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1. INTRODUCTION

Background

- 1.1 The title of this project is known as “Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction (Natural Terrain Risk Mitigation Works)” (hereafter known as the Project). The Project Proponent is the Planning Division of the Geotechnical Engineering Office, Civil Engineering and Development Department (CEDD), Government of the Hong Kong Special Administrative Region (HKSAR). Maunsell Environmental Management Consultants Limited (MEMCL) has been commissioned to carry out an Environmental Impact Assessment Study for the Project.

Project Objectives

- 1.2 The objective of this Project is to carry out detailed design and supervision of landslide preventive works to improve the long-term stability of the Po Shan area against large-scale and deep-seated slope failure. This Environmental Impact Assessment focuses on the local repair works on the hillside, which is proposed to minimize slope deterioration and shallow slope instabilities.
- 1.3 The hillside is susceptible to shallow failure and a shallow landslide had occurred during a rainstorm in June 2005. This project aims to mitigate the natural terrain against shallow instabilities.
- 1.4 The proposed landslide preventive works will be constructed to protect the existing residential developments at the toe of the project site.

2. DESCRIPTION OF THE PROJECT

Location of the Project

- 2.1 The proposed landslide preventive works will be constructed to protect the existing residential developments at the toe of the project site. The location of the project is shown in **Figure 1.1**. As the proposed works at Po Shan Area will fall within the boundary of the existing Pok Fu Lam Country Park and Special Area, the Project is classified under Category Q.1 of Part 1 in Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) as a Designated Project. Location of Pok Fu Lam Country Park is illustrated in **Figure 1.1**. **Figure 1.2** shows the general layout of the Project.

History of the Project site

- 2.2 The study area can be broadly defined as encompassing the mostly undeveloped hillsides above the residential development at Po Shan Road and adjacent to the trimmed back slope on the site of the catastrophic 1972 Po Shan Road failure. Previous studies had been carried out and results indicated that the natural hillside above Po Shan Road is affected by high groundwater level and unfavourable geology. Sub-surface drainage measures by means of sub-horizontal drains had been installed in 1984-85. These measures have been successful in lowering the main ground water table, thus improving the stability of the slopes such that large-scale failures have not occurred in the last twenty years. However, the hillside is susceptible to shallow failure and a shallow landslide was occurred on hillside during a rainstorm in June 2005.
- 2.3 The Agreement was awarded by CEDD to Maunsell Geotechnical Services Ltd. (MGSL) as the engineering consultant in April 2005 for design and construction of the underground drainage adits.
- 2.4 Following a shallow landslide on the hillside in June 2005, the CEDD carried out a natural terrain landslide risk assessment. The assessment concluded that natural terrain risk mitigation works is necessary on the hillside above Po Shan Road. On 28 Nov 2005, CEDD entered into agreement with MGSL for carrying out the design of the natural terrain risk mitigation works.

Scope of the Project

- 2.5 The scope of works includes the installation about 700 numbers of soil nails and about 60 numbers of raking drains on the natural terrain within the concerned area as shown in **Figure 1.4**. The length of the soil nails is about 20m with a spacing of 2m horizontally and 3m vertically; the length of raking drains is about 10m with a spacing of 5m horizontally and 15m vertically.
- 2.6 Rock slope stabilisation works will be provided for the rock outcrop / boulders at the upper portion of the natural terrain. Measures such as scaling, installation of rock bolts / dowels, construction of concrete buttress and provision of wire mesh protection will be provided where necessary.
- 2.7 No tree felling will be proposed under this Project.
- 2.8 The Project will be carried out concurrently with the construction works of drainage adit within the Po Shan area as shown in **Figure 1.1**

Purpose of EIA

- 2.9 The purpose of this EIA Study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the proposed landslide preventive works, and to contribute to decisions on the overall acceptability of the Project, after the implementation of proposed mitigation measures.

The Approach

- 2.10 The EIA study has been prepared in accordance with the guidelines provided in Annex 11 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) for the report contents and Annexes 12 to 19 for the impact assessments of various environmental issues. The general approaches and methodologies adopted for this EIA study are described below.

Existing Environment Condition

- 2.11 The characteristics of the existing environment were reviewed for identification and prediction of environmental impacts. Baseline surveys were conducted to determine the existing environmental conditions on the Project site and environs likely to be affected by the Project. The baseline conditions of the key issues as identified in the EIA Study Brief including ecology, landscape & visual, noise, water quality and air quality are described in the assessment.

