

CHAPTER 13: NOISE

Introduction

- 13.1 This chapter of the ES considers the effect of the proposed development on noise within and surrounding the site. A Glossary of acoustic terms is included in Appendix 13.1.
- 13.2 The baseline situation is considered before the likely environmental effects of the development are identified, both during the construction and operational phases of the development. Mitigation measures to reduce any negative environmental effects are identified as appropriate, before the residual environmental effects are assessed.
- 13.3 This chapter of the ES is informed by the Noise Impact Assessment (NIA) for the proposed development, which is provided as an accompanying document to the hybrid planning application and is contained in Volume 2 of the ES (ENS ref: NIA/4789/13/4515 RevA, April 2014). Whilst this Chapter of the ES considers the likely or potential impact of the proposed development on aspects of the environment which may be affected by noise, the NIA considers the likely or potential impact of the existing noise climate on aspects of the proposed development which may be affected by noise.

Methodology

- 13.4 The assessment identifies noise sensitive receptors (NSRs) adjacent to the development site, and considers the noise that will be generated by both the construction and operation of the development and associated potential impacts on the NSRs.
- 13.5 Where impacts are assessed as potentially significant, they are considered with reference to guidelines provided by national standards and good practice guides and mitigation measures recommended to control the degree of impact. Residual impacts are considered with mitigation measures in place.

Significance Criteria

- 13.6 In order to determine whether the potential environmental impacts associated with noise are significant, and require further consideration, the identified potential impacts have been categorised using the significance criteria contained in Table 13.1.

Table 13.1: Significance Criteria

Significance	Comment	Associated magnitude of impact*
Major beneficial	Considerable effects (by extent, duration or magnitude) or of more than local significance	n/a
Moderate beneficial	Limited effects which may be considered significant	n/a
Slight beneficial	Slight, very short or highly localised effects	n/a
Neutral		No change/negligible
Slight adverse	Slight, very short or highly localised effects	Minor/low
Moderate adverse	Limited effects which may be considered significant	Moderate/medium
major adverse	Considerable effects (by extent, duration or magnitude) or of more than local significance or breaching identified standards or policy	Major/high

*With reference to the classification scales described in Table 13.1, the impact significance will depend upon both the impact magnitude and the sensitivity of the receiving environment.

Planning Policy Context

The Development Plan

- 13.7 At a local level, the Development Plan comprises the saved policies of the Boston Borough Local Plan (1999) and the Boston Borough Interim Plan – Non Statutory Development Control Policy (2006).
- 13.8 Policy G1 relates to general amenity and states that permission shall only be granted for development which will not substantially harm amenities of other nearby land users or residents.

- 13.9 Policy H3 relates to the quality of housing development and states that permission shall not be granted for such developments that do not provide a pleasant environment for residents or which are close to an existing use which is likely to cause environmental problems for future residents.
- 13.10 Policy R2 relates to new recreational open space and states that permission shall be granted for new open spaces for recreational uses, together with any associated facilities, provided the proposal is unlikely to cause unacceptable environmental problems or harm the amenities of other adjacent land or residents. Policy R3 relates to new indoor leisure facilities and echoes the requirements of Policy R2. Policy R8 relates to leisure facilities in the countryside and also echoes the requirements of Policy R2.

Other Material Considerations

National Planning Policy Framework¹

- 13.11 The National Planning Policy Framework (NPPF) came into force in March 2012 and must be taken into account in the preparation of local and neighbourhood plans, and is a material consideration in planning decisions. At the heart of the NPPF is a presumption in favour of sustainable development, and the policies in paragraphs 18 to 219 of the NPPF, taken as a whole, constitute the Government's view on what sustainable development in England means in practice for the planning system.
- 13.12 The policy statement specifically in relation to noise is Paragraph 123, which states:

'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 (note: subject to the provisions of the Environmental Protection Act 1990 and other relevant law); 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.'**

13.13 Whilst the NPPF talks in general terms about 'significant adverse impacts' and the requirement to 'mitigate and reduce to a minimum other adverse impacts' it does not offer specific noise limits, but refers to the Explanatory Note to the Noise Policy Statement for England for further guidance (NPPF footnote on page 29).

Noise Policy Statement for England²

13.14 The Noise Policy Statement for England (NPSE) and associated Explanatory Note were published by DEFRA in 2010 and set out the Government's noise management strategy to enable noise management decisions to be made within the wider context (i.e. need for sustainable development), in a cost-effective manner and in a timely fashion. Fundamental to this approach is that, 'the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications'.

13.15 The noise policy aims of NPSE are to (i) avoid significant adverse impact on health and quality of life, (ii) mitigate and minimise adverse impacts on health and quality of life, and (iii) where possible, contribute to the improvement of health and quality of life. The policy aims are always to be considered in the context of sustainable development as a whole.

