

AGREEMENT NO. CE 92/96
Formation And Servicing In Area 36, Fanling -
Environmental Impact Assessment

Executive Summary

Maunsell

EIA 131.2/
BC

EIA/029/97

MAUNSELL CONSULTANTS ASIA LTD

EIA-131.2/BC

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Reference : R1932.97

Client : Civil Engineering Department

Date : December 1997

Maunsell Consultants Asia Ltd.
in association with
EHS Consultants Ltd.
Ecosystems Ltd.
Hassell Ltd.

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1. INTRODUCTION

1.1 Background

- 1.1.1 Area 36, Fanling (hereafter referred to as "Area 36") is located at the south-western perimeter of the Fanling/ Sheung Shui New Town. Figure A shows the location of the site. It was re-zoned in Layout Plan No. L/FSS 36/1 to meet the territory-wide increasing demand for housing. The Committee on Planning and Land Development endorsed the development proposal on 5 December 1995.
- 1.1.2 Area 36 covers a total area of about 22 hectares. At present, the site is a rural land consisting of village dwellings and agriculture. It is bisected by the Shek Sheung River in an approximately south-west to north-east direction. River water at the downstream side of the site was found to be grossly polluted.
- 1.1.3 Area 36 is planned for the development of public rental estate, Home Ownership Scheme, Sandwich Class Housing, village type houses, and G/IC facilities. Figure B gives the proposed future land use zonings in Area 36. In order to implement these future developments, it is necessary to carry out the Project - "Formation and Servicing in Area 36, Fanling" (hereafter referred to as "the Project").
- 1.1.4 There are two proposed alternative uses on the vacant G sites. These include the development of i) special and international schools or ii) sandwich class housing.
- 1.1.5 Maunsell Consultants Asia Limited, in association with EHS Consultants Limited, Ecosystems Limited and Hassell Limited, were commissioned by Civil Engineering Department (CED), the Government of the Hong Kong Special Administrative Region (SAR) to undertake an Environmental Impact Assessment (EIA) for the Project.
- 1.1.6 This Executive Summary presents the main findings and recommendations set out in the Final Assessment Report (FAR) Volume 1 - EIA. The FAR Vol. 1 - EIA was developed from an Initial Assessment Report and a Key Issue Report, taking into account all comments and responses provided by relevant Government Departments during the course of the EIA study.

1.2 Objectives of the EIA

- 1.2.1 The main objective of the EIA study was to identify and assess potential environmental impacts associated with the construction and operation of the Project, and to propose cost-effective mitigation measures to eliminate or minimise such identified adverse impacts.
- 1.2.2 The environmental issues identified and addressed in the EIA study include the following :

Construction phase

- ◇ Air quality, noise, water quality, visual and ecological impacts and waste management.

Operation phase

- ◇ Air quality and noise impacts arising from the operation of the proposed Roads D1, D2 and nearby existing road carriageways;
- ◇ Potential water quality impact and waste management;
- ◇ Sewerage study;
- ◇ Visual and Ecological Impacts.

2. PROJECT DESCRIPTION

2.1 Scope of the Project

2.1.1 The scope of the Project involves the following :

- (i) formation of land for future developments in Area 36;
- (ii) construction of about 900m of road carriageways (Roads D1 and D2);
- (iii) construction of associated sewerage, stormwater drains and watermains;
- (iv) Shek Sheung River Diversion;
- (v) village expansion works for Ng Uk Tsuen; and
- (vi) construction of subways;
- (vii) improvement of road junctions;
- (viii) provision of associated landscaping works.

2.2 Implementation Programme

2.2.1 A tentative two-phase construction programme was established by the CED for the purpose of assessing the nature and extent of construction phase environmental impacts. Phase 1 construction activities were scheduled to commence in February 1999. Phase 2 would start in January 2000. Both phases of construction works were scheduled to be completed together in July 2001. Figures C-1 and C-2 show the land covered in the Phases 1 and 2 construction programme.

3. AIR QUALITY IMPACTS

3.1 Construction Phase

3.1.1 The major air quality impacts during the construction phase of the Project would arise from dust emissions, mainly arising from excavation, filling, material handling and vehicle movement on unpaved haul roads. Air quality impact from emissions of criteria pollutants is not expected to be significant as total number of construction plant and diesel trucks will be limited.

3.1.2 Potential dust impacts were assessed quantitatively by air quality dispersion modelling. Based on some assumed worst case situations, the assessment results revealed that in the absence of any dust mitigation measures, construction activities from the Project would pose air quality impacts on some nearby existing sensitive receivers. These sensitive receivers include the village houses situated within or in close vicinity to Area 36. The maximum hourly, unmitigated Total Suspended Particulate (TSP) concentration was predicted to reach $976 \mu\text{g}/\text{m}^3$ at the worst affected representative sensitive receiver selected for the assessment. This exceeds the TSP hourly guideline of $500 \mu\text{g}/\text{m}^3$ recommended by the EPD.

