

135 Finchley Road

London NW3 6JH, UK

1. Head south on Finchley Rd/A41 towards College Cres/B511
Continue to follow A41
2. Turn left onto Adelaide Rd/B509
3. Turn right onto Haverstock Hill/A502
Continue to follow A502
4. Turn right onto Kentish Town Rd/A400
5. Turn right onto Hawley Cres
6. Continue onto Jamestown Rd
7. Turn left onto Oval Rd

31 Oval Road

London NW1, UK

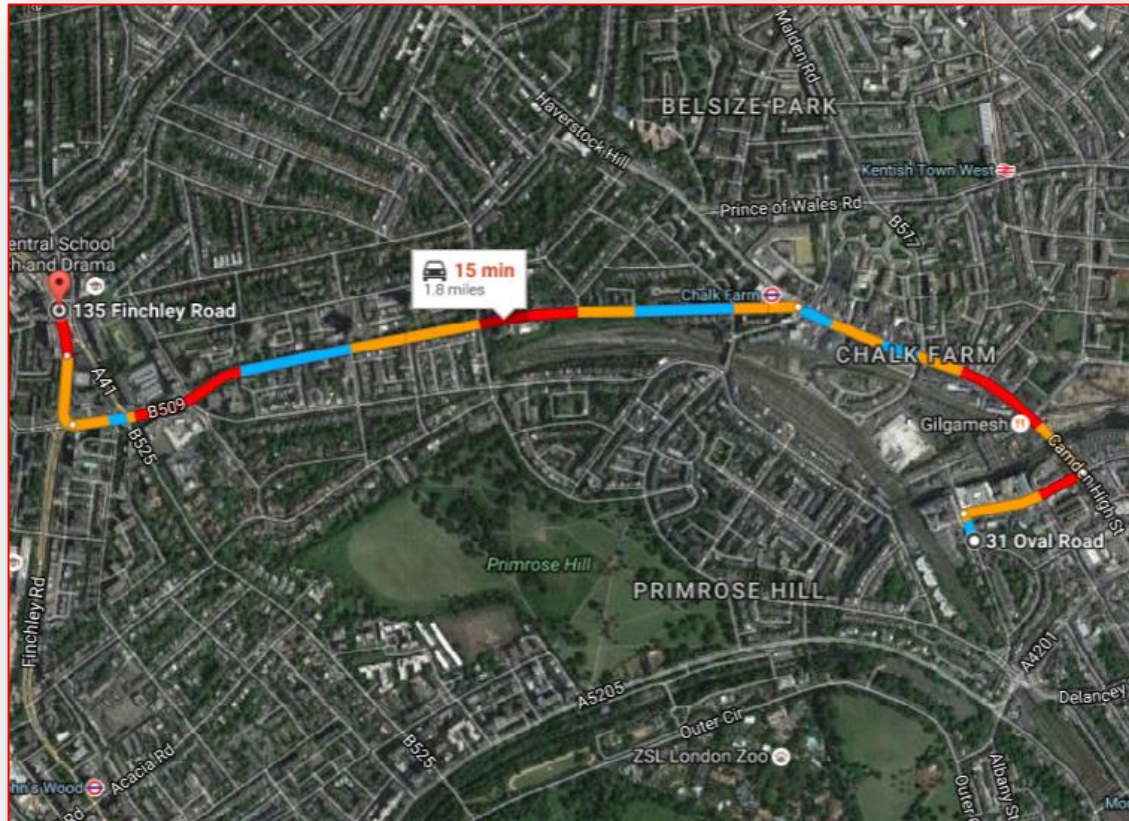
31 Oval Road

London NW1, UK

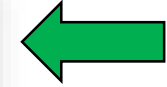
1. Head north on Oval Rd towards Jamestown Rd
2. Turn right onto Jamestown Rd
3. Turn left onto Camden High St/A502
Continue to follow A502
4. Slight left onto Adelaide Rd/B509
Continue to follow Adelaide Rd
5. Use the 2nd from the right lane to turn right onto Finchley Rd/A41
6. Keep left to stay on Finchley Rd/A41

135 Finchley Road

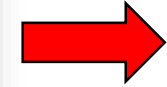
London NW3 6JH, UK



KEY



Vehicle
Routing to
Site



Vehicle
Routing from
Site

Note:

This is vehicle routing
to and from the:

A41

Fairview
NEW HOMES Ltd.

Construction Department

Telephone No: 020-8366-1271 ext 217

Email: George.Abbott@Fairview.co.uk

FNH425
Centric Close, Camden

Appendix 8

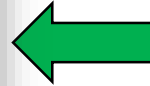
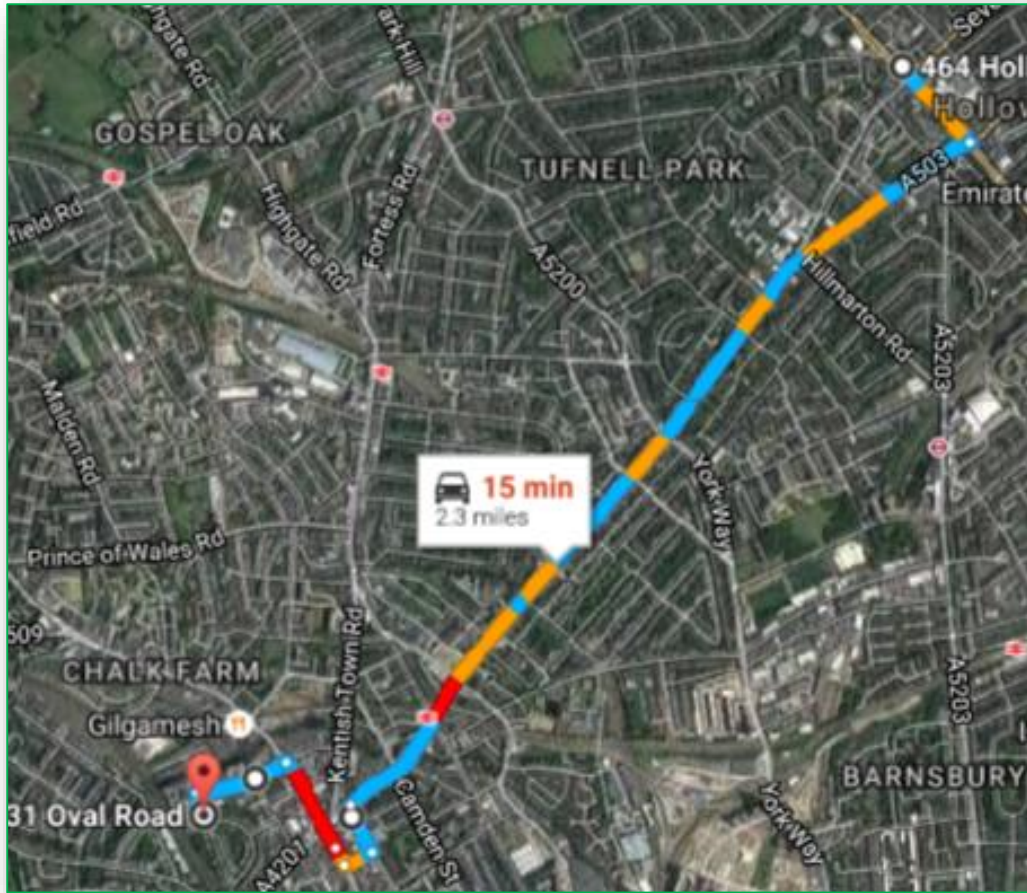
Date:
29.11.16

