

M5 Junction 10 Improvements Scheme

Environmental Management Plan

Annex B.3 - Noise and Vibration Management Plan

TR010063 - APP 9.3

Regulation 5 (2) (q)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Volume 9

March 2024



Gloucestershire
COUNTY COUNCIL

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Infrastructure Planning Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M5 Junction 10 Improvements Scheme Development Consent Order 202[x]

Environmental Management Plan

Annex B.3 - Noise and Vibration Management Plan

Regulation Number:	Regulation 5 (2) (q)
Planning Inspectorate Scheme Reference	TR010063
Application Document Reference	TR010063/APP/9.3
Author:	M5 Junction 10 Improvements Scheme Project Team

Version	Date	Status of Version
Rev 0	March 2024	Section 51

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B.3. Noise and Vibration Management Plan

B.3.1. Introduction

Purpose

- B.3.1.1. This document forms Annex B.3 of the Environmental Management Plan (EMP) (1st iteration) (Application Document TR010063/APP/7.3). Annex B.3 is a Noise and Vibration Management Plan (1st iteration) (NVMP) for the M5 Junction 10 Improvements Scheme (the Scheme). This NVMP (1st iteration) will be updated by the appointed Principal Contractor (PC) into a NVMP (2nd iteration), as required by Requirement 3 of the DCO, prior to commencement of works. The purpose of this NVMP (1st iteration) is to present the methodology for undertaking construction noise and vibration monitoring during the construction of the Scheme.
- B.3.1.2. Additionally, this NVMP (1st iteration) defines the measures to control and limit noise emissions and vibration levels at residential receptors and other 'Noise Sensitive Receptors' (NSRs) in the vicinity of the Scheme. The PC will discuss and agree with the local authority whether to seek their formal consent in accordance with Section 61 of Control of Pollution Act (CoPA) 1974 to their proposed methods of work and to the steps proposed in order to minimise noise. Notwithstanding this, the PC will discuss in detail and agree the proposed noise and vibration control measures with Cheltenham Borough Council (CBC) and Tewkesbury Borough Council (TBC), prior to the commencement of the works.
- B.3.1.3. This NVMP (1st iteration) contains information on the procedures that the PC and its supply chain will follow to manage, control and report on construction noise and vibration, for the Scheme, in accordance with relevant legislation, regulations and contractual requirements.
- B.3.1.4. This NVMP (1st iteration) defines:
- Roles and responsibilities at project and site-specific levels.
 - The approach to construction noise and vibration management.
 - Section 61 (CoPA 1974) consent process.
 - Noise and vibration control measures.
 - Noise and vibration monitoring.
 - The criterion for noise insulation and rehousing.
 - Complaint and incident procedures.
 - Communication arrangements.
 - Reporting requirements.

Structure of the noise and vibration management plan

- B.3.1.5. The NVMP (1st iteration) is set out into the following section:
- B.3.1.6. Section B.3.2 discusses the key roles and responsibilities discussed within this NVMP (1st iteration).
- B.3.1.7. The general methodology along Legislative and Guidance documents used within the NVMP (1st iteration) are discussed in Section B.3.3.

- The general principles of noise and vibration management, considered as BPM, are provided Section B.3.4.
- Section B.3.5 provides details on BPM and noise and vibration control measures that should be undertaken and part of the Scheme.
- Section B.3.6 discusses where Sound Insulation and Temporary Rehousing should be considered and the method of determining this prior to the undertaking of any works.
- The procedure for Monitoring and Measurements of noise and vibration prior and during construction is discussed withing Section B.3.7.
- Section B.3.8 discusses the PC's responsibilities for Communications and Complaints of noise and vibration during the construction of the Scheme.
- Section B.3.9 states the requirements of the PC's responsibilities in regard to the Considerate Constructor Scheme.

