

**TRANSPORT AND WORKS ACT 1992
TOWN AND COUNTRY PLANNING ACT 1990
PLANNING (LISTED BUILDINGS AND CONSERVATION AREAS) ACT 1990**

**PROPOSED LONDON UNDERGROUND
(NORTHERN LINE EXTENSION) ORDER**

**TRANSPORT FOR LONDON'S REBUTTAL
OF
THE EVIDENCE OF THE HEART OF KENNINGTON RESIDENTS' ASSOCIATION
ON
GROUND SETTLEMENT, KENNINGTON STATION, AND NOISE AND
VIBRATION**

DECEMBER 2013

1. INTRODUCTION

- 1.1.1 This rebuttal has been prepared on behalf of Transport for London to address the evidence of the Heart of Kennington Residents' Association (OBJ 30) ("HKRA") related to ground settlement, Kennington station, and noise and vibration.
- 1.1.2 It is not intended that this rebuttal should address points that witnesses for TfL have previously covered in their evidence; however, cross-references to relevant paragraphs of those witnesses' proofs of evidence are made where appropriate.
- 1.1.3 It is intended that this rebuttal proof should be a composite response to those issues raised by the objector as set out above. In this respect, for cross-examination purposes the name of the TfL witness who is responsible for each aspect of this rebuttal proof is given at the beginning of each section below.
- 1.1.4 This rebuttal proof begins with ground settlement, followed by noise and vibration, and Kennington station. For each of these sections, the points are organised into sub-themes with the objector's point summarized in plain font, with any quotations shown in italics. This is followed by TfL's response in bold font, preceded by the name of the witness making that part of the rebuttal. Within each sub-theme, there may be several points, each of which is dealt with separately in turn, and with the witness identified as described.

2. GROUND SETTLEMENT

2.1 *Impacts on owners of properties at risk from ground movements*

2.1.1 The HKRA proof sets out in paragraph 6 the follow concern:

“We do not want a pocket of properties at risk from ground movements and therefore potentially unsale-able as well as possibly uninhabitable”

TfL witness: *Jonathan Gammon*

2.1.2 **London has experienced a number of major tunnelling and civil engineering projects in recent years, including Crossrail and the Jubilee line extension. As a result, there is extensive experience of how the ground behaves when tunnels, shafts and station boxes are constructed and how to minimise the effects of ground movement on structures and utilities above.**

2.1.3 **For this specific application, I have explained in chapter 16 of my Proof of Evidence [TFL2/A] the process for the assessment of the potential impact on properties along the route and the types of mitigation measures that will be put in place if required. This reflects the approach approved by Parliament in relation to Crossrail. I have referred to this basis additionally in [TFL29].**

2.1.4 **All owners of property within the ‘limits’, which includes those properties predicted to experience 10mm or more of settlement (identified as part of TfL’s Transport & Works Act Order application for the Northern line Extension, April 2013) will receive a building defects survey by a qualified chartered building surveyor or engineer commissioned by TfL at TfL’s cost. TfL is also willing to enter into a ‘Settlement Deed’ relating to these properties, on the property owner’s request. The Deed would regulate the timescales relating to the survey process and the rectification of any damage, as set out above. If the Transport & Works Act Order is made, TfL will then write to all property owners within the ‘limits’ to offer them a Settlement Deed.**

2.1.5 **The works will be designed and carried out such that any damage caused to property will be limited to slight, or less, meaning that if any damage is caused it will be non-structural and therefore repairable without undue difficulty.**

2.1.6 **Appropriate analysis and research has been undertaken for the current stage of the project’s design. More detailed assessment will be conducted during detailed design.**

2.1.7 A range of measures can be used during tunnelling and excavation works to reduce the magnitude of ground movements generated. The detail of the measures will depend on the type of construction involved. These include all actions taken from within the tunnel, shaft or box construction to reduce the ground movements generated at source.

2.2 Anticipated level of risk to properties from ground movements

2.2.1 In paragraph 8 the HKRA proof asks what ‘*significant*’ means further to being told informally by TfL that although a number of properties would be potentially affected by the gallery tunnel construction, there would be no ‘significant’ increase in risks to the properties beyond those of construction of the main running tunnels.