Logic:
S. Hall

Drawn:
G. Abbott

REF:

Vehicle Routing



464 Holloway Road
London N7 6HT, UK

Take Camden Rd/A503 to Bayham St

1. Head south-east on Holloway Rd/A1 towards Seven Sisters Rd/A503
2. Turn right at the 2nd cross street onto Camden Rd/A503

Continue on Bayham St to Camden High St/A400

3. Camden Rd/A503 turns left and becomes Bayham St
4. Turn right onto Greenland St

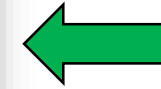
Follow Camden High St to Jamestown Rd

5. Turn right onto Camden High St/A400
6. Keep left to stay on Camden High St/A400
Continue to follow Camden High St

Continue on Jamestown Rd. Drive to Oval Rd

7. Turn left onto Jamestown Rd
8. Turn left onto Oval Rd

31 Oval Road
London NW1, UK



Vehicle
Routing to
Site

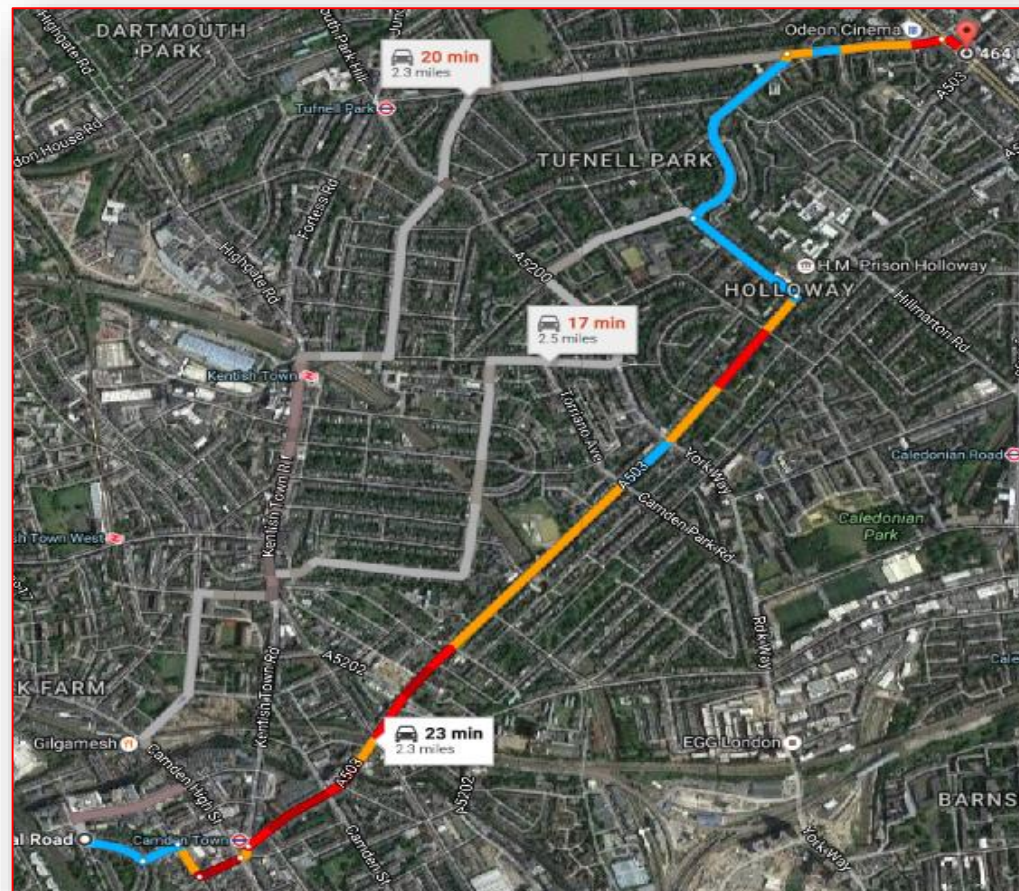
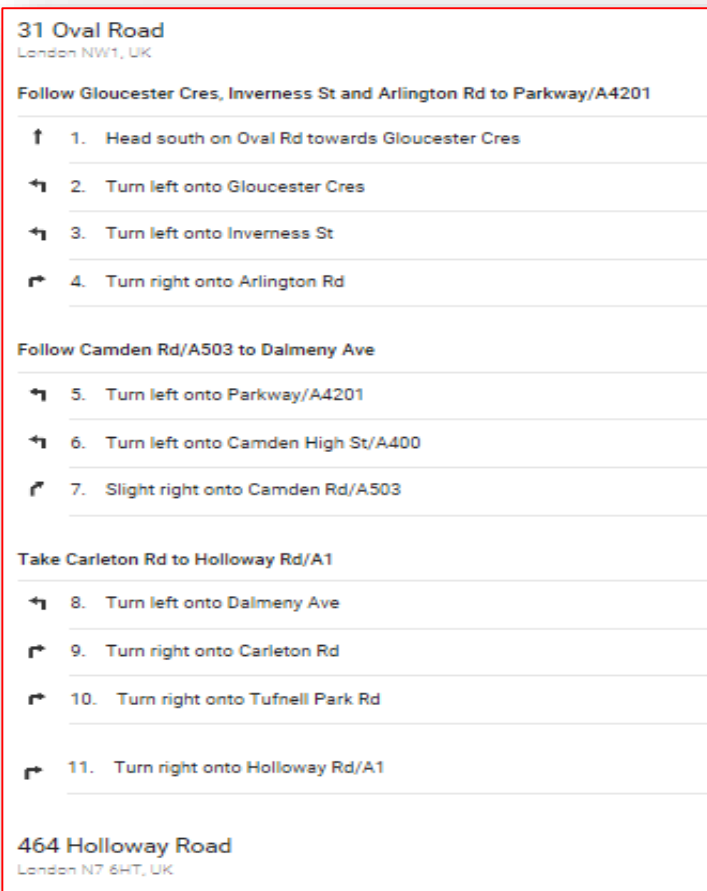


Vehicle
Routing from
Site

Note:

This is vehicle routing
to and from the:

A1/A503



Fairview
NEW HOMES Ltd.