13.16 In relation to explaining the 'significant adverse' and 'adverse' effects quoted in the NPPF, NPSE uses the two established concepts from toxicology that are currently being applied to noise impacts, for example by the World Health Organisation (WHO), these are:

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

13.17 The NPSE then extends these concepts to lead to a SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur. No specific SOAEL values are presented in the NPSE. In lieu of specific SOAEL values, reference is made to existing guideline documents, which are summarised in the following paragraphs.

Guidance issued in support of the NPPF and the NPSE (Planning Practice Guidance: Noise)³

13.18 Further guidance in relation to the NPPF and NPSE has been published on the Planning Portal which summarises the noise exposure hierarchy, based on the likely average response. This is reproduced in Table 13.2 below:

Table 13.2: Significance Criteria (from Planning Practice Guidance: Noise)

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking	Observed Adverse Effect	Mitigate and reduce to

	more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.		a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

WHO Guidelines⁴

13.19 The World Health Organisation (WHO) Guidelines for Community Noise (1999) (WHO guidelines) sets absolute noise criteria for community noise in various specific environments.

BS 8233⁵

13.20 *BS 8233: 2014 Guidance on Sound Insulation Noise Reduction for Buildings'* (BS 8233) sets absolute noise criteria for environmental noise in various specific environments.

BS 4142⁶

- 13.21 *BS 4142: 1997* 'Method for rating industrial noise affecting mixed residential and industrial area' (BS 4142) sets out a comparative methodology for assessing the likelihood of complaint associated with industrial noise sources in a mixed residential and industrial area.

The Design Manual for Roads and Bridges (DMRB): Vol 11: Environmental Assessment⁷

- 13.22 Section 3 Part 7 of this document is that which is pertinent to noise and vibration and was published by the Department of Transport in 1993 with later amendments, the latest of which is November 2011. This document sets out procedures for undertaking the environmental assessment of new road schemes, including the assessment of noise impacts from road traffic. In particular, Section 3 Part 7 describes a method for assessing the severity of a noise impact, in terms of the number of people who will be bothered from any noise increase due to a new road scheme. In undertaking a DMRB assessment, the calculation of traffic noise levels uses the methodology contained within the Calculation of Road Traffic Noise (CRTN) document as described below.
- 13.23 Although the DMRB strictly applies to new road schemes, the principles of the approach contained within the document can also be applied to the assessment of noise from road traffic in general. The proposed development has the potential to affect road traffic noise levels along existing roads, hence the need for this assessment.
- 13.24 The DMRB assessment suggests that the magnitude of noise changes from a project should be classified into levels of impact. The November 2011 amendment to Section 3 Part 7 gives detailed consideration to how impact magnitude will be affected by whether a noise level change will occur in the short term (e.g. as a result of a sudden opening of a scheme), or whether the noise level change would occur in the long term (e.g. gradually over time, such as that associated with natural traffic growth).

13.25 The two example classification scales are duplicated in Table 13.3 (short term) and Table 13.4 (long term) below.

Table 13.3: Classification of Magnitude of Noise Impacts in the Short Term

Noise Change, $L_{A10, 18h}$, dB	Magnitude of Impact
0	No Change
0.1 to 0.9	Negligible
1.0 to 2.9	Minor / Low
3.0 to 4.9	Moderate / Medium
5.0+	Major / High

Table 13.4: Classification of Magnitude of Noise Impacts in the Long Term

Noise Change, $L_{A10, 18h}$, dB	Magnitude of Impact
0	No Change
0.1 to 2.9	Negligible
3.0 to 4.9	Minor
5.0 to 9.9	Moderate
10.0+	Major

13.26 With reference to tables 13.1, 13.2 and 13.3, 'no change' and 'negligible impact' are considered to be of neutral impact, a minor impact is considered to represent a slight adverse impact, a moderate impact is considered to represent a moderate adverse impact and a major impact is considered to represent a major adverse impact.

Calculation of Road Traffic Noise (CRTN) 1988⁸

13.27 This document sets out standard procedures for calculating noise levels from road traffic. The calculation methods use a number of input variables, including traffic flow volume, average vehicle speed, percentage of heavy goods vehicles, type of road surface, site geometry and the presence of noise barriers or acoustically absorbent ground. CRTN predicts the L10 (18hour) dB(A) or L10 (1hour) dB(A) noise level for any receptor point at a given distance, up to 300 metres, from the road.

BS 5228-1⁹

13.28 *BS 5228-1: 2009 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise'* (BS 5228-1) provides methods and data for predicting the noise levels to be expected from particular construction activity.

