

11. Noise and Vibration

Introduction

- 11.1 This Chapter reports the outcome of the assessment of likely significant environmental effects arising from the Proposed Scheme in relation to Noise and Vibration.
- 11.2 The Chapter describes the consultation that has been undertaken during the EIA, the scope of the assessment and assessment methodology, and a summary of the baseline information that has informed the assessment.
- 11.3 A number of effects have been avoided in advance of the assessment and where relevant these are clearly stated. The assessment reports on the likely significant environmental effects, the further mitigation measures required to prevent, reduce or offset any significant adverse effects, or further enhance beneficial effects. The conclusions are provided both in terms of the residual effects and whether these are considered significant.
- 11.4 This Chapter, and its associated figures and appendices, is intended to be read as part of the wider Environmental Statement (ES) with particular reference to the introductory chapters of this ES (**Chapters 1 - 5**).
- 11.5 In addition, this Chapter should be read in conjunction with **Chapter 13 – Cumulative Effects Assessment**.

Legislative Framework, Noise Policy and Guidance

- 11.6 The following legislation has informed the assessment of effects within this Chapter, and is detailed further in **Appendix 11.1**:
- The Environmental Protection Act (EPA) 1990ⁱ
 - Control of Pollution Act 1974 Sections 60 and 61ⁱⁱ
 - The Land Compensation Act 1973 Part 1ⁱⁱⁱ
 - The Noise Insulation Regulations 1975 (amended 1988)^{iv}
- 11.7 The following policy and guidance have informed the assessment of effects within this Chapter, and is detailed further in **Appendix 11.1**:
- The National Planning Policy Framework (NPPF)^v
 - The Noise Policy Statement for England (NPSE)^{vi}
 - Planning Practice Guidance – Noise (PPG-N)^{vii}
 - The World Health Organization’s (WHO) Guidelines for Community Noise^{viii}
 - British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise^{ix}

- British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration^x
- British Standard BS 4142 Methods for rating and assessing industrial and commercial sound^{xi}
- Design Manual for Roads and Bridges Volume LA111, Noise and vibration Rev 0^{xii}
- Calculation of Road Traffic Noise (CRTN)^{xiii}
- Code of Practice on Environmental Noise Control at Concerts^{xiv}
- IEMA Guidelines for Environmental Noise Impact Assessment^{xv}
- TRL Research Report 53 - Ground vibration caused by civil engineering works^{xvi}

Summary of Consultation

11.8 **Table 11.1** provides an overview of the consultation that has been undertaken to inform the Proposed Scheme and EIA, including the consideration of likely significant effects and the methodology for assessment.

Table 11.1: Summary of Consultation

Body / Organisation	Contact	Date and Form of Consultation	Summary
Liverpool City Council (LCC)	Officers from LCC including representatives from the Environmental Protection Unit	Presentation of the Proposed Scheme for LCC officers, 26th November 2019	The Environmental Health Officers expressed general satisfaction with approach to control of construction impacts from previous projects and did not raise concerns with respect to concerts held in the Summer of 2019
LCC	Noise specialist from Environmental Protection Unit	E-mail correspondence 4th December 2019 and 10th December 2019	Consultation was undertaken on proposals for assessment of significance for the noise and vibration assessment. LCC agreed the approach set out in this Scoping Report (Appendix 2.1)
LCC	Special Projects Planning Officer and noise specialist from Environmental Protection Unit	Meeting, LCC, Cunard Building 20th January 2020	The focus of the meeting related to setting a limit on the numbers of concerts and potential noise mitigation measures, including the potential for more stringent Music Noise Levels (MNL) limits where more than six concert events occur within a 12-month period

Scope of the Assessment

- 11.9 An EIA Scoping Report was submitted to LCC in January 2020, as presented as **Appendix 2.1**. This section provides an update on the scope of the assessment presented within this Chapter following submission of the EIA Scoping Report.

Effects which are Not Significant

- 11.10 The following not significant effects were identified as part of the EIA Scoping Report and are not considered further in this Chapter. The effects and evidence to support this are represented and updated as below.

Disturbance as a Result of Operational Vibration

- 11.11 It is intended that all potential for operational vibration will be entirely mitigated through the design process and maintenance work, by for example appropriate design of stand structure, installing building services plant on anti-vibration mountings or inertia bases and ensuring that plant is maintained in good order. There are unlikely to be any adverse effects on nearby receptors during the operational phase and operational vibration has not been considered within the EIA or reported in the ES.

Change in Noise from Crowds and Public Address and Voice Alarm (PAVA) Within the Stadium on Match Days

- 11.12 The nature of crowd noise is continuously variable and is dependent on a number of factors, including match attendance, level of away team rivalry, number of goals scored, etc. It is anticipated that noise from crowds on match day will remain a variable component of the acoustic environment, but the development of the Anfield Road Stand will not cause a significant increase in the range of crowd noise before, during or after the match. Therefore, any change in crowd noise is unlikely to be considered significant and has not been considered within the ES.
- 11.13 Noise from PAVA systems within the Stadium will be entirely mitigated through the design process to ensure that additional PAVA systems required as a result of the Proposed Scheme do not increase noise levels above those associated with the use of existing PAVA systems. Therefore, any change in PAVA noise effects for nearby receptors are unlikely to be considered significant and has not been considered within the ES.
- 11.14 Since the submission of the EIA Scoping Report (December 2019) the following additional effects are not considered significant and the evidence to support this are outlined below.

Operational Noise from Building Services Plant (General)

- 11.15 Noise from all new items of building services plant installed as part of the Proposed Scheme will be mitigated through the design process to ensure that the rating level of the emitted sound as defined in BS4142 shall not exceed the current baseline background noise levels of 42 dB $L_{A90,T}$ daytime and 39 dB $L_{A90,T}$ night time at the nearest noise sensitive receptors. No significant adverse effects are therefore anticipated due to this source and it has not been considered within the ES.

Operational Noise from Waste Compactors

- 11.16 Liverpool Football Club (LFC) proposes to relocate the existing waste compactors within the Sir Kenny Dalglish Stand car park from adjacent to the southern entrance (to Walton Breck Road) to the northern end of the car park. An additional compactor will be provided to deal

with the additional waste generated by the Proposed Scheme. The compactors will operate intermittently between the hours of 08:00 and 21:30. The compactors will be fitted with noise reducing mufflers and an appropriate acoustic enclosure to ensure that the rating level of the emitted sound as defined in BS4142 shall not exceed the current baseline background noise levels of 46 dB $L_{A90,T}$ daytime at the nearest noise sensitive receptors. No significant adverse effects are therefore anticipated due to this source and it has not been considered within the ES.

