



Figure 8.3: Site and Receptor locations (courtesy of Google Earth Pro)

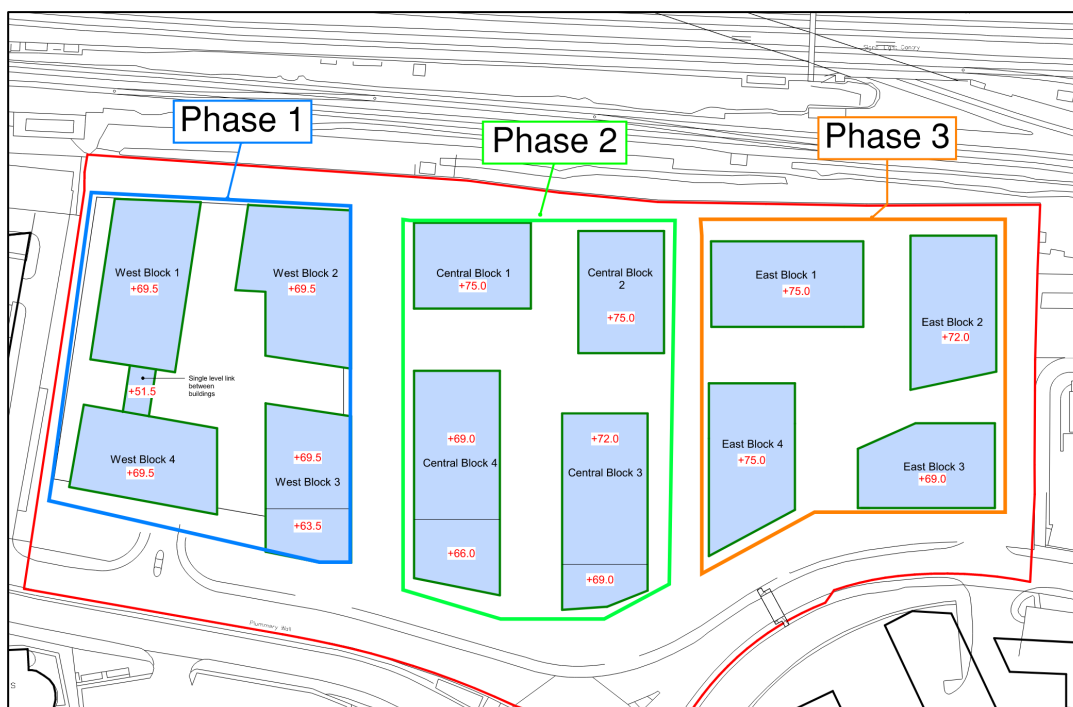


Figure 8.4: Future receptors

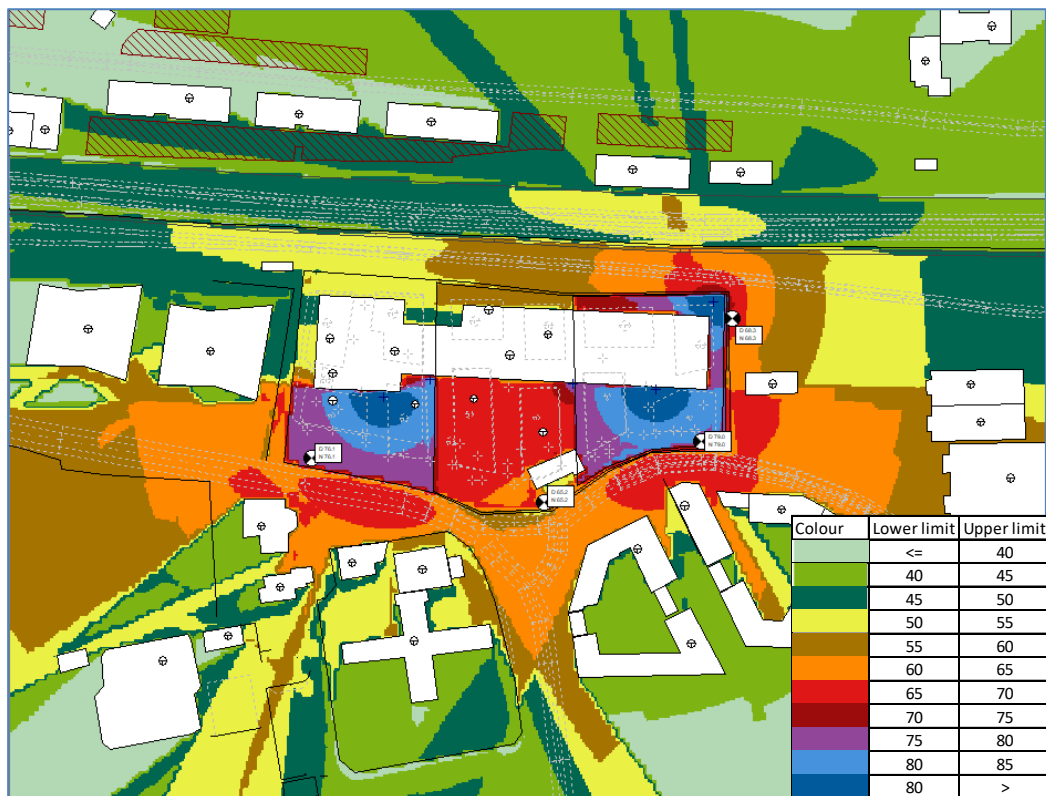


Figure 8.5: Demolition – Construction Noise Level ($L_{Aeq,10h}$ dB)

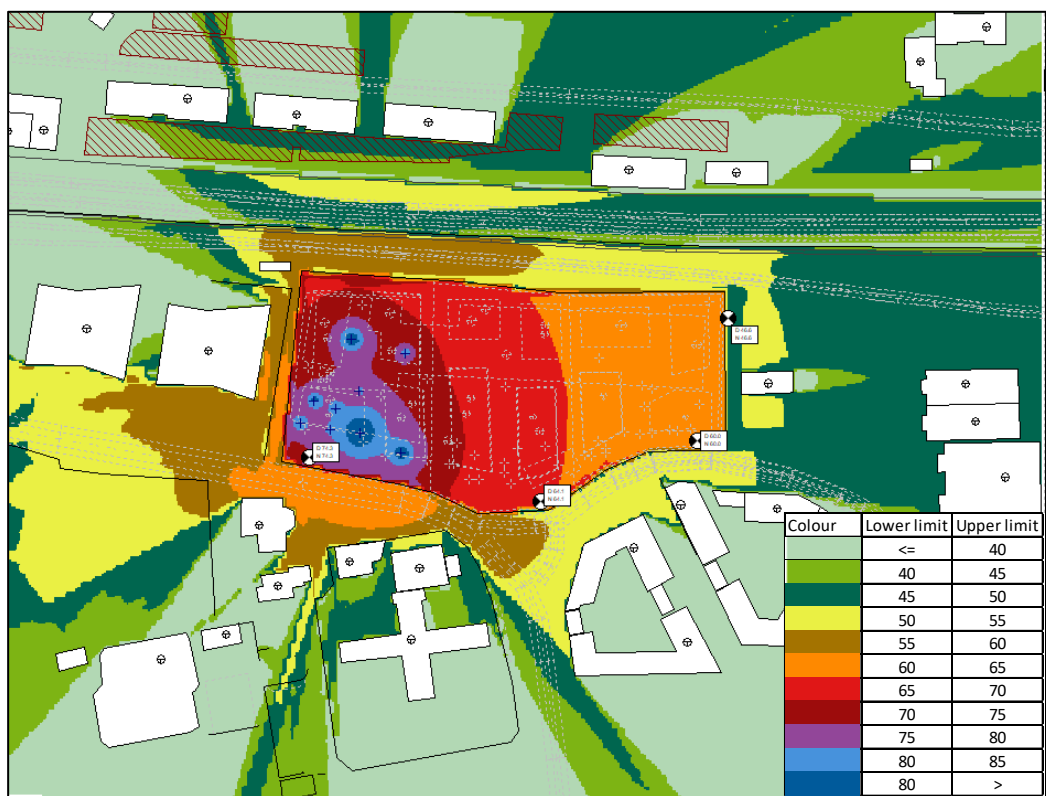


Figure 8.6: Substructure Phase 1 – Construction Noise Level ($L_{Aeq,10h}$ dB)

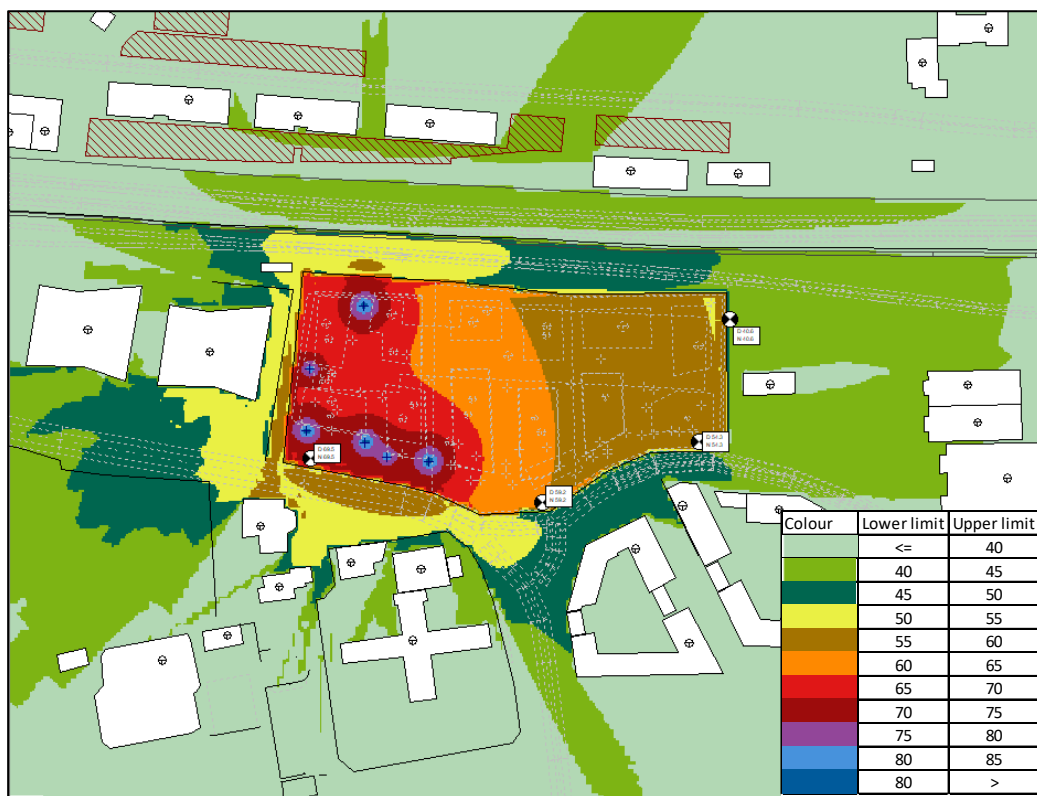


Figure 8.7: Superstructure Phase 1 – Construction Noise Level ($L_{Aeq,10h}$ dB)

