



Aggregate Recycling Plant,
Asphalt Production Plant and
Gully Waste Recycling Plant
Bulls Bridge, Hayes

Noise and Vibration
Impact Assessment Report

Prepared for:
FM Conway Ltd

Prepared by:
ENVIRON
London, UK

Date:
August 2012

Project or Issue Number:
UK11-17199

Contract No:	UK11-17199
Issue:	Final
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Date:	August 2012

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Version Control Record				
Issue	Description of Status	Date	Reviewer Initials	Author Initials
1	First Issue	10/08/2012	MW	KF/VV
1A	Amendments in response to Client comments and to update Development Description	21/08/2012	KF	KF/MW
2	Second Issue	22/08/2012	MW	MW
3	Final Issue to London Borough of Hillingdon	05/09/2012	MW	MW

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Executive Summary

ENVIRON was commissioned by FM Conway Ltd to produce a Noise and Vibration Assessment for the redevelopment of the former Powergen site, for an Aggregate Recycling Plant, Asphalt Production Plant and Gully Waste Recycling Plant.

The scope of the noise assessment was discussed and agreed with the London Borough of Hillingdon. The Environmental Health Officer confirmed that the assessment should follow the guidance and recommendations as set out within the Council's Noise Supplementary Planning Document (NSPD) and referenced British Standard 4142 as being the appropriate methodology for the assessment of noise impacts associated with the continuously operated plant at the Proposed Development, at existing, traditional residential receptor locations.

In summary the scope of this assessment comprised:

- the undertaking of a baseline monitoring survey in the vicinity of the closest noise-sensitive receptors to the Site, to set limiting noise criteria from operation of the Proposed Development;
- detailed noise modelling using the Cadna modelling suite and ISO9613 prediction methodology to predict noise levels at the sensitive receptors;
- an assessment of operational completed development noise against the assessment methodology contained in British Standard 4142 and the NSPD;
- an assessment of construction noise against the assessment methodology contained in British Standard 5228; and
- an assessment of changes in traffic noise resulting from the Proposed Development in accordance with the Calculation of Road Traffic Noise (CRTN) methodology.

The assessment is based upon background environmental noise measurements undertaken in the vicinity of the closest noise-sensitive receptors to the Site, the noise emitting characteristics of the development proposals, in addition to the physical form of the existing buildings and the topography of the surrounding area.

Background environmental noise measurements were undertaken during both daytime and night-time periods, at four separate locations. The locations were agreed with the Environmental Health Officer with the measurements undertaken between Thursday 12th to Sunday 15th January 2012, to cover both weekday and weekend periods.

The purpose of the noise monitoring was to provide sufficient acoustic information to determine the design targets for the Proposed Development and allow an assessment in accordance with British Standard 4142 and the Council's NSPD, to determine the acoustic acceptability of the Proposed Development. To represent a robust worst case, the targets limits have been derived on the basis of the quietest measured daytime and night-time noise levels measured at the closest receptors to the Site.

The operational profile of the Proposed Development varies between daytime and night-time periods, so the assessment considers each of these respective periods separately.

In order to assess the impact of the Proposed Development it has been necessary to predict the likely specific noise level at each of the assessment receptor locations. The predictions have been undertaken using the noise modelling suite Cadna/A, in accordance with the prediction methodology ISO 9613: 1996.

The predictions have been based on source noise measurements carried out at existing plants with similar characteristics to that of the Proposed Development at Bulls Bridge. Specifically, the Erith Asphalt Plant and Dartford Depot Recycling Plant, both owned and operated by the Applicant.

The predictions include the mitigating effect of several acoustic design measures that have been incorporated within the design of the Proposed Development to ensure that the target criteria adopted for the assessment are achieved. These measures include the acoustic enclosure of noise generating equipment associated with the Asphalt Plant and the Aggregate Recycling Plant.

Furthermore, the mitigation effects of a number of acoustic barriers that will be constructed to physically prevent the propagation of noise from the Proposed Development and protect the closest noise sensitive receptors, have been considered.

The noise prediction and assessment identify that once operational, both daytime and night-time $L_{Aeq,T}$ specific noise levels are predicted to remain within the target criteria adopted for the assessment at all sensitive receptor locations. The $L_{A_{r,Tr}}$ rating noise level is predicted to remain at least 5dB below the quietest $L_{A90,T}$ background noise level at all existing traditional residential receptor locations, which is considered to demonstrate that the impact of noise from the Proposed Development will be adequately controlled and ensure that complaints are unlikely.

In addition, no detectable increase in noise has been predicted within Nature Conservation Areas or in areas prized for their amenity, leisure and recreational value. As such, no further mitigation measures will be required to reduce the impact of operational noise, and the requirements of the LBH, as set out within their NSPD, will be met.

The operation of equipment associated with site preparation and construction of the Proposed Development has the potential to result in noise impacts at existing noise sensitive receptors in the vicinity of the Site. In order to predict and assess the potential impact, noise predictions have been undertaken using the noise modelling suite Cadna/A, which implements the full range of UK calculation methods, including British Standard 5228. The results of the construction noise predictions and assessment identified that construction noise levels are likely to remain well below the levels recommended within the Standard at all receptor locations.

The impact of changes in traffic noise has been assessed in accordance with the Calculation of Road Traffic Noise (CRTN) methodology. Predictions have considered the relative changes in noise level that is likely as a result of the Proposed Development and have identified that at worst, a Minor change in road traffic noise generation at North Hyde Gardens, and a Negligible change across the rest of the adjacent road network, are likely.

1 Introduction

1.1 Overview

ENVIRON UK Limited (ENVIRON) was commissioned by FM Conway Ltd. (hereinafter referred to as 'the Applicant'), to produce a Noise and Vibration Assessment of the former Powergen site (hereinafter referred to as 'the Site'), Bulls Bridge, Hayes. The Applicant proposes to redevelop the Site into an Aggregate Recycling Plant, Asphalt Production Plant, and Gully Waste Recycling Plant (hereinafter referred to as 'the Proposed Development').

Following the receipt of an Environmental Impact Assessment (EIA) Screening Request compiled by ENVIRON, on behalf of the Applicant, in May 2011, the London Borough of Hillingdon (LBH) confirmed that the development proposals do not fall within Schedule 2 of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations (as amended) (the EIA Regulations); however, discreet technical assessment reports would be required to accompany the planning application for the Proposed Development.

Accordingly, the following technical noise and vibration assessment has been produced to support a full planning application to LBH.

1.2 Scope

The scope of the noise assessment has been discussed and agreed with LBH and can be summarised as follows:

- Liaison with Environmental Protection Officer (EPO) at LBH, Chima Umunnakwe, during December 2011 and January 2012 to agree the scope of this assessment and with Mike Rickerby at LBH on 17th July 2012 to update and agree noise limits.
- Undertaking of a baseline monitoring survey in the vicinity of the closest noise-sensitive receptors to the Site;
- Detailed noise modelling using the Cadna modelling suite and ISO9613 prediction methodology¹ to predict noise levels at key sensitive receptors;
- An assessment of operational completed development noise against the assessment methodology contained in British Standard 4142² and the LBH Noise Supplementary Planning Document (NSPD)³; and
- An assessment of construction noise against the assessment methodology contained in British Standard 5228⁴.

¹ International Standards Organisation (ISO): 9613: 1993: Acoustics – Attenuation of sound during propagation outdoors.

² British Standards Institute, 1997. British Standard 4142: (1997) Method for rating industrial noise affecting mixed residential and industrial areas. HMSO.

³ London Borough of Hillingdon, 2006. Noise Supplementary Planning Document. Hillingdon Local Development Framework. Planning and Transportation Group. April 2006.

⁴ British Standards Institute, 2009. British Standard 5228: (2009) Code of practice for noise and vibration control on construction and open sites. HMSO

2 Policy Requirements

The Development Plan consists of the saved policies of the London Borough of Hillingdon Unitary Development Plan (1998); the London Plan (2011); and the emerging London Borough of Hillingdon Local Development Framework. Given the Site's close proximity to both the London Boroughs of Ealing and Hounslow, some consideration has been given to prevailing policy as set out in these boroughs' adopted Unitary Development Plans (UDPs).

2.1 National

National Planning Policy Framework, 2012

The National Planning Policy Framework (NPPF)⁵ published on March 27th 2012 sets out the Government's economic, environmental and social planning policies for England. It summarises in a single document all previous national planning policy advice. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations.

The NPPF sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Under Section 11; Conserving and enhancing the natural environment, the following is stated:

"The planning system should contribute to and enhance the natural and local environment by:

- preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability."*

The document goes on to state:

"Planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

Noise Policy Statement for England, 2010

The underlying principles and aims of existing noise policy documents, legislation and guidance are clarified in DEFRA: 2010: Noise Policy Statement for England (NPSE)⁶. The

⁵ Department for Communities and Local Government, March 2012. National Planning Policy Framework. HMSO.

⁶ Department for Environment, Food and Rural Affairs (DEFRA), March 2010: Noise Policy Statement for England DEFRA.

NPSE sets out the 'Long Term Vision' of Government noise policy as follows, *"Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development"*.

2.2 Regional

The London Plan - Spatial Development Strategy for Greater London, 2011

The London Plan⁷ provides the policy context for managing noise through the regional planning process. More detail is provided in Sounder City, an additional leaflet on the Mayor's Ambient Noise Strategy. This document, also referred to as The London Ambient Noise Strategy⁸ is aimed at managing 'ambient' or 'environmental noise', the main source of which is road traffic. The aim of the Strategy is to minimise the adverse impacts of noise on people living and working in, and visiting London, using the best available practices and technology within a sustainable development framework. Road traffic, planning and building design are key areas of focus.

Policy '7.15 - Reducing Noise and Enhancing Soundscapes' of the London Plan aims to minimise noise in the city by a number of means, including:

- *"minimising the existing and potential adverse impacts of noise on, from, within, or in the vicinity of, proposed developments;*
- *separating new noise sensitive development from major noise sources wherever practicable through the use of distance, screening or internal layout in preference to sole reliance on sound insulation; and*
- *promoting new technologies and improved practices to reduce noise at source."*

Policy 7.15 also guides individual borough authorities, through the preparation of their Local Development Frameworks, to:

- *"reduce the adverse impact of noise through the distribution of noise-making and noise-sensitive uses, and in highway management and transport policies; and*
- *identify and protect Quiet Areas, and spaces of relative tranquillity or high soundscape quality, particularly through borough Open Space Strategies"*

2.3 Local

Hillingdon Unitary Development Plan, 1998

In September 2007, the Government Office for London, under the direction of the Secretary of State, directed LBH to save certain policies within the UDP⁹. Some of these saved policies will eventually be replaced by Hillingdon's Local Development Framework (LDF). The following saved policies are of relevance to this assessment:

- 'Policy OE1' which states that "Planning permission will not normally be granted for uses and associated structures which are, or are likely to become, detrimental to the character or amenities of surrounding properties or the area generally, because of:
 - (i) the siting or appearance;

⁷ Mayor of London, 2011. The London Plan, Spatial Development Strategy for London. Greater London Authority. London

⁸ Mayor of London, 2004. The London Plan Ambient Noise Strategy. Greater London Authority. London

⁹ London Borough of Hillingdon, 2007. London Borough of Hillingdon Unitary Development Plan (adopted 1998) Saved Policies 27th September 2007.

- (ii) the storage or display of vehicles, goods, equipment or other merchandise;
- (iii) traffic generation and congestion;
- (iv) noise and vibration or the emission of dust, smell or other pollutants, unless sufficient measures are taken to mitigate the environmental impact of the development and ensure that it remains acceptable.” This policy will be retained within the LDF.
- ‘Policy OE2’ which states the *“The Local Planning Authority will require, where appropriate, that an assessment of environmental impact be made for any proposed development which would have a significant environmental impact, such an assessment to be submitted to the local planning authority before consideration is given to the relevant planning application”*. In respect of this policy, the UDP goes on to state *“...The Local Planning Authority will use its power to ensure that new development which have potential to cause noise nuisance are appropriately located and incorporate measures to reduce noise emissions ...”*.
- ‘Policy OE3’ which states that *“Buildings or uses which have the potential to cause noise annoyance will only be permitted if the impact is mitigated within acceptable levels by engineering, lay-out or administrative measures”*. This policy will be retained within the LDF.

In addition to the above, Chapter 15 of the UDP, provides a number of site specific policies and proposals, which includes the Powergen/Bulls Bridge Site. It confirms that the Site is located within a designated Industrial and Business Area and has been identified as a major opportunity for employment generating development in the Regeneration Strategy for the Hayes/West Drayton Corridor. It suggests that development of this land should be on a comprehensive basis and goes on to state in ‘Policy PR10’ that *“Land at North Hyde Gardens, Hayes as identified on the proposals map should be developed for business, industrial and warehousing purposes and associated canalside activities within the conservation area and should take into account the following:*

- *(i) the need for planned comprehensive treatment of the whole site;*
- *(ii) the need for improvements to the junction of North Hyde Gardens and North Hyde Road;*
- *(iii) measures to ameliorate the impact of traffic on residents;*
- *(iv) adequate access arrangements for Nestles Conservation Area and canalside enhancement;*
- *(vi) the contribution of the proposal to the economic regeneration of Hayes.”*

This policy will be retained within the LDF.

Adjacent Borough – Ealing Unitary Development Plan

Ealing’s adopted 2004 Plan for the Environment, officially known as the UDP sets out the council’s intentions for land use and development from 2002 to 2017.

Policy 4.11 Noise and Vibration states, *“Development generating noise or vibration will not be permitted where it would cause noise or vibration above acceptable levels, particularly where it would harm existing or proposed noise sensitive development, unless this can be satisfactorily mitigated”*.

Adjacent Borough – Hounslow Unitary Development Plan

The Hounslow UDP is part of the development plan for the borough. It was approved in December 2003 and was amended and saved as of 28 September 2007 by direction from the Secretary of State.

In respect of noise and vibration, Policy ENV-B.1.1, which is relevant to this application states: *“B.7 – ensure any noise is minimised at source and provides measures to protect local and neighbourhood amenity; ensure protection from any adverse impact of external noise”*.

Policy ENV-P.1, which is of relevance to this application states: *“To protect residents and workers in the Borough from further detrimental effects due to noise, poor air quality, contaminated land and general environmental pollution”*.

Policy ENV-P.1.5 Noise Pollution, which is also of relevance to this application states: *“The Council will not allow any development proposals which could result in unacceptable levels of noise nuisance to nearby existing or future occupiers”*.

London Borough of Hillingdon Noise Supplementary Planning Document, 2006

Guidance on the assessment and control of noise associated with developments within the London Borough of Hillingdon (LBH) is set out within their 2006 publication, Noise - Supplementary Planning Document (NSPD), which is described in more detail in Section 5.

Draft London Borough of Hillingdon Local Development Framework, 2012

The LBH LDF comprises a suite of development planning documents including the Core Strategy and Development Management Plan Policies. The Core Strategy was submitted to the Secretary of State on 31 October 2011 and an independent Inspector has been appointed to conduct the EiP which commenced on 13 March 2012. The Core Strategy is expected to be adopted later in 2012.

The Core Strategy sets out the vision, strategic objectives, spatial strategy and policies for the spatial development of the borough over the next 15 years. In this regard, Strategic Objective 10 aims to improve and protect air and water quality, reduce adverse impacts from noise including the safeguarding of quiet areas and reduce the impacts of contaminated land.

In addition, Core Policy ‘EM8: Land, Water, Air and Noise Quality’ states that LBH will seek:

- to safeguard and improve both ground and surface water quality, with priority given to the Yeading Brook amongst others.
- of all major development within the Air Quality Management Area to demonstrate air quality neutrality where appropriate; and
- to promote the maximum possible reduction in noise levels and to minimise the number of people potentially affected.

3 Assessment Methodology

3.1 Consultation

The Site and closest noise-sensitive receptors are located within the LBH. Accordingly, an EPO (Chima Amunnakwe) within the Environmental Protection Unit (EPU) of LBH was consulted in December 2011 and January 2012 to agree the methodology and criteria for the assessment. This consultation was updated in July 2012 when a new EPO (Mike Rickaby) was contacted to provide an update on preliminary findings and discuss appropriate noise limits and criteria adopted in this assessment.

The EHO confirmed that the assessment should follow the guidance and recommendations as set out within LBH's NSPD and referenced BS4142: 1997 as being the appropriate methodology for the assessment of noise impacts associated with the continuously operated plant at the Proposed Development, at existing, traditional residential receptor locations.

Accordingly, this assessment has been undertaken considering the following criteria and assumptions:

3.1.1 Existing and Proposed Residential Premises

Further to communications with the LBH, the guidance presented within the NSPD and BS4142, the design target for the Proposed Development is to ensure that the operational $L_{A_{r,T}}$ rating noise level remains at least 5dB below the lowest measured existing $L_{A_{90,T}}$ background noise level outside traditional residential premises, both at day time and at night time.

3.1.2 Leisure Moorings

Moorings are located on the Paddington Branch of the Grand Union Canal, immediately to the east of the Site. These moorings are listed by British Waterways as leisure mooring. The canal towpath and leisure moorings are prized for their leisure, recreational and amenity value. Accordingly, the design target for the Proposed Development is to ensure that no detectable increase in noise level occurs as a result of operational activities, at the moorings or on the canal towpath. This has been achieved by adopting a limiting criteria that will ensure any increase in $L_{A_{eq,T}}$ noise level is less than 1dB, which would be undetectable to receptors. This limiting criteria has been derived based on the lowest measured existing $L_{A_{eq,T}}$ value to represent worst case.

