



**CLIENT: LONDON UNDERGROUND LIMITED**

**CONTRACT REF: TLL 7917**

**NORTHERN LINE EXTENSION**

**MAIN WORKS CONTRACT**

## **NOISE AND VIBRATION MANAGEMENT PLAN**



### **Issue and Revision Control**

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### 1.0 Introduction

This Noise and Vibration Management Plan relates to the management of construction noise and vibration only and applies the commitments within the Northern Line Extension (NLE)

Code of Construction Practice (CoCP) Part A and associated contractual environmental requirements regarding the noise and vibration aspects of works. It is to ensure all contractual and legal obligations are satisfied in addition to ensuring works are implemented in a considerate way to avoid unnecessary noise and vibration impacts.

To ensure that this document remains relevant, adequate and effective as the works progress, the Noise and Vibration Management Plan will be reviewed and updated as necessary:

- following any change in scope of work that has an impact on environmental requirements;
- as instructed by the Project Manager; and
- at least every 6 months.

This plan complies with the requirements of the Code of Construction Practice Part A.

## **2.0 Purpose and Scope**

The purpose of this Construction Noise and Vibration Management Plan is to ensure that the works are undertaken in accordance with the NLE requirements, to ensure that the Section 61 consent process is properly managed and that Best Practicable Means (BPM) is employed to control noise and vibration for all works undertaken.

This plan is used in the preparation of the construction risk assessments and method statements (RAMS) and to inform site personnel of the NLE requirements to properly manage noise and vibration throughout the construction phase of the NLE.

## **3.0 Project Scope**

This plan is designed to cover the construction of the NLE which will create a new underground line as an extension to the existing Charing Cross branch of the Northern line between Kennington and a terminus station to the south of Battersea Power Station. The extension will consist of new twin bore running tunnels of 5.2m internal diameter and covering a distance of approximately 3.3km with two permanent ventilation shafts at Kennington Park and Kennington Green and new stations at Battersea and Nine Elms.

### **3.1 Description of the sites**

The surface worksites associated with the construction of the NLE are located at Battersea, Nine Elms, Kennington Park and Kennington Green.

**Battersea Station worksite** is located within the south western section of Battersea Power Station (BPS) Development, within the London Borough of Wandsworth. Where the worksite abuts Battersea Park Road, Battersea Park Road is at a higher level than the site. The site is bounded to the west by Network Rail, to the north by Battersea Power Station and to the east by the Battersea Power Station Development Company.

**Nine Elms Station worksite** including part of the Covent Garden Market Authority (CGMA) is located on the land to the west of A3036 Wandsworth Road and north of its junction with

Pascal Street, within the London Borough of Lambeth. The worksite includes the north footway of Pascal Street. The worksite is bounded to the north by a Sainsbury's worksite and to the west by land owned by Covent Garden Market which is within the London Borough of Wandsworth. The demolition of the Banham building on the west end of the worksite, the CGMA office, boiler house, including the chimney and underground fuel tanks and the relocation of two substations are necessary to release the full area of the worksite.

**Kennington Green worksite** is located at Kennington Green within the London Borough of Lambeth. The triangular site is bounded on all three sides by Kennington Road, the eastern boundary being the main route of the road. The worksite includes footways and parking bays. It is necessary to carry out some demolition to release the full worksite. There is a local satellite worksite (hereafter referred to as Montford Place) to the west of Kennington Green adjacent to the Beefeater Gin Distillery and this is accessed via a narrow road to the west of Kennington Green. The area although not containing any permanent works for NLE is very close to the Kennington Green shaft. FLO has taken early occupation of the area and developed it for 'satellite' temporary offices and storage.

**Kennington Park worksite** is located in the north east corner of Kennington Park, south of Kennington Park Place and west of its junction with St Agnes Place, within the London Borough of Lambeth. It is necessary to demolish Kennington Park Lodge to release the full worksite.

Two shafts of approx. 25m deep will be sunk at Kennington Green and Kennington Park respectively. These shafts will be used to remove the Tunnel Boring Machine's (TBM), service the Sprayed Concrete Lining (SCL) running tunnels up to the step plate junction, build the step plate junction and build the four cross passages at Kennington Station. The current proposal to build the step plate junction includes two SCL gallery tunnels but this method is currently being reviewed.

### **3.2 Tunneling works**

The project will launch two Earth Pressure Balance Tunnel Boring Machines (TBMs) from the Battersea Power Station site, from here the TBM's will travel approximately 2.5km where they will then be dismantled and removed from two previously constructed shafts located in Kennington Green and Kennington Park.

All TBM operations will be carried out up to 24 hours a day 7 days a week over a seven month period during which each TBM will be travelling up to 30 metres per day, building pre-formed rings behind it as it advances. The TBM's will travel mainly through London Clay and will vary from 20m to 33m below ground level. As the TBM advances it will be supplied by a locomotive and rolling stock which will carry all personal, equipment and materials required for tunnelling operations. The spoil however will be carried back to Battersea by a conveyor in each tunnel.

### **3.3 Sprayed Concrete Lining**

There are a number of areas on this project where Sprayed Concrete Lining (SCL) tunnelling techniques will be used:

- Two overrun tunnels at Battersea Site of approximately 180m in length.
- Five cross passage connections between running tunnels (3 located within the TBM drive and 2 in the overrun tunnels).
- Two tunnels from Kennington Green and Kennington Park Shafts (approx. 230m and 145m long respectively) up to the existing Kennington Loop where we will then commence our Step Plate Junction Works.
- Four cross passages within the existing Kennington Station.

The SCL works involve mechanically excavating the tunnel and then rapidly spraying the excavated ground with concrete to stabilise it and form the permanent tunnel lining. Unlike bored tunnels which are built using a tunnel boring machine, SCL allows variation in the tunnel shape and diameter.

All of these works will be carried out up to 24 hours a day and up to 7 days a week except in the cases where we are working in close proximity to the existing London Underground Assets which will be carried out during times agreed with London Underground.

A review of the SCL activities associated with tunnelling is undertaken prior to works commencing and during each phase of the works and all reasonable endeavours are taken to minimise the levels of ground borne noise and vibration from these activities.

#### **4.0 Working hours**

The core working hours (for all works outside of tunnelling) are from 08:00 – 18:00 on weekdays (Monday to Friday excluding bank holidays) and 08:00 – 13:00 on Saturday. Tunnelling works together with directly associated surface activities will normally be carried out on a 24 hours per day, 7 days per week basis. Once tunneling has commenced it will need to continue uninterrupted for reasons of engineering practicability and safety.

In addition to the core working hours, start up and shut down activities can take place for up to one hour before and after these times, these activities can include but are not limited to:

- Maintenance
- Site briefings, meetings and training

The start-up and shut down activities do not include operation of plant and materials, equipment and machinery. The start-up and shut down periods shall not be regarded as extensions to normal working hours and particular care will be taken to limit and control disturbance to local residents during such periods.

Non-disruptive preparatory works, repairs and maintenance may be carried out on Saturday afternoons 13:00 – 18:00 and Sundays between 10:00 - 16:00.

Ferrovial Agroman Laing O'Rourke Joint Venture (FLO) will adhere to the normal working hours as far as reasonably practicable. If the project team believes that some works would cause less disturbance and/or disruption if carried out wholly or partly outside normal working hours, this will be identified to the *Project Manager* prior to permission being sought from the relevant local authorities as part of a Section 61 application. This rescheduling of works will take into account impacts upon local receptors.

## **5.0 Definitions**

### **5.1 Section 61**

Section 61 of the Control of Pollution Act, 1974 (CoPA) allows a contractor to apply for prior consent to undertake construction works in a specific manner. Site specific conditions can be attached to the consent by the local authority.

### **5.2 Best Practicable Means**

The Northern Line Extension project requires that Best Practicable Means is adopted at all times for all works.

Practicable means reasonably practicable having regard, among other things, to local conditions and circumstances, to the current state of technical knowledge and to also consider financial and health and safety implications.

The means to be employed include the design, installation, maintenance, manner and period of operation of plant and machinery, and the design, construction and maintenance of buildings and structures.

### **5.3 Guidance**

The following guidance for the assessment of noise and vibration arising from construction activities will be utilised throughout the duration of this project.

- BS5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites. Part 1: Noise;
- BS5228-2:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration;
- BS4142:2014. Method for rating industrial noise affecting mixed residential and industrial areas;
- BS6472-1:2010: Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting;
- BS 7385-1: 1990. Guide for measurements of vibration and evaluation of their effects on buildings;
- BS 7385-2: 1993. Guide to damage levels from ground borne vibration;
- Transport Research Laboratory Report 429. Ground borne Vibration from Mechanical Construction Works, 2000; and
- London Underground Northern Line Extension Construction Noise and Vibration Mitigation Scheme.