2.2.2 In paragraph 9 the HKRA proof states that TfL should specify to individual property owners what increase in risk they do estimate for properties affected by the construction of gallery tunnels over and above the risks faced by construction of the main tunnels. The HKRA proof does note that they consider the assessment process and draft Settlement Deed to be “*fair*”.

TfL witness: *Jonathan Gammon*

2.2.3 **The potential impact of the construction of the running tunnels and the gallery tunnels upon ground movement was assessed in the ES. The detail of this can be found in the Buro Happold Report in the ES Appendix I2. At Appendix A5 a series of plans is set out that identify the buildings examined in the phase 2 assessment and their classification in terms of potential impact. None of the buildings in the vicinity of Kennington station have been identified as being at risk of anything more than “slight” damage.**

2.2.4 **The “slight” damage category is taken from the work of Burland *et al* (1977). The tensile strains relevant to this category equate in practice to the potential for cracks to be caused that are easily filled. This level of damage would thus be mitigated via the Settlement Deed and the commitments given in the CoCP that TfL will remedy damage caused.**

2.2.5 **It has to be remembered that the gallery tunnels have a much smaller diameter than the running tunnels with a similar elevation, thus it is not expected that the gallery tunnels will significantly increase the risk of settlement on the properties above.**

3. NOISE AND VIBRATION

3.1 *Code of Construction Practice: consultation*

3.1.1 Paragraph 10 of the HKRA Proof of Evidence notes that they have not seen a draft of the final version Code of Construction Practice.

TfL witness: *Richard de Cani*

3.1.2 **A draft was included in the original TWAO submission (Appendix N1 of Volume II of the ES [NLE/A19/5]) and an updated version provided in Appendix NA of the Environmental Statement Addendum [NLE/A19/9]. Transport for London has engaged regularly with the Councils regarding the Code of Construction Practice (CoCP). The document has also been available to other stakeholders and local residents to comment on since submission of the TWAO.**

3.1.3 **A further update has been submitted to the Inspector that reflects some further comments from stakeholders [TFL13A]. Transport for London has now reached substantial agreement on the details of Part A of the CoCP with the London Boroughs of Lambeth, Wandsworth and Southwark, and the Environment Agency and English Heritage. TfL remains open to any further suggested changes to Part A made during the course of the Inquiry.**

3.2 *Impacts of operation on noise and vibration levels*

3.2.1 The HKRA proof in paragraph 11 notes the possibility of additional noise and vibration from the step plate junctions and adjacent stretches of track between the step plate junctions and Kennington station. It states that the trains using the section of track between Kennington station and the new line will be more frequent than the trains currently using the Loop, and will also be laden with passengers.

TfL witness: *Richard de Cani*

3.2.2 **The NLE does not increase frequency of trains on the Kennington Loop. As part of the Northern line upgrades discussed in paragraph 3.4.4 of my Proof of Evidence [TFL1/A] the frequency of trains on both branches of the Northern line will be increased. TfL will ensure that the level of groundborne noise on the stretch of track between Kennington Station and the step plate junctions will be no worse with the NLE than the position without it.**

3.2.3 In paragraph 14 the HKRA proof goes on to state that:

“Studies show that noise levels of 35dB L_{max} can wake people up, and 32dB L_{max} disturbs sleep.”

TfL witness: *Rupert Thornely-Taylor*

3.2.4 **The objector has not cited which study they are referring to or whether the noise index is a “fast” or “slow” index so I respond to this point in general: In my Proof of Evidence I set out in section 5.4 a comparison of the proposed design level with national and international guidance. I demonstrate that the proposed design level of 35 dB LAF_{max} is lower than the “No Observed Effect Level” for transportation noise in general and the L_{night} level identified at the NOEL threshold within the Night Noise Guidelines for Europe. I do not accept that the adoption of the design level proposed would result in sleep disturbance.**

3.3 Confidence in predicted noise levels

3.3.1 The HKRA proof in paragraph 13 notes that statements made by TfL indicate a sliding away from the 30dB predictions.

