

10 Light Pollution

10.1 Introduction

- 10.1.1 This chapter reports the potential impacts and effects on lighting conditions within the area directly surrounding the stadium as a result of the proposed development.
- 10.1.2 The lighting environment around a stadium can have an impact on the safety and security of spectators using the stadium, and the visual and general amenities of pedestrians and residents in its near vicinity. An evaluation of how the lighting conditions will be altered by the proposed stadium expansion is therefore important in identifying potential impacts for its users and the surrounding community. 3-D computer modelling of the proposed lighting conditions including pitch floodlighting, public realm lighting and stadium façade lighting has been undertaken to identify any impacts and associated effects.
- 10.1.3 Two temporal phases are considered in this lighting assessment: the existing baseline conditions and the conditions following completion of Phase 1 construction (with the Main Stand complete). As Phase 2 (Anfield Road Stand) is currently only at outline planning stage, detailed designs are not currently available and so Phase 2 is limited to defining a set of lighting design principles; these principles ensuring that once the detailed design is completed, the impact of the scheme lighting will be mitigated against. Lighting conditions apparent during construction are also considered in this assessment.
- 10.1.4 This chapter presents the assessment methodology, outlines the relevant light pollution policy and legislation, records the consultation undertaken to date, describes the existing or 'baseline' conditions, and assesses the potential effects arising following completion of the development. This allows the performance of the design to be assessed relative to the existing conditions and the significant impacts of the proposal to be identified. Mitigation measures are identified to avoid or minimise any potentially adverse effects on the light environment.
- 10.1.5 This chapter has been prepared by Mott MacDonald Ltd with inputs from the following design and manufacturing organisations:
- Phase 1 pitch floodlighting design – Mott MacDonald;
 - Phase 1 external stadium public realm lighting design - iGuzzini and Sinclair Knight Merz (SKM); and
 - Phase 1 stadium façade lighting design - iGuzzini and SKM.
- 10.1.6 This chapter is supported by a Lighting Impact Assessment provided in ES Volume 2, Part 3, Appendix 1.1, also undertaken by Mott MacDonald Ltd.

Design measures incorporated

- 10.1.7 Other than carrying out the Stage D design in accordance with appropriate lighting design codes and standards, no specific lighting-related design measures are incorporated within this

assessment. Where lighting standards are predicted to be exceeded in this assessment, additional design measures are recommended to bring the lighting scheme back in line with relevant design codes and standards.

10.2 Methodology

Sources of information

10.2.1 This assessment has utilised the following sources of information:

- Architectural 3D model – KSS;
- Topographical survey information – Planit-IE;
- External stadium public realm Stage D design – iGuzzini and SKM;
- Stadium façade Stage D design – iGuzzini and SKM;
- Pitch floodlighting Stage D design – Mott MacDonald.

Desk Study

10.2.2 A desk study was undertaken using readily available information to identify key receptor locations in the streets immediately surrounding the existing stadium (see Table 10.8). These locations, representing receptors which could potentially be affected by the proposed Phase 1 lighting scheme, were used to identify properties from which to collect field survey information.

Field Survey

10.2.3 Daytime and night time surveys were undertaken on the 3rd of April 2014 for non-match day conditions and on the 4th of April 2014 for full match day conditions, to determine the current baseline lighting and the types of lighting installations present on site and in the immediate vicinity of the stadium.

10.2.4 During the daytime survey the weather conditions were generally misty, giving way to heavy cloud conditions and the occasional light shower.

Figure 10.1: Daytime weather conditions



Source: Mott MacDonald

- 10.2.5 On both match day and non-match day, the night time surveys were undertaken with good visibility and no rain; however cloud cover was such that the moon and stars were not visible.

Figure 10.2: Night time weather conditions



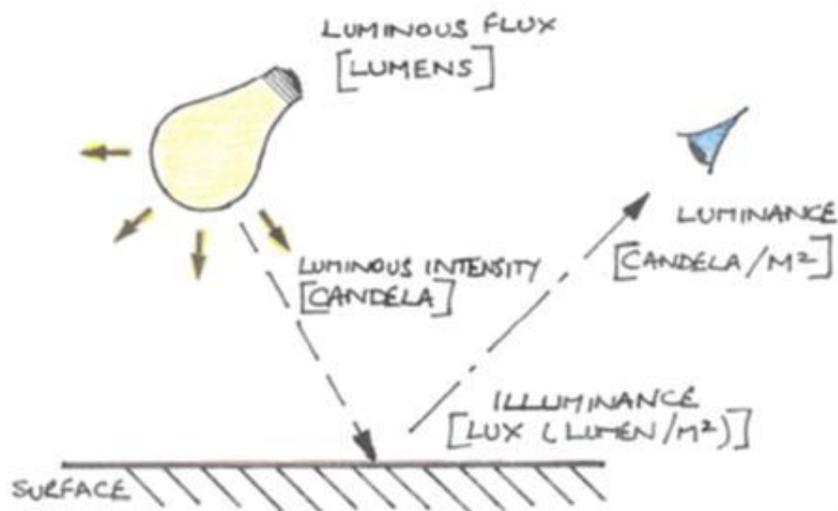
Source: Mott MacDonald

Source: Mott MacDonald

10.2.6 Readings of illuminance to establish light spill were taken from predetermined receptor locations considered to best represent the sensitive residential properties. The locations were determined during the desk study and confirmed during the day-time survey. In particular, properties in close proximity to the site were evaluated in terms of their direct and intermittent views towards the site and whether existing screening prevented any existing views.

10.2.7 Figure 10.3 provides an explanation of illuminance and how this differs from luminance. To summarise, illuminance is the measurement of the amount of light falling on a surface whereas luminance is an indicator of how bright the surface will appear from a given observed position.

Figure 10.3: Luminance and illuminance



Source: Mott MacDonald, 2014

10.2.8 A TES 1330A Heavy Duty hand held Light Meter was utilised for all on site light readings in lux.

10.2.9 The camera utilised for the site photos was a Canon 550d, a tripod was used for longer exposure shots associated with night time photography, to provide increased stability.

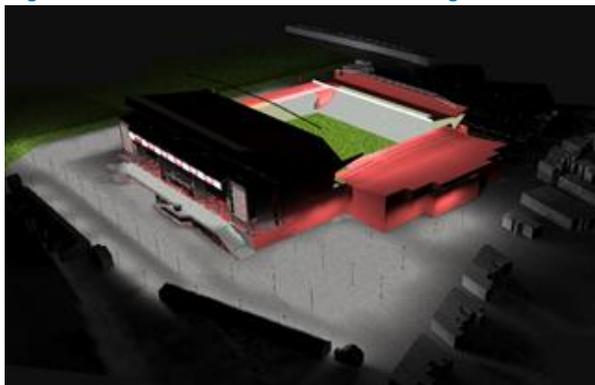
10.2.10 The illuminance readings were taken between 21:00hrs and 23:00hrs to establish the existing ambient lighting conditions on which to base the lighting assessment upon. Readings were taken at ground level and at a height of 1.5m facing towards the existing stadium.

Assessment Methodology

Approach

- 10.2.11 The baseline assessment for the existing lighting conditions has been carried out, using the guidance produced by the Institution of Lighting Professionals (ILP) - Guidance Note PLG 04, Guidance on Undertaking Environmental Lighting Impact Assessments [Ref 1].
- 10.2.12 Baseline conditions were established on a non-match day where all of the stadium lighting is switched off except for the security lighting which remains on at all times. This was then directly compared to a match day situation where all lighting for the stadium is switched on. This gave an accurate representation of how the stadium visually affects the surrounding area in its current state.
- 10.2.13 With the use of a 3D model and the Phase 1 lighting design, a direct comparison of how the expanded stadium will affect the baseline conditions, match day and non-match day was then made.
- 10.2.14 An assessment was then carried out at key lit receptor locations as detailed in Table 10.8.
- 10.2.15 Utilising the baseline information and with the aide of the design team information and the architects model, the proposed luminaires were able to be plotted into AGi 32 lighting software package to create the model shown below:

Figure 10.4: LFC Pre-curfew East Facing



Source: Mott MacDonald Ltd

Figure 10.5: LFC Post-curfew East facing



Source: Mott MacDonald Ltd

- 10.2.16 The model was then manipulated to take readings at the same locations as the baseline on site assessment which were then compared to the existing match day impact against the proposed impact created by the development.

- 10.2.17 The ILP has provided a guidance note on the reduction of obtrusive light, GN01:2011. This document forms the basis for the obtrusive light assessment carried out for Phase 1 [Ref 02].
- 10.2.18 Four types of impact have been identified as being of potential environmental concern with regards to lighting installations. These are:
- Sky glow;
 - Light intrusions (into windows);
 - Glare/source (luminaire) intensity;
 - Building luminance (brightness of surfaces).
- 10.2.19 In order to measure the degree of these potential impacts, a number of technical parameters are used which are presented below in Table 10.1:

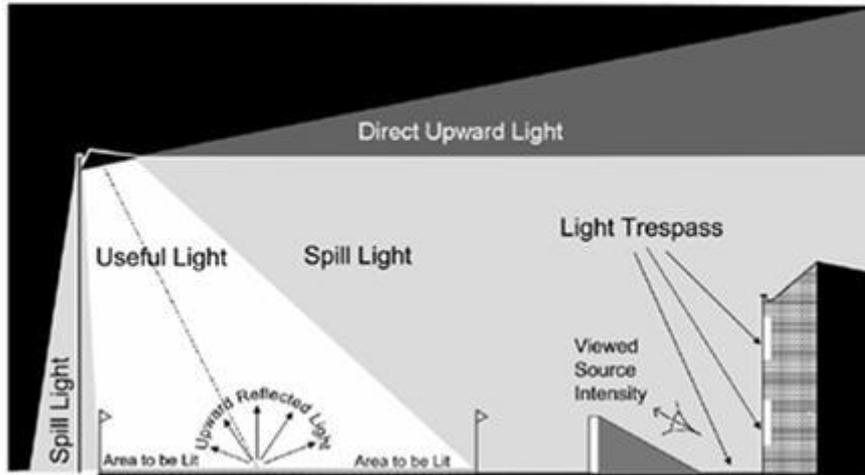
Table 10.1: Potential impacts for obtrusive light assessment

Impact	Technical parameter	Unit of measurement
Sky glow	Upward light ratio	% of upward light
Light intrusion	Vertical illuminance	Lux (or lumens per m ²)
Glare/source intensity	Intensity	Candelas
Building luminance	Luminance	Candelas/m ²

Source: Mott MacDonald Ltd

- 10.2.20 In order to understand the methodology used in this report, an understanding of some lighting terminology is required:
- Light (or luminous flux) is a type of radiation and forms part of the electromagnetic spectrum visible to the eye. It is measured in lumens (lm);
 - The amount of light falling on a surface is known as illuminance and is measured in lumens/m² or lux;
 - While illuminance is easy to calculate and measure and is widely used, the eye does not see this, but rather the light radiated or reflected off a surface. This is known as luminance, or brightness and is measured in candelas/m² (cd/m²);
 - The term candela (cd) is by itself a measure of light intensity. Whether this light intensity is seen as a glare or not, depends on the surrounding luminance as can be noted when comparing a road lighting luminaire or floodlight lit during the day and again at night;
 - The upward light ratio (ULR) of an item of lighting equipment (a luminaire) is the ratio of its light output when installed on site, at and above the horizontal, to its total light output and is measured as a lumen percentage (%).
- 10.2.21 Light intensity and distribution needs to be carefully considered during the design process to ensure that direct upward light is minimised, and light distribution cut-offs from luminaries do not result in severe lighting contrast on light receiving surfaces such as floors and walls. Luminaries, lamps, optics and equipment should be specified and located to minimise any direct upward light component in order to reduce light pollution. In addition light trespass and spill light will need to be minimised through design.

Figure 10.6: Types of Obtrusive Light



Source: ILP Guidance Notes for the Reduction of Obtrusive Light (GN01:2011) [Ref 02]

Environmental Zone Classification

- 10.2.22 To assess the levels of obtrusive light an appraisal was carried out to classify the site in terms of its 'Environmental Zone' which equates to the district brightness of the surroundings (see Table 10.2 for environment zone information).
- 10.2.23 In the case of a site being between two possible environmental zones, ILP guidance recommends that the most sensitive environmental zone of the two options to achieve is assigned for assessment purposes. In this case it could be argued that the site lies between an E3 and E4 zone. Therefore in line with ILP guidance, an E3 zone has been applied to the site.

Table 10.2: Environmental Zones

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark areas	National Parks, Areas of Outstanding Natural Beauty etc.
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night time activity

Source: ILP Guidance Notes for the Reduction of Obtrusive Light (GN01: 2011) [Ref 02]

Obtrusive Light Limitations

10.2.24 It can be seen from Table 10.3 that a lighting installation located in an area deemed to be more sensitive will understandably equate to greater constraints with regards to obtrusive light. Light limitations for an E3 zone have been highlighted.

Table 10.3: Obtrusive Light Limitations

Environmental Zone	Sky Glow ULR (Max %)	Light Intrusion (into Windows) Ev (Lux)		Luminaire Intensity I (Candelas)		Building Luminance Pre-curfew Average, L (cd/m ²)
		Pre-curfew*	Post-curfew*	Pre-curfew*	Post-curfew*	
E0	0	0	0	0	0	0
E1	0	2	0	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	6*	2	10,000	1,000	10
E4	15	25	5	25,000	2,5000	25

Source: ILP guidance notes for the reduction of obtrusive light – 2011 [Ref 02]

*Curfew is defined as the time after which more stringent requirements (for control of obtrusive light) will apply; often a condition of use of lighting by the local planning authority. If not otherwise stated, 23:00 hours is suggested by the ILP.

**See paragraph 10.2.25 for further explanation.

Lighting Restrictions

10.2.25 LCC's Environmental Health Officer has confirmed that the light restrictions highlighted in Table 10.3 are to be applied for this development. LCC has also confirmed that 23:00hrs is the curfew time, after which the more stringent requirements for control of obtrusive light, highlighted in Table 10.3, will apply. It should be noted that the pre-curfew limit for light intrusion (into windows) set by the ILP is usually 10 Ev(lux) however at the request of LCC this has been lowered to 6 Ev(lux) for the purpose of this assessment increasing the stringency of requirements [Ref 03].

Evaluation of Effects

10.2.26 The proposed scheme will have varying levels of effect and these have been assessed based on the scale of change experienced by each identified key receptor (magnitude) and their ability to absorb such change (sensitivity).

10.2.27 To determine the scale of the change in lighting levels at each key receptor, the following criteria have been utilised:

- The obtrusive light limitations detailed in Table 10.3;
- Type of lighting that will be in use during the construction and operational phases;
- The anticipated duration of artificial lighting during the hours of darkness;

- The distance between the proposed lighting installation and the key receptor;
- Type of view (e.g. direct, intermittent or constrained); and
- Existing and proposed screening from the proposed scheme.

10.2.28 The level of change evaluated from the criteria above is assessed using the criteria detailed in Table 10.4:

Table 10.4: Magnitude of impact

Magnitude of impact	Criteria for assessing impact
Major beneficial	Significant improvement in night environment and/or reductions in glare, spill light and sky glow.
Moderate beneficial	Noticeable improvements in night environment and/or reductions in glare, spill light and sky glow etc.
Minor beneficial	Slight improvement in night environment and/or reductions in glare, spill light and sky glow etc.
None/negligible	No significant effect or overall effects balancing out.
Minor adverse	Slight increase in visibility of site, glare, and sky glow etc
Moderate adverse	Noticeable increase in visibility of site, glare and sky glow etc.
Major adverse	Significant problems with increase in visibility of site, glare, and sky glow etc.

Source: ILP Professional Lighting Guide 04.

10.2.29 Table 10.5 sets out the measure of the sensitivity of the receptors identified.

Table 10.5: Sensitivity of receptors

Sensitivity	Description
High	The receptor has little ability to absorb change without fundamentally altering its present character, or is of international or national importance.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, or is of high importance.
Low	The receptor is tolerant of change without detriment to its character, or is of low importance.

Source: Mott MacDonald

10.2.30 Receptors within the study area range from residential dwellings to commercial premises consisting of food outlets, offices and public houses. In some instances, a property may contain both residential and commercial receptors e.g. food outlet on ground floor with residential on upper floors.

10.2.31 Residential properties have been classified as high sensitivity given their nature of use e.g. bedrooms which have little ability to absorb any increase in light intrusion. Commercial premises have been classified as low sensitivity given their nature e.g. offices which are generally not in use during evening matches or food outlets which have their own light emission sources and generally have a high tolerance to change without detriment to its character.

10.2.32 In instances where a property has both residential and commercial uses, the property has been classified as high sensitivity on a worst case basis.

Significance

10.2.33 The term "significant effect" is an effect that (either in isolation or combination with others) would, in the opinion of a lighting specialist, having regard to relevant criteria, be taken into account in the decision-making process.

10.2.34 By assessing a potential impact in terms of its individual magnitude and combining it with an evaluation of the sensitivity of the receiving environment to that potential impact, the significance of effect can be determined in line with the Matrix for Assessment of Effects, shown in Table 6.2.

Table 10.6: Matrix for Assessment of Significance of Effects

Magnitude of Effect	Sensitivity of Receptors		
	Low	Medium	High
None/negligible	Insignificant	Insignificant	Insignificant
Minor	Insignificant	Minor	Minor
Moderate	Minor	Moderate	Moderate
Major	Minor	Moderate	Major

10.2.35 Levels that are either moderate or above are considered to be a significant effect. Note that significant effects can be either beneficial or adverse.

10.3 Legislation and policy

Legislation

The Planning (Clean Neighbourhoods and Environment) Act 2005

10.3.1 The legislation governing light pollution is the Planning (Clean Neighbourhoods and Environment) Act 2005 which applies to artificial light emitted from premises so as to be prejudicial to health or a nuisance. The relevant section is 102. This legislation makes light nuisance subject to the same criminal law as noise and smells.

National Planning Policy

The National Planning Policy Framework (March 2012)

10.3.2 The National Planning Policy Framework (NPPF) was published in March 2012 and consolidates the previously adopted Planning Policy Statements and Planning Policy

- Guidance Notes for use in England. It contains a number of criteria relating to the importance of good design and sustaining and enhancing the significance of heritage assets.
- 10.3.3 Relevant sections of the NPPF include (paragraph 125):
- 10.3.4 *“By encouraging good design, planning policies and decisions should limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation”.*
- 10.3.5 Local Planning Policy
- 10.3.6 The Liverpool Unitary Development Plan (UDP) Adopted 2012
- 10.3.7 The Liverpool UDP was adopted in November 2002. Relevant policies of the UDP comprise:
- 10.3.8 Policy C7: refers specifically to Liverpool and Everton Football Clubs. It recognises their importance to the economy of the city and indicates that the City Council will assist the clubs in progressing their development proposals provided that these do not adversely affect residential amenity. The policy also recognises car parking and amenity problems experienced by local residents to the clubs, particularly on match days, and aims to provide effective solutions to remedy those problems and maintain and enhance residential amenity in the area.
- 10.3.9 Policy HD18 sets out the general design requirements that the City Council will expect from new developments including:
- i. scale, density and massing of the proposed development and relationship with its locality;
 - ii. local characteristics and distinctiveness in terms of design, layout and materials
 - iii. external boundary and surface treatment;
 - iv. impact on the city skyline, roofscape and local views;
 - v. the provision of adequate arrangements for pedestrian and vehicular access and car parking.
- 10.3.10 Policy HD28 refers to the requirements for external lighting schemes that have regard to amenity and impact on landscape area.
- [Liverpool Local Plan \(Draft 2014\)](#)
- 10.3.11 Following the publication of the NPPF in March 2012, LCC has resolved to prepare a Local Plan. This single document will take forward the principles of the Core Strategy, updated to take account of this new guidance, the changed economic climate and emerging corporate priorities. The Core Strategy (that reached draft stage in 2012) places considerable emphasis

on North Liverpool and seeks to focus new development to regenerate it and similar 'Urban Core' areas of the City. Relevant draft strategic policies of the Core Strategy include:

- 10.3.12 SP23 - Place Making and Design Principles which sets out criteria to ensure innovative, high quality design to create well-integrated and useable place.

10.4 Consultation

- 10.4.1 Liverpool FC Stadium Expansion Environmental Scoping Report [Ref 04] was referred to Liverpool County Council Planning Department. Table 11.3 summarises the key points of the scoping responses in relation to the light pollution assessment.

Table 10.7: Scoping responses for light pollution assessment

Name of Organisation	Key Concerns	Comment
Liverpool County Council	None	I have studied the Lighting sections of the Scoping Report and I have no adverse comments to make.

Source: Email from McEvoy F. (LCC) [Ref 04]

10.5 Assumptions and limitations

- 10.5.1 A limitation is the environment itself. While the area generally is urban and well lit, the degree of sky glow at any time will depend on atmospheric pollution and any moisture within it.
- 10.5.2 The detailed lighting design for Phase 2 Anfield Road Stand expansion is not available at this stage of the project and therefore it has not been possible to calculate the light spill levels, percentage of sky glow, source illuminance etc. A set of lighting design principles have been developed in this instance; these principles ensuring that once the detailed design is completed, the impact of the Scheme lighting will be mitigated against.
- 10.5.3 Light (illuminance) readings in lux obtained in the field can be obstructed by trees, vegetation, and street furniture, although at the stadium site, the most prevalent issue was parked vehicles. As the field survey was conducted over two consecutive days (to obtain measurements for both a non-match day and a match day) it is possible that parked cars may have been in place on only one of those nights, which may have affected the measurements.
- 10.5.4 Despite the limitations cited above, there remains a good level of confidence that the assessments are robust.

10.6 Baseline conditions

Key receptors

10.6.1 Following the desk study exercise, 41 key baseline locations were identified. These are illustrated in the Lighting Impact Assessment report which accompanies this ES [Ref 04] and listed below in Table 10.8:

Table 10.8: Key Lit Baseline Survey Location Summary

Key Baseline No:	Drawing Reference No:	Description of Location
1	317415-EIA-002	Walton Breck Road - Outside property no: 220
2		Walton Breck Road - Outside property no: 214
3		Walton Breck Road - Outside property no: 208
4		Walton Breck Road - Christ Church Building
5	317415-EIA-001	Walton Breck Road - Outside property no: 194
6		Walton Breck Road - Outside property no: 182
7		Walton Breck Road - Outside property no: 178/176
8		Walton Breck Road - Outside property no: 172
9		Walton Breck Road - Outside property no: 168
10		Walton Breck Road - Outside property no: 162
11		Walton Breck Road - Outside property no:160
12		Walton Breck Road - Outside property no: 152
13		Walton Breck Road - Outside property no: 144
14		Gilman Street - Outside property no: 1
15		Gilman Street - Outside property no: 17/19
16		Gilman Street - Outside property no: 35/37
17		Baltic Street - Outside property no: 1
18		Baltic Street - Outside property no: 19/21
19		Baltic Street - Outside property no: 39/41 currently demolished
20		Rockfield Road - Beside property no: 53
21		Alroy Road - Outside property no: 20
22		Alroy Road - Outside property no: 12/10
23		Alroy Road - Outside property no: 4
24		Anfield Road - Beside property no: 144
25		Anfield Road - Outside property no:45
26		Anfield Road/Mill Lane junction to Stanley Park - Beside property no:46
27		Stanley Park - Next to substation on Mill Lane
28		Stanley Park location 1
29		Stanley Park location 2

Key Baseline No:	Drawing Reference No:	Description of Location
30	317415-EIA-002	Stanley Park location 3
31		Anfield Road - Outside property no:73/71
32		Anfield Road - Beside property no:250
33		North west car park - Inside stadium boundary location 1
34		North west car park - Inside stadium boundary location 2
35		North west car park - Inside stadium boundary location 3
36		North west car park - Inside stadium boundary location 4
37		North west car park - Inside stadium boundary location 5
38		Skerries Road - Outside property no:30
39		Skerries Road - Outside property no:20
40		Skerries Road - Outside property no:8
41		Walton Breck Road - Beside property no:271

Source: Mott MacDonald

- 10.6.2 Existing light measurements (illuminance) were recorded at these locations during the day and night time surveys and match day and non-match day surveys undertaken during April 2014.
- 10.6.3 Full survey result details are located in ES Volume 2, Part 3, Appendix 1.1.

Existing site conditions

Walton Breck Road (Locations 1-13 & 41)

- 10.6.4 Walton Breck Road is an A-class road situated to the south of the stadium. This is the main road running through the area; it is a bus route and was the busiest of those roads surveyed. There are a number of businesses along the road close to the stadium including a public house, church, cafés and fast food outlets. There is a wide footway on the northern side of Walton Breck Road and a relatively narrow footway on the southern side, with double yellow lines on both sides of the road. There are no trees or planting of any significance in the area near to the stadium.
- 10.6.5 There is existing highway lighting on Walton Breck Road in the form of lighting columns which are approximately 10 metres in height. The luminaires incorporate low pressure sodium lamps which are classed as a monochromatic light source providing negligible colour recognition properties. The system of lighting appears to be operated by the local highway authority and as such will be to a standard of lighting appropriate for a traffic route.

10.6.6 There are significant existing views of the stadium. When the stadium lighting is operational there is a significant amount of light falling on the advertising hoarding and both the The Albert and The Park Public Houses.

10.6.7 From reviewing the Illuminance readings, the difference in the non-match day and match day Illuminance of the majority of readings are negligible. Comparing the match and non-match day readings at receptors 2 and 12 there is an increase in Illuminance during match day however adjacent readings do not show any significant increase.

Gilman Street (Locations 14-16)

10.6.8 Gilman Street is located to the west of the stadium and has a row of small 2-storey terraced houses on the west side and an area on the east side which is grassed with planting. Restricted parking is allowed on the west side of Gilman Street but there are double yellow lines for the length of the east side. The road allows 2-way traffic and incorporates traffic calming measures at 2 locations within the area surveyed.

10.6.9 Gilman Street has relatively narrow footways on both sides and is sparsely lit with 3 lighting columns of approximately 6 metres in height. The luminaires incorporate low pressure sodium lamps which are classed as a monochromatic light source providing negligible colour recognition properties. The system of lighting appears to be operated by the local highway authority and as such will be to a standard of lighting appropriate for a residential road.

10.6.10 From reviewing the Illuminance readings, the non-match day readings have significantly increased compared to the match day readings. The increase at two of the receptor locations has been attributed to the readings being taken later in evening when the existing highway lighting, which is in close proximity to the receptor sites, have been operational for longer and are therefore operating at increased intensity. The readings from the third receptor location, which is not positioned in close proximity to the existing street lighting, illustrates a significant increase in lux levels both at ground level and at 1.5 metres above ground level which can be attributed to the increase of stadium building illuminators.

10.6.11 It is noted that all of the properties in the area between Gilman Street and Pulford Street are now vacant. They have been acquired by LCC and are due to be cleared during the 3rd quarter of 2014 to make way for commercial / residential development in accordance with the Anfield Strategic Regeneration Framework.

Baltic Street (Locations 17-19)

10.6.12 Baltic Street is to the west of the stadium and joins Walton Breck Road at the south and Back Rockfield Road at the north. There are small 2-storey terraced houses on both sides of the street with no planting or trees on either side. There are double yellow lines for the length of the west side of Baltic Street and restricted parking on the east. 2-way traffic is allowed on Baltic Street and there are speed humps at 2 locations on the highway in the area surveyed.

- 10.6.13 The majority of the properties on Baltic Street have no existing views of the stadium; however one property on the corner of Walton Breck Road appears to have a small direct view of the stadium from a second floor window.
- 10.6.14 There is existing highway lighting on Baltic Street in the form of lighting columns which are approximately 6 metres in height. Compared to Gilman Street the luminaires have been upgraded and incorporate high pressure sodium lamps which have improved colour recognition properties when compared to low pressure sodium lamps however are considered poor when compared to 'white light' sources such as Cosmopolis and LED based lighting. The system of lighting appears to be operated by the local highway authority and as such will be to a standard of lighting appropriate for a residential road however the overall uniformity of the lighting appears to be poor.
- 10.6.15 From reviewing the illuminance readings, the difference in the non-match day and match day illuminance readings are negligible. Based on these readings the stadium lighting has no impact in the areas of receptors 17 to 19. There is a slight increase in the non-match 1.5m reading for receptor 19 however this is attributed to the readings being taken later in evening when the existing highway lighting, which is in close proximity, have been operational for longer and therefore at increased intensity.
- 10.6.16 Baltic Street is included in the area of housing intended for clearing as described in paragraph 10.6.11 above.

Alroy Road (Locations 21-23)

- 10.6.17 Alroy Road is situated to the north-west of the stadium and allows 1-way traffic heading south-east. The road joins Anfield Road to the north-east and Rockfield Road at the south-west. There is restricted parking on both sides of Alroy Road and 2 speed humps towards either end. The houses on Alroy Road are generally 2-storey with the loft space utilised for an additional room with a front facing dormer window. There is a small area of private land outside each property adjoining the footway, some of which have planting however this is small and does not overhang into the footway and would not affect lighting.
- 10.6.18 There are no direct views of the stadium from Alroy Road. There are however views of the Anfield Road car park and its associated lighting.
- 10.6.19 There is existing highway lighting on Alroy Road in the form of lighting columns which are approximately 6 metres in height with the majority of luminaires incorporating high pressure sodium lamps which have improved colour recognition properties when compared to low pressure sodium lamps however are considered poor when compared to 'white light' sources such as cosmopolis and LED. There is one 4 metre lighting column at the junction of Rockfield road which incorporates a low pressure sodium light source. The system of lighting appears to be operated by the local highway authority and as such will be to a standard of lighting appropriate for a residential road.

- 10.6.20 From reviewing the Illuminance readings, the difference in the non-match day and match day illuminance readings are negligible. Based on these readings the stadium lighting has no impact in the areas of receptors 20 to 24. There is a slight increase in the non-match 1.5m reading for receptor 24 however this is attributed to the readings being taken later in evening when the existing highway lighting, which is in close proximity, have been operational for longer and therefore at increased intensity.

Rockfield Road (Facing the stadium) (Location 20)

- 10.6.21 It was decided to take an additional photo at this location as the proposed development will remove the houses which currently block any lighting from the stadium and may potentially be an area of concern when the new development is modelled.
- 10.6.22 Rockfield Road is situated to the north-west of the stadium and joins Lothair Road on the south-east and Anfield Road on the north-west. Rockfield Road allows 1-way traffic heading south-east. Restricted parking is allowed on the south-west side of the road and the north-east side is restricted with double yellow lines. There are footways on either side of the road and speed humps at a number of locations along its length. The houses are 2-storey terraced, some of which have a dormer window in the loft space. There are no trees or planting on Rockfield Road however there is a small area of private land outside each house which may have some small planting though doesn't overhang into the footway and will not affect lighting.
- 10.6.23 There are existing minor views of the stadium roof and its lighting from Rockfield Road.
- 10.6.24 There is existing highway lighting on Rockfield Road in the form of lighting columns that are approximately 6 metres in height with the majority of luminaires incorporating a white light source such as cosmopolis lamps which have considerably higher improved colour recognition properties when compared to high pressure sodium. The system of lighting appears to be operated by the local highway authority and as such will be to a standard of lighting appropriate for a residential road.

Anfield Road / Mill Lane (Locations 24-27)

- 10.6.25 Anfield Road runs to the north of the stadium and joins the A580 Walton Lane at the west end and Walton Breck Road at the east end.
- 10.6.26 Mill Lane runs down the side of the house leading to Stanley Park. Photos were taken at this location because there is a significant amount of spill light from the temporary car park north of the stadium.
- 10.6.27 There are footways on both sides of Anfield Road and double yellow lines along its length. Anfield Road allows 2-way traffic and speed humps are situated at several locations.

- 10.6.28 There are 3 large trees on the north side of the road close to the photograph location. Houses on the north side of the road close to the photograph location are large 3-storey semi-detached properties. Housing on the south side are a combination of small 2-storey terraced houses and large 2-storey terraced houses some of which have a room in the loft space with dormer type windows.
- 10.6.29 The stadium is located on Anfield Road and as such is a significant feature. There is no floodlighting on the stadium orientated towards the road in this location. There is significant lighting of the temporary car park in the form of floodlighting mounted at approximately 8 metres in height. There is a significant amount of spill light from the car park affecting property number 45 on Anfield Road (Receptor 25). Although there is hoarding around the car park this is not sufficient to shield the lighting from the car park.
- 10.6.30 There is existing highway lighting on Anfield Road in the form of lighting columns that are approximately 8 metres in height with the luminaires incorporating high pressure sodium lamps which have improved colour recognition properties when compared to low pressure sodium lamps however are considered poor when compared to 'white light' sources such as cosmopolis and LED. The system of lighting appears to be operated by the local highway authority and as such will be to a standard of lighting appropriate for a traffic route.
- 10.6.31 There is also lighting on Mill Lane in the form of lighting columns approximately 4 metres in height however during the visit the lighting was not operational. The luminaires have been fitted with shields to limit light spill to the rear of the footpath.
- 10.6.32 From reviewing the illuminance readings, the difference in the non-match day and match day illuminance readings are negligible. Based on these readings the stadium lighting has no impact in the areas of receptors 25 to 27, although it is apparent that property number 45 Anfield Road (receptor 25) receives a significant amount of spill light from the temporary car park.

Stanley Park (Locations 28-30)

- 10.6.33 Stanley Park is located to the north of the stadium behind the temporary car park on Anfield Road. There is a run of trees and a 6ft mesh fence between the Park and the temporary car park on Anfield Road. The stadium lies immediately to the south side of Anfield Road. Photos were taken along the footway, Dahlia Walk, which is approximately 2m above the ground level of the temporary car park.
- 10.6.34 At this photo location, lighting from the temporary car park can be seen. Street lighting on Anfield Road can also be seen as can stadium lighting and its roof structure. There is no lighting in the vicinity of the footway in the Park.
- 10.6.35 From reviewing the illuminance readings, there is a significant increase in match day lighting levels which has been attributed to the temporary car park lighting and the visible stadium

pitch floodlighting having a detrimental effect on the general district brightness in the park area.

Anfield Road (Locations 31 & 32)

- 10.6.36 This location on Anfield Road faces north-west looking towards the stadium. There is the entrance to Stanley House which lies immediately to the east of the fan zone and temporary parking area. As mentioned previously, Anfield Road is 2-way, has double yellow lines and footways on both sides and traffic calming in several locations. There are no trees surrounding the photo location. There are significant views of the stadium and temporary car park in this location.
- 10.6.37 As discussed for receptors 25-27, there is existing highway lighting on Anfield Road. There is also existing lighting for the fan zone on the north side of the road and existing lighting for the North West car park (Centenary Stand car park). There is an increase in non-match day illuminance at 1.5m reading height which has been attributed to lighting being emitted from the localised property. It is apparent that the lux level on the ground on match day is significantly greater due to the façade lighting at the stadium..

Skerries Road (Locations 38-40)

- 10.6.38 Skerries Road is located to the south-east of the stadium and joins Anfield Road at the north end and Walton Breck Road at the south. Skerries Road allows 1-way traffic heading south west, with restricted parking on both sides and a narrow carriageway. There are footways on both sides of the road and traffic calming at 2 locations along its length. The houses are small 2-storey terraces on both sides. There is a small area of private property outside the front of each property, none of these have any significant planting and there are no trees on either side of the road.
- 10.6.39 There is existing highway lighting on Skerries Road that are approximately 4 metres in height with the column closest to Walton Breck Road being approximately 6 metres in height. The luminaires incorporate low pressure sodium lamps which are classed as a monochromatic light source providing negligible colour recognition properties. The system of lighting appears to be operated by the local highway authority and as such will be to a standard of lighting appropriate for a residential road.
- 10.6.40 There are no existing significant views of the stadium from the front of the properties; there are however significant existing views from the rear of the properties on the east side of the road towards the stadium and the North West car park adjacent to the Centenary Stand. It is anticipated that this existing system of lighting will provide a level of spill light to the rear of these properties and gardens. (see below) .
- 10.6.41 From reviewing the illuminance readings, the difference in the non-match day and match day illuminance readings are negligible. Based on these readings the stadium lighting has no

impact in the areas of receptors 32 and 38 to 40. There is a slight increase in the non-match day 1.5m reading for receptor 39 however this is attributed to the readings being taken later in evening when the existing highway lighting, which is in close proximity, have been operational for longer and therefore at increased intensity.

North West Car Park (Locations 33-37)

- 10.6.42 The North West car park runs parallel to Skerries Road and perpendicular to Anfield Road. The gardens to the rear of the properties on Skerries Road back on to the car park. There is lighting provided to the car park area in the form of floodlighting attached to the stadium orientated towards the rear of the properties on Skerries Road and tilted at approximately 70° from the horizontal.
- 10.6.43 Spill light from the North West Car Park lighting falls on the rear of the properties on Skerries Road.
- 10.6.44 From reviewing the illuminance readings, there is a significant increase of illuminance during match days. The difference has been attributed to the North West Car Park lighting which is only operational during match days.

Proposed stadium pitch floodlighting design

- 10.6.45 The proposed stadium pitch floodlighting for Phase 1 has been designed by Mott MacDonald to the Premier League Handbook 2014/15, summarised below:
- Maintained vertical illuminance of:
 - An average of 1650 Lux and a minimum of 1000 lux when measured towards the principal camera on the Television Gantry;
 - An average of 1000 Lux and a minimum of 650 Lux at any one location on the pitch when measured towards the pitch level cameras on the 4 sides of the stadium;
 - Uniformity of:
 - U1 [min/max] > 0.50;
 - U2 [min/ave] > 0.6;
 - Calculation grid:
 - Calculation of the illuminance values shall be undertaken on the pitch using a minimum of 96 measurement points in a grid format at 5m x 5m;
 - Vertical illuminance calculation grids have been assumed to be at 1.5m above pitch level.
- 10.6.46 Details of the luminaires, lamp, optical setting, arrangement, lamp output and overall maintenance factor utilised for the Stadium Pitch Lighting design are located in ES Volume 2, Part 3, Appendix 1.1. Summary information is provided in Table 10.9 below:

Table 10.9: Luminaire Schedule Stadium Pitch Floodlighting

Manufacturer & Model	Lamp/Optic	Quantity	Maintenance Factor
Philips Arena Vision	B2, B4, B6 & B8	180	1

Source: Mott MacDonald Ltd, 2014

Proposed external public realm lighting design

- 10.6.47 The proposed external public realm lighting design for Phase 1 has been designed by iGuzzini and SKM in accordance with BS5489-1, BS EN12464-2 & CIBSE Guide LG6 to appropriate lighting levels for their intended use. Table 10.10 provides details, as provided by iGuzzini.

Table 10.10: iGuzzini External public realm lighting design

Lit Area Descriptor	Lighting Standard/s	Average illuminance (Lux)	Uniformity (Uo)
Alroy Road & Gilman Street* (Roadway Surface)	BS5489-1, Table 5, Class S2	10	0.47
Front of Stadium Forecourt	CIBSE LG6 (1992), Section 4.1, Open Pavement	19**	0.48**
Side of Stadium Forecourt	CIBSE LG6 (1992), Section 4.1, Open Pavement	25**	0.29**
Entire Stadium Forecourt	CIBSE LG6 (1992), Section 4.1, Open Pavement	22**	0.30**
Car Park	BS EN12464-2, clause 5.9.3, Heavy Traffic	21	0.25
TV Parking Zone	BS EN12464-2, clause 5.9.3, Heavy Traffic	25	0.44

Source: iGuzzini

* S class lighting should be provided from highway boundary to highway boundary rather than for the roadway surface, this issue will be resolved at the next stage of the design process.

** It is not possible to confirm that the requirements of CIBSE LG6, Section 4.1 have been achieved in terms of horizontal and vertical illuminance at a height of 1.5m. Furthermore the uniformity requirement of greater than 0.3 has not been achieved. It is recommended that a standard in line with modern lighting practices should be used such as BS 5489-1:2013.

- 10.6.48 Details of the luminaires, lamp, optical setting, arrangement, lamp output and overall maintenance factor utilised for the External Stadium Public Realm Lighting design are located in ES Volume 2, Part 3, Appendix 1.1. Summary information is provided in Table 10.11 below:

Table 10.11: Luminaire Schedule iGuzzini External Public Realm Lighting

Manufacturer & Model	Lamp/Optic	Quantity	Maintenance Factor
iGuzzini Frame Woody	39w LED BV13	108	1
iGuzzini Maxi Woody	39w LED BV13	56	1
iGuzzini WoW	89w LED BH38	7	1
iGuzzini WoW	128w LED BH39	19	1

Source: Mott MacDonald Ltd.

Proposed stadium façade lighting design

- 10.6.49 The proposed stadium facade lighting design for Phase 1 has been designed by iGuzzini and SKM and is not designed to meet any specific standards, rather to provide a night -time feature with illumination levels that are proportionate to the site surroundings.
- 10.6.50 A schedule of architectural feature lighting utilised on this project is located in ES Volume 2, Part 3, Appendix 1.1. Summary information is provided in Table 10.12.

Table 10.12: Architectural Feature Lighting Summary

Manufacturer & Model	Lamp/Optic	Quantity	Total Lamp Lumens	Maintenance Factor
iGuzzini (A1) Linealuce	LED (Warm White)	28	Various	1
iGuzzini (A2) Linealuce	LED (Neutral White)	59	Various	1
iGuzzini (B1) Iroll	LED (Neutral White)	14	Various	1
iGuzzini (C1) Strip Tube	LED (Warm White)	37	Various	1
iGuzzini (D1) Maxi Woody	LED (Warm White)	22	Various	1
iGuzzini (D2) Maxi Woody	LED (Warm White)	14	Various	1
iGuzzini (E1) Maxi Woody	LED (Neutral White)	19	Various	1
iGuzzini (E2) Maxi Woody	LED (Neutral White)	6	Various	1

Source: Mott MacDonald Ltd

10.7 Assessment of effects

Construction - likely significant effects and mitigation

- 10.7.1 During the construction phase it is likely that temporary site lighting will be installed to provide for the purposes of health and safety and site security. The main causes for concern for the lighting used during construction will be spill light and glare (luminaire intensity).

- 10.7.2 Lighting for health and safety will be required where work is required to take place during the hours of diminishing ambient lighting levels which is likely to occur when the construction works are carried out during the winter months or if night working is carried out. This form of lighting should become non-operational outside of the operational working hours of the construction site. The magnitude of effects caused by this type of lighting are considered to be minor adverse due to the low likelihood that this lighting will be in operation for any lengthy period during the hours of darkness. The majority of residential properties within the area are located in areas of existing highway lighting and are considered as highly sensitivity resulting in an overall minor adverse effect.
- 10.7.3 Security lighting will be operational during the night with the location, levels of light and hours of operation being dependent on the individual security concerns of the construction site. Security lighting is normally concentrated towards the perimeter and entrances to the construction site. It is considered that due to the nature of construction that significant lighting for security will be required which is considered to have moderate adverse magnitude of effect. The majority of residential properties within the area are located in areas of existing highway lighting and are considered as highly sensitivity resulting in an overall moderate adverse effect.
- 10.7.4 On balance, this element of the works will have an overall moderate adverse effect on the townscape character of this area, for the duration of the construction phase. Mitigation measures to reduce effects are described below.

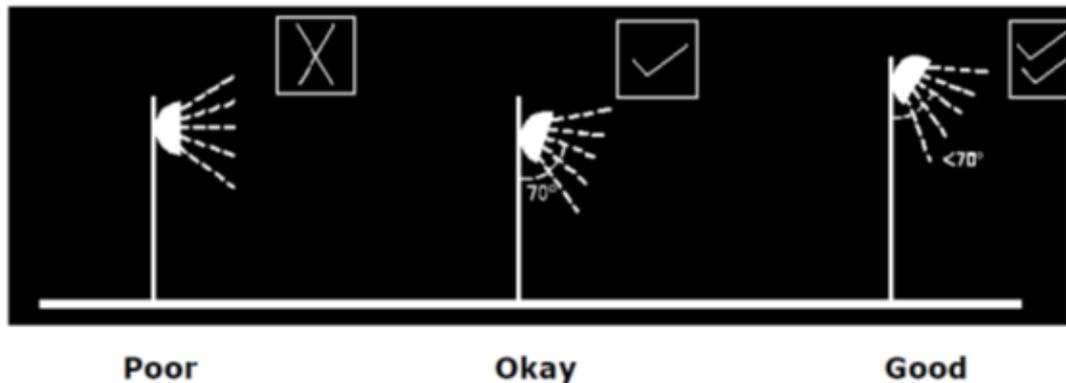
Construction Phase Mitigation

- 10.7.5 To minimise the effects of lighting provided during the construction phase, the following mitigation methods should be applied:
- Ensure that the correct level of light is provided and that areas of lighting are carefully selected. Lighting levels should be selected from relevant British / European standards to ensure lighting is appropriate to the task in hand and that areas are not over lit (refer to BS EN 12464-2-2007 Lighting for work places (outdoor));
 - Hours of operation should be limited during periods of diminishing ambient lighting levels. There should be an agreement in place that work tasks requiring lighting for health and safety purposes should not be carried out during periods that could be considered a nuisance;
 - The limitations for obtrusive light obtained from the ILP Guidance Notes for the Reduction of Obtrusive Light GN01:2011 as provided in Table 10.3 should be adhered to ;
 - Floodlighting provided should ideally be mounted at a tilt of 0° and utilise a double asymmetrical photometric configuration. The ILP advises in GN01:2011 that a maximum main beam angle of 70° should be utilise to minimise the effects of glare, an example of main beam angles for floodlighting is shown in **Error! Reference source not found.**;
 - Luminaires should be located and directed away from residential properties;

- Consider the possible use of infrared spectrum security lighting, as infrared light is outside of our visible spectrum;
- Where security lighting is being considered as a form of deterrent for vandalism and theft, alternative forms of security should also be considered to limit the burden to the lighting;

10.7.6 The use of solid site hoarding to contain and limit light spill and also improve security.

Figure 10.7: ILP Recommended main beam angles for floodlights



Source: ILP – Guidance Notes for the Reduction of Obtrusive Light GN01:2011

Operation - likely significant effects and mitigation

Phase 1

Sky Glow

- 10.7.7 Upward Light Ratio or ULR is the maximum permitted percentage of the luminaires flux that emits directly into the sky; the general term for ULR over a large area such as a city or town is referred to as Sky Glow. ULR is not subject to differing limits dependant on time and hence there are no pre- and post-curfew readings, as they are not required. The maximum permissible ULR for an E3 zone is 5%.
- 10.7.8 Sky glow is considered to apply on an area-wide basis. As the study area is predominantly made up of residential housing, the sensitivity of receptors on an area-wide basis is considered as high.
- 10.7.9 The luminaire utilised for the stadium pitch floodlighting design has an ULR of 0% when mounted at 0° tilt. Photometric data and lighting model analysis confirms a total ULR of 0% therefore the magnitude of effect resulting from the stadium pitch floodlighting is None / Negligible, resulting in an insignificant effect.

- 10.7.10 The luminaires utilised for the external public realm lighting design have an ULR of 0% when mounted at 0° tilt (this specifically applies to the iGuzzini Wow C1 & E1 type luminaires). Two further luminaries are proposed which will be mounted at 10° and 20° tilt. Photometric data and lighting model analysis shows that one luminaire arrangement within the external public realm lighting has a total ULR of 5.46%, therefore the magnitude of effect resulting from the external public realm lighting has been classified as Minor Adverse, resulting in an overall minor adverse effect which is not deemed significant.
- 10.7.11 The external stadium façade lighting installation will require the deliberate and careful use of upward light, for example ground recessed luminaires, wall wash type luminaires and ground mounted floodlights. In these cases the limits for upward light do not apply, however care should be taken to minimise any wasted upward light by proper use of suitably directional luminaires, correct beam angles and lighting controlling attachments such as louvers, barn doors etc.

Light intrusion (onto windows and ground)

- 10.7.12 This section assesses the light intrusion on the ground at the baseline survey locations and onto windows of properties in the affected areas. The spilling of light beyond the boundary of the area being lit onto adjacent areas may affect sensitive receptors, particularly residential properties.
- 10.7.13 Although the ILP recommends a maximum pre-curfew limit of 10 Lux onto windows, it has been requested by LCC that this figure should be reduced to a maximum of 6 lux. The maximum post-curfew limit set by the ILP of 2 Lux will apply.
- 10.7.14 It has been confirmed by LCC that 23:00hrs is the curfew time, after which the more stringent requirements for control of obtrusive light will apply.
- 10.7.15 The following table shows the light intrusion results on the ground at the baseline survey locations, pre- and post-curfew:

Table 10.13: Light intrusion on ground at baseline survey locations (pre- and post-curfew)

Illuminance grid location	Description of baseline survey location	Pre-curfew light intrusion Ev <6 lux max	Post-curfew light intrusion Ev <2 lux max
Receptor Position_01	Walton Breck Road - Outside property no: 220	0	0
Receptor Position_02	Walton Breck Road - Outside property no: 214	0	0
Receptor Position_03	Walton Breck Road - Outside property no: 208	0.1	0
Receptor Position_04	Walton Breck Road - Christ Church Building	0.4	0

Illuminance grid location	Description of baseline survey location	Pre-curfew light intrusion Ev <6 lux max	Post-curfew light intrusion Ev <2 lux max
Receptor Position_05	Walton Breck Road - Outside property no: 194	4.5	0
Receptor Position_06	Walton Breck Road - Outside property no: 182	3.8	0.1
Receptor Position_07	Walton Breck Road - Outside property no: 178/176	3.5	0.2
Receptor Position_08	Walton Breck Road - Outside property no: 172	4.6	0.8
Receptor Position_09	Walton Breck Road - Outside property no: 168	4.2	0.7
Receptor Position_10	Walton Breck Road - Outside property no: 162	4.6	1.3
Receptor Position_11	Walton Breck Road - Outside property no:160	3.4	1.9
Receptor Position_12	Walton Breck Road - Outside property no: 152	0.5	0
Receptor Position_13	Walton Breck Road - Outside property no: 144	0.2	0
Receptor Position_14	Gilman Street - Outside property no: 1	25.4	24
Receptor Position_15	Gilman Street - Outside property no: 17/19	18.1	17.1
Receptor Position_16	Gilman Street - Outside property no: 35/37	23.8	23.5
Receptor Position_17	Baltic Street - Outside property no: 1	0.1	0
Receptor Position_18	Baltic Street - Outside property no: 19/21	0	0
Receptor Position_19	Baltic Street - Outside property no: 39/41 currently demolished	0	0
Receptor Position_20	Rockfield Road - Beside property no: 53	0	0
Receptor Position_21	Alroy Road - Outside property no: 20	0	0
Receptor Position_22	Alroy Road - Outside property no: 12/10	0	0
Receptor Position_23	Alroy Road - Outside property no: 4	0	0
Receptor Position_24	Anfield Road - Beside property no: 144	12.5	11.7
Receptor Position_25	Anfield Road - Outside property no:45	0.2	0
Receptor Position_26	Anfield Road/Mill Lane	0.3	0

Illuminance grid location	Description of baseline survey location	Pre-curfew light intrusion Ev <6 lux max	Post-curfew light intrusion Ev <2 lux max
	junction - Beside property no:46		
Receptor Position_27	Stanley Park - Next to substation on Mill Lane	0.4	0
Receptor Position_28	Stanley Park location 1	3.3	0.1
Receptor Position_29	Stanley Park location 2	0.9	0.9
Receptor Position_30	Stanley Park location 3	1.6	1.6
Receptor Position_31	Anfield Road - Outside property no:73/71	0.1	0.1
Receptor Position_32	Anfield Road - Beside property no:250	0	0
Receptor Position_33	North west car park - Inside stadium boundary location 1	0	0
Receptor Position_34	North west car park - Inside stadium boundary location 2	0	0
Receptor Position_35	North west car park - Inside stadium boundary location 3	0	0
Receptor Position_36	North west car park - Inside stadium boundary location 4	0	0
Receptor Position_37	North west car park - Inside stadium boundary location 5	0	0
Receptor Position_38	Skerries Road - Outside property no:30	0	0
Receptor Position_39	Skerries Road - Outside property no:20	0	0
Receptor Position_40	Skerries Road - Outside property no:8	0	0
Receptor Position_41	Walton Breck Road - Beside property no:271	0	0

Source: Mott MacDonald Ltd, 2014

10.7.16 3D lighting model analysis shows that all three locations on Gilman Street are over the ILP limits for a pre- and post-curfew light intrusion. Based on professional judgement, the magnitude of effect has been classified as major adverse. These three properties are considered as high sensitivity given their residential nature, resulting in an overall major adverse effect which is deemed significant.

10.7.17 Note: Properties in Gilman Street are now vacant and are intended for clearance in the 3rd quarter of 2014 to make way for proposed development in line with the Anfield SRF.

10.7.18 3D Lighting model analysis shows that one location on Anfield Road is over the ILP limits for a pre- and post-curfew light intrusion. Based on professional judgement, the magnitude of effect has been classified as moderate adverse. 144 Anfield Road is considered as high sensitivity given its residential nature resulting in an overall moderate adverse effect which is deemed significant.

10.7.19 The following table shows the light intrusion results onto windows, pre and post-curfew:

Table 10.14: Light intrusion onto windows (pre- and post-curfew)

Illuminance grid location	Pre-curfew light intrusion Ev <6 lux max	Post-curfew light intrusion Ev <2 lux max
150 to 160 Walton Breck Road	10.7	7.4
162 - 170 Walton Breck Road	13.3	6.2
172 - 182 Walton Breck Road	12.7	4.3
194 Walton Breck Road	12.1	0.4
208 - 220 Walton Breck Road	0.2	0.0
45 Anfield Road South East 01	1.6	1.0
45 Anfield Road South West 02	2.4	1.8
45 Anfield Road South West 01	0.1	0.0
53 Rockfield Road	5	4.8
No. 2 to No. 24 Alroy Road	1.9	1.8
Christ Church Walton Breck Road	0	0.0
No. 1 to No. 39 Gilman Street Calculation Grid 1	35.2	33.5
North West Car Park – Rear of Residential Properties	0.0	0.0
Skerries Road - Residential Front face of Residential Properties	0.0	0.0

Source: Mott MacDonald Ltd, 2014

10.7.20 3D Lighting model analysis shows that the following properties on Walton Breck Road suffer from light intrusion onto windows that exceed LCC pre-curfew requirements of 6 lux; house numbers 159, 160, 162, 164, 166, 168, 170, 172, 174, 176 & 178. The properties are a mix of residential and commercial with the residential section on the top floors. The magnitude of effect has been classified as major adverse. These properties are considered as high sensitivity given their residential nature resulting in an overall major adverse effect which is deemed significant.

10.7.21 Whilst 194 Walton Breck Road has a maximum light intrusion level of 12.1 lux this light spill level does not encroach on any windows and as such has been classified as None/Negligible.

10.7.22 3D Lighting model analysis shows that the following properties on Gilman Street suffer from light intrusion onto windows that exceed LCC pre-curfew requirements of 6 lux; house

numbers 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 29, 31, 33, 35, & 37. The magnitude of effect has been classified as major adverse. These properties are considered as high sensitivity given their residential nature resulting in an overall major adverse effect which is deemed significant.

- 10.7.23 Note: Properties in Gilman Street are now vacant and are intended for clearance in the 3rd quarter of 2014 to make way for proposed development in line with the Anfield SRF.
- 10.7.24 3D Lighting model analysis shows that the following properties on Walton Breck Road suffer from light intrusion onto windows, the level of lighting intrusion exceeds the 2 Lux post-curfew limit agreed by LCC; house numbers 154, 156, 158, 159, 160, 162, 164, 166, 168, 170, 172 & 174. The magnitude of effect has been classified as moderate adverse. The property is considered as high sensitivity given its residential nature resulting in an overall moderate adverse effect which is deemed significant.
- 10.7.25 3D Lighting model analysis shows that 53 Rockfield Road suffers from light intrusion onto windows, The magnitude of effect has been classified as moderate adverse. The property is considered as high sensitivity given its residential nature resulting in an overall moderate adverse effect which is deemed significant.
- 10.7.26 3D Lighting model analysis shows that the following properties on Gilman Street suffer from light intrusion onto windows that exceed LCC agreed post-curfew requirement of 2 lux; these are house numbers 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35 & 37. The magnitude of effect has been classified as moderate adverse. These properties are considered as high sensitivity given their residential nature resulting in an overall moderate adverse effect which is deemed significant.
- 10.7.27 Note: Properties in Gilman Street are now vacant and are intended for clearance in the 3rd quarter of 2014 to make way for proposed development in line with the Anfield SRF.

Glare/Source (Luminaire) Intensity

- 10.7.28 Luminaire intensity is a direct calculation, measured in Candelas, from an observer location at a given height looking at the luminaire. It is standard practice for an observer height to be 1.5m above ground level and this has been applied to the obtrusive light assessment.
- 10.7.29 It has been confirmed by LCC that 23:00hrs is the curfew time, after which the more stringent requirements for control of luminous intensity apply. Luminaire Intensity has been calculated for both pre-curfew hours (before 23:00) and post-curfew hours (after 23:00) for the entire site.
- 10.7.30 The following table shows the Proposed Luminaire Intensity Results calculated using manufacturer's data and AGI32 lighting software:

Table 10.15: Summary of Proposed Luminous Intensity Results Pre-Curfew and Post-Curfew

Illuminance grid location	Description of baseline location	Pre-curfew Luminaire Intensity I < 10,000 cd	Post-curfew Luminaire Intensity I < 1,000 cd
Receptor Position_01	Walton Breck Road - Outside property no: 220	1101	262
Receptor Position_02	Walton Breck Road - Outside property no: 214	1138	270
Receptor Position_03	Walton Breck Road - Outside property no: 208	1183	292
Receptor Position_04	Walton Breck Road - Christ Church Building	1640	337
Receptor Position_05	Walton Breck Road - Outside property no: 194	1859	418
Receptor Position_06	Walton Breck Road - Outside property no: 182	2024	1,032
Receptor Position_07	Walton Breck Road - Outside property no: 178/176	2020	1,147
Receptor Position_08	Walton Breck Road - Outside property no: 172	15,221	15,211
Receptor Position_09	Walton Breck Road - Outside property no: 168	2097	1,553
Receptor Position_10	Walton Breck Road - Outside property no: 162	2094	2,050
Receptor Position_11	Walton Breck Road - Outside property no:160	2610	2,607
Receptor Position_12	Walton Breck Road - Outside property no: 152	2000	499
Receptor Position_13	Walton Breck Road - Outside property no: 144	1890	217
Receptor Position_14	Gilman Street - Outside property no: 1	2260	2,255
Receptor Position_15	Gilman Street - Outside property no: 17/19	2239	2,236
Receptor Position_16	Gilman Street - Outside property no: 35/37	1579	1,578
Receptor Position_17	Baltic Street - Outside property no: 1	1179	220
Receptor Position_18	Baltic Street - Outside property no: 19/21	112	112
Receptor Position_19	Baltic Street - Outside property no: 39/41 currently demolished	41	41
Receptor Position_20	Rockfield Road - Beside property no: 53	1511	1,511
Receptor Position_21	Alroy Road - Outside property no: 20	1022	553

Illuminance grid location	Description of baseline location	Pre-curfew Luminaire Intensity I < 10,000 cd	Post-curfew Luminaire Intensity I < 1,000 cd
Receptor Position_22	Alroy Road - Outside property no: 12/10	943	568
Receptor Position_23	Alroy Road - Outside property no: 4	945	773
Receptor Position_24	Anfield Road - Beside property no: 144	1464	525
Receptor Position_25	Anfield Road - Outside property no:45	8	8
Receptor Position_26	Anfield Road/Mill Lane junction - Beside property no:46	592	40
Receptor Position_27	Stanley Park - Next to substation on Mill Lane	832	77
Receptor Position_28	Stanley Park location 1	21,686	21,685
Receptor Position_29	Stanley Park location 2	21,094	21,086
Receptor Position_30	Stanley Park location 3	18,076	18,076
Receptor Position_31	Anfield Road - Outside property no:73/71	26,204	26,204
Receptor Position_32	Anfield Road - Beside property no:250	1165	1,165
Receptor Position_33	North west car park - Inside stadium boundary location 1	370	370
Receptor Position_34	North west car park - Inside stadium boundary location 2	327	327
Receptor Position_35	North west car park - Inside stadium boundary location 3	98	98
Receptor Position_36	North west car park - Inside stadium boundary location 4	63	63
Receptor Position_37	North west car park - Inside stadium boundary location 5	34	34
Receptor Position_38	Skerries Road - Outside property no:30	19	19
Receptor Position_39	Skerries Road - Outside property no:20	0	0
Receptor Position_40	Skerries Road - Outside property no:8	0	0
Receptor Position_41	Walton Brek Road - Beside property no:271	0	0

Source: Mott MacDonald Ltd, 2014

- 10.7.31 3D Lighting model analysis shows that one location on Walton Breck Road (property number 172) is over the ILP limit for a pre-curfew luminaire intensity. Based on professional judgement, the magnitude of effect has been classified as minor adverse. 172 Walton Breck Road is considered as high sensitivity given its residential nature resulting in an overall minor adverse effect which is not deemed significant.
- 10.7.32 There are 3 locations within Stanley Park which are over the ILP limit for a pre-curfew luminous intensity. Based on professional judgement, the magnitude of effect has been classified as moderate adverse. Stanley Park is considered as high sensitivity given its registered park and garden status which results in an overall moderate adverse effect which is deemed significant.
- 10.7.33 There is one location on Anfield Road (property number 73/71) over the ILP limit for a pre-curfew luminous intensity. Based on professional judgement, the magnitude of effect has been classified as moderate adverse. 73/71 Anfield Road is considered as high sensitivity given its residential nature resulting in an overall moderate adverse effect which is deemed significant.
- 10.7.34 3D Lighting model analysis shows that 6 locations on Walton Breck Road (property numbers 182, 178/176, 172, 168, 162 & 160) are over the ILP limits for a post-curfew luminous intensity. Based on professional judgement, the magnitude of effect has been classified as moderate/major adverse. These properties on Walton Breck Road are considered as high sensitivity given their residential/commercial nature resulting in an overall moderate/major adverse effect which is deemed significant.
- 10.7.35 There are 3 locations on Gilman Street (property numbers 1, 17/19 & 35/37) over the ILP limits for a post-curfew luminous intensity. Based on professional judgement, the magnitude of effect has been classified as minor adverse. These properties on Gilman Street are considered as high sensitivity given their residential nature resulting in an overall minor adverse effect which is not deemed significant.
- 10.7.36 Note: Properties in Gilman Street are now vacant and are intended for clearance in the 3rd quarter of 2014 to make way for proposed development in line with the Anfield SRF.
- 10.7.37 There is one location on Rockfield Road (property number 53) that is over the ILP limit for a post-curfew luminous intensity. Based on professional judgement, the magnitude of effect has been classified as minor adverse. 53 Rockfield Road is considered as high sensitivity given its residential nature resulting in an overall minor adverse effect which is not deemed significant.
- 10.7.38 There are 3 locations in Stanley Park that are over the ILP limit for a post-curfew luminous intensity. Based on professional judgement, the magnitude of effect has been classified as moderate adverse. Stanley Park is considered as high sensitivity given its registered park and garden status which results in an overall moderate adverse effect which is deemed significant.

- 10.7.39 There are two locations on Anfield Road (property 73/71 and 250) over the ILP limit for a post-curfew luminous intensity. Based on professional judgement, the magnitude of effect has been classified as minor adverse. 73/71 and 250 Anfield Road are considered as high sensitivity given its residential nature resulting in an overall minor adverse effect which is not deemed significant.

Building Luminance

- 10.7.40 Building luminance should be limited to avoid over-lighting and should also be related to the general district's brightness. The maximum limit suggested by the ILP of an average of 10cd/m² is applicable to the Main Stand as the stand is lit as a night time feature.
- 10.7.41 The luminance results, as provided by SKM, confirm that the Main Stand frontage luminance is well under the 10 cd/m² average luminance limit set by the ILP and Mott MacDonald lighting model analysis confirms this. Therefore the level of effect has been classified as None / Negligible.

Operation Phase Mitigation

- 10.7.42 To minimise the effects of lighting provided for the operation of the development, the following mitigation methods should be applied:
- Lighting levels will be designed to relevant British / European standards with the usage level of the football pitch agreed. The level of lighting for the pitch is deemed to be appropriate with the pitch deemed not to be over-lit;
 - Restrictions on the operational times for the sports pitch and the surrounding development including public realm lighting and façade lighting will need to be applied. These restrictions will need to be implemented through the correct specification of the control equipment in the form of timers and photocells;
 - Illuminance levels can be mitigated through trees, vegetation, and street furniture and so careful consideration of the public realm design will assist in reducing potential significant adverse impacts and effects. ;

Upward light ratio mitigation

- 10.7.43 There is only one particular luminaire that has an upward light ratio over the required 5% by the ILP. This is the iGuzzini luminaire for the public realm lighting (reference number BV13 Type A1). The manufacturer's data suggests that the luminaire mounted at 20° has an upward light ratio of 5.46%. It is therefore recommended a more appropriate tilt for this luminaire is used to ensure it is under the required 5% upward light ratio.

Stadium façade lighting mitigation

- 10.7.44 The proposed lighting design for the façade lighting can be mitigated using the following methods:

- Keep lighting understated and aim to enhance rather than swamp architectural character;
- Ensure light is directed only at the structure, re-siting lights and using baffles and shielding where possible;
- Minimise upward lighting where it distorts architectural detailing;
- Consider timing of lighting to maximise the visual beauty of the building to the public at night-time but not to floodlight the building at dusk or nightfall; and
- Consider the choice of surface materials being illuminated, the reflectance value may be high causing reflected light to generate excessive sky glow.

Luminaire intensity mitigation

10.7.45 From the results in the 3D model it is apparent that there are many locations where the luminous intensity for the surrounding buildings does not meet the required standard ILP standard for pre- curfew and post-curfew times.

10.7.46 It is recommended that to mitigate the luminous intensity of the luminaire the following methods are utilised:

- Baffles and shields applied to luminaires facing the adjacent houses as per the ILP recommendations to reduce the visibility of the luminaire;
- Orientate luminaires away from adjacent buildings;
- Reduction of luminaire mounting heights and tilts where luminaire is close to the adjacent properties; and
- Further design development required and negotiations with local council to reduce the overall standard of lighting along Gillman Street and Alroy Road from S2 lighting class to S3 lighting class.

Light intrusion (into windows) mitigation

10.7.47 From the results in the 3D model it is apparent that there are several locations where the light intrusion into the windows of the surrounding buildings from the modelled scheme does not meet the required standard ILP standard for pre-curfew and post-curfew times.

10.7.48 It is possible to mitigate the light spill into windows using the following methods :

- Baffles and shields applied to luminaires facing the adjacent houses as per the ILP recommendations to reduce the visibility of the light emitted from the luminaire;
- Orientate luminaires away from adjacent buildings to reduce light spill;
- Reduction of luminaire mounting heights and tilts where luminaire is close to the adjacent properties to reduce light spill; and
- Further design development required and negotiations with LCC to reduce the overall standard of lighting along Gilman Street and Alroy Road from S2 lighting class to S3 lighting class.

10.8 Obtrusive Light Recommendations for Phase 2

- 10.8.1 As Phase 2 is at outline planning stage, conditions and limitation of lighting required for Phase 2 have been established for use in the outline planning application. Relevant documents/design standards, general levels of light and lighting limitations have been established.
- 10.8.2 As described earlier and confirmed by LCC it is accepted that the environmental zone of E3 is continued to be used for the Phase 2 development and it is recommended that the proposed lighting designs for Phase 2 are within the parameters based on this zone.
- 10.8.3 Further details can be found within ES Volume 2, Part 3, Appendix 1.1.

10.9 Cumulative Effects

- 10.9.1 Cumulative effects are those that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence (ZoI). While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.
- 10.9.2 The current list of planned developments which are included in the cumulative impact assessment, are those identified in the Anfield Spatial Regeneration Framework (SRF) comprising:
- Anfield Village & Rockfield housing refurbishment;
 - New build housing led regeneration;
 - The Walton Breck Road (The High Street) Corridor;
 - New public space and Village Square development (training hotel and offices);
 - Completion of the restoration of Stanley Park east of Mill Lane.
- 10.9.3 Subject to the appropriate mitigation as described in section 10.8 the stadium expansion proposals will have insignificant effects on off-site streets and parkland subject to all lighting design meeting ILP obstructive light limitations. Given the nature of the additional proposals in the surrounding area, which are typically limited to 3-4 storeys, for office, small scale food retail, surface parking, hotel and community uses in accordance with the parameters identified in the SRF, it is possible that these may give rise to significant cumulative impacts in terms of the lighting environment surrounding the stadium site. However, subject to these proposals also being required to meet ILP obstructive light limitations there is the potential to limit cumulative impacts to acceptable levels.

10.10 Residual effects

- 10.10.1 Following application of the appropriate mitigation as described in section 10.7 above, there should be no significant residual effects with regards to the lighting environment.

10.11 Summary of effects

- 10.11.1 A tabulated summary of effects is given in Table 10.16

Table 10.16: Summary of Lighting Effects

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/Beneficial	Permanent/Temporary	Residual Effect
Phase 1 Construction	Those with direct views of the stadium and construction compound	Increased light intrusion (spill light and glare) from the installation of temporary site lighting for health and safety purposes	As defined in paragraph 10.7.5	Minor	Adverse	Temporary (in use during diminishing light conditions)	Insignificant
	Those with direct views of the stadium and construction compound	Increased light intrusion (spill light and glare) from the installation of temporary site lighting for site security purposes	As defined in paragraph 10.7.5	Moderate	Adverse	Temporary (in use during diminishing light conditions)	Insignificant
Phase 1 Operation	Area wide	Exceedence of sky glow ILP criteria resulting from the proposed stadium pitch floodlighting	None required	None / Negligible	-	Temporary (during match days)	Insignificant
	Area wide	Exceedence of sky glow ILP criteria resulting from the proposed external public realm lighting	As defined in paragraph 10.7.42 to 10.7.43	Minor	Adverse	Permanent (non-match days (post-curfew levels only) and during match days (pre- and post-curfew))	Insignificant
	Area wide	Increased light intrusion resulting from the proposed stadium façade lighting	As defined in paragraph 10.7.42 to 10.7.44	Negligible	Adverse	Temporary (during match days)	Insignificant
	Gilman Street (ground outside property numbers 1, 17/19 & 35/37)	Exceedence of light intrusion ILP criteria on ground levels pre- and post-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.47 to 10.7.48 Properties in Gilman St are currently vacant and subject to clearance as part of the Anfield SRF.	Major	Adverse	Temporary (during match days, pre- and post-curfew)	Insignificant
	Anfield Road (ground outside property number 144)	Exceedence of light intrusion ILP criteria on ground levels pre- and post-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.47 to 10.7.48	Moderate	Adverse	Temporary (during match days, pre- and post-curfew)	Insignificant
	Walton Breck Road (property numbers 159, 160, 162, 164, 166, 168, 170, 172, 174, 176 & 178)	Exceedence of light intrusion ILP criteria onto windows pre-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.47 to 10.7.48	Major	Adverse	Temporary (during match days, pre-curfew)	Insignificant

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/Beneficial	Permanent/Temporary	Residual Effect
	Gilman Street (property numbers 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 29, 31, 33, 35 &37)	Exceedence of light intrusion ILP criteria onto windows pre-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.47to 10.7.48 Properties in Gilman Street are currently vacant and subject to clearance as part of the Anfield SRF.	Major	Adverse	Temporary (during match days, pre-curfew)	Insignificant
	Walton Breck Road (property numbers 154, 156, 158, 159, 160, 162, 164, 166, 168, 170, 172, 174)	Exceedence of light intrusion ILP criteria onto windows post-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.47to 10.7.48	Moderate	Adverse	Temporary (during match days, post-curfew)	Insignificant
	Rockfield Road (property number 53)	Exceedence of light intrusion ILP criteria onto windows post-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.47to 10.7.48	Moderate	Adverse	Temporary (during match days, post-curfew)	Insignificant
	Gilman Street (property numbers 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35 &37)	Exceedence of light intrusion ILP criteria onto windows post-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.47to 10.7.48 Properties in Gilman Street are currently vacant and subject to clearance as part of the Anfield SRF.	Moderate	Adverse	Temporary (during match days, post-curfew)	Insignificant
	Walton Breck Road (property number 172)	Exceedence of glare/source (luminaire) intensity ILP criteria pre-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.45to 10.7.46	Minor	Adverse	Temporary (during match days, pre-curfew)	Insignificant
	3 locations within Stanley Park (backing onto Anfield Road car park) Anfield Road (property number 73/71)	Exceedence of glare/source (luminaire) intensity ILP criteria pre-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.45to 10.7.46	Moderate	Adverse	Temporary (during match days, pre-curfew)	Insignificant
	Walton Breck Road (property numbers 182, 178/176, 172, 168, 162 & 160)	Exceedence of glare/source (luminaire) intensity ILP criteria post-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.45to 10.7.46	Moderate / Major	Adverse	Temporary (during match days, post-curfew)	Insignificant

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/Beneficial	Permanent/Temporary	Residual Effect
	Gilman Street (property numbers 1, 17/19 & 35/37)	Exceedence of glare/source (luminaire) intensity ILP criteria post-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.45 to 10.7.46 Properties in Gilman Street are currently vacant and subject to clearance as part of the Anfield SRF.	Minor	Adverse	Temporary (during match days, post-curfew)	Insignificant
	Rockfield Road (property number 53) Anfield Road (property 73/71 & 250)	Exceedence of glare/source (luminaire) intensity ILP criteria post-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.45 to 10.7.46	Minor	Adverse	Temporary (during match days, post-curfew)	Insignificant
	3 locations in Stanley Park (backing onto Anfield Road car park)	Exceedence of glare/source (luminaire) intensity ILP criteria post-curfew resulting in nuisance effect	As defined in paragraph 10.7.42 & 10.7.45 to 10.7.46	Moderate	Adverse	Temporary (during match days, post-curfew)	Insignificant
	Area wide	Exceedence of building luminance ILP criteria resulting in nuisance effect	As defined in paragraph 10.7.42 to 10.7.44	None / Negligible	Adverse	Permanent (non-match days and match days pre-curfew only)	Insignificant

10.12 Proposed monitoring

10.12.1 No monitoring is required for the proposed scheme

10.13 Statement of significance

10.13.1 Minor to moderate adverse effects are anticipated to occur as a result of the construction of Phase 1; however, subject to the application of appropriate mitigation measures as defined in section 10.7, no significant effects are predicted to occur.

10.13.2 Minor to negligible adverse effects resulting from sky glow are anticipated to occur as a result of the operation of Phase 1 however subject to the application of appropriate mitigation measures as defined in section 10.7, ensuring ILP criteria for obtrusive light is met, no significant effects are predicted to occur.

10.13.3 Moderate (144 Anfield Road) to major (1, 17/19 & 35/ 37 Gilman Street) adverse effects pre and post-curfew resulting from light intrusion at ground level are anticipated to occur as a result of the operation of Phase 1 however subject to the application of appropriate mitigation measures as defined in section 10.8, ensuring ILP criteria for obtrusive light is met, no significant effects are predicted to occur.

10.13.4 Major (1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 29, 31, 33, 35 & 37 Gilman Street and 159, 160, 162, 164, 166, 168, 170, 172, 174, 176 & 178 Walton Breck Road) adverse effects pre-curfew and moderate (53 Rockfield Road and 154, 156, 158, 159, 160, 162, 164, 166, 168, 170, 172, 174 Walton Breck Road and 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 29, 31, 33, 35 & 37 Gilman Street) adverse effects post-curfew resulting from light intrusion onto windows are anticipated to occur as a result of the operation of Phase 1 however subject to the application of appropriate mitigation measures as defined in section 10.8, ensuring ILP criteria for obtrusive light is met, no significant effects are predicted to occur.

10.13.5 Minor (172 Walton Breck Road) to moderate (3 locations within Stanley Park and 73/71 Anfield Road) adverse pre-curfew effects resulting from glare/source (luminaire) intensity are anticipated to occur as a result of the operation of Phase 1 however subject to the application of appropriate mitigation measures as defined in section 10.8, ensuring ILP criteria for obtrusive light is met, no significant effects are predicted to occur.

10.13.6 Minor (1, 17/19 & 35/37 Gilman Street, 53 Alroy Road, 73/71 Anfield Road and 250 Anfield Road), moderate (3 locations in Stanley Park) and moderate/major (182, 178/176, 172, 168, 162 & 160 Walton Breck Road) adverse post-curfew effects resulting from glare/source (luminaire) intensity are anticipated to occur as a result of the operation of Phase 1 however

subject to the application of appropriate mitigation measures as defined in section 10.8, ensuring ILP criteria for obtrusive light is met, no significant effects are predicted to occur.

10.13.7 No significant effects resulting from building luminance are anticipated to occur as a result of the operation of Phase 1..

10.13.8 Subject to the detailed design of Phase 2 expansion meeting the design recommendations set out in ES Volume 2, Part 3, Appendix 1.1, no significant effects are anticipated to occur.

10.14 References

[Ref 01] – Guidance on Undertaking Environmental Lighting Impact Assessments, The Institution of Lighting Professionals - Guidance Note PLG 04;

[Ref 02] - Guidance note on the reduction of obtrusive light, The Institution of Lighting Professionals - GN01:2011;

[Ref 03] – Email communication with LCC’s Environmental Health Officer, Mr Ian Rushforth,;

[Ref 04] - Lighting Impact Assessment, Mott MacDonald, May 2014

11 Microclimate (wind)

11.1 Introduction

- 11.1.1 This chapter reports the potential effects on the microclimate of the proposed development. For the purposes of this chapter, microclimate has been interpreted as relating to the effects of the wind environment. A separate sunlight and shadowing chapter has been compiled and is presented in Chapter 9.
- 11.1.2 The wind environment around a stadium can have an impact on the comfort and safety of spectators using the stadium and pedestrians in its near vicinity. It can also influence the quality of pitch conditions. An evaluation of how the wind environment will be altered by the proposed stadium expansion is therefore important in identifying potential impacts for its users. Wind tunnel testing has therefore been carried out to model the proposed wind environment and to identify any associated impacts.
- 11.1.3 Three temporal phases are considered in this wind assessment: the existing baseline conditions, the conditions following completion of construction Phase 1 (with the Main Stand complete) and the conditions following the completion of construction Phase 2 (with the Anfield Road Stand complete). Wind effects during the construction of the proposals are not considered in this assessment. These are not considered to be significant, since any associated wind effects will be temporary in nature.
- 11.1.4 The physical extent of the assessment is limited to a radius of around 500m around the stadium. This radius is sufficient to capture the wind effects that the stadium proposals may have on the surrounding area. The effects of terrain on the incoming wind profile further away from the stadium are represented by suitable roughness elements.
- 11.1.5 The wind effects are measured at discrete points within the models, encompassing the pitch conditions, the spectator stands and the pedestrian environment external to the stadium.
- 11.1.6 This chapter presents the assessment methodology, outlines the relevant microclimate policy and legislation, records the consultation undertaken to date, describes the existing or 'baseline' conditions (Section 11.7), and assesses the potential effects arising following completion of Phases 1 and 2 (Section 11.7). This allows the performance of the design to be assessed relative to the existing conditions and the significant impacts of the proposal to be identified. Mitigation measures are identified to avoid or minimise any potentially adverse effects on the wind environment.
- 11.1.7 This chapter has been prepared by Mott MacDonald Ltd. Wind tunnel studies carried out by BMT Fluid Mechanics have been used to inform this microclimate assessment [Ref 01 & Ref 02]. This chapter provides a summary of these reports, identifies significant impacts, and proposes measures to mitigate adverse impacts where appropriate.

Design measures incorporated

No specific wind-related design measures are incorporated within this assessment.