3.1.3 Coachworks Staff Accommodation

It is understood that the property immediately to the south of the Site (and also owned by British Waterways) has recently been granted planning consent for a coachworks development. Approved site plans indicate that that staff accommodation will be provided in the existing Toll House building on this property. For the purposes of this assessment the staff accommodation has not been considered to be a traditional residential use, as it is understood that the accommodation will only be used occasionally and temporarily by staff working at the development for the purpose of rest and will therefore be much less sensitive to noise than permanent, private residential dwellings with outdoor amenity space.

Notwithstanding the limited sensitivity of this potential receptor, the design target for the Proposed Development, is to ensure that internal noise levels within the staff accommodation of the coachworks development remains below 35 dBA $L_{A_{eq,T}}$ at night, with

windows open for ventilation, which would be described as a 'reasonable' standard by the guidance contained within BS8233¹⁰. For living areas in the daytime, BS8233 recommends an internal level of 40dB $L_{Aeq,T}$ as being a 'reasonable' standard. In accordance with the guidance presented in BS8233, this assumes a drop in level of 15dB from outside to inside with a partially open window.

3.2 Assessment Methodology and Relevant Guidance

3.2.1 British Standard 4142: 1997

BS4142 sets out a method to assess whether noise from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises are likely to give rise to complaints from noise-sensitive receptors in the vicinity.

The procedure contained in BS4142 for assessing the likelihood of complaint is to compare the measured or predicted noise level from the source in question, the $L_{Aeq,T}$ 'specific noise level', immediately outside the dwelling with the $LA_{90,T}$ background noise level.

Where the noise contains a "*distinguishable discrete continuous note (whine, hiss, screech, hum etc.) or if there are distinct impulses in the noise (bangs, clicks, clatters or thumps), or if the noise is irregular enough to attract attention*" then a correction of +5 dB is added to the specific noise level to obtain the $L_{Ar,Tr}$ 'rating noise level'. Given the intermittent nature of many of the sources associated with the Proposed Development, this acoustic correction has been applied in the assessment to determine the $L_{Ar,Tr}$ rating noise level.

The likelihood of the noise giving rise to complaints is assessed by subtracting the background noise level from the rating noise level. BS4142 states:

"A difference of around 10 dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance. A difference of -10 dB is a positive indication that complaints are unlikely."

For the daytime, the assessment is carried out over a reference time period of 1-hour, but at night-time it is carried out over a 5-minute period. The periods associated with day or night are not defined in the Standard, but it states that night, by definition, should cover the times when the general adult population are preparing for sleep or are actually sleeping. In this case it is assumed that day and night is 07.00 to 23.00 and 23.00 to 07.00 hours respectively.

As described above, based on the guidance presented within the NSPD, the design target for the Proposed Development is to ensure that the operational $L_{Ar,Tr}$ rating noise level remains at least 5dB below the lowest measured existing $LA_{90,T}$ background noise level outside residential premises, both at day time and at night time. Given the requirement for a +5dB acoustic correction, this results in $L_{Aeq,T}$ specific noise design target that is 10 dB below the lowest measured existing $LA_{90,T}$ background noise.

¹⁰ British Standards Institute, 1999. British Standard 8233: (1999) Sound insulation and noise reduction for buildings – Code of practice. HMSO.

3.2.2 British Standard 8233: 1999

The scope of BS8233: 1999 is the provision of recommendations for the control of noise in and around buildings.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings. It suggests that an internal noise level of 30dB LAeq,T within bedrooms is a 'good' standard, whilst 35dB LAeq,T is a 'reasonable' standard. For living areas in the daytime, the standard recommends 30dB LAeq,T as a 'good' standard and 40dB LAeq,T as being a 'reasonable' standard.

BS8233 also provides guidance on appropriate noise levels within the principal external living areas of dwellings, stating that for the prevention of moderate levels of annoyance, that 55 dB LAeq,T should be regarded as an upper limit for noise levels within gardens, with 50 dB LAeq,T being a more desirable target value.

With respect to internal noise levels with windows open, in accordance with the guidance presented within BS8233, it is assumed that with a partially open window, the weighted sound reduction in noise from outside to inside will be 15dB.

3.2.3 LBH Noise Supplementary Planning Document and Guidance

Guidance on the assessment and control of noise associated with developments within the London Borough of Hillingdon (LBH) is set out within their 2006 publication, Noise - Supplementary Planning Document (NSPD).

In respect of industrial noise, the NSPD states;

"4.22 Industrial uses will require particular attention as they can often cause severe noise problems due to both the character of industrial noise and its level. Sudden impulses, irregular noise or noise which contains a distinguishable continuous tone will require special consideration.

4.23 In considering new industrial development, the Council will apply policies OE1 and OE3 of the UDP and will have regard to, amongst other considerations, the British Standard 4142:1997 "Method for rating industrial noise affecting mixed residential and industrial areas", and internal and external noise criteria. Specific consideration will also be given to the features and characteristics of the noise.

4.24 British Standard 4142:1997 gives advice on measuring and assessing the noise from machinery or plant, and is relevant if surrounding residential areas might be affected. Developments with a BS4142 assessment of marginal significance or above would not ordinarily be permitted. Consequently, the development should be controlled such that the rating level of the noise from the proposed development determined according to BS4142 is at least 5 dB below the background noise level $L_{A90,T}$. Ideally, the assessment of noise should give a positive indication that complaints are unlikely.'

The Proposed Development would be considered an 'Industrial' use, in accordance with the following guidance presented in the NSPD: *"4.25 In addition to being applied to straightforward cases where fixed industrial plant is used, BS4142 provides a useful assessment method for the following cases, and the Council adopts these categories ...*

Loaders, dumpers and haulage vehicles operating in yards handling building materials or at waste disposal sites.

4.26 In support of this use of BS4142, it should be noted that the stated scope of the standard is for assessing noise levels from “factories, or industrial premises, or fixed installations, or sources of an industrial nature in commercial premises”.

The LBH NSPG goes on to state;

“4.28 If the surrounding area is not residential, controls on noise from noise generating development may still be required if the existing noise environment is already significantly affected or where the existing noise environment is prized for its amenity value. Depending on the circumstances of the case, the Local Planning Authority may require that no detectable increase in background level takes place, or it may allow a small increase in background level, generally no more than 2dB.”

3.2.4 Road Traffic Noise - DMRB

The impact of any changes in $L_{A10,18\text{hour}}$ road traffic noise levels due to completed development traffic have been assessed in accordance with the principles and guidance presented within the Highways Agency Design Manual for Roads and Bridges (DMRB)¹¹.

The DMRB states that “The impact of a project at any location can be reported in terms of changes in absolute noise level. In the UK the standard index used for traffic noise is the $L_{A10,18\text{hour}}$ level, which is quoted in decibels”.

In order to determine whether changes in traffic noise levels are likely to occur as a result of the Proposed Development, noise levels have been predicted in accordance with the methodology contained within the Calculation of Road Traffic Noise (CRTN).

The calculation method uses a number of input variables to predict the $L_{A10,18\text{hour}}$ noise level for any receptor point at a given distance from the road. In this assessment however, the key factors are changes in traffic flows and the composition of the traffic (i.e. percentage HGV's). Therefore, the likely increase in road traffic noise levels as a direct result of the Proposed Development has been calculated in accordance with the Basic Noise Level (BNL) prediction method detailed in CRTN. This method considers the relative change in noise level for a notional road-side receptor at a distance of 10 m from the kerb and at a height of 1.5 m (free-field).

The DMRB presents a significant matrix for assessing the magnitude of long-term changes in noise level, which is reproduced in Table 3.1 and has been utilised in this assessment to consider the effect of any changes in road traffic noise levels. An increase in noise level represents an adverse effect whilst a reduction in noise represents a beneficial effect.

Table 3.1: Road Traffic Noise Criteria	
Change in Noise Level, dB(A)	Significance of Effect
0.0	No Change - No Effect
0.1 - 2.9	Negligible
3.0 - 4.9	Minor
5.0 - 9.9	Moderate
>10.0	Major

¹¹ The Highways Agency, 2011. Design Manual for Roads and Bridges: Part 7: HA 213/11 Noise and Vibration: Volume 11: Noise Assessment, Section 3: Environmental Assessment Techniques.

3.2.5 Construction Noise and Vibration - British Standard 5228

Noise levels generated by construction activities have the potential to impact upon nearby noise-sensitive receptors. BS5228¹² sets out a methodology for predicting, assessing and controlling noise levels arising from a wide variety of construction and related activities. As such, it can be used to predict noise levels arising from the operations at proposed construction sites. BS5228 also sets out tables of sound power levels generated by a wide variety of construction plant to facilitate such predictions.

Construction Noise

BS5228-1 gives several examples of acceptable limits for construction or demolition noise. The most simplistic is based upon the exceedance of fixed noise limits and paragraph E.2 states that: *"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut."*

Paragraph E.2 goes on to state: *"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the Site boundary should not exceed: 70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise or 75 decibels (dBA) in urban areas near main roads in heavy industrial areas. These limits are for daytime working outside living rooms and offices."*

Accordingly, 75 dB $L_{Aeq,T}$ has been selected as the target criteria to control the impact of construction noise, with the criteria for assessing the magnitude of noise impacts according to the margin by which this target criteria is achieved or exceeded presented in Table 3.2.

Table 3.2: Construction Noise Significance Criteria

Noise Level, $L_{Aeq,T}$ dB	Significance of Effect
>75 dB	Major Adverse
70 - 75	Moderate Adverse
55 - 70	Minor Adverse
<55	Negligible

It is worth noting that the purpose of the target construction noise criteria is to control the impact of construction noise insofar as is reasonably practicable, whilst recognising that it is unrealistic for developments of this nature to be constructed without causing some degree of temporary disturbance in the locality. Hence, even if the criteria adopted for this assessment is achieved, noise from construction activities is likely to be readily noticeable and as such, in broad assessment terms may be approaching a level of moderate significance. The criteria above are upper limits and would be set for all construction activities; such activities are transient in nature and it should be noted that this is not seen as a level of noise that will be generated throughout the construction period. Levels of noise at this limit would only be expected when works are undertaken at locations on the construction site boundary, where the separation from sensitive receptors is minimal.

Site preparation and construction noise in excess of 75 dB $L_{Aeq,T}$ would be considered material to the planning process.

¹² British Standards Institute, 2009. British Standard 5228: (2009) Code of practice for noise and vibration control on construction and open sites. HMSO.

Construction Vibration

In accordance with the guidance given in BS5228-2, 1 mm/s ppv has been selected as the target criteria to control the impact of site preparation and construction vibration, with the criteria for assessing the magnitude of vibration impacts according to the margin by which this target criterion is achieved or exceeded presented in Table 3.3. This target criterion is based on the guidance contained within BS5228, experience from previous sites and accepted vibration policy criteria across a range of enforcing authorities elsewhere in the UK.

The limits are presented in terms of peak particle velocity (PPV) as it is the simplest indicator for both perceptibility and building damage.

Table 3.3: Construction Vibration Significance Criteria

Vibration Level, mm/s PPV	Significance of Effect
>1.0	Major Adverse
0.30 - 1.0	Moderate Adverse
0.15 - 0.30	Minor Adverse
<0.15	Negligible

Notes

The above vibration limits relate to maximum PPV ground borne vibration occurring in any one of three mutually perpendicular axes (one of which may be vertical). Vibration is to be measured on the foundation or on an external façade no more than 1m from the ground, or failing this, solid ground as near to the building façade as possible.

It is again worth noting that the purpose of the target site preparation and construction vibration criteria is to control the impact of vibration insofar as is reasonably practicable and is entirely based on the likelihood of the vibration being perceptible, rather than causing damage to property. Hence, although vibration levels in excess of 1 mm/s PPV would be considered major adverse in respect of the likelihood of perceptibility, they would not be considered significant in terms of the potential for building damage, which would require levels of at least 15 mm/s PPV to result in minor cosmetic damage in light / unreinforced buildings.

4 Site Description

The Proposed Development Site is located in Bulls Bridge, Hayes, Middlesex and centred at national grid reference NGR TQ 107 792 as shown in Figure 4.1. Access to the Site is off North Hyde Gardens Road, which connects to the A312 (the Parkway) via North Hyde Road. The A312 southbound provides access to Junction 3 of the M4 motorway, approximately 1.3 km south of the Site.

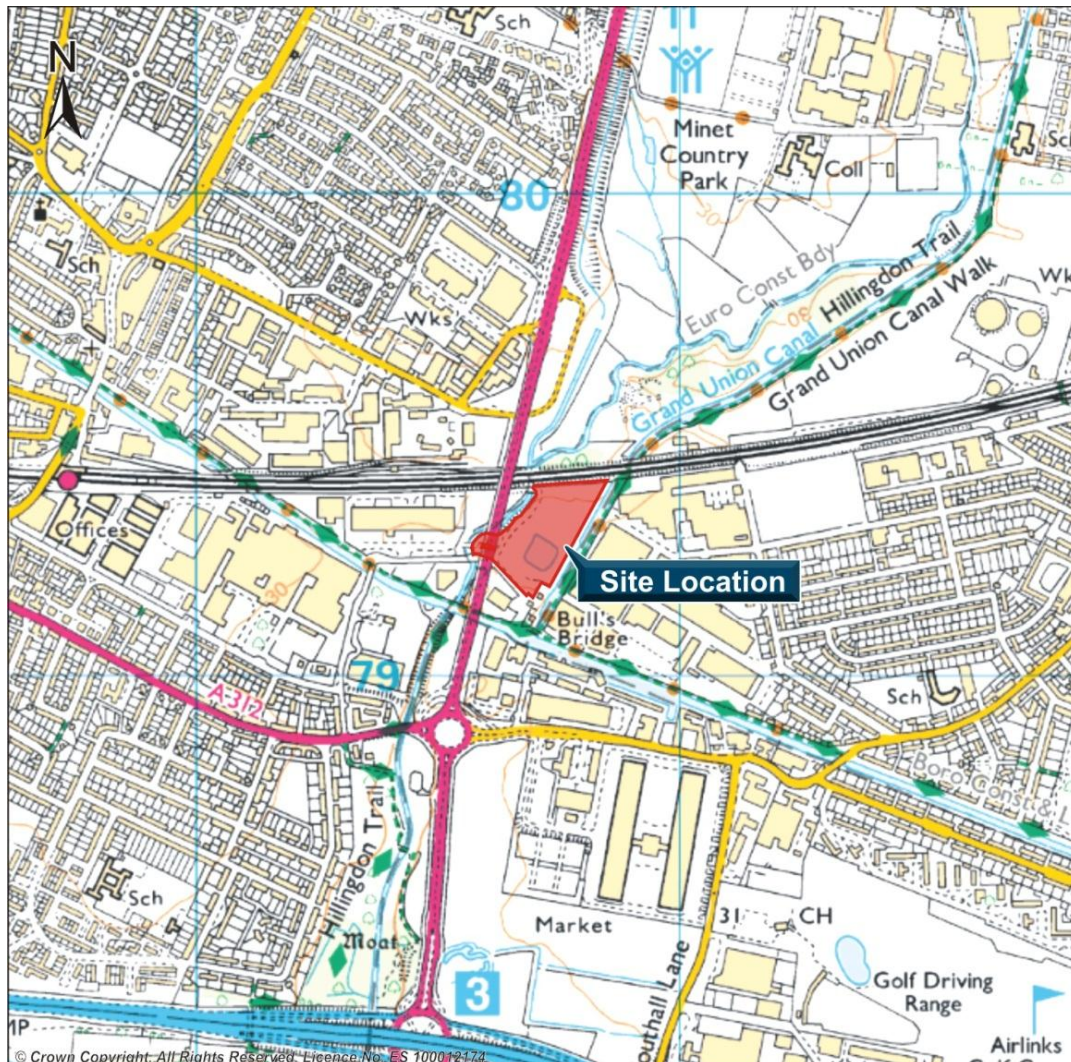


Figure 4.1: Site Location

The Site is bound to the north by the Swansea to Paddington railway line, to the east by the Grand Union Canal (Paddington Branch), to the south by North Hyde Gardens Road and to the west by the Yeading Brook. North Hyde Gardens Road passes under the flyover of the A312 to terminate at the Grand Union Canal. An access road off North Hyde Gardens Road to the DHL Lorry Park cuts north-south through the western extent of the Site.

The land uses surrounding the Site comprises Minet Country Park to the north; industrial and commercial to the east, south, west and north-west, with some residential properties south-west of Roseville Road, approximately 400 metres distant. A number of leisure barges are moored on the Paddington Branch of the Grand Union Canal, immediately to the east of the Site.

The Site is approximately 3 hectares in size. It is brownfield having been previously operational as a Powergen site, a fuel storage facility for the nearby Bulls Bridge Power Station, and a creosote works. All previous structures have been demolished and the Site is now characterised by a largely level area surrounded by a 3-4 meter tall stockpile bund along the Site perimeter, all of which are covered by predominantly either tall ruderal or ephemeral/short perennial vegetation.

To the west of the DHL access road, the Site includes a narrow roadside verge, which widens out to the south underneath the A312 flyover. Much of this western portion of the Site supports scrub vegetation. Small patches of scrub also occur to the east of the DHL access road, particularly along the hoarding on the Site's southern boundary with North Hyde Gardens Road. A line of broad-leaved woodland extends along the eastern boundary of the Site beside the Paddington Branch of the Grand Union Canal.

