2 METHODOLOGY

2.1 OVERALL APPROACH

Data on all of the flyovers within the Territory have been collected for analysis in the Study. The selection of suitable flyovers for consideration with direct technical measures has been divided into three major steps:

- the coarse screening of all flyovers in the Territory to identify a list of flyover candidates that are suitable for further consideration with regard to the provision of direct technical remedies;
- the assessment of the design and installation constraints of each mitigation measure needed to satisfy the requirements of various Government departments; and
- the prediction of noise levels at the worst affected NSRs.

The results of these three steps of the selection process have been used to prepare a list of recommended flyovers to which direct technical measures could be applied to bring environmental improvements to nearby NSRs. In each case, the recommendations include:

- the optimal form of the direct technical remedies;
- cost estimates for the remedies; and
- the likely noise reduction and number of dwellings to be benefited with the measures in place.

Finally, a timetable for the incorporation of the recommendation measures has been prepared, and this is supported with recommendations for further site surveys and investigations which should be undertaken prior to implementation.

The Technical Approach adopted for this Study is summarised in *Figure 2.1a*. The key tasks which have been undertaken in order to complete the review are discussed in the following sections.

2.2 TECHNICAL APPROACH

Seven key tasks have been completed in accordance with the specifications in the *Special Conditions of Contract*.

2.2.1 *Task 1 - Coarse screening of Noisy Flyovers*

A total of 48 flyovers on Hong Kong Island and 140 flyovers throughout Kowloon and the New Territories have been considered during this coarse screening process. These flyovers have been identified by inspection of 1:5000 scale survey maps. All of these flyovers are listed in *Annex A* and their locations are shown in *Figures A1 to A14*.

Each flyover has been individually reviewed using a multi-factor coarse

screening process. The purpose of this screening process is to generate a shorter list of flyover candidates from the complete list of existing flyovers in the Territory. The three criteria used in this screening process were:

- ***The location of the flyover:*** Flyovers which are located within Central Business Districts (CBDs) and industrial areas were screened out of the review as commercial and industrial developments are not considered as NSRs.

- ***The use of noise mitigation measures:*** Flyovers which have already been provided with direct technical remedies to reduce noise levels were screened out of the review.

- ***The completion of an Environmental Impact Assessment (EIA):*** Road traffic noise is a key environmental aspect of a new flyover, and is investigated during an EIA. For flyovers with an EIA conducted before construction or with a proposed EIA to be conducted in 1997, mitigation measures would have been identified/installed as necessary or would be assessed respectively and consideration in this study would represent a duplication of effort. Flyovers which have been, or will in 1997 be, subject to an EIA have therefore excluded from further consideration.

All flyovers which meet any of the three criteria above have been excluded from further consideration to enable the better utilisation of resources and efforts for this study.

2.2.2 *Task 2 - Assessment of Government Constraints for Direct Technical Remedies*

Direct technical remedies have been considered in respect of the special requirements of various interested Government departments for the purposes of fire fighting, access for emergency appliances and road safety. These factors may apply constraints to the physical form and implementation of the measures.

Site visits were conducted to collect the required details to assess the physical layout of the site and implications on the constraints. Where the necessary requirements could not be satisfied, consideration for the implementation of direct technical remedies on these heavily constrained flyovers would not lead to fruitful outcome and therefore they have been excluded from recommendation for such remedies.

2.2.3 *Task 3 - The Prediction of Noise Levels At the Nearest NSR*

In order to establish whether the shortlisted flyovers are likely causes of adverse traffic noise problem, noise levels have been predicted at their nearest NSRs using *Calculation of Road Traffic Noise* (CRTN) procedures published by the UK Department of Transport. Predicted noise levels have then been compared to two criteria to establish whether the flyover is likely to cause adverse conditions at the nearest NSR:

- The predictions have been compared to other noise sources in the vicinity. Where the traffic noise contribution from other nearby sources (such as neighbouring at-grade roads) are comparable to or dominate the noise arising from the flyover, mitigation measures on the flyover would not be effective. It has therefore not been necessary to include these instances for further consideration.