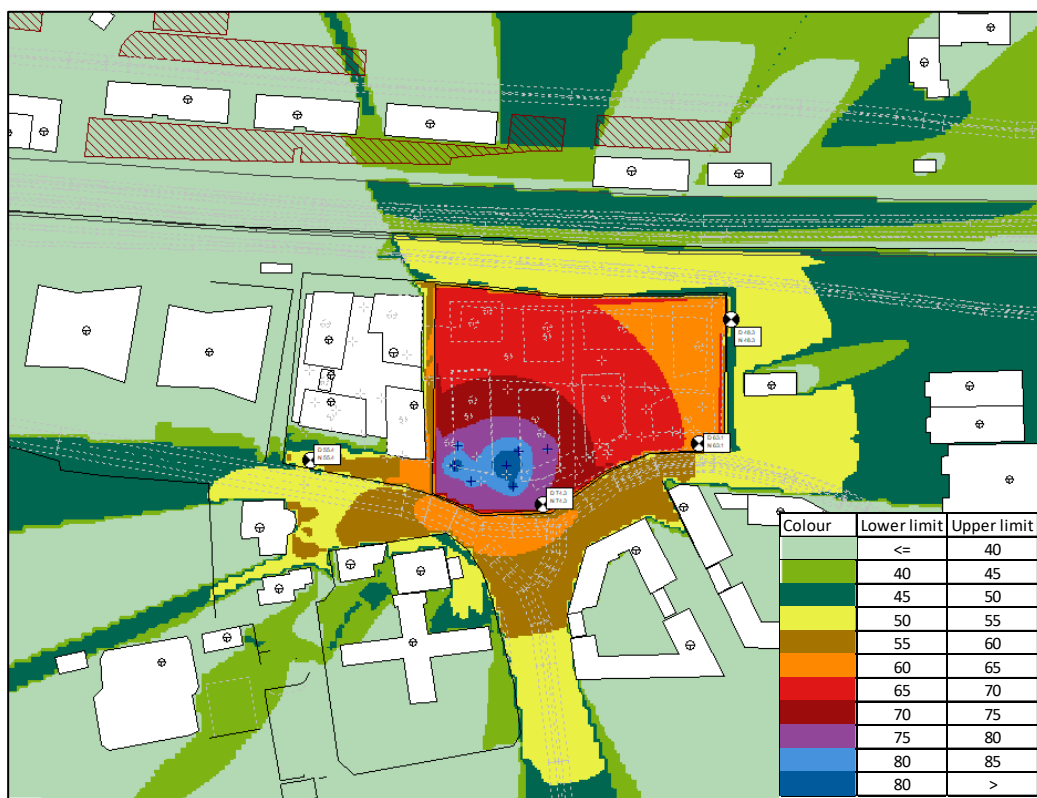


Figure 8.8: Substructure Phase 2 – Construction Noise Level ($L_{Aeq,10h}$ dB)

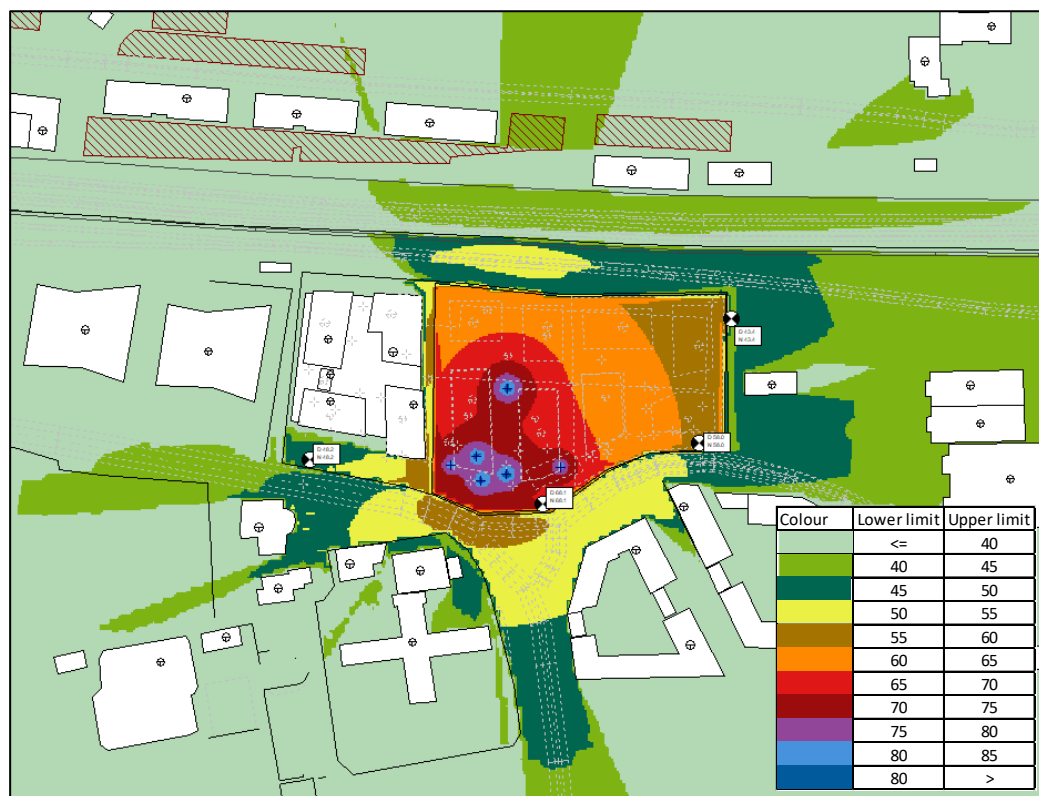


Figure 8.9: Superstructure Phase 2 – Construction Noise Level ($L_{Aeq,10h}$ dB)

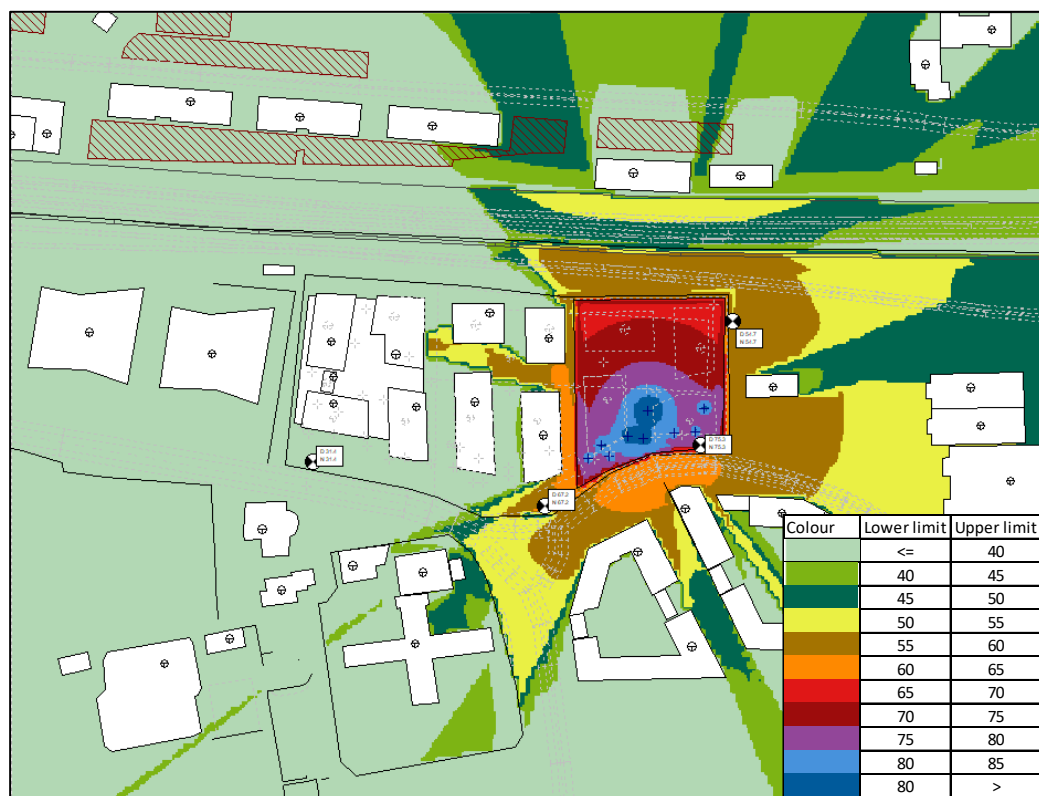


Figure 8.10: Substructure Phase 3 – Construction Noise Level ($L_{Aeq,10h}$ dB)

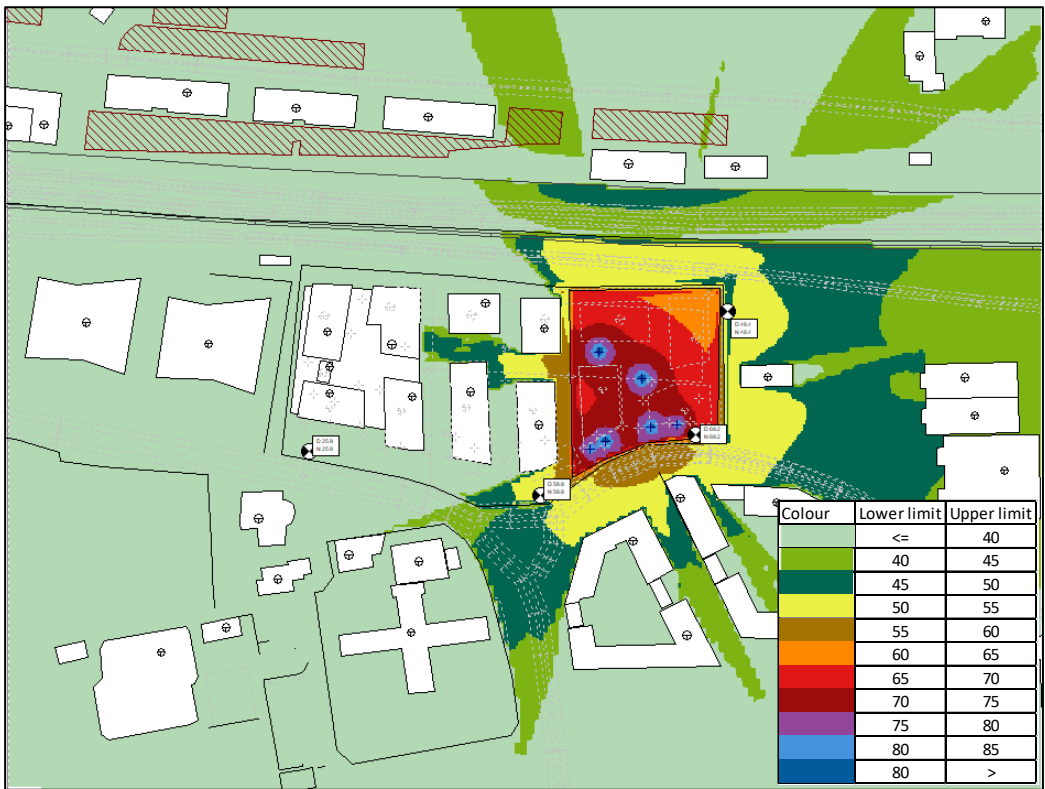


Figure 8.11: Superstructure Phase 3 – Construction Noise Level ($L_{Aeq,10h}$ dB)

