Network Rail
Meridian House, 4th Floor
85 Smallbrook Queensway
Birmingham
B5 4HP

Fiona Bartholomew
City Development
Oxford City Council
St Aldate's Chambers
109-113, St Aldgate's
Oxford
OX1 1DS

2 April 2015

Dear Fiona

BICESTER TO OXFORD TRANSPORT AND WORKS ACT ORDER AND PLANNING PERMISSION (TWA/10/APP/01) – SECTION H DISCHARGE OF CONDITION 19

I am writing to you to provide Network Rail's responses to a number of matters raised by the Council and consultees in relation to (i) the Vibration Scheme of Assessment and the Arup Comments on Atkins Technical Note – Condition 19 Vibration Scheme of Assessment 11 March 2015 (ii) other points raised by David Stevens in his email of 19 March that accompanied the Arup Comments and (iii) other matters raised in recent discussions, for example, at the meeting with MPs and local residents on 5 March 2015.

Scope of the Vibration Schemes of Assessment (VSoAs) for Decision

At the MPs and local residents meeting, concerns were raised about the use by Atkins of a 'screening distance' of 15m, between the nearest track and residential properties in Section I. This approach has been endorsed in relation to plain line track, in the VSoA, by Chris Jones, the Independent Expert.

This would justify the position that was taken in the ERM letter to the City Council, 12 February 2015, that all of the residential properties in Section I can be screened out and that there will be no vibration impacts likely to approach the thresholds set out in the Noise and Vibration Mitigation Policy.

However, Network Rail recognises that various concerns about vibration have been expressed by residents in Section I, which would be better addressed by the submission of a separate consolidated VSoA for Section I, in due course, which can then be the subject of further local consultation.

Network Rail is, therefore, asking the City Council, at this stage, only to consider and approve the VSoAs in relation to Section H.

Confirmation that the Assessments of Noise and Vibration in Section H are based on Consistent Train Operating Assumptions

We have reviewed the train movements and speed assumptions used in the submitted Vibration Schemes of Assessment, as modified by the Atkins Technical Note of 18 February 2015, against those set out in Annex D of the Noise Scheme of Assessment, dated March 2015.

The numbers and types of train movements shown in the table below, which have been extracted from the Noise Scheme of Assessment, are derived from the Noise and Vibration Mitigation Policy. These are the anticipated train movements after the opening of East West Rail Phase 2 and are, in Network Rail's view, the appropriate basis for determining mitigation in both the Noise and Vibration Schemes of Assessment. The table shows a maximum of 171 train movements per day in Section H.

Noise SoA Table D2.7 Summary of Modelled Train Movements with the Order Scheme

Area	Number of Chiltern Train Movements		Number of EWR Train Movements		Number of Freight Train Movements	
	Day 07.00 – 23.00	Night 23.00 – 07.00	Day 07.00 – 23.00	Night 23.00 – 07.00	Day 07.00 – 23.00	Night 23.00 – 07.00
Bicester Chord	61	7	0	0	0	0
North of Gavray Junction	0	0	64	14	17	8
Gavray Junction to the MoD Sidings	61	7	64	14	17	8
MoD Sidings to the Banbury Road Sidings	61	7	64	14	17	8
Banbury Road Sidings to the Oxford North Junction (includes Section H)	**61**	**7**	**64**	**14**	**17**	**8**
Oxford North Junction to Oxford Station (in Sections I and J)	61	7	64	14	0 (1)	0 (1)

1) Freight trains that currently use the Banbury-Oxford mainline are expected to divert via the Order Scheme between North of Gavray Junction and Oxford North Junction. At Oxford North Junction they will rejoin the mainline through Oxford as they would have done prior to diversion. Therefore, no additional movements are expected as a result of the Order Scheme in this area.

The assumptions in relation to train movements in the Vibration SoA, as originally submitted, included an additional 16 passenger trains each day, over those shown in Table D2.7. These were an assumed Cross Country train service used in earlier assessments (for example in the Environmental Statement). It had, however, been confirmed, before the Order was granted in October 2012, that these services should not form part of the 'planning assumptions' for determining the noise and vibration mitigation to be provided under Planning Condition 19. The numbers of freight train movements assumed in both Schemes of Assessment are the same. In our response, given below, in relation to the potential exceedance of the vibration thresholds, these additional passenger train movements have been removed.

In terms of train speeds, the assumptions used in the latest, submitted Noise SoA and the earlier Vibration SoAs do show some minor differences. This is principally because the Vibration SoAs were undertaken based on the track layout designs current in late 2013. The Noise SoA is based on the latest anticipated track layouts and the most up to date information on train speed profiles.

