

PURPOSE OF THE MANUAL

The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme to be undertaken for the construction of the proposed housing developments and associated works in Tuen Mun Area 54. It aims to provide systematic procedures for monitoring, auditing and minimising of the environmental impacts associated with the proposed development, focussing on impacts during the construction phase.

Hong Kong environmental regulations for noise and air quality, the *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)* and recommendations in the EIA Study of the *Planning and Development Study of Potential Housing Site in Area 54, Tuen Mun (Agreement No CE 21/97)* (the Planning Study) have served as environmental standards and guidelines in the preparation of this Manual.

This Manual contains the following :

- (a) responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET), and the Independent Checker (Environment) (IC(E)) with respect to the environmental monitoring and audit requirements during the course of the project;
- (b) information on project organisation and programming of construction activities for the project;
- (c) the hypotheses of potential impacts, the basis for and description of the broad approach underlying the environmental monitoring and audit programme;
- (d) requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- (e) the specific questions and testable hypotheses that the monitoring programme is designed to answer;
- (f) full details of the methodologies to be adopted, including all field, laboratory and analytical procedures, and details on quality assurance and quality control programme;
- (g) the rationale on which the environmental monitoring data will be evaluated and interpreted and the details of the statistical procedures that will be used to interpret the data;
- (h) definition of Action and Limit levels;

- (i) establishment of Event and Action Plans;
- (j) requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria and complaints;
- (k) requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures.
- (l) requirements for review of EIA predictions and effectiveness of the environmental monitoring and audit programme.

For the purpose of this manual, the "Engineer" shall refer to the Engineer as defined in the Contract and the Engineer's Representative (ER), in cases where the Engineer's powers have been delegated to the ER, in accordance with the Contract. The ET leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the environmental monitoring and audit requirements.

Whilst the focus of this Manual provides mainly the guidelines on the environmental monitoring and audit requirements during the construction phase of the proposed development, requirements of the operational phase traffic noise monitoring is also specified.

In addition, in order to guide the implementation of mitigation measures during the various stages of the proposed development, implementation schedules for the execution of the recommendations in the EIA Study are also included in the *Annex*. It should be noted however that these implementation schedules are included for reasons of completeness of the Study, and they should be further refined in terms of the exacting timing and locations during the design and construction stages. The implementation agents included in these schedules are also suggested in this early stage of the planning process, and they should be agreed with the concerned agents in a later stage during project implementation.

1.2

BACKGROUND

In response to the Territorial Development Strategy Review (TDSR) published by the Government of the Hong Kong Special Administrative Region (the Government) in July 1996, which identified a shortfall of housing supply between 2001/02 and 2004/05 even with the development of a number of Strategic Growth Areas (SGAs), a list of tentative housing sites (including Tuen Mun Area 54) have been identified to be potential areas for producing housing flats between 2001/02 and 2004/05.

Scott Wilson (Hong Kong) Ltd (SWHK), in association with specialist sub-consultants, have been commissioned by the Territory Development Department (TDD) to undertake the Planning Study in September 1997. The overall objective of the Planning Study is to establish an optimum development scheme for Tuen Mun Area 54 (the Study Area), taking into account considerations in planning, traffic, engineering, infrastructure, geotechnical, environmental, socio-economic, land acquisition, and financial aspects.

An EIA has been conducted as part of the Planning Study. The overall purpose of this EIA Study is to establish the nature and extent of environmental constraints

of the proposed developments within the Study Area and to identify measures to overcome these constraints to realise the full potential of the Study Area and safeguard the environmental quality at the same time.

The project site and boundary is shown in *Figure 1.2a*. As recommended in the EIA Study, EM&A is required with regard to noise and air quality during the construction stage. The identified noise and air sensitive receivers are listed in *Tables 1.2a* and *1.2b* respectively. The locations of noise and air sensitive receivers are indicated in *Figures 1.2b* and *1.2c* respectively.