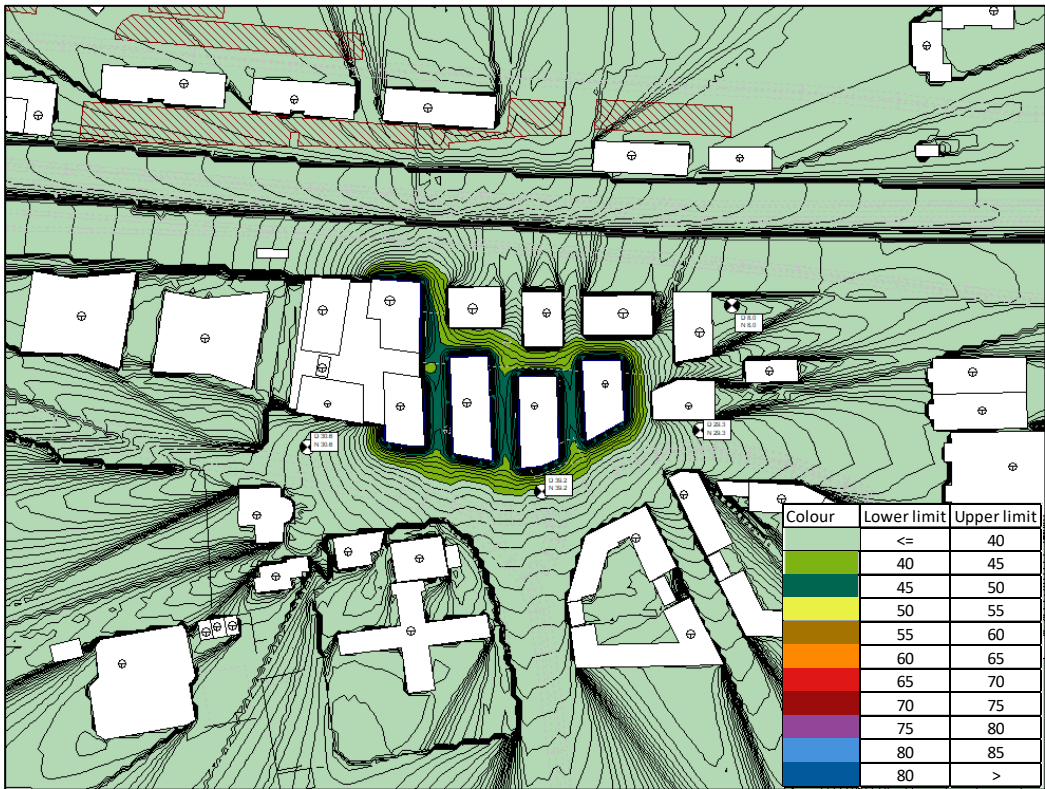


Figure 8.12: Amplified Music from Proposed Development

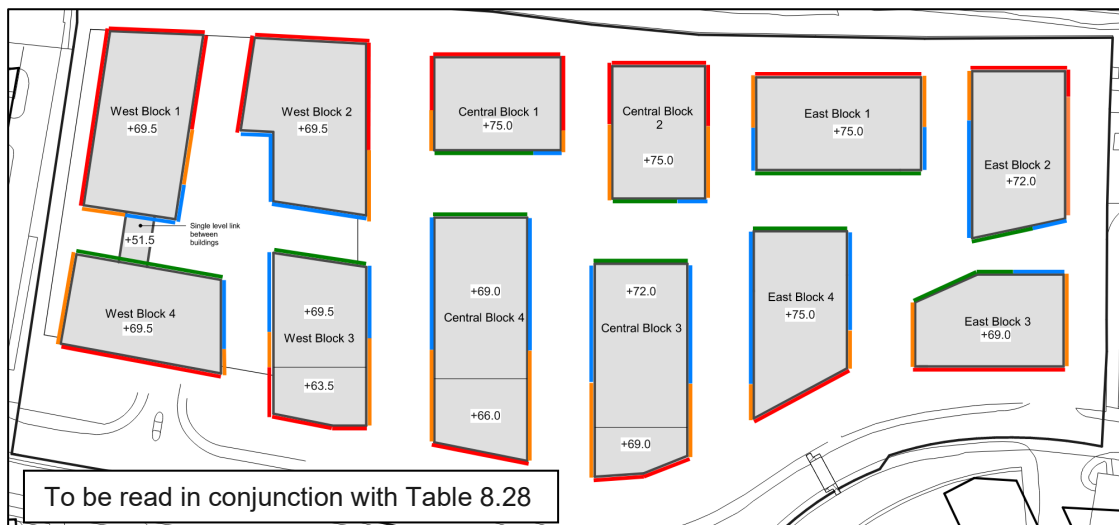


Figure 8.13: Façade location key



Figure 8.14: Assessment of External Noise Levels in Private Amenity

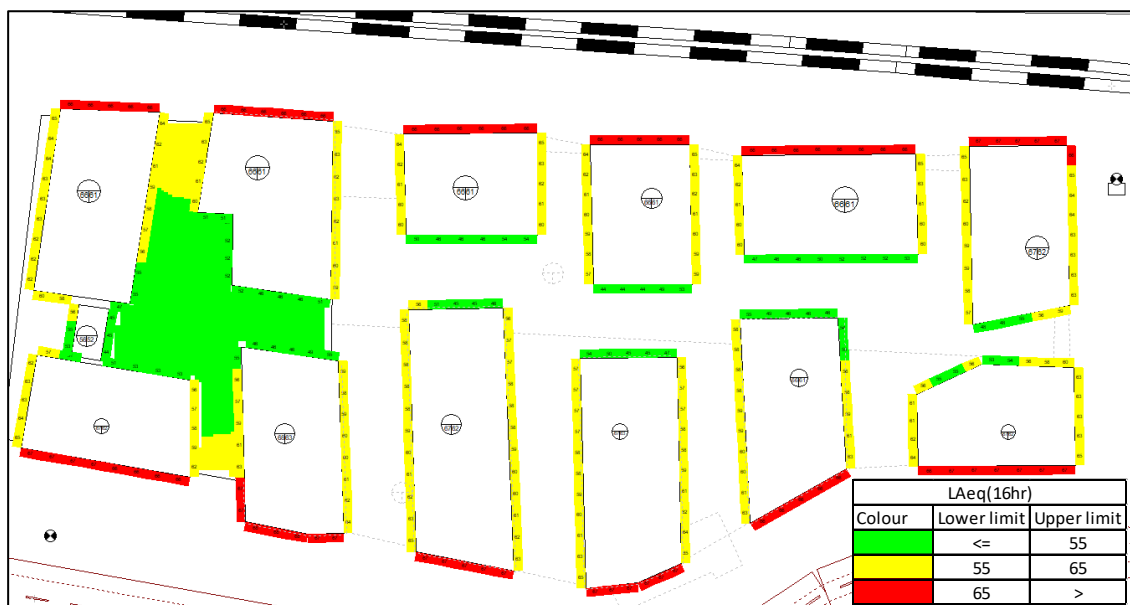


Figure 8.15: Assessment of External Noise Levels in Shared Amenity

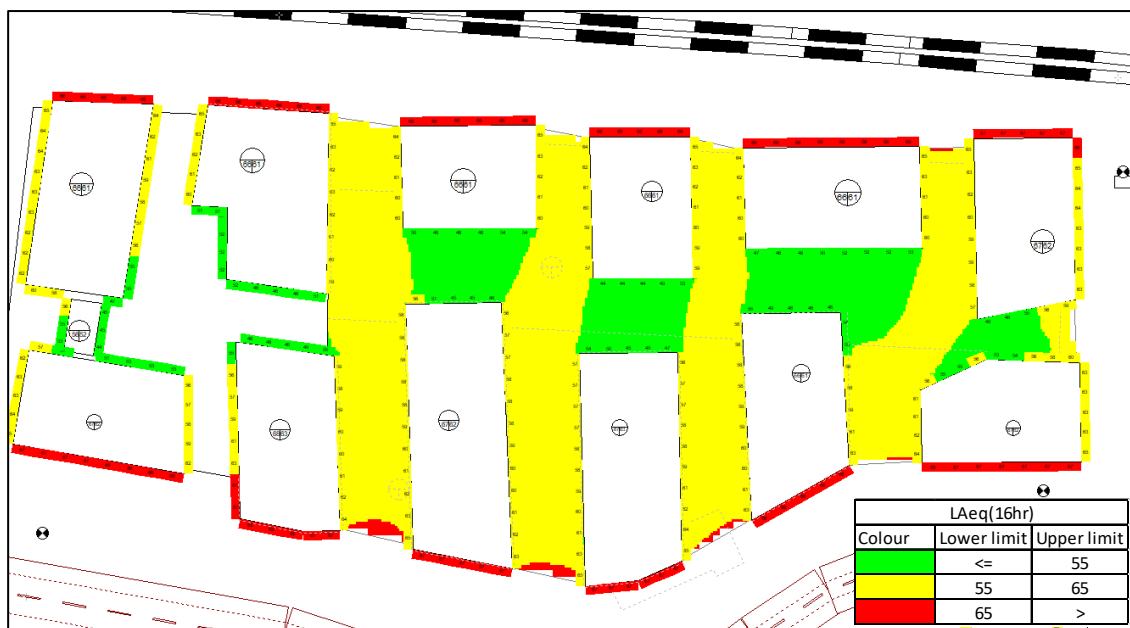


Figure 8.16: Assessment of External Noise Levels in Public Realm

Appendix H.3 Environmental Noise and Vibration Survey

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

21348-R02-A

5 April 2023

Forbury Retail Park

Environmental noise and vibration report

London, Manchester, Edinburgh, Birmingham, Belfast

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SANDY BROWN

Consultants in Acoustics, Noise & Vibration

Version	Date	Comments	Author	Reviewer
A	5 Apr 23		John Sails Aleksejs Apolskis	David Elliott

Disclaimer

This report has been prepared for the sole benefit and use of our client based on their instructions and requirements. Sandy Brown Ltd extends no liability in respect of the information contained in the report to any third party.

Summary

Sandy Brown has been commissioned by Ikon Consultancy, UK House, 180 Oxford Street, London, to provide acoustic advice in relation to the proposed development at Kings Meadow View (formerly Forbury Retail Park), Reading.

An environmental noise and vibration survey has been carried out at the site. The noise survey was carried out between 10 September 2021 and 15 September 2021. The vibration survey was undertaken on 10 September 2021.

The representative background sound levels measured during the survey were $L_{A90,15min}$ 48 dB during the daytime and $L_{A90,15min}$ 38 dB at night.

The average ambient noise levels measured at the unattended noise monitoring location were $L_{Aeq,16h}$ 53 dB during the daytime and $L_{Aeq,8h}$ 51 dB at night. Attended noise measurements were used to determine typical noise levels near to Forbury Road and Kenovan Drive.

A vibration survey was carried out to determine existing vibration levels at the site.

Data from the survey will be used to inform the design of the development with respect to atmospheric noise emissions from building services plant, environmental noise ingress through the building envelope and tactile and ground borne vibration levels within the residences.

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4 Measurement results 11

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Appendix C – Measured LLSmax acceleration results at Location V 22

1 Introduction

Sandy Brown has been commissioned by Ikon Consultancy, to provide acoustic advice in relation to the proposed development at Forbury Retail Park, Reading.

Environmental noise and vibration surveys have been carried out to establish:

- background sound levels around the site and by nearby noise sensitive premises
- ambient and maximum noise levels at the site
- vibration levels affecting the site.

This report provides details of the noise and vibration surveys, including measurement results.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in Figure 1. Currently the site primarily comprises commercial units with associated carpark. On the southern boundary of the site there is a fast-food restaurant.

The nearest major road is Forbury Road, which leads to Kenovan Drive to the east of the roundabout. National rail lines serving Reading Station run across the northern perimeter of the site. The line is also used for freight.



Figure 1 Areal view of the site (courtesy of Google Earth Pro) showing site, survey measurement positions and surrounding premises

3 Survey method

3.1 Noise survey method

The survey included unattended and attended noise measurements.

3.1.1 *Unattended measurements*

Unattended noise monitoring was undertaken at the site over 5 days.

Details of the equipment used, and the noise indices measured are provided in Appendix A.

The unattended measurements were taken over 15-minute periods between 14:16 on 10 September 2021 and 11:16 on 15 September 2021. The equipment was installed by John Sails and collected by Gunes Dincer.

The measurement position used during the survey is indicated in Figure 1, denoted by the letter 'L'. A photograph showing the measurement location is provided in Figure 2. This location was chosen to be reasonably representative of noise levels at the site and outside the nearest noise sensitive premises.