11.2 Methodology

11.2.1 The wind environment around the proposed stadium expansion has been assessed by means of wind tunnel testing. The testing has been carried out by BMT Fluid Mechanics Limited within their Boundary Layer Wind Tunnel, using the following methodology:

- A model scale of 1:250, analysed on a 4.4 m diameter turntable;
- The use of a detailed stadium model at each expansion phase, created using a rapid prototyping approach;
- Detailed modelling of buildings and terrain within an equivalent radius of 660 m around the site ;
- The use of a calibrated Atmospheric Boundary Layer wind profile to provide a realistic representation of incoming wind conditions, with roughness elements used to represent the effect of upstream terrain;
- Analysis of 16 wind angles (at a 22.5° angle increment);
- Measurement of wind speed-ups (both mean wind speeds and fluctuating wind speeds) in key areas of interests:
 - External to the stadium (circa 50 locations at street level);
 - Over the pitch (an array of 35 measurement locations);
 - Within the spectator stands (circa 40 measurement locations).

Figure 11.1: Wind tunnel model arrangements



Source: BMT Report 431590rep3v2 [Ref 0]

Figure 11.2: Existing stadium model



Source: BMT Report 431590rep3v2 [Ref 0]

Figure 11.3: Phase 1 model



Source: BMT Report 431590rep3v2 [Ref 0]

Figure 11.4: Phase 2 model



Source: BMT Report 431590rep3v2 [Ref 0]

11.2.2 The measured wind speed-up factors have been analysed in conjunction with long-term wind climate statistics for the region to derive an assessment of pedestrian comfort and safety in terms of the industry-standard Lawson Criteria [Ref 02 & 03]. This defines the type of activities for which the wind conditions would be safe and comfortable. An area that has relatively low wind speeds and would be comfortable for recreational use (involving sitting or standing) would also be suitable for uses that tolerate higher wind speeds (such as walking).

Table 11.1: Lawson Comfort and Safety Criteria

Comfort Classification	Description	Threshold mean-hourly wind speed exceeded < 5% of the time
Long term sitting	Reading a newspaper, eating and drinking	4 m/s
Standing or short term sitting	Appropriate for bus stops, window shopping and building entrances	6 m/s
Walking or strolling	General areas of walking and sightseeing	8 m/s
Business walking	Local areas around tall buildings where people are not likely to linger	10 m/s
Uncomfortable	Uncomfortable for all pedestrian activities	> 10 m/s

Safety Rating	Description	Threshold mean hourly wind speed exceeded once per annum
Unsuitable for general public	Less able and cyclists find conditions physically difficult	>15 m/s
Unsuitable for able-bodied	Able-bodied persons find conditions difficult. Physically impossible to remain standing during gusts	> 20 m/s

Source: BMT Report 431590rep3v2 [Ref 02]

11.2.3 At each area investigated, the assessment takes full account of seasonal variation in wind conditions and pedestrian activities. For example, conditions for recreational activities focus on summer but also consider spring and autumn, whilst conditions for pedestrian thoroughfare, access or waiting (at bus stops, for example) consider all seasons, with winter usually being the critical season. The activities considered and their relation to the Lawson Comfort Criteria are summarised as follows:

Table 11.2: Pedestrian areas considered in the assessment

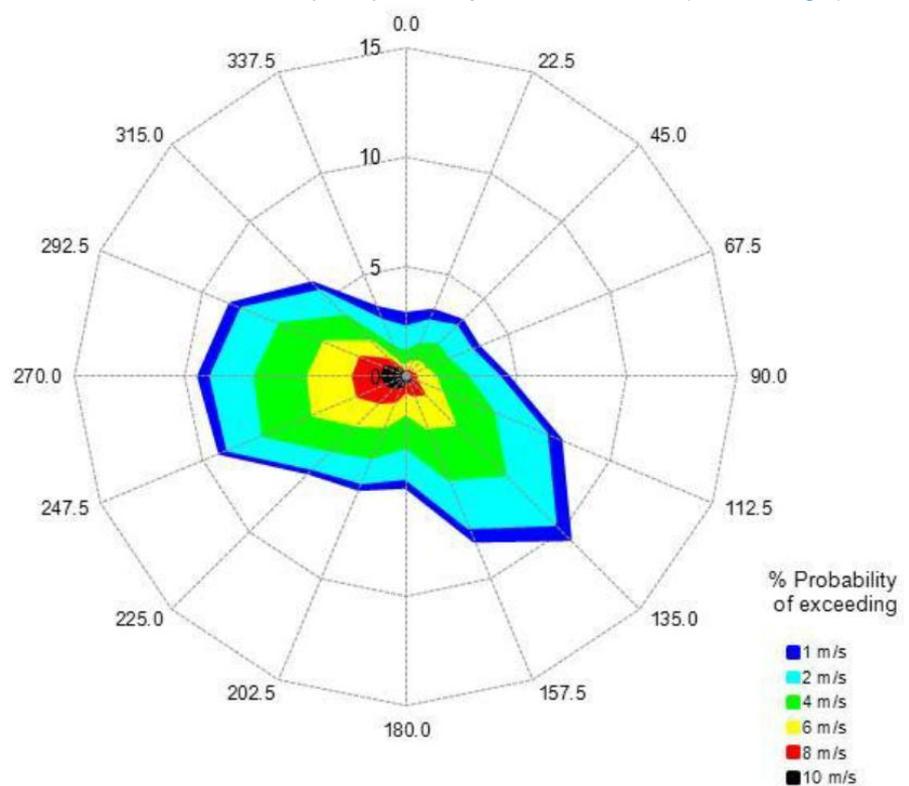
Location Type	Usage	Corresponding Lawson Category
Outdoor Seating	For long periods of sitting such as for an outdoor café	'Long term sitting' in summer
Entrances, Waiting Areas	For pedestrian ingress/egress at a building entrance, or periods of sitting or standing such as at a bus stop, taxi rank, meeting point, etc.	'Standing or short term sitting' in all seasons
General Leisure (excluding seating areas)	For leisure uses excluding long periods of outdoor sitting such as a park, children's play area etc.	'Standing or short term sitting' from spring to autumn
Thoroughfare	For access to and passage through the development and surrounding area	'Business walking'/'Walking or Strolling' in all seasons

Source: BMT Report 431590rep3v2 [Ref 02]

Sources of information

- 11.2.4 The methodology and results of the wind tunnel studies have been reported by BMT in reports “*Spectator and Player Comfort Study*” and “*Wind Microclimate Study*”, as referenced in Section 11.14 and Volume 2, Part 2, Appendix 3.1.
- 11.2.5 Long-term wind statistics from the nearby Aughton Liverpool Weather Centre have been used by BMT in the assessment. This station is approximately 10 km from the site and is therefore considered to be a close representation of the wind conditions at Anfield. Nevertheless, the data has been corrected for the site, considering any differences in terrain conditions between the weather centre and site locations. The corrected data is summarised in Figure 11.5.

Figure 11.5: Annual directional wind speed probability distribution at site (at 50m height)



Source: BMT Report 431590rep3v2 [Ref 02]

- 11.2.6 The statistics show that the most frequent and strongest winds come from the west (270°), and this is generally the case throughout the year. A secondary peak occurs for winds from the south-east, which are particularly frequent during autumn and winter. However, winds from the south-east are typically less strong than those from the west.

11.2.7 The historical trends and magnitudes observed at Aughton are closely comparable to those measured at Crosby Weather Station, which is also approximately 10 km from the Anfield site.

11.3 Legislation and policy

11.3.1 There are no specific statutory requirements in the UK National Planning Policy Framework governing pedestrian-level wind microclimate around buildings.

11.3.2 Whilst the LCC UDP does not specifically require the consideration of wind effects within an Environmental Statement, their consideration is deemed necessary in this case, given the size of the proposal and its potential to affect the wind microclimate in the surrounding area. The outcome of the wind assessment is also of interest to the Applicant in terms of spectator comfort and pitch conditions.

11.4 Consultation

11.4.1 Liverpool FC Stadium Expansion Environmental Scoping Report [Ref 04] was referred to LCC Planning Department. Table 11.3 summarises the key points of the scoping responses in relation to the microclimate assessment.

Table 11.3: Scoping responses for microclimate assessment

Name of Organisation	Key Concerns	Comment
Liverpool County Council	None	The proposed methodology ie: wind tunnel testing with (i) Main Stand and (ii) Main Stand/Anfield Road Stand is considered acceptable.

Source: Email from McEvoy F. (LCC) [Ref 05]

11.5 Assumptions and limitations

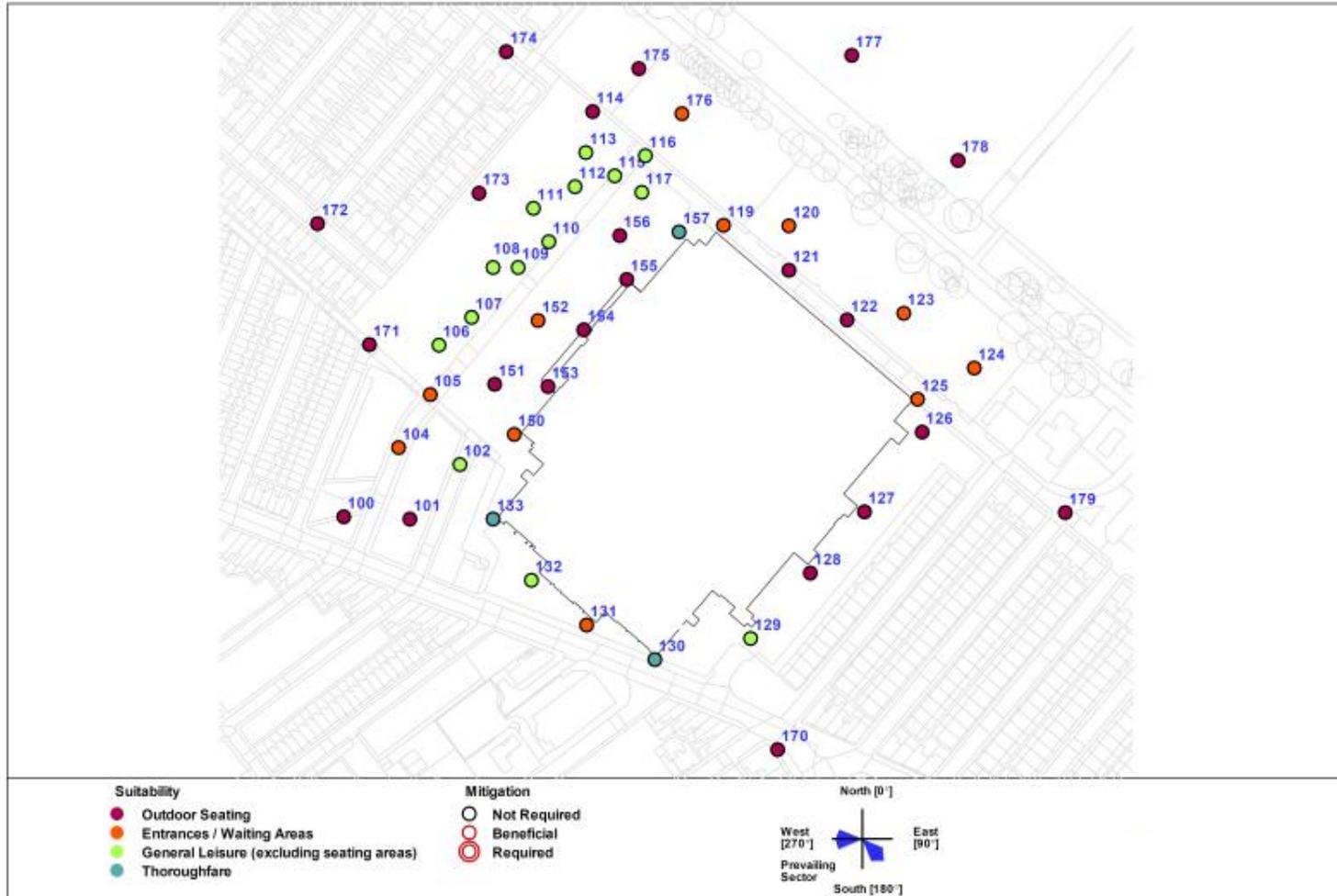
11.5.1 Wind tunnel testing is modelling and hence it is necessarily subject to assumptions and limitations:

- A finite number of measurement points have been tested within the model. Engineering judgement and experience has been used to select points which are representative of the stand or pedestrian area in question, but nevertheless conditions may sometimes differ significantly in the vicinity of the measurement location;
- The thermal effects of wind cannot be explicitly modelled; and
- Long-term historical wind data has been used in the analysis. Future wind conditions are obviously not known and could be more severe than the historical conditions. A statistically rare, extreme case could happen tomorrow.

11.6 Baseline conditions

- 11.6.1 The results of the assessment for the existing configuration are given in Figure 11.6. These consider the pedestrian activities stated in Table 11.2 and take into account the seasons for which the given activities will typically be carried out.
- 11.6.2 With regards to pedestrian safety, wind conditions within and around the site are deemed suitable. With regards to pedestrian comfort, wind conditions within and around the site are deemed suitable for the intended uses, including all entrances and thoroughfares.
- 11.6.3 In terms of spectator comfort, wind conditions in all four stands are relatively calm, being suitable for their intended purpose more than 95% of the time (on an annual basis).
- 11.6.4 In terms of the suitability of pitch environment, conditions on the pitch are very calm, being suitable for sporting activities at least 99% of time.

Figure 11.6: Pedestrian level wind environment, suitability assessment: existing configuration



Source: BMT Report 431590rep3v2 [Ref 02]

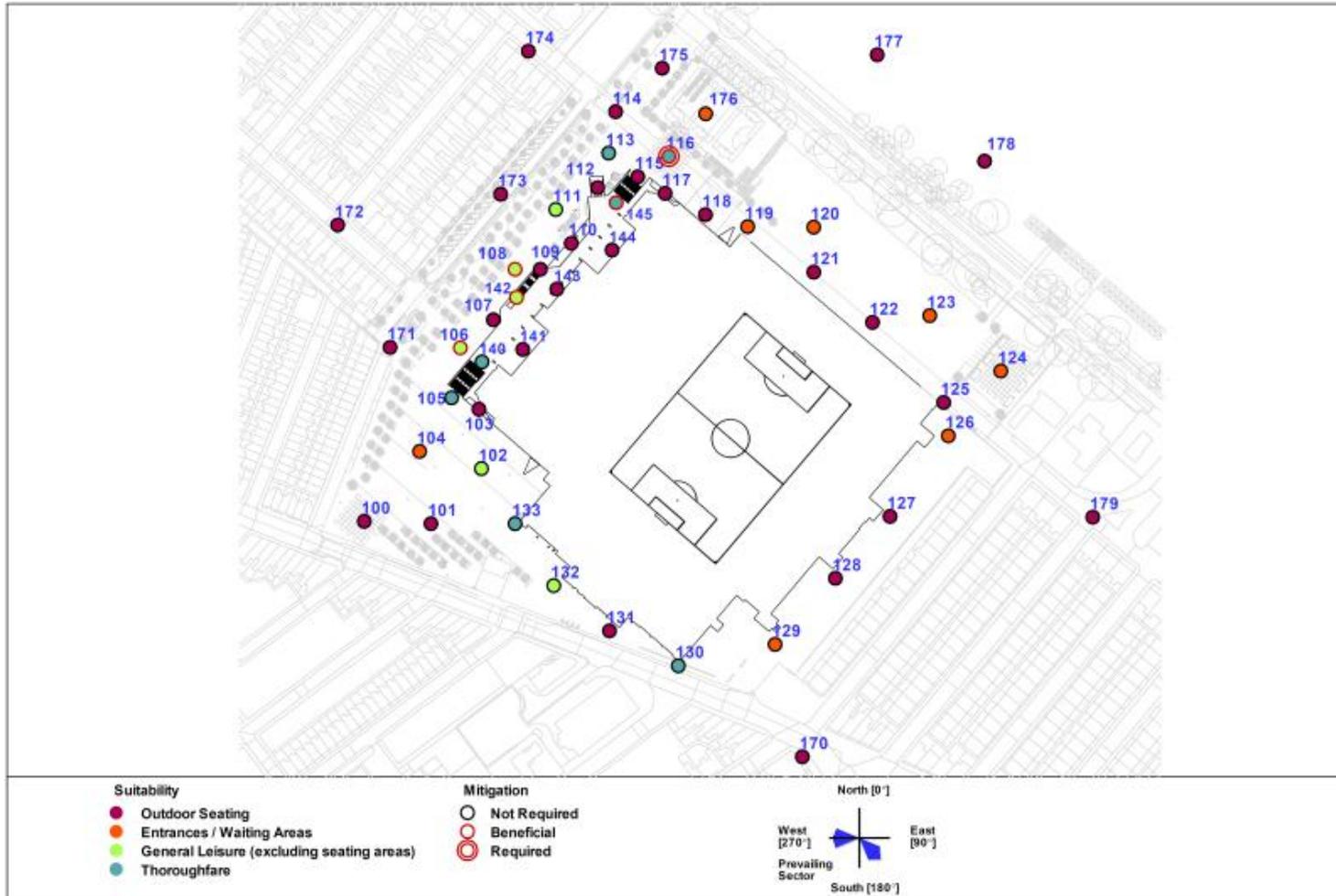
11.7 Assessment of effects

Operation – likely significant effect (Phase 1)

- 11.7.1 The results of the assessment for the Phase 1 configuration (with extended Main Stand) are given in Figure 11.7. These consider the pedestrian activities stated in Table 11.2 and take into account the seasons for which the given activities will typically be carried out.
- 11.7.2 The surrounding, off-site streets and pedestrian routes are not significantly impacted and remain suitable for their intended use.
- 11.7.3 Stanley Park, to the north of the stadium, is expected to remain suitable for leisurely pedestrian activity, including long-term sitting.
- 11.7.4 The redevelopment of the stadium concourse means that its intended usage will now include pedestrian waiting and recreation areas. In certain locations (particularly around the north corner of the stadium), it is expected that pedestrians risk experiencing discomfort due to wind effects if sitting or waiting outside. If it is expected that pedestrians will be waiting outside in these areas for long durations (at amenity areas for example) then the environment can be considered deficient by two comfort levels. If pedestrians are expected to be using this area for short-term waiting (to use as a meeting point for example) then the environment can be considered deficient by one comfort level only. Mitigation should be considered, such as planning the location of seats and amenity areas to ensure they are not within the windiest areas.
- 11.7.5 The relatively windy environment in this area is due to west winds, which are frequent and relatively strong in all seasons. These tend to accelerate around the north corner of the stadium and can be deflected down to pedestrian level by the stadium facades. Other areas around the concourse are expected to be more sheltered, and pedestrians should be able to move to these areas if uncomfortable.
- 11.7.6 Wind safety levels are found to be acceptable around the site and surrounding pedestrian areas.
- 11.7.7 In terms of spectator comfort, with the addition of the new Main Stand, the wind conditions in the three existing stands are largely unchanged. Wind conditions within the new Main Stand are expected to be relatively calm, being suitable for comfortable use by spectators for at least 95% of the time (on an annual basis).
- 11.7.8 In terms of player comfort, wind conditions on the pitch are expected to be calm, being suitable for at least 98% of the time (on an annual basis).

- 11.7.9 Under this configuration, wind safety levels within the stadium are expected to be acceptable both in the stands and on the pitch.

Figure 11.7: Pedestrian level wind environment, suitability assessment: Phase 1 configuration

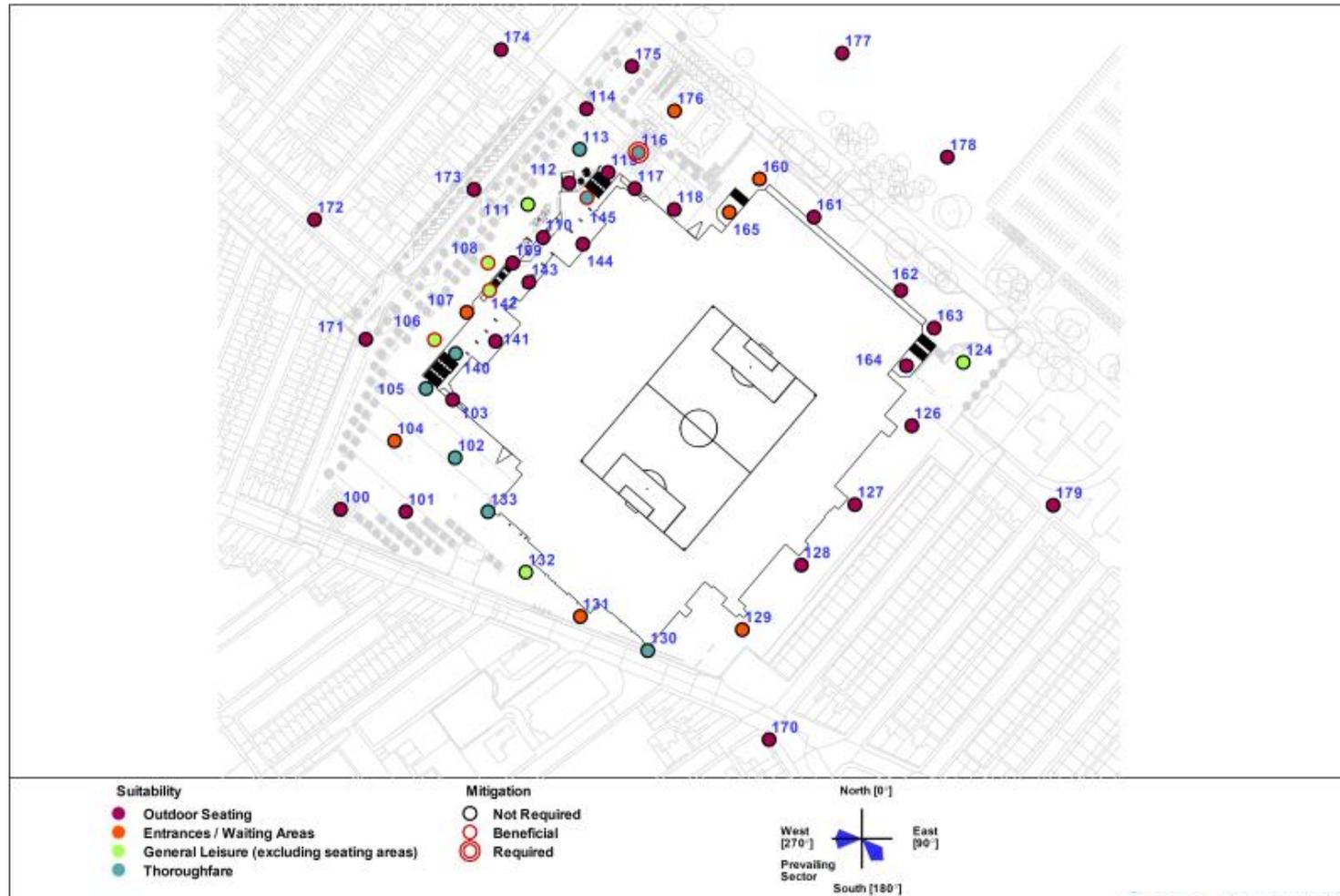


Source: BMT Report 431590rep3v2 [Ref 02]

Operation – likely significant effects (Phase 2)

- 11.7.10 The results of the assessment for the Phase 2 configuration (with extended Main and Anfield Road Stands) are given in Figure 11.8. These consider the pedestrian activities stated in Table 11.2 and take into account the seasons for which the given activities will be carried out.
- 11.7.11 The surrounding, off-site streets and pedestrian routes are not significantly impacted and remain suitable for their intended use.
- 11.7.12 Stanley Park, to the north of the stadium, is expected to remain suitable for leisurely pedestrian activity, including long-term sitting.
- 11.7.13 The redevelopment of the stadium concourse means that its intended usage will now include pedestrian waiting and recreation areas. In certain locations (particularly around the north corner of the stadium), it is expected that pedestrians risk experiencing discomfort due to wind effects if sitting or waiting outside. If it is expected that pedestrians will be waiting outside in these areas for long durations (at amenity areas for example) then the environment can be considered deficient by two comfort levels. If pedestrians are expected to be using this area for short-term waiting (to use as a meeting point for example) then the environment can be considered deficient by one comfort level only. Mitigation should be considered, such as planning the location of seats and amenity areas to ensure they are not within the windiest areas.
- 11.7.14 The relatively windy environment in this area is due to west winds, which are frequent and relatively strong in all seasons. These tend to accelerate around the north corner of the stadium and can be deflected down to pedestrian level by the stadium facades. Other areas around the concourse are expected to be more sheltered, and pedestrians should be able to move to these areas if uncomfortable.
- 11.7.15 Wind safety levels are found to be acceptable around the site and surrounding pedestrian areas.
- 11.7.16 In terms of spectator comfort, with the addition of the new Main Stand and the new Anfield Road Stand, the wind conditions in the remaining two existing stands are largely unchanged. Wind conditions within the new Main Stand and new Anfield Road Stand are relatively calm, being suitable for comfortable spectator use for at least 94% of the time (on an annual basis).
- 11.7.17 In terms of player comfort, wind conditions on the pitch are expected to be calm, being suitable for at least 98% of the time (on an annual basis).
- 11.7.18 Under this configuration, wind safety levels within the stadium are expected to be acceptable both in the stands and on the pitch.

Figure 11.8: Pedestrian level wind environment, suitability assessment: Phase 2 configuration



Source: BMT Report 431590rep3v2 [Ref 02]

11.8 Mitigation

- 11.8.1 It is recommended that careful consideration be given to the location of seating, waiting point and amenity locations within the proposed stadium concourse. Around the corners of the stadium, the wind environment is typically suitable for use as a thoroughfare only. Careful placement of seating areas, under consideration of the wind tunnel test results, will ensure that they are located in more sheltered areas around the concourse, and that any adverse effects on pedestrian comfort are minimised.
- 11.8.2 If it is found to be unavoidable that the location of seating, waiting and amenity areas must coincide with areas of unsuitable wind environment (due to spacing constraints, for example), the installation of wind breaks or evergreen vegetation barriers should be considered. When used appropriately, these can provide shelter to pedestrians in affected areas and increase comfort levels.

11.9 Cumulative Effects

- 11.9.1 Cumulative effects are those that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence (Zol). While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.
- 11.9.2 The current list of planned developments which are included in the cumulative impact assessment, are those identified in the Anfield Spatial Regeneration Framework (SRF) comprising:
- Anfield Village & Rockfield housing refurbishment;
 - New build housing led regeneration;
 - The Walton Breck Road (The High Street) Corridor;
 - New public space and Village Square development (training hotel and offices); and
 - Completion of the restoration of Stanley Park east of Mill Lane.
- 11.9.3 The results of the wind tunnel testing show that the stadium expansion proposals have negligible impact on off-site streets and parkland; the only significant impacts occur in the immediate vicinity of the stands themselves. It is not therefore expected that the proposal will have significant implications for these proposals.
- 11.9.4 Given the nature of the additional proposals in the surrounding area, which are typically limited to 3-4 storeys in accordance with the parameters identified in the SRF, it is also not expected that these will lead to significant impacts in terms of the wind environment around the stadium.

11.10 Residual effects

11.10.1 Following the appropriate mitigation as described above, there should be no significant residual effects with regards to the wind microclimate.

11.11 Summary of effects

11.11.1 A tabulated summary of effects is given in Table 11.4.

Table 11.4: Summary of Microclimate (Wind) Effects

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/ Beneficial	Permanent/ Temporary	Residual Effect
Phases 1 and 2	Off-site streets and pedestrian routes	No significant change	None	Negligible	N/A	Permanent	None
	Stanley Park	No significant change	None	Negligible	N/A	Permanent	None
	Stadium concourse	The redevelopment of this area means that its intended usage will include pedestrian waiting and recreation areas. In certain locations (particularly around the north corner of the stadium), pedestrians are likely to experience discomfort due to wind effects if sitting or waiting outside. Other areas around the concourse are expected to be more sheltered, and pedestrians should be able to move to these areas if uncomfortable.	Revise location of outdoor seating/amenity /waiting areas, or install suitable wind breaks to reduce impacts	Minor	Adverse	Permanent	None
	Stadium entrances	No significant change to existing entrances. Proposed entrances are deemed acceptable.	None	Negligible	N/A	Permanent	None
	Spectator comfort in stands	No significant change	None	Negligible	N/A	Permanent	None
	Pitch conditions	No significant change	None	Negligible	N/A	Permanent	None

11.12 Proposed monitoring

11.12.1 No monitoring is required for the proposed development.

11.13 Statement of significance

11.13.1 The wind microclimate within and around the proposed stadium is not expected to be significantly altered by the completed proposals. The only predicted adverse effects are for the proposed stadium concourse. The redevelopment of this area means that it will be used for pedestrian waiting and recreation and for these purposes pedestrians risk discomfort in certain locations, particularly at the north-eastern corner of the stadium in the area of the outside broadcast compound / informal outdoor pitch. Other areas around the concourse are expected to be more sheltered, and pedestrians should be able to move to these areas if uncomfortable. To minimise these impacts, it is recommended that the predicted wind environment should be considered when confirming the location of outdoor seating and amenity areas around the stadium. In certain areas, the use of wind breaks or evergreen vegetation barriers may be considered to provide additional shelter to pedestrians.

11.14 References

[Ref 01] - BMT Report "*Spectator and Player Comfort Study*", 431590rep2v2, 02/04/2014.

[Ref 02] - BMT Report "*Wind Microclimate Study*", 431590rep3v2, 02/04/2014.

[Ref 03] - Blackmore P., "*Wind Microclimate around Buildings*", BRE DG 520, May 2011.

[Ref 04] - MM Report "*Liverpool FC Stadium Expansion Environmental Scoping Report*", 317415/BTL/BNI/1/C, December 2013.

[Ref 05] - Email from McEvoy F. (Liverpool City Council) to Ryan S. (Turley Associates) "*RE:LFC*", 17/02/2014.

12 TV Reception and Telecommunications

12.1 Introduction

12.1.1 Radio-frequency (RF) signals used for telecommunications are attenuated, reflected and scattered by buildings. This chapter considers the potential RF effects of increasing the stadium mass on local terrestrial and satellite TV reception and point-to-point fixed microwave links which may pass near the stadium. FM and DAB radio reception will not be affected due to the relatively low frequencies used (which propagate more readily around corners in the presence of obstructions) and the very strong coverage in the Liverpool area. Interference to radio signals is less noticeable than on television signals therefore new structures often have a lesser effect on radio reception. As such, radio reception will not be considered further in this assessment.

12.1.2 The proposed development has the potential to cause RF effects during construction and operational phases. Key potential effects include:

- Interference with terrestrial television (TV) signals;
- Interference with satellite TV signals; and
- Interference with point-to-point fixed microwave communication signals.

12.1.3 This chapter presents the assessment methodology, outlines the relevant legal context, records the consultation undertaken to date, describes the existing or 'baseline' situation and assesses the potential TV reception and telecommunication effects arising from the construction and operation of the proposed development. Mitigation measures are identified to avoid or minimise any potentially adverse effects.

12.1.4 This chapter has been prepared by Mott MacDonald Ltd.

Design measures incorporated

12.1.5 No specific TV reception and telecommunications related design measures are incorporated within this assessment

12.2 Methodology

12.2.1 The general approach to this assessment is similar to that described in the Ofcom document *Tall structures and their impact on broadcast and other wireless services*⁵.

Technical Background

12.2.2 New structures may affect the transmission paths of television and other telecommunication services. In the case of terrestrial television, users may be affected either by blocking off

⁵ Ofcom, 26th August 2009, available online at https://licensing.ofcom.org.uk/binaries/spectrum/fixed-terrestrial-links/wind-farms/tall_structures.pdf

signal access from the television transmitter or by causing ghost images in receivers from signal reflections caused by the new structures façade. Digital terrestrial television (e.g. Freeview) is more resilient to the effects of signal reflections. In the case of satellite television, users may experience loss of signal reception due to a structure blocking signals between the satellite dish and receiving dish.

- 12.2.3 In the UK, terrestrial television signals are transmitted as electromagnetic waves in the Ultra-High Frequency (UHF) band of the electromagnetic spectrum.
- 12.2.4 Satellite television services are transmitted at Super High Frequency (SHF) at around 10GHz. The transmitting antennas are located on satellites which are in geo-stationary orbit above the equator. From the northern hemisphere they form an arc in the southern sky. BskyB, the only satellite television provider in the UK, transmits from the Astra 2 satellite, located above the equator at 28.2 degrees east.
- 12.2.5 Each type of service is transmitted using a different frequency and wavelength which means that each type of signal will behave differently in certain situations.

Sources of information

- 12.2.6 For assessment of TV reception, the following sources of information were used:
- *The Digital TV Group Limited*, www.dtg.org.uk [Ref 01];
 - *Digital UK*, www.digitaluk.co.uk [Ref 02];
 - *Satellite Signals Dish Pointing Calculator*, www.satsig.net/maps/satellite-tv-dish-pointing-uk-ireland.htm [Ref 03].
- 12.2.7 For assessment of fixed microwave links, Ofcom (Office of Communications, the independent regulator for the UK communications industries) was consulted initially. Subsequent enquiries were made with the organisations listed in the consultation section of this chapter.

Desk study

- 12.2.8 For assessment of terrestrial TV reception conditions, inspection of the current azimuths (compass bearings) of local TV reception antennas was performed using Google Streetview for a sample of streets surrounding Anfield Stadium. The publically-available RF coverage plots from the TV transmitters near Liverpool were obtained and inspected, and are included in Section 12.6.
- 12.2.9 For assessment of satellite TV reception conditions, the required azimuth and elevation from Anfield to the Sky broadcast satellite located at the 28.2E geostationary orbit was determined using a dish pointing calculator, and current and new shadow zones geometrically calculated based on these figures and the stand heights.

12.2.10 A desk study was not required for assessment of fixed microwave links, the consultation being relied upon.

Field survey

12.2.11 A field survey was not conducted as little additional predictive information could be obtained.

Assessment Criteria

12.2.12 The evaluation of interference effects and corresponding significance criteria are described below.

12.2.13 The magnitude of the effect of the development on the reception of television and fixed microwave signals will provide an indication of the level of interference on properties outside the development site. Table 12.1 describes the magnitude criteria:

Table 12.1: Assessment of Magnitude

Magnitude Criteria	Definition
High Adverse / Beneficial Effect	Substantial deterioration / improvement compared to the current scenario e.g. high impact on a regionally or nationally importance resource.
Moderate Adverse / Beneficial Effect	Noticeable deterioration / improvement compared to the current scenario e.g. moderate to high impact on a locally important resources or low impact on a regionally or nationally important resource.
Low Adverse / Beneficial Effect	Slight deterioration / improvement compared to the current scenario e.g. low impact on a locally important resource.
Neutral	No noticeable alterations to the current scenario and impacts are negligible.

12.2.14 The potential impact of an environmental topic which is identified will be assessed in terms of its individual magnitude and this will be combined with an evaluation of the sensitivity of the receiving environment to that potential impact.

12.2.15 The likely severity of the effects will be assessed using the metrics in Table 12.2.

Table 12.2: Likely severity of effects

Magnitude of Effect	Sensitivity of receptor		
	Low	Medium	High
Low	1	2	3
Moderate	2	3	3
High	3	4	5

12.2.16 A descriptive meaning for each of the five points on the severity of effects scale, and the corresponding significance of the impact is shown in Table 12.3.

Table 12.3: Significance Criteria Descriptions

Scale Point	Description	Examples	Significance
1	Negligible Impact	No discernable negative signal reception effects	Not significant
2	Slight Impact	Easily preventable, re-orientation of antennae Minor, low-level and localised interference of off-site signal reception	
3	Minor Impact	Easily preventable, relocation of antennae to minimise reflection effects Localised interference; re-orient antennae to alternative signal sources	
4	Moderate Impact	Re-orientation of antennae to alternative sources in medium to large area	Significant
5	Major Impact	Complete loss of signal requiring alternative measures to receive signals e.g. use of cable in lieu of air signal reception	

12.2.17 It is assumed that requiring adjustment of terrestrial TV reception antennas is a minor impact. However, some building occupants may experience delay (gaining landlord agreement) and cost in adjusting their antennas.

12.2.18 It is assumed that loss of satellite TV reception capability is a major impact; for many building occupants this may not be so.

12.3 Legislation and policy

Legislation

12.3.1 There is no legal right to TV, satellite, or other radio communications reception in the UK. “We do not have any powers or means of providing a remedy if the cause of the interference is due to generally poor signal levels in a particular area, or if it is due to a physical obstruction, or signal reflection, from such a large new building or wind turbine.” – Ofcom, 2009⁶. Some local councils have also published information which supports this conclusion⁷⁸⁹.

⁶ [Ref 04] - Ofcom, 26th August 2009, available online at https://licensing.ofcom.org.uk/binaries/spectrum/fixed-terrestrial-links/wind-farms/tall_structures.pdf

⁷ [Ref 05] - <http://www.surreyheath.gov.uk/planning/treepreservationorders/treestv.htm>

⁸ [Ref 06] - https://www.haverling.gov.uk/Pages/FAQ.aspx?lgsl=508#My_television_and_satellite_reception_has_been_disrupted_by_nearby_trees

⁹ [Ref 07] - <http://www.caerphilly.gov.uk/site.aspx?s=C1YEJw6HXEAJwLzx5gE15SizQBhJrt3VLAM0MiwvJDR717QE2E+bQ=#t12>

Policy

- 12.3.2 The National Planning Policy Framework sets out the government's planning policies for England. There are no specific policies relating to TV reception and telecommunications.
- 12.3.3 The LCC Unitary Development Plan (UDP) was adopted in November 2002. The current UDP which is still currently used for determining planning applications contains no policies regarding TV, satellite, or other radiocommunications reception.
- 12.3.4 LCC commenced preparation of a Core Strategy to replace the strategic policies of the adopted UDP. While that plan reached an advanced stage of preparation it was not submitted for examination and has now been abandoned in favour of producing a city-wide Local Plan. The draft strategic policies of the Core Strategy will be used to inform the emerging Local Plan. No draft policies exist relevant to TV, satellite, or other radiocommunications reception matters.

12.4 Consultation

- 12.4.1 For assessment of fixed microwave links Ofcom was consulted. Ofcom's response identified Vodafone and EE as being potentially affected and suggested further consultations listed in Table 12.5. Vodafone provided clarification that none of their links would be affected. EE provided clarification that five Orange links have nearby endpoints but these face away from the stadium. EE also advised that the effect on T-Mobile's microwave links was not known.
- 12.4.2 Table 12.4 summarises the scoping response received in relation to TV reception and telecommunications:

Table 12.4: Summary of scoping response for TV reception and Telecommunications

Name of organisation	Comment
Liverpool City Council (LCC)	The suggestions for mitigation, enhancement and monitoring measures (in relation to TV reception and telecoms) are considered prudent and would likely to be controlled by way of condition.

12.5 Assumptions and limitations

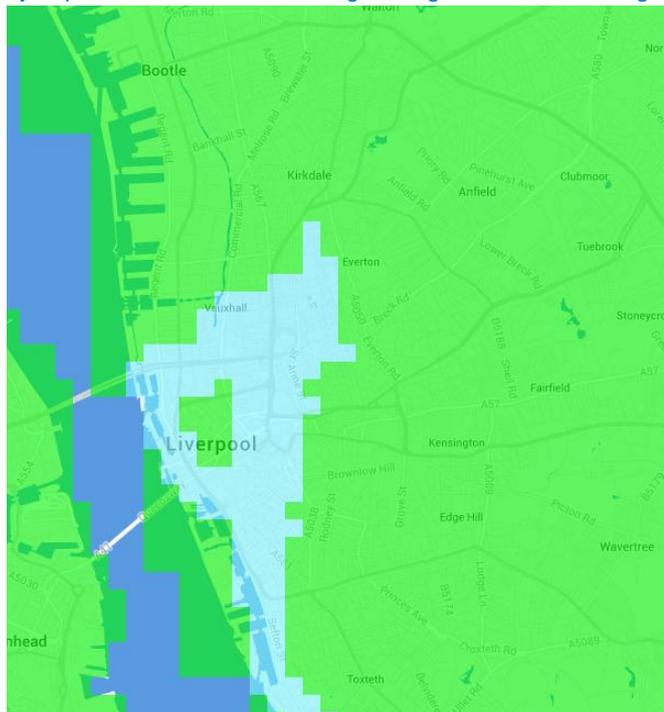
- 12.5.1 It is assumed that Ofcom maintain a comprehensive list of fixed links using licensed spectrum and have supplied the details of all parties with links passing near the stadium.

12.6 Baseline conditions

Terrestrial TV reception

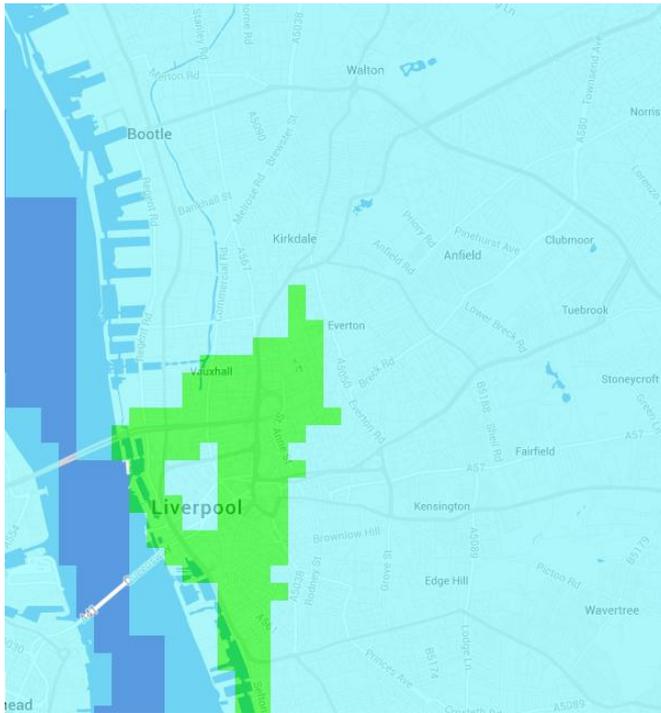
- 12.6.1 Most local terrestrial TV antennas are pointing towards the Winter Hill transmitter (bearing 54°), including some antennas which are currently in the line-of-sight shadow of the existing stadium. Coverage maps of the local area from these transmitters are shown in Figure 12.1, Figure 12.2, and Figure 12.3.

Figure 12.1: Map of Anfield area coverage from Winter Hill TV transmitter (green pixels indicate coverage, cyan pixels also indicate coverage though it would be stronger from another transmitter)



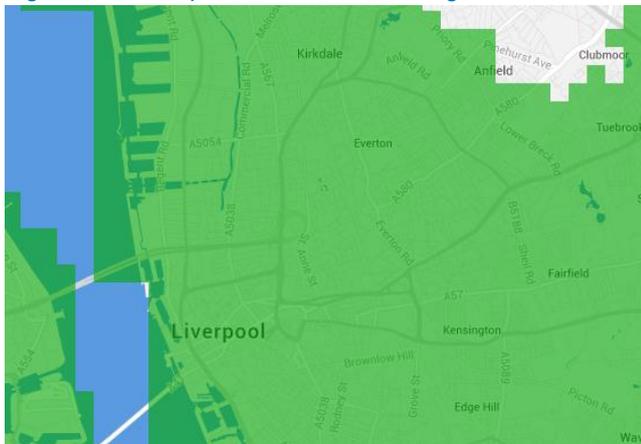
Source: ukfree.tv. Contains map data © Google 2014.

Figure 12.2: Map of Anfield area coverage from Moel-Y-Parc TV transmitter (green pixels indicate coverage, cyan pixels also indicate coverage though it would be stronger from another transmitter)



Source: ukfree.tv. Contains map data © Google 2014.

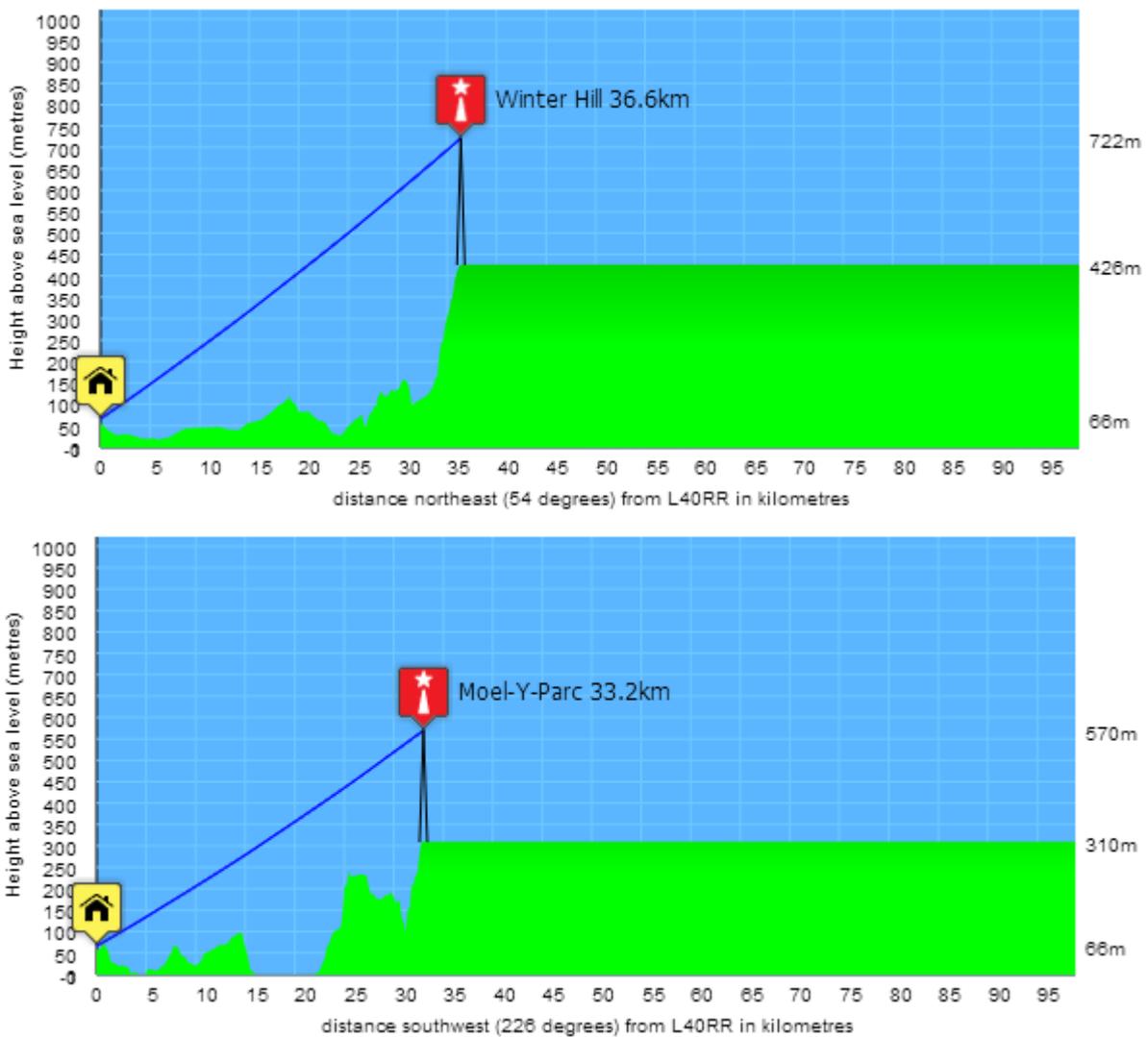
Figure 12.3: Map of Anfield area coverage from Storeton TV transmitter (green pixels indicate coverage)

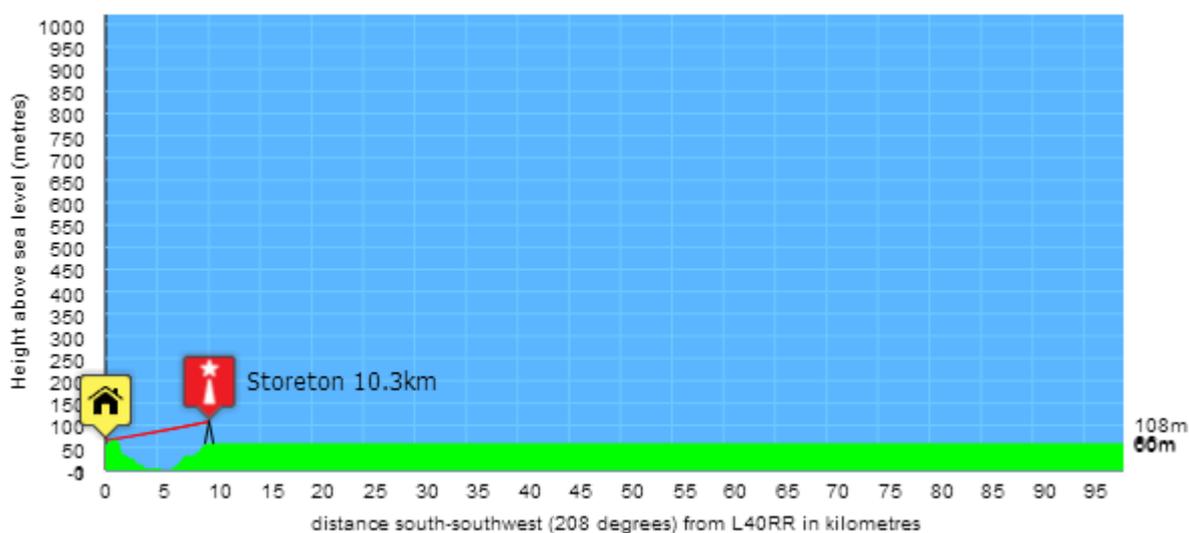


Source: ukfree.tv. Contains map data © Google 2014.

12.6.2 The line-of-sight terrain plots from these three transmitters to the region of Anfield stadium are shown in Figure 12.4. It may be seen that terrain-blocking does not occur, supporting the coverage plots above.

Figure 12.4: Terrain elevation plots between Anfield and TV transmitters at Winter Hill (top), Moel-Y-Parc (middle), and Storeton (bottom).





Source: ukfree.tv

Satellite TV reception

- 12.6.3 Some houses in many streets surrounding the site have satellite TV dishes fitted. Some of these may be lapsed subscribers, though it is not possible to distinguish between active and lapsed subscribers by visual inspection. It seems reasonable to assume that most streets in the area have a few active Sky subscribers or Freesat viewers.
- 12.6.4 Virgin Media cable service is available to streets in the immediate area. This service offers an alternative to Sky (and free-to-air) channel delivery via satellite, and these two companies compete heavily for customers wishing to pay to view Sky channels.

Fixed Microwave Links

- 12.6.5 Point-to-point microwave link paths near the stadium were identified via consultation; a list of parties with potentially-affected links was obtained from Ofcom and is shown in Table 12.5.

Table 12.5: Summary of scoping response for fixed microwave links

Organisation	Key Concerns	Comment
Vodafone Ltd	Ofcom identified link within 500m	No objections
EE Ltd	Ofcom identified link within 500m	5 nearby, none likely to be affected
JRC Ltd	Telemetry links in vicinity of site; further consultation requested if expansion occurs in a SW direction	Cleared with respect to radio links operated by NAMWEB, National Grid Gas Networks, United Utilities water
Atkins Ltd	None	Not in the region of any contracted water industry members

12.7 Assessment of effects

12.7.1 This assessment considers the likely effects of both phases of the development.

Construction– likely significant effects

Temporary effects

12.7.2 Signal shadowing and reflection by temporary structures such as cranes and scaffolding is difficult to predict as the positions of these structures and their interference effects will change over time. In addition, these structures do not have suitably large/flat surface areas to effectively produce reflected signals of adequate strength to result in signal 'ghosting'. The construction phase of the development is not anticipated to have a significant effect on the reception of television.

Permanent effects

12.7.3 No permanent effects have been identified as a result of the construction phase of the proposed development.

Operation – likely significant effects

Temporary effects

12.7.4 No temporary effects have been identified as a result of the operational phase of the proposed development.

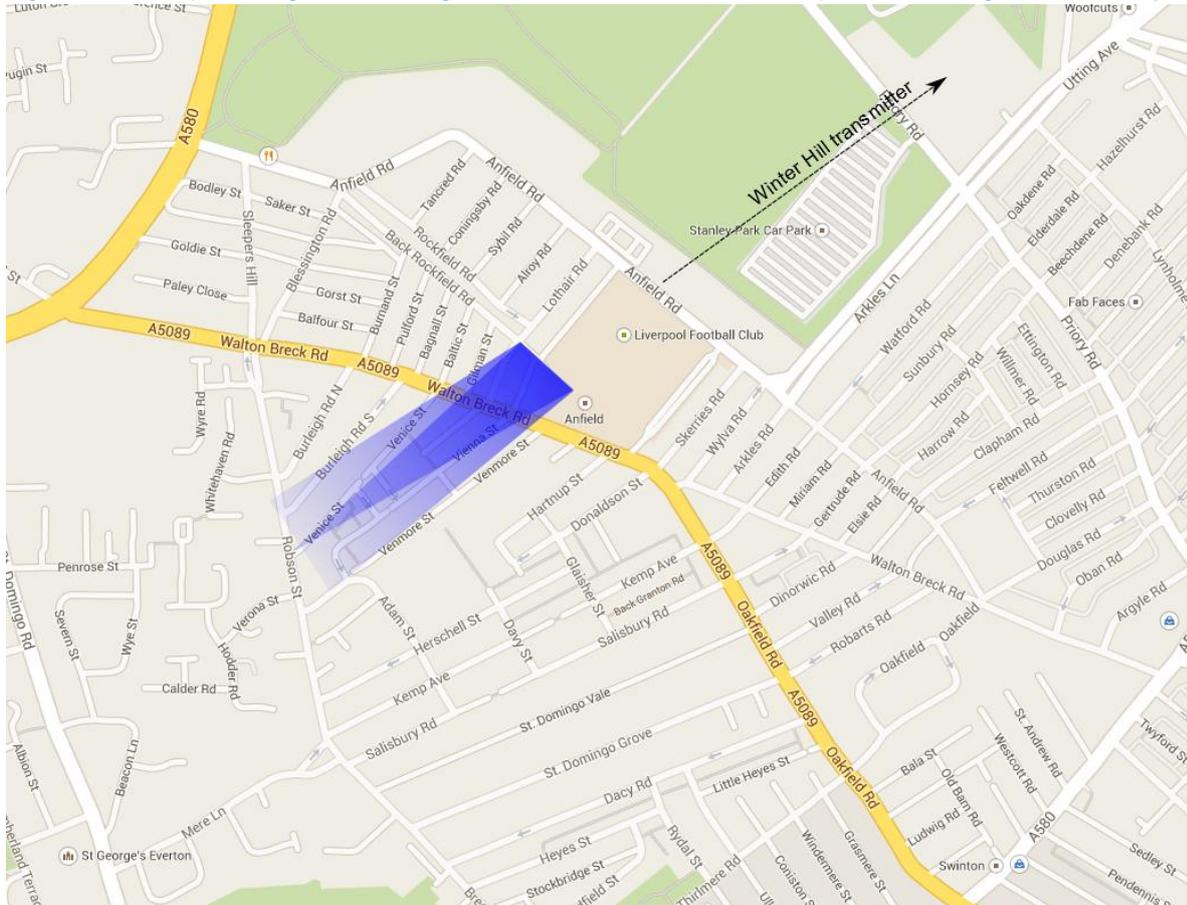
Permanent effects

12.7.5 **Terrestrial TV reception:** TV viewers are considered highly sensitive receptors. Some households within an estimated 400 metres of the site to the south-west may experience a reduced terrestrial TV signal following construction of the new stand. Of these, some may have a sufficiently reduced (or reflection-interfered) signal so as to experience noticeable disruption to TV reception requiring antenna re-pointing. The magnitude of effect is defined as moderate (noticeable deterioration compared to the current scenario, potentially losing signal strength), leading to a minor adverse impact (not significant) which is easily preventable and of local interference.

12.7.6 The potentially affected zone of 400m is an estimate. An estimate of the most likely location in which effects might be noticeable is shown in Figure 12.5. It is difficult to precisely predict how many properties will be affected because the shadow cast by a structure does not have hard edges and does not usually extend indefinitely. While there would be a large reduction in signal levels immediately behind the structure, the blocking effect of the structure diminishes

with distance because of diffraction and is also affected by reflection of the signal from roads, buildings and even trees.

Figure 12.5: Map showing estimated region within which terrestrial TV reception effects might be noticed by some residents.

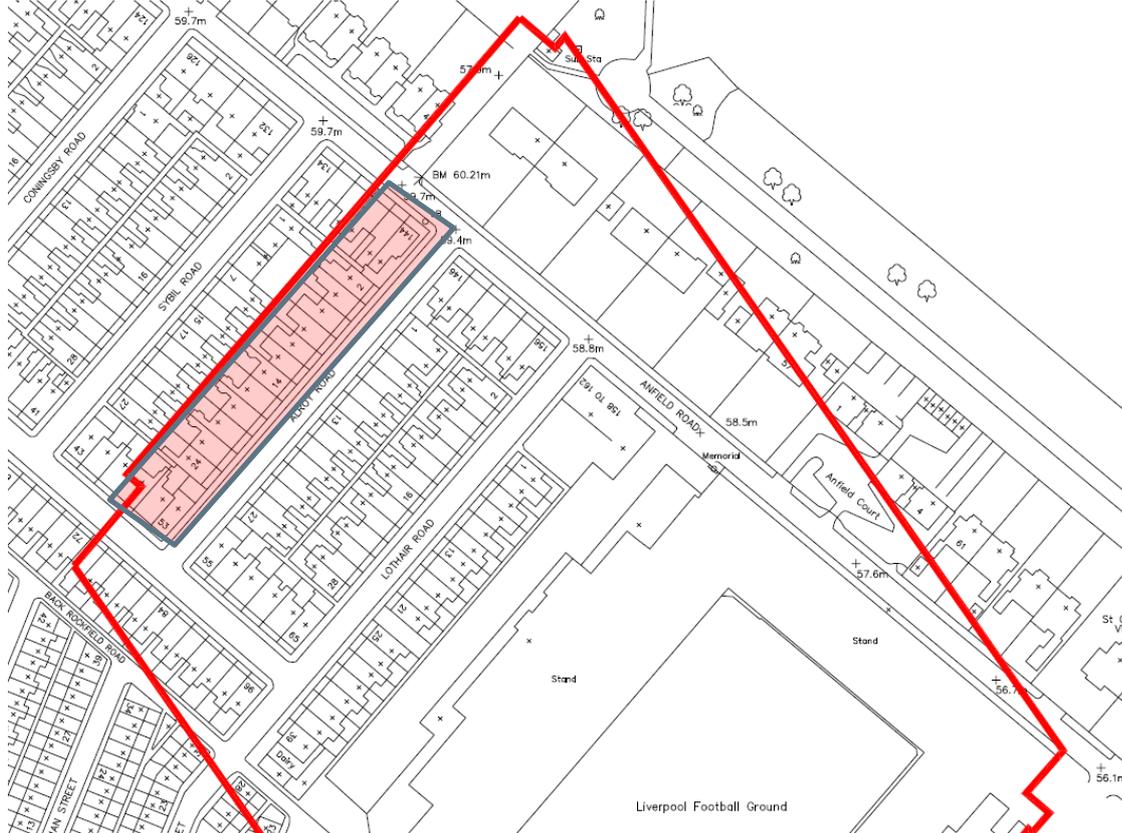


Source: Mott MacDonald. Contains map data © Google 2014.

12.7.7 **Satellite TV reception:** TV viewers are considered highly sensitive receptors. Households between 85 metres from the edge of the current stadium stands and 110 metres from the edge of the new stadium stands, in a north-north-westerly direction only (i.e. 325.3° azimuth w.r.t. grid north), may lose line of sight to the Freesat and Sky satellites located in geostationary orbit at 28.2E. The magnitude of effect is defined as high (substantial deterioration compared to the current scenario with potentially a total loss of signal in the worst case), leading to a major adverse impact (significant).

12.7.8 Referring to the region shaded red in the map in Figure 12.6, this indicates the households potentially affected. These households may no longer have the option to watch Freesat or Sky satellite broadcasts. Inspection of street-level imagery of the affected houses in Alroy Road (captured in 2008) shows a total of six satellite dishes fitted.

Figure 12.6: Map showing buildings on Alroy Rd potentially shadowed from satellite TV reception (shaded red)



12.7.9 **Fixed microwave links:** No impingement upon existing fixed microwave links has been identified.

12.8 Mitigation

Terrestrial TV Reception

12.8.1 An alternative nearby transmitter for those households potentially occluded from the Winter Hill transmitter is located at Storeton (209° 10km), whose line of sight is not interrupted by the stadium. Alternative digital transmitters for repointing also include Skelmersdale (045° 20km) and Moel y Parc (225° 33km). Some residents are likely to re-point their antennas themselves, or to arrange for a specialist tradesman to do so. Others may ask LFC to do this, so prior arrangements with a suitable local TV aerial installer/maintainer to act on a call-off basis to re-point antennas if requested should be put in place. Such a job is common place for an experienced TV aerial installer.

Satellite TV Reception

- 12.8.2 There are two potential solutions for any households affected:
- For households wishing to watch Sky TV channels, these are also available via Virgin Media's terrestrial cable service. Virgin Media service is available in the affected area and there is keen competition between these two companies for subscribers. Both services provide access to the main terrestrial and Sky channels, though the more esoteric Sky channels are not available via Virgin Media;
 - For households wishing to maintain a satellite service, the installation of a communal distribution system is feasible. Space for a powered reception dish with a clear view of the satellite would need to be allocated on LFC land, along with a powered cabinet adjacent to Alroy Rd to contain a multiswitch, and a fibre run between the two. From the multiswitch cabinet, coaxial cable drops to affected households wishing to make use of the service could be provided subject to suitable wayleaves and civil works.

12.9 Cumulative effects

- 12.9.1 Cumulative effects are those that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence (Zol). While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.
- 12.9.2 The current list of planned developments which are included in the cumulative impact assessment, are those identified in the Anfield SRF comprising:
- Anfield Village & Rockfield housing refurbishment;
 - New build housing led regeneration;
 - The Walton Breck Road (The High Street) Corridor;
 - New public space and Village Square development (training hotel and offices); and
 - Completion of the restoration of Stanley Park east of Mill Lane.
- 12.9.3 There are no cumulative impacts currently in relation to TV reception and fixed microwave signals. However, if any cumulative impacts were to occur then this would be limited to terrestrial TV reception and mitigation is assumed to be as that described above i.e. adjust pointing of TV antennae.

12.10 Residual Effects

- 12.10.1 Subject to the application of the above mitigation measures, the proposed development is not anticipated to have any significant residual effects on TV reception and telecommunications during the construction or operation phase.

12.11 Summary of effects

12.11.1 A tabulated summary of effects is presented within Table 12.6:

Table 12.6: Summary of Effects

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/ Beneficial	Permanent/ Temporary	Residual Effect
Construction	Terrestrial and satellite reception	Loss of signal through interrupted line of sight	No effect predicted.	None	-	-	-
Operation	Terrestrial TV reception to the SW to approx. 400m distance	Noticeable loss of signal	For each affected building, adjust TV reception antenna azimuth to achieve stronger signal. If necessary, repoint TV antenna from Winter Hill transmitter towards Storeton or Moel-Y-Parc transmitter.	Minor	Adverse	Permanent	Not significant
	Freesat and Sky TV reception to the NNW between 85m from edge of current stands and 110m from edge of new stands.	Loss of line of sight to satellite, resulting in inability to receive satellite TV.	Suggest switch to Virgin Media service, to Freeview terrestrial service, or communal distributed dish system to be arranged.	Major	Adverse	Permanent	Minor, not significant (VM/Freeview) or negligible, not significant (communal)
	Fixed microwave links	Link loss or increased bit error rate	No affected links identified	None	-	-	-

12.12 Proposed monitoring

12.12.1 No monitoring is required for the proposed development.

12.13 Statement of significance

12.13.1 A minor significant impact on terrestrial TV reception is predicted to be experienced by receptors to the south west of the development within an approximate distance of 400m.

12.13.2 A major significant impact on satellite TV reception is predicted to be experienced by receptors to the north, north-west of the development between 85m from the edge of the current stands to 110m from the edge of the new stands.

12.13.3 No fixed microwave links have been identified within the development area.

12.13.4 Subject to the application of mitigation measures, the proposed development is not anticipated to have any significant residual impacts on TV reception and telecommunications during the construction or operation phase.

12.14 References

[Ref 01] – The Digital TV Group Limited, www.dtg.org.uk;

[Ref 02] – Digital UK, www.digitaluk.co.uk;

[Ref 03] – Satellite Signals Dish Pointing Calculator, www.satsig.net/maps/satellite-tv-dish-pointing-uk-ireland.htm;

[Ref 04] – Ofcom, 26th August 2009, available online at https://licensing.ofcom.org.uk/binaries/spectrum/fixed-terrestrial-links/wind-farms/tall_structures.pdf;

[Ref 05] - <http://www.surreyheath.gov.uk/planning/treepreservationorders/treestv.htm>;

[Ref 06] - https://www.havering.gov.uk/Pages/FAQ.aspx?lgsl=508#My_television_and_satellite_reception_has_been_disrupted_by_nearby_trees;

13 Transport

13.1 Introduction

- 13.1.1 The proposed development is fundamentally dependant on the capability of the local transport network to deliver an increased number of supporters to football matches, but therefore also has the potential to generate significant impacts on this network.
- 13.1.2 These impacts have been identified, quantified and, if necessary, mitigated through the introduction of measures to control or reduce the impact, as reviewed within this chapter.
- 13.1.3 This process has primarily been completed as part of the Transport Assessment (TA) work, which is a separate supporting document (**Document C2/3**). This Transport chapter of the EIA therefore draws from this document to provide a summary of transport impacts and mitigation where appropriate.
- 13.1.4 An Interim Staff Travel Plan (TP) (**Document C3/3**) has also been created to sit alongside the TA and this EIA chapter. Both of these reports provide further details on the development and the required mitigation to ensure impacts upon the local highway network, and those associated with trips to the site, are kept to an acceptable level.
- 13.1.5 This chapter reviews the impacts from the development during the construction phase, followed by an assessment of these for the operational phase.

Timescales

- 13.1.6 Two phases of construction are proposed, with Phase 1 providing an additional 8,300 seats (just over 50% of which are for hospitality) through the redevelopment of the Main Stand; and Phase 2 a further 4,800 general admission seats through the redevelopment of the Anfield Road Stand.
- 13.1.7 These phases will not occur concurrently, but will take place one after the other.
- 13.1.8 The estimated timescales for review are as follows by review phase:
- Construction phase
 - Development Phase 1: Commencing in January 2015 to be completed for the start of the 2016/17 season. This includes two closed seasons; and
 - Development Phase 2: to be determined after the construction of Phase 1.
 - Operational phase:
 - The stadium will remain operational during both construction phases.
- 13.1.9 Within the Operational phase, this chapter evaluates the impacts from the development for the following assessment scenarios:
- A weekday evening match;

- A weekend afternoon match; and
- A non-match day.

13.1.10 Both of the match day scenarios will be permanent features in the calendar but only occur for short durations lasting for short periods of time. The construction phase is considered temporary occurring for a finite period whilst works are undertaken.

Study area

13.1.11 Anfield Stadium has been the home of LFC since its formation in 1892 and is positioned within the residential area at Anfield, approximately 3km north of Liverpool City Centre. Before that, since 1884, the site was used as a football venue by Everton Football Club. As such, the stadium has been operational for some time and match access strategies have become established and are well tested.

13.1.12 The stadium has grown up as a pivotal point of its community in the pre-car era, and is one of the few major football stadiums outside London still to retain this type of locality. It is in the middle of a complex network of interconnected streets that form the fabric of North Liverpool.

13.1.13 The stadium is bounded by Anfield Road to the north east, Skerries Road to the south east, Walton Breck Road to the south west and Lothair Road to the northwest.

13.1.14 The surrounding area is predominately residential dwellings, with a number of retail units and food outlets along Walton Breck Road. The majority of the residential dwellings immediately surrounding the site, with the exception to those along Skerries Road, are currently unoccupied and marked to be demolished as part of the Anfield Regeneration Scheme, with some properties on streets adjacent to the stadium having already been demolished.

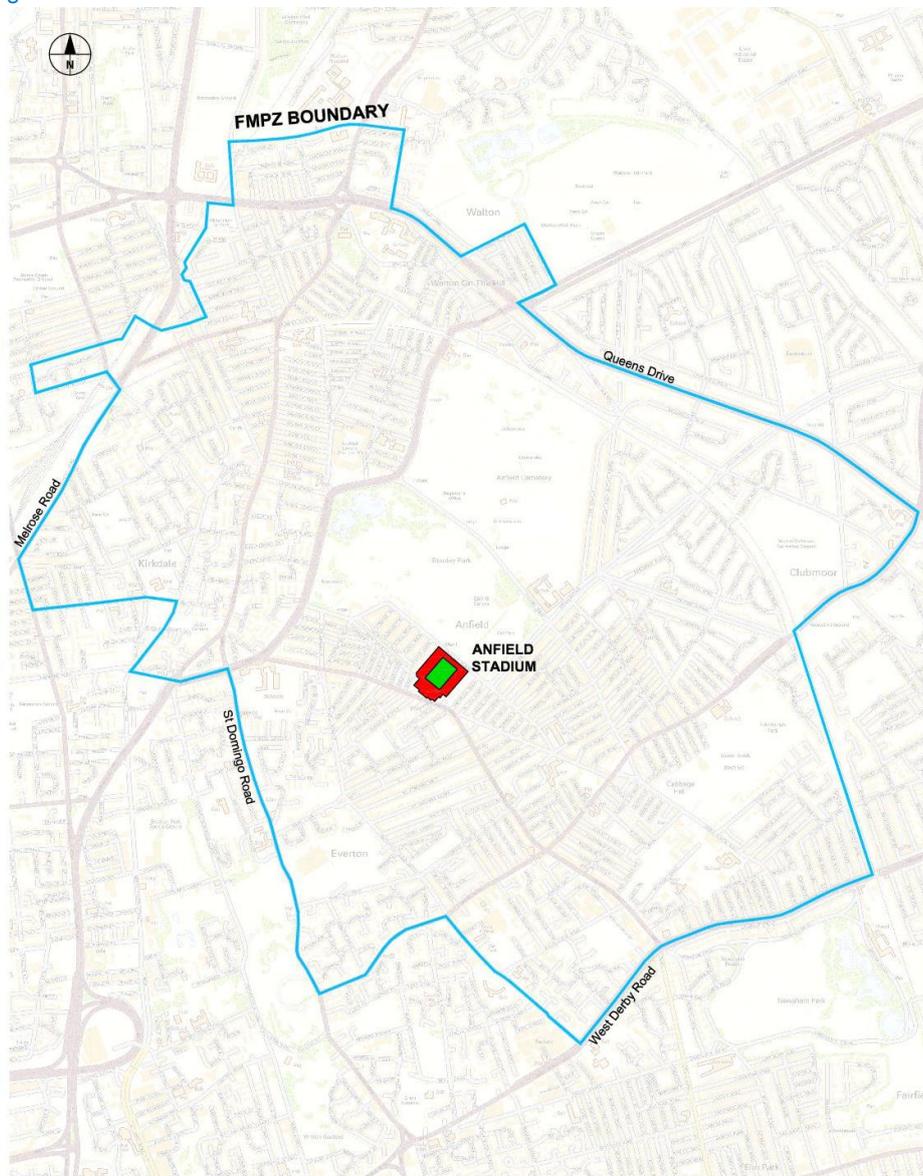
13.1.15 To the north of the stadium lies Stanley Park which is a grade II* listed park and supports a large surface car park which is leased from LCC by LFC for use on match days. The car park can accommodate approximately 1,000 vehicles and is accessed from Priory Road, with a pedestrian connection to Arkles Lane to provide access to the Stadium via Anfield Road.

13.1.16 The area surrounding the stadium is experiencing significant change with a number of developments underway or completed to help regenerate the locality. These are discussed further in more detail within the TA as well as within the Cumulative Impacts section of this chapter.

13.1.17 Surrounding the stadium is a Football Match Parking Zone (FMPZ), the extent of which is shown in Figure 13.1. Within this zone, on-street parking is split between marked bays for residents, and bays which are free, within which any vehicle can park. Parking on match days within resident's bays is only permitted by vehicles which are displaying a valid permit, and the free bays can be occupied by any vehicle, without the requirement to display a permit.

13.1.18 As such, on match days on-street parking in the vicinity of the stadium is controlled, with on-street parking occurring beyond the boundary of the zones away from the vicinity of the stadium.

Figure 13.1: Extent of the FMPZ



Source: Mott MacDonald Ltd

13.1.19 There is a history of previous planning applications in relation to Anfield Stadium and proposed improvements to it, which have been submitted over the last years, including its expansion and relocation to Stanley Park.

- 13.1.20 The 'original' application (AFL designed scheme), for the development of a 60,000 seat stadium on Stanley Park (a relocation of the existing stadium) was granted permission on 11th April 2006 (LPA Ref: 03/3214). This application provided an Access Strategy report (AS1) which essentially was produced in place of a Transport Assessment and presented how supporter travel would be managed to facilitate the new stadium.
- 13.1.21 The 'recent' application (HKS designed) also for a 60,000 seat stadium on Stanley Park was granted permission on 19th June 2008 (LPA Ref: 07F/2192) and included Access Strategy 2 (AS2). Within AS2, modal splits for supporter travel from 2003 (collected from AS1) were established and these have been used within the Anfield Stadium Expansion TA to assess changes in supporter travel from 2008 to 2013.
- 13.1.22 A series of mitigation measure have been implemented from these two previous planning permissions which are of relevance to this chapter. These include the following:

Table 13.1: Previous mitigation measures implemented or funded by LFC

Intervention	Status	Topic
1 Football Match Parking Zone	Implemented	Traffic Management
2 Signage Contribution	Implemented	Traffic Management
3 Footway improvements on Utting Avenue and Priory Road	Implemented	Pedestrian
4 Signalisation of Utting Avenue / Priory Road junction	Implemented	Traffic Management
5 New pelican crossing on Walton Lane (at Tetlow Street)	Implemented	Pedestrian
6 Variable Message Signs on Strategic Approach Routes	Funded for by LFC	Traffic Management
7 St Domingo's coach park	Implemented	Traffic Management
8 New traffic signals at Walton Breck / Everton Valley junction	Implemented	Traffic Management
9 Upgrade of traffic signals at Stanley Road / Lambeth Road junction	Implemented	Public Transport
10 Coach parking lay-by on Priory Road	Implemented	Public Transport

Chapter structure

- 13.1.23 This chapter firstly presents the proposed methodology for the assessment, followed by a review of relevant policy in relation to the development, consisting of national and local policy documents.
- 13.1.24 An overview of consultation undertaken with stakeholders is then presented and all assumptions applied within this assessment outlined.
- 13.1.25 Multi-modal baseline conditions are then presented to enable the net impacts to be determined, which will cover both cumulative and residual effects.

- 13.1.26 Likely impacts include:
- Construction stage specific;
 - Potential construction impacts such as: HGV routing and numbers; hours of operation; traffic management on adjacent roads including temporary road closures, presence of construction workers in and around the site and their trip generation (*Construction stage specific*);
 - Dust, dirt and pollution (*mainly Construction stage*);
 - Driver / passenger severance and delay, including public transport;
 - Pedestrian severance and delay;
 - Pedestrian amenity;
 - Increased utilisation of the public transport network;
 - Road safety; and
 - Increased traffic congestion around the site.
- 13.1.27 Finally, a summary section provides an overview of the key findings from this transportation chapter.
- 13.1.28 This chapter has been prepared by Mott MacDonald Ltd and is informed by the TA also prepared by Mott MacDonald Ltd.

13.2 Methodology

- 13.2.1 Many of the transport impacts of the proposed development will not be new impacts, as the existing stadium already generates its own impacts. We have therefore first established the baseline conditions against which net impacts can be measured, in terms of supporter travel.
- 13.2.2 In accordance with EIA guidelines, the following potential net impacts generated by the development have been considered to help understand the scope of the impact and to determine suitable mitigation measures:
- Changed waiting times, e.g. increased waiting for public transport, increased queuing on local network;
 - Change in accident rate, e.g. impact of more pedestrian / vehicle interaction;
 - Change in access to parking, e.g. for local residents, for existing fans;
 - Effects on pedestrians/cyclists, e.g. crowding, delay, improved infrastructure; and
 - Effects on car users, e.g. impacts on football and non-football traffic.
- 13.2.3 These have been reviewed using both qualitative and quantitative approaches, with baseline data reviewed to determine the likely effect the above impacts will have. Required mitigation measures are set out within the chapter to address these impacts and minimise them where possible.
- 13.2.4 The classifications applied are:
- Level of magnitude:

- **Substantial** - Total loss or major/substantial alteration to key elements/features of the baseline (pre-development) conditions such that the post development character/composition/attributes will be fundamentally changed;
 - **Major** - Loss or alteration to one or more key elements/features of the baseline conditions such that post development or during construction character/composition/attributes of the baseline will be materially changed;
 - **Minor** - A minor shift away from baseline conditions. Change will be discernible/detectable but not material. The underlying baseline conditions will be similar to the pre-development circumstances/situation. Change is barely distinguishable; and
 - **Neutral** – ‘No change’ situation with no alteration from baseline conditions.
- Level of Sensitivity of Receptors
 - **High sensitivity** – Pedestrians, Cyclists;
 - **Moderate sensitivity** – Public transport (buses);
 - **Low sensitivity** – Private vehicles, taxis, general traffic including access and servicing.
 - Nature of effect:
 - Adverse or Beneficial; and
 - Permanent or Temporary.

13.2.5 Where effects are identified to be adverse, we have considered the mitigation proposed and then established what residual impacts remain following the implementation of the measure.

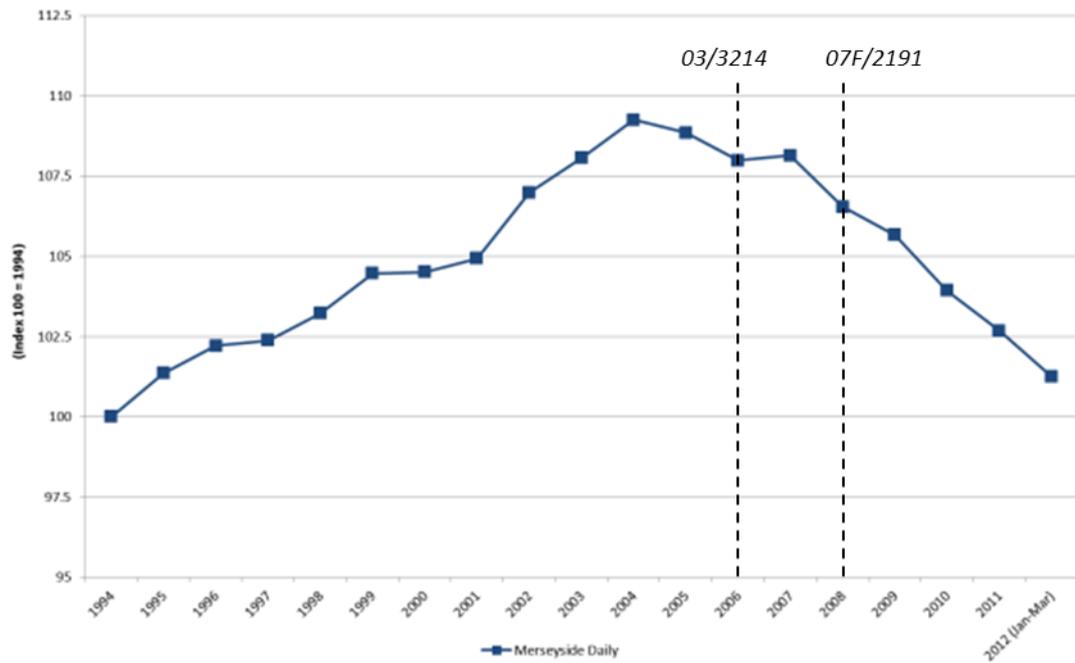
13.2.6 Given the historical operation of the stadium, the scope of the transport impact of the proposed increase in seating will principally be concentrated on the roads and other access routes in the near vicinity of the site; this will be where match day impacts will be at their greatest.