## 6.0 Selection and use of equipment

FLO will, as far as reasonably practicable, seek to control and limit noise and vibration levels associated with construction activities. This is done by observing the following:

- Each item of equipment used for the *Works* complies with the noise limits quoted in the relevant European Commission Directive 2005/88/EC and regulation (EC) 219/2009/ United Kingdom Statutory Instrument (SI) 2005/3525. The Noise Emission in the Environment by Equipment for Use Outdoors Regulations (as amended);
- Adopting the recommendations for the control of noise, as set out in BS 5228-1:2009+A1:2014 section 8, and for the control of vibration, as set out in BS 5228-2:2009+A1:2014 section 8. Where alternative authoritative guidance and procedures are thought to be more reasonable and have been agreed in advance with the relevant local authority, these are adopted in place of the aforementioned;
- Plant and equipment liable to create noise and/or vibration whilst in operation is, as far as reasonably practicable, located away from sensitive receptors. The use of barriers to absorb and/or deflect noise away from noise sensitive areas are employed where required and reasonably practicable;
- All plant, equipment and noise control measures applied are maintained in good and efficient working order and operated such that noise emissions are minimised as far as reasonably practicable. Any plant, equipment or items fitted with noise control equipment found to be defective will not be operated until repaired;
- Where reasonably practicable, fixed items of construction equipment will be electrically powered in preference to being diesel or petrol driven;
- Vehicles and mechanical equipment utilised on site for any activity associated with the construction works are fitted with effective exhaust silencers and are maintained in good working order with sustained efficient performance and operated in a manner such that noise emissions are controlled and limited as far as reasonably practicable;
- Machines in intermittent use are shut down or throttled down to a minimum during periods when not in use. Static noise-emitting equipment operating continuously are housed within suitable acoustic enclosure, where appropriate.

For underground activities, and also for conveyors above surface level, the measures below are adopted, where reasonably practicable and appropriate:

- The mounting for any conveyors used to remove excavated material from the *works* (underground, sub-surface or surface) will be designed and installed to mitigate the transmission of noise and vibration. A maintenance programme will be developed to ensure efficient performance and to ensure that the noise generation of any conveyor does not deteriorate over time;



- Surface conveyor systems are of similar standard to underground conveyors and are acoustically enclosed where they run through, or adjacent to, noise sensitive areas. They too are subject of a maintenance programme as above and covered throughout its length to prevent material spillage.
- A review of the SCL activities associated with tunnelling is undertaken prior to works commencing and all reasonable endeavours are taken to minimise the levels of ground borne noise and vibration from these activities.

## **7.0 Temporary construction railway and conveyors**

FLO is designing the temporary construction railway in such a way so as to minimise the transmission of vibration and ground borne noise from the passage of rail vehicle(s). Prior to the tunnelling works an assessment is carried out on the noise and vibration impacts associated with the tunnelling works and in particular with locomotive movements. There are a number of mitigation measures that will be implemented to address noise and vibration during the construction of the tunnels including;

- Procurement of rolling stock: - fitted with mass spring suspension and designed to minimise noise and vibration when running empty.
- Dedicated crews and supervisors: - applying strict operations and maintenance regime including the rolling stock and infrastructure.
- The alignment, jointing and mounting of the temporary construction railway will be installed, maintained and operated in a manner so as to minimise the transmission of vibration and ground borne noise from the passage of rail vehicles.

## **8.0 Noise Sensitive Receptors**

The closest noise sensitive receptors for each work site are identified and reported within the Code of Construction Practice (CoCP) Part B document for each relevant site. Sensitive receptors are defined as buildings or land uses utilised for activities which are sensitive to noise and/or vibration. For each site these are identified using available mapping and address point data and through consultation with the local authority. These receptors will be used to calibrate the noise model predictions.

## **9.0 Review of Noise Insulation and Temporary Re-housing Requirements**

FLO agrees with the relevant Local Authorities about where and when to undertake appropriate noise and vibration management in advance of construction commencement, including agreeing appropriate threshold levels before works start and in accordance with the NLE Construction Noise and Vibration Mitigation Scheme (included as Appendix 1). FLO identifies properties that will require noise insulation (and or temporary rehousing) to the Project Manager in a timely manner ensuring there is sufficient time to implement any required noise mitigation.

## 10.0 Construction Vibration Assessment Methodology

FLO uses BPM to control ground borne vibration and any consequent ground borne noise. As per the assessment methodology used within the ES, the relevant thresholds for determining significant impacts is derived from the relevant British Standards and guidance as stated below.

To minimise the effects from vibration on human receptors, Peak Particle Velocity (PPV) levels in excess of 1 mm/s in any axis, measured external to a building, is considered to represent a significant impact on the occupants of residential buildings (although higher levels may be tolerated in certain instances) in accordance with BS5228-2. For commercial premises, a level of 2mm/s in any axis is taken as a significant impact on its occupants. If these levels are either predicted to be routinely exceeded or monitoring shows it to be routinely exceeded throughout the construction period for 10 or more days of working in any 15 consecutive days or for a period of 3 or more nights (22:00 – 07:00) of working in any 7 consecutive period or for a total of 40 days or more in any six month period) then further vibration surveys will be required to derive a Vibration Dose Value and to provide a more detailed assessment of human disturbance in accordance with BS6472.

To minimise the risk of structural damage to buildings, vibration levels will be controlled so that when measured at the base of any building (in accordance with BS7385 Part 1) the PPV does not routinely exceed a level of 5mm/s, or 3mm/s for vulnerable buildings. Where these levels are predicted to be exceeded, a more detailed assessment is undertaken to further inform the level of risk of damage, which may subsequently result in the commissioning of an appropriate condition survey.

In addition, where premises or equipment are identified as potentially being susceptible to the effects of vibration, appropriate protection measures are implemented.

The FLO Noise and Vibration specialists will undertake a screening assessment of the proposed work programme which will be undertaken to establish if any significant vibration generating activities are scheduled to occur (e.g. piling, vibro compaction etc.). Should significant vibration generating activities be identified a detailed assessment will be undertaken to predict vibration levels at all sensitive receptors from the construction and demolition in accordance with the calculation methodology set out in BS5228-2:2009 Annex E comprising the following:

- a detailed construction method statement identifying the rationale for work, proposed working hours and a breakdown of construction methodology;
- site location maps and worksite layout plans detailing the geographical locations of all equipment for each stage of the works;
- a construction equipment schedule showing the number, type and make of equipment used for each stage of the construction;
- details of proposed on-site mitigation measures;

- schedules detailing predicted vibration levels at the sensitive receptors.

## **11.0 Construction Noise Assessment Methodology**

The FLO Noise and Vibration specialists predict noise levels at all sensitive receptors from the construction and demolition activities using software configured to implement the calculation methodology set out in BS 5228-1:2009+A1:2014. The assessment includes:

- a detailed construction method statement identifying the rationale for work, proposed working hours and a breakdown of construction methodology;
- site location maps and worksite layout plans detailing the geographical locations of all equipment for each stage of the works;
- a construction equipment schedule showing the number, type and make of equipment used for each stage of the construction and a list of sound power levels of activity or  $L_{Aeq}$  levels at 10 meters from the source and a percentage on time for each item;
- details of proposed on-site mitigation measures;
- schedules detailing predicted noise levels at the noise sensitive receptors;
- list of properties qualifying for noise insulation under the NLE Construction Noise and Vibration Mitigation Scheme with the associated predicted noise levels;
- details of properties qualifying for temporary re-housing under the NLE Construction Noise and Vibration Mitigation Scheme with the associated predicted noise levels;
- details of properties which are borderline qualification for noise insulation and/or temporary re-housing under the NLE Construction Noise and Vibration Mitigation Scheme; and
- any other relevant information requested by the Project Manager in order to validate the assessment.

## **12.0 Section 61 applications**

FLO obtains Section 61 (S61) consents from the Local Authorities for all construction works. The S61 consent application includes details of the work to be undertaken, including proposed hours of work, site specific management and mitigation requirements for noise and vibration, both on and off site. FLO does not commence construction activities until a formal S61 consent has been obtained from the local authority.