B.3.2. Project team roles and responsibilities

Staff Roles

B.3.2.1. The following staff will be responsible as set out below:

- Contract Leader - for the duration of the construction phase with any requirements communicated to contractors as applicable and for the effective management of the works in line with the Employer's Requirements and in line with additional agreements.
- Site Agents, Senior Engineers and Traffic Safety Officers - to provide information on programme and timing of works, and issue to the Environmental Manager. To review the resources, work activity and hours worked to reflect agreements reached with the local authority and to provide additional information, should it be necessary for over-runs, variations and night-time working. Ensure the Community Liaison Manager is notified 4 weeks in advance of potential noisy works and provide details about the activities.
- Environmental Manager – responsible for the preparation of management of noise-monitoring as required and for reporting the results to the site team, Environmental Health Officer (EHO) and Employer's Site Representative.
- Community Liaison Manager – responsible for coordinating communications informing public of forthcoming works and receiving noise related comments or complaints from scheme neighbours and liaising with the site team to provide responses to the complainant, EHO and Employer's Representative.

Management Tasks

B.3.2.2. This NVMP (1st iteration) is relevant to all construction activities undertaken as part of the Scheme. The management activities addressed by this NVMP (1st iteration) are:

- The management of procedures to obtain consents under S61 of CoPA.
- Training construction staff in the requirements relating to S61 Consents and BPM relating to noise control with emphasis on the legal status of S61 Consents and implications of non-compliance.
- Dissemination of the specific documentation relating to S61 applications, dispensations, variations, over-runs and consent conditions for specific activities to the staff responsible for construction.
- Keeping records of applications for S61 Consents, date of consents, expiry and conditions pertaining.

- The application for renewal (time extensions), Dispensations (major alterations and additions) and Variations (minor alterations and additions) to Consents and keeping records thereof.
- Notifications to the local authority of emergency requirements in over-runs of working hours or additional plant or different methods.
- Ensuring compliance with S61 Consents and contractual requirements related to noise and vibration.
- The establishment and operation of both semi-permanent and ad-hoc noise monitoring stations.
- The establishment and operation of unattended and ad-hoc vibration monitoring equipment.
- Development and maintenance of a noise and vibration monitoring equipment inventory.
- Preparation and issuing of noise and vibration monitoring reports in accordance with contractual requirements and the proposals set out in the Section 61 consent applications.
- The management of complaints and incidents including investigations and the deployment of corrective and preventative actions.

Section 61 Compliance

- B.3.2.3. The PC will be responsible for developing a monitoring programme to ensure compliance with any Section 61 consents.

B.3.3. Methodology

- B.3.3.1. The NVMP (1st iteration) follows the guidance provided in the documents in Table B 3-1.

Table B 3-1 - Guidance

Document Title	Synopsis
BS 5228. Code of practice for noise and vibration control on construction and open sites. Part 1: 2009 Noise (+A1: 2014)	<p>This part of BS 5228 gives recommendations for basic methods of noise control relating to construction sites, including sites where demolition, remediation, ground treatment or related civil engineering works are being carried out, and open sites, where work activities/ operations generate significant noise levels, including industry-specific guidance.</p> <p>The legislative background to noise control is described and recommendations are given regarding procedures for the establishment of effective liaison between developers, site operators and local authorities.</p> <p>This part of BS 5228 provides guidance concerning methods of predicting and measuring noise and assessing its impact on those exposed to it.</p>
BS 5228. Code of practice for noise and vibration control on construction and open sites. Part 2: 2009 Vibration (+A1: 2014)	<p>This part of BS 5228 gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels, including industry-specific guidance.</p> <p>The legislative background to vibration control is described and recommendations are given regarding procedures for the establishment of effective liaison between developers, site operators and local authorities.</p>