Noise Generated by Team Sports Other than Football and Rugby

- 11.17 It is proposed to seek permission to host team sports other than football and rugby league within the Stadium during breaks in the football season (these would predominantly be during international breaks). These sports fixtures are similar in nature to the existing football matches. These would occur over a similar duration and timing to weekend or weekday evening matches, and have a similar noise profile, e.g. mainly crowd noise with limited broadcast of amplified music and PA announcements. Event management will follow the procedures currently employed. No significant adverse impacts or effects are anticipated due to noise from non-football sporting events so they have not been considered further within the ES.

Construction Compound Operation

- 11.18 The main construction compound is to be located at the rear of the club parking directly opposite the stand on Anfield Road, within the boundary of Stanley Park (as detailed in **Chapter 4**). This location is remote from noise sensitive receptors.
- 11.19 Detailed information on plant and usage of the compound is not anticipated to be available until the detailed design stage of the Proposed Scheme, albeit a robust assumption has been adopted at this time. It is likely that equipment such as heavy vehicles, cranes and forklift trucks will access the compound, which will generate noise on an intermittent basis. The compound is likely to have welfare facilities which may require the use of a generator.
- 11.20 Likely noise mitigation will include:
- Acoustic enclosure of external plant such as generators;
 - Temporary noise barriers where there are sensitive receptors close by;
 - Restrictions on delivery times; and
 - Appropriate location of ingress and egress point.
- 11.21 No significant adverse noise and vibration effects are anticipated due to operation of the compound. and it has not been considered further within the ES.

Construction Traffic

- 11.22 A prediction of change in Basic Noise Level (BNL) has been undertaken based upon projected construction traffic flows compared with baseline traffic flows provided by Mott MacDonald transportation engineers. A summary of this prediction is presented in **Appendix 11.3**. The roads considered were Priory Road, Arkles Lane and Anfield Road which are the likely access routes for construction traffic. Predicted changes in noise level were less than $L_{A10,T} +1$ dB. This is considered to represent a negligible impact (refer to **Table 11.5**).

- 11.23 No significant adverse noise effects are anticipated due to construction traffic and it has not been considered further within the ES.

Construction Phase Traffic Diversion

- 11.24 Anfield Road will be closed to through traffic during construction of the Proposed Scheme and through traffic diverted. Mott MacDonald transportation engineers have provided predictions of changes in traffic flow along potential diversion routes which include Walton Lane, Arkles Lane, Priory Road and Walton Breck Road. Conservative predictions of change in BNL based upon projected flows of diverted traffic compared with baseline traffic flows have been undertaken. A summary of this prediction is presented in **Appendix 11.3**. Predicted changes in noise level were less than $L_{A10,T} +3$ dB. This is considered to represent a minor impact (refer to **Table 11.5**).

- 11.25 No significant adverse noise effects are anticipated due to diverted traffic during construction and it has not been considered further within the ES.

Stage Set Delivery, Installation and Removal

- 11.26 Stage set delivery and construction occurs over a relatively short period of time prior to a given event. The detail of the works will vary depending upon the event. With the exception of delivery, works will be contained within the Stadium with no line of sight to noise sensitive receptors in the surrounding streets.

- 11.27 More detailed consideration of set delivery, installation and removal may be found in **Appendix 11.3**. No significant adverse noise and vibration effects due to set delivery, installation and removal associated with events are anticipated and this noise source is not considered further within the ES.

Changes to Coach Pick-up and Drop-off Location

- 11.28 The current approach to coach parking is for home fan coaches to Park on Priory Road and away coaches to park on Arkles Lane. An optioneering process is currently underway evaluating the possibility of moving home coach parking to an alternative off road site leaving the possibility that away coach parking can be moved from Arkles Lane, to Priory Road. Alternatives to the current arrangement proposed would not adversely change noise impacts associated with coach parking at noise sensitive receptors.
- 11.29 No significant adverse noise and vibration effects are anticipated and this noise source is not considered further within the ES.

Changes to Public Transport Arrangements

- 11.30 The strategy for the public transport parking and routing does not differ greatly from the existing situation; changes being the relocation of the 917 and 501 match day bus services to Walton Lane (from Walton Breck Road) for both drop off pre match and pick up post-match. The 502 match day service will no longer occur. Regular scheduled bus services will continue to divert around road closures as per existing arrangements. No significant adverse noise and vibration effects are anticipated, and this noise source is not considered further within the ES.

Likely Significant Effects

- 11.31 The following effects (**Table 11.2**) are considered to have the potential to be significant and are reported within this Chapter:

Table 11.2: Likely Significant Effects

Likely Significant Effect	Applicable Phase
Temporary adverse effects from construction noise	Construction
Temporary adverse effects from construction vibration	Construction
Changes in road traffic noise due to realignment of Anfield Road	Operation
Noise break-out from events staged during the football closed season	Operation

Extent of the Study Area

11.32 For the construction phase the spatial extent of the assessment includes the following elements:

- All locations where construction impacts generated by activities within the site boundary are predicted to be above SOAEL of $L_{Aeq,T}$ 65 dB¹ at sensitive receptors; and
- All locations where construction vibration, is expected to reach or exceed SOAEL of Peak Particle Velocity (PPV) of 1.0 mm/s.

11.33 The study area for the assessment of traffic noise changes due to the realignment of Anfield Road to accommodate the footprint of the Proposed Scheme area, where a change in road traffic noise of ≥ 1 dB is anticipated. This is limited to assessment of traffic noise increases at 73 Anfield Road on Anfield Road where the change in road alignment will bring the carriageway closer to the northwest facing façade of this residential property.

11.34 The study area for the assessment of events encompasses those residential locations where staging of events may result in a MNL of 15dB or more, above the prevailing background noise level expressed as $L_{A90,T}$.²

Background Studies to Inform the ES

11.35 The following background studies have informed this Chapter:

¹ This is the threshold level at which day-time construction noise is considered be potentially significant based upon methodology from BS 5228-1.

² The threshold of music noise level (MNL) provided as a guideline noise limit in Table 1 of the Noise Council Code of Practice on Environmental Noise Control at Concerts where there are 4 to 12 concerts days per calendar year. The Background noise levels used to define this threshold are those measured by Mott MacDonald in 2018 and the study area includes those areas where MNL was measured to be 15dB or more above background noise level during the concerts held in the Summer of 2019.

