

1 Construction Noise and Vibration Management Plan

1.1 Objective

This management plan defines the measures to control and limit noise emissions and vibration levels, at residential properties and other sensitive receptors in the vicinity of the Project.

The Contractor will discuss and agree with the Local Authority whether to seek their formal consent in accordance with Section 61 of Control of Pollution Act 1974 to his proposed methods of work and to the steps he proposes in order to minimise noise. Notwithstanding this, the Contractor will discuss in detail and agree the proposed noise and vibration control measures with the Local Authority (Boston Borough Council).

1.1.1 General Requirements – Noise

Best Practicable Means (BPM) of noise control will be applied during construction works to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors arising from construction activities.

The general principles of noise management are given below:

Control at source:

- Equipment – noise emissions limits for equipment brought to site.
- Equipment – method of directly controlling noise e.g. by retrofitting controls to plant and machinery.
- Equipment - indirect method of controlling noise e.g. acoustic screens.
- Equipment - indirect method of controlling noise e.g. benefits and practicality of using alternative construction methodology to achieve the objective e.g. vibratory piling techniques or hydro-demolition as opposed to more conventional but noisier techniques; selection of quieter tools/machines; application of quieter processes.

Control across site by:

- Administrative and legislative control,
- Control of working hours,
- Control of delivery areas and times,
- Careful choice of compound location,
- Physically screening site,
- Control of noise via Contract specification of limits,
- Noise Monitoring, to check compliance with noise level limits, cessation of works until alternative method is found.
- Many of the activities which generate noise can be mitigated to some degree by careful operation of machinery and use of tools. This may best be addressed by tool box talks and site inductions.

1.2 Best Practicable Means

BPM are defined in Section 72 of the Control of Pollution Act 1974 and Section 79 of the Environmental Protection Act 1990 as those measures which are:

“reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to financial implications”.

The Environment Agency will require its contractors to consider mitigation in the following order:

- BPM as identified above, including:
 - Noise and vibration control at source: for example the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on site, control of working hours, the provision of acoustic enclosures and the use of less intrusive audible warnings such as broadband vehicle reversing alarms;
 - Screening: for example local screening of equipment or perimeter hoarding; and
- Where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in this Construction Noise and Vibration Management Plan, or where there are residents who would still be affected (eg shift workers, young mothers, the elderly, sick or disabled residents) the Agency would offer temporary relocation if required. These residents will be identified prior to works taking place.

The recommendations of BS5228: 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 management plan.

1.3 Consultation

Consultation was carried out with the environmental health department of Boston Borough Council during and subsequent to preparation of the Environmental Statement regarding the management of noise and vibration during construction of the Project.

The Council recognises that construction operations by their nature are noisy, however the impact on those living and working in the vicinity must be minimised as far as is reasonably practicable.

The Council requires the following in terms of regarding noise and vibration management:

- 1) The maintenance of good community relations is vital. Experience shows that construction noise has the potential to cause disturbance but can be tolerated if prior warning and explanation has been given to residents. In particular advice regarding the nature of construction works, the duration of the works and mitigation measures to be implemented can help to reduce people’s reaction to noise. Contractors will consult local residents/communities regarding works and to give them details of a responsible appointed person on site who will be able to deal with queries.
- 2) Construction working hours should be carefully managed. All works should take place between normal working hours 07:30 and 18:30, Monday to Friday with the exception of restricted works such as tide dependant dredging and any identified as planning conditions.
- 3) The local authority have no pre-defined construction noise limits however, it is requested that all works should employ best practicable means to control noise levels as far as is reasonably possible.

