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DEVELOPMENT OF WORKING TOOLS FOR ROAD ASSESSMENT

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8.1. Overview

8.1.1. On completion of a detailed investigation of "13 sites of noisy road" over the territory, it becomes clear that the feasibility of mitigating noise from existing roads is critically dependent on the local site constraints and the type of sensitive developments to be protected. While it is desirable to undertake a detailed feasibility study as outlined in Section II to identify all these site constraints for direct noise mitigation of an existing at-grade it is useful to adopt simplified procedures for initial assessment, since the study usually takes time to complete. To this end, a working tool has been developed to enable an assessor such as the EPD to carry out a desk-top study to assess if the required mitigation is at all feasible before the mitigation is subject to a detailed feasibility study.

8.1.2. This working tool involves a set of simple assessment procedures, which require no complicated modelling and lengthy calculations. The assessor is guided systematically through these procedures to identify and classify the problem and, where appropriate, to recommend further investigation.

8.1.3. The simplified assessment procedures are illustrated in seven flow charts which cover the following aspects of the investigation :

- identification of problems at the subject site,
- selection of a barrier form for the identified problems,
- implication of the identified barrier form on the provision of existing emergency access and fire fighting requirements,
- implication of the identified barrier form on road safety, pedestrian and vehicular movements,
- social implication and severance to commercial activities,
- availability of space, amenity and land for the likely barrier provision,
- checking of the acoustic effectiveness and possible engineering feasibility.

The procedures are summarised in the form of flow charts and the basis for the procedures are described in subsequent sections.

8.1.4. This set of assessment procedures is not meant to replace the formal procedures as outlined in Section II but as a quick working tool to identify whether the existing noise problem can be mitigated by means of noise barriers or not. If the assessment is positive, a preliminary engineering feasibility study should then be carried out to confirm the viability of the proposal. An overview of the simplified procedures is shown in Figure 8.1. Figures 8.2 to 8.8 show the details of Chart 1 to Chart 7. The applicability of these procedures to the "13 sites of noisy road" is illustrated in Appendix A.

8.2. Identification of Problems

8.2.1. Problem identification procedures are given in Chart 1. The identification is based on the number of lanes (L) and the distance of the subject road from the affected facade (D). Appendix B gives the technical basis for the formulation of Chart 1.

8.2.2. The number of lanes in a road gives an indication of the likely volume of traffic using the road. In general, a single two-lane carriageway carries 800 vehicles per hour in two directions while a four-lane single carriageway or a dual two-lane carriageway carries 2,400 to 2,800 vehicles per hour in one direction. This is a simplified approach to define the range of basic noise level generated from the subject road, although the vehicle composition, geometry of the road and speed of traffic also determine the noise level.

8.2.3. As a quick screening process, these factors can be ignored. Distance is also a useful parameter to assist the identification. If the road is identified as a possible noisy road, the next step should be to identify the form of noise barrier for the particular site conditions and the type of sensitive receivers and, furthermore, the chance of providing such barrier in an effective manner. If the subject road is not found to be a noisy road, no immediate noise mitigation measures should be applied.

8.3. Selection of Barrier Form

8.3.1. When a road has been identified as noisy, the next step is to review the site conditions and determine the form of noise barrier to mitigate the noise impact on the affected buildings. Plain vertical noise barriers would be effective to protect receivers up to about 5th floor. For receivers in the mid floor range, i.e. from 5th to 10th floor, a bend top barrier would normally be required. The receivers at floors above 10th would need semi-enclosures to be installed on the subject road. Chart 2 provides a quick procedure to assist the assessor to identify the likely form of barrier on the subject site. Appendix C gives the technical basis for formulation of Chart 2.

8.4. Emergency Access Consideration

8.4.1. Provision of noise barriers may often create an obstruction between the carriageway and the affected development. No provision is made for any noise barrier at the emergency vehicle access (EVA) for fire fighting and emergency vehicles.

