278; 29978
Pre-amplifier	Rion	NH25	20999; 21614; 21615
½" diameter pre-polarised condenser microphone	Rion	UC53	308532; 315941
½" diameter pre-polarised condenser microphone	Rion	UC59	03876; 04715; 04716

Table 1 Detailed measurement kit used for the survey

1.4 Unattended survey periods

A number of unattended noise surveys were carried out set up at the locations shown in Figure 1 by Ray Houghton and Daniel Lurcock of Arup as follows:

The logging meters were set to run over the following periods:

- between 28 February 2013 and 1st March 2013 at location 1
- between 21 June 2013 and 28 June 2013 at location 1
- between 21 June 2013 and 28 June 2013 at location 2
- between 27 June 2013 and 2 July 2013 at location 3
- between 21 June 2013 and 28 June 2013 at location 5
- between 27 June 2013 and 2 July 2013 at location 6
- between 27 June 2013 and 2 July 2013 at location 7

NB it was not possible to install logging equipment at location 4 due to access and security issues.

1.5 Unattended survey methodology

The NL52, NOR140 and B & K2260 logging meters were set to record noise levels over 15-minute periods for 12 hours to cover all three periods i.e. the interpeak period (daytime), late evening and quietest night time. The meters were set to automatically store the L_{Aeq}, L_{A10}, L_{A90} and $L_{Amax,F}$ indices. Measurements were made with a fast (0.125s) time constant.

The measurements were made with the measurement microphone mounted using a tripod approximately 1.2m-1.5m above ground level under acoustically free field conditions (i.e. at least 3.5m from any acoustically reflecting surface other than the ground).

The measurement locations were chosen to provide a representative indication of the typical ambient noise levels across the area proposed for mixed use development.

The weather conditions during the survey were dry and variable with wind speeds less than 4ms-1 generally from the northeast.

1.6 Unattended measurements

At the logging position 1, measurements were made over consecutive 15 minute periods between 014:00hrs on 28 February and 04:00hrs on 1 March 2013, to give a full 12 hours dataset for that location. Table A1 details the full survey results as a time history for the 12 hour unattended noise survey. The summary results of the L_{Aeq} and L_{A90} measurements are shown in Table 2, Table 3 and Table 4.

The full survey results of the remaining more recent logged surveys in June and July 2013 are provided graphically in Appendix A

1.7 Attended measurements

The summary results of the L_{Aeq} and L_{A90} measurements are shown in Table 2, Table 3 and Table 4. Measurement locations are as shown in Figure 1.

Figure 1 Measurement locations

1.8 Summary noise survey results

Measured noise levels are summarised in Table 2 to Table 4 below.

Location	Sound pressure level, dB		
	L_{A90}	L_{Aeq}	L_{Amax}
1	54-56	59-63	
2	49-50	53-54	71-75
3	62-63	63-65	70-79
4	69-72	78-79	84-86
5	59-60	60-62	71-76
6	59-63	65-68	80-87
7	53-54	62-63	85-86

Table 2 Summary of measured daytime noise levels (10:00-17:00)

Location	Sound pressure level, dB		
	L_{A90}	L_{Aeq}	L_{Amax}
1	54	55-56	
2	44-45	46-47	56-59
3	59-60	62	67
4	72-74	76-77	83-84
5	56-58	58-59	64-67
6	57-58	61-62	72-85
7	50	64	86-87

Table 3 Summary of measured evening noise levels (20:00-22:00)

Location	Sound pressure level, dB		
	L_{A90}	L_{Aeq}	L_{Amax}
1	54	55-56	
2	44-45	46-47	53-65
3	59-60	62	62-65
4	72-74	76-77	81-83
5	56-58	58-59	60-67
6	57	61-62	70-75
7	50	64	59-62

Table 4 Summary of measured night time noise levels (midnight -03:00)

Appendix A

Full Noise Survey Results

Date	Time		Noise Level, dB (A)				Comments
	Start	Finish	L_{90}	L_{10}	L_{max}	L_{eq}	
27.02.13	14:07	14:22	54.5	58.6	66.5	56.8	----------Unattended measurement----------
27.02.13	14:22	14:37	55.6	61.9	73.8	59.3	
27.02.13	14:37	14:52	56.8	62.5	77.8	61.4	
27.02.13	14:52	15:07	55.8	60.4	73.0	58.5	
27.02.13	15:07	15:22	57.5	63.3	73.9	60.9	
27.02.13	15:22	15:37	57.8	62.8	80.6	61.1	
27.02.13	15:37	15:52	57	62.1	80.5	60.2	
27.02.13	15:52	16:07	55.4	61.2	75.2	58.9	
27.02.13	16.07	16:22	55.5	61.1	73.9	58.7	
27.02.13	16.22	16.37	56.0	61.2	75.2	59.2	
27.02.13	16.37	16.52	53.5	58.0	70.8	56.2	
27.02.13	16.52	17.07	53.6	57.4	63.8	55.7	
27.02.13	17.07	17.22	53.2	56.8	65.7	55.2	
27.02.13	17.22	17.37	53.1	57.7	65.7	55.6	
27.02.13	17.37	17.52	52.4	58.5	78.0	57.8	
27.02.13	17.52	18.07	52.3	56.5	69.4	54.7	
27.02.13	18.07	18.22	52.3	55.8	67.5	54.2	----------Unattended measurement----------
27.02.13	18.22	18.37	52.1	54.9	66.0	53.6	
27.02.13	18.37	18.52	53.0	56.4	79.1	58.5	

Date	Time		Noise Level, dB (A)				Comments
	Start	Finish	L_{90}	L_{10}	L_{max}	L_{eq}	
27.02.13	18.52	19.07	52.6	56.0	70.0	54.5	
27.02.13	19.07	19.22	52.2	57.2	70.4	55.1	
27.02.13	19.22	19.37	52.0	55.2	64.2	53.8	
27.02.13	19.37	19.52	53.2	56.7	78.4	56.3	
27.02.13	19.52	20.07	53.7	56.7	68.5	55.4	
27.02.13	20.07	20:22	54.1	57.4	74.5	56.1	
27.02.13	20:22	20:37	53.7	56.5	62.8	55.2	
27.02.13	20:37	20.52	53.6	56.6	62.9	55.1	
27.02.13	20.52	21.07	53.7	56.9	65.7	55.4	
27.02.13	21.07	21.22	53.9	57.0	67.4	55.6	
27.02.13	21.22	21.37	53.7	57.1	76.5	56.1	
27.02.13	21.37	21.52	52.9	56.6	63.1	54.9	
27.02.13	21.52	22.07	52.7	55.6	63.0	54.2	
27.02.13	22.07	22.22	52.8	56.1	69.1	54.8	
27.02.13	22.22	22.37	53.3	57.5	72.1	55.9	----------Unattended measurement----------
27.02.13	22.37	22.52	52.6	56.4	64.4	54.8	
27.02.13	22.52	23.07	52.4	55.7	64.6	54.2	
27.02.13	23.07	23.22	52.6	55.5	79.5	57.7	
27.02.13	23.22	23.37	52.3	55.4	62.7	54.0	

Date	Time		Noise Level, dB (A)				Comments
	Start	Finish	L_{90}	L_{10}	L_{max}	L_{eq}	
27.02.13	23.37	23.52	52.0	54.9	65.5	53.5	
27.02.13	23.52	00.07	52.1	54.5	61.8	53.3	
28.02.13	00.07	00.22	51.9	54.4	60.4	53.3	
28.02.13	00.22	00.37	51.5	54.0	57.8	52.8	
28.02.13	00.37	00.52	51.7	54.3	59.7	53.0	
28.02.13	00.52	01.07	52.3	54.9	60.4	53.7	
28.02.13	01.07	01.22	52.0	54.0	59.7	53.0	
28.02.13	01.22	01.37	52.4	54.5	61.9	53.5	
28.02.13	01.37	01.52	52.7	55.1	64.3	54.0	
28.02.13	01.52	02.07	53.3	55.4	60.7	54.4	
28.02.13	02.07	2.22	53.0	55.1	59.1	54.1	
28.02.13	2.22	2.37	52.5	54.8	58.2	53.7	
28.02.13	2.37	2.52	51.8	54.7	66.9	53.7	----------Unattended measurement----------
28.02.13	2.52	3.07	51.8	59.1	70.5	56.4	
28.02.13	3.07	3.22	51.8	54.2	61.9	53.1	
28.02.13	3.22	3.37	51.9	54.3	63.7	53.3	
28.02.13	3.37	3.52	52.4	64.7	88.8	64.6	
28.02.13	21:22	21:37	53.7	57.1	76.5	56.1	
28.02.13	23:52	00:07	52.1	54.5	61.8	53.3	

Date	Time		Noise Level, dB (A)				Comments
	Start	Finish	L_{90}	L_{10}	L_{max}	L_{eq}	
29.02.13	00:52	01:07	52.3	54.9	60.4	53.7	
29.02.13	01:52	02:07	53.3	55.4	60.7	54.4	

Table A1 Unattended measurement results at location 1 (15min samples from meter at 1hour intervals)

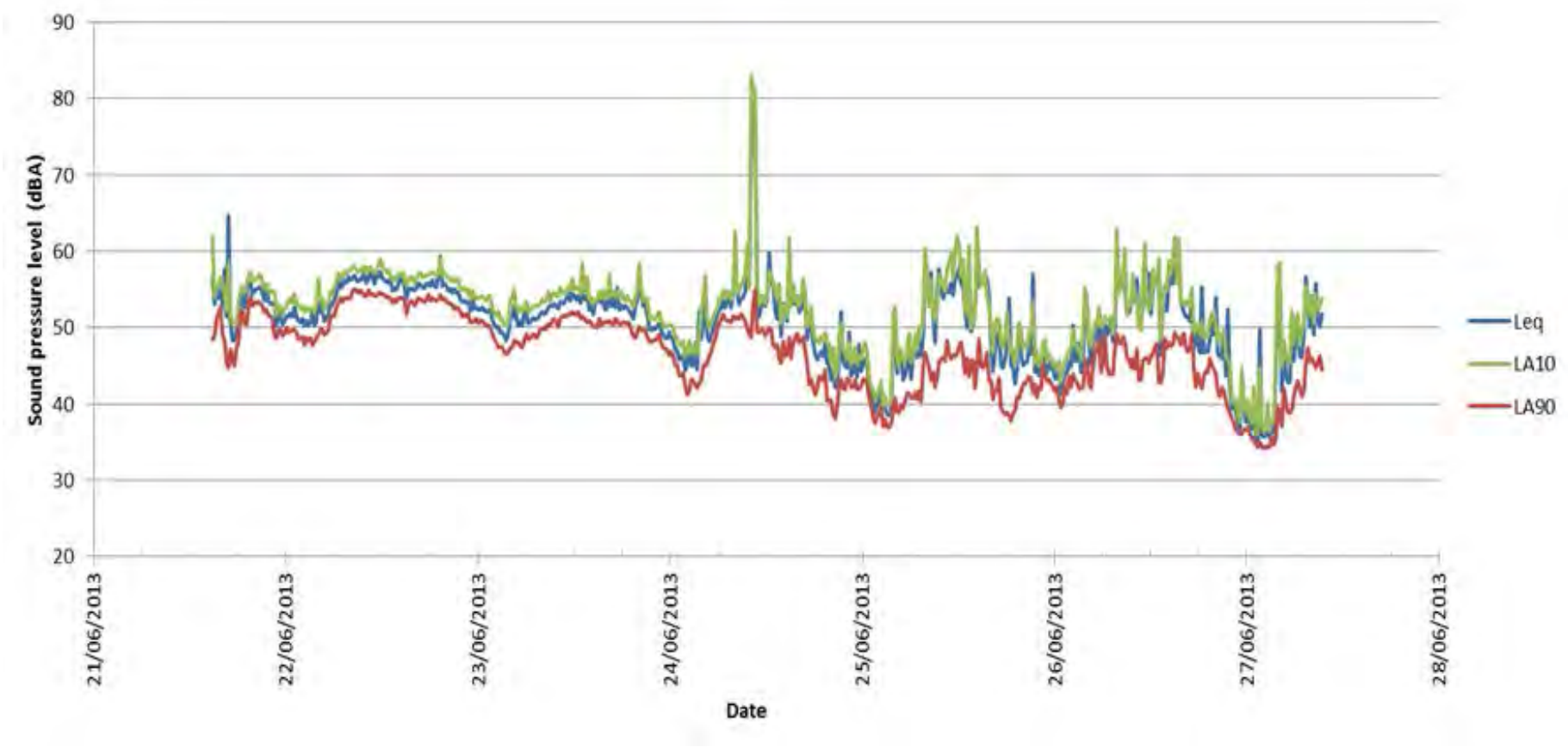
90
80
70
60
50
40
30
20
Sound pressure level (dBA)
21/06/2013
22/06/2013
23/06/2013
24/06/2013
25/06/2013
26/06/2013
27/06/2013
28/06/2013
Date
Leq
LA10
LA90

Figure A1

Date	Time		Wind Speed		Noise Level. dB (A)				Comments
	Start	End	Speed (ms^{-1})	Direction	L_{A90}	L_{10}	L_{max}	L_{eq}	
27.02.13	13:52	14:07	1.9 m/s	N	54.9	60.4	93.5	63.0	Large plant machines at work to north of site
27.06.13	20:42	20:52	0.5m/s	S	40.9	53.8	76.0	52.6	Traffic can be heard on A103 and trains can be heard in distance when wind changes direction. Background is dominated by roads to west of location. No pass traffic on Russell Road
27.06.13	01:37	01:42	0.2m/s	S	37.1	39.8	76.5	48.8	Now traffic is lighter water movement can be heard above distant road noise. Quiet location at back of house on Russell road, rural bungalows and 1930s bay window houses. Water noise is on par with road noise in distance. Russell road no traffic during measurement
27.06.13	03:08	03:13	0.3m/s	SW	46.6	49.0	69.2	44.3	Distance you can hear the A406 to the south, but when the background levels have dropped you now can clearly hear running water from this location
27.06.13	11:49	12:01			50.7	54.5	72.6	53.0	No roads can be heard above heavy plant working s/w of location (Thames Water). All type of earth movers are on site, quiet location apart from this background
27.06.13	13:21	13:36	0.5m/s	N	47.1	52.1	67.6	50.1	Plant on site not running, so A406 can now be heard plus 747 over flying location

Table A2 Attended measurement results at location 1

Date	Time		Wind Speed	Noise Level. dB (A)				Comments
	Start	End		L_{A90}	L_{10}	L_{max}	L_{eq}	
23.06.13	10:07	10:17	Windspeed 2-3 m/s increased to ~5 m/s gusts in middle of measurement.	52	55	66	54	Constant high speed road traffic - distant but dominant noise source. 3 no. aircraft passbys. Plants/grass rustling in wind and rattling against fence. Birdsong.
23.06.13	11:33	11:43	Wind ~3 m/s.	52	56	74	56	Low helicopter - passby for 2 minutes. 2 no. distant aircraft. Very light rain in last 2 minutes of measurement. Occasional distant bangs from direction of EcoPark.
23.06.13	12:58	13:13	Low windspeed	53	56	64	55	Constant road traffic. Motorcycle acceleration 3 times in measurement on distant road. 1 no. aircraft passby.
24.06.13	00:59	01:04	Low wind speed <2 m/s.	47	50	62	49	Distant road traffic - Walthamstow Ave and closer Waltham Way. Constant traffic flow, but less heavy flow than daytime.
24.06.13	02:34	02:39	Low windspeed.	44	48	51	46	Traffic less consistent flow than previous measurements. Some distant, quiet industrial banging sounds from direction of EcoPark, possibly from Lower Hall pumping station.

Table A3 Further attended measurement results at location 1

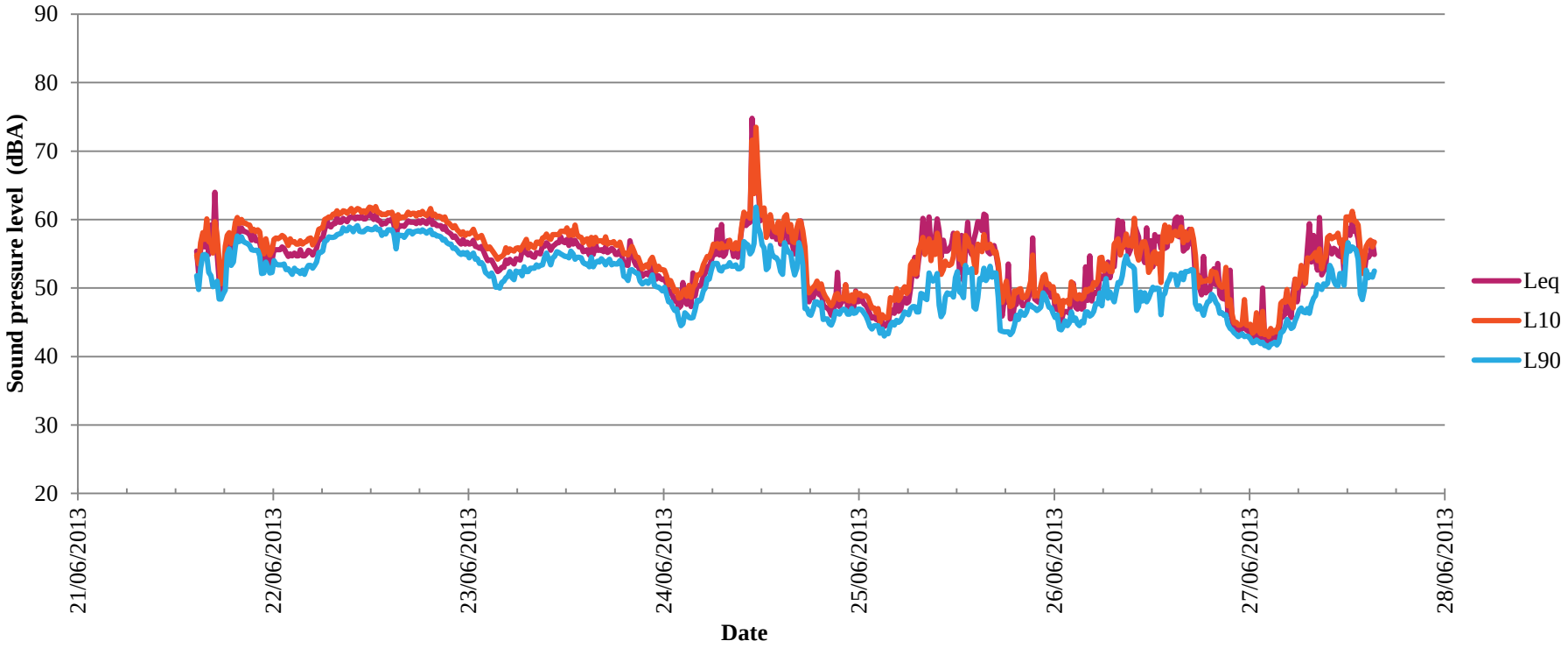
90
80
70
60
50
40
30
20
Sound pressure level (dBA)
21/06/2013
22/06/2013
23/06/2013
24/06/2013
25/06/2013
26/06/2013
27/06/2013
28/06/2013
Date
Leq
L10
L90

Figure A2

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
28.02.13	14:07	14:22	1.8 m/s	N	48.5	57.2	70.9	53.9	Residential traffic movements passing location parking and leaving flats on lower hall lane and (A406) road noise levels can be heard to south.
28.02.13	15:30	15:45	1.9 m/s	N/E	50.0	54.6	71.2	53.0	No roads can be heard above heavy plant working NW of location (Thames Water). All type of earth movers are on site, quiet location apart from this background Earth moves at work on site
28.02.13	16:37	16:52	1.4m/s	N	50.1	54.5	75.2	53.1	Large plant machines at work to north of site (Thames water)
28.02.13	20:36	20:46	1.8 m/s	N	45.4	47.9	59.4	46.7	Road traffic from Walthamstow Ave and other nearby busy roads. Some low noise coming from Lower Hall Pumping Station. Vehicle movements on nearby residential road - car door slams.
28.02.13	21:27	21:37	0.9m/s	N	44.4	47.6	56.1	46.0	Road traffic from Walthamstow Ave and other nearby busy roads. Occasional vehicle movements around residential estate.
01.03.13	00:00	00:05	0.0m/s	N/A	41.3	44.9	64.7	44.3	Traffic in distance to N/W from (A1009) and road noise (A406) to south of location. Apart from this background, no other noise can be heard
01.03.13	01:17	01:23	0.1m/s	N	40.7	43.2	55.1	42.2	Road noise is all coming from the (A406) north circular. Two cars passbys during measurement on lower hall lane turning around and dead end of lane.
01.03.13	02:25	02:30	0.3m/s	NE	41.6	45.3	52.6	43.6	Background noise from Eco Park can now be heard. Traffic on A406 is lighter than before, also traffic is audible north west of location.
27.06.13	20:58	21:08	0.2m/s	S	43.8	46.4	62.3	45.3	Quiet, no through road, no passing traffic during measurement. Background dominated by A406 to south of location. Some noise from open windows in flats voices can be heard.
27.06.13	22:33	22:43	0.8m/s	S	42.8	46.0	76.6	47.4	Road noise in distance to N/W and road noise south of location. Apart from this background, no other noise can be heard.
27.06.13	01:49	01:54	0.0m/s	N/A	42.4	44.7	62.0	43.8	Background noise is all coming from the A406 north circular. Small amount of traffic on Lower hall Lane turning around and dead end of lane.
27.06.13	03:20	03:25	0.0m/s	N/A	42.1	45.6	50.2	44.1	Plant noise from Eco Park can now be heard. Traffic on A406 is slightly lighter than before, also traffic is audible north west of location.
27.06.13	12:12	12:27	2.2m/s	S	58.3	42.0	69.7	60.3	Heavy plant can be seen to S/W of location working on Thames water site and dominating background noise. Quiet location apart from this.

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	13:52	14:07	0.0m/s	N/A	51.6	55.0	73.1	53.9	No plant running on Thames water site, so A406 becomes the dominant background noise for this location

Table A4 Attended measurement results at location 2

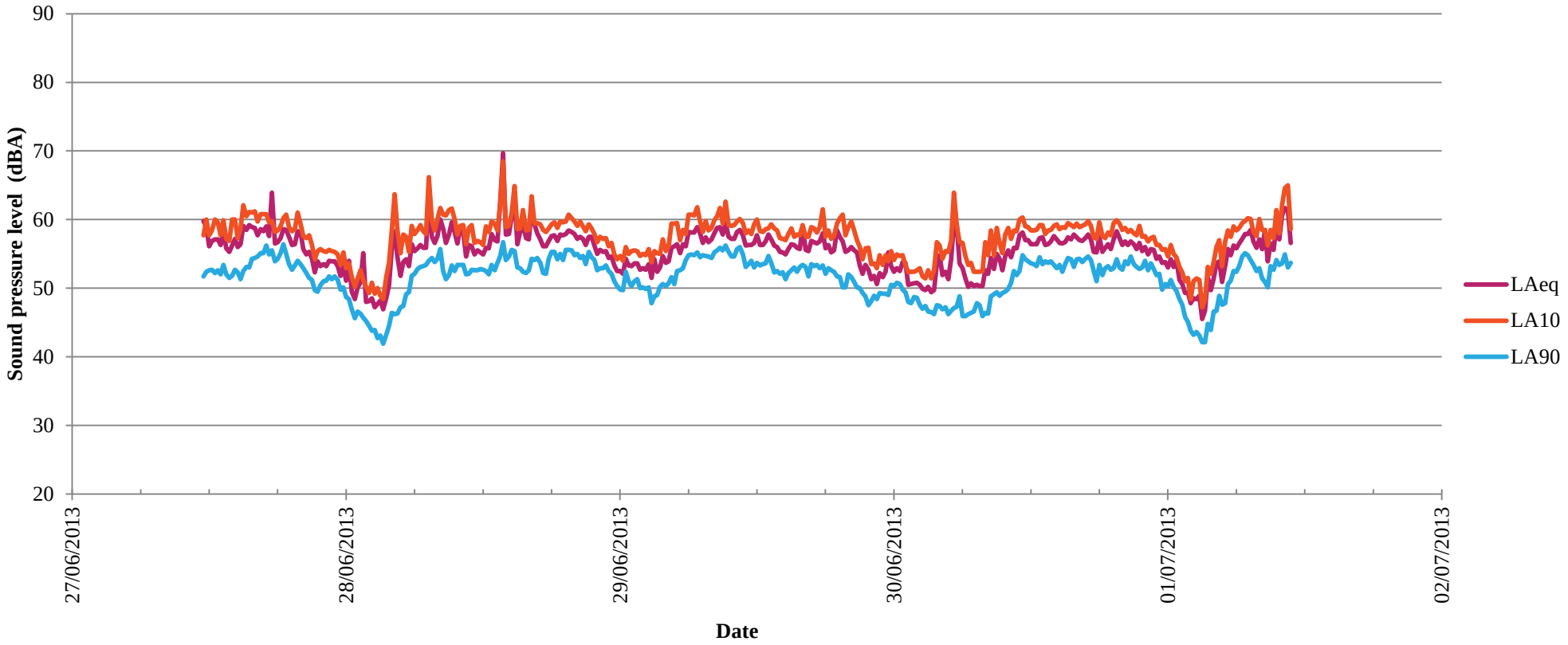
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Figure A3

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	10:31	10:46	Sheltered from wind - occasional low speed gusts.	56	59	71	58	Constant high speed (~50mph) road traffic from Walthamstow Ave and other nearby busy roads. Use of power tools or heavy plant from Lower Hall Pumping Station. Vehicle movements on nearby residential road - car door slams, low speed engine noise, horn around corner. 4x4 towing mini digger and unloading - banging sounds ~20m away.
23.06.13	11:47	12:02	Windspeed 3-4 m/s with faster bursts.	55	59	64	57	Constant high speed (~50mph) road traffic from Walthamstow Ave and other nearby busy roads. Banging from car park/scrap yard (?) at end of Lower Hall Ln. Distant plant movements from Lower Hall Pumping Station. Occasional vehicle movements around residential estate. Car playing loud music passed and parked - 30 sec. 2 no. distant light aircraft passbys.
23.06.13	13:19	13:34	-	55	59	70	58	Constant high speed (~50mph) road traffic from Walthamstow Ave and other nearby busy roads. Motorcycle acceleration on closer road. 2 no. aircraft passbys. 3 car movements nearby - parking, engine noise, door slams.
24.06.13	01:10	01:15	Minimal wind.	48	52	60	51	Distant road traffic - Walthamstow Ave. Lower traffic flow than daytime, but still constant and dominant noise source. One car movement on Mandeville Court (~10m away). Occasional traffic on Hall Ln.
24.06.13	02:48	02:53	Light wind.	48	53	59	51	Distant road traffic - Walthamstow Ave. Lower traffic flow than daytime, but still constant and dominant noise source. 1 no. distant train. 2 no. Cars on nearby residential roads.