13.2.7 No wider area transport impact assessment has been undertaken based on findings presented in Access Strategies 1 and 2 which were both able to demonstrate, on the basis of information available at that time, that a new 60,000 capacity stadium could be accommodated, subject to implementation of a variety of mitigating measures. These measures are outlined further in the TA, but it should be noted that they have mainly been implemented/funded by the Club, despite the previous planning permissions not delivering a new stadium. As such, the network is already primed for an increase in capacity at the stadium.

13.2.8 AS2 reviewed the impact of the development in line with National Road Traffic Forecasts growth scenario and concluded that there were no concerns for the network with significant spare capacity remaining. Since this report, background traffic growth has in fact reduced from the baseline used and not increased in line with the applied growth factors. This further reduces the scale of the likely impact in today’s terms when compared against the historic

assessment. This can be seen in the following chart which also highlights the traffic levels at the time of the previous planning permissions in 2003 and 2007.

Figure 13.2: Traffic Growth in Merseyside



Source: Travel in Merseyside, 2013

13.2.9 In addition to this, the objective of the transport strategy is to have no increase to the proportions of people visiting with the stadium using private vehicles on match days, with a reduction in the mode share anticipated for Phase 2.

13.2.10 This approach has been discussed and agreed with LCC (Development Control and Highway Departments) in early consultation regarding the preparation of the TA, EIA Chapter and Interim Staff Travel Plan.

Sources of information

13.2.11 The following sources of information have been used in the assessment presented in this chapter:

Supporter travel surveys

13.2.12 Surveys were undertaken with home supporters at two home matches on:

- Wednesday 4th December 2013 (LFC vs. Norwich City. Kick off was at 19:45) to represent the weekday scenario and;

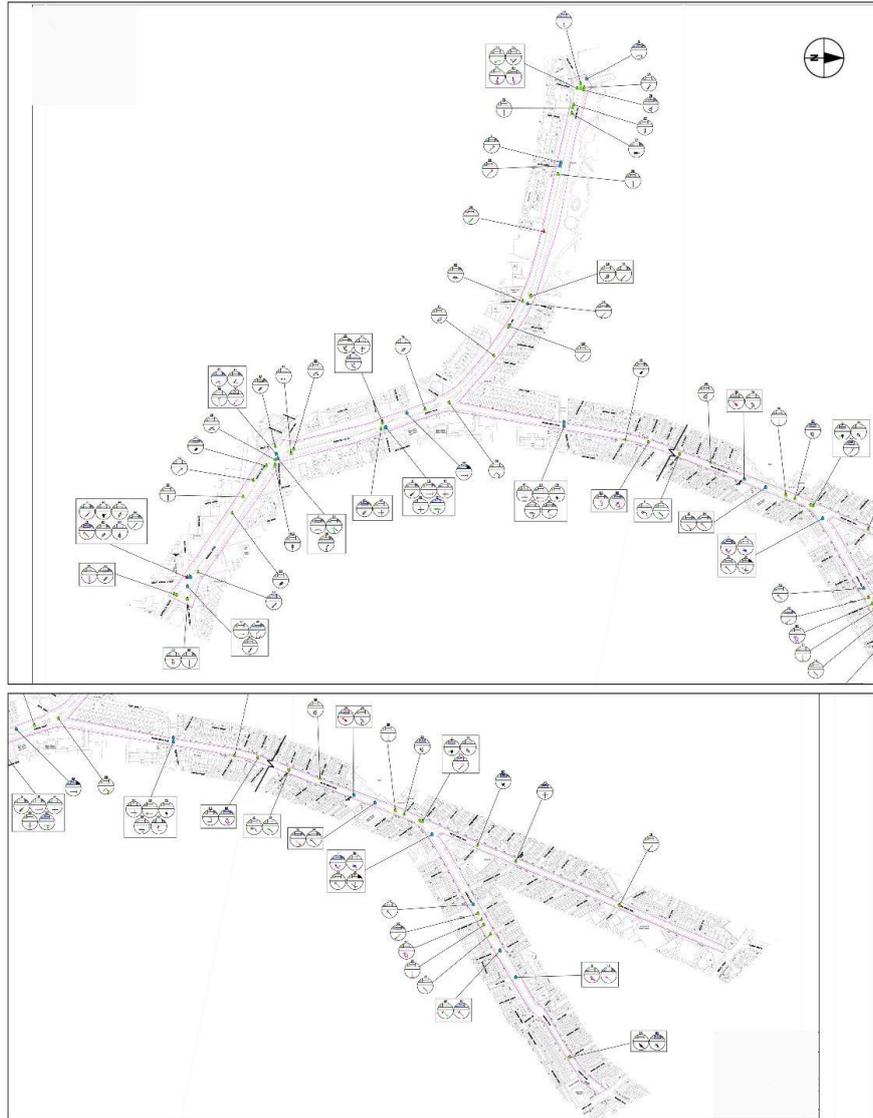
- Saturday 7th December 2013 (LFC vs. West Ham United. Kick off was at 15:00) to represent the weekend.

13.2.13 These surveys enabled an establishment of the 2013 baseline modal splits for home supporters, allowing an appreciation of how supporters currently choose to travel to the stadium on match days and a subsequent calculation from this of the volume of vehicles (by vehicle type) the stadium currently attracts on match days.

Injury accident data

13.2.14 Data for the 5 year period of November 2008 – November 2013 was reviewed to understand the nature, frequency and distribution of accidents on the road network in the vicinity of the stadium. The extent of the area covered by the review is shown in Figure 13.3.

Figure 13.3: Extent of accident review



Source: Mott MacDonald Ltd

13.2.15 Over a 5 year period from 29th November 2008 to 28th November 2013 there have been a total of 103 accidents; 80 producing slight injuries, 21 serious and 2 fatalities. The fatalities both occurred in the autumn but in different conditions and locations, one was a 45 year old pedestrian, one a 37 year old cyclist. 30 of the accidents have involved pedestrians, 7 pedal cyclists and 5 motor cyclists.

13.2.16 This analysis showed that there are no notable clusters of incidents in the vicinity of the stadium.

Match day observations

13.2.17 A range of data gathering observations were undertaken on several match days (weekday and weekend) within the 2013/14 season to better understand the operation of the stadium and the use of various modes of transport to reach the venue.

13.2.18 These observations comprised:

- Review of on-street parking within FMPZ's and the scale of this practice;
- Review of on-street parking outside the FMPZ;
- Review of off-street parking within the vicinity of the stadium and the scale of this practice;
- Use of the Soccerbus from Sandhills with passenger counts undertaken for each service pre- and post-match;
- Use of the 917 City Centre Express Bus with passenger counts undertaken for each service pre-match;
- Use of the Taxi One service with passenger counts undertaken for each vehicle departure pre-match;
- Use of rail services to and from Sandhills and Kirkdale Station on both match and comparable non-match days for pre- and post-match;
- Taxi occupancy rates and popular drop off and pick up locations; and
- Identification of the number of and the origins of coaches with occupancy rates.

Desk top data review

13.2.19 Several data sets have been reviewed and interrogated as part of gaining an understanding of the operation of the stadium. These comprise:

- Supporter attendance figures from historic matches over recent seasons;
- Season ticket holder home postcodes to enable an understanding of supporter catchments; and
- Historical data and reports from previous work undertaken in relation to the proposal for a new Anfield Stadium on Stanley Park and its operation, such as AS1, 2 and 3.

13.3 Legislation and policy

13.3.1 The following points with regards to legislation and national and local policy are felt to be applicable to this ES chapter. Further detailed analysis of these documents (and others of less relevance here) is provided within the TA.

National Planning Policy & Guidance

- 13.3.2 The NPPF sets out the Government's policies on planning for England; it states how it expects these to be applied and provides a framework for local councils and people to work within whilst still reflecting the needs of the local community.
- 13.3.3 Chapter 4 of the NPPF discusses the important role that transport plays in facilitating sustainable development and contributing towards wider sustainability and health objectives. It states that the *"transport system needs to be balanced in favour of sustainable transport modes, giving people a real choice about how they travel"* (paragraph 29).
- 13.3.4 In this Chapter the NPPF requires that *"all developments that generate significant amounts of movement should be supported by a Transport Statement or Transport Assessment."* This assessment should take account of whether *"the opportunities for sustainable transport modes have been taken up"*, that *"safe and suitable access... can be achieved"* and that *"improvements can be undertaken within the transport network that cost effectively limit the significant impacts of the development. ... Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe"*
- 13.3.5 The development should be located where *"the need to travel will be minimised and the use of sustainable transport modes can be maximised"* with *"access to high quality public transport facilities."* Furthermore where practical it should *"give priority to pedestrian and cycle movements."* and *"create safe and secure layouts which minimise conflicts between traffic and cyclists or pedestrians."*
- 13.3.6 The proposed development of Anfield Stadium complies with the policy guidance set out in the NPPF being in an area well served by public transport; there are frequent bus services and three rail stations within 1.5 miles which connect with Northern Line services to Liverpool City Centre, Southport, Ormskirk and Kirkby.
- 13.3.7 National Planning Practice Guidance (NPPG) outlines the requirements for the provision of Environmental Impact Assessments, as well as Transport Assessments and Travel Plans. For Environmental Impact Assessments, attention should be provided for *"those aspects of the environment that are likely to be significantly affected"* with transport having the potential to impact upon a range of environmental factors including (but not limited to) population, air quality and landscape.

Local Planning Policy

- 13.3.8 The City of Liverpool UDP was adopted by LCC in 2002. Those saved policies relevant to Traffic and Transport are as follows:
- 13.3.9 Policy C7 of the UDP refers specifically to Liverpool and Everton Football Clubs and covers Community Facilities, stating “*the plan aims to promote the satisfactory provision and distribution of community facilities – including recreational, leisure, health, education and social facilities – for all the City’s residents.*”
- 13.3.10 In Chapter 12 the plan recognises the important role played by the City’s football clubs and indicates that the City Council will assist the clubs in progressing their development proposals so long as these do not adversely affect residential amenity.
- 13.3.11 The UDP also makes reference to the Council’s concern of increased activity at the stadium in the evenings, not as a result of match nights but due to other functions or visitors to the Anfield Museum. The need to protect residential amenity at these times is emphasised, and recognised by this ES chapter as well as within the TA, both of which undertake a review of the impact from the proposed development on non-match days.
- 13.3.12 LCC commenced preparation of a Core Strategy to replace the strategic policies of the adopted UDP. While that plan reached an advanced stage of preparation it was not submitted for examination and has now been abandoned in favour of producing a City-wide Local Plan. The draft strategic policies of the Core Strategy will be used to inform the emerging Local Plan.
- 13.3.13 The draft Core Strategy for Liverpool places considerable emphasis on North Liverpool and seeks to focus new development to regenerate it and similar ‘*Urban Core*’ areas of the City.
- 13.3.14 The Anfield ward falls within the Urban Core and is highlighted as one of the most deprived areas in the country but one with “*enormous potential for sustainable economic and residential growth*”.
- 13.3.15 The Core Strategy has identified eight objectives; with the aim of ‘More Sustainable Access’ of relevance to transportation: *More Sustainable Accessibility – by supporting the improvement of the City’s transport infrastructure and ensuring that all new development is highly accessible by sustainable modes of transport.*
- 13.3.16 Chapter 6 of the Core Strategy recognises the football clubs’ significant role as tourist and visitor centres and their important role in the economy of the City. Whilst the Council’s support for the redevelopment is repeated, the need to ensure that the proposals are “*carefully managed to protect amenity for those living in nearby areas and to minimise adverse impacts arising from the construction and operation of new development*” is highlighted. (paragraph 6.66)

- 13.3.17 Following the publication of the NPPF in March 2012, the Council has resolved to prepare a Local Plan. This single document will take forward the principles of the Core Strategy, which will be updated to take account of this new guidance, the changed economic climate and emerging corporate priorities. It will also include strategic policies, site allocations and development management policies for the City. That plan will be published for consultation in late 2014 with adoption anticipated in late 2015/early 2016

Supplementary Planning Documents

- 13.3.18 A consultation version of the Anfield Strategic Regeneration Framework (SRF) was published on January 28th 2014. Subsequently, the SRF has completed a public consultation phase and was adopted in late April 2014 following approval by the LCC cabinet.
- 13.3.19 It provides a formal spatial framework for the regeneration of Anfield and outlines proposals to regenerate the area. The SRF aims to explore and harness the potential of the area, bringing a number of current live projects and new proposals together in a coordinated and comprehensive manner in order to deliver lasting social, economic and environmental regeneration. In particular it seeks to support the proposed expansion of the stadium; explores opportunities for re-integrating Stanley Park with the surrounding residential areas and for reinvigoration of the 'High Street' through new and improved commercial opportunities to be delivered along Walton Breck Road and Oakfield Road. The SRF also supports any future proposals which seek to ensure the long term conservation and enhancement of the Anfield Cemetery.
- 13.3.20 'Ensuring a Choice of Travel Supplementary Planning Document' (SPD) was developed by a collaboration of the Merseyside local authorities and Merseytravel and was adopted in December 2008. It provides guidance on the access and transport requirements for new developments across Merseyside.
- 13.3.21 The SPD Objectives are:
- Ensure a reasonable choice of access by all modes of transport to new development;
 - Reduce the environmental impact of travel choices, by reducing pollution, and improving the local environment;
 - Improving road safety;
 - Promote healthier lifestyles by providing opportunities for people to walk or cycle for work or leisure purposes;
 - Reduce the level of traffic growth and congestion on the strategic and local road network; and
 - Encourage opportunities to improve the quality of development proposals by better use of space through the provision of less car parking spaces where appropriate.
- 13.3.22 Although the stadium is not a new site development, the expansion process is committed to ensuring that accessibility to the stadium is enhanced, with sustainable modes supported.

- 13.3.23 It recognises that good design can contribute to sustainable modes of travel and enhance the environmental quality of a development, something which is reinforced through the Transport Strategy in the TA and taken into consideration in this EIA chapter.

Other Transport Related Strategies

- 13.3.24 The Merseyside Local Transport Plan 3 (LTP3) became active on 1st April 2011 and has a vision to provide “a city region committed to a low carbon future, which has a transport network and mobility culture that positively contributes to a thriving economy and the health and wellbeing of its citizens and where sustainable travel is the option of choice.”
- 13.3.25 To achieve the vision, six goals have been set which include “ensure the transport system promotes and enables improved health and wellbeing and road safety” and “ensure equality of travel opportunity for all, through a transport system that allows people to connect easily with employment, education, healthcare, other essential services and leisure and recreational opportunities.”
- 13.3.26 Of relevant to this ES chapter, LTP3 also recognises that work on larger developments is generally completed in phases and requires that “*the developer provides a robust schedule of infrastructure development combined with the development phases and the agreed private sector funding. This will need to be supported with a monitoring framework that is capable of allowing the delivery of transport interventions to be varied depending on the actual travel volumes, patterns and modes to and from the development compared to those identified in a monitoring framework agreed between the planning authority and the developer.*” (paragraph 5.45 (e))

13.4 Consultation

- 13.4.1 A range of key stakeholders have been actively engaged with from a transportation perspective during the development of the TA, Transport Strategy, Interim Staff Travel Plan and this ES Chapter. These include:
- Liverpool City Council;
 - Merseytravel;
 - Mersey Police;
 - Merseyrail;
 - Network Rail (for Lime Street Station)
 - Bus Operators (Arriva and Stagecoach); and
 - Taxi operators (including Taxi One).
- 13.4.2 Table 13.2 provides a breakdown of their responses to the proposed development and a broad summary of the proposed measures to be taken to address their concerns.

Table 13.2: Summary of scoping response for transportation

Name of Organisation	Key Concerns	Comment
Liverpool City Council	Increase in vehicles associated with match day travel. Requirement for there to be a modal choice of travel to the stadium for both match and non-match days.	Whilst the proportions of car use are proposed to not be increased as part of the development, there will be an absolute increase in numbers of vehicles, with the impact upon the road network and parking needed to be taken into account. A variety of modes are available for match day travel, with mitigation measures proposed to ensure these can continue to provide adequate capacity following the stadium expansion.
Merseytravel	None	There are no concerns with regards to the accommodation of additional supporters on Merseytravel's services, such as the Soccerbus, with spare capacity remaining.
Mersey Police	The closure of Walton Breck Road should be formalised for safety reasons as the volume of pedestrians close to kick off and after final whistle is a risk when traffic is allowed along Walton Breck Road.	The formalisation of the closure of Walton Breck Road has been proposed as a mitigation measure to facilitate safe pedestrian access to the stadium.
Merseyrail	None	No concerns with accommodating additional supporters on the MerseyRail network as adequate spare capacity exists.
Bus Operators	Scheduled bus routes which are affected by the closure of Walton Breck Road will require re-routing during the closure, with the formalisation of the closure time assisting with this.	Alternative diversion routes have been provided for services which are affected by the road closure. These have been accepted in principle by the operators.
Taxi Operators	No formal drop off or pick up points are available in the vicinity of the stadium, particularly once Walton Breck Road is closed.	The provision of dedicated taxi pick up and drop off facilities will ensure that capacity on this mode is maximised.

13.5 Assumptions and limitations

13.5.1 The following assumptions have been made and applied within this ES chapter:

- The construction of the Stadium expansion is temporary in nature;
- Matches being held there will only occur for a short period of time;
- There is no typical modal split for away fans as different supporters are in attendance for each game. Away fans account for a small proportion of supporters at any one game (typically up to 3,000 seats for a Premiership game, with this figure remaining static following the proposed development);
- Additional trips to the site as a result of the proposed development will be mitigated by a range of proposed measures which will encourage the use of sustainable transport;

- No increases to the existing 2013 proportion of car use is proposed; the use of this mode is not being actively encouraged to ensure the number of new vehicles approaching the stadium on match days as part of the proposed development is limited;
- Given this assumption, no junction modelling has been undertaken as part of this assessment; however increases in traffic on the network due to future growth has been taken account of in historical assessments which indicated that even with a growth in baseline traffic there remained no concerns in relation to the increase in capacity associated with the stadium, as previously demonstrated;
- The opening year has been assumed to be 2016 for Phase 1 with Phase 2 to be determined and occur after the construction of Phase 1; and
- The CEMP has not yet been finalised to inform thinking with regards to the construction phase at the time of writing.

13.6 Baseline conditions

13.6.1 Multi-modal baseline transport conditions have been established for each of the scenarios noted above. These are based upon a combination of:

- New data collection;
- Supporter travel surveys;
- Historic data sets; and
- Detailed site observations.

Match Days

13.6.2 On match days, a range of transport options are available for supporters to reach the stadium. The supporter travel surveys produced the following modal splits for match day travel for the weekday and the weekend scenarios, which have been weighted to take account of the varying Hospitality and General Admission ticket types:

Table 13.3: Weekday modal split – 2013 baseline

Mode	% travelling by mode based on survey responses	Number travelling to match based on attendance on match day
Scheduled Regular Bus	5.0%	2,110
City Centre Express Bus (917)	1.2%	506
Car (passenger and driver combined)	63.6%	26,895
Coach and Mini Bus	1.5%	640
Dropped off	3.6%	1,540
Soccerbus	2.1%	880
Taxi	19.6%	8,302
Sandhills & Kirkdale (Train)	1.0%	426
City Centre and Local Area (Walk)	2.4%	998
TOTAL	100%	42,296

Table 13.4: Weekend modal split – 2013 baseline

Mode	% travelling by mode based on survey responses	Number travelling to match based on attendance on match day
Scheduled Regular Bus	6.0%	2,524
City Centre Express Bus (917)	1.4%	603
Car (passenger and driver combined)	57.7%	24,417
Coach and Mini Bus	2.6%	1,104
Dropped off	3.5%	1,492
Soccerbus	2.7%	1,154
Taxi	23.7%	10,023
Sandhills & Kirkdale (Train)	0.5%	226
City Centre and Local Area (Walk)	1.8%	755
TOTAL	100%	42,296

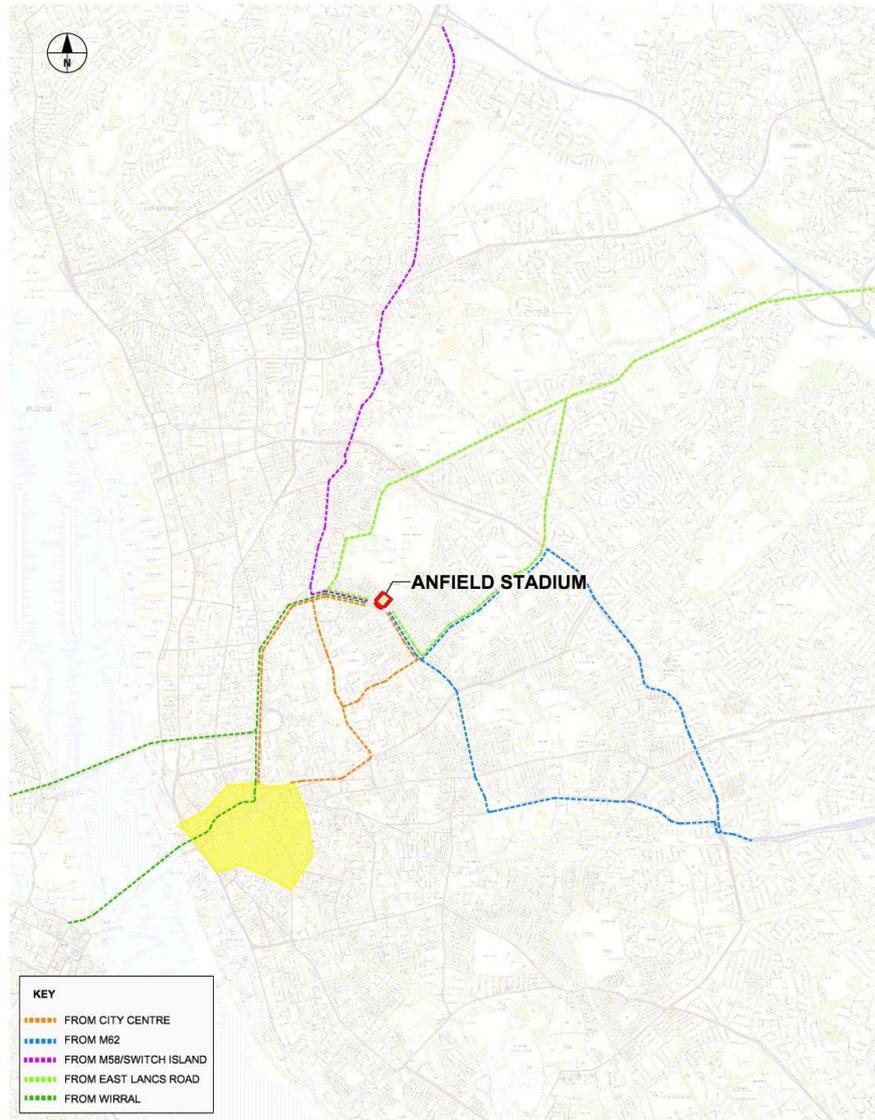
- 13.6.3 Each mode is briefly outlined within this section, with further detailed information presented within the TA with further analysis undertaken by ticket type.
- 13.6.4 Many people, particularly at weekends, break their journey by visiting the City Centre, with a significant proportion of trips to the stadium originating from here on weekend match days, with home and work being more popular on weekdays.
- 13.6.5 In comparison to the mode shifts provided in the previous Access Strategies, there has already been a reduction in the use of private vehicles for match day travel, particularly post the implementation of the FMPZ. This demonstrates a real mode shift and is reviewed in detail within the TA.

Car

- 13.6.6 The catchment of supporters at LFC covers a wide geographical area, and as such, it is recognised that the private car currently represents the predominant means of access for supporters travel to matches at Anfield. This trend will persist into the future, with car continuing to be the main mode of travel on match days.
- 13.6.7 Parking occurs off-street in privately operated car parks or car parks managed by the club and also on-street outside of the boundary of the FMPZ.
- 13.6.8 In the vicinity of the stadium there is a range of off-street private car parking facilities available on match days. The vast majority of this parking is dedicated to match day parking, and is either not occupied or not operational for other uses on non-match days. The exception to this is the parking area on Stanley Park which is mainly used by hospitality ticket holders on match days but is free and uncontrolled on non-match days, and used by Everton FC for their home match events.

- 13.6.9 It was observed on match days that for both a weekday and weekend, the car parks were well utilised but not always 100% occupied with capacity remaining in some, particularly those further away from the stadium.
- 13.6.10 The distribution of parking in the vicinity of the stadium ensures that vehicles are dissipated across the network, so ensuring that pressure on the network is not concentrated on single or several key points. Also, the effective enforcement of the FMPZ means far fewer vehicles are directly accessing the stadium in search of a parking space.
- 13.6.11 Several routes are possible to reach the vicinity of the stadium with easy connections to the motorway network (M62 and M58) and strategic routes possible. Figure 13.4 shows the main routes from the surrounding area to the vicinity of the stadium.

Figure 13.4: Main access routes to the vicinity of the stadium



Source: Mott MacDonald Ltd

Drop off

- 13.6.12 Drop-off and pick-up is a car-based mode of travel which negates the need to find a parking space and was observed as being undertaken on match days.
- 13.6.13 There is currently no dedicated drop-off or pick-up point at the stadium on match days, with the practice on non-match days tending to happen informally on Walton Breck Road, directly outside the Kop stand on Oakfield Road and Arkles Lane to the north of the stadium.
- 13.6.14 On match days, drop-off at the front of the stadium on Walton Breck Road is complicated by the closure of Walton Breck Road to vehicles as and when Police deem necessary. The ad hoc nature of this closures means attempts are made to enter the area on the assumption that the road will still be open. Closure then results in congestion at either end of the road as cars change their route and try to drop off as close as possible to the stadium at the closure points.
- 13.6.15 Pick-ups are not able to occur on Walton Breck Road after the match as it is closed to vehicles for a period of between 15 – 30 minutes to enable the crowd to disperse.

Taxi

- 13.6.16 Taxis are a popular mode to reach the stadium on match days. Within this ES, the term taxi incorporates hackney carriages, mini-cabs and the Taxi One service.
- 13.6.17 Taxi One operates as a bus service but using black hackney cab taxis. It provides a direct service from St Johns Lane, situated directly opposite Lime Street Station in Liverpool city centre, to Walton Breck Road. The service begins 3 hours prior to kick-off; each taxi takes five passengers, charging £1.90 per adult, and departs when full. No return service is provided, however very limited use of this service has been recorded which therefore does not cause concern about post-match travel for this small proportion of supporters who can be accommodated on other alternative modes such as the City Centre Express bus service.
- 13.6.18 Before a game, taxis drop off outside the stadium on Walton Breck Road. When the road is closed, taxis drop off as close to the road closure as possible, for instance on Oakfield Road and the westward end of Walton Breck Road and Walton Lane, causing increased congestion at these points.
- 13.6.19 During the game, taxis queue outside the stadium on Walton Breck Road to cater for those leaving the match early; however, they are required to move before final whistle as the road closes to allow supporters to disperse post-match. There is no designated place for taxis to pick people up post-match; therefore, they tend to circulate around the surrounding streets until hailed or until the road closure is lifted and they can return to Walton Breck Road.

Bus

- 13.6.20 A number of bus services operate in the vicinity of Anfield Stadium, offering a viable non-car mode alternative from a range of origins and destinations across the city and surrounding areas.
- 13.6.21 Bus stops located on Walton Breck Road, Walton Lane, Breck Road and Priory Road are all within walking distance of the stadium and are utilised by supporters attending the match via this mode of transport.
- 13.6.22 The stadium is well connected to the City Centre via bus, with four of the five routes outlined in the table below originating at, or serving, City Centre bus stops.
- 13.6.23 The following tables outline services which operate to these locations in the period before and after the match, as well as on non-match days:

Table 13.5: Services in the vicinity of Anfield Stadium

Service no.	Operator	Nearest Stop	Route
17	Stagecoach	Walton Breck Road	City Centre – Fazakerley – Kirkby
26/27	Arriva	Walton Breck Road	Liverpool One – Sheil Road Circular
14	Arriva and Stagecoach	Breck Road	City Centre – Croxteth
19/119/244	Stagecoach	Walton Lane	City Centre – Gillmoss – Croxteth – Kirkby
68/168	Arriva	Priory Road	Bootle Bus Station – Aigburth Vale

Table 13.6: Bus Services per hour serving Anfield Stadium weekdays (both directions)

Service no.	08:00	09:00	10:00	11:00-16:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
17	16	16	16	16	16	8	8	2	6	4	4	2
26/27	12	12	12	12	12	4	4	4	4	4	4	4
14	30	30	30	30	30	30	14	8	8	8	8	8
19/119/244	12	12	12	12	12	10	18	8	8	8	8	8
68/168	8	8	8	8	8	8	8	2	2	2	2	2
Total	78	78	78	78	60	52	24	28	26	26	20	78

Table 13.7: Bus Services per hour serving Anfield Stadium Saturdays (both directions)

Service no.	08:00	09:00	10:00	11:00-16:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
17	16	16	16	16	16	8	8	2	6	4	4	2
26/27	12	12	12	12	12	4	4	4	4	4	4	4

Service no.	08:00	09:00	10:00	11:00-16:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
14	30	30	30	30	30	14	9	8	8	8	8	8
19/119 /244	12	12	12	12	12	10	18	8	8	8	8	8
68/168	8	8	8	8	8	8	8	2	2	2	2	2
Total	78	78	78	78	60	44	47	28	26	26	20	78

Table 13.8: Bus Services per hour serving Anfield Stadium Sundays (both directions)

Service no.	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00
17	8	8	8	8	8	8	8	8	4	4	4	4
26/27	4	6	6	6	6	6	6	4	4	4	4	4
14	8	16	16	16	16	16	16	16	8	8	8	8
19/119 /244	8	8	8	8	8	8	8	6	2	2	2	2
68/168	2	4	4	4	4	4	4	4	2	2	2	2
Total	30	42	42	42	42	42	42	38	20	20	20	20

13.6.24 Walton Breck Road, adjacent to the main entrance of the Stadium, is a key bus stop location for access to Anfield, with bus stops in both directions located close to the main gates. The 17, 26 and 27 services call at these stops, providing links with the City Centre, plus wider links with Fazakerley and Kirkby. The 17 service is operated by Stagecoach, whilst the 26/27 services are run by Arriva.

City Centre Express Service

13.6.25 The 917 bus is a dedicated Stagecoach service running from Liverpool City Centre to Liverpool Football Club on match days only. Buses depart from St Johns Lane, opposite Queens Square Bus Station in Liverpool City Centre and in close proximity to Liverpool Lime Street Station. The bus fare is £2 each way.

13.6.26 The first bus currently departs 3 hours before kick-off for Saturday and Sunday matches and 1.5 hours before kick-off for mid-week matches. Buses continue to depart at frequent intervals until the last departure which leaves in time to ensure arrival at the ground in time for kick-off.

13.6.27 Post-match buses to Liverpool City Centre depart from Walton Breck Road to the west of the stadium once the road closure is lifted. Buses are stacked along Walton Breck road prior to its closure, facing in a westerly direction.

Soccerbus

- 13.6.28 The Soccerbus provides a bus service from Sandhills Station to Anfield Stadium on match days only. It runs for 2 hours before each match with the last bus from Sandhills station departing approximately 15 minutes before kick-off. It then provides a return service for 50 minutes after the final whistle with the pickup point being on Walton Lane (on the opposite side of the road where passengers are dropped off before the match).
- 13.6.29 The service is fully accessible. It costs £1.40 return if the passenger adds the Soccerbus journey on to their train ticket at the beginning of the journey or £1.70 single if buying a ticket on the bus. The service is free for people with valid Trio, Solo and Saveaway tickets and Concessionary Travel Passes.

Train

- 13.6.30 There are three rail stations located at a similar distance to Anfield Stadium and served by the Merseyrail Northern Line rail service:
- Sandhills Station is served by trains running to all three Northern Line northbound end destinations (Southport, Ormskirk and Kirkby) from Hunts Cross in South Liverpool via Liverpool Central in the city centre. The Station is 1.3 miles walk from the Stadium and is served by the Soccerbus which runs a shuttle service between Sandhills and the Stadium on match days both before and after a match on match days only.
 - Kirkdale Station is served by trains running to Ormskirk and Kirkby from Liverpool Central and is 1.4 miles walk from the Stadium.
 - Bank Hall is served by trains running between Southport and Hunts Cross via Liverpool Central in the city centre and is 1.4 miles walk from the Stadium. Sandhills Station is on the same line as this station and is closer to the stadium for walking, therefore this has not been observed to be a particularly popular station for supporters to travel to and from.
- 13.6.31 The Northern Line interchanges with the Wirral Line at Liverpool Central and Moorfields Stations providing access to the Wirral as well as Liverpool Lime Street Station which facilitates national services to destinations such as Warrington, Manchester, Crewe, Birmingham and London via the City Line.

Table 13.9: Number of services per hour at each station

Day	Sandhills		Kirkdale		Bank Hall	
	Southbound	Northbound	Southbound	Northbound	Southbound	Northbound
Weekday & Saturday	12	12	8	8	4	4
	10 <i>(from 19:29)</i>	9 <i>(from 19:03)</i>	6 <i>(from 19:27)</i>	5 <i>(from 19:06)</i>		
Sunday	8 <i>(from 20:44)</i>	6 <i>(from 21:16)</i>	4 <i>(from 20:42)</i>	4 <i>(from 21:19)</i>	2	2

13.6.32 Once alighted at these stations the main options for travel to the Stadium are:

- Walk;
- Taxi;
- Cycle (with bicycles permitted on Merseyrail services); and
- Soccerbus (from Sandhills Station only and on match days only).

13.6.33 Observations at the stations showed that the train is currently being used by some supporters on match days but it is not a well-used mode of transport for accessing the stadium in comparison to other modes. This is likely due to the limited routes directly available from nearby stations (Merseyrail Northern Line only) and the number of changes required if coming from elsewhere.

13.6.34 In addition to the stations in close proximity to the stadium, there is also Lime Street station in the city centre which is important for providing regional and long-distance travel options to Liverpool, with supporters then changing onto an alternative mode of transport to complete their journey to the stadium, typically taxi or bus.

13.6.35 Especially at the weekends, there is likely to be a break in the journey for these rail users who may spend some time in the city centre, for example shopping, eating, drinking or staying overnight before then making their way to Anfield.

13.6.36 The location of Lime Street reinforces the importance of the city centre as a hub for which shorter shuttles operate to the stadium, either by bus or taxi, and influences the proportion of journeys which originate from the city centre, highlighting this as a critical catchment.

13.6.37 The locations of the stations and walk routes to the stadium are shown in Figure 13.5.

Figure 13.5: Main access routes to the vicinity of the stadium.



Source: Mott MacDonald Ltd

Walk

- 13.6.38 The only existing designated walk route to Anfield Stadium runs from Sandhills Train Station. A number of signs directing pedestrians to Anfield, and returning to the train station in the opposite direction, are located along this route.
- 13.6.39 Despite a lack of designated walking routes to the stadium, it has been observed that supporters do walk from the city centre and rail stations to the stadium. Natural flows of crowds provide an indication of preferred routes which are adopted by supporters accessing the stadium.

Cycle and Motorcycle

- 13.6.40 Currently, there are limited cycling provisions at the stadium and in the area surrounding – with a designated area for the storage of cycles in the Food Village located in the Family Park off Anfield Road. Cycle parking is also provided in the south west corner of Stanley Park at the Isla Gladstone Conservatory.
- 13.6.41 Match day observations indicate that this mode is very infrequently used by supporters at present, although it is likely to be more feasible for staff working at the stadium on non-match days.
- 13.6.42 It is possible to carry bicycles on the Merseyrail network making this a viable mode of transport from surrounding stations as an alternative to walking or the Soccerbus.
- 13.6.43 Regional Cycle Route 81 provides a connection between the city centre and Stanley Park, making it an ideal route for cyclists to connect to the stadium from the south. The route traverses Everton Park, eastwards along Mere Lane to Robson Street, north along Robson Street onto Sleepers Hill and into Stanley Park. A second route runs from Robson Street along St Domingo Grove and then Valley Road/Robarts Road which leads on to Walton Breck Road, south east of the stadium. The following extract demonstrates this route.

Figure 13.6: Regional Cycle Route 81



Source: *Liverpool City Centre to Walton Regional Route 81 –part of the National Cycle Network, Travelwise, Merseyside*

13.6.44 There is currently no specific provision for motorcycles in the area surrounding Anfield Stadium; that is, no designated parking bays for motorcycles.

Coach and minibus

13.6.45 Home supporters travel from across the UK, including a considerable proportion from Ireland, Wales and the Midlands, making coaches ideal and cost effective for group travel.

13.6.46 During the match, home supporter coaches and minibuses park along Priory Road. They point northwards to enable easy departure after the match, when Priory Road becomes one-way northbound to allow coaches and traffic from the adjacent Stanley Park car park to exit

smoothly and without undue delay. Approximately 35 coaches can locate on Priory Road, with additional coaches over spilling into parking on Utting Avenue.

- 13.6.47 Hospitality coaches and away supporter coaches park on Arkles Lane northbound. This stretch can accommodate approximately 15 coaches and is intended to ensure some segregation between home and away supporters, particularly following a match.

Non Match Days

- 13.6.48 On a typical non-match day, the stadium is generally open for meetings, conferences and tours. Staff based on the site commute to the stadium daily, with limited parking available on site, and the baseline public transport links (with the exception of the match day specific 917 City Centre Express bus and the Soccerbus) still in operation providing a modal choice.
- 13.6.49 On non-match days, Walton Breck Road is not closed and as such, pick-ups and drop offs along this road occur outside the stadium without any concern, with taxi's also able to provide a service directly to and from the stadium on Walton Breck Road.
- 13.6.50 There are no known accessibility issues associated with access to the stadium on non-match days and the proposed expansion is not anticipated to create any impacts associated with this situation.

13.7 Assessment of effects

Construction – likely significant effects and mitigation

- 13.7.1 It should be noted that there is a requirement to appoint a main contractor and for the development of a detailed Construction Programme and an accompanying Construction Environmental Management Plan (CEMP). Prior to this it is not possible to quantify precisely the impacts of the construction phase, particularly in relation to traffic generation and the impact of this upon the traffic network. This is explained further below.
- 13.7.2 It is understood that the construction traffic is to access the site from Anfield Road and egress onto Walton Breck Road, with the actual preferred construction route for HGV's to be agreed within the CEMP. It is likely that this access and egress configuration would route vehicles to the site from Walton Lane via Priory Road and Arkles Lane. The egress route would be on to Walton Breck Road back to Walton Lane.
- 13.7.3 The guidance on the assessment of theoretical road capacity is set out in Design Manual for Roads and Bridges, Volume 5, Section 1, TA79/99 Amendment number 1, Traffic Capacity of Urban Roads. This guidance can be used for designing new roads, or assessing the theoretical capacity of existing roads. The guidance note states "*that for the purposes of this*

Advice Note, capacity is defined as the maximum sustainable flow of traffic passing in 1 hour, under favourable road and traffic conditions”.

13.7.4 It should be noted that there are many factors other than width and traffic flow which determine the traffic capacity of a road including, but not limited to:

- Traffic composition;
- On-street parking activity;
- Number of junctions and their capacity;
- Pedestrian activity;
- Bus stops; and
- Environmental issues.

13.7.5 Taking these into account, and using available data for Walton Breck Road, the theoretical hourly vehicle flow (road category UAP4) is **2,200** vehicles per hour. This assumes an existing HGV composition of 15%. Assuming a 60/40 directional split (recommended in TA79/99) the highest (one) directional flow is **1,320** per hour. The theoretical flow is not to be confused with an acceptable traffic level, it merely indicates a maximum capacity.

13.7.6 Assuming access would be via Walton Breck Road, the Department for Transport (DfT) traffic flow data for 2012 has been used to provide an existing flow of vehicles along the road.

Table 13.10: *Traffic Flow Data from DfT Traffic Counts for Walton Breck Road*

Road Description	Count Point	AADT	Light Duty Vehicle Daily Flow	Heavy Duty Vehicle Daily Flow	Speed (kph)
A5089 Walton Breck Road	57671	9435	8999	436	48

13.7.7 The COBA (Cost Over Benefit Assessment) Manual, estimates that the PM peak hour constitutes 8% of the annual average daily traffic (AADT) flow. Therefore 9435×0.08 equates to 755 two way vehicles per hour in the PM peak on Walton Breck Road. This is 34% of the theoretical maximum two way hourly flow.

13.7.8 In terms of estimating the effect of construction traffic, in theory, Walton Breck Road has significant spare capacity to carry additional traffic. In AS2, estimations of construction traffic were provided by the main contractor (Laing O’Rourke) directly.

13.7.9 Similar information has been provided with regards to the estimated construction deliveries by week for the construction period (albiet these do not distinguish between vehicle types). Taking this schedule, (provided in Volume 2, Part 2, Appendix 4.1) the following assumptions have been applied to estimate the likely movements:

- The majority of the large HGV movements are required at the early to mid-stages of the construction period to move material to and from the site, with the latter stages of the

construction being less intense in terms of HGV movements, with a higher focus likely on Light Goods Vehicles (LGVs) during the fit-out period;

- Deliveries (HGVs) would be permitted over 5 days a week (Mon-Fri), although worker movements may also occur on a Saturday morning;
- HGV movements have been assumed to represent 80% of deliveries during the construction phase, prior to Close Season 2 (summer of 2016), with the other 20% being LGVs. During Close Season 2, prior to the opening of the stand, this would be reversed, with 20% HGV movements and 80% LGV's when the majority of the fit-out would be taking place;
- This is based upon the Stage D programme providing dates for the retail and box fit outs which we assume to be more the focus of LGV movements (such as plasterers, electricians, decorators, etc) with some HGV's possible to deal with the removal of the roof (no.56 – 59 on the programme attached);
- The maximum number of deliveries estimated is just post Close Season 2 where there are c.215 (in, with 430 total) within the week, so an average daily total movement of 86. If 80% of these are HGV this would mean 69 HGV vehicles. Although these are post close season 2 (but outside of the programme times for tasks 56-59) we will take them as a worst case scenario, even though most of the large deliveries are likely to have been completed by then; and
- The maximum number of deliveries estimated within Close Season 2 is c.192 – so 77 per day of which 62 would be HGV's.

13.7.10 The movement of construction workers also need to be considered, with it likely that the majority of these would drive to the vicinity of the site and make use of Stanley Car Park. The intensity of construction workers on site would be finalised within the CEMP, together with details of any shift working or private transport provisions (such as shuttle buses).

Temporary effects and mitigation

13.7.11 The stadium will remain in use whilst the construction phase of the development is being progressed i.e. during the football season, with works which would affect the operation of the stadium being undertaken during the close season (between May and mid-July).

13.7.12 The construction period will be temporary in nature, and undertaken in two phases, one for each of the stands to be developed, with the Main stand being developed in Phase 1 and Anfield Road in Phase 2.

13.7.13 A CEMP will be produced by the contractor and approved by LCC prior to the commencement of any construction work to specifically address identified adverse impacts from the development phases.

13.7.14 This document will provide, amongst other things, information on the management of construction vehicles to and from the site and measures for minimising their impact and will ensure that the impacts associated with the development are managed and mitigated against.

- 13.7.15 It is anticipated at this stage, that the construction of the stadium will likely generate several impacts during its programme, however mitigation measures will seek to minimise these impacts as much as possible.
- 13.7.16 The following points are of relevance to this phase:
- Presence of HGV's on the surrounding strategic network – It is envisaged that the impact and associated effect from this will be **major** (but temporary), with the possibility of reducing this further with appropriate mitigation measures which would be outlined in the CEMP. The assessment of major impact has been made due to the disruption that will be expected from road closures, the diversion of bus routes and any associated pedestrian and cycle severance.
The site access arrangements would need to be approved by LCC and detailed within the CEMP, with the preferred HGV route being identified and ideally concentrating the movements on one route ensuring other alternative routes are not affected and remain available to non-construction vehicles. There would also be the requirement for abnormal loads to be routed to the site;
 - Presence of construction workers in and around the site and their trip generation – This impact and associated effect is likely to be **minor**, with the construction workers using the appropriate footways and crossing points when moving around outside of the site. The impact of their trip generation is expected to be **minor**, especially when compared to the levels of trip generation experienced on match days, with good public transport connections providing an alternative mode of travel to commute to the site for construction workers and the favourable proximity of the city centre. It is expected that the CEMP would seek to address the travel of construction workers and provide travel advice to them to promote mode choice and identify appropriate parking;
 - Potential temporary road closures – Any required temporary road closures would be informed and confirmed within the CEMP, however given the position of the site and the position of the stands to be developed in relation to the road network, it is considered that the requirement for closures will be minimal, and as such the impact and associated effect is **minor**;
 - Increased traffic congestion around the site – The impact and associated effect from this is expected to be **minor** as the majority of the works will be contained within the immediate vicinity of the construction site, and therefore having minimal impact upon the surrounding road network;
 - Delays on the network for both private and public transport – In conjunction with the point above, the impact and associated effect upon public transport is envisaged to be **minor**. This is because there is not expected to be significant disruption to the surrounding transport network with road closures and deliveries being scheduled outside of peak times where possible;
 - Potential impacts on road safety with the potential for increases in accidents and collisions – Additional traffic in the area associated with the construction phase may have an impact upon the number and severity of accidents and collisions within the area, however mitigation measures will seek to ensure that safety concerns are addressed, reducing the effect to **minor**. There should be a number of requirements for construction traffic that are

put in place to minimise their presence on the network and to reduce the risk of accidents occurring. These include:

- No delivery vehicles allowed to wait in the vicinity of the site, with a ‘just in time’ delivery system in operation instead;
- Vehicle delivery times should be co-ordinated and pre-booked to prevent several vehicles arriving at once;
- Agreed freight routes will be used to travel to and access the site. These will be confirmed with LCC and detailed in the CEMP;
- All unloading activities should occur within the boundary of the site;
- All deliveries should be undertaken in a manner that prevents vehicles reversing into the road upon exit as much as is feasibly possible;
- All external roads will be kept free of mud and dirt;

13.7.17 Given the presence of the HGVs on the road network, once quantified, these are likely to be classified as a major impact. As such, the overall impact and associated effect of construction is therefore considered to be **major** as the highest magnitude anticipated across the construction effects. The majority of impacts contained within the site and steps taken to reduce the impact to a lower level through the mitigation measures will be presented within the CEMP. This will further address how the potential impact will be managed and reduced.

Permanent effects

13.7.18 There are likely to be no permanent effects from the construction phase, with impacts being mitigated accordingly during the stage to also ensure that post construction, there are no residual impacts.

Operation – likely significant effects and mitigation

13.7.19 The operation, the likely impacts and their mitigation have been extensively reviewed and assessed within the TA and Interim Staff Travel Plan with mitigation measures presented where appropriate. The methodology used for this assessment is outlined in detail within the TA, the scope of which has been approved by LCC.

13.7.20 The overarching aim of the Transport Strategy presented in the TA is to not increase the proportions of existing levels of match day private car use, with a proportion of journeys generated by the stadium expansion being facilitated via alternative modes and in time through an increase in the modal share of these more sustainable modes.

13.7.21 No substantial additional parking supply, junction capacity improvements, or other developments that might encourage additional traffic are put forward as part of the strategy for this reason, and no area-wide transport modelling has been undertaken as a result, reflecting the difficulty in assessing a ‘standard’ or ‘average’ match day with so much potential for variation.

- 13.7.22 The proposed mitigation measures presented in the TA are designed to maximise the efficiency of the systems already in place in order to ensure that access to the stadium is achieved with the least overall impact upon the network and the stadium's immediate neighbours.
- 13.7.23 The key driver behind the Transport Strategy for the proposed stadium expansion is the consolidation/continuation of the existing modal split of visitors to the stadium, and its projection into the future with the additional seating capacity operational for Phase 1, with a further shift towards sustainable travel modes facilitated for Phase 2. Whilst the timescales for delivering Phase 2 are unknown, it is intended that the mitigation measures are to be implemented during or prior to Phase 1 so will begin to have an effect during and post Phase 1, prior to the start of Phase 2.
- 13.7.24 Football matches typically last for around 1.5 hours, with 45 minutes allocated to each half with a 15 minute break in-between. As such, matches will be a permanent feature in the calendar, albeit they only operate for a short duration, with a limited impact period with the build-up, match and after match dispersal typically taking a total of about 5 to 5.5 hours, meaning all effects from the match are generally short in duration too, with movement based around these time periods.
- 13.7.25 There are never more than 30 first team home matches held at Anfield annually (even with Cup and European matches taken into account); as an example in the 2013/14 season (August to May) there are 22 first team games scheduled. This equates to roughly one match every 2 weeks over the course of a year. Matches are co-ordinated to ensure that LFC and Everton FC do not both play at home on the same day.

Road Closures

- 13.7.26 To help facilitate the stadium expansion a number of nearby roads will need to be permanently closed and stopped up. This will be necessary, firstly as the footprints of the Main and Anfield Road stands will increase, and secondly to facilitate improved pedestrian circulation around the stadium.
- 13.7.27 To accommodate the stadium expansion, the following roads are proposed to be closed;
- Lothair Road;
 - Tinsley Street;
 - A small length of Rockfield Road and Back Rockfield Road;
 - Lake Street; and
 - Back passageways to the rear of Lothair Road and Alroy Road.
- 13.7.28 A separate application for Anfield Road is proposed for it to be permanently closed and stopped up between Alroy Road and Skerries Road. A review of traffic flows along this road has confirmed that the majority of vehicles travelling along this are using the route as a short

cut and are not necessarily travelling to or from the area immediately affected by the road closure

- 13.7.29 The closure of Anfield Road will mean that some local residents will have a slightly longer journey to reach certain destinations, however the number of affected properties is low and suitable alternative routes are available. To mitigate the impact of the closures, it is proposed to construct a new section of road between Alroy Road and Gilman Street which will facilitate a more convenient alternative route.
- 13.7.30 This section of new road and Gilman Street will be two-way, and will increase the permeability of the area and improve the connectivity of Anfield Road to Walton Breck Road. As part of this measure, the one-way directions of Alroy Road and Rockfield Street are proposed to be reversed which will further complement the accessibility of the area.
- 13.7.31 As such, the road closure will require a change to current travel habits, alternative routings are to be provided to minimise the impact and associated effect to **minor**.

Private vehicles

- 13.7.32 The calculations of projected vehicle numbers are based on the following assumptions:
- Changes to parking on-site in the vicinity of the site in the car parks managed by LFC will be restricted to permit holders (hospitality ticket holders, operational staff and officials) and will not be available for general use on match days;
 - The continued enforcement by LCC Parking Services of the FMPZ around the stadium to make car a less convenient mode of transport;
 - No new highway capacity improvements are planned for the vicinity of the area which may improve access routes to the stadium making them more attractive to car users;
 - Several recent and committed developments in the area, such as Project Jennifer on Great Homer Street, provide the potential for improved walking routes between the city centre and the stadium, providing a stronger link between city centre parking and the site and making this option more attractive to supporters.
 - It is not the intention of the strategy to increase the proportional use of private cars and this is supported by mitigation/intervention measures to ensure more sustainable modes of travel are even more attractive to fans.
- 13.7.33 Based on these assumptions, the review of existing baseline travel and a comparison of this against future demand and expected travel modes has enabled the quantification of the number of vehicles which are expected to be generated on match days following the development in the context of those which are currently generated as well as those which were previously generated and outlined in AS2.
- 13.7.34 As previously outlined, the methodology for the calculation of these vehicle numbers is presented in greater detail within the TA. The outputs in terms of vehicles numbers are presented in the following table for cars.

Table 13.11: Estimated number of private vehicles by phase

		Weekday			Weekend		
		Hospitality	General Admission	Total vehicles	Hospitality	General Admission	Total vehicles
Criteria	Car occupancy	2.62	2.3	-	2.68	2.44	-
	% parked off street	89.95%	64.40%	-	86.68%	61.20%	-
	% parked on street	10.05%	35.60%	-	13.32%	38.80%	-
Existing 2013	Total Vehicles	1,058	10,488	11,546	732	9,203	9,935
	No. vehicles off street	952	6,754	7,706	634	5,632	6,267
	No. vehicles on street	106	3,734	3,840	97	3,571	3,668
Phase 1	Total Vehicles	2,605	11,155	13,759	1,800	9,789	11,589
	No. vehicles off street	2,343	7,184	9,526	1,561	5,991	7,551
	No. vehicles on street	262	3,971	4,233	240	3,798	4,038
Phase 2 Target	Total Vehicles	2,468	10,878	13,346	1,563	8,766	10,329
	No. vehicles off street	2,220	7,006	9,226	1,355	5,365	6,720
	No. vehicles on street	248	3,873	4,121	208	3,401	3,609

- 13.7.35 Whilst this estimates that there is anticipated to be an absolute increase in the number of vehicles in the area in the match build-up and post-match (although it is important to note that the proportion is maintained), the anticipated numbers, once the proposed intervention measures are bedded in and take effect are lower than those previously experienced in 2008 (where 11,241 vehicles were estimated for the baseline scenario), with the mitigation measure ensuring that the supporters are adequately supported by the necessary infrastructure to minimise impacts upon the surrounding area. For example having signed routes to encourage supporters to walk along key routes to minimise disturbance in surrounding residential areas. For these reasons, the overall impact and associated effect is considered to be **minor**.
- 13.7.36 It should be stressed again that the majority of the mitigation measures will be implemented prior to Phase 1, with these likely to begin to have an effect once the construction of Phase 1 is complete, and are not reliant upon Phase 2. As such, the figures presented for Phase 1 do not take into account the impact of the mitigation measures to take into account the 'bedding in' time these require. It is anticipated that once these take effect, the number of vehicles will significantly reduce from those shown for Phase 1 above, to be in line with proportions for Phase 2, demonstrating a further shift in profile.
- 13.7.37 Although there will be additional vehicles within the area on match-days, no interventions are proposed to support the accommodation of these vehicles within the FMPZ, meaning they will be dispersed over the local network minimising their overall impact and associated effect to **minor**. This assumption is also supported through the reduction in traffic overall from previous years as discussed earlier in this chapter.

- 13.7.38 Associated with the match is the pre- and post-match travel, with these movements having a short term impact upon public transport during these periods.
- 13.7.39 It is proposed to formalise the closure of Walton Breck Road on match days only for a period of 2 hours prior to kick off until 30 minutes post final whistle to aid more efficient and safe dispersal of pedestrian crowds. This practice currently occurs on an ad-hoc basis with the road being closed when safety becomes a concern.
- 13.7.40 The formalisation of this process will enable scheduled bus routes to be diverted to reduce delays and enable local residents to know when to alter their journeys to avoid the closure, reducing congestion and waiting behind the road closure. The promotion of the closure could be displayed at appropriate decision points and within timetable information to provide wider awareness.
- 13.7.41 This formalisation will therefore have a positive impact upon traffic flows on match days by ensuring that the road is closed at pre-agreed times making diversions and route changes a certain requirement rather than something to chance. Proposed diversion routes, although slightly longer in distance, are not likely to add significant time on to journeys as they will be less congested than a route which previously tried to navigate through Walton Breck Road, therefore being beneficial to both private car users and bus operators. In addition to this there are several possible alternative routes which will ensure that diversion traffic is dissipated across the network so not adversely affecting just one or two alternative routes.
- 13.7.42 The closure of Walton Breck Road will improve pedestrian connectivity to the station and remove the severance the road presented when it is operational with traffic. The diversion of public transport services, which has been agreed with the operators, will remove the risk of severance on these services too, ensuring they remain attractive to users and can continue to operate to a defined schedule.
- 13.7.43 The closure is therefore considered to be a permanent feature of matches but occur for a short duration, which therefore results in a **minor** effect which will be beneficial to certain users.

Public Transport

- 13.7.44 A review of the capacity of the public transport network (undertaken in Chapter 10 of the TA) showed that there was sufficient capacity within the existing service to accommodate additional supporters, with the match days specific services (Soccerbus and the City Centre Express Service) being able to change their frequencies to match demand and sufficiently increase capacity. Within the restrictions of the service timetables for the scheduled buses and the train services from the local stations (Sandhills, Kirkdale and Bank Hall), sufficient capacity remained even after non-match travel demand was taken out of the equation.

13.7.45 Formalisation of the closure for Walton Breck Road will enable scheduled bus services to overcome the current delay they experience by being held behind the closure, as diversion routes can be implemented and promoted. This will enable the service to continue to operate to an advertised frequency and schedule and ensure this impact and associated effect is **minor** and is therefore considered **beneficial**.

13.7.46 It is proposed that the Soccerbus route is reversed from its current anti-clockwise route to enable passengers to alight on the eastern side of Walton Lane, which removes the requirement for passengers to cross the road (which is the current arrangement), improving pedestrian safety. This will have a **minor** effect upon the service in terms of journey times and be **beneficial** in terms of safety, reducing the effect of this from minor to **neutral**.

Taxis

13.7.47 The following table provides an overview of the number of taxi trips which are anticipated to accommodate supporter travel to the stadium for Phases 1 and 2. Note there is no change between Phase 1 and 2 for hospitality movements as no additional hospitality ticket holders are proposed as part of Phase 2.

Table 133.12: Proposed number of taxi trips by phase

Phase	Hospitality	Weekday		Weekend		
		General Admission	Total vehicles	Hospitality	General Admission	Total vehicles
Taxi occupancy	2.49	2.26	-	2.38	2.5	-
Existing 2013	355	3,756	4,112	645	3,396	4,040
Phase 1	875	3,995	4,870	1,586	3,612	5,198
Phase 2	875	4,452	5,327	1,586	4,025	5,611

13.7.48 To facilitate more formal use of taxis and the City Centre Express service post-match, waiting areas are proposed in the following locations which will be provided through the introduction of the appropriate TRO:

- Sleepers Hill taxi drop off / pick up area;
- Oakfield Road taxi drop off / pick up area;
- Arkles Lane taxi drop off / pick up area;
- Anfield Road taxi drop off / pick up area specifically for the Taxi One service;
- Robson Street bus stands specifically for the match day City Centre Express Service.

13.7.49 On match days, vehicles (taxis or buses) will therefore be arriving to and departing from these streets for around one hour post-match to support the movement of supporters away from the stadium. Parking within these areas by residents and other vehicles will be prohibited on match days (except in existing residents parking bays). Outside of this period, there will be no effect (**neutral**) from the measure, i.e. no other non-match day services are proposed to use

the stops or drop off / pick up areas, with these spaces reverting back to public use, albeit still covered by the encompassing FMPZ restrictions as is existing.

Permanent effects

- 13.7.50 As noted above, several changes to the parking and waiting restrictions in some streets within the vicinity of the stadium are proposed to support the expansion but be enforced on match days only. The infrastructure for the measures is permanent however it is not enforced on non-match days and therefore it is not expected to have a significant effect upon local residents who have the option of alternative parking locations on match days and with these days representing a small number each season. These effects are therefore considered **minor**.
- 13.7.51 No other permanent effects are anticipated due to the short duration of football matches and the comparatively low non-match day use of the stadium. The operational Traffic Management Plan ensures that match day measures are enforced (such as road closures) and implemented but on non-match days, these are generally not visible and do not have any impact to vehicle flows, or pedestrians and public transport.

Non-match days

- 13.7.52 On non-match days there are ample parking spaces available (on Stanley Park) as well as strong public transport options (with the exception no match day specific travel by the City Centre Express bus service or the Soccerbus) which ensure a modal choice. The expected non-match day traffic is anticipated to be low and therefore able to be easily accommodated onto the transport network without any residual effect and a **minor** effect.
- 13.7.53 On non-match days, there is the potential for a small increase in trips associated with the enhanced facilities at the stadium acting as an attraction to visitors and tourists. This practice already occurs, and it is not anticipated that the proposed development would generate a substantial increase to this number, with the overall impact and associated effect being **minor**.

13.8 Cumulative effects

- 13.8.1 Cumulative effects are those that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence (Zol). While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.
- 13.8.2 The current list of planned developments which are included in the cumulative impact assessment, are those identified in the Anfield SRF comprising:
- Anfield Village & Rockfield housing refurbishment;

- New build housing led regeneration;
- The Walton Breck Road (The High Street) Corridor;
- New public space and Village Square development (training hotel and offices);
- Completion of the restoration of Stanley Park east of Mill Lane.

- 13.8.3 The highway network within the vicinity of the stadium was reported within AS2 in 2007 to have significant capacity with future background traffic growth also assumed, which as demonstrated earlier has failed to be realised by 2013. Consequently there is now further capacity in addition to that was previously anticipated meaning the anticipated increases in background flow from the other developments combined with the stadium together will not exceed the previous estimations, especially given the short duration of the stadium operation on match days and the anticipated marginal use of the site on non-match days.
- 13.8.4 The previous implementation of mitigation measures from historic planning permissions has ensured that the impact from the stadium is already reduced against a 'do nothing' scenario had these measures not been executed. This essentially means that the vicinity is equipped for an increase in capacity at the stadium with the network primed and ready to accommodate this.
- 13.8.5 The likely movement times of residents/occupiers from the developments will be during the traditional commuter peaks, with match day movements occurring around these and increasingly on weekends over weekdays. The formalisation of the Walton Breck Road Road closure will provide some guarantee to residents about their movement options enabling them to plan their journeys to avoid match day delays.
- 13.8.6 The Anfield SRF will improve connectivity and accessibility through improvements to the wider area including north, south and east of Stanley Park and to Walton Breck Road therefore improving access to facilities for both visitors and the local community. Pedestrian access and cycling through the park will be improved, as well as synergistic benefits to the public realm from the expanded stadium.

13.9 Residual effects

- 13.9.1 For the purpose of this chapter, residual effects are the effects that remain after mitigation has been implemented.

Construction

- 13.9.2 During the Construction stage, mitigation measures should be presented within the CEMP and enforced to ensure that the effects from the construction within the stage itself are effectively managed and consequently minimised. These will be agreed with LCC prior to the commencement of development. This will ensure that residual effects after the implementation

of mitigation measures are minimal and fall within an acceptable level as denoted within the CEMP.

Operation

Match Day

- 13.9.3 The mitigation measures presented within the TA are aimed at minimising the impacts from the proposed development through managing and promoting more sustainable travel. This review showed that there was both the capacity on the road network and the public transport network to accommodate the additional transport associated with match day travel with the mitigation measures seeking to further ensure that this is the case to prevent there being any residual effects.
- 13.9.4 There will be some residual effects in terms of impacts on the local community however these will be short term in nature and the mitigation measures will seek to be controlled and minimise them as much as possible.
- 13.9.5 An example is the use of residential streets for bus and taxi drop off/pick up locations as previously discussed. The residual impact from this would be the presence of the vehicles in the street post-match, however they would be there for a short period of time and also have a requirement to minimise their impact by not waiting with their engines running.
- 13.9.6 It has been observed that informal waiting for pick-ups already occurs at some of the locations (such as Sleepers Hill) the mitigation measures seeking to formalise and control this activity to reduce negative impacts (such as obstructions and lengthy wait times).
- 13.9.7 Given the short term nature of the practice, this is considered to be acceptable, with the impact and associated effect considered **minor**. Indeed, the better management and facilitation of public transport drop-off and pick-up will increase the efficiency of this operation to the benefit of supporters and local residents.

Non Match Day

- 13.9.8 The additional expected non-match day traffic associated with the stadium is anticipated to be marginal and therefore able to be easily accommodated onto the transport network without any residual impact. The change is likely to be insignificant in terms of traffic levels with there being sufficient capacity upon the network to accommodate non-match traffic and reasonable growth associated with this.

13.10 Summary of effects

- 13.10.1 A tabulated overview of the effects associated with the stadium expansion is provided overleaf to summarise the effects in terms of transportation:

Table 13.13: Summary of Effects for transport

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/Beneficial	Permanent/Temporary	Residual Effect
Construction	Surrounding residential community	The construction phase has the potential to cause disruption (such as temporary road closures and increased HGV movements) to sensitive receptors within the vicinity of the construction boundary and along access routes.	Mitigation to be determined through the CEMP and reviewed following the development of a construction programme. This will likely include preferred HGV routings, hours of operation and alternative diversion routes for vehicles to avoid delays in the area.	Major	Adverse	Temporary	Not significant (assuming implementation of effective CEMP)
	Construction route residents	There will be an increase in movements of large construction vehicles along the pre-agreed construction route.	The CEMP will set out ways which this can be mitigated against to reduce the impact upon the residents and local businesses located along the route.	Major	Adverse	Temporary	Not significant (assuming implementation of effective CEMP)
	Abnormal loads	Abnormal loads will need to be transferred to the site which may cause delays upon the road network	The abnormal loads will be required to follow a set route and will likely be scheduled to take place outside of peak periods, as determined in the CEMP.	Minor	Adverse	Temporary	Not significant (assuming implementation of effective CEMP)
	Surrounding residential community	Construction workers in and around the vicinity of the site.	As part of the CEMP, a travel plan would need to be implemented to ensure that construction staff are aware of various travel choices and do not rely upon private vehicles.	Major	Adverse	Temporary	Not significant (assuming implementation of effective CEMP)
Operation	Surrounding residential community	Match days will generate additional pedestrian and vehicle movements in the vicinity of the stadium which will impact upon the surrounding local community.	This practice already occurs on match days, however mitigation measures are proposed to manage the movements, such as the closure of Walton Breck Road to minimise their impacts.	Minor	Adverse	Permanent but match days only	Not significant

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/Beneficial	Permanent/Temporary	Residual Effect
	Residents affected by the road closures	Several roads are anticipated to be closed to accommodate the stadium expansion, which will require alternative routes to be used.	Alternative routes are provided which will minimise the impact of the road closures and ensure adequate circulation in the area.	Minor	Adverse	Permanent	Not significant
	Scheduled Bus Services and users	The unreliable closure of Walton Breck Road means services experience delay on match days along this road.	Formalisation of the road closure and diversion route for buses during this period will mean that delays to services are minimised. Service can continue to operate to their advertised frequencies and timetables.	Minor	Beneficial	Permanent but match days only	Not significant
	Residents of Walton Breck Road (WBR)	WBR is proposed to be closed for a period of 2 hours pre-match until 30 minutes post-match to improve safety and provide a guaranteed time for the closure to enable the area to be avoided.	There are a range of alternative routes available to remove the need to travel along Walton Breck Road which would not add significant time or distance to the trip. Formalisation of the closure (which currently happened ad-hoc) will provide more certainty about when the route is closed, enabling alternative routes to be taken, saving time. Residents who display a valid permit will be able to pass through the closure to and from their properties.	Minor	Beneficial	Permanent but match days only	Not significant
	Improved safety for Soccerbus users	The Soccerbus is proposed to be re-routed which would remove the requirement for users to cross Walton Lane once they have alighted the bus.	The anti-clockwise route is reversed to enable passengers to alight on the correct side of Walton Lane for Anfield Stadium	Minor	Beneficial	Permanent but match days only	Not significant
	Residents on streets to host formalised bus and taxi pick up points.	Vehicles waiting within the residential streets post-match with supporters waiting for vehicles to arrive. It is anticipated that taxis would only wait for very short periods to pick up and set down.	This will typically take place for around one hour post-match. Vehicles waiting would be required to turn off their engines. This formalises the existing practice of private vehicles waiting post-match.	Minor	Adverse	Permanent but match days only	Not significant

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/ Beneficial	Permanent/ Temporary	Residual Effect
	Local Transport Network	Additional trips will place increased pressure upon the transport network. There are no anticipated concerns for non-match days	A range of measures have been proposed to promote a range of travel choices to dissipate the trips over several modes. A review of the transportation network showed that it had the capacity to accommodate additional increases in vehicles.	Minor	Adverse	Permanent but match days only	Not significant

13.11 Proposed monitoring

- 13.11.1 Monitoring or effecting should be undertaken during the construction phase, with the requirements clearly set out in the CEMP. These should be reviewed at regular intervals as well as milestone stages to ensure that the mitigation measures are effective and that residual effects are in line with or below those predicted in the plan.
- 13.11.2 One of the proposed mitigation measures is the formulation of a Transport Working Group whose role would be to review the effects of the mitigation measures in line with the Transport Strategy.
- 13.11.3 The forming of a Transport Working Group, consisting of dedicated representatives from LFC, LCC, Merseytravel, the Police and transport operators would enable a forum for discussion on issues relating to accessibility and transportation to the stadium and a platform for managing interventions moving forwards to review the effectiveness of these in relation to the Transport Strategy.
- 13.11.4 Assessments and monitoring should cover both match and non-match days, with the Interim Staff Travel Plan also supporting monitoring of staff travel on both of these days.
- 13.11.5 The group should meet on a regular basis and consider the following:
- Where there are issues or concerns with supporter access;
 - If demand is being met for sustainable transport modes;
 - Any changes to the club operation, transport services or provisions which need to be taken into consideration which will influence supporter travel;
 - Progress of the strategy and any actions required to keep this moving forwards.
- 13.11.6 The proposed interventions are a combination of physical measures requiring on-the-ground works, and promotional measures requiring effective communication to future visitors to the stadium on the travel opportunities which will be available to them.
- 13.11.7 To help ensure that the proposed interventions are positively influencing how spectators are travelling to and from the stadium on match days, a Monitoring Strategy is proposed to be implemented by the Transport Working Group. This strategy will both review modal choice over time, and identify any significant on-the-ground issues which may require mitigation or action.
- 13.11.8 Items that could be covered within the Monitoring Strategy as an example may include:
- Review of target mode splits;
 - Spot surveys of modes of travel to review occupancy and usage on match days;
 - Creation of a transport working group of key stakeholders (such as Merseytravel, Liverpool City Council, bus operators, and the Police) to regularly meet and review progress / issues on the implementation of the strategy;

- Nomination of a suitable employee of LFC to take ownership of the strategy;
- Discussions with representatives of the surrounding residential populations and supporters groups to identify any significant travel issues.

13.12 Statement of significance

- 13.12.1 Whilst there will be obvious impacts on match days associated with supporter movements to the stadium, many of which already occur, a range of intervention measures have been proposed (or previously implemented) to promote sustainable travel and to reduce the convenience of the private car for match day travel. Football matches are temporary in nature and as such the impacts from them are also temporary with impacts and associated effects resulting from high volumes of supporters being managed and experienced temporarily as in the existing scenario.
- 13.12.2 There are no anticipated concerns for non-match days, with impacts and associated effects being minor.
- 13.12.3 The impacts and effects associated with the construction of the development are anticipated to be major but these would be reviewed and mitigated against within the CEMP.

13.13 References

[Ref 01] - National Planning Policy Guidance, 2012, Department for Communities and Local Government.

[Ref 02] - Planning Practice Guidance, 2014, Department for Communities and Local Government.

[Ref 03] - Unitary Development Plan, 2002, Liverpool City Council

[Ref 04] - Anfield Spatial Regeneration Framework, 2014, Liverpool City Council

[Ref 05] - Ensuring a choice of travel, Supplementary Planning Document, 2008, Liverpool City Council.

[Ref 06] - Local Transport Plan 3 for Merseyside, 2011, Travelwise.

[Ref 07] - Access Strategy One (AS1), 2003, Access Strategy Update, Ove Arup & Partners Ltd

[Ref 08] - Access Strategy 2 (AS2), 2007 Access Strategy Update, Ove Arup & Partners Ltd

14 Air Quality

14.1 Introduction

- 14.1.1 This section presents the assessment of the potential air quality effects relating to the proposed Liverpool Football Stadium Expansion (hereafter referred to as 'proposed development').
- 14.1.2 The proposed development has the potential to cause air quality effects during the construction and operational phases. The key pollutants for consideration within the assessment of air quality effects are:
- nitrogen oxides (NO_x), particularly nitrogen dioxide (NO₂);
 - fine particles (particulate matter defined as those of less than 10 and 2.5 microns in diameter; PM₁₀ and PM_{2.5} respectively); and
 - dust (defined as particulate matter in the size range 1-75 microns in diameter).
- 14.1.3 During the construction phase, the proposed development will introduce new emission sources in the form of traffic and plant at some locations, and involve potentially dust-generating activities. The distances from the emission source at which significant construction dust effects are likely to occur are dependent on the extent and nature of mitigation measures, the prevailing wind conditions, rainfall and the presence of screening etc. However, research indicates that effects from construction activities that generate dust are generally limited to within 150-200m of the construction site boundary [Ref 01] although guidance issued by IAQM requires consideration of effects up to 350m from the construction area boundary [Ref 02]. The construction phase study area is therefore limited to within 350m of the area where construction activities will take place.
- 14.1.4 During operation the proposed development will contribute additional spectator numbers to the existing transport network. While the transport strategy aims to facilitate a mode shift away from private car use, it is likely that, overall, the amount of traffic generated by the proposed development will increase at least in the short term (Phase 1). Changes in traffic flows can impact the location and amount of emissions to air and subsequently, affect ambient air quality. Potential changes in air quality at the sensitive receptor with the greatest change as a result of the proposed development have been considered within this assessment and considered by comparison with air quality standards, as well as with relevant policy and legislation.
- 14.1.5 This chapter presents the assessment methodology, outlines the relevant air quality management policy and legislation, records the consultation undertaken to date, describes the existing or 'baseline' air quality situation and assesses the potential air quality effects arising from the construction and operation of the proposed development. Mitigation measures are identified to avoid or minimise any potentially adverse effects on air quality.
- 14.1.6 This chapter has been prepared by Mott MacDonald Ltd.

Design Measures Incorporated

- 14.1.7 No specific air quality and dust related design measures are incorporated within this assessment.

14.2 Methodology

- 14.2.1 This section provides a description of the approach taken for the assessment of effects on air quality.

Sources of information

- 14.2.2 Information has been taken from a number of different sources including LCC, Defra and other documents produced as part of the planning application for the proposed development. These source documents are listed fully in Section 14.14 (References).

Desk study Construction Phase

Overview

- 14.2.3 Construction activities can result in temporary effects from dust. 'Dust' is a generic term which usually refers to particulate matter in the size range 1-75 microns in diameter; the most common impacts from dust emissions are soiling and increased ambient PM₁₀ concentrations (Building Research Establishment, 2003). Assessment methodologies based on a qualitative approach are advocated in a range of guidance, including that produced by the Mayor of London [Ref 3], the Buildings Research Establishment (BRE) [Ref 04] and more recently guidance published by the IAQM [Ref 02]). Therefore, a qualitative approach has been adopted for this assessment based on key issues identified in the guidance described above, based on a review of likely dust raising activities and identification of sensitive receptors within 350m.
- 14.2.4 Construction work requires the use of a range of site plant, such as excavators, piling equipment, cranes and on site generators. All of these plant have an energy demand and some may result in direct emissions to air from exhausts.
- 14.2.5 Guidance from the IAQM notes that impacts from exhaust emissions from on-site plant are unlikely to be significant. Given the local and temporary nature of site plant, effects of plant emissions on local air quality are considered to be of negligible significance relative to the surrounding road traffic contributions on the local road network. Construction plant emissions have therefore not been assessed further. Nevertheless, mitigation measures to reduce the effect of site plant on local air quality are discussed in Section 14.7.

- 14.2.6 At this stage, information related to traffic generated during construction is limited. Environmental Protection UK (EPUK), 2010 guidance [Ref 05] indicates that assessment of construction traffic emissions is only likely to be required for large, long-term construction sites that will generate HGV flows of over 200 movements per day over a period of a year or more. Although the construction programme is estimated at 20 months, construction activities generating higher numbers of construction traffic numbers are anticipated to occur in the close season. In addition, 200 movements per day over a year or more would require 20 vehicle movements per hour (assuming a 10 hour working day). It is not anticipated that HGV flows would reach this level. On this basis no further consideration has been given to the impacts of construction traffic on ambient air quality.

Assessment Criteria

- 14.2.7 Guidance from the IAQM recommends splitting the construction phase into four separate source categories and determining the dust risk associated with each of those sources individually. This assessment has determined the risk of each of the following source categories:
- Demolition;
 - Earthworks;
 - Construction; and
 - Track out (the transport of dust and dirt onto the public road network).
- 14.2.8 The risk of each source for dust effects is described as 'negligible', 'low risk', 'medium risk' or 'high risk' depending on the nature and scale of the construction activities and the proximity of sensitive receptors to the construction site boundary. The assessment is used to define appropriate mitigation measures to reduce the level of effects such that they are not significant.
- 14.2.9 The assessment considers three separate effects from dust:
- annoyance due to dust soiling;
 - harm to ecological receptors; and
 - the risk of health effects due to significant increase in exposure to PM₁₀.
- 14.2.10 Step 1 of the assessment applies screening criteria to the proposed development which states that an assessment will normally be required where there is:
- A 'human receptor' within:
 - 350m of the boundary of the site; or
 - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).
 - An 'ecological receptor' within:
 - 50m of the boundary of the site; or
 - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

- 14.2.11 No further assessment is required if there are no receptors within the defined boundaries.
- 14.2.12 Step 2A of the assessment is to determine the overall dust-raising magnitude (small, medium or large) from each of the dust sources identified (demolition, earthworks, construction and trackout) in accordance with the criteria outlined in Table 3.1 in Volume 2, Part 3, Appendix 3.
- 14.2.13 Step 2B of the assessment is to define the sensitivity of the area (as high, medium or low) in accordance with the criteria presented Table 3.1 in Volume 2, Part 3, Appendix 3. The sensitivity takes account of a number of factors:
- the specific sensitivities of receptors in the area;
 - the proximity and number of those receptors;
 - in the case of PM₁₀, the local background concentration; and
 - site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.
- 14.2.14 The receptor sensitivity has been based on the highest of any of the criteria being met and therefore the assessment is considered robust.
- 14.2.15 The sensitivity of the area is further determined for dust soiling, human health and ecosystem impacts by considering the criteria in Table 3.3, Table 3.4 and Table 3.5 in Volume 2, Part 3, Appendix 3 respectively. Criteria presented in these tables are based on the distance of the source to the closest receptors.
- 14.2.16 The final step of the assessment (Step 2C) takes the risk category identified for each of the dust sources and the sensitivity of the area, to determine the overall significance of effects on annoyance due to dust soiling, harm to ecological receptors and the risk of health effects due to an increase in exposure to PM₁₀. The criteria for each of the dust sources have been presented within Table 3.6 and Table 3.7 of Volume 2, Part 3, Appendix 3 and determine the mitigation measures appropriate for the assessment.

Desk study Operational Phase

Overview

- 14.2.17 This section provides a description of the approach used to assess the operational phase air quality effects of the proposed development. The assessment uses a dispersion model to predict contributions from road traffic at the nearest residential receptor, using assumptions set out within the proposed development traffic assessment (**Document C/2/3**) [Ref 06]. It has not been possible to undertake model verification due to the approach adopted in the traffic assessment. Model verification is the process by which any difference between modelled and observed pollutant concentrations are investigated and minimised, and requires modelling of pollutant concentrations at a local monitoring location. The traffic assessment (as agreed with LCC) does not include area wide traffic modelling as it was not considered

necessary for the application, therefore, traffic data were not available on the local roads where monitoring is undertaken.

- 14.2.18 To account for the absence of model verification a number of robust assumptions have been included within the assessment. All private vehicles and taxi movements predicted for phases 1 and 2 are assumed to travel along one single road (assumed to be Walton Breck Road since baseline Department for Transport (DfT) traffic data are available for this road). In reality Walton Breck Road will be closed pre- and post-match as part of proposed traffic interventions. In the circumstances, this approach is considered highly robust since it assumes that all additional vehicles will pass a single point while in reality the additional vehicle movements predicted to be generated by the development will be dispersed, principally over a wide area outside the existing Football Match Parking Zone (FMPZ)

Assessment Scenarios

- 14.2.19 Although the proposed development is due to be in operation by the 2016/2017 season, this assessment calculates the concentrations of NO₂, PM₁₀ and PM_{2.5} along Walton Breck Road for the current year (2014). This is a robust approach since background pollutant concentrations and vehicle emissions are predicted to fall with time as a result of improved vehicle and fuel efficiencies [Ref 07].

