Our ref: NIA/8648/19/8773/v3 Barnsley West Roundabouts

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Dear Sir

NOISE IMPACT ASSESSMENT FOR PROPOSED NEW ROUNDABOUTS BARUGH GREEN ROAD AND HIGHAM COMMON ROAD, BARNSLEY

1.00 INTRODUCTION

1.01 Environmental Noise Solutions has been commissioned by Pegasus Group, on behalf of its client Strata Sterling Barnsley West Limited, to carry out an operational noise impact assessment for the proposed new roundabouts on Barugh Green Road and Higham Common Road, Barnsley (hereafter referred to as the Scheme).

1.02 The objectives of the noise impact assessment were to:

- Identify the noise-sensitive receptors (NSRs) likely to be affected by the Scheme
- Determine the noise impact of the Scheme with reference to pertinent guidelines

1.03 This report details the methodology and results of the assessment.

1.04 This report has been prepared for Strata Sterling Barnsley West Limited for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult Strata Sterling Barnsley West Limited (applicant), Pegasus Group (applicant's agent) and ENS as to the extent to which the findings may be appropriate for their use.

1.05 A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

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2.00 NOISE IMPACT ASSESSMENT CRITERIA

National Planning Policy Framework

2.01 The National Planning Policy Framework (NPPF) was updated in February 2019 and sets out the Government's planning policies for England and how these are expected to be applied.

2.02 Where issues of noise impact are concerned the NPPF provides brief guidance in paragraph 170 where it states that planning policies and decisions should contribute to and enhance the natural and local environment by:

'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of…..noise pollution'.

2.03 Paragraph 180 advises that:

'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should…..mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life'.

2.04 The NPPF also refers to the 2010 DEFRA publication, the Noise Policy Statement for England (NPSE) which reinforces and supplements the NPPF.

Noise Policy Statement for England

2.05 The Noise Policy Statement for England (NPSE) sets out the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by the following aims:

- Avoid significant adverse impacts on health and quality of life
- Mitigate and minimise adverse impacts on health and quality of life
- Where possible, contribute to the improvement of health and quality of life

2.06 NPSE describes the following levels at which noise impacts may be identified:

- NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise

- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected

- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur

Planning Practice Guidance – Noise

2.07 In July 2019, Planning Practice Guidance (PPG) was updated online which provides additional guidance and elaboration on the NPPF. It advises that the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur
- Whether or not an adverse effect is occurring or likely to occur
- Whether or not a good standard of amenity can be achieved

2.08 In line with the Explanatory Note of the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome.

2.09 Table 2.1 summarises the noise exposure hierarchy, based on the likely average response.

Table 2.1 – Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level (NOEL)			
Not Noticeable	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level (NOAEL)			
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.10 However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that:

'…the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation'.

Design Manual for Roads and Bridges LA 111 (DMRB)

2.11 DMRB sets out procedures for undertaking the environmental assessment of new road schemes, including the assessment of noise effects from road traffic, and describes a method for categorising the magnitude of impact due to a new road scheme. In undertaking a DMRB assessment, the calculation of traffic noise levels uses the methodology contained within the Calculation of Road Traffic Noise (CRTN) document as described below.

2.12 DMRB requires comparisons of the following sets of data:

- Do-Minimum scenario (without the Scheme) in the opening year (DMOY) against Do-Something scenario (with the Scheme) in the opening year (DSOY)
- Do-Minimum scenario in the opening year (DMOY) against Do-Something scenario in the future assessment year (DSFY)
- Do-Minimum scenario in the opening year (DMOY) against Do-Minimum scenario in the future year (DMFY)

2.13 The DMRB assessment suggests that the magnitude of noise changes from a project should be classified into levels of impact, and gives detailed consideration to how impact magnitude will be affected by whether a noise level change will occur in the short term (e.g. as a result of a sudden opening of a scheme), or whether the noise level change would occur in the long term (e.g. gradually over time, such as that associated with natural traffic growth).

2.14 The 'magnitude of change' classifications are duplicated in Tables 2.2 and 2.3 below.

Table 2.2 – Classification of Magnitude of Noise Effects in the Short Term

Noise Change, $L_{A10, 18h}$, dB	Magnitude of Change
Less than 1.0	Negligible
1.0 to 2.9	Minor
3.0 to 4.9	Moderate
5.0+	Major

Table 2.3 – Classification of Magnitude of Noise Effects in the Long Term

Noise Change, $L_{A10, 18h}$, dB	Magnitude of Change
Less than 3.0	Negligible
3.0 to 4.9	Minor
5.0 to 9.9	Moderate
10.0+	Major

2.15 DMRB confirms that the above scales apply to the impact magnitude, not the impact significance. The impact significance will depend upon both the impact magnitude and the sensitivity of the receiving environment.