Table A5 Further measurement results at location 2

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
28.02.13	14:34	14:49	3.8m/s	N	62.5	65.9	79.2	65.3	Helicopter fly over @4.2mins. Road noise from A406 is very high
28.02.13	15:55	16:10	2.0m/s	N/E	62.5	65.2	69.7	64.0	Background noise is all coming from the A406 north circular. Small amount of traffic on Harbet Road, which goes through industrial estate. Car movements at other end of car park
28.02.13	16:58	17:13	0.9m/s	N	62.0	64.5	69.8	63.3	Road noise levels mask any plant noise from ECO power plant. Traffic levels at A406 are still very high.
28.02.13	20:54	21:04	0.7m/s	N	60.2	63.1	67.2	61.8	Clear line of sight to A406 (north circular) traffic still is the dominant noise source at this location. No other noise can be heard
28.02.13	21:44	21:54	0.9m/s	N	59.0	63.3	67.1	61.5	No other background noise apart from constant road noise from A406
01.03.13	00:11	00:16	0.0m/s	N/A	56.0	61.1	64.8	59.0	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping.
01.03.13	01:28	01:33	0.1m/s	SW	49.0	59.1	62.8	56.4	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping but still the dominate background. Distant plant noise from retail units can be heard.
01.03.13	02:36	02:41	0.0m/s	N/A	51.4	58.9	62.4	56.3	Road noise levels are still masking any plant noise from ECO power plant. Traffic levels are A406 lighter but still constant.
27.06.13	21:23	21:33	0.1m/s	S	55.1	58.6	65.3	57.1	No other background noise apart from constant road noise from A406
27.06.13	22:49	22:59	0.2m/s	S	54.0	58.9	66.4	56.8	Background noise is all coming from the A406 north circular. Small amount of traffic on Harbet Road, which goes through industrial estate
27.06.13	02:04	02:09	0.1m/s	SW	50.5	57.0	62.4	54.3	Clear line of sight to A406 (north circular) traffic still is the dominant noise source at this location. No other noise can be heard
27.06.13	03:31	03:36	0.0m/s	N/A	47.5	58.3	70.7	55.1	Bird song in tress. Road noise from A406
27.06.13	12:35	12:50	2.5m/s	S/W	54.8	59.0	75.1	57.4	Local traffic on Harbet Road, local traffic/high flyovers by 747-400. Total dominated by A406. Car door shutting nearby.
27.06.13	14:04	14:19	0.1m/s	S	54.9	59.5	70.6	57.8	Bird song in trees and bushes. A406 still very busy, no other noise can be heard above Traffic noise, airbus 380 @12:30. Car movements at other end of car park.
27.06.13	14:46	15:01	0.1m/s	S	54.8	57.9	65.2	56.6	Bird song from trees, 747 overfly at 10,000ft @10:30 mins. A406 still dominating noise source

Table A6 Attended measurement results at location 3

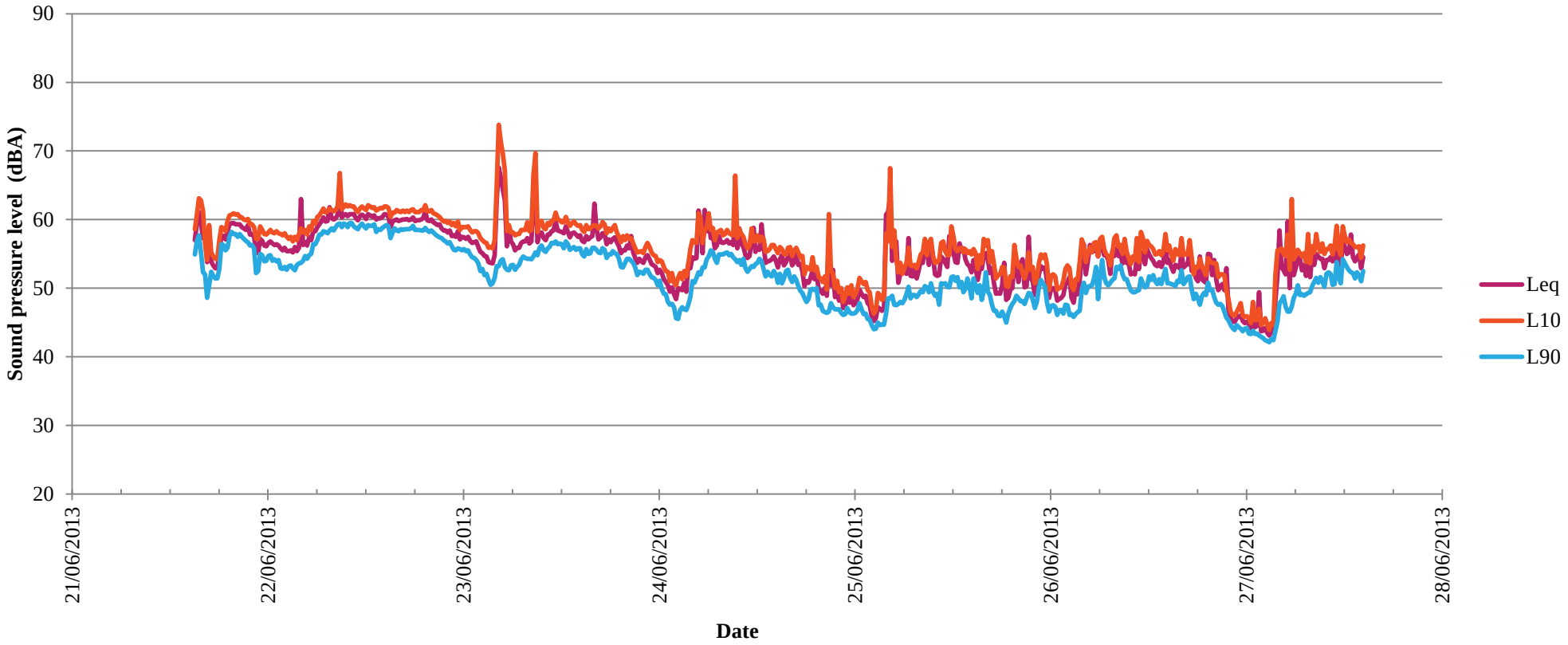
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Figure A4

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	10:52	11:02	Occasional gusts of strong wind (>6 m/s).	59	76	86	72	65 Vehicles in 10min measurement on Harbet Rd. Avg. speed ~25mph and accelerating. Gate rattling in wind 2m away. Flags outside shops flapping in wind. Constant road traffic noise from screened Walthamstow Way and other distant busy roads. Horn from passing car. 3 no. HGVs accessing carpark ~10m away. Trolley on Blackwood avenue approaching measurement position - 2 minutes of noise from wheels.
23.06.13	12:06	12:16	Brief gusts of wind causing gate to squeak/rattle (2m away).	59	75	83	70	72 vehicle passbys in 10 minute measurement. Avg. speed ~20mph, accelerating and braking at roundabout. Bangs from industrial estate opposite. Pedestrians talking nearby while passing. Very light rain at end of measurement.
23.06.13	13:41	13:56	-	61	75	88	72	85 vehicles passed - 5mph avg (slow moving queue). Car parked nearby - 3m away. 2 Door slams, engine idling. Pedestrians talking and walking by. Engine start near (3m). Queue of traffic from roundabout back to microphone position. Car alarm down the road - out of sight. Loud music from a car in the queue of traffic - 30 seconds.
23.06.13	19:35	-	-	56	67	84	66	Traffic noise from main road. 10 no. cars on Harbet Rd. Started raining. Noise from rain hitting boat/clipboard/puddles. Wet roads affecting high frequency measurement. Rain too heavy - abandoned measurements.
24.06.13	01:24	01:29	Minimal wind.	50	57	84	61	3 no. vehicles on Harbet Rd. Distant road traffic - lower traffic flow but consistent still. Motorbike accelerating on A406. HGV engine starting and idling for 2 minutes, 20m away (parked).
24.06.13	03:00	03:05	-	44	53	81	59	HGV with chiller on for 25 seconds of measurement. 2 no. cars on Harbet Rd. Distant road traffic - similar to previous measurement at this location.

Table A7 Further attended measurement results at location 3

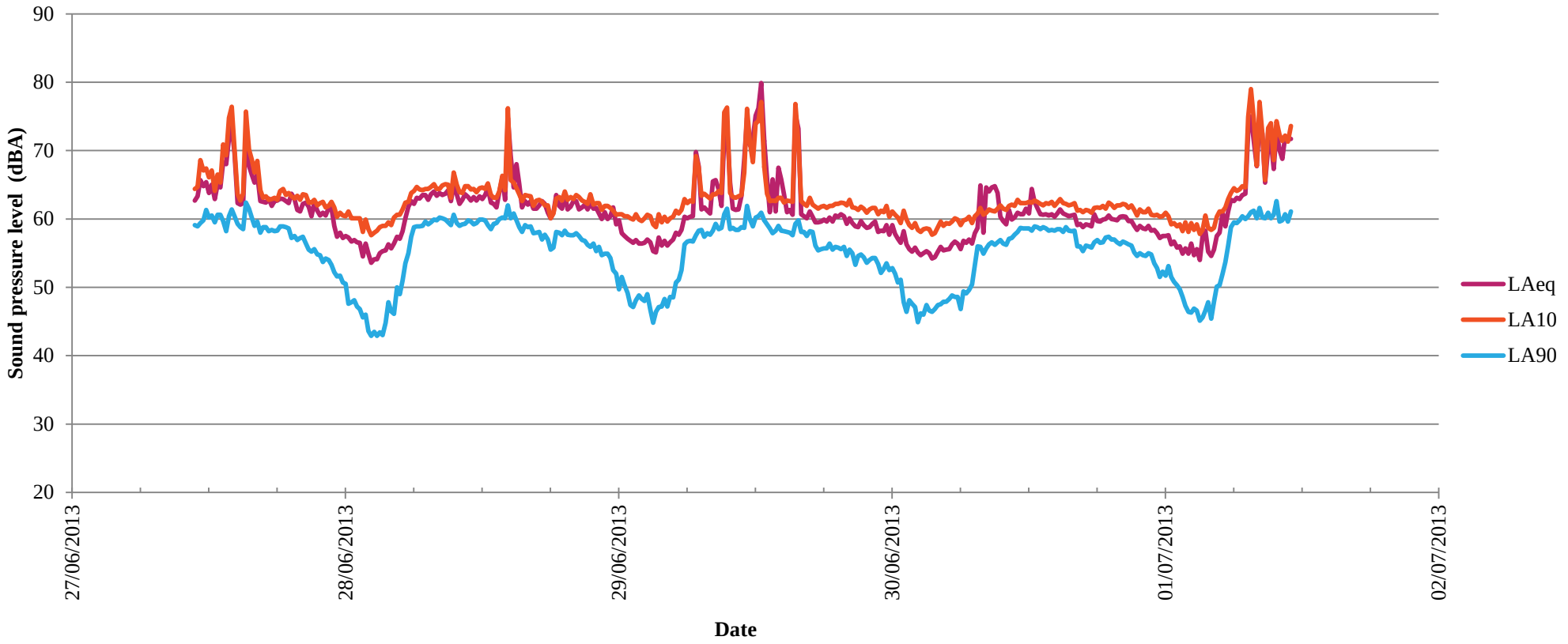
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Figure A5

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
28.02.13	15:00	15:15	1.5m/s	N/E	75.9	80.2	84.3	78.4	Police car @02:45mins, police car at 09:40mins. Noise from A406 as before very high flow.
28.02.13	16:14	16:29	1.8m/s	N	76.7	80.1	85.8	78.7	Traffic passbys using retail outlets, but measurement level not affect because of high level of traffic noise from (A406).
28.02.13	17:19	17:34	0.9m/s	N	75.7	79.2	82.3	77.7	Local traffic movements passed location parking and leaving using Next and Argos shopping outlet and the (A406) road noise levels mask any plant noise. Road still very busy with traffic.
28.02.13	20:10	21:20	0.7m/s	N	73.6	79.6	84.3	77.4	Traffic flow on A406 very heavy, approx. 150 cars and HGV-LDV per min. No other noise sources can be heard above traffic drone
28.02.13	21:59	22:09	1.1 m/s	N	71.7	78.9	82.5	76.3	This location is totally dominated by A406, approx. 75 cars per min. No other noise can be heard above road noise.
01.03.13	00:21	00:26	0.0m/s	N/A	66.5	77.6	82.5	74.3	No plant noise can be heard from the retail shopping outlet and the road noise levels mask any plant noise from ECO power plant. Traffic levels on A406 are still very high.
01.03.13	01:40	01:45	0.1m/s	S	61.1	74.4	81.9	70.7	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping.
01.03.13	02:46	02:51	0.0m/s	N/A	61.9	74.3	81.4	70.7	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping but still the dominate background. So some plant noise from retail units can be heard.
27.06.13	21:38	21:48	0.1m/s	S	71.2	79.3	85.7	76.2	Location totally dominated by A406, approx. 60 cars per min. No other noise can be heard above road noise!!
27.06.13	23:05	23:15	0.1m/s	S	68.4	77.5	90.7	74.8	Location dominated by A406 (north circular road) levels are so high, no other sounds can be heard.
27.06.13	02:15	02:20	0.0m/s	N/A	60.9	74.5	82.7	70.8	No plant noise can be heard from the Next and Argos shopping outlet and the road noise levels mask any plant noise from ECO power plant. Road still very busy with traffic
27.06.13	03:43	03:48	0.0m/s	N/A	61.6	73.7	77.6	69.6	Traffic is building up on A406 and dust carts are starting to leave ECO park .Traffic flows on Angel Road and Walthamstow Avenue (A406) are starting to increase again.
27.06.13	11:24	11:39	0.1m/s	S	76.7	80.7	94.4	79.1	Location totally dominated by pass traffic on A406, six lane 50mph passing mixed vehicles car LGV-HGV, buses
27.06.13	12:56	13:11	0.2m/s	SE	76.0	80.4	89.7	78.8	Traffic flow on A406 very heavy, approx. 150 cars and HGV-LDV per min. No other noise sources can be heard above traffic drone
27.06.13	14:25	14:40	0.1m/s	S	75.0	79.4	89.9	77.7	Ambulance @04:00, A406 still running at full flow per minute. Police at @14:02 mins

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	15:07	15:22	0.0m/s	N/A	75.7	79.9	87.5	78.1	Police car @02:34mins, police car at @09:30mins. Noise from A406 as before

Table A8 Attended measurement results at location 4

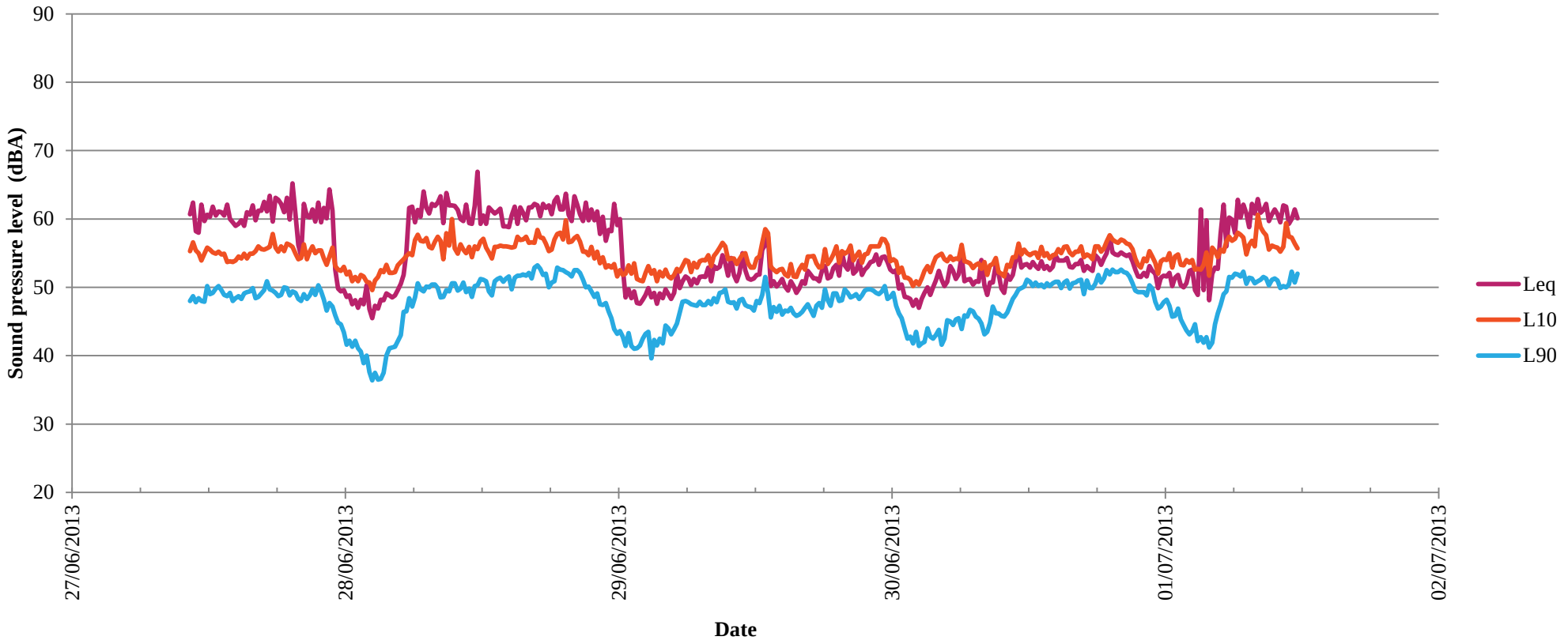
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Figure A6

Date	Time		Wind Speed	Statistical Indices				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	14:20	14:35	Light wind, generally <3m/s except occasional gusts	73	77	79	75	Argon Rd, A406 and Advent Way (10 lanes of traffic). Nearest lane ~15m away. Average speed of vehicles 50mph. Retail advertisement flags flapping in wind - metal on rope hitting the pole.
23.06.13	15:15	15:30	Constant wind 3-4m/s.	74	78	80	76	Busy Road dominant. Consistent flow of 115 vehicles per minute. Vehicle movements in car-park - door slams, engines idling. Quiet compared to busy roads.
23.06.13	16:35	16:50	Flags rattling in wind.	75	78	85	77	Traffic flow ~120 cars per minute over 10 lanes of traffic. Minimal car park movements - shops closed.
24.06.13	01:37	01:42	Flags still hitting poles in breeze.	62	76	80	72	~22 cars per minute on all lanes of traffic. Plant noise (?) from direction of Eco Park - just audible in absence of road traffic.
24.06.13	03:11	03:16	Very light breeze.	62	74	81	71	21 cars per minute. 1 no. aircraft - distant. Plant noise (?) from direction of Eco Park - just audible in absence of road traffic.

Table A9 Further attended measurement results at location 4

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
01.03.13	00:31	00:36	0m/s	NE	53.5	56.9	67.2	55.6	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping, so plant noise from London waste Eco park is starting to dominate background.
01.03.13	01:48	01:53	0.1m/s	N	51.5	55.3	60.0	53.6	Traffic flows on Angel Road and Walthamstow Avenue (A406) are dropping, so plant noise from London waste Eco park is starting to dominate background.
01.03.13	02:57	03:02	0.2 m/s	N	51.0	56.6	61.9	54.3	The plant noise on roof of London waste Eco park dominates Background noise above Angel Road (A406) to south of location. Very quiet to the east measurement location.
01.03.13	12:29	12:44	3.3m/s	NE	59.4	62.1	70.8	60.9	Plant machines at work on east of site and Angel Road (A406) to the south of measurement location. Fork lifts moving about and constant stream of dust cart going into plant building loading bay
01.03.13	13:45	14:00	4.3m/s	N	58.6	61.4	76.0	60.2	Road traffic from Angel Road (A406) / North Circular dominates background. Plant from Eco Park audible, affecting background. fork lifts- constant stream of dust cart going into plant building loading bay Some birdsong audible
01.03.13	15:03	15:08	3.5m/s	N	59.9	62.9	72.4	61.9	The plant noise on roof of London waste Eco park dominates Background noise above Angel Road (A406) to south of location. Heavy plant working east of location on Thames water site. All types of plant are on site.
01.03.13	20:00	20:10	0.2 m/s	N	57.8	60.4	64.1	59.2	Road traffic from Angel Road and Walthamstow Avenue (A406) dominates background. Roof top plant and intermittent dust cart engine noise from EcoPark audible, affecting background.narrow boat pass by but quietly. Some birdsong audible.
01.03.13	20:59	21:09	0.1m/s	NE	55.7	60.1	67.2	58.3	Road traffic from North Circular dominates background. Plant and intermittent engine noise from EcoPark audible, affecting background. Narrow boat engine running, but quietly. Some birdsong audible.
27.06.13	01:24	01:29	0.1m/s	S	48.2	50.5	68.2	49.8	Measurement location is equally dominated by A406/North and London Waste Eco Park. Noisy plant running on roof.
27.06.13	02:54	02:59	021m/s	S	38.6	44.5	62.3	48.1	The plant noise on roof of London waste Eco park dominates Background noise above Angel Road (A406) to south of location.

Table A10 Attended measurement results at location 5

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	11:10	11:25	High windspeeds. 3-6 m/s with stronger bursts - noticably affecting measurement below 100Hz.	60	63	70	62	High speed road traffic from A406 (screened, distant sounding). Whirring noise from EcoPark - Road sweep on access ramp at high level. HGVs at plant area/carpark below measurement position.
23.06.13	12:26	12:41	Windspeed constant ~4 m/s with strong gusts of wind.	59	63	73	61	Canal boat engine on, idling at mooring location for entire measurement. A406 screened road traffic noise - 50mph. HGV in EcoPark carpark below. No audible plant from EcoPark this time.
23.06.13	12:38	12:53	Windspeed constant ~4 m/s with strong gusts of wind.	60	63	70	62	Repeat of last measurement. Similar conditions. Aircraft passby. Cyclist bells on canal towpath below. Distant siren on A406.
23.06.13	14:01	14:16	-	60	63	66	62	Plant noise from Eco Park - not visible and very low level (possibly behind). Road traffic as before.
24.06.13	01:50	01:55	Windspeed 2-3m/s, not constant.	52	55	59	54	Distant road traffic & constant plant noise from Eco Park determine background noise level. Occasional HGVs on road bridge down the canal (250m away)
24.06.13	03:26	03:31	-	50	56	60	53	Distant road traffic & constant plant noise from Eco Park determine background noise level. Additional whistling sound occasionally from the south - possibly from plant items.
24.06.13	03:32	03:37	-	52	56	61	54	Constant plant noise from Eco Park determines background noise level. Birds starting to sing. Plant noise and road traffic as previous.

Table A11 Further attended measurement results at location 5

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	11:45	12:00	Wind: ~6m/s	56	61	72	59	Road traffic from North Circular dominates background. Plant from EcoPark audible, affecting background. Some birdsong audible. 11:56 cyclist passes quietly. 11:59 cyclist passes quietly. 11:59 DIY rotary tool noise from nearby narrow boat.
27.06.13	12:54	13:09	Wind: ~6m/s	56	59	65	58	Road traffic from North Circular dominates background. Plant and intermittent engine noise from EcoPark audible, affecting background. Engine running on narrow boat, but quietly. Some birdsong audible. 12:58 cyclist passby talking. 13:08 cyclist passes quietly.
27.06.13	14:04	14:19	Wind: ~6m/s	55	58	68	56	Road traffic from North Circular dominates background. Plant from EcoPark audible, affecting background. Some birdsong audible. 14:07 cyclist passes, almost silently. 14:13 impulsive event from narrow boat. 14:19 four cyclists pass quietly.

Table A12 Further attended measurement results at location 5

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
01.03.13	00:50	00:55	0.1m/s	NNE	50.7	63.9	70.7	59.6	Road traffic from Conduit Lane dominates noise environment. Some background noise just audible from North Circular. Lorries occasionally passing on Kenninghall Road.
01.03.13	02:01	02:06	0.1m/s	NE	48.5	62.7	71.6	59.1	Road traffic from Conduit Lane dominates noise environment. Some Lorries occasionally passing on Kenninghall Road to park-up for the night. Occasional HGV doors closing up for the night. Occasional car horns causing the max level.
01.03.13	03:09	03:14	0.1m/s	NE	49.3	67.4	75.0	62.5	Bird song form trees overlooking location. Conduit Lane has lighter traffic flows now, but still dominated by HGV. Fewer cars, Traffic light at cross roads of Conduit Lane and Montague Road (B137) are not changing at the same frequency as before, due to traffic on Montague Road (B137) is very light, so no traffic is being stopped on Conduit Lane.
01.03.13	12:55	13:10	0.5m/s	N	59.3	68.1	85.8	65.2	Noise from Conduit Lane. Very heavy traffic and stop start at traffic lights south.
01.03.13	14:14	14:39	0.5m/s	NNE	63.0	71.4	79.7	68.2	Fridge lorry with chillier running at 20m from meter location. HGV's moving around location .Very heavy traffic and stop start at traffic lights south.
01.03.13	15:30	15:45	2.1m/s	NE	59.2	67.2	86.8	65.3	HGV's moving around location and parking up for the night. Noise from Conduit Lane. Very heavy traffic and stop start at traffic lights south.
01.03.13	20:19	20:29	0.1m/s	N	57.1	63.6	72.2	61.2	Traffic on Conduit Lane and the junction of Montague Road (B137), is constant. Cars and HGVs slowing at traffic lights and then accelerating away from junction. Mixed traffic LGV and cars.
01.03.13	21:17	21:27	0.1m/s	NNE	57.5	64.2	84.8	61.8	Location is totally dominated by traffic on Conduit Lane and the junction of Montague Road (B137), Traffic level has slightly eased from last measurement.
27.06.13	20:21	20:31	0.9m/s	S	55.3	64.2	71.6	61.0	Heavy traffic on Conduit Lane and junction of Montague Road (B137), approx. 225 car pass buy at 10min per cars and HGVs slowing at traffic lights and then accelerating away from junction. Mixed traffic LGV and cars.
27.06.13	22:15	22:25	0.1m/s	S	51.1	64.1	75.9	60.7	Location dominated by traffic starting and stopping at lights at Conduit Lane and the junction of Montague Road (B137). More HGV using Conduit Lane during this measurement.
27.06.13	01:10	01:15	0.2m/s	S	48.6	64.1	79.9	60.1	Road still dominates background, more HGV running on Conduit Lane, when break in traffic, large transformer next to Conduit Lane can be heard humming.