3.1.3 The dust impacts can be mitigated to acceptable levels through the implementation of standard dust suppression measures. These should include frequent watering, enclosure of dust emission sources, appropriate routing of vehicular paths, and imposition of speed limits for vehicles on site etc. Mitigation clauses are recommended in the EIA for inclusion into contract documents and implementation by Contractors during the construction phase. The continuous implementation of sufficient dust mitigation measures shall be checked by environmental monitoring and audit (EM&A) requirements specified in the EM&A Manual.

3.2 Operation Phase

Vehicular Emission Impact

- 3.2.1 Potential air quality constraints due to on-road traffic emissions on future developments in Area 36 were evaluated quantitatively using air quality dispersion modelling. The air pollutants studied include the criteria pollutants - carbon monoxide (CO), nitrogen dioxide (NO₂) and respirable suspended particulate (RSP). The emission source of concern included Roads D1, D2 and other road carriageways lying in the proximity of Area 36.
- 3.2.2 Based on the traffic forecasts for the design years 2006 and 2011 and the corresponding emission factors, a sensitivity analysis by computer modelling indicated that the worst case scenario would appear in 2006. Based on the identified worst case scenario, concentrations of CO, NO₂ and RSP were predicted at some selected representative Air Sensitive Receivers (ASRs). The modelling results indicated that the Air Quality Objectives (AQOs) will be complied with at all representative ASRs. Therefore, future vehicular emissions will unlikely pose any significant air quality impact on the nearby ASRs.

Chimney Emission Impact

- 3.2.3 The chimney emission impact assessment involved assessing potential air quality constraints posed by chimney emissions on future ASRs in Area 36. Locations and chimney emission data of all registered existing fuel consuming chimneys situated in the vicinity of Area 36 were obtained from the Air Management Group of EPD and inputted into an air quality dispersion model. Future chimney emissions at the new North District Hospital have also been included in the dispersion model. Concentrations of sulphur dioxide (SO₂) were predicted at some representative ASRs selected from ground level up to the anticipated maximum building height of future high-rise residential developments in Area 36.
- 3.2.4 The modelling results obtained based on the worst case scenario indicated that the predicted hourly, daily and annual SO₂ concentrations at all selected representative ASRs at all height levels will be able to comply with the relevant AQOs. Therefore, chimney emissions will unlikely pose any unacceptable air quality impacts or constraints on the future air sensitive land uses on the site.

4. NOISE IMPACTS

4.1 Construction Phase

- 4.1.1 It is not envisaged that construction activities within the "restricted hours" (i.e. between 19:00 to 07:00 hours the next day on Monday to Saturday and any time on Sunday and public holidays) will be required. Potential construction phase noise impacts have therefore been assessed based on the non-statutory limits recommended for day-time construction activities. The assessment methodology was developed based on the "Technical Memorandum on Noise From Construction Works Other than Percussive Piling" issued by the EPD.
- 4.1.2 Based on the tentative construction programme and a reasonably developed equipment inventory, construction noise impacts from the Project on nearby Noise Sensitive Receivers (NSRs) were studied. The assessment results showed that the cumulative noise impacts generated from the equipment used on site would exceed the relevant noise limits recommended by the EPD in the absence of noise control measures. The unmitigated noise impact was predicted to reach 86dB(A) at two selected representative NSRs.