FLO follows the below process:

- Submission of a draft S61 application for review by the Local Authority;
- Submission of a formal application for prior consent under Section 61 of the Control of Pollution Act, in advance of commencement of the *works*, which addresses the

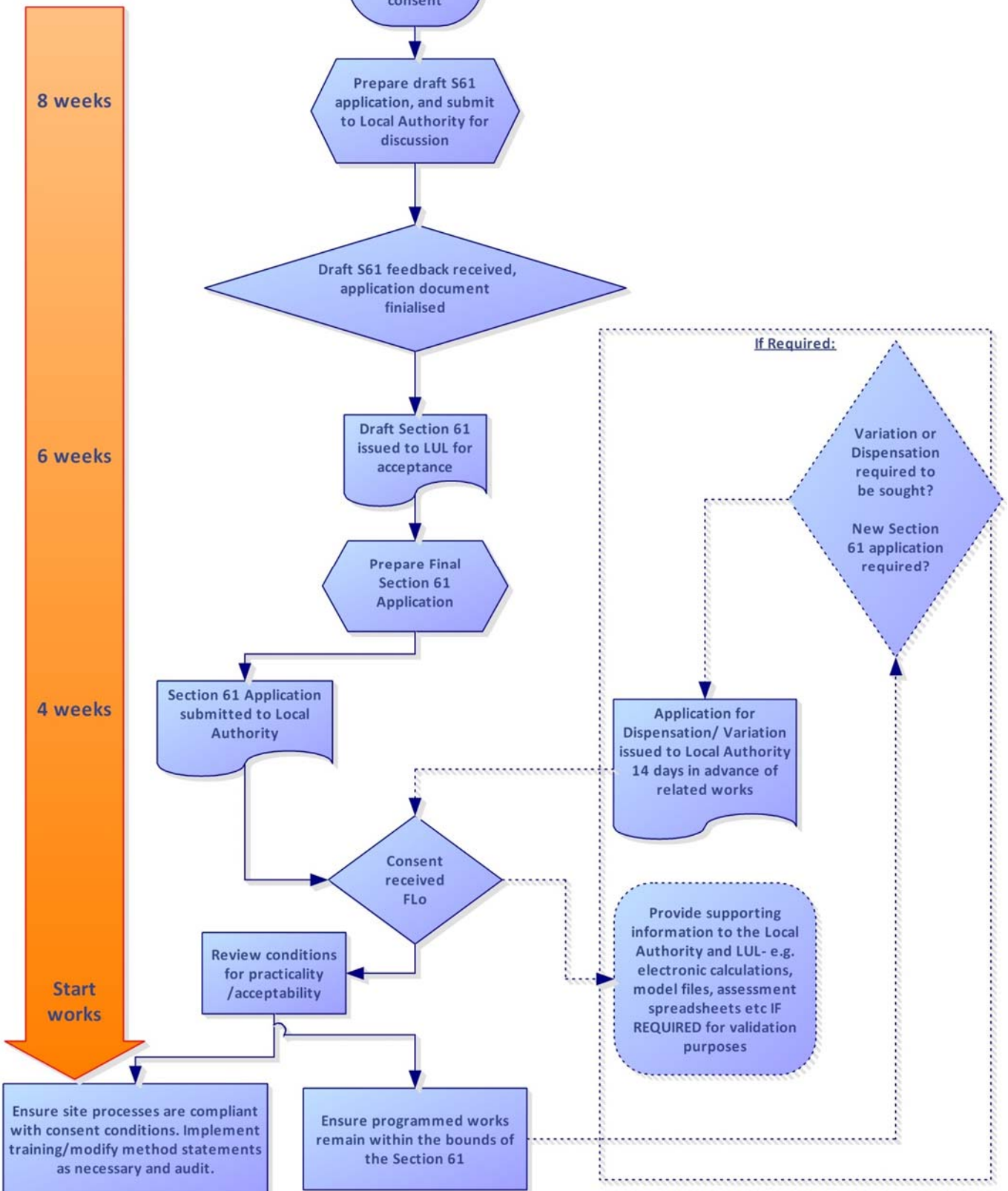
comments received from the local authority on the draft Section 61 application in accordance with Best Practicable Means;

- In advance of any Section 61 application, provides notification by letter to the relevant local authority naming the person(s) authorised to sign Section 61 consent applications for FLO;
- Holds regular meetings with the Project Manager and the local authority to discuss Section 61 consent applications and compliance; and
- Informs the Project Manager of any breach of a Section 61 consent by raising it as an environmental incident.

FLO obtains dispensation from Section 61 consent for any material changes to consented working methods which are predicted to result in an increase to predicted noise or vibration effects. This may include revision to working hours, work duration, persistent overrun, or major changes to the proposed construction methodology, for example, changes to major items of equipment.

A more detailed overview of the Section 61 process is presented in the following flowchart:

Minimum lead time  
necessary before  
consent required



## 12.1 Section 61 Compliance

ITEM	ACTIVITY
B1	<p><b>General</b> FLO ensures that all works comply with the requirements of the S61 consent and the Contract.</p>
B2	<p><b>Works Briefings</b> Briefings are given by the Construction Managers regarding the requirements of the S61 consent conditions and the noise and vibration control measures that are implemented. This information is then cascaded to the site operatives.</p>
B3	<p><b>Monitoring of Construction Activities</b> The Construction Manager ensures that the requirements for noise and vibration control measures are complied with on site. Site inspections are undertaken at appropriate points throughout the works (e.g. at commencement of a new works phase /activity, upon receipt of a noise/vibration complaint or identification of a non-compliance). Routine inspections assess working methods, the implementation of BPM etc. Where necessary, additional mitigation measures or remedial measures are identified.</p>
B4	<p><b>Overruns and Emergencies</b> In the event that it becomes necessary for certain construction activities to over-run their permitted working hours, due to unforeseen circumstances (e.g. safety critical works, technical problems) the Local Authority is notified as soon as possible. Where it is necessary to undertake activities in response to an emergency, both London Underground (LU) and the Local Authority is advised as soon as reasonably practicable of the nature and reasons for the works in accordance with the Incident Plan.</p>
B5	<p><b>Dispensations and Variations</b> Where it becomes necessary to alter the manner of working from that detailed within the S61 consent, it will be necessary for either Dispensation or Variation to the S61 consent to be prepared in advance of the works taking place. This requires a review to be undertaken of the proposed construction methodologies and control measures and an assessment to determine if the change constitutes a dispensation or a variation. For variations (considered to represent minor changes that do not materially affect the predicted noise levels), approval for the change in working methods and control measures are sought from the Local Authority. The dispensation to the S61 consent is completed and signed by the authorised person for the Contract before being formally submitted to the Local Authority.</p>
B6	<p><b>Monitoring of Noise &amp; Vibration Levels</b> Monitoring of both noise and vibration is undertaken in accordance with the requirements set out within the CoCP Part A and the Works Information.. Monitoring includes, as appropriate, baseline ambient noise levels, construction noise levels (using both unattended continuous monitoring and attended sample techniques), construction vibration monitoring and measurement of construction plant noise levels. Unprocessed results of all monitoring is kept by FLO and made available to LU and the Local Authority for inspection. Results of sampled, attended</p>

	monitoring and site inspections are reported and kept in accordance with project requirements.
B7	<b>Vibration</b> FLO employs Best Practicable Means to control vibration generated by the works and its subsequent effects on people, buildings and vibration sensitive equipment. The control measures are agreed through the S61 process with the Local Authority and will be developed in accordance with the guidance contained within BS6472, BS7385 and BS5228. The need for vibration monitoring is agreed between FLO and the Local Authority as part of the S61 consent process, but is nonetheless undertaken at their reasonable request. In the event of complaint of vibration arising during the construction works, monitoring is undertaken and subsequent evaluation provided against the derived threshold values/trigger levels for vibration. Where vibration levels are found to exceed the relevant identified threshold values, FLO undertakes an investigation in order to determine the cause of the exceedance. Where necessary, corrective action is implemented in order to reduce / control vibration levels.

### 13.0 Monitoring of works

FLO inspects the works to ensure that the steps taken to control construction noise and vibration are compliant with Best Practicable Means and the specific requirements of the Section 61 consent. London Underground is notified immediately of any non-compliance issues. Non-compliance issues are managed using the provisions set out in the Environment Incident and Nonconformity Plan.

FLO undertakes noise and / or vibration monitoring in order to:

- Comply with the Section 61 consent process;
- Satisfy the requirements of any consent obtained under Section 61 of the Control of Pollution Act 1974;
- Monitor Noise Insulation/Temporary Rehousing thresholds;
- Satisfy the requirements of the NLE Construction Noise and Vibration Mitigation Scheme; and
- Respond to any complaints or incidents about noise and vibration.

#### 13.1 Local Authority Liaison

The Environment Manager makes available the results of any noise and vibration monitoring to the relevant local authority if required. The Noise and Vibration specialists hold regular meetings with the Environment/Project Manager and, if required, with the local authority to discuss Section 61 consents applications and compliance.