2.16 To aid in the determination of significance, DMRB sets out operational noise LOAELs and SOAELs as follows:

Table 2.4 – DMRB Operational Noise LOAELs and SOAELs

Time Period	LOAEL	SOAEL
Day (0600–2400)	55 dB $L_{A10\ (18\ hour)}$ façade	68 dB $L_{A10\ (18\ hour)}$ façade
Night (0000–0600)	40 dB $L_{night,\ outside}$ (free field)	55 dB $L_{night,\ outside}$ (free field)

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Calculation of Road Traffic Noise (CRTN) 1988

2.17 Published by the Department of Transport and the Welsh Office in 1988, this document sets out standard procedures for calculating noise levels from road traffic. The calculation methods use a number of input variables, including traffic flow volume, average vehicle speed, percentage of heavy goods vehicles, type of road surface, site geometry and the presence of noise barriers or acoustically absorbent ground. CRTN predicts the $L_{10\ (18hour)}$ dB(A) or $L_{10\ (1hour)}$ dB(A) noise level for any receptor point at a given distance, up to 300 m, from the road.

3.00 PROPOSED SCHEME

3.01 The proposed Scheme comprises:

- A new four-arm roundabout linking Barugh Green Road to 'Barnsley West' (a proposed mixed-use development to the south of Barugh Green Road) and to Claycliffe Business Park (an existing industrial estate to the north of Barugh Green Road) via Cannon Way.

- A new four-arm roundabout linking Higham Common Road to Barnsley West – Link Road and Barnsley West – Employment Uses

3.02 As part of the wider Barnsley West development, a new link road is also proposed between the two roundabouts. Although this is outside the scope of the proposed Scheme, the use of the link road is intrinsically linked to the Scheme, and therefore the impact of the link road is considered within the assessment.

3.03 Additionally, the Scheme will lead to changes on existing road links by way of development-led traffic associated with Barnsley West and the associated link road, which are also considered within the assessment.

3.04 Traffic flows produced by Fore Consulting Limited for the wider Barnsley West development designates the proposed roundabouts as Location 2 and Location 8 respectively.

3.05 An annotated layout for the Barugh Green Road roundabout is provided in Figure 3.1 below.

Figure 3.1 – Road Sections (Barugh Green Road Roundabout)

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3.06 The nearest NSRs which have the potential to be affected by the Barugh Green Road roundabout are considered to be Nos. 166 and 220 Barugh Green Road.

3.07 Site plans indicate that the Barugh Green Road roundabout is set back circa **40 metres** from No. 220 Barugh Green Road (to the east) and circa **80 metres** from No. 166 Barugh Green Road (to the west). Both properties are positioned with the gable-end facing the roundabout.

3.08 An annotated layout for the Higham Common Road roundabout is provided in Figure 3.2 below.

Figure 3.2 – Road Sections (Higham Common Road Roundabout)

3.09 The nearest NSRs which have the potential to be affected by the Higham Common Road roundabout are considered to be dwellings on Hermit Lane and Nos. 446–510 (evens) Higham Common Road.

3.10 Site plans indicate that the Higham Common Road roundabout is set back at least **75 metres** from dwellings on Hermit Lane. As the proposed roundabout does not result in any material changes to the position of the road relative to dwellings on Higham Common Road, this is assessed as an *existing* road link, in terms of changes to traffic flows and composition.

3.11 The nearest NSRs which have the potential to be affected by the link road are considered to be residential dwellings on Hermit Lane, St. John's Avenue and Welland Court. Site plans indicate that the link road is set back at least **28 metres** from dwellings on Hermit Lane, at least **130 metres** from dwellings at Welland Court and at least **145 metres** from dwellings at St. John's Avenue.

3.12 With cognisance to other committed developments in the area, it is noted that M1 J37 Phase 2 Higham Lane is currently under consideration. This development proposes to introduce a roundabout at the northern end of Capitol Close (an access road to commercial premises). Changes to traffic flows as a result of this development are encapsulated in the long-term traffic flow data used in this assessment.

4.00 BASELINE CONDITIONS

4.01 Baseline noise monitoring was carried out on Wednesday 4th September 2019, Tuesday 25th February 2020, Wednesday 4th March 2020 and Monday 16th March 2020.