- 4.1.3 Various standard noise mitigation measures were recommended for implementation during construction works, where practicable. These measures include :
- ◇ Use of quiet equipment;
 - ◇ Use of temporary noise barriers and machinery enclosures;
 - ◇ Phasing of construction works and avoid simultaneous noisy activities;
 - ◇ Good site practice and noise management ; and
 - ◇ Reduction in number of equipment operating together in critical areas close to NSRs.
- 4.1.4 Quantitative assessment indicated that the implementation of the recommended noise mitigation measures will be sufficient to alleviate construction noise impact at all existing NSRs to levels below the noise limits. The implementation of sufficient noise mitigation measures during the construction phase shall be continuously monitored and audited.
- 4.2 Operation Phase**
- 4.2.1 Potential noise impact of concern during the operation phase of the Project is in relation to traffic flows on Roads D1 and D2 and other nearby main roads. The HKPSG Noise Standards were used as the assessment criteria. Future traffic noise impacts were assessed in accordance with the procedures given in the U.K. Department of Transport's procedure "*Calculation of Road Traffic Noise*" (CRTN). Traffic noise impacts were predicted at some selected representative NSRs based on projected A.M. peak hour traffic forecast in the design year 2011.
- 4.2.2 The assessment results indicated that, in the absence of any mitigation measures, various noise sensitive future land uses in Area 36 would be affected by future traffic noise from the proposed Roads D1 and D2. These affected land uses include the proposed public rental estate and HOS on the RS site, private residential developments on the two R2 sites, primary and secondary schools situated near the north-western boundary of Area 36, Sandwich Class Housing (SCH) on the G/IC site, and special and international schools/ SCH on the vacant G site. There would also be traffic noise impact caused mainly by Po Kin Road and Pak Wo Road on the proposed SCH and/ or special and international schools on the G/IC site and vacant G site.
- 4.2.3 The feasibility of implementing various options of direct technical remedies at Roads D1 and D2, namely, alternative road alignment, paving road surface with open texture, and partial or full enclosure of roads were considered. The measures were found to be impracticable due to various identified constraints. Moreover, erection of roadside noise barriers is also not found to be a practicable noise mitigation option, on the basis of various identified site constraints. These constraints include :
- ◇ the need to satisfy the horizontal clearance requirements along the road carriageways;
 - ◇ the impracticability of erecting noise barriers at vehicular ingress/ egress points and at road junctions;
 - ◇ the need to maintain the visibility splays near each of the numerous vehicular ingress/ egress points and at road junctions;
 - ◇ the low acoustic effectiveness of short and discontinuous noise barriers;
 - ◇ the difficulties and undesirability of erecting noise barriers at kerbsides near bus stops;
 - ◇ the potential obstruction of erected noise barriers to access that need to be maintained for RSD's workers in routine plant maintenance;
 - ◇ the ineffectiveness of erecting noise barriers of limited height for the protection of high-rise residential developments;
 - ◇ potential obstruction of access to fire hydrants;
 - ◇ the undesirability of erecting noise barriers for future land uses at which boundary fence walls would likely be erected in parallel.

- 4.2.4 For the protection of future land uses in Area 36, it is necessary to seek mitigation measures at receivers. Various options of noise mitigation measures, including the provision of noise-tolerant buildings (e.g. multi-storey car parks, commercial/ recreational facilities, etc.) as noise screens, self-protecting building design, careful building orientation, and sufficient setback of noise sensitive buildings have been recommended for each affected future land uses in Area 36 and agreed with the relevant Government Departments.
- 4.2.5 At the potentially affected international and special schools, based on the level of exceedance from the noise standard predicted, it was considered that after the exhaust of all practicable direct noise mitigation measures, there may still be residual noise impacts exceeding the noise standards at some teaching classrooms i.e. those that can not be positioned to face away from Road D1 or Po Kin Road via building design. Indirect technical remedies in the form of noise insulation and air-conditioning are recommended to be provided for these still affected teaching rooms, if any.

5. WATER QUALITY

5.1 Baseline Water Quality

- 5.1.1 Baseline water quality in Shek Sheung River was established through water sampling and laboratory analysis. Water quality at the upstream and downstream sides of the river section within Area 36 was established to be "Fair" and "Very Bad", respectively based on the Water Quality Index (WQI) approach commonly adopted by EPD.

5.2 Construction Phase

- 5.2.1 The requirements regarding water quality during the construction phase of the Project is to meet the relevant acceptable discharge limits specified in the "*Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Water*" (TM) issued under Section 21 of the Water Pollution Control Ordinance. A valid licence should be obtained from the Authority for any discharge from the construction site. The Contractor shall follow the terms and conditions specified in the licence.
- 5.2.2 The Best Management Practices (BPMs) in controlling water pollution should be implemented during the construction phase. Mitigation clauses with respect to the prevention of water pollution from site runoff, construction site wastewater, oils and solvents, excavation of riverine sediments, etc. have been recommended for inclusion into Contract documents as an environmental requirement. It was further recommended in the EIA that removal of riverine sediment via dredging/ excavation shall only be conducted after river diversion and the drying of river bed, where practicable.

5.3 Operation Phase

- 5.3.1 Potential water quality impacts arising from discharge of contaminated stormwater runoff from Area 36 were evaluated. Mitigation measures were recommended for implementation.
- 5.3.2 Existing pollution of Shek Sheung River arising from discharge of sewage and/ or agricultural wastes from Area 36 will cease once the existing land uses are cleared. Sewage to be generated from future occupants in the Area would unlikely pose any adverse impact on local waters on the basis that adequate sewerage system and communal sewerage treatment facilities would be provided.