## **14.0 Noise and Vibration Monitoring**

This noise and vibration monitoring will utilise the methods and types of instruments highlighted below:

### **14.1 Baseline Monitoring**

Baseline monitoring is necessary to ensure that any potential changes during the works are identified and correctly attributable to the construction works. The results for the baseline noise monitoring is covered within the noise and vibration section of the site specific CoCP Part B's. The baseline monitoring data is used to validate the measurements within the ES and any predictions that have been made to ensure they are consistent with current actual levels.

### **14.2 Construction Phase Monitoring**

Noise and vibration monitoring is undertaken throughout the construction phase. The measurements will comprise a combination of long term unattended locations (continuous measurements) and short term attended measurements. The details of the monitoring locations are provided in the respective CoCP Part B documents.

The methodology to be adopted for the monitoring of noise is principally based upon the method for acquisition of data contained within BS 7445: Part 2: 1991: *"Description and measurement of environmental noise. Part 2, Guide to the acquisition of data pertinent to land use"*, along with other relevant sources of guidance. This standard sets out general methods for the acquisition of data for describing environmental noise.

Attended measurements during daytime works will be taken at the start of any new major construction activity and at regular intervals thereafter. Measurements will initially be undertaken each week, although the need for weekly measurements will be reviewed as the works progress and longer intervals between measurements may be appropriate.

However, it may also be necessary to sample more frequently than weekly, depending on the activities being undertaken. The measurement sample duration at each location for both day and night-time monitoring will be no less than 15 minutes, comprising 3x 5 minute samples. Data collected for the identified receptors includes the following parameters:  $L_{A10}$ ,  $L_{A90}$ ,  $L_{Aeq}$ ,  $L_{Amax}$ .

Attended measurements during night-time works will be undertaken at the start of each major construction activity where necessary.

### **14.3 Type of instruments to be deployed**

All noise monitoring equipment complies with class 1 specifications for sound level meters as defined in BS61672 and any additional project requirements. Monitoring equipment is calibrated on site during weekly visits by the Noise and Vibration specialist and is sent for traceable calibration every 2 years.

### **14.4 Collection, Interpretation and Reporting of Monitoring Data**

The unattended noise monitors to be installed will allow noise levels to be monitored remotely rather than relying on the collection of data from the field. Once the data is



effectively recorded and ratified by the Noise and Vibration Specialist it is then compiled and made available to the Environmental Manager on a weekly basis. In addition, trends and anomalies are reported as they occur.

FLO will undertake unattended vibration monitoring should it be discerned by the Environment Team that vibration associated with certain activities extends beyond site boundaries, or complaints are received. Vibration monitors will have their alarms set at a trigger level defined by the agreement with the building owner / occupier or best practice.

The configuration on the noise and vibration monitoring systems will allow trigger levels to be pre-programmed to alert of potential exceedances of the pre-set trigger levels (see Section 16), thus allowing a rapid and immediate response to elevated levels. Trigger alerts from the monitoring equipment are delivered to up to 4 individuals, including as a minimum, a FLO on-site member of staff (who will immediately investigate) and the Noise and Vibration Specialist. Following this the Noise and Vibration specialist will submit a trigger report, detailing the alerts and any probable and possible causes informed by the site inspection carried out.

#### **14.5 Reporting**

FLO proposes that weekly noise and vibration monitoring reports will be produced by the Noise and Vibration specialist for the duration of operation of each worksite and presented to the FLO Environmental Manager.

To ensure effective and consistent reporting and feedback of monitoring results, all monitoring is undertaken using a proforma designed for that purpose. The monitoring reports summarise the measured levels (including minimum, maximum and average of the weekly 15 minute monitoring intervals) and provide a basic analysis of any changes or increases in level, relative to the baseline period. The report also highlights any exceedance of the site action level.

Any photographic records taken by the Construction Team during the daily on-site inspections are kept, recorded and maintained alongside monitoring records.

#### **15.0 Noise and Vibration Environmental Incident**

The following situations are examples of Noise and Vibration Environmental Incidents and as such will be subject to the relevant controls and procedures set out within the incident plan:

- A complaint received from a member of the public or the Local Authority;
- An incident or activity which results in a breach of consent conditions under S61 of the CoPA e.g. non-compliance with the consented working hours, non-permitted plant/equipment or non-compliance with BPM;
- Measured exceedance of predicted noise levels as defined in a S61;
- A measured exceedance of vibration trigger levels for building damage and/or human disturbance.

## **16.0 Trigger Levels**

### **16.1 Noise Insulation/Temporary Rehousing Trigger Levels**

Where noise monitoring demonstrates that the trigger noise levels for noise insulation or temporary re-housing are being exceeded then FLO will identify whether the planned activity causing those levels will carry on for longer than listed below, and report the findings to the Project Manager:

- A period of 10 or more days of working in any 15 consecutive days;
- A period of 3 or more nights of working in any 7 consecutive nights; or
- For a total of 40 days or more in any 6 consecutive months.

The London Underground NLE trigger levels for noise insulation and temporary rehousing are detailed in Appendix A of the NLE Construction Noise and Vibration Mitigation Scheme which can be found in Appendix 1 of this document.

### **16.2 Noise and Vibration Trigger Levels**

Unattended noise monitors are fitted with alarms to enable monitoring against trigger levels. The trigger levels are site specific and defined by the Section 61 agreement with the Local Authority. When the noise monitors detect an elevated noise reading (averaged over the appropriate timescale) it will send an automated alert (i.e. SMS text messages and/or email alert) to the work site manager and environmental manager so that they can take appropriate action to investigate and mitigate the impact, enabling an instant response to a potential problem.

When the results of the noise or vibration monitoring indicates that the predicted construction noise levels contained in the relevant Section 61 Application are exceeded by 3 dB(A) or more, or vibration levels exceed a PPV of 1mm/s for residential and 2 mm/s for commercial, an investigation will be conducted into the possible causes.

The investigation will include but not be limited to the following actions:

- Inspect site daily record sheets including deliveries to site;
- Review the noise and vibration results to determine as far as is reasonable practicable the activities/ plant responsible for exceeding the relevant noise or vibration level;
- Investigate possible activities on neighbouring construction sites;
- Extreme weather conditions – very high winds, rain, thunder or hailstorms;
- Inspect and undertake field calibration of monitoring equipment (if considered necessary);
- Evaluate and implement any reasonable practicable means of reducing the measured construction noise levels by 3 dB(A) or more, or reduce vibration to below 1mm/s for residential property;
- Complete an incident/complaint investigation.

## **17.0 Complaints procedure**

Complaints are managed in accordance with the complaints procedure outlined within the Environmental Management Plan. It is anticipated that most complaints are directed to a NLE Public Helpdesk and then relayed to the site team. Should any complaints come direct to the site teams they are logged with the NLE Public Helpdesk (0343 222 2424), and then investigated accordingly.

Where appropriate, the Environmental Manager and project Community Liaison Manager undertake an investigation of the complaint. They decide upon the appropriate course of action and any corrective actions to be undertaken in response to this investigation. In this instance, complaint resolution is confirmed by the Environmental Manager.

Notification of the complaint and actions taken are provided to the local authority.

Actions to be taken as soon as possible by FLO:

- Note the time, date, identity and contact details of complainant. Note if the complaint has been referred from the local authority. Ask complainant to describe the noise and vibration emission; is it constant or intermittent, how long has it been going on for, is it worse at any time of day, does it come from an identifiable source.
- As soon as possible after receipt of a complaint undertake a site inspection. Note all noise and vibration producing activities taking place and the noise and vibration mitigation methods that are being employed. If the complaint was related to an event in the recent past, note any noise and vibration producing activities that were underway at that time, if possible. Implement any remedial action necessary.
- As soon as possible visit the area from where the complaint originated to ascertain if noise and vibration is still a problem.
- If another source of noise and vibration other than the construction work is causing the noise and vibration nuisance verify the source. Photograph the source and emissions.
- As soon as possible after the initial investigations have been completed contact the complainant to explain any problems found and remedial actions taken.
- If necessary update any relevant method statements to prevent any recurrence of problems.
- File the noise and vibration complaint form on the complaint register.
- Notify the Project Manager, Community Liaison Manager, Environmental Manager and local authority as soon as practicable that a complaint has been received and what the findings of the investigation were and any remedial measures taken
- Inform workers on site of complaint and what the findings of the investigation were and any remedial measures taken.

## **18.0 Training**

All site personnel are made aware of the noise and vibration issues covered in this plan during site induction. Regular toolbox talks are given to remind all site personnel of the requirements on a regular basis. All training received is logged. Bulletins and alerts from both the FLO and LU systems are also briefed out to all site personnel.

Method statements and risk assessments are written and briefed to all site personnel before any works are carried out on site. Integrated into these documents are specific control and risk mitigation methods relating to the noise and vibration issues detailed in this document.

