



Figure 13-3 Proposed Noise Monitoring Location with Construction Noise Barriers

13.6 Ground-borne Vibration EMMP Requirements

During the construction phase, the Contractor will control construction vibration levels using the best available techniques (BAT). The Contractor will ensure that the vibration levels for any construction activities at the sensitive receptors (excluding the worksite area) do not exceed Peak Particle Velocity, PPV, 15 mm/s, to avoid cosmetic damage. No night work should be conducted after 7 pm for all non-safety critical activities since the site is next to the sensitive receptors.

Routine ground-borne vibration monitoring shall be undertaken during the construction phase. Based on a review of sensitive receptors around the construction worksite areas, a continuous monitoring program is proposed to be conducted during project construction. The proposed monitoring locations are shown in Table 13-3 and Figure 13-4.

Table 13-3 Recommended Monitoring Program (Vibration)

Location	Parameters	Frequency and Duration
1 Clementi Crescent, Clementi Green	Vibration Velocity PPV	Continuous during piling and tunnel boring activities
SIM Headquarters	Vibration Velocity PPV	Continuous during piling and tunnel boring activities
479 Clementi Road, Rosedale	Vibration Velocity PPV	Continuous during piling and tunnel boring activities
Singapore University of Social Sciences (SUSS)	Vibration Velocity PPV	Continuous during piling and tunnel boring activities

Environmental Parameter	Environmental Issue	Minimum Controls	Mitigation / Management Measures	Monitoring Parameter	Monitoring Locations	Recommended Frequency of Monitoring	Site Responsibility	Triggers ^{2,3}
Airborne Noise	Noise from construction machines and equipment, especially rotational and vibratory equipment (e.g. dozers, cranes, excavators, trailers, generators, etc.), as listed in Appendix F	<ul style="list-style-type: none"> Construction prohibition period should be followed, as per fourth schedule of Environment Protection and Management regulation; Prepare a Construction Noise Management Plan, to establish baseline monitoring prior to site clearance, plan for monitoring during the construction phase, and procedure for complaint handling; The Contractor shall review the equipment to be used on site and erect localised noise barriers prior to undertaking high noise generating work; Machines (such as trucks) that may be in intermittent use shall be shut down between work periods or shall be throttled down to a minimum; Only well-maintained plants shall be utilized on-site and plants shall be serviced regularly during the entire construction period; The number of PMEs shall be reduced as far as practicable when construction works are carried out at areas close to the noise sensitive receivers; Silencers or mufflers on construction equipment shall be utilized and shall be properly maintained during the construction programme; Behavioural practices including no shouting, no loud stereos/radios on site, no dropping of materials from height, no throwing of metal items shall be ensured; Construction respite: Restrict high noise generating drilling activities only in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block, if possible; Periodic noise monitoring by an independent third party, to establish compliance with requirements and to advise on equipment causing concern, and additional potential mitigation measures; Plan the layout of the site by considering using materials and other large structural equipment as noise barriers; Plant known to emit noise strongly in one direction shall, wherever possible, be orientated so that the noise is directed away from the nearby NSRs; and Material stockpiles and other structures shall be effectively utilized, wherever practicable, in screening noise from on-site construction activities. Acoustic sheds should be provided at the locations of the noise generating activity such as operation of hand-held breaker. All construction works should be conducted within the daytime period. TBM works are to be conducted in the daytime as much as possible. The optimisation of worksite to be situated away from ecological sensitive sites as far as practicable. Activities may be scheduled to minimize noise generated at certain areas during periods which may be particularly sensitive to noise, Works using machines or vehicles that generate noise should be prohibited in the night and the dawn; Appropriate hearing protectors shall be used by personnel operation the plant or equipment, the hearing protector must attenuate the exposure of the user to sound pressure levels below 85 dB (A). Signage to remind personnel to put on hearing 	<p>MITIGATION MEASURES FOR GENERAL CONSTRUCTION NOISE CONTROL:</p> <ul style="list-style-type: none"> Control of noise sources at the source from construction site – Analyse construction inventory list and check equipment causing high noise levels. The equipment with lower noise level shall be prioritised. Where controlling noise sources at the source is not feasible, acoustic enclosures or sheds are to be introduced to mitigate noise at the source. Typical acoustic enclosure covers the machine as fully as possible (with or without ventilation where applicable) to provide sound insulation. <p>MITIGATION MEASURES FOR CONSTRUCTION NOISE:</p> <p>Noise Barrier (see Figure 13-3) of minimum Sound Transmission Class (STC) 20 are proposed to be erected at all the following locations:</p> <ul style="list-style-type: none"> <u>Construction of necessary noise barriers to meet the relevant authorities/agencies requirements along his construction worksite boundary</u> <u>LTA's standard 15M high TBM enclosure (one facade opening at northern side) at boundary of launch shaft.</u> <ul style="list-style-type: none"> Above-ground works not critical for safety reasons to be restricted to weekdays (avoiding works on Sunday and Public holidays) No night works after 7pm for all non-safety critical activities since the site is next to biodiversity Study Area Portable noise barrier were highly recommended close to the noisy equipment/ activities For noisy machinery such as the Secant Pile Auger - that typically operate for long period, the sound proof baffles can be mounted directly on the machine around the engine cowling. 	Leq 12hours, Leq1hour and Leq 5mins	<ul style="list-style-type: none"> Singapore University of Social Sciences 479 Clementi Road 	<p>Before commencement of any construction works (including site clearance)</p> <ul style="list-style-type: none"> One-time airborne noise monitoring for 1 week at these locations, for establishment of latest baseline. <p>During Construction Phase</p> <ul style="list-style-type: none"> Continuous monitoring at this location for the entire duration of construction. Records on noise levels from construction sites should be properly kept and produced when requested. 	CT, EM/ECO	<p>Investigation and corrective actions to be taken, when</p> <ol style="list-style-type: none"> Any of the following documentation are found inadequate / missing: <ul style="list-style-type: none"> Construction Noise Management Plan; Monitoring Log. If the monitored parameters exceed applicable values of EPM regulations. If complaints are received due to Project activities. If visual non-compliance to any of the minimum control or mitigation measures are observed onsite. <p>If there are any cracks / leaks present on the noise barrier erected.</p>