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	02:41	02:46	0.3m/s	S	44.5	59.1	66.7	55.4	Conduit Lane not too busy, but still dominated by HGV. Fewer cars, Traffic light at cross road, not changing as frequent as before, due to traffic on Montague Road (B137) is very light.

Table A13 Attended measurement results at location 6

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	14:39	14:54	-	59	63	70	61	Road traffic on Conduit Lane. Car Horns, accelerating traffic from traffic lights. Quiet while cars are stopped at lights. Vehicle movements from inside Edmonton Auto and movement/stacking of metal - very brief impact events. Tree knocking against metal fence in wind.
23.06.13	15:31	15:46	Occasional gusts of strong wind (>5m/s) - slightly affecting measurement below 100Hz.	58	63	71	61	Horns from junction nearby. Similar road traffic to previous measurement. Helicopter overhead for 30 seconds - low frequency engine sound and propeller noise.
23.06.13	16:16	16:31	Wind <5m/s with occasional strong gusts - did not noticably affect the measurement.	58	63	67	61	Loud engine idling & accelerating at traffic lights. Constant distant road traffic (not visible but from direction of North Circular/Angel Road - A406). HGVs at traffic lights accelerating & engine idling. 2 no. distant aircraft.
24.06.13	02:05	02:20	-	46	57	65	54	Distant HGVs, occasionally crossing junction with Kenninghall Rd, accelerating from lights. Periods of no traffic nearby, only very distant sounding road traffic. Vehicles on Conduit Lane/Montague Rd are mainly HGVs with a few small vehicles.
24.06.13	03:44	03:59	-	49	64	72	60	Loud acceleration from car at traffic lights. HGVs at lights. Road traffic becoming more noticeable (distant roads and some closer roads)

Table A143 Further attended measurement results at location 6

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	12:10	12:25	Wind: ~1m/s	59	68	80	65	Road traffic from Conduit Lane dominates noise environment. Some background noise audible from North Circular. Lorries occasionally passing on Kenninghall Road. 12:12 car horns. 12:29 car/truck horns.
27.06.13	13:18	13:33	Wind: ~1m/s	59	68	75	65	Road traffic from Conduit Lane dominates noise environment. Some background noise audible from North Circular. Lorries occasionally passing on Kenninghall Road. Frequent impulsive 'clangs' from recycling yard. 13:30 car horn causing the max event.
27.06.13	14:42	14:57	Wind: ~1m/s	59	68	76	65	Road traffic from Conduit Lane dominates noise environment. Some background noise audible from North Circular. Lorries occasionally passing on Kenninghall Road. Occasional impulsive 'clangs' from recycling yard. Occasional car horns causing the max level.

Table A15 Further attended measurement results at location 6

Date	Time		Wind		Noise Level, dB (A)				Comments
	Start	Finish	Speed (ms^{-1})	Direction	L_{90}	L_{10}	L_{max}	L_{eq}	
01.03.13	01:02	01:07	0.1m/s	N	43.4	54.5	60.6	50.7	Trains are on overhead power lines, train passbys are relatively quiet due to road noise from Meridian way (A1055). No car passbys during measurement.
01.03.13	02|:11	02:16	0.0m/s	N/A	41.6	51.4	58.8	47.8	Background is dominated by general road traffic, particularly from Meridian way (A1055 and probably Montagu Road (B137). No car passbys during measurement
01.03.13	03:20	03:25	0.1m/s	N	43.6	56.0	61.7	51.7	Car passbys during measurement @3:30 mins Traffic on Meridian way (A1055) can be heard and dominates background levels
01.03.13	13:19	13:34	1m/s	N	53.2	60.3	85.2	62.2	Road noise from Meridian way (A1055)and construction breaker from North. Train pass @3:50 mins,@5:02mins,@8:32mins, @10:32 mins
01.03.13	14:36	14:51	4.4m/s	N	53.8	61.2	85.9	62.2	Car passbys during measurement @12:30 mins. Train @3:30 mins, @3:5 mins,@ 6:06 mins, @8:36 mins,@8:56 mins and @14:15mins
01.03.13	15:56	16:11	2.4m/s	NE	53.2	60.1	86.3	62.5	Train slow & quiet @13:33 mins, @14:54 mins. construction breaker noise. No car passbys during measurement.
01.03.13	20:39	20:49	0.1m/s	NE	49.5	60.0	85.5	63.6	Trains @30 secs, @2:19 mins,@3:48 mins,@4:48 mins, @6:48 mins quiet engine running for 3:45 mins, now is switched off.
01.03.13	21:36	21:46	0.1m/s	N	50.4	59.4	87.1	64.1	Train @3:09 mins, @3:45 mins, @6:35 mins, 8:10 mins, @8:48 mins. Plant noise from industrial park and earth land fill to the east of location.
27.06.13	20:02	20:12	1.1m/s	S	46.9	53.8	71.5	51.9	Traffic on Meridian way (A1055) can be heard and dominates background levels, no other roads can be heard to the north of location. Slow train @ 06:53mins and @08:35mins, helicopter at @9:45mins
27.06.13	21:59	22:09	0.1m/s	S	43.5	53.4	67.9	49.9	Dead end road. No house noise, background dominated by Meridian way (A1055), plane over fly @5:30mins No car passbys during measurement
27.06.13	00:59	01:04	0.7m/s	S	39.2	49.0	55.0	45.2	Road noise coming from N/E of location dominated by quite new build flats and town houses, Approx. construction date 2000. No car passbys during measurement.
27.06.13	02:30	02:35	0.2m/s	S	35.9	49.6	74.1	48.3	Traffic levels on Meridian way (A1055) to the N/E of location are now lighter, no trains running during measurement, bird song from trees. No car passbys during measurement

Table A16 Attended measurement results at location 7

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
23.06.13	14:56	15:06	-	50	54	70	53	Children shouting - playing on bikes ~20m down the road. Distant road traffic (Meridian Way, and more distant A406). 3 no. aircraft in 10 min measurement. 2 no. car movements on Zambezie Dr. Pedestrians and residents outside talking 15m away. Distant music from a house. Hoarding up all along road - possible screening that wasn't present in the last survey.
23.06.13	15:48	16:02	-	51	56	72	56	Infrequent road traffic on Zambezie Dr (2no. Cars total). Low flying light aircraft caused L_{max}. Residents opening/closing doors, taking bins out - not loud. Distant aircraft. Road traffic on Montagu Rd dominant. 3 minutes of minimal road traffic. Distant ice cream van.
23.06.13	15:59	16:14	-	51	57	92	66	5 no. cars on Zambezie Dr, 2 parking 10m away with quiet door open/close, car engine idling for 1 min. Car door slam 5m away. Ice cream van music on this road caused Lmax. Also engine idling 3m away for last 10 seconds of measurement.
24.06.13	02:16	02:21	-	40	45	50	43	Humming sound from other side of hoarding - quiet but constant. Occasional road traffic on Montagu Rd. Distant road traffic - not a consistent flow. 4 no. car door slams from around the corner - distant. 2 no. metal sliding/banging sounds - distant, not sure of the location of the source.
24.06.13	03:54	03:59	-	43	47	55	46	Humming sound from other side of hoarding. Less road traffic - 1 minurte with no obvious traffic noise. Empty passenger train passby at end of Zambezie Dr.

Table A17 Further attended measurement results at location 7

Date	Time		Wind Speed	Noise Level, dB (A)				Comments
	Start	End		L_{90}	L_{10}	L_{max}	L_{eq}	
27.06.13	12:31	12:46	Wind: ~5m/s	48	57	78	56	Background is dominated by general road traffic, particularly from Montague Road and probably Meridian Way, although this was not visible. Some continuous construction noise audible. 12:34 pedestrian passes. 12:36 nearby residents holding elevated conversation. 12:40 train. 12:41 light van passes and parks up. Reversing beeper causes max event. 12:42 train. 12:44 train (slow & quiet). 12:45 train.
27.06.13	13:38	13:53	Wind: ~5m/s	47	53	73	52	Background is dominated by general road traffic, particularly from Montague Road and probably Meridian Way, although this was not visible. Some continuous construction noise audible. 13:40 train. 13:41 resident moving refuse bin nearby. 13:42 train. 13:44 pedestrian passes. 13:45 train. 13:51 train.
27.06.13	15:02	15:17	Wind: ~5m/s	48	56	70	53	Background is dominated by general road traffic, particularly from Montague Road and probably Meridian Way, although this was not visible. Some continuous construction noise audible. 15:04 car door shutting. 15:06 car passes. 15:07 a quiet engine that had been running is switched off. 15:07 some DIY impulsive events from nearby. 15:09 train. 15:10 train (quiet). 15:13 pedestrian pass, children whistling. 15:14 fairly loud aeroplane passing overhead. 15:16 car passes.

Table A48 Further attended measurement results at location

Appendix B

Glossary of Acoustic Terminology

Decibel

The ratio of sound pressures, which we can hear, is a ratio of 106 (one million: one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L_p) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

dB(A)

The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as L_{A10}, L_{A90}, and L_{Aeq} for the 'A' weighted equivalent continuous noise level.

Equivalent Continuous Sound Level

Another index for assessment for overall noise exposure is the equivalent continuous sound level, Leq. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

Statistical Noise Levels

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L_{10}, the level exceeded for ten per cent of the time period under consideration, has been adopted in this country for the assessment of road traffic noise. The L_{90}, the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The L_1, the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted L_{A10}, dBL_{A90} etc. The reference time period (T), is normally included, e.g. $dBLA_{10,\ 5min}$ or $dBLA_{90,\ 8hr}$.

Maximum Noise Level

This is generally expressed as the maximum A-weighted noise level (LAmax) and represents the maximum instantaneous noise level that occurred with the monitoring period. Certain assessment criteria recommend maximum noise levels to avoid disturbance as well as limits for longer-term averaged noise exposures.

Frequency

The rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted kHz, e.g. 2kHz = 2000Hz. Human hearing ranges approximately from 20Hz to 20kHz. For design purposes, the octave bands between 63Hz to 8kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.

Sound Pressure Level

The sound power emitted by a source results in pressure fluctuations in the air, which are heard as sound.

The sound pressure level (L_p) is 10 times the logarithm of the ratio of the measured sound pressure (detected by a microphone) to the reference level of 2 x 10^{-5}Pa (the threshold of hearing).

Thus L_p (dB) = 10 log $(P1/P_{ref})^2$ where P_{ref}, the lowest pressure detectable by the ear, is 0.00002 pascals (i.e. $2x10^{-5}$ Pa).

The threshold of hearing is 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB(A) or more and a change of 3dB is only just detectable. A change of 10dB is subjectively twice, or half, as loud.

Vibration

Vibration may be expressed in terms of displacement, velocity and acceleration. Velocity and acceleration are most commonly used when assessing structureborne noise or human comfort issues respectively. Vibration amplitude may be quantified as a peak value, or as a root mean squared (rms) value.

Vibration amplitude can be expressed as an engineering unit value e.g. 1 mms-1 or as a ratio on a logarithmic scale in decibels:

Vibration velocity level, dB = 20 log (V/V_{ref}).

(where the preferred reference level, V_{ref}, for vibration velocity = 10^{-9} ms^{-1}.)

The decibel approach has advantages for manipulation and comparison of data.

Typical Noise Levels

Some typical noise levels are given below:

Noise Level, dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100m
110	Chain saw at 1m
100	Inside disco
90	Heavy lorries at 5m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing

Appendix B

Noise Survey Histograms

B1 Histograms

B1.1 L_{A90} results, weekday/weekend combined

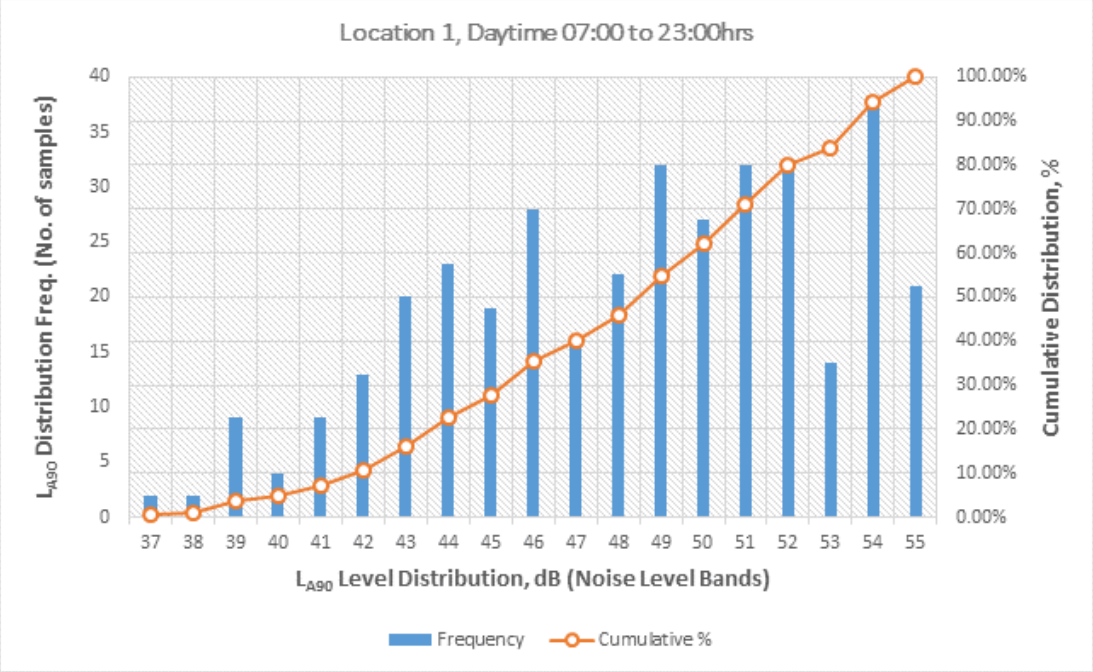

Figure 1 Location 1 – Daytime L_{A90} Histogram

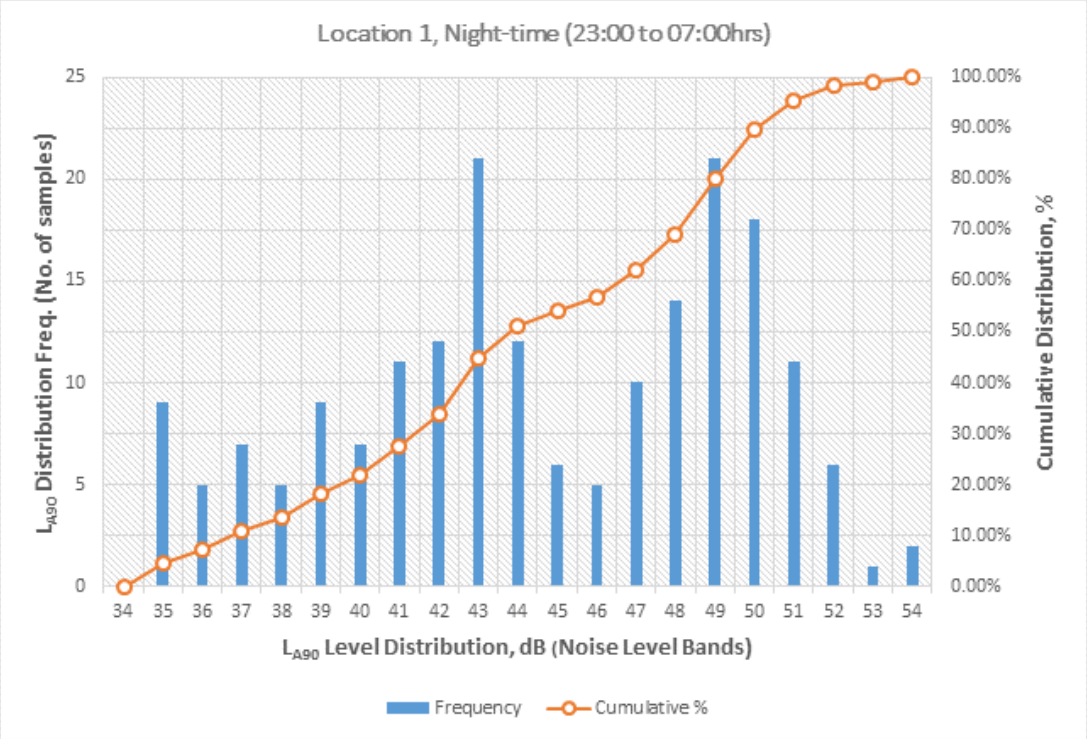

Figure 2 Location 1 – Night-time L_{A90} Histogram

Location 1 – Daytime (07:00 – 23:00hrs)	
L_{A90}	Level, dB
Average	48.7
Mode	54.0
1 Standard Deviation	4.3
Average plus Standard Dev.	53.0
Average minus Standard Dev.	44.3
25% of Cumulative	44.5
75% of Cumulative	51.5

Table 3 Location 1 – Daytime L_{A90} Histogram

Location 1 – Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	44
Mode	43 (49)
1 Standard Deviation	5.0
Average plus Standard Dev.	49.1
Average minus Standard Dev.	39.2
25% of Cumulative	40.5
75% of Cumulative	48.5

Table 2 Location 1 – Night-time L_{A90} Histogram

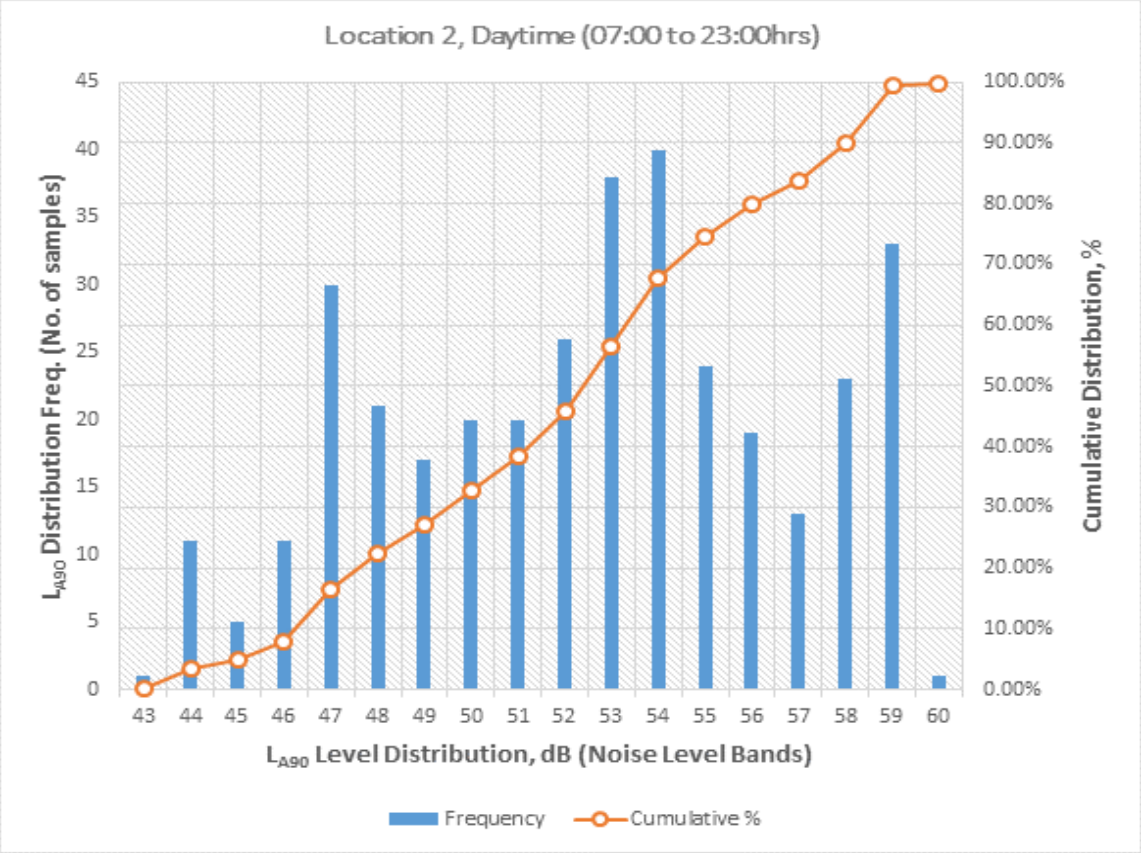

Figure 4 Location 2 – Daytime L_{A90} Histogram

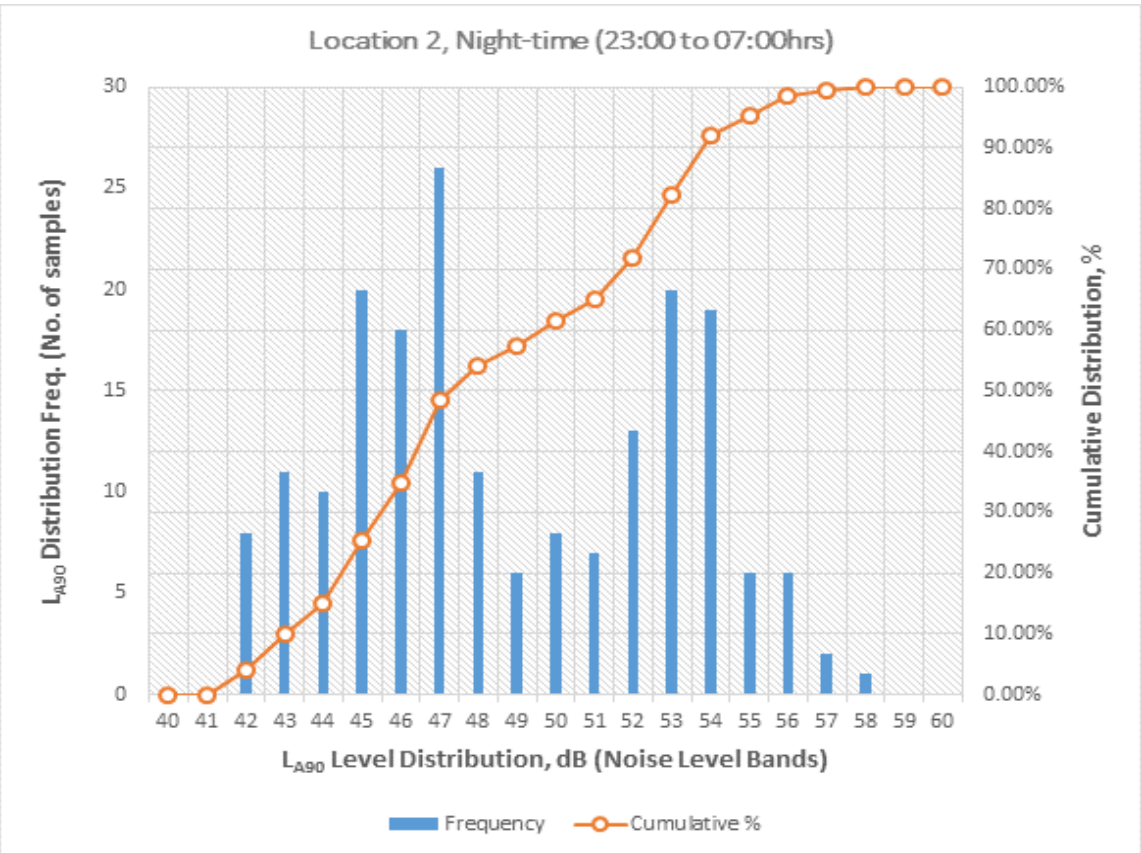

Figure 5 Location 2 – Night-time L_{A90} Histogram

Location 2 - Daytime (07:00 – 23:00hrs)	
L_{A90}	Level, dB
Average	52.0
Mode	54.0
1 Standard Deviation	4.2
Average plus Standard Dev.	56.3
Average minus Standard Dev.	47.9
25% of Cumulative	48.5
75% of Cumulative	55.0

Table 6 Location 2 – Daytime L_{A90} Histogram

Location 2 - Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	48
Mode	47
1 Standard Deviation	4.1
Average plus Standard Dev.	52.5
Average minus Standard Dev.	44.3
25% of Cumulative	45
75% of Cumulative	52.5