BS 5228-2¹⁰

13.29 *BS 5228-2: 2009 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration'* (BS 5228-2) provides recommendations for basic methods of vibration control relating to construction and open sites.

Existing Situation

Site Setting and Noise Sensitive Receptors

13.30 A detailed description of the site and proposed development scheme is provided in Chapters 2 and 3. For ease of reference, the application site is located 2 kilometres to the south of Boston town centre and is set in a predominantly residential area.

13.31 The western section of the application site to the west of the A16 is bound by:

- The A16 to the east;
- The rear of residential properties along Tytton Lane East to the north;
- The rear of residential properties along London Road to the west; and
- A residential estate to the south.

13.32 The section of the application site to the east of the A16 is bound by:

- The A16 to the west;
- The rear of residential properties along Tytton Lane East to the north; and
- Open fields to the south and east with further residential dwellings beyond.

13.33 Current proposals are for a proposed sustainable mixed-use scheme including new community stadium for Boston United Football Club, housing, retail, commercial and leisure uses.

13.34 The community stadium is to be located to the east of the A16, with the residential and (majority of the) retail/commercial aspects of the development situated to the west of the A16.

Baseline Noise Levels

13.35 In order to assess the ambient noise climate across the site, noise measurements were made as part of the NIA. Ten monitoring positions (MP1 – MP10) were used, with measurements taken at 1.5 metres above ground level in a free field environment. The approximate locations of the MPs are presented on an annotated site plan contained in Appendix 13.2.

13.36 Full details of the noise monitoring are contained in the NIA (see Volume 2 of the ES), with a summary of the representative noise measurement data at each monitoring position, rounded to the nearest decibel, presented in Table 13.5 below.

Table 13.5: Summary of Noise Measurement Data

Position	Date	Time	L _{Aeq} (dB)	L _{A90} (dB)	L _{A10} (dB)	L _{A1} (dB)	Comment
MP1	06/11/2013	10:00-10:15	71	62	74	77	Road traffic on A16 approximately 1200 vehicles per hour
MP1	06/11/2013	11:45-12:00	71	64	73	77	
MP1	06/11/2013	12:15-12:30	71	63	74	76	
MP1	07/11/2013	01:17-01:32	58	30	58	72	Road traffic on A16 (typically <77 dB LAFMax)
MP1a	06/11/2013	12:04-12:09	64	60	67	69	Road traffic on A16, (typically <70 dB LAFmax), approximately 1200 vehicles per hour
MP2	06/11/2013	10:44-10:59	68	59	72	74	Road traffic on A16, approximately 1200 vehicles per
MP2	06/11/2013	11:25-11:40	67	59	70	73	

Position	Date	Time	L _{Aeq} (dB)	L _{A90} (dB)	L _{A10} (dB)	L _{A1} (dB)	Comment
MP2	06/11/2013	12:40-12:55	69	61	71	74	hour
MP2	07/11/2013	00:49-01:04	59	35	63	72	Road traffic on A16 (typically 75 dB LAFMax)
MP2a	06/11/2013	11:02-11:17	64	58	66	68	Road traffic on A16
MP3	06/11/2013	11:09-11:24	61	57	63	65	Road traffic on A16
MP3	07/11/2013	13:30-14:00	61	57	64	65	
MP3	06/11/2013	20:37-21:07	58	51	61	65	
MP3	07/11/2013	00:32-00:47	46	30	50	56	Road traffic on A16 (typically <58 dB LAFMax)
MP4	06/11/2013	14:00-14:15	56	52	57	60	London Road, A16 and occasional traffic on Tytton Lane East
MP4	07/11/2013	11:03-11:33	53	50	55	59	
MP4	06/11/2013	23:43-23:58	39	33	43	48	Intermittent traffic on London Road and A16
MP5	06/11/2013	13:20-13:35	54	52	55	57	Distant road traffic on both London Road and the A16
MP5	07/11/2013	10:29-10:44	52	49	54	56	
MP5	07/11/2013	14:19-14:34	53	50	55	57	
MP5	06/11/2013	23:03-23:18	43	32	47	52	
MP6	06/11/2013	13:40-13:55	53	51	55	57	Distant road traffic on both London Road and the A16
MP6	06/11/2013	11:39-12:08	52	49	53	55	
MP6	07/11/2013	23:22-23:37	43	35	46	50	
MP7	06/11/2013	10:19-10:34	49	47	50	53	Distant road traffic on A16
MP7	07/11/2013	12:12-12:42	49	47	51	55	
MP7	06/11/2013	19:19-19:49	53	46	57	60	
MP7	07/11/2013	02:02-02:17	39	32	42	48	
MP8	06/11/2013	15:22-15:37	48	47	50	52	Road traffic on London Road
MP8	07/11/2013	10:03-10:18	47	46	49	51	
MP8	07/11/2013	14:40-14:55	50	48	51	56	
MP8	06/11/2013	18:58-	53	48	56	59	