4.02 For the purpose of the assessment, the following noise monitoring positions were adopted (the approximate locations of the noise monitoring positions are contained in Appendix 2 for reference):

- MPA was located in the vicinity of existing residential dwellings on St. John's Avenue
- MPB was located in the vicinity of existing residential dwellings on Welland Court
- MPC was located in the vicinity of No. 29 Hermit Lane (circa 13 metres to the nearside kerb)
- MPD was located in the vicinity of No. 220 Barugh Green Road (circa 10 metres to the nearside kerb)

4.03 Noise measurements were undertaken using Bruel & Kjaer 2250 Type 1 integrating sound level meters. The measurement system calibration was verified immediately before the commencement of the measurement sessions and again at the end, using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration level was noted. A windshield was fitted for all measurements. All noise measurements were made in a free field environment at a height of circa 1.5 metres above local ground level.

4.04 The noted weather conditions during the survey were dry, mild and calm, with average wind speeds < 5 m/s. Weather conditions were therefore considered appropriate for noise monitoring.

4.05 Measurements consisted of A–weighted broadband parameters. The following table contains a summary of the measurement data for each measurement session, at each measurement position, rounded to the nearest decibel.

Table 4.1 – Summary of Noise Measurement Data

Position	Date	Time	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	Comment
MPA	16/03/20	1259–1559	49.1	50.9	Distant M1 motorway dominant
MPB	04/03/20	1308–1608	53.0	55.4	Distant M1 motorway dominant
MPC	25/02/20	1253–1553	57.3	59.9	Road traffic on Hermit Lane dominant
MPD	04/09/19	1000–1300	63.8	67.8	Road traffic on Barugh Green Road dominant

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4.06 For the prediction of daytime road traffic noise, the CRTN explains that the following shortened measurement procedure may be used. Measurements of L_{A10} are made over any three consecutive hours between 10:00 and 17:00 hours. Using $L_{A10\ (3\ hour)}$ as the arithmetic mean of the three consecutive values of hourly L_{A10}, the $L_{A10\ (18\ hour)}$ can be calculated from the equation:

(i) $L_{A10\ (18\ hour)} = L_{A10\ (3\ hour)} - 1$ dB

4.07 CRTN advises that a correction of 2.5 dB should be applied to free field levels in order to derive the noise level at 1 metre from the façade.

4.08 Based on the above, the façade-corrected $L_{A10\ (18\ hour)}$ levels are as follows:

- **52.4 dB $L_{A10\ (18\ hour)}$** at MPA
- **56.9 dB $L_{A10\ (18\ hour)}$** at MPB
- **61.4 dB $L_{A10\ (18\ hour)}$** at MPC
- **69.3 dB $L_{A10\ (18\ hour)}$** at MPD

4.09 The 2019 $L_{A10\ (18\ hour)}$ levels at the façades of dwellings on Hermit Lane and Barugh Green Road have also been modelled in accordance with the procedure contained in the CRTN, using traffic data prepared by Fore Consulting.

4.10 The calculations have incorporated the following assumptions:

- Vehicle speeds of 30 mph (48 km/h)
- Impervious / bituminous road surface
- Unobstructed propagation from road to receiver position
- Hard intervening ground cover between the road and the dwellings

4.11 Using the guidance set out in CRTN, along with the traffic flow data and assumptions listed above, a basic noise level of **61.7 dB $L_{A10\ (18\ hour)}$** has been determined at a distance of 10 metres from the kerb of Hermit Lane. For reference, this equates to a façade-corrected noise level of **61.2 dB $L_{A10\ (18\ hour)}$** at 13 metres from the kerb, which is consistent with the façade-corrected measured noise level at **MPC**.

4.12 Using the guidance set out in CRTN, along with the traffic flow data and assumptions listed above, a basic noise level of **67.4 dB $L_{A10\ (18\ hour)}$** has been determined at a distance of 10 metres from the kerb of Barugh Green Road. For reference, this equates to a façade-corrected noise level of **69.8 dB $L_{A10\ (18\ hour)}$** at 10 metres from the kerb, which is consistent with the façade-corrected measured noise level at **MPD**.

4.13 Noise levels at **MPA** and **MPB** are wholly due to distant noise on the M1 motorway. As the motorway is > 300 metres from the monitoring positions, with complex intervening site conditions, the measurement method advocated in CRTN is considered to be preferable to the prediction method in determining baseline conditions.