Table 4 Location 2 – Night-time L_{A90} Histogram

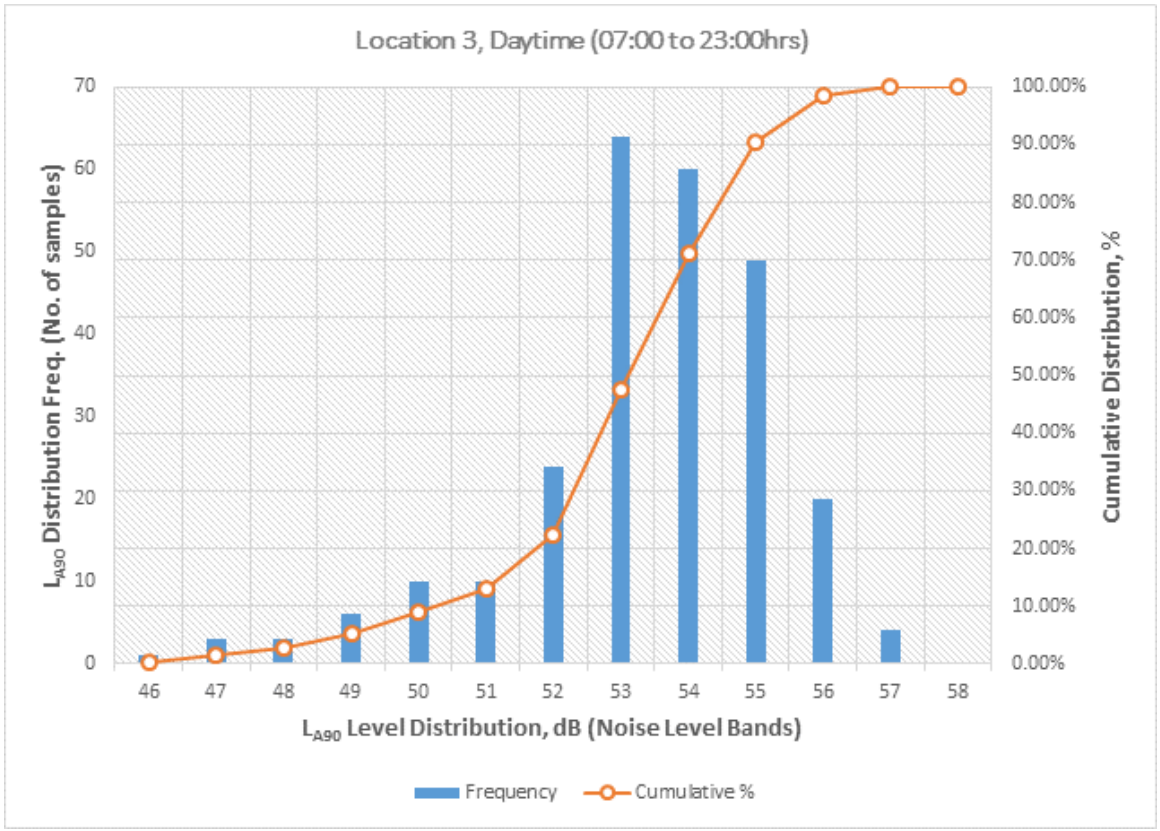

Figure 7 Location 3 – Daytime L_{A90} Histogram

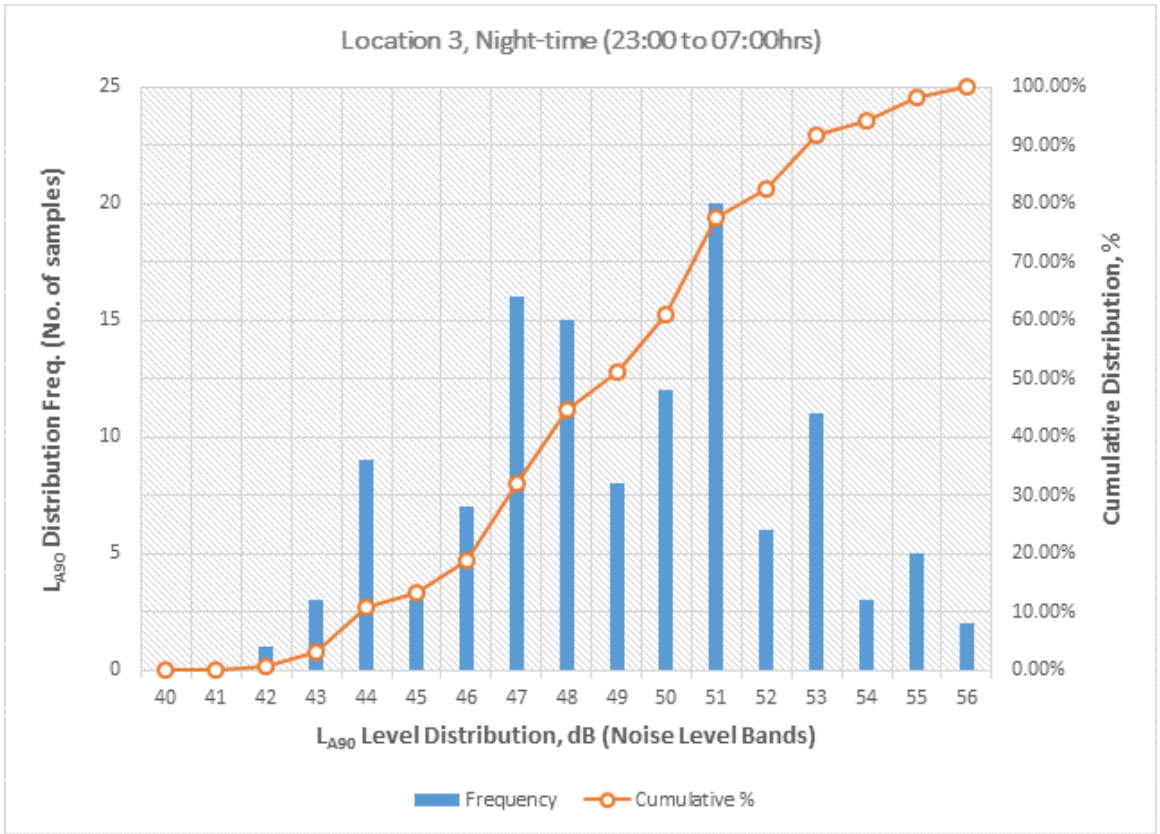

Figure 8 Location 3 – Night-time L_{A90} Histogram

Location 3 – Daytime (07:00-23:00hrs)	
L_{A90}	Level, dB
Average	52.9
Mode	53
1 Standard Deviation	1.9
Average plus Standard Dev.	54.8
Average minus Standard Dev.	51.0
25% of Cumulative	52
75% of Cumulative	54

Table 9 Location 3 – Daytime L_{A90} Histogram

Location 3 – Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	48.8
Mode	51
1 Standard Deviation	3.1
Average plus Standard Dev.	51.9
Average minus Standard Dev.	45.6
25% of Cumulative	46.5
75% of Cumulative	50.5

Table 10 Location 3 – Night-time L_{A90} Histogram

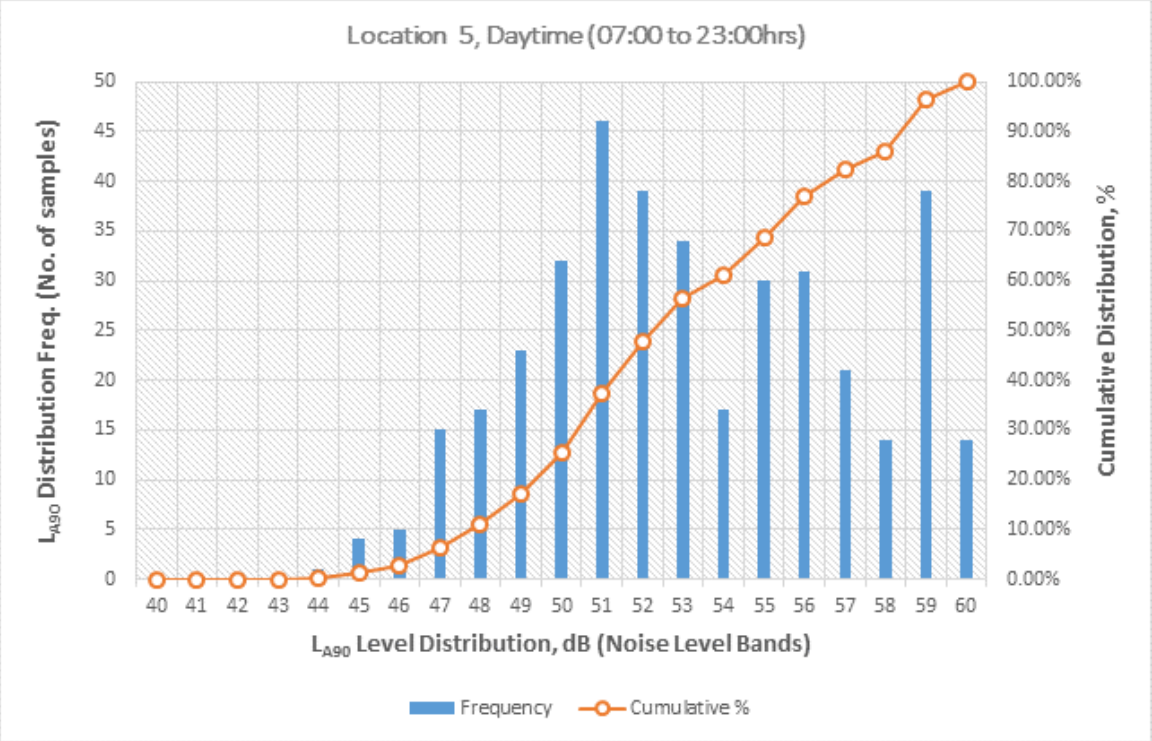

Figure 11 Location 5 – Daytime L_{A90} Histogram

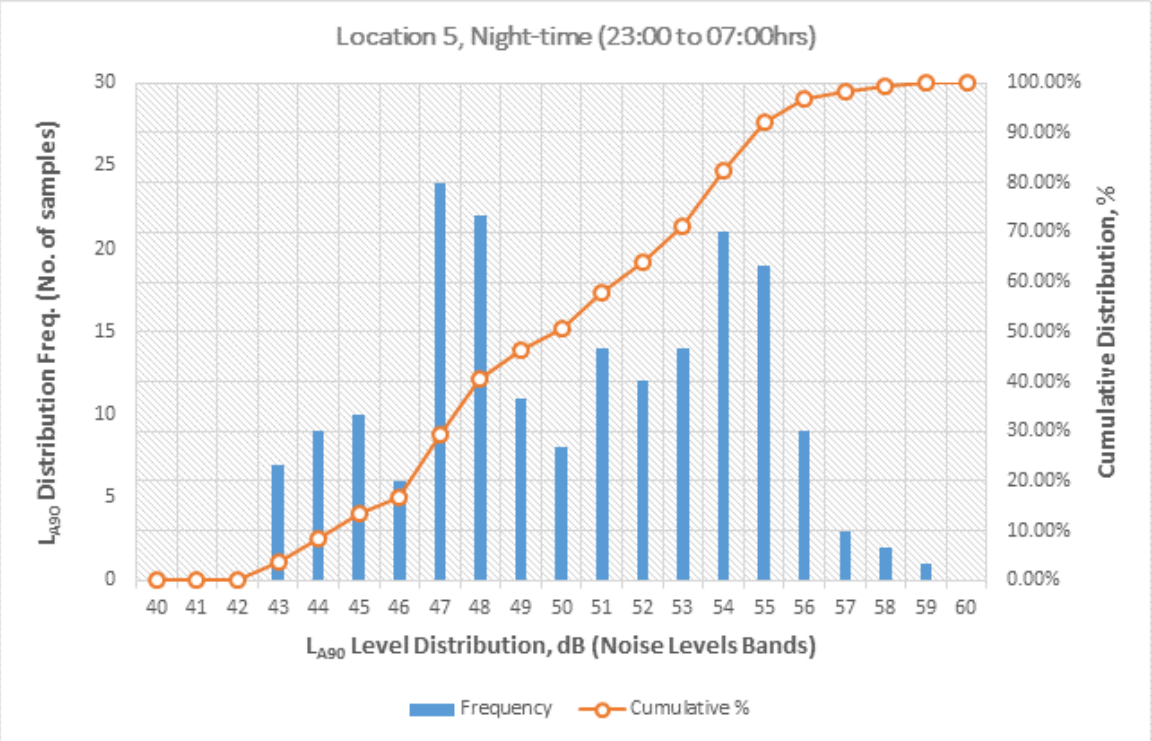

Figure 12 Location 5 – Night-time L_{A90} Histogram

Location 5 – Daytime (07:00-23:00hrs)	
L_{A90}	Level, dB
Average	53
Mode	51
1 Standard Deviation	3.8
Average plus Standard Dev.	56.6
Average minus Standard Dev.	49.0
25% of Cumulative	50
75% of Cumulative	56

Table 13 Location 5 – Daytime L_{A90} Histogram

Location 5 – Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	49.8
Mode	47
1 Standard Deviation	4.0
Average plus Standard Dev.	53.8
Average minus Standard Dev.	45.8
25% of Cumulative	46.5
75% of Cumulative	53.5

Table 14 Location 5 – Night-time L_{A90} Histogram

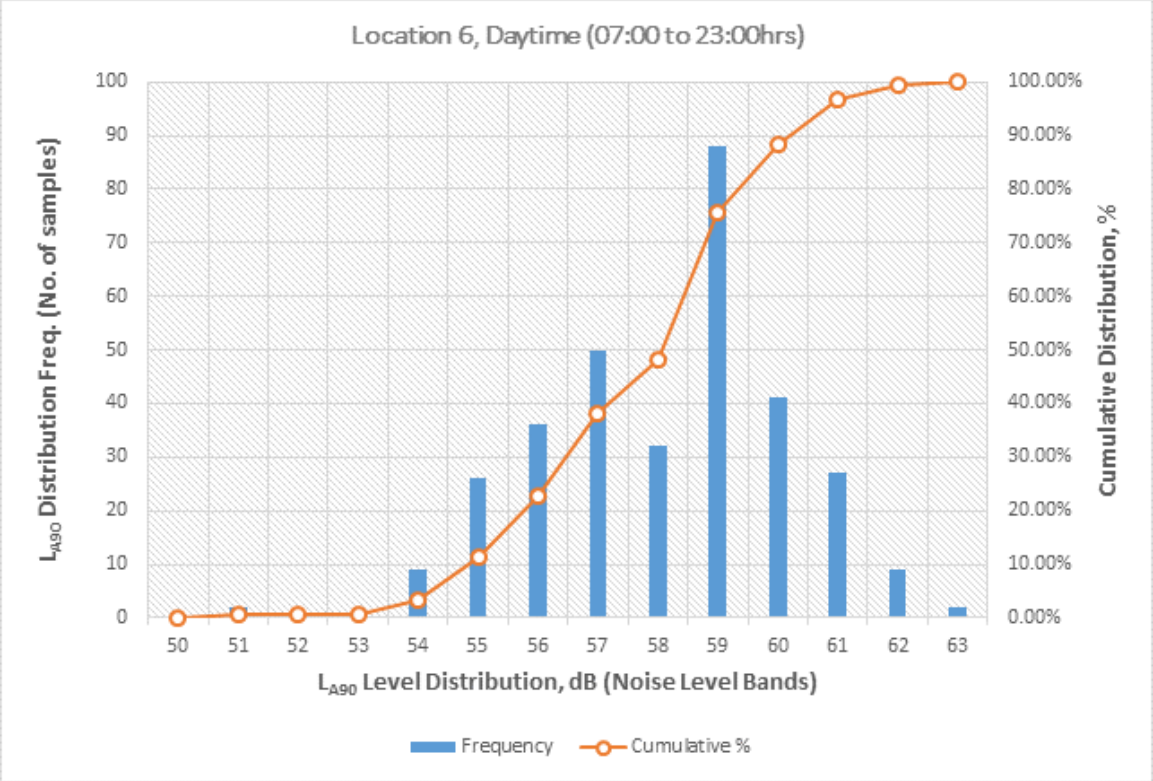

Figure 15 Location 6 – Daytime L_{A90} Histogram

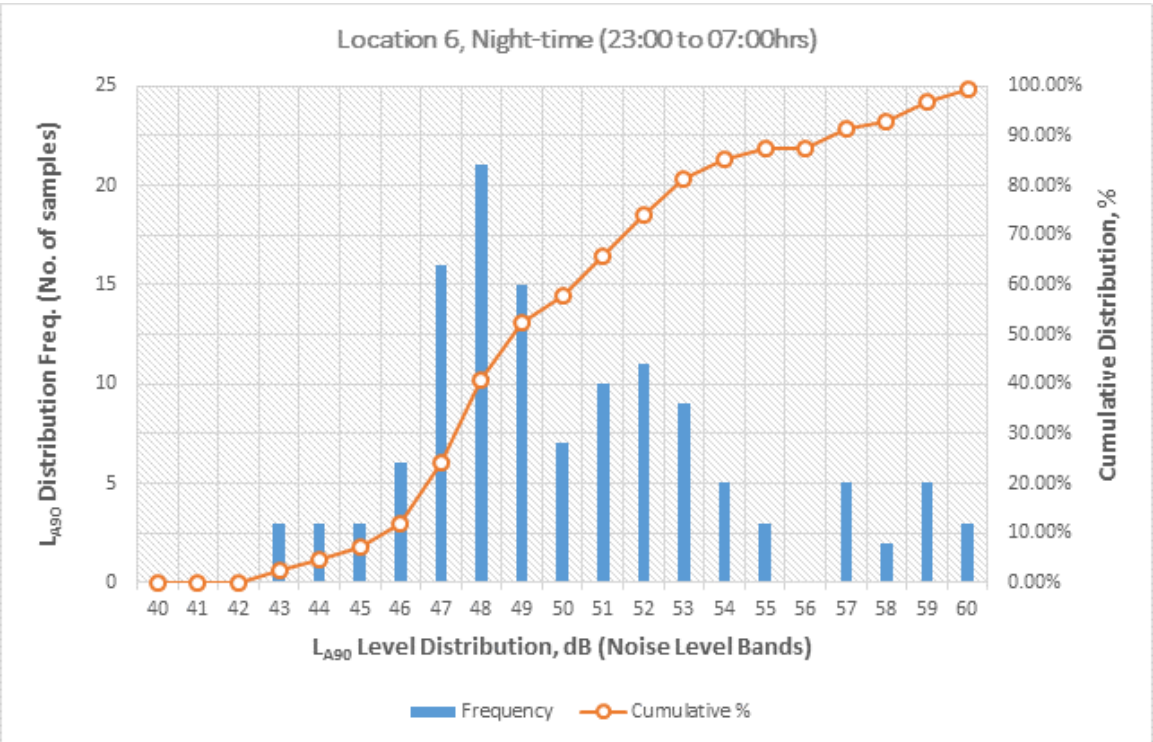

Figure 16 Location 6 – Night-time L_{A90} Histogram

Location 6 – Daytime (07:00-23:00hrs)	
L_{A90}	Level, dB
Average	58
Mode	59
1 Standard Deviation	2.0
Average plus Standard Dev.	59.7
Average minus Standard Dev.	55.7
25% of Cumulative	56
75% of Cumulative	59

Table 17 Location 6 – Daytime L_{A90} Histogram

Location 6 – Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	49.9
Mode	48
1 Standard Deviation	4.1
Average plus Standard Dev.	54.0
Average minus Standard Dev.	45.8
25% of Cumulative	47
75% of Cumulative	52

Table 18 Location 6 – Night-time L_{A90} Histogram

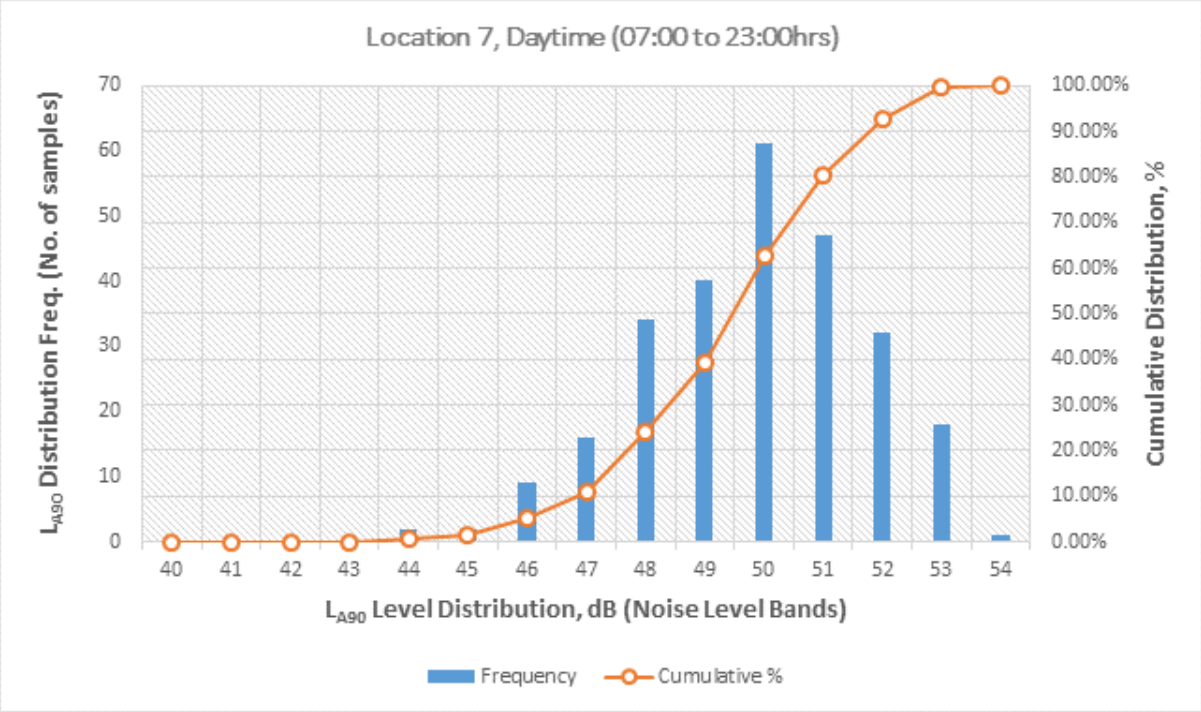

Figure 19 Location 7 – Daytime L_{A90} Histogram

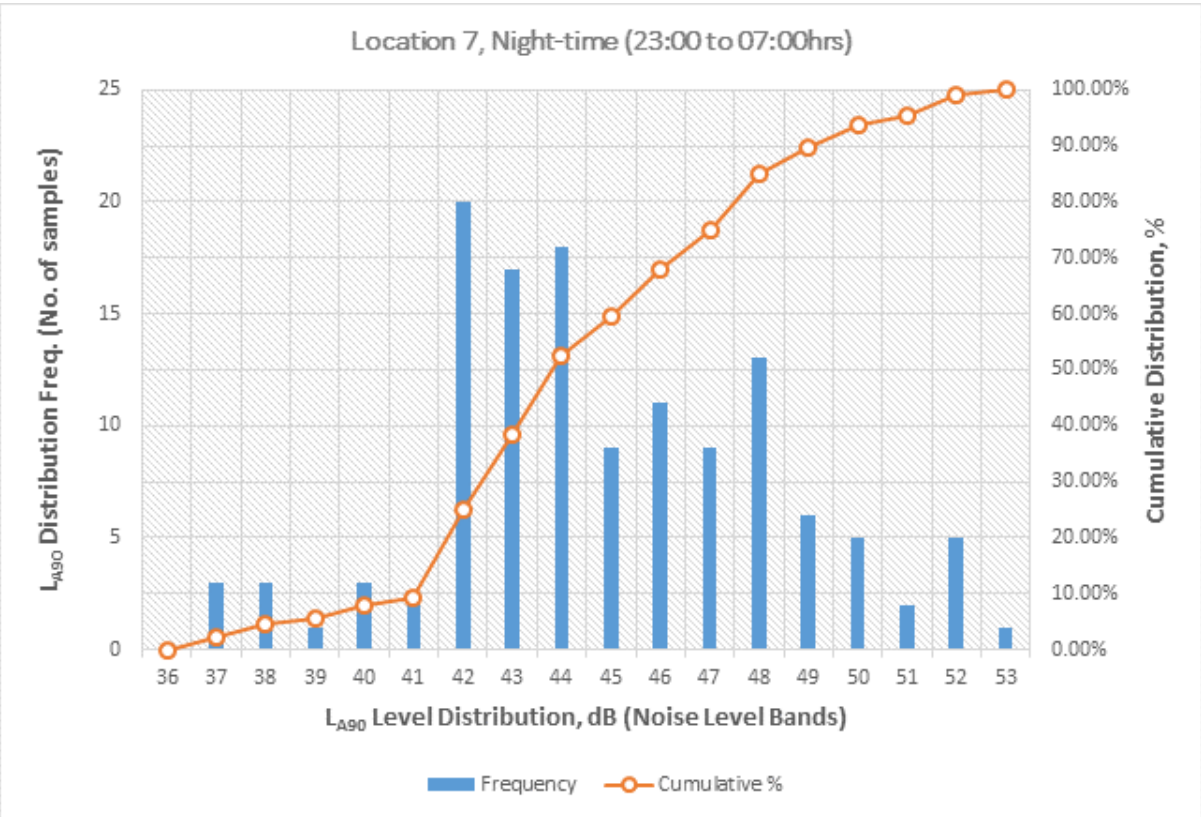

Figure 20 Location 7 – Night-time L_{A90} Histogram

Location 7 – Daytime (07:00-23:00hrs)	
L_{A90}	Level, dB
Average	49.4
Mode	50
1 Standard Deviation	1.9
Average plus Standard Dev.	51.2
Average minus Standard Dev.	47.5
25% of Cumulative	48
75% of Cumulative	50.5

Table 21 Location 7 – Daytime L_{A90} Histogram

Location 7 – Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	44.4
Mode	42
1 Standard Deviation	3.4
Average plus Standard Dev.	47.9
Average minus Standard Dev.	41.0
25% of Cumulative	42
75% of Cumulative	47