Table 11.3: Summary of Background Studies that Inform the ES

Study / Survey	Overview	Date
Match day noise survey (weekday evening)	Attended noise measurements have been completed in residential areas in the lead up to, during, and immediately after the match	April 2018
Non-match day noise survey (weekday and weekend)	Both attended and unattended noise measurements have been completed in residential areas	May 2018
Match day noise survey (Saturday daytime)	Completed by third party acoustic consultants Sandy Brown	November 2019
Post-concert reporting including, monitoring	Monitoring of noise management during Take That, Bon Jovi and P!nk concerts. Completed by third party acoustic consultants Vanguardia.	June and July 2019
Traffic data for Anfield Road	Traffic data for roads around the Stadium, in particular Anfield Road have provided a baseline for traffic noise changes at receptors associated with the proposed realignment of Anfield Road, and to give context for consideration of the additional motor-vehicle trips associated with operation of the redeveloped Anfield Road Stand	January 2020
Anfield Stand Expansion Concert Planning Noise Assessment	Completed by third party acoustic consultants Vanguardia Ltd. The assessment provided modelling of concert noise break-out from the Stadium following implementation of the Proposed Scheme.	February 2020

Assessment Methodology

Construction Noise

- 11.36 The methodology used for the prediction and assessment of construction noise is set out in detail in **Appendix 11.3**.
- 11.37 The level of construction noise has been predicted at noise sensitive receptors using methodology set out in Annex F of BS5228-1, based upon knowledge of construction activities, plant inventories and programme available at the time of assessment. Where uncertainties exist, a robust assumption has been made based on the likely worst-case plant selection and construction method.

Construction Vibration

- 11.38 Construction vibration has been predicted and assessed using methodology from BS5228-2 informed by data from TRL Report 53. This has been based upon knowledge of construction activities, plant inventories and programme available at the time of assessment.
- 11.39 Where uncertainties exist, a robust assumption has been made based on the likely worst-case plant selection and construction method. Further details of the construction vibration methodology is set out in **Appendix 11.3**.

Operational Traffic Noise

11.40 Changes in vehicular traffic noise associated with implementation of the Proposed Scheme, principally the realignment of Anfield Road, have been determined by calculation at the receptor using methodology from Calculation of Road Traffic Noise (CRTN). The assessment is based upon traffic flow counts for Anfield Road from December 2019 provided by Mott MacDonald transportation engineers, in terms of 18-hour weekday traffic flow between the hours of 06:00 to 24:00 along with average vehicle speed and the percentage of Heavy Goods Vehicles (HGVs). It is not anticipated that growth in traffic flow along Anfield Road between 2019 and the Proposed Scheme opening year of 2023 would be sufficient to result in perceptible changes on noise, therefore the 2019 count data may be considered representative of the opening year. The methodology takes into account variables including angle of view of the road from the receptor, distance of the receptor from the road and shielding of the receptor afforded by intervening structures.

11.41 Calculations of the road traffic noise level have been carried out for two scenarios:

- Without the Proposed Scheme in the opening year of 2023 (do minimum scenario); and
- With implementation of the Proposed Scheme in the opening year of 2023 (do something scenario).

11.42 Traffic noise changes have been described in terms of the UK traffic noise index $L_{A10,18\text{hour}}$ which is a statistical description of the time-varying noise levels from road traffic and is defined as the arithmetic average of the values of hourly $L_{A10,1\text{hour}}$ for each of the eighteen one-hour intervals between 06:00 and 24:00.

Events

11.43 Operational noise assessment for events follows the approach set out in the Noise Council Code of Practice (NCCP) on Environmental Noise Control at Concerts (ENCC).

11.44 Concert music noise break-out from the Stadium to the surrounding residential areas was modelled using proprietary computer software by acoustic consultants Vanguardia Limited who are industry experts in this field. Three concert stage locations were evaluated:

- North East Facing Stage;
- South West Facing Stage; and
- Central Stage Location.

11.45 The modelling was based upon typical concert speaker configurations providing acceptable concert sound levels within the Stadium for all proposed seating locations. The modelled MNL was then reviewed in conjunction with background noise measurements representative of the relevant noise sensitive receptors during the final four hours of an event and considered against the criteria set out within the Code of Practice.

11.46 The assessment of event noise is presented in detail in **Appendix 11.4**.

Reporting of the Environmental Effect and Significance Criteria

- 11.47 The assessment of likely significant environmental effects as a result of the Proposed Scheme has taken into account the construction and operational phases.
- 11.48 The duration of the effect has been assessed as either ‘short-term’, ‘medium-term’ or ‘long-term’. Short-term is considered to be up to 1 year, medium-term is considered to be between 1 and 10 years and long-term is considered to be greater than 10 years.

Determining Sensitivity of Receptor

- 11.49 Noise and vibration affect people in a number of different ways. These may include factors such as anxiety, annoyance and sleep disturbance, enjoyment of quiet spaces, ability to communicate with others, ability to concentrate at home or at work, and participation in social and community activities.
- 11.50 The noise and vibration assessment focused on receptors regarded as having high sensitivity to noise and vibration. These are predominantly residential receptors but also include the places of worship such as Christ Church on Walton Breck Road. Licenced premises in the vicinity of the Proposed Scheme have been assumed to be residential receptors.

Determining the Magnitude of Impact

- 11.51 The magnitude of impact is defined differently for each of the noise and vibration parameters assessed, and is in accordance with the methodologies set out in the Assessment Methodology Section above.

Construction Noise

- 11.52 Construction noise is assessed not according to magnitude of impact but by the application of a series of tests for potential significance which combine magnitude of construction noise level, noise change compared to baseline noise levels and duration of impact. The approach used was Example Method 2, the 5 dB(A) change method from BS5228-1 Annex E Section E.3.3. The method states:

“Noise levels generated by site activities are deemed to be potentially significant if the total noise (pre-construction ambient plus site 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 site 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 effect.”

- 11.53 This assessment has considered the day-time period only as apart from exceptional circumstances, construction activities will be limited to daytime only³.
- 11.54 BS 5228–1 does not state what might constitute potentially significant noise levels from “works of a shorter duration”; however the standard does provide example criteria for levels of construction noise and duration and frequency of occurrence which might trigger additional mitigation measures over and above best practicable means. These “trigger levels” are discussed in detail in **Appendix 11.3**. In summary, for day-time construction activities, a level of 75 dB (façade) exceeded for ten or more days of working in any fifteen

³ In accordance with Liverpool City Council *Construction hours of work Guidance note for contractors and developers*: <https://liverpool.gov.uk/media/2779/construction-site-noise-guidance.pdf> (accessed in November 2019)

consecutive days, or for a total of days exceeding 40 in any six month period, has been used in this assessment as a measure whether construction noise levels have the potential to be significant for activities with a duration of less than one month.