- 4) A scheme of noise and vibration monitoring should be undertaken and assessed periodically during construction. Monitoring would aim to demonstrate that noise levels are being sufficiently controlled in order to protect residents from adverse noise and vibration levels. [Details of such monitoring are outlined in Appendix C]. The Noise and Vibration Monitoring Plan is to be agreed with LA prior to commencement to include full term continuous monitoring at the nearest property to the Barrier works.
- 5) A pre-commencement external structural assessment of the properties closest to the construction areas where vibration is likely will be required.
- 6) Details of a 24/7 Complaints Procedure and Contacts to be agreed with LA

1.4 Noise and Vibration Control Measures

In addition to specific requirements of the Local Authority, the Contractor will be required to adopt the following more specific measures:

1.4.1 Control measures

Without prejudice to the other requirements of this section, the Contractor shall comply with the recommendations set out in BS5228:2009 and in particular with the following requirements:

- Vehicles and mechanical plant will be maintained in a good and effective working order and operated in a manner to minimise noise emissions. The contractor will ensure that all plant complies with the relevant statutory requirements;
- HGV and site vehicles will be equipped with broadband, non-tonal reversing alarms;
- Compressor, generator and engine compartment doors will be kept closed and plant turned off when not in use;
- All pneumatic tools will be fitted with silencers/mufflers;
- Care would be taken when unloading vehicles to avoid un-necessary noise;
- The use of particularly noise plant will be limited, i.e. avoiding use of particularly noisy plant early in the morning;
- Restrict the number of plant items in use at any one time;
- Plant maintenance operations will be undertaken at distance from noise-sensitive receptors;
- Reduce the speed of vehicle movements;
- Ensure that operations are designed to be undertaken with any directional noise emissions pointing away from noise-sensitive receptors;
- When replacing older plant, ensure that the quietest plant available is considered;
- Drop heights will be minimised when loading vehicles with rubble;
- Vehicles should be prohibited from waiting within the site with their engines running or alternatively, located in waiting areas away from sensitive receptors;
- Local hoarding, screens or barriers should be erected to shield particularly noisy activities;
- Piling will be carried out with the method that minimises both noise and the transmission of vibration to sensitive receptors;

- Temporary noise screens will be used to reduce noise from particularly noisy activities and the height of perimeter hoarding will be extended where this would assist in reducing noise disturbance at sensitive receptors; and
- Hours of operation should be strictly enforced and any deviations other than those previously identified will be with the consent of the local authority.

1.4.2 Notifications

Occupiers of adjacent properties will be informed by the Contractor up to 2 weeks in advance of the works taking place, including the duration and likely noise and vibration effects. In the case of work required in response to an emergency, the Environment Agency and local residents will be advised as soon as reasonably practicable that emergency work is taking place. Potentially affected residents will also be notified of the helpline number for the contractor.

1.4.3 Noise and vibration monitoring

A regular programme of noise and vibration monitoring shall be implemented as a minimum in accordance with Appendix C of this document.

The Contractor will submit the proposed method, the frequency and the location of monitoring site to the Planning Authority for agreement prior to commencing works. Proposed monitoring requirements and locations are detailed in Appendix C. Noise baseline levels will be agreed prior to commencement of construction.

2 Mitigation of Temporary Effects

Notwithstanding general advice on best practicable means as outlined in Section 1 of this document, for those construction activities which have shown to have the highest potential to give rise to temporary significant adverse effects, the mitigation measures detailed below will be required. Appendix A shows the site works layout plan.

2.1 Noise Mitigation

2.1.1 Dredging

Lower noise dredging equipment:

Although recognised that the choice of dredgers is likely to be determined by the engineering requirements and the suitability of available equipment, dredging activities should be planned where possible to reduce the overall source noise level during the works – e.g. limiting night-time works directly adjacent to noise-sensitive properties etc.

Acoustic screens:

Screening shall be provided nearest to those properties most likely to experience high noise levels from dredging, particularly during more sensitive night-time periods.

The contractor shall provide acoustic screening to the rear of Wyberton Low Road to reduce potential noise impact during dredging. The proposed location of acoustic screening along Wyberton Low Road during dredging is presented in Figure 4 in Appendix D.