Table 1.2a *Identified Representative Noise Sensitive Receivers for Construction Phase*

NSR	Description
N2	Planned SH at Site 1
N3	Planned Educational Uses at Site 1A
N4	Po Tong Ha
N5	Village House (north of Tsz Tin Tsuen) (future village zone)
N6	Tsz Tin Tsuen
N7	Siu Hang Tsuen
N11	Kei Lun Wai
N16	Vertical Interim Housing Development (Area 29)
N17	Goodrich Garden and Blossom Garden
N18	Siu Hin Court
N19	Existing low-rise residential buildings next to Castle Peak Hospital
N20	Castle Peak Hospital
N21	Tuen Mun Government School
N22	Siu Hong Court
N23	Yau Tze Tin Memorial College
N24	San Hing Tsuen
N24A	Village House, south of San Hing Tsuen
N25	Approved Section 16 Application Housing Development

Table 1.2b *Location of Representative Air Sensitive Receivers for Construction Phase*

ASR	Location
A1	Vertical Interim Housing Development in Area 29
A2	Siu Hang Tsuen West
A3	Siu Hang Tsuen East
A4	Po Tong Ha West
A5	Po Tong Ha East
A6	Scattered Village House
A7	Scattered Village House



FIGURE 1.2b

IDENTIFIED NOISE SENSITIVE RECEIVERS

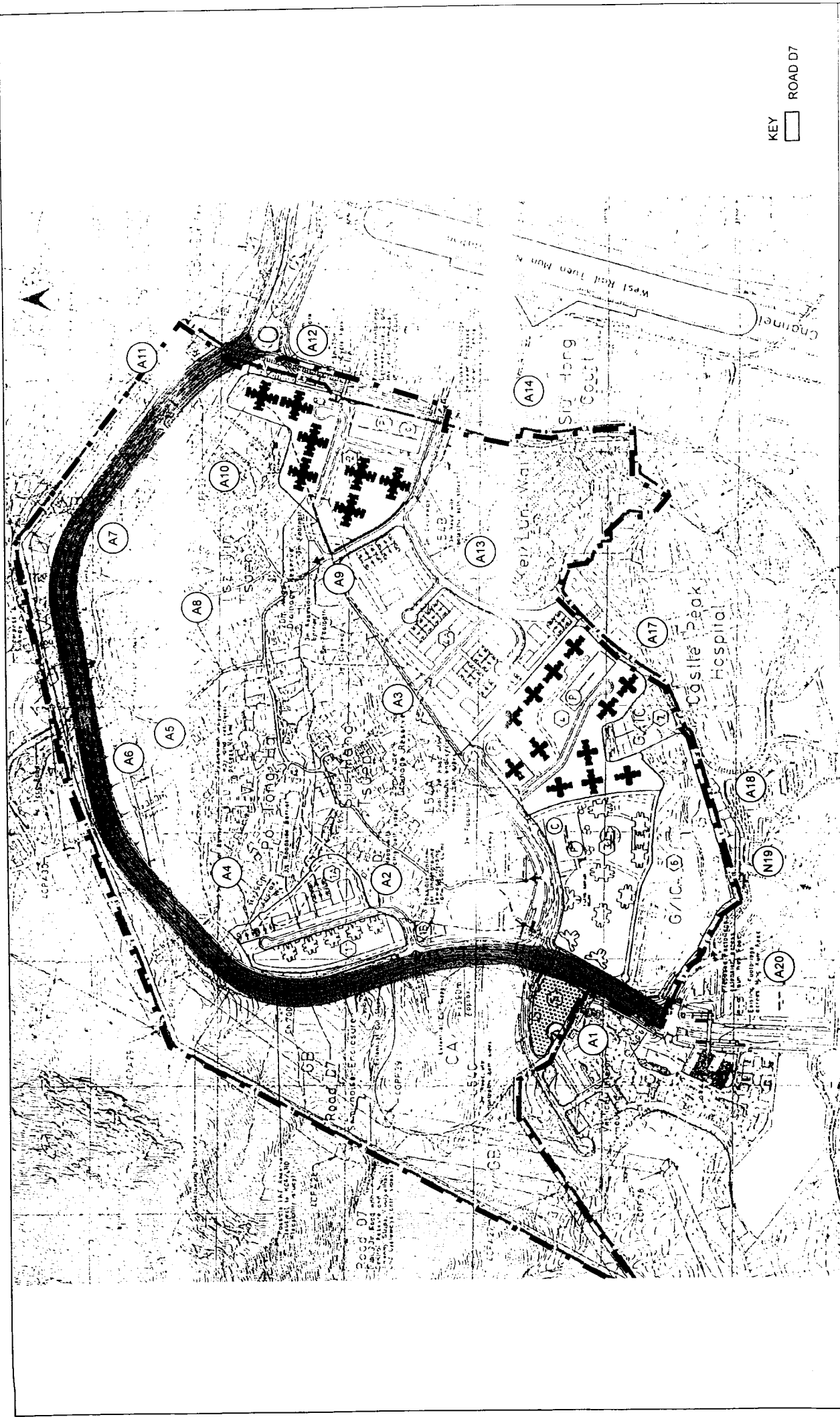


FIGURE 1.2c TUEN MUN AREA 54 - AIR SENSITIVE RECEIVERS FOR CONSTRUCTION PHASE

ASR	Location
A8	Tsz Tin Tsuen West
A9	Tsz Tin Tsuen South
A10	Tsz Tin Tsuen East
A11	San Hing Tsuen
A12	Yau Tze Tin Memorial College
A13	Kei Lun Wai
A14	Siu Hong Court
A17	Castle Peak Hospital
A18	Quarters of Castle Peak Hospital
A19	Police Station at Leung Shun Street
A20	Goodrich Garden/Blossom Garden

1.3 ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS

1.3.1 *Noise during Construction Phase*

Exceedance of the established noise criteria has been predicted for the Project during the construction phase without applying any mitigation measures. As recommended in the EIA Study, noise emissions from construction sites can be minimised through good site practice, selecting quiet plant, adopting quieter working methods, erection of