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5.00 NOISE IMPACT ASSESSMENT

5.01 18-hour AAWT traffic flows have been provided by Fore Consulting for:

- **2021** – The opening year of the Scheme
- **2026** – The opening year of the link road
- **2033** – Future period following implementation of the Scheme, including the wider Barnsley West development and link road (which will be the subject of a later planning application) and other committed developments. Adopted as 'future assessment year'

DMOY to DSOY Short Term Assessment

5.02 Although the Scheme is set to open in 2021, the purpose of the roundabouts is to provide access to the wider Barnsley West development (Phase 1 completion due for 2026) and/or the link road (completion due for 2033). As such, there are no changes to $L_{A10\ (18\ hour)}$ levels at the façades of the nearest NSRs to the Scheme in the opening year (2021) and therefore the short-term magnitude of impact is classified as **negligible** in accordance with the DMRB.

5.03 Paragraph 3.59 of the DMRB states: *'Where the magnitude of change in the short term is **negligible** at noise sensitive buildings, it shall be concluded that the noise change will not cause changes to behaviour or response to noise and as such, will not give rise to a likely significant effect'*.

DMOY to DMFY Long Term Assessment

5.04 The DMRB requires a comparison of DMOY against DMFY, in order to demonstrate how noise levels will vary in the long-term, irrespective of the Scheme.

5.05 The long-term change in $L_{A10\ (18\ hour)}$ levels along existing road links is calculated using the guidance set out in CRTN, in accordance with traffic flows and HGV percentages provided, and assuming that vehicle speed limits are to remain unchanged. The results of the calculations are summarised in Appendix 3.

5.06 For reference, the long-term changes in noise levels without the Scheme are +1.1 dB at Higham Common Road (northern end, at the junction with Barugh Green Road) and < 1.0 dB at all other road links.

DMOY to DSFY Long Term Assessment

5.07 The future year (2033) $L_{A10\ (18\ hour)}$ levels at the façades of the nearest NSRs to the Scheme (and link road) are modelled in accordance with the procedure contained in the CRTN, using traffic data prepared by Fore Consulting. These levels may then be compared against the existing $L_{A10\ (18\ hour)}$ levels at the nearest NSRs in order to determine the long-term magnitude of impact.

5.08 The calculations have incorporated the following assumptions:

- Generally neutral gradient
- Impervious / bituminous road surface
- Unobstructed propagation from road to receiver position
- Soft intervening ground cover between the Scheme and the dwellings

5.09 Table 5.1 overleaf summarises the long-term magnitude of impact with the Scheme at the nearest NSRs. This includes the completed link road and the wider Barnsley West development, and takes into account all other committed developments in the vicinity, including the M1 J37 Phase 2 roundabout.

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Table 5.1 – DMOY to DSFY long-term changes with the Scheme

Noise sensitive receptor(s)	Road Section	2021 Do-Minimum $L_{A10, 18h}$	2033 Do-Something $L_{A10, 18h}$	Change in $L_{A10, 18h}$	Magnitude of Change
220 Barugh Green Road	Barugh Green Road – Site Access	55.7 dB	60.1 dB	+4.4 dB	Minor
166 Barugh Green Road	Barugh Green Road – Site Access	55.9 dB	58.6 dB	+2.7 dB	Negligible
Dwellings on St. John's Avenue	Barugh Green Road – Site Access	52.5 dB	56.3 dB	+3.8 dB	Minor
Dwellings on Welland Court	Higham Common Road – Link Road	56.5 dB	59.0 dB	+2.5 dB	Negligible
Dwellings on Hermit Lane	Higham Common Road – Link Road	61.2 dB	64.7 dB	+3.5 dB	Minor

5.10 The long-term magnitude of change is **negligible** or **minor** at all NSRs in the vicinity of the roundabouts and link road.

5.11 The **long-term** changes in $L_{A10\ (18\ hour)}$ levels along *existing* road links is calculated using the guidance set out in CRTN, in accordance with traffic flows and HGV percentages provided, and assuming that vehicle speed limits are to remain unchanged. The results of the calculations are summarised in Appendix 4.

5.12 With the exception of 'Capitol Close', the traffic data prepared by Fore Consulting illustrate that the Scheme will give rise to < 3 dB increase in $L_{A10\ (18\ hour)}$ levels at all existing road links in the **long term**, which corresponds to a **negligible** impact.