Position	Date	Time	L _{Aeq} (dB)	L _{A90} (dB)	L _{A10} (dB)	L _{A1} (dB)	Comment
		19:13					
MP8	07/11/2013	01:42-01:57	38	30	42	47	
MP9	06/11/2013	14:29-14:44	59	55	61	63	Road traffic noise on A16
MP9	07/11/2013	12:54-13:24	60	55	63	66	
MP9	06/11/2013	20:02-20:32	57	50	60	63	
MP9	07/11/2013	00:10-00:25	48	32	53	58	
<p>Daytime ambient noise level \approx 71 dB L_{Aeq} (07:00–23:00) at MP1, 68 dB L_{Aeq} (07:00–23:00) at MP2, 61 dB L_{Aeq} (07:00–23:00) at MP3, 53 dB L_{Aeq} (07:00–23:00) at MP4, 52 dB L_{Aeq} (07:00–23:00) at MP5, 51 dB L_{Aeq} (07:00–23:00) at MP6, 50 dB L_{Aeq} (07:00–23:00) at MP7, 51 dB L_{Aeq} (07:00–23:00) at MP8 and 59 dB L_{Aeq} (07:00–23:00) at MP9 based on CRTN methodology</p> <p>Night time ambient noise level of \approx 62 dB L_{Aeq}(23:00–07:00) at MP1, 59 dB L_{Aeq} (23:00–07:00) at MP2 and < 55 dB L_{Aeq}(07:00–23:00) throughout the remainder of the site based on TRL methodology</p>							

13.37 Ambient noise levels varied across the development site, with elevated noise levels at locations adjacent to the road network.

Impact of Development

During Construction

13.38 Construction works have the potential to cause disturbance through noise and vibration emissions. The disturbance is, however, temporary in nature and localised.

13.39 Noise from earthworks and construction activities can be generated from a variety of sources including excavation, use of pumps, generators, delivery vehicles together with other noisy activities. The main construction activities with the potential to generate significant ground borne vibration are piled foundation options or ground improvement techniques.

13.40 Although there are techniques available to predict the likely effect of noise from earthwork / construction works, such as those contained within BS 5228: 2009: Part 1, they are necessarily based on detailed information of the type and number of plant being used, their location and the length of time they are in operation.

Sufficient detailed information upon which to base detailed construction noise calculations, such as construction techniques and equipment, is not currently available. Notwithstanding this, with traditional construction techniques, the potential impact of construction noise and earth works is considered to be **moderate adverse**.

- 13.41 It is understood that foundations could potentially be driven piles. Although this technique has the potential to create disruption, it is understood that a shallower foundation solution may not be suitable due to the ground conditions.
- 13.42 The indicative masterplan shows proposed developments (both residential and commercial) located at least 20 metres from the façades of the nearest existing residential facades (with the majority located > 30 metres). Based on manufacturers data for typical piling rigs (for reference a Junttan PM16 rig has been assessed) at a distance of 20 metres noise associated with piling activities will be < 80 dB $L_{Aeq,T}$ during piling.
- 13.43 Although a level of up to 80 dB $L_{Aeq,T}$ is considered to be high, the noise source will be temporary in nature. With reference to the Planning Practice Guidance: Noise, this will result in a temporary change in behaviour for local residents and therefore the potential impact of noise associated with piling is considered to be **moderate adverse**.

After Completion – New Non-residential Development

- 13.44 The non-residential element of the development scheme potentially consists of a number of retail and entertainment units to the west of the A16 and a community stadium to the east. These facilities have the potential to impact on both proposed and existing residential dwellings.
- 13.45 The potential impact of the retail and stadium facilities on the new and existing residential development has been addressed in the NIA contained in Volume 2 of the ES. For ease of reference, the potential impact is considered to be **major adverse** prior to mitigation due to the potential unrestricted nature of these units.

After Completion – Road Traffic

- 13.46 Annual average daily traffic (AADT) data has been provided by Northern Transport Planning Ltd, the transport consultant for the development. The data includes 2013 & 2023 baseline data, together with committed development and development scenarios.
- 13.47 The potential noise impact has been assessed by making a comparison (in terms of decibel (dB) increase in noise level) between the predicted 2023 'do nothing' scenario (i.e. difference between 2013 and 2023 base data) and the 'do something' scenario (2023 data including committed development and the proposed development). The noise change has been assessed against Table 13.4 'Classification of Magnitude of Noise Impacts in the Long Term' on the basis that the noise change will take place over a relatively long time period due to phasing of the development. The assessment is detailed in Table 13.6.