The equipment was installed on the east-side within the property boundaries of Forbury Retail Park, at a 20 m distance from the railway.

The microphone was positioned on a tripod approximately 2 m above ground level at 2.5 m from the closest reflective surface. Measurement results are considered to be free field.

The location was chosen to be reasonably representative of noise levels at the site.



Figure 2 Photograph of unattended measurement position

3.1.2 *Attended measurements*

Attended sample measurements were taken by Gunes Dincer at three locations around the site. Location's 1 and 2 are indicated in Figure 3. The attended measurements were carried out on 10 September 2021, over 15-minute periods.

At each position the microphone was mounted on a tripod approximately 1.5 m above the ground level and 4.0 m from Forbury Road. There were no reflective surfaces in proximity to the measurement locations and therefore the results are considered to be free field.

Details of the equipment used, and the noise indices measured are provided in Appendix A.

Dominant noise sources occurring during the measurements were noted.



Figure 3 Attended noise measurement locations 1 (left) and 2 (right)

3.2 Vibration survey method

Vibration measurements were taken at one location around the site in order to determine the vibration levels resulting from the passage of trains on the overground line adjacent to the site. The vibration measurement locations are indicated in Figure 1 as position “V”.

The measurements were taken on 10 September 2021 by John Sails between 12:15 and 15:13. Measurement periods containing multiple train events were obtained during the survey.

Vibration time histories were recorded using a tri-axial accelerometer and data recorder. The accelerometers were arranged on a mounting block that was connected to a ground-bearing concrete slab. A metal washer was fixed to the slab using a thin layer of epoxy adhesive, away from the boundaries of the room, with the mounting block attached to the washer.

The vibration measurements were conducted in three axes as follows:

- X axis - Horizontal vibration approximately parallel to the railway tracks
- Y axis - Horizontal vibration approximately perpendicular to the railway tracks
- Z axis - Vertical vibration.

Details of the equipment used and the noise indices measured are provided in Appendix A.

The vibration measurements taken at location V is considered to be reasonably representative of the vibration levels to be experienced by the proposed residential premises.



Figure 4 Vibration measurement location closest to rail tracks

3.3 Weather conditions

Weather conditions during the survey are described in Appendix A.

4 Measurement results

4.1 Observations

4.1.1 Noise

The dominant noise sources observed at the site during the survey was road traffic from the adjacent main road, rail noise from the near rail lines/station and helicopter noise. The traffic noise was a constant throughout the measurements, whereas the rail noise was only dominant when present as it was occasional. Helicopter noise was dominant when present, but not constant.

Less significant noise sources included pedestrian activity around the retail park, adjacent construction work, faint plant noise and the wind through the trees. The pedestrian noise was constant, construction noise occasional and both the plant noise and wind through the trees was only audible when no other sources were present.

4.1.2 Vibration

Subjectively there was no perceptual vibration however train events could be seen from the measurement location.

4.2 Noise measurement results

4.2.1 Unattended measurement results

A graph showing the results of the unattended measurements is provided in Appendix B.

Day and night-time ambient noise levels measured during the unattended survey are presented in Table 1. All measurements are considered to be free-field.

Table 1 Ambient noise levels measured during the unattended survey

Date	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
	$L_{Aeq,16h}$ (dB)	$L_{Aeq,8h}$ (dB)
Friday 10 September 2021	-	50
Saturday 11 September 2021	53	46
Sunday 12 September 2021	52	52
Monday 13 September 2021	55	53
Tuesday 14 September 2021	56	52
Average	54	51

Analysis of night-time maximum noise levels indicates that the night-time maximum noise level not normally exceeded 10 times a night is L_{AFmax} 74 dB.

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Daytime and night-time statistical analysis of representative values for the site are given in Figure 5 and Figure 6.

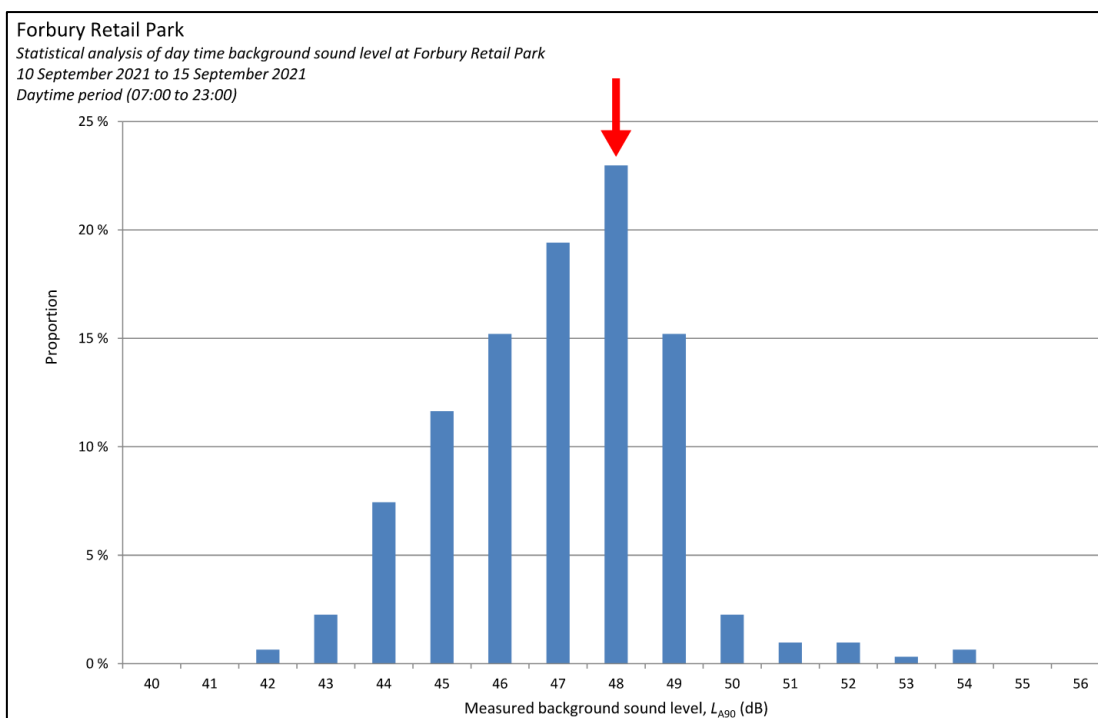


Figure 5 Measured representative background sound level for the daytime period (07:00-23:00)

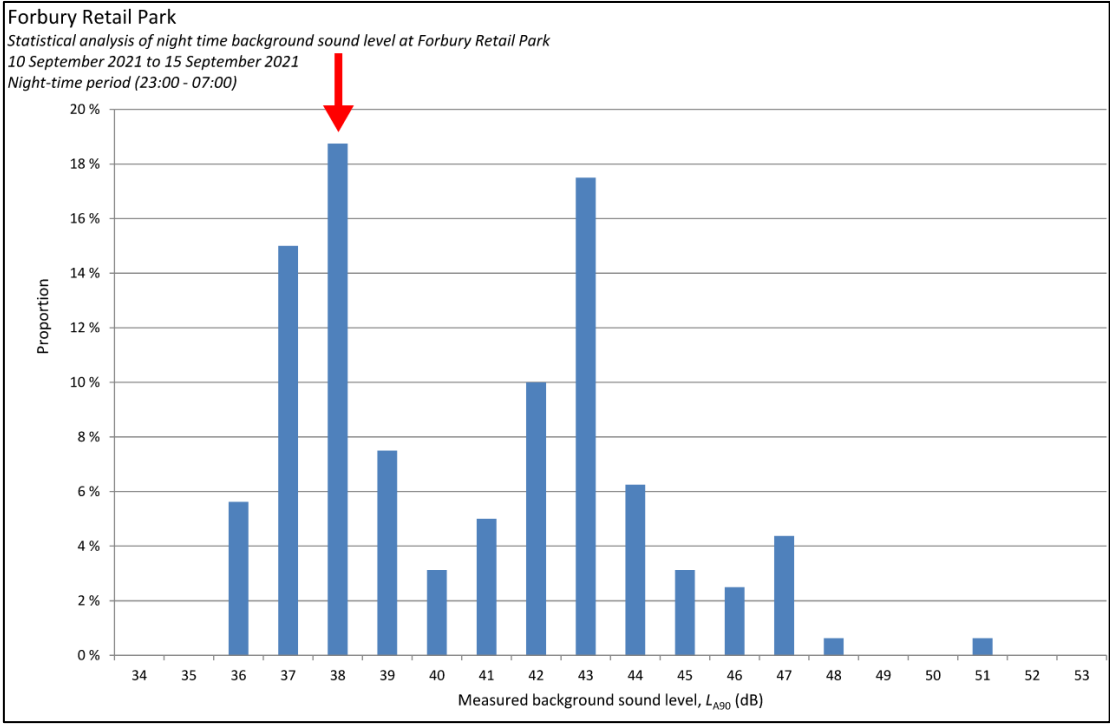


Figure 6 Measured representative background sound level for the night time period (23:00-07:00)

From this analysis, the representative background sound levels measured during the survey were $L_{A90,15min}$ 48 dB during the daytime and $L_{A90,15min}$ 38 dB at night.

4.2.2 Attended measurement results

Noise levels and key sources recorded during the attended measurements are summarised in Table 2.

Table 2 Noise levels and key noise sources from attended measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		$L_{Aeq,15min}$	$L_{AFmax,15min}$	$L_{A90,15min}$	
1	12:30	71	93	60	Max was caused by truck carrying scaffolding
1	13:47	70	84	59	Busy road almost 50 cars per minute (3 buses every min) Dominated by trucks
1	14:45	70	83	62	Road busy, 48 cars per minute. (2 buses every min). Trucks dominant.
2	13:01	68	85	63	Road Noise. Max happens when trucks pass by. Cars accelerate in the roundabout.
2	14:07	68	86	63	Similar to previous measurement
2	15:07	67	78	63	No trucks passed in this interval.
3	13:26	67	79	59	Busy road with cars and trucks. Distant construction.
3	14:26	66	77	57	Busy road with cars and trucks. Distant construction.
3	15:27	67	79	57	Busy road with cars and trucks. Distant construction.

4.3 Vibration measurement results

VDVs measured at location V are presented in Table 3. The maximum VDV's measured for each of the directions are highlighted in red.

Table 3 VDV's measured at location V

Event number	Start time (hh:mm)	Duration (mm:ss)	VDV (m/s ^{1.75})		
			X	Y	Z
1	12:03	01:09	0.002	0.001	0.003
2	12:05	00:34	0.002	0.002	0.005
3	12:11	00:31	0.001	0.001	0.003
4	12:20	01:00	0.001	0.001	0.003
5	12:30	00:39	0.001	0.001	0.003
6	12:33	01:17	0.002	0.001	0.004
7	12:38	00:24	0.002	0.002	0.004
8	12:51	00:27	0.002	0.001	0.003
9	13:00	00:53	0.003	0.001	0.001
10	13:03	00:14	0.003	0.003	0.003
11	13:11	01:48	0.004	0.003	0.005
12	13:15	00:23	0.003	0.002	0.003
13	13:20	00:14	0.003	0.002	0.003
14	13:27	00:43	0.003	0.002	0.003
15	13:32	00:42	0.003	0.004	0.006
16	13:38	01:02	0.005	0.001	0.004
17	13:42	00:26	0.002	0.001	0.003
18	13:59	00:17	0.001	0.002	0.003
19	14:03	01:42	0.003	0.001	0.005
20	14:21	00:31	0.002	0.001	0.003
21	14:28	00:19	0.001	0.001	0.002
22	14:38	00:28	0.001	0.001	0.003
23	14:52	00:54	0.002	0.002	0.003

[1] Measurements of RMS acceleration are presented in Appendix C.