Construction Department

Telephone No: 020-8366-1271 ext 217

Email: George.Abbott@Fairview.co.uk

FNH425
Centric Close, Camden

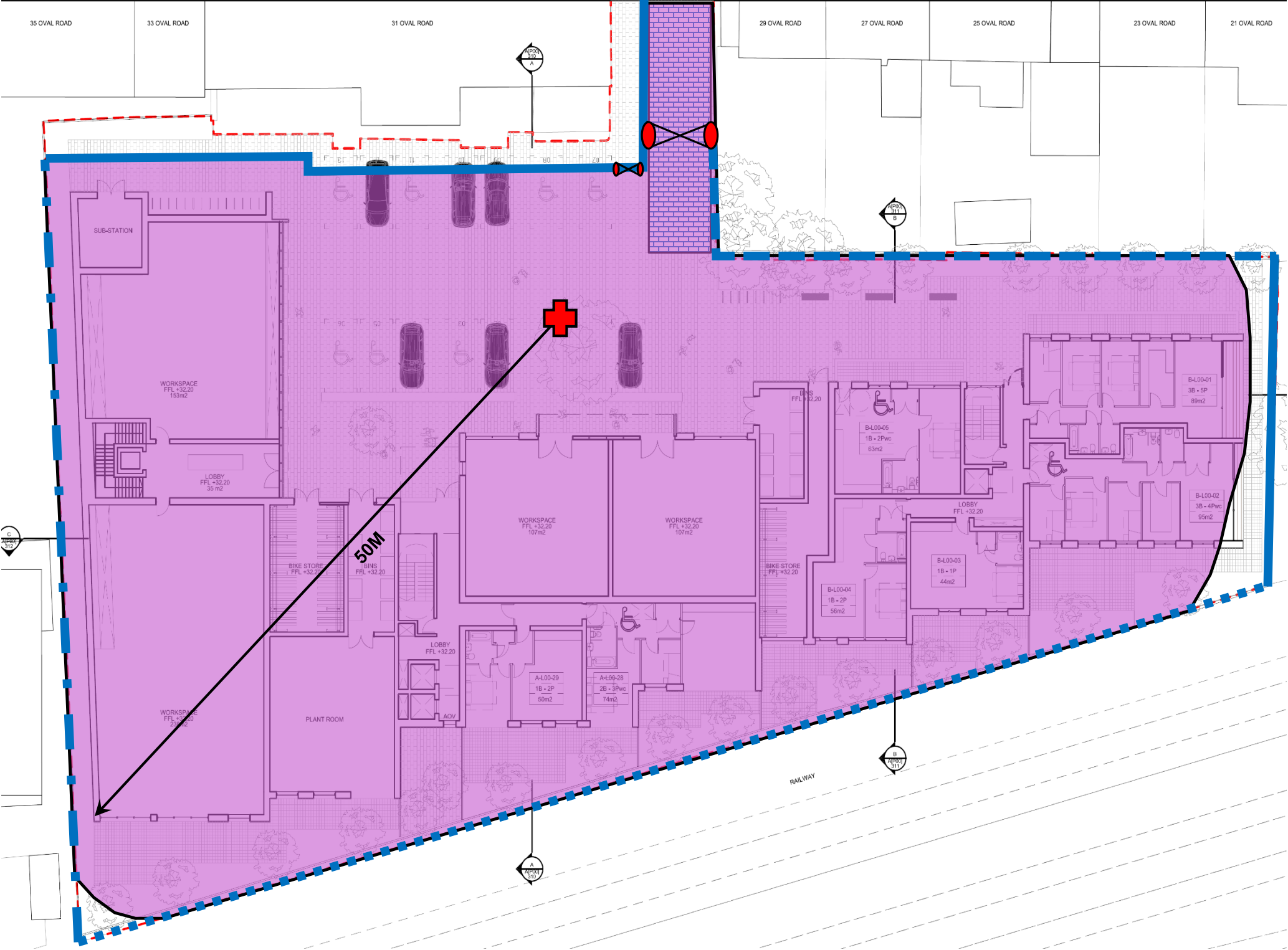
Appendix 8

Date:
29.11.16





Logic:
S. Hall



Drawn:
G. Abbott

REF:
Vehicle Routing



KEY

-  Unloading area
-  50M Luffing JiB T/C
-  Maximum Crane reach
-  Crane Reach

-  Timber Hoarding
-  Existing Chain-link Metal Fence
-  Existing Brick Wall
-  Existing Palisade



Construction Department

Telephone No: 020-8366-1271 ext 217

Email: George.Abbott@Fairview.co.uk

FNH425
Centric Close, Camden

Appendix 9

Date: 29.11.16	Logic: J. Wood	Drawn: G. Abbott
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REF:
Crane Reach

Appendix 10

Fairview Estates (Housing) Limited Standard Purchase Order Condition And Health/Safety Clauses

Centric Close Oval Road Camden NW1 7EP

- 1. All materials, packaging, plant, and equipment supplied must comply with all relevant statutory provisions.**
- 2. Material safety data sheets must accompany all materials delivered to site and a copy forwarded to the buying department of Fairview.**
- 3. Where appropriate, a copy of current thorough examination certificates must accompany plant and equipment when delivered to site, along with the necessary health and safety literature for its safe operation and use.**
- 4. Drivers of delivery vehicles must report to the site office 30 minutes before arrival. They must adhere to site rules and wear a hard hat, protective footwear, a high visibility vest/ jacket and suitable protective gloves at all times.**
- 5. Delivery drivers off loading plant, equipment or materials must be trained and competent in the use of any lifting appliance and/ or accessory used. Copies of necessary documentation confirming this must be kept by the driver for presentation to Fairview as and when requested.**
- 6. Plant, equipment and materials off loaded on site by delivery drivers must not obstruct access/ egress routes, footpaths or roadways. If the delivery driver is working from the lorry or unloading materials, fall prevention measures must be put in place by the supplier/haulage company**
- 7. Materials off loaded by delivery drivers must be stacked in a safe manner that will prevent tipping, collapse or unintentional movement.**
- 8. Delivery drivers must not off load onto public footpaths or carriageways.**
- 9. All delivery drivers must be CRB checked and carry all necessary identification.**
- 10. The quantities detailed in the purchase order are the maximum to be supplied.**

- 11. No deliveries are to be made before 9.30AM or after 4.30PM. No queuing/parking is allowed on site/development or on adjacent roads outside these hours.**
- 12. All delivery notes and invoices must contain the following information:**
- a) Site address**
 - b) Purchase order number**
 - c) Flat type, plot number and/ or floor level**
 - d) Product description and quantity**
 - e) Product unit rate and total**
 - f) Material safety data sheets for products supplied**
- 13. The site contact will be Michael Nevins who can be contacted on mobile number 07740 800918**
- 14. The following personnel are authorised to sign delivery tickets:**
- a) Michael Nevins**
 - b) Alex Knight**
 - c) Robert Gruzczeska**

If delivery tickets are not signed by the above, payment will not be processed.

- 15. Please contact the site manager 24 hours prior to delivery to inform if an AM OR PM delivery. On the date of delivery please contact the site manager 1 hour prior to delivery to confirm this site is clear for the delivery to be completed.**
- 16. Large deliveries vehicles for bricks, blocks, roof trusses, eco joist etc... must park in a sensible area AWAY from site and call site manager, site manager will inform driver when they can safely enter the site.**
- 17. Please ensure that the conditions detailed on the attached Camden Council document are adhered to at all times.**

CLIENT:

Fairview New Homes Limited
50 Lancaster Road
Enfield, Middlesex, EN2 0BY

PROJECT:

Noise Impact Assessment to Support a Planning
Application for a Residential Development.

SITE LOCATION: Centric Close, Oval Road, LB
Camden, NW1 7EP.

PREPARED BY: Rachel Grant Dip.H.E. MIOA
Principal Acoustic Consultant

30th November 2016

Report Ref: GA-2016-0026-R1-Draft

Table of Contents

1. INTRODUCTION.....	4
1.1 EXISTING SITE LOCATION:	4
1.2 PROPOSED SITE DESCRIPTION:	5
2. LOCAL AUTHORITY CRITERIA.....	5
2.1 AGREED SURVEY METHODOLOGY:.....	5
2.2 LEGISLATION AND POLICY:.....	5
2.3 NOISE CRITERIA:	15
3. SURVEY DETAILS	16
3.1 NOISE SURVEY DETAILS:	16
3.2 NOISE SURVEY EQUIPMENT:.....	16
3.3 VIBRATION SURVEY EQUIPMENT:	17
3.4 VIBRATION MONITORING POSITION:.....	18
3.5 WEATHER CONDITIONS:.....	18
4. NOISE SURVEY RESULTS	19
5. VIBRATION SURVEY RESULTS	20
6. NOISE MAPPING	21
7. POLICY DP28 ASSESSMENT	21
7.1 NOISE ASSESSMENT:	21
7.2 VIBRATION ASSESSMENT:	22
8. RESIDENTIAL NOISE PREDICTIONS	23
8.1 INTERNAL NOISE PREDICTIONS:.....	23
8.2 RESIDENTIAL EXTERNAL NOISE PREDICTIONS: Rail / Road Noise	25
9. PLANT NOISE LIMITING CRITERIA	27
10. DISCUSSION OF EXISTING PLANT NOISE.....	28
10.1 PLANT NOISE: Amenity Predictions	28
10.2 PLANT NOISE: Internal Noise Predictions	30
11. VIBRATION ASSESSMENT.....	31
12. WORKSPACE NOISE PREDICTIONS	33
13. RECOMMENDATIONS AND CONCLUSIONS.....	35
13.1 NOISE MAPPING OF SITE:	35
13.2 RESIDENTIAL INTERNAL NOISE PREDICTIONS:.....	35