5 Proposed Development

5.1 Proposed Development Scope

The development proposals are for the construction and operation of an Aggregate Recycling Plant; Asphalt Production Plant; Gully Waste Recycling Plant; together with associated ancillary structures and facilities, car and HGV parking, regrading and landscaping.

The redevelopment proposals provide for:

- clearance and spreading of the existing bund material across the Site (as outlined in the Proposed Development's Land Contamination Strategy Report);
capping of the Site with concrete and/or asphalt as appropriate for circulation and parking;
- construction of administration offices;
- construction of an Aggregate Recycling Plant;
- construction of a Gully Waste Recycling Plant;
- construction of an Asphalt Production Plant; and
- implementation of landscaping.

Upon completion the Aggregate Recycling Plant will have a maximum process and recycle capacity of approximately 300,000 tonnes per annum (tpa) of waste material extracted from pavements that will otherwise have been landfilled. Some of this material will be used within the Asphalt Production Plant which will at completion, have a production capacity of 300,000 tpa. In addition, the Gully Waste Recycling Plant, will accept material from road sweepers and gully suckers (that will otherwise have been sent to landfill) to recycle up to 20,000 tpa. The recycled water and the recovered solid materials from this process will be redirected back into the Aggregate Recycling Plant.

The Proposed Development's key objective will be to recycle all the waste materials that arise from the delivery of the Applicant's wide ranging services. These include asphalt; road and pavement sub base, paving, concrete and wet wastes such as gully waste and road sweepings.

The Proposed Development will also serve as an operating centre for the Applicant's Term Maintenance Division by providing parking for vehicles and storage for equipment and materials.

A maximum of 79 workers will be catered for at the Site upon completion of the full development which will include lorry drivers and Term Maintenance operatives working out of the Site.

5.2 Proposed Development Layout

Figure 5.1 illustrates the layout of the Proposed Development, which has been informed by a number of limitations, considerations and requirements, including:

- the constrained area of the Site, especially following the set back of the eastern Site boundary to safeguard existing woodland trees on-site and immediately to the east of the Site;
- environmental issues including the location of sensitive receptors, the visibility of the Site, the setting of the Site; the past uses at the Site;

- the Applicant's operational experience based on their existing facilities at Dartford and Erith;
- site logistical arrangements including internal circulation and swept path analyses; and
- design criteria, including the desire to ensure uniformity in building presentation and to 'contain' industrial features to least visible areas of the Site.

In light of the re-spread of existing bund material across the Site and capping layers on top, the current site levels are likely to be raised by up to a maximum of 1.2 m. These materials will be retained by means of a 1.2 m high retaining wall along the entire site perimeter. The following boundary treatment will be implemented on top of this retaining wall:

- north-west: 2.4 m palisade fence;
- north-east :6 m acoustic boundary wall;
- east: 7 m acoustic boundary wall;
- south-east: 3-5 m acoustic boundary wall with 1.2 m high landscaping planters;
- south: 2 m acoustic boundary wall with 1.2 m high landscaping planters; and
- west: 2.4 m palisade fence.

In all instances the walls, and their respective heights, will be provided for acoustic attenuation purposes.

Road access will be provided from two points along the existing road - one access point to the main facility and one access point to the staff car parking located beneath the A312 Parkway.

The development layout will comprise the following:

Northern and North-Eastern Site Area:

- Aggregate Recycling Plant including Washing Plant and Inbound Material Stockpile up to 5m high
- Low level cement silo
- Water storage tank
- Staff welfare and storage facilities

Eastern Site Area:

- Inbound storage bays
- Covered aggregate storage bays
- Site storage and/or parking (comprising hardstanding areas, enclosed as necessary)
- Water storage tank

Southern Site Area:

- Asphalt Plant
- Asphalt HGV tracking lanes and parking spaces
- Site storage

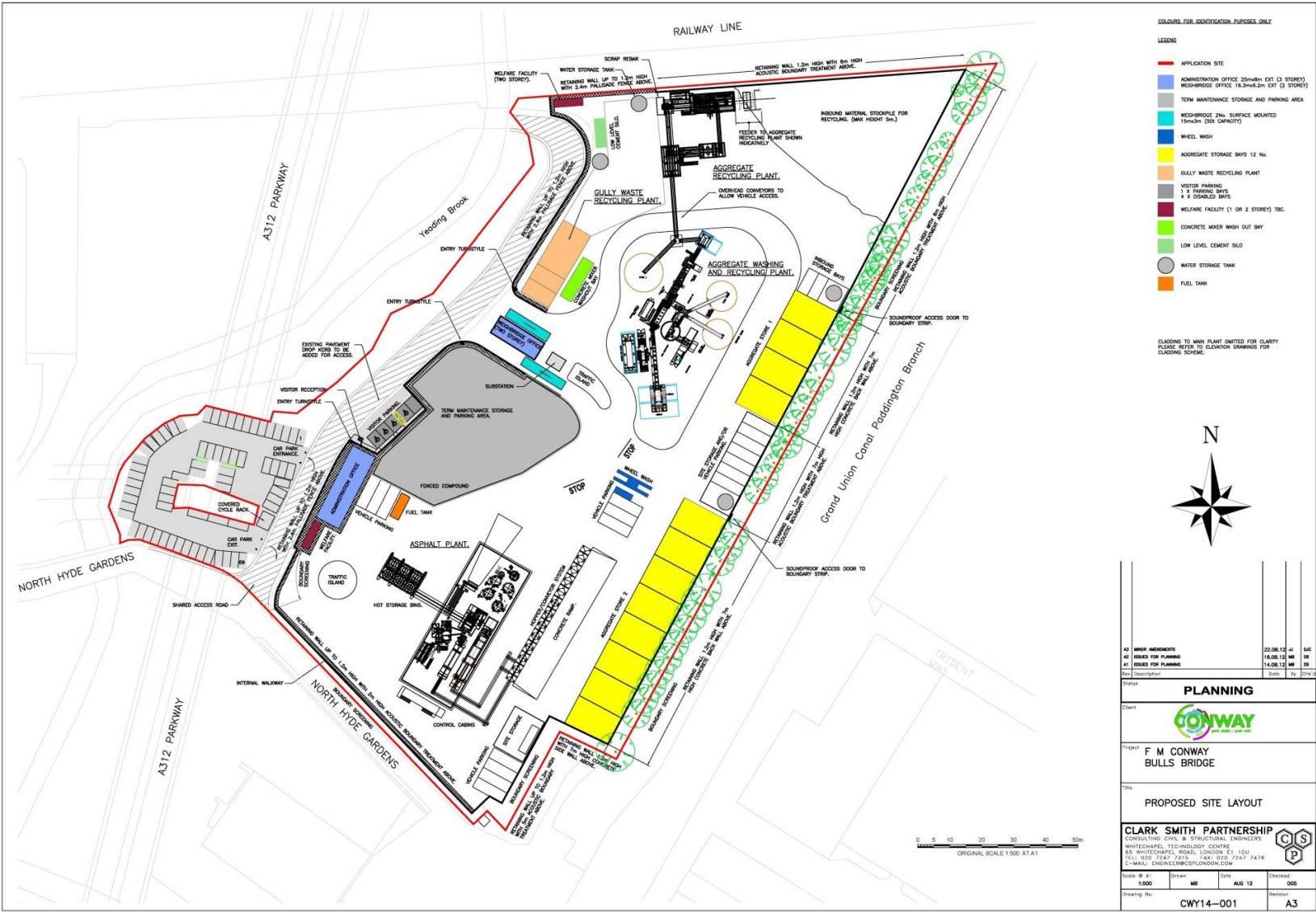


Figure 5.1: Proposed Development Layout

Western Site Area:

- Landscaped car park with 70 car parking spaces, five cycle and five motorcycle spaces
- Staff welfare facilities
- Office building and visitor car parking spaces
- Term Maintenance Yard (enclosed as necessary) and fuel storage areas
- Main site entrance point with entry and exit roads, incorporating weighbridges, on either side of the weighbridge office including the plant control room
- Gully Waste Recycling Plant
- Concrete washout bay
- Water storage tank
- Diesel fuel tank with 60,000 litre capacity and bunded containment of 110%.

Central Site Area:

- Hardstanding and circulation routes
- Drive-through wheel wash

5.3 Proposed Development Components and Processes

This section discusses in more detail the component parts and processes of the Proposed Development, as well as ancillary components.

5.3.1 Aggregate Recycling Plant**Component Parts**

The Aggregate Recycling Plant will comprise a processing plant, screens, washing plant, hoppers, conveyors, fines treatment equipment, control cabins, inbound storage bays (of block wall or sleeper construction) and other ancillary plant, equipment and structures.

The processing plant will be fully housed/enclosed as necessary to accord with the Proposed Development's noise and vibration impact assessment. Dry product conveyors will be enclosed whilst wet product conveyors will be open; dust suppression will be fitted as appropriate (water sprays).

Recovered materials delivered to the Site for recycling will be from the Applicant's existing contracts and will be stored in the inbound storage bays. Materials will typically include the following:

- road and pavement infrastructure materials including asphalt, sub-base, concrete, kerbs, slabs and drainage media (all inert);
- construction and demolition waste – inert only;
- road planings;
- waste asphalt;
- waste concrete;
- solid materials recovered from Gully Waste Recycling Plant; and
- primary aggregate for blending with recycled products.

The combined volume of the above components will reach up to 300,000 tpa.

Processes

The processing of material will be carried out through any combination of processing, re-grading, screening, washing, blending or simply re-handling. The process can be summarised as follows:

- Recovered materials will be delivered to Site in HGVs and unloaded into the inbound storage bays or stockpile in the north-eastern corner of the Site, not to exceed 5 m in height. Potential dust from these stock piles would be attenuated by means of perimeter installed dust suppression sprays.
- The processing plant will be fed material by a hydraulic excavator.
- All Materials will initially pass through the enclosed processing plant and be screened to produce either 0-25 mm product or 0-45 mm material stream. Both these activities will take place within high performance noise attenuation enclosures.
- The 0-25 mm material will be further washed and screened by transporting the material, via a semi covered conveyor, directly to the washing plant with a high pressure washing system. The material will be screened to 0-4 mm, producing recovered 4 mm sand and 4-20 mm recovered stone. These products will then be blended to produce fully recycled ballast. The recycled ballast is the principal raw material used by the Applicant's fleet of volumetric concrete mixers. The recycled ballast, together with cement, water and any required additives are mixed at the delivery point to produce fresh concrete. Only the exact quantity of concrete required is therefore mixed to avoid any wastage via the volumetric concrete mixers.
- The processing and washing plant are designed to allow for different size products to be produced including drainage media. The 0-45 mm material will be used for Type 1 sub base, and sold to the Applicant's own contracts or any third party customers. Stockpiles of recycled aggregates will not exceed 6 m in height and will be regularly dampened down to ensure that dust and visual impacts are minimised.
- A loading shovel will be used for moving materials and loading lorries.

The above processes will produce the following products:

- sub-bases;
- capping materials;
- Type 1;
- Type 4;
- drainage media;
- graded aggregate;
- sand;
- ballast; and
- recycled asphalt products (('RAP') a screened blend of road planings) and waste asphalt.

These products will be re-used on-site or loaded for off-site sale or re-use. Any unusable arisings, including fines and filter cake from the washing process, that cannot be re-used will be disposed of off-site. Any scrap metal, wood, plastic or litter will be separated as part of the process and recycled as appropriate. This would be less than 1% of all inbound material.

The above processes will be subject to the conditions of any waste management license as appropriate, issued by the Environment Agency, as is the case with the Applicant's existing Dartford Facility.

Operating Hours

The Aggregate Recycling Plant will operate as follows:

Plant Activity	Weekday Operating Hours	Weekend Operating Hours
Inbound material delivery	24/7, although principally from 07.00-18.00	24/7, although principally from 07.00 - 14.00
Aggregate processing and washing	07.00-18.00	07.00-14.00 Saturday
Loading out of recycled materials for off-site sale or collection by customers	06.00-18.00	06.00-14.00 Saturday

5.3.2 Asphalt Plant

Component Parts

The Asphalt Plant will comprise the production unit, an asphalt hot storage facility (with six 80 tonne capacity bins), twelve covered aggregate storage bays and ancillary plant, equipment and structures, including three sea-container style units for the storage of spare parts and equipment.

It will have a rated capacity of 160 tpa incorporating a parallel dryer drum for the use of hot RAP, which will significantly increase the proportion of RAP that can be used in different product mixes.

The hot storage facility would be fed by an enclosed conveyor from a ground level unloading facility. These component parts will all be fully contained and clad as show in Figure 5.2.

The fleet of vehicles serving the Asphalt Plant will be parked in the south-western corner of the Site. All vehicles would be fitted with air brake silencers, rubber tailgate buffers and white-noise proximity beepers (as per the loading shovel).

Processes

The Asphalt Plant will manufacture coated road-stone (asphalt) from a mix of primary and secondary aggregates, as well as RAP which will be combined with bitumen and fillers depending upon the required asphalt mix. . RAP will be sourced from the adjoining Aggregate Recycling Plant, and could in some instances comprise 70% of product mixes. At full capacity, maximum output will be up to 300,000 tpa.

The process comprises five main stages:-

(1) Site Storage of Raw Materials.

The majority of aggregates, sand, fillers, bitumen, fuel and various additives necessary for production of asphalt will be brought to Site by sheeted HGVs. Bitumen will be delivered to the Site by delivery tanker and will be drawn directly from the delivery tanker into one of five dedicated bitumen tanks (located within the Asphalt Production Plant) to minimise any risk of spillages.

On-site storage arrangements will be as follows:

- Aggregates, sand and RAP will be stored in 12 box profile clad and covered storage bays each capable of holding up to 1,200 tonnes, of material. Reclaimed and imported fillers including hydrated lime will be stored within three sealed silos located inside the main enclosure of the Asphalt Plant;
- Pigment will be stored within the main plant enclosure in a small 3 m³ hopper with closable lid;
- Bitumen will be stored within five electrically heated vertical tanks, three will hold 80 m³ and the fourth will be split into 2 x 40 m³ held at approximately 160 °C;
- Emulsion will be stored in a 30,000 litre heated tank holding the emulsion at approximately 80 °C. All binder tanks will comply with the refined bitumen association (RBA) safe storage regulations.
- Fuel oil will be stored within a 80,000 litre tank within the main plant enclosure with bunded containment of 110%.
- Diesel fuel will be stored in a 60,000 litre tank with bunded containment of 110%.

(2) Aggregate Feed and Proportioning

Aggregates and sands will be fed independently via a wheeled loading shovel from the storage bays into one of the thirteen three sided and roofed 14 m³ capacity “cold feed” steel storage hoppers; each providing a variable feed onto the transfer conveyor belts feeding the rotary dryer drum. RAP will be similarly fed by loading shovel into the plant but will proceed via an inclined slinger conveyor and elevator to the parallel dryer drum. The walls of the hoppers will be insulated and heated to keep the material at the required temperature.

(3) Heating and Drying

During the production process, the bitumen will be heated by a “high efficiency” automated system. Binder heating will be controlled using a P100 sensor with electric temperature regulator and analogue output for remote readouts. Additional safety thermostats will be installed to monitor the products.

The aggregate will be dried and heated in a sealed steel contra flow rotary dryer which will be 10 m in length by 2.8 m in diameter. This step is required to ensure the aggregate is free from moisture prior to mixing with bitumen and filler. The dryer has a 23,720 kW burner which will be fired on gas oil. Water vapour and exhaust air will pass through the bag filtration plant to be discharged via a 30 m stack and trapped particulates fed back as filler into the process.

A second parallel flow drum dryer, will receive and dry the RAP via a recycle elevator.

(4) Screening, Weighing and Mixing

Heated and dried aggregates discharged from the dryer will be passed via a bucket elevator to the top of the mixing tower to the vibrating screen deck and separated by size, in terms of the recipe mix required and pass into six hot stone bins. The required proportions of aggregate and RAP will be mixed with the bitumen and fillers and transferred to the paddle mixer. The plant will be able to mix up to 3 tonnes per batch. The mixing time is typically no more than 45 seconds per batch.

(5) Mixed Material Storage

The final asphalt product will either be directly loaded out into a waiting HGV below or stored in one of six 80 tonne capacity electrically heated mixed material storage hoppers. From these the asphalt is directly discharged via overhead doors into an insulated HGV for final dispatch from the plant. HGVs tippers will drive under the plant to a pre-notified hopper. The hopper would then discharge the required amount into the tipping body of the vehicle. The operation is controlled by computer via the plant control room, which will be located in the weighbridge office. All asphalt carrying HGVs will leave the Site sheeted.

Asphalt can be stored in the hot storage bins for up to twelve hours but this depends upon a number of factors including the amount and individual product mix. Any asphalt unused or, returned from site will be recycled on-site at the Aggregate Recycling Plant.

Process Requirements

The Asphalt Plant will be subject to the conditions of a Local Authority Pollution Prevention Control (LAPPC) Permit, issued by LBH.

The Permit will control all aspects of the operation through a series of enforceable conditions that will specify the acceptable levels of any emission including smoke, moisture, odour or airborne dust. Any breach of these conditions could potentially lead to revocation of the Permit by the Local Authority.