6. SEWERAGE STUDY

- 6.1.1 The total population in the Area 36 is estimated to be approximately 28,800.
- 6.1.2 The sewage generated from Fanling and Sheung Shui new town will be conveyed into the Shek Wu Hui Sewerage Treatment Works (STW) which will receive secondary treatment before discharge to River Indus. The Shek Wu Hui STW is currently being expanded from the existing capacity of 60,000 m³/d to 80,000 m³/d to cater for the treatment need in the North District up to 2011. It is found that the existing sewers inside the Fanling and Sheung Shui sewage catchment are adequate to handle the ultimate flows without the development of Area 36. With the development of Area 36, some existing sewers are required to be upgraded to cater for the additional sewage generated from Area 36.
- 6.1.3 Two options are proposed for the connection of sewage from Area 36 to the existing sewerage systems. Option A proposes that all sewage generated in Area 36 will be conveyed to the north of Area 36, with this option employed, approximately 850 m long existing sewers which are measured from the south east corner of Area 28B to the connection point of the main trunk sewer of 1800 mm diameter located in San Wan Road will need to be upgraded. Option B proposes that most of the sewage generated in the Area 36 can be conveyed to Area 29 and the remaining sewage in Area 36 will be discharged into the north of Area 36. Then the improvement work will be limited to approximately 480 m length of the existing 450 mm diameter pipe in Area 29.
- 6.1.4 Option B is chosen to be the preferable option for sewage discharge of Area 36. The upgrading works of the existing sewers drains under this option are considered more feasible than that of option A in terms of the extent and cost of works. Furthermore, most of the roads in Area 29 are local distributors with low traffic flow, the construction difficulties of Option B is less in term of the diversion of the existing traffic during upgrading stage.
- 6.1.5 There is an increased flowrate and BOD loading from the proposed Area 36 development. The current upgrading works of Shek Wu Hui STW is designed to meet the requirements up to 2011 and should be sufficient to handle the additional loading from Area 36, which will materialize in 2006.

7. WASTE MANAGEMENT

7.1 Construction Phase

- 7.1.1 Metal analysis of mud samples revealed that sediment in the portion of Shek Sheung River in Area 36 can be classified as uncontaminated Class A material, based on the classification scheme given in EPD's Technical Circular No. 1-1-92, "*Classification of Dredge Sediments for Marine Disposal*". No special requirement regarding the dredging/ excavation, transport and disposal of contaminated mud is therefore deemed necessary, beyond those which would normally be applied for the purpose of ensuring compliance with EPD's Water Quality Objectives (WQOs), or for protection of sensitive receptors near the dredging/ excavation areas in Shek Sheung River.
- 7.1.2 Whether the riverine sediment can be left intact during the construction phase shall first be considered to minimise waste generation. Should excavation/ dredging of riverine sediments be found required in support of site investigation data, dredged/ excavated materials shall be delivered to public filling areas for reclamation, if the materials are sandy, or otherwise disposed of to landfill.

7.1.3 Guidelines on appropriate construction waste handling and disposal strategies aiming at minimisation of construction waste generation, reuse and recycling of wastes are provided in the EIA report.

7.2 Operation Phase

7.2.1 Issues on collection, storage, transport and disposal of municipal wastes generated from future developments in Area 36 were addressed. Recyclable waste collection points are recommended to be provided in the design of future developments in Area 36.

8. VISUAL IMPACTS

8.1.1 The Visual Impact Assessment identifies the source and magnitude of the scheme's proposals in terms of its effects on the existing views, visual amenity, character and quality for the Visually Sensitive Receivers. These comprise of residents, pedestrians and vehicular passengers within the context of the site and its environs. The site is located on the suburban/ rural fringe area of south-eastern Fanling/ Sheung Shui. To the north and east of the site is the North District Hospital, and a number of high-rise housing estates including : Tai Ping Estate, Venice Garden, police Married Quarters, Glamour Gardens, Government Disciplined Service Quarters and Greenpark Villas. To the south are rural/ agricultural areas and the hillsides of Lam Tsuen Country Park. To the west is a golf course, the edge of which is included as part of the site.

8.1.2 The scheme proposals include : levelling of much of the site; diversion of the Shek Sheung river into an open channel; and the construction of a new road and cul-de-sac. The Green Belt zoned woodland and Ng Uk Tsuen will be retained.

8.1.3 Mitigation measures proposed to reduce the visual impact of the scheme proposals include : erection of hoarding along part of the site boundary to block poor views during the construction period; tree and shrub planting to all amenity strips to provide partial screening for views from pedestrians to the road; sympathetic use of materials and integration of the Ng Uk Tsuen Village extension with the surrounding streetscape; and the sympathetic treatment of the landscape design along the Shek Sheung River diversion.

9. ECOLOGY

9.1 Study Methods

9.1.1 Habitats on site were delineated and characterised through site surveys and aerial photography. Standard field surveys were conducted to establish a species baseline for the site in selected taxa, supported by literature review to assess the significance of species recorded. Species, habitats and potential project impacts were considered in the SAR context to establish their local significance. The Technical Memorandum on EIA Process and other relevant guidelines, legislation and international conventions were used to assess the importance of habitats and species recorded and the severity of predicted impacts.

9.2 Ecological Baseline

9.2.1 The site was dominated by village development and agricultural land, with scattered trees, orchards and small areas of woodland. The largest area of woodland was found at Ng Uk Tsuen Village at the northern edge of the site. The Shek Sheung River flowing through the site was subject to heavy organic pollution, and the abundance and diversity of aquatic fauna in the river were low.