13.3	RESIDENTIAL EXTERNAL NOISE PREDICTIONS:.....	36
13.4	PLANT NOISE LIMITING CRITERIA:.....	36
13.5	NOISE ASSESSMENT DUE TO EXISTING PLANT:.....	37
13.6	VIBRATION ASSESSMENT:.....	37
13.7	WORKSPACE NOISE ASSESSMENT:.....	37
13.8	CONCLUSION:	38
14.	REFERENCES.....	39
	Figure 1: Location of Site and Noise Monitoring Positions Relative to Surrounding Area	40
	Figure 2: Illustrative Layout of Site: Ground Floor.....	41
	Figure 3: Illustrative Layout of Site: 1st and 5th Floor	42
	Figure 4: Daytime Noise Contours at 4m – Existing Layout.....	43
	Figure 5: Night time Noise Contours at 4m - Existing	44
	Figure 6: Day time Noise Contours at 1.5m – Illustrative Layout	45
	Figure 7: Night time Noise Contours at 1.5m – Illustrative Layout.....	46
	Figure 8: Daytime Noise Contours at 4m – Illustrative Layout	47
	Figure 9: Night time Noise Contours at 4m – Illustrative Layout.....	48
	Figure 10: Day time Noise Contours at 15m – Illustrative Layout	49
	Figure 11: Night time Noise Contours at 15m – Illustrative Layout.....	50
	Figure 12: Proposed Mitigation – Ground Floor	51
	Figure 13: Proposed Mitigation 1st to 4th Floor.....	52
	Figure 14: Proposed Mitigation – Fifth Floor and Above	53
	Appendix 1: Continuous Noise Survey Results.....	54
	Appendix 2: Sample Noise Survey Results.....	58
	Appendix 3: Vibration Survey Results.....	59
	Appendix 4: Technical Summary for Mitigation – Centric Close	66

1. INTRODUCTION

This report has been produced by Grant Acoustics on behalf of Fairview New Homes Ltd. It accompanies an application for full planning permission for a residential-led development of the site at Centric Close, along Oval Road, London Borough of Camden. The Local Authority has been contacted to agree the survey method and obtain their noise criteria for the site.

The survey results have been given along with octave band noise calculation results to give guidance on the mitigation required for proposed residential apartments in terms of noise from road and rail traffic and general urban noise sources. Mitigation and noise limiting criteria have also been given for the commercial aspect of the development.

Due to the close proximity of the railway line, a vibration assessment has been undertaken to determine the probability of adverse comment.

1.1 EXISTING SITE LOCATION:

The site is located at Centric Court off Oval Road, LB Camden which is currently a small business estate. To the western boundary of the site is the main railway line to Euston Station to the south. The line has passenger and freight trains.

There are existing residential dwellings / apartments to the north, north east of the site. The proposed site is generally triangular in nature and comprises mainly hardstanding and the former steel works workshop buildings. Access to the site is to the east from Oval Road.

Figure 1 shows the location of the site relative to the surrounding area along with the noise monitoring positions.

1.2 PROPOSED SITE DESCRIPTION:

The proposed development comprises the demolition of existing buildings and the erection of 76 residential units and 1,219 sqm of commercial floor space (Use Class B1) over 4, 5, 6 and 7 storeys providing a mix of 1, 2 and 3 bed apartments. The development includes a landscaped courtyard and communal amenity areas.

The redevelopment of the site will make a positive enhancement to the visual appearance of the area, providing much needed homes for the local area, including commercial floor space to reflect the Council's aspirations for the area. **Figure 2** shows the illustrative site layout.

2. LOCAL AUTHORITY CRITERIA

The Environmental Health Department at The London Borough of Camden has been contacted to establish their criteria and agree the survey methodology relating to noise and vibration prior to visiting the site.

2.1 AGREED SURVEY METHODOLOGY:

The EHO confirmed that a noise survey over a typical weekday and weekend period is acceptable. The guidance given in their Development Policy DP28 – Noise and Vibration [1] must be considered. Internal and external noise criteria as described in BS8233:2014 [2] and The World Health Organisation (WHO) [3] was agreed to be considered along with the guidance given in BS4142:2014 [4] for plant noise affecting the site from any proposed commercial use. Vibration is to be compared with the guidance set out in BS6472:2008 [5] to determine probability of adverse comment.

2.2 LEGISLATION AND POLICY:

The Government's policies on noise related planning issues are set out within the National Planning Policy Framework (NPPF) [6] which makes reference to the Noise Policy Statement for England (NPSE) [7].

“Noise Policy Statement for England (NPSE)”

The NPSE provides clarification to the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The principal aims of the NPSE are stated as follows in Section 1.7 of the document:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life;*
- *and where possible, contribute to the improvement of health and quality of life.”*

“National Planning Policy Framework (NPPF)”

The National Planning Policy Framework (NPPF) set out the Government’s planning policies for England and how they are expected to be applied. It provides a framework within which local authorities are to prepare local plans and use their planning powers to minimise the adverse impact of noise. It contains the following in relation to noise impacts found in Section 11, paragraph 123:

“Planning policies and decisions should aim to:

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from a new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;*

- *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.”*

“Greater London Authority”

The Mayor of London's Ambient Noise Strategy sets out London-wide policy aims for the control of noise. The Strategy considers a wide range of issues relating to noise which may affect this particular development. These include noise from transportation sources, known as ambient noise, and construction activities, which are described as neighbourhood noise.

The general objectives are identified as minimising the adverse impacts of road traffic noise and improving noise environments in London's neighbourhoods, especially for housing, schools, hospitals and other noise sensitive uses. The strategy states the following policies for urban noise-sensitive development:

- *“Minimising the existing and potential adverse impacts of noise on, from, within, or in the vicinity of, development proposals;*
- *Separating new noise sensitive development from major noise sources wherever practicable;*
- *Supporting new technologies and improved practices to reduce noise at source, especially in road, rail and air transport;*
- *Reducing the impact of traffic noise through highway management and transport policies*
- *Containing noise from late night entertainment and other 24-hour activities, and where appropriate promoting well-managed designated locations; and,*
- *Identifying areas of relative tranquillity, which it is intended should be protected or enhanced.*

The Mayor will work with strategic partners to ensure that the transport, spatial and design policies of this plan support the objectives, policies and proposals set out in the London Ambient Noise Strategy.”

Additional Relevant Guidance

In addition to the above mentioned planning policy, the following British Standards and guidance documents are considered relevant to the assessment of noise in respect of this project:

“British Standard BS8233:2014, Sound Insulation and Noise Reduction for Buildings – Code of Practice.