5.13 Whilst Capitol Close is set to experience an +8.5 dB increase in $L_{A10\ (18\ hour)}$ levels in the long-term, this is an industrial estate road with no noise sensitive receptors and the increase is largely due to the new road junction with Higham Lane, which re-routes industrial estate traffic.

5.14 In summary, the long-term magnitude of change is **negligible** or **minor** at all NSRs. In accordance with the DMRB this is an indication that the effects on existing NSRs are **not significant**.

<u>DMOY(LR) to DSOY(LR) Short Term Assessment (Link Road)</u>

5.15 Although the link road itself is outside the scope of the proposed Scheme, the use of the link road is intrinsically linked to the Scheme, and therefore it was requested that the short-term impact of the link road is considered within the assessment.

5.16 Table 5.2 overleaf summarises the short-term magnitude of impact with the link road at the nearest NSRs.

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Table 5.2 – DMOY(LR) to DSFY(LR) short term changes with the link road

Noise sensitive receptor(s)	Road Section	2026 Do-Minimum $L_{A10, 18h}$	2026 Do-Something $L_{A10, 18h}$	Change in $L_{A10, 18h}$	Magnitude of Change
220 Barugh Green Road	Barugh Green Road – Site Access	57.2 dB	57.6 dB	+0.4 dB	Negligible
166 Barugh Green Road	Barugh Green Road – Site Access	57.4 dB	57.5 dB	+0.2 dB	Negligible
Dwellings on St. John's Avenue	Barugh Green Road – Site Access	53.0 dB	53.3 dB	+0.3 dB	Negligible
Dwellings on Welland Court	Higham Common Road – Link Road	57.0 dB	57.0 dB	+0.0 dB	Negligible
Dwellings on Hermit Lane	Higham Common Road – Link Road	61.5 dB	61.8 dB	+0.3 dB	Negligible

5.17 The short-term magnitude of change is **negligible** at all NSRs in the vicinity of the roundabouts and link road.

5.18 The short-term changes in $L_{A10\ (18\ hour)}$ levels along *existing* road links is calculated using the guidance set out in CRTN, in accordance with traffic flows and HGV percentages provided, and assuming that vehicle speed limits are to remain unchanged. The results of the calculations are summarised in Appendix 5.

5.19 With the exception of 'Higham Common Road' (at the junction with Barugh Green Road), the traffic data prepared by Fore Consulting illustrate that the Scheme will give rise to < 1 dB increase in $L_{A10\ (18\ hour)}$ levels at all existing road links in the **short term**, which corresponds to a **negligible** impact.

5.20 In accordance with the DMRB this is an indication that the short-term effects on NSRs are **not significant**, with the exception of receptors on Higham Common Road.

5.21 NSRs on Higham Common Road are set to experience an +1.2 dB increase in $L_{A10\ (18\ hour)}$ levels in the short-term, which corresponds to a **minor** change in accordance with the DMRB. Worst-case noise levels at the façades of dwellings on Higham Common Road are above the SOAEL as defined in the DMRB.

5.22 Although the DMRB advises that a minor change can constitute a **significant effect** where the SOAEL is also exceeded, the wider context is that the long-term increase in noise level **with** the Scheme is +0.2 dB, whereas the long-term increase in noise level **without** the Scheme is +1.1 dB, meaning that there is an overall beneficial impact at receptors on Higham Common Road with the Scheme.

5.23 It is also noted that the change is at the lower end of the minor magnitude, tending towards negligible, and that noise levels are set to **decrease** by 1.2 dB between 2026 and 2033.

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6.00 CONCLUSIONS

6.01 A noise impact assessment has been carried out for proposed new roundabouts on Barugh Green Road and Higham Common Road, Barnsley

6.02 There are no changes to noise levels at the façades of the nearest NSRs to the Scheme in the opening year and therefore the short-term magnitude of impact is classified as **negligible** in accordance with the DMRB. In accordance with the DMRB this is an indication that the short-term effects of the Scheme are **not significant**.

6.03 The long-term magnitude of change is **negligible** or **minor** at all NSRs with the Scheme. In accordance with the DMRB this is an indication that the long-term effects of the Scheme are **not significant**.

6.04 The short-term magnitude of change due to the opening of the link road is **minor** at NSRs on Higham Common Road (northern end). Worst case noise levels at the façades of dwellings on Higham Common Road are above the SOAEL as defined in the DMRB.

6.05 Although the DMRB advises that a minor change can constitute a **significant effect** where the SOAEL is also exceeded, the wider context is that there is an overall long-term beneficial impact at receptors on Higham Common Road with the Scheme.