Operating Hours

The Asphalt Plant will operate on a 24/7 basis to meet the needs of service contracts with different London Boroughs and other public and private sector clients.

5.3.3 Gully Waste Recycling Plant

Component Parts

The Gully Waste Treatment and Recycling Plant comprises a shallow sloping concrete pad (10 x 24 m), filters and two below ground tanks for the treatment and recycling of gully sucker waste and road sweeper waste arising from street cleansing activities. At maximum output, up to 20,000 tpa of waste will be treated and recycled.

Processes

Gully waste treatment is a passive process. As the gully sucker tips up, water will drain through a series of filters, whilst trapping any hydrocarbons, and recovering any solid residue. These residues will be moved from the plant by loading shovel or hydraulic excavator, and processed at the Aggregate Recycling Plant. All water used in the process, will be re-circulated and used again (either by gully suckers or elsewhere on-site).

Any residue that cannot be recycled will be collected and disposed of off-site.

The above process will be subject to the conditions of any waste management license as appropriate, issued by the Environment Agency.

Operating Hours

There will be a requirement for 24/7 availability; however, the gully suckers typically only operate between 06.00-18.00 Monday to Friday and 06.00-14.00 on Saturday.

5.3.4 Cement Silo

The low level cement silo will comprise a 100 tonne capacity, prefabricated steel constructed silo. Cement from the silo will be taken by the Applicant's fleet of volumetric concrete mixer trucks as required, to facilitate the mixing of concrete at the point of use. No concrete will be produced on-site. The operation and maintenance of the cement silo will be governed by the terms of an LAPPC issued by LBH.

5.3.5 Concrete Washout Bay

The proposed Concrete Washout Bay, or settlement bay, will be used to wash down volumetric concrete mixers at the end of each working day. Through a system of weirs, the water will be recycled for re-use and residues will be removed for re-processing in the Aggregate Recycling Plant. The use of the Concrete Washout Bay will be subject to the conditions of a LAPPC Permit or Discharge Licence as may be deemed appropriate, by the Local Authority or Environment Agency.

5.3.6 Term Maintenance Yard

The Term Maintenance Yard will comprise the following:

- Open storage of plant, equipment and materials such as paving slabs, setts, lighting, street furniture etc.;
- Low-level enclosed storage of plant equipment and material items such as power tools, PPE, high value items and items requiring inside storage;
- Vehicle parking; and
- Security fencing.

5.3.7 Welfare Facilities

Up to six Portacabin style units will be provided along the perimeter of the Site to provide changing, washing, toilet, drying and seating areas.

5.3.8 Office Buildings

Two buildings will be provided on-site:

- Two storey weighbridge office from where site access and plant control will take place.
- Three storey administrative office that will provide for general site and contract management and control.

5.3.9 Ancillary Components

The following ancillary components will be provided within the Proposed Development:

- Service supply cabins/buildings including brick constructed substations;
- Two surface mounted 50 tonne capacity weighbridges (15 x 3 m) located on either side of the Weighbridge Office;
- Up to 70 car parking spaces for employees/visitors beneath the A312 Parkway flyover;
- Up to 50 HGV parking spaces;
- Fuel storage tanks;
- Up to four water tanks, each with 60,000 litre capacity;
- Recycling skips and waste bins;

- CCTV;
- Site lighting (in accordance with lighting strategy to be developed post consent); and
- Landscaping.

5.4 Proposed Development Appearance

5.4.1 Massing and Scale

The scale and massing of proposed buildings and structures are dictated by standard plant and process requirements, although a reduction in the height of the Asphalt Plant has been achieved during the design process by separating the proposed storage facility from the main production plant. This will limit visual impact considerably.

The principal elements of the proposal will range from 7.55 to 27.8 m as shown in Figure 5.2 and outlined in Table 5.1.

Table 5.1: Proposed Development Built Heights	
Plant Component	Height above Finished Site Level
Aggregate Recycling Plant	9.5 and 10.4 m
Asphalt Plant	27.8 m
Asphalt Stack	30.0 m
Asphalt Storage Facility	20.0m
Aggregate Storage Bays	9.5 m
Office Buildings	Weighbridge Office 7.55m Admin Office 11.4m
Cement Silo	6 m
Welfare Facilities	Single storey 3m, stacked two storey 6 m
Water Storage Tanks	Up to 6 m and 4 m diameter
Acoustic Boundary Treatment	Up to 7 m

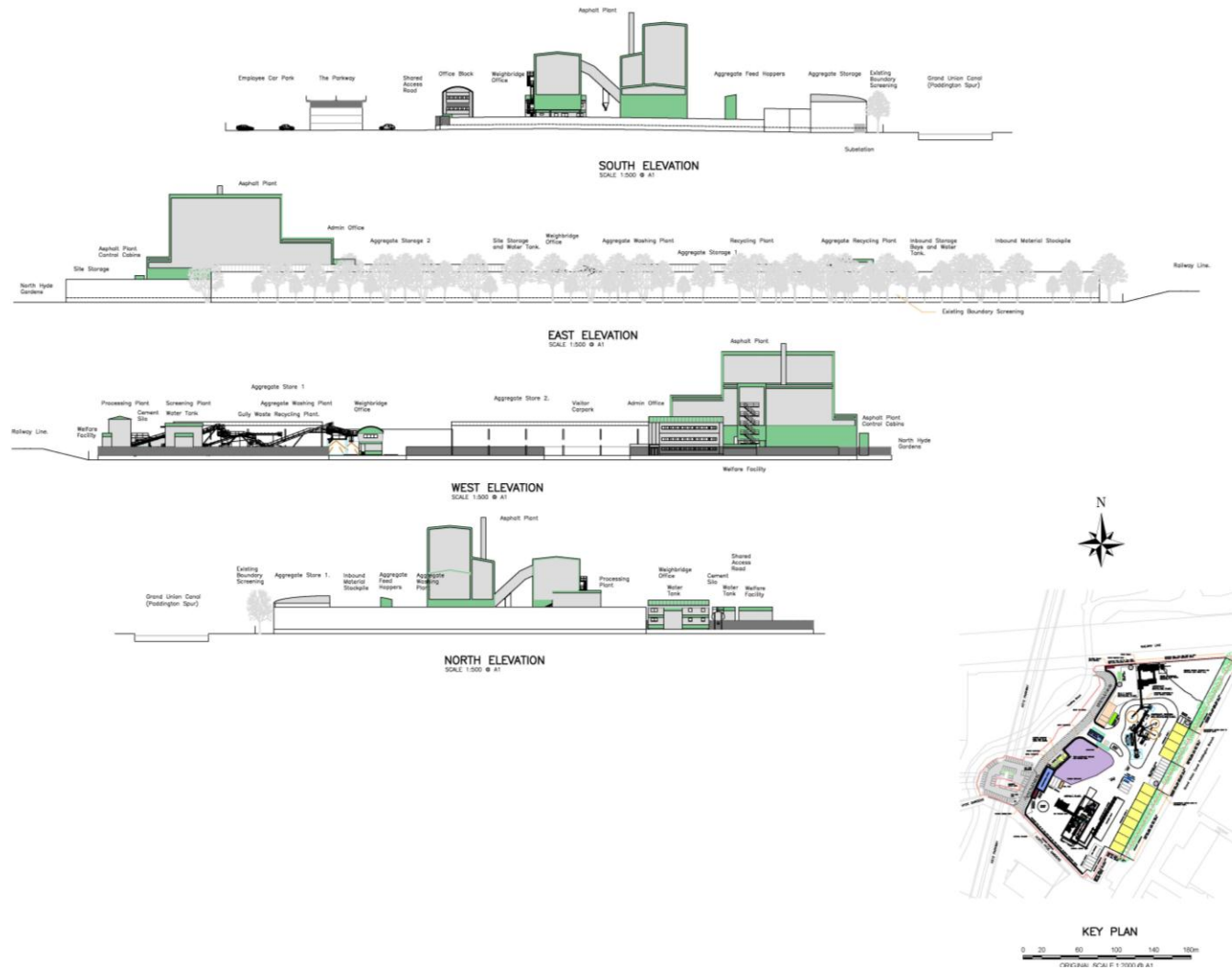


Figure 5.2: Proposed Development Elevations

5.4.2 Materials and Finishes

Foundations will comprise standard spread foundations and where necessary Continuous Auger Piling (CFA) piling, which is recognised as a quiet and low vibration free method of construction.

Buildings will be steel frame constructed with holrib decking and concrete structural floors. Exterior finishes will be similar to that adopted at the Applicant's Erith and Dartford Facilities and therefore will comprise:

- proprietary metal composite roof panels with an approximate 5 degree duo pitch;
- non-combustible metal profiled panel system cladding, finished with a coloured PVC coating; and
- ventilation louvres at various external locations, which will be finished with a coloured polyester powder coating or standard paint finish.

The colour coding of the building elevations will comprise goose wing grey and Conway green. The same coding would be applied to welfare facilities and storage containers.

Process Plant will be fully enclosed and will comply with the noise limits prescribed in this noise and vibration assessment.

6 Baseline Noise Conditions

Existing noise conditions representative of the closest noise-sensitive receptors to the Site have been determined by an environmental noise survey conducted during both daytime and night-time periods, at four separate locations.

The purpose of the noise monitoring was to provide sufficient acoustic information to determine the design targets for the Proposed Development and allow an assessment in accordance with BS4142 and LBH NSPD guidance, to determine the acoustic acceptability of the Proposed Development.

6.1 Environmental Noise Measurements

All noise measurements were undertaken by consultants certified as competent in environmental noise monitoring, and in accordance with the principles of BS7445: 2003¹³ and following the guidance given in BS4142.

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of BS61672¹⁴. A full inventory of this equipment is shown in Table 6.1 below.

Table 6.1: Inventory of Acoustic Measurement Equipment

Item	Make & Model	Serial Number	Calibrated
Calibrator	NC-74	34662223	01/04/2011
Sound Level Meter 1	RION NL-52	810308	08/12/2011
Preamplifier 1	RION NH-25	10302	08/12/2011
Microphone 1	RION UC-59	276	08/12/2011
Sound Level Meter 2	RION NL-52	610176	19/08/2011
Preamplifier 2	RION NH-25	10170	19/08/2011
Microphone 2	RION UC-59	2517	19/08/2011
Sound Level Meter 3	RION NL-52	810309	08/12/2011
Preamplifier 3	RION NH-25	10303	08/12/2011
Microphone 3	RION UC-59	2766	08/12/2011
Sound Level Meter 4	Brue & Kjaer 2250	2559293	04/11/2011
Preamplifier 4	Brue & Kjaer ZC0032	3560	04/11/2011
Microphone 4	Brue & Kjaer 4189	2556374	04/11/2011

The noise measurement equipment used during the survey was calibrated at the start and end of the measurement period. The calibrator used had itself been calibrated by an accredited calibration laboratory within the twelve months preceding the measurements. No significant drift in calibration was found to have occurred on any of the sound level meters.

¹³ British Standards Institute, 2003. British Standard 7445: (2003) Description and measurement of environmental noise. HMSO.

¹⁴ British Standards Institute, 2003. Standard 61672: (2003) Electroacoustics. Sound level meters. Part 1 Specifications. HMSO.

The microphones were fitted with protective windshields for the measurements. The weather during the survey was suitable for noise measurement, it being dry with light winds.

The noise measurement locations, as agreed with LBH, are set out below and identified in Figure 6.1. A description of the noise climate discernible at each location during the noise survey is also presented.

- Location 1: Leisure Moorings and Canal Towpath - Dominant noise sources: road traffic on The Parkway, industrial noise from adjacent estates and regular noise from railway;
- Location 2: Approved residential development (Southall Gas Works) - Dominant noise sources: road traffic on The Parkway and regular noise from railway;
- Location 3: Scotts Road - Dominant noise sources: industrial noise from adjacent units and local road traffic with high numbers of HGVs; and
- Location 4: North Hyde Gardens - Dominant noise sources: industrial noise from adjacent units and local road traffic.



Figure 6.1: Noise Measurement Locations

As agreed with LBH, measurements were undertaken between Thursday 12th to Sunday 15th of January 2012. Locations 1 (Moorings) and 2 (approved residential development) were largely unattended, while Location 3 was fully attended. Location 4 was partially attended. Technical issues with the monitoring equipment at Location 2 resulted in a truncation of this particular measurement during the day time of the weekend, however; this period is not viewed as critical to the overall assessment and the recorded data is considered to be sufficient to carry out a robust assessment.

6.1.1 On-site Noise Measurements

A summary of the mean recorded background noise levels, during the daytime and night-time periods are presented in Table 6.2, below.

Table 6.2: Summary of MEAN Measured Noise Results					
Location	Period	Mean Measured Daytime Noise Level - dB		Mean Measured Night-time Noise Level - dB	
		L _{Aeq,1-hour}	L _{A90,1-hour}	L _{Aeq,5-minute}	L _{A90,5-minute}
Location 1: Leisure Moorings	Midweek	59.0	52.9	55.3	49.9
	Weekend	55.6	49.6	52.0	48.3
Location 2: Approved residential development	Midweek	65.2	54.2	62.1	51.4
	Weekend	-	-	59.1	48.7
Location 3: Scotts Road	Midweek	65.6	54.2	61.8	48.4
	Weekend	68.1	55.4	55.2	46.0
Location 4: North Hyde Gardens	Midweek	71.4	55.1	61.7	51.0
	Weekend	59.5	52.8	57.5	50.4

A summary of the lowest recorded background noise levels, during the daytime and night-time periods are presented in Table 6.3, below.

Table 6.3: Summary of LOWEST Measured Noise Results					
Location	Period	Lowest Measured Daytime Noise Level - dB		Lowest Measured Night-time Noise Level - dB	
		L _{Aeq,1-hour}	L _{A90,1-hour}	L _{Aeq,5-minute}	L _{A90,5-minute}
Location 1: Leisure Moorings	Midweek	56.8	48.0	47.2	44.4
	Weekend	55.0	44.0	45.1	42.8
Location 2: Approved residential development	Midweek	64.3	50.3	47.7	45.3
	Weekend	-	-	47.7	45.8
Location 3: Scotts Road	Midweek	63.8	55.6	55.6	47.0
	Weekend	60.9	53.5	55.4	45.7
Location 4: North Hyde Gardens	Midweek	57.3	51.1	49.0	48.2
	Weekend	59.5	52.8	49.8	47.8

6.2 Noise Limits

Based on the guidance presented within BS4142, the LBH NSPD, consultation with the EPO at LBH, the criteria adopted for this assessment and the results of the environmental noise measurements at the closest receptors to the Site, target noise limits have been derived and are set out in Table 6.4. To represent a robust worst case, these limits have been derived on the basis of the quietest measured noise levels.

Table 6.4: Adopted Target Noise Limits for the Proposed Development			
Noise Limits based on $L_{Aeq,T}$			
Location	Period	Lowest Measured Noise Level (dB)	Noise Level Limit at Receptor (dB), to ensure no detectable increase in noise level
		$L_{Aeq,T}$ Residual	$L_{Aeq,T}$ Specific
Location 1: Leisure Moorings	Day	55.0	49.1
	Night	45.1	39.2
Noise Limits based on $L_{A90,T}$			
Location	Period	Lowest Measured Noise Level (dB)	Noise Level Limit at Receptor (dB), to ensure rating noise level at least 5dB below background
		$L_{A90,T}$ Residual	$L_{Aeq,T}$ Specific
Location 2: Approved residential development	Day	50.3	40.3
	Night	45.3	35.3
Location 3: Scotts Road	Day	53.5	43.5
	Night	45.7	35.7
Location 4: North Hyde Gardens	Day	51.1	41.1
	Night	47.8	37.8
Noise Limits based on fixed limits			
Location	Period	BS8233 Criteria	Noise Level Limit at Receptor (dB) to meet BS8233 based target criteria
		$L_{Aeq,T}$ Internal 'reasonable'	$L_{Aeq,T}$ External - Facade
Coachworks Staff Accommodation	Day	40	55
	Night	35	50

Providing the Proposed Development is designed to meet the noise limits above, there will be no detectable increase in noise level within any area prized for amenity value, the rating noise level will meet the criteria set out in the LBH NSPD at all existing traditional residential noise-sensitive receptors in the vicinity, and a 'reasonable' degree of protection will be provided for staff utilising the temporary accommodation at the coachworks development. It is considered that this would afford an appropriate level of protection against noise and comply with the guidance presented within the LBH NSPD.

7 Operational Noise and Vibration Impact Assessment

7.1 Plant Noise

In order to assess the potential impact of noise from the Proposed Development, it has been necessary to predict the likely specific noise level from the most significant noise sources associated with the Proposed Development at the closest noise-sensitive receptors.

The most significant sources of noise are associated with the proposed Recycling Plant, the Washing Plant and the Asphalt Plant, in addition to machinery and material movements around the Site. Accordingly, the noise predictions and assessment have focussed on the following sources;

- Recycling Plant
 - Break-out through enclosure and openings
 - Conveyors
- Washing Plant
 - Washer
 - Conveyors
 - Centrifuge
- Asphalt Plant
 - Break-out through enclosure and openings
 - Load Out Point
 - Aggregate Feed Hoppers and Conveyors
- Vehicles
 - Loading shovel at aggregate storage area and inbound material stockpile
 - Lorry movements through the Site
 - Lorry tipping
 - Excavator at inbound material stockpile
 - Road sweep vehicle
 - Bitumen and Fuel supply lorry at asphalt plant

The locations of the main areas described above and included in the modelling exercise, are presented in Figure 7.1.