Construction Vibration

- 11.55 Impacts from construction vibration have been predicted based upon likely magnitude of vibration Peak Particle Velocity (PPV) and proximity to construction plant. Guidance on thresholds for human perception and response to vibration are provided in BS 5228-2.
- 11.56 BS 5228-2 provides the following guidance on perception of and tolerance of construction vibration:
- At a vibration level of PPV 0.14mm/s vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction;
 - At a vibration level of PPV 0.3mm/s vibration might be just perceptible in residential environments;
 - At a vibration level of PPV 1.0mm/s “It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents”; and
 - At a vibration level of PPV 10mm/s vibration is likely to be intolerable for any more than a very brief exposure period.”
- 11.57 This guidance has been translated into degree of impact in **Table 11.4**.

Table 11.4: Magnitude of Impact for Construction Vibration

Vibration PPV (mm/s)	Degree of Impact
Less than 0.3	Negligible
0.3-0.9	Minor
1.0 – 9.9	Moderate
10 or greater	Major

Operational Traffic Noise

- 11.58 Impacts from traffic noise have been determined based upon predicted noise change between do minimum and do something scenarios in the opening year of the Proposed Scheme, using the principals of the approach set out in Design Manual for Roads and Bridges (DMRB) Volume LA111, Noise and vibration Rev 2. The scale of impacts shown in **Table 11.5** are defined in DMRB and have been used in this assessment.

Table 11.5: Magnitude of Impact for Traffic Noise Change in the Short Term

Short Term Noise Change (dB $L_{A10,18hr}$)	Short Term Degree of Impact (can be beneficial or adverse depending upon whether noise decreases or increases)
Less than 1.0	Negligible Adverse
1.0-2.9	Minor Adverse
3.0-4.9	Moderate Adverse
Greater than or equal to 5.0	Major Adverse

Events Noise

11.59 The hierarchy of impacts set out in **Table 11.6** has been used for the evaluation of MNL.

Table 11.6: Hierarchy of MNL Impacts

Description of Music Noise Level	Degree of Impact
MNL $< L_{Aeq,15mins}$ 50 dB	Negligible Adverse
MNL $\geq L_{Aeq,15mins}$ 50 dB but no greater than 15dB above background noise level defined as L_{A90T}	Minor Adverse
MNL greater than 15 dB above background noise level but ≤ 75 dB	Moderate Adverse
MNL $> L_{Aeq,15mins}$ 75 dB	Major Adverse

Determining the Level of Effect

11.60 Consideration of the Lowest-observed-adverse-effect Level (LOAEL) and Significant-observed-adverse-effect Level (SOAEL)

11.61 Significance of noise and vibration impacts have been determined using the concepts of LOAEL and SOAEL introduced in the NPSE and elucidated further in PPG and the IEMA Guidelines. LOAEL and SOAEL for each parameter have been agreed for the assessment in consultation with LCC and are set out in **Table 11.7**.

Table 11.7: Summary of Levels of Significance of Noise and Vibration Impacts

Parameter Assessed	LOAEL and SOAEL	Source Guidance
Construction Noise	LOAEL $L_{Aeq,T}$ 50dB (free field)	WHO guideline value for moderate annoyance in outdoor living areas
	SOAEL $L_{Aeq,T}$ 65 dB (free field)	BS 5228-1 threshold for potential significance of day-time construction noise
Construction Vibration	LOAEL peak particle velocity (PPV) 0.3mm/s	BS 5228-2 threshold at which vibration “might be just perceptible in residential environments”
	SOAEL PPV 1.0 mm/s	BS 5228 threshold at which vibration is likely to cause

Parameter Assessed	LOAEL and SOAEL	Source Guidance
		complaint within residential environments “but can be tolerated if prior warning and explanation has been given to residents”
Music Noise	LOAEL $L_{Aeq,T}$ 50dB (free field)	WHO guideline value for moderate annoyance in outdoor living areas
	SOAEL Music Noise Level (MNL) of $L_{Aeq,15min}$ 76dB (façade).	NCCP on Environmental Noise Control at Concerts, lowest noise level rounded to the nearest dB.
Traffic Noise Impacts	LOAEL $L_{A10,18hour}$ (façade) 55dB	DMRB LA111Table 3.49.1
	SOAEL $L_{A10,18hour}$ (façade) 68 dB	DMRB LA111Table 3.49.1

- 11.62 Exceedance of SOAEL has not in itself been regarded to constitute a significant adverse effect. The assessment of likely significant effects at sensitive receptors considers the sensitivity of the receptor and the magnitude, duration and frequency of change.
- 11.63 Note that for the assessment of changes in traffic noise, DMRB Volume LA111, Noise and vibration Rev 2 advises that where predicted noise levels remain below SOAEL, noise changes may still be regarded as resulting in significant effects where the changes are regarded as moderate or major.

Baseline Conditions

- 11.64 Residents and users of the area around the Stadium are accustomed to regular football games with associated noise impacts from transportation sources, football crowds both outside the Stadium in the lead-up to and after games, and within the Stadium during games, concessions outside the ground, public address and occasional amplified music emanating from within the ground. On non-match days the noise climate is dominated by road traffic on Walton Breck Road with contributions from passage of vehicles on local roads including Anfield Road and Arkles Lane.
- 11.65 The noise measurement surveys which have been undertaken in support of the assessment are detailed in **Appendix 11.2**. Noise measurement locations are illustrated in **Appendix 11.5**. Representative daytime ambient noise levels relevant to the assessment of construction are summarised in **Table 11.8**. Evening background noise levels included to inform the assessment of MNL from events are summarised in **Table 11.9**.

Table 11.8: Summary of Baseline Noise Conditions Relevant to the Construction Noise Assessment

Representative Measurement Location	Description of Receptors	Ambient Noise Level $L_{Aeq,T}$ dB (daytime)
Noise Level Derived from DEFRA noise mapping	Receptors situated to the south of the Stadium directly exposed to traffic noise from Walton Breck Road	73 $L_{Aeq,16hour}$
LT1	Receptors situated to the west of the Stadium remote from Walton Breck Road including: Alroy Road, Gilman Street, Sibyl Street, Rockfield Road and Parts of Anfield Road.	55 $L_{Aeq,9hour}$ (1400-23.00)
LT2	Receptors situated to the east of the Stadium remote from Walton Breck Road including Skerries Road, Arkles Lane, Wylva Road, Arkles Road and Parts of Anfield Road	53 $L_{Aeq,16hour}$

Table 11.9: Summary of Short Term Background Noise Measurements (façade)

Location	Average Background Noise level 19:00 – 23:00 $L_{A90,15mins}$ (dB)
ST1	46
ST2	44
ST3	56
ST4	44
ST5	45
ST6	46

Future Baseline

- 11.66 The future baseline is considered the noise climate of the Site without the implementation of the Proposed Scheme in 2023, the opening year of the Proposed Scheme. Changes in baseline noise level will predominantly occur due to projected traffic growth. Baseline noise levels are not anticipated to vary substantially from the current baseline.