6.06 The short-term magnitude of change due to the opening of the link road is **negligible** at all remaining NSRs. In accordance with the DMRB this is an indication that the short-term effects of the link road are **not significant** at remaining NSRs.

I trust the foregoing is sufficient for your needs. Should you have any queries regarding the above, please do not hesitate to contact me.

Yours sincerely

Thomas Crabb
MIOA, Diploma in Acoustics and Noise Control
Environmental Noise Solutions Limited

Appendix 1
Glossary of Acoustic Terms

Sound Pressure Level (L_p)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 µPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_0 = reference sound pressure (20 µPa).

A-weighting Network

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$

The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.

$L_{AF\ max}$

The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

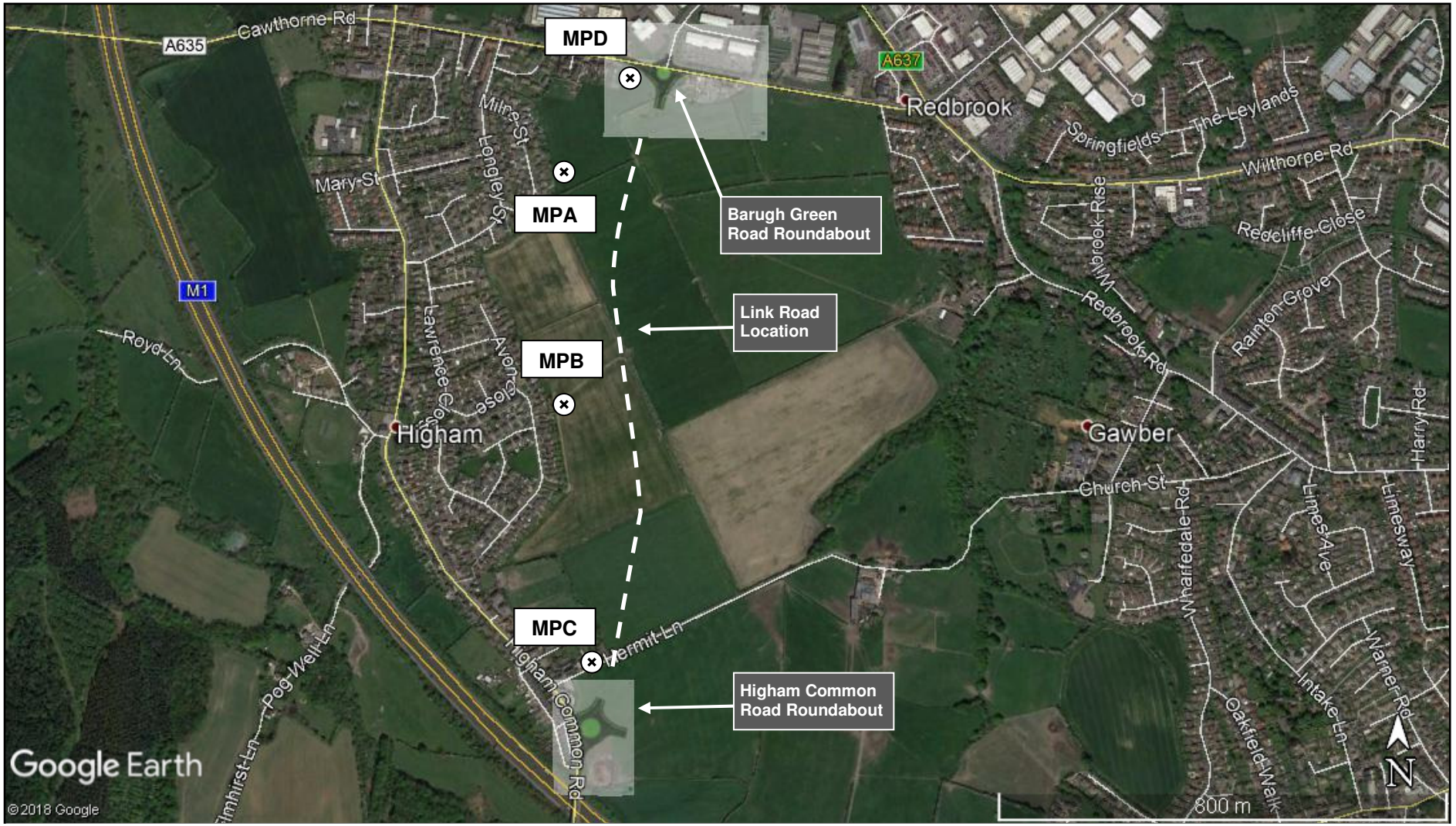
Sound Exposure Level (SEL or L_{AE})

The energy produced by a discrete noise event averaged over one second, no matter how long the event actually took. This allows for comparison between different noise events which occur over different lengths of time.