Impacts Prediction

- 2.12 The EIA Study was undertaken in accordance with the guidelines on assessment methodologies given in Annexes 12 to 19 of the EIAO-TM.
- 2.13 Quantitative approach was adopted for assessing the construction noise impacts. The predictions were conducted based on well-proven, internationally accepted methods.
- 2.14 The applied methodologies for the Project had previously been adopted in other EIA studies. They have been generally accepted for use in predicting environmental impacts and for comparison of assessment results with the EIAO-TM requirements. Limitations are however envisaged of these methodologies. The accuracy of the prediction result will be affected by uncertainty in input data such as sound power levels of construction plants to be used on-site. The most realistic data have been used in the prediction in order to provide a result with as small as possible the quantitative uncertainty.

Mitigation Measures

- 2.15 Mitigation measures are proposed to alleviate the potential impacts predicted. The proposed mitigation measures were adopted in other environmental assessment study with similar construction works. Environmental Monitoring and Audit programme is recommended to ensure the recommended mitigation measures could effectively mitigate the impacts to comply with the corresponding criteria.

Considerations of Different Technology and Design Options

- 2.16 The concerned area had been studied under Agreement No. CE 29/2003(GE) for assessing the risk to facilitates downslope generated by shallow geological processes. Based on the findings by the Quantitative Risk Assessment (QRA), the proposed mitigation works scheme had been optimized as the only possible method to adequately reduce the natural terrain landslide risk, which includes a combination of soil nails and raking drains; otherwise, massive upgrading works such as retaining wall and backfilling may have to be applied that would cause excessive nuisance to the environment.
- 2.17 The QRA carried out under the captioned study had identified four groups of landslide hazards (**Figure 2.1**) that have been significant in the geomorphological development of the site as below.
1. Retrogressive / retreating failures of the residual colluvium on the eastern and western spurs of the study area within the locally steeper portions of slope.
 2. Debris avalanche and debris flow type failures sourcing from the upper rock dominated part of the study area, between the cliffs.

3. Rock slide (wedge and planar) and rock fall failures on the rock cliffs in the mid to upper portions of the catchment.
 4. Deep-seated failures may have occurred in the past within the residual colluvium, and possibly within the buried saprolite below the colluvium.
- 2.18 In order to improve the stability of the Po Shan area against shallow slope failures (i.e. the aforementioned hazard group No. 1), the proposed mitigation scheme by means of localised soil nails was proposed under this Study.

Considerations of Alternative Construction Methods and Sequence of Works

- 2.19 The detailed design of the proposed works was accepted by GEO Checker in March in 2007 under this Agreement No. CE 28/2004(GE). Under this specific design, all soil nails and raking drains have been well located so that no tree felling will be involved. However, exact locations for the proposed soil nails and raking drains can still be slightly adjusted on site (if necessary) to minimize nuisance to those existing trees on the captioned area.
- 2.20 As recommended under the QRA, it is concurred that provision of soil nails and raking drains would cause the least impact to the environment as comparing with retaining wall construction, filling and slope cutting. If other slope upgrading measures have to be applied instead of the current proposed scheme by means of soil nails and raking drains, bulk excavation is inevitably required and tree felling or transplant has to be carried out.
- 2.21 Regarding the rock slope stabilisation works, measures such as scaling, installation of rock bolts / dowels, construction of concrete buttress and provision of wire mesh protection installations on locally unstable rock outcrops would be proposed. The scope for such works is considerably small in extent and shall not have any environmental impact.

Selection of the Preferred Scenario

- 2.22 The soil nailing scheme for the slope stabilization works involves no slope cutting or filling that may cause unnecessary tree felling. Also, it shall induce significantly lower ground disturbance when comparing with the construction of massive retaining structure. Hence, it is considered to be more environmental friendly.
- 2.23 Following the review of available mitigation measures, the natural terrain hazard risk mitigation at the study area was therefore designed with a combination of soil nails, raking drains and some localised rock slope stabilisation works. After applying the proposed measures, the risk generated by shallow geological process would be reduced to acceptable levels.

Implementation and Planning of the Proposed Project

- 2.24 The proposed works are scheduled to commence in November 2007 with duration of 10 months. The preliminary construction programme for the Project is shown as shown in **Table 2.1** and presented in **Appendix 2.1**.