The inclusion of acoustic screening to the rear of Wyberton Low Road together with the shielding provided by the existing embankment is considered to be the most practicable mitigation. Predicted residual noise levels at worst affected properties are estimated to be within the scheduled noise limits given Appendix C but will be verified with an agreed schedule of noise monitoring.

2.1.2 Widening of the Wet Dock Entrance

Acoustic screens:

Acoustic screens should be installed to the north of the construction area of the new Wet Dock Lock gate to reduce potential noise effect particularly during noisy night time work such as earthworks and concreting. The proposed location for acoustic screening is indicated on Figure 5 in Appendix D.

Predicted residual noise levels inclusive of acoustic screens are estimated to be within the scheduled noise limits given Appendix C but will be verified with an agreed schedule of noise monitoring.

2.1.3 Piling

Lower noise piling methods:

Piling is typically one of the most intrusive noise sources associated with construction works, with the loudest element of the piling coming from the noise generated upon impact of the hammer driving the piles in to the ground. Test data indicates a reduction of approximately 20dB from use of hydraulic methods over impact hammer.

Anchor piles will be driven into the ground adjacent to the rear boundaries of properties along Wyberton Low Road while main piling activities will take place further away and there will be some screening by the existing bund. The acoustic screen erected as a protection against dredging activities shall be retained for the duration of piling

A press piling method, sometimes known as 'silent' piling shall therefore be adopted to the rear of properties on Wyberton Low Road which avoids the high percussive noise associated with impact piling. If harder than expected ground conditions are encountered, pre-auguring and jetting should be considered in conjunction with press piling.

Predicted residual noise levels inclusive of acoustic screens are estimated to be within the scheduled noise limits given Appendix C but will be verified with an agreed schedule of noise monitoring.

2.1.4 Re-cabling power lines along Wyberton Low Road

Cable laying associated with the enabling works will take place predominantly along Wyberton Low Road which is a narrow street with terraced housing located close to the road.

Should intrusive excavation will be required then acoustic screens shall be placed adjacent to excavation and road break-up activities along Wyberton Low Road to reduce noise levels at the nearest residential properties.

Noise monitoring should be undertaken in accordance with Appendix C of this document to confirm noise levels along Wyberton Low Road during re-cabling. In spite of the noise mitigation provided, where necessary, additional mitigation measures such as individual noise insulation or temporary relocation of local residents should be considered on a case by case basis if excessive prolonging of noise impacts is envisaged once the construction works commence.

2.1.5 Construction Traffic

The Contractor will incorporate the following measures into the scheme to avoid noise related impacts from construction traffic:

- Vehicles will not wait or queue up with engines running on the site or the public highway;
- Vehicles will be properly maintained to comply with noise emissions standards;
- Deliveries will be restricted to be within working hours of the site; and
- Design and routing of access routes will minimise vehicle noise and the need to perform reversing manoeuvres.

2.2 Vibration Mitigation

2.2.1 Piling

Vibration levels due to percussive piling are predicted to be approximately 1.0 mm/s Peak Particle Velocity (PPV) at the nearest residential properties on Wyberton Low Road which falls at the threshold of effects significant adverse effect due to vibration. Comparatively, piles installed using a vibratory piling rig are predicted to result in vibration levels exceeding 1.5mm/s PPV at the same location.

Press piling shall therefore be adopted by the contractor to minimise vibration levels during Piling along the right bank in conjunction with pre-auguring and jetting dependant on ground conditions. Vibration levels at properties due to press piling including pre auguring are predicted to be less than 0.2mm/s at 23m.

2.2.2 Re-cabling power lines along Wyberton Low Road

Vibration levels due to the use of vibratory rollers at 10m from the works are predicted to be approximately 1.5 mm/s PPV.

BS5228-2 notes "It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents" Residents should therefore be given prior warning of the use of vibratory rollers.