Table 13.6: Road Traffic Noise Impact Assessment

Highway	AADT 2023 Without Development	AADT Including 2023 Development	Predicted Change in ambient noise level
A16 North of Site Access	19829	22490	+0.5 dB
A16 South of Site Access	19829	20650	+0.2 dB
London Road North of Site Access	9048	10048	+0.5 dB
London Road South of Site Access	9048	10548	+0.7 dB

- 13.48 With reference to the Table 13.4 data, the significance of the impact of committed development and the proposed development highway traffic is assessed as **negligible/neutral**.
- 13.49 It is further understood that the speed limit on the A16 could potentially be reduced from 60 mph to 40 mph as a result of the proposed development. Based on the calculation methodology outlined in CRTN, this would result in a 3.4 dB reduction,

resulting in a net change in ambient noise level of -2.9 dB (north of site access) and -3.2 dB (south of site access). With this reduction in speed limit in place, the significance of the impact of road traffic along the A16 is assessed as slight beneficial.

13.50 In addition to increased vehicle numbers on existing roads, current proposals are for two existing dwellings on London Road to be demolished to allow for the formation of an access road to the proposed development. Average noise levels in the vicinity of the gardens to these dwellings was measured at circa 52 dB $L_{Aeq,(0700-2300)}$ during the daytime.

13.51 Predicted noise levels associated with development led traffic on this access road have been modelled following the calculation procedure contained in CRTN. Based on predicted traffic flows associated with the development of up to 2500 vehicles AADT accessing London Road, the predicted daytime noise level is 58 dB $L_{A10,18hour}$ at a distance of 10 metres from the nearside kerb.

13.52 For road traffic noise sources, the equivalent ambient ($L_{Aeq(0700-2300)}$) level may be calculated as follows:

- $L_{Aeq(0700-2300)} \approx L_{A10(18 \text{ hour})} - 2$

13.53 The predicted noise level associated with development led traffic is therefore calculated to be 56 dB $L_{Aeq(0700-2300)}$ at a distance of 10 metres to the kerb.

13.54 The nearside kerb of the proposed access road is situated at a distance of circa 4 metres to the residential boundary. To calculate the predicted noise level at the boundaries of the properties, point source propagation is assumed (6 dB per doubling of distance) due to the limited traffic numbers along this highway, as follows:

- Distance attenuation = $20 * \log (D1 / D2)$

where:

- $D1 = 13.5$ metres (i.e. 10 metres to the kerb and additional 3.5 metres to the

centre of carriageway)

- $D2 = \text{Distance of receiver to kerb} + 3.5 \text{ metres} = 7.5 \text{ metres}$

13.55 The predicted noise level at the residential boundary is therefore calculated to be 61 dB $L_{Aeq(0700-2300)}$. Based on existing noise levels of 52 dB $L_{Aeq,T}$ measured in the vicinity of the existing dwellings, this will result in a circa 10 dB increase in noise level.

13.56 Based on the classification scales in Table 13.4, an increase of 10 dB represents a **major adverse** impact prior to mitigation.

Mitigation Measures

13.57 Based on an assessment of the potential effects of the proposed development on the environment, four aspects of the development have been identified as potentially significant and requiring further consideration as follows:

- Potential impact of the construction phase of the development on existing local noise sensitive receptors.
- Potential impact of the operation of the introduced non-residential elements of the development on existing local noise sensitive receptors.
- Potential impact of the operation of the introduced non-residential element of the development on the residential element of the development.
- Potential impact of the proposed access road on the existing local noise sensitive receptors.

13.58 This Section considers the mitigation measures necessary to control the identified potential impacts. Additionally, good practice guidance on the control of construction noise is provided.

During construction

13.59 The control of construction noise is considered to be amenable to planning condition, requiring a restriction of hours and adherence to good construction practices. The

following measures are considered appropriate to ensure that the impact of the construction works is kept to a minimum:

- Careful selection of working methods and programme.
- Selection of the quietest working equipment available, where practicable (e.g. electric/battery powered equipment, which is generally quieter than petrol/diesel powered equipment).
- Vehicles and mechanical plant used for the purpose of the works should be fitted with effective exhaust silencers, should be maintained in good and efficient working order and operated in a manner as to minimise noise emissions.
- Where available, equipment should be used which is fitted with white noise or directional reversing alarms.
- Machines in intermittent use should be shut down in the intervening periods between work or throttled down to a minimum.
- Plant / machinery known to emit strongly in one direction should, where possible, be oriented such that noise is directed away from noise sensitive areas.
- Stationary equipment and plant should be placed so as to provide screening to other items of plant and located to provide minimum noise emissions in the direction of the nearest NSRs.
- Care should be taken when loading and unloading materials to limit impact noise.
- Vehicles waiting to enter the site in the morning should be switched off.
- Audits of site activities should be done at regular and frequent intervals during the construction programme to check that noise mitigation is being undertaken.

