9 Noise and vibration

Introduction

9.1 This chapter assesses the impact of the proposed development on the noise and vibration climate. In particular, it considers the potential impacts of noise and vibration on existing and proposed sensitive receptors during the construction and post-construction phases. Where appropriate, mitigation measures are specified that will minimise any significant effects.

9.2 This chapter (and its associated figure and appendices) is not intended to be read as a stand alone assessment and reference should be made to the front end of this ES as well as the cumulative effects assessment in chapter 14.

9.3 This chapter is necessarily technical in nature, and in order to assist the reader, a glossary of acoustic terminology can be found in technical appendix F1.

Legislation and policy

9.4 The applicable legislative framework is summarised as follows:

- *The Control of Pollution Act 1974*, which was introduced to cover a wide range of environmental pollution, including noise. Parts of the act have been superseded by the *Environmental Protection Act 1990* (see below)
- *The Environmental Protection Act 1990* (EPA 1990), which amongst (many) other things empowers local authorities to issue a noise abatement notice where nuisance can be proven

9.5 A summary of the relevant policy and guidance is set out below, with further details shown in technical appendix F2.

9.6 Of relevance to noise issues in the national planning policy context is Planning Policy Guidance Note 24: *Planning and Noise* (PPG24). This sets out the government's policies on noise (and vibration) related planning issues, including the considerations to be taken into account in determining planning applications for noise-sensitive developments and those activities that will generate noise. It introduces the concept of noise exposure categories (NECs) for residential development and advises on the use of conditions to minimise the impact of noise. Paragraph 173 of the draft National Planning Policy Framework (July 2011) sets out emerging policy on noise.

9.7 The Localism Bill was enacted in November 2011, thereafter becoming the Localism Act. Different parts of the Act will, however, come into effect at different times over the coming months. The Act enables Regional Spatial Strategies, including the East of England Plan, to be abolished, but this will be undertaken by statutory order by the government in due course (it is currently understood that this will be around March / April 2012), subject to

consultation. Whilst the East of England Plan remains part of the development plan until it is formally abolished, the government has advised that the proposed abolition of Regional Spatial Strategies should be regarded as a material consideration by local planning authorities when deciding planning applications. It should therefore be afforded limited weight in the determination of this planning application.

9.8 Relevant local planning guidance includes the following, as advised by South Cambridgeshire District Council (SCDC):

- SCDC's Policy NE/15: *Noise Pollution* as set out in the Local Development Framework, Development Control Policies, Development Plant Document, adopted July 2007, which requires that proposed developments do not have an unacceptable noise impact on sensitive receptors, and are not themselves subject to unacceptable noise levels from existing sources
- SCDC's District Design Guide: High Quality and Sustainable Development in South Cambridgeshire
- SCDC's supplementary planning guidance *Open Space in New Development* (adopted January 2009)

9.9 Further guidance is set out in British Standards and guidance documents, including:

- BS4142: 1997 *Method for rating industrial noise affecting mixed residential and industrial areas*
- BS7445: 2003 Part 1 and 1991 Parts 2 and 3: *Description and measurement of environmental noise*
- BS 5228-1:2009 *Noise control on construction and open sites* Part 1 *Noise*
- BS 5228-2:2009 *Noise control on construction and open sites* Part 2 *Vibration*
- BS 6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings* Part 1: *Vibration sources other than blasting*
- BS 7385: 1993: Part 2 *Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration*
- BS 8233: 1999 *Sound insulation and noise reduction for buildings – Code of practice*
- World Health Organisation (WHO) (2000) *Guidelines for Community Noise*
- The Building Regulations 2000. *The Building Regulations. Resistance to the passage of sound'. Approved Document E* (2003)
- Department for Education and Science, *Building Bulletin (BB) 93* (2003)
- Department of Transport / Welsh Office (1988), *Calculation of Road Traffic Noise* (CRTN)
- *The Noise Insulation Regulations* 1975, as amended 1988
- The Highways Agency, Scottish Government, Welsh Assembly and The Department for Regional Development Northern Ireland

(November 2011) *The Design Manual for Roads and Bridges* (HD213/11)
- Institute of Acoustics / Institute of Environmental Management and Assessment *Draft Guidelines for Noise Impact Assessment*

Methodology

Scope of the assessment

9.10 In accordance with the noise and vibration section of the scoping report and the scoping opinion received from SCDC, this chapter of the ES considers the following impacts:

Impacts during the construction phase
- Construction noise and vibration on sensitive receptors within the proposed development
- Construction noise and vibration on existing sensitive receptors in the area of the proposed development

Impacts during the post-construction phase
- Noise and vibration impact on sensitive receptors within the proposed development
- Noise and vibration impact from the proposed development on existing sensitive receptors in the vicinity of the proposed development

Extent of the study area

9.11 The study area includes regions within and beyond the site boundary. The extent of the study area beyond the site is largely defined by the proximity of existing noise-sensitive uses to the site (figure 9.3). This area includes dwellings within the village of Longstanton to the west and south west of the site. Receptors further away are also considered in the post-construction road traffic noise assessment.

Consultation

9.12 SCDC's environmental health department was consulted to agree the survey and assessment methodologies. Details of these consultations can be found in technical appendix F3.

Method of baseline data collection

9.13 Baseline noise measurements were undertaken in 2003, 2004 and 2006 for the purpose of previous planning applications for the proposed Northstowe development.

9.14 The above surveys included measurements at 23 receptors, and in most cases were over a period of at least 24 hours. It is recognised that the noise climate may have changed since previous measurements were undertaken, particularly

in parts of Longstanton, due to the recent opening of the Longstanton western bypass. The 23 receptors locations were identified with respect to the outline planning application for the overall Northstowe development and therefore included some receptors that are not relevant to this phase 1 application.