Traffic Data

- 14.2.20 As highlighted above, no formal modelled traffic data is available to inform this assessment. Therefore the additional private vehicle flows and additional taxi movements predicted for each phase of the proposed development have been used. No increase on existing levels of other forms of transportation (train & bus) to the games has been assumed. The proposed development traffic assessment [Ref 6] states that the frequency of the Soccerbus and City Centre services may increase and there may be a slight increase in coaches. It also notes that local buses (N^o 17, 19, 26, 27 & 68) using Walton Breck Road will be subject to local diversions during discrete times only. These movements will be small in comparison to the additional private vehicle flows and additional taxi movements predicted for each phase and are therefore not considered further.
- 14.2.21 It is worth noting that the ES prepared for the new stadium in Stanley Park used air dispersion modelling to assess the air quality effects of changes on the local road network resulting from all proposals within the associated Access Strategy, including service buses, the 'Soccerbus' from the railway station, supporters' coaches and the proposed new Park and Ride system. In that case, the predicted operational phase air quality impacts were assessed as negligible. Given the minimal additional bus and coach flows assumed in the traffic assessment compared with the Stanley Park ES, no significant air quality effects are likely as a result of the proposed development in respect of additional bus and coach movement.

14.2.22 Queuing spaces for 12 buses will be provided on Robson Street, with additional buses (estimated to be eight in number) queuing on St Domingo Road and being moved to Robson Street as spaces arise. Bus companies have been asked to switch off their engines when laying over.

14.2.23 Traffic assumptions and modal split information presented within the proposed development traffic assessment have been utilised for this assessment

14.2.24 For a change in the annual mean pollutant concentration to be calculated and compared to relevant air quality objectives, an annual average daily traffic (AADT) is required. Department for Transport (DfT) traffic flow data [Ref 08] for Walton Breck Road, for 2012 has been used to represent existing AADT flows in this area. Table 14.1 summarises the DfT data used to represent the existing flows for Walton Breck Road. No speed data is available from the DfT website, therefore speed limit information has been used.

Table 14.1: Traffic Flow Data from DfT Traffic Counts for Walton Breck Road

Road Description	Count Point	AADT	Light Duty Vehicle Daily Flow	Heavy Duty Vehicle Daily Flow	Speed (kph)
A5089 Walton Breck Road	57671	9435	8999	436	48

14.2.25 The Transport Strategy for the proposed development provides a three hour prediction of additional vehicle and taxi movements (Light Duty Vehicles (LDVs) only) before the start of the game for Phases 1 and 2. The sum of the pre-game flow predictions were divided by three to give an hourly 'Match Flow'. This hourly match flow was applied to the three hours pre-game and for the three hours post-game. The six hour additional Match Flow for each phase has been applied to the DfT LDV Daily flow and conservatively assumes this increased flow will be constant for all days of the week. Table 14.2 summarises the predicted Phase 1 and Phase 2 (traffic data used for this assessment).

Table 14.2: Predicted Traffic Flow Data (6hr additional match flow)

Phase	Road Description	AADT	Light Duty Vehicle Daily Flow	Heavy Duty Vehicle Daily Flow	Speed (kph)
1	A5089 Walton Breck Road	15317	14881	436	48
2	A5089 Walton Breck Road	18669	18233	436	48

14.2.26 The assessment has assumed an additional 5882 LDVs per day within phase 1 and an additional 9234 LDVs per day within Phase 2 for all days of the week. It is likely that this is an over prediction of flows as at most, there will be only two games in a week. Therefore it is anticipated that if an actual AADT was calculated using an automated traffic counter at this location, the value would be significantly lower.

- 14.2.27 By taking a robust and worst-case approach to calculating the daily traffic flow, it is also considered that the traffic data accounts for emissions from cars idling outside the stadium during drop-offs and at junctions.

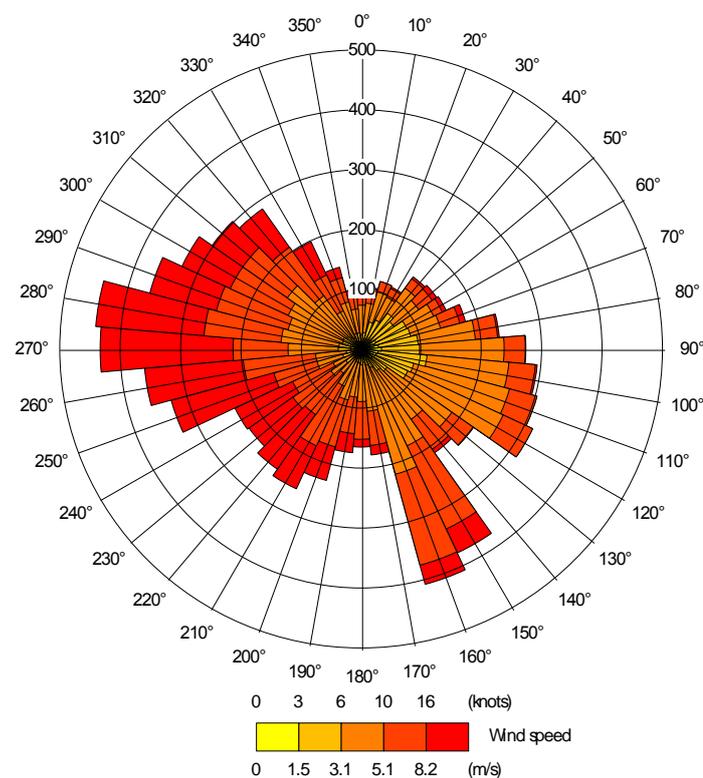
Model Selection

- 14.2.28 The assessment uses a dispersion model called 'ADMS-Roads' (version 3.1); a PC-based model of dispersion in the atmosphere of pollutants released from road traffic sources, produced and validated by Cambridge Environmental Research Consultants (CERC). This model is widely used in the UK, including by Local Authorities for Review and Assessment purposes and to support planning application assessments.

Meteorological Data

- 14.2.29 The most important meteorological parameters governing the atmospheric dispersion of emissions are wind direction and wind speed as described below:
- wind direction determines the sector of the compass into which the plume is dispersed; and
 - wind speed affects the distance, which the plume travels over time and can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise.
- 14.2.30 For meteorological data to be suitable for dispersion modelling purposes, a number of meteorological parameters need to be measured on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.
- 14.2.31 After consultation with the meteorological data provider, data from Crosby for 2013 was used as this is the most representative data available for the study area. This meteorological station is located approximately 10km to the north west of the proposed development. A wind rose presenting this data is show in Figure 14.1.

Figure 14.1: Meteorological Data used within the Assessment (2013)



Background Pollutant Concentrations

14.2.32 Only road traffic emission sources have been explicitly included within the dispersion model. Non-road traffic related emission sources have been accounted for within the assessment by assigning appropriate 'background' concentrations to modelled receptor locations. Section 14.6 provides further details of existing background pollutant concentrations used within the assessment.

NO_x to NO₂ Relationship

14.2.33 Recent research undertaken on behalf of Defra has provided a new spreadsheet-based method which is available from Defra's Air Information Resource Website [Ref 09]. This method has been used within the assessment and is the most appropriate way of determining NO₂ concentrations from road NO_x contributions.

Receptors – Human Health

- 14.2.34 A receptor, representing the façade of the closest residential property likely to be affected has been included within the model so a comparison against the air quality objectives can be made. The air quality objectives only apply in locations of relevant exposure. Table 14.3 provides details of where the respective objectives should and should not apply and therefore the types of receptors that are relevant to the assessment.

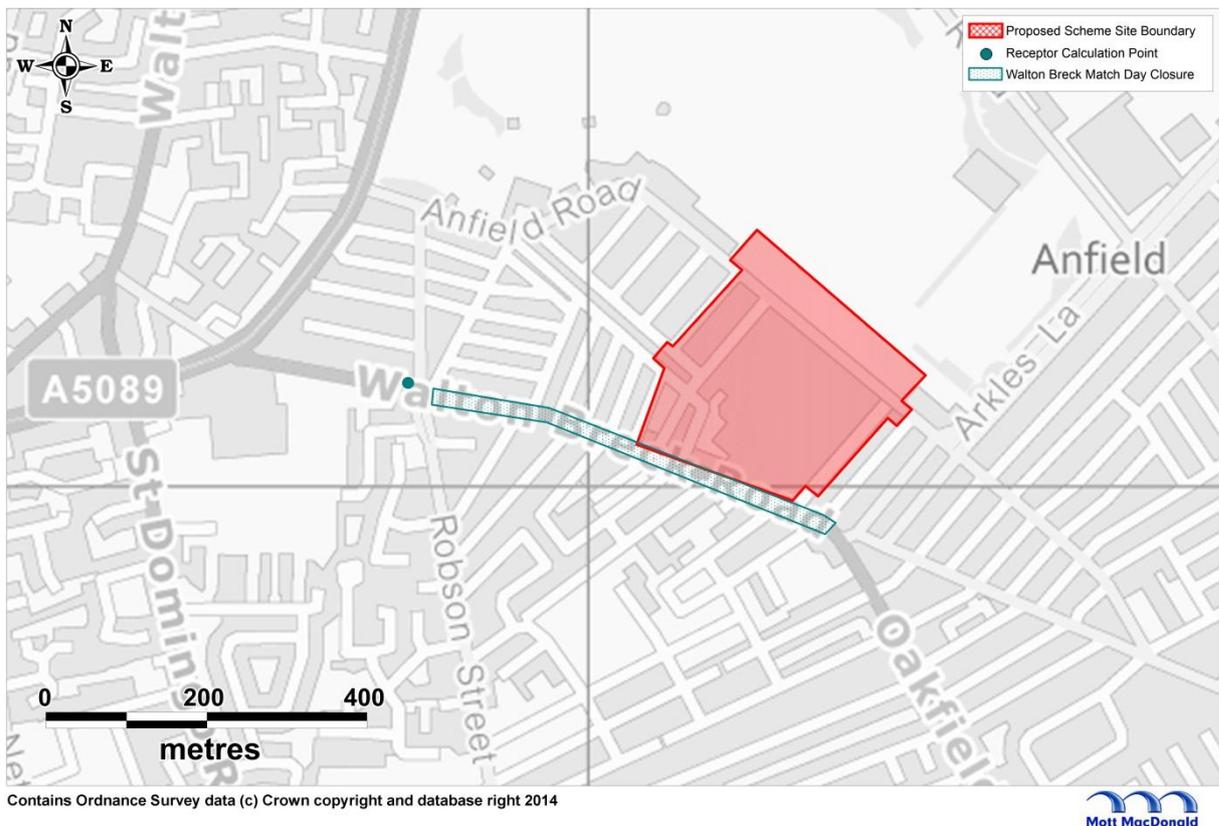
Table 14.3: Locations where the air quality objectives apply

Averaging period	Objectives should apply at:	Objectives should not apply at:
Annual	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
24 Hour	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
1 Hour	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

Source: [Ref 7]

- 14.2.35 The receptor location chosen for this assessment is presented in Figure 14.2. This receptor is located on the corner of Sleepers Hill and Walton Breck Road, just outside the match day road closure area proposed as part of the Transport Strategy.

Figure 14.2: Receptor Location



Receptors - Ecological

14.2.36 There are no statutory ecologically designated sites within 200m of the proposed development.

Field survey

14.2.37 No field surveys were undertaken as part of this assessment.

14.3 Legislation and policy

Legislation

European Union

- 14.3.1 EU Framework Directive 96/62/EEC on ambient air quality assessment and management came into force in November 1996 and had to be implemented by Member States by May 1998. This Directive aimed to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants. As a Framework Directive, it required the European Commission to propose 'Daughter' Directives which set air quality limit and target values, alert thresholds and guidance on monitoring and measurement for individual pollutants. The four Daughter Directives are as follows:
- Council Directive 1999/30/EC (the first Daughter Directive) relating to limit values for sulphur dioxide (SO₂), nitrogen dioxide (NO₂) and oxides of nitrogen (NO_x), particulate matter (PM₁₀) and lead in ambient air;
 - Directive 2000/69/EC (the second Daughter Directive) relating to limit values for benzene and carbon monoxide (CO) in ambient air;
 - Directive 2002/3/EC (the third Daughter Directive) relating to ozone (O₃) in ambient air; and
 - Directive 2004/107/EC (the fourth Daughter Directive) relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.
- 14.3.2 Directive 2008/50/EC on ambient air quality and cleaner air for Europe was adopted in May 2008. This Directive merges the first three existing Daughter Directives and one Council Decision into a single Directive on air quality (it is anticipated that the fourth Daughter Directive will be brought within the new Directive at a later date). It also sets new standards and target dates for reducing concentrations of fine particles.

English legislation

Air Quality - Human Health

- 14.3.3 The Air Quality Standards Regulations 2010 came into force in June 2010; they implement the EU's Directive 2008/50/EC on ambient air quality.
- 14.3.4 Part IV of the Environment Act 1995 requires that every Local Authority shall periodically carry out a review of air quality within its area, including likely future air quality. As part of this review, the Authority must assess whether air quality objectives are being achieved, or likely to be achieved within the relevant periods. Any parts of an Authority's area where the objectives are not being achieved, or are not likely to be achieved within the relevant period must be identified and declared as an Air Quality Management Area (AQMA). Once such a

declaration has been made, Authorities are under a duty to prepare an Action Plan which sets out measures to pursue the achievement of the air quality objectives within the AQMA.

- 14.3.5 The air quality objectives specifically for use by Local Authorities in carrying out their air quality management duties are set out in the Air Quality (England) Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002.
- 14.3.6 The Environment Act also requires that the UK Government produces a national 'Air Quality Strategy' (AQS) containing standards, objectives and measures for improving ambient air quality and to keep these policies under review. Further details of the AQS are presented below.

Statutory Nuisance

- 14.3.7 Section 79(1)(d) of the Environmental Protection Act 1990 defines one type of 'statutory nuisance' as "any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance". Where a Local Authority is satisfied that a statutory nuisance exists, or is likely to occur or recur, it must serve an abatement notice. Failure to comply with an abatement notice is an offence. However, it is a defence if an operator employs the best practicable means to prevent or to counteract the effects of the nuisance.

Policy

UK Air Quality Strategy

- 14.3.8 As described above, the Environment Act 1995 requires the UK Government to produce a national AQS. The AQS establishes the UK framework for air quality improvements. Measures agreed at the national and international level are the foundations on which the strategy is based. The first Air Quality Strategy was adopted in 1997 and was replaced by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland published in January 2000. The 2000 Strategy has subsequently been replaced by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007.
- 14.3.9 The Environment Act 1995 requires that the Environment Agency has regard to the AQS in exercising its pollution control functions. Local Authorities are also required to work towards the Strategy's objectives prescribed in regulations for that purpose.
- 14.3.10 The air quality objectives in the AQS are a statement of policy intentions and policy targets. As such, there is no legal requirement to meet these objectives except in as far as they mirror any equivalent legally binding limit values in EU Directives and English Regulations.

National Planning Policy Framework

14.3.11 The National Planning Policy Framework sets out the government's planning policies for England.

14.3.12 With regard to air quality the Framework states at paragraph 109 that:

"The planning system should contribute to and enhance the natural and local environment by... preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability..."

And at paragraph 124 that:

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative effects on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

14.3.13 On 6 March 2014, the Department for Communities and Local Government (DCLG) published a national planning practice guidance web-based resource.

14.3.14 The National Planning Guidance includes a dedicated section on 'Air Quality'. It notes that, for new planning applications, the local planning authority may want to know about:

- "the 'baseline' local air quality;
- whether the proposed development could significantly change air quality during the construction and operational phases; and/or
- whether there is likely to be a significant increase in the number of people exposed to a problem with air quality, such as when new residential properties are proposed in an area known to experience poor air quality."

14.3.15 It also states the following in relation to determining whether air quality is relevant to a planning decision:

14.3.16 *"Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)." [Ref 10].*

Local Planning Policy

14.3.17 The Unitary Development Plan (UDP) was adopted in November 2002.

14.3.18 The current UDP which is still currently used for determining planning applications states in policy EP11;

“Planning permission will not be granted for development which has the potential to create unacceptable air, water, noise or other pollution nuisance”.

14.3.19 LCC commenced preparation of a Core Strategy to replace the strategic policies of the adopted UDP. While that plan reached an advanced stage of preparation it was not submitted for examination and has now been abandoned in favour of producing a city-wide Local Plan. The draft strategic policies of the Core Strategy will be used to inform the emerging Local Plan.

14.3.20 Those saved draft policies relevant to Air Quality that may be carried forward into the emerging local plan are::

Strategic Objective Six which states that sustainable growth should be ensured by

“Minimising adverse impacts on water and air quality” and

Strategic Policy 33 which stated that development proposals should

“Minimise adverse impacts on, and include measures to improve, air quality within the City”.

Summary

14.3.21 This section has identified the legislation and policy framework relevant to the assessment. On the basis of the above, applicable numerical environmental quality standards are summarised in Table 14.4, hereafter referred to as air quality ‘objectives’. It should be noted that these objectives only apply at locations where the members of the public might reasonably be exposed to pollutants for the respective averaging periods. Further details of this are provided in Table 14.3.

Table 14.4: Relevant Air Quality Objectives

Pollutant	Averaging Period	Air Quality Objective		
		Concentration	Allowance	Attainment Date
Nitrogen Dioxide (NO ₂)	1-hour	200 µg/m ³	18 per calendar year ^(d)	31 December 2005 ^{(a)(b)} 1 January 2010 ^(c)
	Annual	40 µg/m ³	-	31 December 2005 ^{(a)(b)} 1 January 2010 ^(c)
Particulates (PM ₁₀)	24-hour	50 µg/m ³	35 per calendar year ^(e)	31 December 2004 ^{(a)(b)} 1 January 2005 ^(c)
	Annual	40 µg/m ³	-	31 December 2004 ^{(a)(b)} 1 January 2005 ^{(c)(d)}

Pollutant	Averaging Period	Air Quality Objective		Attainment Date
		Concentration	Allowance	
Particulates (PM _{2.5})	Annual	25 µg/m ³	-	2020 ^{(b)(f)} 1st January 2010 ^(c)

Notes: (a) Air Quality (England) Regulations 2000 as amended.

(b) Air Quality Strategy 2007.

(c) EU Directive 2008/50/EEC on ambient air quality and cleaner air for Europe and The Air Quality Standards Regulations 2010. Derogations (time extensions) have been agreed by the EU for meeting the NO₂ limit values in some zones/agglomerations.

(d) Can be expressed as the 99.79th percentile of 1 hour means.

(e) Can be expressed as the 90.41st percentile of 24 hour means.

(f) Also a 'Target' of 15% reduction in annual mean concentrations at urban background between 2010 and 2020.

14.4 Consultation

14.4.1 Table 14.5 summarises the scoping responses received in relation to air quality and provides comment on each item.

Table 14.5: Summary of scoping response for Air Quality

Name of Organisation	Key Concerns	Comment
Natural England	Air quality in the UK has improved over recent decades but air pollution remains a significant issue; for example over 97% of sensitive habitat area in England is predicted to exceed the critical loads for ecosystem protection from atmospheric nitrogen deposition (England Biodiversity Strategy, Defra 2011). A priority action in the England Biodiversity Strategy is to reduce air pollution impacts on biodiversity. The planning system plays a key role in determining the location of developments which may give rise to pollution, either directly or from traffic generation, and hence planning decisions can have a significant impact on the quality of air, water and land. The assessment should take account of the risks of air pollution and how these can be managed or reduced. Further information on air pollution impacts and the sensitivity of different habitats/designated sites can be found on the Air Pollution Information System (www.apis.ac.uk). Further information on air pollution modelling and assessment can be found on the Environment Agency website.	In accordance with relevant guidance, there are no relevant designated sites for ecology (Nature Conservation Sites; Special Areas of Conservation (SAC); Special Protected Areas (SPA); Sites of Special Scientific Interest (SSSI) & Ramsar Sites) within 200 metres of the proposed development study area.
Liverpool City Council (LCC)	Having read this scoping report, the proposed methodology for assessing impact on air quality by the proposed	No further comment required.

Name of Organisation	Key Concerns	Comment
	development has been covered adequately.	

14.5 Assumptions and Limitations

14.5.1 As discussed within section 14.2 –Desk Study Operational Phase – Traffic Data the primary assumptions and limitations to the study are associated with the traffic data available for the assessment. Assumptions based on flows assumed for the assessment are discussed within section 14.2.

14.6 Baseline Conditions

Information Sources

14.6.1 Information on air quality in the UK can be obtained from a variety of sources including Local Authorities and national network monitoring sites. For the purposes of this assessment, data has been obtained from Department for Environment, Food and Rural Affairs (Defra) Air Information Resource website [Ref 11] and from LCC, with a focus on ‘background’ air quality measurements that are considered representative of wider urban background population exposure and account for all local sources including road traffic and any industry.

Local Authority Review & Assessment

14.6.2 LCC declared an AQMA for the whole City on 1 April 2009, following several Review and Assessments which revealed that the annual mean NO₂ air quality objective was being exceeded at a number of congested junctions across the city. Air quality objectives for all other pollutants are below relevant standards within LCC’s administrative area.

Local Authority Background Monitoring

14.6.3 LCC undertakes air quality monitoring at four continuous monitoring stations across the City, one of which is classed as urban background. One of these sites is part of the AURN (Automatic Urban and Rural Network) and within a suburban residential area, similar to the proposed development, therefore representative. However it is located close to an industrial estate and the John Lennon Airport. Table 14.6 presents the latest continuous monitoring results for that site.

Table 14.6: LCC Background Continuous Monitoring Data for 2010-2012

Site Name	Site Classification	National Grid Reference		Approximate Distance to Proposed Development (km)	Pollutant	Annual Mean Concentration $\mu\text{g}/\text{m}^3$		
		X	Y			2010	2011	2012
Liverpool Speke ¹	Urban Background	343887	383603	12	NO ₂	30	24	25
					PM ₁₀	16	16	13
					PM _{2.5}	N/A	N/A	11

Source: Liverpool City Council
Note: N/A indicates no monitoring available
Data capture for all pollutants in above 75%

- 14.6.4 Table 14.6 shows that monitored concentrations are well below the relevant objectives for NO₂, PM₁₀ and PM_{2.5} (see Table 14.4) and that background concentrations of NO₂ and PM₁₀ have declined slightly over the monitoring period.

Local Authority Roadside Monitoring

- 14.6.5 LCC undertakes roadside air quality monitoring at three continuous monitoring stations across the City. Liverpool Queens Drive is located in the suburban outskirts of Liverpool and lies closest to the application site, whereas Liverpool Islington and Liverpool Old Haymarket are located within Liverpool city centre. Table 14.7 presents the latest roadside continuous monitoring results for these sites, all located by junctions within 3km of the proposed development.

Table 14.7: LCC Roadside Continuous Monitoring Data for 2010-2012

Site Name	Site Classification	National Grid Reference		Approx Distance to Proposed Development (km)	Pollutant	Annual Mean Concentration $\mu\text{g}/\text{m}^3$		
		X	Y			2010	2011	2012
Liverpool Queens Drive	Roadside	336164	394906	1.3	NO ₂	38	34	(a)
					PM ₁₀	30	24	25
Liverpool Islington	Roadside	335394	390956	2.2	NO ₂	40	35	35
					PM ₁₀	27	21	19
Liverpool Old Haymarket	Roadside	334762	390686	2.8	NO ₂	50	46	44

Source: Liverpool City Council
Note: (a) poor data capture for period of monitoring (Below 75%)
All other pollutants record a data capture above 90%

14.6.6 Table 14.7 shows that monitored concentrations are below the relevant objectives for NO₂ and PM₁₀ at the Liverpool Queens Drive site, the closest roadside site to the application site.

14.6.7 Roadside monitoring is also carried out for NO₂ using diffusion tubes at 42 sites across the city. These sites are classified as roadside or kerbside, located at busy junctions. Table 14.8 presents the latest roadside monitoring data for selected sites located at junctions within 3km of the proposed development.

Table 14.8: LCC Roadside Diffusion Tube Monitoring Data for 2010-2012

Site ID	Location	Site Classification	Approximate Distance to Proposed Development (km)	National Grid Reference		Annual Mean Concentration µg/m ³		
				X	Y	2010	2011	2012
N63	Millbank/ Queens Drive- Junction	Urban Roadside	2.7	339066	392667	76	74	76
N64	Muirhead Ave/Queens Dr	Urban Roadside	2.3	338689	393167	61	62	62
B15	Everton Rd/ Breck Road	Urban Roadside	0.7	336740	392464	N/A	47	49
B20	Lamp outside 93 Townsend Lane	Urban Roadside	1.9	338136	393961	N/A	42	48
N69	Queens Drive Monitoring Station	Urban Roadside	1.6	336164	394906	N/A	42	45
N70						N/A	44	44
N71						N/A	43	39

Source: Liverpool City Council
Note: 2012 Bias Adjustment: 1.08
All data capture rates above 90%

14.6.8 Table 14.8 shows that measured concentrations of annual mean NO₂ at urban roadside locations close to the application site are elevated.

14.6.9 All monitoring locations discussed above are presented within Figure 14.3.

Figure 14.3: Relevant Liverpool City Council Monitoring



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Defra Projected Background Concentrations

- 14.6.10 Defra provide estimates of background pollution concentrations for NO_x, NO₂, PM₁₀ and PM_{2.5} across the UK for each one kilometre grid square for every year from 2010 to 2030. Future year projections have been developed on the base year for the background maps which is currently 2010 [Ref 11]. The maps include a breakdown of background concentrations by emission source, including road and industrial sources which have been calibrated against 2010 UK monitoring data.
- 14.6.11 Table 14.9 presents the predicted background concentrations for the study area during the baseline year (2014), the earliest construction year (2015) and the opening year (2016) of the proposed development. 2012 data have also been included for comparison with monitored data. All background concentrations, including future projections, have been obtained from Defra for the receptor location (the corner of Sleepers Hill and Walton Breck Road in OS Grid Square: 335500, 393500) discussed within section 14.2.

Table 14.9: Defra Projected Background Concentrations

Pollutant	2012	2014	2015	2016
NO _x	40.6	37.4	35.8	34.3
NO ₂	25.4	23.9	23.1	22.3
PM ₁₀	15.6	15.2	15.0	14.9
PM _{2.5}	11.2	10.8	10.6	10.5

Source: [Ref 11]

Summary

- 14.6.12 Overall, the available baseline data indicates that ambient air quality at the proposed development site meets air quality objectives (comparison of Table 6.9 with Table 6.4). LCC monitoring highlights that congested junctions across the city exceed the air quality objectives for NO₂ as a result of road traffic emissions.
- 14.6.13 The 2012 Defra projected background concentrations for NO₂ are consistent with the LCC background monitored data. As a result, Defra background data has been taken as the baseline for this chapter. The operational assessment has conservatively used the higher 2014 Defra background data for the quantitative calculations presented within section 14.7.

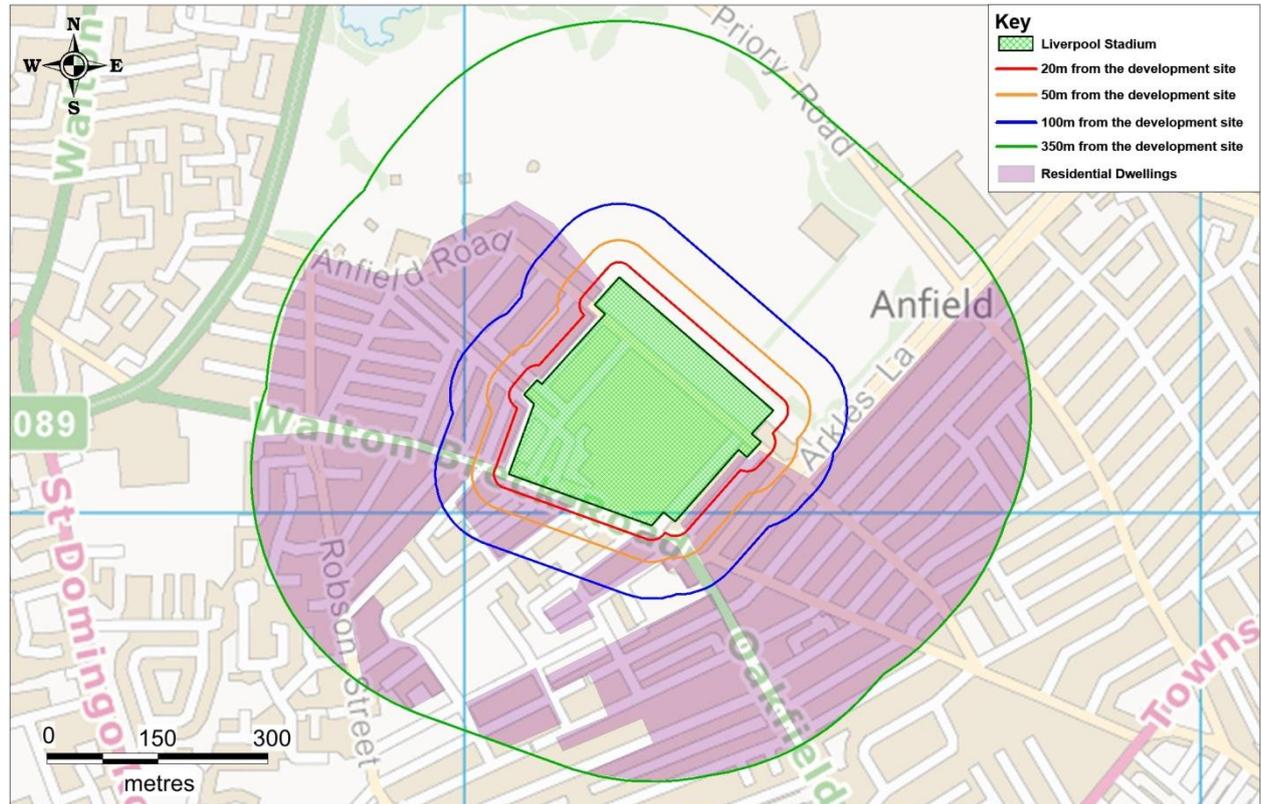
14.7 Assessment of effects

Construction – likely significant effects

Temporary effects

- 14.7.1 The construction programme for the Main Stand and associated works is anticipated to begin in January 2015 and be completed by August 2016. Work will be restricted to the off-season where appropriate. Key works such as demolition of the existing roof and re-profiling/repair of the terraces will be undertaken in the close season, however, the majority of construction works (including construction of the roof and new section of the stand) will take place throughout the 20 month construction programme. The construction phase will consist of several activities with dust-raising potential including demolition, earthworks, construction and track out from heavy duty vehicles. The duration of these activities will vary depending on the individual task being carried out. In order to assess the worst case scenario it has been assumed that all activities will be carried out for the duration of the construction period. In this context, Figure 14.4 shows the construction study area for the proposed development.

Figure 14.4: Proposed Development Construction Study Area



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- 14.7.2 Magnitude and sensitivity descriptors that have been applied to assess the overall impact of the construction phase have been presented in Volume 2, Part 3, Appendix 3.
- 14.7.3 Table 14.10 presents the potential dust emission magnitude based on demolition and construction activities and is based on the criteria presented in Table 3.1 within Volume 2, Part 3, Appendix 3.

Table 14.10: Dust Emission Magnitude

Activity	Dust Emission Magnitude
Demolition	Large
Earthworks	Large
Construction	Medium/Large
Track Out	Medium

14.7.4 Table 14.11 presents the sensitivity of receptors to effects caused by construction activities and is based on the criteria presented in Table 3.3, Table 3.4 and Table 3.5 within Volume 2, Part 3, Appendix 3.

Table 14.11: Receptor Sensitivity

Effect	Receptor Sensitivity	Comment
Dust Soiling	High	There are approximately 55 residential dwellings within 20 metres of the construction site boundary.
PM ₁₀	Low	Background PM ₁₀ concentrations are well below the air quality long term and short term objectives.

14.7.5 The overall risk of receptors to dust soiling effects and PM₁₀ effects are presented in Table 14.12. Risk is based on the criteria presented in Table 3.6 to Table 3.9 within Volume 2, Part 3, Appendix 3.

Table 14.12: Summary of the Risk of Construction Effects

Activity	Dust Soiling Effects	PM ₁₀ Effects
Demolition	High Risk	Low Risk
Earthworks	High Risk	Low Risk
Construction	High Risk	Low Risk
Track Out	Medium Risk	Low Risk

14.7.6 As Table 14.12 shows, the risk of dust soiling effects is generally high and the risk of PM₁₀ effects is low.

14.7.7 Based on the above, the overall effect of dust nuisance from the construction phase is described as High Risk at worst without mitigation. Mitigation measures appropriate for the proposed development have been presented below and incorporation of such measures within a Construction Environmental Management Plan (CEMP) will reduce this predicted risk to low.

Operation – likely significant effects

Permanent effects

14.7.8 Table 14.13 and Table 14.14 present the modelled NO₂ contributions and pollutant concentrations for Phases 1 and 2 respectively. The results indicate that even with the over prediction of flows along Walton Breck Road, concentrations of NO₂ are well below the objective at the modelled receptor.

Table 14.13: NO₂ Modelled Concentrations (µg/m³) at Walton Breck Road for Phase 1 of the Proposed Development

Receptor Name	Objective	Background Concentration	DM Total Ambient Concentration	DS Phase 1 Road Contribution	DS Phase 1 Total Predicted Ambient Concentration
Walton Breck Road	40	23.9	28.2	6.1	30.0

Table 14.14: NO₂ Modelled Concentrations (µg/m³) at Walton Breck Road for Phase 2 of the Proposed Development

Receptor Name	Objective	Background Concentration	DM Total Ambient Concentration	DS Phase 2 Road Contribution	DS Phase 2 Total Predicted Ambient Concentration
Walton Breck Road	40	23.9	28.2	7.1	31.0

14.7.9 Table 14.15 and Table 14.16 present the modelled PM₁₀ contributions and pollutant concentrations for Phases 1 and 2 respectively. The results indicate that even with the over prediction of flows along Walton Breck Road, concentrations of PM₁₀ are well below the objective at the modelled receptor.

Table 14.15: PM₁₀ Modelled Concentrations (µg/m³) at Walton Breck Road for Phase 1 of the Proposed Development

Receptor Name	Objective	Background Concentration	DM Total Ambient Concentration	DS Phase 1 Road Contribution	DS Phase 1 Total Predicted Ambient Concentration
Walton Breck Road	40	15.2	16.0	1.3	16.5

Table 14.16: PM₁₀ Modelled Concentrations (µg/m³) at Walton Breck Road for Phase 2 of the Proposed Development

Receptor Name	Objective	Background Concentration	DM Total Ambient Concentration	DS Phase 2 Road Contribution	DS Phase 2 Total Predicted Ambient Concentration
Walton Breck Road	40	15.2	16.0	1.5	16.7

14.7.10 Table 14.17 and Table 14.18 present the modelled PM_{2.5} contributions and pollutant concentrations for Phases 1 and 2 respectively. The results indicate that even with the over

prediction of flows along Walton Breck Road, concentrations of PM_{2.5} are well below the objective at the modelled receptor.

Table 14.17: PM_{2.5} Modelled Concentrations (µg/m³) at Walton Breck Road for Phase 1 of the Proposed Development

Receptor Name	Objective	Background Concentration	DM Total Ambient Concentration	DS Phase 1 Road Contribution	DS Phase 1 Total Predicted Ambient Concentration
Walton Breck Road	25	10.8	11.3	0.8	11.6

Table 14.18: PM_{2.5} Modelled Concentrations (µg/m³) at Walton Breck Road for Phase 2 of the Proposed Development

Receptor Name	Objective	Background Concentration	DM Total Ambient Concentration	DS Phase 2 Road Contribution	DS Phase 2 Total Predicted Ambient Concentration
Walton Breck Road	25	10.8	11.3	0.9	11.8

- 14.7.11 Government guidance [Ref 01] states that exceedences of the 1 hour NO₂ objective are unlikely if the annual mean concentrations are below 60µg/m³. Predicted annual mean NO₂ concentrations are well below this level and therefore no exceedences of the 1 hour objective along Walton Breck Road are expected. In addition, as the contributions to annual mean PM₁₀ are extremely small, changes in the 24 hour mean concentrations have not been considered further as no exceedences are considered likely.
- 14.7.12 The assessment has focussed on the assumed worst affected receptor along Walton Breck Road, close to the Match Day closure point (see further explanation in paragraphs 14.2.34 and 14.2.35). As the predicted NO₂, PM₁₀ and PM_{2.5} concentrations at this location are significantly lower than the relevant objectives it is considered that there will be no exceedences of NO₂, PM₁₀ or PM_{2.5} as a result of the proposed development, even with the significant increase in ADDT identified in Table 14.1 and Table 14.2.
- 14.7.13 Queuing spaces for 12 buses to take spectators off-site will be provided on Robson Street, with additional buses (estimated to be 8 in number) queuing on St Domingo Road and being moved to Robson Street as spaces arise. Emissions from queuing buses have been accounted for in the over-estimation of traffic numbers and are not anticipated to cause any significant air quality effects. Bus companies have been asked to switch off their engines when laying over.

14.8 Mitigation

Construction

14.8.1 Construction activities are predicted to present a high risk in terms of generating dust for a temporary period; this is typical of construction activity. Best practice mitigation measures to control fugitive dust are contained in the IAQM Guidance [Ref 02] that Guidance recommends the production of a CEMP with the following measures:

■ General

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary.
- Display head or regional office contact information.
- Record all dust and air quality complaints, identify causes and take appropriate and record measures to reduced emissions.
- Make complaints log available to Local Authority when asked.
- Establish a method for visual dust monitoring across site and ensure key site personnel are fully trained in this respect.
- Plan site layout so that machinery and dust causing activities are away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site. Keep clean using wet methods.
- Avoid site run off of water or mud.
- Cover, seed or fence stockpiles to prevent wind whipping.
- No idling vehicles.
- Impose and signpost a maximum speed limit.
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques.
- Use enclosed chutes and conveyors and covered skips.
- Ensure equipment is readily available on site to clean any dry spillages.
- No burning of waste.

■ Demolition

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure effective water suppression is used during demolition operations.
- Avoid explosive blasting, using appropriate manual or mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

■ Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.

- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once
- **Construction**
 - Avoid scabbling (roughening of concrete surfaces) if possible.
 - Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
 - Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
 - For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.
- **Track Out**
 - Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
 - Avoid dry sweeping of large areas
 - Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
 - Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
 - Record all inspections of haul routes and any subsequent action in a site log book.
 - Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
 - Implement a wheel washing system.
 - Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
 - Access gates to be located at least 10m from receptors where possible.

14.8.2 LCC can impose a planning condition requiring that these measures are incorporated into a development CEMP by the appointed contractor. The effect of those measures is to reduce the risk of construction dust causing nuisance from 'high' to 'low'.

Operation

14.8.3 No specific mitigation measures are included for the operational phase of the proposed development as results are concluded to be negligible.

14.9 Cumulative effects

14.9.1 Cumulative effects are those that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence (ZoI). While a single

activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.

14.9.2 The current list of planned developments which are included in the cumulative impact assessment, are those identified in the Anfield SRF comprising:

- Anfield Village & Rockfield housing refurbishment;
- New build housing led regeneration;
- The Walton Breck Road (The High Street) Corridor;
- New public space and Village Square development (training hotel and offices);
- Completion of the restoration of Stanley Park east of Mill Lane.

Construction

14.9.3 It has not been possible to ascertain the year of completion of construction for the other developments in the area. While it is possible that such developments could generate dust from construction activities, all developments are also expected to have appropriate mitigation measures (CEMP) implemented by the appointed contractor and, as a result, significant cumulative effects from dust are not expected.

Permanent effects

Operation

9.1.1 It has not been possible to ascertain the year of operation for the above developments or associated traffic generation and associated air quality effects. However, legally all developments with the potential to affect local air quality will have been / will be assessed and the significance of their effects considered by the Local Authority in granting planning permission, therefore, significant cumulative effects from operation are not expected.

14.10 Residual effects

Construction

14.10.1 There is low risk of temporary adverse dust nuisance during the construction phase, however, no significant residual air quality impacts are predicted to occur as a result of the construction phases of the proposed development provided that the mitigation measures discussed within section 14.7 are implemented effectively by the appointed contractor.

Operation

14.10.2 The proposed development is not anticipated to have any significant impacts on air quality or fugitive dust emissions during the operation phase.

14.11 Summary of effects

14.11.1 A tabulated summary of effects is presented within Table 14.19.

Table 14.19: Summary of Effects

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/ Beneficial	Permanent/ Temporary	Residual Effect
Construction	The closest sensitive receptors are residential	The construction phase has the potential to cause dust nuisance to sensitive receptors within 350 m of the construction boundary and 50m of HGV routes within 500m of the construction site	No additional mitigation required over and above proposed mitigation and CEMP	High Risk	Adverse	Temporary	Low Risk
		Changes in ambient concentrations of NO ₂ , PM ₁₀ and PM _{2.5} as a result of increased construction traffic.	None	No exceedences of objectives	N/A	Temporary	None
Operation	Human health	Changes in ambient concentrations of NO ₂ , PM ₁₀ and PM _{2.5} as a result of increased traffic movements associated with the proposed development.	None	No exceedences of objectives	N/A	Permanent (though limited in temporal extent)	None

14.12 Proposed monitoring

14.12.1 No monitoring is required for the proposed development.

14.13 Statement of significance

14.13.1 A qualitative assessment of potential dust effects has been undertaken, based on a review of likely dust raising activities and identification of sensitive receptors within 350m of the construction site and 50m of the HGV routes within 500m of the site. Potential dust effects will be suitably controlled using the best practice mitigation measures proposed which LCC will be able to control through the submission, approval and monitoring of the Construction Environmental Management Plan. Potential construction dust effects will not cause statutory nuisance or loss of amenity according to legislative definition and are therefore concluded to be not significant.

14.13.2 Dispersion modelling has been undertaken to predict concentrations of NO₂, PM₁₀ and PM_{2.5} along Walton Breck Road during operation based on traffic assumptions and model split information presented within the proposed development traffic assessment.

14.13.3 The results indicate that ambient pollutant are currently below the relevant objectives, based on higher background concentrations for 2014 and are likely to remain so in 2016; that would be the case even if all of the predicted additional traffic were to travel past a single point. Overall, operational impacts as a result of the proposed development are not significant.

14.14 References

[Ref 01] - Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07, Air Quality. Highways Agency 2007;

[Ref 02] - Institute of Air Quality Management (February 2014), 'Guidance on the Assessment of dust from demolition and construction';

[Ref 03] - Greater London Authority and London Councils Best Practice Guidance - The Control of Dust and Emissions from Construction and Demolition, 2006;

[Ref 04] - Building Research Establishment (March 2003), The 'Control of Dust from Construction and Demolition Activities';

[Ref 05] - Environmental Protection UK (April 2010), Guidance 'Development Control: Planning for Air Quality' 2010;

[Ref 06] - Proposed Development Traffic Assessment V7 (Please provide details);

[Ref 07] - Local Air Quality Management - Technical Guidance (09). Department for Environment, Food and Rural Affairs, 2009;

[Ref 08] - Department for Transport website: <http://www.dft.gov.uk/traffic-counts/index.php>. Accessed March 2014;

[Ref 09] - Department for Environment, Food and Rural Affairs, NO_x to NO₂ calculator. Available at: <http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html> Accessed March 2014;

[Ref 10] - National Planning Practice Guidance 'Air Quality Section'. Accessible at: <http://planningguidance.planningportal.gov.uk/blog/guidance/air-quality-new/why-should-planning-be-concerned-about-air-quality/>

[Ref 11] - Department for Environment Food and Rural Affairs (2013-2014) available at: <http://laqm.defra.gov.uk/maps/maps2010.html>;

15 Noise and Vibration

15.1 Introduction

- 15.1.1 This technical chapter presents details of the noise and vibration aspect of the EIA prepared in support of the hybrid planning application for the expansion of the stadium at Anfield.
- 15.1.2 The proposed development will increase the height and footprint of the stadium; expanding onto land formerly occupied by residential housing to the north-west and onto that portion of Anfield Road immediately to the north-east of the stadium. Phase 1, the expanded Main Stand will increase the capacity of the stadium by c.8,300 seats. It will be built 45m from retained properties in the Rockfield area, separated from them by a wide public concourse that will be the main meeting/gathering point for match-goers. In Phase 2 a further 4,800 general admission seats will be delivered through the redevelopment and expansion of the Anfield Road Stand.
- 15.1.3 The Transport Strategy (**Document C1/3**) proposes to introduce temporary road closures on Walton Breck Road prior to, during and for a period following matches and direct the majority of pedestrian movements away from the stadium towards new designated areas for bus and taxi pick-up in the Robson Street and Sleeper's Hill area
- 15.1.4 Potential temporary noise and vibration impacts arising from the construction phase include:
- Impacts arising from demolition of existing structures and construction of the development;
 - Impacts arising from site traffic using the public highways and accessing the site and contractor's compounds;
 - Activities within the contractors compounds; and
 - Impacts from diverted road traffic.
- 15.1.5 Potential sources of permanent noise and vibration arising from the operation of the development include:
- Change in noise and vibration due to changes in existing traffic flows;
 - Changes to pedestrian activity around the stadium, including routes from modified or additional parking and public transport areas;
 - Noise from new building services plant associated with the development; and
 - Changes in noise from crowds within the stadium and from public address and voice alarm (PAVA) systems associated with the development.
- 15.1.6 Operational impacts from noise generated by patrons of the stadium and PAVA systems (PAVA both internal to and external to the stadium) may be evaluated by predicted noise increase against existing baseline noise levels (measured as $L_{Aeq,T}$). Crowd noise break-out from the stadium cannot be directly controlled. Sandy Brown Associates are engaged as acoustic designers for the stadium and have evaluated noise egress due to increased capacity for both Phase 1 and for Phase 2 in conjunction with Phase 1; their evaluation is provided in report referenced 12431-M001-C (Sandy Brown Associates, 2014). There is no

accepted methodology for evaluation of crowd noise due to its sporadic and highly variable nature (limited to the duration of the sporting fixture) however the anticipated noise changes are assessed in qualitative terms informed by the predictions reported by Sandy Brown Associates. PAVA systems will be designed such that they do not increase noise levels above those associated with use of existing PAVA systems.

- 15.1.7 The assessment contained within this technical chapter considers temporary impacts during the construction period from initial enabling works to the completion of construction, during those periods of the day or night when construction works, or measures implemented to facilitate those works; are in progress.
- 15.1.8 The assessment considers permanent impacts during normal operating hours of the stadium on both match days and non-match days.
- 15.1.9 The study considers those sensitive receptors most likely to experience changes in levels of noise and vibration due to construction and operation of the development. These receptors lie principally within the network of residential streets immediately outside the red-line boundary of the development as shown in Mott MacDonald drawing referenced MMD-317415-EN-DR-00-XX-3001 Revision P1.
- 15.1.10 The construction and operation of the development have the potential to give rise to both temporary and permanent noise and vibration effects at sensitive receptors in the vicinity of the stadium. This technical chapter discusses noise related legislation and policy from both a national and local perspective; reports baseline noise conditions; identifies potential noise and vibration impacts, describes the methodology by which the effects of these impacts have been assessed, and, if appropriate what mitigation measures will be implemented to address noise and vibration impacts. Residual effects are subsequently identified.
- 15.1.11 This chapter has been prepared by Mott MacDonald Ltd. Noise studies carried out by others have also been used to inform this noise and vibration assessment [see Section 15.3.2].

15.2 Design measures incorporated

- 15.2.1 The new Main Stand design incorporates side screening at each end of the stand. This partial enclosure minimises the line of site from the crowd to sensitive receptors outside the stadium and hence limits noise egress. This measure is considered by the designers to provide the optimum amount of noise screening.
- 15.2.2 It is anticipated that specific design measures to limit noise from fixed plant and PAVA associated with the development will be subject to condition and will be developed during detailed design.

15.3 Methodology

15.3.1 An environmental impact assessment of noise and vibration requires a comparison of the predicted impacts of noise resulting from the proposed development with the pre-existing (baseline) levels. The predicted increases/decreases (impacts) and the resulting effects on people and resources are then quantified (resulting in an assessment) which enables significant adverse effects of the development to be identified and reduced or eliminated where possible, and the identification of additional mitigation measures if appropriate.

Sources of information

15.3.2 The main sources of information relevant to the assessment of the potential noise and vibration impacts of the extension of the LFC Anfield stadium include:

- Walk-over of the area around the stadium;
- Development drawings and information including third party noise assessments carried out on behalf of the development designers;
- The ES and associated noise survey report and assessment for a previous proposal to construct a new stadium on an adjacent site at Stanley Park (planning applications 03/3214 and 07F2191);
- In addition, consultation was undertaken with LCC to establish other sources of information which may assist in deriving the baseline noise and vibration conditions for the areas of interest;
- The Anfield stadium expansion assessment of noise egress from the stadium expansion (Sandy Brown, 2014)
- The Liverpool Football Club Stadium Expansion Transport Strategy and Assessment (Mott MacDonald, 2014) produced in support of this planning application.

Desk study

15.3.3 A desk-based review and walk-over of the area around the stadium has been carried out to inform the assessment process. The sources of information described above were evaluated. It was decided a further baseline survey was appropriate to update and validate the existing data set due to the time elapsed since the previous noise survey data was collected in 2002/3.

Field survey

15.3.4 Noise survey work has been carried out by Mott MacDonald acoustic engineers in December 2013 and January 2014 on both a match day and non-match day. The survey work was carried out in part to characterise baseline noise levels in the vicinity of the stadium and in part to validate the current relevance of extensive noise measurements carried out in support of the previous application for a new stadium in Stanley Park. Details of the noise survey are provided in the Baseline Conditions section.

15.3.5 A baseline survey to establish the existing level of ground-borne vibration was not considered appropriate. This is because the significance of potential vibration effects is determined based on the exceeding of absolute thresholds and does not relate to existing levels of vibration.

Assessment methodology

Approach

15.3.6 For the purposes of this chapter of the ES, impact is defined as a physical change to the baseline environment resulting from the proposed development. For example, an impact can be an increase in the level of ambient noise due to the addition of new fixed building services plant. 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 building services noise may produce the effect of increased disturbance in the community.

15.3.7 The assessment of the effects on receptors arising from changes to levels of noise or vibration comprises of 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 baseline conditions;
- Evaluation of the receptor sensitivity and the significance of effects; and
- The consideration of noise mitigation measures incorporated within the design and an assessment of any residual effects.

Evaluation of effects

15.3.8 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.

15.3.9 Table 15.1 sets out criteria used in this assessment to determine the sensitivity of a receptor. It should be noted that, generally, the variation in the sensitivity of receptors in terms of noise impact is taken into account by applying different scales to classify magnitude of impact (e.g. by using different scales for daytime and night-time) rather than by varying the assignment of sensitivity to specific types of receptors.

Table 15.1: Criteria to define the sensitivity of receptors

Sensitivity	Description	Examples of receptors
High	Receptors where occupants or activities are particularly susceptible to noise	Residential Quiet outdoor areas used for recreation

Sensitivity	Description	Examples of receptors
		Conference facilities Auditoria/studios Schools in daytime Hospitals/residential care homes Religious institutions e.g. churches or mosques
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance	Offices Restaurants Sports grounds where spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g. golf or tennis)
Low	Receptors where distraction or disturbance from noise is minimal	Residences and other buildings not occupied during working hours Factories and working environments with existing high noise levels Sports grounds where spectator noise is a normal part of the event

Source: Based on CIRIA C693 Noise and Vibration from Road and Rail (CIRIA, 2011)

15.3.10 The majority of the receptors that are expected to be affected by noise and vibration impacts arising due to the proposed development would be dwellings. Therefore, the following tables that set out scales for magnitude of impact, apply to receptors having high sensitivity.

Significance

15.3.11 The significance of the effect of any noise and vibration impacts is determined as a function of the sensitivity of the receptor and the magnitude of the impact that it is exposed to. In this assessment, sensitive receptors are generally residences and are regarded as having high sensitivity. Using the definition of receptor sensitivity and the magnitudes of impact (defined below), significance of any effects are identified using the matrix presented in Table 15.2.

Table 15.2: Matrix for determining significance of effect for receptors of high sensitivity.

Magnitude of impact (beneficial or adverse)	Significance of effect for receptors having high sensitivity
Major	Large or Very Large
Moderate	Moderate or Large
Minor	Slight
Negligible	Slight
No impact	Neutral

Source: DMRB 11-2-5 HA205/08 (Highways Agency, 2008)

15.3.12 Effects are considered to be significant when identified as likely to have a Moderate, Large or Very Large effect.

Construction noise

- 15.3.13 BS 5228 ‘Code of construction practice for noise and vibration control on construction and open sites – Part 1: Noise’ (BSI, 2009) provides a methodology for calculating noise levels generated by fixed and mobile plant used for a range of typical construction activities. 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.
- 15.3.14 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. In this case ‘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 EIA methodologies compared with the use of fixed/absolute noise limits.
- 15.3.15 Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction baseline noise plus construction noise) exceeds the pre-construction baseline noise by 5 dB or more, subject to lower cut-off values of 65 dB (daytime), 55 dB (evening) and 45 dB L_{Aeq} (night-time) from construction noise alone; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.
- 15.3.16 The day-time period is defined as 07:00 to 19:00; the evening period as 19:00 to 23:00 and the night-time period as 23:00 to 07:00.
- 15.3.17 BS 5228 – 1:2009 does not qualify what might constitute a significant noise impact from works of shorter duration; however the Standard does provide an example of criteria for the significance of noise effects which might be used to determine whether a development for installation of noise insulation or temporary rehousing of occupants is appropriate. This example cites the occurrence of the trigger noise levels reproduced in Table 15.3 subject to the following conditions:
- Predicted noise level exceeds the noise trigger level in Table 15.3;
 - The total noise (baseline plus construction noise) is 5 dB above the existing baseline noise level (from Example Method 2); and
 - The noise level exceeds the trigger level for ten or more days of working in any fifteen or for a total of days exceeding 40 in any 6 month period.

Table 15.3: Examples of time periods, averaging times and noise levels associated with the determination of eligibility for noise insulation.

Time	Relevant time period	Averaging time, T	Noise insulation trigger level dB $L_{Aeq,T}$
Monday to Friday	07:00 – 08:00	1h	70
	08:00 – 18:00	10h	75

Time	Relevant time period	Averaging time, T	Noise insulation trigger level dB L _{Aeq,T}
	18:00 – 19:00	1h	70
	19:00 – 22:00	3h	65
	22:00 – 07:00	1h	55
Saturday	07:00 – 08:00	1h	70
	08:00 – 13:00	5h	75
	13:00 – 14:00	1h	70
	14:00 – 22:00	3h	65
	22:00 – 07:00	1h	55
Sunday and Public Holidays	07:00 – 21:00	1h	65
	21:00 – 07:00	1h	55

Construction vibration

- 15.3.18 In general, vibration arising from construction activities is ground-borne and, for example in the case of typical earthworks developments, may be generated by operations such as ground compaction, piling and the movement of vehicles over irregular surfaces. It is generally recognised that it is not realistic to undertake a detailed prediction and assessment of construction vibration as it is a complex subject comprising many factors.
- 15.3.19 Notwithstanding this, the Transport Research Laboratory (TRL) has published the results of a series of measurements of vibration levels at distances from a range of construction works (Department of Transport, 1986). These have been adopted as the basis for the assessment. The data is reproduced in Table 15.4 with vibration levels expressed as peak particle velocity (PPV). PPV is defined as the instantaneous maximum velocity reached by a vibrating element as it oscillates about its rest position and can be used in the assessment of vibration impacts with respect to disturbance and building damage.

Table 15.4: Estimated peak particle velocities at distances between construction plant and vibration measurement positions

Construction plant	Distance between construction site and vibration measurement position in m	Peak particle velocity at measurement position in mm/s
General construction traffic including haul routes	1	0.60
	2	0.24
	4	0.14
	6	0.10
	≥8	<0.10
Heavy lorry on poor road surface	1	2.20
	2	0.80
	4	0.24
	6	0.16

Construction plant	Distance between construction site and vibration measurement position in m	Peak particle velocity at measurement position in mm/s
	8	0.10
	≥10	<0.10

- 15.3.20 BS 5228 ‘Code of construction practice for noise and vibration control on construction and open sites – Part 2: Vibration’ (BSI, 2009) provides guidance on the effect of vibration and the likelihood they will cause complaint and cosmetic damage to buildings. BS 5228 – 2:2009 does not indicate whether particular vibrations are significant. The standard states:
- 15.3.21 *“Vibrations above these levels [0.14mm/s to 0.3mm/s] can disturb, startle, cause annoyance or interfere with work activities. At higher levels they can be described as unpleasant or even painful. In residential accommodation, vibrations can promote anxiety....”*
- 15.3.22 In addition BS 5228 – 2:2009 provides the following guidance on effects:
- At a vibration level of 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 0.3mm/s vibration might be just perceptible in residential environments;
 - At a vibration level of 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 10mm/s vibration is likely to be intolerable for any more than a very brief exposure to this level.
- 15.3.23 Generally, vibration from construction activities will be temporary and intermittent in nature. On this basis, in this assessment a PPV of 1.0 mm/s or more, lasting for a minimum of one hour during the normal hours of working, is considered to have a major adverse impact and deemed to produce a significant adverse effect in terms of annoyance to the occupiers of affected buildings. Lower vibration magnitudes would have progressively less significant effects. Table 15.5 presents the criteria adopted within this assessment for receptors having high environmental sensitivity. It should be noted that moderate and major impacts are considered to be significant.

Table 15.5: Criteria for the assessment of the significance of transient vibration effects for receptors having high environmental sensitivity.

		Continuous peak particle velocity (1 hour minimum) [mm/s]	Magnitude of impact	Significance of effect
Environmental value	High	0	None	Neutral
		>0 and <0.14	Negligible adverse	Slight adverse
		≥0.14 and <0.3	Minor adverse	Slight or moderate adverse
		≥0.3 and <1.0	Moderate adverse	Moderate or large adverse
		≥1.0	Major adverse	Large or very large adverse

- 15.3.24 To put the values in Table 15.5 into context, BS 7385 ‘Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground-borne vibration’ (BSI, 1993) provides guidance on the levels of vibration that would be necessary to cause structural damage to different types of buildings. BS 7385 – 2:1993 indicates that:
- In industrial and heavy commercial buildings, continuous PPVs of more than about 25 mm/s would be required to cause structural damage; and
 - In residential buildings and light commercial buildings, continuous PPVs of more than about 7 mm/s would be required to cause structural damage.

Operational noise – changes in road traffic noise

- 15.3.25 The Design Manual for Roads and Bridges (DMRB) HD213/11 (Highways Agency, 2011) describes the impacts 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 performed following the Calculation of Road Traffic Noise (CRTN) methodology (Department of Transport and Welsh Office, 1988).
- 15.3.26 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 be the smallest perceptible change. For this reason the magnitude of short-term and long-term impacts are expressed differently as shown in Table 15.6.

Table 15.6: Magnitude of impact due to changes in road traffic noise in the short-term and long-term

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 and ≤ -5		Moderate beneficial
> -5 and ≤ -3	Moderate beneficial	Minor beneficial
> -3 and ≤ -1	Minor beneficial	Negligible beneficial

Noise change dB LA10,18h	Magnitude of impact for a short-term change in road traffic noise	Magnitude of impact for a long-term change in road traffic noise
> -1 and ≤ -0.1	Negligible beneficial	
0	No change	No change
≥ 0.1 and < +1	Negligible adverse	Negligible adverse
≥ 1 and < +3	Minor adverse	
≥ 3 and < +5	Moderate adverse	Minor adverse
≥ +5 and < +10	Major adverse	Moderate adverse
≥ +10		Major adverse

15.3.27 It can be seen by reference to the Transport Assessment (TA) (**Document C2/3**) produced by Mott MacDonald in support of the planning application that no numerical junction or traffic impact assessment has been undertaken, and no area-wide modelling was considered to be required. The following points are put forward in justification of this approach.

- Car parking spaces facilitated by the club will not be substantially changing, with parking provided by the club restricted to certain users (generally hospitality ticket holders and some season ticket holders) and not available to the majority of supporters;
- The existing Football Match Parking Zones (FMPZ) are effective at deterring match day parking, with a reduction in those travelling to the stadium by car recorded since their implementation in 2008;
- No new highway capacity improvements are planned for the area such as modifications to junctions or widening of strategic roads;
- There are a range of public transport options available for travel to the site providing supporters with a modal choice, reducing reliance upon the car; and
- As junction improvements or other capacity increasing measures would only be required for a short time on a less than weekly basis, and would only serve to encourage additional traffic, no such measures are proposed.

15.3.28 The focus of the TA has been the establishment of the existing modal split of journeys associated with the stadium and its projection into the future with the stadium extension in operation.

15.3.29 This approach has been agreed with LCC.

15.3.30 An increase in vehicle journeys, predominantly private car and taxi are anticipated due to the increase in capacity of the stadium. Based upon the predicted increase in journeys which will be limited to a three-hour period leading up to and one hour following a match, changes in traffic flow sufficient to result in a significant increase in noise are not anticipated. On this basis acoustic modelling of noise impact due to changes in road traffic has not been carried out. A qualitative discussion on traffic noise is included within the assessment section of this technical chapter.

Operational noise – fixed plant associated with the development.

- 15.3.31 Operational noise impacts from fixed plant are assessed in accordance with BS 4142 (BSI, 1997). The BS 4142 approach is based on a comparison of the received noise levels from the source (referred to in the standard as the ‘rating level’) with the baseline background noise level (L_{A90} dB) to determine the likelihood of complaint. The rating level is the noise level (L_{Aeq} dB) received at the receptor location that is representative of the source under consideration. This level may be corrected if the source is judged to have acoustic features such as tonal or impulsive characteristics, in which case an upward correction of 5 dB may be applied.
- 15.3.32 The criteria given by BS 4142 for assessing significance are based on the difference between background noise and the rating level. The differences correspond with a likelihood of complaint, i.e. where:
- the rating level is around 10 dB or more below background: complaints are unlikely;
 - the rating level is around 5 dB above background level: the noise has marginal significance; and
 - the rating level is around 10 dB or more above background: complaints are likely.
- 15.3.33 These criteria have been adapted, as presented in Table 15.7, in order to describe the magnitude of impact and hence the significance of effects in a way that is consistent with the approach of the EIA.

Table 15.7: Criteria for determining the magnitude of noise impacts of fixed plant.

Noise change with respect to existing background (dB)	Magnitude of impact
<-10 dB	None
≥10 and <0	Negligible adverse
≥0 and <5 dB	Minor adverse
≥5 and <10	Moderate adverse
≥10 dB	Major adverse

Operational noise – patrons of the stadium.

- 15.3.34 Noise impacts generated by patrons internal to the stadium cannot be directly controlled and there is no accepted methodology to determine significance of changes in crowd noise egress which is sporadic and highly variable. Sandy Brown Associates is engaged as acoustic designers for the stadium and have evaluated noise egress due to increased capacity; their evaluation is provided in report referenced 12431-M001-B which is appended to this ES (Volume 2, Part 2, Appendix 5.1). The predictions are based upon modelling the crowd noise as a steady state match duration L_{Aeq} noise level and as such do not express the inherent variability and sporadic nature of crowd noise. The anticipated noise changes are discussed in qualitative terms, supported by the Sandy Brown Associates predictions in the ES. Mitigation of crowd noise has been addressed through the design process. The ES

summarises the status of crowd noise mitigation measures inherent in the stand design at the time of issue.

- 15.3.35 Noise impacts generated by patrons external to the stadium in the lead up to and immediately following a game are to a large extent governed by access routes to the stadium and to public realm outside the stadium where patrons can congregate. While noise levels external to the stadium including patron noise have been captured by the baseline survey, there is no established methodology to assess the significance of potential noise increases due to changes in number of members of a football crowd. Potential noise impacts are therefore considered in a narrative way in Section 15.7.

Operational noise – public address and voice alarm systems

- 15.3.36 A PAVA consultant has not been appointed at this stage. Noise from PAVA systems will be addressed later in the design process; however, it is possible to design the PAVA to ensure that public address announcements are no louder at nearest noise sensitive receptors than is currently the case; therefore there will be no significant effect.

15.4 Legislation and policy

National policy

- 15.4.1 The National Planning Policy Framework (NPPF) came into force in March 2012 (DCLG, 2012).
- 15.4.2 Paragraph 109 of the NPPF states that: “*the planning system should contribute to and enhance the natural and local environment by:preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability*”
- 15.4.3 Paragraph 123 of the NPPF states that planning policy 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 placed 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.
- 15.4.4 The Noise Policy Statement for England (NPSE) (DEFRA 2010) was issued by the Department for the Environment, Food and Rural Affairs (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.

Environmental Protection Act

- 15.4.5 Local authorities have 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.

Development Plan Policy

- 15.4.6 The City of Liverpool Unitary Development Plan (LCC, 2002) was adopted in November 2002. The Plan is a "saved plan" under the current planning framework and as such many of its policies remain current. Four policies are of relevance to noise generated by new development and are relevant to the stadium expansion.

Policy EP11 Pollution

- 15.4.7 "1. *Planning permission will not be granted for development which has the potential to create unacceptable air, water, noise or other pollution or nuisance.*"

Policy E9 Leisure Development

- 15.4.8 "1. *Planning permission will be granted for leisure development (as defined below) in the City and District Centres, on those sites listed in Schedule 6.4 and in other locations including edge of centre sites provided: residential amenity is not adversely affected.*"

Policy H4 Primarily Residential Areas

- 15.4.9 *“Within the Primary Residential Areas defined on the Proposals Map, planning permission will be granted for:..... iv. other forms of development, redevelopment or changes of use, provided there is no adverse impact on residential amenity or the character of the area and subject to other policies of the Plan.”*

Policy C7 The Football Clubs

- 15.4.10 *“1. In recognition of the car parking and other amenity problems experienced by many residents living within the locality of Liverpool and Everton Football Clubs, particularly on match days, the City Council will seek to provide effective solutions to remedy these problems, and to maintain and enhance residential amenity in the area.*
- 15.4.11 *2. The City Council will assist both clubs in progressing their development proposals, provided that these do not adversely affect residential amenity and are in accordance with other policies in the Plan.”*
- 15.4.12 LCC commenced preparation of a Core Strategy to replace the strategic policies of the adopted UDP. While that plan reached an advanced stage of preparation it was not submitted for examination and has now been abandoned in favour of producing a city-wide Local Plan. The draft strategic policies of the Core Strategy will be used to inform the emerging Local Plan.
- 15.4.13 Those saved draft policies relating to noise from new development that may be carried forward into the emerging local plan are in the draft Strategic Policy 33, Environmental Impacts, which states:

“New development should seek to avoid negative impacts on the environment through adoption of best practice. Where a negative effect is identified this should be mitigated by appropriate measures. Specifically, development proposals should:.....Minimise light and noise pollution through design”

15.5 Consultation

- 15.5.1 LCC Environmental Protection Department was consulted on 29 November 2013 to confirm the terms of reference for the baseline noise survey. No particular concern was raised other than that the match day noise survey should include measurements during crowd dispersal following the match.
- 15.5.2 A further telephone discussion was carried out on 21st March 2014 during which it was confirmed that for noise from new fixed plant associated with the development, LCC are likely to set a condition that rating level from plant at sensitive receptor locations, when assessed

using BS4142 methodology should not exceed the current background noise level expressed as L_{A90} . The relevant background levels are identified in Section 7.8.

- 15.5.3 In addition, preferred construction hours were confirmed as 8am to 6pm Monday to Friday and 8am to 1pm Saturdays.
- 15.5.4 Scoping responses from interested stakeholders were obtained following submission of the Liverpool FC Stadium Expansion Environmental Scoping Report (Mott MacDonald, 2013). A summary of the scoping responses is provided in Table 15.8.

Table 15.8: Summary of scoping response for noise and vibration

Name of Organisation	Key Concerns	Comment
LCC	None	<i>"I have studied the Noise/Vibration and Lighting sections of the Scoping Report and I have no adverse comments to make."</i>

15.6 Assumptions

Development design

- 15.6.1 The development details are based on those as shown on the planning application plans (**Document A3/4**)

Baseline description

- 15.6.2 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.

Patron noise

- 15.6.3 Noise from patrons both outside and inside the stadium is not directly controllable, nor is it predictable depending as it does on such subjective parameters as prevailing mood, nature of team rivalry, prevailing weather conditions etc. Assessment of patron noise impacts is therefore necessarily qualitative.

Construction activities

- 15.6.4 Information on construction activities at this stage of a project is limited to high level description of construction sequences and provisional details of likely plant to be used.

Professional judgement has therefore been used, when carrying out construction noise predictions, drawing on noise levels for plant provided in BS 5228 Part 1.

15.7 Baseline conditions

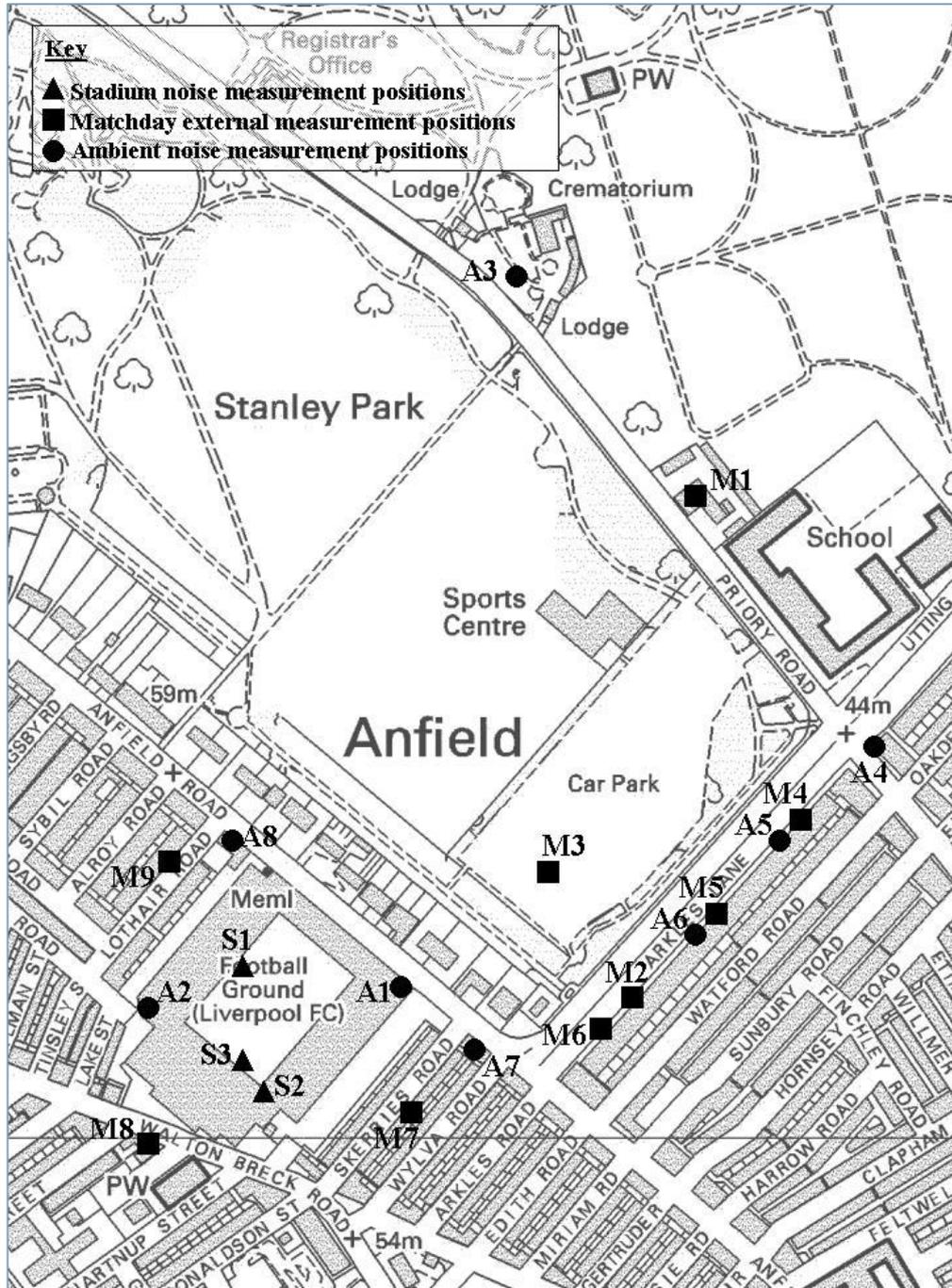
Historic Field Survey

- 15.7.1 Comprehensive noise surveys were carried out in 2002/2003 and then supplemented in 2007 in support of previous planning applications for a new LFC stadium which was to be located in the adjacent Stanley Park. Details of these surveys are available in the ES accompanying both of those applications (LPA ref: 03F/3214 and LPA ref: 07F/2191 respectively), most comprehensively in a report prepared by Arup Acoustics which is reproduced in Appendix 4.3.1 of that document. The Arup document will henceforth be referred to in this technical chapter as “the Arup report” and is reproduced in Volume 2, Part 2, Appendix 5.2.
- 15.7.2 Noise measurements were carried out both within and external to the stadium during two matches. Further ambient noise measurements were carried out to characterise the noise climate on non-match days. Measurement positions are shown in Figure B1 of the Arup report. For ease of reference this figure is reproduced as Figure 15.1. Note that since this figure was produced, most of the residences on Anfield Road immediately to the north east of the stadium and the school buildings on Priory Road have been demolished.

Match Day Noise Levels

- 15.7.3 Measurements were carried out during the following matches:
- Liverpool v Everton, 22 December 2002 (kick off 16:05);
 - Liverpool v Aston Villa, 11 January 2003 (kick off 15:00).
- 15.7.4 Crowd noise break-out from the stadium is considered qualitatively within this assessment supported by predictions of crowd noise egress provided by Sandy Brown Associates who carried out measurements within the ground for the purpose of their predictions. The measurements carried out within the stadium by Arup on match day will not be considered further here. Measurements made external to the stadium may be compared with the recent survey data reported later in this chapter.
- 15.7.5 Continuous noise measurements were made at position M1 on Priory Road over the period 22 to 23 December 2002 from 14:17 to 05:17 recording noise levels before during and after the Everton Match.
- 15.7.6 Continuous noise measurements were made at position M2 at 20 Arkles Lane over the period 11 January 2003 from 13:12 to 17:52 recording noise levels before during and after the Aston Villa Match.

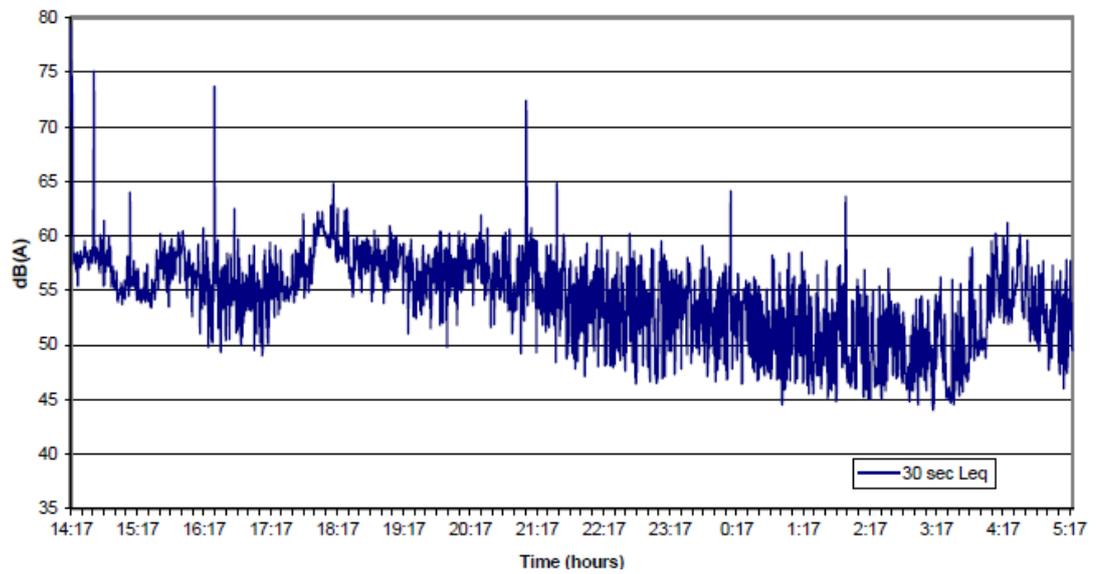
Figure 15.1: 2002/2003 noise survey locations - Anfield



Source: Reproduction of Figure B1 The ARUP report (Volume 2, Part 2, Appendix 5.2)

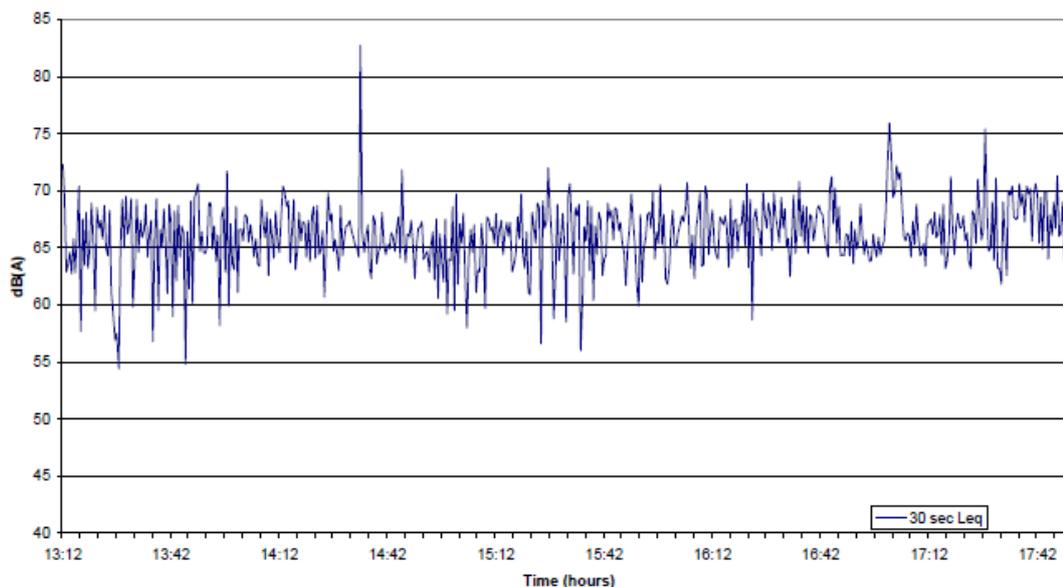
15.7.7 The noise measurement traces in terms of $L_{Aeq,30seconds}$ for each location are reproduced in Figure 15.2 and Figure 15.3.

Figure 15.2: Noise measurements from Position M1 on 22nd December 2002



Source: Figure B4 the Arup report.

Figure 15.3: Noise measurements from Position M2 on 11th January 2003



Source: Figure B4 the Arup report

15.7.8 Further short-term spot measurements were carried out at positions M3 to M9. For convenience of viewing, these measurements are reproduced in Table 15.9 and Table 15.10.