**Appendix 1 - London Underground Northern Line Extension Construction Noise and Vibration Mitigation Scheme.**



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# London Underground Northern Line Extension Construction Noise and Vibration Mitigation Scheme

Issue No.: 1

Issue date: November 2012

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MAYOR OF LONDON



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## 1 Introduction

- 1.1 The construction of Northern Line Extension (NLE) will cause noise and vibration impacts in some locations.
- 1.2 During construction, London Underground (LU), through design and mitigation, will control the effects of noise and vibration from within the construction sites. Nevertheless, there will be circumstances in which noise impacts will arise that will need to be mitigated still further. In certain circumstances, explained below, LU will offer to either provide and install free of charge, or provide grant aid for, noise insulation. In certain cases where the level of noise created by construction activity is predicted to be acute, LU will contact you to offer to arrange temporary rehousing, or help residents to arrange it for themselves and recoup the costs from LU.
- 1.3 LU has adopted a set of noise and vibration thresholds in relation to the provision of grant aid for noise insulation and, if appropriate, temporary rehousing. These thresholds follow the precedents established by recent and similar major schemes.
- 1.4 The purpose of this document is to explain both how the noise insulation and temporary rehousing schemes work, and what you should do next if you think that you may be eligible for either scheme.

## 2 Am I eligible for the scheme?

- 2.1 Construction noise insulation and temporary rehousing arrangements apply to dwellings and other buildings lawfully used for residential purposes.
- 2.2 To be eligible you must own or occupy a private dwelling and the dwelling must be one in which the predicted or actual construction noise exceeds the relevant 'noise trigger level' (as shown in Appendix A) for:

- a period of 10 or more days of working in any 15 consecutive days
- a period of 3 or more nights of working in any 7 consecutive nights;  
or
- for a total of 40 days or more in any 6 consecutive months

The rooms to which this scheme applies, eligible rooms, are defined as living rooms or bedrooms having a qualifying door or a qualifying window in any eligible building. On your behalf LU will prepare the predictions and monitor the actual noise levels in consultation with the relevant local authority.

- 2.3 Initially eligibility for the scheme depends on the predicted noise level following the assessment that will be carried out for that purpose once detailed construction plans are in place. If those noise predictions indicate that a property is eligible, the offer of noise insulation will be made and, if accepted and all necessary approvals obtained, the insulation installed before the works commence. However, the actual noise may turn out to be more or less than the prediction and therefore the noise levels will be monitored as work progresses. If it is found that noise levels are not as high as expected, the insulation package will not be removed. If it is found that the noise levels are higher than expected and meet the thresholds set out in this document, you will be informed and the provisions set out in paragraphs 9.5 to 9.10 will apply. Full details of the noise trigger levels, for both noise insulation and temporary rehousing are set out in Appendix A.
- 2.4 Some buildings and/or their occupants will be treated as special cases:



- Mobile homes and houseboats will be treated on a case by case basis. Given that noise insulation does not represent a viable option for mobile homes, where eligibility is confirmed, appropriate alternative mitigation measures will be adopted. The sorts of measures that will be considered include works management methods (eg adopting quiet times, rescheduling works, and imposing noise limits), or where this is not effective or appropriate, temporary rehousing will be offered even if the Temporary Rehousing thresholds are not exceeded.
- Night workers, those needing a particularly quiet home environment to work in, or those that have a medical condition which will be seriously aggravated by construction noise, will also be considered on a case by case basis. Whilst these discretionary arrangements only apply to residential properties, buildings which may be particularly sensitive to noise (including, commercial, educational and community) will be subject to individual consideration by LU on the application of any body or person responsible for, or holding a legal interest or estate in, any such building.

### 3 What is the Noise Insulation Package?

3.1. The package will consist of:

- Secondary glazing or thermal double glazing (see also sections 5.1, 5.2 and 5.5) for living room and bedroom windows on eligible facades, plus additional ventilation if required under the relevant specifications.
- Blinds, for south facing windows.
- Insulation treatment for external doors on eligible facades.

3.2 Depending on the type of window you already have, secondary glazing will usually comprise another pane of glass in its own frame (wood, metal or plastic) 100-200 mm inside the existing window. This can be opened for cleaning or ventilation.

3.3 Secondary glazing works best when closed – so additional ventilation is usually required. The package includes an electric ventilator fan in a slim metal cover, fitted inside the room in question, to an outside wall (a 75-100 mm hole is drilled through the wall, through which the fan draws in air from the outside).

3.4 On a south facing window secondary glazing may make the room too hot. As set out under the relevant specifications, subject to the agreement of the claimant, blinds will be fitted between the main window and the secondary glazing to minimise this effect. If the claimant chooses not to accept blinds as part of the noise insulation package the possible impacts of this will be explained to them, blinds will not be retrofitted post installation of the noise insulation package should the claimant change their mind at a later date.

3.5 LU may be able to install a “secondary” door to improve noise insulation. If the design of your house prevents this, other methods can be used, such as sealing strip between the existing door and its frame.

3.6 There may be circumstances in which it is not possible to fit secondary glazing. Such cases will be considered on a case by case basis. Where eligibility is confirmed, appropriate mitigation measures will be adopted. The sorts of measures that will be considered include works management methods (eg adopting quiet times, rescheduling works, and imposing noise limits), or temporary rehousing even if the Temporary Rehousing thresholds are not exceeded.

## 4 Who does the insulation work and on what terms?

- 4.1. Once LU has conducted an initial survey and the details of the insulation for your house are agreed with you, LU will either offer to do the work at its expense, or offer grant aid for you to carry out the works.
- 4.2. LU will ask you to ensure that you provide adequate access for the survey and installation; and if you should incur expense in arranging access, LU will reimburse you provided it has agreed the amount before the cost is incurred.
- 4.3. In the cases where LU offer you a grant so that you can have the work done yourself, the grant would be made on the following conditions:
- i. You must first obtain 3 independent written quotations.
  - ii. The work must comply with the relevant specifications.
  - iii. You must select the quote that represents the best price for complying with point ii, above.
  - iv. The amount of the grant will be for whichever is the lesser amount of either your selected quote, or the actual cost of the installation.
  - v. LU may pay 10% of the estimated cost in advance, and the balance when the work is satisfactorily completed.
  - vi. The work must be completed within 12 months of any advance payment, or before completion of the NLE construction works for which insulation is needed, whichever is the earlier. If this condition is not complied with, no further grant will be paid, and any payments already made will have to be repaid to LU or its agent.
  - vii. You must obtain the consent of any other person or body that may be required to permit the carrying out of insulation work (e.g. your landlord if you are a tenant, or any consents required from your local authority).
- 4.4. Please note that the Scheme can not be used for work needed to remedy existing building defects.
- 4.5. The scheme also covers the making good of the existing fabric and decoration (not including curtains) after the installation of secondary glazing, ventilation equipment, and second doors, including the adaptation of any existing pelmet and curtain rack.

## 5 Frequently asked questions relating noise insulation

### 5.1 Is secondary glazing the same as double glazing?

- 5.1.1 No. Secondary glazing is a separate pane of glass installed 100 – 200 mm inside the existing window, and the existing window remains in place. Double glazing consists of two panes of glass in the same casing, typically around 20mm apart which replace the existing windows.

### 5.2 What if I already have double glazing?

- 5.2.1 The noise assessments are based on the expected noise immediately outside the building so the type of glazing you currently have installed would not affect your eligibility under the scheme (subject to 5.4 below). You are not obliged to accept the

offer of insulation if you do not think you need it. LU will provide advice as to the effectiveness of any currently installed double glazing in terms of attenuation of external noise compared to the offer of secondary glazing. You may, at your own discretion, and accepting the reduced level of noise attenuation, choose only to have ventilation units and blinds installed.

### **5.3 What if I choose not to accept the offer of noise insulation but subsequently wish to adopt it?**

- 5.3.1 A decision to accept an offer of noise insulation must be made within a certain timeframe. Specifically an offer must be accepted no later than 6 months after the date it is made in writing to you or one month before LU intends to install the other noise insulation at eligible properties affected by the same NLE construction works, whichever is the sooner. In the latter case, you will receive notice of the cut-off date for acceptance at the time the offer is made or shortly thereafter. If you do not respond within the time-frame due to circumstances beyond your control, LU will give due consideration to your case but the construction works will continue as programmed. If you choose not to accept the offer of noise insulation there is no scope to change your mind later. However, if the noise levels change during the course of the works such that you would be eligible for temporary rehousing, then the process set out in paragraphs 9.5 to 9.10 will apply.

### **5.4 What if I already have secondary glazing installed as the result of a grant from another public works scheme?**

- 5.4.1 If your home has already had insulation work carried out or a grant for such work in respect of another public works scheme (such as a road or earlier railway works) you will not be eligible for further work or grant from NLE. However, the existing noise insulation will be inspected to ensure that it is in a state adequate to attenuate the construction noise to the extent that it should. If it is not, the works will be carried out or a grant made to have them carried out to bring the installed noise insulation package up to the appropriate standard.