13.60 With the implementation of the good practice control measures (and setting of an appropriately worded planning condition) it is considered that the overall impact of noise during the earthworks / construction phase of the proposed development will be local in effect. Where activities take place in close proximity to existing receptors, effects will be of **slight adverse** impact. Where activities take place at locations more distant from the site boundaries with existing NSRs, effects of **negligible/neutral** impact are expected.

- 13.61 Due to the requirement for piled foundations, highly temporary localised noise levels of up to 80 dB $L_{Aeq,T}$ are predicted at nearby existing dwellings. In order to minimise disruption to local residents it is recommended that residents are informed of the piling schedule, with specific communication taking place with residents when piling is to be undertaken within close proximity (i.e. <40 metres) to their properties. It is further recommended that piling activities are restricted to between the hours of 08:00 and 18:00 hours (i.e. times when the majority of the population are not at home).
- 13.62 In order to mitigate against vibration, it is recommended that a schedule of vibration monitoring is prepared/undertaken to ensure that damage to residential properties (including cosmetic damage) is prevented. Monitoring should be undertaken at the site boundary nearest to the piling being undertaken.
- 13.63 BS 5228 provides guidance on acceptable vibration levels in structures, with the threshold for minor cosmetic damage given as 10 mms^{-1} . It is recommended that in the unlikely scenario of this trigger level being reached at the site boundary, piling work should be halted and condition surveys of the nearby residential properties should be put into place.
- 13.64 A number of mitigation measures are available for reducing the level of noise and vibration associated with driven piling techniques. These include the provision of a pad above the pile to cushion the blow and reducing the drop height of the hammer. Although these techniques can reduce the specific noise level associated with this activity, both increase the length of time required to drive each pile. The benefit of slightly reduced noise levels is therefore offset by the increased exposure time and hence is not recommended.
- 13.65 With the above mitigation measures and a suitable vibration monitoring scheme in place, the impact of noise and vibration associated with construction noise will be local in effect. Where activities take place in close proximity to existing receptors effects will be of moderate adverse impact. Where activities take place at locations more distant from the site boundaries with existing NSRs, effects of slight impact are expected. Details of the monitoring program will vary dependent on the proposed

layout of the development and should therefore be prepared at detailed design stage.

After Completion – New Non-residential Development

Stadium

- 13.66 The proposed stadium is located to the east of the A16. The potential impact without mitigation is considered to be **major adverse**. A 'bowl' stadium type has been proposed, this will be the most suitable stadium type in terms of noise breakout as the enclosed nature will prevent direct sight lines into the stadium.
- 13.67 The main noise source associated with the proposed stadium is due to crowd noise and noise associated with the PA (including announcements and music played before and after the matches as well as at half time).
- 13.68 It is understood that the stadium's primary purpose is to act as the home for Boston United Football Club (BUFC). BUFC plays an average of 1 home game per week (with approximately 25 home games per season), with matches generally beginning at either 15:00 hours or 19:45 hours, with occasional matches taking place at 13:00 hours. It is understood that matches will finish no later than approximately 22:30 (with the majority of matches finishing at approximately 21:45 hours). As a result, there should be no noise associated with the development outside of daytime (i.e. 07:00-23:00) hours.
- 13.69 With reference to the Planning Practice Guidance: Noise, published as supporting information to the NPPF and NPSE, **“noise that causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time”** does not represent a significant adverse effect.
- 13.70 With reference to internal ambient noise level criteria detailed in BS 8233, it is considered that designing the stadium to ensure that noise associated with its use is <40 dB $L_{Aeq,T}$ within dwellings with windows closed, satisfies the first aim of NPPF by

avoiding a significant impact, whilst designing to <35 dB $L_{Aeq,T}$ would satisfy the second aim by mitigating the noise to a minimum.