Table 15.9: Measurement results outside stadium during Liverpool v Everton match 22 December 2002

Location	Start time (hrs)	L _{A90} (dB)	L _{A10} (dB)	L _{Amax} (dB)	L _{Aeq} (dB)
M3	15:50	48	55	66	53
M3	15:57	50	62	74	58
M3	16:55	43	49	59	47
M3	17:50	46	55	62	52
M4	16:10	59	71	79	66
M4	17:05	54	69	78	64
M5	16:17	53	70	80	66
M5	17:11	52	66	75	62
M6	16:25	54	65	75	61
M6	17:20	50	65	72	61

Location	Start time (hrs)	L _{A90} (dB)	L _{A10} (dB)	L _{Amax} (dB)	L _{Aeq} (dB)
M7	16:34	51	56	73	56
M7	17:27	52	61	74	58
M9	16:44	42	51	60	48
M9	17:40	45	53	67	51

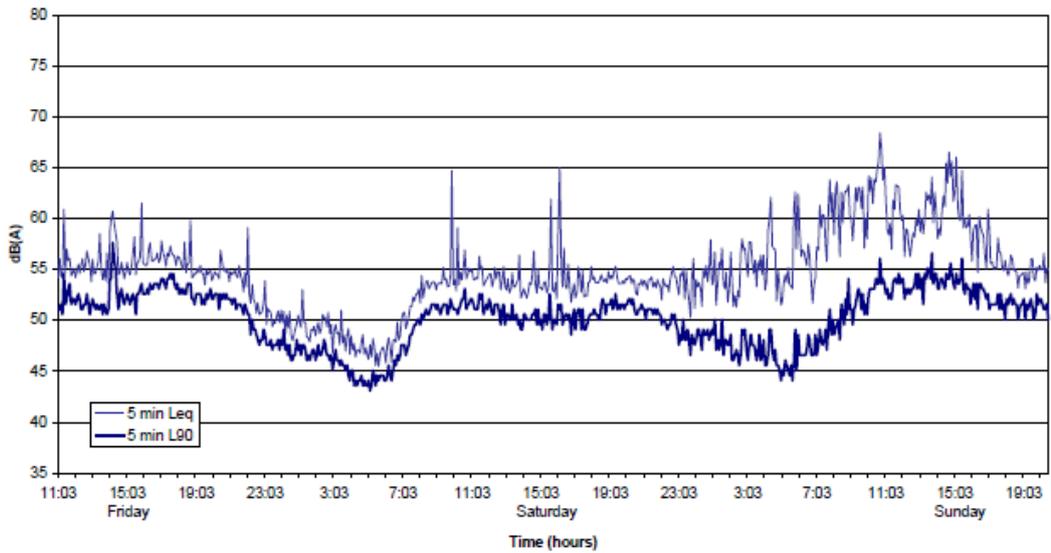
Table 15.10: Measurement results outside stadium during Liverpool v Aston Villa match 11 January 2003

Location	Start time (hrs)	L _{A90} (dB)	L _{A10} (dB)	L _{Amax} (dB)	L _{Aeq} (dB)
M3	14:30	46	58	64	53
M3	14:38	45	55	70	52
M3	14:45	46	56	69	52
M3	14:52	44	53	66	50
M3	14:58	43	57	63	53
M3	15:57	43	49	61	47
M4	16:07	60	71	85	68
M5	15:15	58	69	76	64
M5	16:14	60	70	75	66
M7	15:25	49	57	74	56
M7	16:23	50	59	75	58
M8	15:35	64	75	86	72
M8	16:32	64	73	79	70
M9	15:44	48	64	73	60
M9	16:41	49	59	73	56

Non-Match Day Ambient Noise Levels

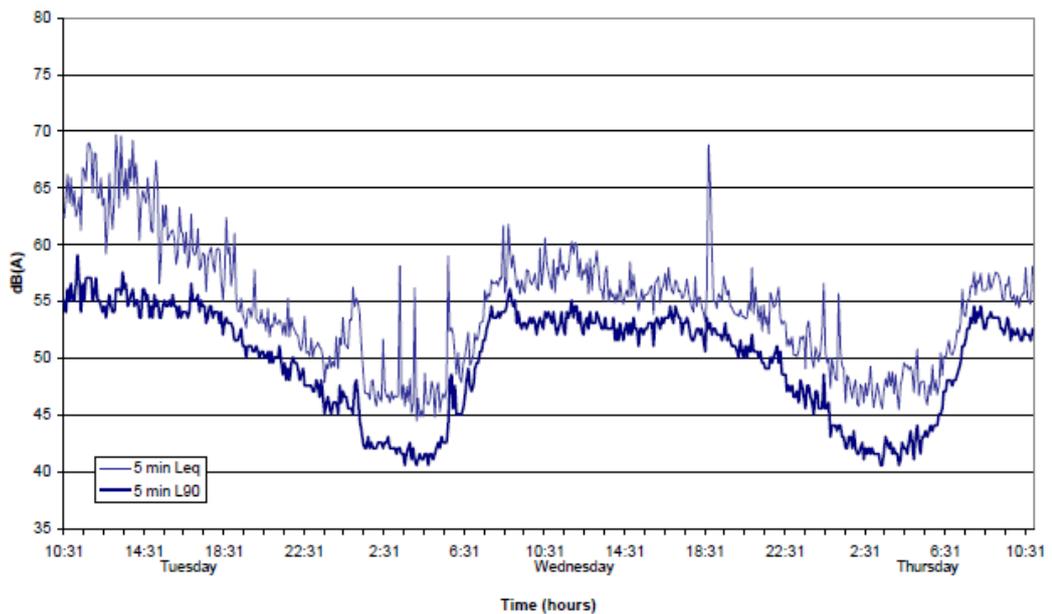
- 15.7.9 Two fixed measurements were taken at positions A1 and A2 on the existing stadium over the periods Friday 14 to Sunday 16 February 2003 and Tuesday 18 to Thursday 20 February 2003. Further attended spot measurements were carried out on Wednesday/Thursday 12/13 March 2003 and Sunday/Monday 16/17 March 2003 at locations A3 to A8. These measurements are reproduced in Figure 15.4 and Figure 15.7 and in Table 15.11 and Table 15.12.

Figure 15.4: Ambient noise data from position A1 14 February to 16 February 2003



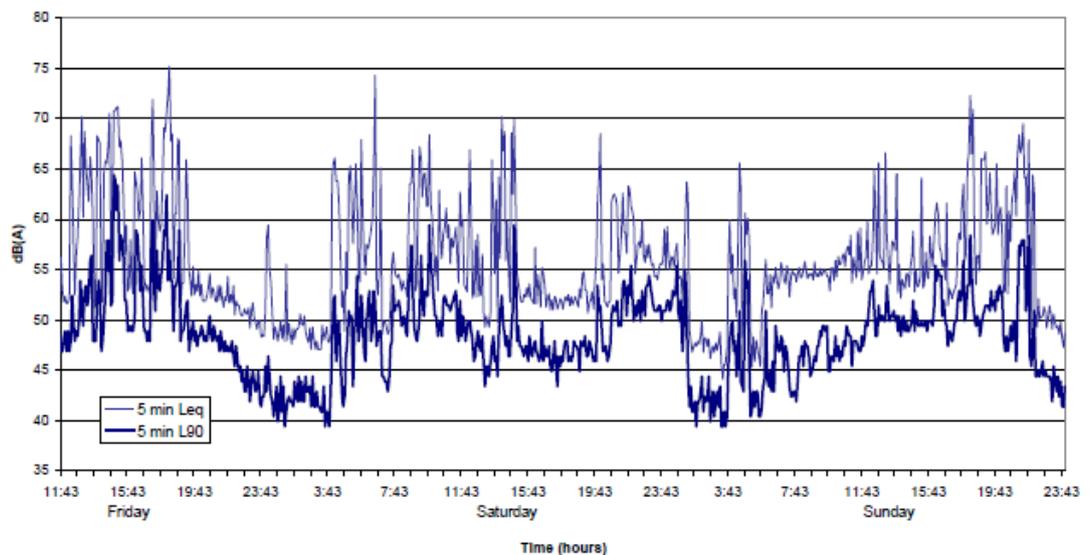
Source: Figure B5 the Arup report

Figure 15.5: Ambient noise data from position A1 18 February to 20 February 2003



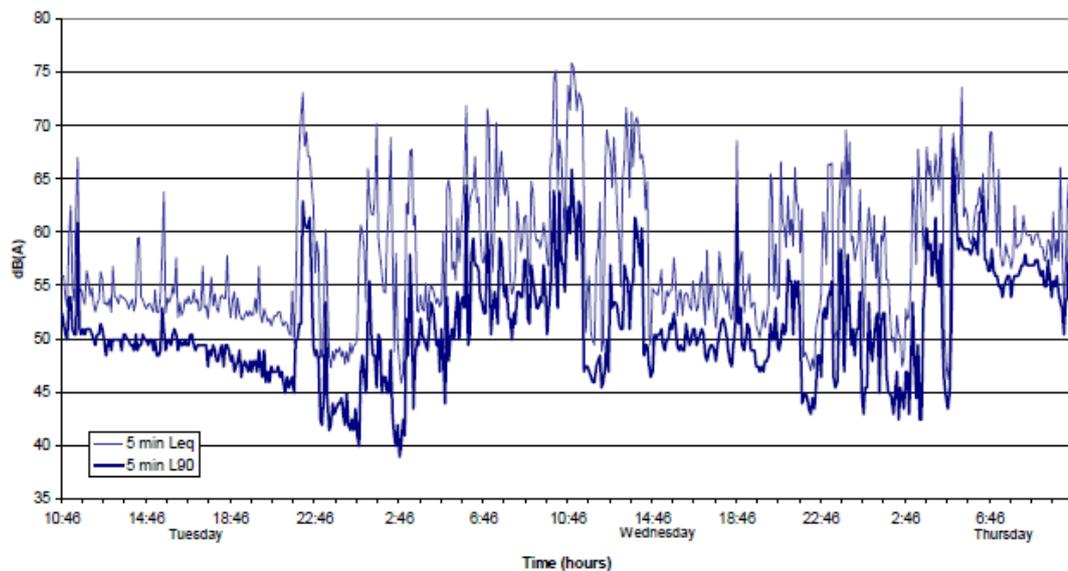
Source: Figure B5 the Arup report

Figure 15.6: Ambient noise data from position A2 14 February to 16 February 2003



Source: Figure B6 the Arup report

Figure 15.7: Ambient noise data from position A2 18 February to 20 February 2003



Source: Figure B6 the Arup report

Table 15.11: Results for measurements at position A3

Date	Start time (hrs)	L _{A90} (dB)	L _{A10} (dB)	L _{Amax} (dB)	L _{Aeq} (dB)
12/03/03	14:06	45	55	65	52
	14:11	46	54	65	52
	15:22	47	55	70	53
	15:27	49	58	71	56

Table 15.12: Results of measurements at position A4

Start Date	Start time (hrs)	L _{A90} (dB)	L _{A10} (dB)	L _{Amax} (dB)	L _{Aeq} (dB)
12/03/03	14:26	62	74	83	70
	14:31	62	75	86	71
	20:55	57	70	79	67
	21:00	59	71	87	68
	22:05	59	71	80	67
	22:10	57	69	76	65
	01:57	31	60	77	59
	02:02	31	60	67	55
	03:11	31	60	76	57
	03:16	32	54	77	56
16/03/03	20:58	56	69	81	66
	21:04	55	70	77	66
	21:57	53	68	78	64
	01:52	39	61	84	61
	02:54	40	63	73	59
	02:59	41	59	74	57

Table 15.13: Results of measurements at position A5

Start Date	Start time (hrs)	L _{A90} (dB)	L _{A10} (dB)	L _{Amax} (dB)	L _{Aeq} (dB)
12/03/03	14:44	58	73	81	68
	14:49	57	75	81	70
	21:53	45	67	80	63
	21:58	48	64	74	61
	02:09	28	50	73	52
	02:14	30	52	72	51
	03:23	27	49	67	48
	03:28	28	53	70	51
16/03/03	21:11	47	69	76	63
	21:16	50	68	83	65

Start Date	Start time (hrs)	L _{A90} (dB)	L _{A10} (dB)	L _{Amax} (dB)	L _{Aeq} (dB)
	22:11	45	63	77	60
	22:16	47	64	75	60
	01:57	34	53	74	53
	02:02	34	54	80	60
	03:08	43	48	58	47
	03:13	43	47	74	52

Table 15.14: Results of measurements at position A6

Start Date	Start time (hrs)	L _{A90} (dB)	L _{A10} (dB)	L _{Amax} (dB)	L _{Aeq} (dB)
12/03/03	14:40	55	73	78	68
	14:45	55	73	81	68
	21:41	44	67	79	63
	21:46	45	68	81	65
	22:52	39	61	78	61
	22:57	37	57	76	58
	02:21	28	46	68	49
	02:26	28	45	72	51
	03:35	27	31	48	30
	03:40	29	49	83	59
16/03/03	22:23	39	59	76	57
	22:28	39	60	76	58
	02:10	34	51	75	54
	02:15	33	44	75	51
	03:20	39	45	56	43
	03:25	39	51	77	56

Table 15.15: Results of measurements at position A7

Start Date	Start time (hrs)	L _{A90} (dB)	L _{A10} (dB)	L _{Amax} (dB)	L _{Aeq} (dB)
12/03/03	14:58	55	67	79	64
	15:03	53	67	82	64
	21:28	44	62	79	60
	21:33	45	59	76	58
	22:39	43	58	72	56
	22:44	44	62	78	60
	2:34	38	47	66	48
	2:39	38	41	52	40
	3:48	38	40	44	39

Start Date	Start time (hrs)	L _{A90} (dB)	L _{A10} (dB)	L _{Amax} (dB)	L _{Aeq} (dB)
	3:53	38	40	47	40
16/03/03	21:25	46	60	84	61
	21:31	46	59	77	59
	22:36	45	55	74	55
	22:41	44	58	69	55
	2:23	43	51	67	49
	2:28	42	44	56	44
	3:34	42	45	58	44
	3:39	43	49	60	47

Table 15.16: Results of measurements at position A8

Start Date	Start time (hrs)	L _{A90} (dB)	L _{A10} (dB)	L _{Amax} (dB)	L _{Aeq} (dB)
12/03/03	15:00	47	64	90	63
	15:05	48	64	84	61
	21:14	44	60	67	56
	21:19	42	57	65	53
	22:26	40	56	74	56
	22:31	40	55	75	52
	02:52	32	42	68	46
	02:57	29	36	47	34
	04:02	31	44	59	42
	04:07	30	37	46	34
16/03/03	21:39	40	61	74	57
	21:44	40	55	75	54
	22:50	37	44	68	48
	22:55	38	55	85	58
	02:36	34	38	54	39
	02:41	34	39	50	37
	03:49	39	46	53	42
	03:54	39	45	53	42

2013/2014 Field survey

15.7.10 Following consultation with LCC Environmental Health Department, additional noise surveys were carried out in December 2013 and January 2014 on a match day and a non-match day in order to provide a more up to date picture of the noise climate in the vicinity of the stadium, and to demonstrate that the previously reported noise measurements remained valid.

15.7.11 Noise measurement locations were selected, to reflect the current proposal to extend two of the existing stands at Anfield, while allowing comparison with relevant data from the previous surveys. The positions were also chosen to reflect the fact that some of the receptors considered in the previous applications will be demolished prior to commencement of the current development. Measurement positions are representative of the nearest receptors which will remain when the proposed development becomes operational. The measurement locations are shown in Figure 15.8.

Figure 15.8: Measurement positions for 2013/2014 noise surveys



Source: Annotated excerpt from SKM Stage C report ref. UN12544 R02, Page 7 figure.

Match Day Noise Measurements

15.7.12 A noise survey was carried out by Mott MacDonald covering the period prior to, during and immediately after the Liverpool v Norwich match on the evening of Wednesday 4 December 2013. Short-term measurements were carried out at five locations in the residential streets around the stadium during the period 18:35 to 22:20. The match was underway between 19:45 and 21:30. Each measurement was of 15 minutes duration, although noise levels over three 5-minute intervals were recorded for approximately half of the measurements taken. Type 1 sound level meters were used for all measurements. The meters were supported

upon tripods so that the microphones were at 1.5m above local ground level. Where possible measurements were taken at least 3.5m from buildings or other obstructions and may be regarded as free field. In some instances, due to restricted room on the footway, measurements were taken at 1m from residential facades. In such instances, a -3dB correction to free field has been applied to the reported measurements. Weather conditions were dry throughout the survey and wind speeds were light and did not influence noise levels.

15.7.13 The measurements are summarised in Table 15.17 to Table 15.22.

Table 15.17: Measurements at position 1 junction of Skerries Road with Anfield Road.

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
04/12/2013	18:36:59	15	62	83	63	56
04/12/2013	19:35:00	15	66	88	68	56
04/12/2013	21:28:00	15	70	89	77	61

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used.

15.7.14 The noise climate at position 1 prior was dominated by noise from a generator powering a memorabilia stall opposite the measurement location, with contribution from amplified music from the food court accessed from Anfield Road, fans approaching the stadium from Arkles Road and PA announcements from within the stadium (the tone introducing the announcement was observed to be clearly audible). Those noise levels exceeded crowd noise during the match.

15.7.15 Subsequent to the match the noise climate continued to be dominated by generator noise and by fans leaving the stadium.

Table 15.18: Measurements at position 2 junction of Skerries Road and Walton Breck Road

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
04/12/2013	19:15:00	15	65	82	67	62
04/12/2013	20:53:09	15	67	78	69	64
04/12/2013	21:45:00	15	65	82	70	61

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used.

15.7.16 The noise climate at position 2 prior to the match was dominated by road traffic on Walton Breck Road, principally buses and taxis and by generators powering food and memorabilia stalls on Walton Breck Road. Additional contributions came from fans approaching the stadium and the beeping of a nearby pedestrian crossing.

15.7.17 During the match the noise climate comprised traffic noise on Walton Breck Road and generator noise.

15.7.18 Subsequent to the match the noise climate principally comprised noise from fans leaving the game and traffic noise. A helicopter overflight was noted on one occasion.

Table 15.19: Measurements at position 3 junction of Varthen Street and Walton Breck Road

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
04/12/2013	18:28:00	15	66	80	69	59
04/12/2013	19:33:59	15	62	84	64	55
04/12/2013	20:31:00	15	64	82	70	50
04/12/2013	21:05:00	15	70	89	72	54
04/12/2013	22:03:15	15	69	94	67	56

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used.

15.7.19 The noise climate at position 3 prior to the match was dominated by road traffic on Walton Breck Road. Additional contributions were observed from car door slams for fans being dropped off, noise from passing fans approaching the stadium, footfall of police horses passing the measurement location and the tone of a nearby pedestrian crossing.

15.7.20 During the match, traffic noise dominated with occasional contributions from the crowd within the stadium, stadium PA announcement and operations within the football stadium service yard.

15.7.21 Subsequent to the match, the noise climate was dominated by traffic noise and fans leaving the stadium on foot. An ambulance siren was noted on one occasion.

Table 15.20: Measurements at position 4 junction of Sybil Road and Rockfield Road

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
04/12/2013	19:15:00	15	55	72	63	46
04/12/2013	20:13:00	15	49	69	49	43
04/12/2013	20:40:00	15	47	71	46	40
04/12/2013	21:50:00	15	48	64	50	43

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used.

15.7.22 The southern end of Sybil Road was a relatively quiet location throughout the survey period. Prior to the match, noise from occasional vehicle movements and passers-by was noted.

15.7.23 During the match, this could be characterised as a quiet location. Occasional passers-by were noted. Crowd noise from the stadium was occasionally just audible.

15.7.24 Subsequent to the match, occasional passers-by were noted. There was a single helicopter movement overhead.

Table 15.21: Measurements at position 5 junction of Sybil Road with Anfield Road

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
04/12/2013	18:56:00	15	60	91	63	50
04/12/2013	19:54:00	15	56	82	61	47
04/12/2013	20:20:00	15	63	84	61	48
04/12/2013	21:30:00	15	64	83	66	57

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used.

15.7.25 The noise at position 5 prior to the match was dominated by fans approaching the stadium along Anfield Road, with some shouting. Intermittent vehicle traffic on Anfield Road and Sybil Road was also noted.

15.7.26 During the match this was a relatively quiet location with occasional passers-by and vehicle movements. Crowd noise was occasionally audible from the stadium.

15.7.27 Subsequent to the match, the noise climate was dominated by fans leaving the stadium along Anfield Road. As the crowd thinned out, there was an increase in vehicle movements. Helicopter noise was noted on one occasion.

Table 15.22: Measurements at position 6 midpoint of Skerries Road

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
04/12/2013	18:54:59	15	57	76	59	53
04/12/2013	19:55:00	15	61	85	60	51
04/12/2013	21:10:13	15	57	82	59	51

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used.

15.7.28 At position 6, prior to the match the noise climate was dominated by amplified music from the fan hospitality area on Anfield Road, with noise from occasional passers-by approaching the stadium.

15.7.29 During the match building services plant noise was noted, apparently emanating from the rear of the Centenary Stand. There was occasional contribution from vehicles, although the road was blocked by police for part of the time, PA from the stadium and occasional noise from the crowd within the stadium.

15.7.30 Further match day noise measurements were carried out by Sandy Brown Associates to inform their modelling of crowd noise egress. These measurements are presented in their report referenced 12431-M001-B which is appended to this ES. Measurements of crowd noise taken within the stadium during a match were used as source terms for computer model predictions of crowd noise transmission to surrounding residential areas for the current

stadium configuration and with the proposed development of the Main Stand in place. Further discussion of these predictions may be found in Section 15.8.

Non-Match Day Noise Measurements

15.7.31 Further short-term noise measurements were undertaken during the day and evening of Thursday 30 January 2014. The measurements were carried out at the same locations as on the match-day, with the exception of an alternative location for position 4 (Sybil Street) which was affected from localised noise from building work on a nearby property during the day-time. In that instance the measurement was carried out at the southern end of Coningsby Road which was observed to experience a similar noise climate to Sybil Street, so the measurement position can be said to be equivalent. Weather conditions were dry throughout the daytime survey; however there was occasional drizzle during the latter part of the evening survey, resulting in damp road surfaces. This was not judged to have significantly affected the noise climate. Wind speeds throughout were light and did not influence noise levels.

15.7.32 The noise measurements are summarised in Table 15.23 to Table 15.28.

Table 15.23: Measurements at position 1 junction of Skerries Road with Anfield Road.

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
30/01/2014	13:26:56	15 mins	58	74	62	45
30/01/2014	15:42:21	15 mins	57	71	63	47
30/01/2014	21:13:16	15 mins	55	75	61	39

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used.

15.7.33 During the day-time the noise climate was dominated by irregular traffic on Anfield Road and Skerries road which predominantly comprised cars and other light vehicles with occasional larger delivery vans. There was some contribution from occasional pedestrians and building services plant – apparently emanating from the rear of the Centenary Stand.

15.7.34 During the evening, the most significant contribution to the noise climate was occasional vehicle traffic on Anfield Road and Skerries Road.

Table 15.24: Measurements at position 2 junction of Skerries Road and Walton Breck Road

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
30/01/2014	14:04:11	15 mins	64	78	67	54
30/01/2014	16:16:48	15 mins	65	81	68	55

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used.

15.7.35 During the day-time, the noise climate at position 2 was dominated by regular traffic on Walton Breck Road, with contributions from passing pedestrians and the tone from a nearby pedestrian crossing. Noise contribution from an aircraft flying over at high altitude was noted on one occasion.

15.7.36 In the evening the traffic on Walton Breck Road continued to be the main source of environmental noise.

Table 15.25: Measurements at position 3 junction of Varthen Street and Walton Breck Road

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
30/01/2014	14:24:24	15 mins	71	82	74	54
30/01/2014	20:14:50	15 mins	67	81	72	42

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used.

15.7.37 The noise climate at position 3 was dominated during both day-time and evening by regular traffic on Walton Breck Road with contribution from passing pedestrians.

Table 15.26: Measurements at position 4 junction of Sybil Road and Rockfield Road

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
30/01/2014	14:48:44**	15 mins	52	74	57	41
30/01/2014	20:36:33	15 mins	45	65	46	33

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used. ** Alternative location used due to localised construction noise.

15.7.38 As described above, during the day, an alternative, equivalent location was selected at the junction of Coningsby Road and Rockfield Road. This is a relatively quiet location. The noise climate was generated by occasional passing cars and pedestrians. There was some contribution from building work being carried out on a number of residences in the neighbourhood.

15.7.39 In the evening, noise was limited to very occasional vehicle movements and noise from residents in nearby houses.

Table 15.27: Measurements at position 5 junction of Sybil Road with Anfield Road

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
30/01/2014	15:06:51	15 mins	61	80	67	46
30/01/2014	20:54:56	15 mins	58	79	64	37

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used.

15.7.40 The noise climate during the day comprised irregular traffic on Anfield Road and occasional passing pedestrians.

15.7.41 In the evening, noise was limited to very occasional vehicle movements and noise from residents in nearby houses. Noise from an aircraft at high altitude was noted on one occasion.

Table 15.28: Measurements at position 6 midpoint of Skerries Road

Date	Start Time	Duration (min)	L _{Aeq} (dB)	L _{Amax} (dB)	Maximum* L _{A10,T} (dB)	Minimum* L _{A90,T} (dB)
30/01/2014	13:46:48	15 mins	58	83	57	48
30/01/2014	16:00:00	15 mins	60	82	61	50
30/01/2014	21:30:25	15 mins	53	79	53	39

* Where 5 minute intervals recorded maximum or minimum L_{n(5mins)} used.

15.7.42 During the day the noise climate at position 6 was dominated by regular traffic on Walton Breck Road and very occasional vehicle movements on Skerries Road. There was limited contribution from plant noise apparently emanating from the Centenary Stand and distant construction noise from site located beyond Walton Breck Road. There was further occasional contribution from amplified music emanating from the stadium during the second measurement period.

15.7.43 During the evening, the noise climate comprised occasional traffic movements on Skerries Road and noise from residents in adjacent houses.

Comparison of 2002/3 and 2013/14 Survey Data

15.7.44 The measurement locations selected for the historic noise surveys and those selected for the more recent surveys differ in a number of cases, partly because the previous surveys were designed to consider a new stadium constructed on an adjacent site and partly because, for the current development, some of the residential streets will be cleared to make way for extension of the new stands. Comparison of Figure 15.1 and Figure 15.8 however shows that there are a number of locations which are approximately equivalent.

15.7.45 For non- match-day measurements, 2002/3 positions A7 and A8 may be said to be equivalent to 2014 positions 1 and 5.

15.7.46 For match-day measurements, 2002/3 positions M7, M8 and M9 may be said to be equivalent to 2013 positions 6, 3 and 4. Table 15.29 and Table 15.30 allow comparison of the range of L_{Aeq} and L_{A90} measurements for the respective sets of non-match day measurements and Table 7.31 allow a comparison of the same parameters during a match. Note that in the case of match days, there was variation in noise between the two matches covered in the historic surveys. The more recent survey was on an evening match rather than a Saturday afternoon

match. Variation should be expected, as parameters affecting the noise climate such as how vocal the fans are inherently variable.

Table 15.29: Non-match Day – Comparison of Historic and Recent Ambient Noise Data

2002/3 Position	2014 Position	Daytime $L_{Aeq,T}$ Range (dB)		Evening $L_{Aeq,T}$ Range (dB)	
		2002/3	2014	2002/3	2014
A7	1	64	57-58	56-60	55
A8	5	61-63	61	48-57	58

Table 15.30: Non-match Day – Comparison of Historic and Recent Background Noise Data

2002/3 Position	2014 Position	Daytime $L_{A90,T}$ Range (dB)		Evening $L_{A90,T}$ Range (dB)	
		2002/3	2014	2002/3	2014
A7	1	53-55	45-47	43-46	39
A8	5	47-48	46	37-44	37

Table 15.31: Match Day – Comparison of Historic and Recent Ambient and Background Noise Data

2002/3 Position	2014 Position	Match $L_{Aeq,T}$ Range (dB)		Match $L_{A90,T}$ Range (dB)	
		2002/3	2014	2002/3	2014
M7	6	56-58	57-61	56-61	51-53
M8	3	70-72	66-70	64	50-59
M9	4	48-60	47-55	42-48	40-46

- 15.7.47 From this comparison two conclusions may be drawn.
- For non-match days, there appears to have been a perceptible reduction in noise level, both L_{Aeq} and L_{A90} ;
 - On match-days noise levels are generally of the same order of magnitude now as they were during the historic noise surveys.
- 15.7.48 The apparent reduction in noise levels for non-match days may be associated with a reduction in traffic levels in this part of Liverpool over the intervening period, reported in the TA produced by Mott MacDonald (**Document C2/3**), and may also reflect local changes in residential occupation with many residences in the area currently standing empty or indeed cleared for regeneration.
- 15.7.49 The more recent survey data should be regarded as definitive for defining existing non-match day baseline noise levels for assessment purposes, but that both sets of data should be regarded as valid for match-day related assessments.

15.8 Assessment of effects

Construction –likely significant effects and mitigation

Incorporated Construction Phase Mitigation

- 15.8.1 Noise and vibration from construction activities will usually be tolerated by the occupiers of sensitive receptors provided that prior notice is given, the impacts are restricted to reasonable times and they are kept to a minimum.
- 15.8.2 Limits for normal working hours and levels of noise at nearby properties will be agreed in advance with LCC and incorporated into the contract specification for the development. The contract will also include a clause requiring that the best practicable means for noise control (BPM) be applied at all times. These should include the selection of the most appropriate method and plant for the job, adequate maintenance of plant, optimum siting of stationary plant, local screening and the education of the workforce. Restrictions may also be placed on early/late delivery times. Potentially affected residents should be kept informed in advance of the works and contacts details be provided to request further information or to report disturbance.
- 15.8.3 Incorporated mitigation related to construction noise and vibration will be set out within the Construction Environmental Management Plan (CEMP). This will identify the series of measures to reduce the environmental effects during the construction period and covers environmental and safety aspects affecting the interests of residents, businesses, all road users and the general public in the vicinity of the works.
- 15.8.4 The effects of potential noise and vibration impacts on affected communities can be mitigated by effective communication between the promoter, contractors and the public. Specific provisions for the notification of affected residents ahead of noisy works and the arrangements for the investigation and remediation of noise issues that may arise during construction will also be required.
- 15.8.5 Where potentially significant residual effects of construction noise and vibration effects are predicted, the contractor should consult LCC to determine potential additional mitigation measures which may be appropriate.

Temporary effects

Effects of Construction of Main Stand

- 15.8.6 At the time of writing, a contractor had not been appointed for the development and the development of the construction methodology was limited to consideration of options for demolition works associated with the Main Stand and construction of the extension to the

stand and new roof. This is reported within the structural engineers' Stage C report (SKM, 2014). A broad construction programme is contained within that report. Information on plant required is limited to the number and type of cranes which will be used for the heavy lifting work throughout the demolition and construction process.

- 15.8.7 In order to provide a more comprehensive construction noise assessment, Mott MacDonald have made assumptions for plant which could be utilised for other operations during the build for site clearance and preparation and for foundation construction. It is understood from correspondence with SKM that piling operations will not be required as part of the construction process.
- 15.8.8 Construction noise emanating from the redevelopment/extension to the Anfield Road Stand has been assessed using the same assumptions applied for the Main Stand construction.
- 15.8.9 Plant noise levels have not been provided to Mott MacDonald, reference noise from Annex C of BS 5228-1:2009 have therefore been assigned to the plant. This information, broken down by construction activity is reproduced in Table 15.32.
- 15.8.10 Two options were provided for grandstand construction, one utilising tower cranes, and the other utilising tracked mobile cranes. The first option has been assumed for the construction noise assessment as BS 5228-1 Annex C data indicates the tower crane option to be a worse case for noise emission.

Table 15.32: Plant information assumed for construction noise assessment.

Construction Activity	Plant Description	Number of Plant Items	BS5228 Reference	Sound Pressure Level at 10m $L_{Aeq, T}$ (dB)	Assumed % on Time of Plant
Site Clearance and Preparation	Mobile Crane	1	C4.46	67	25
	Dozer	1	C2.10	80	50
	Tracked Excavator	1	C2.19	77	50
	Dumper (L_{Amax})	2	C4.9	77	50
Demolition of Main Stand Roof and Seating Tier	Light Weight Crane	1	C4.46	67	50
	Spider Crane	1	C4.39	77	50
	Hand Held Gas Cutter	1	C3.35	65	50
Foundations	Wheeled Loader	1	C2.27	79	50
	Breaker Mounted on Backhoe	1	C1.2	92	25
	Lorry (L_{Amax})	2	C2.34	80	50
	Vibratory Roller	1	C2.37	79	50
	Dump Truck	1	C2.30	79	50

Construction Activity	Plant Description	Number of Plant Items	BS5228 Reference	Sound Pressure Level at 10m $L_{Aeq, T}$ (dB)	Assumed % on Time of Plant
	Tracked Mobile Crane	1	C3.28	67	20
	Tracked Excavator	1	C2.25	78	50
Grandstand Construction	Tower Crane	3	C4.48	76	50
Grandstand Roof Construction	Crawler Crane	2	C4.50	71	50

- 15.8.11 Each activity has been provided with a percentage operating time for any given hour of construction activity. In the absence of detailed contractor's information at this stage in the project, professional judgement has been used in the assignment of this percentage.
- 15.8.12 Noise levels from construction activities have been predicted at the façades of representative sensitive receptors close to the stadium. The predicted construction noise level, combined with the measured baseline level representative of the receptor provides the overall noise level at the receptor during construction. The increase in noise level above the existing baseline due to construction has been determined.
- 15.8.13 Predictions have been carried out for standard working hours, assumed to be Monday to Friday 08:00 – 18:00 and Saturday 08:00 – 13:00.
- 15.8.14 Due to the generally urban nature of the terrain, hard ground conditions are assumed between the construction noise source and the receptor. As a worst case, no screening effect is assumed for intervening structures such as garden fences and walls. For receptors shielded from the construction works by the massing of the stadium itself, a conservative shielding correction of -10dB has been assumed. The baseline measurement selected for calculations is generally the lowest $L_{Aeq, T}$ recorded during standard working hours and is corrected to a façade level if the measurement was carried out in free field.
- 15.8.15 As noise-emitting construction activities will vary in location across the area of the Main Stand and within the red line boundary area in the vicinity of the stand, the noise source to receptor distance has been taken as the distance from the receptor to a notional line half-way between the centre of the likely zone of work and the red line boundary closest to the receptor.
- 15.8.16 Table 15.33 to Table 15.37 present the predicted noise levels at representative receptors. It is important to note that whilst the construction works may take several months, the duration over which noise will be produced in the vicinity of any given receptor will be for shorter periods. Work generating peak levels of noise will be carried out intermittently over this time and will not be constant for these periods. While the details of localised construction durations

will be determined by the contractor, reference to the preliminary construction programme indicates that works will be completed during a two year period.

- 15.8.17 Noise generated by demolition of residential properties within the development red line boundary is covered by a separate application and as such is not considered within this assessment because it will have been completed prior to construction of the expanded stand.

Table 15.33: Predicted increase in façade noise levels due to construction noise at representative sensitive receptors $L_{Aeq,07:00-19:00}$ hours during normal working hours due to site clearance and preparation work for the Main Stand

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
1	45 Anfield Road	50	64	67	+5
2	18 Alroy Road	35	55	70	+15
3	78 Rockfield Road	34	55	71	+16
4	Residence over business Walton Breck Road	90	74	62	0
5	Christ Church Walton Breck Road	115	74	70	+1
6	20 Skerries Road	140	61	48	0
7	Stanley House, Anfield Road	164	60	47	0

Table 15.34: Predicted increase in façade noise levels due to construction noise at representative sensitive receptors $L_{Aeq,07:00-19:00}$ hours during normal working hours due to demolition works on the Main Stand

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
1	45 Anfield Road	50	64	63	+3
2	18 Alroy Road	35	55	66	+11
3	78 Rockfield Road	34	55	67	+12
4	Residence over business Walton Breck Road	90	74	58	0
5	Christ Church Walton Breck Road	115	74	56	0
6	20 Skerries Road	140	61	44	0
7	Stanley House, Anfield Road	164	60	43	0

Table 15.35: Predicted increase in façade noise levels due to construction noise at representative sensitive receptors $L_{Aeq,07:00-19:00}$ hours during normal working hours due to foundation works for the Main Stand

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
1	45 Anfield Road	50	64	76	+12
2	18 Alroy Road	35	55	79	+24
3	78 Rockfield Road	34	55	80	+25
4	Residence over business Walton Breck Road	90	74	71	+2
5	Christ Church Walton Breck Road	115	74	69	+1
6	20 Skerries Road	140	61	57	+1
7	Stanley House, Anfield Road	164	60	56	+1

Table 15.36: Predicted increase in façade noise levels due to construction noise at representative sensitive receptors $L_{Aeq,07:00-19:00}$ hours during normal working hours Main Stand construction

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
1	45 Anfield Road	50	64	66	+4
2	18 Alroy Road	35	55	69	+14
3	78 Rockfield Road	34	55	70	+15
4	Residence over business Walton Breck Road	90	74	61	0
5	Christ Church Walton Breck Road	115	74	59	0
6	20 Skerries Road	140	61	47	0
7	Stanley House, Anfield Road	164	60	46	0

Table 15.37: Predicted increase in façade noise levels due to construction noise at representative sensitive receptors $L_{Aeq,07:00-19:00}$ hours during normal working hours Main Stand roof construction

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
1	45 Anfield Road	50	64	60	+1
2	18 Alroy Road	52	55	63	+9
3	78 Rockfield Road	30	55	63	+9

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
4	Residence over business Walton Breck Road	90	74	54	0
5	Christ Church Walton Breck Road	115	74	52	0
6	20 Skerries Road	140	61	41	0
7	Stanley House, Anfield Road	164	60	39	0

15.8.18 Noise increases of 5 dB or more above existing baseline are deemed to be significant subject to a lower cut-off value for the construction noise component alone of 65 dB $L_{Aeq,T}$ during the day-time, and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.

15.8.19 For the majority of receptors, the predicted noise level from construction alone is not predicted to reach 65 dB. During all phases of construction, with the exception of construction of the roof, frontline properties on Alroy Road and Rockfield Road are predicted to experience noise levels due to construction alone in excess of 65 dBA and a change in overall noise level of 5dB or more. For site clearance and foundation works similar levels of exposure are predicted for receptor 1 (45 Anfield Road). The noise exposure has the potential to last more than 1 month, and therefore may result in a significant effect upon these receptors.

15.8.20 Residences on Rockfield Road, Anfield Road and Sybil Road which are not front-line and therefore benefit from a degree of shielding from the massing of properties closer to the works are not anticipated to experience significant adverse effects.

Effects of Construction of Anfield Road Stand

15.8.21 At the time of writing, no construction information was available for the Anfield Road Stand. A preliminary assessment of potential construction noise impacts has been carried out based upon the assumptions made for the assessment of the Main Stand construction.

15.8.22 Table 15.38 to Table 15.42 present the predicted noise levels at representative receptors.

Table 15.38: Predicted increase in façade noise levels due to construction noise at representative sensitive receptors LAeq,07:00 – 19:00 hours during normal working hours due to site clearance and preparation work for the Anfield Road Stand

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
1	45 Anfield Road	160	64	57	1
5	Christ Church, Walton Breck Road	198	74	45	0
6	20 Skerries Road	72	61	54	1
7	Stanley House, Anfield Road	42	60	69	10
8	144 Anfield Road	147	64	58	1
9	39 Skerries Road	42	60	69	10
10	2 Arkless Lane	148	60	58	2

Table 15.39: Predicted increase in façade noise levels due to construction noise at representative sensitive receptors LAeq,07:00 – 19:00 hours during normal working hours due to demolition works on the Anfield Road Stand

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
1	45 Anfield Road	160	64	53	0
5	Christ Church, Walton Breck Road	198	74	41	0
6	20 Skerries Road	72	61	50	0
7	Stanley House, Anfield Road	42	60	65	6
8	144 Anfield Road	147	64	54	0
9	39 Skerries Road	42	60	65	6
10	2 Arkless Lane	148	60	54	1

Table 15.40: Predicted increase in façade noise levels due to construction noise at representative sensitive receptors LAeq,07:00 – 19:00 hours during normal working hours due to foundation works for the Anfield Road Stand

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
1	45 Anfield Road	160	64	55	1
5	Christ Church, Walton Breck Road	198	74	54	0

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
6	20 Skerries Road	72	61	62	4
7	Stanley House, Anfield Road	42	60	77	17
8	144 Anfield Road	147	64	66	4
9	39 Skerries Road	42	60	77	17
10	2 Arkless Lane	148	60	66	7

Table 15.41: Predicted increase in façade noise levels due to construction noise at representative sensitive receptors $L_{Aeq,07:00-19:00}$ hours during normal working hours for the Anfield Road Stand construction

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
1	45 Anfield Road	160	64	56	1
5	Christ Church, Walton Breck Road	198	74	44	0
6	20 Skerries Road	72	61	53	1
7	Stanley House, Anfield Road	42	60	68	9
8	144 Anfield Road	147	64	57	1
9	39 Skerries Road	42	60	68	9
10	2 Arkless Lane	148	60	57	2

Table 15.42: Predicted increase in façade noise levels due to construction noise at representative sensitive receptors $L_{Aeq,07:00-19:00}$ hours during normal working hours for the Anfield Stand roof construction

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
1	45 Anfield Road	160	64	49	0
5	Christ Church, Walton Breck Road	198	74	38	0
6	20 Skerries Road	72	61	46	0
7	Stanley House, Anfield Road	42	60	61	4
8	144 Anfield Road	147	64	50	0
9	39 Skerries Road	42	60	61	4

Receptor Ref	Receptor	Distance to works (m)	Measured baseline noise level (dBA)	Predicted noise level from construction alone (dBA)	Predicted increase in noise level above baseline with construction (dB)
10	2 Arkless Lane	148	60	50	0

15.8.23 Noise increases of 5 dB or more above existing baseline are deemed to be significant subject to a lower cut-off value for the construction noise component alone of 65dB $L_{Aeq,T}$ during the day-time, and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.

15.8.24 For the majority of receptors, the predicted noise level from construction alone is not predicted to reach 65dB. During all phases of construction, with the exception of construction of the roof, frontline properties at the junction of Anfield Road and Skerries Road which have direct line of site to the work are predicted to experience noise levels due to construction alone in excess of 65 dBA and a change in overall noise level of 5dB or more. During foundation work, similar levels of exposure are predicted for properties at the south end of Arkles Lane, represented by 2 Arkles Lane.

Effects of temporary construction compounds

15.8.25 A construction compound is proposed to be situated off Walton Breck Road in the new ‘Anfield Square’ area. At the time of writing, detailed information has not been defined for the compounds, so quantitative prediction of likely noise impacts has not been carried out. Such a level of information is not anticipated to be available until the detailed design stage of the development. It is likely that equipment such as heavy vehicles, cranes and forklift trucks will access the compounds, which will generate noise on an intermittent basis. The compound is likely to have welfare facilities which may require the use of a generator. There is the potential for sensitive receptors located nearby, to experience noise impacts.

15.8.26 Likely noise mitigation will include:

- acoustic enclosure of external plant;
- temporary noise barriers where there are sensitive receptors close by;
- restrictions on delivery times; and
- appropriate location of ingress and egress point.

Effects of construction traffic

It is understood that the construction traffic is to access the site from Anfield Road and egress onto Walton Breck Road, with the actual preferred construction route for HGV's to be agreed within the CEMP. It is likely that this access and egress configuration would route vehicles to the site from Walton Lane via Priory Road and Arkles Lane, with further investigations and

- any necessary remedial works / traffic management required to make it suitable. The egress route would be on to Walton Breck Road back to Walton Lane.
- 15.8.27 Department for Transport (DfT) traffic flow data for 2012 is available for Walton Breck Road. This data is in the form of annual average daily flow (AADF). In this context a day is 24 hours and the average includes weekends and holiday periods. The AADF data has been used to define an hourly average traffic flow using the following assumptions:
- Traffic flow is constant across the 24 hour period and on all days of the year;
 - Heavy Vehicle (HGV and bus/coach) flow is constant across the 24 hour period and on all days of the year.
- 15.8.28 In reality the traffic flow would be concentrated during the day-time period. The above assumptions may therefore be regarded as extremely conservative for the development of a baseline for the prediction of construction traffic noise.
- 15.8.29 Based upon a schedule of construction deliveries from the contractor provided in Volume 2, Part 2, Appendix 4.1. Mott MacDonald traffic engineers have estimated that, the maximum number of deliveries at any point in the construction period would be approximately 215 per week (430 vehicle movements in total). 80% of these movements are assumed to be HGV, corresponding to approximately 35 daily deliveries, accounting to a total of circa 69 HGV movements during a construction day.
- 15.8.30 Using baseline traffic flows derived as described above and the estimates for construction deliveries traffic flow and composition, a prediction of potential increase in traffic noise level has been made using the methodology provided in CRTN

15.8.31 Table 15.43 summarises the assumed baseline traffic flows and predicted noise levels in terms of descriptor $L_{10,1hour}$.

Table 15.43: Summary of prediction of construction delivery traffic noise.

Condition	Total daily traffic flow	Daily HGV and bus flow	Estimated total hourly traffic flow	Estimated hourly HGV and bus flow	Predicted noise level $L_{10,1hour}$ (dBA)
Baseline	9436*	437*	393	18	66.8
Construction deliveries	86	69	7	6	
Total traffic	9522	506	400	24	66.9

* Based on 2012 AADF data

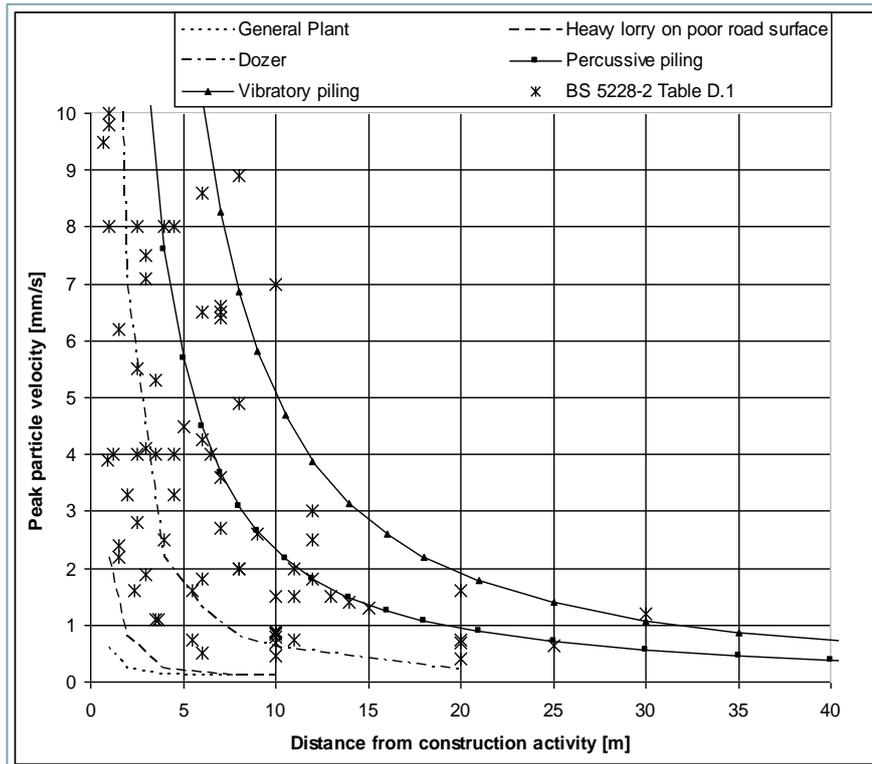
15.8.32 The predicted noise increase due to construction deliveries is less than 1dB and as such would not be regarded as perceptible. No significant adverse effect is therefore anticipated due to construction delivery traffic noise.

15.8.33 The movement of construction workers would also need to be considered. It is anticipated that the majority of these would driver to the vicinity of the site and make use of Stanley Car Park. The intensity of construction workers on site will be finalised within the CEMP, together with details of any shift working or private transport provisions (such as shuttle buses).

Effects of construction vibration

15.8.34 BS 5228 – Part 2: Vibration (2009) provides empirical relationships between various construction operations and vibration levels. Some of these values and those from TRL Report 53 have been plotted – see Figure 15.9.

Figure 15.9: Vibration levels for construction plant using data in BS 5228 and TRL Report 53



15.8.35 From the above figure it can be seen that with the exception of vibratory and percussive piling, other activities attenuate rapidly with distance. No piling work is anticipated for either the Main Stand or Anfield Road Stand extension.

15.8.36 With respect to vibration impacts for the use of general construction plant and vehicle movements which are expected to occur during the majority of works, reference to Table 15.4 and Table 15.7 shows that peak particle velocities (PPV) deemed to have a moderate adverse impact on sensitive receptors (PPV 0.3 – 1.0 mm/s) are unlikely to occur at distances from works of greater than 2m and PPVs deemed to have a minor adverse impact (0.14 to 0.3 mm/s) are unlikely to occur at distances from works of greater than 8m.

15.8.37 Generally sensitive receptors are located more than 8m from the works. Some residential facades lie within 8m of the red line boundary to the overall development e.g. receptor 3 (78 Rockfield Road) and remaining residences on Alroy Road, and therefore have some potential to experience slight or moderate adverse effects from construction vibration should ancillary works approach the boundary. 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. Construction vibration is likely to be at least an order

of magnitude lower than the PPVs of 7mm/s or more which would have the potential to cause cosmetic damage to properties.

Operation – likely significant effects and mitigation

Permanent effects

Changes in Road Traffic Noise

- 15.8.38 Section 15.3 of this technical chapter sets out the reasons identified in the TA why the acoustic modelling of change in traffic noise has not been carried out.
- 15.8.39 Mott MacDonald traffic engineers have produced a summary of anticipated increases in car and taxi journeys associated with the development for the three hours leading up to a match; although detailed information of traffic flow along specific routes is not available. Table 15.44 summarises these anticipated increases.

Table 15.44: Anticipated increases in vehicle journeys associated with the stadium expansion

Day	Mode of Travel	Existing 2013	After Development Implementation
Weekday	Car	11,546	15,036
	Taxi	3,637	4,765
Weekend	Car	9,935	12,709
	Taxi	4,040	5,611

- 15.8.40 The journeys in Table 15.38 are spread across the network of roads in the Anfield area and do not represent traffic flows on individual streets. However, if a simple worst case assessment is made assuming that all the additional traffic is passing front line receptors on a single street a prediction using the calculation methodology provided in CRTN indicates an increase in noise level of no more than 1.2 dB. Reference to Table 15.6 indicates that such an increase would represent a minor adverse effect in the short-term and a negligible adverse effect in the long-term. Furthermore the increase would be restricted to match days/evenings only. It is also anticipated that the measures proposed within the TA relating to manage transport links and routes to the stadium are aimed at reducing private car journeys to less than those shown in Table 15.38.
- Table 15.38: Predicted increase in façade noise levels due to construction noise at representative sensitive receptors LAeq,07:00 – 19:00 hours during normal working hours due to site clearance and preparation work for the Anfield Road Stand
- There are new bus and taxi-drop off points proposed by the TA. Of particular note are city centre express buses, which currently pick-up and drop-off on Walton Breck Road, and will operate to and from new bus stands on Robson Street, due to the proposed temporary closure of Walton Breck Road on match days. It is understood that up to 12 buses may stack on Robson Street during the match whilst awaiting fans. While the numbers of vehicles involved are not sufficient to give rise to an increased traffic noise level, there is the potential

for noise disturbance due to buses, and taxis waiting with engines idling, as well as vehicle door slamming and noise generated by buses pulling away. In mitigation therefore, bus and taxi stands will be managed such that vehicle engines are switched off during waiting periods. Post-match the passenger loading areas for buses on Walton Lane and Robson Street will be managed to help ensure efficient loading of departing spectators, and that the bus waiting area is not used by any other vehicle. And the passenger loading area for taxis on Sleepers Hill will be managed to help ensure efficient loading of departing spectators, and to reduce the likelihood of vehicle conflicts.

- 15.8.41 For the reasons stated above, it is concluded that changes in traffic flow sufficient to produce a significant increase in noise are not anticipated. No significant permanent effects are therefore predicted due to changes in traffic flows upon implementation of the development.

Fixed plant associated with the development

- 15.8.42 At the time of this assessment, details of the type, number, locations and noise output of new items of fixed building services plant associated with the stadium development are not known and it has not been possible to predict resultant rating noise levels for plant at sensitive receptors using the methodology described in BS 4142.
- 15.8.43 Notwithstanding this, it is possible to ensure that mitigation measures for building services plant are included; these may comprise, optimum location of plant to minimise noise emission, selection of quiet equipment options, use of attenuators, deployment of screening measures or other measures appropriate to the equipment specified.
- 15.8.44 Table 15.45 presents the background noise level, determined from the available noise survey data which are appropriate for assessment of building services plant once full details are confirmed. Criteria are provided for both match-day and non-match-day conditions. Background noise levels presented are free field.

Table 15.45: Background noise levels L_{A90} for match days and non-match days

Representative receptor ref	Representative receptor	L_{A90} daytime match (dB)	L_{A90} evening match (dB)	L_{A90} daytime – non-match (dB)	L_{A90} evening – non-match (dB)
1	45 Anfield Road		61	46	37
2	13 Sybil Road rear boundary	42	40	41	33
3	78 Rockfield Road	42	40	41	33
4	Residence over business Walton Breck Road	50	50	54	42
5	Church Walton Breck Road	50	50	54	42
9	39 Skerries Road	49	51	48	39

Representative receptor ref	Representative receptor	L _{A90} daytime match (dB)	L _{A90} evening match (dB)	L _{A90} daytime – non-match (dB)	L _{A90} evening – non-match (dB)
10	2 Arkless Lane	56	56	45	39

- 15.8.45 In accordance with Table 15.7, with mitigation measures implemented such that the rating noise levels due to new building services installations at sensitive receptors are less than 5 dB above the existing background noise level expressed as L_{A90} (dB), no significant adverse effect is predicted.
- 15.8.46 LCC has indicated that it is likely that a planning condition will be set that the rating noise level from building services plant should not exceed the existing background level expressed as L_{A90} (dB).

Patrons of the stadium

- 15.8.47 As discussed in Section 15.2 of this technical chapter noise from patrons of the football stadium is inherently variable and not directly controllable. There is no established methodology to assess noise from patrons external to and within the stadium.
- 15.8.48 No quantitative assessment of impacts and effects has therefore been carried out for patron noise external to the stadium. It is reasonable to assume however that main pedestrian routes to the stadium will continue to experience noise levels of the order of those reported by Arup at positions M4, M5, M2, M6, and M8; and by Mott MacDonald at Positions 1, 2, 3 and 5 during the periods immediately before and after a match. The pedestrian routes from new bus and taxi drop off points provided within the TA will experience additional footfall from fans approaching and leaving the stadium, although this increase is not quantified. An associated increase in noise from pedestrians along these routes may be anticipated. As a worse case noise levels may approach those measured at the positions listed above, however those measurement positions were subject to noise contribution from traffic and generators from stalls etc which will not be present on the new pedestrian routes. In the immediate vicinity of the extended Main Stand, retained properties on Alroy Road and properties at the eastern end of Rockfield Road will become front line properties to the concourse immediately outside the stand. They are therefore likely to be subject to noise generated by fans congregating prior to and dispersing after a match. Noise levels here may therefore approach those currently experienced on Anfield Road close to the stadium.
- 15.8.49 Match day noise measurements along Arkles Lane provided in the Arup report show that the prevailing ambient noise level is in the range L_{Aeq} 62 to 68 dBA in the residential areas where there will be line of sight to the upper tier of the proposed Main Stand.
- 15.8.50 As discussed in Section 15.3, Sandy Brown Associates has made predictions of the contribution to the match-day noise climate from the crowd within the ground with the proposed Main Stand (Phase One) compared to the current situation. Further predictions

- have been carried out with the addition of the expanded Anfield Road Stand (Phase Two) in conjunction with Phase One. The predictions are limited to change in crowd noise contribution in terms of the overall crowd noise L_{Aeq} for the period of the match.
- 15.8.51 Following implementation of Phase One, for the majority of receptors, the Sandy Brown Associates report predicts that there will be little or no increase in crowd noise contribution. For part of Stanley Park, principally that area used for car parking; increases in crowd noise contribution of between 5 and 8 dB will be experienced. Given the use of this area for parking and as a walking route to the stadium for fans during match day, this area of Stanley Park would not be regarded as a sensitive receptor for this type of noise impact. Some west facing properties on Arkles Lane and a small zone at the extreme north end of Watford Road, parallel to Arkles Lane, are predicted to show an increase in crowd noise contribution of 5 to 6 dB. The predicted L_{Aeq} due to crowd noise contribution alone along the residential side of Arkles Lane and along Watford Road is predicted to be in the range 56 to 63 dBA.
- 15.8.52 To the south west of the stadium, in the vicinity of Walton Breck Primary School, the Sandy Brown Associates report predicts very localised zones or position with increases in crowd noise of 3dB or greater. As matches generally occur outside school hours, no adverse effect on the school would occur. The locations are of such limited size, and fall within a broader zone of no or negligible predicted increase that these predictions should not be regarded as being indicative of a significant effect.
- 15.8.53 By cumulative assessment, combining the predicted increase in contribution of crowd noise, with the existing measured match day baseline levels a maximum increase in “match L_{Aeq} ” of 3.5 dB is implied which would be regarded as just perceptible under normal conditions if this were a steady noise source. It is possible that the change in noise from the crowd emanating from the stadium will be perceptible at some residences. However individual response to this type of noise will be subjective. The change in crowd noise will be perceptible for only a limited period on an average of 28 days of the year. Crowd noise is therefore temporary in nature and its character is not anticipated to cause a significant adverse impact in the context of this location, close to an established football stadium.
- 15.8.54 The new Main Stand design, incorporates side screening at each end of the stand. This partial enclosure minimises the line of sight from the crowd to sensitive receptors outside the stadium and hence limits noise egress. This measure is considered by the designers to provide the optimum amount of noise screening.
- 15.8.55 Prediction of crowd noise break-out following the implementation of Phase Two indicates that some of the increase in crowd noise contribution to the overall noise climate resulting from the implementation of Phase One will be mitigated. This is because the extended Anfield Road Stand will act as a barrier to line of sight from the upper tier of the Main Stand to residential areas to the north east of the stadium. Properties on Arkles Lane and Watford Road are predicted to experience increases in crowd noise contribution of 2 to 4 dB compared with the predictions for the current situation. The predicted L_{Aeq} due to crowd noise contribution alone

along the residential side of Arkles Lane and along Watford Road is in the range to 55 to 61 dBA. By cumulative assessment, combining the predicted increase in contribution of crowd noise, with the existing measured match day baseline levels a maximum increase in “match L_{Aeq} ” of 3 dB is implied which would be regarded as just perceptible under normal conditions if this were a steady noise source. The area predicted to experience this level of increase is however significantly smaller than for the implementation of Phase One alone.

Public address and voice alarm systems

- 15.8.56 Proposals to extend the PAVA system to provide coverage of the new stand are being developed. The PAVA systems will be designed to ensure that public address announcements are not more intrusive to sensitive receptors than the currently operating system. Provided this approach to PAVA design is implemented, no significant adverse effects are predicted. Table 15.40 summarises the effects described above.

15.9 Cumulative effects

- 15.9.1 Cumulative effects are those that may result from the combination of past, present or future actions of existing or planned activities in a project’s zone of influence (ZoI). While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.
- 15.9.2 The current list of planned developments which are included in the cumulative impact assessment, are those identified in the Anfield SRF comprising:
- Anfield Village & Rockfield housing refurbishment;
 - New build housing led regeneration;
 - The Walton Breck Road (The High Street) Corridor;
 - New public space and Village Square development (training hotel and offices);
 - Completion of the restoration of Stanley Park east of Mill Lane.

Temporary effects

Construction noise

- 15.9.3 From the perspective of noise and vibration effects, there is uncertainty relating to the timings of construction of the various developments in the vicinity of the stadium and whether construction programmes will coincide resulting in the potential for cumulative construction noise effects. It is possible that individual receptors may be exposed to construction noise from more than one development concurrently resulting in an increase in combined noise level or sequentially resulting in a longer duration of exposure. The CEMP will address the potential for such cumulative construction noise effects and the best practicable means of ameliorating them.

Permanent Effects

Operational Noise

- 15.9.4 The sensitive receptors considered within this ES are generally representative of the nearest receptors to the red line boundary of the Anfield Stadium application. Generally, sensitive receptors located within the other proposed developments will experience noise from operations of the Stadium of a magnitude which is no greater than those existing receptors.

15.10 Residual effects

- 15.10.1 The potential for temporary adverse residual effects has been identified due to construction noise at some locations close to the red line boundary for this proposal. These residual effects are summarised in Table 15.46.

15.11 Summary of effects

- 15.11.1 A tabulated summary of effects is presented within Table 15.46:

Table 15.46: Summary of effects for Noise and Vibration

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/ Beneficial	Permanent/ Temporary	Residual Effect
Construction	Residential receptors on Anfield Road, Alroy Road and Rockfield Road closest to the construction works for the Main Stand Residential receptors close to the junction of Anfield Road and Skerries Road and the southern extremity of Arkles Lane closest to construction works for the Anfield Road Stand.	Potential effect of noise arising from site clearance and preparation, demolition of the existing roof of the Main Stand and from the construction of foundations and erection of the extended Main Stand.	The CEMP will define additional mitigation measures, developed in consultation with LCC, to address the residual effect.	Moderate or Major	Adverse	Temporary	Significant
Operation	Residential and non-Residential Receptors in the vicinity of Anfield Stadium.	Effects of changes in ambient noise due to changes in traffic associated with operation of the extended stadium.	No additional mitigation over and above that incorporated in the development.	Neutral or Minor	Adverse	Permanent	Not significant
		Effects of noise generated by new building services plant associated with the operation of the extended stadium.	No additional mitigation over and above that incorporated in the development.	Neutral	N/A	Permanent	Not significant
		Effects of noise from PAVA systems	No additional mitigation over and above that incorporated in the development.	Neutral	NA	Permanent	Not significant
		Effects of noise from patrons of the stadium	No additional mitigation over and above that incorporated in the development.	Neutral or Minor	Adverse	Permanent	Not significant

15.12 Proposed monitoring

15.12.1 No monitoring is required for the proposed development.

15.13 Statement of significance

15.13.1 This technical chapter has identified the potential for temporary significant residual effects due to construction noise levels at sensitive receptors closest to the zone of construction for the Main Stand and for the subsequent development of the Anfield Road Stand.

15.13.2 No permanent or temporary significant effects relating to noise and vibration are identified due to operation of the extended stadium.

15.14 References

[Ref 01] Mott MacDonald, 2014. "Liverpool Football Club Stadium Expansion Transport Assessment"

[Ref 02] CIRIA, 2011. "C.693 Noise and Vibration from Road and Rail"

[Ref 03] Highways Agency, 2008. "Design Manual for Roads and Bridges, Volume 11 Environmental Assessment, Part 5 HA 205/08 Assessment and Management of Environmental Effects."

[Ref 04] BSI, 2009. "British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise."

[Ref 05] Department of Transport, 1986. "Transport and Road Research Laboratory Report 53. Ground Vibration Caused by Civil Engineering Works."

[Ref 06] BSI, 2009. "British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration."

[Ref 07] BSI, 1993. British Standard BS 7385. "Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground-borne vibration."

[Ref 08] Highways Agency, 2011. "Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration."

[Ref 09] Department of Transport and Welsh Office, 1988. "Calculation of Road Traffic Noise."

[Ref 10] BSI, 1997. "British Standard BS 4142 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas."

[Ref 11] DCLG, 1012. "National Planning Policy Framework."

[Ref 12] DEFRA, 2010. "The Noise Policy Statement for England."

[Ref 13] HMSO, 1974. "Control of Pollution Act – Part III Noise."

[Ref 14] HMSO, 1990. "Environmental Protection Act."

[Ref 15] Liverpool City Council, 2002. "The City of Liverpool Unitary Development Plan."

[Ref 16] Liverpool City Council, 2012. "Submission Draft, Liverpool Core Strategy 2012."

[Ref 17] Mott MacDonald, 2013. "Liverpool FC Stadium Expansion Environmental Scoping Report."

[Ref 18] Turleys Associates, 2008. New Stadium for Liverpool Football Club Stanley Park, Liverpool: Environmental Statement

[Ref 19] SKM, 2014. "UN12544R02 Anfield Stadium Expansion Project Phase 1 Stage C Civil & Structural Engineering, Fire Engineering and Acoustics."

[Ref 20] Sandy Brown Associates, 2014. "Report 12431-M001-A"

16 Ecology

16.1 Introduction

- 16.1.1 Ecology is the study of the interactions of biodiversity and their environment and nature conservation; it is concerned with maintaining a favourable conservation status of a species population, habitat or ecosystems.
- 16.1.2 This chapter considers the ecological assets that have the potential to be affected by the LFC Stadium Expansion located at LFC Stadium and land to the west and north of the current stadium.
- 16.1.3 The proposed development has the potential to cause effects on ecological assets during the construction and operational phases. These include:
- Effects on designated sites;
 - Effects on habitats, plant communities and flora;
 - Effects on protected animal species; and
 - Effects on protected, notable and invasive species.
- 16.1.4 The general approach to the assessment:
- Identifies the relevant framework of nature conservation legislation, policies and planning guidance;
 - Provides an in-depth description of the ecological baseline within the study area;
 - Identifies and assesses all potential significant impacts;
 - Defines all the relevant mitigation measures included as part of the development; and
 - Identifies any residual impacts.
- 16.1.5 This chapter has been prepared by Mott MacDonald Ltd.

Design measures incorporated

- 16.1.6 No specific ecology related design measures are incorporated within this assessment.

16.2 Methodology

- 16.2.1 The assessment has been undertaken in accordance with the Institute of Ecology and Environmental Management (IEEM) Guidelines for Ecological Impact Assessment in the United Kingdom (2006) [Ref 01]. These guidelines are used nationally for the production of ecological impact assessments.

Sources of information

- 16.2.2 A number of standard methods were followed to allow an evaluation of the baseline conditions with the Zone of Influence (Zoi; see section 16.3.18 and Table 16.2). These include a desk

study, an Extended Phase 1 Habitat Survey which included a survey for badgers, as well as an evaluation of the site for potential to support birds, great crested newts and reptiles, and an initial bat survey of the buildings and trees within the site.

- 16.2.3 Details on the precise methodology and best practice guidance followed are outlined in the following section.

Assessment criteria

Scope of the assessment

- 16.2.4 The assessment of the effects follows the IEEM guidelines [Ref 01]. These guidelines are widely used nationally for the production of ecological impact assessments.

- 16.2.5 The starting point of any assessment of effects is to determine which features should be subject to detailed assessment. Ecological receptors to be subject to more detailed assessment should be a) of sufficient value that impacts upon them may be significant (in terms of legislation or policy); and b) potentially vulnerable to significant impacts arising from the development. A summary of the key points from the guidance is given in the following section.

Determining Value

- 16.2.6 The IEEM guidelines recommend that the value of the ecological receptors or features is determined based on a geographic frame of reference that includes the following levels:
- International;
 - UK;
 - National;
 - Regional;
 - County;
 - District;
 - Local;
 - Within Ecological Zone of Influence only.

Valuing Habitats

- 16.2.7 In accordance with the IEEM guidelines, the value of habitats is measured against published selection criteria where available. Reference is also made to National and Local (Merseyside) Habitat Action Plans (HAPs), although as the guidelines note, the presence of a HAP reflects the fact that the habitat is in a sub-optimal state (and hence that action is required) and does not necessarily imply any specific level of protection for the habitat. In accordance with the guidance, features may be assigned greater value if there is a reasonable chance that they can be restored to a higher value in the future.

Valuing Species

- 16.2.8 In accordance with the IEEM guidelines, in assigning a level of value to a species, it is necessary to consider its distribution and status, including a consideration of trends based on available historical records. Rarity is an important consideration because of its relationship with threat and vulnerability although since some species are inherently rare, it is necessary to look at rarity in the context of status. A species that is rare and declining should be assigned a higher level of importance than one that is rare but known to be stable.
- 16.2.9 Reference is also made to National and Local (Merseyside) BAPs although the presence of a BAP-listed species reflects the fact that the population is in a sub-optimal state and does not necessarily imply any specific level of importance.

Predicting and Characterising Ecological Impacts

- 16.2.10 In accordance with IEEM guidelines, when describing impacts, reference is made to the following where applicable:
- Confidence in predictions – owing to the potential unknowns and uncertainties in the impact appraisal, each predicted impact on the ecological resources is given a confidence level, to estimate the probability of that impact having a significant effect on that feature. Confidence levels are shown in Table 16.1

Table 16.1: Confidence levels

Confidence Level	Probability of Outcome
Certain	Probability estimated at 95% chance or higher
Probable	Probability estimated above 50% and below 95%
Unlikely	Probability estimated above 5% but less than 50%
Extremely unlikely	Probability estimated at less than 5%

Source: IEEM, 2006

- Magnitude – the size or amount of an impact, determined on a quantitative basis, if possible, should be assessed;
- Extent – the area over which an impact occurs;
- Duration – the time for which an impact is expected to last
- Reversibility – a permanent impact is one that is irreversible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it; a temporary impact is one from which a spontaneous recovery is possible;
- Timing and frequency – whether impacts occur during critical life stages or seasons.

Direct and Indirect Ecological Impacts

- 16.2.11 Both direct and indirect impacts are considered within this assessment. A direct impact is directly attributable to a defined action such as the physical loss of a habitat or the immediate mortality of an individual of a particular species. Indirect impacts are attributable to an action, but which effect ecological resources through effects on an intermediary ecosystem, process or receptor. An example of an indirect effect would be the change in a plant community following changes to local hydrological conditions which are directly attributable to a development.

Approaches for Determining Significant Effects

- 16.2.12 In accordance with the IEEM guidelines, a significant effect, in ecological terms, is defined as an impact (either adverse or positive) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area, including cumulative effects.
- 16.2.13 In accordance with the IEEM guidelines, the approach adopted here aims to determine an effect to be significant or not on a basis of a discussion of the factors which characterise it, i.e. the ecological significance of the effect is not dependent on the value of the feature in question.
- 16.2.14 As noted above, effects are only assessed in detail for receptors of sufficient value that effects upon them may be significant (in terms of legislation or policy). In this assessment effects are assessed in detail only for receptors of at least local value or subject to some form of legal protection.
- 16.2.15 Any significant effects remaining after mitigation (the residual effects), together with an assessment of the likelihood of success in the mitigation, are the factors to be considered against legislation, policy and development control in determining the application.
- 16.2.16 The effects of the development on the ecological receptor in question will be discussed in terms of the following:
- Description of feature and ecological value;
 - Proposed activity;
 - Effects of unmitigated impact;
 - Effect on integrity or conservation status and confidence level;
 - Mitigation and enhancement; and
 - Residual effects and confidence level.

Study Area

- 16.2.17 Current guidance on ecological assessments recommends that all ecological features that occur within a Zone of Influence around the development are investigated (Ref 01). The potential ZoI includes:
- Areas directly within the land take for the development and access;
 - Areas which will be temporarily affected during construction;
 - Areas likely to be impacted by hydrological disruption; and
 - Areas where there is a risk of pollution and noise disturbance during construction and/or operation.
- 16.2.18 For the development the ZoI is a buffer around the site, the width of which depends on the sensitivity of the habitat or species to disturbance and change in biophysical conditions resulting from the construction and operation of the development. The ZoI for the ecological features around the development is defined in Table 16.2.

Table 16.2: Ecological Features and Zone of Influence

Ecological Features/Receptor	Zone of Influence
International designated sites	2km (30km for sites supporting bats)
National designated sites	2km
Local Nature Reserves	2km
Regional/County Wildlife Sites	1km
Phase 1 Habitats	Within the site boundary
Badger (<i>Meles meles</i>)	30m
Bats (potential roost sites in buildings)	50m
Bats (foraging routes/activity)	Within the site boundary
Birds	Within the site boundary
Great Crested Newt (<i>Triturus cristatus</i>)	250m
Reptiles	Within the site boundary

Method of baseline data collection

Desk study

- 16.2.19 A desk study was undertaken, as recommended in the Chartered Institute of Ecology and Environmental Management (CIEEM) 'Guidelines for Preliminary Ecological Appraisal' (Ref 02), to determine the presence of any designated nature conservation sites and protected or notable species that have been recorded within a 2 km radius of the site. This radius was extended to 5 km for bats, as recommended by English Nature's *Bat Mitigation Guidelines* [Ref 03], and 10 km for International and European conservation sites including: Special

Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar Sites. This radius was extended to 30km for bat Special Areas of Conservation (SAC). This involved consulting the following organisations and ecological databases:

- Merseyside BioBank (MBB); and,
- Multi Agency Geographical Information for the Countryside (MAGIC) website for statutory conservation sites.

Extended Phase 1 habitat survey

16.2.20 An extended Phase 1 habitat survey was undertaken on the 30 October 2013 which involved a combination of mapping the habitat types present on site following the Joint Nature Conservation Committee (JNCC) Phase 1 survey methodology [Ref 04]; and an assessment of those habitats for their potential to support protected or notable species following CIEEM guidance [Ref 02]. During the mapping procedure all dominant species of flora were identified along with sub-dominant species where possible. Any protected or notable species present were recorded either by direct observation or indirectly from the presence of their field signs. At all times general habitat assessments were made for the possibility of the site to support protected or notable species.

16.2.21 This survey provides information relating to the habitats found within the site perimeter as well as the potential presence of legally protected or notable species. A plant species list was recorded for each broad habitat type identified, with nomenclature based on Stace [Ref 05]. This survey cannot, therefore, be considered to provide a wholly comprehensive account of the ecological interest of the site and it should be noted that this report does not constitute an Ecological Impact Assessment. The survey does, however, provide a “snapshot” of the ecological interest present on the day of the survey visit.

Badger Survey

16.2.22 The survey area was searched for evidence of badger (*Meles meles*), following the methodology as outlined by Harris, Creswell and Jefferies [Ref 06]. The search covered all land within the site, and up to and including a 30m potential impact zone beyond the boundaries. Evidence of badger presence includes:

- Setts;
- Latrines;
- Prints and paths or trackways;
- Hairs caught on rough wood or fencing; and
- Other evidence including snuffle holes, feeding remains and scratching posts.

16.2.23 Where setts were present, their status and level of activity was noted. Sett status is broadly categorised as follows:

- **Main:** generally the largest sett within a badger clan's territory, with a relatively large number of sett entrances with well-worn pathways between them, and conspicuous spoil mounds. This type of sett will be occupied throughout the year and used for breeding;
- **Annexe:** normally found within 150m of the main sett comprising many entrances, this type of sett may not be occupied throughout the year, and can be used for breeding if there is more than one breeding sow within the clan;
- **Subsidiary:** similar to an annexe sett, but typically located further from the main sett. This type of sett will not be occupied throughout the year and lacks the well-worn paths associated with main and annexe setts; and
- **Outlier:** consisting of one or two entrances, this type of sett will be found furthest from the main sett and will only be used sporadically throughout the year.

16.2.24 The suitability of the existing habitats, as badger breeding and foraging habitat, was assessed during the preliminary ecological survey.

Bat Survey

Building Inspection

- 16.2.25 The football stadium was internally and externally assessed to determine its potential to support roosting bats. This was undertaken in the field by a licensed bat worker. The survey was commensurate with good practice, following the guidance set out in the Bat Mitigation Guidelines [Ref 03] and Bat Surveys: Good Practice Guidelines 2nd Edition [Ref 07].
- 16.2.26 The building survey included looking for signs of use by bats, internally and externally, including:
- Bat droppings (size of droppings grouped into small, medium or large to signify type of bat that may be present);
 - Feeding remains (bats often eat the bodies and leave the wings of invertebrate prey including moths, butterflies and larger flies such as lace wings);
 - Oil (from fur) and urine stains;
 - Scratch marks;
 - Bat corpses; and
 - Actual sightings.
- 16.2.27 The buildings were examined using direct observation, binoculars, endoscopes, ladders and a high power torch, where necessary, to enable closer inspection of suitable features.
- 16.2.28 Each building or stadium stand was classified as having negligible, low, moderate or high potential for roosting bats, or as a confirmed bat roost, based upon the evidence discovered during the survey or the features of the stand. These features include gaps under roof and ridge tiles, and around lead flashing; holes in the roof or gable end of buildings; gaps under the eaves; gaps between sections of corrugated walls; and in the undercroft and welfare area

behind the stadium seating. The criteria for assessing the potential of each building to support roosting bats are outlined in Table 16.3.

Table 16.3: Criteria for bat roost potential assessment of a structure

Bat Roost Potential	Description
Negligible	The structure lacks any features suitable for roosting bats.
Low	The structure may have some interest to roosting bats, e.g. external roosting features such as fascia or soffit boards, but is considered to be sub-optimal to the extent that bats would not be anticipated to use it.
Moderate	The structure exhibits features suitable for use by roosting bats, such as internal and external cavities well insulated from external weather conditions, but is less than ideal in some way. It may be situated in less than ideal habitat, lacking suitable commuting corridors.
High	The structure exhibits a number of features suitable for use by roosting bats e.g. numerous roosting opportunities such as dark, enclosed roof voids; the structure has a high degree of connectivity with likely navigation routes; and the building is located within suitable foraging habitat, likely to be noticed by commuting bats.
Confirmed	Positive signs of bats are recorded within the structure (internally or externally), such as individual bats or bat droppings.

Source: Modified from Bat Surveys – Good Practice Guidelines – 2nd Edition (Ref 07).

Tree Inspection

16.2.29 All trees within and immediately adjacent to the site were surveyed for evidence of, or potential for, roosting bats. The trees were classified according to the criteria detailed in Table 16.4, based upon the features of trees commonly used by roosting bats, Table 16.5.

Table 16.4: Protocol for visual inspection of trees due to be affected by arboricultural work, to assess the value of the trees to bats

Tree Category	Description
Known Roost	Trees with a confirmed roost present
1*	Trees with multiple, highly suitable features capable of supporting larger roosts.
1	Trees with definite bat potential, supporting fewer suitable features than category 1* trees or with potential for use by single bats.
2	Trees with no obvious potential, although the tree is of a size and age that elevated surveys may result in cracks or crevices being found; or the tree supports some features which may have limited potential to support bats.
3	Trees with no bat potential to support bats.

Source: Bat Surveys – Good Practice Guidelines – 2nd Edition (Ref 07).

Table 16.5: Features of trees commonly used by bats for roosting and shelter, and field signs that may indicate use of trees by bats

Features of Trees Used as Bat Roosts	Signs Indicating Possible Use by Bats
Natural holes	Tiny scratches around entry point
Woodpecker holes	Staining around entry point

Features of Trees Used as Bat Roosts	Signs Indicating Possible Use by Bats
Cracks / splits in major limbs	Bat droppings in, around or below entrance
Loose bark	Audible squeaking at dawn or in warm weather
Hollows / cavities	Flies around entry point
Dense epicormic growth (bats may roost within it)	Distinctive smell of bats
Bird and bat boxes	Smoothing of surfaces around cavity

Source: Bat Surveys – Good Practice Guidelines – 2nd Edition (Ref 07)

16.2.30 Any habitat considered suitable for commuting or foraging bats was also recorded.

16.3 Legislation and policy

Legislative Requirements

- 16.3.1 Many habitats and species are protected to varying degrees through national and European legislation. Advice relating to wildlife is also given in various policy documents. The main legislation and policy guidance relevant to this chapter are:
- Convention on Biological Diversity (CBD) 1992;
 - The Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar) 1971;
 - EC Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (Habitats Directive 1982) as amended (92/43/EEC);
 - EC Directive on the Conservation of Wild Birds (Birds Directive 1979) as amended (79/409/EEC);
 - Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979) as amended;
 - Bonn Convention on the Conservation of Migratory Species of Wild Animals (1979) as amended; and
 - Bonn Convention on the Conservation of Migratory Species of Wild Animals - Agreement on the Conservation of Bats in Europe (1999) as amended.
- 16.3.2 The main piece of UK legislation on nature conservation is the Wildlife and Countryside Act 1981 (as amended). Other relevant national legislation includes:
- Environmental Protection Act 1990;
 - Conservation of Habitats and Species (Amendment) Regulations 2012;
 - Protection of Badgers Act 1992;
 - Wild Mammals (Protection) Act 1996;
 - Countryside and Rights of Way (CRoW) Act 2000;
 - Natural Environment and Rural Communities (NERC) Act 2006;
 - The Hedgerow Regulations 1997; and
 - Environment Act 1995.