5 Conclusion

A noise survey has been carried out at the site. Key noiser sources at the site were noted as traffic on Forbury Road and Kenavon Drive, and railway noise from the tracks leading to and from Reading Station to the north of the site.

The measured representative background sound levels were $L_{A90,15min}$ 48 dB during the day, and $L_{A90,15min}$ 38 dB during the night.

Measurements of tactile vibration and indicate maximum VDV's of:

- X-axis $0.005 \text{ m/s}^{1.75}$
- Y-axis $0.004 \text{ m/s}^{1.75}$
- Z-axis $0.006 \text{ m/s}^{1.75}$.

Appendix A – Survey details

Equipment

The unattended and attended noise measurements were both taken using a Rion NL-52 sound level meter.

Tri-axial acceleration measurements were carried out using a PV-87 accelerometer and recorded using a Rion DA-20 data recorder.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	NL-52/00264550	Rion	29 Jul 22	TCRT20/1422
Microphone	UC-59/09698	Rion	29 Jul 22	TCRT20/1422
Pre-amp	NH-25/64675	Rion	29 Jul 22	TCRT20/1422
Calibrator	NC-74/34367631	Rion	29 Jul 22	TCRT20/1419
Sound level meter	NL-52/00264531	Rion	23 Jun 22	TCRT20/1331
Microphone	UC-59/09678	Rion	23 Jun 22	TCRT20/1331
Pre-amp	NH-25/64656	Rion	23 Jun 22	TCRT20/1331
Calibrator	NC-74/34367630	Rion	23 Jun 22	TCRT20/1328
Data Recorder	DA-20/10870889	Rion	11 Sep 21	TCRT19/1712
Accelerometer	PV-87/33827	Rion	10 Sep 21	TCRT19/1708
Accelerometer	PV-87/74274	Rion	9 Sep 21	TCRT19/1707
Accelerometer	PV-87/33829	Rion	9 Sep 21	TCRT19/1706
Vibration Calibrator	AT01/3015	AP Technology	10 Sep 21	TCRT19/1709

Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meters used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{ASmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a slow time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.

Vibration indices

For each measurement period a number of parameters were recorded. The most relevant of these are described below:

- The vibration dose value (VDV) in each of three axes with the appropriate frequency weightings (as defined in BS 6472-1:2008).
- The maximum RMS acceleration levels in each of three axes in one-third-octave bands, measured using the 'slow response' exponential time weighting.

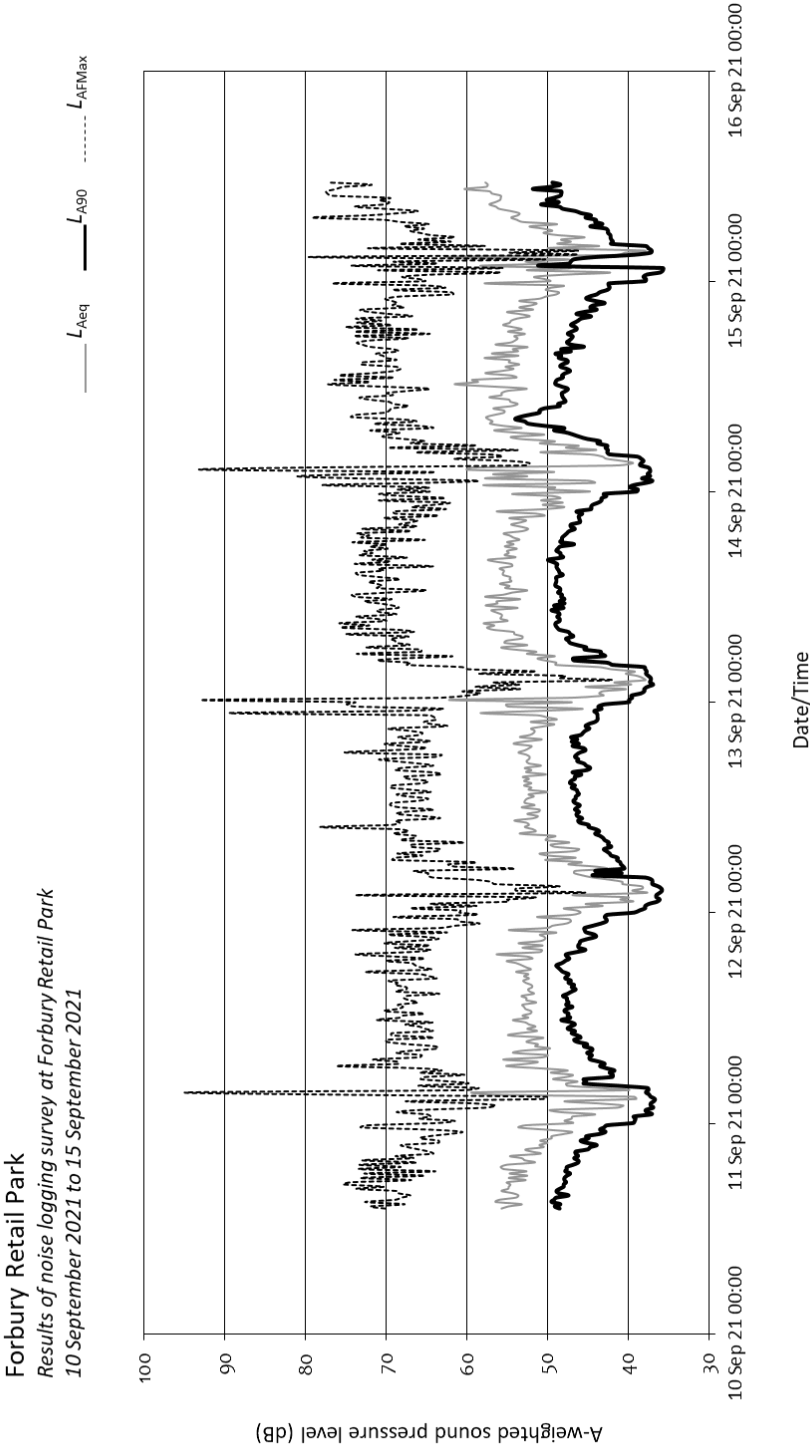
Weather conditions

During the attended noise measurements, the weather was generally clear and dry and no rain occurred. Wind speeds were measured at each position and varied between 2 m/s and 4 m/s.

During the unattended noise measurements, weather reports for the area indicated that temperatures varied between 8°C at night and 22°C during the day, and the wind speed was less than 5 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B – Results of unattended measurements at Location L



Appendix C – Measured LLSmax acceleration results at Location V

Table C1 – Broadband LLSmax data

Event number	Start time (hh:mm)	Duration (mm:ss)	LLSmax (m/s ^{1.75})		
			X	Y	Z
1	12:03	01:09	72	70	68
2	12:05	00:34	77	75	72
3	12:11	00:31	73	771	68
4	12:20	01:00	76	79	74
5	12:30	00:39	75	76	73
6	12:33	01:17	74	73	71
7	12:38	00:24	75	72	70
8	12:51	00:27	74	71	68
9	13:00	00:53	77	68	71
10	13:03	00:14	79	73	76
11	13:11	01:48	77	74	76
12	13:15	00:23	77	72	71
13	13:20	00:14	74	74	68
14	13:27	00:43	75	72	70
15	13:32	00:42	78	75	74
16	13:38	01:02	75	73	70
17	13:42	00:26	72	71	70
18	13:59	00:17	74	74	73
19	14:03	01:42	76	74	72
20	14:21	00:31	73	73	70
21	14:28	00:19	72	71	67
22	14:38	00:28	73	71	68
23	14:52	00:54	72	70	68

Appendix H.4 Construction Plant Assumptions

Construction Plant Assumptions

Typical techniques and methodology has been assumed to assess the potential noise and vibration affects associated with the demolition and construction phases of the Proposed Development.

Further to this review four workstreams of the demolition and construction programme have been assessed in the noise and vibration chapter for the Environmental Statement, namely:

- Demolition and enabling
- Substructure - Phase 1
- Superstructure - Phase 1
- Substructure - Phase 2
- Superstructure - Phase 2
- Substructure - Phase 3
- Superstructure - Phase 3.

These workstreams represent the worst case for potential noise impacts on the nearby noise sensitive receptors. Details of the different construction plant, number, the percentage of time they will be operational and their associated sound pressure level, as set in BS 5228:2009, are provided.

Phase 1 blocks will be occupied during the construction of Phase 2. Phase 1 & 2 blocks will be occupied during the construction of Phase 3.

Demolition

The details included in the construction noise assessment of the demolition works are set out in Table 1.

Table 1 Demolition plant assumptions

Construction plant	Number	% activity	BS5228-1 reference	L_{Aeq} at 10 m (dB)
Tracked excavators with breakers	2	70	C.1-9	90
Bob cats/mini excavators	2	40	C.2-8	68
Concrete crushers	1	25	C.1-14	86

Substructure

The details included in the construction noise assessment of the substructure works are set out in Table 2.

Table 2 Substructure construction plant assumptions

Construction plant	Number	% activity	BS5228-1 reference	L_{Aeq} at 10 m (dB)
Bob cats/mini excavators	2	40	C.2-8	68
Mobile crane	2	50	C.4-50	71
Tracked excavators with breakers	1	20	C.1-9	90
CFA piling rig	2	50	C.3-21	79
Concrete pump and concrete mixer truck	2	40	C.4-28	75

Superstructure

The details included in the construction noise assessment of the superstructure works are set out in Table 3.

Table 3 Superstructure construction plant assumptions

Construction plant	Number	% activity	BS5228-1 reference	L_{Aeq} at 10 m (dB)
Mobile crane	2	50	C.4-50	71
Concrete pump and concrete mixer truck	2	50	C.4-28	75
Tower Crane	2	50	C.4-47	76

Appendix I.1 IAQM Dust Guidance (2016) Approach

Appendix I Air Quality

I.1 IAQM Dust Guidance (2016) Approach

Table I.1.1 Dust Emission Magnitude Classification

Activity	Dust Emission Magnitude		
	Large	Medium	Small
Demolition	Total building volume of >50,000 m ³ , potentially dusty construction material, on-site crushing and screening, demolition activities >20 m above ground	Total building volume of 20,000 – 50,000 m ³ , potentially dusty construction material, demolition activities 10 – 20 m above ground level	Total building volume of <20,000 m ³ , construction material with low potential for dust release, demolition activities <10 m above ground, demolition during wetter months
Earthworks	Total site area of >10,000 m ² , potentially dusty soil type, >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes	Total site area of 2,500 - 10,000 m ² , moderately dusty soil type, 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4 - 8 m in height, total material moved 20,000 - 100,000 tonnes	Total site area of <2,500 m ² , soil type with large grain size, <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes. Earthworks during wetter months
Construction	Total building volume >100,000 m ² , on-site concrete batching, sandblasting	Total building volume 25,000 - 100,000 m ² , potentially dusty construction material, on-site concrete batching	Total building volume <25,000 m ² , construction material with low potential for dust release
Trackout	>50 Heavy Duty Vehicle (HDV) outwards movements in any one day, potentially dusty surface material, unpaved road length >100 m	10 - 50 HDV outwards movements in any one day, moderately dusty surface material, unpaved road length 50 - 100 m	<10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length <50 m

Table I.1.2 Receptor Sensitivity

Receptor Sensitivity	Impact		
	High	Medium	Low
High	An area where: - Users can reasonably expect enjoyment of a high level of amenity; - The appearance, aesthetics of value of their property would be diminished by soiling; - The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples include dwellings, museums and other culturally important collections, medium and long-term car showrooms.	Locations where members of the public are exposed over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objective, a relevant location would be one where individuals may be exposed for eight hours or more per day. Examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	Locations with an international or national designation <i>and</i> the designated features may be affected by dust soiling; OR Locations where there is a community of particularly dust sensitive species such as vascular species included in the Red Data List for Great Britain. Indicative examples include a SAC designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	An area where: - Users would expect to enjoy of a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; - The appearance, aesthetics of value of their property could be diminished by soiling; - The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods, as part of the normal pattern of use of the land. Examples include parks and places of work.	Locations where people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM₁₀ (in the case of the 24-hour objective, a relevant location would be one where individuals may be exposed for eight hours or more per day. Examples include office and shop workers, but will generally not include workers occupationally exposed to for PM₁₀, as protection is covered by Health and Safety at Work legislation.	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; OR Locations with a national designation where the features may be affected by dust deposition. Indicative example is a SSSI with dust sensitive features.