Document Title	Synopsis
BS 6472-1:2008. Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting	<p>BS 6472-1:2008 provides guidance on predicting human response to vibration in buildings over the frequency range 0.5 Hz to 80 Hz. Frequency weighting curves for human beings exposed to whole-body vibration are included, together with advice on measurement methods to be employed. Methods of assessing continuous, intermittent and impulsive vibration are presented.</p> <p>BS 6472-1:2008 describes how to determine the vibration dose value, VDV, from frequency-weighted vibration measurements. The vibration dose value is used to estimate the probability of adverse comment which might be expected from human beings experiencing vibration in buildings. Consideration is given to the time of day and use made of occupied space in buildings, whether residential, office or workshop.</p> <p>BS 6472-1 offers guidance on how people inside buildings respond to building vibration.</p>
BS 7385 Evaluation and measurement for vibration in buildings: Part 2: 1993 Guide to damage levels from ground borne vibration	<p>This British Standard, a part of the BS 7385 series, gives guidance on the assessment of the possibility of vibration-induced damage in buildings due to a variety of sources, and identifies the factors which influence the vibration response of buildings.</p> <p>This standard is intended to provide a standard procedure for measuring, recording and analysing building vibration together with an accurate record of any damage occurring.</p> <p>Vibrations of both transient and continuous character are considered. A method of assessment which takes into account the characteristics of the vibration, the building and the measured data are given.</p> <p>This standard is applicable only to vibration transmitted through the ground and not to vibration set up by machinery within a building. It does not cover chimneys, bridges and underground structures such as chambers, tunnels and pipelines.</p>

B.3.4. Management measures

Register of Environmental Actions and Commitments

- B.3.4.1. The following are the Register of Environmental Actions and Commitments (REAC) (Application document TR010063/APP/7.4) as they relate to the NVMP (1st iteration). The REAC is secured through Schedule 10, article 44 of the DCO.

Table B 3-2 - Noise and Vibration Management Plan REAC

REAC	Commitment Text	Implementation mechanism
NV1	Manage noise and vibration at construction stage.	EMP (2nd iteration). Annex B3 – Noise and vibration management plan.
NV2	Manage noise and vibration in the operation of the Scheme	EMP (2nd iteration). Annex B3 – Noise and vibration management plan.
PHH6	Prevent adverse effects on human health determinants, derived from water, air and soil quality/pollutants and noise	EMP (1 st iteration) (Application document TR010063/APP/7.3) DCO Schedule 2, Requirement 3(1) and 3(3).

REAC	Commitment Text	Implementation mechanism
PHH7	Prevent adverse effects on human health determinants, derived from light pollution nuisance, disturbed sleep/night-time working.	EMP (1 st iteration) (Application document TR010063/APP/7.3) DCO Schedule 2, Requirement 14.
LV6	Design of the noise barriers.	DCO Schedule 2, Requirements 11 and 14. EMP (2nd iteration). Annex B3 – Noise and vibration management plan.

Noise Control Strategy (Best Practicable Mean (BPM))

B.3.4.2. The general principles of noise management, considered as BPM, are provided below.

- The control of noise at source
 - Equipment –well-maintained equipment, certified to meet current EU legislation, and not louder than the noise levels provided in Annex C and D of BS 5228 Part 1
 - Equipment – controlling plant and machinery noise.
 - Equipment – indirect methods of controlling noise.
- The control of noise across the worksite
 - Control of working hours.
 - Control of routes to site for staff and deliveries. Construction vehicle movements will be restricted where possible to specified preferred construction traffic routes. PC to confirm the preferred construction traffic route to each construction area within the Traffic Management Plan (Annex B11 to the EMP 1st iteration, Application document TR010063/APP/9.12).
 - Control of delivery areas and times.
 - Careful choice of compound location.
 - Physically screening site.
 - Noise monitoring to check compliance with noise level limits, cessation of works until alternative method is found.
 - Use of vehicles, plant and equipment that generate lower levels of noise or vibration should be selected over alternatives that produce higher levels of noise or vibration as far as reasonably practicable.
 - Many of the activities which generate noise can be mitigated to some degree by careful operation of machinery, use of tools and the management of personal behaviours. This is best addressed by toolbox talks and site inductions.

B.3.5. Noise and Vibration Control Measures

B.3.5.1. The appointed Contractor will consult with the Environmental Health Departments, at CBC and TBC prior to the commencement of construction works, to obtain guidance on requirements for managing and controlling noise and vibration from construction works.