temporary noise barriers to screen out the noise source and pose restriction on the use of noisy equipment on site. With the implementation of all the above measures, noise impact at all the identified NSRs from construction works could be mitigated to comply with the daytime construction noise criteria.

It is also recommended that noise monitoring should be conducted as part of the EM&A programme during the construction period of the Project at locations including Po Tong Ha, north of Tsz Tin Tsuen, Siu Hang Tsuen, Kei Lun Wai, Vertical Interim Housing in Area 29, Castle Peak Hospital, Siu Hong Court, Yau Tze Tin Memorial College and south of San Hing Tsuen; and at additional locations where considered necessary, in agreement with the EPD. Noise mitigation measures should be implemented as part of the Action Plan.

1.3.2 *Noise During Operational Phase*

Apart from the above, noise monitoring during the operational phase (ie when Road D7 and the widened Tsing Lun Road are in operation) is also recommended at NSRs which are located along Road D7 and the widened Tsing Lun Road and in the vicinity of the recommended direct technical remedies. The purpose of this monitoring is to ensure the proposed mitigation measures are effective and that the impact at NSRs that are not protected will be within acceptable noise limits.

1.3.3 *Air Quality during Construction Phase*

Dust arising from the construction activities of the Project is the main air pollutant during the construction phase. Exceedance has been predicted at Siu

Hang Tsuen West and Po Tong Ha West. Mitigation measures, including good site practice, covering of stockpiles, paving of haul roads, watering of site and wheel-washing for vehicles, have been recommended to limit the dust emission and dispersion. With the implementation of proper dust control measures, the TSP levels at the affected ASRs will comply with the dust criteria.