9.15 A validation noise survey has been undertaken at locations agreed with SCDC in order to determine any changes to the noise climate since the previous surveys were undertaken. Where possible, the exact locations where previous measurements were undertaken have been chosen. Figure 9.1 shows the previous noise monitoring locations (taken from the 2007 ES for the wider site) and figure 9.2 shows the 2011 monitoring locations.

9.16 The validation noise survey was undertaken between Monday 19 September and Thursday 22 September 2011. Unattended measurements were undertaken at three locations and short term attended measurements were undertaken at two locations. Table 9.1 details the noise monitoring locations.

Table 9.1: Noise monitoring locations – validation survey

Position	Description	Measurement Information	Previous Monitoring Location
1	Elm Cottage, Longstanton	Unattended long term	11
2	Greysley House, Longstanton	Unattended long term	18
3	Striplands Farm, Longstanton	Unattended long term	23
4	86 Rampton Drift, Longstanton	Attended short term	10
5	Magdalene Close, Longstanton	Attended short term	13

9.17 Position 1 was chosen as it is the closest to the Longstanton western bypass, which has opened since the previous surveys were undertaken. Position 2 is the closest measurement position to the route of the Cambridgeshire Guided Bus (CGB), which has become operational since the previous surveys. Position 3 was also selected due to the potential change in noise climate as a result of the opening of the bypass. Measurements at each of these positions were undertaken between approximately midday on 19 September and approximately 13:00 hours on 22 September 2011.

9.18 Positions 4 and 5 were selected due to their proximity to phase 1 of the proposed development. At these positions, non-consecutive 15 minute measurements were undertaken on Monday 19 September and Thursday 22 September, to total one hour at each location during the daytime period only.

9.19 Details of the equipment used are shown in technical appendix F4. The sound level meters were calibrated before and after measurements, with no significant drift in calibration being found to have occurred. An accredited laboratory calibrated the equipment not more than two years prior to the measurements being made, with the exception of the calibrator, which is calibrated annually.

9.20 The weather conditions during the surveys were suitable for noise measurements, being dry with light winds.

Significance criteria

9.21 The assessment of potential impacts as a result of the proposed development has taken into account both the construction and post-construction phases. The methodologies used in the assessment are based on BS5228: 2009 *Noise and vibration control on construction and open sites* Part 1 *Noise* for construction noise (table 9.2), BS5228: 2009 *Noise and vibration control on construction and open sites* Part 2 *Vibration* for construction vibration (table 9.3) and guidance set out in the *Design Manual for Roads and Bridges* and *Draft Guidelines for Noise Impact Assessment* for road traffic (table 9.4). The assessment methodology is explained in more detail in technical appendix F2.

Table 9.2: Construction noise criteria

Noise level	Scale of effect	Significance of effect
≤65 dB $L_{Aeq,T}$	Negligible	Insignificant
66 to 70 dB $L_{Aeq,T}$	Small adverse	
71 to 75 dB $L_{Aeq,T}$	Medium adverse	Significant
≥76 $L_{Aeq,T}$	Large adverse	

T – the time period over the core working day

Table 9.3: Construction vibration criteria

Peak Particle Velocity (PPV) mms^{-1}	Scale of effect	Significance of effect
≤0.3	Negligible	Insignificant
0.4 – 0.9	Small adverse	
1.0 – 4.9	Medium adverse	Significant
≥5	Large adverse	

Table 9.4: Post-construction road traffic noise criteria

Change in noise level dB(A)	Scale of effect	Significance of effect
>+5.0	Large adverse	Significant (adverse)
+3.0 to +4.9	Medium adverse	
+1.0 to +2.9	Small adverse	Insignificant
0 to +0.9	Negligible	
0 to -0.9	Negligible	
-1.0 to -2.9	Small beneficial	
-3.0 to -4.9	Medium beneficial	Significant (beneficial)
>-5.0	Large beneficial	

Baseline

9.22 As described above, a baseline survey was undertaken between 19 and 22 September 2011, during which measurements were carried out at five locations.

9.23 The measured daytime and night-time noise levels are summarised in table 9.5 and shown in full in technical appendix F5. The daytime (07:00 to 23:00

hours) and night-time (23:00 to 07:00 hours) periods accord with the guidance contained in PPG24.

Table 9.5: Summary of measured noise levels, dB (free-field)

Position	Period	Measured Noise Levels, dB			
		$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{AFmax}
1 - Elm Cottage	Day	56.0 – 58.7	47.9 – 49.8	58.6 – 61.1	78.0
	Night	46.8 – 51.3	38.3 – 39.8	47.1 – 52.5	74.9
2 - Greysley House	Day	64.6 – 64.7	49.1 – 49.7	68.5 – 68.7	92.4
	Night	59.0 – 60.1	35.9 – 38.7	54.7 – 55.0	84.3
3 - Striplands Farm	Day	57.5 – 57.8	45.6 – 46.0	60.2 – 60.7	80.5
	Night	48.2 – 48.8	34.8 – 37.5	44.0 – 46.2	74.9
4 - 86 Rampton Drift *	Day	52.5	45.4	53.2	72.1
5 – Magdalene Close*	Day	45.9	40.5	46.1	64.2

*Average of short term measured noise levels

9.24 A comparison of the 2011 measured noise levels and the previous noise levels (technical appendix F6) shows that, as expected, the Longstanton western bypass and the CGB have increased the noise levels at some receptors. The greatest increases can be seen at position 1 (Elm Cottage) and position 2 (Greysley House), where noise levels have increased in the region of 11 dB since the previous noise surveys. Increases in the region of 11 dB can be seen during the daytime at position 1 and during both the daytime and night-time at position 2. It is expected that the increase at position 1 is a result of the bypass and the increase at position 2 is a result of both the bypass and the CGB. These differences will be applied to the previously measured levels to determine the revised baseline noise levels at these locations.