B.3.5.2. At all times, the principles of BPM as defined in Section 72 of the CoPA will be employed, and work carried out in such a manner as to avoid or reduce any disturbance from noise and vibration:

B.3.5.3. This will include the following general measures where appropriate:

- Plant and working methods will be selected to ensure that the minimum possible amount of noise is generated whilst carrying out the work in an efficient and cost-effective manner.
- Consideration will be made to site compound layouts and laydown areas in order that noise impact at nearby NSRs is minimised, including introducing a one-way system where feasible to minimise the need for reversing.
- All plant will be shut down or throttled back to idling speed in between periods of use.
- No start-up or shut down of vibratory plant e.g., rollers or compactors, within 50m of receptors, where practicable.
- Selection of quiet and low vibration equipment and methodologies following a review of construction programme and methodology to consider quiet / low vibration methods (including non-vibratory compaction plant where required).
- Alternative construction methodologies will be considered for construction activities with the potential to cause cosmetic damage to an asset.
- All ancillary pneumatic percussive tools will be fitted with mufflers or suppressors as recommended by the manufacturers which should be kept in a good state of repair.
- Where possible, hydraulic equipment will be used in preference to pneumatic plant. For cleaning out formwork prior to concreting, pressure washing will be used in preference to air lancing where practicable.
- Every effort will be made to ensure that the plant in use comprises the quietest available models suitable for the purpose, including white noise reversing alarms and 'super silent' generators.
- Plant and equipment will be maintained in good working order, with particular attention being paid to the condition of silencers and acoustic panels.
- Temporary noise barriers or other noise containment measures will be installed to minimise construction noise levels, where noise barriers can provide a reduction in noise levels of 5dB when the top of the plant is just visible over the noise barrier, and 10dB when a plant is completely screened from a receptor.
- Noisy hand-held equipment such as 'Stihl' saws will be shielded using temporary barriers such as Heras fencing fitted with acoustic shielding panels (similar to the 'Heras' Acoustic Barrier System).
- The provision of acoustic enclosures, hoardings and portable barriers around static plant, where necessary.
- Optimal location of equipment on site to minimise noise disturbance. Where practicable, plant with directional noise characteristics should be orientated to minimise noise at nearby properties.
- Static plant (such as generators and lighting sets) will be located so as to minimise impacts on sensitive receptors as far as is practicable in relation to occupied premises.
- Concrete mixers will not be cleaned by hammering the drums.
- Compliance with standard working hours, pursuant to Requirement 3 of the DCO.
- Wherever possible, avoid piling within 30m of NSRs. Where piling is required within 30m of a receptor, use alternative low noise/vibration methods. If such piling works are unavoidable, vibration levels will be monitored if receptors are located less than 30m from the piling works.

- Quiet methods of demolition will be employed where practicable, for example breaking out of concrete structures using low noise methods such as munching or similar, rather than percussion breaking.
- Whilst remaining fit for purpose, the plant and equipment selected for use will meet the current EU legislation and be noise reduced models e.g. within the lower range of expected noise emission levels based on the example data contained with BS5228-1. Particular care over plant selection will be taken for works required during out-of-hours / night-time periods if this is required.

B.3.5.4. Where works take place adjacent to NSR, the following measures will be implemented where possible:

- Provision of lined and sealed acoustic covers for all equipment.
- Regular maintenance of all equipment.
- Operation of equipment in the mode of operation that minimises noise.
- Shutting down equipment when not in use. No keys are to be left in plant.
- No waiting or queuing on the public highway with engines running.
- Audible warning systems designed to minimise noise.
- Close plant engine doors whilst in use and running.
- Machinery which is used intermittently should be turned off or throttled down to a minimum between work periods.
- Maintain all plant and service regularly and record, report any faults immediately.
- Contact the supervisor regarding any items of plant, which are not running normally.
- Avoid shouting (and swearing) on site.
- Arrange delivery times to suit the area, outside of school run times, not in the early hours etc.
- Acoustic covers to engines to be kept closed when engines are in use or idling.
- Materials lowered instead of dropped from height.

B.3.5.5. Regular onsite observation monitoring and checks/audits will be undertaken to ensure that BPM is being employed at all times. The site reviews will be logged and any remedial actions recorded.