Dust monitoring is recommended to ensure the efficacy of the control measures. It is recommended that dust monitoring be carried out as part of the EM&A programme during the construction period of the proposed development within the Study Area at Siu Hang Tsuen West and Po Tong Ha West; and any additional locations considered necessary, in agreement with the EPD.

1.4

PROJECT ORGANISATION

The project organisation and lines of communication with respect to environmental protection works is shown in *Figure 1.4a*.

The ET shall not be in any way an associated body of the Contractor. The ET leader shall have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the ER and the Environmental Protection Department (EPD).

The responsibility of respective parties are:

The Contractor:

- Employ an Environmental Team (ET) to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audit;
- Provide assistance to ET in carrying out monitoring;
- Submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event and Action Plans;
- Implement measures to reduce impact where Action and Limit levels are exceeded.
- Adhere to the procedures for carrying out complaint investigation in accordance with *Section 4.3*.

The Engineer or Engineer's Representative:

- Supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with;
- Inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
- Employ an Independent Checker (Environment)(IC(E)) to audit the results of the EM&A works carried out by the ET; and
- Adhere to the procedures for carrying out complaint investigation in accordance with *Section 4.3*.

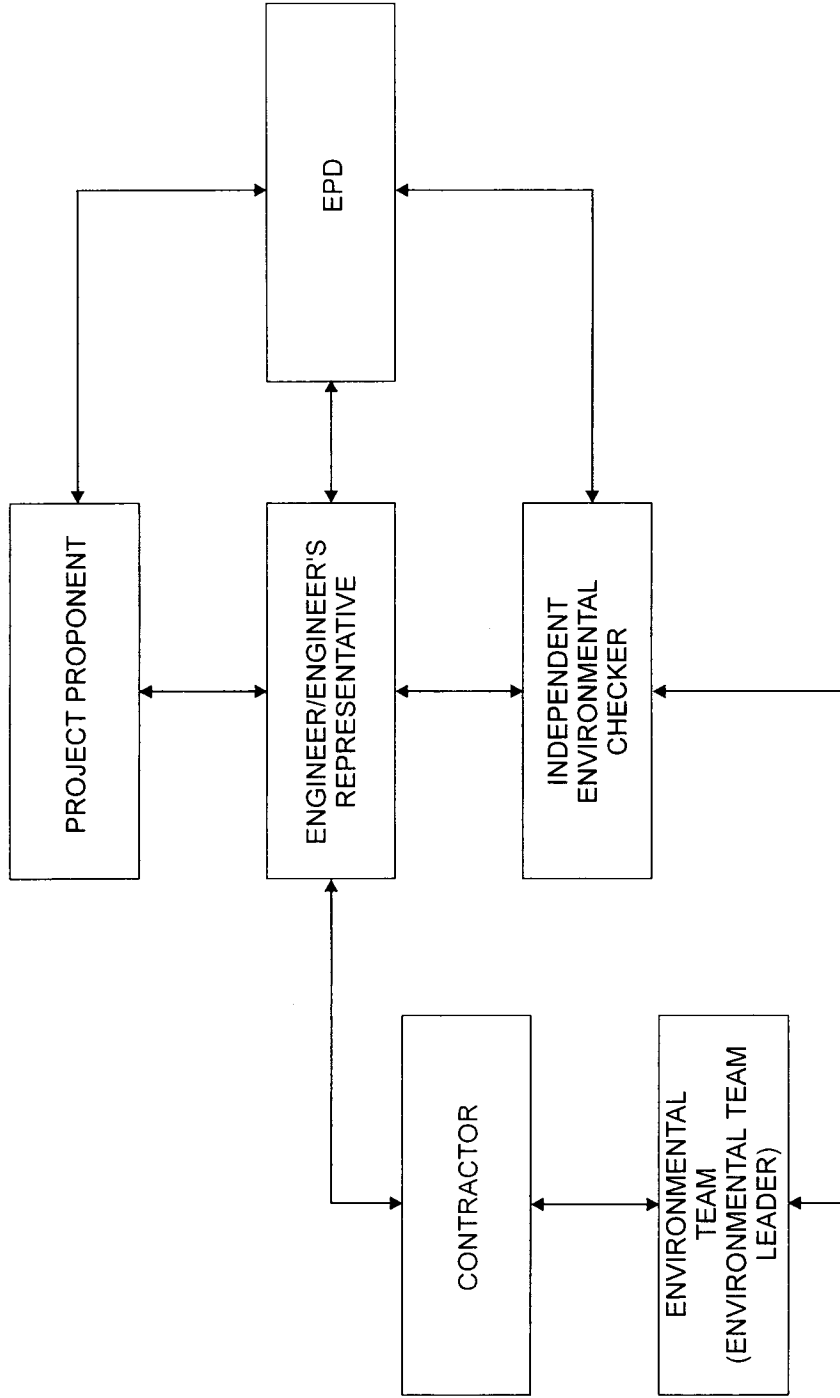


FIGURE 1.4a TUEN MUN AREA 54 - PROJECT ORGANISATION AND LINES OF COMMUNICATION WITH RESPECT TO THE EM&A PROGRAMME

The Environmental Team:

- Monitor the various environmental parameters as required in the EM&A Manual;
- Analyse the environmental monitoring and audit data and review the success of EM&A programme to cost effectively confirm the adequacy of mitigatory measures implemented and the validity of the EIA predictions and to identify any adverse environmental impact arising;