Sensitive Receptors

11.67 The following sensitive receptors have been identified and assessed within the ES:

- Noise sensitive receptors in the form of residential dwellings immediately to the southeast, northeast and northwest of the Stadium, with residences on Skerries Road, parts of Anfield Road, Arkles Lane, and Alroy Road having direct line of sight to the Stadium;
- To the southwest the Stadium is bounded by the A5099 Walton Breck Road which has a mix of commercial properties, residences, Christ Church and a licenced premise “The Park”.
- Residential regeneration beyond Walton Breck Road, which includes developments of recently constructed residences; and
- Receptors on the surrounding local roads; the north side of the Stadium is bounded by Anfield Road with Stanley Park beyond.

11.68 **Figure 11.1** shows the location of these sensitive receptors.

Primary and Tertiary Mitigation

Construction Phase

11.69 The following primary and tertiary mitigation which has been evaluated as part of the construction phase assessment are outlined below.

11.70 Application of Best Practicable Means (BPM) as defined in Section 72 of the Control of Pollution Act 1974 by implementation of a Construction Environmental Management Plan (CEMP) based on good industry practice. Apart from exceptional circumstances, construction activities will be limited to daytime only⁴.

11.71 As a minimum requirement, BPM should be applied to manage noise emissions from construction works. Typical means by which noise may be controlled include the following:

- Selecting quiet equipment;
- Use of mains electrics instead of generators;
- Ensure equipment is maintained, in good working order, and is used in accordance with the manufacturer’s instructions;
- Members of the construction team should be trained and advised on quiet working methods;
- Equipment should not be left running unnecessarily;

⁴ In accordance with Liverpool City Council *Construction hours of work Guidance note for contractors and developers*: <https://liverpool.gov.uk/media/2779/construction-site-noise-guidance.pdf> (accessed in November 2019)

- Equipment should be fitted with silencers or mufflers;
- Use plant enclosures whenever feasible;
- Use temporary acoustic screens around small works where feasible;
- Careful orientation of plant with directional features away from sensitive receptors;
- Materials should be lowered instead of dropped from height;
- Inform nearby noise sensitive receptors in advance of construction activities and keep them up to date with progress and changes to works. A letter drop to residents will be made in this instance; and
- Give nearby noise sensitive receptors a site contact telephone number; the contact should liaise with residents and maintain good rapport prior to and during construction works.

11.72 Temporary acoustic screening should be provided around breaking activities. Screening should aim to prevent line of sight between works and receptor locations. This is most likely practical around hand-held equipment (e.g. hand-held breakers, compressors, etc.) compared to heavy plant (e.g. dumpers and excavators).

Operational Phase

11.73 The following primary and tertiary mitigation which has been evaluated as part of the operational phase assessment is outlined below.

11.74 The realigned carriageway for Anfield Road will be a low speed road with a 10 mph advisory limit incorporating measures to discourage speeding and with a high-quality surface which should ensure traffic noise is controlled as effectively as practicable. The road surface will be subject to an appropriate maintenance regime to ensure that performance does not deteriorate.

11.75 The Event Management Strategy (EMS) confirms that noise mitigation will be applied for all concert type events as a matter of best practice. Noise associated with concert type events will be mitigated principally by implementation of an effective event Noise Management Plan (NMP) with noise control measures based upon the guidance in Section 4 of the NCCP. The NMP would be included in the Event Management Plan (EMP) for each individual event. Where between six and twelve events are held within one year, a lower MNL limit of $L_{Aeq,15min}$ 70 dB will be applied for the seventh event onward.

11.76 The current EMS and an example NMP are presented along with further discussion of event noise mitigation in **Appendix 11.4**.

Assessment of Effects, Secondary Mitigation and Residual Effects

Construction Phase

Construction Noise

11.77 **Table 11.10** details the distances from the works for each activity at which the noise levels from construction is predicted to fall below $L_{Aeq,T}$ 75 dB façade and $L_{Aeq,T}$ 65dBA

free field respectively. These are the two thresholds considered in evaluation of significance.

Table 11.10: Distance from Construction Activities at Which Noise Levels Fall Below $L_{Aeq,T}$ 75dBA (Façade) and 65dBA (Freefield)

Activity	Foundations and substructure	Superstructure	Roof	Works to Anfield Road stand	Existing upper tier and roof demolition	Road surfacing
Distance (m) at which construction noise level falls to $L_{Aeq,T}$ 65 dB free field	175	81	62	122	91	136
Distance (m) at which construction noise level falls to $L_{Aeq,T}$ 75 dB facade	78	36	27	54	41	61

- 11.78 **Tables 11.11 to 11.13** below summarise the assessment of construction noise, identifying noise sensitive receptors where the potential for significant adverse effect has been predicted from construction activities associated with the Proposed Scheme. Full details of the construction noise assessment are provided in **Appendix 11.3**.
- 11.79 Where construction noise level exceeds $L_{Aeq,T}$ 75 dB (façade) a significant adverse effect may occur where activities last for a shorter duration than one month, defined as ten or more days of working in any fifteen consecutive days or 40 days in any six month period. In **Tables 11.9 to 11.14** this is indicated with a “*” against the receptor location in the tables.
- 11.80 Note that at the time of writing, the construction programme indicates that all construction activities assessed will exceed a duration of one month.
- 11.81 The locations of noise and vibration sensitive receptors where a construction phase significant adverse effect has been predicted are shown in **Figure 11.1**.

Construction of Foundations and Substructure

Table 11.11: Calculation of Significance of Construction Noise due to Foundation and Substructure works.

Representative baseline ambient noise measurement location	Representative daytime baseline noise level $L_{Aeq,T}(dB)$	Construction noise level ≥ 65 dB	Total noise level with construction \geq Baseline + 5dB	Duration of Effect ≥ 1 month	Properties experiencing significant adverse effect
LT1	55	Yes	Yes	Yes	2-24 Alroy Rd, 128-144 Anfield Rd, 33-45 Anfield Rd
LT2	53	Yes	Yes	Yes	73-75 Anfield Rd*, 77-85 Anfield Rd, 250-252 Anfield Rd*, 254-268 Anfield Rd, 1-29 Skerries Rd, 31-39 Skerries Rd*

*Properties falling in the 75dBA (façade) noise radius

Construction of Superstructure

Table 11.12: Calculation of significance of construction noise due superstructure works.