Prioritisation of Mitigation

B.3.5.6. The prioritisation of mitigation measures shall run as provided below.

- BPM as identified above.
- Specific noise and vibration control measures as identified above.
- Where, despite the implementation of these measures, there are residents who would still be affected (e.g. shift workers, elderly, sick or disabled residents, etc.), the possibility of an offer of temporary relocation may be considered, if appropriate. These residents would be identified prior to works taking place.
- The recommendations of BS 5228: 2009+A1:2014 'Code of practice for Noise and Vibration Control on Construction and Open Sites', will be implemented, together with the specific requirements of this NVMP (1st iteration).

B.3.6. Noise Insulation & Temporary Rehousing

Construction Noise

- B.3.6.1. The PC will undertake a noise insulation / temporary rehousing appraisal six to nine months prior to starting the construction phase of the works or such time appropriate to the scale and nature of the works. Noise insulation or temporary re-housing, or the reasonable costs thereof, will be offered to residential receptors which meet the criteria provided below.
- B.3.6.2. Noise insulation, or temporary re-housing, will be offered where construction noise levels exceed trigger level criteria for a time period exceeding either:
- 10 days in any consecutive 15 day period, or;
 - any 40 days in any consecutive 6 month period.
- B.3.6.3. Noise insulation would be triggered by the higher of:
- a noise level 5 dB above the pre-construction ambient noise levels, or
 - the noise insulation trigger levels presented in Table B 3-3.
- B.3.6.4. Temporary re-housing would be triggered by the higher of:
- a noise level 10 dB above the pre-construction ambient noise levels, or
 - the temporary rehousing trigger levels presented in Table B 3-3.

Table B 3-3 - BS5228 Noise Insulation & Temporary Re-housing Thresholds

Day	Time period	Averaging time, T	Noise insulation trigger level (L _{Aeq,T} dB)	Temporary rehousing trigger level (L _{Aeq,T} dB)
Monday to Friday	07:00 – 08:00	1 hour	70	80
	08:00 – 18:00	10 hours	75	85
	18:00 – 19:00	1 hour	70	80
	19:00 – 22:00	3 hours	65	75
	22:00 – 07:00	1 hour	55	65
Saturday	07:00 – 08:00	1 hour	70	80
	08:00 – 13:00	5 hours	75	85
	13:00 – 14:00	1 hour	70	80
	14:00 – 22:00	3 hours	65	75
	22:00 – 07:00	1 hour	55	65
Sunday and Public Holidays	07.00 – 21.00	1 hour	65	75
	21.00 – 07.00	1 hour	55	65

All noise levels are predicted at 1m in front of the most exposed of any windows and doors in any façade of any eligible dwelling

Table Source: British Standards Institution (2014). BS 5228 Part 1, Table E2

- B.3.6.5. There may be special circumstances where, despite the above criteria not being met, the residents have reasonable grounds to make an application for noise insulation or temporary rehousing. Special circumstances could include night workers, those working in home occupations, local businesses or buildings that provide community facilities requiring a particularly quiet environment and those with a medical condition which will

be seriously aggravated by construction noise. The PC will consider all applications supported by evidence. The PC will provide noise insulation or temporary re-housing where it is demonstrated that this is necessary.

- B.3.6.6. The PC shall inform the local authority and owners / occupiers should it be identified that noise insulation or temporary re-housing is required.