2.3 Noise Insulation

Where, in spite of the mitigation measures applied and consents from the local authority, noise levels at some properties exceed the scheduled periods defined below, a scheme for the installation of noise insulation or the reasonable costs thereof, or a scheme to facilitate temporary rehousing of occupants, as appropriate, will be implemented by the developer or promoter. The scheme will include provision for the notification of affected parties.

Noise insulation or the reasonable costs thereof will be offered by the developer or promoter to owners, where applied for by owners or occupiers, subject to meeting the other requirements of the proposed scheme, if either of the following apply to property lawfully occupied as a permanent dwelling:

- a. where the predicted noise level exceeds the scheduled noise levels presented in Table 1; or
- b. where the total noise (pre-construction ambient plus construction noise) is 5 dB above the existing airborne noise level for the corresponding times of day, whichever is the higher; and

for a period of ten or more days of working in any fifteen consecutive days or for a total of days exceeding 40 in any 6 month period.

3 Summary

This reports gives details of a noise and vibration construction management plan to be implemented by the appointed contractor prior to and during the construction of the Project – Boston Barrier.

The location of noise sensitive receptors are identified where there is the potential for disturbance from either noise and or vibration during construction.

The principles of noise management are outlined for which the Contractor shall comply with based on the recommendations set out in BS5228:2009.

Best Practicable Means (BPM) of noise control are outlined and will be applied by the contractor during construction works to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors arising from construction activities.

Specific mitigation measures should be implemented by the contractor during those construction activities identified as having the highest potential to cause disturbance from either noise and or vibration.

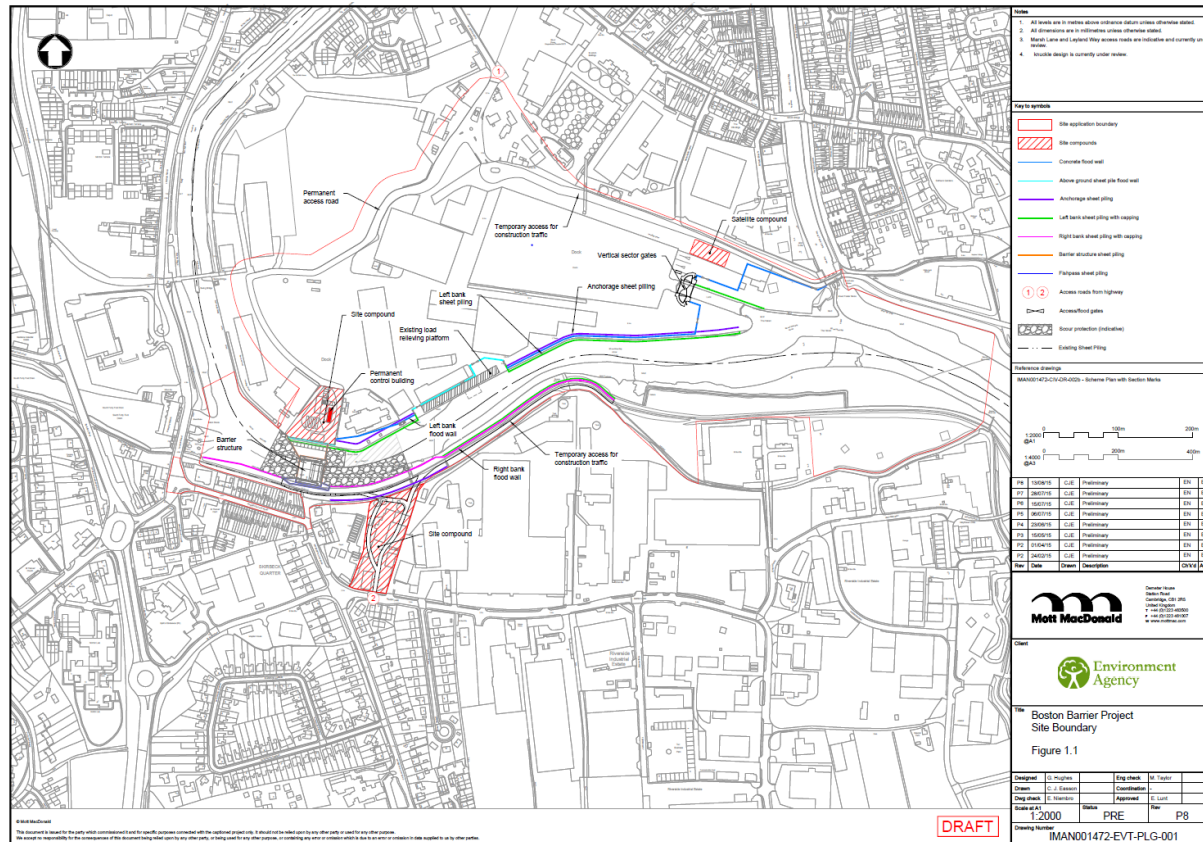
Noise and vibration monitoring locations are given in Appendix C.