9.25 There is no considerable change in the noise climate at position 3 (Striplands Farm), where there is a difference of between +1 dB and -1 dB during the daytime and night-time noise levels respectively. The results of the 2011 unattended long term monitoring will be used in this assessment.

9.26 With respect to the short term measured noise levels at positions 4 and 5, an increase in daytime noise levels of 5.5 dB can be seen at Rampton Drift and an increase in 1.5 dB at Magdalene Close. These differences in the daytime noise levels will be applied to the previously measured noise levels to determine the revised baseline daytime noise levels at these locations. It has been assumed that the night-time noise levels have not increased since the last surveys.

9.27 The sensitive receptors at which assessments have been undertaken are shown in figure 9.3. Noise measurements were undertaken at Ladywalk during previous surveys, the results of which will be used in this assessment. The noise climate at the proposed receptors has been derived considering the post-construction road traffic noise and the CGB. The sensitive receptors are as follows and are all considered to have a medium sensitivity to noise:

1. Greysley House / Orchard Cottage, Station Road, Longstanton.
2. Striplands Farm, Longstanton.

3. Rampton Drift, Longstanton.
4. Magdalene Close, Longstanton.
5. Ladywalk, Longstanton.
6. Hatton Park Primary School, Longstanton.
7. Dwellings on the proposed development.

Future baseline

9.28 The post-construction road traffic noise assessment and site suitability assessment have used road traffic flows provided by WSP Property and Development (WSP P&D), who has undertaken the transport assessment. The results of the transport assessment are presented in technical appendix D.

9.29 If the proposed development were not to go ahead, no significant changes are expected to the future baseline noise climate.

Effects during construction

9.30 It is inevitable that with any scheme of a scale similar to the proposed development there will be some disturbance caused to those nearby during the construction phase. However, disruption due to construction will be localised and temporary.

9.31 The noise and vibration levels are attenuated by distance from the source; the greater the distance between the source and receptor, the lower the noise and vibration at that receptor. Features between the source and receptor also help to obstruct the transmission and passage of noise. When works are being conducted where a line of sight to the plant is obscured, or the works are contained within a building or structure, a significant reduction in noise levels will be experienced.

9.32 An assessment of the effects of noise and vibration during the construction phases has been carried out in accordance with the methodology detailed above and in technical appendix F2. The following four phases have been considered:

- Phase 1-1 (years 1 to 3)
- Phase 1-2 (years 2 to 4)
- Phase 1-3 (years 3 to 5)
- Phase 1-4 (years 4 to 6)

9.33 There is some information available regarding the construction methodology and, where appropriate, this has been used to inform the calculations. A list of the assumed construction plant is shown in technical appendix F7.

Effects of construction noise affecting existing and proposed sensitive receptors

9.34 Noise levels and the likely effects during the works associated with the above phases have been predicted at nearby existing and propose noise-sensitive premises (as shown on figure 9.3), which are considered to represent those receptors that are likely to be exposed to construction noise:

1. Greysley House / Orchard Cottage, Station Road (to the north of the site).
2. Striplands Farm, Longstanton (to the west of the site).
3. Rampton Drift, Longstanton (to the south of the site).
4. Magdalene Close, Longstanton (to the south west of the site).
5. Ladywalk, Longstanton (to the west of the site).
6. Hatton Park Primary School, Longstanton (to the west of the site).
7. Dwellings on the proposed development.

9.35 The worst-case scenario where plant are operating at the closest point to the receptor during each phase has been considered. It has been assumed that the intervening ground between the construction sources and the noise-sensitive properties is acoustically hard such that there is no attenuation of sound due to ground absorption.

9.36 The predicted construction noise levels are shown in table 9.6 for the four construction phases listed above.

Table 9.6: Predicted construction noise levels ($L_{Aeq,10hours}$) façade					
Receptor	**Activity**	**Predicted noise level $L_{Aeq,10hours}$, dB**			
		Phase 1-1	**Phase 1-2**	**Phase 1-3**	**Phase 1-4**
Greysley House / Orchard Cottage	Demolition	54	N/A	N/A	N/A
	Site preparation	62	52	N/A	N/A
	Foundations	56	52	51	53
	Building erection	54	50	49	52
	Infrastructure	54	48	47	50
Striplands Farm, Longstanton	Demolition	63	N/A	N/A	N/A
	Site preparation	65	53	N/A	N/A
	Foundations	64	54	49	50
	Building erection	63	52	48	48
	Infrastructure	53	52	46	46
Rampton Drift, Longstanton	Demolition	48	N/A	N/A	N/A
	Site preparation	51	55	N/A	N/A
	Foundations	51	54	54	51
	Building erection	49	53	53	49
	Infrastructure	47	52	52	47
Magdalene Close, Longstanton	Demolition	51	N/A	N/A	N/A
	Site preparation	68	68	N/A	N/A
	Foundations	52	61	51	49
	Building erection	50	60	49	48
	Infrastructure	49	59	47	46
Ladywalk, Longstanton	Demolition	58	N/A	N/A	N/A
	Site preparation	64	64	N/A	N/A
	Foundations	55	55	50	50
	Building erection	54	54	48	48
	Infrastructure	54	53	46	46
Hatton Park Primary School, Longstanton	Demolition	52	N/A	N/A	N/A
	Site preparation	66	66	N/A	N/A
	Foundations	52	55	49	49
	Building erection	50	54	48	47
	Infrastructure	50	53	46	45
Dwellings on the proposed development	Demolition	N/A	N/A	N/A	N/A
	Site preparation	77	76	N/A	N/A
	Foundations	75	75	79	75
	Building erection	74	74	78	74
	Infrastructure	74	74	77	77

9.37 It can be seen by comparing the predicted noise levels in the tables above with the construction noise criteria in table 9.2 that at all receptors, except the dwellings on the proposed development, there will be a short term negligible or small adverse (insignificant) effect.

9.38 At the dwellings on the proposed site there will be a short term medium or large adverse (significant) effect, depending on the construction phase and the works being undertaken.

9.39 The predicted construction noise level at Hatton Park Primary School during the site preparation of phases 1-1 and 1-2 will be 66 dB $L_{Aeq,10hours}$. At other times, the predicted construction noise levels at Hatton Park Primary School will be 55 dB or below.

Effects of construction vibration affecting existing and proposed sensitive receptors

9.40 In accordance with the methodologies and criteria detailed above and in technical appendix F2, table 9.7 shows the predicted levels of vibration that are likely during vibro-piling. At this stage, the method of piling (if required) has not been determined. However, the assessment below has been undertaken to provide an indication of likely levels. In each instance, the closest position to the receptor on the site where piling may occur has been used. The assessment considers the reasonable worst-case where there is a 5% probability that the level will be exceeded. The highest levels are presented below and these are likely to be experienced during start up and run down.

Table 9.7: Predicted vibration levels during piling

Position	Peak Particle Velocity	Vibration effect
Greysley House / Orchard Cottage	0.27	Negligible (insignificant)
Striplands Farm, Longstanton	0.94	Small (insignificant)
Rampton Drift, Longstanton	0.21	Negligible (insignificant)
Magdalene Close, Longstanton	0.58	Small (insignificant)
Ladywalk, Longstanton	0.28	Negligible (insignificant)
Hatton Park Primary School, Longstanton	0.25	Negligible (insignificant)
Dwellings on the proposed development	7.31	Large (significant)

9.41 It can be seen from the table above that there will be a short term negligible (insignificant) effect at Greysley House, Rampton Drift, Ladywalk and Hatton Park Primary School during reasonable worst-case piling. There will be a short term small (insignificant) effect at Striplands Farm and Magdalene Close and a short term large (significant) effect at the dwellings on the proposed development.

Effects post-construction

Effects of road traffic noise from the proposed development affecting sensitive receptors

9.42 This assessment considers the permanent post-construction effects of the proposed development on the wider road network. The assessment has been carried out for 2015, 2018 and 2021, which are the opening year, interim year and year of completion respectively. The assessment years have been agreed with SCDC during consultation.

9.43 The assessment has been undertaken using traffic flow data provided by WSP P&D. A notional receptor at 10 metres from the road has been used, as it is the difference in noise levels that is important rather than the absolute noise levels at the receptors.

9.44 Tables 9.8, 9.9 and 9.10 detail the difference between the future baseline and with development traffic for 2015, 2018 and 2021 respectively.

Table 9.8: Post-construction road traffic noise assessment – 2015, dB $L_{A10,18hour}$

Road	2015 predicted noise level		Difference
	Future baseline	With development	
Station Road	69.2	69.1	-0.1
Rampton Road	64.9	65.2	+0.3
Ramper Road	60.0	61.2	+1.2
High Street	60.9	61.5	+0.6
B1050	69.6	69.8	+0.2
Bucking Way Road	65.0	65.2	+0.2
School Lane	62.1	62.2	+0.1
Oakington Road	70.5	70.5	0
Hatton's Road	71.7	72.0	+0.3
Water Lane	69.0	69.1	+0.1
Dry Drayton Road	70.8	70.8	0
A14 north of J28	81.1	81.1	0
A14 south of J28	81.6	81.6	0
A14 south of J29	82.6	82.5	-0.1
A14 south of J30	82.2	82.3	+0.1

Table 9.9: Post-construction road traffic noise assessment – 2018, dB $L_{A10,18hour}$

Road	2018 predicted noise level		Difference
	Future baseline	With development	
Station Road	69.3	69.2	-0.1
Rampton Road	65.3	65.6	+0.3
Ramper Road	60.4	62.2	+1.8
High Street	61.5	62.4	+0.9
B1050	69.7	70.0	+0.3
Bucking Way Road	65.0	65.5	+0.5
School Lane	62.3	62.6	+0.3
Oakington Road	70.6	70.5	-0.1
Hatton's Road	71.9	72.3	+0.4
Water Lane	69.1	69.1	0
Dry Drayton Road	70.9	70.8	-0.1
A14 north of J28	81.2	81.2	0
A14 south of J28	81.8	81.8	0
A14 south of J29	82.7	82.7	0
A14 south of J30	82.4	82.4	0

Table 9.10: Post-construction road traffic noise assessment – 2021, dB $L_{A10,18hour}$

Road	2021 predicted noise level		Difference
	Future baseline	With development	
Station Road	69.4	69.3	-0.1
Rampton Road	65.5	66.0	+0.5
Ramper Road	60.9	62.9	+2.0
High Street	62.0	62.9	+0.9
B1050	69.8	70.2	+0.4
Bucking Way Road	65.1	65.8	+0.7
School Lane	62.5	62.7	+0.2
Woodside	61.4	61.4	0
Oakington Road	70.6	70.5	-0.1
Hatton's Road	72.1	72.5	+0.4
Water Lane	69.2	69.1	-0.1
Dry Drayton Road	70.9	70.8	-0.1
A14 north of J28	81.3	81.4	+0.1
A14 south of J28	81.9	81.9	0
A14 south of J29	82.8	82.8	0
A14 south of J30	82.6	82.6	0

9.45 It can be seen from the tables above that the greatest difference in road traffic noise levels in 2015 is +1.2 dB, in 2018 is +1.8 dB and in 2021 is +2.0 dB. In each instance, the greatest impact is on Ramper Road. With the exception of Ramper Road, all other impacts are less than +1.0 dB.

9.46 As expected, the impacts on the roads closest to the development generally increase over the three assessment years and it can be seen that as the development progresses the road traffic noise impacts generally become greater.

9.47 By comparing the predicted road traffic noise levels with the effect scale detailed in table 9.5, it can be seen that, with the exception of Ramper Road, during all three assessment years there will be differences of up to 0.9 dB as a result of the development. At receptors on these roads there will be a long term negligible (insignificant) effect.

9.48 At Ramper Road there will be differences of up to +2 dB, which will be a long term small adverse (insignificant) effect.

Effects of mechanical noise from fixed plant items on the proposed development affecting sensitive receptors

9.49 The parameter plans show that the proposed development includes, amongst other things, an employment area and household recycling centre in the north, with a mixed use local centre immediately to the south and a primary school in the central area of the site. There will potentially be fixed plant items associated with these uses.

9.50 At this stage the exact type, location and number of such items are not known, therefore it is not possible to undertake an assessment to determine the potential impact at both the existing and proposed noise-sensitive receptors.

9.51 It is therefore appropriate to set an overall noise limit for fixed plant items. The noise limits are based on the guidance in British Standard 4142: 1997 and the requirements of SCDC, as set out in technical appendices F2 and F3 respectively.

9.52 Table 9.11 shows the noise design criteria that must be achieved at all noise-sensitive receptors (both at existing and proposed dwellings and at the proposed school).

9.53 The noise limits are set for both the daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) periods and are derived from the lowest measured one hour daytime and night-time background noise level (L_{A90}) at positions 1, 4 and 5, which are respectively representative of:

1. The existing dwellings on Station Road, including Orchard Cottage and Greysley House.
2. Proposed new dwellings and Rampton Drift, Longstanton.
3. The existing dwellings on Magdalene Close in Longstanton.

Table 9.11: Noise limits for new mechanical plant, free-field, dB $L_{Ar,T}$

Location	Period	Measured background noise level (L_{A90})	Noise limit ($L_{Ar,T}$)
Orchard Cottage / Greysley Farm	Daytime	34	24
	Night-time*	30	20
Rampton Drift / proposed residential areas	Daytime	32	22
	Night-time*	22	12
Magdalene Close	Daytime	34	24
	Night-time*	23	13

*The night-time background noise levels and rating levels are too low for BS 4142 to be applied.

9.54 The above limits apply to the overall plant noise level and individual items of plant may need to be designed to achieve a lower level such that the overall noise limit is not exceeded.

9.55 The measured night-time background noise levels are 30 dB or below and the night-time noise limits (set as rating levels) are below 35 dB. BS 4142 does not apply where levels are this low; therefore, it is necessary to consider an alternative method for assessing noise from the proposed plant.

9.56 SCDC's *District Design Guide SPD* (adopted March 2010) states:

> "In applying BS 4142, due to the relative noise methodology employed the significance of absolute noise levels detailed in BS 8233 should not be ignored and SCDC outdoor and indoor noise level standards / criteria for noise sensitive development will also need to be considered".

9.57 The absolute noise levels detailed in BS 8233 and table 2 of SCDC's *District Design Guide SPD* are:

1. External private amenity areas – 50 dB $L_{Aeq,T}$.
2. Bedrooms (between 23:00 and 07:00 hours) – 30 dB $L_{Aeq,T}$ and not greater than 45 dB $L_{Amax(fast)}$.
3. Living and dining rooms (between 07:00 and 23:00 hours) – 35 dB $L_{Aeq,T}$.

9.58 The above absolute noise levels should be considered in conjunction with the noise limits set out in table 9.11. However, in this instance BS 4142 is not applicable for the night-time period and the above internal noise levels for bedrooms should be considered as the design criteria.

Effects of noise from the employment area and household recycling centre on the proposed development affecting sensitive receptors

9.59 At this stage of the proposals there is little information available regarding the proposed employment area and household recycling centre to enable assessment.

9.60 Any fixed plant items associated with the employment area and household recycling centre will be selected to comply with the noise limits stated in table 9.11 above. An assessment should be undertaken at the detailed design stage to ensure that fixed plant noise limits will be achieved.

9.61 However, mobile noise sources may also be present, particularly at the household recycling centre where heavy goods vehicles and cars are likely to be in use. Again, at this stage there is little information available; therefore, an assessment will be undertaken at the detailed design stage to ensure that the adjacent residential areas (both existing and proposed) are not subject to unacceptable noise levels.

Effects of noise from the sports pitches on the proposed development affecting sensitive receptors

9.62 The proposed sport pitches are in the region of 70 metres from the closest existing dwellings (on Magdalene Close) and approximately 20 metres from the proposed dwellings. At this stage, the types of sports pitches and frequency and times of use are not known; therefore, it is not possible to undertake an assessment to determine the potential impact. An assessment should be undertaken at the detailed design stage to predict noise levels and derive suitable mitigation measures.

9.63 The guidance in SCDC's supplementary planning guidance *Open Space in New Developments* (adopted January 2009) should be followed, where practicable. The guidance states minimum buffer zones for different types of outdoor spaces and these should be considered alongside the proposed frequency and times of use.

Site suitability

Existing noise affecting the proposed residential development

9.64 An assessment has been carried out in accordance with the noise exposure categories of PPG24 to determine the suitability of the site for residential development.

9.65 The noise sources that have been considered in this section are:

1. Road traffic from the B1050 Station Road.
2. Road traffic from the primary road within the development itself.
3. The CGB.