B.3.7. Monitoring and Measurement

- B.3.7.1. Noise and vibration monitoring will include observational checks by the PC, Environmental Manager and the construction team. These will be supplemented by physical measurements. The locations will be agreed with the local authority. These locations may vary dependant on phasing and type of construction activity.
- B.3.7.2. Prior to construction works commencing, background noise monitoring will be undertaken at agreed locations with the local authority where required. During the construction works monitoring will be undertaken on a regular basis as agreed by the local authority or by the PC, Environmental Manager and will depend on location and type of work being carried out in each area.
- B.3.7.3. Noise will be monitored in line with DMRB LA 111 which refers to BS5228-1 and BS 7445-1. Measurements will be undertaken under free-field conditions i.e. there will not be any reflective surface within 3m of the microphone other than the ground. The following will also be considered:
- The sound level meter will be class 1 following the specification in IEC 61672 (International Electrotechnical Commission. International Electrotechnical Commission. IEC 61672, 'Electroacoustics - Sound level meters - Part 1: Specifications) as stated in DMRB LA 111.
 - The microphone will be positioned at least 1.5m above local ground level.
 - The monitoring period will be a minimum of 15 minutes. This period may be extended to an hour or beyond if levels stated in the section 61 consent are exceeded.
 - Noise monitoring equipment will be field calibrated in accordance with the manufacturer's instructions and evidence of calibration will be available on request.
- B.3.7.4. The following aspects will be recorded at the time of attended monitoring:
- Weather conditions; including approximate wind direction and speed, temperature, and cloud cover.
 - Ground conditions; wet or dry.
 - Description of activities nearby, including distance and direction of the monitoring point, that will contribute to the noise level recorded.
 - A description as to whether the activity is a dominant noise source, clearly audible or barely audible.
- B.3.7.5. Weather conditions will be taken into account before attended monitoring commences, for example the monitoring will not be carried out during periods of precipitation, or wind speeds above 4.5 m/s.
- B.3.7.6. The noise monitoring results will be recorded and made available to the local authority, upon request. Results of noise and vibration monitoring will be compared against predictions in the S61 consent. Where readings that are significantly greater than predicted levels or noise levels stipulated in the S61 consent, a review will be undertaken, and remedial actions implemented. The measured noise levels will be reported to the local authority EHO as soon as reasonably practicable and the relevant prediction calculations reviewed if exceedance levels are significant.

- B.3.7.7. Should vibration measurements be required, equipment will be installed at the potentially affected property or structure and left to run for several days or for the rest of the duration of the high-risk activities. The vibration meter will feed data to a webhost where live data can be monitored, and trigger alarms pre-set to notify site personnel in advance of breaching limits or building damage criteria. This allows works to be reconsidered in advance of an exceedance and / or impact.
- B.3.7.8. All results from noise and vibration measurements undertaken in response to complaints will be shared with the complainant and the local authority if requested and will be recorded in accordance with the Environmental Management System (EMS).

B.3.8. Communication and Complaints

- B.3.8.1. The PC will appoint a Community Relations Manager (CRM) responsible for leading engagement with affected communities. The CRM is responsible for the notification to residents that may be affected by potential disruptive activities, for example night-time working.
- B.3.8.2. Notifying and communicating with residents during construction will be via the following routes:
- Letter drops.
 - Newsletters.
 - Social media.
 - Dedicated internet page.
- B.3.8.3. An information webpage will be provided and kept up to date on the Gloucestershire County Council (GCC) website to reflect construction and community liaison requirements. It is envisaged that the webpage will provide up-to-date information on the progress of the construction works, areas affected by construction, mitigation in place to reduce adverse effects, information regarding planned construction works (including any proposed works outside normal hours, diversion routes etc.) and works recently completed.
- B.3.8.4. Public engagement will ensure that prior notification of works in unsocial hours, or noisy activities are communicated to those who may be affected (residents and / or businesses) well in advance of the works. This will include time, duration and types of work activities planned. A complaints procedure has been produced. The GCC Scheme mailbox address will be provided to allow complaints to be directed to the project team and an M5 Junction 10 Project Helpline Number used to facilitate enquiries and complaints from the public.
- B.3.8.5. A complaint management system will be in place, in line with systems used by GCC on other major infrastructure projects. Any noise and vibration complaints will be investigated, and appropriate action taken as required. The complainant and the relevant local authority will be provided with a response outlining the results of the investigation and any action taken. The relevant local authority will be invited to visit the site to view and validate the success or otherwise of the remedial action. Should further practical mitigation be appropriate to prevent a re-occurrence, this will be discussed with the relevant local authority and implemented where reasonably practicable.

B.3.9. Considerate Constructor Scheme

- B.3.9.1. The PC will register and adhere to the requirements of the Considerate Constructors Scheme (CCS).

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