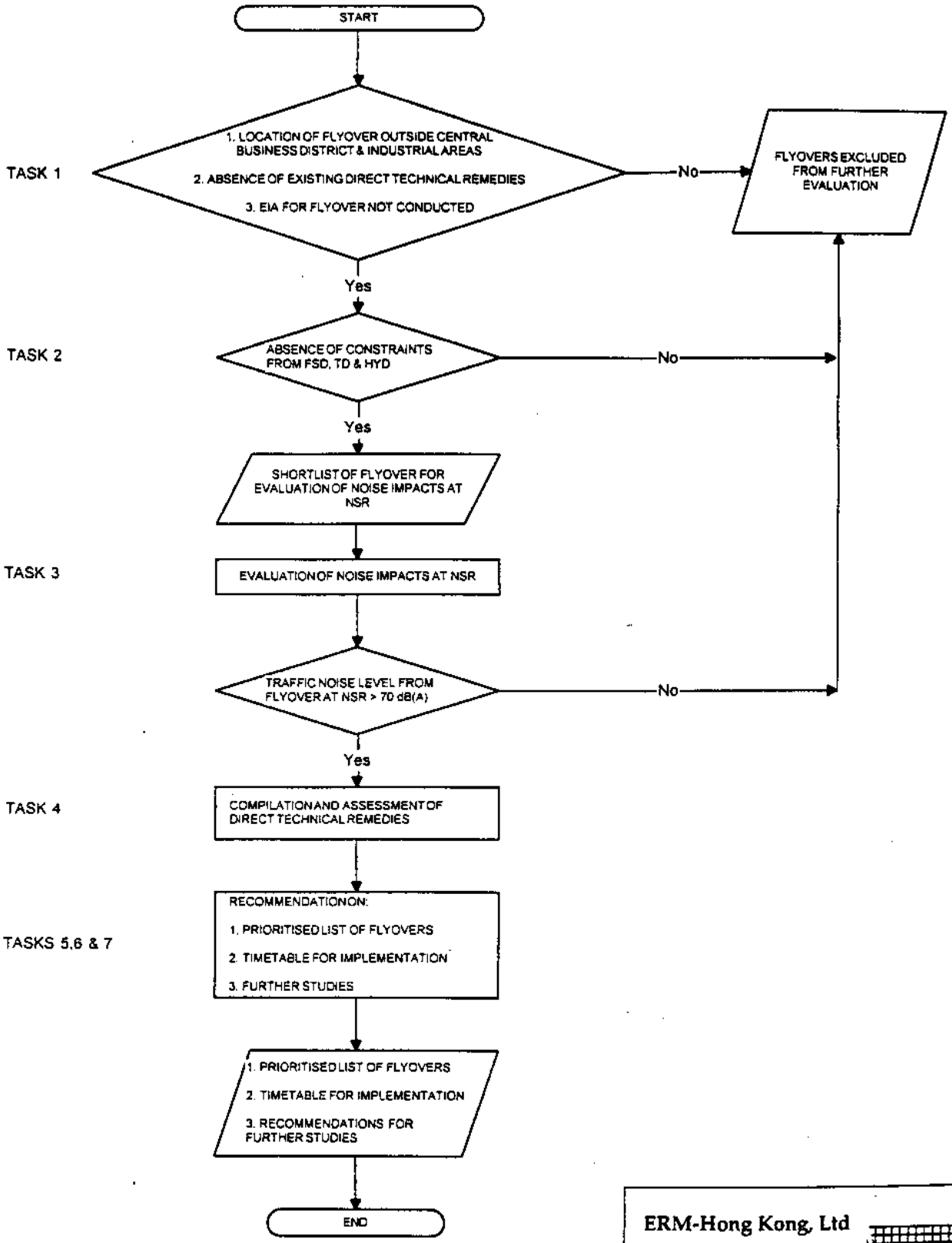

FIGURE 2.1a - TECHNICAL APPROACH OF THE STUDY

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Hecny Tower
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Tsimshatsui, Kowloon
Hong Kong

ERM

- The predicted noise level from each flyover has been compared to the *Hong Kong Planning Standard and Guidelines* (HKPSG) criteria. Where the predicted levels at the NSR are less than the HKPSG criteria, the situation is considered acceptable and the flyover has not been put forward for consideration with regard to implementation of direct technical remedies. At present there are no standing policies to redress traffic noise from existing roads. For the evaluation of noise impacts at existing sensitive receivers, it is considered appropriate to adopt road traffic noise criteria similar to those stipulated in the HKPSG, which require that the noise level $L_{10, \text{peak hour}}$ at the external façade due to road traffic should not exceed 70dB(A) for domestic premises.

In accordance with the technical requirements of this study, NSRs in the Study refers to all existing domestic premises including temporary housing accommodation. Courts of law, hotels and education institutions are not included as NSRs in this Study since they are either fully air-conditioned for the former two types of uses or being included in the Territory-wide Noise Abatement Measures of Schools projects for the latter.

2.2.4 *Task 4 - The Assessment of Direct Technical Remedies*

The potential direct technical measures for noise mitigation have been identified and their effectiveness assessed in terms of their effectiveness of noise reduction. The measures considered included vertical barriers, cantilevered barriers, semi-enclosures and full enclosures.

Where the flyover is suitable for treatment, the effectiveness of direct technical remedies has been assessed using CRTN. It was anticipated that in some areas it might not be possible to provide sufficient mitigation to achieve the HKPSG standard. In these cases, the number of dwellings to benefit from the remedies and the resultant reduction in noise level will be employed to prioritise the selected flyovers.

Detailed noise modelling that may be required in the engineering design of these structures is beyond the scope of the present Stage 1 Scoping Study. Where necessary, these have been recommended for the Stage 2 Study.

2.2.5 *Task 5 - The Compilation of a List of Recommended Flyovers for Treatment*

Based upon the coarse screening process, the constraints on direct technical remedies and their effectiveness, a list of flyovers which should be considered for treatment has been complied.

The list of recommended flyovers includes three factors:

- the optimal form of the direct technical remedies;
- cost estimates for the remedies; and
- the likely noise reduction and number of dwellings to be benefited with the measures in place.

The direct technical remedies appropriate for the shortlist of flyover candidates have been costed on the basis of experience gained from environmental assessment studies previously conducted for roadworks projects.

The likely levels of noise reduction was established in *Task* 3 above. The approximate number of dwellings to benefit from the proposed remedial measures was estimated or observed from site visits, allowing the flyover candidates to be ranked on a *'cost per dB per dwelling'* basis. This provides a clear indication of the most suitable candidates for future consideration in the Stage 2 Study in terms of cost-effectiveness.

2.2.6 *Task 6 - Programme for Implementation*

A programme has been prepared to enable the optimum implementation of the recommended remedial measures on the basis of effectiveness.

2.2.7 *Task 7 - Recommendations for Further Studies*

The findings of each task in the study, and the prioritised list of flyovers, have identified areas where more focused studies and site investigations would be prudent or necessary. Recommendations regarding the engineering and environmental feasibility of the remedial measures have been identified for consideration in future studies.