The scope of this Standard is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

This standard suggests suitable internal noise levels within different types of buildings, including residential dwellings. It suggests that an internal noise level of 30 $\text{dBL}_{\text{Aeq,T}}$ within bedrooms is a ‘good’ standard. For living areas in the daytime, the standard recommends 35 $\text{dBL}_{\text{Aeq,T}}$ as a good standard in Living rooms and 40 $\text{dBL}_{\text{Aeq,T}}$ as being a good standard for dining rooms.

The new version of BS8233:2014 does not give limits as to maximum noise levels in bedrooms at night, but merely states the following note under Table 4 of the Guidance:

***NOTE 4** Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{\text{Amax,P}}$ depending on the character and number of events per night. Sporadic noise events could require separate values.*

Maximum noise criterion has therefore been referred to in The WHO as described later.

BS8233:2014 also refers to preferable levels of 55 dBL_{Aeq} or less in garden and amenity areas, but also understands that noise levels may be higher than this in urban areas. The context of the site should however be taken into account and BS8233:2014 states in relation to amenity noise levels that:

“It is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.”

“World Health Organisation: Guidelines for Community Noise – 1999”

This document states that, in dwellings, the critical effects of noise are on sleep, annoyance and speech interference. According to this document, to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55dB_{LAeq} for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50dB_{LAeq}.

To avoid any possibility of sleep disturbance, indoor guideline values for bedrooms are 30dB_{LAeq} for continuous noise and 45dB_{LAmax} for single sound events. These indoor noise levels correspond to sound pressure levels at the outside façades of the living spaces of 45dB_{LAeq} and 60dB_{LAmax}. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15dB(A).

“British Standard BS4142:2014, Methods for Rating and Assessing Industrial and Commercial Sound”

BS4142 provides guidance on the assessment of industrial sound affecting residential areas, and indicates the likelihood of complaints about such sound, by comparing the imposed sound with the pre-existing background sound conditions.

The context of the sound source also has to be taken in to account in the revised 2014 version of the guidance.

The existing background sound level should be measured at the location of concern. The 'specific' sound level ($L_{Aeq,T}$) from plant is measured or predicted and should take into account distance correction and screening where necessary.

Once the 'specific' sound level is obtained, the 'rating' level needs to be determined. If the sound source in question has distinguishable, discrete, continuous note, contains distinct impulses or is irregular enough to attract attention, then various penalties needs to be added. These are described further later in the report.

The measured background sound level should then be taken away from the 'rating' level. The new BS4142 version still requires the difference between the Rating Sound Level and background sound level to be determined and defines the differences as follows:

- *Typically, the greater the difference, the greater the magnitude of the impact.*
- *A difference of around 10dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the Rating Level is relative to the measured background sound level, the less likely it is that the specific source will have an adverse impact or a significant adverse impact. Were the Rating Level does not exceed the background sound level; this is an indication of the specific sound source having a low impact, depending on the context.*

The context includes consideration of the absolute level of the sound as well as the level of the residual sound compared to the character and level of the specific sound. The sensitivity of the receptor and whether dwellings already incorporate design measures that secure good internal and / or outdoor acoustic conditions must be taken into account.

BS6472:2008 - A Guide to the evaluation of human exposure to vibration in buildings.

The vibration assessment has been undertaken in accordance with BS6472:2008 which determines the likelihood of adverse comment to the effects of vibration. The Vibration Dose Value (VDV) is predicted from measurements for day and night periods. Table 2.1 gives the limits to which adverse comment may or may not occur from vibration.

Table 2.1: Vibration Dose Value Ranges which Might Result in Various Probabilities of Adverse Comment in Residential Buildings

Place and Time	Low probability of adverse comment m.s ^{-1.75}	Adverse comment Possible m.s ^{-1.75}	Adverse comment Probable m.s ^{-1.75}
Residential Buildings 16 hr day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential Buildings 8 hr night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Source: Section 6, Table 1, BS6472:2008

The vibration survey results will be compared with the above table to determine the probability of adverse comment to closest dwellings to the railway line.

BS7385:1993 – Part 2: Evaluation and measurement for vibration in buildings.

BS7385: Part 2 [8] gives guidance on the likelihood of cosmetic damage to buildings. Peak Particle Velocity (PPV) gives an indication at which levels of cosmetic damage to buildings may occur. Table 2.2 gives the values for which cosmetic damage can occur.

Table 2.2 Transient Vibration guide values for cosmetic damage:

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures industrial and heavy commercial buildings	50mm/s at 4 Hz and above	
Unreinforced or light framed structures	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above
Residential or light commercial buildings		

(Source: BS7385:Part 2)

Values are at the base of the building. The highest measured PPV for day and night periods will be compared with the above limits.

The British Council for Offices Guide to Specification 2014 (BCO) [9]

The BCO gives guidelines as to suitable internal noise levels within different office and working spaces. Commercial premises on the ground floor of the proposed site have been considered as offices and as such internal noise levels suitable for this type of working environment are shown in Table 2.3 below.

Table 2.3: Criteria for Internal Spaces as Recommended in BS8233 and BCO

Criteria	Location	Design Range – $L_{Aeq,T}$
BS8233:2014: Reasonable acoustic privacy in shared spaces	Open plan offices	45-50 dB(A)
British Council for Offices:	Open plan offices	NR40 (L_{eq})
	Speculative	NR38 (L_{eq})
	Cellular offices	NR35 (L_{eq})

The criterion of 40dB(A) has been taken as a compromise between the ideals for open plan and cellular offices.

“Camden Development Policy: DP28 – Noise and Vibration 2010-2025”

A description of the relevant noise policy is copied from the Local Development Framework below and has been considered in this assessment.

- 28.1 Noise and vibration can have a major effect on amenity and health and therefore quality of life. Camden's high density and mixed-use nature means that disturbance from noise and vibration is a particularly important issue in the borough. Camden's Core Strategy recognises the importance of this issue for Camden's residents and policy DP28 contributes to implementing a number of Core Strategy policies, including CS5 – *Managing the impact of growth and development*, CS9 – *Achieving a successful Central London*, CS11 – *Promoting sustainable and efficient travel* and CS16 – *Improving Camden's health and well-being*.

DP POLICY

DP28 – Noise and vibration

The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:

- a) development likely to generate noise pollution; or
- b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.

Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.

The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds.

The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact.

Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	74 dB L_{Aeq} 12h	72 dB L_{Aeq} 12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	74 dB L_{Aeq} 4h	72 dB L_{Aeq} 4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	66 dB L_{Aeq} 8h	66 dB L_{Aeq} 8h

Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	65 dB L_{Aeq} 12h	62 dB L_{Aeq} 12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	60 dB L_{Aeq} 4h	57 dB L_{Aeq} 4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	55 dB L_{Aeq} 1h	52 dB L_{Aeq} 1h
Individual noise events several times an hour	Night	2300-0700	>82 dB L_{Amax} (S time weighting)	>82 dB L_{Amax} (S time weighting)

Table C: Vibration levels on residential sites adjoining railways and roads at which planning permission will not be granted

Vibration description and location of measurement	Period	Time	Vibration levels
Vibration inside critical areas such as a hospital operating theatre	Day, evening and night	0000-2400	0.1 VDV ms ^{-1.75}
Vibration inside dwellings	Day and evening	0700-2300	0.2 to 0.4 VDV ms ^{-1.75}
Vibration inside dwellings	Night	2300-0700	0.13 VDV ms ^{-1.75}
Vibration inside offices	Day, evening and night	0000-2400	0.4 VDV ms ^{-1.75}
Vibration inside workshops	Day, evening and night	0000-2400	0.8 VDV ms ^{-1.75}

Where dwellings may be affected by ground-borne regenerated noise internally from, for example, railways or underground trains within tunnels, noise levels within the rooms should not be greater than 35dB(A)_{max}

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBL _{Aeq}

2.3 NOISE CRITERIA:

The following internal criteria have been adopted as agreed with the EHO to achieve a 'good' standard of internal noise level within all habitable rooms of the residential aspect of the development:

Daytime Living / Dining rooms: 35dBL_{Aeq} (0700-2300hrs)
Night time bedrooms: 30dBL_{Aeq} (2300-0700hrs),
45dBL_{Amax}

Mitigation in terms of glazing and ventilation will be given. External noise levels will be compared with the criterion set within the World Health Organisation guidelines of not to exceed 55dBL_{Aeq,16 hr}.