Table 2.1 Preliminary Construction Programme

Activity	Time period
Site clearance and set up	November 2007 to mid November 2007
Soil nail installation	Mid November 2007 to mid July 2008
Soil nail head construction	December 2007 to July 2008
Rock slope stabilization works	Mid November 2007 to July 2008
Raking drain installation	March 2008 to July 2008
Landscaping works	August 2008 to Early September 2008
Site reinstatement works	August 2008 to Early September 2008

- 2.25 There are interactions with another designated project “Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction” (under Environmental Permit EP-235/2005/A) on-going during the same period within the captioned area which will also be carried out by the Project Proponent.
- 2.26 The project "Agreement No. CE13/2005(WS), Improvement to Hong Kong Central Mid Level and High Level Areas Water Supply – Remaining Works" proposed by Water Supplies Department, will be commenced in end of 2007. With reference to the proposed development at Hatton Road Service Reservoirs, it is noted that such works will be carried out at location away from the works areas of the Project. No interaction between the two projects is expected.

Scenarios with or without the Project

- 2.27 A qualitative risk assessment was performed to identify the optimal scheme with consideration of environmental disturbance during installation and visual appearance following installation. Based on the findings, the proposed scheme involving localised soil nailing works and minor rock slope / boulder treatment works has been optimised to adequately reduce the natural terrain landslide risk to below the current risk acceptability criteria.
- 2.28 Without having the proposed works implemented, the facilities situated downslope of the Po Shan Catchment are considered vulnerable to future natural terrain landslides. Based on the rational assessment of the likely debris flow paths, lateral spread of debris deposition, and the debris volume sourcing from natural terrain landslides initiating with the catchment, the vulnerable facilities are defined laterally as the frontage of Po Shan Mansions, the nearby amenity plot to the east and the drainage channel to the west.

Scope of Key Environmental Issues

- 2.29 The identified key environmental issues regarding the construction of the proposed Project are listed as below:
- potential losses or damage to flora, fauna and natural habitats and the potential ecological impacts from the Project during its construction and operation stages;
 - potential landscape and visual impacts to nearby sensitive receivers from the Project during its construction and operation stages;
 - potential construction noise impacts to nearby sensitive receivers from the Project;
 - potential construction water quality and dust impacts to nearby sensitive receivers, as well as waste management implications, from the Project; and

- potential cumulative impacts to nearby sensitive receivers for the above key issues, taking into account the existing construction works mentioned in paragraph 2.13.
- 2.30 The assessments of these key environmental issues are to be discussed in the following chapters of this Report.
- 2.31 It is identified that the proposed Project has no impacts at all on environmental aspects of cultural heritage and agriculture & fisheries. Hence these impacts are not assessed in this EIA Study.

Key Assessment Assumptions and Limitations of Methodologies

- 2.32 The key assessment assumptions, limitation of assessment methodologies and all relevant prior agreements with the EPD on individual environmental media assessment components are summarised in **Appendix 10.2**.

3. ECOLOGICAL IMPACT

Introduction

- 3.1 The following section presents the results of an ecological assessment of potential impacts resulting from the Project. A literature review and field surveys were undertaken to establish ecological baseline conditions and evaluate the ecological importance of habitats/species potentially affected by proposed works. The scale of possible ecological impacts resulting from the proposed works was assessed and necessary mitigation measures were identified. Residual ecological impacts were assessed, and ecological monitoring and audit requirements were identified.
- 3.2 The assessment follows the criteria and guidelines as stated in Annexes 8 and 16 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) and the EIA Study Brief No. ESB-158/2006.

Environmental Legislation, Standards and Guidelines

- 3.3 Guidelines, standards, documents and HKSAR Government ordinances and regulations listed in the followings were referred to during the course of the ecological impact assessment.
- 3.4 The *Country Parks Ordinance* (Cap. 208) provides for the designation and management of country parks and special areas. Country parks are designated for the purpose of nature conservation, countryside recreation and outdoor education. Special Areas are created mainly for the purpose of nature conservation.
- 3.5 The *Forests and Countryside Ordinance* (Cap. 96) prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on Government land. Related subsidiary Regulations prohibit the selling or possession of listed restricted and protected plant species. The list of protected species in Hong Kong which comes under the Forestry Regulations was last amended on 11 June 1993 under the *Forestry (Amendment) Regulation 1993* made under *Section 3* of the *Forests and Countryside Ordinance*.
- 3.6 Under the *Wild Animals Protection Ordinance* (Cap. 170), designated wild animals are protected from being hunted, whilst their nests and eggs are protected from injury, destruction and removal. All birds and most mammals, including marine cetaceans, are protected under this Ordinance. The Second Schedule of the Ordinance, which lists all the animals protected was last revised in June 1992.
- 3.7 *The Protection of Endangered Species of Animals and Plants Ordinance* (Cap. 586) restricts the import and export of scheduled species. The Ordinance is primarily related to controlling trade in threatened and endangered species and restricting the local possession of them.
- 3.8 The amended *Town Planning Ordinance* (Cap. 131) provides for the designation of coastal protection areas, Sites of Special Scientific Interest (SSSIs), Conservation Area, Country Park, Green Belt or other specified uses that promote conservation or protection of the environment. The authority responsible for administering the *Town Planning Ordinance* is the Town Planning Board.
- 3.9 *Chapter 10* of the *Hong Kong Planning Standards and Guidelines (HKPSG)* covers planning considerations relevant to conservation. This chapter details the principles of conservation, the conservation of natural landscape and habitats, historic buildings, archaeological sites and other antiquities. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong and government departments involved in conservation.
- 3.10 *Annex 16* of the *EIAO TM* sets out the general approach and methodology for assessment of ecological impacts arising from a project or proposal, to allow a complete and objective identification,