Planning Policy Requirements

- 16.3.3 Chapter 11 of the National Planning Policy Framework (NPPF) 'Conserving and enhancing the natural environment' sets out the Government's policies on biodiversity, landscape and geological conservation. In summary, with regards to ecology and biodiversity, the NPPF requires that the planning system and planning policies should:
- Minimise impacts on biodiversity and provide net gains in biodiversity where possible;
 - Recognise the wider benefits of ecosystem services;
 - Explore and encourage opportunities to incorporate biodiversity in and around developments;
 - Refuse planning permission if significant harm cannot be avoided, adequately mitigated, or, as a last resort, compensated for;
 - Not normally lead to a consent where the development on land within or outside a Site of Special Scientific Interest (SSSI) would be likely to have an adverse effect on the SSSI (either individually or in combination with other developments), and Lead to a refusal of planning permission if development will result in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss.

Local Policy

Unitary Development Plan

- 16.3.4 The Liverpool Unitary Development Plan (UDP) is a statutory document that plays a major role in shaping the future of the city. It was adopted in November 2002. Under the new planning system, the UDP is a 'saved plan'; the majority of its policies have been 'saved' and continue to carry development plan status. The UDP will eventually be replaced by the new Local Plan. Until then the saved policies of the UDP, together with those of the Merseyside and Halton Waste Local Plan comprise the adopted statutory development plan for making planning decisions in Liverpool

- 16.3.5 Within the current UDP, the following policies are relevant to the development:

OE5 – Protection of Nature Conservation Sites and Features

- 16.3.6 The City Council will seek to protect the nature conservation interest of open land and the water environment in the City by not permitting development which would:

- 16.3.7 Destroy, fragment or adversely affect directly or indirectly a designated or proposed Special Protection Area (SPA), Ramsar site, or Site of Specific Scientific Interest (SSSI), unless the City Council is satisfied that there is no alternative solution and there are imperative reasons of overriding public interest;

1. Destroy, fragment or adversely directly or indirectly affect a site of Nature Conservation Value as identified by the City Council unless it can be clearly demonstrated that there are reasons for the proposal including benefits to the community, which outweigh the need to safeguard the substantive nature conservation value of the site;
2. Destroy, fragment or adversely directly or indirectly affect a Regionally Important Geological/Geomorphological Site (RIGS) unless it can be demonstrated that the benefits of the proposal to the community outweigh the need to safeguard the geological value of the site; or,
3. Have an adverse effect on legally protected wildlife species.

16.3.8 In assessing the criteria 1-4 full account will be taken of proposed mitigation measures.

OE6 – Development and Nature Conservation

16.3.9 In the circumstances where development is permitted on or adjacent to any sites covered by policy OE5, which in the case of the Mersey Estuary will be subject to the most rigorous examination, the City Council will seek to minimise potential damage by:

1. Requiring developers to undertake a site investigation to identify the nature conservation interest of the site;
2. Requiring developers to set out proposals for the protection and management of the nature conservation value of the site; and,
3. Considering the use of conditions and/or planning obligations to safeguard the nature conservation interest and/or provide compensatory measures for any nature conservation interest damaged or destroyed during the development process.

OE7 – Habitat Creation and Enhancement

16.3.10 The City Council will seek to enhance the nature conservation interest of open land and water courses in the City by:

1. Supporting and initiating proposals for habitat creation and enhancement particularly within Sites of Nature Conservation Value and those other sites which, although do not meet the criteria required to be designated as an SNCV, are considered to be of value for nature conservation;
2. Supporting proposals which strengthen and enhance wildlife corridors in the City;
3. Managing its own land, and particularly the City's parks, in a manner more positively beneficial to wildlife and encouraging other landowners to do the same where appropriate;
4. Encouraging the reopening of culverted water courses where opportunities arise and supporting the Alt 2000 initiative;
5. Encouraging developers to undertake landscaping in an ecologically sensitive manner; and,

6. Encouraging and supporting community groups, schools and other organisations to work in partnership with the City Council on habitat creation and enhancement initiatives.

OE12 – Enhancement of Green Space

- 16.3.11 The City Council will seek to enhance the overall stock of publicly accessible green space by:
1. Improving the quality and management of existing parks, playing fields, golf courses and cemeteries;
 2. Pursuing opportunities for new recreational provision in areas of local open space deficiency as identified in this Plan, particularly on green spaces surplus to the City Council requirements for other purposes; and,
 3. Providing new parks as identified on the Proposals Map.

Liverpool Local Plan

- 16.3.12 Liverpool City Council commenced preparation of a Core Strategy to replace the strategic policies of the adopted UDP. While that plan reached an advanced stage of preparation it was not submitted for examination and has now been abandoned in favour of producing a city-wide Local Plan. The draft strategic policies of the Core Strategy will be used to inform the emerging Local Plan.
- 16.3.13 The draft Core Strategy recognises that Liverpool has a significant green infrastructure resource which contributes to the character and environmental quality of the City. Green infrastructure is described in the Liverpool Green Infrastructure Strategy as "*the network of natural environmental components and green and blue spaces within and around Liverpool which provides multiple social, economic and environmental benefits.*" This network includes land in both public and private ownership, comprising the City's Green Wedges, parks, local wildlife sites, allotments, street trees, hedges, cemeteries and private gardens, and its water spaces, including the River Mersey, the Leeds Liverpool canal, park lakes and water courses.
- 16.3.14 The document includes a number of draft policies that may be included in the emerging Local Plan. These set out the broad framework for protecting and enhancing green infrastructure in Liverpool and specific priorities for different areas of the City.

Strategic Policy 26 – Protecting and Enhancing Green Infrastructure

16.3.15 Protection

1. Liverpool's green infrastructure resource will be protected from inappropriate development. Specifically, protection will be afforded to:
 - a. Sites that provide a high number of green infrastructure functions/benefits or a function/benefit in an area of need

- b. Strategically important open spaces, comprising Green Belt, Green Wedges and the Mersey Estuary SSSI/SPA/Ramsar Site
 - c. The network of City, District, Neighbourhood and Local Parks
 - d. Biodiversity assets, including Local Wildlife Sites (LWS) and Local Nature Reserves (LNR)
 - e. Regionally Important Geological/Geomorphological Sites (RIGS)
 - f. Locally important open spaces and water courses, including amenity spaces, allotments, playing fields and pitches
 - g. Open spaces of historic value
2. Development which is considered likely to cause material harm to a site will not be supported unless the benefits outweigh its loss. Where there is a loss of a green infrastructure asset, replacement provision may be required. In assessing material harm, account will be taken of:
- a. Recreational function, visual amenity, biodiversity, historic and structural quality and value; and,
 - b. The green infrastructure functions provided.

16.3.16 Enhancement

3. Green infrastructure will be managed and enhanced to support the regeneration of the City, strengthen its distinctive sense of place and provide a multi-functional resource capable of delivering a wide range of environmental, economic and other quality of life benefits for local communities within the City by:
- a. Requiring development proposals to make an appropriate contribution to the enhancement of the City's green infrastructure resource, either through on-site provision or a contribution to improving the function, quality and/or value of a nearby open space or green infrastructure asset. This could include:
 - i. The use of innovative green infrastructure measures such as green roofs in the design of the development
 - ii. Integration and enhancement of biodiversity features
 - iii. Contributing to effective water management through the use of permeable surfaces and/or Sustainable Urban Drainage Systems and where possible and appropriate to do so the opening up of culverted watercourses
 - iv. Improving or creating green routes to encourage active and sustainable travel and recreation
 - v. Improving the recreational function of open spaces, particularly where it would assist in minimising recreational pressures on internationally-designated sites both within and beyond the City boundary
 - vi. Providing or enhancing green infrastructure at key gateways to, and along, key corridors in the City
 - vii. Maintaining access to, and where required addressing deficiencies in, accessible open space.

- b. Requiring green infrastructure plans for all major development proposals to set out how the proposal will contribute to the objectives of the Green Infrastructure Strategy, including an assessment of the green infrastructure functions and benefits provided.
 - c. Supporting innovative small-scale green infrastructure projects which meet identified needs of that area. This could include food growing, small community gardens or public art projects.
4. The City's green infrastructure assets will be identified, and the detailed criteria-based policy for protecting and enhancing green infrastructure, will be set out in a further development plan document.

Strategic Policy 27 – Supporting Green Infrastructure Initiatives

16.3.17 The City Council will support and help deliver the aims and objectives of local and sub-regional green infrastructure initiatives and programmes that seek to enhance and create green infrastructure in Liverpool and which deliver a wide range of environmental, economic and quality of life benefits for local communities within the City, including:

- a. The Mersey Forest;
- b. Green Infrastructure Framework for the Liverpool City Region
- c. North Merseyside Biodiversity Action Plan;
- d. Liverpool City Region Ecological Framework.

Strategic Policy 29 – Green Infrastructure in the Urban Core

16.3.18 In the Urban Core, the focus will be on improving the overall quality, value and function of the existing green infrastructure resource for the benefit of local communities. This will be achieved by:

- a. Protecting and enhancing:
 - i. City Parks - Newsham, Everton, Stanley, Walton Hall and Princes Parks, and Wavertree Botanic Park and Gardens;
 - ii. Locally important open space sites;
 - iii. Existing locally important wildlife sites at Melrose Cutting and Stanley Sidings.
- b. Maximising opportunities to enhance and/or introduce wildlife into existing areas of open space;
- c. Improving or creating green paths and cycle ways, through development proposals that link residential areas with existing open spaces (including the waterfront), employment locations, local community services and leisure facilities.

Biodiversity Action Plans

- 16.3.19 As a result of new drivers and requirements, the 'UK Post-2010 Biodiversity Framework', published in July 2012, has now succeeded the UK Biodiversity Action Plan (UK BAP). A key aspect of this new mechanism has been the devolution of UK habitat and species action plan lists to individual countries, meaning that Natural England now maintains these lists of Habitats and Species of Principal Importance in England. Under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, the Secretary of State has a requirement to produce and maintain these lists. As a result, the former UK BAP habitats and species are now referred to as Section 41 (or S41) habitats and species. Additionally, under section 40 of the NERC act public authorities have an obligation to conserve biodiversity.

16.4 Consultation

- 16.4.1 Table 16.6 provides a summary of the consultation activities undertaken in support of the preparation of this Chapter.

Table 16.6: Summary of scoping response for ecology and nature

Name of Organisation	Key Concerns	Comment
Natural England	None	At present it is not a priority for Natural England to advise on the detail of this EIA as it does not affect any nationally designated sites
LCC – Kevin Curran (Nature Conservation Officer)	The derelict terraced housing inside the red line boundary will be demolished irrespective of the stadium development and should therefore be excluded from the assessment.	The derelict and empty terraced housing is excluded from the assessment.

16.5 Assumptions and limitations

- 16.5.1 LCC is pursuing separate applications for the demolition of the terraced housing (on Lothair Road, Alroy Road, Rockfield Road) and works of demolition are due to commence prior to the stadium expansion application. Those works are independent and will be happening regardless of whether the stadium development happens, and therefore the baseline for the EclA assumes that all the houses within the red line boundary will be demolished and are excluded from this assessment.

16.6 Baseline conditions

- 16.6.1 This section presents descriptions of the key and protected ecological receptors in the relevant Zol. More detailed descriptions, survey data and aerial maps are presented in the

Preliminary Ecological Appraisal (Volume 2, Part 3, Appendix 4.1) and the Initial Bat Assessment (Volume 2, Part 3, Appendix 4.2).

Designated sites

- 16.6.2 There are no statutory designated nature conservation sites within 2 km of the development (and none designated for bats within 30 km). However, there are two non-statutory nature conservation sites: Melrose Cutting LWS (1.6 km north-west) and Leeds and Liverpool Canal LWS (1.7 km west).
- 16.6.3 Given the distance to these sites (it is significantly beyond the ZOI for the development) and that the impacts during construction and operation of the development are likely to be limited to the curtilage or very close to the site; the proposed works are not predicted to directly impact upon any of the statutory or non-statutory nature conservation sites.
- 16.6.4 There is, therefore, no requirement to consider designated sites further within this assessment.

Habitats, Plant Communities and Flora

Phase 1 habitat survey results

- 16.6.5 The following sections include brief descriptions of the main habitat types and plant communities present within the site and the immediately adjacent areas. It is comprised of information from the Preliminary Ecological Appraisal (Volume 2, Part 3, Appendix 4.1).
- 16.6.6 Anfield Stadium is located between Walton Breck Road and Anfield Road in the Anfield ward of Liverpool, approximately 2 miles (3 km) to the north of the city centre, with terraced housing positioned on three sides of the stadium. The application site is approximately 6.9ha in area and consists predominately of buildings and associated hard-standing including the stadium and its environs, terraced housing and existing roads; a small area of public open space formerly occupied by housing lies at the south-eastern corner.
- 16.6.7 There are two main areas of amenity grassland within the site, the current football pitch inside the stadium and the newly created area of public open space (POS) in the south-west corner of the site. The football pitch is subject to an intensive growth and cutting regime and as such the grass species present within the sward were unidentifiable. The amenity grassland located in the area of POS consists mainly of annual meadow-grass (*Poa annua*) with red fescue (*Festuca rubra*) and perennial ryegrass (*Lolium perenne*) also present. A few common forb species were identified within the swards including white clover (*Trifolium repens*), daisy (*Bellis perennis*), creeping buttercup (*Ranunculus repens*), greater plantain (*Plantago major*) and dandelion (*Taraxacum officinale* agg.).

- 16.6.8 The area north of Anfield Road was previously occupied by a number of large detached houses which have subsequently been demolished leaving two large areas of bare ground consisting of mixed hard-core rubble and earth. The bulk of the ground cover around the stadium is comprised from hardstanding including blacktop car parks and access routes and concrete paving slabs.
- 16.6.9 Some small areas of introduced shrub are present in the south-west corner of the site in the area of POS. An ornamental shrub border along Gilman Street includes lavender (*Lavandula latifolia*), rosemary (*Rosmarinus officinalis*), hydrangea (*Hydrangea* sp.), magnolia (*Magnolia* sp.) and ornamental rose (*Rosa* sp.) and is fenced off from the adjacent amenity grassland. Two other areas of introduced shrub bisect the amenity grassland creating a screen between Walton Breck Road and the grassland behind it. Cherry laurel (*Prunus laurocerasus*) and an ornamental bamboo (*Bambusa* sp.) are the main species present in these areas.
- 16.6.10 Planted within the amenity grassland in the area of POS are some silver birch (*Betula pendula*) saplings along with more individual stands of bamboo. Additionally, a number of mature trees including ash (*Fraxinus excelsior*), cherry (*Prunus* sp.) and horse-chestnut (*Aesculus hippocastanum*) are present immediately adjacent to the site within Stanley Park.

Protected, Notable and Invasive Plant Species

- 16.6.11 No protected, notable or invasive plant species were identified during the Extended Phase 1 Habitat Survey and none were listed within the historic records obtained during the desk study. As such, they will not be considered further in this assessment.

Protected Animal Species

Badgers

- 16.6.12 No badgers or signs of badgers were found during the Preliminary Ecological Appraisal (Volume 2, Part 3, Appendix 4.1) and no historical records of badger were returned by the desk study. The site and the vast majority of the immediately surrounding habitats are completely unsuitable for badgers. As a result, this species will not be considered further within this assessment.

Bats

- 16.6.13 The desk study identified five different species of bat which frequently occur within 5 km of the site.
- 16.6.14 An Initial Bat Assessment of the buildings and trees located inside the red line boundary was undertaken on 30 October 2013, full details of which can be found in ES Volume 2, Part 3,

- Appendix 4.1. This assessment excluded all buildings currently outside the ownership of LFC, which includes the empty housing on Lothair Road, Alroy Road and Rockfield Road.
- 16.6.15 The stadium as a whole offers very little suitability for roosting bats; however, despite the lack of roosting opportunities, a single pipistrelle (*Pipistrellus* sp.) bat was found roosting in The Kop stand during the survey. The presence of the bat is likely because of a number of factors:
1. The stadium is not regularly used over the summer period when bats are active, or at night, meaning it is quiet;
 2. Unrestricted access is available to the roosting position via open entrance/exit points into the seating area; and,
 3. Stable atmospheric conditions; the welfare areas behind the seating are unheated and not in direct sunlight.
- 16.6.16 Pipistrelle bats are the most common bat in the urban environment and a small, opportunistic species able to exploit areas for roosting unsuitable for other bats. The presence of the bat within The Kop stand can potentially be explained by the combination of factors outlined above, combined with the opportunistic nature of the species and daring of a singular bat. It is highly unlikely that more bats will be roosting elsewhere with the stadium or that more bats will exploit the unique environment currently found within the second floor welfare area of The Kop.
- 16.6.17 None of the trees within the site are of sufficient maturity to support roosting bats. The trees immediately adjacent to the site within Stanley Park are of sufficient maturity but currently lack the features required to support roosting bats. All trees within and immediately adjacent to the site have been classified as Category 3 trees – no potential to support bats, and therefore roosting bats are not anticipated as being present within these habitats.
- 16.6.18 Foraging bats are unlikely to use the site in any great capacity. The small amount of suitable habitat, the introduced shrub, which is present within the site, is not likely to support the numbers of invertebrates required to make it a regular foraging resource. It is more likely that bats occasionally forage or move across the site when heading towards Stanley Park, which has good foraging resources for a range of different bat species. Although now over six years old, the survey work completed as part of the LFC Stanley Park Environmental Statement supports this assumption.
- 16.6.19 As no works are currently planned to The Kop stand, and given the levels of disturbance the bat is willing to endure when the stadium is in use, it is considered that the planned development will have no significant effect on the individual currently roosting within the stand. As a result, this species will not be considered further within this assessment.

Birds

- 16.6.20 The desk study identified a number of different urban bird species, although only feral pigeon was noted during the survey. The buildings and introduced shrub within the site have some low potential to support nesting birds but there is better quality nesting habitat located immediately adjacent to the site in Stanley Park. As a result, birds will not be considered further within this assessment.

Great crested newts

- 16.6.21 The desk study failed to identify any records of great crested newts within 2 km of the site and based on aerial photography and OS mapping there are no ponds within 500m of the site. The site mainly contains buildings and hardstanding habitats which are completely unsuitable for great crested newts and other amphibians. Even though the areas of introduced shrub could be utilised by great crested newts and other amphibians as terrestrial habitat these habitats are completely isolated from breeding ponds and are recently created habitats so will not have historic populations. As a result, this species will not be considered further within this assessment.

Invertebrates

- 16.6.22 The habitats found on site are generally of poor quality and low ecological interest, frequently occurring across the wider landscape, with the vast majority of the site unsuitable for anything other than common invertebrate species. As a result, invertebrates will not be considered further within this assessment.

Reptiles

- 16.6.23 The desk study failed to highlight any reptile species within 2 km of the site and there is negligible suitable habitat within the site to support reptiles. Additionally the site is isolated from other suitable areas of reptile habitat and as such reptiles are not anticipated to be present on the site. As a result, reptiles will not be considered further within this assessment.

Summary of Valued Ecological Receptors for Further Consideration

- 16.6.24 As recommended in the current EclA guidance (IEEM, 2006), the assessment in this chapter only considers those ecological receptors that are both of sufficient conservation value and vulnerable to significant impacts arising from the development. These are termed Valued Ecological Receptors (VERs).
- 16.6.25 It is generally considered inappropriate to attempt to address all ecological receptors and likely impacts in EIAs; instead, the focus should be on ecological receptors and ecological features which are covered by the relevant nature conservation and environmental legislation

and policies. The EIA Directive and resulting UK Regulations only require the assessment of significant effects.

Valued Ecological Receptors (VERs)

- 16.6.26 Based on the surveys undertaken to date, the habitats found on and immediately adjacent to the site, and the fact that the derelict terraced housing has been excluded from this assessment, no sensitive receptors have been identified.
- 16.6.27 All ecological receptors, described within the baseline conditions above (Section 16.6), are excluded from further consideration in this assessment. This is because their conservation value is not sufficiently high, according to those criteria already described, for them to be considered as VERs, or because it is considered unlikely that they will be significantly impacted by the proposed development.

16.7 Assessment of effects

- 16.7.1 There are no significant effects to assess.

16.8 Cumulative effects

- 16.8.1 Cumulative effects are those that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence (ZoI). While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.
- 16.8.2 The current list of planned developments which are included in the cumulative impact assessment, are those identified in the Anfield SRF comprising:
- Anfield Village & Rockfield housing refurbishment;
 - New build housing led regeneration;
 - The Walton Breck Road (The High Street) Corridor;
 - New public space and Village Square development (training hotel and offices);
 - Completion of the restoration of Stanley Park east of Mill Lane.
- 16.8.3 The presence of bats within the terraced housing due to be demolished on Lothair Road, Alroy Road and Rockfield Road has yet to be confirmed. In anticipation that these dwellings support low numbers of commonly occurring bat species, and despite the Main Stand having low to negligible potential to support roosting bats the loss of the Main Stand could have a small cumulative effect on the local bat population.
- 16.8.4 As mitigation for the loss of potential roosting habitat within the site boundary the erection of bat boxes is recommended. These should ideally be located within Stanley Park on mature

trees away from artificial lighting. Given the limited ecological value of the site at present, the provision of bat boxes is likely to result in a positive effect on the local bat population.

16.9 Residual effects

16.9.1 There are no residual effects as there are no significant effects.

16.10 Summary of effects

16.10.1 There are no significant effects.

16.11 Proposed monitoring

16.11.1 No monitoring is required for the proposed development.

16.12 Statement of significance

16.12.1 There are no significant effects.

16.13 References

[Ref 01] - IEEM (2006). Guidelines for Ecological Impact Assessment in the United Kingdom. Available from:

http://www.cieem.net/data/files/Resource_Library/Technical_Guidance_Series/EcIA_Guidelines/TGSEcIA-EcIA_Guidelines-Terrestrial_Freshwater_Coastal.pdf

[Ref 02] - CIEEM (2013) *Guidelines for Preliminary Ecological Appraisal*. Institute of Ecology and Environmental Management, Winchester.

[Ref 03] - Mitchell-Jones, A.J. (2004) *Bat Mitigation Guidelines*. English Nature, Peterborough.

[Ref 04] - JNCC (2010): *Handbook for Phase 1 habitat survey: A technique for environmental audit (reprint)*. Joint Nature Conservation Committee, Peterborough.

[Ref 05] - Stace, C.S. (2010). *New Flora of the British Isles*. 3rd Edition. Cambridge University Press, Cambridge.

[Ref 06] - Harris S, Cresswell, P and Jefferies D (1991). *Surveying Badgers*. The Mammal Society, Bristol.

[Ref 07] - Hundt, L. (2012). *Bat Surveys: Good Practice Guidelines*, 2nd Edition. Bat Conservation Trust.

[Ref 08] - Merseyside Biodiversity Group (2008) North Merseyside Biodiversity Action Plan.
Website: <http://www.merseysidebiodiversity.org.uk/>

[Ref 09] - Multi-Agency Geographic Information for the Countryside (MAGIC) website:
<http://magic.defra.gov.uk/>

17 Geology and Soils

17.1 Introduction

- 17.1.1 This chapter provides an assessment of the geology and soils, including contaminated or unstable land that could impact, or be impacted by the Liverpool FC Stadium Expansion,
- 17.1.2 The nature of the geology and soils of an area play an important part in determining the environmental character, including influencing the landform and vegetation present, as well as the types of horticultural and agricultural practices that an area can support, and the risks which may be posed from potentially contaminated soils.
- 17.1.3 The development comprises construction of an extension to the LFC Stadium and associated facilities to enable increased seating capacity. It is anticipated that the site areas external to the stadium will be developed with a mixture of hard and soft landscaping and car parking. The development has the potential to impact on local geology and soils, and constraints could be imposed on its construction as a result of the existing ground conditions.
- 17.1.4 Geological and geomorphological features considered to be of national importance are designated Sites of Special Scientific Interest (SSSIs). They have some legal protection under the Wildlife and Countryside Act (1981) against operations which may damage their interest. Other sites of geological importance may be designated as Regionally Important Geological Sites (RIGS). RIGS are any geological or geomorphological sites, excluding SSSIs that have an educational, historical or aesthetic importance. There are no SSSIs or RIGS identified within the study area.
- 17.1.5 The study area is limited to a 250m radius from the development as it is considered highly unlikely that geology or soil features further away will be impacted by construction or operation of the development.
- 17.1.6 This chapter presents the assessment methodology, outlines the relevant geology and soils (including land contamination) policy and legislation, records the consultation undertaken to date, provides an overview of the baseline, geological and soil conditions in the area, the potential for presence of land and groundwater contamination, designated sites and assessment of potential impacts of the development relating to geology and soils both for the construction phase and subsequent operational phase. Mitigation measures are identified to avoid or minimise any potentially adverse effects identified.
- 17.1.7 This chapter has been prepared by Mott MacDonald Ltd.

Design measures incorporated

- 17.1.8 To date, no specific geology, soils and contaminated land related design measures are incorporated within this assessment.

17.2 Methodology

- 17.2.1 This section describes the methodology which has been used in the assessment of geology and soils, including contaminated land, which may impact, or be impacted, by the construction and operation of the development.
- 17.2.2 This assessment has been carried out in accordance with Part IIA of the Environmental Protection Act (EPA) 1990 (as amended), and statutory guidance, together with the NPPF (March 2012), which provides a framework for the assessment of risks to controlled waters in accordance with statutory obligations. The Statutory Guidance (DEFRA, 2012) also provides a framework for the classification of different categories of contaminated sites based on the Significant Possibility of Significant Harm (SPOSH) concept.

Sources of information

- 17.2.3 Sources of information used in this report include:
- Anfield Stadium Expansion Phase I Geo-environmental Desk Study , SKM, December 2013 [Ref 01];
 - Anfield Stadium Expansion Project: Phase 1 Liverpool FC, Stage C Civil Engineering, Fire Engineering and Acoustics, SKM, January 2014 [Ref 02];
 - Stanley Park Regeneration Plan; Planit EDC, 2005 [Ref 03]; and
 - Anfield Spatial Regeneration Framework, Liverpool City Council [Ref 04].

Desk study

- 17.2.4 A preliminary assessment of the effects of the development with regards to geology and soils at the site has been carried out in this chapter, using information available from the data sources listed above and also from on-line resources.
- 17.2.5 The EPA provides a statutory definition of contaminated land:
- “Contaminated Land is any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that...*
- significant harm is being caused or there is a significant possibility of such harm being caused; or
 - significant pollution of controlled waters is being, or there is a significant possibility of significant pollution being caused.”
- 17.2.6 Underpinning the guidance is a source-pathway-receptor methodology, which is used to identify Significant Pollutant Linkages (SPLs). The following definitions apply:
- **Source/ hazard:** contamination identified (exceeding corresponding guideline values);
 - **Pathway:** the means by which the hazardous contamination can come into contact with the receptor; and

- **Receptor:** the entity which is vulnerable to harm from the source.

17.2.7 The assessment of risks presented by geological and geomorphological conditions and potential land contamination adopted in this report is based on current guidance documents, in particular CIRIA Report C552 (CIRIA, 2001) [Ref 05].

17.2.8 Effects of contaminated land on the receptors have been assessed taking into account sensitivity of the receptor and magnitude of the effect. The sensitivity of geological receptors is determined according to the methodology shown in Table 17.1.

Table 17.1: Scale for evaluating sensitivity of receptors

Sensitivity	Criteria	Typical Examples
High	High importance and rarity, international or national scale and very limited potential for substitution.	Geology: World Heritage Sites or site protected under EU or UK wildlife legislation (SAC, SPA, SSSI, Ramsar site). Soils: Agricultural land of Grade 1 or 2 quality. Controlled Water: Groundwater vulnerability is classified as high; Principal aquifer providing a regionally or locally important resource or supporting site protected under wildlife legislation; or SPZ I or II.
		Future site users: Sensitive land uses proposed such as residential housing with gardens, allotments, schools. Built Environment: Sites of international Importance, World Heritage Sites, Listed Buildings, Scheduled Monuments.
Medium	Attribute has a medium quality and rarity on local scale	Geology: Regionally Important Geological Sites (RIGS). Soils: Agricultural land of Grade 3 quality. Controlled Water: Moderate classification of groundwater vulnerability; Secondary aquifer providing water for agricultural or industrial use with limited connection to surface water; SPZ III.
		Future site users: Moderately sensitive land uses such as residential housing without gardens, commercial developments and open spaces. Built Environment: Sites with local interest for education or cultural appreciation.
Low	Attribute has a low quality and rarity on local scale	Geology: Rock exposures. Soils: Agricultural land of Grade 4&5 quality. Controlled Water: Deep Secondary aquifer with poor water quality not providing baseflow to rivers; Aquifer not used for water supplies (public or private).
		Future Site Users: Low sensitivity land use such as Industrial Sites, highways and rail. Built Environment: Infrastructure (e.g. Roads, railways, tramways).
Negligible	Very low importance and rarity, local scale.	Geology: No rock exposures. Soils: Urban classified soils. Controlled Water: Non-aquifer.
		Future Site Users: No sensitive land use proposed.

17.2.9 Magnitude is determined by the predicted deviation from the baseline conditions and the scale of impact. Intrusive ground investigations have not yet been completed to inform either the Main Stand or Anfield Road Stand expansions. Assessment of magnitude in this report is therefore qualitative in nature and adopts a ‘worst-case’ approach based on the desk-top appraisal and potential for contamination. The methodology for determining the magnitude of an impact is shown in Table 17.2:

Table 17.2: Scale for magnitude with respect to impact on geological/soil receptors

Magnitude	Description
Major	<p>Change in favourable condition status of geological SSSI;</p> <p>Generation of large volume of hazardous materials for disposal off site;</p> <p>Permanent impact on geological conditions;</p> <p>Physical removal or degradation (including loss of structure and contamination) of a large area of soil;</p> <p>Previous or on-going activities on or near to a site where severe harm to a defined receptor is very likely;</p> <p>Site investigation data indicating contamination on many sites impacted by current or former uses. Quantitative or qualitative risk assessment data estimating a significant likelihood of adverse impacts from exposure to pollutants in the environment; and</p> <p>Loss of special characteristics of a water resource. Change in GQA grade, pollution of potable source, severe flood risk, loss of fisheries. Any pollution inside Zone 1 or a groundwater protection zone of special interest.</p>
Moderate	<p>Generation of hazardous and non-hazardous materials for disposal off site;</p> <p>Temporary impact on geological conditions; and physical removal or degradation (including loss of structure and contamination) of a moderate area of soil.</p> <p>Previous or on-going activity where harm to a defined receptor is possible but severe harm is unlikely;</p> <p>Site investigation data indicating moderate contamination. Quantitative or qualitative risk assessment data estimating medium risk of adverse impacts from exposure to pollutants in the environment; and</p> <p>Impact on water resources. Reduction in the production of fisheries, moderate changes insufficient to reduce water quality.</p>
Minor	<p>Generation of inert and non-hazardous waste materials which may be suitable for re-use on site;</p> <p>No permanent impact on geological conditions;</p> <p>Physical removal or degradation (including loss of structure and contamination) of a minor area of soil.</p> <p>Greenfield site or previous on-going activities where harm to a defined receptor is unlikely;</p> <p>Site investigation data indicating significant contamination is unlikely. Quantitative or qualitative risk assessment data estimating low likelihood of adverse impacts from exposure to pollutants in the environment; and</p> <p>Minor impact insufficient to impact on the use or characteristics of the water resource.</p>
Neutral	<p>No loss or alteration of characteristics, features or elements; and</p> <p>No impact on geological conditions.</p>

17.2.10 The likely severity of impacts is assessed using the matrix in Table 17.3 in conjunction with professional judgement to consider site specific factors that may be of relevance.

Table 17.3: Severity of impact with regards to geology and soil receptors.

Magnitude of Effect	Sensitivity of Receptor			
	High	Medium	Low	Negligible
Major	Major	Moderate	Minor	Insignificant
Moderate	Moderate	Moderate	Minor	Insignificant
Minor	Minor	Minor	Insignificant	Insignificant
Neutral	Insignificant	Insignificant	Insignificant	Insignificant

17.2.11 The significance criteria are detailed in Table 17.4.

Table 17.4: Significance criteria for geology, soils and land contamination

Significance category	Description and examples	Significance
Insignificant	- Minimal impact on geological condition, minor loss of urban soils; and No discernible negative impact with regards to contaminated land.	Not Significant
Minor	Adverse Changes to Made Ground deposits only, moderate/ major loss/ degradation of Grade 4 or 5 soils. minor or moderate loss/ degradation of Grade 3 soils Easily preventable, non-permanent health impacts on humans; Minor low-level and localised contamination of on-site soils; Pollution of non-sensitive water resource or low long term risk of pollution to sensitive water resource; and Easily repairable damage to buildings / infrastructure.	
	Beneficial Remediation of localised low levels of contamination; Remediation of non-sensitive water resource contamination; and Minimal improvements to overall soil and water quality.	
Moderate	Adverse Superficial disturbance to near surface deposits, Changes in geomorphology, large loss/ degradation of Grade 3 soils, minor loss/ degradation of Grade 1 or 2 soils. Sterilisation of low quality mineral resources. Easily preventable, permanent health impacts on humans or medium-term (chronic) risk to human health; Medium long-term risk of pollution of sensitive water resources; damage to buildings / infrastructure (on or off site); and Localised damage to buildings/ infrastructure (on or off site).	
	Beneficial Remediation of localised moderate levels of contamination; Remediation of moderate to high, localised sensitive water resource contamination; and Re-use of excavated soils on-site to avoid disposal to landfill.	
Major	Adverse Substantial changes due to cuttings, moderate/ large loss/ degradation of Grade 1 or 2 soils; Loss of exposed designated geological features; Sterilisation of high quality mineral resource Long-term (chronic) risk to human health or short-term (acute) risk to human health;	

Significance category	Description and examples	Significance
	Short- term risk of pollution of sensitive water resources; Extensive damage to buildings / infrastructure (on or off site); Generation of significant quantities of waste sediment or soils for landfill ; and Contamination of offsite soils.	
Beneficial	Remediation of widespread high levels of contamination/ widespread contamination; Remediation of significant, widespread sensitive water resource contamination; and Re-use of significant quantities of excavated soils on-site to avoid disposal to landfill	

Field surveys

- 17.2.12 Ground investigations were carried out in 2002-2003 and 2007 at the adjacent Stanley Park Site by Soil Mechanics/ Ove Arup & Partners Ltd and Soil Mechanics/ SKM respectively. The results of these ground investigations have been used to inform this assessment.
- 17.2.13 Intrusive ground investigations to inform the design of the Main Stand and Anfield Road Stand will be undertaken when access is available. The results of this will inform the development of a Phase II Contaminated Land Risk Assessments for each phase of the proposed development.

17.3 Legislation and policy

- 17.3.1 The main legislative framework regarding geology and soils (including contaminated land) is set by the following Acts and Regulations:
- Agriculture Act 1986;
 - Construction (Design and Management Regulations) 2007;
 - Contaminated Land (England) (Amendment) Regulations 2012;
 - Control of Pollution (Oil Storage) (England) Regulations 2001;
 - Control of Substances Hazardous to Human Health 2002 (as amended);
 - Environmental Damage and Liability (Prevention and Remediation) Regulations 2009;
 - Environmental Permitting Regulations (England and Wales) 2010;
 - Environmental Protection Act 1990 (as amended by the Environment Act 1995);
 - Environmental Protection (Duty of Care) Regulations 1991 (as amended 2003);
 - Landfill Directive 1999/31/EC 1999;
 - Hazardous Waste (England and Wales) Regulations 2005;
 - Landfill (England and Wales) Regulations 2002;
 - Town and Country Planning Act 1990;
 - Water Act 2003;
 - Water Resources Act 1991 (WRA 1991) and Amendment 2009; and

- Wildlife and Countryside Act 1981 and (Amendment) Act 1985 (as amended by the Countryside and Rights of Way Act 2000).
- 17.3.2 The Wildlife and Countryside Act 1981 (as amended) provides statutory protection of SSSIs in England, some of which are of geological importance. Special Protection Areas (SPAs) and Ramsar Sites, as well as Limestone pavements, are also protected under this act. Environmentally Sensitive Areas (ESAs) are agricultural areas benefiting from special protection. The importance of nature conservation, including areas with geological features, is also emphasised in the Environmental Protection Act 1990 (as amended).
- 17.3.3 The prevention of pollution is regulated by several pieces of legislation including the Environmental Permitting Regulations 2010, which regulates pollution control by requiring permits for emissions to, for example, air and water.
- 17.3.4 The statutory process for dealing with contaminated land in England and Wales is set out in Part IIA of the Environmental Protection Act 1990 (EPA 1990) (as amended by the Environment Act 1995 and the Water Act 2003). Part IIA sets in place a regime whereby contaminated land can be identified, a decision made as to how the land will be remediated and where responsibility for this will fall. The primary legislation is supported by a number of secondary legislative instruments including the Contaminated Land (England) (Amendment) Regulations 2012.
- 17.3.5 There are also a number of waste-related regulations which serve to protect soils from contamination by waste management, such as the Hazardous Waste (England and Wales) Regulations 2005 (as amended by Hazardous Waste (England and Wales) Regulations 2009), Environmental Protection (Duty of care) Regulations 1991, Waste Management Licensing Regulations 1994 (as amended by Waste Management Licensing Regulations 1997), Landfill Directive 1999, Landfill Tax (Contaminated land) Order 1996 and Landfill (England and Wales) Regulations 2002 (as amended by The Landfill (England and Wales) Regulations 2004 and 2005).
- 17.3.6 Under the Control of Substances Hazardous to Health Regulations 2002 (COSHH) and the Construction and Design Management (CDM) Regulations 1994, where a developer knows or suspects the presence of contaminated soil, provision will be made to ensure that risks to the public and site workers are minimised.

National Planning Policy

- 17.3.7 As the majority of sites impacted by historic contamination are not classed as “Contaminated Land” under Part IIA of the EPA, the remediation of any contamination present is generally managed by the planning regime. The actual or possible presence of contamination is a material planning consideration and requires that as a precautionary approach, the possibility of contamination should be assumed when considering planning applications in relation to all

land subject to or adjacent to previous industrial use and also where uses are being considered that are particularly sensitive to contamination.

- 17.3.8 The National Planning Policy Framework (NPPF) (Department for Communities and Local Government) March 2012 provides guidance on contaminated land and protection from a planning perspective.
- 17.3.9 Paragraphs 120 to 122 of the NPPF details recommendations for planning policies and decisions with regards to contaminated land, stating that
- 17.3.10 *“to prevent unacceptable risk from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location”.*

Local Planning Policy

- 17.3.11 The Liverpool Unitary Development Plan (UDP) was adopted in November 2002 and is the only statutory document for planning in the area.
- 17.3.12 EP1, EP2, EP12 and EP15 of the UDP outline policy requirements of planning with regards to geology, soils and contaminated land.
- 17.3.13 EP1 is for the promotion of reclamation of derelict land and restoration of neglected land.
- 17.3.14 EP2 details the requirements for site surveys prior to development on land that the City Council considers seriously contaminated.
- 17.3.15 EP12 states that *“permission will not be granted for development which, in the opinion of the City Council following consultation with the Environment Agency, would adversely affect the quality or supply of surface water or groundwater”.*
- 17.3.16 Under EP 15 it is a requirement for all planning applications and development proposals to include sufficient information to enable the City Council and consultees to assess the potential environmental impacts accurately.
- 17.3.17 LCC commenced preparation of a Core Strategy to replace the strategic policies of the adopted UDP. While that plan reached an advanced stage of preparation it was not submitted for examination and has now been abandoned in favour of producing a city-wide Local Plan.
- 17.3.18 The Joint Merseyside Waste Development Plan [Ref 07] was formally adopted by six councils, including Liverpool, with effect from July 2013. Policy WM8 for Waste Prevention and Resource Management states that:
- 17.3.19 *“Any development involving demolition and/or construction must implement measures to achieve the efficient use of resources, taking particular account of:*

- Construction and demolition methods that minimise waste production and encourage re-use and recycling materials, as far as practicable on-site;
- Designing out waste by using design principles and construction methods that prevent and minimise the use of resources and make provision for the use of high-quality building materials from recycled and secondary sources;
- Use of waste audits or site waste management plans (SWMP), where applicable, to monitor waste minimisation, recycling, management and disposal.”

17.4 Consultation

17.4.1 Liverpool FC Stadium Expansion Environmental Scoping Report [Ref 08] was referred to the Environment Agency (EA) and Natural England. Table 17.5 summarises the key points of the scoping responses in relation to geotechnical/ contamination assessment.

Table 17.5: Scoping responses for contamination/ geotechnical assessment

Name of Organisation	Key Concerns	Comment
Environment Agency	None	Agreed with Proposed Assessment Methodology in Scoping Report with regards to the investigation and assessment of potentially contaminated land.
Natural England	ES should thoroughly assess potential for proposal to affect designated sites, including Special Areas of Conservation, Special Protected Areas, Ramsar sites and Sites of Special Scientific Interest. Should the proposal result in an emission to air or discharge to the ground or surface water catchment of a designated site then the potential effects and impact of this should be considered in the ES. The ES should thoroughly assess the impact of proposals on non-statutory sites. Impacts from the development should be considered in light of the Government’s policy for the protection of the best and most versatile (BMV) agricultural land as set out in paragraph 112 of the NPPF.	Proposal is located outside of geographical buffer zones within which development is likely to affect designated sites.
Liverpool City Council (via separate correspondence)	None	Accepted that a desk-based assessment will be acceptable for the ES. Noted that the conditions that will be applied with respect to contaminated land will be LCC standard conditions both pre and post commencement. Asked that all relevant information is submitted in accordance with LCC Contaminated Land checklist and in a timely manner.

17.5 Assumptions and limitations

- 17.5.1 No intrusive ground investigation data is currently available for the site. Therefore the assessment of impacts relating to geology and soils including land contamination is qualitative. The results of the ground investigation undertaken in March 2014 and the further planned investigation will enable quantification of the potential impact on local geology and soils and constraints imposed on the construction of the development as a result of the existing ground conditions.
- 17.5.2 A source-pathway-receptor methodology has been used to assess the impacts relating to geology and soils. Without a significant pollutant linkage (i.e. with a source, receptor and viable pathway present), a contamination source may be a hazard but would not constitute a risk to human health or the environment. During the assessment it has been assumed that there will be (either during or after construction) a pathway present between the source and the receptor, unless there is a clear indication that this will not be the case.
- 17.5.3 In the absence of ground investigation data, and given the likelihood of encountering made ground from unknown sources from the previous development of the stadium, and sandstone quarrying in the vicinity of the site, it is assumed that there is potential for contaminated soils to be present on site.

17.6 Baseline conditions

Desk Study

Spatial Scope

- 17.6.1 The site area comprises LFC Stadium and the adjacent areas of land lying to the west, north and north-east. The boundary of the site is shown in Chapter 2, Figure 2.4.
- 17.6.2 The scope of this assessment considers sensitive receptors within 250m of the site in each direction. It is considered unlikely that geology or soil features further away will be impacted by construction or operation of the development.

Temporal Scope

- 17.6.3 This baseline scenario considers the sub-surface conditions on site as they exist at the time of writing in 2014 and the current impacts on any particular resources or receptors.
- 17.6.4 The construction period is proposed to commence in January 2015 with completion aimed to be in time for commencement of the 2016/2017 football season. Assessment of the construction period considers the impacts of construction on areas of potentially contaminated

land or geological resources within the spatial scope of the proposed development and associated works, including the remediation of any contamination if required.

17.6.5 The operational scenario considers the impact that any residual contamination could have on the general environment surrounding the proposed development, an assessment of the risks of ground pollution as a result of the operation of the development, and identification of mitigation measures to address these risks.

17.6.6 EA records do not indicate any past pollution incidents and there are no historic or authorised landfills within the vicinity of the site.

Geomorphology and Topography

17.6.7 The topography across the site is relatively flat; the land rises gently from south to north and then falls away gently again further north outside the application site boundary.

Regional Geology

17.6.8 British Geological Survey (BGS) maps [Ref 09] indicate that the bedrock underlying the site is Chester (previously called Bunter) Pebble Beds Formation sandstone of the Sherwood Sandstone Group. The lithology is described to be fine to coarse grained sandstone, commonly pebbly, with conglomerates and sporadic siltstones. The maps indicate that there are no superficial deposits at the site.

17.6.9 The site is located in an urban area, with much development having occurred historically; on that basis it is highly likely that Made Ground will be encountered beneath the site.

17.6.10 The regional geology displays faulting. However, BGS maps do not indicate any faults in the proposed area of development.

Regional Soils

17.6.11 The National Soil Resources Institute [Ref 10] classifies the soil as freely draining, slightly acid sandy soils with low fertility.

17.6.12 The soils at the site are not classified under the Agricultural Land Classification of England and Wales (Ministry of Agriculture, Fisheries and Food 1988) [Ref 11].

Hydrology and Hydrogeology

17.6.13 The Chester Pebbles Beds Formation underlying the site is designated as a Principal Aquifer by the EA [Ref12], which is described as:

- 17.6.14 “layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale”.
- 17.6.15 The site is not within any Source Protection Zones (SPZ) and no sensitive groundwater abstractions are located within 1km of the site.
- 17.6.16 There is one licensed groundwater abstraction listed within 1km of the site, which is associated with abstraction for Stanley Park Lake, operated by LCC.
- 17.6.17 There are a number of surface water bodies in the site vicinity, including Stanley Lake located 550m to the north-west in Stanley Park. There are no watercourses within 1km of the site.

Regionally Environmentally Sensitive Sites

- 17.6.18 There are no geologically designated sites within the vicinity of the site [Ref 11].

Historic and Current Land Use

- 17.6.19 Historic maps [Ref 13] and photos have been reviewed to determine the past land use in the vicinity of the site which are summarised in Table 17.6. Historical plans are provided in Appendix 12 of the Phase 1 Geo-environmental Desk Study Report [Ref 01].

Table 17.6: Historic land use at the site

Historic Land Use from Maps			
Period	Scale and year	Detail	Historic Land Use from Photos/ Diagrams
1851	1:10,560 1851	The site is largely undeveloped comprising agricultural land. The surrounding land consists of fields with some residential buildings and roads. Anfield Road crosses the site from south-east to north-west. Sandstone quarrying is occurring to the north of the site	
1890-1900	1: 2,500 1890-93	Everton Football Club occupies the site until 1892, with stands at the north-east and south-west ends. Liverpool FC occupies the site from 1892. The surrounding area is much more densely developed with residential properties and roads. Approximately 40m south of the site there is a disused quarry. A park has been developed adjacent to the football stadium.	1894-95 First main stand and uncovered terracing behind goals developed at the stadium.

Period	Historic Land Use from Maps		Historic Land Use from Photos/ Diagrams
	Scale and year	Detail	
1908	1:2,500	Further residential development has occurred. The area of the disused quarry has been developed and a church has been built.	1906- Football Grand Stand developed
1950-1970	1:2,500 1951-55	The stadium has been developed, with stands now present on all sides of the pitch and an embankment to the south-west of the stadium. The area of the disused quarry is now indicated to be a recreation site.	1960s- Main Stand expanded 1963- Kemlyn Road Stand Construction 1965- Anfield Road Stand developed
1970-1980	1983	A sport centre and car park has been developed in the park adjacent to the stadium.	Early 1970s- Main Stand construction 1973- Main Stand completed
1990 to Present day	1:10,000	The sports centre has been demolished and the land cleared. Housing on Kemlyn Road to the south-east of the stadium has been demolished to facilitate Centenary Stand construction in 1990s. Residential properties to the north of Anfield Road have been demolished. Further modification and enlargement to the stadium since the 1900's.	1994 New Centenary Stand constructed 1990s: New Kop stand constructed 1998: Anfield Road Stand expanded

17.6.20 The current land use comprises LFC Stadium and associated facilities. The site generally comprises hardstanding with some landscaped areas. Land to the south-west of the Main Stand, and within the application site boundary, is currently laid out as open space having previously been occupied by terraced dwellings. The application site also includes residential dwellings in three terraces east and west of Lothair Road, and east side of Alroy Road which are due for demolition.

17.6.21 The site is surrounded by residential properties to the west and east, with small shops and further housing beyond Walton Breck Road to the south. A large area of hardstanding (used for match-day parking and food outlets) and Stanley Park lie to the north-east beyond Anfield Road.

Fieldwork

17.6.22 Borehole logs available from ground investigations in 2002-2003 and 2007 indicate the geology within Stanley Park to comprise Sherwood Sandstone (comprising thin to medium bedded, medium/ coarse grained sandstone with close to medium spaced fractures). The bedrock was proven up to 38.9m. In some locations, the Sherwood Sandstone was found to be overlain by sand (often clayey/ gravelly, or gravel) up to 0.74m thick.

- 17.6.23 During the previous Stanley Park investigations, groundwater was struck within the Sherwood Sandstone in one borehole at 29.5m depth. Two other boreholes struck perched water at 0.15m and 0.2m within Made Ground.

17.7 Assessment of effects

- 17.7.1 The following sections provide a qualitative assessment on the impacts relating to geology and soils, prior to intrusive data being available for the site.

- 17.7.2 Sensitive receptors which may be affected by the development include:
- Geology: There are no geological rock exposures, so the sensitivity is considered negligible.
 - Soils: Although soils may be exposed during site works, they are not classified under the Agricultural Land Classification of England and Wales (Ministry of Agriculture, Fisheries and Food 1988) and are considered urban soils. The receptor sensitivity is considered negligible.
 - Groundwater: The site is underlain by a Principal Aquifer as classified by the EA, so this receptor sensitivity is considered high.
 - Construction workers: Due to the nature of their work, construction workers are likely to come in contact with potentially contaminated materials and the sensitivity of the receptor is considered high.
 - General public: The site is predominantly covered with hard-standing, limiting exposure of the general public to soils. However, during construction works, soils may be exposed with a risk of generation of dust from potentially contaminated material. The sensitivity of the receptor is considered to be medium.
 - Fauna and flora: The site is currently predominantly covered with hard-standing and this will remain the case. However, there are areas of landscaping and a large area of public open space between the Main Stand and properties on Alroy Road is proposed. This will be a mix of new hard and soft landscaping including grassed areas, concrete/aggregate surfacing and a grove of trees. The sensitivity of the receptor is considered to be low.
 - Structures: The Stadium represents a structure with local interest, so the sensitivity of the receptor is considered to be medium.

Construction – likely significant effects

- 17.7.3 The proposed development will include a range of demolition and construction activities including:
- Demolition and removal of the existing main stand roof. Asbestos testing will be undertaken on structures prior to demolition to ensure that asbestos-containing materials (ACM) are not released to air or allowed to contaminate soils within the site or surrounding areas.
 - Shallow excavation works for hard and soft landscaping, resulting in permanent removal of made ground and soils.

- It is envisaged that the steel frame will sit on large mass or reinforced concrete pad foundations which are founded in the top of the sandstone strata. The size and depth of the pads will need to be confirmed following the site investigation works, though based on record drawings of the existing foundations of the main stand, these typical pads are likely to be around 1.5m-2m deep. A pad foundation solution is also proposed under the two towers that will support the roof truss as well as under the three principle vertical bracing positions. These pads will need to be deeper and more heavily reinforced. There will therefore be a requirement to remove Made Ground, shallow soils and potentially some rock from the site, for off-site disposal or re-use.
- General construction works including movement of materials and storage of hazardous chemicals which could potentially lead to secondary impacts on geology and soils.

Temporary effects

- 17.7.4 The most significant temporary effects resulting from the development are considered to be:
- Potential contamination of groundwater within the Principal Aquifer due to accidental spills and leaks of hazardous materials. During local ground investigations in Stanley Park groundwater in natural ground was only struck at one location, at depths of 29.5m; however the locally fractured nature of the bedrock underlying the site and the temporary removal of topsoil during construction workers may promote contaminant migration.
 - Inhalation of dust from exposed potentially contaminated material during construction works due to removal of hard-standing and topsoil. This could cause short term health effects to the general public and construction workers.
- 17.7.5 Table 17.7 summarises the anticipated temporary effects with regards to geology and soils.

Table 17.7: Temporary effects of construction phase with regards to contamination/ geotechnical features

Receptor	Summary of effect	Sensitivity of receptor	Magnitude of effect	Nature of impact	Severity of impact	Mitigation Required?
Geology	No temporary effects anticipated					
Soils	Soil deterioration and consolidation due to poor storage and handling or vehicle movements during construction works.	Urban classified soils- negligible	Physical removal or degradation of a moderate area of soil- moderate	Adverse	Insignificant	No
	Potential for excess material to be generated which could be suitable for re-use.		Moderate volume of soil anticipated- moderate	Beneficial	Insignificant	No
Groundwater	Temporary removal of topsoil during construction works may decrease retardation of contaminants, increasing the risk of contaminants leaching into groundwater.	Groundwater is classified as a Principal Aquifer. No local abstractions- high	Impact on water resource insufficient to reduce water quality- moderate	Adverse	Moderate	Yes
	Accidental spills or leakages of hazardous substances may lead to migration of contaminants into underlying groundwater.					Yes
Construction workers	Removal of hardstanding and topsoil during construction works may lead to exposure of potentially contaminated material. Generation of dust from this material and subsequent uptake by construction workers could cause short-term health effects.	Higher potential of exposure of construction workers to potentially contaminated material during construction works- high	No site investigation data is available, therefore it is assumed that contamination is present for a conservative assessment- moderate	Adverse	Moderate	Yes
General public	Removal of hardstanding and topsoil during construction works may lead to exposure of potentially contaminated material. Generation of dust from this material and subsequent uptake by general public could cause short-term health effects.	Higher potential of exposure of general public to potentially contaminated material during construction works- medium	No site investigation data is available, therefore it is assumed that contamination is present for a conservative assessment- moderate	Adverse	Moderate	Yes
Fauna and flora	Consolidation of soils due to construction work may hinder vegetation growth due to a reduction in pore spaces containing oxygen.	Vegetation comprises landscaped areas- low	Loss of landscaped vegetation- minor	Adverse	Insignificant	No
Structures	No temporary effects anticipated					No

Permanent effects

- 17.7.6 The most significant permanent effects which may arise from the scheme include:
- Pollution of the Principal Aquifer due to mobilisation of contaminants in construction works; this is only likely to be a realistic scenario if piling works are required for significant structures. At this stage, it is anticipated that pad foundations will be utilised as the preferred foundation solution, though this is dependent on the results of the intrusive ground investigation.
 - Pollution of the Principal Aquifer due to spillages of fuel/oils from large vehicles stored in the Outside Broadcast area.
 - Long-term health effects to construction workers; due to the nature of their work construction workers are more likely to come in contact with potentially contaminated materials. As there is no intrusive ground investigation data available it has been assumed that the site contains shallow contaminated soils to allow for a conservative assessment.
 - Corrosion of new structures developed for the scheme by chemicals and acidity within the soil or made ground underlying the site.
- 17.7.7 Permanent effects anticipated from the construction of LFC Stadium Expansion are summarised in Table 17.8.

Table 17.8: Permanent effects of construction phase with regards to geology and soils

Receptor	Summary of effect	Sensitivity of receptor	Magnitude of effect	Nature of impact	Severity of impact	Mitigation required?
Geology	Potential for permanent removal or deterioration of rock during excavations for new foundations.	There are no geological rock exposures- negligible	Excavations could lead to permanent impacts on geological conditions- major	Adverse	Insignificant	No
Soils	Excavation works could lead to permanent removal of soils.	Urban classified soils- negligible	Physical removal or degradation of a moderate area of soil: site is mainly covered in hardstanding- moderate	Adverse	Insignificant	No
	Construction is likely to involve digging new trenches for utilities/ diverting existing utilities which could cause loss of soils.					No
	Potential contamination of soils through accidental spills and leakages of hazardous substances.					No
	Opportunity for removal of potentially contaminated soils.					Moderate volume of soil anticipated- moderate
Groundwater	Mobilisation of contaminants during excavation works could cause migration of contaminants into controlled waters. Potential for fuel/oil leakage from vehicles stored in Outside Broadcast area.	Groundwater is classified as a Principal Aquifer- high	Potential for pollution of a potable source – moderate (assuming no piling)	Adverse	Moderate	Yes
Construction workers	Harm to human health by ingestion/ inhalation/ dermal contact with contaminated soils, asphyxiation or explosion due to hazardous gases from contaminated land during construction activities.	Due to the nature of their work construction workers are likely to come in contact with potentially contaminated materials- high	No site investigation data is available, therefore it is assumed that contamination is present for a conservative assessment- moderate	Adverse	Moderate	Yes
General Public	No permanent effects are anticipated					No
Fauna and flora	Harm to fauna and flora by contaminants mobilised during excavations or through accidental spills/ leakages of hazardous materials.	Landscaped areas of vegetation are present, including the proposed vegetated avenue to be developed parallel to the Main Stand - low	Loss of landscaped vegetation- minor	Adverse	Insignificant	Yes
Structures	Chemicals and acidity within soil and made ground could cause corrosion of structures.	The stadium represents a site with local interest- medium	Harm to receptor is possible - moderate	Adverse	Moderate	Yes

Operation – likely significant effects

Permanent effects

- 17.7.8 Operational effects include surface water runoff from hardstanding that is anticipated to cover the majority of the site. This has been considered in the Flood Risk and Water Resources ES Chapter and therefore not reproduced here.
- 17.7.9 There will be no other permanent effects on geology and soils.

17.8 Mitigation

- 17.8.1 Appropriate mitigation measures which will be implemented for the construction phase of the LFC Stadium Expansion include:
- Measures to protect the soil and rock structure and quality, such as re-use of excavated materials on site where possible, with handling and storage of materials in accordance with best practice procedures;
 - Measures for prevention of contamination, such as storage, handling, transportation and disposal of hazardous materials in accordance with relevant legislation and supply of personal protective equipment (PPE) to construction workers. This will be implemented via the use of a Construction Environmental Management Plan (CEMP);
 - Dust suppression measures;
 - Assessment of the aggressive chemical character of the ground and selection of concrete in accordance with BRE Special Digest 1:2005 [Ref17];
 - Measures to minimise generation of off-site waste through implementation of a Site Waste Management Plan.
- 17.8.2 For the operational phase of the LFC Stadium Expansion, fuel interceptors will be installed within the Outside Broadcast area to ensure that any spillages from parked vehicles will be captured and not contaminate underlying groundwater.
- 17.8.3 In addition, LCC will apply standard planning conditions with respect to contaminated land, both pre and post commencement to ensure that potential contaminated land is dealt with in an appropriate manner.
- 17.8.4 Surface water runoff from hardstanding during operation can be mitigated through the implementation of appropriate drainage. This is addressed in chapter 18: Flood Risk and Water Resources and is not replicated here.

17.9 Cumulative effects

- 17.9.1 Cumulative effects are those that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence (ZoI). While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.
- 17.9.2 The Anfield Spatial Regeneration Framework (SRF) [Ref02] aims to regenerate an area which includes the LFC Stadium and its surrounding land to the north and west of the site.
- 17.9.3 The current list of planned developments which are included in the cumulative impact assessment, are those identified in the Anfield SRF comprising:
- Anfield Village & Rockfield housing refurbishment;
 - New build housing led regeneration;
 - The Walton Breck Road (The High Street) Corridor;
 - New public space and Village Square development (training hotel and offices); and
 - Completion of the restoration of Stanley Park east of Mill Lane.
- 9.1.2 Cumulative effects on geology and soils have been considered. Minimal earthworks and excavations are anticipated for the proposed developments; therefore there are not considered to be any cumulative effects with regards to geology and soils.

17.10 Residual effects

- 9.1.3 Assuming implementation of the mitigation measures detailed in section 17.7, there are no significant effects anticipated in relation to geology and soils due to the construction and operation of the LFC Stadium Extension.

17.11 Summary of effects

- 17.11.1 A tabulated summary of effects is included in Table 17.9.

Table 17.9: Summary of effects with respect to contamination/ geotechnical features

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/ Beneficial	Permanent/ Temporary	Residual Effect
Construction	Geology	Permanent removal or deterioration of rock during excavations and piling works.	Cut and fill balance to be aimed for where possible and re-use of materials within the development.	Insignificant	Adverse	Permanent	Insignificant
	Soils	Potential deterioration/ removal/ loss of soils as a result of construction works.	Soil handling and storage according to best practice procedures. Use of tracked equipment where possible.	Insignificant	Adverse	Temporary/ Permanent	Insignificant
		Opportunity for remediation of contaminated soils or re-use of soils generated during excavations.	Storage of hazardous substances in accordance with relevant legislation. Emergency procedures in place in case of accidental spills. Site Waste Management Plan to be produced.	Insignificant	Beneficial	Temporary/ Permanent	Insignificant
	Groundwater	Potential contamination of the Principal Aquifer due to accidental spills/ leaks of hazardous materials or mobilisation of contaminants during construction works. Temporary removal of soils can increase contaminant leaching into groundwater.	Storage of hazardous substances in accordance with relevant legislation. Emergency procedures in place in case of accidental spills. Procedures put in place should contaminated land be encountered- all works ceased until an assessment has been carried out. If required, piling works to be carried out in accordance with EA guidance.	Moderate (without piling)	Adverse	Temporary/ Permanent	Minor (without piling); Insignificant
	Construction workers	Due to the nature of their work construction workers are more vulnerable to exposure to contaminated material and harm to human health.	Construction workers to use appropriate PPE. Direct contact with soil to be limited. Procedures put in place should contaminated land be encountered- all works ceased until an assessment has been carried out.	Moderate	Adverse	Permanent	Minor; Insignificant
	General public	Generation of dust from potentially contaminated material could lead to adverse health effects.	Dust suppression using best practice methods.	Moderate	Adverse	Temporary	Minor; Insignificant
	Fauna and flora	Mobilisation of contaminants/ accidental spills and leaks/ consolidation of soils due to construction works could lead to loss of landscaped vegetation.	Storage of hazardous substances in accordance with relevant legislation. Emergency procedures in place in case of accidental spills.	Insignificant	Adverse	Temporary/ Permanent	Insignificant

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/ Beneficial	Permanent/ Temporary	Residual Effect
			Use of tracked equipment where possible.				
	Structures	Acidity and chemicals within the soils could lead to corrosion of concrete.	BRE assessment of the Aggressive Chemical Environment for Concrete and selection of concrete class accordingly.	Moderate	Adverse	Permanent	Minor; Insignificant
Operation	Groundwater	Potential for fuel/oil leakage from vehicles stored in Outside Broadcast area.	Installation of fuel interceptors in Outside Broadcast area.	Moderate	Adverse	Temporary/ Permanent	Minor; Insignificant
The potential for surface water runoff from hardstanding is discussed thoroughly in Chapter 10: Flood Risk and Water Resources							

17.12 Proposed monitoring

- 17.12.1 No intrusive ground investigation data is currently available for the site. The EHO at LCC has confirmed that, given the low probability for significant contamination, the desk top appraisal is sufficient for the purposes of carrying out the assessment in this chapter. Nevertheless, intrusive site investigations will be carried out to inform the nature of any remediation required pursuant to planning conditions.
- 17.12.2 Ground investigations for the expansion of both the Main Stand and Anfield Road Stand will comprise collection of soil, leachate and groundwater samples for laboratory analysis, and groundwater monitoring.

17.13 Statement of significance

- 17.13.1 The following significant effects are anticipated for the development during construction phase:
- Moderate effect on groundwater from pollution of the underlying Principal Aquifer due to accidental spills/ leaks of hazardous materials and mobilisation of contaminants during construction works. Assuming the implementation of appropriate mitigation measures, the risk is reduced to Minor, insignificant.
 - Moderate effect on construction workers from coming into contact with potentially contaminated material. Assuming implementation of appropriate mitigation measures the risk is reduced to Minor, insignificant.
 - Moderate effect on general public during construction works, principally from dust generation of exposed potentially contaminated material which could lead to short term health effects. Assuming implementation of appropriate dust suppression measures the risk is reduced to Minor, insignificant.
 - Moderate effect on structures, due to Made Ground and soils underlying the site having the potential to contain chemicals and acidity corrosive to concrete. Assuming assessment of the aggressive chemical environment and selection of an appropriate concrete class, the risk is reduced to Minor, insignificant.
- 17.13.2 The following significant effects are anticipated for the development during the operational phase:
- Moderate effect on groundwater from pollution of the underlying Principal Aquifer due to fuel/oil spillages from large vehicles parked in the Outside Broadcast area. Assuming the implementation of fuel interceptors, the risk is reduced to Minor, insignificant.
- 17.13.3 The operational effects of the development also include run-off from hardstanding. This is covered in Chapter 18: Flood Risk and Water Resources.

17.14 References

[Ref 01] - Anfield Stadium Expansion, Liverpool, Phase 1 Geo-environmental Desk Study Report, SKM, December 2013

[Ref 02] - Anfield Stadium Expansion Project: Phase 1 Liverpool FC, Stage C Civil Engineering, Fire Engineering and Acoustics, SKM, January 2014

[Ref 03] - Stanley Park Regeneration Plans; PlanitEDC, 2005

[Ref 04] - Anfield Spatial Regeneration Framework, Liverpool County Council

[Ref 05] - CIRIA C552, Contaminated Land Risk Assessment, A Guide to Good Practice, CIRIA 2001

[Ref 06] - Submission Draft Liverpool Core Strategy, Liverpool County Council, 2012

[Ref 07] - Halton Council, Knowsley Council. Liverpool City Council, Sefton Council. St.Helens Council and Wirral Council Joint Waste Local Plan, 2013

[Ref 08] - Liverpool FC Stadium Expansion Environmental Scoping Report, Mott MacDonald for Liverpool Football Club and Athletics Group Limited, December 2013, report no. 317415/BTL/BNI/1/C

[Ref 09] - British Geological Survey, <http://www.bgs.ac.uk/>, accessed January 2014

[Ref 10] - National Soil Resources Institute, <https://www.landis.org.uk/soilscapes/>, February 2014

[Ref 11] - Magic Maps Website: <http://magic.defra.gov.uk/MagicMap.aspx>, accessed February 2014

[Ref 12] - Environment Agency, <http://www.environment-agency.gov.uk/>. Accessed January 2014

[Ref 13] - Online repository of old maps, <http://www.old-maps.co.uk/index.html>, accessed January 2014

[Ref 014] - Code of Practice for the Sustainable Use of Soils on Construction Sites, DEFRA, 2009

[Ref 15] - Environment Agency, Piling into contaminated sites, 2002

[Ref 16] - Environment Agency , Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention, 2001

[Ref 17] - Concrete in aggressive ground, BRE Special Digest 1:2005, third edition

18 Flood Risk and Water Resources

18.1 Introduction

- 18.1.1 This chapter assesses the risk of flooding to the site from all sources of flooding, the possible impact of the development on flood risk elsewhere, and makes allowances for increased flows and rainfall due to climate change. The chapter also assesses the potential impact of the proposed stadium expansion on water resources.
- 18.1.2 The assessment includes consideration of the impact on flood risk and water resources during both the construction and operational phases.
- 18.1.3 The impacts of the construction and operation of the proposed development may not be restricted to the site itself. Where the development impacts on the flow or water quality of surface water runoff, sewers or groundwater, locations off-site may also be affected. The flood risk and water resources study area therefore comprises the whole site and the surrounding area up to 1km, to consider potential sewer, groundwater and surface water pathways which may be affected by the development. It includes groundwater resources, which are hydraulically connected to the site and may therefore also be affected by the development.
- 18.1.4 The proposed development is located in an urban area which has an existing drainage network, as detailed in the site drainage strategy (see Volume 2, Part 2, Appendix 7.1). The proposed development has the potential to affect the quantity and flow rate of surface water runoff at the site, and run-off flowing into the existing drainage systems. It also has the potential to impact on groundwater resources and the quality of surface water run-off during the construction phase.
- 18.1.5 This chapter presents the assessment methodology, outlines the relevant flood risk and water resources policy and legislation, records the consultation undertaken to date and describes the existing or 'baseline' situation. This chapter then reviews the temporary and permanent effects of the proposed development on flood risk and water resources during the construction phase and the operational phase. Mitigation measures are identified to avoid or minimise any potentially adverse effects on water resources.
- 18.1.6 This chapter has been prepared by Mott MacDonald Ltd. In addition, the chapter has been informed by a Stadium Expansion Drainage Strategy Report compiled by SKM.

Design Measures Incorporated

- 18.1.7 To mitigate the risk from surface water flooding at the site during Phase 1 it is proposed that the surface water drainage design for the extension of the LFC Stadium's Main Stand is to drain the new stand's roof and surrounding impermeable surfaces by means of an underground drainage network, which is to discharge into a United Utilities combined sewer located on Back Rockfield Road. The surface water drainage design accounts for additional capacity for future climate change rainfall increase offering no flooding for 1in30 years return

period (+ climate change) events and containment of flooding resulting from 1in100 years return period (+ climate change) events. There is no requirement to attenuate surface water on the site during this Phase.

- 18.1.8 To mitigate the risk from surface water flooding at the site during Phase 2 it is proposed to drain the Anfield Road stand's roof, via rainwater pipes, and surrounding impermeable surfaces to an attenuation area. From here water will discharge through a flow control device and then outfall into the United Utilities public sewer which runs to the back of the fan zone / car park near to Stanley Park. The surface water drainage design accounts for additional capacity for future climate change rainfall increase offering no flooding for 1in30 years return period (+ climate change) events and containment of flooding resulting from 1in100 years return period (+ climate change) events.

18.2 Methodology

- 18.2.1 This section provides a description of the approach taken for the assessment of effects of flood risk and on water resources.

Sources of information

- 18.2.2 The following sources of information were used in the compilation of this chapter:
- Draft Liverpool Core Strategy (Liverpool City Council) (2012).
 - Environment Agency Indicative Flood Zone Map (www.environment-agency.gov.uk) (accessed February 2014).
 - Environment Agency Risk of Flooding from Surface Water Map (www.environment-agency.gov.uk) (accessed February 2014).
 - Environment Agency Risk of Flooding from Reservoirs (www.environment-agency.gov.uk) (accessed February 2014).
 - Environment Agency Groundwater Source Protection Zone Map (www.environment-agency.gov.uk) (accessed February 2014).
 - Environment Agency Groundwater Vulnerability Map (www.environment-agency.gov.uk) (accessed February 2014).
 - Environment Agency Aquifer Maps (www.environment-agency.gov.uk) (accessed February 2014).
 - Liverpool Strategic Flood Risk Assessment Report (Liverpool City Council) (January 2008)
 - Liverpool Preliminary Flood Risk Assessment Report (Liverpool City Council) (June 2011).
 - Liverpool Surface Water Management Plan (draft report) (Liverpool City Council). The City of Liverpool Unitary Development Plan (Liverpool City Council) (November 2002).
 - Liverpool FC Stadium Expansion, Environmental Scoping Report (Mott MacDonald) (December 2013).
 - United Utilities Sewer Records (October 2006).
 - Stadium Expansion Drainage Strategy Report (SKM) (2014).

Desk study

- 18.2.3 To inform the assessment of effects, consultation was undertaken with the Environment Agency and LCC to obtain any site specific flood risk and water resources information which they hold, including records of any historic flooding.
- 18.2.4 A desk study was undertaken to establish the site location, geological, hydrological and hydro-geological setting. The desk study also determined the current baseline conditions and the potential for mitigation measures by reviewing information on existing groundwater sources, and investigating all sources of existing flood risk to the development site, including fluvial flooding, tidal flooding, flooding from artificial drainage systems, surface water flooding, groundwater flooding and flooding from other manmade sources such as reservoirs.
- 18.2.5 This chapter also presents the outcome of the standalone Flood Risk Assessment (FRA) which has been carried out as a part of the Environment Impact Assessment (EIA). This requires development to be directed away from areas of highest flood risk, but where development is necessary, making it safe without increasing flood risk elsewhere. Since the development will be in Flood Zone 1, the requirement to avoid areas of highest flood risk will be satisfied, and the primary focus of the FRA is on the proposed arrangements for surface water drainage from the site. The FRA was produced in accordance with the NPPF and associated Technical Guidance, and can be found in Volume 2, Part 3, Appendix 5.1.
- 18.2.6 The FRA demonstrates that the proposed site is not at risk from fluvial, tidal, groundwater or sewer flooding, or flooding from artificial sources, but is at risk from surface water flooding. The FRA therefore recommends that surface water run-off at the site is managed through the use of new and existing underground sewer systems for Phase 1, as detailed in the site Drainage Strategy (Volume 2, Part 2, Appendix 7.1). SuDS were considered during the development of the Drainage Strategy for Phase 1 however, due to the local geology, most options were not viable and were ruled out. Therefore a system of new and existing underground sewers has been outlined to dispose of surface water from the site. For Phase 2 it is proposed to drain the Anfield Road stand's roof, via rainwater pipes, and surrounding impermeable surfaces to an attenuation area. From here water will discharge through a flow control device and then outfall into the existing public sewer network.
- 18.2.7 The baseline conditions described in Section 18.6 below were used as the basis for an assessment of the significance of the potential effects of the proposed stadium expansion on flood risk and water resources.
- 18.2.8 The effect of the proposed stadium expansion on flood risk and water resources has been assessed by evaluating the sensitivity of the baseline environment, and the potential magnitude of predicted effects. The sensitivity of the receptors including groundwater, surface water, sewer networks and water supplies, is defined in Table 18.1 below. The criteria used

for determining the magnitude of the effect and assessing the overall effect are defined in Chapter 6 Table 6.2 and Table 6.3 respectively.

18.2.9 Finally, potential mitigation measures, including the outputs from the site Drainage Strategy (see Volume 2, Part 3, Appendix 5.1), have been outlined and an assessment of the residual effect of the proposed development on flood risk and water resources has been carried out.

Table 18.1: Sensitivity of Receptor

Sensitivity	Definition
High	<p>Receptor is of high ecological importance or National or International value (e.g. Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), habitat for protected species, Environment Agency (EA) water quality RE110).</p> <p>The River Basin Management Plan Ecological Quality is 'High' or 'Good'.</p> <p>Receptor is at high risk from flooding (Flood Zone 3a or 3b).</p> <p>Receptor is used for public and/or private water supply.</p> <p>Groundwater vulnerability is classified as high, presence of a Principal aquifer. Site is within a groundwater source protection zone 1 or 2 (SPZ1/SPZ2), inner and outer protection zones.</p> <p>Soil type and associated land use is highly sensitive (e.g. bog/ Agricultural Land Classification Grade 1-2).</p>
Medium	<p>Receptor is of medium environmental importance, EA water quality RE 211-312.</p> <p>The River Basin Management Plan Ecological Quality is 'Moderate'.</p> <p>Receptor is at moderate risk from flooding (Flood Zone 2).</p> <p>Moderate classification of groundwater vulnerability, presence of a Secondary aquifer. Site is within SPZ3, a source catchment protection zone.</p> <p>Soil type and associated land use moderately sensitive (e.g. arable, commercial forestry, Agricultural Land Classification Grade 3).</p>
Low	<p>Receptor is of low environmental importance, EA water quality RE413-514 (seriously polluted).</p> <p>The River Basin Management Plan Ecological Quality is 'Poor or Bad'.</p> <p>Receptor is at low risk from flooding (Flood Zone 1).</p> <p>Receptor not used for water supplies (public or private).</p> <p>Presence of Unproductive Strata.</p> <p>Soil type and associated land use not sensitive to change in hydrological regime and associated land use (e.g. intensive grazing, Agricultural Land Classification Grade 4-5).</p>
Negligible	<p>Receptor lies outside of the sphere of influence of the proposed development.</p>

10 River Ecosystem Classification Target 1: Water is of very good quality suitable for all fish species.

11 River Ecosystem Classification Target 2: Water is of good quality suitable for all fish species.

12 River Ecosystem Classification Target 3: Water is of fairly good quality suitable for high-class coarse fisheries.

13 River Ecosystem classification Target 4: Water is of fair quality suitable for coarse fisheries.

14 River Ecosystem Classification Target 5: Water is of poor quality likely to limit fish populations.

18.3 Legislation and policy

National Legislation and Policy

18.3.1 The NPPF and associated Technical Guidance (2012) states that:

“a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.” (paragraph 102 of the NPPF)

Development Planning Policy

18.3.2 The City of Liverpool UDP was adopted by Liverpool City Council in 2002. Those saved policies relevant to Flood Risk and Water Resources are:

18.3.3 GEN8 Environmental Protection

18.3.4 The Plan aims to protect and enhance Liverpool’s environment by [inter alia]:

“iv) protect land drainage and prevent flooding”

18.3.5 EP12 Protection of Water Resources

“1. Planning permission will not be granted for development which, in the opinion of the City Council following consultation with the Environment Agency, would adversely affect the quality or supply of surface water or groundwater as a result of:

i. the nature of the surface or waste water discharge; or

ii. unsatisfactory arrangements for the disposal of foul sewage, trade effluent or surface water; or

iii. the disturbance of contaminated land; or the spillage or leakage of stored oil or chemicals.

2. Planning permission will not be granted for developments involving local abstraction of surface or ground water which in the opinion of the City Council following consultation with the Environment Agency would:

i. increase requirements for water, unless an adequate water supply already exists or would be provided in time to serve the development; or

ii. pose an unacceptable risk to the current supply of water users.

18.3.6 EP13 Flood Prevention

1. Unless appropriate alleviation or mitigation measures are carried out, planning permission will not be granted for development which would:

- i. be at direct unacceptable risk from flooding;
- ii. be likely to increase the risk of flooding elsewhere;
- iii. cause loss of access to watercourses for future maintenance;
- iv. result in an adverse impact on the water environment due to additional surface water run off; or
- v. have adverse effects upon the integrity of tidal and fluvial defences.

2. All works in, under, over or adjacent to water courses, waterbodies and the coast will need to be approved by the Environment Agency's Environmental Appraisal Procedure. Culverting and diversion will not be permitted except to enable reasonable access over a watercourse.

18.3.7 LCC commenced preparation of a Core Strategy to replace the strategic policies of the adopted UDP. While that plan reached an advanced stage of preparation it was not submitted for examination and has now been abandoned in favour of producing a city-wide Local Plan. The draft strategic policies of the Core Strategy will be used to inform the emerging Local Plan.

18.3.8 Those draft policies relevant to Flood Risk and Water Resources that may be carried forward into the emerging local plan are:

18.3.9 *Strategic Policy 1: Sustainable Development Principles*

... To ensure the sustainable growth of the City new development should be located and designed so that resources are used prudently, the local and wider environment is protected, the challenges of climate change are addressed and the needs of the whole community are taken into account. New development should:

... Avoid areas at risk from flooding, demonstrating it will not exacerbate potential sources of flood risk, include flood mitigation measures and provide Sustainable Urban Drainage Systems (SUDS) ...

18.3.10 Strategic Policy 23: Key Place-Making and Design Principles

... *Development proposals will be required to demonstrate:*

... g. Inclusion of measures to ensure that proposed buildings and spaces can adapt to changing environmental, social and economic circumstances, particularly climate change including flood risk and energy management...

18.3.11 Strategic Policy 31: Sustainable Growth

To ensure the sustainable growth of the City development proposals should:

contribute to achieving the objectives of the City Council's Climate Change Strategic Framework

ensure high levels of energy and water efficiency and a sustainable approach to construction and the use of materials....

Take into account the location and condition of culverted watercourses to enable improvement through development opportunities and provides and/or support continuing management as necessary for sustainable urban drainage methods

18.3.12 Strategic Policy 33 : Environmental Impacts

1... New development should seek to avoid negative impacts on the environment through

adoption of best practice. Where a negative effect is identified this should be mitigated by appropriate measures. Specifically, development proposals should:

...c. Improve and protect water and groundwater quality, including the River Mersey, Leeds & Liverpool Canal, and other inland rivers and watercourses and including where appropriate and feasible the opening up of watercourses to assist in flood risk management...

...f. Demonstrate that it will not exacerbate potential sources of flood risk...