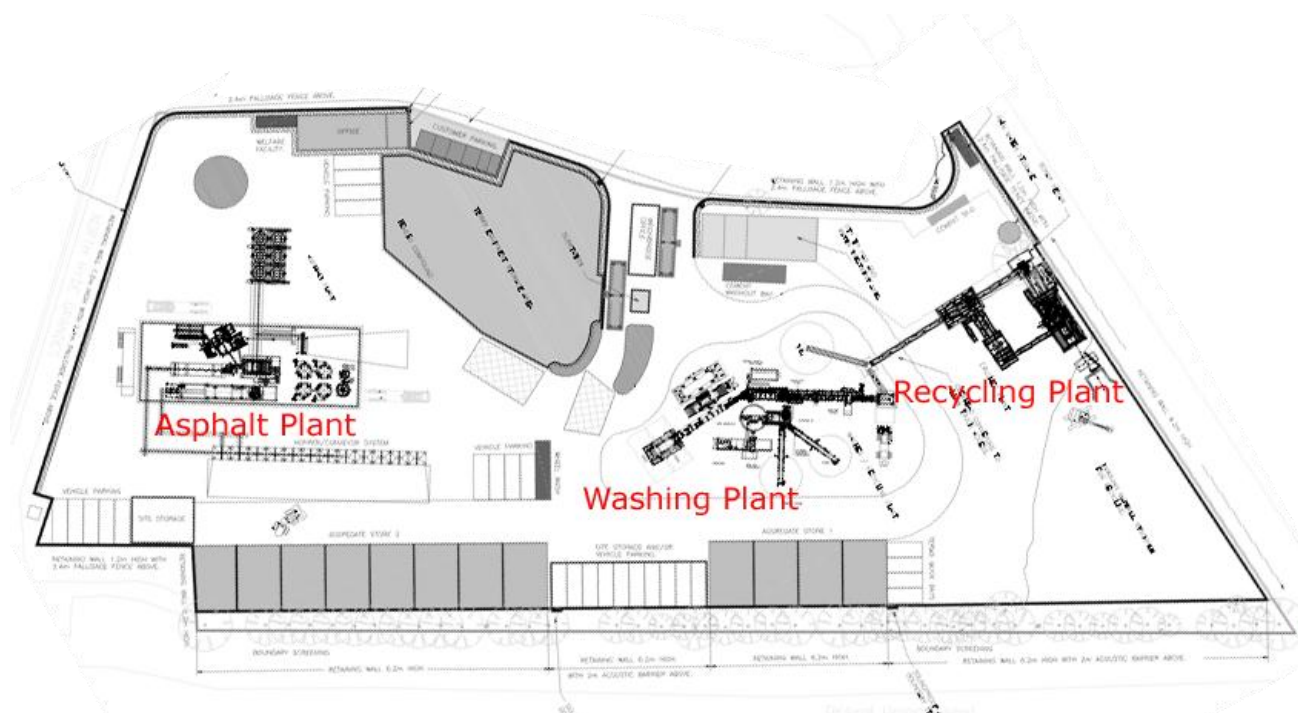


Figure 7.1: Main Noise Sources at the Proposed Development

The predictions have been based on source noise measurements carried out at existing plants with similar characteristics to that of the Proposed Development at Bulls Bridge. Specifically, the Erith Asphalt Plant and Dartford Depot Recycling Centre, both owned and operated by the Applicant.

A summary of noise levels measured at these existing operations is shown in Table 7.1, as an average of the different measurements taken at every source. These levels were used to calculate the source power levels and noise emitting characteristics to be used in the predictive model for the Proposed Development.

Table 7.1: Sound Pressure Levels measure at similar noise sources											
Noise Source	Distance (m)	Frequency (Hz)									
		31.5	63	125	250	500	1K	2K	4K	8K	Global dBA
Erith Plant											
Asphalt Plant	IRL	86.0	87.9	87.3	84.2	82.6	77.0	74.8	72.6	67.8	84.2
Hopper System	1 m	82.1	77.5	73.2	71.8	74.5	73.4	73.6	75.3	73.7	81.1
Lorry being loaded at Load Out Point	5 m	79.6	78.0	72.3	69.6	72.3	73.5	72.5	66.7	62.5	78.0
Lorry manoeuvring	4 m	82.8	80.5	75.0	70.0	72.4	73.0	69.6	65.9	57.0	76.8
Sweeper	3 m	82	88.1	80.8	85.5	82.2	79	77.2	74.5	73.1	85.3
Loading Shovel	5 m	87.0	92.6	82.3	77.3	69.9	68.1	65.5	60.1	53.5	75.4

Table 7.1: Sound Pressure Levels measure at similar noise sources

Noise Source	Distance (m)	Frequency (Hz)									
		31.5	63	125	250	500	1K	2K	4K	8K	Global dBA
Lorry reversing beeper	1 m	73.2	75.7	71.2	65.6	66.1	79.3	78	81.3	81.3	86.5
Bitumen and Fuel Lorry	3 m	77.7	72.4	68.5	66.1	71.9	75.4	69.1	71.1	67.1	78.7
Dartford Plant											
Processor	IRL	97.5	91.5	100.2	109.2	104.8	94.9	91.2	88.5	83.2	105.2
Screener	IRL	90.1	83.5	83.8	85.9	89.4	92.1	93.1	88.5	82.2	97.6
Processor conveyor drive motor	1 m	82.7	72.9	73.8	72.8	69.8	74.6	73	70.8	62.5	79.0
Excavator loading crusher	4 m	79.3	77	77.5	80.6	76.3	74	68.9	65.3	59.8	79.0
Loading Shovel - Aggregate	4 m	80.2	87.8	83.0	74.7	74.6	72.3	69.0	63.6	56.1	77.5
Shovel and Excavator	10 m	76.5	83.7	81.2	77.2	72.5	71.4	68.4	62	54.8	76.6
Lorry unloading material	6 m	76.4	78.8	80.1	78.3	79.8	76.2	74.5	75.1	70	82.7
Washing Plant	NFL	101.9	95.7	87.0	84.1	83.6	81.1	79.4	77.4	74.3	87.0
Centrifuge	IRL	86.2	88.0	79.3	78.9	79.2	81.7	73.9	71.6	70.9	84.2
General ambience	-	84.4	79.9	73.9	73.2	70.1	66.6	63.3	61.1	52.4	72.6
IRL = Internal Reverberant Level, NFL = Near-field Level											

In order to accurately predict the noise likely to propagate from the Proposed Development, the modelling exercise has been made with the following assumptions, which are based on observations and measurements carried out at the existing Erith Asphalt Plant and Dartford Depot Recycling Plant. The assumptions have been confirmed as a reasonable representation of likely operations at the Proposed Development by the Applicant;

- Day-time operations (07.00-23.00)
 - The Recycling Plant (including Washing Plant), Asphalt Plant and Term Maintenance activities will be fully operational (Note that these activities would normally cease at 18.00);
 - Excavator working on the inbound material stockpile for recycling will be actively sorting material on top of the material or feeding this into the processing plant for up to 50% of the time. At all other times the excavator will either be idling, or distributing material at the base of the material stockpile (Note that these activities would normally cease at 18.00);

- Up to 40 lorries could arrive and depart in any one-hour period, to service the Asphalt Plant and Aggregate Recycling, Gully Waste Recycling and Term Maintenance activities;
- Road sweeping vehicle will operate continuously (Note that this activity would normally cease at 18.00);
- The Asphalt Plant will be fully operational, with the material feed hoppers being loaded and operated continuously.
- Night-time operations (23.00-07.00)
 - Only the Asphalt Plant and Term Maintenance activities will be fully operational.
 - The Recycling Plant (incl. Washing Plant) will not operate, although limited material deliveries to the Recycling Plant will occur.
 - Up to two lorries could arrive and depart in any five-minute period, to service the Asphalt Plant and Aggregate Recycling, Gully Waste Recycling and Term Maintenance activities;
 - The Asphalt Plant will be fully operational, with the material feed hoppers being operated continuously and actively loaded for up to 80% of the time in any five-minute period. It is assumed that the engine of the loader would be idling when not actively loading.

7.1.1 Plant Mitigation Measures

The predictions include the mitigating effect of several acoustic design measures that have been incorporated within the design of the Proposed Development to ensure that the criteria adopted for the assessment area achieved.

Enclosures

The enclosures at the Proposed Development that will contain potentially significant noise sources, such as the recycling plant, the screening plant and the asphalt plant, will meet the acoustic performance requirements detailed in Table 7.2 below.

Table 7.2: Sound Reduction Index (SRI) for Plant Enclosures

Enclosure	Frequency (Hz)						Global Rw (dB)
	125	250	500	1K	2K	4K	
Recycling Plant	20	29	43	48	56	57	41
Screening Plant	14	16	20	25	29	23	25
Asphalt Plant	14	16	20	25	29	23	25

Any ventilation openings within these buildings will be fitted with acoustic attenuators or acoustic louvres that meet or exceed the acoustic performance values presented above.

Acoustic Barriers

A number of acoustic barriers will be constructed to physically prevent the propagation of noise from the Proposed Development and protect the closest noise sensitive receptors. The extent and height required by these barriers are presented on the Figure 7.2. In addition to the acoustic barriers, the proposed aggregate storage bays will also provide significant

acoustic screening along the eastern site boundary. Their height will be commensurate with the 7m acoustic barrier proposed between the two separate aggregate storage bays, and the vertical interface between the storage bays and acoustic barriers will be acoustically sealed.

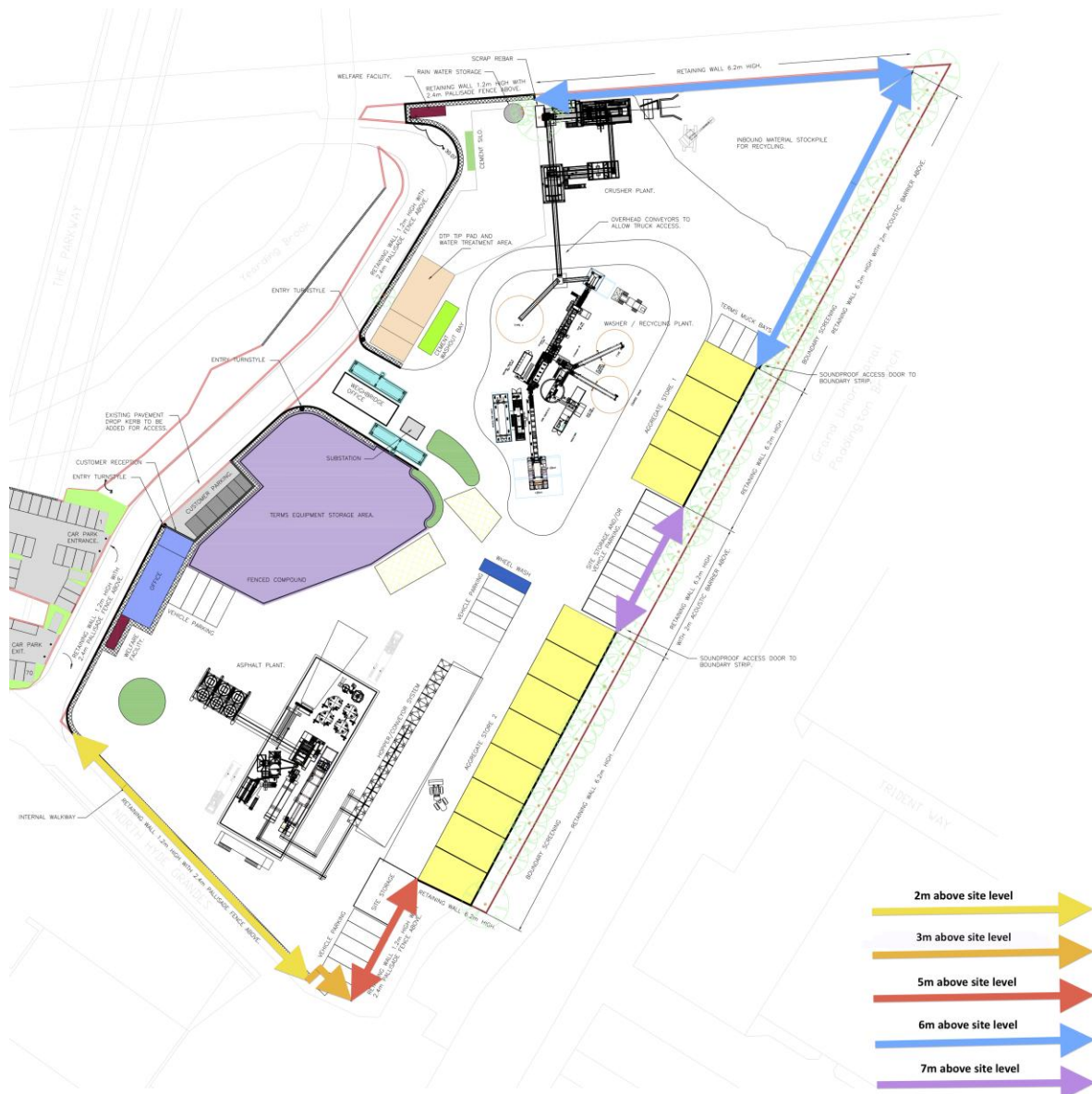


Figure 7.2: Proposed Acoustic Barriers

7.1.2 Predicted Plant Noise Levels and Assessment

The $L_{Aeq,T}$ specific noise level predicted during operation of the Proposed Development (with the above mitigation measures in place) at each of the receptor locations considering a 1.5 m height within valued amenity and leisure areas and 4.0m height at residential receptors to reflect the worst case upper storey, is presented in Table 7.3. The overall predicted level is compared with target noise limit set at every location.

Table 7.3: Predicted Plant Noise Levels				
Location	Period	Predicted Noise Level (dB) L_{Aeq,T}	Noise Level Limit at Receptor (dB) L_{Aeq,T} Specific	Margin below limit (dB)
Location 1: Leisure Moorings	Day	44.3	49.1	- 4.8
	Night	39.1	39.2	- 0.1
Location 2: Approved residential development	Day	40.2	40.3	- 0.1
	Night	34.1	35.3	- 1.2
Location 3: Scotts Road	Day	36.2	43.5	- 7.3
	Night	28.9	35.7	- 6.8
Location 4: North Hyde Gardens	Day	36.9	41.1	- 4.2
	Night	31.6	37.8	- 6.2
Coachworks Staff Accommodation	Day	53.5	55.0	- 1.5
	Night	48.9	50.0	- 1.1

Table 7.3 identifies that once operational, both daytime and night-time L_{Aeq,T} specific noise levels are predicted to remain within the limits established for every receptors and as such, will not result in any significant creep in background noise levels, which is considered to demonstrate that the impact of noise from the Proposed Development will be adequately controlled and ensure that complaints are unlikely.

Consideration has also been given to the potential impact of noise from the Proposed Development on the three Sites of Importance for Nature Conservation within 1 km of the Site, namely:

- London's Canals Site of Metropolitan Importance for Nature Conservation (SMINC) which includes the entire Grand Union Canal (closest point 50 m south of the Site) and the Paddington branch which lies immediately adjacent to the eastern boundary of the Site;
- Crane Corridor SMINC: a corridor of habitats that follows the River Crane situated approximately 380 m to the south-west of the Site; and
- Yeading Brook, Minet Country Park and Hitherbroom Park Site of Borough Grade I Importance for Nature Conservation (SBINC): approximately 68 hectares of grassland, situated approximately 25 m to the north of the Site and separated by the main Swansea to Paddington railway line.

In order to assess the potential disturbance to these Conservation Areas as a result of operational noise from the Site, the specific noise from the Proposed Development has been compared with the lowest potential existing noise level at the closest point of each Conservation Area to the site as shown in Table 7.4.

Table 7.4: Predicted Plant Noise Levels at Nature Conservation Areas

Area	Period	Lowest Measured Noise Level (dB) $L_{Aeq,T}$	Noise Level Limit at (dB), to ensure no detectable increase in noise level	Predicted Noise Level (dB)	Margin below limit (dB)
Grand Union Canal - Paddington Branch	Day	55.0	49.1	44.3	- 4.8
	Night	45.1	39.2	39.1	- 0.1
Crane Corridor SMINC	Day	55.0	49.1	44.2	- 4.9
	Night	45.1	39.2	39.2	0.0
Minet Country Park	Day	64.3	58.4	48.1	- 10.3
	Night	47.7	41.8	40.3	- 1.5

Considering the predicted $L_{Aeq,T}$ specific noise associated with the Proposed Development shown in Table 7.4, in a worst case scenario, no detectable increase in noise level is predicted at these locations and as such, there will be no acoustic impact that could potentially cause disturbance to the ecological receptors and thus integrity of these designated sites.

As such, no further mitigation measures will be required to reduce the potential impact of noise, and the criteria adopted for this assessment will be achieved.

A noise contour map is presented in Figures 7.5 and 7.6, to graphically articulate the propagation of noise from the Proposed Development, both at daytime and at night time, at a height of 1.5 metres above local ground level.