Appendices

A.	Site Works Layout Plan	10
B.	Not Used	11
C.	Noise and Vibration Monitoring	12
D.	Mitigation Locations	15

A. Site Works Layout Plan

Figure 1: Site Works Layout Plan



B. Not Used

C. Noise and Vibration Monitoring

C.1 Noise Monitoring

During working hours, noise levels should be measured at a free-field position equivalent to one metre from the most affected façade of any occupied dwelling or other building used for residential purposes.

The noise levels (see Note (i) below) scheduled below for periods outside the normal working hours will only be permitted when consent has been given to exceptional working.

2. The ambient noise level, L_{Aeq} (see Note (ii) below) from all sources when measured 2.0m above the ground at noise control stations numbers 1 to 4 indicated on the noise measurement map given in Appendix A shall either not exceed the appropriate level given in the Schedule or not exceed by more than 3 dB the existing ambient noise level, L_{Aeq} (see Note (iii) below), at the control station measured over the same period, whichever level is the greater.
3. Where, in spite of the mitigation measures applied and consents from the local authority, noise levels at some properties exceed the scheduled periods defined below, a scheme for the installation of noise insulation or the reasonable costs thereof, or a scheme to facilitate temporary rehousing of occupants, as appropriate, will be implemented by the developer or promoter. The scheme will include provision for the notification of affected parties.

Noise insulation or the reasonable costs thereof will be offered by the developer or promoter to owners, where applied for by owners or occupiers, subject to meeting the other requirements of the proposed scheme, if either of the following apply to property lawfully occupied as a permanent dwelling:

- a. where the predicted noise level exceeds the scheduled noise levels presented in Table 1; or
- b. where the total noise (pre-construction ambient plus construction noise) is 5 dB above the existing airborne noise level for the corresponding times of day, whichever is the higher; and
- c. for a period of ten or more days of working in any fifteen consecutive days or for a total of days exceeding 40 in any 6 month period.

Table 1: Schedule of Noise Monitoring Levels

Schedule	Total Noise level at Measurement Locations			
	Period	Hours	Ambient Noise Level, L_{Aeq} at Measurement Locations: dB	Period of Hours Over Which L_{Aeq} is Applicable
Mondays to Friday		0700 – 0800	62	Any 1 hour
		0800 – 1800	72	Any 1 hour
		1800 – 2100	62	Any 1 hour
Saturdays		0700 – 0800	62	Any 1 hour
		0800 – 1300	72	Any 1 hour
		1300 – 2100	62	Any 1 hour
Sundays		0700 – 0900	47	Any 1 hour
		0900 – 1700	62	Any 1 hour
		1700 – 2100	47	Any 1 hour
Nights		2100 – 0700	55	Any 1 hour
All unattended plant			55	Any 1 hour