Representative baseline ambient noise measurement location	Representative daytime baseline noise level $L_{Aeq,T}$ (dB)	Construction noise level \geq 65 dB	Total noise level with construction \geq Baseline + 5dB	Duration of Effect \geq 1 month	Properties experiencing significant adverse effect
LT2	53	Yes	Yes	Yes	75 Anfield Rd, 250-252 Anfield Rd, 31-39 Skerries Rd, 73 Anfield Rd*

*Properties falling in the 75dBA (façade) noise radius

Construction of Roof

Table 11.13: Calculation of significance of construction noise due roof works.

Representative baseline ambient noise measurement location	Representative daytime baseline noise level $L_{Aeq,T}$ (dB)	Construction noise level \geq 65 dB	Total noise level with construction \geq Baseline + 5dB	Duration of Effect \geq 1 month	Properties experiencing significant adverse effect
LT2	53	Yes	Yes	Yes	73-75 Anfield Rd, 37-39 Skerries Rd

*Properties falling in the 75dBA (façade) noise radius

Steel Frame Erection Anfield Road Stand

Table 11.14: Calculation of significance of construction noise due to the Anfield Stand works.

Representative baseline ambient noise measurement location	Representative daytime baseline noise level $L_{Aeq,T}$ (dB)	Construction noise level ≥ 65 dB	Total noise level with construction \geq Baseline + 5dB	Duration of Effect ≥ 1 month	Properties experiencing significant adverse effect
LT1	55	Yes	Yes	Yes	45 Anfield Rd, 140-144 Anfield Rd, 2-12 Alroy Rd
LT2	53	Yes	Yes	Yes	17-37 Skerries Rd, 75 Anfield Rd, 250-260 Anfield Rd, 73 Anfield Rd*, 39 Skerries Rd*

*Properties falling in the 75dBA (façade) noise radius

Existing Upper Tier and Roof Demolition

Table 11.15: Calculation of significance of construction noise due to the existing upper tier and roof demolition works.

Representative baseline ambient noise measurement location	Representative daytime baseline noise level $L_{Aeq,T}$ (dB)	Construction noise level ≥ 65 dB	Total noise level with construction \geq Baseline + 5dB	Duration of Effect ≥ 1 month	Properties experiencing significant adverse effect
LT2	53	Yes	Yes	Yes	75 Anfield Rd, 250-254 Anfield Rd, 27-39 Skerries Rd, 73 Anfield Rd*

*Properties falling in the 75dBA (façade) noise radius

Construction of new Anfield Road Alignment

Table 11.16: Calculation of significance of construction noise due to the road alignment works.

Representative baseline ambient noise measurement location	Representative daytime baseline noise level $L_{Aeq,T}$ (dB)	Construction noise level ≥ 65 dB	Total noise level with construction \geq Baseline + 5dB	Duration of Effect ≥ 1 month	Properties experiencing significant adverse effect
LT1	55	Yes	Yes	Yes	41-45 Anfield Rd, 136-144 Anfield Rd, 2-8 Alroy Rd
LT2	53	Yes	Yes	Yes	77-81 Anfield Rd, 256-266 Anfield Rd, 5-27 Skerries Rd, 29-39 Skerries Rd*, 73-75 Anfield Rd*, 250-254 Anfield Rd*

*Properties falling in the 75dBA (façade) noise radius

- 11.82 The sensitivity of the noise sensitive receptors (as identified in **Tables 11.11 to 11.16** above) in relation to construction noise impact is considered to be high. The predicted construction noise impact is considered to present the potential for a direct, temporary, short-term significant adverse effect depending upon duration of works activities.

Secondary Mitigation or Enhancement

- 11.83 Where significant adverse effects are predicted, specific measures for mitigation will be discussed with LCC and described within the contractor method statements. Where practicable, construction activities resulting in noise levels exceeding $L_{Aeq,T}$ 65 dB (freefield) will be limited to periods not exceeding one month. Where practicable construction activities resulting in noise levels exceeding $L_{Aeq,T}$ 75 dB (façade) will be limited to periods not exceeding 10 days in any consecutive 15 days or 40 days in any six month period. Where these noise levels and durations have the potential to be exceeded, the Main Contractor will prepare an application under Section 61 of the Control of Pollution Act 1974, to cover these works or undertake an informal process equivalent to a Section 61 application at the discretion of LCC.

Residual Effect

- 11.84 The sensitivity of the noise sensitive receptors (as identified in **Tables 11.9 to 11.14** above) in relation to construction noise impact is considered to be high. The predicted construction noise impact following secondary mitigation continues to present the potential for a direct, temporary, short-term significant adverse effect depending upon duration of works activities. Note that due to the constraints of the location of the Proposed Scheme, in close proximity to residential noise sensitive receptors, this is an anticipated outcome and even with application of all reasonable mitigation steps a significant adverse effect cannot be avoided.
- 11.85 This effect is considered to be Significant.

Construction Vibration

- 11.86 A detailed assessment of construction vibration is presented in **Appendix 11.3**. No piling work is anticipated during the construction of the Proposed Scheme. With reference to **Appendix 11.3** Chart A11.3.1, which indicates that for general construction plant and vehicle movements exceedance of SOAEL of PPV 1.0 mm/s would only be anticipated at vibration sensitive receptors within 2m of the plant.
- 11.87 The façade of one property lies along the red line boundary of the Proposed Scheme: 39 Skerries Road. This property has some potential to experience a significant adverse effect from construction vibration. It should be noted however that any vibration impacts from construction would be transient, for example the passage of an excavator, crawler crane or other construction vehicle, and unlikely to occur for one hour or more, further reducing the likelihood of significant adverse effects.
- 11.88 The sensitivity of the vibration sensitive receptor (as identified in the section above) is considered to be high. The predicted construction vibration impact is considered to present the potential for a direct, temporary, short-term significant adverse effect.

Secondary Mitigation or Enhancement

- 11.89 Secondary mitigation to limit the adverse effects of construction vibration should include the following measures, which would be delivered as part of the CEMP:

- Minimising operation of heavy plant within 8m of vibration sensitive receptors; and
- Avoid approach of heavy plant to within 2m of vibration sensitive receptors if reasonably practicable.

Residual Effect

11.90 The sensitivity of the vibration sensitive receptor (identified in the section above) is considered to be high. The predicted construction vibration impact and associated effect following secondary mitigation would fall below SOAEL.

11.91 This effect is therefore considered to be Not Significant.

Operational Phase

Road Traffic Noise Due to Re-alignment of Anfield Road

11.92 Traffic noise change in terms of $L_{A10,18\text{hours}}$ has been predicted for the north west facing façade of 73 Anfield Road due to the re-alignment of Anfield Road. This is the only noise sensitive receptor where the re-alignment of Anfield Road will bring the carriageway significantly closer to a façade. The prediction was undertaken for the first-floor level which will have direct line of sight to the alignment. 73 Anfield Road has been assumed to be residential accommodation. The prediction utilised traffic count data provided by Mott MacDonald traffic engineers. 3% HGV traffic was assumed which is based upon traffic counts for this road.