- 13.71 Assuming approximately 30 dB of attenuation for a standard thermal double glazed window within a masonry facade, the maximum free field noise level at the nearest residential facades should be no higher than 65 dB $L_{Aeq,T}$ (based on achieving an internal noise level of 35 dB $L_{Aeq,T}$).
- 13.72 As detailed in the NIA (contained in Volume 2 of the ES) the predicted free field noise level associated with crowd noise at the nearest existing facades is calculated to be 61 dB $L_{Aeq,T}$.
- 13.73 In line with the above calculations, it is recommended that the PA system is set to ensure that noise levels at the residential dwellings are no higher than 60 dB $L_{Aeq,T}$ (free field), including during times when music is being played. Careful positioning and direction of speakers should be used to ensure a suitable level is achieved within the stadium, whilst preventing an excessive level being experienced at the existing dwellings due to overspill.
- 13.74 Current proposals show that car parking is to be provided to the north, west and south of the stadium. The car parks are likely to be used very sporadically outside of match times, with the match day parking limited to two periods of heavy activity (immediately prior to and after the matches). It is therefore considered that the noise impact is likely to be **negligible**. Screening has been recommended to the northern boundary of the application site to ensure that noise associated with vehicles is mitigated to a minimum.
- 13.75 It is further recommended that the car parks to the west and south are prioritised over those to the north to further reduce the noise impact on local residents. This will require management controls to be put in place by the operator.
- 13.76 With the above mitigation measured in place, the impact of noise associated with the stadium is considered to be **slight to moderate adverse**, however mitigated to a minimum by both stadium design and limiting of the PA system.

Retail/Commercial

- 13.77 The proposed retail/commercial element of the development is located in the eastern half of the western land parcel. The potential impact without mitigation is considered to be **major adverse** due primarily to the potential impact of deliveries and noise associated with items of fixed services plant.
- 13.78 The impact of noise associated with these units will vary depending on the separation distance of each unit from the NSRs and screening provided by each unit. Based on the indicative masterplan, the greatest impact will be associated with deliveries to the food store in the southern section of the site.
- 13.79 In line with the recommendations contained in the Noise Impact Assessment, all fixed services plant associated with the proposed retail/commercial elements of the development should be controlled in line with the recommendations contained in BS 4142 to ensure an assessment of no greater than 'marginal significance'. For reference the lowest background noise levels in the vicinity of the nearest existing and proposed residential dwellings was measured at 46 dB $L_{A90,T}$ during the daytime and 32 dB $L_{A90,T}$ at night.
- 13.80 Mitigation measures for delivery yards and other operational noise sources should be confirmed during detailed design stage, however the following should be considered based on the indicative masterplan:
- Provision of an acoustic barrier around the service yard and service yard access road.
 - Provision of acoustically enhanced glazing and an alternative method of ventilation to all proposed dwellings in close proximity to and with a direct line of sight to the service yard.
 - Implementation of a quiet delivery system including enclosed docking bays.
- 13.81 24 hour deliveries may be acceptable, however this should be assessed at detailed design stage.

- 13.82 It is not possible to accurately predict noise associated with the other retail/commercial units at outline stage due to the uncertainty regarding the occupiers, however localised screening (including orientation of the proposed units) may be utilised to attenuate noise sources associated with these units. Noise associated with their operation is therefore not considered to represent a constraint to development, however noise associated with each unit should be assessed on an individual basis at detailed design stage.
- 13.83 The indicative masterplan shows some car parks are to be situated within close proximity to proposed residential boundaries/façades. An ambient noise level of 48 dB $L_{Aeq,1hour}$ has previously been measured by ENS at 10 metres from the boundary a major supermarket car park. A noise level of 48 dB $L_{Aeq,T}$ is not likely to result in any loss of amenity at either existing or proposed residential dwellings, however it is considered prudent to provide localised screening to both proposed and existing dwellings in the vicinity of proposed car parks.
- 13.84 It is considered that with the above mitigation measures in place and provided suitable mitigation is provided at detailed design stage, the impact of noise associated with the commercial/retail units will be **neutral to slight adverse**.

After Completion - New Access Road

- 13.85 Due to the proximity of existing residential dwellings to the proposed access road, the potential impact is considered to be **major adverse** due to a 10 dB increase in ambient noise level in this location.
- 13.86 In order to reduce the noise impact of the proposed access road it is recommended that acoustic barriers are provided to the north and south of this highway in the vicinity of the existing dwellings.
- 13.87 BS 5228:2009 Part 1 states "**In the absence of spectral data, as a working approximation, if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the**

sources from the receiver. High topographical features and specifically designed and positioned noise barriers could provide greater attenuation.”