### **5.5 What if I have already had secondary glazing or thermal double glazing installed privately, i.e. not as the result of a grant from another public works scheme?**

- 5.5.1 If you have had a noise insulation package (i.e. secondary glazing or thermal double glazing, plus ventilation units and blinds) installed privately, it will be inspected to check whether it is in a state adequate to attenuate the construction noise to the extent that it should.
- 5.5.2 If LU identifies that you are eligible for noise insulation following the procedure set out in section 8 of this document, and the package meets the specification of the works set out in this document, the person who incurred the cost of those works can receive a grant in respect of the work already done. The amount of that grant will be for the full amount (as qualified by section 4.3 (iv) and, in the case of thermal double glazing, section 5.6), and excluding any element of cost attributable to work in excess of the specification for the works in this document, if you have followed the procedure for seeking and selecting a quotation set down in sections 4.3 (i) and (iii) of this document for private installation. If you have not followed that procedure, LU will make a grant to the amount that it would have offered if the procedure set out in section 8.1 for his carrying out the works had been followed. If the noise insulation package does not meet the specification set out in this document, the works will be carried out, or a grant made to you to have them carried out, to bring the installed noise insulation package up to the appropriate standard. In addition, LU will make a grant to the person

who incurred the cost of the work previously carried out to the amount of the difference between:

- The amount it would have offered if the procedure set out in section 8.1 for his carrying out the works meeting the specification had been followed; and
- The cost of the remedial works to bring the installed package up to the appropriate standard.

If the cost of the remedial works is greater than the amount of grant that would have been paid under the procedure set out in section 8.1 then no such further grant will be paid.

## **5.6 Can I just have thermal double glazing installed instead of secondary glazing?**

- 5.6.1 Once an offer of noise insulation has been made pursuant to section 4.1, thermal double glazing can be provided instead of secondary glazing only if it is specifically requested by the claimant. The claimant will be made aware of the potential shortfall in sound insulation performance of the thermal double glazing compared to the secondary glazing.
- 5.6.2 The amount of the grant payable for the installation of thermal double glazing will be no more than the cost of installing the secondary glazing package specified in this document. If you arrange for the work to be carried out yourself, the amount paid to you in reimbursement will be for no more than the cost that would have been incurred if the secondary glazing package specified in this document had been installed. LU will calculate the cost that would have been incurred for installing the secondary glazing package using the experience gained from installing it in the nearest similar properties.
- 5.6.3 Neither secondary nor thermal double glazing can be provided without additional ventilation and or blinds where required to comply with the Noise Insulation (Railways and other Guided Transport Systems) Regulations 1996, Schedule I, Specifications.

## **5.7 If I choose to just have thermal double glazing installed instead of secondary glazing, and find later that due to the noise impact I would like secondary glazing due to the construction noise, can I claim again?**

- 5.7.1 No. As noted in 5.6, the claimant will be made aware of any potential shortfall in sound insulation performance of the thermal double glazing compared to the secondary glazing. If the claimant elects to take a grant for the installation of thermal double glazing no further grant will be made or works undertaken to later install secondary glazing on top of the thermal double glazing.

## **5.8 Can I take the grant and not do the works?**

- 5.8.1 No. If a grant is offered and you accept it, you must have the works carried out to the specification in the offer. Otherwise you must repay the grant. You are not obliged to accept the offer if you do not think you need it. See also para 4.3 (vi).

## **5.9 What if my landlord / tenant does not want the work carried out but I do?**

- 5.9.1 LU will try to reach agreement between all parties where possible. In any event, the party wishing to have the work carried out is requested to do all that they reasonably

can to reach agreement with all other interested parties that can influence whether or not the work can be carried out.

## 5.10 Will there be a maintenance grant for the noise insulation package?

- 5.10.1 No. There will be no obligation to repair, maintain or make any payments in respect of repairing or maintaining any equipment or apparatus installed under the application of this document or to pay for the running costs, which will be minimal for mechanical ventilation units. Notwithstanding this, should equipment such as the ventilation units fail after installation of the noise insulation package through no fault of the resident, and this occurs during NLE construction works, the failed apparatus will be repaired or replaced as necessary.

## 6 What is the Temporary Rehousing Package?

- 6.1. If, following the assessment that will be carried out for that purpose once detailed construction plans are in place, the predicted or actual (see section 9) construction noise level exceeds the trigger level for temporary rehousing, LU will notify you that you are eligible for alternative temporary accommodation. There are two options:

**Option A:** to arrange temporary alternative accommodation to meet your agreed needs.

**Option B:** to provide information and guidance to help you arrange your temporary alternative accommodation

- 6.2 If you choose Option A, the services provided by LU will include arranging for:

- Temporary alternative accommodation (which, where appropriate, could be a local hotel or guest house).
- Removals.
- Storage and insurance of your personal effects.
- Insurance for the house you vacate.
- Where appropriate your pets to go into kennels, catteries etc.
- Where appropriate the disconnection and later reconnection of gas, water, electricity etc.

- 6.3 If you choose Option B then, instead of actually identifying the alternative accommodation and making the arrangements for you, LU will supply you with information and guidance on all the matters listed above, to enable you to make the arrangements yourself; and LU will also help you ensure that the costs you incur can be agreed and paid to you as soon as practicable.

- 6.4 Whether you choose Option A or Option B, LU will bear (or reimburse you with) the reasonable costs associated with your temporary rehousing together with the continuing, unavoidable costs of maintaining your own house whilst you are away. However, these will be paid less the costs that you would have paid if you had stayed in your own house over the same period.

## **7 Frequently asked question relating to temporary rehousing**

### **7.1 Do I have to move?**

- 7.1.1 No. The acceptance of any offer of temporary rehousing is discretionary. You do not have to move if you do not want to. If you do decide to stay, you cannot claim compensation for disruption due to the noise of the works.

### **7.2 What happens in relation to my existing tenancy**

- 7.2.1 The offer of temporary accommodation will be in addition to your current home. You will still be responsible for the rent, bills and other outgoings at your current home and you will still be a tenant there. The offer will include the additional cost of the relocation accommodation. You are free to visit and use your current home as you wish during the relocation, subject to the terms of your existing tenancy. If your tenancy agreement expires during the relocation you should (if you want to) renew it with your landlord in the normal way. If you choose not to renew your tenancy, the grant to meet the cost of the alternative accommodation will cease when your tenancy expires.

### **7.3 What about insurance, mail and redirection etc?**

- 7.3.1 Most temporary relocations will be short term. In some areas, the relocation may be longer term and you will be reimbursed reasonable additional costs which you incur due to long term absence from your property.

### **7.4 Will the temporary accommodation offered be of the same quality a my current home?**

- 7.4.1 The type of rehousing offered will depend on the duration of the relocation. For short durations hotel accommodation may be appropriate. For longer periods, alternative rented accommodation would be more suitable. In all cases account will be taken of your existing accommodation as far as possible.

### **7.5 How far away will I be moved?**

- 7.5.1 The accommodation offered will be governed by what is available at the time and your reasonable requirements. Some people may be prepared to move to another area on a temporary basis if they would be nearer friends, family or work. Others may need to stay in the same area.

### **7.6 Can I have noise insulation and temporary relocation?**

- 7.6.1 This will depend on the circumstances. The noise generated by the works will vary over the course of the job. In some areas, the noise may qualify for temporary relocation for one period, and noise insulation only for a different period. In these circumstances you would receive a temporary relocation offer for one period and a noise insulation offer for the other period. In other areas, a home may qualify for temporary relocation for a given period, but outside that period the noise may not trigger a separate noise insulation offer. In such a case, a temporary relocation offer only would be made and noise insulation would not be offered.
- 7.6.2 If you qualify for temporary relocation but not noise insulation, you do not have to accept the offer of relocation and may request noise insulation instead. You will be made aware of any shortfall in sound insulation performance of the noise insulation in relation to the thresholds presented in Appendix A and that the degree of disturbance

could be high even with the noise insulation in place. If you choose to adopt this approach and noise insulation is provided you will not be able to later request temporary relocation under this scheme.

