

Northern line extension

Factsheet F: Operational noise and vibration on the proposed Northern line extension

1. Background

We understand the concerns of some residents about the potential impact noise and vibration could have once the Northern line extension (NLE) becomes operational. We take these concerns seriously and we are committed to ensuring that the proposed extension will meet the levels defined in Transport for London's (TfL) London Underground Noise and Vibration Asset Design Guidance.

2. TfL's Noise guidance for new underground railways

This guidance commits us to a noise criterion for underground trains running on a new railway track of a maximum of $40\text{dB}_{L_{AFmax1}}$ and to use reasonable endeavours to meet a more stringent measure of $35\text{dB}_{L_{AFmax}}$. The NLE is being designed to meet noise levels of $35\text{dB}_{L_{AFmax}}$.

Rupert Taylor is a world leader in the field of vibro-acoustics of railway structures and tunnels, with extensive experience in the measurement of railway vibration

and noise, including on the London Underground. He has recently completed a benchmarking survey of underground railways across the world and his conclusion is that TfL's London Underground commitment sits within the range of limits and guidance values found worldwide. He also concludes that TfL's standard is better than that of Crossrail and the Dublin Metro for residential areas.

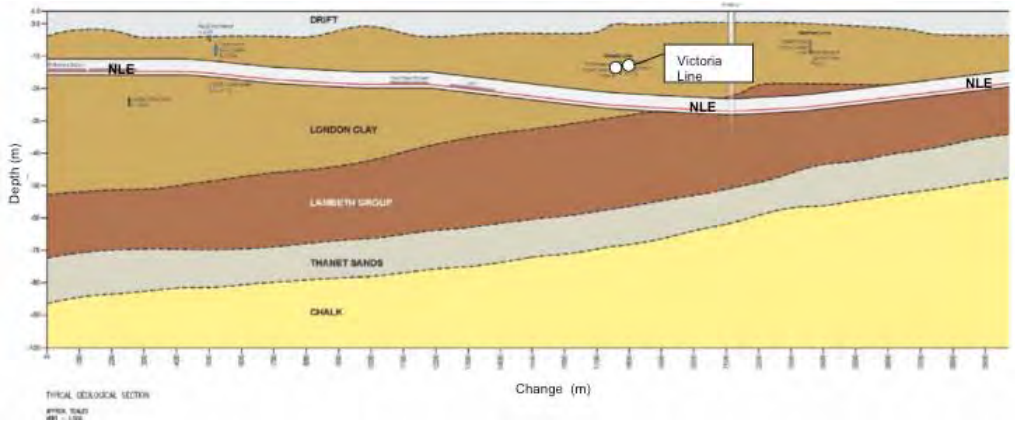
The environmental statement submitted as part of our NLE Transport and Works Act Order (TWAo) application makes an assessment of the future operational noise and vibration impacts of the extension.

3. Groundborne noise - existing Victoria line

In July 2012 TfL undertook noise and vibration surveys at three sites on the existing Victoria line, where the tunnel construction, depth and ground conditions are similar to those of the proposed NLE (see Figure 1). These measurement locations were



Figure 1 Ground conditions and depth of the NLE



chosen as they were the closest points to the proposed NLE that had suitable below ground access.

The Victoria line monitoring locations are shown in Figure 2.

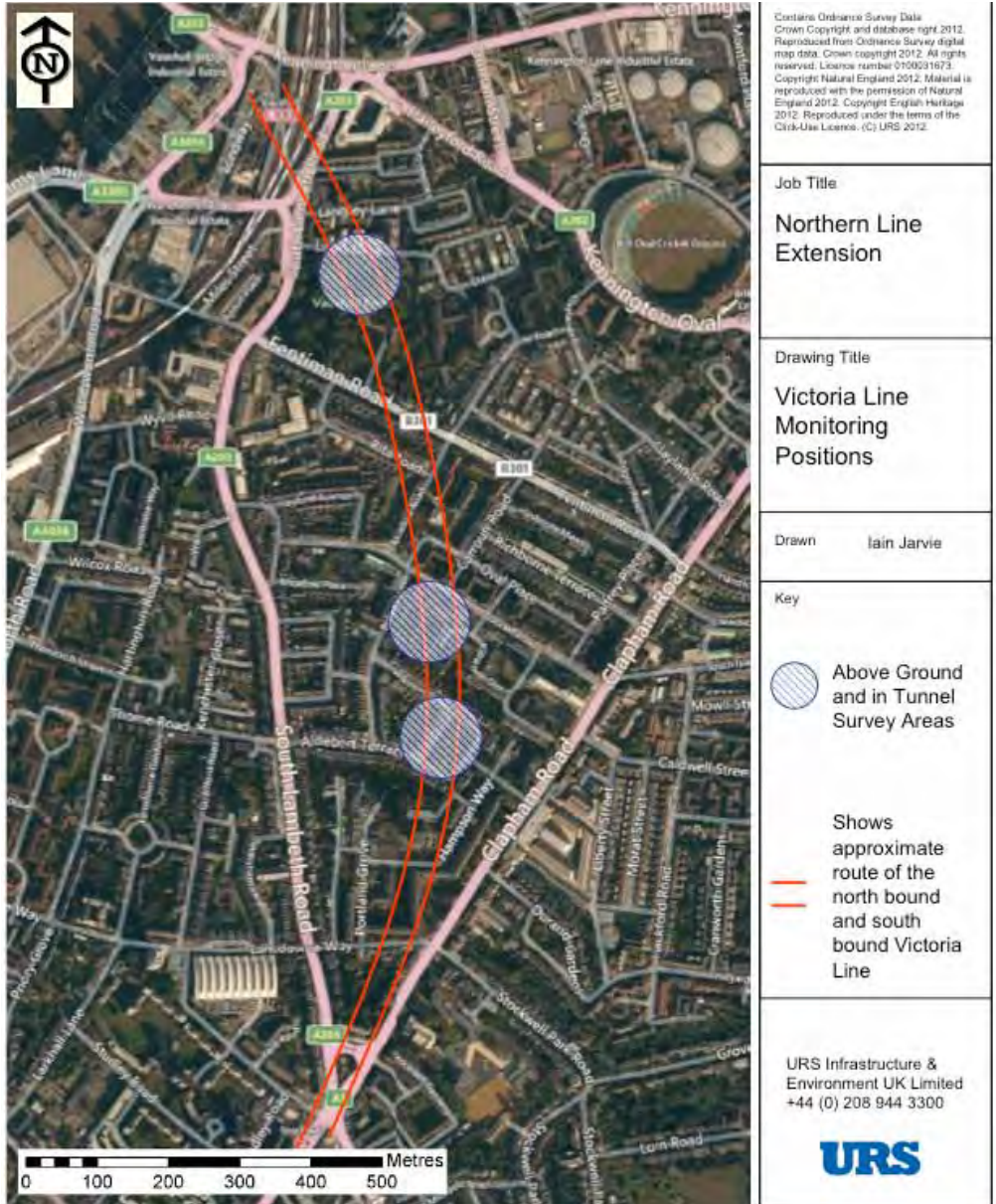
The measurements have been used to verify the groundborne noise and vibration prediction models used for the NLE. The prediction methods are comparable with those used on recent railway engineering projects including Crossrail, the Jubilee line extension and the Docklands Light Railway (DLR).