TfL witness: *Rupert Thornely-Taylor*

3.3.2 **The NLE will be designed to achieve a maximum level of 35dB LAF_{max}. I explain in section 5 of my Proof of Evidence [TFL3A] why this noise level is sufficient to prevent adverse impacts on amenity and how it complies with relevant policy and guidance. To be clear this design level would be the lowest ever adopted in any underground railway in the UK.**

3.3.3 **The noise predictions as set out in the Environmental Statement (ES) [NLE/A19/1] for the operation of trains on the NLE give a high level of confidence that by incorporating appropriate mitigation the requirement of 35dB LAF_{max} can be achieved even at the locations where noise levels are predicted to be at their maximum. The trackform used for NLE, and the incorporated mitigation, will be consistent along the whole length of NLE so it follows that the noise levels predicted for most of the length of NLE are less than the maximum and below 30dB LAF_{max} in many cases as set out in the ES.**

3.3.4 **I have carried out a benchmarking exercise to compare the noise guidance for the NLE with international practice and the predicted NLE noise levels are in line with, or are better than, best practice elsewhere. For example the highest level predicted is better than the current Night Noise Guidelines for Europe. The NLE design specification complies with the most relevant of the WHO guidelines.**

3.3.5 The proposed condition to control groundborne noise arising from the plan track would require a design aim of 35 dB LAFmax to be achieved. I have explained to the Inquiry that there is “pinch point” on the track to the West of Kennington Station such that the levels identified in the ES at Table 9.31 can be relied upon.

3.3.6 The HKRA proof goes on to state in paragraph 14:

“It seems to us to be inadequate and inappropriate for TfL to aim for 35dB Lamax round the step plate junctions, just where the line will be shallowest and noise levels most intrusive.”

and in paragraph 18:

“No detail is given of the “measures [to] be taken to ensure that noise levels on this short section of the line will not increase as a result of the NLE” and given TfL’s answers to previous complaints, these promises of no ‘increase in noise as a result of NLE trains’ using that particular stretch of track seem to us to be unrealistic.”

TfL witness: Rupert Thornely-Taylor

3.3.7 The planning condition proposed to control the levels of ground borne noise arising from the operation of trains across the step plate junction applies the same approach and design level as is applied to the rest of the railway, namely a design level of 35dB LAFmax. This is a No Observed Effect Level. To adopt such a design level is entirely consistent with policy and with scientific research which does not identify any effect upon the human body of noise below this level at night.

3.3.8 The track form in the vicinity of the step plate junctions will be a special case. It is likely that a special resilient track support system will be required to achieve the noise level in the draft planning condition of 35dB LAFmax. I explain in section 5 of my Proof of Evidence [TFL3A] why this noise level is sufficient to prevent adverse impacts on people and how it complies with relevant policy and guidance.

3.3.9 Because this means that the designer has to achieve the design level at “pinch points”, i.e. the locations likely to experience the highest levels of groundborne noise, the consequence is likely to be that levels of ground borne noise actually experienced in the vast majority of cases will be considerably below the design level.

3.3.10 Indeed, the JLE was designed to a design level of 40 LASmax but the outturn has been that ground borne noise levels actually experienced are significantly below that level, i.e. 28 to 30 LAFmax (see my Proof of

Evidence [TFL3-A] page 17 paragraph 5.2.5). This demonstrates that the approach proposed to be adopted is effective in practice.

3.3.11 In paragraph 15 the HKRA proof states:

“...if the predictions of noise levels along the line turn out to be wrong and the levels are higher than 30dB L_{max}, it is quite unrealistic to expect that it will be possible to take any significant remedial action once construction is finished.”

3.3.12 The proof also expresses a concern that TfL will be relying permanently on ‘*uncertain measures*’ (e.g. reduced train speeds) for achieving acceptable noise levels for a project with this sort of life expectancy.

TfL witness: *Rupert Thornely-Taylor*

3.3.13 **In the tender documents for the construction of the NLE TfL will require bidders to design the works such that it can be demonstrated that groundborne noise levels are expected to be no more than 35dB L_{AFmax} across the length of the extension. This will be made legally binding in the form of a planning condition.**

3.3.14 **I am confident that the design aim can be achieved. In my experience it is extremely unlikely that remedial action following construction would be required. However, the proposed conditions provide for such action to be undertaken if necessary.**

3.3.15 **TfL Commitment 2: Operational Noise [TFL10] explains the approach taken by TfL to ensure the effective mitigation of operational noise arising from the use by underground trains of the new railway to be constructed as part of the NLE.**

3.3.16 **The note sets out the details of the two principal components to TfL's approach:**

- **local authority control through the imposition of a planning condition dealing with operational noise; and**
- **contractual control through requirements imposed on the contractor appointed to construct the NLE.**

3.4 Construction standards to reduce noise impacts

3.4.1 In paragraph 14 the HKRA proof states:

“...the whole of the new line, including the step plate junctions, should be constructed to the highest standards of noise mitigation using the best available technology, such that the predicted 30dB Lamax levels are certain to be achieved along the full length of the line. If that is not done, there will be a significant risk of disturbance for the occupants of houses above and around the step plate junctions where the tunnels are nearer the surface and predicted noise levels are higher.”