Weighted Sound Reduction Index (R_W)

Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_W is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix 2
Site Location Plan and Approximate Monitoring Positions



Appendix 3
Long Term Changes to $L_{A10(18\ hour)}$ on Existing Road Links (without the scheme)

Location		Link	2021 DMOY		2033 DMFY		Total Change in $L_{A10\ (18\ hour)}$
			2-Way Flow	HGV %	2-Way Flow	HGV %	
1	Cawthorne Rd / B6428 Barugh Lane / Barugh Green Rd / Higham Common Rd	Cawthorne Road	8,764	2%	10,008	2%	+ 0.6
		B6428 Barugh Lane	8,542	4%	9,756	4%	+ 0.6
		Barugh Green Road	9,013	4%	10,294	4%	+ 0.7
		Higham Common Road	6,793	3%	7,757	5%	+ 1.1
2	Barugh Green Rd / Cannon Way / Site Access	Barugh Green Road west	9,752	3%	11,137	4%	+ 0.7
		Cannon Way	2,279	6%	2,603	5%	+ 0.4
		Barugh Green Road east	10,124	4%	11,562	4%	+ 0.7
3	Barugh Green Rd / Whaley Rd / Claycliffe Rd / A635	Barugh Green Road west	10,537	3%	12,034	4%	+ 0.7
		A637 Claycliffe Road	14,817	2%	16,922	2%	+ 0.5
		Whaley Road	4,640	3%	5,299	3%	+ 0.5
		A635	24,442	2%	27,913	2%	+ 0.6
4	M1 Junction 37	M1 southbound off slip	7,568	3%	8,633	3%	+ 0.5
		A628 Dodworth Road	27,730	3%	31,631	3%	+ 0.5
		M1 southbound on slip	12,756	3%	14,551	3%	+ 0.6
		M1 northbound off slip	12,399	4%	14,143	4%	+ 0.5
		Whinby Road	26,520	4%	30,194	4%	+ 0.6
		M1 northbound on slip	7,937	3%	9,054	3%	+ 0.5
5	Whinby Rd / B6449 Roundabout	Whinby Road east	25,659	4%	29,213	4%	+ 0.6
		B6449	9,694	1%	11,052	1%	+ 0.6
		Whinby Road north	20,247	5%	23,011	5%	+ 0.6
6	Whinby Rd / Capitol Close Roundabout	Capitol Close	2,417	4%	2,618	4%	+ 0.3
		Whinby Road south	20,340	5%	23,117	5%	+ 0.6
		Whinby Road west	18,863	5%	21,512	5%	+ 0.6
7	Whinby Rd / Higham Lane Roundabout	Higham Lane	9,399	3%	10,718	4%	+ 0.9
		Whinby Road east	19,102	5%	21,785	5%	+ 0.6
		Whinby Road west	15,309	5%	17,469	5%	+ 0.5
8	Higham Common Rd / Site Access	Higham Common Road north	9,484	2%	10,831	2%	+ 0.5
		Higham Common Road south	9,484	2%	10,831	2%	+ 0.5

Appendix 4
Long Term Changes to $L_{A10(18\ hour)}$ on Existing Road Links (with the Scheme)