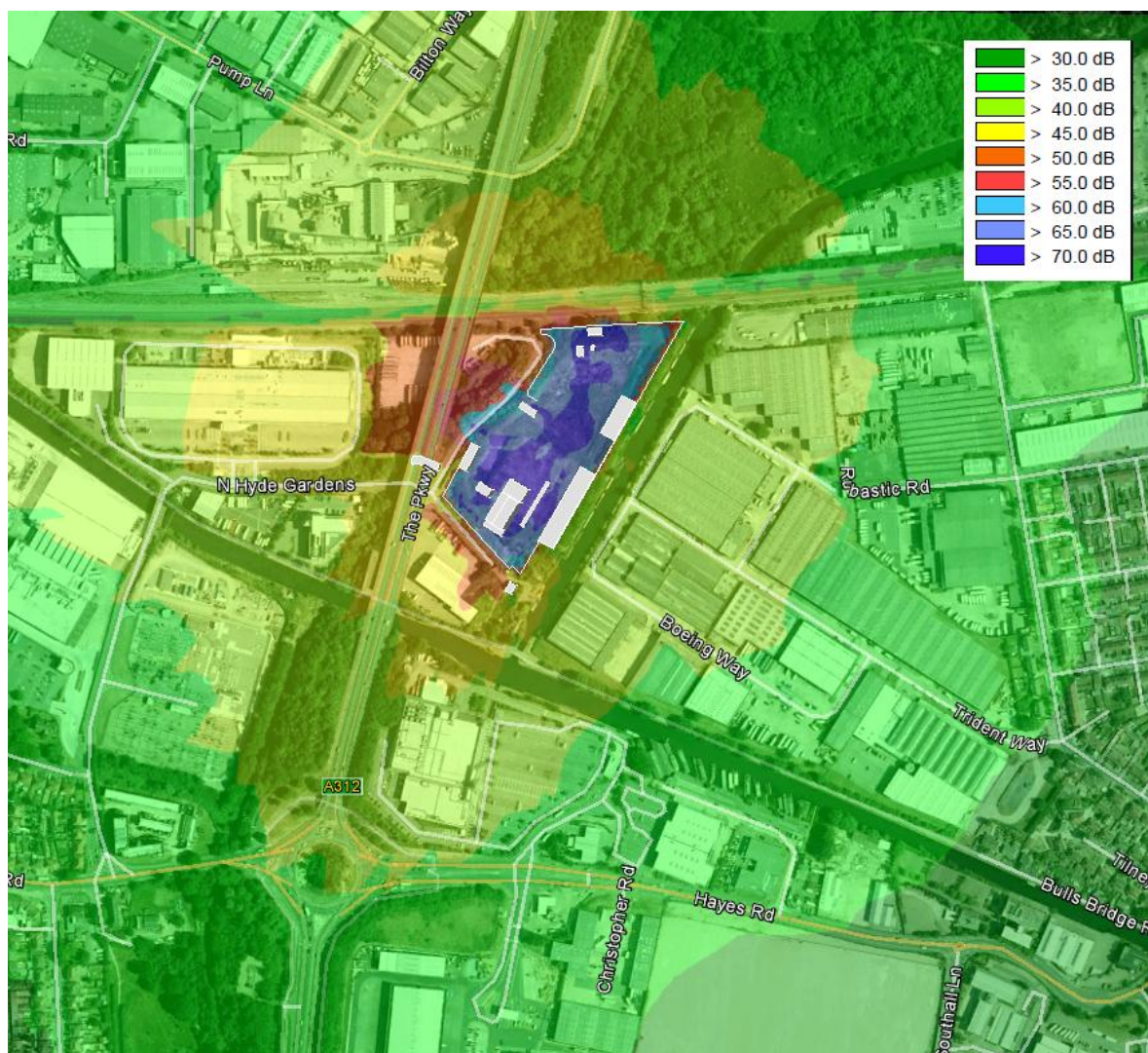


Figure 7.5: Plant Noise Contour Map – Daytime

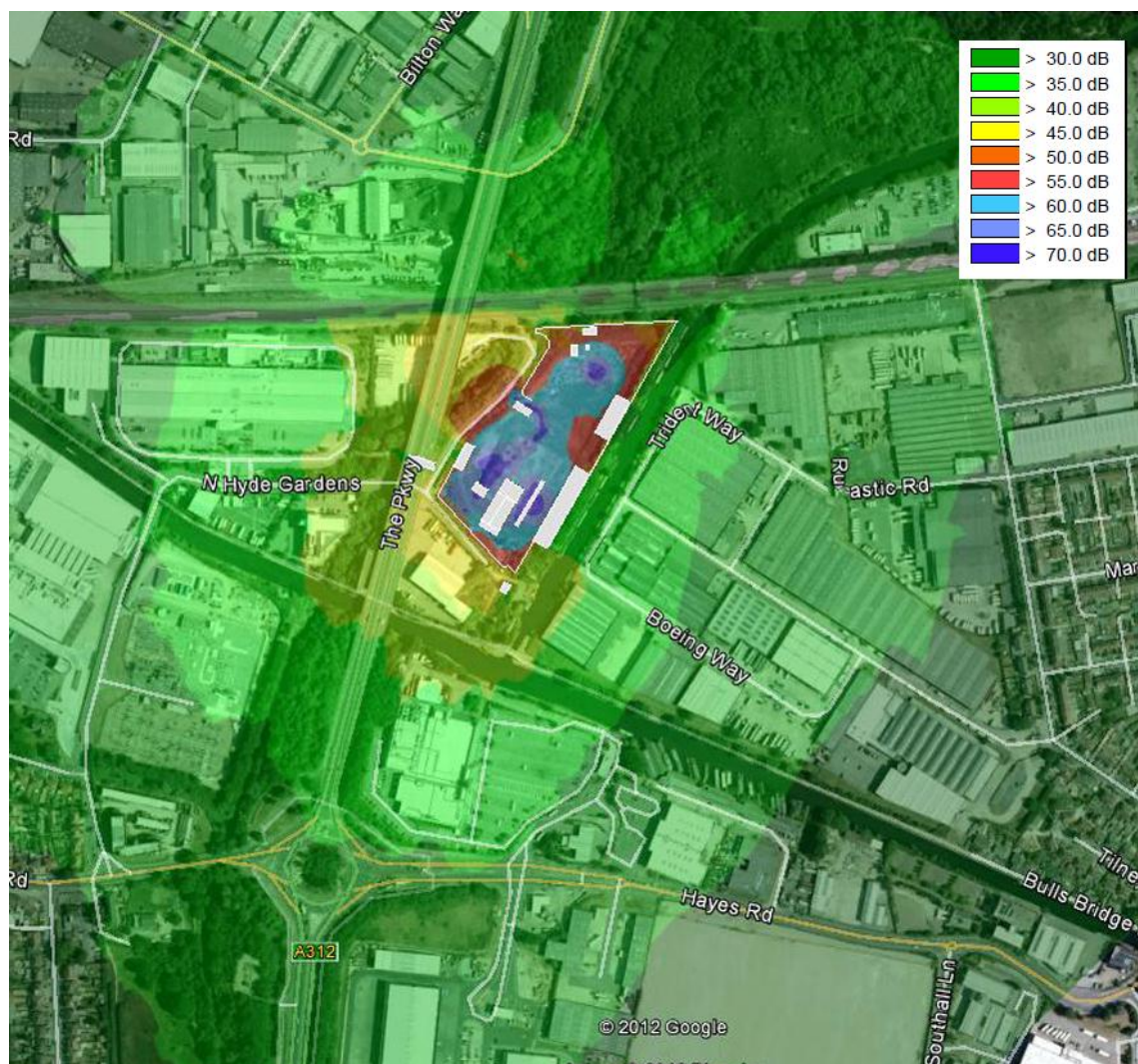


Figure 7.6: Plant Noise Contour Map – Night-time

7.2 Traffic Noise

The 18-hour weekday traffic flows provided by the Applicant's Transport Consultant, WSP, have been used as the basis of the road traffic noise assessment. The likely change in road traffic noise levels as a direct result of the Proposed Development has been determined by comparing the noise level predicted for road traffic in the 2016 Future Base Year, with the noise level predicted for road traffic for the two different 2016 Operational Year scenarios described below:

- the predicted noise levels for 2016 baseline with the predicted 2016 baseline plus the Proposed Development.
- the predicted noise levels for 2016 baseline with the predicted 2016 baseline plus the Proposed Development and the Committed Development in the area (Southall Gas Works).

The calculations reflect the predicted change in traffic flows at five different locations, shown on the Figure 7.7 below.

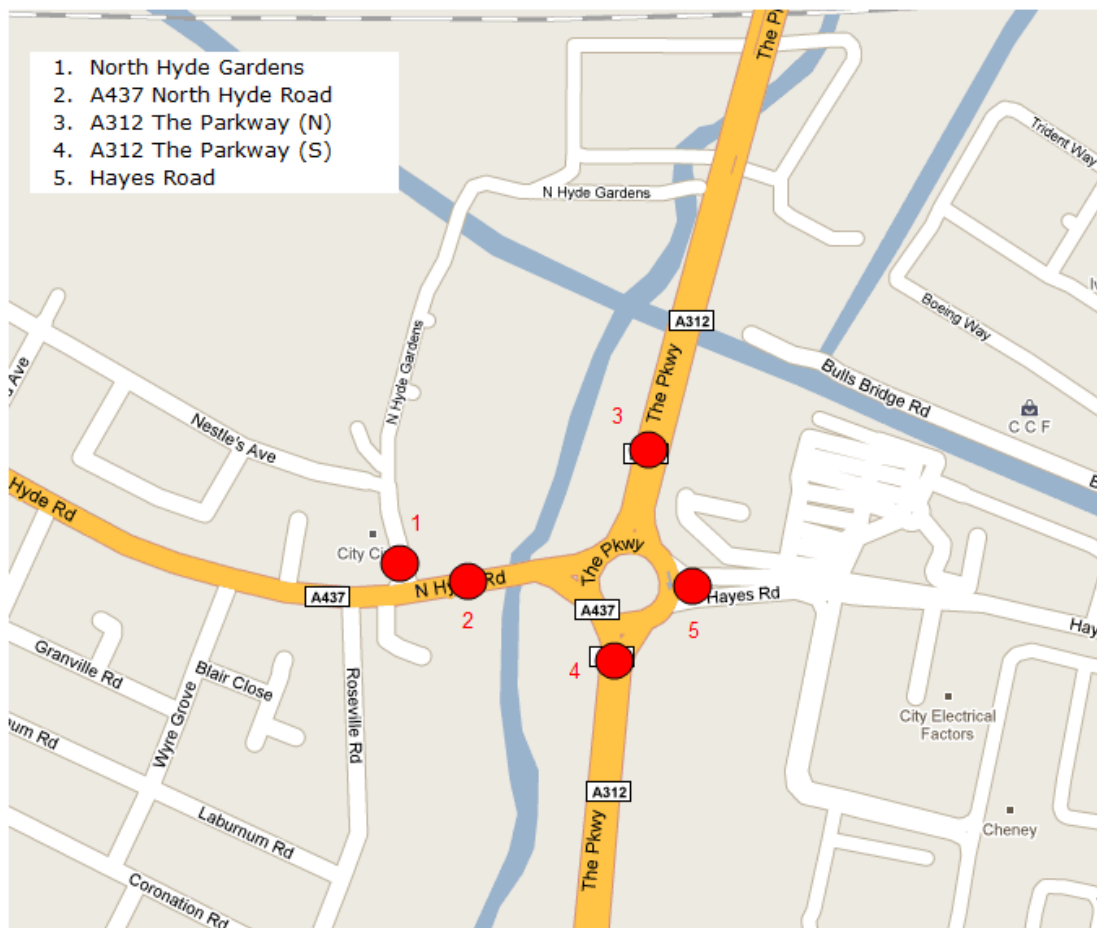


Figure 7.7: Traffic Flow Location Plan

Table 7.5 shows the traffic data for each road link used in this assessment.

Table 7.5: 18 hour (06.00 - 24.00) Seven Day Traffic Data				
Scenario	Location	Total Vehicles 2-way	% HGVs	Traffic Speed (Km/h)
2010 Base Year	1. North Hyde Gardens	2,039	11.11	30.00
	2. A437 North Hyde Road	24,859	4.04	28.75
	3. A312 The Parkway (N)	73,847	2.91	42.10
	4. A312 The Parkway (S)	65,621	4.01	40.90
	5. Hayes Road	35,182	3.35	40.00
2016 Baseline	1. North Hyde Gardens	2,110	11.11	30.00
	2. A437 North Hyde Road	25,741	4.04	28.75
	3. A312 The Parkway (N)	76,469	2.91	42.10
	4. A312 The Parkway (S)	67,951	4.01	40.90
	5. Hayes Road	36,431	3.35	40.00
2016 Baseline + Proposed Development	1. North Hyde Gardens	2,685	25.68	30.00
	2. A437 North Hyde Road	26,316	5.68	28.75
	3. A312 The Parkway (N)	76,650	3.07	42.10
	4. A312 The Parkway (S)	68,338	4.47	40.90
	5. Hayes Road	36,434	3.35	40.00
2016 Baseline +Proposed Development + Comm. Development	1. North Hyde Gardens	2,686	25.67	30.00
	2. A437 North Hyde Road	27,805	5.38	28.75
	3. A312 The Parkway (N)	77,408	3.04	42.10
	4. A312 The Parkway (S)	69,087	4.42	40.90
	5. Hayes Road	36,465	3.35	40.00

The traffic noise predictions have been undertaken in accordance with the BNL principles detailed within the CRTN. These predictions consider the relative changes in noise level that is likely as a result of the Proposed Development at a notional roadside receptor for each considered road link. The predicted changes in noise level are presented in Table 7.6.

Table 7.6: Predicted Future Changes in Road Traffic Noise

Scenario	Location	Predicted Increase in Road Traffic Noise, $L_{A10,18\text{hour}}$	Significance of Effect
2016 Baseline + Proposed Development	1. North Hyde Gardens	3.7	Minor
	2. A437 North Hyde Road	0.8	Negligible
	3. A312 The Parkway (N)	0.1	Negligible
	4. A312 The Parkway (S)	0.2	Negligible
	5. Hayes Road	0.0	No Effect
2016 Baseline + Proposed Develop + Committed Development	1. North Hyde Gardens	3.7	Minor
	2. A437 North Hyde Road	0.9	Negligible
	3. A312 The Parkway (N)	0.1	Negligible
	4. A312 The Parkway (S)	0.2	Negligible
	5. Hayes Road	0.0	No Effect

The calculation shows that the change in road traffic noise levels resulting from use of this Site for to the Proposed Development represents, at worst, a Minor change in road traffic noise generation at North Hyde Gardens, and a Negligible change across the rest of the adjacent road network.

7.3 Operational Vibration

The primary cause of community concern in relation to vibration generally relates to building damage from both construction and operational sources of vibration, although, the human body can perceive vibration at levels which are substantially lower than those required to cause building damage.

Damage to buildings associated solely with ground-borne vibration is not common and although vibration may be noticeable, there is little evidence to suggest that they produce cosmetic damage such as a crack in plaster unless the magnitude of the vibration is excessively high. The most likely impact, where elevated levels of vibration do occur during construction phases, is associated with perceptibility.

BS5228 indicates that the threshold of human perception to vibration is around 0.15 mm/s, although it is generally accepted that for the majority of people vibration levels in excess of between 0.15 and 0.3 mm/s peak particle velocity (ppv) are just perceptible, which forms the basis of the recommended maximum permitted vibration levels of 1 mm/s PPV within occupied residential dwellings.

BS5228 also sets out the distances (based on historical field measurements) at which certain activities could give rise to a just perceptible level of vibration. These distances are presented in Table 7.7.

Table 7.7: Distances at which Vibration may be just perceptible	
Construction Activities	Distance from activity when vibration may just be perceptible (metres)
Excavation	10 - 15
Heavy Vehicles (e.g. dump trucks)	5 - 10
Hydraulic Breaker	15 - 20
Rotary Bored Piling	20 - 30

The long distance between the Site and the closest sensitive receptors (approximately 120 m north-east to the approved residential development at the Southall Gas Works) would ensure that the effects of any operation related vibration is not perceptible.

Any leisure barges moored on the Paddington Branch of the Grand Union Canal, although closer to the Site, would not be affected by vibration given the absence of a vibration transmission pathway.

8 Construction Noise and Vibration Impact Assessment

8.1 Construction Noise

The operation of equipment associated with site preparation and construction of the Proposed Development has the potential to result in noise impacts at existing noise sensitive receptors in the vicinity of the Site.

In order to predict and assess the potential impact of noise during construction of the Proposed Development, noise predictions have been undertaken using the noise modelling suite Cadna/A, which implements the full range of UK calculation methods, including BS 5228.

The predictions procedure described in BS5228 involves taking the source noise level of each item of plant and correcting it for:

- (i) distance effects between source and receiver;
- (ii) percentage operating time of the plant;
- (iii) barrier attenuation effects;
- (iv) ground absorption; and
- (v) facade corrections.

The latter correction involves a 3 dB noise increase due to reflection effects for a receiving point location 1m in front of a building facade. All predictions presented in this section include the façade correction, except for receptor at the leisure moorings. In addition, these predictions assume that the ground between the source and receiver is acoustically hard, to represent worst case.

For the purpose of the assessment, the construction works associated with the Proposed Development have been divided into four discrete sub-phases:

- site preparation works;
- foundation works (including earthworks and formation of foundations);
- super-structure works (building and plant erection); and
- road works (minor road improvement works, paving and landscaping) together with plant complements typical of each sub-phase.