11.93 The predictions took into account the distance from the road to receiver, angle of view, road gradient, and angle of reflection. Speed was assumed to be 32km/h (20mph) in the do minimum consistent with the current speed limit for Anfield Road. The new alignment is proposed to have an advisory speed limit of 10 mph, however the predictions have assumed 24km/h (15mph) in the do something; a conservative approach. The results of the prediction are summarised in **Table 11.17** below.

Table 11.17: Traffic noise prediction

Noise Sensitive Receptor	Noise Level Do minimum $L_{A10,18\text{hour}}$ façade (dB)	Noise Level Do something $L_{A10,18\text{hour}}$ façade (dB)	Noise Change (dB)	Magnitude of Impact (DMRB)
73 Anfield Road	54.6	60.7	+6.1	Major

11.94 The sensitivity of 73 Anfield Road (as identified in the Section above) is considered to be high. The magnitude of change is considered to be large. Therefore, there is likely to be a direct permanent long-term adverse effect which is considered to be major although the predicted noise level following implementation of the Proposed Scheme falls below SOAEL. Note that this effect relates to one façade of the receptor only (DMRB advises that number of receptors should not however be a consideration when determining significance).

Secondary Mitigation or Enhancement

11.95 Primary mitigation in the form of low speed designation, traffic calming and a well maintained road surface will be designed into the re-aligned Anfield Road. These measures will limit road noise as far as is reasonably practicable and are appropriate to the context of a residential street. The predicted noise levels following implementation of the Proposed

Scheme fall well below the specified noise level ($L_{A10,18\text{hour}}$ 68 dB) which is the threshold for entitlement to noise insulation treatment under the Noise Insulation Regulations. No secondary mitigation measures are therefore proposed.

Residual Effect

- 11.96 In the absence of secondary mitigation the residual effects for noise sensitive receptors (as identified in the Section above) is the same as that reported in the pre-mitigation scenario. This effect is considered to be Significant.

Event Noise – Assessment of Concert Music Noise Level (MNL)

- 11.97 A Detailed evaluation of concert MNL is set out in **Appendix 11.4**.
- 11.98 With the exception of properties on Walton Breck Road, which are exposed to significant through traffic noise, existing background noise levels at residential facades were generally of the order L_{A90} 44 – 46 dB during the period of an evening event.
- 11.99 For all stage configurations, minor adverse impacts may therefore be experienced for those residential areas where the noise contour plots in **Figures 11.3, 11.4 and 11.5** predicted MNL in the approximate range $L_{Aeq,15\text{mins}}$ 50-60 dB (i.e. above LOAEL but less than 15 dB above prevailing background noise level).
- 11.100 Concert MNL was predicted to be more than 15 dB above the prevailing background noise levels at residential locations around the Anfield Stadium and therefore the Code of Practice guideline recommended criteria for 4 – 12 concert days per year are likely to be exceeded.
- 11.101 Where MNL was predicted to exceed 15dB above the prevailing background noise level but below SOAEL of $L_{Aeq,15\text{mins}}$ 75 dB, this has been considered a moderate adverse impact. Management of this impact would be by means of effective implementation of the event noise management plan.
- 11.102 Locations of noise sensitive receptors where this moderate adverse impact was predicted to occur are summarised for each potential stage orientation below. Background noise level has been assumed to be L_{A90} 45 dB for this evaluation.

North East Facing Orientation

- 11.103 Areas where the MNL modelling indicated that a moderate adverse impact may occur were:

- 45 Anfield Road, north west of the Stadium;
- Residences on Anfield Road, to the south east of the Stadium as far as the junction with Arkles Lane;
- Residences on the north west side of Skerries Road (approximately northern third of Skerries Road from the junction with Anfield Road); and
- Residences facing onto Arkles Lane.

South West Facing Orientation

- Residences at junction of Anfield Road and Arkles Lane;
- Residences on the southwestern portion of Skerries Road;

- Residences to the south of Walton Breck Road (but set back from junctions with Walton Breck Road) including Venmore Street, Burleigh Road South, Hartnup Street, Donaldson Street, Glaisher Street and Davy Street;
- Residences on the southern part of Pulford Street.

Central Orientation

- Residential Streets to the east and Northeast of Anfield Stadium including Anfield Road, Skerries Road, Wylva Road, Arkles Road and Arkles Lane;
- Residential Streets to the west and northwest of Anfield Stadium including Anfield Road, Alroy Road, Rockfield Road, Sybil Road, Conningsby Road, Pulford Street and streets accessed from Burnand Street.
- Residences to the south of Walton Breck Road (but set back from junctions with Walton Breck Road) including Burleigh Road South, Burleigh Road North, Venmore Street, Hartnup Street, Donaldson Street, Glaisher Street, Maslin Drive and Davy Street.

11.104 MNL was not predicted to exceed SOAEL of $L_{Aeq,15mins}$ 75 dB for any noise sensitive receptor. A significant adverse effect is not therefore anticipated due to event noise.

11.105 In summary the sensitivity of noise sensitive receptors (as identified in the Section above) in relation to event noise is considered to be high. The magnitude of change is considered to constitute a moderate impact falling between LOAEL and SOAEL. This situation falls within the context of the second aim of the NPSE. Clause 2.24 of NPSE states that where this occurs: *“all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development”*. It goes on to state, *“This does not mean that such adverse effects cannot occur”*. With the implementation of the robust mitigation measures set out in paragraph 11.76, all reasonable steps will be taken to mitigate this impact. The experience of the three concerts held in the summer of 2019 (see narrative in **Appendix 11.4**) was that events can successfully be held with MNL between LOAEL and SOAEL with only a small number of noise-related complaints from residents. Whilst this impact will occur annually and could therefore be considered a permanent effect, it will only occur for limited duration each year.

11.106 Therefore, there is likely to be a direct permanent long-term adverse effect which is not however considered to be significant.

Note on Boxing Events

11.107 Boxing events, which are considered in this assessment to be analogous to music events, may extend beyond 23:00, to a latest finish time of 23:30. This represents a potential intrusion into the night-time period of 30 minutes. For this exceptional case, there is the potential for a major impact. Given the very limited duration of the impact (maximum 30 minutes) and very limited frequency (no more than twice per calendar year) this has not been regarded as resulting in a significant adverse effect.

Secondary Mitigation or Enhancement

11.108 Comprehensive primary/tertiary mitigation has been assumed in the assessment and further mitigation to that described in the sections above is not considered practical.