## **7.7 I am a landlord. Will you compensate me for lost rent if you temporarily relocate my tenant?**

7.7.1 No. Your tenant will remain your tenant and remain liable to pay rent in the normal way.

## **8 What is the procedure for noise insulation and temporary rehousing?**

8.1 The procedure comprises 7 steps.

i. LU will carry out an assessment in every area likely to be materially affected by NLE construction noise, so as to predict what the noise levels will be and will discuss and agree the findings with the relevant local authority.

ii. LU will then notify owners or occupiers of buildings which, on the basis of the assessment, LU considers qualify, and accordingly which type of assistance (noise insulation or temporary rehousing) they are eligible for. LU will also send an application form at this stage.

iii. If you receive such a notice and application form, you should complete and return the form to LU or his agent. LU will then assess your application and if acceptable notify you in writing.

iv. LU will then arrange to visit you in order to discuss the application with you generally; view your home and in the case of noise insulation take any necessary measurements; and identify any special issues or requirements (such as any other approvals that may be required in the case of noise insulation).

v. LU will then assess your case in detail and, if it is accepted, notify you of:

- any further survey likely to be needed at your house, and (in insulation cases) the work LU thinks should be done and its offer to do it; or
- (in rehousing cases) either its proposals to re-house you temporarily or the information and guidance you need to make your own rehousing arrangements. In either case the proposals will be discussed with you and you will not be under any obligation to accept the offer.

vi. Assuming you agree, the noise insulation package or temporary rehousing plan (as the case may be) is then put into effect.

vii. LU reimburses you for any agreed costs, which you have incurred or (in grant cases) pays the balance of the grant. Alternatively, LU pays for noise insulation or removal/rehousing costs where it or its agent has done the work. A noise insulation package will not be offered if the noise trigger level is only exceeded whilst you are in temporary alternative accommodation (however see section 7.6 above).

8.2 Further technical information describing the process for predicting eligibility, particular in relation to cut-off points on long facades such as terraced housing, is presented in Appendix B.

## 9 What if I am not initially considered eligible to received either noise insulation or temporary rehousing but it is found subsequently that I qualify?

9.1 The following section address the procedure that will be followed in the case of people who consider themselves affected by construction noise and eligible for noise insulation or temporary rehousing who have not been offered either form of mitigation. Such claims may arise before or after the start of construction work.

### 9.2 Predictions for eligibility for noise insulation / temporary rehousing

Predictions will be carried out on behalf of LU using the British Standard method of calculating construction noise, based on the contractor's method of working and plant lists

9.3 Noise levels received at dwellings near the construction site will only vary significantly from the predictions already produced if there has been (i) a significant variation in the method of working or plant used from that currently anticipated or (ii) an error in the predictions.

### 9.4 Claims before the start of construction

If a person does not receive notification of eligibility for noise insulation/temporary rehousing according to paragraph 8.1 (ii) above, they may request a copy of the noise predictions on which the determination of the extent of eligibility was based. If they consider there to be any error in the predictions (for example incorrect identification of the claimant's property) they should provide to LU sufficient information concerning the claimed error. LU will then reconsider the matter of eligibility and either make an offer of noise insulation/temporary rehousing or confirm that the claimant remains ineligible.

### 9.5 Claims after the start of construction

The trigger levels for eligibility for noise insulation/temporary rehousing involve both noise levels and durations (temporal criteria). There are two possible cases that may arise:

i. The predictions do not identify that noise insulation/temporary rehousing thresholds will be exceeded, but in practice they are and this is expected to continue for a period of time sufficient to exceed the temporal criteria.

ii. The predictions identify that the noise insulation/temporary rehousing thresholds will be exceeded but will not carry on for a sufficient duration to trigger the temporal criteria. However, in practice the works go on for longer and the temporal criteria are triggered.

In both cases the approach will essentially be the same.

9.6 If a person claims, after the start of construction work, that the noise levels actually experienced are such as to cause eligibility for noise insulation/temporary rehousing where none was predicted, or that received noise levels are sufficient for eligibility for noise insulation/temporary rehousing where this was predicted, and that the noise has continued, or seems to them likely to continue for longer than the temporal triggers where that had not been predicted, the claim will be considered by LU according to the following process.



- 9.7 A claim after the start of construction will inevitably take the form of a complaint or formal representation to the nominated undertaker. On receipt of the claim, LU will review the works being undertaken that have generated the claim and assess whether it is likely that the claim is valid. Where LU considers there is a potentially valid claim short-term site monitoring will be undertaken to identify whether the noise insulation/temporary rehousing trigger levels are indeed being exceeded. Whether or not monitoring is undertaken LU will discuss the results of the review with the claimant and explain the findings and any actions that have been taken.
- 9.8 At the same time, LU will inform the local authority that granted the Section 61 (Control of Pollution Act 1974) consent about the claim and what actions are being taken to address it. If LU considers that works are being carried out in breach of the Section 61 consent, they will ensure that all necessary steps are taken to put it right and inform the local authority of the actions taken. On being informed by LU about the claim and the steps being taken to address it, it is for the local authority to consider whether enforcement action should be taken pursuant to the Section 61 consent.
- 9.9 If the short-term noise monitoring identifies that the noise insulation/temporary rehousing thresholds are being exceeded, but that operations are being performed in accordance with the terms of the relevant Section 61 consent, LU will identify whether the activities causing those levels will carry on for longer than a period of 10 or more days of working in any 15 consecutive days or for 3 or more nights of working in any 7 consecutive nights or for a total of days exceeding 40 in any six consecutive months. If they are not, then no further action is required. The findings will be made known to the local authority who issued the S61 consent and discussed with them.
- 9.10 If the works causing noise levels above the noise insulation/temporary rehousing thresholds are projected to go on for longer than a period of 10 or more days of working in any 15 consecutive days or for 3 or more nights of working in any 7 consecutive nights or for a total of days exceeding 40 in any six consecutive months, but the construction works are being carried out in accordance within the terms of the relevant Section 61 consent, then LU will require action to be taken to reduce the level of noise being caused, or offer noise insulation and/or temporary rehousing to the affected property as appropriate. Works will not cease during the organisation and installation of the noise insulation. However, if appropriate, temporary rehousing will be offered to cover the period during which the noise insulation is installed. The temporary rehousing will be withdrawn:
- once the noise insulation is installed;  
or
  - if the claimant unnecessarily delays obtaining any necessary consents in accordance with paragraph 4.3 (vii). If it is not possible to fit secondary glazing appropriate measures will be considered on a case by case basis (see paragraph 3.6).

If the complainant is not satisfied by the response of LU following a claim under section 9.7 above, they may register a complaint in accordance with the project's complaints procedure (to be determined prior to the start of the main construction works).

## 10 How do I start making a request for assistance?

- 10.1 In the majority of cases where residents are eligible, they will receive from LU a notice and application form. Once you receive a notice, you simply complete and return the form.

- 10.2 If you do not receive a notice, but you believe you may be eligible (e.g. because your neighbours have received notices, or you have some particular reason to think you will be affected by construction noise even if you might not strictly speaking be eligible under the Scheme) please contact LU at the address given below, and LU will then consider your position individually. See also section 9.4 above.
  
- 10.3 Whilst every endeavour will be made to ensure all those who might be eligible under this policy receive notices and application forms, some properties may be inadvertently missed, particularly in relation to special cases where specific circumstances may not be apparent. Clearly, we would hope that such an occurrence does not occur. LU or its agents will liaise with the relevant local authority to minimise the risk of any inadvertent omissions.
  
- 10.4 This noise and vibration mitigation scheme will be implemented together with any relevant procedures set down in any detailed community relations plan established by LU to ensure that residents understand how any concerns raised will be made known to LU and the lines of communication available through which action will be initiated.

## 11 I have further questions that are not answered here. Where can I get further information?

Email us at: [NLE@tfl.gov.uk](mailto:NLE@tfl.gov.uk)

Write to us at:

Northern Line Extension  
 London Underground  
 55 Broadway  
 London  
 SW1H 0PD

## 12 References

### 12.1 Abbreviations

The following abbreviations are created:

Abbreviation	Definition
LU	London Underground
NLE	Northern Line Extension

### 12.2 Definitions

The following terms are used within this document:

Term	Definition
A-weighted	Is the A-weighted level, expressed as “dB(A)”, allows for the frequency dependent characteristics of hearing. Corrections are applied for each octave frequency band, and the resultant values summed, to obtain a single overall level.
Claimant	Means an owner or occupier of an eligible building who makes a request, or is made an offer under the NLE Construction Noise and Vibration Mitigation Scheme.
Construction	Includes demolition and excavation
Contiguous façade	Means a façade of a building that is horizontally separated from other facades by a stairwell, corner or some other discontinuity.