8.4.2. For fire fighting, it is essential that the affected facades should be within reach of the fire engines. As a rule of thumb, the maximum unobstructed distance between the fire engine and the farther-most facade should be less than 10 meters. If this is not achievable, the barrier option should be considered as not practical unless alternative arrangement can be identified. Alternatively, the scheme should be modified to comply with the emergency access requirement.

8.5. Road Safety Considerations

8.5.1. Chart 4 focuses on the road safety aspects, which cover the basic traffic engineering requirements, stipulated in the TPDM. A detailed investigation would involve the measurements of visibility splays and speed of traffic. As a quick assessment, Chart 4 has been designed to provide a step-by-step procedure to identify a suitable scheme which duly considers all likely implication of the scheme to road safety and pedestrian and vehicle access.

8.5.2. Provision of a noise barrier close to an existing junction could obstruct the visibility splays of the junction and would violate the principle of "Seeing and be seen". Installation of a barrier along a bend on road could also obstruct the sight line for safe stopping should there be a stationary object on the carriageway.

8.5.3. The proposed noise barrier may often intercept existing pedestrian and vehicular access at the carriageway. Junction visibility requirements would need to be observed and the scheme would need to be modified accordingly.

8.6. Socio-Economic Considerations

8.6.1. Apart from the above road safety requirements, the provision of a noise barrier may interfere with street level commercial activities, and cause social severance, e.g. severing two housing areas or obstructing pedestrian flows/crossings. Street level commercial activities include all shops, restaurants, cinemas etc. There is no way to determine the level of interference from a given barrier in an objective manner. Where a barrier obstructs totally a commercial entity from the right of way on the opposite side of the road is considered objectionable unless some form of compensation is provided to the owner of the entity. Chart 5 provides quick checking on whether the proposed barrier scheme would cause any of the above social problems. If this is the case, the scheme should be modified before adopting it for the identified problem.

8.7. Land Availability

8.7.1. Having established the possibility of providing a barrier to mitigate the noise impact, the available space on site for construction of the proposed noise barrier should be identified prior to carrying out a preliminary engineering feasibility study. This is to confirm the land requirements for the installation of the proposed barrier. Chart 6 provides a quick process to identify the minimum space required for installation of the proposed barrier.

8.8. Acoustic Effectiveness

8.8.1. When no insurmountable obstacle appears to exist in the first six rounds of quick assessment, the next and the final step should be the checking of the acoustic effectiveness of the noise barrier. In order that the scheme is effective and viable, the proposed scheme should achieve more than 50% of protection in terms of meeting the HKPSG noise guideline for the affected properties. If the proposed scheme satisfies this criterion, it should be recommended for a preliminary engineering feasibility study.

8.8.2. Table 4 gives the minimum distance required for a particular form of noise barrier to provide a shadow zone for at least 50% of the exposed facades.

Table 4 Minimum Distance between Road Kerb and Receiver to Achieve 50% Noise Protection

Form of Barrier	Vertical Height of Barrier (m)	Max. No. of Floors (1)	Minimum Distance, (m) (2)
Plain Barrier	3	5	20
		10	39
		15	57
	4	5	14
		10	27
		15	40
	5	5	9
		10	20
		15	30
Canti levered Barrier	5.6 (Type A)	10	14
		15	20
		20	29
	6.4 (Type B)	10	11
		15	17
		20	23

Note:
1. Refers to the height of buildings that can be protected.
2. Distance is measured from road kerb to facade.

8.8.3. In order to achieve the required effectiveness, the proposed extent of the horizontal noise mitigation measures must aim to reduce the angle of view to those exposed facades by 70% or more. At least 50% of the exposed facades would be protected from the proposed mitigation measures and thus noise levels at the protected facades will at least be reduced by 5 dB(A).

8.8.4. The above simplified procedures can only be used to estimate compliance with the HKPSG noise limit subject to the volume of traffic, percentage of heavy vehicles, speed and other geometric factors are required in order to determine the noise level and therefore the compliance.

8.8.5. The items that need to be addressed in the preliminary engineering feasibility are listed in Chart 7.