In terms of possible plant associated with the development, it was agreed with the Local Authority that the guidance in BS4142 will be used to set noise limiting criteria to ensure that a low adverse impact is not exceeded. Plant noise levels shall therefore be designed to be 10dB(A) below the background level for day (0700-1900hrs), evening (1900-2300hrs) and night time (2300-0700hrs) periods.

3. SURVEY DETAILS

3.1 NOISE SURVEY DETAILS:

The noise survey was undertaken from Friday 21st to Monday 24th October 2016 over a typical weekend and weekday period. Due to security on site one continuous noise meter was set up to measure the existing noise environment at the worst-case location adjacent to the railway line with samples taken around the site to measure road traffic, noise decay and obtain octave band frequency data.

Noise monitoring position 1 (MP1) was located along the western boundary adjacent to the railway line and screened from Oval Road and existing on site activities. The microphone was secured to the boundary fence at a height of approximately 1.5m above ground level with line of sight along the track.

Sample noise measurements (a-b) were taken at locations around the site to measure noise levels from various sources such as road traffic and existing plant associated with adjacent apartments. Position 'a' measured plant noise from louvres at ground floor level of the apartments. Position 'b' was located at a position set back from Oval Road to representative of closest facades of the development to the road. The microphone position was approximately 1.5m above existing ground level set on a tripod.

Figure 1 shows the location of the site and all the noise monitoring positions.

3.2 NOISE SURVEY EQUIPMENT:

The noise meters were set up to measure over hourly and 30-minute time intervals for the duration of the survey and 3-30-minute intervals for the sample measurements. The parameters recorded include:

- L_{90} – Is the level exceeded for 90% of the total sample time. The L_{90} level is often referred to as the background noise level.

- L_{eq} – Is the equivalent continuous noise level over the sample also referred to as the average noise level.
- L_{Max} – Is the maximum noise level reached during a sample period.
- L_{10} – Is the noise level exceeded for 10% of the time period. This is generally accepted as the noise level from road traffic.

The equipment used in the survey includes:

- 2 x Cirrus Optimus Green CR:171B sound analysers
- 1 x Environmental kit type CK:670
- 1 x environmental kit type CK:680.
- Calibrator type CR:515
- Anemometer and wind shields.
- Tripod.

The sound level meters were calibrated before and after the survey with the Cirrus meters calibrating to 93.7dB at 1kHz.

3.3 VIBRATION SURVEY EQUIPMENT:

The vibration equipment used in the survey includes:

- Anemometer and wind shield
- Vibrock 901 digital seismograph kit
- Tri-axial velocity transducer
- Tri-axial vdv transducer

Vibration equipment was hired and calibrated in line with current requirements.

3.4 VIBRATION MONITORING POSITION:

Due to security on site, the vibration meter was set up within one of the existing commercial units on a concrete floor and with a sand bag to weigh down the accelerometers. The meter was set up to closest external wall of the unit closest to the railway line at a distance of approximately 3m from the boundary. Commercial activities within the unit did not occur in the evenings, over night or at weekends and so vibration levels recorded are considered acceptable and representative of trains passing.

3.5 WEATHER CONDITIONS:

Friday 21st October 2016

The weather conditions during the survey were calm and dry with day time temperatures of up to approximately 14 degrees Celsius. There was approximately 80% cloud cover with wind speeds typically measured as less than 1.5m/sec on average during the day. It was dry overnight with temperatures down to 5 degree Celsius and wind speeds less than 2m/sec.

Saturday 22nd October 2016

The weather conditions were partly cloudy and sunny with day time temperatures of up to 13 degrees Celsius. Wind speeds were typically less than 3m/sec on average during the day. It was dry and calm overnight with temperatures down to 5 degrees Celsius and wind from the N NE.

Sunday 23rd October 2016

The weather conditions were mainly sunny and clear with day time temperatures of up to 13 degrees Celsius. The wind was from the N, NE. It was dry overnight with temperatures down to 5 degrees Celsius.

Monday 24th October 2016

The weather conditions during Monday morning were dry with temperatures of up to 12 degrees Celsius. Wind speeds were typically less than 2m/sec on average, therefore allowing unaffected noise measurements to be taken.

4. NOISE SURVEY RESULTS

The survey results have been analysed and are summarised in Table 4.1 below for ease of reference for day, evening and night periods. Although the site is still operational, the noise monitoring position behind the existing units is unlikely to be affected due to screening by the units themselves. Results have been rounded to the nearest whole dB(A). The full noise survey results are given as **Appendix 1** of this report.

Table 4.1: Summary of Survey Results – MP1

Time Period	Log L_{Aeq}	Log $L_{Amax,F}$ (Range)	Av L_{A10}	Av L_{A90}
<u>MP1: Weekdays</u>				
Day (0700-1900hrs)	72	91	75	45 (43-47)
Evening (1900-2300hrs)	71	91	71	43 (42-43)
Night (2300-0700hrs)	66	89 (54-94)	50	39 (37-41)
<u>MP1: Weekend</u>				
Day (0700-1900hrs)	70	91	68	44 (40-45)
Evening (1900-2300hrs)	69	90	66	43 (43-45)
Night (2300-0700hrs)	64	86 (50-91)	49	41 (38-46)

Sample survey results are shown in Table 4.2 below. These give an indication of typical noise levels across the site and from road traffic. Full sample results are shown in **Appendix 2**.

Table 4.2: Sample Noise Survey Results

Location	L_{Aeq}	$L_{Amax,F}$	L_{A10}	L_{A90}
a – Plant louvre noise at 3m	53	56	54	52
b – Road traffic noise	57-58	72-78	61-62	47

The proposed development experiences noise predominantly from railway traffic sources to the west with road traffic noise to the east of the site to a lesser degree. There is some plant noise at ground level associated with the adjacent apartments but this is not dominant and appeared to be continuous in nature.

5. VIBRATION SURVEY RESULTS

The vibration survey results have been analysed and the results for day and night time periods for the duration of the survey are shown in Table 5.1 below. **Appendix 3** gives the full survey results. The Vibration Dose Value (VDV) and the maximum Peak Particle Velocity (PPV) results are shown.

Table 5.1: Summary of Vibration Results – VDV and PPV

Time Period	X-axis VDV	Y-axis VDV	Z-axis VDV	PPV mm/s
Friday Day	0.037	0.039	0.06	4.45
Friday Night	0.03	0.032	0.041	0.525
Saturday Day	0.038	0.036	0.06	0.725
Saturday Night	0.031	0.03	0.038	0.65
Sunday Day	0.04	0.035	0.055	0.725
Sunday Night	0.035	0.028	0.04	0.625
Monday Day	0.04	0.034	0.061	4.325

The above vibration levels will be used in the assessment for determining the degree of adverse comment to future occupiers of the residential apartments and the likelihood of cosmetic damage.