- 13.88 It is calculated that a circa 2 metre high barrier will fully break the line of sight from ground floor windows and gardens to the proposed access road, reducing noise levels by circa 10 dB, to 51 dB $L_{Aeq(0700-2300)}$.
- 13.89 Based on existing noise levels of 52 dB $L_{Aeq(0700-2300)}$, development led traffic will result in an increase in overall noise level of circa 3 dB at the dwellings. With reference to the classification of magnitudes in table 13.4, such an increase is considered to represent a minor impact.
- 13.90 Although the provision of a circa 2 metre high fence is unlikely to provide any degree of attenuation to 1st floor windows, due to the residential nature of the development (and primarily daytime operations at the proposed retail/commercial units) traffic flow at night is likely to be negligible. Based on experience at similar schemes, approximately 93% of AADT vehicle traffic is likely to occur during daytime hours (0700-2300 hours), resulting in approximately 175 vehicles per hour along this access road.
- 13.91 It is therefore calculated that night time noise levels will be circa 10 dB below the predicted daytime levels of 61 dB L_{Aeq} . Furthermore, the nearest residential façade is located at a separation distance of circa 7.5 metres from the nearside kerb of the proposed access road, resulting in an additional 3 dB of distance attenuation.
- 13.92 An additional 3 dB of attenuation may also be applied to noise levels based on a 90° angle of view (assuming there are no windows to habitable rooms on the facades directly overlooking the proposed access road). The predicted free field external noise level at the existing residential facades is therefore calculated to be 45 dB $L_{Aeq,T}$.
- 13.93 Based on 15 dB for a partially open window, the predicted noise level within bedrooms is therefore calculated to be 30 dB $L_{Aeq(0700-2300)}$. This is considered to be in line with the criterion contained in BS 8233 for good internal noise levels within bedrooms at night.

13.94 With the above mitigation measures in place, the impact of noise associated with the access road will be local in effect. The overall potential impact is considered to be **slight adverse**.

Robustness of Analysis

13.95 Accurate assessment of noise associated with the retail/commercial and residential elements of the development has not been possible due to the outline nature of this element of the application.

13.96 It is recommended that the noise impact of the retail/commercial elements is dealt with on a plot by plot basis during detailed design stage. Notwithstanding this, with suitable localised screening, and appropriate selection and location of fixed services plant, it is considered that the impact of noise associated with the operation of these units can be controlled to be **negligible to slight adverse**.

13.97 The impact of construction noise on the existing noise sensitive receptors cannot be accurately calculated until a frozen detailed layout is available along with a detailed construction program including items of equipment. Notwithstanding this it is considered that construction noise may be dealt with by a suitably worded planning condition.

Summary & Conclusions

13.98 An EIA has been undertaken to assess the potential noise impacts of a proposed sustainable mixed-use scheme including new community stadium for Boston United Football Club, housing, retail, commercial and leisure uses.

13.99 This chapter of the ES is informed by the Noise Impact Assessment (NIA) for the proposed development.

13.100 In relation to the requirements of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (as amended), the

aspects of the environment which may be significantly affected include human beings and material assets as follows:

- Potential impact of the construction phase of the development on existing local noise and vibration sensitive receptors.
- Potential impact of the operation of the introduced non-residential element of the development on existing local noise sensitive receptors.
- Potential impact of the operation of the introduced non-residential element of the development on the residential element of the development.
- Potential impact of road traffic associated with the development on existing local noise sensitive receptors.

13.101 On the basis of a screening assessment using significance criteria, a number of impacts were identified as potentially significant and requiring further scrutiny using recognised acoustic guidance, standards and target criteria.

13.102 Mitigation measures have been identified to control potentially significant impacts.

13.103 On the basis of the mitigation measures identified, there are considered to be localised temporary residual **moderate, slight** and **negligible/neutral adverse** noise impacts associated with the construction phase of the proposed development, with the magnitude of impact varying depending on separation distance to the existing dwellings and the activity being undertaken. The residual noise impacts associated with the operational phase of the residential and retail/commercial aspects of the proposed development are considered to be **neutral to slight adverse**. The impact of generated traffic on the proposed access road will have a **slight adverse** impact on the existing residential dwellings either side of formed access.

13.104 The residual noise impacts associated with the proposed stadium are considered to be **slight to moderate adverse**, although mitigated to a minimum by both design and limiting of the PA system.

13.105 The impact of noise associated with increased traffic flow on local roads is considered to be **neutral**.

References

- 1 The National Planning Policy Framework 2012.
- 2 Noise Policy Statement for England, March 2010.
- 3 Planning Practice Guidance: Noise
(<http://planningguidance.planningportal.gov.uk/blog/guidance/noise/noise-guidance/>)
- 4 The World Health Organisation: 1999: Guidelines for Community Noise.
- 5 The British Standards Institute, BS 8233: 2014: Guidance on Sound Insulation Noise Reduction for Buildings’.
- 6 The British Standards Institute, BS4142: 1997: Method for rating industrial noise affecting mixed residential and industrial areas.
- 7 Department of Transport 1993 (as amended), The Design Manual for Roads and Bridges (DMRB): Volume 11: Environmental Assessment.
- 8 The Department of Transport and the Welsh Office: 1988: Calculation of road traffic noise.
- 9 The British Standards Institute, BS 5228: 2009 Noise & Vibration Control on Construction and Open Sites – Part 1: Noise.
- 10 The British Standards Institute, BS 5228: 2009 Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration.