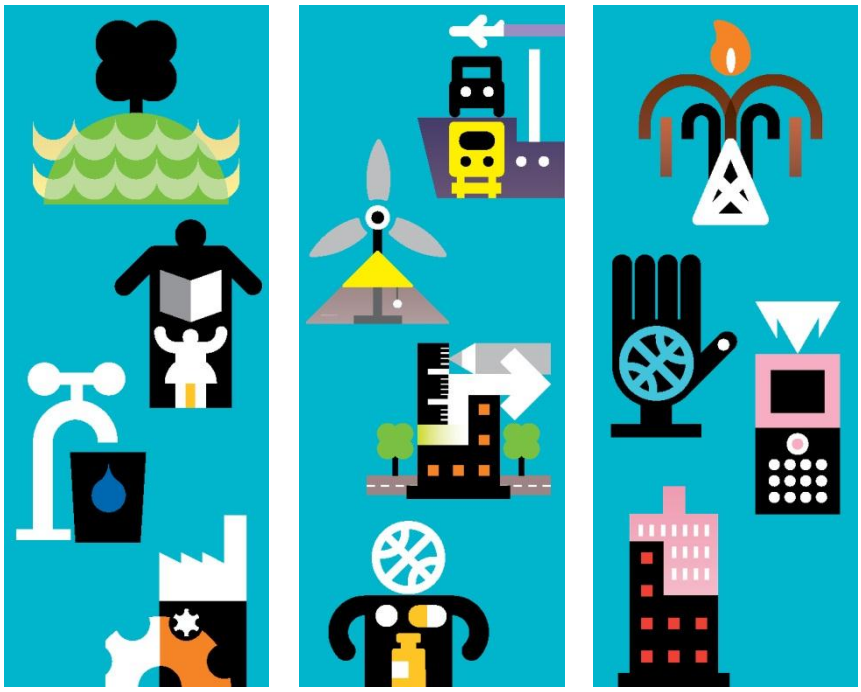


Lynnsport Access Road

Acoustic Assessment

September 2014

Borough Council of King's Lynn & West Norfolk

Mott MacDonald

Lynnsport Access Road

Acoustic Assessment

September 2014

Borough Council of King's Lynn & West Norfolk

Borough Council of King's Lynn & West Norfolk
Kings Court
Chapel Street
King's Lynn
Norfolk
PE30 1EX

Mott MacDonald, Spring Bank House, 33 Stamford Street, Altrincham, WA14 1ES United Kingdom
T +44 (0)11 926 4000 **F** +44 (0)161 926 4100 **W** www.mottmac.com

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description	Standard
A	15 September 2014 30 October 2014	L Nikolova AMIOA	A Morgan MIOA R. Roper MIOA	M. Forni	For issue	

Contents

Mott MacDonald

Appendices 29

Executive Summary

An acoustic assessment has been undertaken for the proposed development of the Lynnsport Access Road using the principles of the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3 and the Calculation of Road Traffic Noise (CRTN) and for construction noise and vibration BS5228 Parts 1 and 2.

During construction, there is the potential for significant temporary residual effects at the front line properties closest to the proposed development represented by receptors on Chadwick Square, Garden Court and Somersby Close.

Large residual short term effects due to increases in traffic noise are predicted for front line properties represented by dwellings near to Somersby Close, Garden Court and Chadwick Square. These would reduce to moderate significant effects in the long term.

1 Introduction

1.1 Introduction

Mott MacDonald Ltd has been appointed by the Borough Council of King's Lynn & West Norfolk (BCKLWN) to prepare an acoustic assessment report on the Lynnsport Access Road as a supporting document for the Environmental Assessment of the project. This report presents the noise and vibrations assessments, undertaken in accordance with Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 [HMSO, 2011].

1.2 Scheme Description

1.2.1 Access Road

The scheme proposes to link the A1078 Edward Benefer Way with the Lynnsport facility by means of a 6.0 metre wide single carriageway road approximately 1.4km in length. A plan showing the current Access Road scheme is provided in **Appendix A** to this report.

The Access Road will provide access to a housing development site at Marsh Lane as well as up to three housing development sites on the Lynnsport grounds. The exact breakdown of housing on the Lynnsport grounds is still being finalised but there are five allocations of land which have been identified as potential locations for housing; three which would be accessed via the new Access Road and two via the existing Lynnsport access off Columbia Way. The Access Road will retain the existing access to Spenser Road and provide a new link to Reid Way and Front Way.

The existing mixed-use 3.0 m wide Sandringham Railway Path forming part of National Cycle Route 1 (NCN1) will be retained and the Access Road constructed immediately to the west of the Internal Drainage Board (IDB) ditch. The IDB ditch will be culverted using 1.8m diameter pipes.

From north to south the route will join Hamburg Way from the A1078 Edward Benefer Way by means of a new signalised junction. After 110 metres, at the location of the existing priority junction with Spenser Road, a new 3-arm mini roundabout will be constructed providing access onto the new road. The Access Road will leave the mini-roundabout heading east before immediately turning south. At this point, a new priority junction will be formed providing access onto Spenser Road. The Access Road will then continue southwards along the grass margin immediately to the west of the culverted drain.

The route continues adjacent to the culverted drain for some 500 metres as a 6.0 metre wide carriageway before linking onto Reid Way via a new mini-roundabout. At this mini-roundabout, a 4th arm to the east will provide a cycle route link onto the NCN1 Sandringham Rail Path. Approximately 50m to the north of the mini-roundabout, an access will be constructed to the east side and across the NCN1 Sandringham Rail Path to link into the proposed Marsh Lane development site.

The route continues along Reid Way and Front Way for a further 370 metres. A traffic calming feature will be provided on this section of road in the form of a narrowed section of carriageway with directional priority. Located to the east of Front Way are the first two allocations identified for housing on the Lynnsport site. Access to these sites will be provided by means of a new priority junction with Front Way. The Bawsey Drain runs between the two housing allocations and as part of this planning application, it is proposed to build a culvert over the drain which will ultimately enable vehicular access to the proposed housing site on the south side of the drain.

At the point where Front Way currently heads west, the route of the Access Road continues in a southerly direction, crossing the Bawsey Drain by way of a new culvert. A new priority junction will be formed with the western section of Front Way.

The Access Road then continues in a southerly direction across open grass land and the Lynnsport playing fields as a new 6.0 metre wide road. After a further 300 metres the route joins the existing car parking area at the eastern end of Greenpark Avenue, which will be reconfigured as part of the proposals. A further new car park with associated pedestrian facilities will also be constructed to the east of the new access road and accessed via a priority junction. This will require a pond to be filled in, and the fish stock relocated to one of the other existing Lynnsport ponds.

The area to the west of the proposed Access Road opposite the new Lynnsport car park has been identified as the third potential allocation for housing development. Access would again be provided by means of a new priority junction with the Access Road.

Street lighting will be provided along the new lengths of the Access Road. The route will have a 30mph speed limit reducing to 20mph within the Lynnsport site. Traffic calming in the form of speed cushions and raised table crossings will be provided within the Lynnsport site.

1.2.2 Footway and Cycleway Connections

The existing 3.0 m wide NCN1 Sandringham Rail Path will be retained and the Access Road constructed immediately to the west of the culverted drain. The construction of the road will make this section of the National Cycle Network less remote and better lit thereby improving safety on the route.

As part of the signalisation of the A1078 Edward Benefer Way/Hamburg Way junction, it is proposed to provide Toucan crossings across the northbound and southbound carriageways of Hamburg Way. The southbound carriageway crossing will have a perpendicular approach from the east and be set back at least one car length into Hamburg Way. This will provide a safer facility for pedestrians and cyclists using the existing mixed-use route running along the southern side of the A1078 Edward Benefer Way. A new mixed-used footway/cycleway will be provided along the western side of Hamburg Way from the new Toucan crossing to the new mini-roundabout junction with Spenser Road. This will provide a more direct route for pedestrians and cyclists into the North Lynn Industrial Estate.

A new 2.0 m wide footway will be provided along the eastern side of the new section of road between Spenser Road and the new access into the Marsh Lane site. This will provide an alternative facility for pedestrians to the mixed-use NCN1 Sandringham Rail Path.

A new mixed-use footway/cycleway link will be provided between the new Access Road/Reid Way mini-roundabout and the NCN1 Sandringham Rail Path.

A new mixed-use footway/cycleway will be provided along the eastern side of the new section of access road south of Front Way. A further new mixed-use facility will be provided through the new Lynnsport car park providing connections to the Lynnsport facility and the NCN1 Sandringham Rail Path. Further new footway connections will be provided throughout the Lynnsport car parks and surrounding facilities to improve accessibility for pedestrians.

To the south of the new Lynnsport car park, the mixed-use footway/cycleway will cross the new access road via a raised table and continue along the western side of the new road providing access to the existing car park area. A new footway will also be provided along the eastern side of this section of access road. A further new footway will be created heading west from the raised table crossing providing access to the relocated hockey pitches.

New crossings will be required on the NCN1 Sandringham Rail Path at the point of the new accesses into the Marsh Lane residential development site and Lynnsport Phase 1 allocation. These crossing points will take the form of raised traffic tables to maintain a level route for pedestrians and cyclists and to assist with slowing vehicles using the development accesses. Pedestrians and cyclists will be given priority over motorised traffic at these crossing points.

2 Scoping and Consultation

2.1 Spatial Scope

2.1.1 Temporary Effects

In terms of construction noise, the extent of the assessment is limited to areas where the calculated total noise (construction noise plus pre-construction ambient noise) could exceed the pre-construction ambient noise level by 5dB or more, subject to threshold values for daytime, evenings and weekends, and night periods. This is largely restricted to the proposed scheme envelope, although could extend along elements of the existing road network, depending on the quantity of construction-related traffic.

2.1.2 Permanent Effects

The noise impacts from a proposed new road project are assessed using the methodology given in DMRB. The DMRB HD213/11 methodology requires that the study area is identified as an area within 1km of the physical works associated with the Lynnsport Access Road. Within this study area road traffic noise predictions are performed at any sensitive receptor within 600m of a road where there is the possibility of a change of 1 dB $L_{A10,18hr}$ upon scheme opening. In this case predictions were carried out at several properties within 50m of the physical works.

The assessment of operational noise and vibration effects considers the change, hence impact, brought about by the proposed scheme between conditions in the year of opening (in the absence of the proposed scheme) and the design year (15 years after opening).

In summary a desk study exercise was undertaken to determine the appropriate level of assessment for the Lynnsport Access Road following the flowchart in Annex 1 of DMRB. The desk study determined that a 'Detailed Assessment' following HD213/11 would be appropriate as:

- there are changes to infrastructure that may cause a change in noise level of more than 1dBA in the short term;
- there are sensitive receptors within 1 km that may be subject to change in noise level; and
- it is evident that the project will result in changes greater than the threshold levels stated within HD213/11 and further discussed in Chapter 7.2.1 of this report.

2.2 Temporal Scope

2.2.1 Temporary Impacts

The baseline for noise and vibration conditions with respect to temporary effects during construction is represented by the conditions immediately prior to construction. The effects during construction are compared to this baseline for as long as construction continues.

2.2.2 Operational Effects

The assessment of operational noise and vibration effects considers the change, hence impact, brought about by the proposed scheme between conditions in the year of opening (in the absence of the proposed scheme) and the design year (15 years after opening).

2.2.3 Consultation

The assessment approach and the identification of key sensitive receptors and selection of measurement positions were developed by Mott MacDonald. An environmental screening request including details of the proposed noise assessment methodology was submitted to BCKLWN in January 2014.

3 Legislation, Policy and Plans

3.1 National

3.1.1 Overview

Environmental effects of a major project, including those arising due to noise and vibration, are required to be considered under Council Directive 85/337/EEC [Council of European Communities, 1985] as amended by Directive 97/11/EC [Council of the European Communities, 1997] and Directive 2003/35/EC [Council of the European Communities, 2003] These Directives are implemented under UK law by the Town and Country Planning (Environmental Impact Assessment (EIA)) (England and Wales) Regulations [HMSO,1999].

3.1.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF) [DCLG, 2012] came into force in March 2012 and replaces the majority of planning policy.

Paragraph 123 of the NPPF states that:

"*Planning policies and decisions should aim to:*

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

In considering decision making, paragraph 186 of the NPPF states that:

"*Local planning authorities should approach decision-taking in a positive way to foster the delivery of sustainable development. The relationship between decision-taking and plan-making should be seamless, translating plans into high quality development on the ground*."

3.1.3 The Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) [DEFRA, 2010] was issued by the DEFRA in 2010. Its purpose is to promote *"good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development"*. The three main aims are to:

- *"avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development;*

- *mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development; and,*
- *where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development*."

3.1.4 The Land Compensation Act 1973 Part 1

The Land Compensation Act 1973 Part 1 [Department of Transport and Welsh Office, 1988] includes provision for compensation for loss in property value resulting from physical agents, including noise and vibration, resulting from the use of public works, such as new or improved roads. The criteria for defining entitlement to provision of compensation are contained within the Noise Insulation Regulations 1975 [HMSO, 1975].

3.1.5 Sections 60 and 61 of the Control of Pollution Act 1974 (amended 1989) and The Environmental Protection Act 1990

Local authorities have other statutory controls on noise and vibration. Sections 60 and 61 of the Control of Pollution Act 1974 [HMSO, 1974] concern impacts relating to construction sites; and The Environmental Protection Act 1990 [HMSO,1990] which places a duty on local authorities to serve abatement notices where noise from premises, vehicles and machinery which are judged to constitute a statutory nuisance. Compliance with these controls is required although the requirements fall outside the planning system.

3.2 Regional Policies

Regional Planning Guidance Note 6: Regional Planning Guidance for East Anglia to 2016, Policy 37 comments: "planning for development should provide effective protection of the environment by integrating a site-based approach with a more broadly based concern for and awareness of....noise pollution" [GOEE, 2000].

The Regional Environment Strategy for the East of England, July 2003, in Strategic Aim 1: Accommodate Population and Economic Growth whilst Protecting and Enhancing the Environment observes that noise is an indirect environmental effect of the modern way of life but does not provide an explicit solution to the problem, other than to encourage development with opportunities to use public transport, walking and cycling as modes of transport [EERA and EEEF, 2003].

The Borough Council of King's Lynn & West Norfolk's Local Plan [The Borough Council of King's Lynn & West Norfolk, 1999], indicates in policy GP3, 2.29 "Conserving environmental quality also embraces other "liveability" aspects such as caring for general public amenity by controlling potential disturbance (noise, smells and visual intrusion) and a concern about public safety in the environment."

The Norfolk County Council Local Transport Plan**,** *Connecting Norfolk,* April 2011 (which covers the period from 2011 to 2026 [Norfolk County Council, 2011] states in Policy 4 "Protecting the Environment" that:

"Transport decisions should take account of the character of the historic environment, landscape and local biodiversity. In particular:

- Negative impacts should be mitigated
- Reasonable opportunities for creating habitats taken
- Due regard should be given to ecological networks and European designated sites
- Impact assessments should be undertaken where necessary."

4 Overall Approach and Assessment Methodology

This section sets out the approach that has been taken for the assessment of effects on noise and vibration as a result of the proposed scheme.

Desk-based studies have been carried out to inform the assessment process. The main sources of information that are relevant to the assessment of potential noise and vibration effects of the proposed scheme include:

- review of the proposed scheme drawings and information;
- forecasted traffic flows; and
- Ordnance Survey mapping;

4.1 Site Assessment

No noise surveys have been undertaken for the acoustic assessment of the Lynnsport Access Road Scheme.

The baseline and predicted ambient noise levels have been calculated using modelling software Cadna, the methodology in Calculation of Road Traffic Noise (CRTN) [Department of Transport and Welsh Office, 1988] and are based on the traffic data provided by the transport planners within the Mott MacDonald project team.

4.2 Approach

Impact is defined as a physical change to the baseline environment resulting from the proposed scheme or development. For example, an impact can be an increase in the level of road traffic noise due to an expected increase in traffic volumes. The consequence of the change to the baseline environment on any environmental receptor or particular value or sensitivity is defined as the effect. For example, the impact of an increased level of road traffic noise may produce the effect of increased disturbance in the community.

The assessment of the effects of impacts due to noise and vibration impacts generally comprises of some or all the following elements:

- identification of potential sources and prediction of noise and vibration impacts likely to be received at nearby sensitive receptors including dwellings;
- comparison of the predicted impacts with the appropriate criteria for acceptability;
- the consideration of possible noise mitigation measures and review of effects if appropriate and an assessment of any residual effects.

4.3 Evaluation of Effects

4.3.1 Sensitivity

Noise affects people in a number of different ways. This may include factors such as annoyance and sleep disturbance, enjoyment of quiet spaces, ability to communicate with others, ability to concentrate at home

or at work, participation in social and community activities. As a consequence it is not appropriate to consider a single criterion when assessing the value of an existing noise environment.

Table 4.1 gives criteria that could be used to determine the value of the noise environment at a receptor. This table is an analogue to Table 2.1 in DMRB HA 205/08 'Assessment and Management of Environmental Effects' [HMSO, 2008]. However, the latter is written in general terms and not specific to any particular environmental discipline. For this assessment, it is necessary to consider how the intrinsic characteristics of a receptor define its intrinsic environmental value. For example:

- a national park (which in general would be characterised by isolation, tranquillity and corresponding low background noise and vibration) would be considered to have 'very high' environmental value. Any loss of tranquillity by way of increasing noise levels could potentially alter its intrinsic character; and
- an area of heavy industry (characterised by being built-up and a source of noise and vibration) would be considered to have 'negligible' environmental value. Any increase in noise would be considered very unlikely to alter its intrinsic value.

Table 4.1 Criteria for Determining Environmental Value/Sensitivity

Environmental Value	Characteristics	Level of importance	Impact
Very High	No ability to absorb change [increase] in noise level without fundamentally altering character	International Importance	People or operations are extremely susceptible to noise where any change (increase) would permanently stop people working
High	Low ability to absorb change (increase) in noise level without fundamentally altering character	National Importance	People or operations are particularly susceptible to noise where any change (increase) would stop people working for long periods
Moderate	Some ability to absorb change (increase) in noise level without fundamentally altering character	Regional/County Importance	People or operations are moderately sensitive to noise, where any change (increase) would stop people working for short periods
Low	High ability to absorb change (increase) in noise level without fundamentally altering character	District Parish Importance	People or operations are not very sensitive to noise, where any change (increase) would stop people working for very short periods
Negligible	Tolerant of change (increase) in noise without altering its character	No Listed Importance	People or operations are not at all sensitive to noise, where any change (increase) would not stop people working

The vast majority of receptors that could be affected by the proposed scheme are dwellings that would be considered to have 'high' environmental value on the basis that:

- people in dwellings have a low ability to absorb increases in noise and vibration without affecting the enjoyment of their dwelling; and
- people in dwellings are particularly susceptible to increases in noise and vibration because it may stop activities permanently.

In this assessment all receptors that could be affected by the proposed scheme are assumed to have high environmental value. Therefore, tables describing the significance of effects are for receptors having high environmental value.

4.3.2 Significance

The significance of the effect of any noise impacts will be based on a consideration of the environmental noise value, or sensitivity, of existing features and the magnitude of the noise impacts on them. Using the impact magnitude classification, and receptor values described above, the significance of any effects is considered using the matrix presented in Table 4.2.

Table 4.2: Significance of Effects of Noise Impacts

Magnitude of impact	Significance of impact for receptors with high environmental value
Major beneficial	Large or very large beneficial
Moderate beneficial	Moderate or large beneficial
Minor beneficial	Slight or moderate beneficial
Negligible beneficial	Slight beneficial
No impact	Neutral
Negligible adverse	Slight adverse
Minor adverse	Slight or moderate adverse
Moderate adverse	Moderate or large adverse
Major adverse	Large or very large adverse

Effects will be considered to be significant when identified as having a moderate, substantial or very substantial effect.

4.4 Construction Effects

4.4.1 Construction Noise

BS 5228-1:2009+A1:2014 [BSI, 2009, amended 2014] provides a methodology for calculating noise levels generated by fixed and mobile plant used for a range of typical construction operations. The standard includes a database of equivalent continuous noise levels (L_{Aeq} dB) at a reference distance of 10m and a simple noise propagation model that can be used to make allowances for source-receiver distances, ground properties, utilisation time etc.

The standard does not define strict criteria to determine the significance of noise impacts although examples of how limits of acceptability have been applied historically and some examples of assessing significance are presented. ‘Example Method 2 – 5dB (A) change’ (Annex E ‘Significance of Noise Effects’ Section E.3.3) has been adopted for the assessment of effects at residential receptors as the approach

considers the expected changes in ambient noise levels and better reflects conventional assessment methodologies compared with the use of fixed/absolute noise limits.

Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB L_{Aeq} from construction noise alone, for the daytime, evening and night-time periods respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.

4.5 Operation Effects

4.5.1 Daytime Road Traffic Noise Impacts

DMRB HD 213/11 describes the impacts/effects of road traffic noise in terms of the noise descriptors conventionally used for assessing the impact of road traffic in the UK, i.e. the statistical noise level $L_{A10,18hr}$ over an 18-hour period between 06:00 and 24:00 (the traffic noise index). The DMRB assessment of road traffic noise calculations is performed following the CRTN methodology.

In order to predict the level of road traffic noise from the road network traffic data has been provided by Mott MacDonald transport planners in terms of 18 hour Annual Average Weekday Traffic (AAWT) flow between the hours of 06:00 to 00:00 along with average vehicle speed and the percentage of heavy vehicles.

Calculations of the road traffic noise level are carried out for four scenarios:
- the Do Minimum option in the baseline year;
- the Do Minimum option in the future assessment year;
- the Do Something option in the baseline year; and
- the Do Something option in the future assessment year.

The assessment of road traffic noise impacts is undertaken via the following scenario comparisons:
- the short-term change in road traffic noise upon proposed scheme opening (Do Minimum option in the baseline year vs. Do Something option in the baseline year.
- the long-term change in road traffic noise assuming the proposed scheme is built (Do Minimum option in the baseline year vs. Do Something option in the future assessment year); and
- the long-term change in road traffic noise assuming the proposed scheme is not built (Do Minimum option in the baseline year vs. Do Minimum option in the future assessment year).

DMRB HD213/11 states that ‘in terms of road traffic noise, a methodology has not yet been developed to assign significance according to both the value of a resource and the magnitude of the impact. For this reason the magnitude of the road traffic noise impact is reported rather than the significance of the impact.

For short-term changes in road traffic noise the smallest change in road traffic noise level that is considered perceptible is 1 dB $L_{A10,18hr}$. In the long-term a 3 dB $L_{A10,18hr}$ change in road traffic noise is

considered to the smallest perceptible change. For this reason the magnitude of short-term and long-term impacts are expressed differently as shown in Table 4.3 below.

Table 4.3 Magnitude of Impact for Noise Level Changes

Noise change dB $L_{A10,18h}$	Magnitude of impact for a short-term change in road traffic noise	Magnitude of impact for a long-term change in road traffic noise
<= -10	Major Beneficial	Major Beneficial
<= -10 to -5		Moderate Beneficial
<= -5 to -3	Moderate Beneficial	Minor Beneficial
<,=-3 to -1	Minor Beneficial	Negligible Beneficial
<= -1 to -0.1	Negligible Beneficial	
0	No Change	No Change
=> 0.1 to 1	Negligible Adverse	Negligible Adverse
=,>1 to 3	Minor Adverse	
=> 3 to 5	Moderate Adverse	Minor Adverse
=> 5 to 10	Major Adverse	Moderate Adverse
=> 10		Major Adverse

- Impact assessments should be undertaken where necessary."

5 Baseline Conditions

The prevailing acoustic conditions in the area of the sensitive receptors are dominated by road traffic noise from the current road network. Therefore, baseline noise levels at each receptor have been predicted based upon traffic data in terms of $L_{A10,18hour}$ using acoustic modelling software Cadna.

Hourly traffic flows have been obtained from the Mott MacDonald Transportation Planning team on 04 August 2014

In order to provide a baseline for construction noise assessment in terms of $L_{Aeq,T}$, the $L_{A10,18hour}$ data has been converted using methodology detailed in TRL report PR/SE/451/02 [TRL, 2002].

The baseline data is presented in Table 5.1.

Table 5.1: Predicted Baseline Noise Levels

		Weekday Daytime			
ID	Location	LA10,12hr	LAeq,12hr	LA10,18hr	LAeq,18hr
1	Hamburg Way	65.9	62.0	66.6	62.4
2	A1078 Edward Benefer Way (East of Access Road)	70.7	64.8	71.4	65.1
3	Columbia Way	66.3	62.2	66.9	62.6
5	Loke Road West	65.7	61.9	66.4	62.3
6	A1078 Edward Benefer Way (West of Access Road)	70.5	64.6	71.1	65.0
7	Loke Road South	67.9	63.1	68.5	63.5
8	A148 Gaywood Road (East of Loke Road)	70.7	64.7	71.3	65.1
9	A148 Wootton Road	67.7	63.0	68.3	63.4
10	Spenser Road	63.6	60.7	64.2	61.0
11	Reid Way	54.8	55.7	55.4	56.0
12	A148 Gaywood Road (West of A148 Wootton Road)	72.0	65.5	72.6	65.8
13	A148 Wootton Road (South)	70.2	64.5	70.8	64.8
14	A148 Gaywood Road (East of A148 Wootton Road)	70.3	64.5	70.9	64.9
15	A148 Gaywood Road (West of Loke Road)	69.6	64.1	70.2	64.5

6 Assessment

6.1 Temporary Impacts

6.1.1 Construction Noise

The works will be carried out as follows:

- Excavation and earthworks;
- Rolling and compaction; and
- Pavement works.

Details of likely construction activities have been provided by Mott MacDonald construction engineers. Construction plant information was not available for rolling and compaction, pavement works or piling, therefore we have used our professional judgement to determine likely plant operating for these activities.

It is understood that piling will be required around the Bawsey Drain. This work will be undertaken for relatively short periods during the mid-part of the working day. For assessment purposes we have assumed a continuous flight auger. This method is considered to have the lowest noise and vibration impact. If alternative methods are considered the construction noise and vibration assessment should be reviewed.

Noise levels for construction plant has been assigned based upon the reference levels provided in Annex C of BS 5228-1(2009+A1:2014).

The main activities and items of noise-emitting equipment that are expected to be required during each stage of the works are indicated in **Appendix B**.

Tables 6.1 to 6.5 summarise the predicted noise impacts at the five representative receptors during each stage of the works. Significant effects are expected during the daytime due to the potential of noise level increase above 65 dB(A) during each activity and a potential change in ambient noise levels of 5 dB or more.

Table 6.1: Calculated noise impacts during the excavation and earthworks

Receptor	Shortest Distance to Works (m)	Activity L_{Aeq} dB at receptor	Baseline weekday daytimes dB(A)	Baseline + activity L_{Aeq} dB	Change in noise level dB
Spenser Road	17	61	60	64	3
Somersby Close	40	53	52	56	3
Garden Court	20	60	54	61	7
Chadwick Square	32	58	55	60	5
Salter's Road	148	43	52	53	0

Table 6.2: Calculated noise impacts during the rolling and compaction

Receptor	Shortest Distance to Works (m)	Activity L_{Aeq} dB at receptor	Baseline weekday daytimes dB(A)	Baseline + activity L_{Aeq} dB	Change in noise level dB
Spenser Road	17	73	60	73	13
Somersby Close	40	65	52	65	13
Garden Court	20	71	54	71	18
Chadwick Square	32	70	55	70	15
Salter's Road	148	55	52	57	5

Table 6.3: Calculated noise impacts during the pavement works

Receptor	Shortest Distance to Works (m)	Activity L_{Aeq} dB at receptor	Baseline weekday daytimes dB(A)	Baseline + activity L_{Aeq} dB	Change in noise level dB
Spenser Road	17	72	60	72	12
Somersby Close	40	63	52	63	11
Garden Court	20	70	54	70	17
Chadwick Square	32	68	55	68	13
Salter's Road	148	53	52	56	3

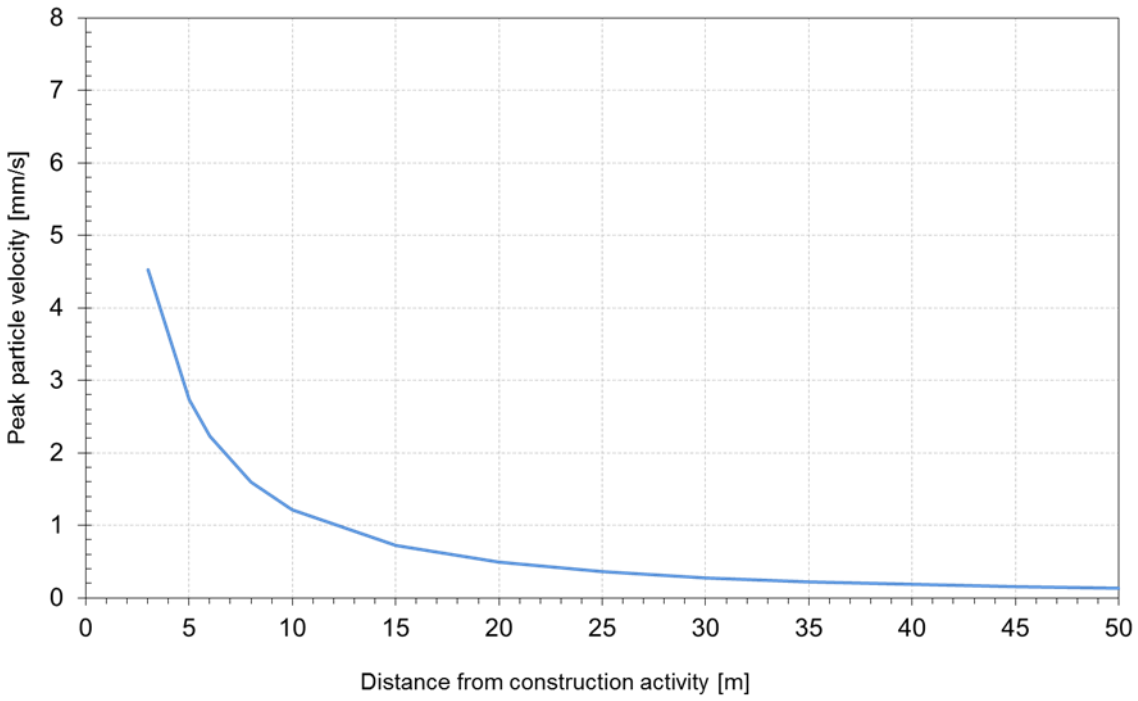
Table 6.4: Calculated noise impacts during the works using the continuous flight auger method

Receptor	Shortest Distance to Works (m)	Activity L_{Aeq} dB at receptor	Baseline weekday daytimes dB(A)	Baseline + activity L_{Aeq} dB	Change in noise level dB
Spenser Road	17	37	60	60	0
Somersby Close	40	50	52	54	2
Garden Court	20	46	54	54	1
Chadwick Square	32	71	55	71	16
Salter's Road	148	46	52	53	1

6.1.2 Construction Vibrations

BS 5228-2:2009 [BSI, 2009] provides empirical relationships for ground-borne vibration arising from a range of mechanised construction activities including vibratory compaction. Figure 6.1 presents a graph showing the level of vibration from vibratory compaction expressed as peak particle velocity (mm/s) as a function of distance from the works.

Figure 6.1: Ground-borne vibrations from a vibratory roller as a function of distance from the activity



For front line properties approximately 10m from the carriageway, the corresponding level of vibration is around 1.5 mm/s. This is expected to be perceptible and therefore indicative of potential for significant adverse effects. However, due to the short-term nature of the work it is likely to be tolerated provided that prior notice is given to the occupiers.

There is no indication of significant effects in terms of potential cosmetic or structural damage in residential buildings.

6.2 Permanent Impacts

6.2.1 Road Traffic Noise

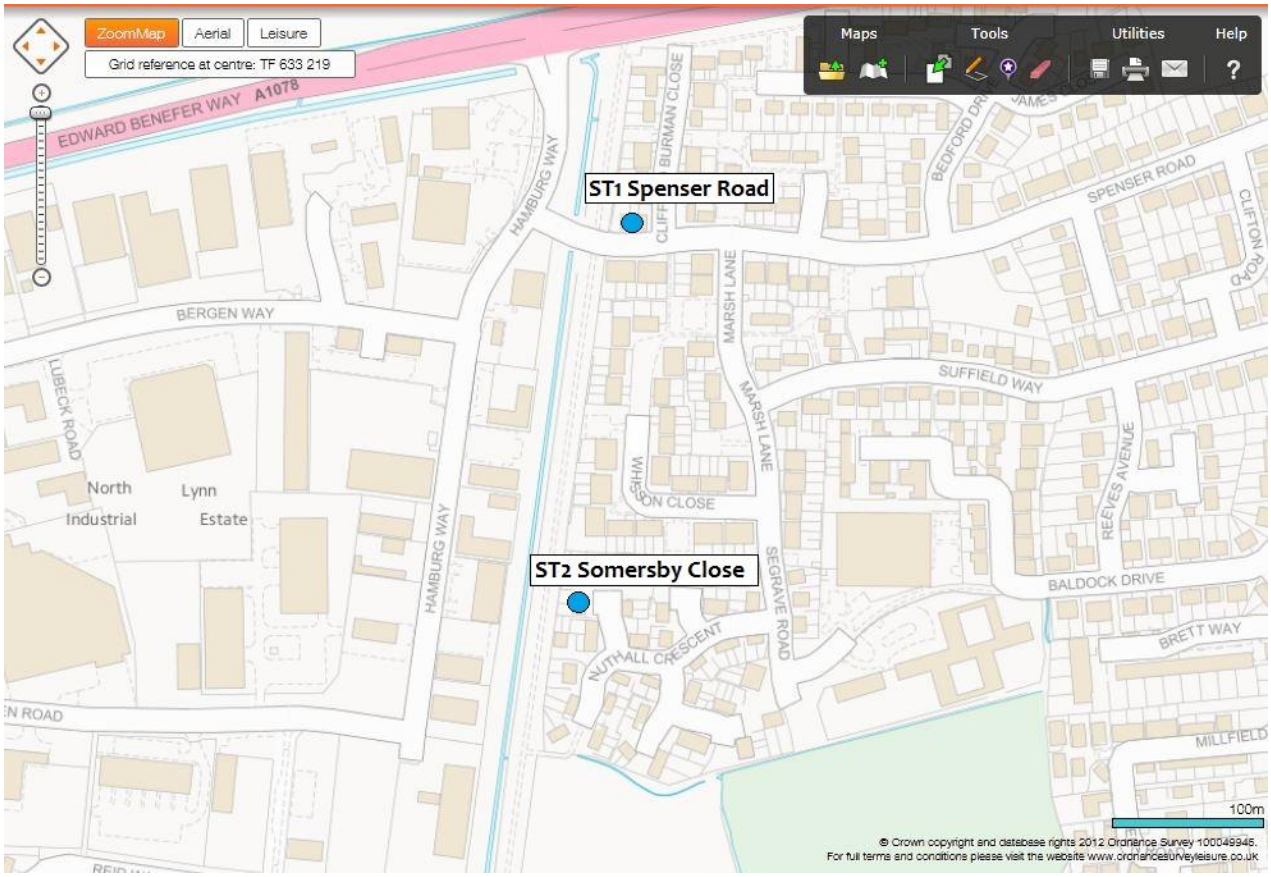
Baseline and predicted noise conditions have been calculated in accordance with the procedure defined in the DoT technical memorandum CRTN.

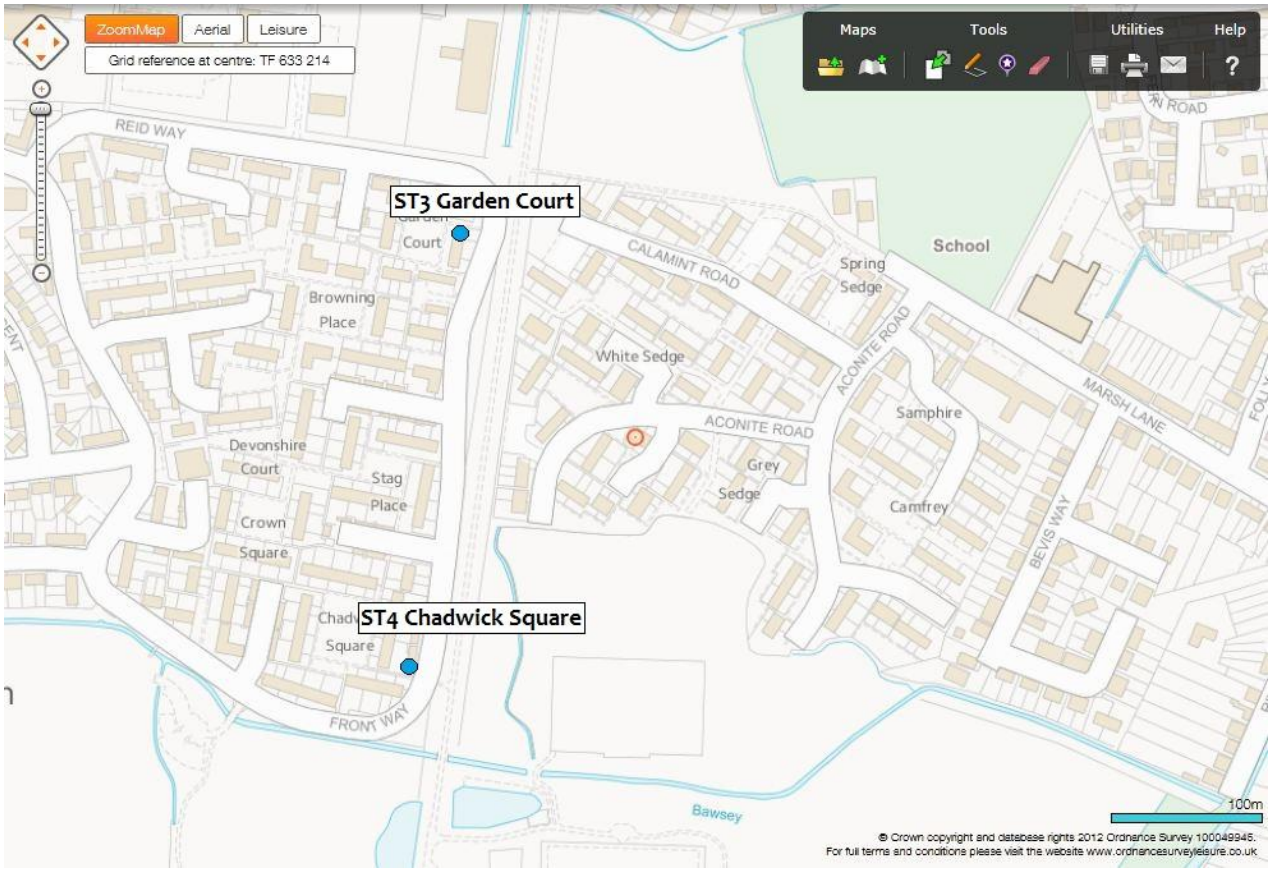
Factors influencing the noise level close to a road comprising freely flowing traffic are the traffic volume, speed and composition (% heavy vehicles), and the road gradient and surface characteristics. At a distant reception point the noise level is attenuated by a number of additional factors, including the distance from the noise source, the nature of the intervening ground surface and the presence of obstructions.

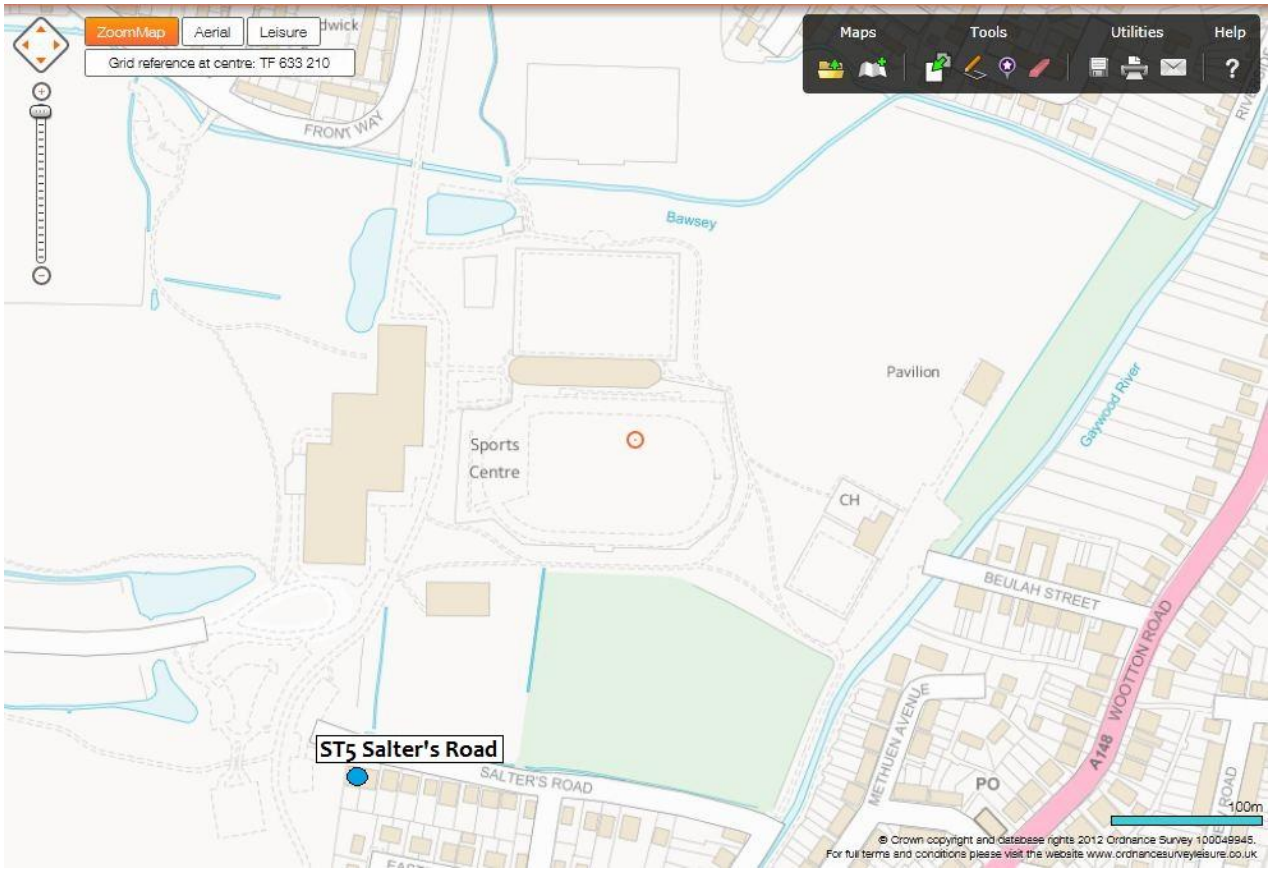
The prevailing acoustic conditions in the area are dominated by the road traffic noise of the existing road network. Therefore baseline noise levels at sensitive receptors in the immediate vicinity on the road can be predicted based on these flows. As the access road is being developed, it is expected that as traffic is taken away from areas to the west of the access road, noise levels to the east will increase.

Figure 6.2 shows a map of the five closest sensitive receptors used for assessment locations.

Figure 6.2: Map of the five Assessment Locations




ZoomMap
Aerial
Leisure
Grid reference at centre: TF 633 214
Maps
Tools
Utilities
Help
REID WAY
ST3 Garden Court
Court
CALAMINT ROAD
School
Spring
Sedge
Browning
Place
White Sedge
ACONITE ROAD
Samphire
MARSH LANE
Devonshire
Court
Stag
Place
Grey
Sedge
Camfrey
Crown
Square
BEVIS WAY
ST4 Chadwick Square
Square
FRONT WAY
Bawsey
100m
© Crown copyright and database rights 2012 Ordnance Survey 100049945.
For full terms and conditions please visit the website www.ordnancesurveyleisure.co.uk



Source: Ordnance Survey, 2012

Baseline noise levels have been calculated at each of the five assessment locations based on the contribution from the existing traffic flows from A1078 Edward Benefer Way, Hamburg Way, Spenser Road, Reid Way and Front Way. Table 6.5 gives the calculated noise levels in terms of $L_{A10,18h}$ dB (06:00 to 24:00) used as a baseline for calculating the magnitude of impacts from changes to road traffic noise.

Table 6.5: Baseline Noise Levels at Sensitive Receptors

Receptor	Distance from nearest carriageway (m)	Contribution from Existing Carriageway $L_{A10,18h}$ dB
Spenser Road	18	63.2
Somersby Close	42	48.9
Garden Court	20	50.6
Chadwick Square	32	54.4
Salter's Road	148	48.5

Traffic flows on Hamburg Way, Front Way and Reid Way are expected to change with the implementation of the proposed scheme. The new sections of road will be subject to a 30 mph speed limit in line with the

existing speed limits on Hamburg Way, Front Way and Reid Way and thus there will be no alternation in traffic speeds on these roads.

The study area for the assessment has been limited to the closest sensitive receptors to the scheme extents. Five representative receptors within close proximity to the proposed works are shown in Table 6.6 below.

Table 6.6: Sensitive receptors within 50 metres of the scheme extents

Receptor	Description	Distance to the scheme extents (m)
1	Spenser Road	18
2	Somersby Close	42
3	Garden Court	20
4	Chadwick Square	9
5	Salter's Road	148

It is assumed that road traffic noise from Front Way, Reid Way and Hamburg Way is the dominant source of noise affecting the baseline climate at all sensitive receptors and is calculated from traffic flow data along the existing road. The predicted noise levels without scheme for 2016 and 2026 at each receptor are shown in Table 6.7 and take into account the speed of the traffic flow and the proportion of heavy vehicles.

Table 6.7: Calculated baseline noise levels due to road traffic at each receptor

Receptor	Description	Weekday daytime $L_{A10,18hour}$ dB(A)	Weekday daytime (DN 2016) $L_{A10,\ 18hour}$ dB(A)	Weekday daytime (DN 2026) $L_{A10,\ 18\ hour}$ dB(A)
1	Spenser Road	63.2	63.3	64.0
2	Somersby Close	48.9	49.0	49.6
3	Garden Court	50.6	50.7	51.3
4	Chadwick Square	54.4	54.5	55.2
5	Salter's Road	48.5	48.7	49.3

Tables 6.8 and 6.9 show the predicted impacts at representative receptors due to changes in traffic noise in the short and long term.

Table 6.8: Predicted Short Term Noise Impact with Scheme at Sensitive Receptors

Receptor	Predicted Existing Noise Level $L_{A10,18h}$ dB	Predicted Scheme Noise Level (Short-Term) $L_{A10,18h}$ dB	Difference	Magnitude of Impact (short term)
Spenser Road	63.2	65.5	1.3	Minor
Somersby Close	48.9	56.6	7.7	Major
Garden Court	50.6	56.2	5.6	Major
Chadwick Square	54.4	60.0	5.6	Major

Receptor	Predicted Existing Noise Level $L_{A10,18h}$ dB	Predicted Scheme Noise Level (Short-Term) $L_{A10,18h}$ dB	Difference	Magnitude of Impact (short term)
Salter's Road	48.5	48.4	-0.1	Negligible

Table 6.9: Predicted Long Term Noise Impact with Scheme at Sensitive Receptors

Receptor	Predicted Existing Noise Level $L_{A10,18h}$ dB	Predicted Scheme Noise Level (Long-Term) $L_{A10,18h}$ dB	Difference	Magnitude of Impact (short term)
Spenser Road	63.2	66.1	2.9	Negligible
Somersby Close	48.9	56.2	7.3	Moderate
Garden Court	50.6	56.7	6.1	Moderate
Chadwick Square	54.4	60.9	6.5	Moderate
Salter's Road	48.5	49.1	0.6	Negligible

7 Mitigation and Predicted Effects

7.1 Construction Phase

7.1.1 Incorporated Mitigation

In order to reduce the magnitude of the significance of effects resulting from the construction and operation of the proposed Access Road the following additional mitigation is recommended:

- a construction noise management plan will be developed prior to construction starting and incorporated into the Construction Environmental Management Plan; and
- local residents will be informed by letter drop of proposed works, particularly where these are due to occur during the evening and night-time periods.

in order to avoid significant noise effects works will where practical be confined to daytime. Where evening and night time working is necessitated by road closures, noisy operations will be kept to a minimum, the use of quieter items of plant and working methods will be considered and local residents will be given notice before work starts

7.1.2 Predicted Effects

During construction there will be temporary noise impacts at residences adjacent to the length of the access road. The predicted noise levels due to construction will generally be highest at residences closest to the access road.

Table 7.1 summarises the construction noise impacts.

Table 7.1: Summary of Predicted Construction Noise Impacts

Location	Predicted existing noise level, $L_{Aeq,16hr}$	Predicted worst case range noise levels during construction $L_{Aeq,16hr}$	Predicted worst case change $L_{Aeq,16hr}$
Spenser Road	63	63 - 72	0 to 9
Somersby Close	49	54 - 65	5 to 16
Garden Court	51	52 - 71	1 to 20
Chadwick Square	54	60 - 72	6 to 18
Salter's Road	49	50 - 56	1 - 7

There is the potential for significant temporary effects due to construction noise at all the front-line receptors assessed with the exception of receptors on Salter’s Road.

7.2 Operational Phase

7.2.1 Predicted Effects

The main increases in traffic noise are predicted for rear elevations of the front line properties to the proposed development represented by receptors on Chadwick Square, Garden Court and Somersby Close. Major impacts are predicted here in the short term due to traffic noise, reducing to moderate impacts in the long term.

Using the matrix provided in Table 4.2 to translate the magnitude of impact to magnitude of effect for noise sensitive receptors of high sensitivity, and given that the predicted noise changes at these locations fall within the lower half of the major short term/moderate long term range; the predicted noise changes can be said to have a large effect in the short term reducing to a moderate effect in the long term.

To provide context to these predicted impacts and effects, the absolute noise levels at the receptors concerned are predicted to be in the range of 56 to 60 dB $L_{A10,18\ hours}$ and as such are significantly below the "specified" level of 68dB $L_{A10,18\ hours}$ which is the threshold above which there is a duty to carry out insulation work or make grants to facilitate such work under the Noise Insulation Regulations 1975.

It should be noted that the baseline level used for the comparative assessment is a prediction based upon existing traffic flow data. It is likely that, given the relatively low traffic flows on the affected residential roads, there is a significant contribution from other noise sources of a domestic and industrial origin resulting in a higher baseline than that predicted.

8 Residual Effects

8.1 Temporary Residual Effects

8.1.1 Construction Noise

During construction, there is the potential for significant temporary residual effects at the front line properties closest to the proposed development represented by receptors on Chadwick Square, Garden Court and Somersby Close.

For front line properties approximately 10m from the carriageway, the corresponding level of vibration is around 1.5 mm/s during vibratory roller operation. This is expected to be perceptible and therefore indicative of potential for significant residual adverse effects. However, due to the short-term nature of the work it is likely to be tolerated provided that prior notice is given to the occupiers.

8.2 Permanent Residual Effects

8.2.1 Road Traffic Noise

Large residual short term effects due to increases in traffic noise are predicted for front line properties represented by dwellings on Somersby Close, Garden Court and Chadwick Square. These effects will reduce to moderate residual effects in the long term.

9 Summary

The potential temporary and permanent noise and vibration impacts associated with the proposed development have been considered.

During construction, there is the potential for significant temporary residual effects at the front line properties closest to the proposed development represented by receptors on Chadwick Square, Garden Court and Somersby Close.

For front line properties approximately 10m from the carriageway, there is the potential for significant residual adverse effects due to construction vibration during vibratory rolling operations. However, due to the short-term nature it should is likely to be tolerated provided that prior notice is given to the occupiers.

Large residual short term effects due to increases in traffic noise are predicted for front line properties represented by dwellings near on Somersby Close, Garden Court and Chadwick Square. These effects would reduce to moderate effects in the long term.

10 References

HMSO, 2011. “Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.”

Council of European Communities, 1985. “Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment.”

Council of the European Communities, 1997. “Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment.”

Council of the European Communities, 2003. “Council Directive 2003/35/EC of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice.”

HMSO, 1999. “The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations.”

DCLG, 2012. “National Planning Policy Framework.”

DEFRA, 2010. “The Noise Policy Statement for England.”

HMSO, 1973. “Land Compensation Act.”

HMSO, 1975. “1975 No. 1763 Building and Buildings The Noise Insulation Regulations 1975.”

HMSO, 1974. “Control of Pollution Act”

HMSO, 1990. “Environmental Protection Act.”

GOEE, 2000. “Regional Planning Guidance for East Anglia to 2016”

The Borough Council of King's Lynn & West Norfolk, 1999. “The Borough Council of King's Lynn & West Norfolk’s Local Plan.”

Norfolk County Council, 2011. “Connecting Norfolk – Norfolk’s Transport Plan for 2026”.

HMSO, 2008. “Design Manual for Roads and Bridges Volume 11 Section 2 Part 5 HA 205/08 Assessment and Management of Environmental Effects.”

BSI, 2009 Amended 2014, “British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.”

TRL, 2002. Project report PR/SE/451/02. “Converting The UK traffic index LA10,18h to EU noise indices for noise mapping”.

BSI, 2009. “British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.”

Appendices

Appendix A. Scheme Layout

Appendix B. Construction Noise Calculations

Table A.1: Reference noise levels for the prediction of noise impacts from construction works

Activities	Plant item	BS 5228 – 1:2013 Reference	Reference noise level for individual items at 10m dB(A)	Quantity	Percentage of time	Combined reference noise levels for the activity at 10m dB(A)
1. Excavation and earthworks	Wheeled (360) excavator (18 – 20 t)	C.4 #10	66	1	50%	81
	Articulated dump truck (25t)	C.4 #1	81	1	50%	
2. Rolling and compaction	Vibratory roller	C.5 #26	77	1	50%	75
	Lorry pulling up	D.7 #121	70	1	50%	
3. Pavement works	Asphalt Paver + Tipper Lorry	C.5 #30	75	1	50%	73
	Lorry pulling up	D.7 #121	70	1	50%	
4. Piling works	Continuous flight auger	C.3 #21	79	1	50%	79

Table A.2: Calculated noise impacts during the works

		Shortest distance to the works (m)	Activity LAeq dB at receptor	Baseline weekday daytimes dB(A)	Baseline + activity LAeq dB daytime	Change in noise level dB – daytime
Spenser Road	Excavation and earthworks	17	61	60	64	3
	Rolling and compaction	17	73	60	73	13
	Pavement works	17	72	60	72	12
	Piling	780	37	60	60	0
Somersby Close	Excavation and earthworks	40	53	52	56	3
	Rolling and compaction	40	65	52	65	13
	Pavement works	40	63	52	63	11
	Piling	215	50	52	54	2
Garden Court	Excavation and earthworks	20	60	54	61	7
	Rolling and compaction	20	71	54	71	18
	Pavement works	20	70	54	70	17
	Piling	309	46	54	54	1

		Shortest distance to the works (m)	Activity LAeq dB at receptor	Baseline weekday daytimes dB(A)	Baseline + activity LAeq dB daytime	Change in noise level dB – daytime
Chadwick Square	Excavation and earthworks	32	58	55	60	5
	Rolling and compaction	32	70	55	70	15
	Pavement works	32	68	55	68	13
	Piling	32	71	55	71	16
Salter's Road	Excavation and earthworks	148	43	52	53	0
	Rolling and compaction	148	55	52	57	5
	Pavement works	148	53	52	56	3
	Piling	410	46	52	53	1