2. Sensitive areas where development may have an impact, and which would therefore require avoidance or careful assessment and mitigation measures, include:

a. Areas at risk from coastal, river and surface water flooding, including small areas along the River Mersey and on the north east and south east fringes of the City, and North Docks and Garston Docks which provide access to processing and trans-shipment facilities for mineral resources from the Mersey Estuary, Liverpool Bay and other sources

b. Areas at risk from ground water flooding

c. Natura 2000 sites and Ramsar sites both within and beyond the Liverpool City Council boundary. Development proposals which may have an adverse impact will be subject to a Habitat Regulations Assessment at the project level to ensure that any likely significant effects

have been assessed, and measures to avoid or mitigate these effects have been identified and are deliverable.

18.4 Consultation

- 18.4.1 The EA has been consulted with regards to the Scoping Report and obtaining information on flood risk and water resources. The EA agrees with the approach being taken and has outlined the need for a FRA, which is included in Volume 2, Part 3, Appendix 5.1.
- 18.4.2 LCC was approached to obtain information on flood risk at the site. The Strategic Flood Risk Assessment and Surface Water Management Plan (SWMP) are both still in draft form and therefore not available for use in this ES, however LCC provided the 1 in 200 year Surface Water Flood Map for the site taken from the draft SWMP.
- 18.4.3 Table 18.2 provides a summary of the consultation activities undertaken in support of the preparation of this Chapter.

Table 18.2: Summary of scoping response for Flood Risk and Water Resources

Name of Organisation	Key Concerns	Comment
Environment Agency	A Flood Risk Assessment will be required Agree with the proposed Assessment Methodology	The Flood Risk Assessment is included as part of the EIA (Volume 2, Part 3, Appendix 5.1)

18.5 Assumptions and limitations

- 18.5.1 Flood Zone extents given on the EA flood map are only indicative and do not take into account any man-made structures such as railway embankments and roads or flood defences.

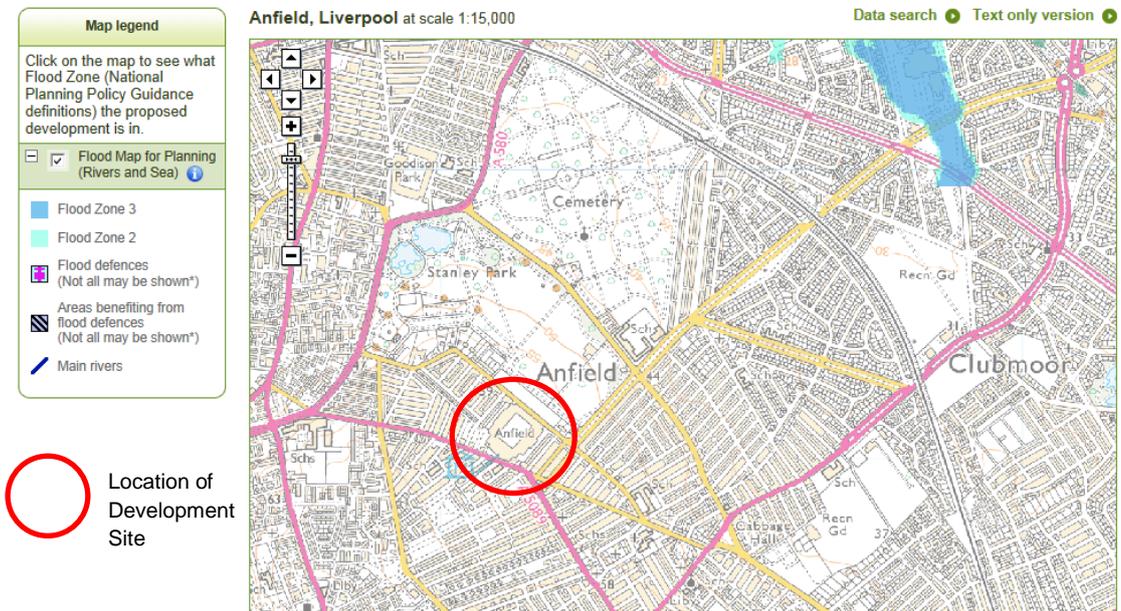
18.6 Baseline conditions

- 18.6.1 With respect to flood risk, the primary source of information in England is the EA Flood Maps, as made available on their website, <http://www.environment-agency.gov.uk/homeandleisure/37793.aspx>
- 18.6.2 The Flood Maps indicate the assessed risk from fluvial and tidal flooding, and allocate all land into one of three Flood Zones. The flood risk within these Zones is defined as follows:
- Zone 1 – Low Probability, land having less than a 1 in 1000 annual probability of river or tidal flooding in any year.
 - Zone 2 – Medium Probability, land having between a 1 in 100 and 1 in 1000 annual probability of river flooding, or between a 1 in 200 and 1 in 1000 annual probability of tidal flooding in any year.

- Zone 3 – High Probability, land having a 1 in 100 or greater annual probability of river flooding, or 1 in 200 or greater annual probability of tidal flooding in any year.

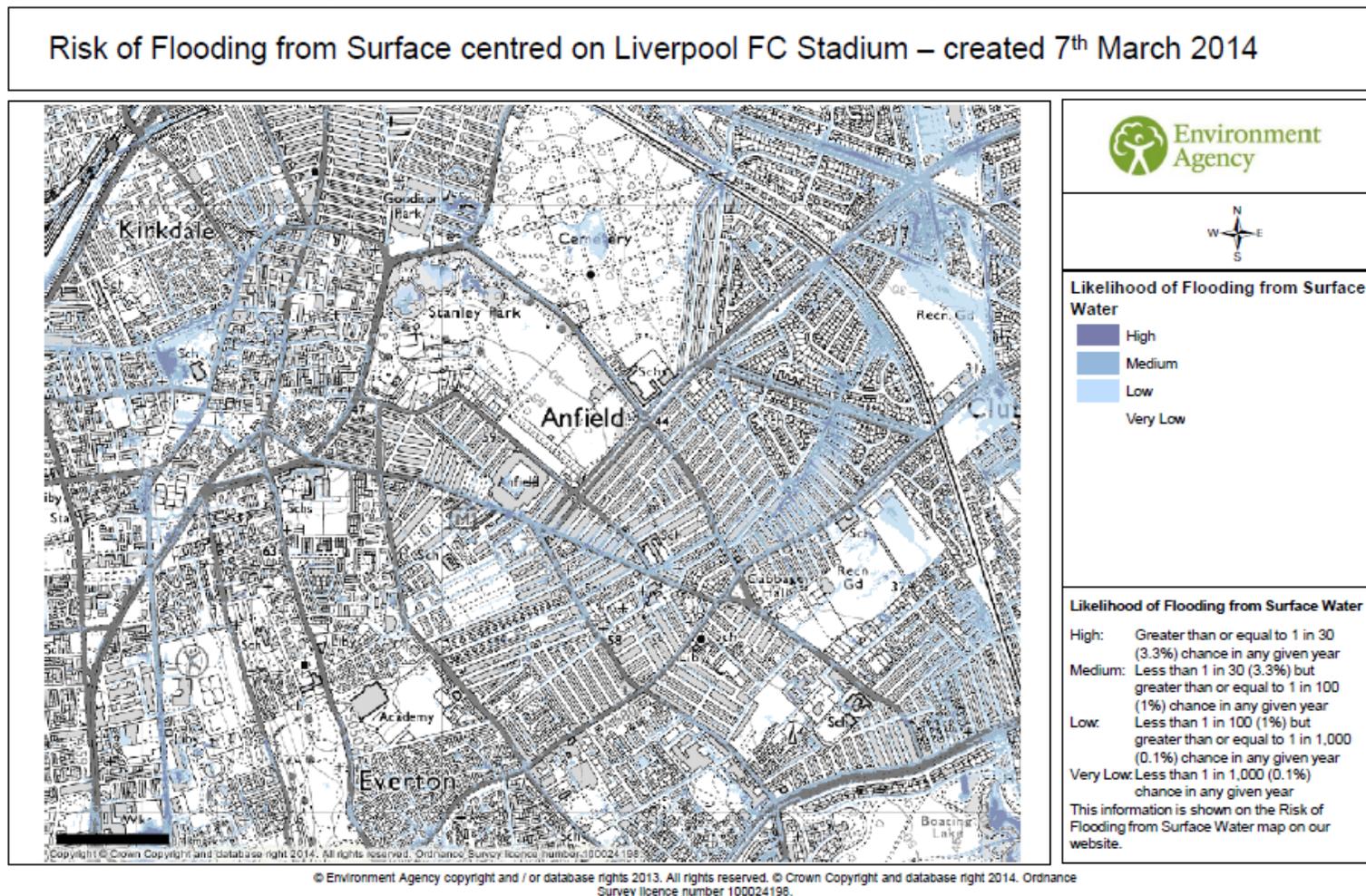
18.6.3 The EA Flood Maps show the site to be within Flood Zone 1 (Figure 18.1 and Figure 18.2), and thus to be at low probability of fluvial or tidal flooding.

Figure 18.1: Environment Agency Flood Map (March 2014)



Source: www.environment-agency.gov.uk

Figure 18.2: Environment Agency Risk of Flooding from Surface Water Flood Map (March 2014)

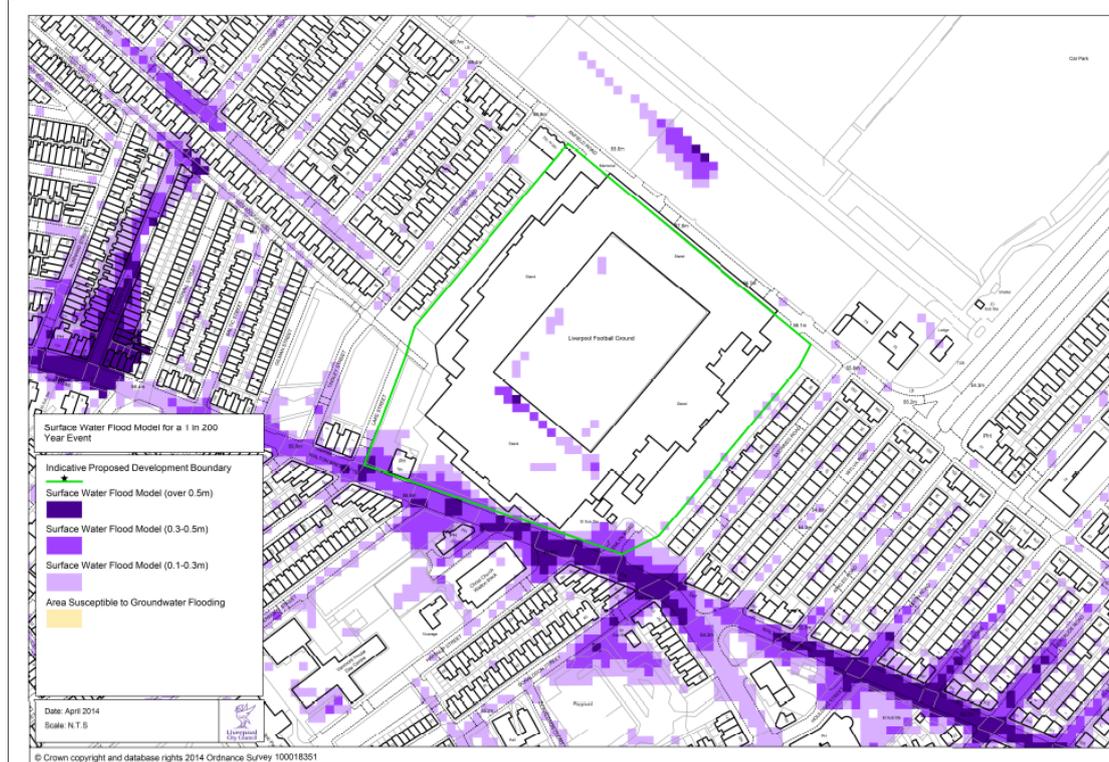


Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Source: Email from Environment Agency Dated 07 March 2014

- 18.6.4 The EA Risk of Flooding from Surface Water Map (Figure 10.3) shows there is some risk to the proposed development site from surface water flooding. The area at risk is, however, small and constrained to the football pitch itself. There is a small area at “High” risk, meaning that each year, this area has a chance of flooding of greater than 1 in 30 (3.3%). Part of Walton Breck Road, lying immediately to the south of the application site, is also shown to be at high risk of surface water flooding.
- 18.6.5 LCC provided the Surface Water Flood Map for a 1 in 200 year rainfall event, as shown in Figure 18.3. This map also shows there is a small area at risk from flooding on the football pitch, and there is some risk from surface water flooding along the southern edge of the site with depths of up to 0.5m. Walton Breck Road is again shown to be at risk from flooding of depths greater than 0.5m.

Figure 18.3: 1 in 200 year Surface Water Flood Map

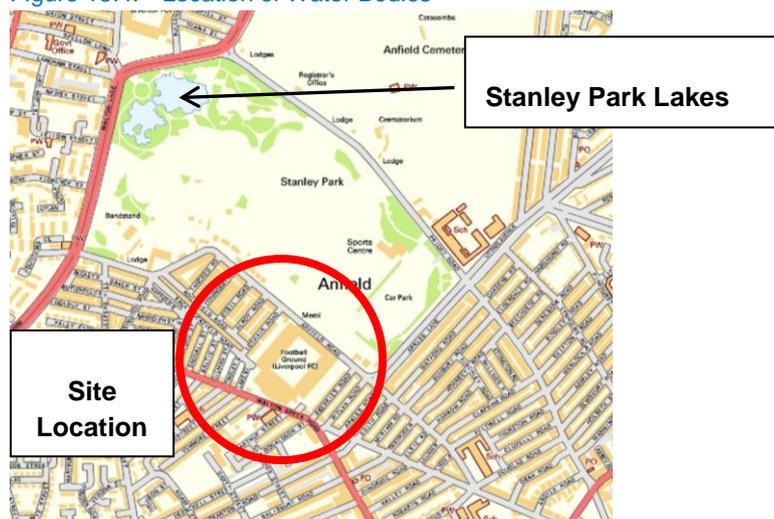


Source: Liverpool City Council

- 18.6.6 The Liverpool Preliminary Flood Risk Assessment (PFRA) shows that Walton Breck Road, to the south of the site, is within an Area Susceptible to Surface Water Flooding (intermediate), however the proposed development is not in a “Known Flooding Area” (PFRA 2011, Figure

- 5.2.1), and the EA has “no records of flooding at the site” (email correspondence, 10 March 2014, see Volume 2, Part 3, Appendix 5.1).
- 18.6.7 The PRFA also indicates the site is not in an Area Susceptible to Groundwater Flooding, and the EA has “no records of flooding at the site” (email correspondence, 10 March 2014, see Volume 2, Part 3, Appendix 5.1).
- 18.6.8 The United Utilities (UU) sewer records show there are combined sewers within the site boundary. However, the PRFA does not contain any historic information of sewer flooding at the site and the EA has “no records of flooding at the site” (email correspondence, 10 March 2014). Any intention to discharge surface-water run-off into the sewerage system is subject to the utility providers (UU) approval. In an email sent on the 21 November 2013 UU confirmed that “UU will not impose any restrictive discharges over and above the existing regime” (Volume 2, Part 3, Appendix 5.1).
- 18.6.9 The EA website indicates that there is no risk of flooding to the site from the potential breach of reservoirs.
- 18.6.10 With respect to Water Resources, the principal surface water body in the vicinity of the proposed development is the River Mersey which flows some 3km to the east of the site. There is a small pond, Stanley Park Lake, situated some 600m north of the site across the park (Figure 18.4).

Figure 18.4: Location of Water Bodies



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- 18.6.11 The Chester Pebbles Beds Formation underlying the site is designated as a Principal Aquifer by the EA, which is described as:

“layers of rock or drift deposits that have high inter-granular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale”.

- 18.6.12 The site is not within any source protection zones and no sensitive groundwater abstractions are located within 1km of the site.

18.7 Assessment of effects

Construction – likely significant effects

Temporary effects

- 18.7.1 During the construction phase of Phase 1 and Phase 2 there is the potential for excavated or stockpiled material to be washed into local sewers. This could lead to blockages, increasing flood risk at manhole locations near the blockages. There are a number of sewers in the vicinity of the proposed construction site which are considered to be of low sensitivity due to the low risk from flooding. Therefore it is assessed that the magnitude of the effect would be moderate, having an overall minor effect prior to mitigation.
- 18.7.2 Accidental spills or leakages of hazardous substances may lead to contaminants in surface water run-off and the sewer system, affecting the water quality. Surface water and sewer water is not used for water supplies and is considered to be of low sensitivity. Therefore it is assessed that the magnitude of the effect would be moderate, having an overall minor effect prior to mitigation.
- 18.7.3 Temporary removal of topsoil during construction works of Phase 1 and Phase 2 may decrease retardation of contaminants, increasing the risk of contaminants leaching into groundwater. Groundwater is classified as a Principal Aquifer and while there are no local abstractions, groundwater is considered to be of high sensitivity. It is assessed that the impact on the water resource would be insufficient to reduce water quality; therefore the magnitude of the effect would be moderate, having an overall moderate effect prior to mitigation.
- 18.7.4 Accidental spills or leakages of hazardous substances may lead to migration of contaminants into underlying groundwater. Groundwater is classified as a Principal Aquifer and while there are no local abstractions, groundwater is considered to be of high sensitivity. It is assessed that the impact on the water resource would be insufficient to reduce water quality; therefore the magnitude of the effect would be moderate, having an overall moderate effect prior to mitigation.
- 18.7.5 Mobilisation of contaminants during excavation works during Phase 1 and Phase 2 could cause migration of contaminants into controlled waters. Groundwater is classified as a Principal Aquifer and while there are no local abstractions, groundwater is considered to be of

high sensitivity. It is assessed that there is potential for pollution of a potable source; therefore the magnitude of the effect would be major, having an overall major effect prior to mitigation.

Permanent effects

- 18.7.6 There are not considered to be any permanent effects on flood risk and water resources from the construction phase.

Operation – likely significant effects

Temporary effects

- 18.7.7 The proposed development involves the construction of impermeable surfaces which has the potential to increase surface water run-off peak rates and volumes, increasing the flood risk both on site and off site. The impact of this increase will be temporary until the peak storm has passed. The implementation of the site Drainage Strategy (Volume 2, Part 3, Appendix 5.1), will reduce surface water runoff rates and volumes at the site during rainfall events. The Drainage Strategy proposes that surface water run-off at the site is managed through the use of new and existing underground sewer systems for Phase 1. For Phase 2 it is proposed to drain the Anfield Road stand's roof, via rainwater pipes, and surrounding impermeable surfaces to an attenuation area. From here water will discharge through a flow control device and then outfall into the existing public sewer network. The design accounts for additional capacity for future climate change (CC) rainfall increase offering no flooding for 1in30 years return period (+CC) events and containment of flooding resulting from 1in100 years return period (+CC) events.
- 18.7.8 The EA Surface Water Flood Map (Figure 18.2) shows the site to have some risk from surface water flooding and this receptor is considered to be of medium sensitivity. As the existing surfaces are predominantly impermeable and taking into consideration the additional landscaping that is proposed it is considered that the magnitude of the effect would be minor, having an overall minor effect prior to mitigation (beyond that incorporated into this assessment i.e. the site drainage strategy).
- 18.7.9 Given the site is in Flood Zone 1, there will be no direct risk of flooding to the development from tidal or fluvial sources and no significant impacts of the development on fluvial or tidal flood risk elsewhere.
- 18.7.10 For the operational phase of the LFC Stadium Expansion spillages from parked vehicles may contaminate underlying groundwater. Groundwater is classified as a Principal Aquifer and while there are no local abstractions, groundwater is considered to be of high sensitivity. It is assessed that the impact on the water resource would be insufficient to reduce water quality; therefore the magnitude of the effect would be moderate, having an overall moderate effect prior to mitigation.

Permanent effects

- 18.7.11 There are not considered to be any permanent effects on flood risk and water resources from the operation phase.

18.8 Mitigation

Construction

- 18.8.1 The Contractor will produce a Construction Environmental Management Plan (CEMP) prior to commencement of construction of the development.
- 18.8.2 During construction, care will be taken to prevent stockpiled materials from being washed into the sewer system. Workers onsite will be given the necessary guidance to ensure that blockages of the sewer system are prevented. Site drainage will be designed to ensure that sediment, litter and other foreign materials are removed from surface water runoff prior to discharge into the sewer system.
- 18.8.3 In order to mitigate the pollution risk to surface water, sewer water and groundwater during construction, the CEMP will include recommendations as follows:
- Storage of hazardous substances in accordance with relevant legislation;
 - Emergency procedures in place in case of accidental spills; and
 - Procedures put in place should contaminated land be encountered- all works to cease until an assessment has been carried out.

Operation

- 18.8.4 The implementation of the site Drainage Strategy (Volume 2, Part 3, Appendix 7.1), will reduce surface water runoff rates and volumes at the site during rainfall events. The Drainage Strategy proposes that surface water run-off at the site is managed through the use of new and existing underground sewer systems for Phase 1. For Phase 2 it is proposed to drain the Anfield Road stand's roof, via rainwater pipes, and surrounding impermeable surfaces to an attenuation area. From here water will discharge through a flow control device and then outfall into the existing public sewer network.
- 18.8.5 SuDS were considered for Phase 1 and a system that would better the existing surface water flood risk situation was investigated. However, due to the local geology, most options were not viable and were ruled out. Therefore betterment could not be achieved.
- 18.8.6 For the operational phase of the LFC Stadium Expansion, fuel interceptors will be installed within the Outside Broadcast area to ensure that any spillages from parked vehicles will be captured and not contaminate underlying groundwater.

18.9 Cumulative effects

- 18.9.1 Cumulative effects are those that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence (ZoI). While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.
- 18.9.2 The current list of planned developments which are included in the cumulative impact assessment, are those identified in the Anfield SRF comprising:
- Anfield Village & Rockfield housing refurbishment;
 - New build housing led regeneration;
 - The Walton Breck Road (The High Street) Corridor;
 - New public space and Village Square development (training hotel and offices); and
 - Completion of the restoration of Stanley Park east of Mill Lane.
- 18.9.3 The Anfield Village & Rockfield housing refurbishment, new-build housing-led regeneration and Walton Breck Road Corridor developments involve the construction of impermeable surfaces and therefore have the potential to increase surface water runoff peak rates and volumes, increasing the risk of flooding from this source. However, the completion of Stanley Park involves examining opportunities to improve SuDS, and the new public space and village square may also have the opportunity to implement SuDS and help to reduce the risk from surface water flooding. It is assumed that any new development will be in accordance with NPPF and the supporting Technical Guidance, and will therefore mitigate any increase in surface water runoff. Therefore, the cumulative effect of all the planned developments will be minor positive in reducing the risk of surface water flooding.
- 18.9.4 The only surface water body within the SRF area and surrounding area is the pond in Stanley Park. Therefore, potential for effects from the Anfield SRF development options on water quality is limited.
- 18.9.5 There is potential for spillages or pollution incidents during construction. However, the indicative depth of the groundwater is at 20m, therefore, effects are unlikely. There is potential for localised improvements to water quality through increased landscaping, particularly through the Stanley Park development options. Therefore, the cumulative effect of all the planned developments will be minor positive on water quality.

18.10 Residual Effects

Construction

- 18.10.1 There will be no predicted residual impacts because through the application of a CEMP, prevention of stockpiled and excavated materials from washing into the watercourse and

drains to mitigate the pollution risk to surface water, sewer water and groundwater during construction will reduce the magnitude of the effect to neutral.

Operation

18.10.2 It is predicted there will be a minor residual effect resulting from surface water flooding.

18.11 Summary of effects

18.11.1 A tabulated summary of effects is presented within Table 18.3:

Table 18.3: Summary of Effects for flood risk and on water resources

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/ Beneficial	Permanent/ Temporary	Residual Effect
Construction	Sewer flood risk	During the construction phase there is the potential for excavated or stockpiled material to be washed into local sewers. This could lead to blockages, increasing flood risk at manhole locations near the blockages.	Workers on site will be given the necessary guidance to ensure that blockages of the sewer system are prevented. Site drainage will be designed to ensure that sediment, litter and other foreign materials are removed from surface water runoff prior to discharge into the sewer system.	Minor	Adverse	Temporary	Neutral
	Surface and Sewer water quality	Accidental spills or leakages of hazardous substances may lead to contaminants being present in surface water run-off and entering sewers, affecting the water quality.	Storage of hazardous substances in accordance with relevant legislation. Emergency procedures in place in case of accidental spills.	Minor	Adverse	Temporary	Neutral
	Groundwater	Temporary removal of topsoil during construction works may decrease retardation of contaminants, increasing the risk of contaminants leaching into groundwater.	Procedures put in place should contaminated land be encountered- all works ceased until an assessment has been carried out.	Moderate	Adverse	Temporary	Neutral
	Groundwater	Accidental spills or leakages of hazardous substances may lead to migration of contaminants into underlying groundwater.		Moderate	Adverse	Temporary	Neutral
	Groundwater	Mobilisation of contaminants during excavation could cause migration of contaminants into controlled waters.		Major	Adverse	Temporary	Neutral
Operation	Surface water runoff	Impermeable surfaces leading to an increase in surface water run-off peak rates and volumes	None beyond mitigation incorporated into the assessment (implementation of the drainage strategy)	Minor	Adverse	Temporary	Minor
	Groundwater	Potential for fuel/oil leakage from vehicles stored in Outside Broadcast area.	Installation of fuel interceptors in Outside Broadcast area.	Moderate	Adverse	Temporary/ Permanent	Minor; Insignificant

18.12 Proposed monitoring

18.12.1 The proposed drainage development at the site should undergo regular maintenance to ensure there is no obstruction to flows, which could lead to localised flooding. Maintenance of the drainage development should be regularly monitored.

18.13 Statement of significance

18.13.1 The predicted effects of the construction phase on sewer flood risk and surface and sewer water quality is predicted to be of a minor temporary nature.

18.13.2 The predicted effects of the construction phase on groundwater contamination and quality is predicted to be of a moderate and major temporary nature respectively.

18.13.3 The predicted effects of the operation phase on surface water run off/surface water flooding is predicted to be of a minor temporary nature.

18.13.4 The effects of the operation phase on groundwater quality is predicted to be of moderate temporary or permanent nature.

18.13.5 Following mitigation the proposed development is shown to not have any significant effects on flood risk and water resources. The proposed development is shown to have an overall neutral residual effect on flood risk and water resources.

18.14 References

[Ref 01] - CIRIA (2007), *The SUDS Manual*

[Ref 02] - Department for Communities and Local Government (2012), *Technical Guidance to the National Planning Policy Framework*.

[Ref 03] - Environment Agency (2014), *Indicative Flood Zone Map*, www.environment-agency.gov.uk.

[Ref 04] - Environment Agency (2014), *Risk of Flooding from Surface Water Map*, www.environment-agency.gov.uk

[Ref 05] - Environment Agency (2014), *Risk of Flooding from Reservoirs Map*, www.environment-agency.gov.uk.

[Ref 06] - Environment Agency (2014), *Groundwater Source Protection Zone Map*, www.environment-agency.gov.uk.

[Ref 07] - Environment Agency (2014), *Groundwater Vulnerability Map* www.environment-agency.gov.uk.

[Ref 08] - Environment Agency (2014), *Aquifer Maps* www.environment-agency.gov.uk

[Ref 09] - Environment Agency Pollution Prevention Guidance 1 (PPG1) (2001), *General Guide to the Prevention of Pollution*.

[Ref 10] - Environment Agency Pollution Prevention Guidance 7 (PPG7) (2011), *The Safe Operation of Refuelling Facilities*.

[Ref 11] - Liverpool City Council (2012), *Draft Liverpool Core Strategy*.

[Ref 12] - Liverpool City Council (2011), *Liverpool Preliminary Flood Risk Assessment Report*.

[Ref 13] - Liverpool City Council (2002), *The City of Liverpool Unitary Development*.

[Ref 14] - Mott MacDonald (2013), *Liverpool FC Stadium Expansion, Environmental Scoping Report*.

[Ref 15] - United Utilities (2006), *Sewer Records*.

19 Socio-Economics

19.1 Introduction

- 19.1.1 This chapter considers the likely socio-economic effects of LFC's proposed redevelopment of their football stadium to the local area, Liverpool local authority area, and to the Liverpool city region. The assessment also considers the wider regeneration benefits¹⁵ from the proposed stadium redevelopment, as well as the cumulative effects of related developments proposed by LCC and Your Housing within the boundary of the Strategic Regeneration Framework (SRF) area¹⁶.
- 19.1.2 Specifically, the assessment considers the potential effects associated with the additional economic activity supported as a result of the proposed stadium expansion. This includes the temporary employment supported as a result of construction activity, as well as direct, indirect and induced employment that arises as a result of the operation of the expanded stadium.
- 19.1.3 The following impact areas have been identified and used within the assessment, while their use and justification is also explained:
- **Liverpool impact area** – the football club is one of the city's most important assets, particularly as an employer, purchaser of goods and services, and as an attractor of visitors. The Liverpool local authority area is considered a meaningful economic area in which to assess socio-economic impacts and effects. It is meaningful as it is the spatial scale in which it would be expected that a concentration of economic activity associated with the Club would arise (e.g. in terms of employment and supply chain impacts). This local authority based impact area also coincides with the LCC planning authority area, which will determine the Club's planning application.
 - **Liverpool city region impact area** – the football club also has an important socio-economic reach outside of the LCC boundary, and out across the city region area (including the Merseyside districts and Halton Unitary Authority area). The city region area has also grown in relevance in policy and economic terms in recent years, as this spatial area represents functional economic area of the Liverpool city region. The Local Enterprise Partnership (LEP) area, with its economic strategy and priorities, is also based on this spatial area. For the purposes of this assessment, the city region represents a meaningful area to assess socio-economic impacts and effects. It is an area in which it would be expected a concentration of economic activity associated with the Club would arise (e.g. in terms of employment and supply chain impacts). It also has an important

¹⁵ The assessment also considers the wider regeneration benefits (or sometimes referred to as catalytic effects) that the stadium redevelopment could deliver to support the regeneration of the Anfield area and the proposals coming forward as part of the SRF process (e.g. to what extent does the stadium's redevelopment make a difference in supporting the regeneration objectives for the SRF area). This element of the assessment will be a qualitative discussion of these benefits.

¹⁶ The cumulative assessment should consider the significance of effects on the identified receptors when the socio-economic impacts of both the stadium proposals and other projects taking place within the SRF area are assessed together. However, at this stage there has not been an independent assessment of the economic impacts associated with the other SRF projects. As such, the cumulative assessment is brief and qualitative in nature.

alignment with economic and policy development, given the focus on city-region wide economic development priorities and strategy.

- 19.1.4 The Anfield local area is also an important area to consider. Where possible, reference is made to the potential for impacts to arise locally. However, given the nature of this economic assessment it is extremely challenging to quantify the potential temporary (construction) and permanent (operational) impacts that may arise specifically within the local neighbourhood area (within Anfield ward and parts of Everton ward given the boundary of the SRF and the socio-economic analysis contained within it). There are some uncertainties surrounding the Club's recruitment approach, where construction and supply chain businesses source their labour, and where off-site expenditure is spent, and hence where indirect employment is supported. The Liverpool and Liverpool city region impact areas provide a more appropriate spatial scale for the assessment. While the Club is an important source of local employment, a purchaser of goods and services, and a driver for local visitor expenditure, it is challenging to accurately reflect the effect on receptors at the very local spatial scale. Where appropriate qualitative commentary is provided.
- 19.1.5 This chapter presents the assessment methodology, outlines relevant socio-economic policy and legislation, records the consultation undertaken to date and describes the existing or 'baseline' socio-economic situation, as well as an assessment of the current economic impacts of the existing stadium operations. An assessment of the potential effects arising from the construction and operation of the proposed development as well as a qualitative assessment of the wider regeneration benefits (or 'up-lift' effects) is also presented.
- 19.1.6 This chapter has been prepared by Regeneris Consulting. This chapter has been informed by the economic impact assessment prepared by Regeneris Consulting ('The Socio-economic impact of an Expanded Stadium'). The separate report provides a comprehensive overview of the assumptions made in modelling the economic impact of the expanded stadium, and should be read in conjunction within this chapter.

Employment policies incorporated

- 19.1.7 When the Club was proposing to build a new stadium in Stanley Park they developed an employment and training strategy in line with a S106 obligation required by LCC. This strategy highlighted the Club's proposed approach to maximise the employment benefits of the stadium for local people, as well as Liverpool and city region residents (e.g. through local engagement, Liverpool based print and on-line advertising, Liverpool based recruitment partners). It is anticipated that the Club would follow a similar recruitment approach for the expanded stadium.
- 19.1.8 In line with the above it has been assumed within the assessment below there will be a likely insertion of clauses within the main construction contract for the appointed contractor to use their 'best endeavours' to source local sub-contractors and their labour.

19.2 Methodology

- 19.2.1 The approach to the socio-economic assessment has drawn on accepted methods for calculating the economic impact of major sporting and commercial facilities:
- CLG Environmental Impact Assessment (EIA) Guidance: This guidance was prepared by the Department for Communities and Local Government (CLG) in 2006. It outlines the approach to assessing environmental impacts (e.g. methodology, assessing significance, cumulative effects), as well as guidance on the preparation of the Environmental Statement. Regeneris Consulting adheres to this broad assessment framework when assessing impacts, although no specific guidance for undertaking socio-economic impact assessments has been prepared by CLG.
 - HM Treasury Green Book - Impact Assessment Guidance: The HM Treasury Green Book sets out the broad framework for the appraisal and evaluation of all policies, programmes and projects. While the Green Book guidance is used extensively in appraising and evaluating the costs and benefits of public sector investment projects, the guidance provides the most rigorous methodology to undertake economic impact assessments. The methods outlined in this guidance, particularly around measuring employment, have been used in this assessment. The Green Book is also helpful in guiding on how uncertainty and risk are treated in the assessment of economic impact.
- 19.2.2 Where it has been necessary to make assumptions, these have been cautious in order to ensure an assessment that is both robust and as realistic as possible. The assessment has been a largely desk-based exercise, complemented by consultations with a range of LFC officials, LCC and Marketing Liverpool.
- 19.2.3 The assessment takes account of the latest information supplied by the Club on its current operations, as well as their business and operational plans for the expanded stadium, and on the level of activity that is expected to take place within the stadium.
- 19.2.4 The approach to assessing the potential socio-economic effects was as follows:
- Defining receptors – the choice of socio-economic receptors are appropriate to the circumstances of the development and the impact areas. Receptors have been identified for the construction and operational phases of the proposed development. Assessments of significance follow the approach stated in Chapter 6.
 - Preparation of the socio-economic and regeneration policy context and the socio-economic baseline. The policy context section includes a review of all relevant planning, regeneration and economic development policies which refer to socio-economic priorities and policies in the Anfield, Liverpool and city region areas, as well as specific references to the Football Club and regeneration. The socio-economic baseline provides an overview of the demographic, labour market, employment, housing, and deprivation considerations in the local Anfield impact area and the wider impact areas. The baseline also takes

account of the current scale and nature of the visitor economy in Liverpool and the city region. The policy review and socio-economic baseline are important reference points in judging the sensitivity of the receptors when undertaking the assessment of the significance of effects. The assessment of the magnitude of impact for each receptor is also informed by the change that arises in the context of the baseline conditions in the impact areas. More detail on the assessment of sensitivity and magnitude is presented below.

- Assessing the current impact of the stadium – a further section of the baseline assesses the current impacts of the stadium across the identified impact areas. It is important to assess the current economic contribution of the existing stadium so the potential additional socio-economic impacts arising from an expanded stadium can be assessed. The impact assessment framework is outlined below for both the current and future positions. The most effective approach to gathering information on the current economic impacts and the proposed development impacts is through close liaison with the Club and officials. Consultations were undertaken with club officials (e.g. operations director, human resources, hospitality) to better understand how the Club currently operates, while also getting a clearer understanding of how the Club is likely to operate once the expanded stadium is operational (e.g. the club has undertaken extensive business planning activities assessing the number of fans, non-football visitors, expenditure etc) As well as consultation, a questionnaire for the Club was developed to capture their data in a robust and consistent manner.
- Consultations with key stakeholders - as outlined in the scoping report, as well as consulting with the Club, it has been important to consult with key stakeholders about the proposals for an expanded stadium and the socio-economic implications of this. Given that this is one of the most significant private sector investment in north Liverpool, and its role as part of a wider regeneration and renewal process for the Anfield neighbourhood, it has been important to consult with LCC regeneration/economic development officers, Marketing Liverpool, and other visitor economy representatives about the current and future role of the club as an economic and visitor economy driver for the city.
- Assessment of the significance of socio-economic effects - this task is the substantive element of the overall assessment. It includes the socio-economic impact modelling of the proposed development, in particular assessing the additional economic impacts (direct, indirect and induced) the proposed expansion development will potentially deliver, and their effects on the identified receptors and the associated indicators of change (e.g. employment, worklessness), over and above the baseline position. The wider regeneration benefits are presented largely in a qualitative way¹⁷, in particular drawing on

¹⁷ The approach is largely qualitative given the range of wider benefits which are described. While some wider benefits/effects could be quantified if further information was available for the projects (e.g. increased footfall, visitor expenditure in the wider area), other benefits are more difficult to quantify such as change in investor confidence, changes in image, changes in environment and security.

the relationship between the stadium expansion and other regeneration activities coming forward in the area over the short, medium and longer term.

19.2.5 The following receptors in Table 19.1 are identified for the socio-economic assessment. These are presented for both the construction and operational phases. The indicators used to assess change from the baseline position are also presented, as are the spatial impact areas for the receptor. The assessed impacts and effects are presented in light of the total stadium expansion (i.e the expansion of the Main Stand and Anfield Road Stand).

Table 19.1: Socio-Economic Receptors

Phase	Receptor	Indicators	Impact Area
Construction	The employment base	Jobs created; change in total employment.	Liverpool, Liverpool CR
	The labour market	Number of people employed; capacity within the labour market – changes (reductions) in unemployment; ability for local people to access employment directly and in the supply chain.	Liverpool, Liverpool CR
Operation	The employment base	Jobs created; change in total employment.	Liverpool, Liverpool CR
	The labour market	Number of people employed; capacity within the labour market – changes (reductions) in unemployment; ability for local people to access employment directly and in the supply chain.	Liverpool, Liverpool CR
	The visitor economy	Change in the value and volume of the visitor economy.	Liverpool, Liverpool CR

19.2.6 The assessment of employment effects are based on the following types of economic impacts which typically create or support jobs directly within the stadium’s ‘red-line’ or indirectly in the economy as a result of activities associated with the stadium:

- Direct Impacts: This is the economic activity which arises directly as a consequence of the investment in and subsequent operation and maintenance of the stadium. Much of this is the direct responsibility of LFC, although it will include jobs which are permanent, casual and sub-contracted. The vast majority of the jobs supported will be located within the stadium, although some will be in close proximity to it (e.g. car park attendants). Some, but by no means all, of these jobs will be supported by the expenditure of fans on tickets, merchandising and other goods and services (e.g. food and drink, betting) available within stadium.

- External Visitor Related Impacts: The expenditure of visitors outside of and beyond the stadium as they travel to and from Anfield, will support economic activity and hence jobs in the wider economy of Liverpool and the city region. Whilst the majority of this expenditure will be associated with fans attending LFC games, it will also arise from other events held at the stadium and visitors to the museum and related visitor facilities (both in and around the stadium).
- Supply Chain Impacts: These economic impacts arise as a consequence of LFC and other local businesses that supply services to LFC relating to the operation of the stadium in turn spending money with their own suppliers of goods and services in the local and wider economy. This and subsequent rounds of expenditure in the supply chain can support significant levels of economic activity and hence employment.
- Induced Employment Impacts. These employment impacts arise as a consequence of those people whose jobs are supported directly and indirectly by LFC's stadium, in turn spending their income in the local and wider economy and therefore supporting further employment.

19.2.7 The focus of the economic impact analysis is upon employment impacts (i.e. jobs and employment income created and supported). These employment impacts are presented as 'full time equivalents' (FTEs), an approach which converts part-time and full-time jobs into a common basis to allow comparison. As well as assessing the direct employment impacts, estimates of indirect and induced employment impacts have also been assessed for Liverpool and the Liverpool City Region.

19.2.8 The assessment of the significance of effects follows the approach outlined in ES Volume 1, Chapter 6.. This draws on the assessment of sensitivity of the receptor (see below for further detail) and magnitude of impact. Chapter 6 sets out the approach for assessing magnitude. However, as outlined above, the assessment of the magnitude of impact for each receptor is informed by the potential change that arises as a result of the stadium expansion in the context of the baseline conditions in the impact areas (e.g change in total employment or unemployment in absolute or percentage terms). The framework for assessing the sensitivity of the socio-economic receptors is outlined in the table below. The assessment of the sensitivity of the receptor requires professional judgment and takes account of two factors: (i) the importance attached of each receptor in economic development and regeneration policy (i.e. where specific socio-economic issues have been prioritised by policy makers, e.g. lack of employment opportunities, unemployment); and (ii) drawing on analysis within the socio-economic baseline assessment about the scale of socio-economic issues within the impact areas and their relationship to these receptors.

Table 19.2: Sensitivity of Socio-Economic Receptors

Sensitivity	Definition	Measures
High	The receptor is identified as a high ranking policy priority (as a result of economic potential and / or need). There is evidence of severe socio-economic challenges, underperformance and vulnerability for the receptor in the impact area.	Evidence of major socio-economic challenges, under-performance or vulnerability e.g. patterns of deprivation, employment, and wealth generation, exposure to socio-economic threats.
Medium	The receptor is identified as a policy priority (as a result of economic potential and / or need). There is evidence of moderate socio-economic challenges or underperformance and vulnerability for the receptor in the impact area.	Evidence of moderate socio-economic challenges, under-performance or vulnerability e.g. patterns of deprivation, employment and wealth generation, employment forecasts, exposure to socio-economic threats.
Low	The receptor is not identified as a policy priority (as a result of economic potential and / or need). There is minor evidence of socio-economic challenges or underperformance and vulnerability for the receptor in the impact area.	Evidence of some socio-economic challenges, under-performance or vulnerability.
Negligible	The receptor is not identified as a policy priority (as a result of economic potential and / or need). There is evidence that the receptor is resilient and no particular weaknesses or challenges for the receptor in the impact area.	Evidence of economic prosperity, buoyancy and resilience e.g. low levels of deprivation, relatively high employment and wealth generation rates, relatively strong employment forecasts.

19.3 Legislation and policy

19.3.1 The following section reviews relevant planning and socio-economic policies and strategies in the context of the Liverpool city region, Liverpool, and local impact areas. It also reflects, where stated, on how the football club and the stadium is positioned with regard to planning, economic development and regeneration policies and priorities. A summary table can be found at the end of the policy review section.

19.3.2 As well as relevant policies and strategies from within Liverpool and the city region, it is important to note that the local plan process is now being developed in line with the principles set out within the National Planning Policy Framework (NPPF). Published in March 2012, the NPPF sets out the new planning framework, with a focus on delivering sustainable growth. The proposals for the expansion of LFC's stadium therefore come forward within this new national planning policy framework, given the work undertaken by LCC on their Local Plan

and the Anfield SRF which has been adopted as a Supplementary Planning Document for the area.

- 19.3.3 The framework explicitly sets out objectives for delivering a strong and competitive economy (paragraphs 18-22). Within this section of the NPPF, reference is made for the need for local planning authorities to set out a clear economic vision which promotes sustainable growth, to support existing business sectors, and to identify priority areas for economic regeneration. The framework also sets out objectives for promoting healthy communities, focussed on neighbourhood planning (paragraphs 69-78). This includes ensuring an integrated approach to the planning of housing, economic uses, and community facilities and services.

[Liverpool Unitary Development Plan, 2002](#)

- 19.3.4 The Unitary Development Plan (UDP) was adopted by LCC in 2002 as the City wide development plan for Liverpool. The UDP will gradually be replaced by the new Local Plan which is in development. Numerous policies within the UDP have been saved to form a Local Plan Document within the Local Plan Framework.
- 19.3.5 The plan's economic regeneration objective is to "reverse, the decline in economic activity, investment and employment" and outlines various strategies for achieving this including "promoting regeneration within the city's most deprived communities." The plan also identifies the importance of the city's visitor economy and its role in improving the city environment and economic growth. The plan identifies the key role of housing in contributing to urban regeneration and to meet the needs of the existing population and the reversal of the decline in population that has been experienced in recent decades.
- 19.3.6 The plan supports the development plans of both Liverpool and Everton football clubs due to their important role in the city's economy, subject to impact on residential amenity (policy C7).

[Liverpool City Council Draft Core Strategy, 2012](#)

- 19.3.7 The Draft Core Strategy was submitted in 2012 with the objective of, setting out the key planning policies which will determine the development of Liverpool over a 15 year plan period. The draft strategy particularly focuses on better utilising the city's assets and prioritising areas with the greatest development potential. While the Core Strategy has now been abandoned, its draft strategic policies will provide the strategic framework for the emerging Liverpool Local Plan. Those parts of the draft plan relevant to this chapter are summarised below.
- 19.3.8 A key feature of the draft strategy is to maximise sustainable economic growth in the city, with an emphasis on "key employment locations throughout Liverpool." While there is much focus on the role of the city centre, it also recognises the key role of north Liverpool. Despite being one of the most deprived areas in the country, the area has the potential for sustainable economic and residential growth. The Core Strategy also outlines north Liverpool as the main

focus for new housing and neighbourhood renewal, with a key objective “to create greater housing choice, with an emphasis on family housing and meeting local aspirations”.

- 19.3.9 The draft Core Strategy recognises the major role of Liverpool FC and Anfield stadium as a major tourist and visitor attraction, playing an increasingly important role in the Liverpool economy. With reference to both Liverpool and Everton football clubs, the Core Strategy states the support of the City Council in sustaining their important role in the economy and that the Council “...is keen to maintain this position by supporting the development plans of both clubs, where this will assist in the social and economic improvement of Liverpool in general.”

Mayoral Development Zone, 2012

- 19.3.10 The Liverpool Mayoral Development Corporation (LMDC) is a new body bringing together key parts of the City Council and Liverpool Vision, the economic development agency for the city, to drive economic growth and economic development in the city. The LMDC will work with private sector partners to deliver change within the city’s two Enterprise Zones, as well as in five locally designated Mayoral Development Zones (MDZs).
- 19.3.11 Anfield sits within the North Liverpool Mayoral Development Zone (MDZ), established in 2012. Along with the other MDZs, they have been established as opportunity areas with the aim of focussing investment to create 20,000 jobs across the city. The expansion of LFC and housing regeneration in the Anfield area are identified as key projects in the north Liverpool MDZ.

North Liverpool Strategic Regeneration Framework, 2010

- 19.3.12 The framework sets out the vision and strategic regeneration plan for North Liverpool and South Sefton. The fundamental purpose of the Strategic Regeneration Framework is “to create sustainable communities and to maximise North Liverpool’s contribution to the City’s competitiveness over the next 20 years and beyond.” The strategy identifies the need to attract working households and create high quality neighbourhoods. One of the specific priorities is to sustain the momentum of change in North Liverpool and the completion of the “Anfield regeneration in line with the [Strategic Framework] master plan, including new housing for the private market, and to the right quality.”
- 19.3.13 LFC is identified within the framework as an important asset for the city. The framework outlines how the Club acts as a major driver of market visibility, tourism, leisure and a major international brand. The proposed development of LFC’s stadium¹⁸ is recognised as a key driver of the regeneration of the whole area, with the potential “to address some of the socio-

¹⁸ Given the timing of this regeneration framework, this statement refers to the former proposals for a new stadium in Stanley Park. The subsequent 2014 draft Anfield SRF refers to the stadium expansion project.

economic and physical challenges that have been highlighted and catalyse further regeneration activity through instilling confidence in local communities and investors alike”.

Anfield Spatial Regeneration Framework, 2014

- 19.3.14 The aim of the Anfield SRF is to enable sustained social, economic and environmental regeneration in Anfield through harnessing the full potential of the area. The SRF supplements a number of saved policies in the adopted Liverpool UDP, such as housing renewal policy and policies in support of the development of LFC. The SRF was developed to comprehensively guide development proposals which are expected to come in advance of 2015, which is when the new Liverpool Local Plan will be adopted, replacing the Liverpool UDP. The SRF has the status of a Supplementary Planning Document (SPD) for Anfield.
- 19.3.15 The SRF identifies Anfield as one of the most disadvantaged neighbourhoods in Liverpool in terms of income, employment and health deprivation; with limited employment opportunities and high unemployment rates. The framework states that the area suffers from an over-supply of small two-bedroom terraced houses, which, in parallel with other social and environmental issues which have occurred over many decades, has led to falling demand and de-population within the area. As a result the framework outlines that there is a strong need for regeneration of the area including “refurbishment of dwellings and general environmental improvement in these neighbourhoods” which will be key for the successful transformation of the area.
- 19.3.16 The crucial role of LFC’s and its stadium as a tourist attraction, local employer and driver of economic growth is also evident in the SRF.
- 19.3.17 The SRF outlines ‘The Anfield Project’. This sets out a vision for the regeneration of the area with new build housing-led regeneration as well as the proposals for LFC’s stadium expansion as the key areas of focus for regeneration:
- The potential to create high quality residential neighbourhoods with a mixed housing choice, size and tenure set within a high quality environment.
 - To deliver an expanded stadium which enhances match day experience and broadens the range and choice of facilities at the ground. To successfully integrate the stadium with the surrounding area and harness the benefits that will flow from the stadium proposals as a catalyst to the regeneration of the area and North Liverpool.
 - Potential to utilise existing development opportunities at the interface of Anfield Rd, Breckfield Rd and Walton Breck Rd to introduce new sustainable commercial uses, activity and job opportunities to revitalise the High Street.

Liverpool City Region Visitor Economy Strategy to 2020

- 19.3.18 The strategy provides a framework to achieve the vision of growing the city region’s visitor economy to £4.2 billion and to support 55,000 jobs by 2020. The visitor economy is identified as central to both the current and future economic development of the city region, with the strategic aim to optimise the performance of the visitor economy.

19.3.19 Spectator sports are recognised as a key contributing factor to the city region’s strong performance in the day-visitor market, with selective sporting events significantly driving new international, UK overnight and regional/ local day visitors to the city region. This strategy outlines the objective to optimise the very strong cluster of high profile spectator sport venues, as well as outside of the main sports season, “by developing added value packages and special experiences” and “playing to the strength of key brands and events including Liverpool Football Club.”

[Liverpool City Region Skills for Growth, 2013](#)

19.3.20 This document forms the basis of an agreement between providers (supply) and employees (demand) to support job creation and growth in key growth sectors within the city region. The strategy aims to support the city region in achieving accelerated growth and creating the potential for an additional 100,000 jobs over the next decade. A key challenge identified for the city-region is to raise skill levels and close the performance gap with England averages.

19.3.21 The visitor economy is identified as a key area for growth potential in the city region economy, thus development of relevant and quality skills to contribute to the growth of the sector is a key objective. The labour and skill needs for the visitor economy are acknowledged as “distinctive due to the heavy reliance on interpersonal skills of staff and the delivery of a high quality experience for the visitor.” The visitor economy is a sector that dominates apprenticeship delivery and thus increasing the potential for apprentice opportunities can contribute significant benefits to the local economy. The Skills for Growth annual report states that the Liverpool LEP is seeking to support the growth of a further 12,000 new jobs within the city region over the next decade.

[Liverpool City Region Business Plan 2012/13](#)

19.3.22 The business plan sets out the strategic objectives and key activities of the city region and provides a framework of how the city region LEP will work with other bodies to ensure that economic growth is achieved. The business plan recognises the role of the visitor economy in achieving economic growth and identifies “the main attack brand for the city region is Liverpool which is world famous for culture, music, sport and heritage.” The plan sets out the key priorities of the city region, which include improving the individual performance of businesses to attract more visitors and create and sustain more jobs.

19.3.23 The relevant policies are summarised in Table 19.3.

Table 19.3: Policy Summary

Policy/Strategy	Summary
Liverpool Unitary Development Plan (UDP) 2002	The UDP sets out the local regeneration plan for Liverpool with the aim of increasing economic activity, investment and employment. The plan outlines the importance of the city's visitor economy and states the key role of housing development in contributing to urban regeneration. The plan expresses its support for the development of LFC's stadium proposals due to its important role in the city economy, however outlines the need to address local problems which can arise as a result of spectators drawn to the area.
Liverpool Draft Core Strategy 2012	The draft Core Strategy identifies housing regeneration, focused in areas of the greatest social and economic regeneration need, and an improvement in the quality and diversity of the city's housing offer as a key priority. The draft strategy, which will inform the emerging Local Plan, recognises the potential of North Liverpool for sustainable and economic growth and identifies it as an area of key focus for new housing and neighbourhood renewal. Liverpool FC and Anfield stadium is acknowledged as a major tourist and visitor attraction and states its support for development plans which will assist the social economic improvement of Liverpool.
Mayoral Development Corporation 2012	The North Liverpool Mayoral development zone (MDZ) has been established as a key area of opportunity for focussing investment and job creation. The expansion of LFC and housing regeneration in the Anfield area are identified as key projects in the North Liverpool MDZ.
North Liverpool Strategic Regeneration Framework 2010	The need to retain and attract working age households and to create high quality neighbourhoods across North Liverpool is identified in the SRF. The regeneration of Anfield, which includes new quality housing, is a key project for sustaining the momentum of change in North Liverpool. Liverpool FC is identified as an important city asset and the Club's development proposals were recognised as a key driver of regeneration of the whole area, with the potential of addressing some of the socio-economic and physical challenges across the area.
Anfield Spatial Regeneration Framework 2014	Anfield is identified as one of the most disadvantaged neighbourhoods in Liverpool with a strong need for regeneration, including improvement of dwellings and the general environment across neighbourhoods. The new build housing-led regeneration and the proposal for LFC expansion are key areas of focus for improving the environment, creating jobs and acting as a catalyst to the regeneration of the Anfield and North Liverpool.
Liverpool City Region Visitor Economy strategy to 2020	The visitor economy is central to the economic development of the city region, supporting thousands of jobs and generating significant visitor expenditure across the economy. Spectator sports are recognised as one of the key visitor economy attractions, with the aim to developing the experiences and use of sport venues, as well as outside of the main sports season, to optimise the strong cluster of high profile spectator sport venues.
Liverpool City Region Skills for Growth 2013	Development of relevant and quality skills to meet the needs of the visitor sector is an important focus of skill development for growth of the visitor sector and the LCR economy as a whole. The significant economic benefits the sector generates, particularly through its strong delivery of apprentices, is vital to the local economy.
Liverpool City Region Business Plan 2012/13	The plan outlines the role of the visitor economy in achieving economic growth across the city region, and its aim to make use of key visitor brands, such as LFC, to improve the performance of businesses, attract more visitors and create and sustain more jobs.

9.1.4 The scoping opinion provided by LCC judged that the proposed methodological approach for undertaking the socio-economic assessment was acceptable, as summarised in Table 19.4.

Table 19.4: Summary of scoping response for socio-economics

Name of Organisation	Key Concerns	Comment
LCC	None	Proposed methodological approach was acceptable

- 19.3.24 Consultations to support the development of the socio-economic assessment, as well as inform the socio-economic baseline, have been undertaken with:
- LFC officials;
 - LCC Regeneration officers;
 - Marketing Liverpool; and
 - Liverpool LEP visitor economy officer.

19.4 Assumptions and limitations

- 19.4.1 In a change to the Scoping Report, this assessment focusses on the quantified economic impacts and the significance of effects on receptors within the Liverpool and the Liverpool city region impact areas. The Anfield local area is also an important area to consider. Where possible, reference is made to the potential for impacts to arise locally. However, given the nature of this economic assessment it is extremely challenging to assess the potential temporary (construction) and permanent (operational) impacts that may arise specifically within the local neighbourhood area. The Liverpool and Liverpool city region impact areas provide a more appropriate spatial scale for the assessment. While the Club is an important source of local employment, a purchaser of goods and services, and a driver for local visitor expenditure, it is challenging to accurately reflect the effect on receptors at the very local spatial scale. Where appropriate qualitative commentary is provided.

19.5 Baseline conditions

- 19.5.1 In order to provide a comprehensive understanding of the context surrounding the proposed development, a baseline analysis of socio-economic performance within the identified impact areas was undertaken. This information has been used to understand how the proposed development may support the future socio-economic performance of the local area, Liverpool and Liverpool city region. The baseline is used to inform judgements on the sensitivity of the receptor, as well as the magnitude of impact (change) that the stadium expansion project could deliver in each impact area.
- 19.5.2 Following this section, the current economic impact of the existing stadium has been presented. Along with the socio-economic baseline, this data is necessary to report the change in the baseline conditions as a result of the proposed stadium expansion.

Socio-economic baseline

- 19.5.3 The key sources of data used to assess the socio-economic baseline environment include both local and national datasets (accessed from the Office for National Statistics - ONS) and

the NOMIS online portal) providing intelligence on population, labour market, employment, earnings and deprivation. Data on the Liverpool visitor economy has been provided by the Liverpool Local Enterprise Partnership (LEP) visitor economy officer.

- 19.5.4 For the purposes of this assessment, and for compiling and analysing data for the local Anfield area, the two wards of Anfield and Everton have been used¹⁹. While not an impact area for the main assessment, data on the wider north Liverpool area has also been presented for context where appropriate²⁰. Socio-economic data is also presented for the main impact areas (Liverpool and the Liverpool city region²¹), while national benchmark data is also presented.

Population

- 19.5.5 Between 2001 and 2011 the resident population of the local area (i.e. the combined Anfield and Everton Wards based on 2011 boundaries²²) decreased by around 6% (1,100 residents), relative to a 6% increase in Liverpool, a 2% increase across the city region, and an 8% increase across England as a whole. The decline in population in the local impact area was driven by a decline in population in the Everton ward, where population decreased by 10% (-1,600) from 2001 to 2011. In contrast, the resident population within the Anfield ward increased by 4% (+500 residents).
- 19.5.6 Despite a decline in total population in the local impact area, the working age population grew by 2% from 2001-2011. However, this level of working age population growth is still significantly below the average growth experienced across England (+9%). While absolute growth was modest, as a share of overall population, working age residents now account for 66% of all residents in the local impact area, up from 62% in 2001 (+4 percentage points). So, while overall population has contracted in the local impact area, the number of working age residents has actually been increasing.
- 19.5.7 This point is further amplified if the Anfield ward is looked at in isolation. Here working age residents as a share of total population has increased in line with the local impact area, while absolute working age population growth has been at 10% (+900 residents over the last

¹⁹ Given the boundary of the SRF area, the local area is constituted by the Anfield and Everton 2011 wards. Due to geographical disparities of the Everton ward over time, largely due to boundary changes, when pre-2011 data is required, a best fit lower layer super output areas (LLSOAs) definition has been used to provide a best-fit match with the 2011 boundaries of Anfield and Everton wards. A geographical information system (GIS) was used to ensure this was undertaken robustly.

²⁰ Data presented for this area consists of the four 2011 wards of: Anfield, Everton, Kirkdale and County.

²¹ Liverpool city region is defined as the LEP local authority areas of Liverpool, Sefton, Knowsley, Wirral, St Helens and Halton local authorities.

²² Given ward boundary changes which have taken place for the Everton ward in recent years, it is not robust analysis to combine the Anfield and Everton wards in 2001 and in 2011 and to compare. For consistent analysis between the 2011 and 2001 Census population data, best fit lower layer super output areas are used for 2001 population data. These LLSOAs fit with the current (2011) ward boundary for Everton. These data and boundary issues do not apply for Anfield ward.

decade). In comparison, Liverpool city region’s working age population contracted by 5%, over the same period, while there was a 14% increase in Liverpool and a 9% increase across England as a whole.

Table 19-5 Population growth 2001-2011

2001-2011 percentage Growth	Local Impact Area	Liverpool	Liverpool City Region	England
Total population growth	-6%	6%	2%	8%
Working Age population growth	2%	14%	-5%	9%

Source: ONS, 2001 and 2011 Census

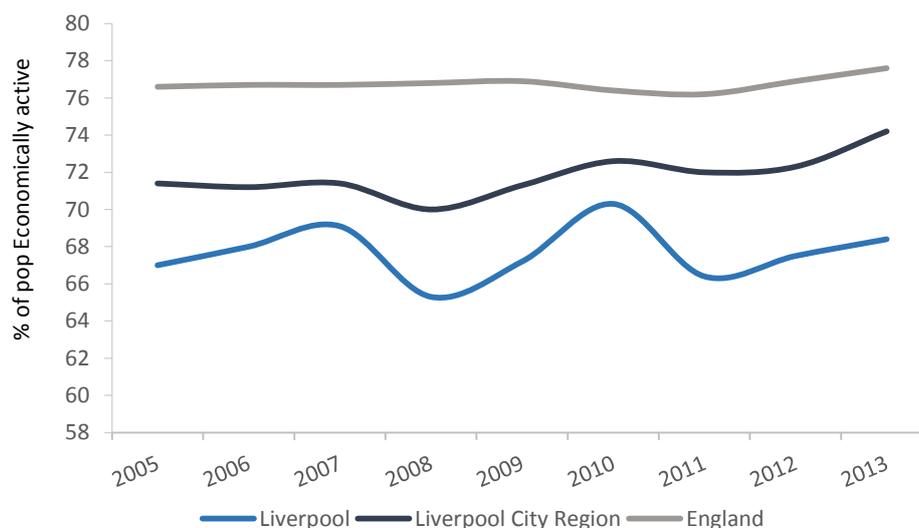
19.5.8 Trends from the last decade reflect the policy messages on the existence of empty and derelict dwellings in the local impact area, and the wider North Liverpool area, and the need to attract working age households to the area. While the population data reflects some improvements in parts of the local impact area, there is evidently a need to continue to attract residents to live in the neighbourhood, and, in particular, encourage a greater number of working age households as they play an important role in sustaining neighbourhoods and in supporting the local economy.

Labour Market Indicators

19.5.9 The working age economic activity rate measures working age residents who are either employed or actively seeking employment. The ONS Annual Population Survey (APS) provides estimates on economic activity and employment rates across the UK, however does not provide estimates at the local impact area level.

19.5.10 In Liverpool, the working age economic activity rate stood at 68% in October 2012-September 2013, considerably below England’s economic activity rate of 78%. Across the city region the economic activity rate exceeded that in Liverpool, however remained below the England average at 74%. Economic activity rates in both the city region and in Liverpool have been consistently lower than the England average, this trend is illustrated in Figure 19.1.

Figure 19.1: Economic activity levels



Source: ONS, Annual Population Survey

- 19.5.11 While economic activity rates are significantly below national levels, economic activity rates were rising during the recession (up to 2010), although rates have now fallen back. This increase up to 2010 was most likely associated with Liverpool’s higher than average share of public sector employment. Given austerity measures implemented since May 2010, public sector employment has been contracting in the city, thus having implications for economic activity rates.
- 19.5.12 In line with low economic activity levels, the proportion of economically active employed residents in Liverpool and the city region stood respectively around 10% points and 4% points below the England average of 71%. Both have historically had a high level of unemployment, exceeding the England average, with unemployment currently standing at 11% in Liverpool and 10% in the city region, compared to an 8% England average.
- 19.5.13 While the APS does not cover the local impact area, the 2011 Census does provide some insights into local levels of economic activity and unemployment, albeit from 2011. The 2011 Census reveals that economic activity rates of those aged 16 and over stood at 82% in the local impact area, marginally exceeding the England average of 81%. Despite the Census illustrating high economic activity levels, employment in the local impact area was around 12% points below the England average of 48%, while unemployment was more than double that of the England average, with 8% of residents unemployed compared to the England average of 4%.
- 19.5.14 The combination of a low economically active residence base and high levels of unemployment in both Liverpool and across the city region demonstrates the need to increase

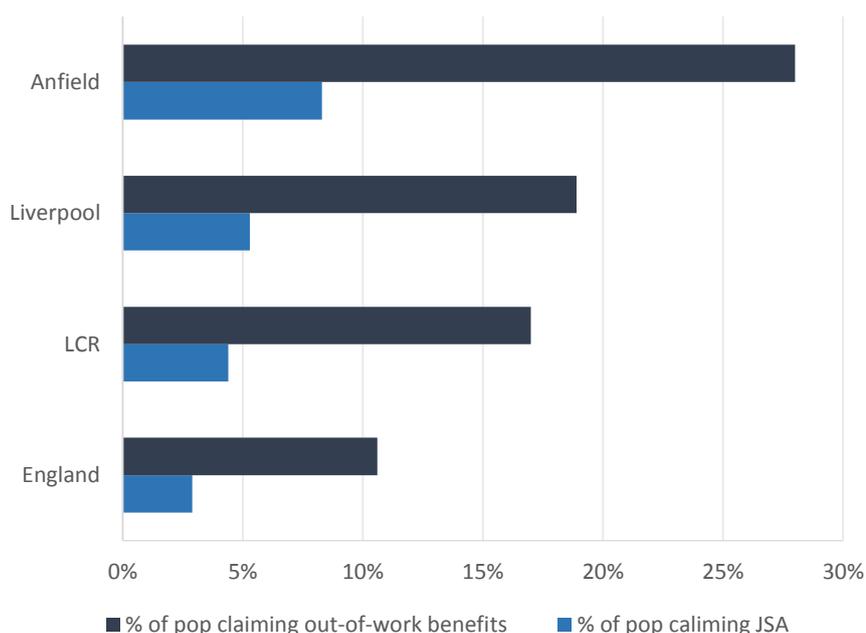
employment opportunities and to attract more working age households to live and work in the area. High unemployment in the local impact area also reiterates the need for increased job opportunities, as well as the need for local job creation where pockets of high unemployment exist.

- 19.5.15 ONS resident based Job Seeker Allowance (JSA) claimant figures support the APS findings of high unemployment across Liverpool and the city region. In January 2014, 4.4% of the city region's resident working age population (aged 16-64 years) were claiming JSA benefits, compared to an England average of 2.9%. This estimate increases to 5.3% at the Liverpool district level and to a high 8.3% at the Anfield Ward level²³.
- 19.5.16 Similar trends are also prevalent for out-of-work benefit claims²⁴. The proportion of out-of-work claimants in both Liverpool and the city region exceeded the England average in August 2013 with 19% and 17% respectively of its' resident working age population claiming out-of-work benefits, compared to the England average of 11%. Claimant rates are again higher in Anfield Ward level, where 28% of its resident working age population claimed out-of work benefits in August 2013. The exceedingly high figure, which was a similar level across North Liverpool, highlights the need for increased local employment opportunities which meet the resident skill set, as well as other interventions which can support residents in to employment (e.g. training).
- 19.5.17 Figure 19.2 illustrates for each impact area the proportion of working age residents claiming JSA, or out of work benefits (i.e. the wider 'worklessness' rate). The proportion of claimants in each area exceeds the England benchmark for both measures.

²³ Data on the proportion of working age residents claiming JSA benefits was not available at the Everton ward level.

²⁴ The DWP dataset measures the proportion of working age residents in an area claiming any type of out of work benefit (e.g. JSA, Employment Support Allowance).

Figure 19.2: Out-of-work and Job Seeker Allowance (JSA) benefit claimants



Source: ONS, Claimant count JSA and DWP out-of-work benefits

Note: Latest data was used for both measures: Jan 2014 JSA claims, Aug 2013 out-of-work benefit claims. Data not available for Everton ward within the local impact area.

The employment base

19.5.18 The number of jobs in the local impact area has grown by around 4% since 2009, with circa. 7,600 jobs in 2012, representing a stronger rate of growth than across Liverpool, the city region and England as a whole. The growth in jobs in the local impact area was mainly attributable to growth in Everton ward by approximately 500 jobs (mainly as a result in jobs in secondary and tertiary education within the Everton wards). In Anfield ward there was a fall of around 200 jobs between 2009 and 2012, representing an 11% decline in total jobs. The Liverpool district and city region also experienced a fall in jobs of approximately 1,700 (-0.7%) and 1,900 (-0.3%) jobs respectively over the same period.

19.5.19 Despite overall employment growth in the local impact area since 2009, negative growth in the Anfield Ward and across Liverpool and city region highlights a need for increased job opportunities to support local, district and wider city region jobs growth.

Table 19-6 Employment growth 2009-2012

	2009	2010	2011	2012	% Growth 2009-2012
Local Impact Area	7,300	7,500	7,800	7,600	4.1%
Liverpool	234,000	228,600	234,200	232,300	-0.7%
LCR	600,100	591,800	596,000	598,300	-0.3%
England	24,068,100	23,982,000	24,062,600	24,177,600	0.5%

Source: ONS, Business Register and Employment Survey data, 2009-2012

Note: These figures exclude farm agriculture (SIC subclass 01000).

- 19.5.20 Assessing the sectoral composition of the employment base reveals the local impact area has an above average concentration of employment in public sector services, construction, and arts, entertainment and recreation sectors. These sectors have Location Quotients (LQ) of 1.9, 1.1 and 2.1 respectively. The arts, entertainment and recreation sector has the largest location quotient with more than double the concentration of employment than the England average. The arts, entertainment and recreation broad sector is made up of sub-sectors such as libraries, archives, museums and other cultural activities, and sports activities and amusement and recreation activities. The operation of LFC is likely to largely contribute to the local impact areas high concentration of employment in the arts, entertainment and recreation sector, highlighting its importance in the local economy.
- 19.5.21 The public sector is by far the predominant employment sector in the local impact area, made up of health, education and business administration and defence, accounting for 51% of employment, followed by the retail and arts, entertainment and recreation sector which account for 10% and 9% respectively of total employment. Public sector employment is a dominant employment sector across Liverpool and Liverpool city region which both have public sector employment above the England average, however to a lesser extent than the local impact area. The heavy reliance on public sector employment in both the local impact area and the wider Liverpool economy, combined with recent and likely future further public sector spending cuts, makes public sector jobs particularly vulnerable and indicates the need to refocus the employment base through expanded employment opportunities in the private sector.
- 19.5.22 The local impact area employment base has a lower concentration of employment in higher value sectors such as financial and insurance and professional, scientific and technical services which fall behind the England average by 3% points and 5% points respectively. To achieve stronger economic growth in the local economy there will need to be a shift in the local employment base to some higher value sectors.

Table 19-7 Sectoral structure of the employment base

	Local Impact Area		Location Quotient Vs. England	Liverpool	Liverpool City Region	England
	Number	%		%	%	%
Manufacturing & motor trades	400	5%	0.5	5%	9%	10%
Public Sector	3,800	51%	1.9	37%	34%	27%
Construction	400	5%	1.1	3%	4%	5%
Wholesale	300	4%	1.0	2%	3%	4%
Retail	800	10%	1.0	11%	11%	10%
Transport & storage	0	0%	0.1	4%	5%	5%
Accommodation & food services	300	4%	0.6	7%	6%	7%
Info & Coms	0	1%	0.1	5%	3%	4%
Financial & insurance	100	1%	0.2	4%	3%	4%
Property	100	1%	0.6	2%	2%	2%
Prof, scientific & technical	200	3%	0.3	6%	6%	8%
Business admin & support	400	6%	0.7	8%	8%	8%
Arts, ent, recreation & other	700	9%	2.1	5%	4%	4%

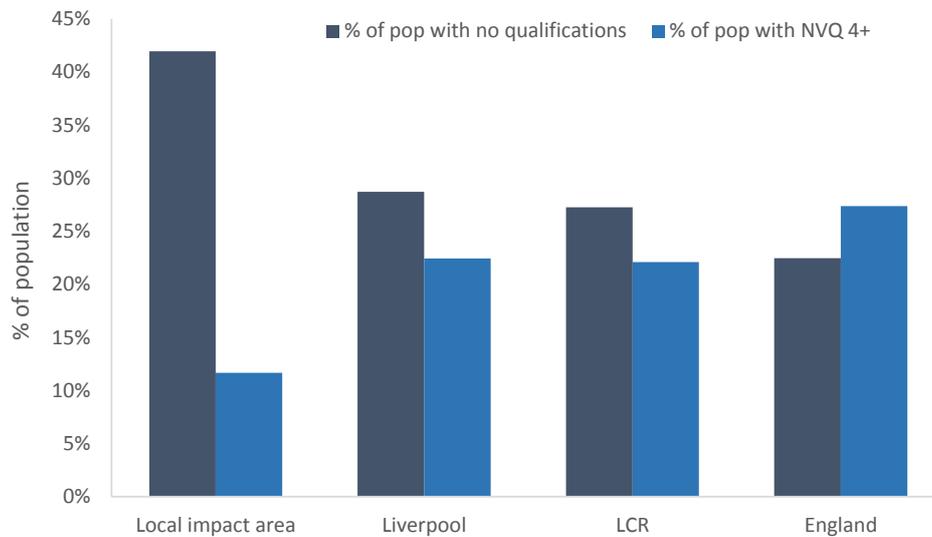
Source: ONS, Business Register and Employment Survey 2012

Note: These figures exclude Agriculture, forestry & fishing, and Mining quarrying & Utilities sectors

Skills

- 19.5.23 More than 40% of residents aged 16 and over have no qualifications in the local impact area according to the 2011 Census, which is also the case across North Liverpool. This figure considerably exceeds the England average of 22% of residents with no qualifications. Although to a lesser extent, the proportion of residents with no qualifications surpasses the England average both in Liverpool and across the city region, with around 29% and 27% of residents respectively with no qualifications. The proportion of residents in the local impact area with NVQ Level 4 qualification or above is below the national average at 12% of residents compared to 27% across England. The low level of qualifications amongst residents in the local impact area is reflected by the sectoral structure of employment, which is more concentrated in lower value sectors.

Figure 19.3: Qualifications amongst resident population

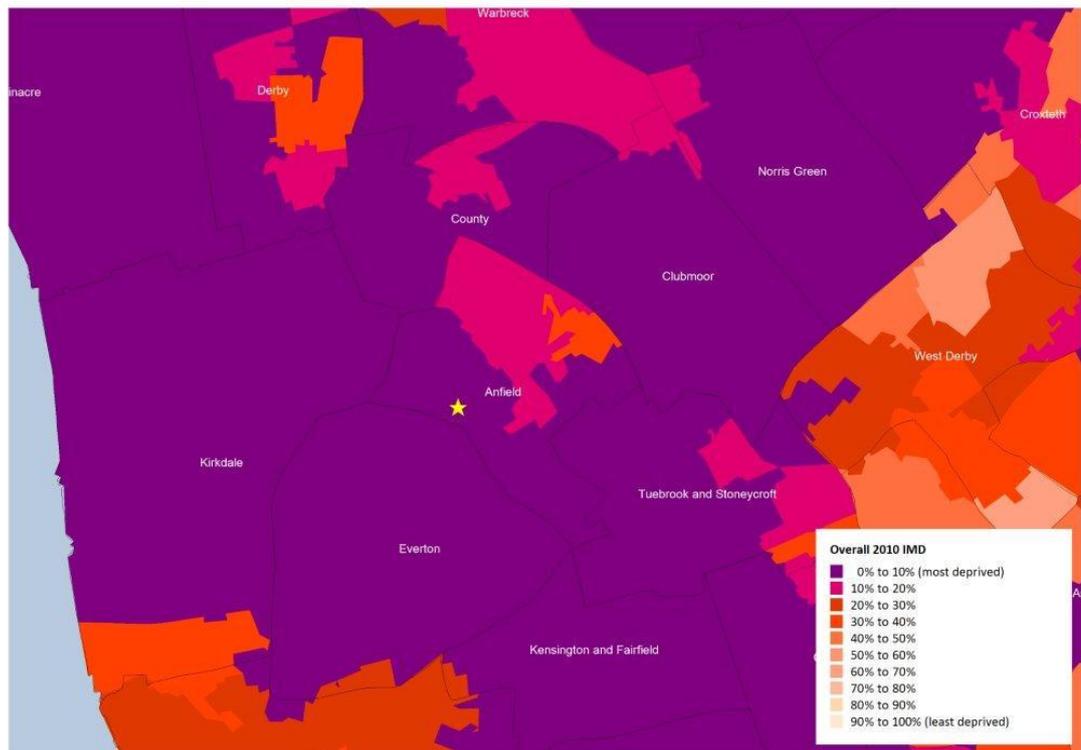


Source: ONS, 2011 Census

Deprivation

19.5.24 Based on the 2010 Index of Multiple Deprivation, Anfield overall shows high levels of deprivation with around a third (31.9%) of the ward falling within the most deprived 1% of neighbourhoods nationally. Around 9,000 Anfield residents live in areas classified as being within the 10% most deprived in England. Child poverty is also a strife and increasing in the Anfield ward with around 43% of children resident in the Anfield ward living in poverty. The following map highlights the scale of deprivation with the local area.

Figure 19.4: Index of Multiple Deprivation (IMD, 2010)



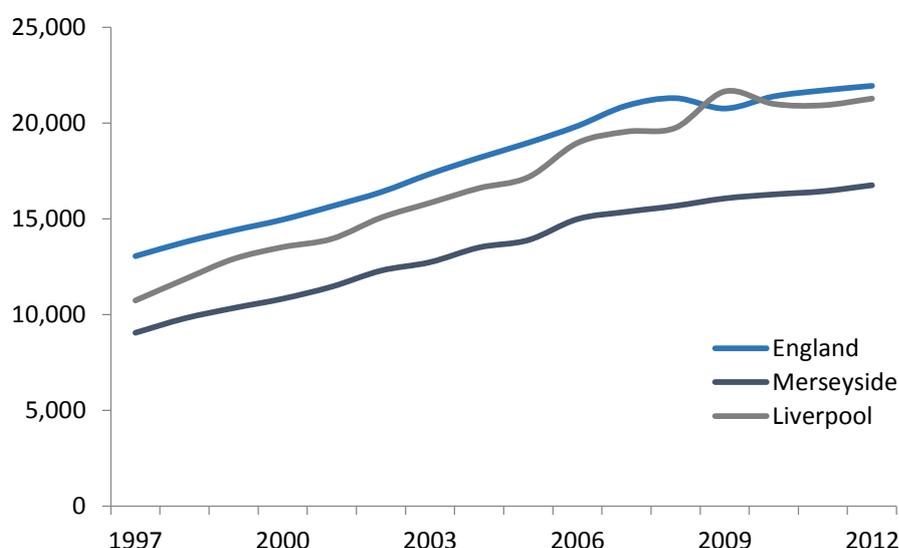
Source: ONS, DCLG

Wealth and Earnings

- 19.5.25 Average gross weekly pay from the ONS Annual Survey of Hours and Earnings (ASHE) reveals the average weekly gross resident earnings of full-time workers in both Liverpool and the city region is significantly below the England average. Resident earnings in Liverpool were on average £545 per week in 2013 and slightly higher across the city region at £553 per week. However, average weekly resident earnings across England were £630 per week in 2013, 15% higher than average weekly resident earnings in Liverpool. Average weekly earnings have consistently been below the England average in both Liverpool and the city region over the last decade.
- 19.5.26 Gross Value Added (GVA) data is a measure of the value of goods and services produced in a local economy. It is estimated by the ONS at various geographical levels.
- 19.5.27 GVA per head allows us to compare GVA amongst various impact areas. GVA in Liverpool (the lowest spatial scale where data is available) was approximately £16,400 per head in 2011 and £20,900 per head across the city region (East Merseyside, Liverpool, Sefton and Wirral).

These figures compare to an England average of £21,900 per head in 2011. GVA per head has remained consistently below the England average in both Liverpool and the city region since 1997.

Figure 19.5: GVA per head



Source: ONS, Regional GVA, NUTS 3 data tables

Note: 2012 is a provisional figure

19.5.28 Although data is not available at the local impact area level, it is assumed that GVA per head is likely to be significantly below the Liverpool, city region and England averages due to the relatively low value concentration of employment in the local impact area, relative to the other three geographies, and higher levels of unemployment.