Details of the plant and assumptions made in the construction noise predictions are summarised in Technical Appendix C. The predictions are based on source noise data for the various items of plant, as presented in BS5228. The predictions also allows for the operation of a temporary material recycling machine with a Sound Power Level of 118 dB operating towards the north of the Site, to enable the use and recycling of existing site material contained within the perimeter bund, throughout the construction programme.

Construction noise levels have been predicted at the closest existing receptor locations to the Proposed Development, as identified in Figure 6.1, on the assumption that 2.4 m hoarding or material embankment screen will be in place around the Site boundary. The predicted noise levels are 'worst case', assuming the shortest distance between the source of construction noise and the receptor. The predictions consider a ground floor receiver height for houses in the vicinity of Site, which is representative of daytime living areas and gardens. The noise levels predicted at the closest noise sensitive receptors during each sub-phase are presented in Table 8.1.

Table 8.1: Predicted Construction Noise Levels (worst case), $L_{Aeq,T}$ dB				
Receptor	Site Preparation	Foundation	Super-Structure	Roads
Location 1: Leisure Moorings*	65.2	67.0	66.6	62.5
Location 2: Approved residential development	57.4	57.8	57.7	56.9
Location 3: Scotts Road	51.6	52.0	51.9	51.2
Location 4: North Hyde Gardens	48.9	49.5	49.3	48.2
* Free-field noise level predicted.				

Comparison of the predicted construction noise levels in Table 8.1 with the $L_{Aeq,T}$ 75 dB façade target noise criteria adopted for this assessment, shows that the criterion is likely to be met (i.e. with no exceedances) during all sub-phases of construction, at all receptor locations.

Notwithstanding that the target criteria is predicted to be met, to control the impact of noise from construction activities, in so far as is reasonably practicable, it is recommended that the appointed Contractors ensure that works are carried out in accordance with Best Practicable Means (BPM) as described in BS5228 comprising the following:

- where possible, 'silenced' plant and equipment will be used;
- where vehicles are standing for a significant period of time, engines will be switched off;
- acoustic enclosures will be fitted where possible to suppress noisy equipment;
- plant will operate at low speeds, where possible, and incorporate automatic low speed idling;
- where possible, electrically driven equipment will be selected in preference to internal combustion powered, hydraulic power in preference to pneumatic and wheeled in lieu of tracked plant;
- all plant will be properly maintained (greased, blown silencers replaced, saws kept sharpened, teeth set and blades flat, worn bearings replaced, etc);
- consideration will be given to temporary screening or enclosures for static noisy plant to reduce noise emissions and plant should be certified to meet any relevant EC Directive standards;
- all contractors will be made familiar with the guidance in BS 5228 (Parts 1 and 2) which will form a pre-requisite of their appointment; and
- early and good public relations with the adjacent tenants and occupants of buildings will also reduce the likelihood of complaints.

The adoption of the above mitigation measures will further reduce the potential impact of noise during construction of the Proposed Development, typically by approximately 5dB. Table 8.2 shows the resultant levels, following the adoption of the above.

Table 8.2: Predicted Construction Noise Levels (using BPM), $L_{Aeq,T}$ dB				
Receptor	Site Preparation	Foundation	Super-Structure	Roads
Location 1: Leisure Moorings*	60.2	62.0	61.6	57.5
Location 2: Approved residential development	52.4	52.8	52.7	51.9
Location 3: Scotts Road	46.6	47.0	46.9	46.2
Location 4: North Hyde Gardens	43.9	44.5	44.3	43.2
* Free-field noise level predicted.				

Table 8.2 shows that with the adoption of BPM, the predicted noise levels achieve the criteria adopted for this assessment by an even greater margin.

8.2 Construction Vibration

There are currently no British Standards that provide a methodology to predict levels of vibration from construction activities, other than that contained within BS5228: Part 2, which relates to percussive or vibratory piling only. Therefore, it is not possible to accurately predict levels of vibration during the Site preparation and construction phases of development. As such, to control the impact of vibration during site preparation and construction of a development, limits relating to the perceptibility of vibration are typically set.

BS5228 sets out the distances (based on historical field measurements) at which certain activities could give rise to a just perceptible level of vibration. These distances are presented in Table 7.6 above.

As for operational activities, the long distance between the Site and the closest sensitive receptors (approximately 120 m to the approved residential development at the Southall Gas Works) would ensure that the effects of any construction related vibration is imperceptible at any receptor.

9 Conclusion

ENVIRON was commissioned by FM Conway Ltd to produce a Noise and Vibration Assessment for the redevelopment proposals of the former Powergen site, into an aggregate recycling plant, asphalt storage and production plant, and gulley waste plant.

The assessment considered noise and vibration from all significant operational sources associated with the Proposed Development, with respect to the prevailing noise levels in the surrounding area and guideline values. Consideration has also been given to the potential impact of noise during construction of the Proposed Development. The assessment methodology contained in BS4142 and BS5228 has been used in the assessment.

The assessment is based upon background environmental noise measurements undertaken in the vicinity of the closest noise-sensitive receptors to the Site, the noise emitting characteristics of the development proposals, in addition to the physical form of the existing buildings and the topography of the surrounding area.

The operational profile of the Proposed Development varies between daytime and night-time periods, so the assessment considers each of these respective periods separately, with the assessment being based on the quietest daytime and night-time background noise levels measured at the closest receptors to the Site.

In order to assess the impact of the Proposed Development it has been necessary to predict the likely specific noise level at each of the assessment receptor locations. The predictions have been undertaken using the noise modelling suite Cadna/A, in accordance with the prediction methodology ISO 9613: 1996.

The noise prediction and assessment identify that once operational, that both daytime and night-time $L_{Aeq,T}$ specific noise levels are predicted to remain within the criteria adopted for the assessment at all sensitive receptor locations. The $L_{A,r,T}$ rating noise level is predicted to remain at least 5dB below the quietest $L_{A90,T}$ background noise level at all existing traditional residential receptor locations, which is considered to demonstrate that the impact of noise from the Proposed Development will be adequately controlled and ensure that complaints are unlikely. In addition, no detectable increase in noise has been predicted within any Nature Conservation Areas or in areas prized for their amenity, leisure and recreational value. As such, no further mitigation measures will be required to reduce the impact of operational noise, and the requirements of the LBH, as set out within their NSPD, will be met.

Lastly, the construction noise predictions and assessment identified that construction noise levels are likely to remain well below the levels recommended within BS5228.

Appendix A: Acoustic Terminology

Glossary of Terms and Introduction to Acoustics

Table A1: Glossary of Terms and Introduction to Acoustics

Sound Exposure Level	In many situations, the total noise exposure over a period of time is made up from a number of different individual events, such as the passing of an aircraft or a train nearby, or a short burst of machinery noise, and L_{eq} measurements of the noise from different events will be made over different durations. It would be convenient for comparison of different types of event if the noise from all events could be averaged over the same duration. For convenience, a time of 1 second is chosen. The sound exposure level of a single discrete noise event is the level, which if maintained constant for a period of 1 second would contain as much A-weighted sound energy as is contained in the actual event.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of $20\mu\text{Pa}$ (20×10^{-6} Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1 / s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A2: Typical Sound Levels Found in the Environment	
Sound Level	Location
0 dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} .

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 5 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1\text{hour}}$ dB and $L_{A90,5\text{mins}}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

Appendix B: Measurement Results

Full Tabulated Noise Measurement Results

Table B1: Full Noise Measurement Results Location 1

Start Period (T=30 min)	Noise Level, dB			
	L _{Aeq,T}	L _{A90,T}	L _{A10,T}	L _{AFmax}
12/01/2012 11:50	60.9	56.7	62.2	89.1
12/01/2012 12:20	58.5	54.4	59.4	75.5
12/01/2012 12:50	59.8	54.6	60.6	78.7
12/01/2012 13:20	59.0	54.2	60.2	78.1
12/01/2012 13:50	60.3	54.8	61.4	77.1
12/01/2012 14:20	60.4	56.0	61.6	75.0
12/01/2012 14:50	59.6	54.9	60.9	75.9
12/01/2012 15:20	59.8	54.6	60.2	78.8
12/01/2012 15:50	61.5	55.2	62.2	80.7
12/01/2012 16:20	59.7	54.8	60.9	75.2
12/01/2012 16:50	59.5	53.6	60.6	76.0
12/01/2012 17:20	60.2	53.9	60.8	78.2
12/01/2012 17:50	60.7	55.0	61.3	77.1
12/01/2012 18:20	60.7	54.3	62.0	77.0
12/01/2012 18:50	60.4	55.0	61.7	77.7
12/01/2012 19:20	61.0	55.5	61.1	80.9
12/01/2012 19:50	58.6	54.4	59.7	74.3
12/01/2012 20:20	59.2	53.7	59.3	80.1
12/01/2012 20:50	57.9	52.3	58.2	75.6
12/01/2012 21:20	57.8	53.6	58.0	76.0
12/01/2012 21:50	57.2	53.1	58.4	74.4
12/01/2012 22:20	54.9	50.7	56.3	69.3
12/01/2012 22:50	54.4	51.3	55.8	65.5
12/01/2012 23:20	57.4	50.8	57.2	74.9
12/01/2012 23:50	52.9	49.2	54.3	72.5
13/01/2012 00:20	51.1	48.7	52.3	65.8
13/01/2012 00:50	51.2	46.3	52.3	69.3
13/01/2012 01:20	52.8	47.8	52.6	69.1
13/01/2012 01:50	51.8	46.7	53.1	66.7
13/01/2012 02:20	48.8	45.1	50.4	63.5
13/01/2012 02:50	48.9	45.6	51.0	60.1
13/01/2012 03:20	51.6	47.5	53.0	64.4
13/01/2012 03:50	53.0	48.0	54.4	70.7
13/01/2012 04:20	52.6	50.2	54.1	65.3
13/01/2012 04:50	54.2	50.9	55.6	73.6
13/01/2012 05:20	58.8	53.9	58.6	85.5
13/01/2012 05:50	59.0	55.7	60.4	74.8
13/01/2012 06:20	59.7	56.3	61.6	75.7
13/01/2012 06:50	60.6	55.6	61.4	80.6
13/01/2012 07:20	59.5	54.1	61.0	75.7
13/01/2012 07:50	59.7	52.4	61.3	76.7
13/01/2012 08:20	59.1	51.6	60.7	76.8
13/01/2012 08:50	59.7	52.2	61.1	74.8
13/01/2012 09:20	58.8	52.3	59.1	80.9
13/01/2012 09:50	59.1	52.6	59.1	83.0
13/01/2012 10:20	56.1	51.6	57.4	74.7
13/01/2012 10:50	57.3	52.0	59.0	73.0
13/01/2012 11:20	59.4	53.2	60.8	76.2
13/01/2012 11:50	57.3	49.4	57.4	75.6
13/01/2012 12:20	56.7	48.7	57.1	74.5
13/01/2012 12:50	55.5	47.1	55.2	74.5
13/01/2012 13:20	56.6	48.3	56.6	76.2
13/01/2012 13:50	57.7	50.1	57.7	77.2
13/01/2012 14:20	57.7	50.9	58.2	73.9

Table B1: Full Noise Measurement Results Location 1

Start Period (T=30 min)	Noise Level, dB			
	L _{Aeq,T}	L _{A90,T}	L _{A10,T}	L _{AFmax}
13/01/2012 14:50	58.1	51.3	58.9	75.3
13/01/2012 15:20	57.2	52.3	59.0	73.7
13/01/2012 15:50	59.7	53.7	61.8	74.8
13/01/2012 16:20	57.8	53.2	59.0	74.0
13/01/2012 16:50	58.9	53.0	60.5	75.9
13/01/2012 17:20	60.1	52.3	60.5	79.1
13/01/2012 17:50	59.6	52.6	60.8	76.7
13/01/2012 18:20	60.1	54.0	62.0	75.7
13/01/2012 18:50	60.2	53.8	61.6	74.9
13/01/2012 19:20	58.7	53.2	60.4	73.6
13/01/2012 19:50	58.7	54.3	60.3	74.0
13/01/2012 20:20	59.0	52.8	60.2	76.2
13/01/2012 20:50	57.2	51.8	57.8	74.7
13/01/2012 21:20	57.3	51.1	57.1	77.6
13/01/2012 21:50	55.3	51.2	56.6	72.3
13/01/2012 22:20	57.8	51.3	58.4	73.8
13/01/2012 22:50	55.5	51.5	56.4	74.4
13/01/2012 23:20	56.5	50.8	56.6	74.6
13/01/2012 23:50	54.3	50.9	55.3	69.6
14/01/2012 00:20	51.6	48.8	53.2	67.1
14/01/2012 00:50	51.6	48.7	53.2	66.3
14/01/2012 01:20	53.9	47.5	53.6	70.8
14/01/2012 01:50	50.6	46.6	52.1	61.5
14/01/2012 02:20	49.5	46.1	50.9	62.2
14/01/2012 02:50	50.3	47.1	52.1	62.2
14/01/2012 03:20	51.4	48.4	53.0	66.4
14/01/2012 03:50	53.7	48.9	54.4	75.6
14/01/2012 04:20	52.9	49.5	54.6	69.3
14/01/2012 04:50	54.0	51.4	55.5	68.0
14/01/2012 05:20	55.5	52.3	56.6	72.9
14/01/2012 05:50	54.3	52.0	55.8	63.8
14/01/2012 06:20	55.9	53.5	57.2	72.3
14/01/2012 06:50	56.9	54.5	58.4	70.8
14/01/2012 07:20	58.3	55.2	59.5	74.0
14/01/2012 07:50	58.2	55.3	59.5	73.9
14/01/2012 08:20	59.2	55.9	61.1	72.9
14/01/2012 08:50	58.7	55.9	60.1	71.9
14/01/2012 09:20	56.4	53.4	57.8	71.8
14/01/2012 09:50	56.3	52.4	57.8	71.3
14/01/2012 10:20	57.2	52.6	58.9	72.6
14/01/2012 10:50	57.4	52.2	58.4	74.6
14/01/2012 11:20	55.9	50.1	57.0	73.6
14/01/2012 11:50	56.1	48.4	56.6	73.9
14/01/2012 12:20	54.3	46.5	54.6	71.5
14/01/2012 12:50	55.0	43.7	55.9	75.4
14/01/2012 13:20	52.7	44.3	55.1	70.1
14/01/2012 13:50	55.1	43.8	54.6	80.3
14/01/2012 14:20	55.0	44.6	56.3	73.2
14/01/2012 14:50	55.4	43.4	55.6	73.1
14/01/2012 15:20	55.2	46.0	56.4	74.0
14/01/2012 15:50	56.2	48.7	57.0	75.2
14/01/2012 16:20	56.5	49.3	57.5	75.9
14/01/2012 16:50	57.8	49.8	58.5	75.0
14/01/2012 17:20	55.9	49.6	57.5	73.2

Table B1: Full Noise Measurement Results Location 1

Start Period (T=30 min)	Noise Level, dB			
	$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{AFmax}
14/01/2012 17:50	57.9	50.0	58.8	74.7
14/01/2012 18:20	56.5	50.8	57.6	73.5
14/01/2012 18:50	56.6	51.2	58.0	72.4
14/01/2012 19:20	57.5	50.9	58.1	76.7
14/01/2012 19:50	54.4	50.0	55.0	72.9
14/01/2012 20:20	56.0	50.8	57.0	74.0
14/01/2012 20:50	56.7	52.1	58.2	72.8
14/01/2012 21:20	57.6	52.6	58.6	73.8
14/01/2012 21:50	56.9	52.2	58.1	73.6
14/01/2012 22:20	55.5	50.4	56.0	72.6
14/01/2012 22:50	52.4	49.6	54.0	66.8
14/01/2012 23:20	54.5	49.6	54.9	72.1
14/01/2012 23:50	52.4	49.8	53.8	68.0
15/01/2012 00:20	49.9	47.8	51.2	61.6
15/01/2012 00:50	49.2	46.3	50.6	64.7
15/01/2012 01:20	47.3	45.1	48.6	57.0
15/01/2012 01:50	46.0	44.0	47.5	53.7
15/01/2012 02:20	46.6	44.3	48.4	58.1
15/01/2012 02:50	47.1	43.9	49.3	58.9
15/01/2012 03:20	46.6	43.7	48.4	58.0
15/01/2012 03:50	48.1	45.2	50.1	57.7
15/01/2012 04:20	49.2	47.4	50.6	58.9
15/01/2012 04:50	51.0	48.8	52.4	64.6
15/01/2012 05:20	52.0	50.1	53.3	65.8
15/01/2012 05:50	51.5	49.8	52.7	63.5
15/01/2012 06:20	52.1	50.2	53.5	62.9
15/01/2012 06:50	52.5	50.8	53.8	63.7
15/01/2012 07:20	53.4	51.3	54.8	64.0
15/01/2012 07:50	53.8	50.7	55.1	69.5
15/01/2012 08:20	52.9	50.5	54.4	68.1
15/01/2012 08:50	52.5	49.9	54.0	67.9
15/01/2012 09:20	52.2	49.8	53.7	62.6
15/01/2012 09:50	51.7	48.7	53.2	66.0
15/01/2012 10:20	52.0	48.2	54.0	66.1
15/01/2012 10:50	53.6	47.4	55.4	68.4
15/01/2012 11:20	53.1	47.4	54.7	74.0
15/01/2012 11:50	51.4	47.0	52.9	68.5
15/01/2012 12:20	53.0	47.5	54.2	69.9
15/01/2012 12:50	51.5	47.8	53.4	66.7
15/01/2012 13:20	51.7	47.9	53.3	67.1
15/01/2012 13:50	51.6	46.7	52.9	68.0
15/01/2012 14:20	51.3	46.4	52.6	70.1