It is possible that the PPV measured during the day on the Friday and Monday could be affected by activities within the building, however this is not possible to confirm. The worst-case values for each axis and the worst-case PPV will therefore be used in the assessment.

6. NOISE MAPPING

For indicative purposes only the software programme SoundPlan has been utilised and noise contours for day and night (0700-2300hrs and 2300-0700hrs respectively) produced based on the survey measurements taken on site. **Figures 4 to 5** in the Appendices show noise contours across the site before the development is completed for day and night periods.

Figures 6 to 11 show the noise levels affecting the site once the development is completed during day and night periods for floors at 1.5m, 4m and 15m above ground level, therefore allowing some screening by the development itself from noise sources. These give an indication of noise decay up the building facades.

7. POLICY DP28 ASSESSMENT

7.1 NOISE ASSESSMENT:

A comparison has been made with the Council's policy DP28 and the measured noise levels during the day, evening and night for road and rail sources. This will determine whether planning permission is likely to be granted and whether attenuation measures are required to ensure satisfactory internal noise levels. Table 7.1 compares the survey results with the relevant criteria 1m from the façade of the proposed development. A distance correction for rail noise has been included to measurements at MP1 from 4m from the closest track to approximately 8m to the façade of the closest apartment block.

Table 7.1: Comparison of Façade Noise Levels with Policy DP28

Time Period	Noise at Façade $L_{Aeq,T}$	DP28:Table A	DP28 Table B
		Criteria for Sites Adjoining Railways	
<u>MP1: as measured</u>			
Day (0700-1900hrs)	71	74	66
Evening (1900-2300hrs)	70	74	60
Night (2300-0700hrs)	65	66	55

The results above indicate that planning permission is likely to be granted with noise mitigation required for those facades closest to the railway. To achieve relevant internal criteria, mitigation will be proposed as necessary for all facades.

It is also required under Policy DP28 that where maximum noise levels exceed $82\text{dBL}_{\text{Amax,slow}}$ at night several times in any hour, then mitigation will be required. Slow maximum noise levels generally range between $41\text{--}86\text{dBL}_{\text{Amax,slow}}$ at the façade at night. Mitigation will therefore be proposed to ensure that internal criteria are met.

Rail noise is dominant and as road traffic noise levels as measured at position 'b' are considerably less than the limits as shown in Table A of DP28, it is considered that road traffic noise is also acceptable and can be mitigated against to achieve internal noise criteria.

7.2 VIBRATION ASSESSMENT:

To determine whether residential development will be granted planning permission based on vibration levels from the railway line, a comparison of the measured VDV's has been made with the limits in Policy DP28. Table 7.2 compares the measured levels and limits. The worst measurement on a specific axis has been indicated.

Table 7.2: Comparison of Measured VDV's and Limits in DP28

Time Period	Vibration Dose Value Measured	DP28 Vibration Limit
Day and Evening (z-axis)	$0.061 \text{ m/s}^{1.75}$	$0.2 \text{ to } 0.4 \text{ m/s}^{1.75}$
Night (z-axis)	$0.04 \text{ m/s}^{1.75}$	$0.13 \text{ m/s}^{1.75}$

The worst-case measured VDV's have been compared with the limits given in DP28 and are shown to fall within the requirements where planning permission may be granted.

8. RESIDENTIAL NOISE PREDICTIONS

8.1 INTERNAL NOISE PREDICTIONS:

Internal noise levels have been predicted to typical plots and façades across the site in accordance with BS8233:2014 using the octave band methodology and compared with the requirements of the Local Authority. Based on the illustrative layout, assumed room dimensions and window areas, calculations have been undertaken which also take into account the reverberation time within the habitable room.

Internal noise levels have been predicted with windows closed and appropriate ventilation open. Table 8.1 gives the predicted internal noise levels during the day and night from the general noise environment. A typical maximum noise level at night of 89dB(A) due to trains at MP1 and typical max's from road traffic of 74dB(A) at position 'b' have been taken into account. Distance corrections and screening have been included where relevant. It should be noted that where Mechanical Vent Heat Recovery (MVHR) is required, no vents are permitted in the habitable room façade with one vent considered for MEV ventilation.

Table 8.1: Internal Noise Predictions with Windows Closed and Vents Open

Plot / Façade	Day		Night		
	L _{Aeq}	Mitigation	L _{Aeq}	L _{Amax}	Mitigation
Block B-L00-05 Façade facing road	32	Glazing: Type 1 Ventilation: Type A	22	37	Glazing: Type 1 Ventilation: Type A
Block B-L00-04 Façade facing railway line	29	Glazing: En. Type 2 Vent Type C: MVHR	23	47	Glazing: En. Type 2 Vent Type C: MVHR
Block A-L01-36 Façade facing / side to railway	33	Glazing: En. Type 2 Vent Type C: MVHR	25	48	Glazing: En. Type 2 Vent Type C: MVHR
Block B-L04-69 Façade facing railway	34	Glazing: En. Type 2 Ventilation: Type B	20	42	Glazing: En. Type 2 Vent Type C: MVHR
Block A-L05-69 Façade facing railway	34	Glazing: En. Type 2 Ventilation: Type B	25	39	Glazing: En. Type 2 Vent Type C: MVHR
<i>Criteria</i>	<i>35</i>		<i>30</i>	<i>45</i>	

Internal noise predictions to typical plots across the site show that enhanced glazing and MVHR and / or MEV with an acoustic vent is required to worst-case plots closest to and facing the railway line. There is a slight excess of 3dB(A) above the maximum criterion for some bedrooms facing the railway line however this is not considered detrimental as the smallest change in noise level normally perceived by the human ear is 3dB(A) and that the maximum noise level is based on the typical highest levels measured.

Internal noise levels to facades facing the road will be adequate with standard glazing and a good quality trickle vent with a minimum $D_{ne,w31}$ to allow for background ventilation. All windows to habitable rooms will need to be closed to achieve the internal criteria, but should be openable should the resident wish to do so.

Internal noise levels during the day and night with windows closed are predicted to fall within the Local Authority criterion of $35\text{dB}_{L_{Aeq,T}}$ and $30\text{dB}_{L_{Aeq,8hr}}$ not to be exceeded with the recommended glazing and ventilation types as indicated above.

Table 8.2 shows the minimum glazing octave band requirements necessary across the site.

Table 8.2: Glazing Requirements – 1/1 Octave Band Sound Reductions

SRI - Octave Band Centre Frequency (Hz)	125	250	500	1k	2k	4k
Standard glazing:* Type 1	21	17	25	35	36	31
Enhanced glazing: Type 2	27	36	43	52	55	59

To achieve the internal noise levels, habitable rooms in apartments closest to and facing the railway line must be fitted with either MVHR and / or MEV with acoustic ventilation to habitable rooms. This will enable occupants to benefit from background ventilation with the windows closed. Table 8.3 shows the minimum octave band values required for different ventilation options where acoustic airbricks or trickle vents are acceptable which includes facades facing the road.

Table 8.3: Ventilation Requirements – 1/1 Octave Band Frequencies

SRI - Octave Band Centre Frequency (Hz)	125	250	500	1k	2k	4k
Type A: Trickle vent / Airbrick	34	34	35	31	29	32
Type B: Acoustic T-vent / Airbrick	40	35	35	52	58	64

It should be noted that the above octave band specifications should be given to the preferred manufacturer / supplier to enable them to select an appropriate product. As long as the octave band specifications above are achieved, ventilation types indicated above can be either an acoustic trickle vent or acoustic airbrick depending on other requirements of the development and Local Authority requirements for ventilation. **Figures 12 to 14** show the required mitigation for residential facades across the site for ease of reference.