TfL witness: *Rupert Thornely-Taylor*

- 3.4.2 The NLE will be designed to achieve a maximum level of 35dB LAFmax. TfL will appoint a contractor to design and construct the NLE following a competitive tender exercise. The successful bidder will enter into a contract with TfL. Through this 'design and build' contract, TfL can impose requirements on the contractor. Further, these requirements can be set down within the tender documentation as obligations with which all bidders must comply. In this way, TfL can ensure that the construction contract will ultimately include particular requirements.**
- 3.4.3 TfL will include within the tender documentation an obligation to comply with the terms of the operational noise planning condition. In other words, the contractor will be contractually obliged to design the NLE to meet the 35dB LAFmax noise limit. The contractor will also be required to adopt an iterative process to the design of the NLE. This process will require the contractor to submit design work to TfL for review and acceptance. In reviewing the contractor's design work TfL will ensure that the requirements of the operational noise condition (and the terms of the design and build contract) have been complied with. TfL will reject submissions which are not satisfactory and the contractor will not be able to proceed until its design work meets the relevant standards.**
- 3.4.4 If the 30 dB Lamax level proposed was adopted as a design aim this would add costs to the project but would not secure any additional public benefit as the 35 dB LAFmax level is the No Observed Effect level. No additional effect is observable between 30 dB LAFmax and 35 dB LAFmax. The adoption of the 35 dB LAFmax design level proposed would not result in sleep disturbance.**
- 3.4.5 Further details are set out in section 3 of the TfL Commitment 2: Operational noise [TFL10].**
- 3.4.6 In paragraph 18 the HKRA proof states that the existing track must be upgraded to modern quieter standards and if TfL expect difficulty in achieving the necessary improvements, it should be explicit and honest about it. Paragraph 16 refers to an earlier response received from TfL in relation to questions relating to track improvements.**

TfL witness: *Rupert Thornley-Taylor*

- 3.4.7 The NLE results in less use of the Kennington Loop than occurs at present, as welcomed in the HKRA proof at paragraph 11. It thus delivers a noise improvement for those occupying buildings above the loop. As the NLE delivers improvement already it is not necessary in order to mitigate the impacts of the NLE scheme to require works to the trackform of the loop.**
- 3.4.8 TfL is currently considering proposing a draft condition to ensure that groundborne noise on the stretch of track between Kennington Station and the step plate junctions will be no worse with the NLE than the position without it.**

4. KENNINGTON STATION

4.1 Accommodating passenger interchanges

4.1.1 In paragraph 20 the objector raises doubts over the ability of additional cross passages to handle increased number of passenger interchanges.

TfL witness: *David Bowers*

4.1.2 **As set out in section 3.4 of Richard de Cani's Proof of Evidence [TFL/1A] both of the Northern line upgrades (NLU1 and NLU2) will have been completed by the time that interchange traffic is forecast to reach its peak, this will accommodate more passengers on the line and, with more frequent trains, will reduce the time that a passenger waits for their train, thereby enhancing the interchange experience.**

4.1.3 **Figure 45 of my Proof of Evidence [TFL/7B] shows that in the "Without NLE" scenario, the situation at the station as a result of future passenger growth on the existing line is expected to result in crowding on the platform reaching to Level of Service D and E at two of the existing cross passages (this categorisation is demonstrated in Figure 43). Figure 45 shows that when the NLE is constructed, adding two additional cross passages to the platform pairs, a Level of Service C is maintained across the peak 15 minute periods in both AM and PM peak periods and across all platforms and all passages. I would emphasise therefore that the works associated with the NLE actually mitigate the impact of future passenger interchange in addition to facilitating the new movement to and from Battersea and make the future situation at Kennington better than if the NLE were not implemented.**

4.1.4 **Furthermore, as shown in TFL44, even if the level of interchange at Kennington was significantly higher than forecast as a result of the NLE, the station would still operate more efficiently and with less crowding than it would do without the NLE.**