- Carry out site inspection to investigate and audit the Contractor's site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive action before problems arise;
- Audit and prepare audit reports on the environmental monitoring data and the site environmental conditions;
- Report on the environmental monitoring and audit results to the IC(E), Contractor, the ER, and the EPD;
- Recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans; and
- Adhere to the procedures for carrying out complaint investigation in accordance with *Section 4.3*.

Independent Checker (Environmental):

- Review the EM&A works performed by the ET;
- Audit the monitoring activities and results;
- Report the audit results to the ER and EPD in parallel;
- Review the EM&A reports submitted by the ET;
- Review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;
- Adhere to the procedures for carrying out complaint investigation in accordance with *Section 4.3*.

Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibility, as required under the EM&A programme for the duration of the project.

1.5

CONSTRUCTION PROGRAMME

According to currently available information, the proposed developments within the Study Area will be divided into two main development packages.

The first development package concerns the development of Site 1 or Phase 1 Development. The major construction work packages within Phase 1 will include:

- construction for village improvements;
- construction for slope drainage and natural terrain hazard mitigation measures;
- construction for Road D7 (Part), drains, sewer mains, water mains and landscaping;
- construction for site formation works;
- construction for piling works for housing;
- construction for housing development; and
- construction for road junction improvement, including the proposed widening of Tsing Lun Road from 2 lanes to 4 lanes.