Residual Effect

11.109 In the absence of secondary mitigation the residual effects for noise sensitive receptors (as identified in the Section above) is the same as that reported in the pre-mitigation scenario.

11.110 This effect is considered to be Not Significant.

Limitation and Assumptions

11.111 To ensure transparency within the EIA process, the following limitations and assumptions have been identified.

- Baseline noise data – It is not possible to monitor noise during all periods of the day and week at all the sensitive receptors in proximity to the Anfield stadium. Priority was therefore given to characterising the baseline noise climate at the most sensitive times of the day within the periods of construction phase hours of working, and the operation of the stadium both on match and non-match days. Wherever possible, individual monitoring locations were selected to provide a suitable overall representation of the baseline noise climate at sensitive receptors.
- An indicative list of construction activities and likely plant is provided within **Appendix 11.3**. Noise levels for this plant have been assigned based upon the database in the appendices of BS5228-1. At this stage in the Scheme development the inventory is provisional and the construction noise assessment should be viewed as indicative of potential magnitude of impact at this stage. Specific controls to mitigate effects would be required by the contractor.
- Where there is no line of sight between the receptor and works due to existing structures and intervening buildings, a screening correction of -10dB has been applied to the prediction of construction noise.

Summary

11.112 Noise and vibration impacts and effects have been considered for residential noise sensitive receptors and one place of worship in the vicinity of the Proposed Scheme. The sensitivity of these receptors has been considered to be high.

11.113 During the EIA process the following effects have been resolved (i.e. considered not significant):

- Construction vibration;
- Road traffic noise changes due to the re-alignment of Anfield Road;
- Noise generated by Events held at the Stadium during the football closed season.

11.114 **Table 11.18** provides a summary of the effects, receptors, residual effects and a conclusion as to whether the effect is significant or not significant.

Effect	Receptor	Residual Effect	Is the Effect Significant
Construction Phase Properties with a * notation are predicted to experience noise levels $\geq 75\text{dBA}$, so a significant effect occurs for durations of works less than one month.			
Foundations and substructure	2-24 Alroy Rd, 128-144 Anfield Rd, 33-45 Anfield Rd 73-75 Anfield Rd*, 77-85 Anfield Rd, 250-252 Anfield Rd*, 254-268 Anfield Rd, 1-29 Skerries Rd, 31-39 Skerries Rd*	Potentially Significant using 5228-1 Example Method Two - The Five dB Change Method	Yes
Superstructure	75 Anfield Rd, 250-252 Anfield Rd, 31-39 Skerries Rd, 73 Anfield Rd*	Potentially Significant using 5228-1 Example Method Two - The Five dB Change Method	Yes
Roof	73-75 Anfield Rd, 37-39 Skerries Rd	Potentially Significant using 5228-1 Example Method Two - The Five dB Change Method	Yes
Steel Frame Erection Anfield Road Stand	45 Anfield Rd, 140-144 Anfield Rd, 2-12 Alroy Rd 17-37 Skerries Rd, 75 Anfield Rd, 250-260 Anfield Rd, 73 Anfield Rd*, 39 Skerries Rd*	Potentially Significant using 5228-1 Example Method Two - The Five dB Change Method	Yes
Existing upper tier and roof demolition	75 Anfield Rd, 250-254 Anfield Rd, 27-39 Skerries Rd, 73 Anfield Rd*	Potentially Significant using 5228-1 Example Method Two - The Five dB Change Method	Yes
Construction of new Anfield Road Alignment	41-45 Anfield Rd, 136-144 Anfield Rd, 2-8 Alroy Rd 77-81 Anfield Rd,	Potentially Significant using 5228-1 Example Method Two - The Five dB Change Method	Yes

Effect	Receptor	Residual Effect	Is the Effect Significant
	256-266 Anfield Rd, 5-27 Skerries Rd, 29-39 Skerries Rd*, 73-75 Anfield Rd*, 250-254 Anfield Rd*		
Construction vibration	39 Skerries Rd	Minor impact below SOAEL	No
Operational Phase			
Road traffic noise	73 Anfield Road, Anfield Road	Major impact in the short term but falling below SOAEL	Yes
Event Noise – Assessment of Concert Music Noise Level (MNL)	<p>North East Facing Stage Orientation:</p> <p>45 Anfield Road, north west of the Stadium;</p> <p>Residences on Anfield Road, to the south east of the Stadium as far as the junction with Arkles Lane;</p> <p>Residences on the north west side of Skerries Road (approximately northern third of Skerries Road from the junction with Anfield Road); and</p> <p>Residences facing onto Arkles Lane.</p> <p>South West Facing Stage Orientation:</p> <p>Residences at junction of Anfield Road and Arkles Lane;</p> <p>Residences on the southwestern portion of Skerries Road;</p> <p>Residences to the south of Walton Breck Road (but set back from junctions with Walton Breck Road) including Venmore Street, Burleigh Road South, Hartnup Street, Donaldson Street, Glaisher Street and Davy Street;</p> <p>Residences on the southern part of Pulford Street.</p> <p>Central Stage Orientation</p> <p>Residential Streets to the east and Northeast of Anfield Stadium including Anfield Road, Skerries Road, Wylva Road, Arkles Road and Arkles Lane;</p>	Moderate impact falling between LOAEL and SOAEL.	No

Effect	Receptor	Residual Effect	Is the Effect Significant
	<p>Residential Streets to the west and northwest of Anfield Stadium including Anfield Road, Alroy Road, Rockfield Road, Sybil Road, Conningsby Road, Pulford Street and streets accessed from Burnand Street.</p> <p>Residences to the south of Walton Breck Road (but set back from junctions with Walton Breck Road) including Burleigh Road South, Burleigh Road North, Venmore Street, Hartnup Street, Donaldson Street, Glaisher Street, Maslin Drive and Davy Street.</p>		

Reference List

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- ⁱⁱⁱ CROWN, 1973. The Land Compensation Act 1973 Part 1
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- ^v MHCLG, 2019. National Planning Policy Framework
- ^{vi} MHCLG , 2019. Planning Practice Guidance – Noise (PPG-N) (Revised July 2019)
- ^{vii} WHO, 1999. The World Health Organization (WHO) Guidelines for Community Noise
- ^{viii} WHO, 2009. WHO Night Noise Guidelines for Europe
- ^{ix} BSI, 2009 amended 2014. British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration
- ^x BSI, (2014) Amended 2019. British Standard BS 4142 Methods for rating and assessing industrial and commercial sound
- ^{xi} Highways England, 2019. Design Manual for Roads and Bridges (DMRB) Volume LA111, Noise and vibration Rev 2
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- ^{xvi} TRANSPORT RESEARCH LABORATORY, 1986. Ground vibration caused by civil engineering works (Research report 53)