Term	Definition
decibel (dB)	Is the ratio of sound pressures which we can hear – a ratio of 10 <sup>6</sup> (one million: one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is the 'sound pressure level' (L <sub>p</sub> ) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply,
Eligible building	Has the meaning assigned to it in regulation 7 of Statutory Instrument 1996 No. 428, The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 excluding that part of regulation 7 (1) which refers to distances from running rail or the nearest apparatus corresponding thereto which is not applicable to noise from construction sites, but does not include any building with respect to which a notice to treat has been or is intended to be served for its acquisition, or with respect to which a vesting declaration for its acquisition has been or is intended to be made.
Eligible room	Means a living room or a bedroom having a qualifying door or a qualifying window in an eligible building.
Equivalent continuous sound pressure level (L <sub>eq</sub> )	Another index for assessing overall noise exposure is the equivalent continuous sound level, L <sub>eq</sub> . This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level. The A-weighted L <sub>eq</sub> is denoted as L <sub>Aeq</sub> .
Façade	Means an outer wall of a building.
Insulation work	Means work carried out to insulate an eligible building against noise which will include adequate ventilation and may include blinds.
Pre-existing ambient noise	Means the level of ambient noise, expressed as a level of L <sub>Aeq</sub> determined with respect to the relevant time period and the relevant L <sub>Aeq</sub> averaging time, prevailing one metre in front of relevant windows or doors in a façade of a dwelling, immediately before the placing of a contract for the construction of the relevant part of the NLE works.
Qualifying door	Means an external door opening directly into an eligible room which is in that part of the façade in respect of which the relevant noise level satisfies the requirements of Appendix A of this document or meets the criteria for a contiguous façade as set out in Appendix B.
Qualifying window	Means a window in an eligible room which is in that part of the façade in respect of which the relevant noise level satisfies the requirements of Appendix A of this document or meets the criteria for a contiguous façade as set out in Appendix B.
The Regulations	Means the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996.
The relevant specifications	Means the items in Part I of Schedule 1 to the Regulations except where they are amended by the provisions of this document, such of the items in Part II of Schedule 1 to the Regulations as may be approved by LU and such of the specifications set out in Part III of Schedule 1 to the Regulations as are applicable in the circumstances of the case or items whose performance is equivalent thereto.
The works	Is the construction works required for NLE which fall within the remit of the NLE Construction Code.

### 12.3 Person accountable for the document

<b>Person accountable for the document</b>
TfLs Consents and Environment Manager



## 12.4 Document history

Issue no	Date	Changes	Author
R1	Sept 2012	New document	Suzie Jackman

## 13 Appendix A

### Criteria for Eligibility for Noise Insulation or Temporary Re-housing

To be read in conjunction with Section 2 above

#### 13.1 Noise Insulation

A dwelling will be eligible where the total noise level due to construction of the railway (pre-existing ambient plus airborne NLE construction noise), measured or predicted at a point one metre in front of the most exposed of any windows and doors in any façade of a building which is an eligible dwelling, exceeds whichever is the higher of either: a) any of the following criteria in Table 1:

**Table 1: Noise Insulation Trigger Level Table**

Time	Relevant Time Period	Averaging Time T	Noise Insulation Trigger Level dB L <sub>Aeq, T</sub>
Monday to Friday	07:00 – 08:00	1 hr	70
	08:00 – 18:00	10 hr	75
	18:00 – 19:00	1 hr	70
	19:00 – 22:00	3 hr	65
	22:00 – 07:00	1 hr	55
Saturday	07:00 – 08:00	1 hr	70
	08:00 – 13:00	5 hr	75
	13:00 – 14:00	1 hr	70
	14:00 – 22:00	3 hr	65
	22:00 – 07:00	1 hr	55
Sunday and Public Holidays	07:00 – 22:00	1 hr	65
	22:00 – 07:00	1 hr	55

Or

- (b) 5 dB above the pre-existing airborne noise level for the corresponding times of day (i.e. the Relevant Time Periods presented in column 2 of Table 1);

And

for a period of 10 or more days of working in any 15 consecutive days or for a period of 3 or more nights (22:00-07:00) of working in any 7 consecutive nights or for a total of days exceeding 40 in any six consecutive months.

#### 13.2 Temporary Rehousing

Occupiers of a dwelling will be eligible for re-housing where the total noise level due to construction of the railway (pre-existing ambient plus airborne NLE construction noise), measured or predicted at a point one metre in front of the most exposed of any windows and doors in any façade of an eligible dwelling, exceeds whichever is the higher of either (a) or (b) or if criteria (c) is met:

- (a) 10 dB above any of the noise levels in Table 1 above or
- (b) 10 dB above the pre-existing airborne noise level for the corresponding time of day (i.e. the Relevant Time Periods presented in column 2 of Table 1);

and in the case of both (a) and (b) this occurs for a period of 10 or more days of working in any 15 consecutive days or for a period of 3 or more nights (22:00-07:00) of working in any 7 consecutive nights or for a total number of days exceeding 40 in any six consecutive months.

or

- (c) When night-time maximum noise levels due to construction works are predicted to regularly (at least 15 occurrences) exceed  $75\text{dB}_{L_{AFmax}}$  throughout the night time period (22:00-07:00) for 3 or more nights of working in any 7 consecutive nights.

### 13.3 Interpretation of the trigger levels

In interpreting and applying the trigger levels in Table 1, two conventions will be adopted. The first is that in interpreting the noise insulation/temporary rehousing policy where eligibility arises if noise levels in Table 1 are exceeded, a resolution of 0.1 dB will be applied. For example, a value of  $L_{Aeq,T}$  of 55 dB (with pre-existing ambient at least 5 dB lower) will not trigger eligibility. A value of 55.1 dB will trigger eligibility<sup>1</sup>.

The second convention relates to the choosing of minimum one-hour  $L_{Aeq,T}$  levels at night to define the pre-existing ambient, given that a series of survey results often shows different minima over a series of nights. The approach will be to select a 7-day survey period during which favourable weather conditions existed<sup>2</sup> and select the lowest one hourly value from that data set.

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<sup>2</sup> Wind speed not more than 5,/s and no precipitation.

## 14 Appendix B

### Eligibility Assessment

#### 14.1 Introduction

As explained in the main body of this appendix, eligibility for noise mitigation arises under the Scheme when three requirements are met (i) the total predicted (or actual) noise level due to construction works (pre-existing ambient plus airborne NLE construction noise) exceeds a trigger level (ii) the margin between the construction noise level plus the pre-existing ambient and the pre-existing ambient is at least 5 dB and (iii) the temporal requirements (10 out of 15 days of working etc) are met.

If the eligibility requirements were applied strictly this could lead to anomalies whereby some dwellings in a terrace might be included and not others or it might result in dividing the facades of apartment blocks into eligible and ineligible properties.

The procedure to be followed by LU in implementing the Scheme so as to avoid dividing facades in a manner likely to be contentious for residents is set out below.

#### 14.2 Procedure for Administering the Policy

While construction noise predictions made using a noise model such as SoundPlan can be presented using contours that will indicate a finite value for any location of interest, the same is not true of eligibility. The principal reason for this is that measured baseline noise levels are of necessity carried out at discrete locations. While interpolation between discrete values is possible in theory, it is in many circumstances impracticable.

The procedure will normally identify a single representative noise measurement location per façade, except for long façades. Sometimes a noise measurement location may serve as a surrogate for other comparable façades as well. Measurement locations should generally be towards the centre of the façade or façade section that they represent. The noise measurements from these locations may well be rounded.

The predicted noise including the contribution from the construction works will then be made for the worst affected window in the façade under consideration.

Whether a property is eligible for noise mitigation or not will then be determined using this predicted level. This determination will be applied to all the dwellings for which the measurement location was taken as representative.

In the case of a very long façade, it may be appropriate to utilise more than one noise measurement location. However, since measured values will vary slightly with quite small movements in position, a protocol needs to be established to avoid anomalous results as described above. The solution is to determine that more than one measurement location will be adopted for the same continuous facade only if the results from different noise measurement locations alongside the same façade differ by at least 3dB. For a façade at right-angles to a noise source such as a road or railway, this broadly means a doubling of distance from the source and would therefore normally only apply to long façades.

#### 14.3 Protocol for Determining Eligibility

- 1) Establish baseline  $L_{Aeq}$  for relevant time of day for appropriate monitoring locations.
- 2) Assign monitoring results to facades according to the following rules:



- a. Monitoring results to apply to whole façade where there is only one monitoring location for that façade. The monitoring location is to be as near as possible to the centre of the façade.
  - b. Monitoring results to apply to whole façade where another façade is used a surrogate.
  - c. Where more than one monitoring location exists for the same façade, only if the  $L_{Aeq}$  levels for any period differ by 3 dB or more shall the façade be divided, in which case façade areas around the location to be apportioned equally (i.e. as far as practicable each monitoring location to be in the centre of the area assigned to it).
  - d. The definition of a façade of a building is one that is horizontally separated from other facades by a stairwell, corner or some other discontinuity, as set out in section 2 of this document.
- 3) The predicted noise levels including construction noise to be utilised for the whole facade are those for the worst affected window/door in any façade.