Low	An area where: - The enjoyment of amenity would not reasonably be expected; - Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; - There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples include playing fields, farmland (unless commercially sensitive horticultural), footpaths, short-term car parks and roads.	Locations where human exposure is transient. Examples include public footpaths, playing fields, parks and shopping streets.	Locations with a local designation where the features may be affected by dust deposition. Indicative example is a LNR with dust sensitive features.
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Table I.1.3 Sensitivity of an Area to Dust Soiling Effects

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	1 – 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table I.1.4 Sensitivity of an Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m ³	>100	High	High	High	Medium	Low
		10 – 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32 µg/m ³	>100	High	High	Medium	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28 µg/m ³	>100	High	Medium	Low	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	<24 µg/m ³	>100	Medium	Low	Low	Low	Low
		10 – 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	>32 µg/m ³	>10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28 - 32 µg/m ³	>10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28 µg/m ³	>10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	<24 µg/m ³	>10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

Table I.1.5 Sensitivity of an Area to Ecological Impacts

Receptor Sensitivity	Distance from Source (m)	
	<20	<50
High	High Risk	Medium Risk
Medium	Medium Risk	Low Risk
Low	Low Risk	Low Risk

Table I.1.6 Risk of Dust Impacts Calculation Matrix

Sensitivity of Area		Dust Emission Magnitude		
		Large	Medium	Small
Demolition	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible Risk
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible Risk
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible Risk
Trackout	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible Risk
	Low	Low Risk	Low Risk	Negligible Risk

Appendix I.2 EPUK/IAQM Guidance (2017) Screening Criteria

I.2 EPUK / IAQM Guidance (2017) Screening Criteria

Table I.2.1 Indicative criteria for requiring an air quality assessment

The development will:	Indicative criteria to proceed to a detailed air quality assessment:
Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors.	A change of LDV flow of: • >100 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA; and • >500 AADT elsewhere.
Cause a significant change in HDV flows on local roads with relevant receptors.	A change of HDV flow of: • >25 AADT within or adjacent to an AQMA; and • >100 AADT elsewhere.
Realign roads i.e. changing the proximity of receptors to traffic lanes.	Where the change is 5 m or more and the road is within an AQMA.
Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle acceleration / deceleration, e.g. traffic lights, or roundabouts.
Introduce or change a bus station.	A change of bus flows of: • >25 AADT within or adjacent to an AQMA; and • >100 AADT elsewhere.
Have an underground car park with extraction system.	The ventilation extract for the car park will be located within 20 m of a relevant receptor; and The car park will have >100 movements per day (total in and out).

The screening criteria presented is amended from Table 6.2 of the EPUK / IAQM guidance (EPUK / IAQM, 2017). Only the screening criteria relevant to changes in transport (including both traffic and the transport network) are outlined.

Appendix I.3 Road Traffic Emissions Air Quality Model Inputs and Results Processing

I.3 Road Traffic Emissions Air Quality Model Inputs and Results Processing

I.3.1 Summary of Model Inputs

Table I.3.1 Summary of Model Inputs

Meteorological Data	2019 hourly meteorological data from the Farnborough meteorological station has been used in the model. The wind rose is shown in Figure I.3.1 .
ADMS	Version 5.0.1.3
Time Varying Emission Factors	Based on Department for Transport statistics. Table TRA0307. Motor vehicle traffic distribution by time of day and day of the week on all roads, Great Britain: 2019
Latitude	51.5°
Minimum Monin-Obukhov length	A value of 30 for 'cities and large towns' was used to represent the modelled area. A value of 10 for 'small towns < 50,000' was used to represent the meteorological station site.
Surface Roughness	A value of 1.0 for 'cities, woodlands' was used to represent the modelled area. A value of 0.3 for 'agricultural areas (max)' was used to represent the meteorological station site.
Emission Factor Toolkit (EFT)	V11.0 (DEFRA, 2021)
NO _x to NO ₂ Conversion	NO _x to NO ₂ calculator version 8.1, August 2020 (DEFRA, 2020c)
Background Maps	2018 reference year background maps (DEFRA, 2020b)

I.3.2 Human Receptor Locations

Table I.3.2 Proposed Human Receptor Locations

Receptor	Description	X Coordinate	Y Coordinate	Modelled Height (m)	Receptor Type
Proposed Receptors					
P01a	West Block 4 (South West) – Ground Floor	472008.55	173683.45	1.5	Commercial/Residential
P01b	West Block 4 (South West) – First Floor	472008.55	173683.45	4.5	Residential
P01c	West Block 4 (South West) – Second Floor	472008.55	173683.45	7.5	Residential
P02a	West Block 4 (South East) – Ground Floor	472037.88	173678.16	1.5	Commercial/Residential
P02b	West Block 4 (South East) – First Floor	472037.88	173678.16	4.5	Residential

Receptor	Description	X Coordinate	Y Coordinate	Modelled Height (m)	Receptor Type
Proposed Receptors					
P02c	West Block 4 (South East) – Second Floor	472037.88	173678.16	7.5	Residential
P03a	West Block 3 – Ground Floor	472072.56	173663.88	1.5	Commercial/Residential
P03b	West Block 3 – First Floor	472072.56	173663.88	4.5	Residential
P03c	West Block 3 – Second Floor	472072.56	173663.88	7.5	Residential
P04a	Central Block 4 – Ground Floor	472119.26	173655.77	1.5	Residential
P04b	Central Block 4 – First Floor	472119.26	173655.77	4.5	Residential
P04c	Central Block 4 – Second Floor	472119.26	173655.77	7.5	Residential
P05a	Central Block 3 – Ground Floor	472134.53	173651.89	1.5	Residential
P05b	Central Block 3 – First Floor	472134.53	173651.89	4.5	Residential
P05c	Central Block 3 – Second Floor	472134.53	173651.89	7.5	Residential
P06a	East Block 4 – Ground Floor	472172.39	173665.95	1.5	Residential
P06b	East Block 4 – First Floor	472172.39	173665.95	4.5	Residential
P06c	East Block 4 – Second Floor	472172.39	173665.95	7.5	Residential
P07a	East Block 3 (South West) – Ground Floor	472210.33	173678.06	1.5	Residential
P07b	East Block 3 (South West) – First Floor	472210.33	173678.06	4.5	Residential
P07c	East Block 3 (South West) – Second Floor	472210.33	173678.06	7.5	Residential
P08a	East Block 3 (South East) – Ground Floor	472246.10	173678.40	1.5	Residential
P08b	East Block 3 (South East) – First Floor	472246.10	173678.40	4.5	Residential
P08c	East Block 3 (South East) – Second Floor	472246.10	173678.40	7.5	Residential
P09a	West Block 1 – Ground Floor	472036.07	173713.07	1.5	Commercial/Residential
P09b	West Block 1 – First Floor	472036.07	173713.07	4.5	Residential
P09c	West Block 1 – Second Floor	472036.07	173713.07	7.5	Residential
P10a	West Block 2 – Ground Floor	472081.22	173713.78	1.5	Commercial/Residential
P10b	West Block 2 – First Floor	472081.22	173713.78	4.5	Residential
P10c	West Block 2 – Second Floor	472081.22	173713.78	7.5	Residential
P11a	Central Block 1 – Ground Floor	472127.41	173729.49	1.5	Residential

Receptor	Description	X Coordinate	Y Coordinate	Modelled Height (m)	Receptor Type
Proposed Receptors					
P11b	Central Block 1 – First Floor	472127.41	173729.49	4.5	Residential
P11c	Central Block 1 – Second Floor	472127.41	173729.49	7.5	Residential
P12a	Central Block 2 – Ground Floor	472138.73	173718.09	1.5	Residential
P12b	Central Block 2 – First Floor	472138.73	173718.09	4.5	Residential
P12c	Central Block 2 – Second Floor	472138.73	173718.09	7.5	Residential
P13a	East Block 1 – Ground Floor	472173.19	173724.65	1.5	Residential
P13b	East Block 1 – First Floor	472173.19	173724.65	4.5	Residential
P13c	East Block 1 – Second Floor	472173.19	173724.65	7.5	Residential
P14a	East Block 2 – Ground Floor	472223.79	173708.74	1.5	Residential
P14b	East Block 2 – First Floor	472223.79	173708.74	4.5	Residential
P14c	East Block 2 – Second Floor	472223.79	173708.74	7.5	Residential

In addition to the discrete human receptors above, a 300 m x 300 m Cartesian grid covering the Site and surrounding area has been run with 5 m x 5 m resolution at a height of 1.5 m.

Table I.3.4 Traffic Data

Link Number	Location	2019 Baseline		2026 With Development		Speed (kph)
		AADT	HDV (%)	AADT	HDV (%)	
1a	A329 Forbury Road east of the site access (Westbound)	13,967	9.5%	14,827	9.5%	48
1b	A329 Forbury Road west of the site access (Eastbound)	11,374	7.0%	12,142	7.0%	48
2a	Kenavon Drive west of the site access	7,257	7.4%	7,759	7.4%	48
2b	Kenavon Drive east of the site access	4,885	8.2%	5,199	8.2%	48
3a	A329 Forbury Road south of the site (Northbound)	11,361	8.4%	12,100	8.4%	48
3b	A329 Forbury Road south of the site (Southbound)	13,261	10.8%	14,233	10.8%	48
4	Kings Road west of Forbury Road	5,310	25.3%	6,060	25.3%	48
5	A329 Kings Road east of Forbury Road	28,462	8.4%	31,509	8.4%	48
6	A329 Watlington Street	26,155	3.3%	28,865	3.3%	48
7a	A329 Vastern Road (Northbound)	11,146	8.2%	11,961	8.2%	48
7b	A329 Vastern Road (Southbound)	15,535	8.2%	16,595	8.2%	48
8	A329 Queens Road West of A329 Watlington Street	19,688	1.8%	N/A ^a	N/A ^a	48
9	A329 Vastern Road west of B3345	25,656	5.0%	N/A ^a	N/A ^a	48
10	A4155 Caversham Road	27,910	4.0%	N/A ^a	N/A ^a	48
11	A329 Caversham Road	22,349	5.0%	N/A ^a	N/A ^a	48 / 64
12	Western Site Access	N/A ^b	N/A ^b	4438	0.0%	20
13	Eastern Site Access	N/A ^b	N/A ^b	49	100.0%	20

Traffic data for road links 2b, 6, 9, 10 and 11 have been split 50/50 into one directional flows close to the junction.

Traffic data for road link 4 has been split into 3 one directional flows close to the junction.