9.66 To comply with PPG24, the noise levels should be measured or determined on an open site at the position of the proposed dwellings and at a height of 1.2 to 1.5 metres above the ground. Where this is not the case it is necessary to correct the measured levels so that they are representative of the position of the closest proposed façade to the road.

Road traffic noise levels

9.67 Noise levels from the B1050 Station Road and the primary road within the development itself have been calculated from traffic flow data for the year 2021 (with the development) to ensure that the assessment considers the future scenario.

9.68 Figure 2.2a (land use parameter plan) in chapter 2 of this ES shows that there will be parcels of residential development fronting both Station Road and the primary road within the site itself. However, at this stage, the exact distance between the roads and the closest dwellings are not known; therefore, a distance of 10 metres has been assumed. This assessment will be repeated at the detailed design stage when a proposed layout is available.

9.69 The calculated noise levels at 10 metres from the B1050 and the primary road within the development are 66.2 dB $L_{Aeq,16hour}$ and 60.1 dB $L_{Aeq,16hour}$ respectively.

9.70 The night-time noise levels have been calculated, considering the difference between the measured daytime and night-time noise levels at Striplands Farm (measurement position 3), which is adjacent to the B1050. The derived night-time noise levels for the B1050 and the primary road within the development are 57.2 dB $L_{Aeq,8hours}$ and 51.1 dB $L_{Aeq,8hours}$ for the B1050 and the primary road within the development respectively.

Cambridgeshire Guided Bus

9.71 The noise level for a CGB pass-by has been obtained from the measurements undertaken at position 2 (Greysley House), which were made at a distance of approximately 20 metres from the tracks. A noise level of 80.6 dB L_{AE} has

been calculated from the measured one second L_{Aeq} noise levels. Figure 2.2a shows that there is a buffer of approximately 50 metres between the CGB and the closest proposed residential area. A distance correction of -4 dB has therefore been applied to derive the noise level at 50 metres from the track.

9.72 It has been assumed that during the daytime (07:00 to 23:00 hours) there is a bus every ten minutes in each direction and also one Whippet bus per hour in each direction. During the night-time (23:00 to 07:00 hours), 12 buses and two Whippets are assumed.

9.73 On the basis set out above, the daytime and night-time noise levels at 50 metres due to the CGB alone are 52.5 dB $L_{Aeq,16hours}$ and 43.5 dB $L_{Aeq,8hours}$ respectively.

PPG 24 assessment

9.74 Table 9.12 shows the PPG 24 assessment for the proposed residential areas closest to the three noise sources detailed above.

Table 9.12: PPG 24 assessment, dB $L_{Aeq,T}$

Location	Period	Derived noise level	NEC	Overall NEC
1. 10 m from the B1050	Daytime	66	C	C
	Night-time	57	B/C	
2. 10 m from the primary site road	Daytime	60	B	B
	Night-time	51	B	
3. 50 m from the CGB	Daytime	53	A	A
	Night-time	44	A	

9.75 Table 9.9 shows that the proposed residential area at 10 metres from the B1050 is exposed to road traffic noise levels in NEC C of PPG 24. The proposed residential area at 10 metres from the primary site access road is exposed to noise levels in NEC B and at 50 metres from the CGB the site is exposed to noise levels in NEC A.

9.76 The following guidance to local authorities is set out in PPG 24 for sites exposed to noise levels in NEC C:

> "Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no other alternative sites available, conditions should be imposed to ensure a commensurate level of protection against noise."

9.77 For sites in NEC B the following guidance is provided:

> "Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise."

9.78 For sites in NEC A the following guidance is provided:

> "Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level."

9.79 The assessment in accordance with the NECs of PPG24 demonstrates that, although the site is exposed to transportation noise, it is suitable for residential development. However, it will be necessary to include mitigation measures in the scheme design to ensure that internal noise levels in habitable rooms and external noise levels in amenity areas are acceptable and meet the requirements of SCDC.

9.80 Mitigation measures for the proposed residential dwellings are set out later in the chapter.

Existing noise affecting the proposed primary school

9.81 The guidance set out in BB93 has been adopted for the assessment of noise at the proposed primary school. The assessment relates to future internal noise levels within teaching classrooms and external noise levels within outdoor teaching areas.

9.82 The noise levels at the proposed primary school are likely to be dominated by road traffic on the primary road within the development itself.

9.83 The one hour noise level has been estimated from the AM peak hour traffic flow. An $L_{A10,1hour}$ noise level of 65.3 dB has been predicted. As set out in the Noise Advisory Council's *A Guide to Measurement and Prediction of the Equivalent Continuous Noise Level L_{eq}*, the $L_{Aeq,1hour}$ noise level can be estimated by subtracting 3 dB from the $L_{A10,1hour}$ value. A noise level of 62.3 dB $L_{Aeq,1hour}$ is therefore predicted at 10 metres from the road.

9.84 It is recognised that a 30 minute noise level is specified in BB93. However, in the absence of measured noise levels, the worst-case AM peak hour noise level will be considered representative of the worst-case 30 minute noise level.

9.85 Although the predicted noise level is higher than the criteria of 50 to 55 dB $L_{Aeq,30mins}$, it is expected that areas further back from the proposed primary road and those areas that are screened by the proposed buildings will be exposed to lower road traffic noise levels and are likely to meet the criteria.

Mitigation

Construction noise affecting existing and proposed sensitive receptors

9.86 A short term negligible or small adverse (insignificant) effect is predicted at all receptors, except the dwellings on the proposed development where there will be a short term medium or large adverse (significant) effect, depending on the construction phase and type of work being undertaken. Furthermore, the

predicted construction noise level at Hatton Park Primary School during the site preparation of phases 1-1 and 1-2 is predicted to be 66 dB $L_{Aeq,10hours}$.