Table 22 Location 7 – Night-time L_{A90} Histogram

B1.2 L_{A90} results, weekend only

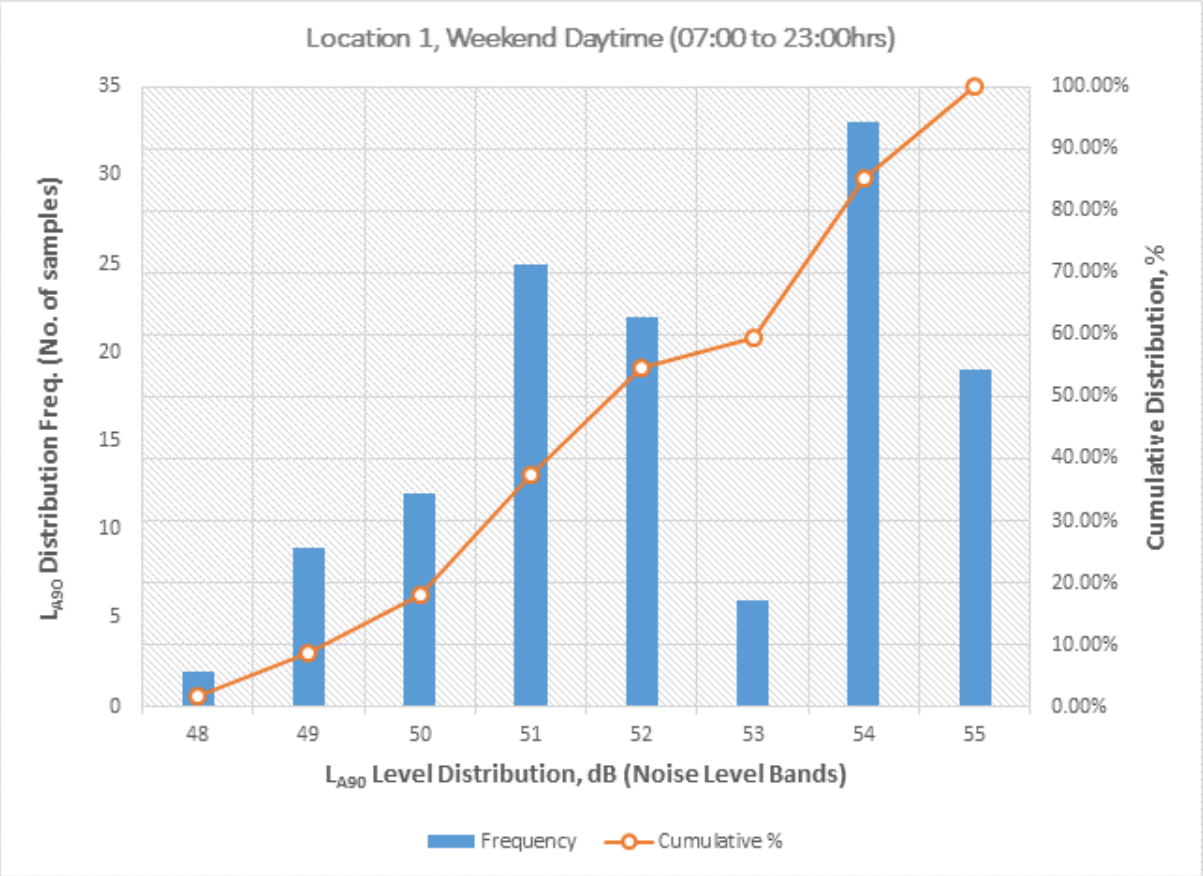

Figure 23 Location 1 – Weekend Daytime L_{A90} Histogram

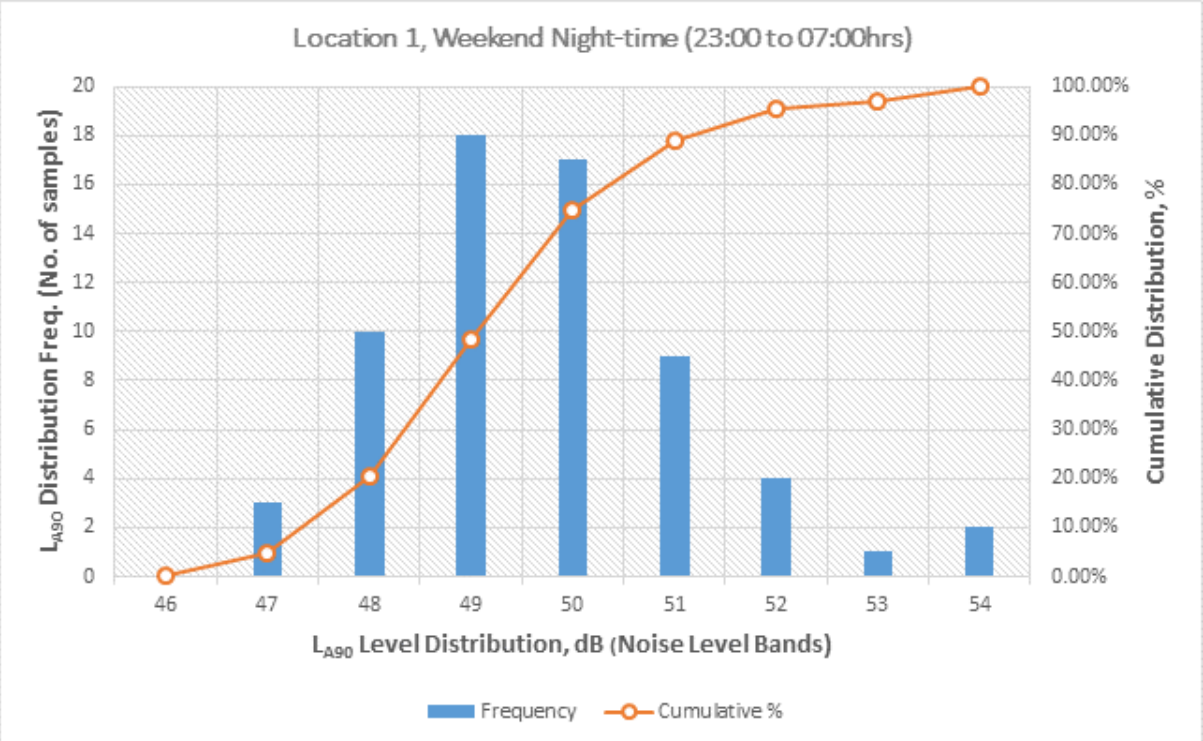

Figure 24 Location 1 – Weekend Night-time L_{A90} Histogram

Location 1 – **Weekend** Daytime (07:00 – 23:00hrs)	
L_{A90}	Level, dB
Average	51.9
Mode	54.0
1 Standard Deviation	1.9
Average plus Standard Dev.	53.9
Average minus Standard Dev.	50.0
25% of Cumulative	50.5
75% of Cumulative	53.5

Table 25 Location 1 – Weekend Daytime L_{A90} Histogram

Location 1 – **Weekend** Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	49
Mode	49
1 Standard Deviation	1.5
Average plus Standard Dev.	50.8
Average minus Standard Dev.	47.7
25% of Cumulative	48.5
75% of Cumulative	50.5

Table 26 Location 1 – Weekend Night-time L_{A90} Histogram

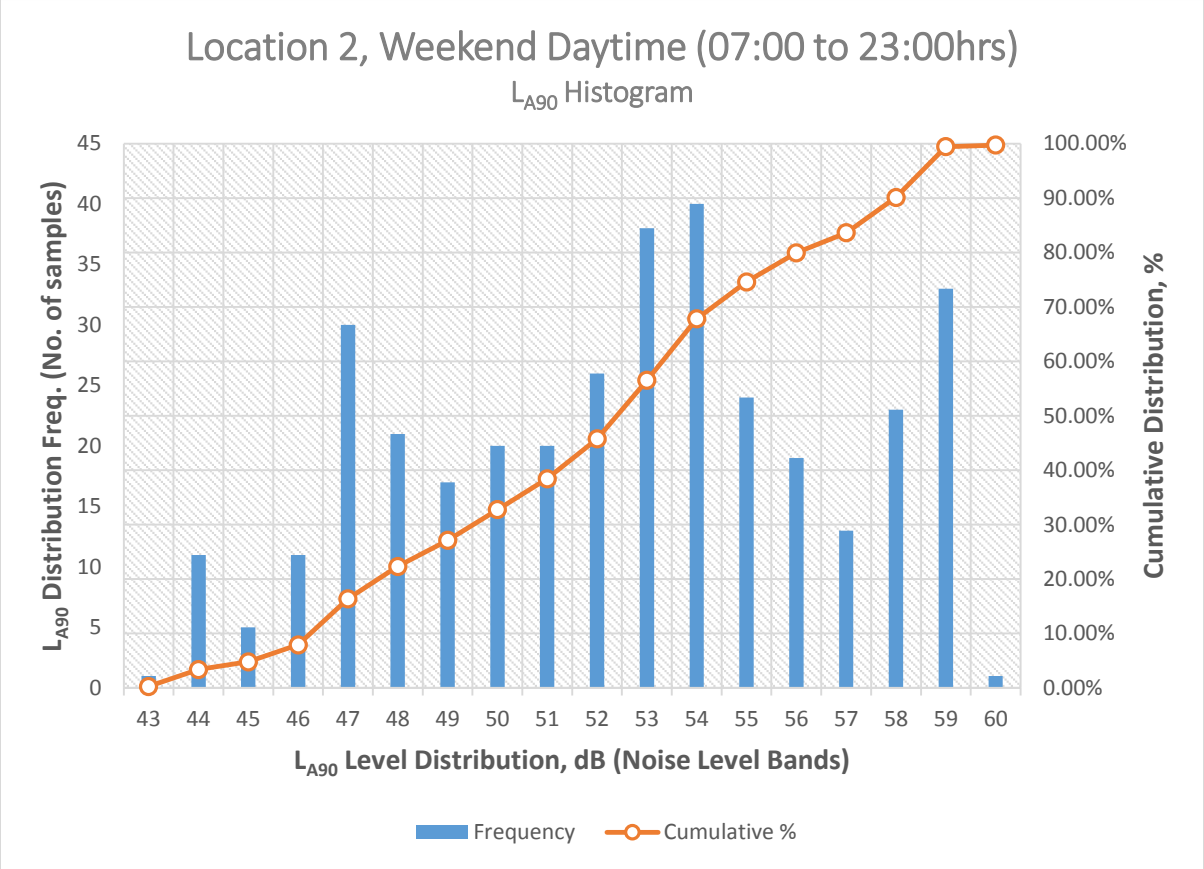

Figure 15 Location 2 – Weekend Daytime LA90 Histogram

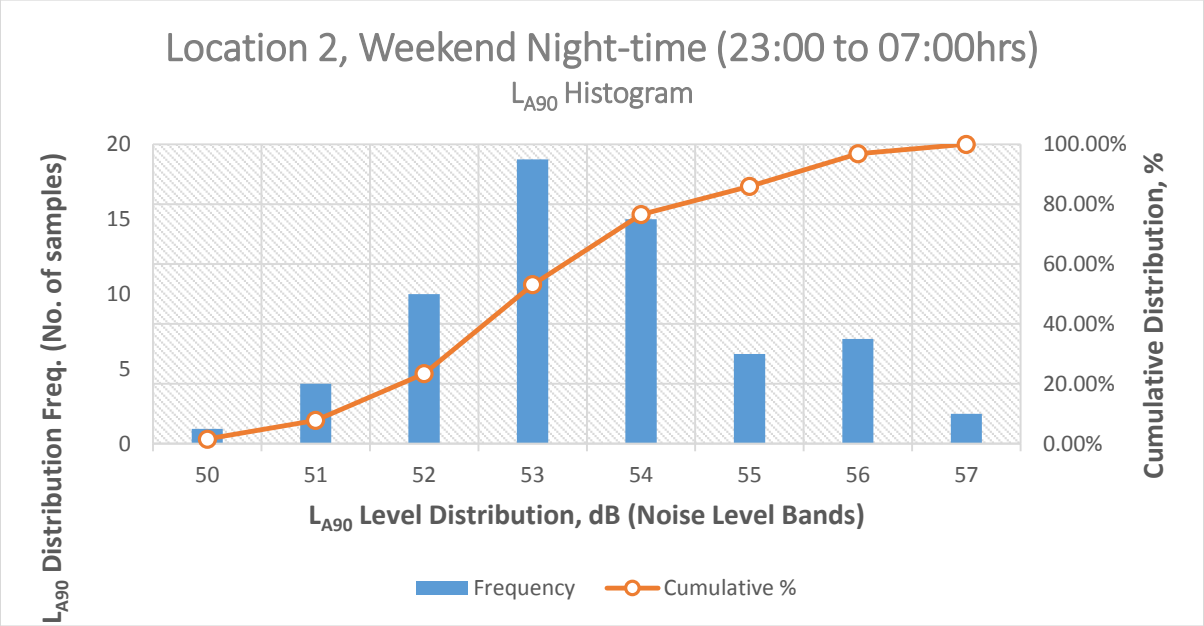

Figure 276 Location 2 – Weekend Night-time L_{A90} Histogram

Location 2 – **Weekend** Daytime (07:00 – 23:00hrs)	
L_{A90}	Level, dB
Average	56
Mode	59
1 Standard Deviation	2.5
Average plus Standard Dev.	58.1
Average minus Standard Dev.	53.1
25% of Cumulative	54
75% of Cumulative	58

Table 15 Location 2 – Weekend Daytime L_{A90} Histogram

Location 2 – **Weekend** Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	53
Mode	53
1 Standard Deviation	1.5
Average plus Standard Dev.	54.6
Average minus Standard Dev.	51.6
25% of Cumulative	52
75% of Cumulative	54

Table 16 Location 2 – Weekend Night-time L_{A90} Histogram

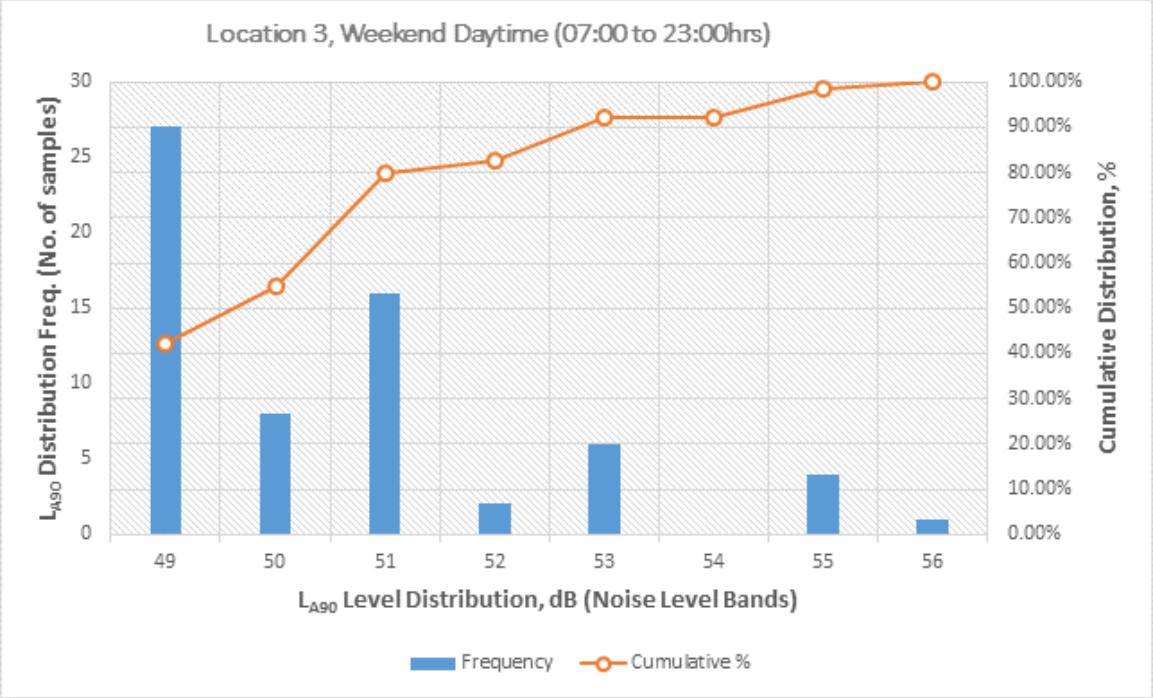

Figure 17 Location 3 – Weekend Daytime L_{A90} Histogram

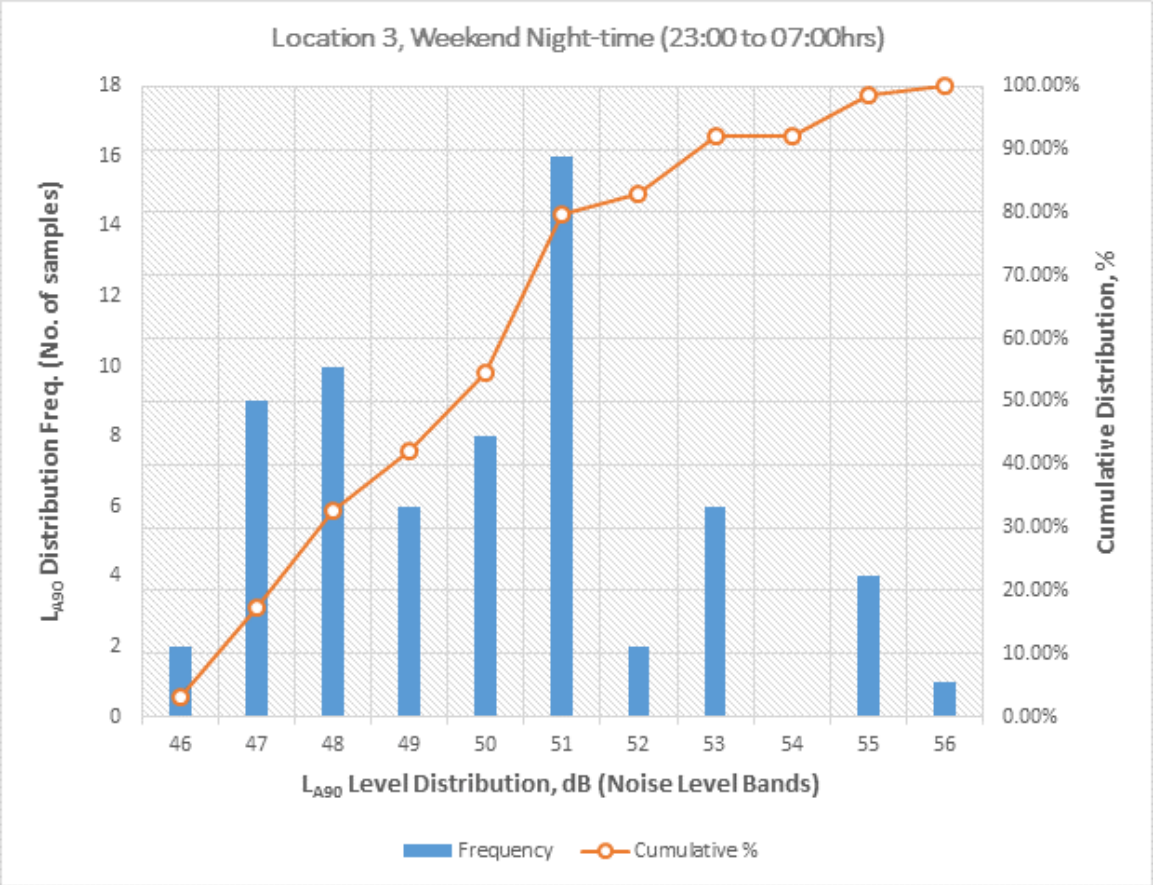

Figure 18 Location 3 – Weekend Night-time L_{A90} Histogram

Location 3 – **Weekend** Daytime (07:00-23:00hrs)	
L_{A90}	Level, dB
Average	53.3
Mode	49
1 Standard Deviation	1.4
Average plus Standard Dev.	54.8
Average minus Standard Dev.	51.9
25% of Cumulative	49
75% of Cumulative	51

Table 17 Location 3 – Weekend Daytime L_{A90} Histogram

Location 3 – Weekend Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	49.6
Mode	51
1 Standard Deviation	2.4
Average plus Standard Dev.	52.0
Average minus Standard Dev.	47.2
25% of Cumulative	47.5
75% of Cumulative	50.5

Table 18 Location 3 – Weekend Night-time L_{A90} Histogram

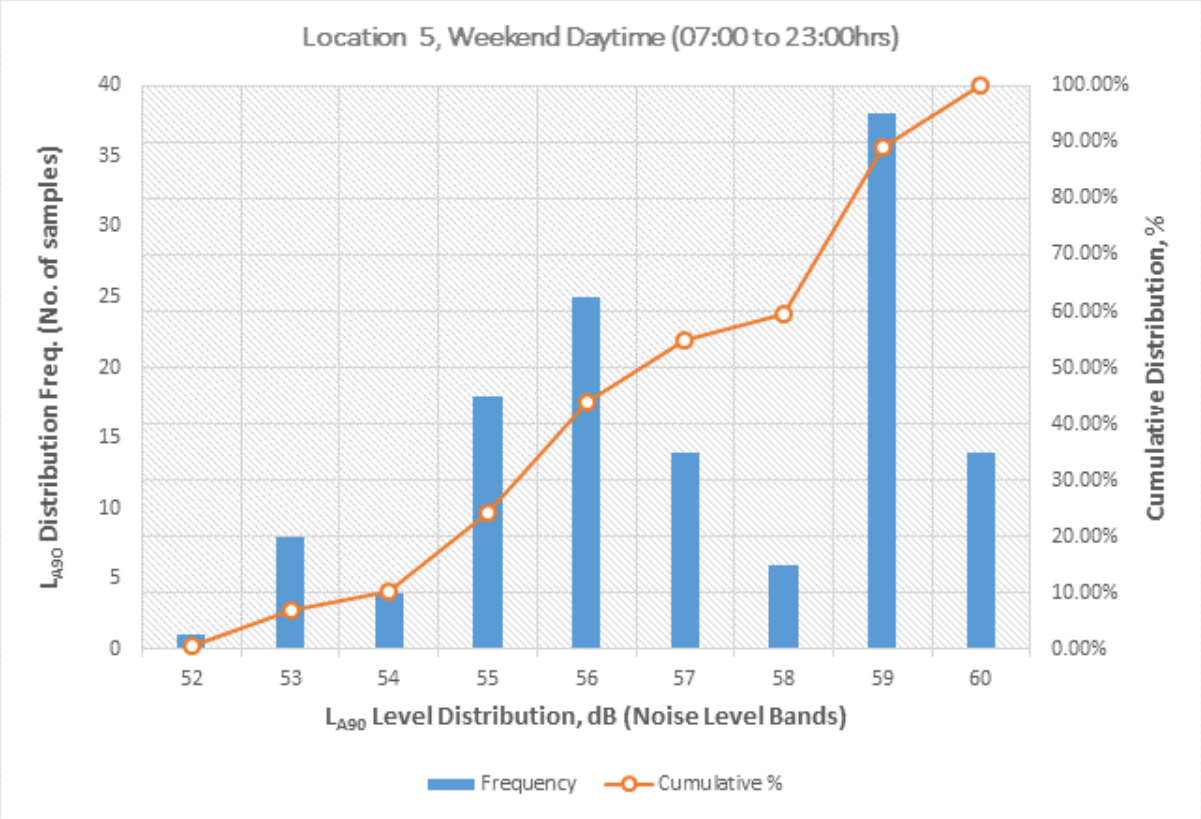

Figure 19 Location 5 – Weekend Daytime L_{A90} Histogram

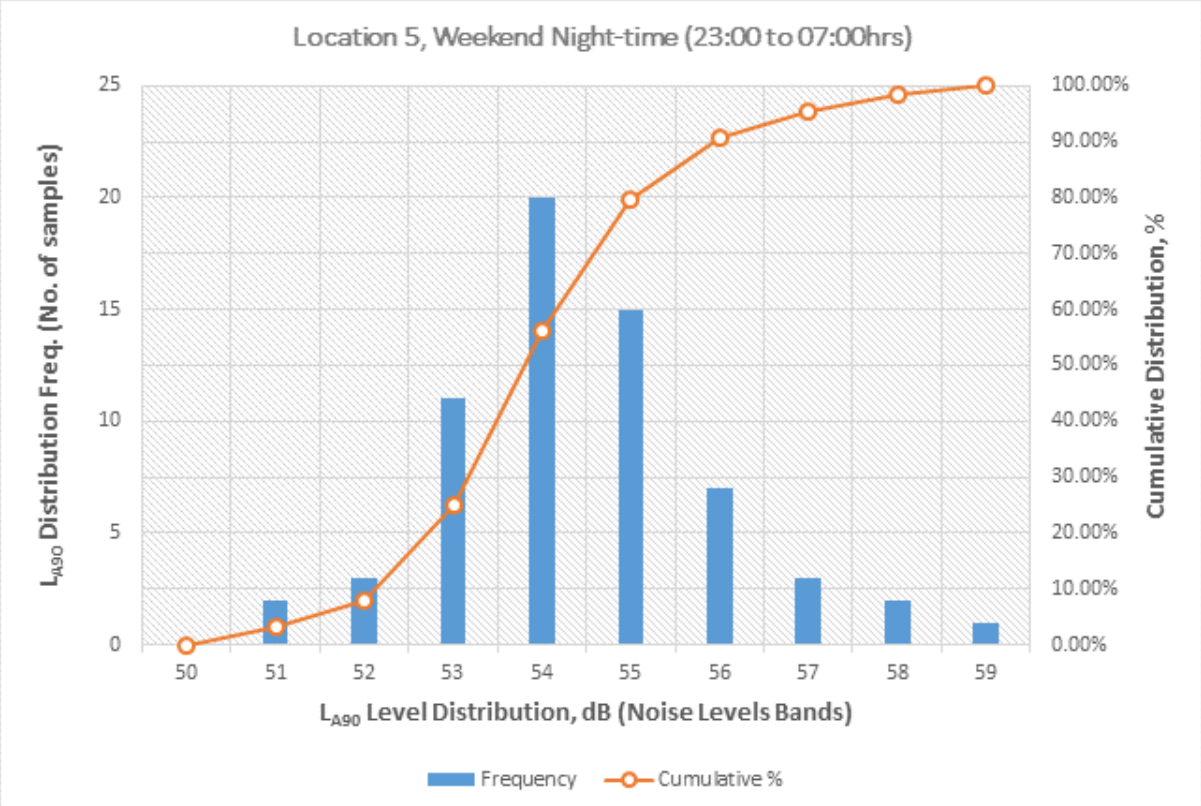

Figure 20 Location 5 - Night-time Weekend L_{A90} Histogram

Location 5 – Weekend Daytime (07:00-23:00hrs)	
L_{A90}	Level, dB
Average	57
Mode	59
1 Standard Deviation	2.1
Average plus Standard Dev.	58.7
Average minus Standard Dev.	54.6
25% of Cumulative	55
75% of Cumulative	58.5