^a Roads used for verification purposes only (2019 traffic flows only)

^b Site Access Roads (2026 traffic flows only)

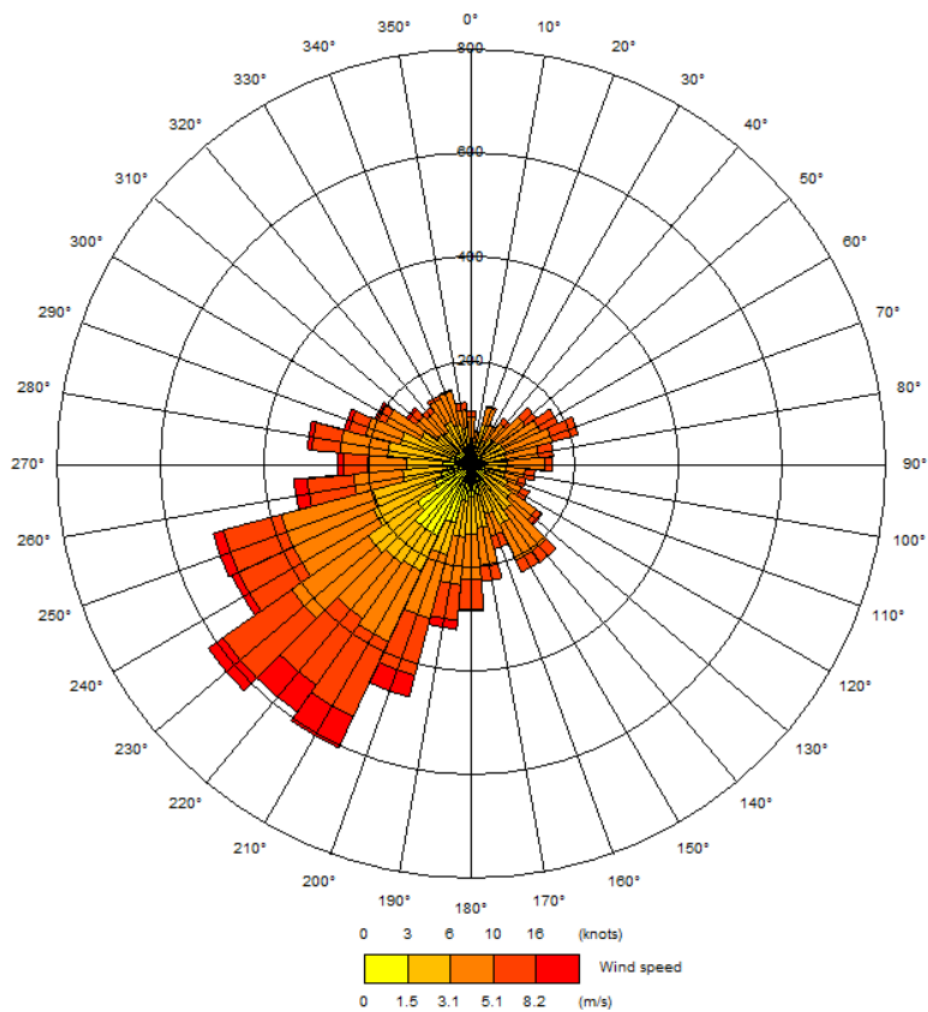


Figure I.3.1 2019 Farnborough Meteorological Station Wind Rose

Appendix I.4 Road Traffic Emissions Air Quality Model Verification

I.4 Road Traffic Emissions Air Quality Model Verification

I.4.1 NO₂

Most NO₂ is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides (NO_x = NO + NO₂). The model has been run to predict the 2019 annual mean road-NO_x contribution at two monitoring locations within the study area, identified in **Table I.4.1** below.

Table I.4.1 Summary of Monitoring Locations used in Model Verification

Site ID	X Co-Ordinate	Y Co-Ordinate	Modelled Height (m)
131 Caversham Rd	471262.3	174236.9	2.0
108 Caversham Rd	471293.6	1742363.	2.0

A primary adjustment factor of **1.9765** has been determined as the slope of the best fit line between the modelled road NO_x contribution and the 'measured' road-NO_x (which is calculated from the measured and background NO₂ concentrations within DEFRA's NO_x from NO₂ calculator (DEFRA, 2020c)), forced through zero (**Figure I.4.1**). This factor has then been applied to the raw modelled road-NO_x concentration to provide adjusted modelled road-NO_x concentrations.

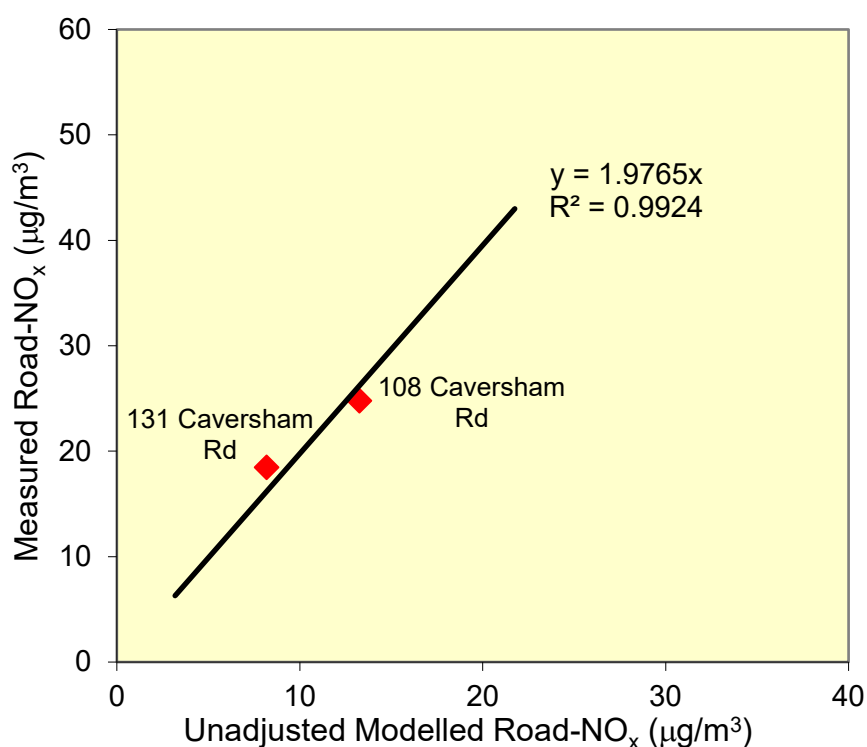


Figure I.4.1 Measured and Unadjusted Road-NO_x Comparison

The total NO₂ concentrations have then been determined by combining the adjusted modelled road-NO_x concentrations with the background NO₂ concentration within DEFRA's NO_x from NO₂ calculator (DEFRA, 2020c). A secondary adjustment factor of **1.0048** has then been calculated as the slope of the best fit line applied to the adjusted data and forced through zero (**Figure I.4.2**).

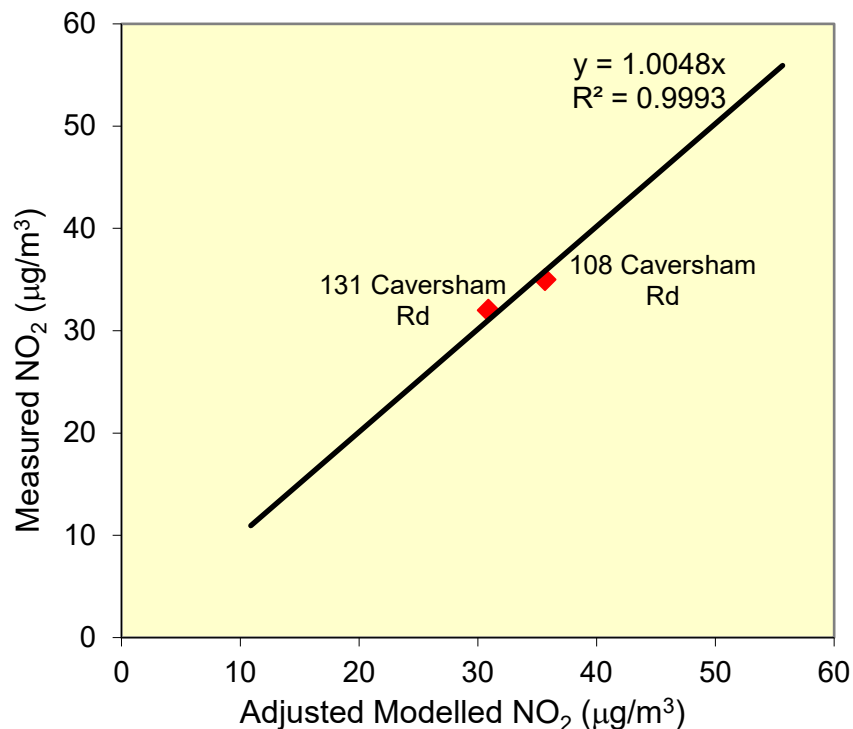


Figure I.4.2 Measured and Primary Adjusted Modelled NO₂ Comparison

Figure I.4.3 compares final adjusted modelled total NO₂ at each of the monitoring sites, to measured total NO_x and shows the 1:1 relationship, as well as $\pm 10\%$ and $\pm 25\%$ of the 1:1 line.

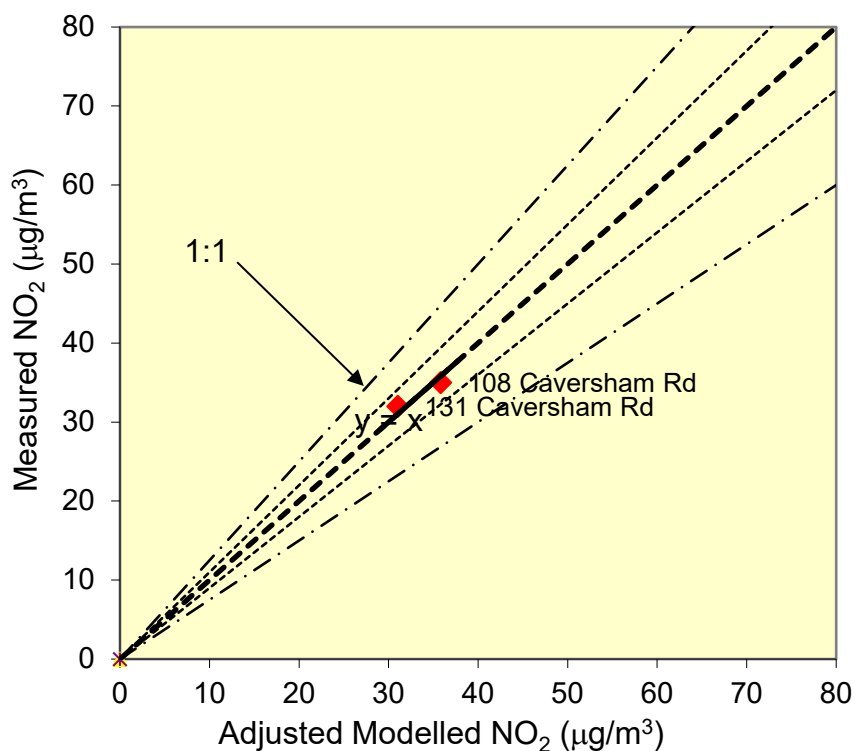


Figure I.4.3 Measured and Final Adjusted Modelled NO₂ Comparison

The calculated adjustment factors imply that overall, the model has under-predicted the road-NO_x contribution. This is a common experience with this and most other models. The calculated Root Mean Square Error (RMSE) for this verification (0.9 µg/m³) lies within the range considered to be acceptable by DEFRA (DEFRA, 2022) (0 – 10).

I.4.2 PM₁₀ and PM_{2.5}

The closest roadside automatic monitoring station to the Site measuring PM₁₀ is RD1, located along Caversham Road. However, as traffic data was unavailable for Richfield Avenue and Caversham Bridge, RD1 has been excluded from model verification. There are also currently no roadside automatic monitoring stations measuring PM_{2.5} in Reading Borough Council's administrative area. On this basis, the adjustment factor calculated for NO₂ has also been applied to both the modelled road-PM₁₀ and modelled road-PM_{2.5} concentrations.