prediction and evaluation of the potential ecological impacts. *Annex 8* recommends the criteria that can be used for evaluating habitat and ecological impact.

- 3.11 *EIAO Guidance Note No. 6/2002* clarifies the requirements of ecological assessments under the *EIAO*. *EIAO Guidance Note No. 7/2002* provides general guidelines for conducting ecological baseline surveys in order to fulfil requirements stipulated in the *EIAO TM*.
- 3.12 *List of Wild Animals Under State Protection* details Class I and Class II protected animal species under Mainland Chinese Legislation.
- 3.13 *List of Wild Plants Under State Protection* details Class I, Class II and Class III protected plant species under Mainland Chinese Legislation.
- 3.14 *The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species* provides taxonomic, conservation status and distribution information on taxa that have been evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction. The IUCN Red List also includes information on taxa that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme.

Assessment Methodology

Scope of Ecological Assessment

- 3.15 Existing literature documenting the ecology of the proposed works area was reviewed. Ecology surveys were conducted from February to July 2006. The surveys covered an assessment area within 500 m of the works site boundary, including the Pok Fu Lam Country Park and Special Area, and area likely to be impacted by the Project.

Literature Review

- 3.16 Previous assessment studies covering the assessment area were reviewed.
- Project Profile for Agreement No. CE28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction (Maunsell, 2005)
 - Environmental Impact Assessment Report for Drainage Improvement in Northern Hong Kong Island - Hong Kong West Drainage Tunnel (Black & Veatch, 2006)

Ecological Survey

- 3.17 A six-month ecological survey covering both dry and wet seasons was conducted from February to July 2006. The surveys covered an assessment area within 500 m of the works site boundary, and comprised:

Terrestrial Ecological Survey

- 3.18 Habitat surveys were undertaken to determine the types, sizes and locations of habitats in the assessment area. The habitat surveys were conducted via a desktop review of aerial photographs, base-maps and other relevant maps and plans followed by site visits. Representative photographs of habitat types in the assessment area were taken.
- 3.19 Vegetation surveys were conducted by direct observation to record species present, relative abundance and dominant species in different habitat types in representative parts of the assessment area. The position of any plant species of conservation interest was recorded. Identification of

species and status in Hong Kong were made with reference to Hong Kong Herbarium (2004), Hu *et al.* (2003), Xing *et al.* (2002), Wu & Lee (2000) and Xing *et al.* (2000).

- 3.20 Habitat/Vegetation surveys of the assessment area were focussed on areas directly impacted by the proposed works, and conducted in both dry and wet seasons from February to July 2006.

Avifauna Surveys

- 3.21 Daytime avifaunal surveys were undertaken on a monthly basis from February to July 2006. Night surveys of the assessment area were conducted in February and May 2006. Avifaunal surveys comprising general walk-transect of the assessment area were undertaken with species present and relative abundance of species in different habitat types recorded. The walk-transect is provided in **Figure 3.1**. Birds were recorded visually and aurally. The location of bird species of conservation interest was recorded, along with any notable behaviour (e.g., breeding behaviour such as nesting and presence of recently fledged juveniles, roosting and feeding activities). Nomenclature and protection status of the species were made with reference to Viney *et al.* (2005) and Carey *et al.* (2001).