Table 19 Location 5 – Weekend Daytime L_{A90} Histogram

Location 5 – Weekend Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	54.0
Mode	54
1 Standard Deviation	1.6
Average plus Standard Dev.	55.6
Average minus Standard Dev.	52.4
25% of Cumulative	53
75% of Cumulative	55

Table 20 Location 5 - Night-time Weekend L_{A90} Histogram

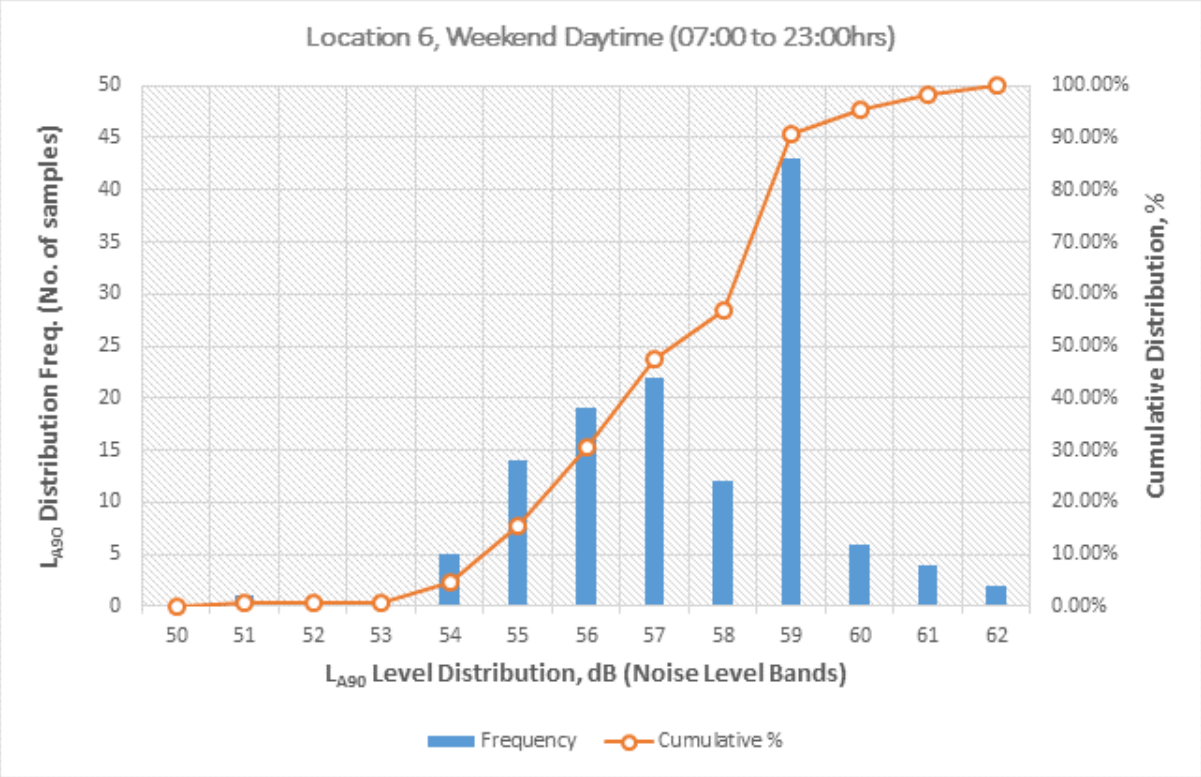

Figure 21 Location 6, Weekend Daytime L_{A90} Histogram

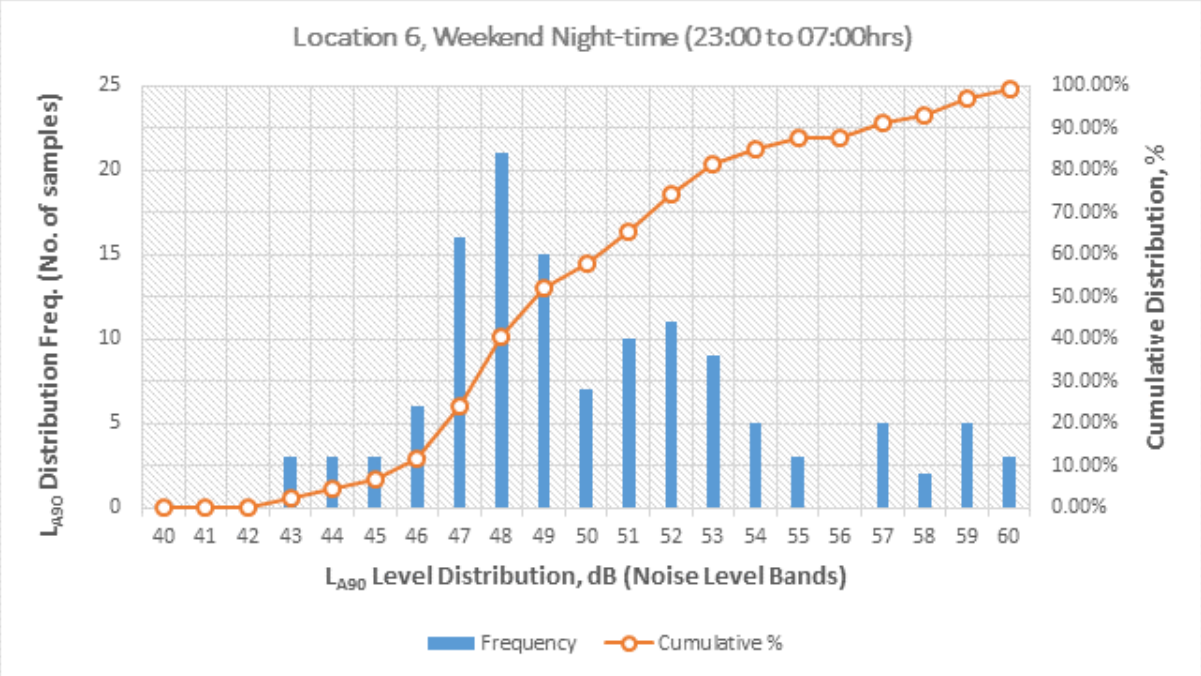

Figure 22 Location 6, Weekend Night-time L_{A90} Histogram

Location 6 – Weekend Daytime (07:00-23:00hrs)	
L_{A90}	Level, dB
Average	57
Mode	59
1 Standard Deviation	1.9
Average plus Standard Dev.	59.0
Average minus Standard Dev.	55.2
25% of Cumulative	56
75% of Cumulative	58.5

Table 21 Location 6, Weekend Daytime L_{A90} Histogram

Location 6 – Weekend Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	49.6
Mode	48
1 Standard Deviation	3.1
Average plus Standard Dev.	52.7
Average minus Standard Dev.	46.5
25% of Cumulative	47
75% of Cumulative	52

Table 22 Location 6, Weekend Night-time L_{A90} Histogram

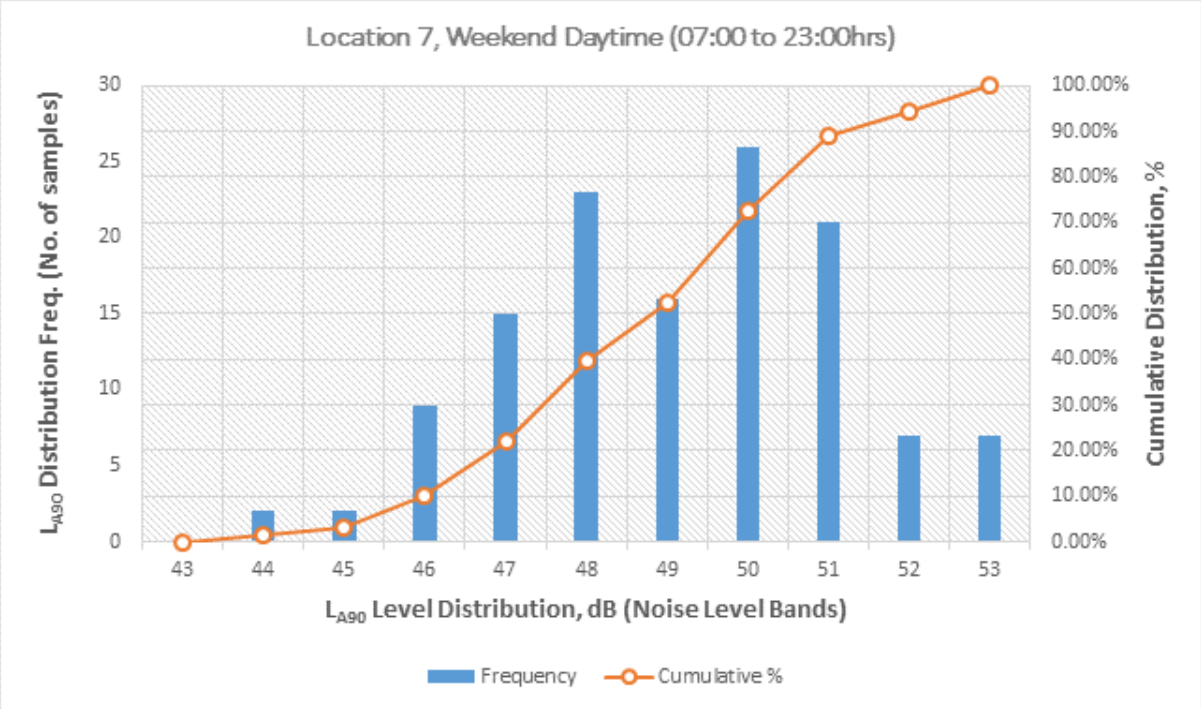

Figure 23 Location 7, Weekend Daytime L_{A90} Histogram

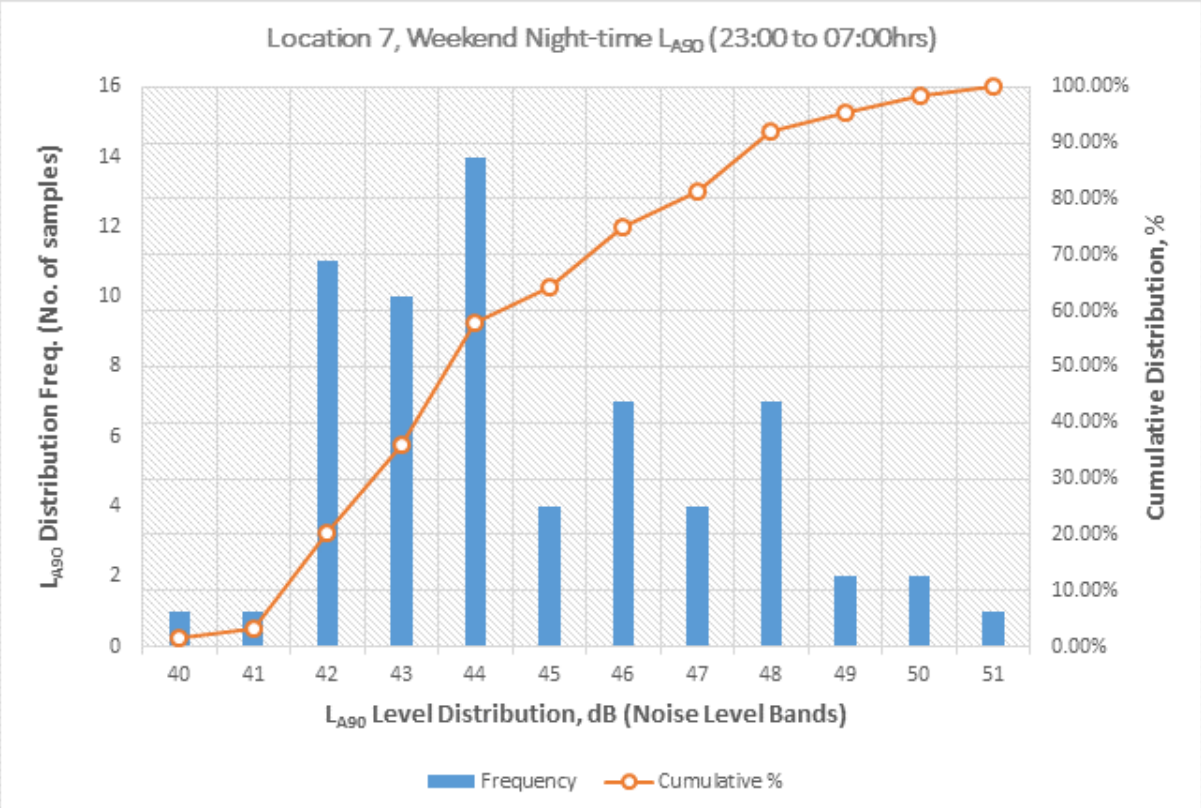

Figure 24 Location 7, Weekend Night-time L_{A90} Histogram

Location 7 – Weekend Daytime (07:00-23:00hrs)	
L_{A90}	Level, dB
Average	48.7
Mode	50
1 Standard Deviation	2.0
Average plus Standard Dev.	50.7
Average minus Standard Dev.	46.7
25% of Cumulative	47
75% of Cumulative	50

Table 23 Location 7, Weekend Daytime L_{A90} Histogram

Location 7 – Weekend Night-time (23:00-07:00hrs)	
L_{A90}	Level, dB
Average	44.3
Mode	44
1 Standard Deviation	2.4
Average plus Standard Dev.	46.8
Average minus Standard Dev.	41.9
25% of Cumulative	42
75% of Cumulative	46

Table 24 Location 7, Weekend Night-time L_{A90} Histogram

B1.3 L_{Aeq} results, weekday/weekend combined

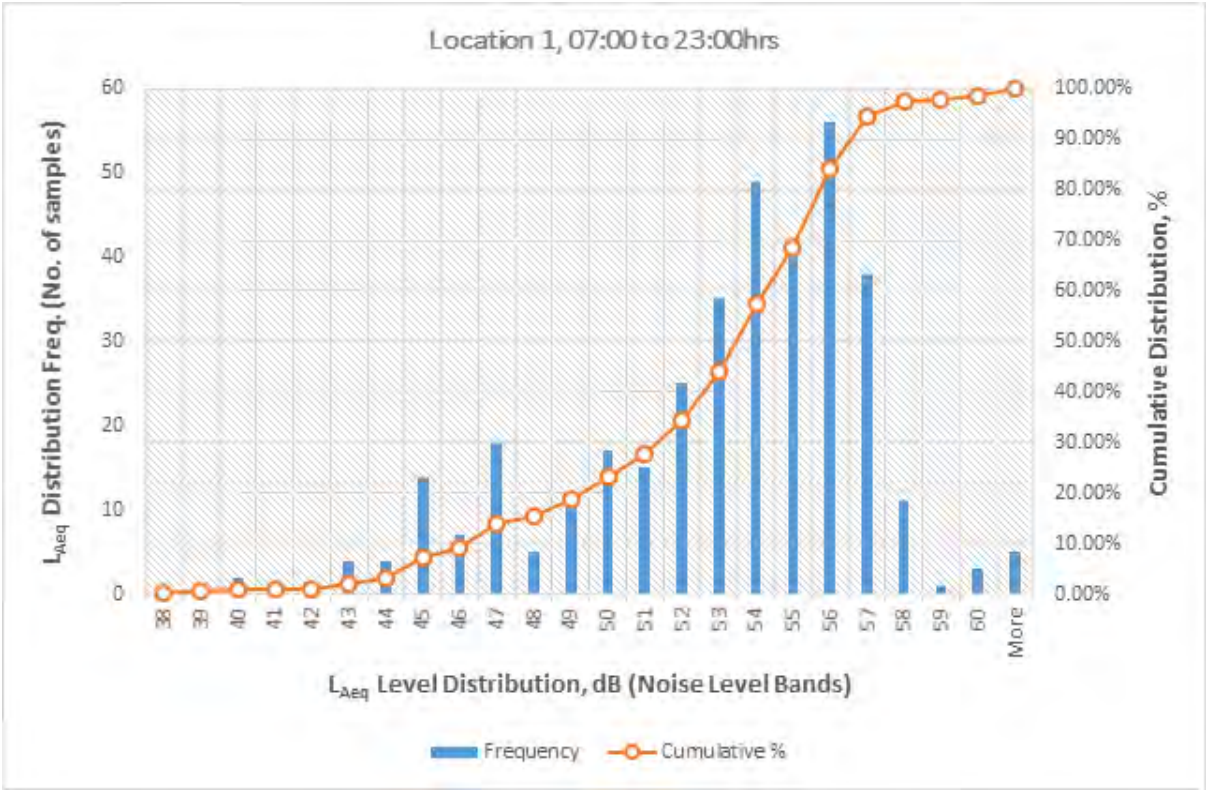

Figure 25 Location 1 - Daytime L_{Aeq} Histogram

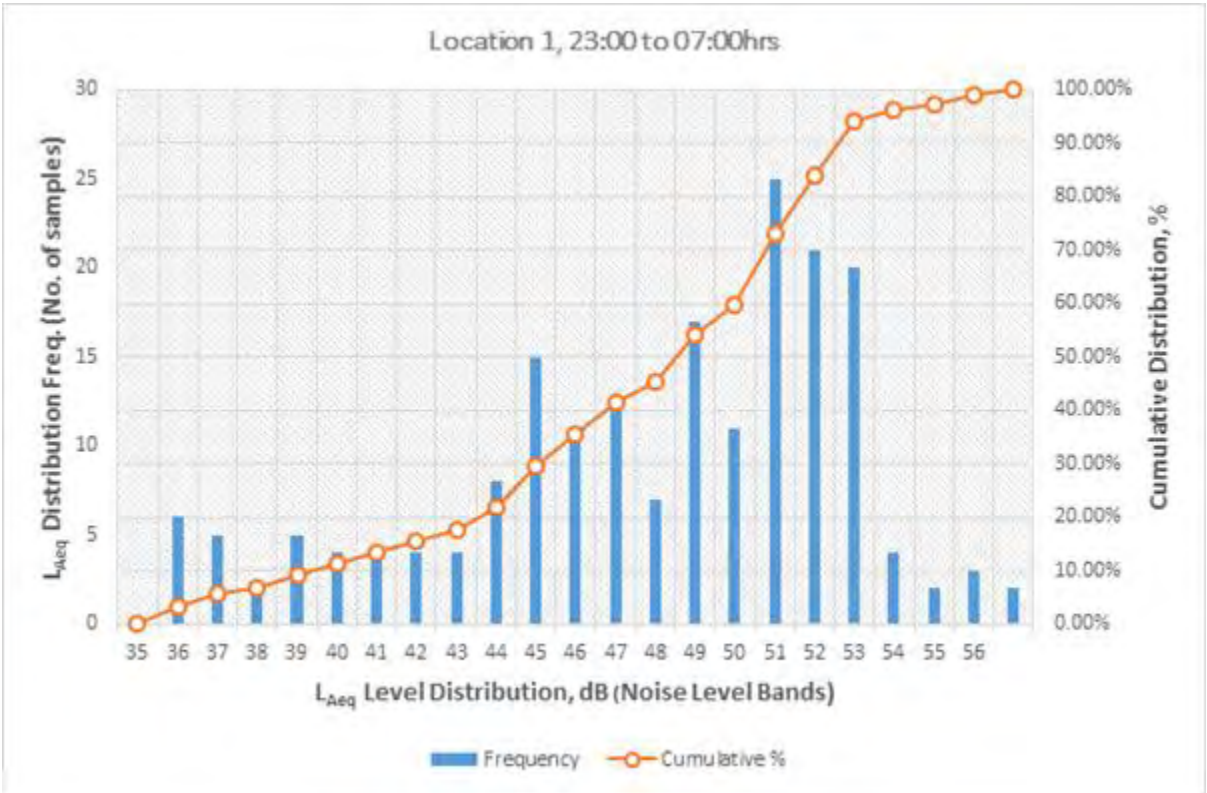

Figure 26 Location 1 – Night-time L_{Aeq} Histogram

Location 1 – Daytime (07:00 – 23:00hrs)	
L_{Aeq}	Level, dB
Average	59
Mode	56.0
1 Standard Deviation	4.6
Average plus Standard Dev.	57.3
Average minus Standard Dev.	48.0
25% of Cumulative	50.5
75% of Cumulative	55.5

Table 25 Location 1 - Daytime L_{Aeq} Histogram

Location 1 – Night-time (23:00-07:00hrs)	
L_{Aeq}	Level, dB
Average	50
Mode	51
1 Standard Deviation	5.0
Average plus Standard Dev.	52.4
Average minus Standard Dev.	42.4
25% of Cumulative	44.5
75% of Cumulative	51.5

Table 26 Location 1 – Night-time L_{Aeq} Histogram

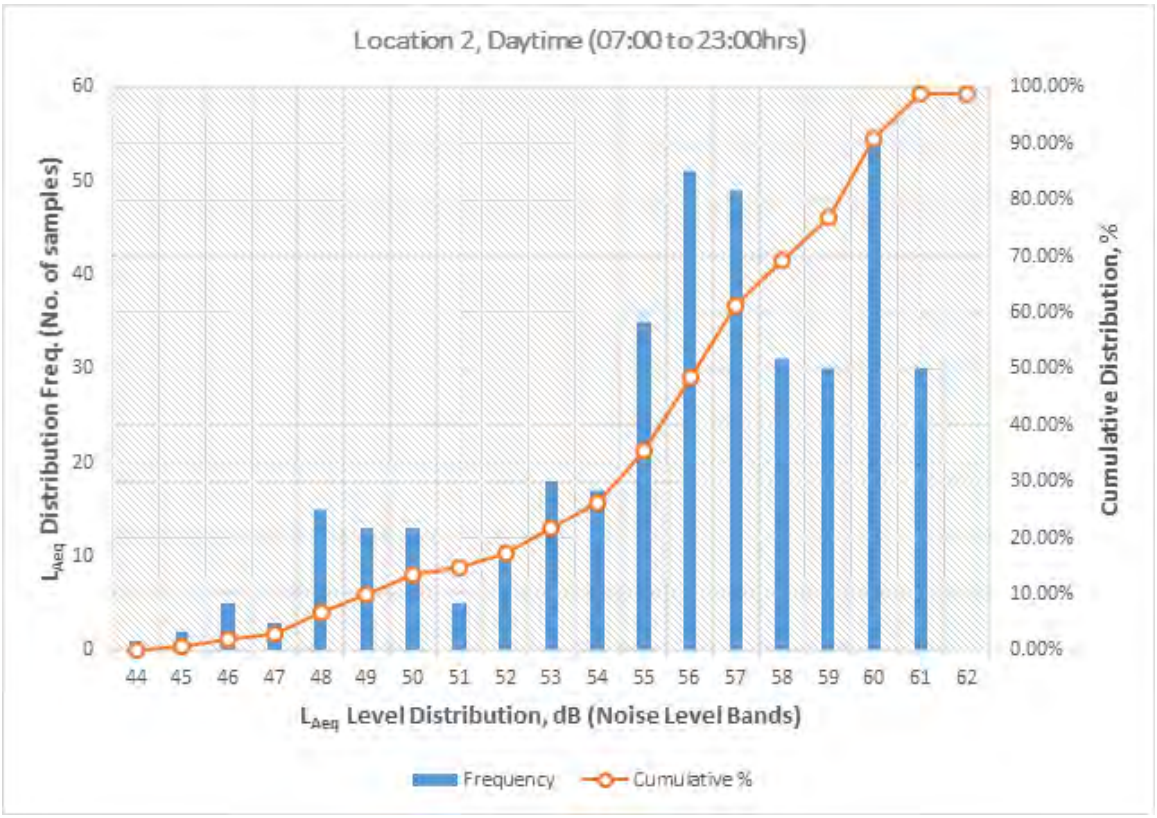

Figure 27 Location 2 – Daytime L_{Aeq} Histogram

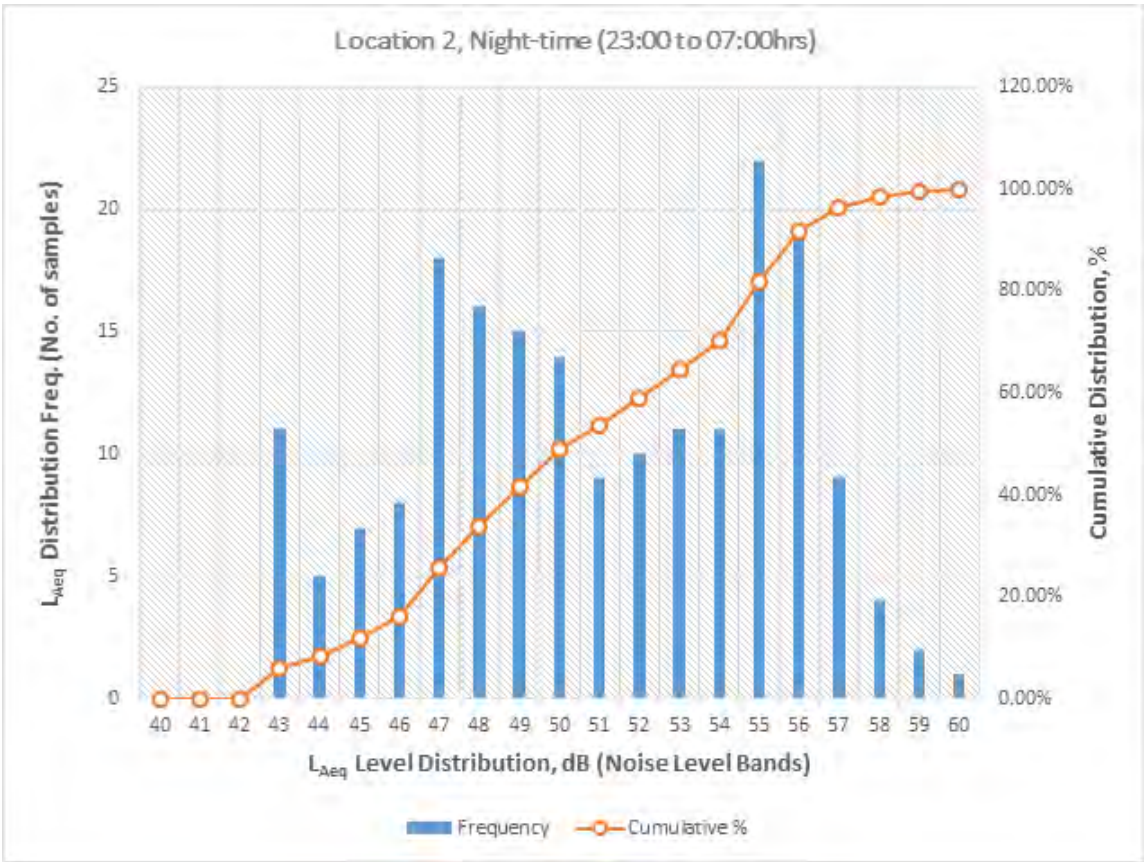

Figure 28 Location 2 – Night-time L_{Aeq} Histogram

Location 2 - Daytime (07:00 – 23:00hrs)	
L_{Aeq}	Level, dB
Average	58
Mode	60.0
1 Standard Deviation	4.0
Average plus Standard Dev.	59.8
Average minus Standard Dev.	51.5
25% of Cumulative	54
75% of Cumulative	59