9.2.2 No species thought to be rare in Hong Kong were recorded on site, with the exception of the butterfly *Hypolimnas misippus*. Habitats recorded were not unusual for a rural New Territories site. Giving due weight to potential ecological value, the river and its riparian zone were identified as the concerned ecological features of the site.

9.3 Ecological Impacts

9.3.1 The major ecological impact predicted from the project is habitat loss, including :

- ◇ loss of the Shek Sheung River and all associated riparian habitat within the site;
- ◇ loss of trees and disturbance to woodlands on site;
- ◇ loss of all active and abandoned agricultural habitats.

9.3.2 Ecological impacts of secondary concern include sedimentation and water pollution of downstream watercourses during construction, and disturbance to adjacent natural or semi-natural habitats during construction and operation phases.

9.3.3 The ecological impact of greatest concern was loss of the Shek Sheung River and riparian zone. Ecological considerations weighed against modifying the existing river. However, planning and drainage considerations supported conversion of the river channel to other forms. The latter, particularly flood control considerations, were considered to take precedence given the future of the site as a densely populated urban area. It was therefore decided following consideration of all factors to adopt the layout proposed in the Layout Plan (No. L/FSS 36/1) for the site, requiring abandonment of the existing river. A positive ecological impact of the Project will be the elimination of on-site sources of organic water pollution, which will also benefit downstream waterbodies.

9.4 Mitigation Measures

9.4.1 The following mitigation measures are recommended to offset the predicted ecological impacts of the project :

- ◇ provision of an open channel instead of an underground box culvert for conveyance of catchment runoff;
- ◇ ecologically sensitive design of the new drainage channel and restoration of channelside vegetation;
- ◇ protection of fung shui woods;
- ◇ use of appropriate native species in roadside and channelside tree and shrub planting;
- ◇ use of Best Management Practices on-site during construction to minimise potential for sedimentation and pollution of watercourses.

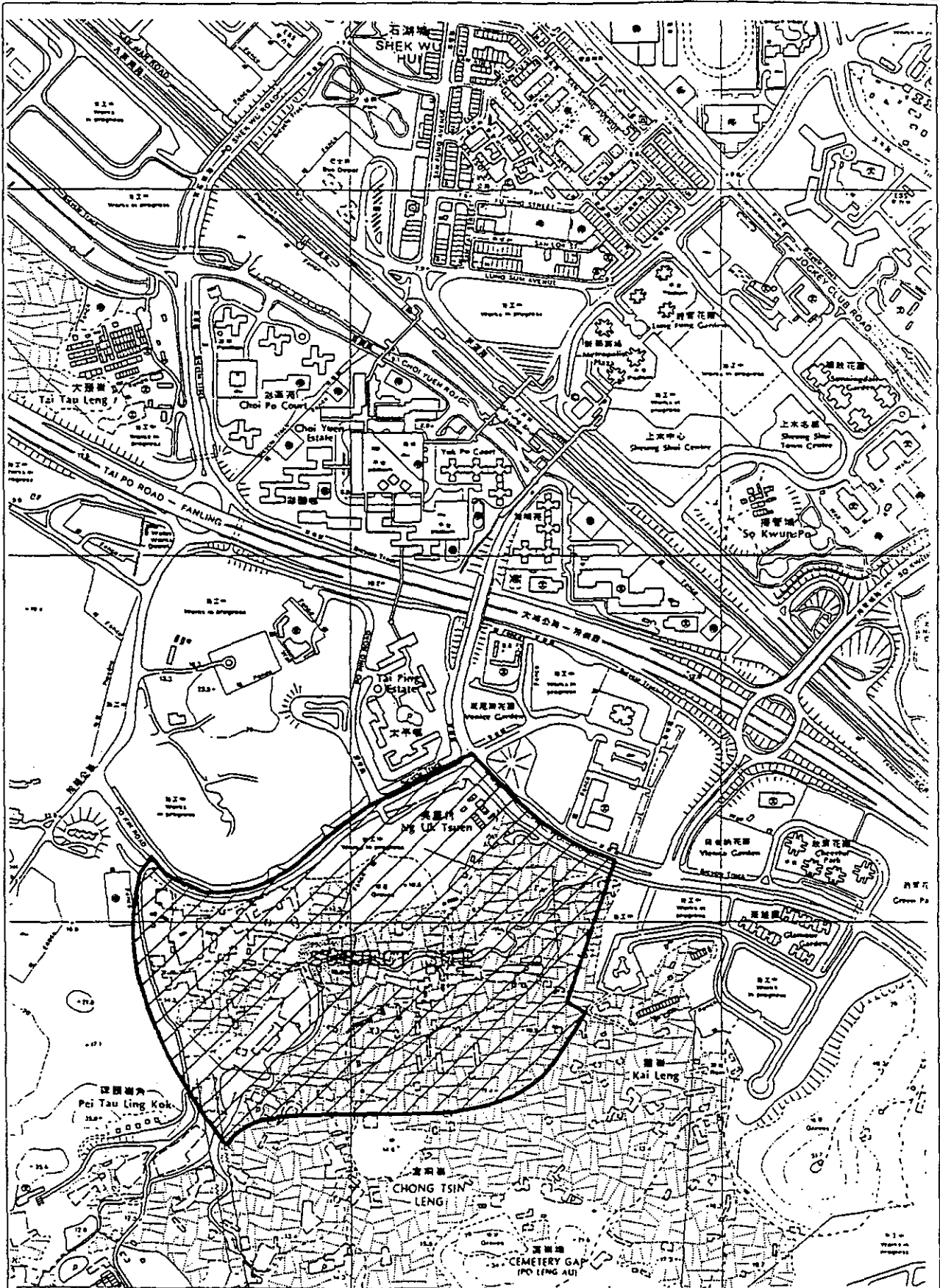
9.4.2 These mitigation measures are anticipated to bring residual impacts of the project within tolerable bounds.