Location		Link	2021 DMOY		2033 DSFY		Total Change in $L_{A10\ (18\ hour)}$
			2-Way Flow	HGV %	2-Way Flow	HGV %	
1	Cawthorne Rd / B6428 Barugh Lane / Barugh Green Rd / Higham Common Rd	Cawthorne Road	8,764	2%	9,168	3%	+ 0.6
		B6428 Barugh Lane	8,542	4%	6,018	7%	- 0.7
		Barugh Green Road	9,013	4%	7,350	5%	- 0.6
		Higham Common Road	6,793	3%	5,371	7%	+ 0.2
2	Barugh Green Rd / Cannon Way / Site Access	Barugh Green Road west	9,752	3%	9,339	4%	+ 0.1
		Cannon Way	2,279	6%	2,426	6%	+ 0.3
		Barugh Green Road east	10,124	4%	22,607	2%	+ 2.9
3	Barugh Green Rd / Whaley Rd / Claycliffe Rd / A635	Barugh Green Road west	10,537	3%	22,108	2%	+ 2.9
		A637 Claycliffe Road	14,817	2%	21,100	1%	+ 1.2
		Whaley Road	4,640	3%	5,159	3%	+ 0.5
		A635	24,442	2%	30,702	2%	+ 1.0
4	M1 Junction 37	M1 southbound off slip	7,568	3%	9,420	3%	+ 1.0
		A628 Dodworth Road	27,730	3%	32,153	3%	+ 0.6
		M1 southbound on slip	12,756	3%	16,008	3%	+ 1.0
		M1 northbound off slip	12,399	4%	15,847	4%	+ 1.1
		Whinby Road	26,520	4%	40,274	3%	+ 1.5
		M1 northbound on slip	7,937	3%	10,133	3%	+ 1.1
5	Whinby Rd / B6449 Roundabout	Whinby Road east	25,659	4%	39,653	3%	+ 1.6
		B6449	9,694	1%	15,064	1%	+ 1.9
		Whinby Road north	20,247	5%	32,710	4%	+ 1.8
6	Whinby Rd / Capitol Close Roundabout	Capitol Close	2,417	4%	19,401	2%	+ 8.5
		Whinby Road south	20,340	5%	32,769	4%	+ 1.8
		Whinby Road west	18,863	5%	14,151	6%	- 1.0
7	Whinby Rd / Higham Lane Roundabout	Higham Lane	9,399	3%	5,712	5%	- 1.8
		Whinby Road east	19,102	5%	15,019	6%	- 0.8
		Whinby Road west	15,309	5%	18,494	4%	+ 0.6
8	Higham Common Rd / Site Access	Higham Common Road north	9,484	2%	7,457	3%	- 0.7
		Higham Common Road south	9,484	2%	7,457	3%	- 0.7

Appendix 5
Short Term Changes to $L_{A10(18\ hour)}$ on Existing Road Links (Link Road opening year)

Location		Link	2026 DMOY(LR)		2026 DSFY(LR)		Total Change in $L_{A10\ (18\ hour)}$
			2-Way Flow	HGV %	2-Way Flow	HGV %	
1	Cawthorne Rd / B6428 Barugh Lane / Barugh Green Rd / Higham Common Rd	Cawthorne Road	9,404	2%	9,606	2%	0.2
		B6428 Barugh Lane	9,166	3%	9,552	4%	0.3
		Barugh Green Road	9,672	3%	10,880	4%	0.6
		Higham Common Road	7,289	3%	8,578	4%	1.2
2	Barugh Green Rd / Cannon Way / Site Access	Barugh Green Road west	10,464	3%	11,673	4%	0.6
		Cannon Way	2,446	6%	2,446	6%	0.0
		Barugh Green Road east	10,864	3%	11,987	4%	0.5
3	Barugh Green Rd / Whaley Rd / Claycliffe Rd / A635	Barugh Green Road west	11,307	3%	12,430	3%	0.5
		A637 Claycliffe Road	15,899	2%	16,155	2%	0.1
		Whaley Road	4,979	3%	4,979	3%	0.0
		A635	26,226	2%	27,284	2%	0.2
4	M1 Junction 37	M1 southbound off slip	8,115	3%	8,237	3%	0.1
		A628 Dodworth Road	29,736	3%	30,236	3%	0.1
		M1 southbound on slip	13,679	3%	14,161	3%	0.2
		M1 northbound off slip	13,296	4%	13,559	4%	0.1
		Whinby Road	28,409	4%	29,591	4%	0.3
		M1 northbound on slip	8,512	3%	8,738	3%	0.1
5	Whinby Rd / B6449 Roundabout	Whinby Road east	27,486	4%	28,668	4%	0.3
		B6449	10,392	1%	10,494	1%	0.1
		Whinby Road north	21,668	4%	22,919	5%	0.4
6	Whinby Rd / Capitol Close Roundabout	Capitol Close	2,520	4%	2,520	4%	0.0
		Whinby Road south	21,768	4%	23,019	5%	0.4
		Whinby Road west	20,225	4%	21,476	5%	0.4
7	Whinby Rd / Higham Lane Roundabout	Higham Lane	10,077	2%	11,541	4%	0.9
		Whinby Road east	20,482	4%	21,733	5%	0.4
		Whinby Road west	16,420	5%	16,755	5%	0.1
8	Higham Common Rd / Site Access	Higham Common Road north	10,177	2%	10,733	2%	0.2
		Higham Common Road south	10,177	2%	10,733	2%	0.2