Table 27 Location 2 – Daytime L_{Aeq} Histogram

Location 2 - Night-time (23:00 to 07:00hrs)	
L_{Aeq}	Level, dB
Average	53
Mode	55.0
1 Standard Deviation	4.4
Average plus Standard Dev.	54.8
Average minus Standard Dev.	46.1
25% of Cumulative	47
75% of Cumulative	54.5

Table 28 Location 2 – Night-time L_{Aeq} Histogram

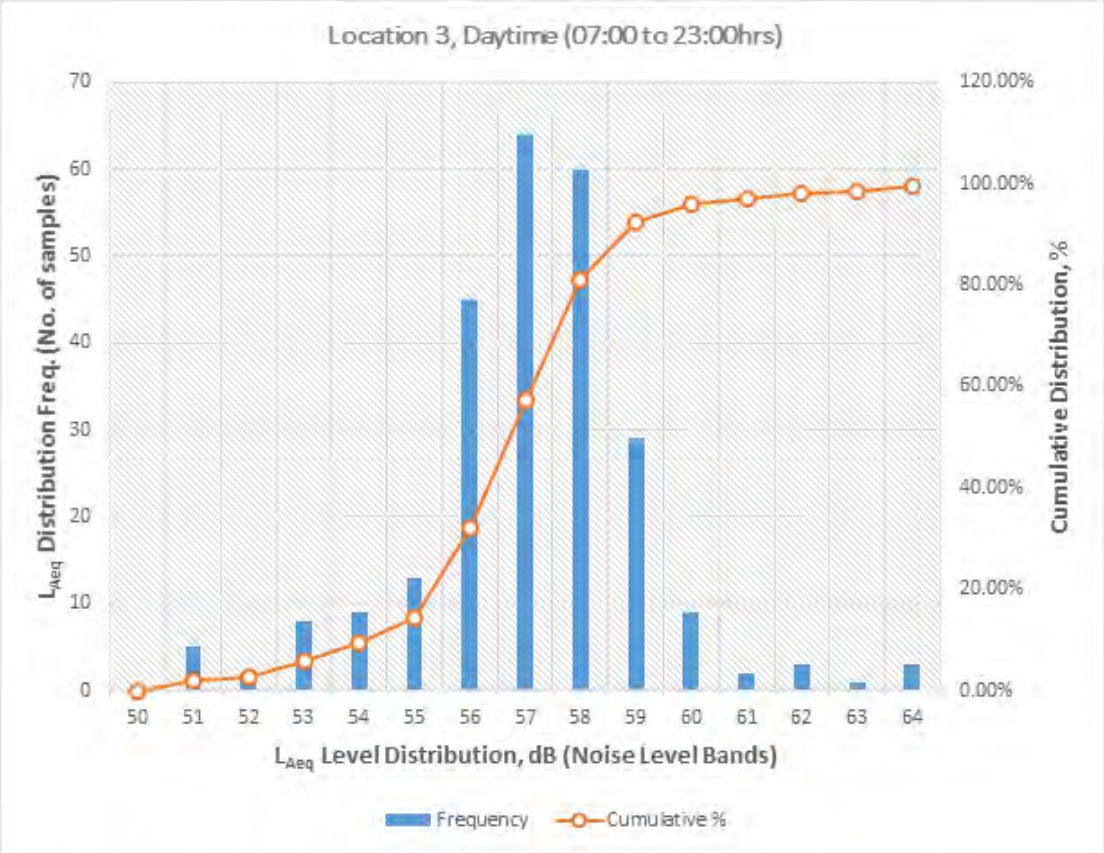

Figure 29 Location 3 – Daytime L_{Aeq} Histogram

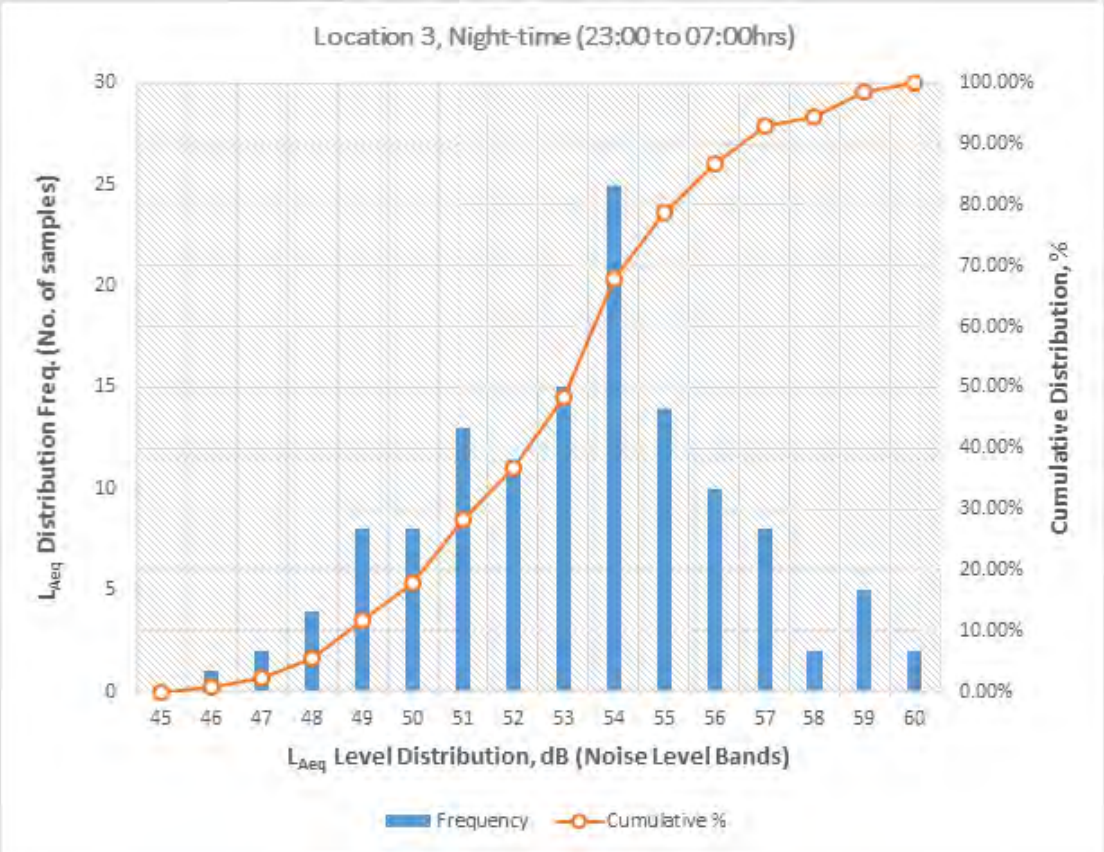

Figure 30 Location 3 - Night-time L_{Aeq} Histogram

Location 3 – Daytime (07:00-23:00hrs)	
L_{Aeq}	Level, dB
Average	57
Mode	57
1 Standard Deviation	2.2
Average plus Standard Dev.	58.9
Average minus Standard Dev.	54.5
25% of Cumulative	55.5
75% of Cumulative	57.5

Table 29 Location 3 – Daytime L_{Aeq} Histogram

Location 3 – Night-time (23:00-07:00hrs)	
L_{Aeq}	Level, dB
Average	54
Mode	54
1 Standard Deviation	2.9
Average plus Standard Dev.	55.7
Average minus Standard Dev.	49.9
25% of Cumulative	50.5
75% of Cumulative	55

Table 30 Location 3 - Night-time L_{Aeq} Histogram

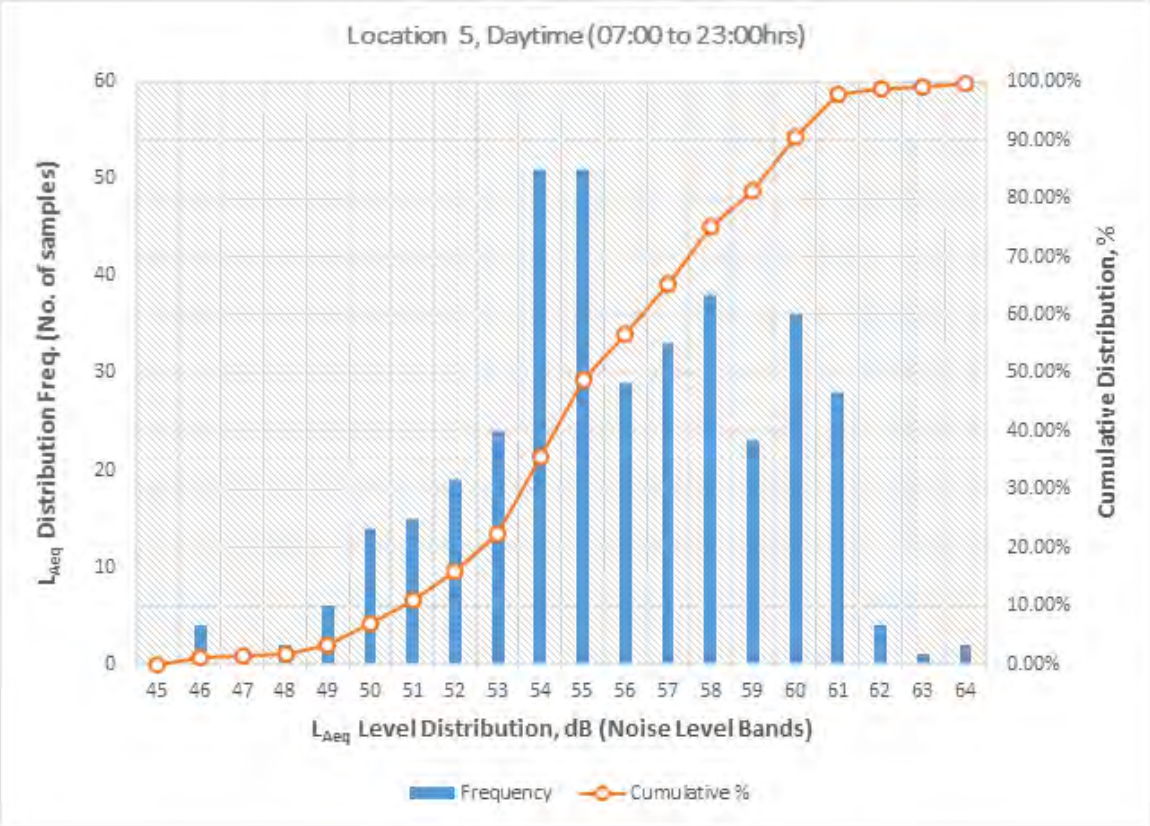

Figure 31 Location 5 – Daytime L_{Aeq} Histogram

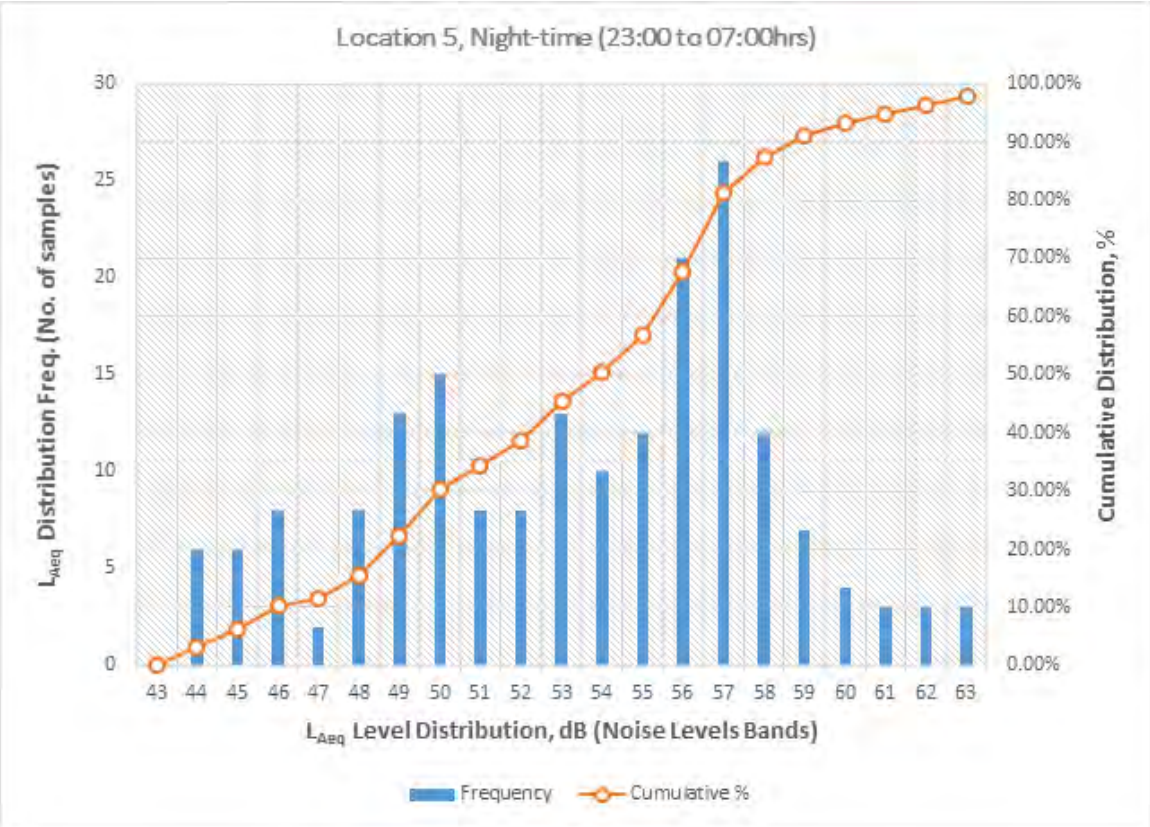

Figure 32 Location 5 - Night-time L_{Aeq} Histogram

Location 5 – Daytime (07:00-23:00hrs)	
L_{Aeq}	Level, dB
Average	57
Mode	55
1 Standard Deviation	3.5
Average plus Standard Dev.	58.9
Average minus Standard Dev.	52.0
25% of Cumulative	53
75% of Cumulative	58

Table 31 Location 5 – Daytime L_{Aeq} Histogram

Location 5 – Night-time (23:00-07:00hrs)	
L_{Aeq}	Level, dB
Average	56
Mode	57
1 Standard Deviation	4.9
Average plus Standard Dev.	58.2
Average minus Standard Dev.	48.8
25% of Cumulative	49.5
75% of Cumulative	56.5

Table 32 Location 5 - Night-time L_{Aeq} Histogram

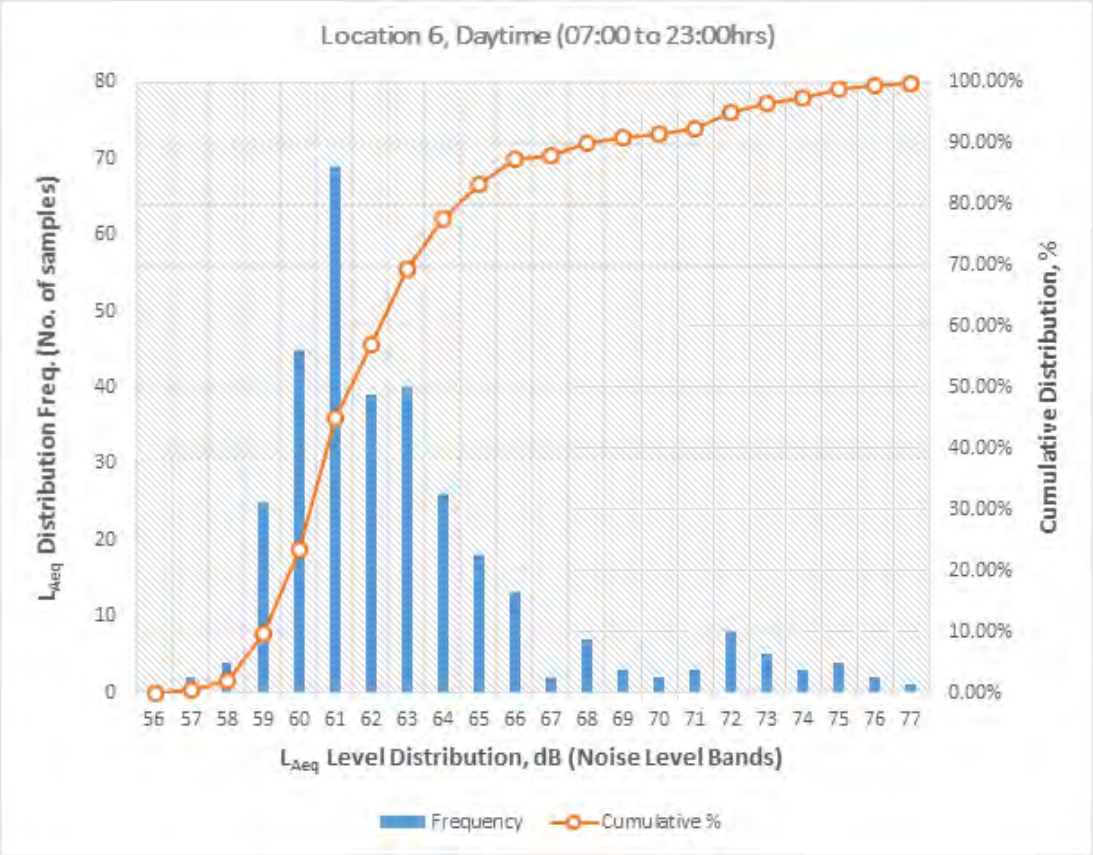

Figure 33 Location 6, Daytime L_{Aeq} Histogram

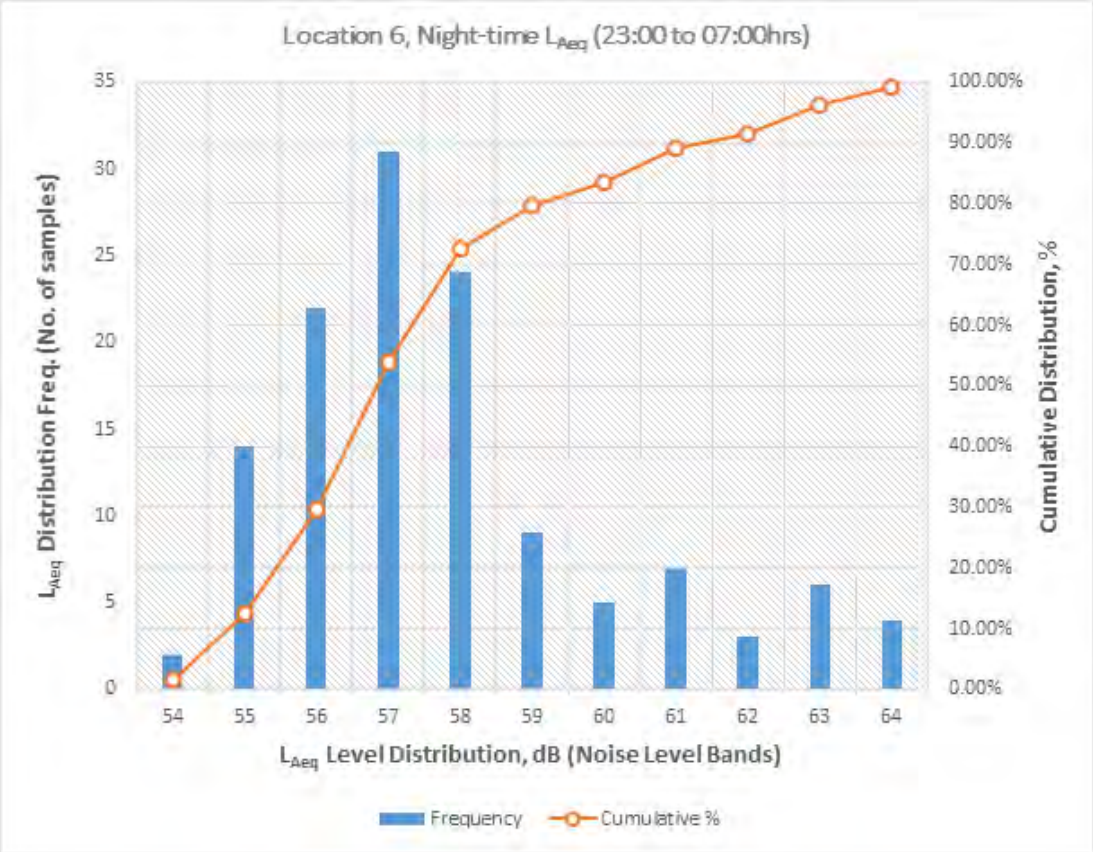

Figure 34 Location 6, Night-time L_{Aeq} Histogram

Location 6 – Daytime (07:00-23:00hrs)	
L_{Aeq}	Level, dB
Average	66
Mode	61
1 Standard Deviation	3.9
Average plus Standard Dev.	66.6
Average minus Standard Dev.	58.7
25% of Cumulative	60
75% of Cumulative	64

Table 33 Location 6, Daytime L_{Aeq} Histogram

Location 6 – Night-time (23:00-07:00hrs)	
L_{Aeq}	Level, dB
Average	59
Mode	57
1 Standard Deviation	2.6
Average plus Standard Dev.	60.0
Average minus Standard Dev.	54.9
25% of Cumulative	56
75% of Cumulative	58.5