10. ENVIRONMENTAL MONITORING & AUDIT REQUIREMENTS

10.1.1 The undertaking of environmental monitoring and audit (EM&A) during the construction phase is necessary for checking the continuous implementation of sufficient mitigation measures to alleviate impact on the environment with respect to air quality, noise, water quality and waste. A separate EM&A Manual has been prepared for the Project.

11. CONCLUSION

11.1.1 In conclusion, all important environmental issues pertaining to the construction and operation phases of the Project have been identified and addressed in the EIA. Qualitative and / or quantitative assessments have been undertaken where appropriate for comparison with the relevant standards or guidelines. Practicable and cost-effective mitigation measures have been recommended to minimise the identified adverse impacts to acceptable ranges. An EM&A programme has been recommended for implementation during the construction phase of the Project. The EM&A requirements are detailed in the EM&A Manual.



TITLE : Location of Area 36, Fanling	
PROJECT : Formation and Servicing in Area 36, Fanling	
Figure : A	Scale : —



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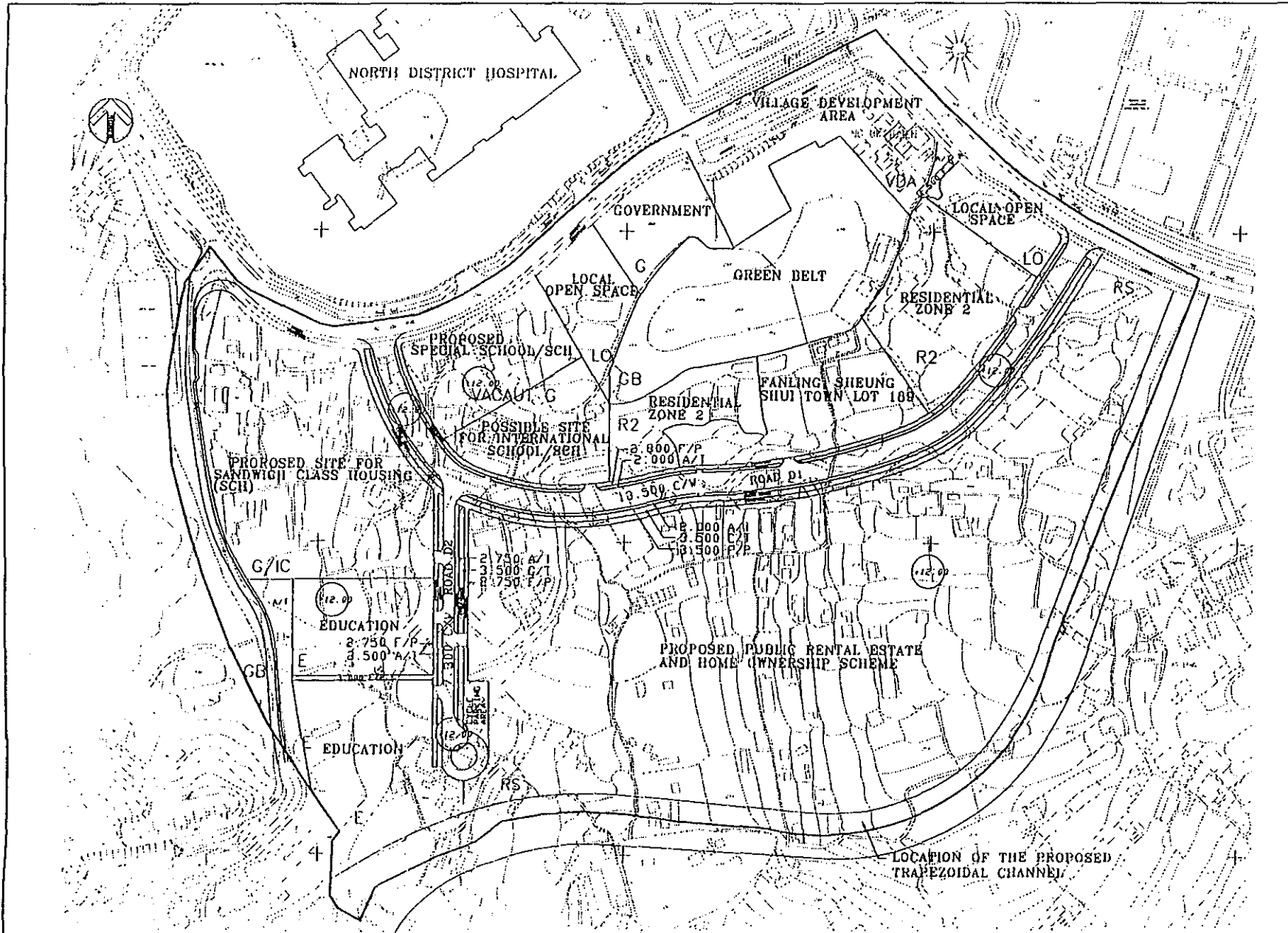
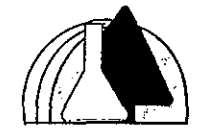