In Section H, the maximum designed line speed for the track as shown on the technical drawings will be 75 mph, although actual speeds will not exceed 70mph. The noise assessment has, generally, in Section H, used this maximum operating speed of 70 mph for passenger and conventional freight services (with the exception of the stone trains, where much lower speeds have been assumed). These assumptions have been confirmed as 'reasonable worst case' for noise, by further review of the likely speed profiles on this section.

The assumptions being used in the Noise and Vibration Schemes of Assessment have now been made as consistent as they need to be to ensure that each of the assessments takes account of the 'reasonable worst case' impacts, for noise and vibration respectively. The amended assumptions for vibration are detailed in the next section of this letter.

Response to the Arup 'Comments on Atkins Technical Note', 11 March 2015

Arup, as the City Council's Review Expert, provided a comprehensive set of Comments on the Atkins Technical Note dated 18 February 2015, dated 11 March.

This has been reviewed by Atkins and the principal outstanding concern is Arup's conclusion that there remains a predicted exceedance of both the day and night-time vibration thresholds at one property, 4 Bladon Close, (otherwise described by Arup as the 'VDV planning criteria').

Generally, Arup have endorsed the findings in the Atkins Technical Note, but do conclude, in the final paragraph of Section 5, for example, that the Technical Note had adopted train speed assumptions that were *'higher compared to the anticipated operational speeds'*.

The train operating assumptions have been revisited by Atkins and the findings of that analysis are set out below. As discussed in the previous section, the assumptions now being used can be confirmed as 'reasonable worst case' for vibration.

A summary of the relevant changes in assumptions is given in Table 1:

Table 1: Summary of Revised Train Operation Assumptions used in Vibration Assessment in Section H

Assumption	Original assumptions in VSoA	Revised assumptions in line with NSoA
No. of day-time passenger trains	79/79 in Up/Down directions	63/62 in Up/Down directions
No. of night-time passenger trains	14/14 in Up/Down directions	11/10 in Up/Down directions
Stone train speed (day-time only)	60mph	50mph/20mph in Up/Down directions
Passenger and conventional freight speeds in Down direction	60mph	70mph
Distribution of stone train	1 loaded stone train on each track	2 loaded trains in Down direction and no loaded trains in Up direction

As previously described in the Atkins Technical Note, 18 February 2015, the frequency based transfer functions at 4 Bladon Close were calculated as shown in Table 2:

Table 2: Summary of Frequency Based Transfer Functions

Dwelling Type	Property	Transfer Function	
		Typical values	Reasonable worst case
Single family residence	4 Bladon Close	1.85	3

Using the assumptions set out in Tables 1 and 2, the 'worst case' internal vibration levels at 4 Bladon Close are predicted as shown in Table 3:

Table 3: 4 Bladon Close: Predicted 'Worst Case' Internal Vibration Levels

Property	Time Period	Avg VSoA Calculated External VDVs (open ground)	Internal vibration Levels, VDV, m/s $^{1.75}$		
			Calculated based on 'typical' transfer functions	Calculated based on 'reasonable worst case' transfer functions	Vibration Thresholds in Noise and Vibration Policy
4 Bladon Close	Day-time	0.11	0.20	0.33	0.4
	Night-time	0.07	0.13	0.21	0.2

The calculations show that, based on 'typical' transfer functions, the estimated VDVs are comfortably within the vibration thresholds in the Policy.

Using the 'reasonable worst case' transfer functions, the estimated day-time VDVs will also fall below the threshold. However, there would be a very marginal exceedance of the night-time threshold at 4 Bladon Close. This corresponds to a 5% exceedance of the night-time limit and would result in the estimated levels going just above the VDV range for 'Low probability of adverse comment' (0.2 m/s $^{1.75}$) and into the lowest part of the next VDV range, described as 'Adverse comment possible' in BS6472-1: 2008 if the predicted results are borne out in reality. This is the VDV range between 0.2 and 0.4 to 0.8 m/s $^{1.75}$ for day-time exposure.

As previously described, the assessments for switch and crossing amplifications apply conservative assumptions. It should also be noted that the revised assumptions include an uplift in passenger and conventional freight train speeds to 70 mph. This is consistent with the Noise SoA and has been done because Atkins' conclusion is that there is unlikely to be any significant reduction in VDVs if 60 mph were to be applied.

The conclusion from this analysis is that, using the '**reasonable worst case**' assumptions, the day- time threshold can be met and the predicted exceedance above the night- time threshold is, at worst, very marginal.

Review of Practicable Measures to Mitigate the Exceedance of the Vibration Threshold

A review has been done of all of the possible means to mitigate this predicted exceedance, including measures previously considered and rejected.

Each of these is briefly summarised below.

Moving the Woodstock Road crossover position

This has been reviewed at length by Network Rail and the design engineering team and it has been confirmed that, because of track geometry, this cannot be moved to take it further away from 4 Bladon Close.