9.87 The occupation of dwellings on the site should be carefully considered and noise calculations undertaken where necessary to ensure that future residents are not exposed to unacceptably high noise levels.

9.88 It is recommended that the site preparation works in phases 1-1 and 1-2 immediately adjacent to Hatton Park Primary School shall have regard to the effective operation of the school and that restricted hours of working and the use of quieter plant should be adopted wherever practicable.

9.89 It is recommended that further calculations are undertaken when sufficient information becomes available and mitigation measures reviewed, where necessary.

9.90 With the above recommendations in place it is considered that the effects will be reduced to insignificant.

9.91 However, it is considered important that the following best practice measures should be integrated into the construction methodologies, where feasible, together with the additional measures set out in the Construction Management Strategy submitted in support of the application:

1. Noisy works should be conducted within the core hours (to be agreed with SCDC), whilst work outside of these hours would be inaudible at the site boundary.
2. 'Best Practicable Means' as defined in Section 72 of the Control of Pollution Act 1974 should be adopted to minimise noise.
3. Guidance given in BS 5228: 2009 Part 1 (Annex B Noise sources, remedies and their effectiveness) should be followed.
4. Best construction practices and methods should be used in executing the construction works so as to avoid or reduce noise and vibration as far as possible. Only plant that conforms to the relevant European Union noise emission standards as defined in EC Directive 86/662/EEC (and any subsequent amendments) should be used during construction of the proposed development.
5. All plant items brought to the site should be properly maintained, provided with effective silencers and operated in a manner so as to avoid causing excessive noise.
6. All items of plant operating on the site in intermittent use should be shut down in the intervening periods between use.
7. All stationary plant should be located as far as possible from occupied dwellings as agreed with the site manager.

Construction vibration affecting existing and proposed sensitive receptors

9.92 A short term negligible (insignificant) effect has been predicted at Greysley House, Rampton Drift, Ladywalk and Hatton Park Primary School during worst-case piling. There will be a short term small (insignificant) effect at

Striplands Farm and Magdalene Close and a short term large (significant) effect at the dwellings on the proposed development.

9.93 As recommended for noise mitigation, the occupation of dwellings on the site should be carefully considered to ensure that future residents are not exposed to unacceptably high levels of vibration from construction works.

9.94 With the above measures in place the effects will be reduced to insignificant.

Road traffic noise from the proposed development affecting sensitive receptors

9.95 The assessment has shown that there will be insignificant effects on all roads for each of the three assessment years. As the effects are insignificant, no mitigation measures are considered necessary.

Mechanical noise from fixed plant items on the proposed development affecting sensitive receptors

9.96 As there is no information available at this early stage, it has not been possible to undertake an assessment of noise from fixed plant items and therefore no mitigation measures are recommended at this stage. However, an assessment will be undertaken at the detailed design stage and mitigation measures will be specified to ensure that the overall plant noise limits set out in table 9.11 are achieved.

Noise from the employment area and household recycling centre on the proposed development affecting sensitive receptors

9.97 There is insufficient information available at this stage to undertake an assessment of noise from the employment area and household recycling centre. The fixed plant items will be designed to achieve the noise limits set out in table 9.11.

9.98 An assessment will be undertaken at the detailed design stage to assess noise levels from both fixed and mobile noise sources and mitigation measures will be specified where necessary.

9.99 The following best practice measures should be considered at this stage:

1. Static and mobile plant should be located as far as possible from residential areas (existing and proposed) and screened where necessary.
2. No plant should be operating or activities undertaken in the evenings and at night.
3. The operating hours of the household recycling centre should be carefully considered to minimise the potential impact at the residential areas.
4. No heavy goods vehicles should be allowed to access the site before 08:00 and HGVs should be prevented from waiting outside.

Noise from the sports pitches on the proposed development affecting sensitive receptors

9.100 The frequency and times of use of the sports pitches is not known at this stage; therefore, it is not possible to undertake an assessment to determine the potential impacts at the existing and proposed sensitive dwellings.

9.101 At the detailed design stage, the assessment will consider the guidance set out in SCDC's supplementary planning guidance *Open Space in New Developments* (adopted January 2009), alongside the proposed frequency and times of the use for the pitches. Where appropriate, mitigation measures will be set out to ensure that potential impacts are minimised. Such measures may include, but will not necessarily be limited to, restrictions on the times of use of the pitches and / or boundary fencing.

Existing noise affecting the proposed residential development

9.102 The proposed residential dwellings will be exposed to noise levels in NEC C at a distance of 10 metres from the B1050, NEC B at a distance of 10 metres from the proposed primary internal road and in NEC A at 50 metres from the CGB.

9.103 Mitigation measures are specified below to ensure that the internal noise levels in habitable rooms and external noise levels in rear gardens meet the guidance in BS 8233. However, due to the proposed site layout not being available at this early stage, the advice given below is considered appropriate for the master planning stage and more detailed advice should be provided at the appropriate time.

9.104 The detailed site layout should be considered such that, where feasible, dwellings are screened from the noise sources by other buildings on the site or are setback as far as possible from the roads. Where feasible, the orientation of the dwellings should be considered so that their angle of view to the noise sources is minimised.

9.105 The internal layout of the dwellings should be considered so that, where possible, habitable room windows do not overlook the B1050 or the primary internal road. Habitable rooms are defined as living rooms, dining rooms and bedrooms, but not kitchens, bathrooms, hallways or common areas such as stairwells and landings.

9.106 The use of acoustic barriers along the site boundaries with the roads may be considered appropriate. The attenuation provided by a barrier will depend on its location, height and density. The closer the barrier to the source or the dwellings, the better it will perform.