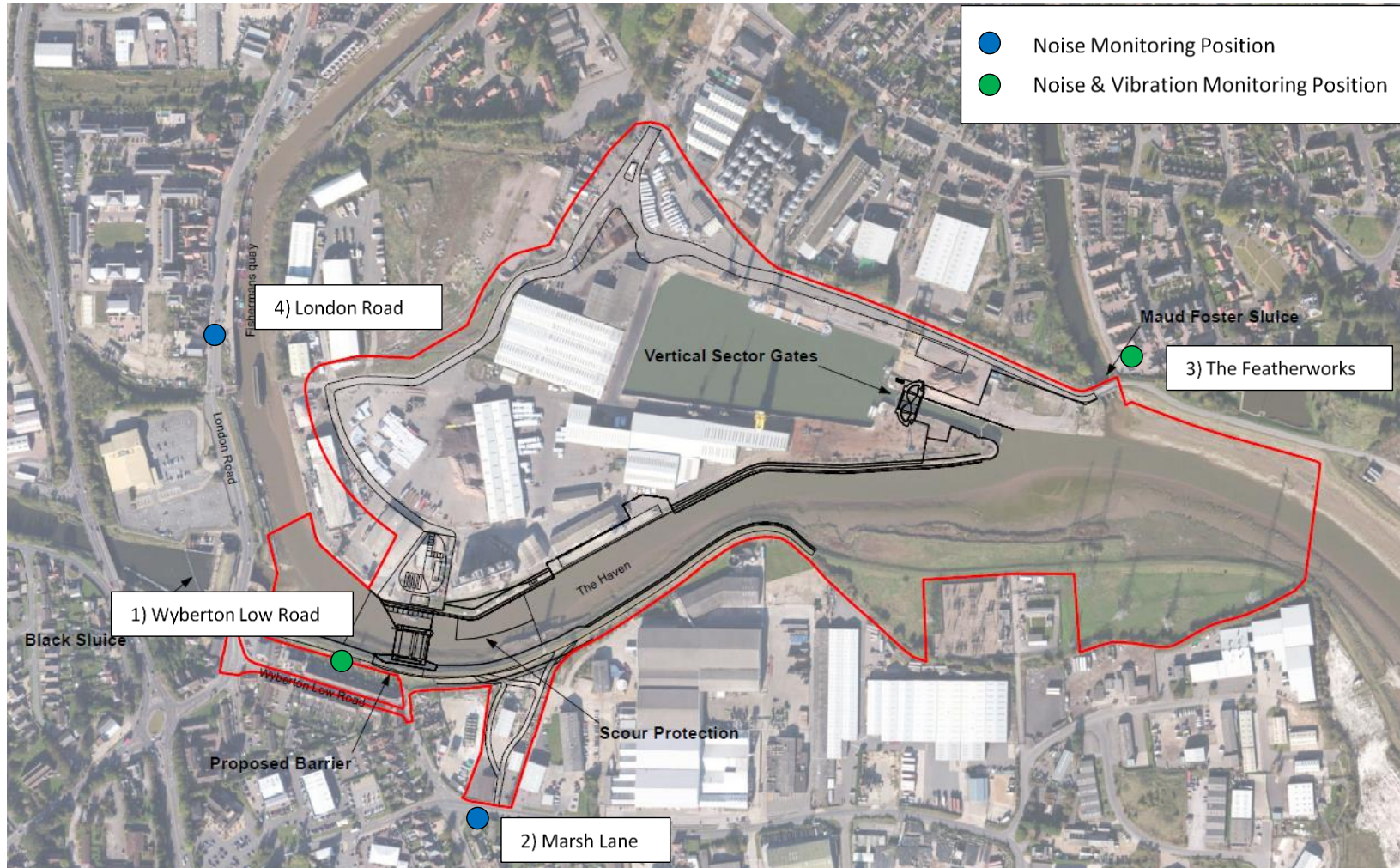
Notes:

- (i) Noise levels relate to free field conditions. Where noise control stations are located 1m from facades of buildings, the permitted noise levels can be increased by 3dB.
- (ii) The ambient noise level, LAeq at a noise control station is the total LAeq from all noise sources in the vicinity (including the site) over the specified period.
- (iii) The existing ambient noise level, LAeq, at a control station is the total LAeq from all the noise sources in the vicinity over the specified period prior to the commencement of the Works

C.2 Vibration Monitoring

The Contractor shall also normally limit vibration levels arising from site activities at any residential building between 0800 and 1800 hours weekdays, 0800 to 1300 hours Saturdays to a peak particle velocity of 1.5mm/second in the vertical direction. No perceptible vibration is permitted in such buildings at any other time. Exceptionally for short periods not exceeding 2 hours in any weekday, vibration levels of up to 2mm/sec may be permitted at the discretion of the Environmental Health Officer. Where vibration occurs, reference should be made to ISO 2631 - Whole Body Vibration and BS6472 - Human Response to Vibration in Buildings.

Figure 2: Noise and Vibration Monitoring Locations



D. Mitigation Locations

Figure 3: Acoustic Screening During Dredging

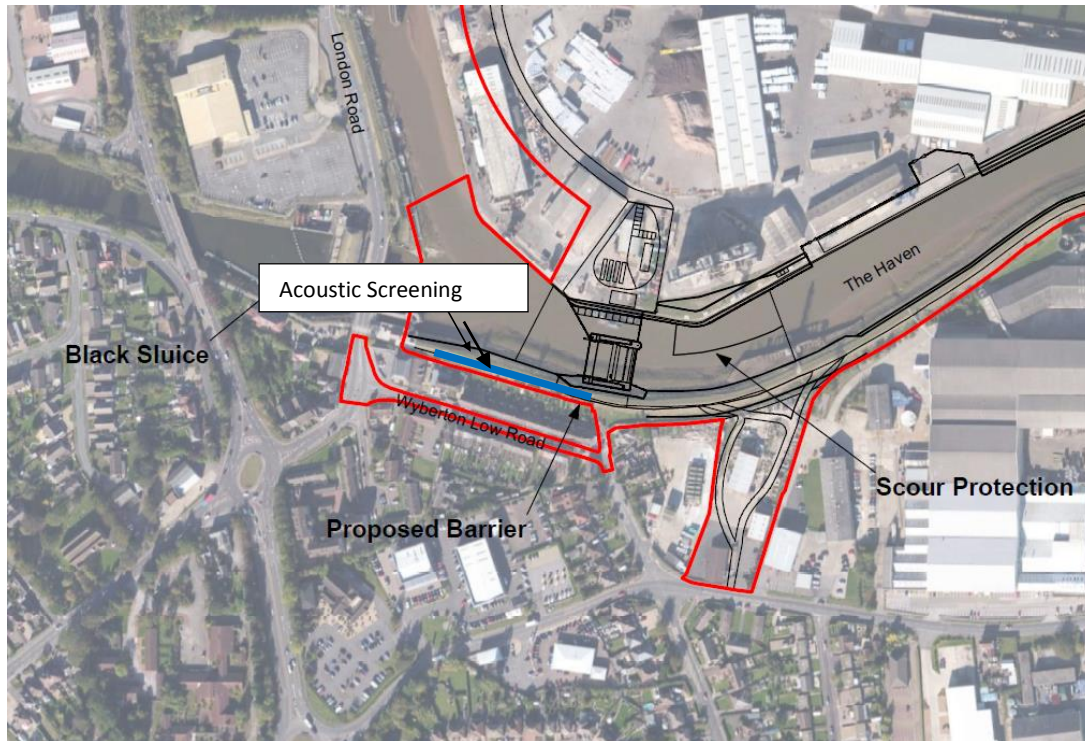


Figure 4: Acoustic Screening During Wet Dock Lock Night Works