Crossover design and track base structures

The Independent Expert advised, at an earlier stage in the assessment, that *'there is no such thing as a design for S&C for the mitigation of vibration. Further, NR designs are strongly controlled for (the) safety of the system'*. While we are aware of a couple of research studies which seek to address this issue, neither offers a solution that can be validated or exists in approved form, for use in short sections of track.

Vertical 'barrier' solutions

In theory, it should be possible to design and implement track side barriers below ground that attenuate vibration. However, there are no proven solutions and, were such a solution to be pursued, it may well not be possible to robustly predict its performance, but to install the barrier and measure performance in a 'before and after' situation.

Local speed restriction

In order to avoid the night-time vibration exceedance, train speeds for passenger and conventional freight would have to be substantially reduced at and at either side of this crossover. However, any substantial reduction, particularly in freight speeds, would increase noise impacts above those predicted in the Noise SoA due to the increased "pass-by" time.

Although Network Rail legitimately imposes speed restrictions for safety reasons, neither Network Rail nor any regulator, such as the ORR or a local planning authority, has the powers to impose speed restrictions (or other operating restrictions such as train service frequencies/hours of operation/types of rolling stock to be used) for environmental reasons.

Monitoring and potential installation of post-construction mitigation

Network Rail is prepared to continue research into vertical barrier solutions at this location. Because there is real doubt whether the crossover will generate vibration above the threshold level at 4 Bladon Close and because there is no proven solution, this would best be pursued by monitoring the vibration levels that arise at 4 Bladon Close after the new track is installed, and then implementing an experimental barrier, if there are exceedances. Further monitoring would then be done after the barrier had been installed.

Eligibility for Compensation at 4 Bladon Close

This is not strictly a mitigation measure. It is, however, the case that all residents adjoining the railway, including the owners of 4 Bladon Close, retain their rights to seek compensation from Network Rail, after the railway re-opens, for 'injurious affection' under the Land Compensation Act 1973.

Conclusion re 'not reasonably practicable'

Planning condition 19(12) anticipates a situation in which there are no mitigation measures that are 'reasonably practicable' which would meet the requirements of the Noise and Vibration Mitigation Policy. In these circumstances, the local planning authority has to be satisfied 'that the mitigation in question is not reasonably practicable and that there is no suitable substitute'.

In the present situation, Network Rail is of the view that there are no measures that are reasonably practicable and can be proven, at this stage, to meet the night -time vibration threshold set in the Policy for 4 Bladon Close if the Arup view on 'worst case assumptions' is taken. Given that the exceedance only occurs under this condition, it would still be entirely proper for the City Council to conclude that the test in Condition 19(12), referred to above, is being met and to proceed to approve the VSoA, without requiring any mitigation.

Network Rail, however, recognises that 4 Bladon Close presents particular problems in relation to the uncertainty of the predicted outcomes and is prepared to commit to post construction vibration monitoring and, if necessary, to install vertical barriers, if further research and analysis suggests that these are likely to be effective in reducing vibration exposure below the threshold level.

Further Refinement of Noise Mitigation Measures

There has been substantial public interest and comment on the potential use of 'at source' noise mitigation measures, and in particular 'silent track'. This is not 'type approved' for use on the Network Rail mainline network at the line speeds that are proposed in North Oxford. However I can confirm that progress has been made in gaining a further 'trial certificate' and it is now planned to install 'silent track' in Wolvercote cutting on an experimental basis where its performance will be monitored, as part of the process for securing type approval. This will give a further reduction in residual noise levels (often quoted as 3dB(A) where rail:wheel noise is the predominant source). This additional noise reduction has not been taken into account in the Noise Scheme of Assessment, which I believe is appropriate, given that there can be no guarantee, at this stage, that 'silent track' can remain installed permanently at this location.

As you know, the final noise barrier designs for Section H, will need to be submitted for approval in relation to their *'size, appearance and location'* by the City Council under Condition 19(13). Part of the continuing design process is intended to refine the barrier designs, and, wherever reasonably practicable, to improve their performance over and above the noise reductions predicted in the Noise Scheme of Assessment. This could take the form of higher barriers in specific locations, subject to detailed design and the approval of the City Council as local planning authority.

Conclusion

I hope that I have, in this letter, addressed all of the present outstanding issues in relation to the Noise and Vibration SoAs for Section H. We recognise that there may be future responses required following the further public consultation. Please refer these to myself and also to ERM as soon as these are received, so that we can assist in providing responses for timely inclusion in the Committee Reports for the West Area Planning Committee meeting on 12 May 2015.

I hope that these reports can now be prepared with a positive recommendation for discharge of Condition 19 in Section H.

Yours sincerely,

Andy Milne
Senior Programme Manager
East West Rail