Housing

19.5.29 2011 census data reveals home ownership in the local impact area is low relative to the average for Liverpool, city region and England, with a mere 34% of the household population in Anfield and Everton having home ownership (full ownership), compared to the England average of 63%. In line with these findings is a high proportion of the local impact areas household population in social rented accommodation, representing 41% of households compared to the England average of 18% of households. The proportion of social rented housing has increased since 2001 in Anfield ward²⁵ and now exceeds the proportion of owner occupied households in the local impact area. This is largely a result of the proportion of socially rented households in Everton ward, which represents 58% of total households.

²⁵ Accurate data to represent Everton's 2011 ward boundary is not available in the 2001 census.

- 19.5.30 Low levels of home ownership and the high proportion of households in social rented accommodation in the local impact area reflects the prevailing housing and socio-economic challenges of the area. Higher than average levels of unemployment and low earnings amongst those in work are contributors to lower levels of home ownership in the area, while the poor quality of some of the housing stock and the environment is also a likely barrier to encouraging people to move to the area and buy homes.

Visitor Economy

- 19.5.31 LFC is an important tourism asset which is evident in both policy messages and tourism statistics. The importance of LFC as a local employer and in bringing significant value to the Liverpool economy, through contributing to the brand of Liverpool and attracting significant visitor numbers, makes it a prominent asset to the Liverpool economy.
- 19.5.32 The LEP digest of city region tourism statistics uses STEAM data to estimate the volume and value of the visitor economy. In 2012 it estimated a total 57 million visitors to the city region, with 32 million visitors to Liverpool. The visitor economy was estimated to be worth £2.3bn to the Liverpool economy through visitor expenditure, and around £3.4bn to the city region. STEAM estimates that the visitor economy supports around 29,800 FTE jobs through tourism expenditure (direct and indirect jobs) in Liverpool, rising to 45,900 FTE jobs across the city region (although retail accounts for a large proportion of these). Visitors to Liverpool were predominantly day visitors representing approx. 93% (30 million) of all visitors.

Summary of Socio-Economic Conditions

- **Population-** There was a declining population in the local impact area, attributable to a large decline in population in the Everton ward. While this is a concern for the growth potential and sustainability of the local impact area, Anfield ward experienced population growth (+500 residents), while the working age population grew across the local impact area (+2%). Despite this, the local impact area overall had a slower rate of growth of working age residents relative to the Liverpool and England average.
- **Economic activity and employment rates-** Economic activity rates amongst working age residents within Liverpool are relatively low (68%), and across Liverpool city region (74%), compared with the national levels (78%)²⁶. Employment rates are low across the local impact area, Liverpool and Liverpool city region compared to the England average. This is particularly the case in the local impact area, where the employment rate was around 7% points below the Liverpool level and 12%²⁷ points below the England average in 2011.
- **Unemployment-** Levels of unemployment in the local impact area are more than double those across England²⁸. Unemployment is also consistently high across Liverpool and

²⁶ ONS, Annual Population Survey

²⁷ ONS, 2011 Census of Population

²⁸ ONS, 2011 Census of Population

Liverpool City Region. In the Anfield ward²⁹ there is an exceedingly high proportion of working age residents claiming JSA benefits and Out-of-work benefits, which in both cases exceeds the proportion in Liverpool and LCR, and is more than double the England average³⁰.

- **Employment base-** Employment levels over the last three years overall increased in the local impact area (300 jobs)³¹. However both Liverpool and the city region experienced a decline in jobs by approximately 1,700 and 1,900 jobs respectively.
- The Local impact area and the wider Liverpool and Liverpool City Region's employment base is heavily reliant on public sector employment. This is particularly the case in the local impact area where public sector services represents 51% of employment compared to the England average which stands at 27%. The local impact area also has an above average concentration of employment in construction, and arts, entertainment, recreation and other services sectors, with a generally lower value profile of employment compared to the England average.
- **Skills-** The local impact area has a high proportion of residents with no qualifications (42%)³², substantially exceeding the England average (22%). This is also the case in Liverpool and across Liverpool City Region, but to a lesser extent. The local impact area also has a low proportion of residents in higher level skills (12% with NVQ4+) which is significantly below the levels in both Liverpool and the city region (22%) and less than half the average proportion across England (27%). The qualification levels of residents in the local impact area are reflected in the occupational structure of the employment base, which has a greater focus on lower value sector employment.
- **Deprivation, Wealth and Earnings-** High levels of deprivation are present in the local impact area with around a third (31.9%)³³ of Anfield ward falling within the most deprived 1% of neighbourhoods nationally. There are numerous pockets of deprivation across Liverpool which is reflected in average weekly resident earnings which are 15%³⁴ points below average weekly resident earnings across England. The low proportion of residents with home ownership and significantly high proportion of residents in social rented accommodation³⁵ in the local impact level also reflects the high levels of deprivation.
- **GVA –** GVA per head falls behind the England average in both Liverpool and the city region. Although data is not available at the local impact area level, we can assume GVA per head is likely to be below the Liverpool, city region and England average due to the relatively low value employment concentration in the local impact area.

²⁹ Due to limited data availability to match the Everton 2011 ward boundary, only the Anfield ward could be assessed

³⁰ ONS, DWP and JSA claimants

³¹ ONS, Business Register and Employment Survey, 2012

³² ONS, 2011 Census of Population

³³ Index of Multiple Deprivation, 2010

³⁴ Annual Survey of Hours and Earnings, 2013

³⁵ ONS, 2011 Census of Population

Current Stadium Impact

- 19.5.33 The current stadium is a major driver of positive economic impact locally, across Liverpool and across the city region. The following provides a summary of the key economic impacts specifically associated with stadium related employment activities:
- The current stadium directly supports 1,790 jobs or 271 full-time equivalent (FTE) jobs. It is one of the largest employers in this area of north Liverpool and in the city.
 - The jobs supported at the stadium are a combination of permanent jobs (7%)³⁶, match-day related jobs (85%)³⁷, as well as jobs which are temporary non-match day related or those which are sub-contracted (8%).
 - Around 90% of all jobs supported at the stadium are taken by residents from within Liverpool, with 97% of all jobs taken by residents from within the Liverpool city region.
 - A small proportion (c2%) of permanent staff reside locally (within Anfield and Everton wards), rising to around 8% within wards in a 3km radius of the stadium. Around 10% of all temporary staff reside locally (within Anfield and Everton wards) and around a third in wards within 3km of the stadium
 - Stadium related employment currently supports £5.1m of employment income per annum; £4.7m per annum within the city region and £4.0m per annum within Liverpool.
 - The Club is also an important supporter of local and city-region based businesses via its stadium expenditure. Stadium-related expenditure in the city-region is of the order of £5m per annum.
 - The stadium also stimulates significant levels of annual off-site visitor expenditure (c£50m in total in the UK), much of which gets spent within Liverpool and the city region, as well as with businesses in the Anfield area (e.g. pubs, food establishments), which supports further indirect employment in the economy.

³⁶ Of the 125 permanent jobs, around 80% are full time roles. These permanent jobs cover the following roles: stadium management and operation; stadium and pitch maintenance and repair; ticketing; ground catering; retail and merchandising; museum and tour; conferencing and banqueting. Around three-quarters are taken by Liverpool residents, and 87% by residents from within the Liverpool city region.

³⁷ The 1,505 temporary match day staff cover a wide range of roles: ticketing, ground catering, turnstile operators, car parking attendants, stewards, betting kiosks, cleaners, hospitality and banqueting, and retail sales advisors. These jobs are predominantly taken by Liverpool residents (1,400 or 93%), or by residents from across the city region (1,475 jobs or 98%). Temporary workers in ground catering and hospitality roles account for around 60% (878 jobs) of all temporary match day jobs, while stewards (crowd control) account for around 30% (440 jobs). These roles offer flexibility for some section of the labour market, while also providing training opportunities (e.g. customer services, health and safety).

Table 19-8 Current Direct Stadium Related Employment (2012/13)

	UK Jobs	UK FTE Jobs	City Region FTE Jobs	Liverpool FTE Jobs
Permanent staff	125	113	98 (87%)	84 (74%)
Temporary match-day staff	1,505	108	105 (98%)	100 (93%)
Sub-contracted and temporary non-match day staff	160	50	45 (90%)	43 (85%)
Total	1,790	271	249 (92%)	226 (84%)

Source: LFC; Regeneris Consulting

Table 19-9 Current Direct Stadium Related Employment Income (2012/13)

	UK (£m)	City Region (£m)	Liverpool (£m)
Permanent Staff	£2.81	£2.44	£2.08
Temporary Match Day Staff	£1.50	£1.47	£1.40
Sub-contracted and Non-match day Staff	£0.82	£0.74	£0.70
Total Stadium Related Impacts	£5.13	£4.66	£4.18

Source: LFC; Regeneris Consulting

19.5.34

The following summary table outlines the current overall economic impact of the existing stadium, taking into consideration direct (stadium related) employment, but also indirect employment (supported via the Club's supply chain expenditure as well as visitor related expenditure), and induced employment impacts. The key impacts are:

- Total direct, indirect and induced employment impact of 1,408 FTE jobs in the UK, supporting a gross employment income of £35.1m per annum.
- Total direct, indirect and induced employment impact of 846 FTE jobs in Liverpool city region (approximately 60% of all employment impact), supporting a gross employment income of £19.3m per annum.
- Total direct, indirect and induced employment impact of 688 FTE jobs in Liverpool (approximately half of all employment impact), supporting a gross employment income of £16.3m per annum.

Table 19-10 Total Economic Impact of Current Stadium (2012/13)

	UK		City Region		Liverpool	
	Jobs (FTEs)	Gross Employment Income (£m)	Jobs (FTEs)	Gross Employment Income (£m)	Jobs (FTEs)	Gross Employment Income (£m)
Stadium Supported Employment						
Permanent Staff	113	£2.8	98	£2.4	84	£2.1
Temporary Match Day Staff	108	£1.5	105	£1.5	100	£1.4
Sub-contracted & Non-match day Staff	50	£0.8	45	£0.7	43	£0.7
Sub-total	271	£5.1	249	£4.7	226	£4.2
External Visitor Expenditure Impacts						
LFC Match Visitor Expenditure Supported	408	£10.7	326	£8.0	285	£7.5
Non-LFC Match Visitor Expenditure Supported	3	£0.1	2	£0.1	2	£0.1
Sub-total	411	£10.8	329	£8.0	287	£7.6
Supply Chain Impacts						
LFC Supply Chain Expenditure Supported	134	£3.5	78	£1.9	56	£1.5
Visitor Expenditure Supply Chain Supported	123	£3.2	49	£1.2	29	£0.8
Sub-total	257	£6.8	127	£3.1	85	£2.2
Induced						
Supported through direct and indirect effects	469	£12.4	141	£3.5	90	£2.4
Sub-total	469	£12.4	141	£3.5	90	£2.4
Grand Total	1,408	£35.1	846	£19.3	688	£16.3

Source: Regeneris Consulting

19.6 Assessment of effects

Construction – likely significant effects

- 19.6.1 This section presents analysis relating to the sensitivity, magnitude and significance of the temporary effects which the construction phase of the stadium expansion project would deliver for each receptor. In assessing these effects, the temporary construction employment impacts of the stadium expansion project have been assessed. These impacts have been estimated using construction cost data provided by the project's quantity surveyors (AECOM).

- 19.6.2 At the time of this assessment, construction costs are being further refined for the Main Stand expansion (ahead of contract tendering), while only an indicative headline cost has been provided for the construction costs associated with the expansion of the Anfield Road Stand. While estimated construction costs are not presented in the analysis, given sensitivities ahead of contract tendering, the assessment only presents the estimated temporary employment impacts associated with the expansion, not how these were derived³⁸. It should also be noted that the expansion of the two stands will not occur in parallel. The Main Stand will be constructed first, followed by the Anfield Road Stand. For the purposes of this assessment, the temporary employment impacts associated with each component stand are highlighted, but an overall impact (average annual temporary FTE construction employment) is presented on the basis of the total construction timeline and costs of the whole stadium expansion project.
- 19.6.3 The assessment of sensitivity, magnitude and significance are presented at the Liverpool and city region impact areas. However, where possible, reference is also made to the impacts that could arise within the local Anfield area.

Receptor: The Employment Base

Sensitivity of receptor:

- 19.6.4 The need to support private sector employment creation and economic growth within this area of Liverpool, and across the wider city and city region, is a strategic objective within several of Liverpool's key planning and economic development policies and strategies (e.g. the UDP, Draft Core Strategy, Mayoral Development Zones, and the Anfield SRF). Delivering new employment opportunities in the city, but particularly in areas of Anfield and North Liverpool, is seen as critical to challenging high levels of unemployment and deprivation within these communities, as well as playing an important role in delivering sustainable regeneration.
- 19.6.5 Analysis within the socio-economic baseline has also highlighted how levels of employment have been contracting locally in recent years (approximately 200 jobs in the ward of Anfield have been lost since 2009, c.-11%³⁹), as well as across the city and city region (approximately 1,700 jobs lost in Liverpool and -1,900 jobs across the city-region since 2009). The baseline also demonstrated that levels of unemployment in the wards of Anfield and Everton area more than double those across England, while unemployment is also consistently higher than average across Liverpool and the city region. Within the ward of Anfield there is a very high proportion of working age residents claiming JSA benefits, or who claim a form of out-of-work

³⁸ Estimated construction costs are not presented in this assessment given sensitivities ahead of a contract tendering process. As such, North West based construction turnover per full-time equivalent job estimates (the benchmark used to divide construction costs to estimated employment) are also not presented.

³⁹ Analysis of employment change within the wards of Anfield and Everton masks this more local decline in employment in Anfield. There has been a growth of approximately 450 jobs in Everton ward since 2009.

benefit, which in both cases exceeds the proportion in Liverpool and the city region, and is more than double the England average.

- 19.6.6 In light of the weight given to supporting employment creation within key policy and strategy documents, as well as the socio-economic challenges faced locally and across Liverpool and the city region, the sensitivity of the receptor is judged as High in the Liverpool and Liverpool city region impact areas.

Magnitude of Impact:

- 19.6.7 The average annual number of temporary full-time equivalent (FTE) jobs supported during the construction phase is the most appropriate figure to use to assess the magnitude of impact of the construction phase employment on the baseline conditions within the impact areas. The annual average can be readily compared to the current baseline level of employment in the impact areas. However, it should be noted that while the average annual figures are helpful, the actual level of employment supported is likely to fluctuate across the construction period in accordance to the scheduling of the programme and the intensity of construction activity required at any one time.
- 19.6.8 It is estimated that the expansion of the Main Stand could support the following temporary impacts:
- 1,000 person years of employment across the UK, or the equivalent of just under 600 temporary FTE construction jobs per annum (based on a 20 month construction timeline).
 - Given the composition of construction required to expand the stadium, the construction business base within Liverpool and across the city region, and the likely insertion of clauses within the main construction contract for the appointed contractor to use their 'best endeavours' to source local sub-contractors and their labour, it is estimated that contractors within the city region could capture around half of this (c. 300 temporary FTE jobs per annum), while in Liverpool this would be around a third (c. 200 temporary FTE jobs per annum).⁴⁰
- 19.6.9 It is estimated that the expansion of the Anfield Road Stand could support the following impacts:
- 640 person years of employment across the UK, or the equivalent of around 390 temporary FTE construction jobs per annum (based on an indicative 20 month construction timeline).
 - It is estimated that contractors within the city region could capture around half of this (c. 190 temporary FTE jobs per annum), while in Liverpool this would be around a third (c. 130 temporary FTE jobs per annum).

⁴⁰ These are indicative temporary construction employment estimates within Liverpool and the city region for the construction of the Main Stand and Anfield Road stand. Much will depend on the main contractor's approach to procuring suppliers for construction materials, as well as their approach to sub-contracting and the use of local labour.

- 19.6.10 However, for the purposes of the hybrid planning application for both stands, and for assessing the magnitude of impacts on the baseline conditions, an assessment of the potential temporary construction employment impact has been made based on the construction of the Anfield Road stand following immediately the construction of the Main Stand. While in practice this may not take place in this sequence, it does enable an assessment of the average annual construction employment supported as a result of the two stand expansion projects.
- 19.6.11 It is estimated that the expansion of the two stands, over a combined 40 month construction period could support the following impacts:
- 1,640 person years of employment across the UK, or the equivalent of just under 490 temporary FTE construction jobs per annum.
 - It is estimated that contractors within the city region could capture around half of this (c. 250 temporary FTE jobs per annum), while in Liverpool this would be around a third (c. 160 temporary FTE jobs per annum).
- 19.6.12 When the annual employment impacts for construction related employment in Liverpool and the city region are placed in the context of the overall existing employment baseline, their magnitude is rather modest in comparison to the total employment base. In Liverpool, this level of construction employment only accounts for between 0.1% of current total employment, and 0.05% in the city region. However, these construction impacts would account for around 2.5% of current total construction employment in Liverpool or 1% of current total construction employment in the city region. If these construction employment impacts are also considered in the context of recent job losses (from 2009-2012), their magnitude is greater. In Liverpool these estimated construction jobs would equate to around 10% of all jobs lost since 2009, while in the City Region they would equate to around 13%.
- 19.6.13 Consequently, the magnitude of impact is considered to be Minor (beneficial) in the city region, and Moderate (beneficial) in Liverpool.
- 19.6.14 It could be the case that some of the temporary construction jobs could be taken by residents within the local Anfield area. However, for the purposes of this assessment, and given uncertainties around the procurement of contractors and where they may draw their labour, there is no robust way of accurately judging the scale of impacts which could arise in the local area.

Significance of Effect:

- 19.6.15 In light of the assessment of the sensitivity of the receptor and magnitude of impact, the overall significance for the receptor is judged to be of Minor beneficial significance in the city region, and of Moderate beneficial significance in Liverpool.

Receptor: The Labour Market

Sensitivity of receptor:

- 19.6.16 The need to support employment creation, economic growth, and tackling unemployment and worklessness is a strategic objective within several key planning and economic development policies and strategies.
- 19.6.17 Liverpool has experienced significant growth amongst its working age population in the last decade (+14%), with working age residents now representing 69% of the total population. However, across the city region as whole working age residents have been contracting (-5%). While there has been working age population growth in Liverpool, economic activity rates in Liverpool and the city region continue to be markedly below national rates (68% in Liverpool and 74% in the city region, compared to 78% in England). The impact areas also suffer from high levels of worklessness – around 19% of working age adults claim some form of out of work benefit in Liverpool (17,000 people), while in the city region this is 17%. JSA claimants (i.e. those people receiving benefit, but actively seeking work or training) in Liverpool are at 5.3% and 4.4% in the city region, compared to 2.9% across England. In the ward of Anfield, JSA claimant levels are 8.3% and the worklessness rate is 28%⁴¹ (the average is 11% nationally).
- 19.6.18 The latest JSA claimant data (January 2014) shows that around 6.5% of all Liverpool JSA claimants (1,125) were actively seeking construction related employment, while this was 6.6% in the city region (2,850). Given high levels of unemployment and inactivity in Liverpool and the city region, and demand for construction related employment, there is clearly available capacity within the local labour market which could be utilised for this project coming forward, particularly with residents within Anfield, Liverpool, and across the city region having the opportunity to access construction employment opportunities.
- 19.6.19 In light of the weight given to supporting employment creation and tackling unemployment and worklessness within key policy and strategy documents, as well as the socio-economic challenges faced locally, and across Liverpool and the city region, the sensitivity of the receptor is judged as High in the Liverpool and Liverpool city region impact areas.

Magnitude of Impact:

- 19.6.20 The actual estimated number of jobs supported from the construction phase is small in comparison to the total overall size of the labour markets across both the Liverpool and city region impact areas (see analysis in employment base receptor on construction employment impacts). Although there is a clear demand for construction related employment from those who are currently unemployed in these area. It should also be noted that labour markets are also influenced by travel to work patterns, and that the labour markets by which construction

⁴¹ January 2014

contractors based within the impact areas draw on could be wider than just Liverpool or the city region.

19.6.21 Given these impacts, and noting that LFC are likely to use clauses within the contract which require contractors to use their 'best endeavours' to source Liverpool or city-region based sub-contractors and labour, the magnitude of the labour market impact in the city region is considered to be Minor (beneficial) and Moderate (beneficial) in Liverpool.

19.6.22 It could be the case that some of the temporary construction jobs could be taken by residents within the local Anfield area. However, for the purposes of this assessment, and given uncertainties around the procurement of contractors and where they may draw their labour, there is no robust way of accurately judging the scale of impacts which could arise in the local area.

Significance of Effect:

19.6.23 In light of the assessment of the sensitivity of the receptor and magnitude of impact, the overall significance for the receptor is judged to be of Minor beneficial significance in the city region, and of Moderate beneficial significance in Liverpool.

Operation – likely significant effects

19.6.24 This section presents analysis relating to the sensitivity, magnitude and significance of the permanent effects which the operational phase of the expanded stadium would deliver for each receptor. In assessing these effects, the net additional employment impacts associated with the operation of the expanded stadium have been quantified. The net additional employment impacts include the direct (stadium related) employment impacts, as well as the indirect employment impacts (supported by the Club's supply chain expenditure, as well as via visitors' off-site expenditure and other visitor related supply chain expenditure made by businesses supporting those visitors), as well as induced employment impacts (employment supported via the expenditure of direct and indirect employees).

19.6.25 The assessment of sensitivity, magnitude and significance are presented at the Liverpool and city region impact areas. However, where possible, reference is also made to the impacts that could arise within the local Anfield area.

Receptor: The Employment Base

Sensitivity of Effect:

19.6.26 As with the justification presented under the construction phase, there is clear focus with economic development and planning policy to support the employment creation and economic growth, as well as to support the ambitions of the football club to expand the stadium. There is also a need locally, within Liverpool and across the city region for projects to come forward

which can create new employment opportunities and address economic decline (see earlier analysis on the employment base within the impact areas).

- 19.6.27 In light of the weight given within key policy and strategy documents, as well as the socio-economic challenges faced locally, and across Liverpool and the city region, the sensitivity of the receptor is judged as High in the Liverpool and Liverpool city region impact areas.

Magnitude of Effect:

- 19.6.28 It is helpful to outline the scale of direct stadium related employment at the expanded stadium once it is operational, and the net additional employment supported over and above the operation of the current stadium. Total stadium related jobs and FTE jobs are presented, although for the purposes of the assessment, the scale of FTE jobs associated with the direct, indirect and induced employment will be used to judge significance of the effect for the receptor.
- 19.6.29 The expansion of the stadium would lead to almost 2,400 jobs being supported at the stadium (or 356 FTE jobs). However, the majority of these jobs (c.2,220 jobs) would be match day or non-match day temporary jobs, predominantly within stewarding, ground catering, or hospitality roles. Permanent jobs would account for only 7% (165 jobs) of all jobs supported by an expanded stadium, although based on the current profile of employment at the stadium, around 85% of these jobs would be full-time positions.
- 19.6.30 It is estimated that the expansion of the stadium would lead to around 600 net additional jobs at the stadium (or 85 FTE jobs). Most of these jobs would be temporary/casual jobs associated with supporting both match and non-match day activities. The main increases in employment will be in stewarding, ground catering, retail and hospitality roles, given the expansion in capacity at the stadium, as well as significantly increased retail and hospitality provision. Given the nature of the additional jobs, it is expected that around 85% would be taken by residents from within Liverpool, and over 90% by residents from across the city region. Many of these jobs could also be taken by residents from within close proximity to the stadium, although this will depend on the Club's approach to recruitment⁴². Currently, around a third of all temporary match day jobs are taken by residents from within wards in a 3km radius of the stadium.

⁴² When the Club was proposing to build a new stadium in Stanley Park they developed an employment and training strategy in line with a S106 obligation required by LCC. This strategy highlighted the Club's proposed approach to maximise the employment benefits of the stadium for local people, as well as Liverpool and city region residents (e.g. through local engagement, Liverpool based print and on-line advertising, Liverpool based recruitment partners). It is anticipated that the Club would follow a similar recruitment approach for the expanded stadium.

Table 19-11 Net Additional Stadium Related Employment Impacts

	Total Jobs	Total FTE Jobs	Liverpool City Region FTE Jobs	Liverpool FTE Jobs
Permanent staff	40	35	30	26
Temporary match-day staff	534	40	39	37
Sub-contracted and temporary non-match day staff	22	11	10	9
Total	596	85	79	72

Source: LFC; Regeneris Consulting

- 19.6.31 Assessing the total economic impact of the expanded stadium (i.e. considering the direct, indirect and induced employment effects), it is estimated that the expanded stadium could support around:
- 1,920 FTE direct, indirect and induced jobs (£47.9m of employment income);
 - 1,136 FTE direct, indirect and induced jobs would be supported in the city region (£25.9m of employment income); and
 - 920 FTE direct, indirect and induced jobs would be supported in Liverpool (£21.8m of employment income).

- 19.6.32 In taking account of the economic impacts already associated within the current stadium, it is estimated that the expanded stadium could support the following net additional economic impacts:
- 410 FTE direct, indirect and induced jobs (£10.2m of employment income) in the UK as a whole
 - 239 FTE direct, indirect and induced jobs (58%) would be supported in the city region (£5.4m of employment income)
 - 191 FTE direct, indirect and induced jobs (46%) would be supported in Liverpool (£4.4m of employment income).

Table 19-12 Net Additional Economic Impact of Expanded Stadium

	UK		City Region		Liverpool	
	Jobs (FTEs)	Gross Employment Income (£m)	Jobs (FTEs)	Gross Employment Income (£m)	Jobs (FTEs)	Gross Employment Income (£m)
Stadium Supported Employment						
Permanent Staff	35	£0.82	30	£0.71	26	£0.60
Temporary Match Day Staff	40	£0.53	39	£0.52	37	£0.50
Sub-contracted & Non-match day Staff	11	£0.21	10	£0.19	9	£0.18

	UK		City Region		Liverpool	
Sub-total	85	£1.56	79	£1.42	72	£1.28
External Visitor Expenditure Impacts						
LFC Match Visitor Expenditure Supported	78	£2.04	57	£1.39	51	£1.34
Non-LFC Match Visitor Expenditure Supported	0.2	£0.05	0.1	£0.04	0.1	£0.03
Sub-total	78	£2.09	57	£1.43	51	£1.38
Supply Chain Impacts						
LFC Supply Chain Expenditure Supported	87	£2.30	53	£1.30	36	£0.94
Visitor Expenditure Supply Chain Supported	23	£0.61	9	£0.21	5	£0.13
Sub-total	110	£2.91	62	£1.51	41	£1.08
Induced						
Supported through direct and indirect effects	137	£3.62	41	£1.00	27	£0.70
Sub-total	137	£3.62	41	£1.00	27	£0.70
Total	410	£10.18	239	£5.36	191	£4.43

Source: Regeneris Consulting

19.6.33 While the net additional stadium related employment impacts are an important consideration, the expansion of the stadium also reinforces the Club's important role as a purchaser in the local economy. The stadium expansion could also lead to a significant increase in the Club's supply chain expenditure (+40%) which will be of benefit to Liverpool and city region based suppliers, and stimulate further indirect employment. The additional capacity at the stadium will also stimulate further net additional off-site visitor expenditure, which is a significant contributor to further indirect employment impacts in Anfield, Liverpool and across the city region as fans make food and drink purchases, or stay as part of trips.

19.6.34 In assessing the magnitude of the total net additional FTE employment impacts for the expanded stadium it is helpful if they are placed in the context of the overall existing employment baseline. In Liverpool, this level of net additional employment (191 FTE jobs) would account for between just 0.1% of current total employment, and 0.05% in the city region (239 FTE jobs). These impacts are considered modest in this context. If only the permanent net additional stadium related employment impacts were considered, within the same context, they would be considered to be extremely modest (26-30 FTE jobs). However, if the total direct, indirect and induced net additional employment impacts are also considered in light of

recent job losses, their magnitude can be judged greater. The total net additional employment impacts arising from the expanded stadium (191 FTE jobs in Liverpool and 239 FTE jobs in the city region) would equate to 11%-13% of all jobs lost since 2009 in Liverpool and the city region respectively.

- 19.6.35 In assessing magnitude, the scale of stadium-related jobs, not FTEs, should also be noted. Around 600 net additional jobs will be created at the stadium. While many of these jobs will be temporary/casual roles, the expanded stadium can be considered an important generator of additional flexible employment opportunities within the impact areas, and locally. These types of jobs can be an important source of income for those currently not in work, but who require flexible working opportunities to draw them back into the labour market, as well as an important supplementary income to those already in work or in education. Over 90% of the net additional jobs are expected to be taken by residents from within the city region, but there is potential for many to be taken by residents from within Liverpool, and from within Anfield and neighbouring areas.
- 19.6.36 Given these impacts, and while noting that LFC will have an important influence over their recruitment policies for stadium related roles as well as their supply chain expenditure (i.e. to maximise the economic and employment impacts within the impact areas), the magnitude of the impact in the city region is considered to be Neutral, and Minor (beneficial) in Liverpool.
- 19.6.37 At the local level, the magnitude of impact could potentially be higher– this judgement is based on the existing take-up of temporary employment opportunities at the stadium by local residents (up to third within wards within 3km of the stadium), the type of work opportunities available, and the Club's approach to recruitment. The actual number of additional temporary operational jobs is around 530 jobs under the expanded stadium, and these are an important source of local flexible working opportunities. The actual number of FTE jobs supported is relatively modest (40 FTE jobs), as is the likely proportion which could be potentially taken by local residents, when judged in the context of the prevailing local employment base.

Significance of Effect:

- 19.6.38 In light of the assessment of the sensitivity of the receptor and magnitude of impact, the overall significance for the employment base receptor is judged to be of Insignificant in the city region, and of Minor beneficial significance in Liverpool.

Receptor: The Labour Market

Sensitivity of receptor:

- 19.6.39 As with the justification presented for this receptor under the construction phase, there is clear focus with economic development and planning policy to support the employment creation and economic growth, to tackle worklessness and disadvantage, and to support the ambitions of the football club to expand the stadium. There is also a need locally, within Liverpool and

across the city region for projects to come forward which can create new employment opportunities and which will contribute to reducing economic inactivity and worklessness in the impact areas (see earlier analysis on the labour market within the impact areas, particularly the high than average levels of economic inactivity, JSA claimants, and worklessness).

- 19.6.40 In light of the weight given within key policy and strategy documents, as well as the socio-economic challenges faced locally, and across Liverpool and the city region, the sensitivity of the receptor is judged as High in the Liverpool and Liverpool city region impact areas.

Magnitude of Impact:

- 19.6.41 The actual number of jobs (c. 600 jobs or 85 FTE jobs – see employment base receptor for full overview) supported in Liverpool or the city region (or FTE jobs) from the operation of the expanded stadium is relatively small in comparison to the total overall size of the labour markets across both the Liverpool and city region impact areas. However, the baseline analysis (see earlier) has shown that there is an evident need amongst those who are currently seeking employment within the impact areas for new employment opportunities. The high proportion of temporary and flexible work could be an important addition to the labour market within these areas, particularly for those seeking to re-enter the labour market, or for people who are seeking additional employment while they work or are in education.
- 19.6.42 Given these impacts, and noting that LFC will have will have an important influence over their recruitment policies for the stadium related roles, as well their supply chain expenditure (i.e. to maximise the economic and employment impacts within the impact areas) the magnitude of the impact in the city region is considered to be Neutral, and Minor (beneficial) in Liverpool.
- 19.6.43 As with the employment base receptor, at the local level, the magnitude of impact could potentially be higher– this judgement is based on the existing take-up of temporary employment opportunities at the stadium by local residents (up to third within wards within 3km of the stadium), the type of work opportunities available, and the Club's approach to recruitment. The actual number of additional temporary operational jobs is around 530 jobs under the expanded stadium, and these are an important source of local flexible working opportunities. The actual number of FTE jobs supported is relatively modest (40 FTE jobs), as is the likely proportion which could be potentially taken by local residents, when judged in the context of the prevailing local labour market (e.g. the scale of local unemployment and worklessness).

Significance of Effect:

- 19.6.44 In light of the assessment of the sensitivity of the receptor and magnitude of impact, the overall significance for the labour market receptor is judged to be of Insignificance in the city region, and of Minor beneficial significance in Liverpool.

Receptor: The Visitor Economy

Sensitivity of receptor:

- 19.6.45 Following the success of Liverpool's Capital of Culture programme, allied to significant investment by the public and private sector in the city's public realm, arts and culture institutions, retail and leisure facilities, arena and conferencing facilities, as well as hotel accommodation, the visitor economy of Liverpool and the city region is key economic and sector priority for the City Council and the wider city region LEP. The LEP's 2020 visitor economy strategy sets out this ambition very clearly.
- 19.6.46 The city's sporting offer, including LFC with its UK and international fan bases, is viewed by the LEP as one of the city's critical drivers in attracting both day and staying visitors to the city, both on match and non-match days (e.g. through stadium tours, the club shop).
- 19.6.47 The LEP digest of city region tourism statistics uses STEAM data to estimate the volume and value of the visitor economy. In 2012 it estimated a total 57 million visitors to the city region, with 32 million visitors to Liverpool. The visitor economy was estimated to be worth £2.3bn to the Liverpool economy through visitor expenditure, and around £3.4bn to the city region. STEAM estimates that the visitor economy supports around 29,800 FTE jobs through tourism expenditure (direct and indirect jobs) in Liverpool, rising to 45,900 FTE jobs across the city region (although retail accounts for a large proportion of these). Visitors to Liverpool were predominantly day visitors representing approx. 93% (30 million) of all visitors.
- 19.6.48 Given the importance placed on the visitor economy by the LEP and the City Council as a driver of future economic growth within the impact areas, as well as the existing important role the sector plays in drawing in visitor expenditure, the sensitivity of the receptor is judged to be **High** in both impact areas.

Magnitude of Impact:

- 19.6.49 Off-site visitor expenditure made by fans attending the new expanded stadium has been estimated over the course of a 25 game season (including league and cup games) for the expanded stadium. This has been informed by a range of information and assumptions provided by the Club on attendance, fan origin for weekday and weekend games, proposed premium seating, and off-site expenditure benchmark expenditure data from a fan survey (please see the technical report prepared by Regeneris Consulting for a full overview of the assessment of off-site visitor expenditure (**Document F1/1**)).
- 19.6.50 It is estimated that gross off-site visitor expenditure as a result of the increase in capacity is in order of £66m per annum, up from £50m per annum currently. This uplift in gross off-site expenditure (+£16m) is driven mainly by the additional visitors coming to LFC games who come from outside of Liverpool (other UK domestic fans) and LFC's international fan base, with typically higher levels of expenditure and overnight stays. It is estimated that

approximately £12.7m of this gross additional off-site visitor expenditure could be captured within the city region, with a round £11.1m captured in Liverpool. The assessment considered what the potential net additional impact of total off-site visitor expenditure could be, taking in to account the effect of displacement. Around £7.6m of net additional off-site visitor expenditure could be spent in the city region, with around £6.7m in Liverpool, as a result of the expanded stadium. Put into the context of the overall scale of the city region and Liverpool visitor economy, the net additional off-site expenditure equates to around 0.2% of the value of the city region's visitor economy, and 0.3% of the value of Liverpool's visitor economy.

19.6.51 Much of this expenditure is likely to be spent within the impact areas on food and drink, accommodation, transport and car parking. It is this expenditure which supports the net additional employment impacts described earlier. The ability of businesses within the Anfield area to capture this additional expenditure, and derive economic benefit, will be influenced by their ability to accommodate the volume of additional fans and meet their pre and post-match needs, as well as non-match day requirements.

19.6.52 Given these impacts the magnitude of the impact in the city region is considered to be Neutral, and Minor (beneficial) in Liverpool.

Significance of Effect:

19.6.53 In light of the assessment of the sensitivity of the receptor and magnitude of impact, the overall significance for the visitor economy receptor is judged to be of Insignificance in the city region, and of Minor beneficial significance in Liverpool.

Wider Benefits of Stadium Expansion

19.6.54 The following section of the ES provides an overview of the wider benefits that the advancement of the stadium expansion project can deliver within Anfield. This is based on the role that the expanded stadium can play in supporting the SRF, and maximising the benefits for the whole area.

- **Image and environment:** The Club's proposals include the significant expansion and redevelopment of the football stadium. While two of the stands will be expanded, the design of the stands will also be much improved compared to the existing facilities, presenting a modern stadium exterior and image. Aligned with the new look stands, the significant environmental improvements within the expanded stadium boundary will present a much improved public façade for the Club within Anfield. These improvements, much as they were important for other Clubs, such as Manchester United's stadium expansion, can also contribute towards changing perceptions of the surrounding area and stimulate other public and private sector investment in the locality. The integrated approach being taken by partners as part of the SRF process, will result in a co-ordinated and complimentary programme of stadium and adjacent environmental improvements

(e.g. through '96 Avenue' and improved walkways in Stanley Park). The key benefit will be a holistic outcome which improves the overall image and environment of the local area.

- **Footfall and visitor expenditure:** The expansion of the stadium to approximately 58,800 seats brings with it a significant increase in match-day visitors to the local area and an increase in off-site visitor expenditure. There will also be an increase in footfall associated with non-match day visitors (e.g. linked to museum and stadium tours, improved retail). Non-match day visitors could increase further, depending on the successes of the football club on the pitch⁴³. Having the right mix of amenities within the local area will be critical to enabling local businesses to tap into this expenditure, capture the economic benefits, and be sustainable. The proposals within the SRF for a commercially sustainable Walton Breck Road, and improved public realm, reflects that partners recognise this point. Our assessment indicates that around 50 net additional FTE jobs could be supported in Liverpool as a result of off-site visitor expenditure linked to an expanded stadium. The proportion of this impact that can be captured locally within Anfield will very much depend on having the right offer for both match and non-match day visitors. Football related visitor expenditure is an important component in securing the long-term sustainable regeneration of the high street in Anfield. This expenditure will sustain businesses and services which will also serve the residential and business community in the area.
- **Funding for other projects:** The development agreement reached by the Club, the City Council and Your Housing Group will result in the funds from the Club's land purchases being used as a catalyst to contribute towards the funding of other projects in the local area. While the scale of this funding remains confidential at this stage, discussions with the City Council indicate that this funding has the potential to enable them and their partners to bring forward some of their current projects to a different scale, quality and timeline than may have been the case without the expansion of the stadium (e.g. the development of the Training Hotel, the Business Hub off Walton Breck Road), and will enable partners to develop new projects such as the proposed Food Hub.
- **Investor confidence:** The Club's decision to remain at Anfield and expand the stadium is a significant statement of intent by the Club of its long-term commitment to the local Anfield area. The Club's decision to invest in the multi-million pound stadium expansion programme immediately provides an economic development project which can play a role in anchoring the future economic prosperity of the area. The Club's decision gives greater certainty to others, both in the residential and business investor community locally, as well as the City Council, to develop the identified regeneration framework for the area and to be able to begin to implement their own investment strategies for housing and business opportunities with much greater confidence.

⁴³ The example of Manchester United is a useful comparator. The number of domestic and international fans which visit Old Trafford on non-match days contributes towards ranking Old Trafford as one of the North West's major visitor attractions.

19.6.55 The development of the SRF has been a positive and collaborative process led by the City Council in conjunction with partners, including the Club. The stadium is an important spatial and economic anchor for the Anfield neighbourhood, given the dominance of the stadium on the local landscape and the role of the Club as an employer, purchaser, and attractor of visitors. Consequently, the Club's stadium expansion proposals are a strategically important component in achieving the SRF's objectives for re-shaping the physical and economic trajectory of the Anfield area to deliver sustainable regeneration.

19.6.56 While the SRF includes a diverse mix of activities and projects, it is likely that some of the SRF projects would still come forward in the absence of an expanded stadium. However, while some housing renewal, business regeneration and environmental improvements could take place within the Anfield area anyway, the absence of the stadium project has the potential to lead to a weakened approach to the holistic and sustainable regeneration of the Anfield area. There could also be greater uncertainty around the deliverability and funding required to support some projects, as well as a potentially reduced level of investor confidence in the absence of additional footfall and the Club's stadium proposals. In summary, the Club's stadium expansion proposals clearly support an important set of wider regeneration benefits for the Anfield area.

19.7 Mitigation

19.7.1 On the basis that LFC will follow a similar recruitment approach for the expanded stadium that was defined for the Stanley Park development, no mitigation measures are required.

19.8 Cumulative effects

19.8.1 Cumulative effects are those that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence (ZoI). While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.

19.8.2 The current list of planned developments which are included in the cumulative impact assessment, are those identified in the Anfield SRF comprising:

- Anfield Village & Rockfield housing refurbishment;
- New build housing led regeneration;
- The Walton Breck Road (The High Street) Corridor;
- New public space and Village Square development (training hotel and offices); and
- Completion of the restoration of Stanley Park east of Mill Lane.

19.8.3 Without any evidence on the likely economic impacts of the identified projects within the SRF, we have not presented any change to the significance judgements reached above. Clearly the development of all of the projects identified within the SRF will deliver a holistic approach to

the regeneration of the Anfield area over the short, medium and longer term. The stadium expansion project (noting the wider benefits described above), aligned with the range of projects within the SRF (some which are still subject to further testing and feasibility work) have the potential to deliver transformational economic, social and environmental change within the neighbourhood of Anfield over the longer term. Particularly through stabilising the resident population base, through improved housing, improving the quality of the environment, creating the conditions for a sustainable non-match day economy, and the creation of a number of new or expanded economic anchors in the local area.

19.9 Residual effects

- 19.9.1 No mitigation is been proposed as part of the socio-economic assessment – all effects are judged to be beneficial at varying scales of significance. The assessment of significance, outlined above, remains the same for the receptors and impact areas.

19.10 Summary of effects

- 19.10.1 Table 19.13 and Table 19.14 presents summaries of the significance of effects for each identified receptor, by phase, and by impact area.

Table 19.13: Summary of Effects for Socio-economics – Liverpool City Region

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/ Beneficial	Permanent/ Temporary	Residual Effect
Construction	The employment base	The construction phase has the potential to create temporary jobs and effect the total employment base in the impact area	No mitigation required	Minor	Beneficial	Temporary	Minor Beneficial
	The labour market	The temporary jobs created by the construction phase have the potential to effect labour markets in the impact area	No mitigation required	Minor	Beneficial	Temporary	Minor Beneficial
Operation	The employment base	The operation of the expanded stadium has the potential to create jobs and effect the total employment base in the impact area	No mitigation required	Insignificant	-	Permanent	Insignificant
	The labour market	The jobs created by the expanded stadium have the potential to effect labour markets in the impact area	No mitigation required	Insignificant	-	Permanent	Insignificant
	The visitor economy	Off-site visitor expenditure has the potential to effect the scale/value of the visitor economy within the impact area.	No mitigation required	Insignificant	-	Permanent	Insignificant

Table 19.14: Summary of Effects for Socio-economics - Liverpool

Project Phase	Receptor	Summary of effect	Mitigation	Level of Effect	Nature of effect		
					Adverse/ Beneficial	Permanent/ Temporary	Residual Effect
Construction	The employment base	The construction phase has the potential to create temporary jobs and effect the total employment base in the impact area	No mitigation required	Moderate	Beneficial	Temporary	Moderate Beneficial
	The labour market	The temporary jobs created by the construction phase have the potential to effect labour markets in the impact area	No mitigation required	Moderate	Beneficial	Temporary	Moderate Beneficial
Operation	The employment base	The operation of the expanded stadium has the potential to create jobs and effect the total employment base in the impact area	No mitigation required	Minor	Beneficial	Permanent	Minor Beneficial
	The labour market	The jobs created by the expanded stadium have the potential to effect labour markets in the impact area	No mitigation required	Minor	Beneficial	Permanent	Minor Beneficial
	The visitor economy	Off-site visitor expenditure has the potential to effect the scale/value of the visitor economy within the impact area	No mitigation required	Minor	Beneficial	Permanent	Minor Beneficial

19.11 Statement of significance

- 19.11.1 The stadium expansion project is one of the most significant investments in the Anfield area and in North Liverpool. It is coming forward in parallel with a wider spatial regeneration framework (SRF) for the neighbourhood. The stadium is an important spatial and economic anchor for the Anfield neighbourhood, given the dominance of the stadium on the local landscape and the role of the Club as an employer, purchaser, and attractor of visitors. Consequently, the Club's stadium expansion proposals, and the socio-economic benefits that this would deliver (particularly in terms of the additional direct, indirect and induced employment opportunities), are a strategically important component in achieving the SRF's objectives for re-shaping the economic, social and environmental trajectory of the Anfield area over the next 10-15 years, to deliver sustainable regeneration.
- 19.11.2 When the Club was proposing to build a new stadium in Stanley Park they developed an employment and training strategy in line with a S106 obligation required by LCC. This strategy highlighted the Club's proposed approach to maximise the employment benefits of the stadium for local people, as well as Liverpool and city region residents. It is anticipated that the Club would follow a similar recruitment approach for the expanded stadium.
- 19.11.3 As the socio-economic assessment of the significance of effects on the employment base, labour market, and visitor economy receptors identifies positive outcomes as a result of the stadium expansion project, no mitigation measures are proposed.
- 19.11.4 As such, the following significant effects are anticipated for the development during the construction phase:
- In the Liverpool city region impact area the construction phase is judged to have a minor beneficial effect on both the employment base receptor and the labour market receptor.
 - In the Liverpool impact area the construction phase is judged to have a moderate beneficial effect on both the employment base receptor and the labour market receptor.
- 19.11.5 The following significant effects are anticipated for the development once the expanded stadium is operational (no significant effects have been assessed at the city region level once the expanded stadium is operational):
- In the Liverpool impact area the operation of the expanded stadium is judged to have a minor beneficial effect on the employment base, labour market, and visitor economy receptors.

19.12 References

[Ref 01] - The following are references drawn upon in undertaking this assessment:

[Ref 02] - Department for Communities and Local Government (1999). Environmental Impact Assessment Guidance.

[Ref 03] - HM Treasury (2003). The Green Book: Appraisal and Evaluation in Central Government.

[Ref 04] - Liverpool City Council (2002). Unitary Development Plan.

[Ref 05] - Liverpool City Council (2012). Draft Core Strategy.

[Ref 06] - Liverpool City Council (2012). Mayoral Development Zone.

[Ref 07] - Liverpool City Council and Sefton Borough Council (2010). North Liverpool & South Sefton Strategic Regeneration Framework.

[Ref 08] - Liverpool City Council (2014). Anfield Spatial Regeneration Framework.

[Ref 09] - Liverpool City Region LEP (2009). Liverpool City Region Visitor Economy Strategy to 2020.

Ref 10] - Liverpool City Region LEP (2012). Liverpool City Region Business Plan

Ref 11] - Liverpool City Region LEP (2013). Liverpool City Region Skills for Growth.

20 Cumulative Effects

20.1 Introduction

- 20.1.1 As part of the EIA regulations Schedule 4, Part 1, the ES should contain a description of the likely cumulative effects associated with a proposed development.
- 20.1.2 Cumulative effects are defined as those that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence (Zoi). While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.
- 20.1.3 The assessment in this chapter has considered two principal types of effects:
- The combination of individual effects, for example noise, airborne dust or traffic on a single receptor or resource; and
 - Cumulative effects of several development schemes which may, on an individual basis be insignificant but cumulatively have a significant impact.
- 20.1.4 The proposed LFC stadium expansion project is part of the wider Anfield SRF which aims to *“explore and harness the potential of the area, bringing a number of current live projects and new proposals together in a coordinated and comprehensive manner in order to deliver lasting social, economic and environmental regeneration. In particular it seeks to capitalise upon Liverpool Football Club’s stated preference to extend its existing stadium and remain in Anfield”*.
- 20.1.5 This chapter describes the scope of the cumulative assessment in terms of other schemes under review and the potential for cumulative impacts and mitigation (where required) to prevent or reduce the potential impacts identified.

20.2 Methodology

- 1.1.4 The cumulative assessment takes account of the proposed developments outlined within the Anfield SRF, of which the Anfield Stadium expansion falls within.
- 1.1.5 The assessment has been prepared taking cognisance of the Sustainability Appraisal Report produced for the Anfield SRF. This identifies and assesses the significant and cumulative effects that the associated plans and programmes may have on the environment.
- 1.1.6 The technical environmental chapters (Chapter 7 – 19) have assessed the residual and cumulative effects as part of their assessment.
- 1.1.7 For the purposes of this assessment a ‘significant combination effect’ has been defined as ‘multiple residual effects which will cause a significant effect on the same receptors resulting in a significant adverse combined effect’.

20.2.1 The significance of the combination and cumulative effects is based on a consideration of the receptor sensitivity and the magnitude of the combination and cumulative effects upon them, as presented in the associated assessment methodology matrix shown in Chapter 6.4.2, and replicated in Table 20.1 below.

Table 20.1: Matrix for Assessment of Significance of Effects

Magnitude of Effect	Sensitivity of Receptors			
	Negligible	Low	Medium	High
Neutral	Insignificant	Insignificant	Insignificant	Insignificant
Minor	Insignificant	Insignificant	Minor	Minor
Moderate	Insignificant	Minor	Moderate	Moderate
Major	Insignificant	Minor	Moderate	Major

20.3 Combination effects

20.3.1 This section describes the significant residual effects that will remain post-mitigation.

20.3.2 The combination of residual effects identified within the environmental technical chapters (Chapter 7 - 19) is summarised diagrammatically for both construction and operation phases in Figure 20.1 and Figure 20.2 respectively.

Figure 20.1: Construction phase combination effects

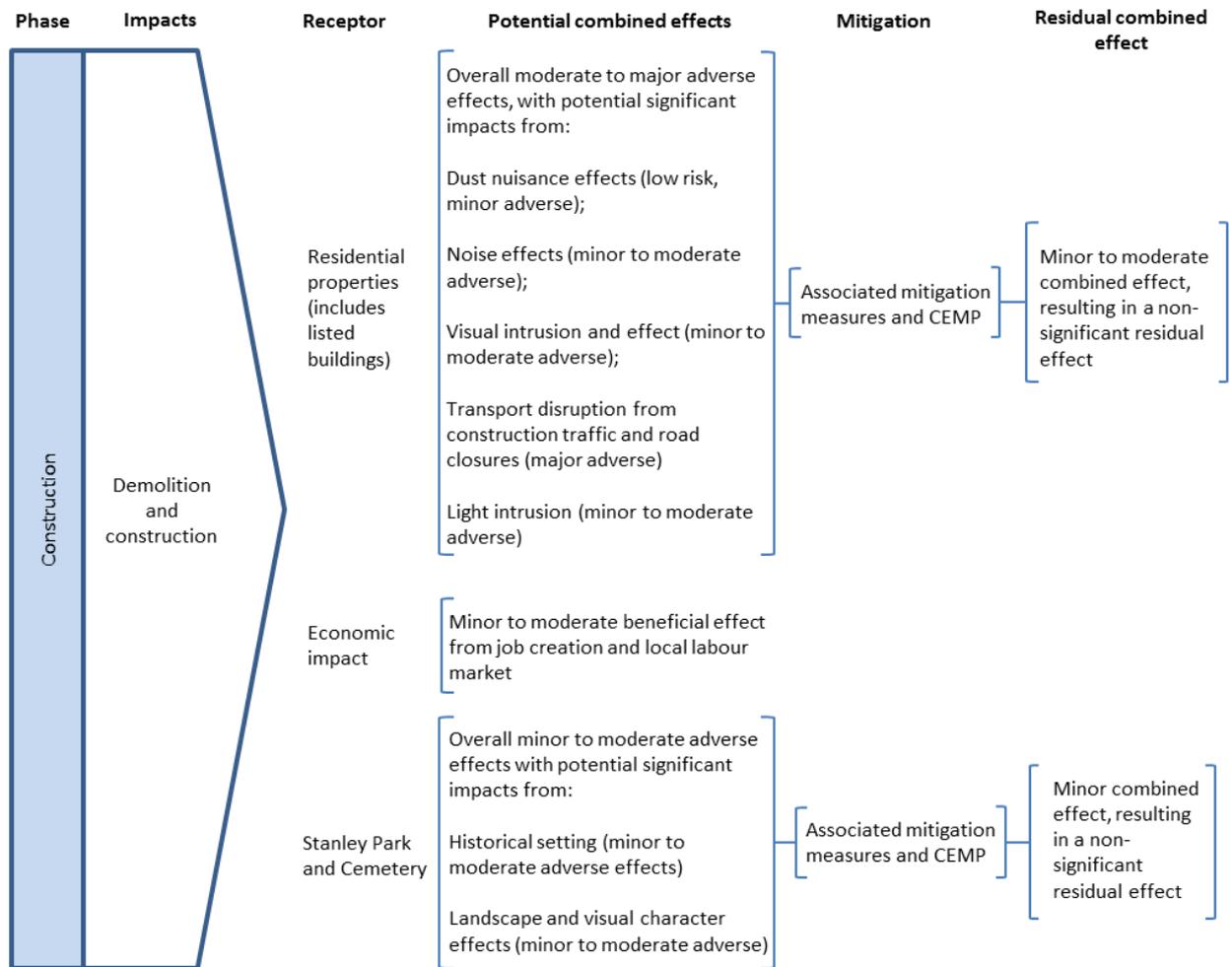


Figure 20.2: Operation phase combination effects

Phase	Impacts	Receptor	Potential combined effects	Mitigation	Residual combined effect
Operation	Stadium expansion of Phase 1 & 2	Residential properties and surrounding local community	Minor to major adverse effects with potential significant impacts from: Transport effects by way of match day pedestrian and vehicle movements and road closures to require alternative routes to be used (minor adverse); Visual effect of stadium structure (minor to moderate adverse); Minor adverse effect to the listed buildings on Anfield Road Noise disturbance (neutral to minor adverse); Shadowing effects (minor, moderate and major adverse effects*); Light pollution effects from: - Sky glow (negligible to minor effects) - Light intrusion into windows (moderate to major) - Glare (minor to moderate/major) - Building luminance (negligible effects)	Refer to specialist technical chapters (7 – 19) for associated mitigation measures	Minor to moderate combined effect, resulting in a non-significant residual effect
		Local economy and employment	Minor beneficial effects from creation of jobs associated expanded labour market and the increased value of visitor economy		
		Bus services and users	Minor beneficial effect on scheduled bus services to minimise delay times and improved safety		
		Stanley Park and Cemetery	Overall minor to moderate adverse effects however expected non-significant impacts: Historical setting (minor to moderate adverse effect) Landscape and visual character (minor to moderate adverse).	Refer to specialist technical chapters (7 - 19) for associated mitigation measures	Minor combined effect resulting in non significant residual effects
		Anfield area	Minor beneficial effects for townscape character and urban environment		
		Surface water runoff	Minor adverse effects with potential minor significant impacts from the increased impermeable surfaces		
		Habitat and protected species	Negligible effects for ecology		

* Major adverse effect assumes baseline takes account of residential demolition (on both sides of Lothair Road, the east side of Alroy Road and some properties at the end of Rockfield Road), which increases the significance compared to the actual current situation.

20.3.3 The construction phase has potential interactions between individual impacts that will result in short-term moderate to major adverse effects upon the residential receptors. These individual impacts can be mitigated through the Construction Environmental Management Plan (CEMP) to limit their significance. Those living in closest proximity to the construction site will experience a period of combined moderate to major adverse impact. It is identified that there will be more beneficial effects under the long-term operation phase in terms of the local economy and employment, bus services, and townscape character for the surrounding area, with minor adverse effects upon residential receptors, Stanley Park and Anfield Cemetery and surface water runoff.

20.4 Cumulative effects

Cumulative Schemes for Consideration

20.4.1 LCC, LFC and Your Housing formed a partnership in 2012 to deliver comprehensive regeneration in the Anfield area. The Anfield SRF has been produced by LCC with the purpose of delivering comprehensive and sustainable regeneration of the Anfield area.

20.4.2 The development opportunity sites proposed as part of the Anfield SRF are as follows:

- Land South of Walton Breck Road;
- Former Anfield Comprehensive Site;
- Mill Lane/Anfield Road; and
- Anfield Square Development Site.

20.4.3 The abovementioned sites are located in the Anfield opportunity site plan shown in Figure 20.3.

Figure 20.3: Opportunity Sites Plan within the SRF



Source: Anfield Spatial Regeneration Framework (2014)

Anfield Square Development Site

20.4.4 The Anfield Square opportunity site has potential to improve the vibrancy and economic potential of the area, capable of accommodating a range of uses, including mixed commercial, residential and community uses. The proposed scale of the opportunity site is between 4 – 6

storeys on the Walton Breck Road and the Square and a maximum of 2 storeys for developments that back onto terrace houses.

20.4.5 The indicative site parameter plan for Anfield Square Development is shown in Figure 20.4.

Figure 20.4: Anfield Square Development Site Parameter plan and bird's eye view



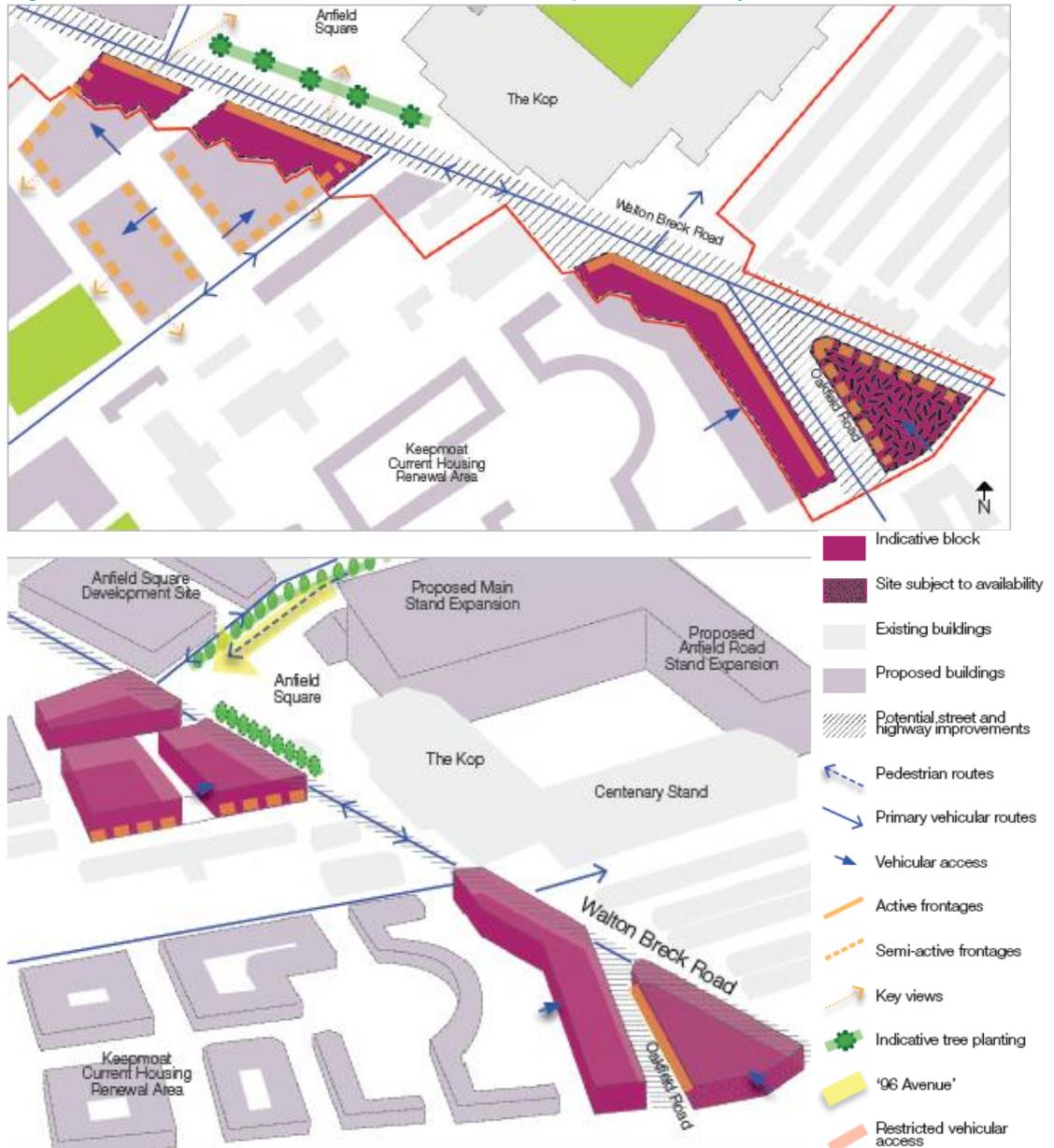
Source: LCC – SRF (April 2014)

Land South of Walton Breck Road

20.4.6 There is a significant opportunity to revitalise the High Street and increase economic activity in the area through the redevelopment and improvements of the properties on Walton Breck Road. There is potential to develop the plot directly opposite the football stadium into a local convenience store, with other commercial local shops with the provision of residential or commercial uses above ground level. In addition, high-density residential development may also be appropriate on Walton Breck Road. The proposed scale of the buildings on Walton Breck Road is between 3 – 5 storeys, while the residential buildings should be between 2 – 3 storeys.

20.4.7 The indicative site parameter plan for Walton Breck Road South is shown in Figure 20.5.

Figure 20.5: Walton Breck Road South Site Parameter plan and bird's eye view



Source: LCC – SRF (April 2014)

Former Anfield Comprehensive Site

20.4.8 The site of the former Anfield Comprehensive School and adjacent petrol station offers the opportunity to accommodate a gateway development, being the preferred location for a University Technology College. The site is also suitable for residential development and a

range of other complementary uses including multi-use parking, surface parking and community uses. The proposed scale of the opportunity site is between 2 – 5 storeys.

20.4.9 The indicative site parameter plan for the Former Anfield Comprehensive Site is shown in Figure 20.6.

Figure 20.6: Former Anfield Comprehensive Site Parameter plan



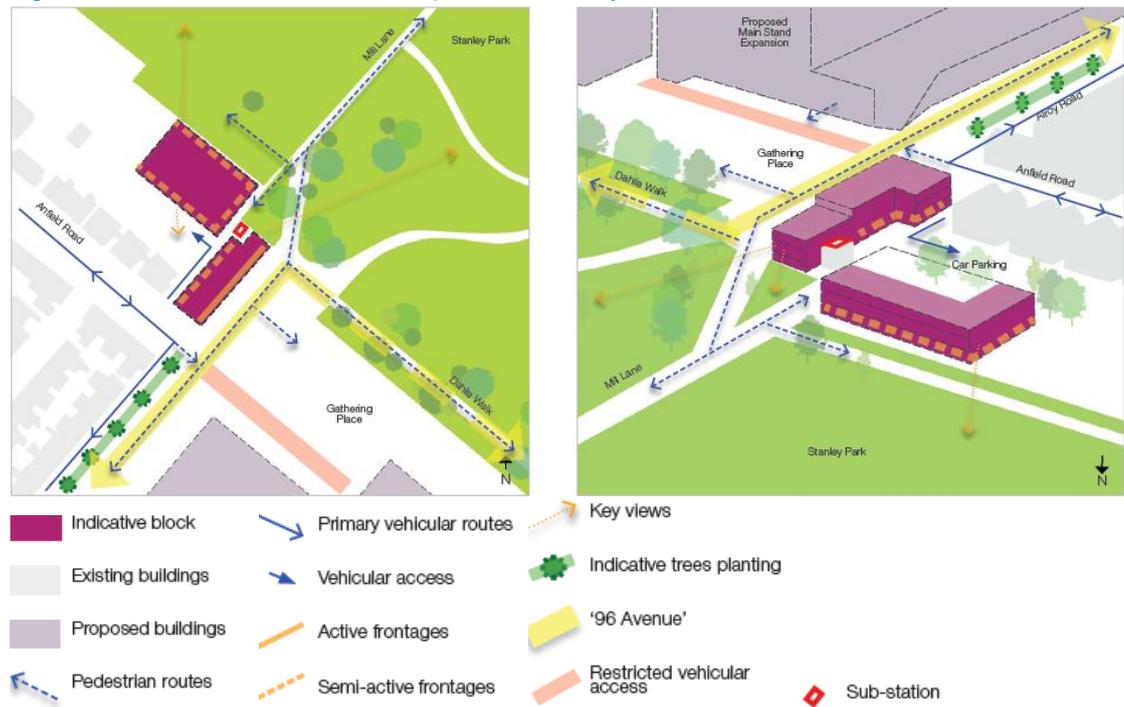
Source: LCC – SRF (April 2014)

Mill Lane/Anfield Road

20.4.10 There is opportunity for this site to introduce new development that would create a link between the formal and informal parts of Stanley Park (East and West of Mill Lane) and engage with the public realm for the expanded stadium and wider residential area. The site has potential for residential and community uses as well as a food hub. The proposed scale of the opportunity site is a maximum of 3 storeys, to match the height of the neighbouring properties on Anfield Road.

20.4.11 The indicative site parameter plan for Mill Lane is shown in Figure 20.7.

Figure 20.7: Mill Lane Site Parameter plan and bird's eye view



Source: LCC – SRF (April 2014)

Cumulative effects assessment

20.4.12 The cumulative effects for the opportunity sites of the Anfield SRF and the proposed stadium expansion have been assessed and are summarised in

20.4.13 Table 20.2. The assessment for each environmental aspect assessed for the proposed development have been made without any evidence of the detailed design of the identified projects within the SRF (aside from the proposed works for the park to the east of Mill Lane).

Table 20.2: Summary of Cumulative effects

Environmental aspects	Cumulative effects
Heritage	With consideration to the proposed Anfield SRF developments, there is no change to the effects on the assessed heritage assets, as set out in Tables 7.6 and 7.7 in Built Heritage, Chapter 7.
Townscape, landscape and visual	The Anfield SRF developments will enhance the urban environment. Regeneration of the area through new high quality residential and commercial development will provide an attractive environment. In particular, re-development of vacant areas and vacant housing would enhance the visual quality of the public realm, especially surrounding Anfield Cemetery and Stanley Park. New public realm and open spaces will be provided. These open spaces will be created in keeping with the wider Anfield regeneration plan and be used for everyday activities while also providing a buffer between the residential neighbourhood and the stadium. Landscaping improvement in Stanley Park will enhance the setting of the park including enhanced public green space.
Sunlight and shading	<p>The results of the sunlight and shading testing show that the stadium expansion proposals generally have a negligible residual effect on off-site streets and open spaces. A small number of individual properties will experience minor to substantial adverse effects; however, taking into account existing conditions, the perceptible effects will be minimal.</p> <p>Given the location and nature of the additional proposals, which is typically limited to 3-4 storey developments in the surrounding area in accordance with the parameters identified in the SRF, it is not expected that these will lead to significant impacts in terms of sunlight and overshadowing effects around the stadium.</p>
Light pollution	Given the nature of the additional proposals in the surrounding area, it is possible that these may give rise to significant cumulative impacts in terms of the lighting environment surrounding the stadium site. However, subject to these proposals also being required to meet ILP obstructive light limitations it should be possible to limit cumulative impacts to acceptable levels.
Microclimate (wind)	<p>The results of the wind tunnel testing show that the stadium expansion proposals have negligible impact on off-site streets and parkland; the only significant impacts occur in the new concourse area of the stadium.</p> <p>Given the nature of the additional proposals in the surrounding area, which are typically limited to 3-4 storeys in accordance with the parameters identified in the SRF, it is not expected that these will lead to further significant impacts in terms of the wind environment around the stadium.</p>
TV reception and telecommunications	There are no cumulative impacts currently in relation to TV reception and fixed microwave signals. However, if any cumulative impacts were to occur then this would be limited to terrestrial TV reception due to the limited height of the proposed SRF development and mitigation is assumed to be as that described previously i.e. adjust pointing of TV antennae.
Transport	<p>The Anfield SRF will improve connectivity and accessibility through improvements to the wider area including to the north, south and east of Stanley Park, and to Walton Breck Road, therefore improving access to facilities for both visitors and the local community. Pedestrian access and cycling through the area will be improved, as well as synergistic benefits to the public realm associated with the stadium. Development may also improve parking and access through the removal of tight terraced streets.</p> <p>The development options for the former Anfield comprehensive site will either involve improved capacity and management of parking facilities on match days, or result in the loss of existing parking facilities on match days which may encourage greater use of sustainable transport modes. The development options for the phase 2 expansion of the stadium will result in the permanent closure of Anfield Road, affecting access for local residents.</p>
Air quality	The combination of the Anfield SRF development options has the potential to have a negative effect on air quality. There will be temporary negative effects during construction of developments associated with construction activities such as dust generation. New commercial development may also increase traffic in the area from both visitors and commercial deliveries. However there are opportunities to promote the use of sustainable

Environmental aspects	Cumulative effects
Noise and Vibration	<p>transport modes which would keep this to a minimum. All schemes with the potential to affect local air quality will be assessed and the significance of their effects considered by the Local Authority in granting planning permission, therefore, significant cumulative effects from operation of the SRF developments are not expected.</p> <p>It is possible that individual receptors may be exposed to construction noise from more than one scheme concurrently resulting in an increase in combined noise level or sequentially resulting in a longer duration of exposure. The CEMPs prepared for each construction project will address the potential for such cumulative construction noise effects and the best practicable means of ameliorating them.</p> <p>The sensitive receptors considered within this ES are generally representative of the nearest receptors to the red line boundary of the Anfield Stadium application. Generally, sensitive receptors located within the other proposed developments will experience noise from operations of the Stadium of a magnitude which is no greater than those existing receptors.</p>
Ecology	<p>The Anfield SRF development options will contribute to protection and enhancement of local biodiversity, flora and fauna, particularly through landscaping and improvements to Stanley Park and potential for some new housing with gardens. There will be temporary minor negative effects from demolition of housing with potential for bats but this will be mitigated through undertaking bat surveys prior to construction/demolition, if applicable relevant licences will be obtained, bat boxes and trees will be provided.</p>
Geology and Soils	<p>Minimal earthworks and excavations are anticipated for the proposed developments; therefore there are not considered to be any cumulative effects with regards to geology and soils.</p>
Flood risk and water resources	<p>The majority of the Anfield SRF projects involve construction of impermeable surfaces and have the potential to increase surface water runoff peak rates and volumes, which have potential to increase the risk of flooding from this source. However, the development options are likely to have negligible to minor effects to flood risk as they will not significantly change the amount of existing hard-standing.</p> <p>The completion of Stanley Park involves examining opportunities to improve SuDS, and the new public space and village square may also have the opportunity to implement SuDS and help to reduce the risk from surface water flooding. It is assumed that any new development will be in accordance with NPPF and the supporting Technical Guidance, and will therefore mitigate any increase in surface water runoff. Therefore, the cumulative effect of all the planned developments will be minor positive in reducing the risk of surface water flooding.</p> <p>The only surface water body within the SRF area and surrounding area is the pond in Stanley Park. Therefore, potential for effects from the Anfield SRF development options on water quality is limited. There is potential for spillages or pollution incidents during construction. However, the indicative depth of the groundwater is at 20m, therefore, effects are unlikely. There is potential for localised improvements to water quality through increased landscaping, particularly through the Stanley Park development options.</p>
Socio-economic	<p>The Anfield SRF will facilitate economic development through regeneration of the area, providing a more attractive environment for investment, businesses and tourism, and directly through commercial development (including the training hotel, food hub, and other retail and office development). The stadium expansion is the catalyst for regeneration in the area. There will be direct benefits to the local economy through job creation both during construction and operation. There will also be indirect job creation through the wider regeneration and investment in the area. The stadium is already a tourist attraction and the expansion is likely to increase visitors and expenditure in the area on match and non-match days.</p> <p>Permeability to Walton Breck Road would be increased, therefore improving access to facilities and employment areas for both the local community and visitors. Commercial developments along Walton Breck Road South and Anfield Square have the potential for increased benefits in the long-term as the sites become established and all units are occupied. There will be economic benefits through the provision of new and improved housing by attracting people to live in the area and contribute to the local economy. Improvements to the park will help attract more visitors to the area who will contribute to the local economy through the use of its facilities. The Food Hub would create direct links between food partners and the local community, becoming a good-food distribution point for North Liverpool, attracting local and regional producers, creating jobs.</p>

Environmental aspects	Cumulative effects
	<p>The Anfield SRF will create temporary and permanent employment and training opportunities. Jobs will be created during construction and operation of development options. Commercial development will provide employment opportunities. Commercial developments along Walton Breck Road South and Anfield Square have the potential for increased benefits in the long-term as the sites become established and all units are occupied. The training hotel would provide increased opportunities for employment, education and training. The Food Hub has the potential to offer direct employment, training and education opportunities in food production, preparation and service. Through links to other production, hospitality and recreational partners and distribution partners the Hub could offer training opportunities and access to new careers for local residents. Links to local schools would provide education opportunities in food production, policy and healthy eating. If the educational use on the former Anfield comprehensive site is developed it would have increased benefits in terms of increased educational facilities and opportunities.</p>

20.5 Summary of cumulative effects

20.5.1 The overall Anfield SRF will have positive effects in terms of promoting and creating employment and training opportunities, regeneration of the area, contributing to the local economy, improving accessibility and enhancing the public realm and landscape of the area. Potentially negative effects, in terms of air quality, noise disturbance and flood risk, will be reduced through adherence to the guidance set out in the Anfield SRF.

20.6 Mitigation of combination and cumulative effects

1.1.8 As mitigation for the loss of potential roosting habitat within the SRF boundary the erection of bat boxes is recommended. These should ideally be located within Stanley Park on mature trees away from artificial lighting. Given the limited ecological value of the area at present, the provision of bat boxes is likely to result in a positive effect on the local bat population.

20.6.1 No other supplementary mitigation measures are necessary for the prevention of combination and cumulative effects.

20.7 Residual effects

20.7.1 No significant adverse residual effects are likely to occur through combination and cumulative impacts, while it is expected that for those effects identified can be mitigated through detailed design and management of construction and operation processes.

21 Summary of Residual Effects and Conclusions

21.1 Summary of the Significant Residual Effects

21.1.1 Significant residual effects are defined as effects arising as a result of the scheme once mitigation has been applied. Each specialist technical chapters (Chapter 7-19) and Chapter 20 (Cumulative Assessment) discusses the mitigation measures appropriate to the environmental topic and takes into consideration the anticipated residual effects for both the construction phases (temporary effects) and operational phase (permanent effects). The significance and nature of residual effects are determined in each specialist technical chapters (Chapter 7-19) and in Chapter 20 (Cumulative Assessment).

21.1.2 A summary of the anticipated significant residual impacts associated with the construction phase and the operation phase of the proposed development is shown in Table 21.1 and Table 21.2.

Table 21.1: Summary of construction residual impacts (temporary)

Environmental Topic	Description of effect/ receptor	Residual Impact of Construction Phase
Built Heritage	Effect on listed assets	Moderate adverse
	Effect on Registered Parks	Moderate adverse
Townscape, Landscape and Visual	Effects on designated landscapes	Not significant
	Effects on townscape character	Moderate adverse
Sunlight and Shading	Effects on window receptors	Not significant
	Effects on gardens and amenity	Not significant
Light Pollution	Effects on residents with direct views of the stadium	Not significant
Microclimate	Effects on pitch conditions	Not significant
	Effects on spectators comfort	Not significant
	Effects on off-site streets and pedestrian routes	Not significant
	Effects on Stanley Park	Not significant
	Effects on stadium concourse	Not significant
	Effects on stadium entrances	Not significant
TV Reception	Effects on terrestrial and satellite reception	Not significant
	Effects on Freesat and Sky TV reception	Not significant
Transport	Effects on surrounding residential community	Not significant
	Effects on construction route residents	Not significant
	Effects from abnormal loads	Not significant
	Effects on surrounding residential community	Not significant
Air Quality	Effects on residents	Not significant
Noise and Vibration	Effects on residents	Low risk/ minor adverse
Ecology	No effects	No impact
Geology and Soils	Effects on geology	Not significant
	Effects on soils	Not significant
	Effects on groundwater	Not significant
	Effects on construction workers	Not significant

Environmental Topic	Description of effect/ receptor	Residual Impact of Construction Phase
	Effects on general public	Not significant
	Effects on fauna and flora	Not significant
	Effects on structures	Not significant
Flood Risk and Water Resources	Effects on sewer flood risk	Not significant
	Effects on surface and sewer water quality	Not significant
	Effects on groundwater	Not significant
Socio-economics	Effects on the employment base	Minor beneficial
	Effects on the labour market	Minor beneficial

Table 21.2: Summary of operation residual impact (permanent)

Environmental Topic	Description of effect/ receptor	Residual Impact of Operational Phase
Built Heritage	Effect on listed assets	Not significant
	Effect on Registered Parks	Not significant
Townscape, Landscape and Visual	Effects on designated landscapes	Minor adverse
	Effects on townscape character	Minor to major beneficial
Sunlight and Shading	Effects on window receptors	Not significant
	Effects on gardens and amenity	Not significant
Light Pollution	Effects on area wide	Not significant
	Effects on residents	Not significant
	Effects on Stanley Park	Not significant
Microclimate	Effects on pitch conditions	Not significant
	Effects on spectators comfort	Not significant
	Effects on off-site streets and pedestrian routes	Not significant
	Effects on Stanley Park	Not significant
	Effects on stadium concourse	Not significant
TV Reception	Effects on stadium entrances	Not significant
	Effects on terrestrial and satellite reception	Not significant
	Effects on Freesat and Sky TV reception	Not significant
Transport	Effects on fixed microwave links	Not significant
	Effects on surrounding residential community	Not significant
	Effects on residents affected by the road closures	Not significant
	Effects on scheduled Bus Services and users	Not significant
	Effects on residents of Walton Breck Road (WBR)	Not significant
	Effects on improved safety for Soccerbus users	Not significant
Air Quality	Effects on residents on streets to host formalised bus and taxi pick up points.	Not significant
	Effects on Local Transport Network	Not significant
Noise and Vibration	Effects on human health	Not significant
	Effects on residential and non-Residential Receptors in the vicinity of Anfield Stadium.	Not significant

Environmental Topic	Description of effect/ receptor	Residual Impact of Operational Phase
Ecology	No effects	No impact
Geology and Soils	Effects on groundwater	Not significant
Flood Risk and Water Resources	Effects on surface water runoff	Not significant
	Effects on groundwater	Not significant
Socio-economics	Effects on the employment base (Liverpool impact area)	Minor beneficial
	Effects on the labour market (Liverpool impact area)	Minor beneficial
	Effects on the visitor economy (Liverpool impact area)	Minor beneficial

21.2 Conclusions

- 21.2.1 Due to the temporary nature of the construction phase of the proposed development, the effects identified in the specialist technical chapters (7 – 19) and in Table 21.1 and Table 21.2, will be temporary and reversible. Significant adverse effects have been identified for noise and visual intrusion arising from the construction phase. It is expected that these will be mitigated with the implementation of an appropriate CEMP, reducing the overall effect to an acceptable level.
- 21.2.2 There are significant beneficial socio-economic effects for the construction phase of the proposed development for both the employment base receptor and labour market in the Liverpool city region and the Liverpool impact area.
- 21.2.3 Adverse impacts have been identified during the operational phase for Stanley Park, Anfield Cemetery, Nos 25 to 45 Anfield Road and Stanley House through visual intrusion of the new stands; albeit these effects will not cause significant effects.
- 21.2.4 There will be residual adverse effects, albeit insignificant, to transport on the local residents expected from the closure of several roads and the additional match day pedestrian and vehicle movements. However, there will be beneficial effects resulting from the proposed scheduled bus services and formalisation of road closures to Walton Breck Road to provide security and formalised practice.
- 21.2.5 It is anticipated that the proposed development will bring significant beneficial effects to the townscape and visual character, significantly improving the townscape component within the Anfield area. Significant beneficial effects will also result from socio-economic aspects of the proposed development in the Liverpool impact region on the employment base, labour market and visitor economy receptors for the proposed development.
- 21.2.6 In conclusion, the potential temporary impacts for the construction phase of the proposed development will be adverse; however they will be controlled to an acceptable level and will be short-term. The permanent effects identified for the operational phase of the Anfield

Stadium Expansion will have an overriding beneficial impact, enhancing and improving the area.