Table 34 Location 6, Night-time L_{Aeq} Histogram

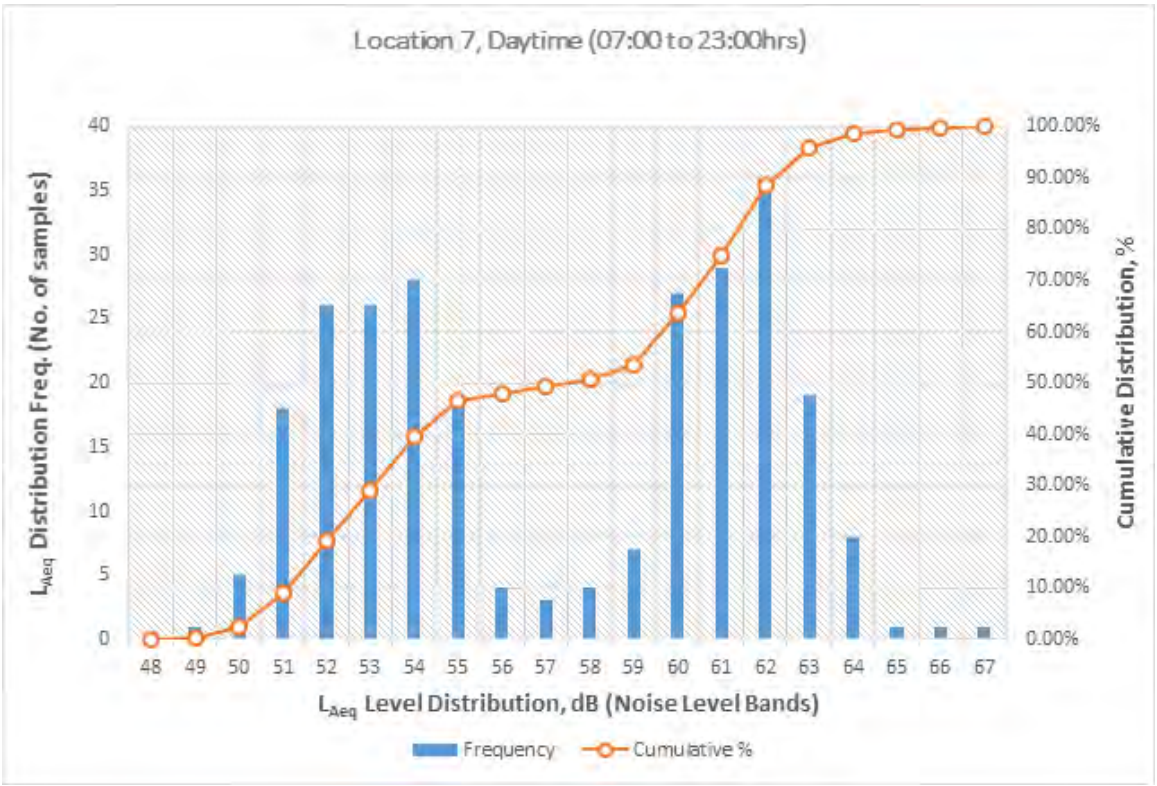

Figure 35 Location 7, Daytime L_{Aeq} Histogram

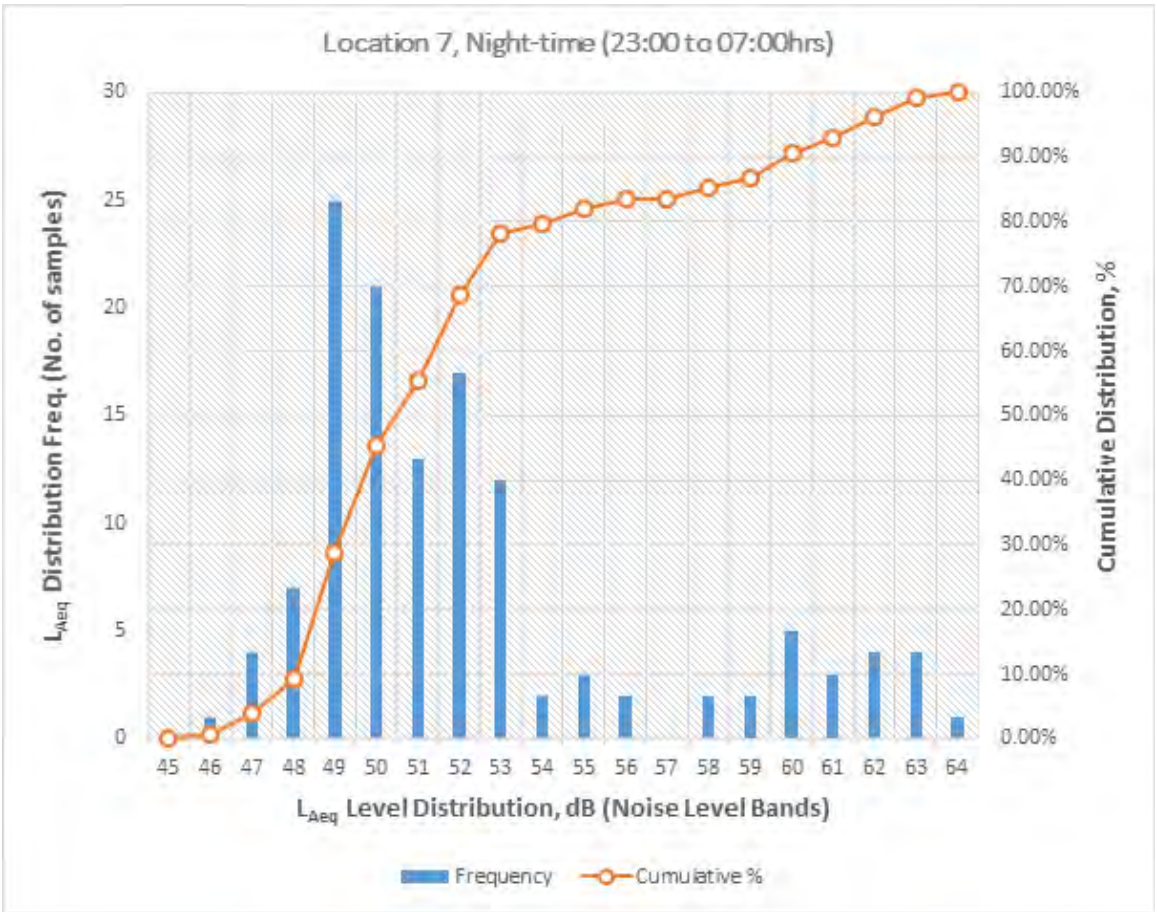

Figure 36 Location 7, Night-time L_{Aeq} Histogram

Location 7 – Daytime (07:00-23:00hrs)	
L_{Aeq}	Level, dB
Average	59
Mode	60
1 Standard Deviation	4.5
Average plus Standard Dev.	61.3
Average minus Standard Dev.	52.4
25% of Cumulative	53
75% of Cumulative	61

Table 35 Location 7, Daytime L_{Aeq} Histogram

Location 7 – Night-time (23:00-07:00hrs)	
L_{Aeq}	Level, dB
Average	55
Mode	49
1 Standard Deviation	4.3
Average plus Standard Dev.	56.1
Average minus Standard Dev.	47.5
25% of Cumulative	49
75% of Cumulative	53

Table 36 Location 7, Night-time L_{Aeq} Histogram

Appendix C

Comparison of LA90 levels from surveys taken during different periods

C1

NLHPP	Job Number 235271-12	Summary of LA90 levels at each Unmanned Location											
	Location 1		**Location 2**		**Location 3**		**Location 5**		**Location 6**		**Location 7**	
	Daytime Results - (07:00-23:00)		**daytime- 07:00-23:00)**		**Daytime Results - (07:00-23:00)**		**Daytime Results - (07:00-23:00)**		**Daytime Results - (07:00-23:00)**		**Daytime Results - (07:00-23:00)**	
	Arithmetic avg	49	Arithmetic avg	52	Arithmetic avg	53	Arithmetic avg	53	Arithmetic avg	58	Arithmetic avg	49
	Mode	54	Mode	54	Mode	53	Mode	51	Mode	59	Mode	50
	standard deviation	4	standard deviation	4	standard deviation	2	standard deviation	4	standard deviation	2	1 standard deviation	2
	0	0		4								
	0	0										
	arithmetic avg+ stnd	53	arithmetic avg+ stnd	56	arithmetic avg+ stnd	55	arithmetic avg+ stnd	57	arithmetic avg+ stnd	60	arithmetic avg+ stnd	51
	arithmetic avg-stndr	44	arithmetic avg-stndr	48	arithmetic avg-stndr	51	arithmetic avg-stndr	49	arithmetic avg-stndr	56	arithmetic avg-stndr	48
	0	0										
	25% of the cumulativ	45	25% of the cumulativ	49	25% of the cumulativ	52	25% of the cumulativ	50	25% of the cumulativ	56	25% of the cumulativ	48
	75% of the cumulativ	52	75% of the cumulativ	55	75% of the cumulativ	54	75% of the cumulativ	56	75% of the cumulativ	59	75% of the cumulativ	51
	0	0										
	Min Range	36			Min range	46	Min range	44	Min range	50		
	Max Range	55			Max range	57	Max range	60	Max range	63		
										Thursday 27th June		
	Job No 224552	Survey Results	Job No 224552	Survey Results	Job No 224552	Survey Results	Job No 224552	Survey Results	Job No 224552	Survey Results	Job No 224552	Survey Results
	Manned measured LA90		Manned measured LA90		Manned measured LA90		Manned measured LA90		Manned measured LA90		Manned measured LA90	
	10:00 to 17:00hrs	54-56	10:00 to 17:00hrs	54-56	10:00 to 17:00hrs	62-63	10:00 to 17:00hrs	59-60	10:00 to 17:00hrs	59-63	10:00 to 17:00hrs	53-54
	20:00 to 22:00hrs	54	20:00 to 22:00hrs	44-45	20:00 to 22:00hrs	59-60	20:00 to 22:00hrs	56-58	20:00 to 22:00hrs	57-58	20:00 to 22:00hrs	50
	00:00 to 03:00hrs	52-53	00:00 to 03:00hrs	41	00:00 to 03:00hrs	49-56	00:00 to 03:00hrs	51-54	00:00 to 03:00hrs	49-51	00:00 to 03:00hrs	42-43
	see Noise Report		see Noise Report		see Noise Report		see Noise Report		see Noise Report		see Noise Report	
	issued 14th March 2013		issued 14th March 2013		issued 14th March 2013		issued 14th March 2013		issued 14th March 2013		issued 14th March 2013	
	Job No 224552		Job No 224552		Job No 224552		Job No 224552		Job No 224552		Job No 224552	
	Nightime 23:00- 07:00		**Nightime 23:00- 07:00**		**Nightime 23:00- 07:00**		**Nightime 23:00- 07:00**		**Nightime 23:00- 07:00**		**Nightime 23:00- 07:00**	
	Arithmetic avg	44	Arithmetic avg	48	Arithmetic avg	49	Arithmetic avg	49.81094	Arithmetic avg	49.94141	Arithmetic avg	44
	Mode	43 (& 49)	Mode	47	Mode	51	Mode	47	Mode	48	Mode	42
	standard deviation	5	standard deviation	4	standard deviation	3	standard deviation	3.976459	standard deviation	4.100563	1 standard deviation	3
	arithmetic avg+ stnd	49	arithmetic avg+ stnd	52	arithmetic avg+ stnd	52	arithmetic avg+ stnd	53.7874	arithmetic avg+ stnd	54.04197	arithmetic avg+ stnd	48
	arithmetic avg-stndr	39	arithmetic avg-stndr	44	arithmetic avg-stndr	46	arithmetic avg-stndr	45.83448	arithmetic avg-stndr	45.84084	arithmetic avg-stndr	41
	25% of the cumulativ	41	25% of the cumulativ	45	25% of the cumulativ	47	25% of the cumulativ	46.5	25% of the cumulativ	47	25% of the cumulativ	42
	75% of the cumulativ	49	75% of the cumulativ	53	75% of the cumulativ	51	75% of the cumulativ	53.5	75% of the cumulativ	52	75% of the cumulativ	47
	Job No 224552	Survey Results	Job No 224552	Survey Results	Job No 224552	Survey Results	Job No 224552	Survey Results	Job No 224552	Survey Results	Job No 224552	Survey Results
	Manned measured LA90		Manned measured LA90		Manned measured LA90		Manned measured LA90		Manned measured LA90		Manned measured LA90	
	10:00 to 17:00hrs	54-56	10:00 to 17:00hrs	54-56	10:00 to 17:00hrs	62-63	10:00 to 17:00hrs	59-60	10:00 to 17:00hrs	59-63	10:00 to 17:00hrs	53-54
	20:00 to 22:00hrs	54	20:00 to 22:00hrs	44-45	20:00 to 22:00hrs	59-60	20:00 to 22:00hrs	56-58	20:00 to 22:00hrs	57-58	20:00 to 22:00hrs	50
	00:00 to 03:00hrs	52-53	00:00 to 03:00hrs	41	00:00 to 03:00hrs	49-56	00:00 to 03:00hrs	51-54	00:00 to 03:00hrs	49-51	00:00 to 03:00hrs	42-43
	see Noise Report		see Noise Report		see Noise Report		see Noise Report		see Noise Report		see Noise Report	
	issued 14th March 2013		issued 14th March 2013		issued 14th March 2013		issued 14th March 2013		issued 14th March 2013		issued 14th March 2013	
	Job No 224552		Job No 224552		Job No 224552		Job No 224552		Job No 224552		Job No 224552	

Table 1: Summary table of data analysis from long-term and short-term surveys

ARUP

Subject	EIA Noise Position Paper 2 for the Environment Agency		
Date	29 June 2015	Job No/Ref	235271

Position Paper 2: Selection of surrogate noise survey locations for the North London Heat and Power Project

1 Purpose of note

The North London Heat and Power Project (NLHPP) would replace the existing EfW facility at the Edmonton EcoPark site with a new Energy Recovery Facility (ERF) and associated development. This note should be viewed as a further note, in addition to the information already set out in Position Paper dated 11 June 2015.

The purpose of this note is to identify suitable alternative or surrogate noise monitoring positions, which might be used to gather additional noise data for the NLHPP site. These have been requested by the Environment Agency, who confirm that they are necessary to comply with the BS4142:2014[1] methodology.

The proposals in this note are intended to form the basis of further technical discussions with the Environment Agency to reach an agreement on the adequacy of the existing noise data and to identify further noise survey monitoring locations, should they be required. This data will inform the Environmental Impact Assessment (EIA) and the Integrated Pollution Prevention and Control (IPPC H3 Horizontal Guidance for Noise Part 2 (2004)[2] environmental control permit. The Environment Agency are therefore requested to review and comment on the proposals set out in this note to inform further technical discussion during the site visit, planned for 1 July 2015, on this matter.

Outcome of technical discussions following Position Paper 1

The outcome of the first technical discussion meeting was that the Environment Agency position remains that:

- Adequacy of data is questioned as surveys were undertaken whilst the current site was operational.
- The Environment Agency stated that in order to understand noise levels for the operational phase the baseline data should be collected without the existing site noise levels (i.e. without the site being operational).
- Arup has been asked to identify a number of “surrogate” locations for further noise monitoring surveys and the suitability of these will be technically discussed on site on 1 July 2015.These locations should be locations of similar “character” with the same noise sources, but without the specific noise source i.e. NLHPP site cannot be heard.

[1] BSI(2014), BS 4142 Methods for rating and assessing industrial and commercial sound, British Standards Institution
[2] Environment Agency (2004) Horizontal Guidance Note IPPC H3 Horizontal Guidance for Noise Part 2 – Noise Assessment and Control.

Arup response following technical discussions on Position Paper 1

All noise surveys were carried out while the EfW facility was operating. However, noise from the existing facility was not audible at most of the measurement locations. Even when noise from the existing facility was audible it was not considered to be a significant contributor to the background sound level.

The survey data contained in Appendix A is compliant with previous and current guidance in terms of monitoring protocol and scope (i.e. British Standards and H3 Horizontal Guidance). Whilst Arup does not agree that there is a need to identify surrogate locations to carry out additional noise surveys in order to inform the permit, as this is not consistent with BS4142:2014, we have nonetheless identified surrogate locations in order to assist in reaching agreement with the Environment Agency and progressing the application.

In BS4142:2014 in para 6.2 it states that survey designers should "choose outdoor measurement locations that will give results that are representative of the ambient sound and residual sound at the assessment location(s)"; i.e. at the receiver locations as far as practicable. Surrogate locations do not represent the assessment receiver locations.

The introduction of surrogate locations also potentially introduces significant uncertainty as discussed in the research paper "A Good Practice Guide on the Sources and Magnitude of Uncertainty Arising in the Practical Measurement of Environmental Noise"[3] (N.J.Craven, G.Kerry.2007). This research informs, and is referred to in the entire section B2 of BS4142:2014. The Guide develops good practice guidelines to help minimise uncertainty in measurement of environmental noise, and these have been taken into account in the preparation of this paper, but cannot eliminate uncertainty arising from using surrogates entirely, and this uncertainty is not quantifiable.

The subjective observations of the noise environment obtained during the survey show that road traffic noise is generally dominant at measurement locations within the area. However, periods of lesser traffic reveal audible mechanical, industrial and material handling noise, which suggests that the introduction of industrial noise from the proposed new facility would to some extent be in keeping with the existing noise environment, albeit not to the extent that it becomes dominant.

Arup opinion is that no further noise surveys are required.

Rationale for the choice of surrogate locations

In order to identify appropriate surrogate locations, according to BS412:2014,(using the principles of Example 10 which apply), the surrogate should be the same distance from the dominant noise source, in this case the North Circular Road A406, as the location it "replaces". There should be a similar amount of screening to the road and the road gradient and surface roughness should be unchanged. The acoustic environment should be equivalent at both locations, except that the specific noise is not present at the surrogate location.

[3] N.J.Craven, G.Kerry 2007 "A Good Practice Guide on the Sources and Magnitude of Uncertainty Arising in the Practical Measurement of Environmental Noise"

The good practice guidelines state "If a suitable position cannot be found locally then a remote position must be chosen. This may require detailed consideration of the topography, distances and bearing between the measurement positions and all of the major background noise sources relative to the prevailing weather. A thorough investigation of the local area may be necessary, for which the judgement and experience of the assessor will be critical factors."

The Good Practice Guide states "where it is necessary to measure at an alternative position the following should be considered:

- Distance to each major background noise source –
- Bearing to each major background noise source
- Topography between the measurement position and each major background noise source.
- There is no recognised method for the choice of alternative measurement positions as problems are often unique to the situation. The best approach is one based upon common sense and reasoned decision-making.

If the time and resources are available, repeated measurement should be made at a number of measurement positions in order to determine the most representative noise level.

The choice of background measurement position should be justified in the survey report."

In terms of the current survey data, in all locations the noise survey reporting indicates that subjectively the background noise climate is dominated by road noise from the North Circular Road. This is corroborated by discussions with the team who carried out the noise survey.

The survey locations are shown in Figure 1. Survey locations 1 and 2 represent residential receptors on Lower Hall Lane, to the east of the site, and survey location 7 represents the nearest sensitive residential receptors on Zambezie Drive to the west of the site. Survey locations 3, 4 and 6 represent future residential receptors as part of the allocated Meridian Water development. Location 5 represents receptors in the Lee Valley Regional Park.

Figure 1 Survey measurement locations in relation to the Application Site

At location 1, it is reported that road noise dominates for most of the measurement period during both the February and June surveys. At midday during the June survey, plant noise was heard coming from the Thames Water site, and it is noted that traffic on the A406 North Circular was lighter than usual. It is not clear what activity the plant were engaged in. During the measurement at 13:21 the plant is not working.

At location 2 it is reported that road traffic noise dominates for most of the measurement period during both the February and June surveys. At midday during the June survey, plant noise was again heard coming from the Thames Water site, and it is noted in the 13:52 survey that no plant was operating, A406 North Circular Road noise was dominant. In the early hours of the morning roof-top plant noise from the EcoPark could be heard.

At location 5 during the daytime, rooftop plant noise from the EcoPark and distant North Circular Road noise in combination determined the background noise at this location. Plant noise was also heard from the Thames water site. At night and in the early hours of the morning, rooftop plant noise from the Eco Park occasionally dominates this location, only when noise from the North Circular Road is reduced. At all other locations A406 road traffic noise is dominant.

As part of the evaluation of the background sound, the influence of noise from the existing facility should be considered as this forms part of the context for the assessment of the new facility. It should be noted though that the facility was only audible at two locations (monitoring locations 2 and 5) and then only rarely audible. Noise from the existing facility was not therefore considered to be a significant contributor to the background sound level. This is demonstrated by the fact that the

background sound levels at the two locations where noise from the existing facility was audible were either lower or consistent with the levels measured at the other locations where noise from the existing facility was not audible.

Surrogate locations

The locations where the EcoPark was present i.e. audible, albeit rarely, were locations 2 and 5.

Surrogate locations for these two positions need to meet the following criteria:

- Similar distance from the A406 North Circular Road and at the same road gradient and surface roughness
- Similar acoustic environment, without EcoPark being audible.

Figure 2 shows the suggested surrogate locations on the map.

Location 2

Location 2 is approximately 310m from the A406, and within 140m of the boundary of the Thames Water site, which has some heavy plant activity intermittently ongoing. It is on the edge of a residential area, with a retail shopping park within 100m. There are no buildings screening it from the A406. The acoustic environment is dominated by the road traffic noise.

Surrogate Options

In order to try and replicate the noise conditions of Location 2 , the surrogate needs to be a similar distance from the A406, and within 140m of the boundary of the Thames Water site, if possible. It should also be a similar area e.g. on the edge of a residential area, with a retail shopping park nearby. There should be no buildings screening it from the A406. The acoustic environment should be dominated by the road traffic noise.

A location to the south of the A406 (see Figure 2, and directly south of the current location 2, on the green space to the immediate north of Harbet Road, might be a consideration. At this location however, the A406, whilst at a similar distance, has greater elevation.

Also, the boundary of the Thames Water site is over 500m away. The acoustic environment is likely to be dominated by A406 road traffic noise but at this location the segment of road visible is much larger (almost 170 degree view) than at the current location 2 (approx 40 degree angle of view of the road), due to the road curvature, and its contribution will be greater at the surrogate. It is at greater distance from the retail shopping park and is not on the edge of a residential area, rather it is on the edge of some retail shopping outlets and small industrial units. It does have an unscreened view of the road, which is good.

This site is the best alternative location identified, but clearly has some limitations in terms of its “area character” and distances to the Thames Water site, as well as the likelihood that the road noise may be louder here due to the large segment of road visible at that location.

Notwithstanding these observations made using aerial mapping, the site meeting to visit, review and discuss these locations on the ground will be useful to determine whether or not they are suitable in reality.

It was not possible to find any other alternatives which are at a similar distance to the road, but which also have a site similar to the Thames Water site in such close proximity.

Location 5

Location 5 is approximately 165m from the A406, and within 50m of the boundary of the Thames Water site, which has some heavy plant activity intermittently ongoing. It is on the River Lee Navigation and has no screening to the A406. The acoustic environment is dominated by the road traffic noise.

Surrogate Options

In order to try and replicate the noise conditions of Location 5, the surrogate needs to be about 165m from the A406, and within 50m of the boundary of the Thames Water site. Ideally it should also be on the River Lee Navigation and have no screening to the A406. The acoustic environment should be dominated by the road traffic noise.

An alternative location for position 5 might also be south of the A406 but at a similar distance to it, remaining on the River Lee Navigation, adjacent to Towpath Road, but again road elevation and distance to the Thames Water or similar site is a confounding factor. Those site conditions which are not aligned to those of location 5, i.e. the road here has greater elevation that the original location, and the Thames Water site is further away, may alter the characteristics of the acoustic environment here. This location is also surrounded by buildings, unlike location 5

This site is the best alternative location identified, but clearly has some limitations. Notwithstanding these observations made using aerial mapping, the site meeting to visit, review and discuss these locations on the ground will be useful to determine whether or not they are suitable in reality

It was not possible to find any other alternatives which are at a similar distance to the road, but which also have a site similar to the Thames Water site in such close proximity

Figure 2 Survey and surrogate survey measurement locations in relation to the Application Site

Survey method

In order to try and minimise the level of uncertainty it is recommended that simultaneous measurements are carried out at both the surrogate and original survey locations.

The survey protocol will follow the measurement procedure laid out in BS4142:2014. The measurement systems will be Type 1, conforming to BS EN 61672-1: 2003. The calibration of the sound level meters, pre-amplifier and microphone chains will be checked before and after use, to confirm that there is no significant drift in meter response at the calibrator frequency and level. All Arup's sound level meters are regularly calibrated and this calibration is traceable to international standards. In addition to noise measurements, weather conditions will also be recorded using a logging meteorological station at the measurement location. Cloud cover should be estimated, and precipitation and temperature recorded.

A detailed consideration of the topography, distances and bearing between the measurement positions and all of the major background noise sources relative to the prevailing weather will be made and reported.

All of the information which will be reported will follow the specification in BS4142:2014 as appropriate.

Next steps

This Position Paper has provided suggested locations for surrogate noise survey positions as requested by the Environment Agency, as well the rationale behind the decision making process which informed the choice of locations. The next planned step relating to this matter is:

1. A site meeting is proposed on 1 July 2015 between Arup, the applicant and Environment Agency to discuss these surrogate sites and their suitability.

NORTH LONDON WASTE AUTHORITY

NORTH LONDON HEAT AND POWER PROJECT

ENVIRONMENTAL STATEMENT: VOLUME 2 APPENDIX 8.4 TRAFFIC DATA FOR ROAD TRAFFIC NOISE ASSESSMENT

AD06 . 02

nlwa
north london waste authority

North London Waste Authority

North London Heat and Power Project

Environmental Statement Volume 2 Appendix 8.4 Traffic Data for Road Traffic Noise Assessment

AD06.02

The Planning Act 2008 The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5 (2)(a)

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Vol 2 Appendix 8.4 Table 1: Future 18hr traffic flow data for Meridian Way south of Ardra Road, with and without the Project

Stages	Year	Vehicle type	Do-Minimum AAWT	Do Something AAWT	Increase in traffic, %
Stage 1b	2020	Vehicle	27899	27945	0 %
		HGVs	2973	2994	1 %
Stage 1c	2021	Vehicle	28088	28272	1 %
		HGVs	2993	3090	3 %
	2022	Vehicle	28314	28499	1 %
		HGVs	3017	3115	3 %
Stage 1d	2022	Vehicle	28314	28357	0 %
		HGVs	3017	3047	1 %
	2023	Vehicle	28541	28584	0 %
		HGVs	3042	3071	1 %
	2024	Vehicle	28766	28810	0 %
		HGVs	3066	3095	1 %
Stage 2	2025	Vehicle	28994	28980	0 %
		HGVs	3090	3093	0 %
Stage 3	2026	Vehicle	29220	29204	0 %
		HGVs	3114	3117	0 %
	2027	Vehicle	29393	29377	0 %
		HGVs	3132	3135	0 %
	2028	Vehicle	29565	29550	0 %
		HGVs	3151	3154	0 %
Stage 4	2028	Vehicle	29565	29550	0 %
		HGVs	3151	3153	0 %

AAWT – Annual Average Weekday Traffic flow
Do Minimum – including future background traffic growth but without the Project
Do Something – including future background traffic growth and the Project

Vol 2 Appendix 8.4 Table 2: Future 18hr cumulative traffic flow data for Meridian Way south of Ardra Road, with and without the Project

Stages	Year	Vehicle type	Do-Minimum + cumulative AAWT	Do Something + cumulative, AAWT	Increase in traffic, %
Stage 1b	2020	Vehicle	30051	30097	0 %
		HGVs	3060	3081	1 %
Stage 1c	2021	Vehicle	30240	30425	1 %
		HGVs	3081	3178	3 %
	2022	Vehicle	30466	30651	1 %
		HGVs	3105	3202	3 %
Stage 1d	2022	Vehicle	30466	30510	0 %
		HGVs	3105	3134	1 %
	2023	Vehicle	30693	30736	0 %
		HGVs	3129	3159	1 %
	2024	Vehicle	30918	30962	0 %
		HGVs	3153	3183	1 %
Stage 2	2025	Vehicle	31146	31132	0 %
		HGVs	3177	3180	0 %
Stage 3	2026	Vehicle	31372	31356	0 %
		HGVs	3201	3204	0 %
	2027	Vehicle	31545	31530	0 %
		HGVs	3220	3222	0 %
	2028	Vehicle	31718	31702	0 %
		HGVs	3238	3241	0 %
Stage 4	2028	Vehicle	31718	31702	0 %
		HGVs	3238	3240	0 %

AAWT – Annual Average Weekday Traffic flow
Do Minimum + cumulative – including future background traffic growth and cumulative developments but without the Project
Do Something + cumulative – including future background traffic growth, cumulative developments and the Project

Series 06 Environmental Statement

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