Figure : B

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TITLE : Proposed Future Land Uses in Area 36

PROJECT : Formation and Servicing in Area 36, Fanling

EHS Consultants Limited

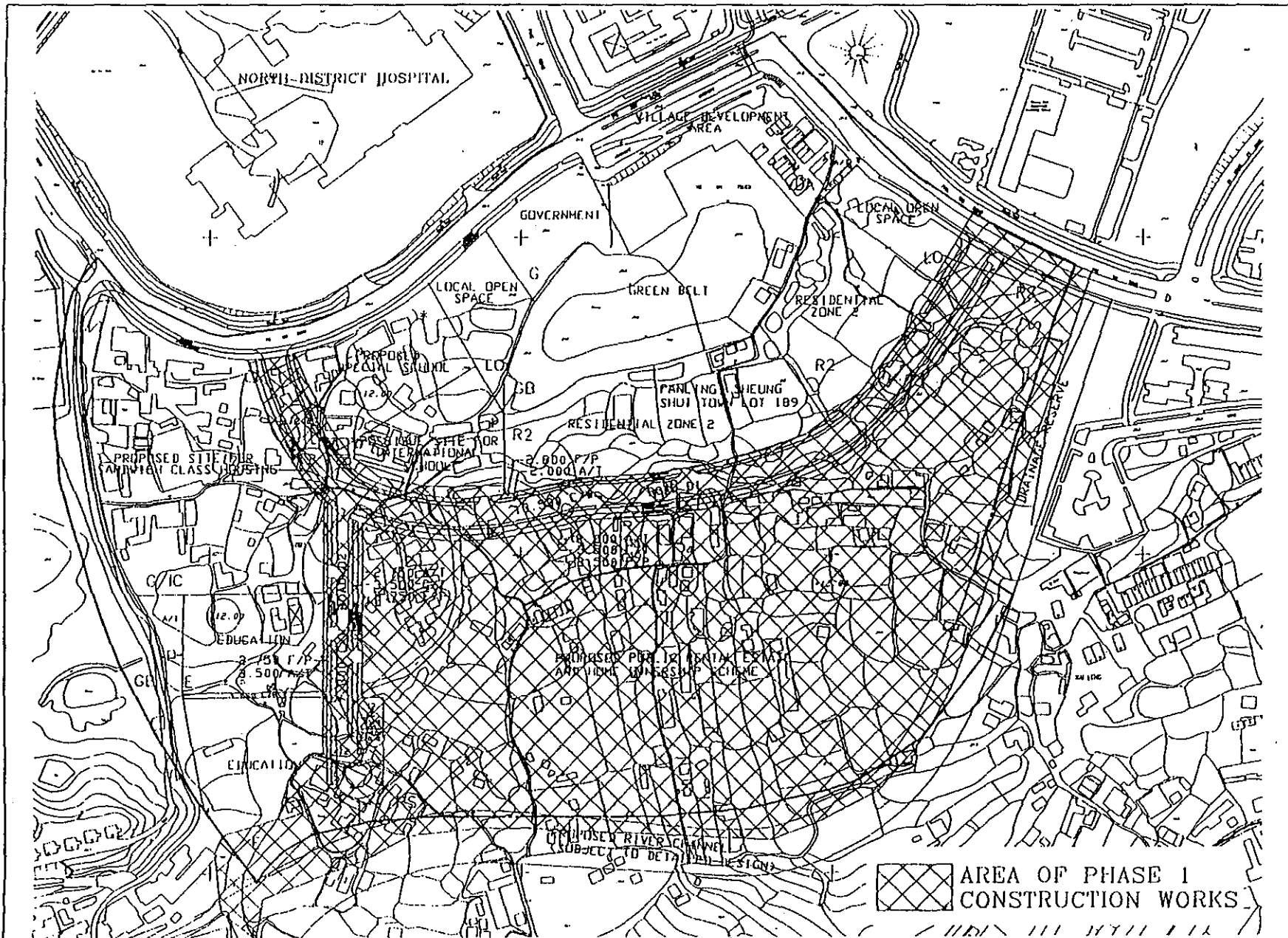
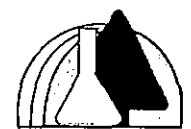