I.4.3 Exclusions

Three monitoring sites within the study area were not considered suitable for verification purposes and have therefore been excluded from the model verification. Justifications for exclusion for each monitoring site are outlined below in **Table I.4.2**.

Table I.4.2 Monitoring Locations Excluded from Model Verification

Excluded Monitoring Site	Justification
Malcolm Place	The monitoring site is located within close vicinity to the railway lines serving Reading Railway Station which is likely to have an influence on nearby NO ₂ concentrations.
181 Kings Road	This monitoring site was excluded from model verification due to poor data capture in 2019.
276 Kings Road	This monitoring site could not be located on Google Maps and therefore it's location could not be accurately modelled for verification purposes.

In addition to the above, modelled NO₂ concentrations at the King Oak Flats and 31a Vastern Road monitoring locations were overpredicting, with a primary adjustment factor of 0.88 and 0.87 respectively. As such, to provide a worst-case adjustment factor and pollutant concentrations at the Site, these monitoring sites have been excluded from model verification.

Appendix I.5 Site Suitability Modelling Results

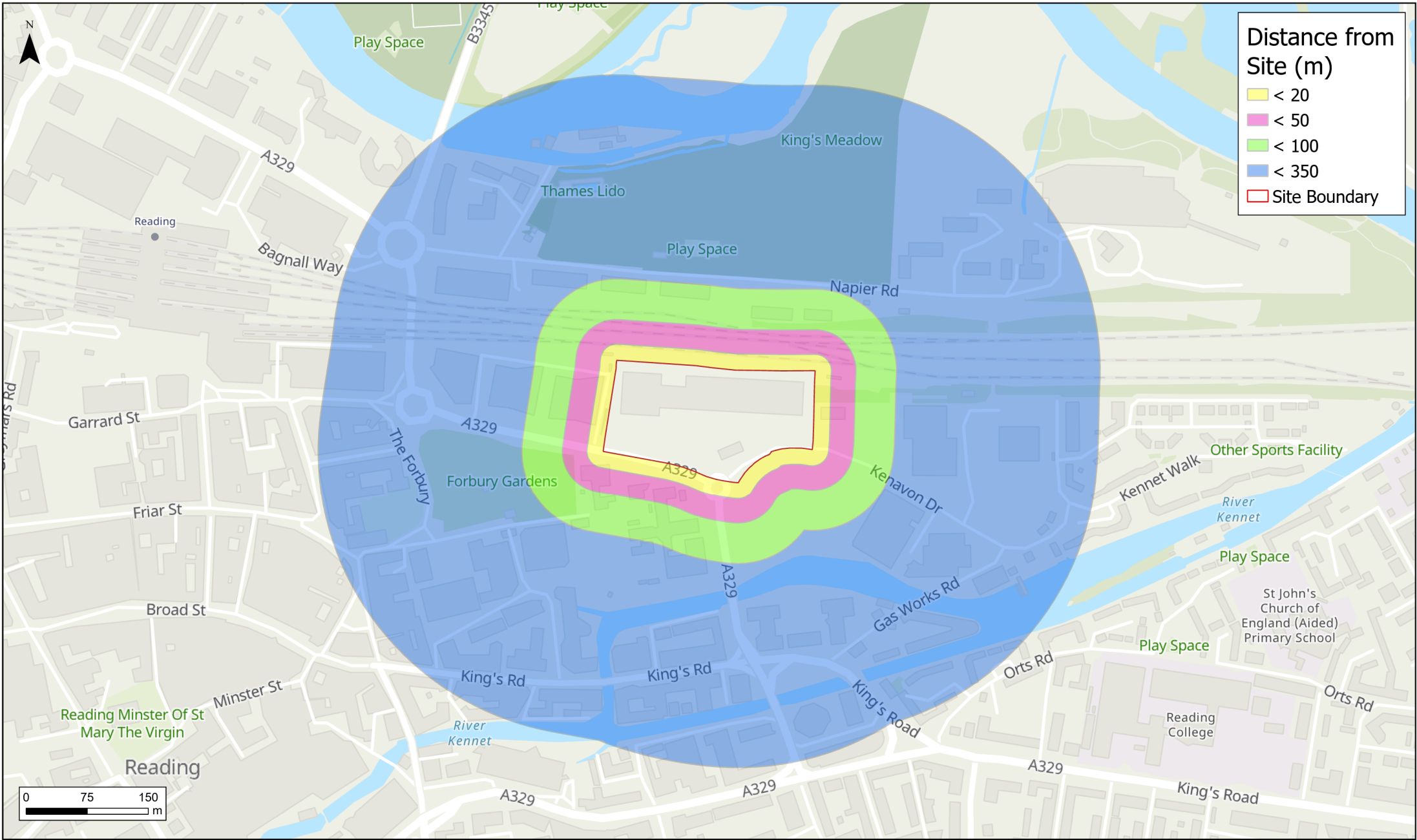
I.5 Site Suitability Modelling Results

Table I.5.1 Predicted Concentrations within the Site in 2026

Receptor	Height (m)	Annual Mean ($\mu\text{g}/\text{m}^3$)		
		NO ₂	PM ₁₀	PM _{2.5}
P01a	1.5	23.8	17.3	11.8
P01b	4.5	23.1	17.0	11.6
P01c	7.5	22.2	16.7	11.4
P02a	1.5	25.3	17.8	12.0
P02b	4.5	23.5	17.2	11.7
P02c	7.5	22.3	16.7	11.4
P03a	1.5	25.3	17.9	12.1
P03b	4.5	23.9	17.4	11.8
P03c	7.5	22.5	16.8	11.5
P04a	1.5	25.1	17.8	12.0
P04b	4.5	24.0	17.4	11.8
P04c	7.5	22.7	16.9	11.5
P05a	1.5	25.2	17.8	12.0
P05b	4.5	24.2	17.4	11.8
P05c	7.5	22.9	16.9	11.5
P06a	1.5	23.2	17.0	11.6
P06b	4.5	22.7	16.9	11.5
P06c	7.5	22.2	16.6	11.4
P07a	1.5	22.7	16.8	11.5
P07b	4.5	22.2	16.7	11.4
P07c	7.5	21.7	16.5	11.3
P08a	1.5	22.5	16.8	11.4
P08b	4.5	22.0	16.6	11.3
P08c	7.5	21.5	16.4	11.2
P09a	1.5	22.0	16.6	11.4
P09b	4.5	21.9	16.6	11.3
P09c	7.5	21.6	16.5	11.3
P10a	1.5	21.8	16.5	11.3
P10b	4.5	21.7	16.5	11.3
P10c	7.5	21.5	16.4	11.2
P11a	1.5	21.5	16.4	11.2
P11b	4.5	21.4	16.4	11.2
P11c	7.5	21.3	16.3	11.2
P12a	1.5	21.6	16.4	11.3
P12b	4.5	21.5	16.4	11.2
P12c	7.5	21.4	16.4	11.2
P13a	1.5	21.4	16.4	11.2
P13b	4.5	21.3	16.3	11.2
P13c	7.5	21.2	16.3	11.2
P14a	1.5	21.5	16.4	11.2
P14b	4.5	21.4	16.4	11.2
P14c	7.5	21.3	16.3	11.2

Receptor	Height (m)	Annual Mean (µg/m³)		
		NO ₂	PM ₁₀	PM _{2.5}
NAQOs/Limit Value		40	40	20

Appendix I.6 Figures



Client



KINGS MEADOW VIEW

IAQM Demolition and Construction Dust
Distance Criteria from Site Boundary

GB Topographic: Contains OS data © Crown Copyright and database
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Contains data from OS Zoomstack

1:6,000 @ A4

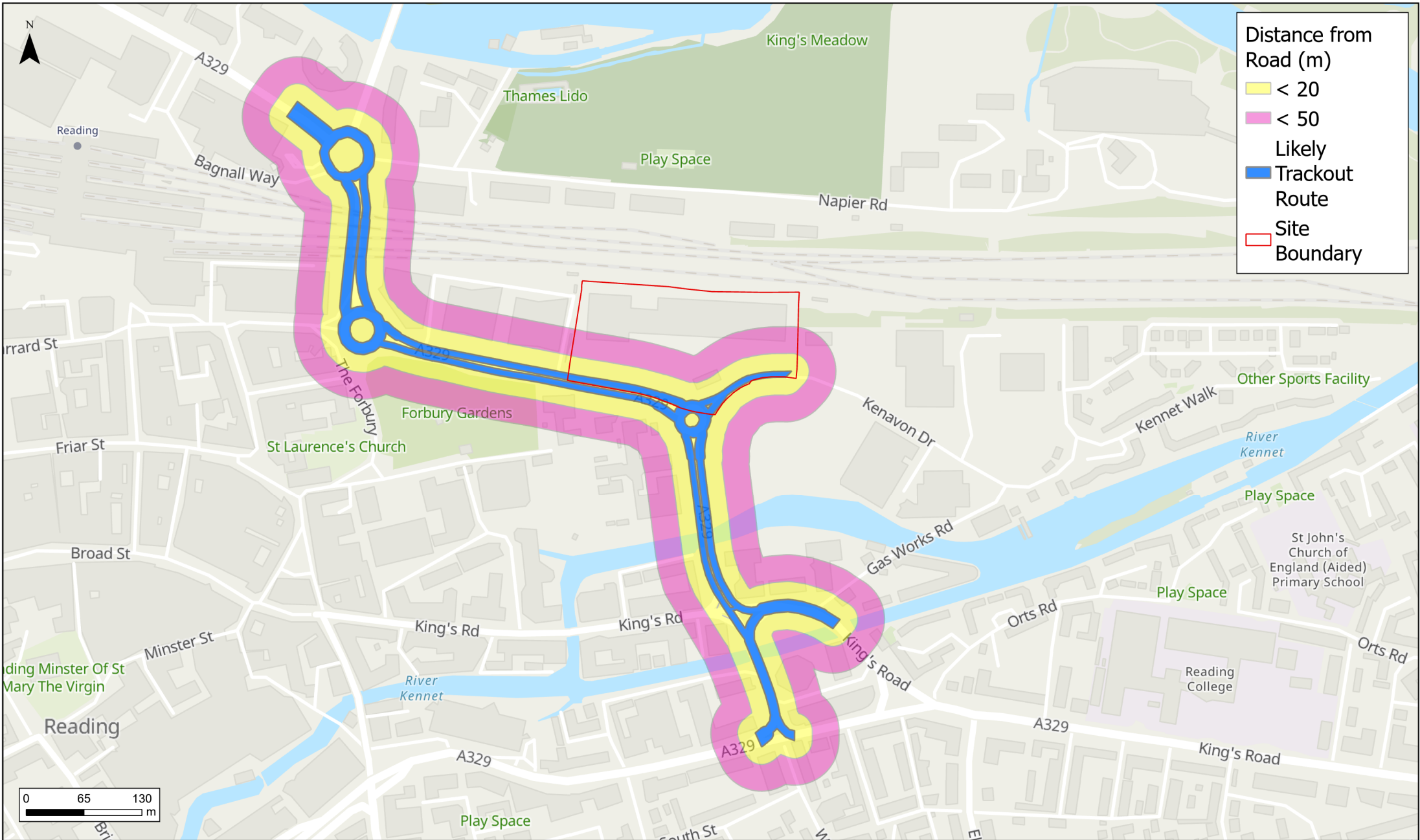
Date: 02/05/2023

Drawn: ER

Checked: CB

Figure 9.1

Rev A



Client



KINGS MEADOW VIEW

IAQM Demolition and Construction Dust
Distance Criteria from Likely Trackout Routes

GB Topographic: Contains OS data © Crown Copyright and database right 2022
Contains data from OS Zoomstack

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Date: 03/05/2023

Drawn: ER

Checked: CB

Figure 9.2

Rev A