8.2 RESIDENTIAL EXTERNAL NOISE PREDICTIONS: Rail / Road Noise

External noise levels have been predicted to amenity areas on the site, taken to be balconies for apartments where relevant and communal areas on the roof of the development. Daytime noise levels measured at MP1 and samples at Position 'b' have been taken into account where necessary. Where appropriate, screening has been included from the development itself along with a distance correction. Table 8.4 shows the predicted amenity noise levels to various plots. Noise levels are based on daytime levels between 0700-2300hrs.

Table 8.4: Predicted External Amenity Noise Levels – $L_{Aeq,T}$

Plot / Location	Daytime $L_{Aeq,T}$
Plot: B-L00-04: Private amenity facing railway line with 2m barrier	67 dB(A)
Plot A-L01-36: Balcony facing railway on First floor, no screening	<72 dB(A)
Plot A-L01-31: Balcony facing road	53 dB(A)
Communal space on roof of 4 th Floor	60 dB(A)
<i>Criterion</i>	<55

The WHO states that for gardens and amenity areas, it is desirable that the steady noise level does not exceed $50\text{dB}L_{Aeq,16\text{ hr}}$ and $55\text{dB}L_{Aeq,16\text{ hr}}$ should be regarded as the upper limit.

BS8233:2014 also refers to preferable levels of $55\text{dB}L_{Aeq}$ or less, but also understands that noise levels may be higher than this in urban areas. Amenity noise levels are predicted to exceed the WHO criterion for balconies facing and side onto the railway and to communal areas. Balconies facing the road are predicted to fall within the 55dB(A) criterion. Based on the location of the site being close to good transport links and being in an urban environment, amenity noise is not considered detrimental to the development of the site. It should also be considered that there is public amenity space close to the site such as Regents Park to the west.

9. PLANT NOISE LIMITING CRITERIA

The proposed development is to have some commercial space with possible plant associated with it on the ground floor. It is not known at this stage the exact plant to be installed and so noise limiting criteria have therefore been given for day and night periods and are based on BS4142 so as not to have an adverse impact. The noise limiting criteria from the proposed development should not be exceeded 1m from the closest noise sensitive façade once established. These are likely to be apartments on the development itself.

BS4142:2014 describes the assessment method for determining whether noise from plant will have an adverse impact. Within the assessment penalties for intermittency, tonality and impulsivity need to be taken into account and should be included within the noise limiting criteria and any final assessment once the plant for the site is determined.

Based on the survey results, noise limiting criteria have been given for day and night periods based on L.A. requirements and Policy DP28. Background levels measured at MP1 have been taken into account for the criteria. Table 9.1 summarises the noise limiting criteria not to be exceeded from cumulative plant at the closest receptors to possible plant. The typical background levels for day and night periods considered in the assessment are shown.

Table 9.1: BS4142 Noise Limiting Criteria

Time Period	Background Level L_{A90}	Noise Limiting Criterion $dB L_{Aeq,T}$
Daytime (0700-1900hrs)	44 dB(A)	34 $dB L_{Aeq, 1hr}$
Evening (1900-2300hrs)	43 dB(A)	33 $dB L_{Aeq, 1hr}$
Night time (2300-0700hrs)	40 dB(A)	30 $dB L_{Aeq, 15mins}$

The above criteria have been based on the typical background levels measured during the day, evening and night. The noise limits set must not be exceeded when all plant is operating simultaneously 1m from the closest receptors. Intermittency, tonal and impulsive characteristics must be included to achieve the criteria.

10. DISCUSSION OF EXISTING PLANT NOISE

10.1 PLANT NOISE: Amenity Predictions

In terms of noise, it is a requirement under the Standard BS4142:2014, that the impact of existing industrial / commercial noise sources be assessed to determine whether there is any detrimental impact on closest residential dwellings. The guidance refers to external noise levels and appreciates that other guidance such as BS8233:2014 will be relevant for predicting internal noise levels for new dwellings.

During the site noise survey it was observed that there was some plant at ground level under existing residential apartments. Table 10.1 gives the source sound levels of the plant measured when on site.

Table 10.1: Plant Source Levels

Location	dB(A)	Comments
a - louvre	52	Noise from louvres at ground floor level were heard and measured at 3m in front of the louvres.

The above sound level will be taken into account in the BS4142 assessment. In line with the guidance the Rating Sound Level has been predicted to external amenity space only as it is agreed that mitigation internally can be mitigated via façade treatment.

Table 10.2 shows the BS4142 assessment based on the noise from the plant being on for 100% of the time in an hour period during the day. Tonality and intermittency corrections have been included as necessary. Distance corrections and screening have been included where appropriate. The closest amenity space facing towards the plant has been taken into account and is assumed to be balconies directly opposite at approximately 26m.

Table 10.2: BS4142 Assessment 1-hour Daytime Period: Amenity Plot A-L01-30

Results		Clause of BS4142:2014	Commentary
Background sound level – day	$L_{A90,T} = 43 \text{ dB(A)}$	8	Typical background level measured at MP1 unaffected by plant
Assessment made during the day so reference time interval is 1-hour		7.2	
Specific sound levels corrected for distance to closest balcony	$L_{Aeq,1hr} = 33 \text{ dB(A)}$	7.3.6	Predicted based on louvre noise includes distance correction to 26m
Total on time in 1hr: corrections	0 dB(A)		100% on time
Acoustic feature correction: Tonal	+2 dB(A)	9.2	Plant noise just perceptible above existing noise environment.
Acoustic feature correction: Intermittent	0 dB(A)	9.2	Plant continuous, not intermittent
Acoustic feature correction: Impulsivity	0 dB(A)	9.2	No impulsive noise
Rating Sound level	35 dB(A)		
Excess of Rating level over background sound level	$35-43 = -8 \text{ dB(A)}$		Rating Level to amenity
Assessment of Impact: likelihood of low adverse impact depending on context		11	Initial estimate
Context	The noise assessment relates to the impact of noise from existing plant noise on the proposed residential development. The site is in a busy urban environment directly adjacent to a busy railway line. It should be noted that the general noise environment on the site is typically 55dB L_{Aeq} during the day when screened from the railway line.		
Uncertainty of the assessment	The predictions identify that the Rating sound level is likely to be -8dB(A) below the background level measured during the day. This prediction confirms the experience on site which observed that noise from the plant was not obvious as you moved away from the louvres. Any uncertainty may be if the plant operates at a higher load, which was not able to be determined on site, and therefore may be slightly louder. It is however likely that noise levels will still be below the background level resulting in a low adverse impact.		

The above assessment shows that there may be a low adverse impact from the plant to closest external amenity areas of the development during the day.

10.2 PLANT NOISE: Internal Noise Predictions

It is recognised in BS4142 that façade mitigation can be implemented to reduce noise levels from plant to new residential developments and the criteria given in BS8233:2014 considered. Internal noise levels have therefore been predicted to the closest plot to the louvres based on the Rating Level predicted in Table 10.3. An open window with a sound reduction of -13dB(A) has been assumed at 26m from the louvres.

Table 10.3: Predicted Internal Noise Levels – $L_{Aeq,T}$

Plot / Location	Daytime $L_{Aeq,T}$	Night time $L_{Aeq,T}$
Plot B-A-01-30 closest to Louvres	22 dB(A)	22 dB(A)
Criterion	<35 dB(A)	<30 dB(A)

Based on the Rating Level predicted and an open window, it is shown that internal noise levels from existing plant will fall within relevant criteria. Mitigation to reduce noise from the general noise environment will therefore also be adequate to reduce plant noise.