Figure : C-1

Scale : ---



TITLE : Land covered in the Phase I Construction Programme

PROJECT : Formation and Servicing in Area 36, Fauling

EHS Consultants Limited

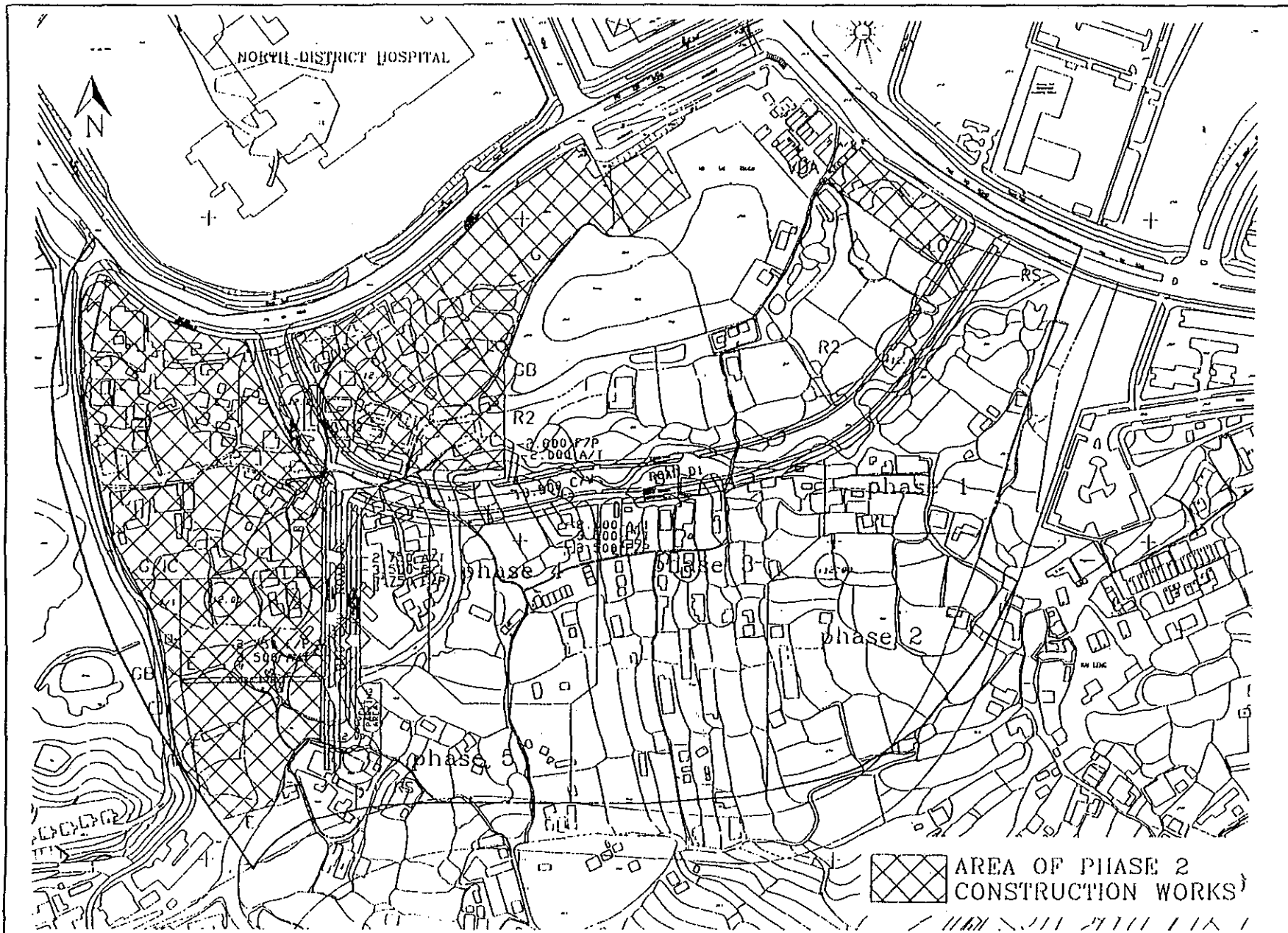
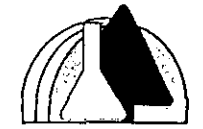


Figure : C-2

Scale : ---



TITLE : Land covered in the Phase 2 Construction Programme

PROJECT : Formation and Servicing in Area 36, Fanling

EHS Consultants Limited