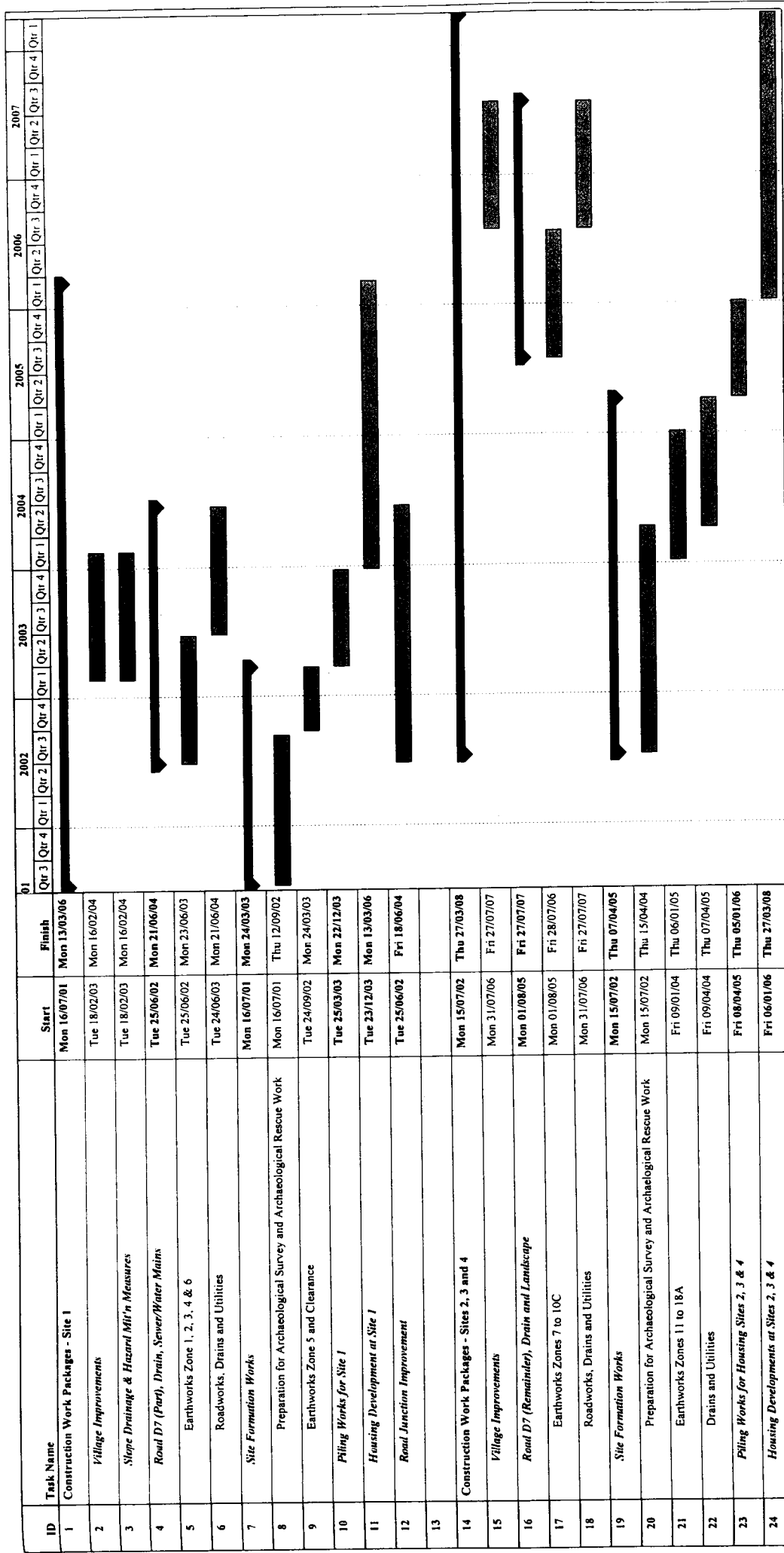
The construction works for Development Package 1 are expected to commence in 2002. The currently envisaged completion date of this package is early 2006, when the housing development in Site 1 will be occupied.

Development Package 2 concerns the development of Sites 2, 3 and 4 or Phase 2 Development. The major construction work packages within Phase 2 will include:

- construction for village improvements;
- construction for Road D7 (Remainder), drains, and landscaping;
- construction for site formation works;
- construction for piling works for housing;
- construction for housing development;
- construction for fresh and salt water mains; and
- construction for sewage pumping station and sewers.

The construction works for Development Package 2 are expected to start in late 2003 and be completed in early 2008.

Figure 1.5a is the tentative works programme for the project. This programme is for information of the ET Leader to get an initial idea of the projection of the works. The ET Leader shall make reference to the actual works progress and programme during the construction stage to schedule the EM&A works, and the Contractor shall provide the respective information to the ET Leader for formulating the EM&A schedule.



Project: Planning & Development Study of Potential Housing Site in Area 54, Tuen Mun Date: 14/04/99		Task	[Gantt bar]	Summary	[Gantt bar]
FIGURE 1.5a Proposed Construction Programme for Tuen Mun Area 54					