4. Groundborne noise – predictions for the NLE

Predictions of groundborne noise and vibration levels were carried out with and without noise mitigation measures. Where the initial predictions without mitigation identified properties that were likely to have noise levels which exceed TfL's London Underground noise and vibration guidelines, the effect of possible mitigation measures was then tested in the model.

Table 1 outlines the predicted noise levels at a number of residential receptors along the route. The highest predicted noise level for the NLE without mitigation is 45dB_{LAFmax} for receptors adjacent to step plate junctions (where the new tunnels join the existing ones) and points and crossings and 38dB_{LAFmax} or lower for receptors along the rest of the route.

Figure 2 Victoria line monitoring locations



The highest predicted noise level with mitigation is 35dB_{L_{AFmax}} for receptors adjacent to the the step plate junctions and points and crossings. The levels are predicted to be 27dB_{L_{AFmax}} or lower for receptors along the rest of the route.

5. Possible mitigation measures for the NLE

Our modelling predicts that through the use of mitigation measures such as resilient base plates, a reduction of at least 10dB in groundborne noise levels can be achieved. This method of mitigation has been used successfully on the Jubilee line extension.

We therefore have a high level of confidence that the operational noise levels on the NLE will fall well within our 35dB_{L_{AFmax}} design criterion.

6. Airborne noise from ventilation shafts and stations

There are two permanent shafts for emergency access, smoke extraction and ventilation located at Kennington Green and Kennington Park. The shafts at these locations are underground, but require a head house for ventilation fans and other equipment. There are also ventilation shafts proposed at Nine Elms and Battersea stations.

Table 1 Predicted groundborne noise levels – with and without mitigation

Receptor	Predicted L _{AFmax} dB without mitigation	Predicted L _{AFmax} dB with mitigation
Adrian House, Wandsworth Road	38	27
MawbeyBrough Health Centre	38	27
1 Dorset Road	38	27
64 Meadows Road	37	26
71 Fentiman Road	32	21
17 Carroun Road	31	20
24 Claylands Road	33	22
AshmolePrimary School	38	27
56 HanoverGardens	38	27
Lockwood House, Kennington Oval	38	27
HenryFawcettJuniorSchool	38	27
16 Aulton Place	40	30
87 de Laune Street	45	35

The ventilation fans will only be used during periods when trains are stationary within the tunnels for a prolonged period of time as a result of breakdowns or emergencies. They will not be used during normal day to day operations of the line. Operation of the tunnel ventilation fans is therefore only expected on an occasional basis and would rarely, if ever, occur during the night time. Smaller capacity Under Platform Exhaust (UPE) fans located at the stations will be operated seasonally.

The sound from the tunnel ventilation fans has been predicted using guidance from a BS standard (BS4142:1997) which assesses industrial noise in a residential environment. In the case of the NLE, this compares the background noise levels close to residential locations and the rating level of the ventilation fans. For the NLE, the target is for the rating level to be 5dB less than the existing night-time background noise levels. This target is to be achieved 1 metre outside the facades of the closest noise sensitive receptors (for example, residential properties) to each tunnel ventilation fan. The assessment has concluded that this level can be achieved with the proposed designs for the ventilation fans.

A range of mechanical equipment will be located at the new stations. These will meet the proposed target through good design practice, the installation of suitable attenuators and acoustic screens and locating equipment in enclosures and plant rooms as necessary.

It is considered the cumulative noise levels from mechanical services equipment and activities at each of the stations will meet the proposed design target based on the typical lowest night time background noise level. It should be noted that most noise producing activities will only occur during the day and the ventilation fans at the permanent shafts will only be used occasionally. This means that the effects of airborne noise as a result of the NLE are likely to be negligible.

7. Further information

If you would like more information about the Northern line extension please email nle@tfl.gov.uk

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