Table B2 – Full Noise Measurement Results - Location 2

Period (T=30 min)	Noise Level, dB			
	L _{Aeq,T}	L _{A90,T}	L _{A10,T}	L _{AFmax}
12/01/2012 14:00	63.3	56.5	62.7	84.2
12/01/2012 14:30	63.9	56.7	63.2	82.4
12/01/2012 15:00	65.0	56.7	63.8	85.9
12/01/2012 15:30	65.2	56.2	64.0	84.7
12/01/2012 16:00	65.7	56.9	64.7	84.2
12/01/2012 16:30	63.7	56.5	63.1	84.1
12/01/2012 17:00	64.8	56.1	64.0	84.4
12/01/2012 17:30	65.2	56.2	64.0	87.3
12/01/2012 18:00	65.4	56.9	65.3	84.1
12/01/2012 18:30	65.4	55.5	63.1	86.9
12/01/2012 19:00	64.8	56.3	63.1	86.8
12/01/2012 19:30	65.1	56.2	62.6	89.2
12/01/2012 20:00	62.5	55.8	61.3	85.4
12/01/2012 20:30	64.2	54.7	63.1	82.9
12/01/2012 21:00	65.8	53.6	60.8	87.5
12/01/2012 21:30	62.7	54.6	60.4	87.1
12/01/2012 22:00	63.9	54.3	61.8	85.5
12/01/2012 22:30	64.8	52.8	59.9	83.1
12/01/2012 23:00	61.5	52.1	58.6	84.5
12/01/2012 23:30	63.9	52.0	59.3	86.2
13/01/2012 00:00	59.9	49.7	56.4	84.5
13/01/2012 00:30	56.8	48.6	53.9	81.7
13/01/2012 01:00	63.3	48.7	55.2	87.5
13/01/2012 01:30	63.1	49.2	55.1	87.8
13/01/2012 02:00	63.5	48.7	56.5	85.0
13/01/2012 02:30	52.3	47.1	51.5	78.3
13/01/2012 03:00	59.2	47.6	52.5	85.1
13/01/2012 03:30	58.7	48.8	53.4	80.4
13/01/2012 04:00	60.1	50.6	55.4	84.5
13/01/2012 04:30	61.7	52.2	57.9	85.4
13/01/2012 05:00	61.3	53.6	58.9	83.9
13/01/2012 05:30	62.6	56.3	61.8	83.2
13/01/2012 06:00	65.9	57.1	63.4	86.2
13/01/2012 06:30	64.0	57.7	62.7	85.8
13/01/2012 07:00	66.4	57.0	63.3	90.4
13/01/2012 07:30	65.7	56.2	64.5	87.6
13/01/2012 08:00	67.3	54.4	65.5	86.5
13/01/2012 08:30	66.1	53.1	64.3	84.8
13/01/2012 09:00	66.2	54.1	63.7	85.7
13/01/2012 09:30	67.4	54.8	62.6	96.9
13/01/2012 10:00	66.0	53.9	61.9	99.7
13/01/2012 10:30	63.6	53.1	61.9	92.9
13/01/2012 11:00	65.5	53.6	62.6	88.4
13/01/2012 11:30	64.2	53.0	61.0	85.6
13/01/2012 12:00	64.7	50.9	62.1	85.4
13/01/2012 12:30	66.6	50.3	59.9	85.4
13/01/2012 13:00	65.0	49.2	61.3	85.0
13/01/2012 13:30	63.4	51.4	59.8	85.5
13/01/2012 14:00	64.0	51.4	60.8	83.8
13/01/2012 14:30	65.0	52.1	60.3	86.7
13/01/2012 15:00	63.3	52.6	61.6	83.5
13/01/2012 15:30	64.0	54.1	62.5	82.9

Table B2 – Full Noise Measurement Results - Location 2

Period (T=30 min)	Noise Level, dB			
	$L_{Aeq,T}$	$L_{A90,T}$	$L_{A10,T}$	L_{AFmax}
13/01/2012 16:00	65.8	54.4	64.3	84.8
13/01/2012 16:30	64.5	53.4	62.5	87.0
13/01/2012 17:00	65.1	53.1	62.8	87.6
13/01/2012 17:30	66.7	53.7	64.9	88.6
13/01/2012 18:00	66.9	54.0	64.2	87.8
13/01/2012 18:30	67.3	54.8	65.9	87.9
13/01/2012 19:00	66.7	55.0	64.1	86.7
13/01/2012 19:30	65.9	54.8	64.8	83.0
13/01/2012 20:00	65.2	54.4	62.5	88.3
13/01/2012 20:30	64.0	52.7	61.4	83.7
13/01/2012 21:00	64.8	51.9	60.4	86.1
13/01/2012 21:30	63.0	51.8	59.2	85.5
13/01/2012 22:00	64.4	52.8	60.6	84.7
13/01/2012 22:30	63.6	53.3	60.4	83.3
13/01/2012 23:00	63.0	53.2	60.0	85.2
13/01/2012 23:30	62.2	51.9	57.7	85.8
14/01/2012 00:00	57.0	50.5	55.2	78.6
14/01/2012 00:30	57.8	49.9	53.7	83.3
14/01/2012 01:00	59.4	49.2	53.6	87.0
14/01/2012 01:30	63.4	48.7	55.5	85.4
14/01/2012 02:00	61.0	47.8	53.8	82.8
14/01/2012 02:30	58.7	47.2	51.7	83.0
14/01/2012 03:00	58.2	47.1	52.7	80.2
14/01/2012 03:30	57.3	47.4	52.3	82.8
14/01/2012 04:00	51.2	49.1	52.6	66.0
14/01/2012 04:30	58.6	50.0	54.9	81.0

Table B3: Full Noise Measurement Results - Location 3

Period (T=30 min)	Noise Level, dB			
	L _{Aeq,T}	L _{A90,T}	L _{A10,T}	L _{AFmax}
12/01/2012 14:30	67.6	55.9	69.1	94.7
12/01/2012 15:00	66.0	55.2	69.5	80.0
-	-	-	-	-
12/01/2012 20:30	64.7	52.9	65.7	87.3
-	-	-	-	-
12/01/2012 21:47	65.3	54.0	66.5	85.7
-	-	-	-	-
14/01/2012 02:10	62.1	49.2	61.5	83.3
14/01/2012 02:40	61.4	48.4	59.1	83.9
-	-	-	-	-
14/01/2012 07:21	66.2	57.0	68.3	82.4
14/01/2012 07:51	67.7	56.1	69.1	88.7
-	-	-	-	-
14/01/2012 10:30	68.2	54.9	70.9	85.4
14/01/2012 11:00	55.2	60.4	74.3	78.4

Table B4: Full Noise Measurement Results - Location 4

Period (T=30 min)	Noise Level, dB			
	L _{Aeq,T}	L _{A90,T}	L _{A10,T}	L _{AFmax}
12/01/2012 15:40	61.1	53.0	63.2	81
12/01/2012 16:10	61.1	54.1	63.6	76.8
-	-	-	-	-
12/01/2012 21:06	58.7	52.7	58.6	79.9
-	-	-	-	-
12/01/2012 22:25	55.6	49.4	55.2	77.9
-	-	-	-	-
13/01/2012 01:59	56.7	49.5	55.0	81.1
13/01/2012 02:29	59.8	48.9	55.8	84.1
13/01/2012 02:59	60.8	49.0	54.9	85.4
-	-	-	-	-
13/01/2012 03:35	58.9	49.2	55.5	84.4
13/01/2012 04:05	57.7	49.5	54.5	82.9
13/01/2012 04:35	60.5	50.1	58.3	84.2
13/01/2012 05:05	61.8	51.2	61.1	84.5
13/01/2012 05:35	63.2	53.0	63.8	83.9
13/01/2012 06:05	63.7	54.3	65.3	87.6
13/01/2012 06:35	66.9	55.0	69.7	89.3
13/01/2012 07:05	63.6	54.0	63.9	85.2
13/01/2012 07:35	63.6	54.0	63.8	84.9
13/01/2012 08:05	63.8	54.0	64.2	83.7
13/01/2012 08:35	63.6	52.2	62.7	85.4
13/01/2012 09:05	62.8	52.5	62.5	87.7
13/01/2012 09:35	64.0	52.3	62.9	82.9
13/01/2012 10:05	82.7	65.4	77.0	104.0
13/01/2012 10:35	92.2	81.0	91.7	106.8
13/01/2012 11:05	85.3	80.2	86.5	99.8
13/01/2012 11:35	79.2	71.9	79.3	94.7
13/01/2012 12:05	67.9	59.9	68.8	92.6
13/01/2012 12:35	67.7	57.4	68.3	87.5
13/01/2012 13:05	63.6	53.8	64.1	81.4
13/01/2012 13:35	73.9	63.3	73.2	95.8

Table B4: Full Noise Measurement Results - Location 4

Period (T=30 min)	Noise Level, dB			
	L _{Aeq,T}	L _{A90,T}	L _{A10,T}	L _{AFmax}
13/01/2012 14:05	78.4	67.9	74.5	98.3
13/01/2012 14:35	74.6	57.9	69.1	94.4
13/01/2012 15:05	62.6	52.5	62.8	80.2
13/01/2012 15:35	63.7	53.1	64.3	85.5
13/01/2012 16:05	63.5	54.2	64.3	88.8
13/01/2012 16:35	63.4	52.8	62.8	88.8
13/01/2012 17:05	63.7	53.5	64.0	87.0
13/01/2012 17:35	61.0	52.3	60.8	86.7
13/01/2012 18:05	60.9	52.0	61.0	82.6
13/01/2012 18:35	60.0	52.8	59.2	81.7
13/01/2012 19:05	58.8	52.3	57.4	78.9
13/01/2012 19:35	60.4	52.7	58.9	82.0
13/01/2012 20:05	60.9	53.7	59.9	80.3
13/01/2012 20:35	59.4	53.4	58.6	79.5
13/01/2012 21:05	59.9	52.6	58.9	79.6
13/01/2012 21:35	61.7	52.5	60.0	80.6
13/01/2012 22:05	60.2	52.0	58.5	83.8
13/01/2012 22:35	58.9	51.4	57.2	81.4
13/01/2012 23:05	57.2	50.8	55.6	81.5
13/01/2012 23:35	61.3	51.2	57.2	84.8
14/01/2012 00:05	57.9	50.9	55.7	78.2
14/01/2012 00:35	56.6	50.3	54.8	78.7
14/01/2012 01:05	57.5	50.2	54.2	80.4
14/01/2012 01:35	56.2	50.1	54.8	79.7
14/01/2012 02:05	56.2	49.1	53.9	81.0
14/01/2012 02:35	55.0	48.3	53.5	80.4
14/01/2012 03:05	57.8	49.1	54.2	81.0
14/01/2012 03:35	56.9	49.1	55.1	80.2
14/01/2012 04:05	57.7	49.7	55.4	78.2
14/01/2012 04:35	58.1	50.0	55.2	80.0
14/01/2012 05:05	59.5	51.7	57.5	83.8
14/01/2012 05:35	62.2	52.3	61.3	86.9
14/01/2012 06:05	60.9	52.4	61.3	80.7
14/01/2012 06:35	60.7	52.7	61.1	80.0
14/01/2012 07:05	62.7	53.3	61.9	85.4
14/01/2012 07:35	60.7	54.0	60.1	79.7
14/01/2012 08:05	60.0	53.3	58.4	84.4
14/01/2012 08:35	61.2	53.7	60.5	84.7
14/01/2012 09:05	60.1	51.8	57.9	87.0
14/01/2012 09:35	60.2	51.4	59.0	80.5
14/01/2012 10:05	59.7	50.9	59.7	79.2
14/01/2012 10:35	60.3	51.3	60.0	81.9
14/01/2012 11:05	60.7	51.0	59.2	82.4
14/01/2012 11:35	60.6	50.1	58.2	82.9
14/01/2012 12:05	61.8	49.9	60.0	83.8
14/01/2012 12:35	59.0	49.8	57.5	80.8
14/01/2012 13:05	59.3	49.9	58.9	81.6
14/01/2012 13:35	59.8	49.9	59.6	80.1
14/01/2012 14:05	59.6	49.8	57.4	82.5
14/01/2012 14:35	59.3	50.4	58.0	83.6
14/01/2012 15:05	59.1	51.3	58.5	83.7
14/01/2012 15:35	56.9	51.9	56.9	76.3
14/01/2012 16:05	59.6	53.5	58.6	83.0
14/01/2012 16:35	58.2	53.4	58.1	81.7

Table B4: Full Noise Measurement Results - Location 4

Period (T=30 min)	Noise Level, dB			
	L _{Aeq,T}	L _{A90,T}	L _{A10,T}	L _{AFmax}
14/01/2012 17:05	58.4	53.7	58.1	81.3
14/01/2012 17:35	60.2	54.4	60.2	82.1
14/01/2012 18:05	60.3	54.5	60.7	80.4
14/01/2012 18:35	61.1	54.7	60.7	81.7
14/01/2012 19:05	60.3	54.9	59.8	79.7
14/01/2012 19:35	59.5	54.7	59.3	79.6
14/01/2012 20:05	58.5	54.3	58.9	77.4
14/01/2012 20:35	58.7	53.4	57.9	80.2
14/01/2012 21:05	57.6	53.4	57.3	80.3
14/01/2012 21:35	58.7	54.4	58.6	79.5
14/01/2012 22:05	58.6	53.9	58.2	80.7
14/01/2012 22:35	55.6	52.0	55.9	78.0
14/01/2012 23:05	53.3	51.2	54.2	72.6
14/01/2012 23:35	54.3	50.9	54.2	79.3
15/01/2012 00:05	58.6	50.8	56.2	80.3
15/01/2012 00:35	57.5	49.7	54.8	80.9
15/01/2012 01:05	54.7	50.1	54.6	77.9
15/01/2012 01:35	55.0	49.3	54.9	78.1
15/01/2012 02:05	54.3	48.7	54.1	77.0
15/01/2012 02:35	53.0	48.7	53.7	76.1
15/01/2012 03:05	54.6	48.2	53.2	79.6
15/01/2012 03:35	53.7	48.5	53.2	77.9
15/01/2012 04:05	54.7	49.6	54.0	78.4
15/01/2012 04:35	54.5	50.4	54.8	77.2
15/01/2012 05:05	55.4	52.2	55.4	81.0
15/01/2012 05:35	60.4	52.7	60.2	81.6
15/01/2012 06:05	59.6	52.7	59.1	79.4
15/01/2012 06:35	58.7	53.3	58.4	81.0
15/01/2012 07:05	59.0	54.4	58.5	82.3
15/01/2012 07:35	58.4	54.7	58.8	80.0
15/01/2012 08:05	57.8	53.7	57.9	80.6
15/01/2012 08:35	58.4	53.6	57.6	79.9
15/01/2012 09:05	58.0	53.2	57.4	79.2
15/01/2012 09:35	59.7	53.6	59.0	80.7
15/01/2012 10:05	57.4	53.2	57.5	78.3
15/01/2012 10:35	58.8	53.0	58.9	79.9
15/01/2012 11:05	61.2	53.6	61.3	83.5
15/01/2012 11:35	60.2	53.4	60.1	80.3
15/01/2012 12:05	59.2	53.6	59.1	80.6
15/01/2012 12:35	59.4	53.5	58.7	80.5
15/01/2012 13:05	59.0	53.5	58.3	81.7
15/01/2012 13:35	58.9	53.6	58.6	78.6
15/01/2012 14:05	58.5	53.2	57.9	81.9
15/01/2012 14:35	59.6	53.1	59.4	80.8
15/01/2012 15:05	58.9	53.2	58.2	82.7

Appendix C: Construction Noise

Construction Noise Assumptions Used in the Assessment

Table C.1: Construction Noise Assumptions Used in the Assessment					
Noise Sources	10m level dB(A)	L_{WA}	No.	% on	Total L_{WA} - dB
Site Preparation					
Tracked Excavator (excavation)	75	103	1	50	100
Dozer (Earthworks)	80	108	1	20	101
Dump Truck (Tipping Fill)	79	107	1	20	100
Dozer (Towing Roller)	81	109	1	20	102
Vibratory Plate	80	108	1	20	101
Hydraulic Vibratory Compactor	78	106	1	40	102
TOTAL					108.9
Foundation					
Tracked Excavator (excavation)	75	103	1	50	100
Concrete Pump	77	105	1	80	104
Tracked Mobile crane	69	97	1	80	96
Gas Cutter	67	95	1	5	82
Generator	73	101	1	100	101
Concrete Mixer Truck	77	105	1	60	103
Bore Piling Rig	83	111	1	50	108
TOTAL					111.3
Super-Structure					
Concrete Mixer Truck	77	105	1	75	104
Truck mounted concrete pump	78	106	1	100	106
Poker Vibrator	76	104	1	100	104
Mobile telescopic crane	73	101	1	50	98
Concrete Cutting (circular saw)	82	110	1	5	97
Generator	66	94	1	100	94
Tower Crane	77	105	1	50	102
TOTAL					110.7
Paving					
Spreading Shipping/Fill (Dozer)	80	108	1	20	101
Earth Works (Tracked Excavator)	80	108	1	10	98
Vibratory Roller	75	103	1	20	96
TOTAL					104