9.107 For example, a barrier of 1.5 metres high erected immediately adjacent to the B1050 would result in ground floor noise levels at 10 metres from the road being reduced by 9 dB, whilst at first floor the reduction would be 5 dB. A 1.5 metre high roadside barrier would result in noise levels from the B1050

being reduced to NEC B and the noise levels from the primary internal road being reduced to NEC A.

9.108 It is also appropriate to consider the sound reduction performance requirements for the building façade, which can be calculated by subtracting the internal target criteria from the derived external noise levels. Since glazing is typically the weakest link in the building façade, at this stage the sound insulation performance values can be taken as a requirement for the glazing units.

9.109 Table 9.13 sets out the sound insulation performance requirements for the glazing units for habitable rooms overlooking the considered noise sources. Both L_{Aeq} and L_{Amax} noise levels are considered, as required in BS 8233 and the WHO guidelines. The night-time L_{Amax} noise levels have been derived based on the difference in distance between the measurement position and the proposed façade, considering a moving point source. The noise levels in table 9.13 do not allow for attenuation provided by a roadside acoustic barrier.

9.110 Following the 'simple calculation' method given in BS 8233, single figure values can be used in lieu of a full spectral noise break-in analysis. This provides adequate information regarding the suitability of the design at the outline application stage, although the sound reduction performance of the façade should be investigated in more depth as part of the detailed design. BS 8233 notes that the simple method can underestimate the sound insulation performance (R_W) requirement by up to 5 dB, and so a 5 dB allowance has been included in the calculations. The simple method uses free-field external noise levels and so no façade reflection correction is required.

Table 9.13: Required sound insulation performance – habitable room windows, dB

Location	Period	Derived noise level	Target value	Required sound insulation performance (dB R_W)**
1. 10 m from the B1050	Daytime L_{Aeq}	66	30	41
	Night-time L_{Aeq}	57	30	32
	Night-time L_{AFmax}	73*	45	33
2. 10 m from the primary site road	Daytime L_{Aeq}	60	30	35
	Night-time L_{Aeq}	51	30	26
	Night-time L_{AFmax}	73*	45	33
3. 50 m from the CGB	Daytime L_{Aeq}	53	30	28
	Night-time L_{Aeq}	44	30	19
	Night-time L_{AFmax}	72	45	32

*L_{Amax} noise levels have been derived from the measured levels at position 3, Striplands Farm.
**Includes +5 dB for the BS 8233 simple calculation method.

9.111 In order to achieve the target internal noise levels stated above for habitable rooms in the façade overlooking the B1050, a glazing unit with a sound reduction of 41 dB is required for daytime habitable rooms and a glazing unit with a sound reduction of 33 dB is required for bedrooms. The daytime and night-time criteria could be achieved with a wide airspace double glazed unit and a 10/12/4 unit respectively.

9.112 For daytime habitable rooms overlooking the primary internal road a glazing unit with a sound reduction of 35 dB is required and for bedrooms a glazing unit with a sound reduction of 33 dB is required. The daytime and night-time criteria could be achieved with a 10/12/4 unit.

9.113 For dwellings at 50 metres from the CGB, a glazing unit with a sound reduction of 28 dB is required for daytime habitable rooms and a glazing unit with a sound reduction of 32 dB is required. The daytime and night-time criteria could be achieved with a 4/12/4 unit and a 6/12/4 unit respectively.

9.114 It should be noted that if roadside acoustic barriers are erected the sound reduction performance for ground floor habitable rooms would reduce by 9 dB, and for first floor habitable rooms would reduce by 5 dB. This would result in a glazed unit with a sound reduction of 32 dB for daytime habitable rooms adjacent to the B1050 being required. This level of sound reduction could be achieved with a 6/12/4 unit.

9.115 It should be noted that internal noise levels will only be achieved when windows are closed. An alternative means of ventilation will therefore be required to comply with the requirements of The Building Regulations 2000: *The Building Regulations: Ventilation Approved Document F* (2010) and the requirements of SCDC.

9.116 SCDC has stated that where achieving acceptable internal noise levels relies on windows being closed, the sound insulation scheme should incorporate forced mechanical ventilation. SCDC's requirement is:

> "…incorporate an alternative form of mechanical forced ventilation to provide suitable and sufficient thermal comfort cooling, removal of moisture and a degree of purge ventilation (two to four air changes per hour). It is paramount to consider noise insulation and ventilation needs together."

9.117 The above requirements should be considered further at the detailed design stage.

Existing noise affecting the proposed primary school

9.118 Following the introduction of the school buildings, and assuming that outside spaces are located to the rear of buildings fronting the primary road, it is anticipated that, with the incorporation of appropriate layout considerations, there will be areas surrounding the facility that will achieve the adopted external noise criteria.

9.119 Future internal noise levels will depend upon the acoustic performance of the proposed building façade. It is expected that, with the incorporation of appropriate façade materials, glazing specifications and ventilation strategies, the internal noise criteria presented within BB93 can be achieved and that the site will be suitable for the development of a school. The mitigation measures will be determined at the detailed design stage.

9.120 Noise from the school itself (such as from building services plant) should also be considered when deriving mitigation measures at the detailed design stage.

9.121 The following measures should be considered, where feasible:

1. Outdoor teaching areas should be located to the rear of the proposed buildings such that they are screened from the road.
2. The internal layout of the school should not place teaching rooms in elevations fronting the primary internal road.
3. The requirements for an enhanced glazing specification and ventilation strategy.

Residual effects

9.122 There will be no significant residual effects following mitigation measures. However, some effects remain to be determined and these assessments will be carried out at the detailed design stage when the required information becomes available.