Herpetofauna Surveys

- 3.22 Herpetofauna (lizards, snakes, frogs etc.) surveys of the assessment area were conducted, with species present and relative abundance of species recorded. Amphibians were searched for by direct observation, searching potential microhabitats (such as stream bank, small water pond, pool, crevice, rock, leaf litter and rotten log), searching for tadpoles in aquatic habitats and listening for calling animals. Reptiles were searched for by direct observation, searching potential microhabitats, and searching for signs of animals (e.g., snake-skins). The location of any herpetofaunal species of conservation interest was recorded. Identification of species and status in Hong Kong of herpetofauna were made with reference to Chan *et al.* (2005), Lau & Dudgeon (1999) and Karsen *et al.* (1998).
- 3.23 Herpetofauna surveys were conducted at three survey days, in March and May 2006. Surveys were conducted during both the day and night.

Mammal Surveys

- 3.24 Mammal surveys of the assessment area were conducted, with species present and relative abundance of species recorded. Mammals (including bats) were searched for by direct observation, searching potential microhabitats (e.g. palm trees as microhabitat for nesting bats), listening for calling animals, and searching for signs of animals (e.g., burrows, faeces, feeding signs and footprints). The location of mammal species of conservation interest was recorded. Identification of species and status in Hong Kong of mammal were made with reference to the Agriculture, Fisheries and Conservation Department (AFCD) Hong Kong Biodiversity Database (2006) and Shek (2006).
- 3.25 Mammal surveys were conducted three times (February, April and May 2006), covering both dry and wet seasons in the assessment area. Surveys were conducted during both the day and night.

Terrestrial Insect Surveys

- 3.26 Species present and relative species abundance of adult butterflies and odonates (dragonflies, etc) were recorded by general walk-transect in the assessment area. The walk-transect is provided in **Figure 3.1**. Terrestrial insect surveys were conducted two times in the wet season (May and July, 2006). Nomenclature and protection status of the species were made with reference to Lo & Hui (2005), Bascombe *et al.* (1999) and Wilson (1995, 1997 & 2004).

Freshwater Community Surveys

- 3.27 Fish and macroinvertebrate populations were surveyed three times in the wet season (April, May and June 2006), with species present and relative abundance of species recorded. Fish were

surveyed by direct observation and netting using aquatic hand nets at various microhabitats. Surveys of macroinvertebrate populations were conducted by kick-sampling with a 500µm mesh D-framed net. Three replicates were taken at the same point at each stream sampling location as shown in **Figure 3.1**. Identification of species and status in Hong Kong were made with reference to Dudgeon (2003) and Dudgeon & Corlett (1994).

Impact Assessment

- 3.28 Potential ecological impacts arising from the Project were assessed following *EIAO TM Annex 16* guidelines and the impacts were evaluated based on criteria in *EIAO TM Annex 8*.

Sites of Conservation Importance

- 3.29 The proposed works area was partly fall within the boundary of the existing Pok Fu Lam Country Park and Special Area. Under the approved the Peak Area Outline Zoning Plan (S/H14/7), Pok Fu Lam Country Park and Special Area contributes to the conservation of the natural environment and recreational use where appropriate.
- 3.30 Pok Fu Lam Country Park is set in foothills of Victoria Peak, locates between Mount Kellett, Sai Ko Shan, Victoria Gap and Pok Fu Lam Road. It is approximately 270 ha in size and surrounding the Pok Fu Lam Reservoir. The Country Park is dominated by woodland habitats around the reservoir area, includes stream course and shrubland. It also supports several rare and protected plant species such as *Camellia hongkongensis*.

Summary of Literature Review

Habitat and Vegetation

- 3.31 Results of habitat and vegetation surveys for Po Shan Project Profile (Maunsell, 2005) identified several habitat types including mature secondary woodland, engineered cut slopes, residential developments and landscape amenity areas. Seven plant species of conservation interest were recorded within the secondary woodland habitat: the fern Lamb of Tartary (*Cibotium barometz*) protected under Hong Kong and Mainland Legislation, the locally protected Hong Kong Pavetta (*Pavetta hongkongensis*), Bird's-nest Fern (*Neottopteris nidus*) and Rhododendron (*Rhododendron* spp.), Chinese Pholidota (*Pholidota chinensis*) and the locally common Small Persimmon (*Diospyros vaccinioides*) and Silver-back Artocarpus (*Artocarpus hypargyreus*) classified as critically endangered and vulnerable respectively in the IUCN Red Data List.
- 3.32 Hong Kong West Drainage Tunnel EIA (Black & Veatch, 2006) identified 5 habitat types: natural woodland, shrubland, fung shui woodland, urban plantation and stream/nullah within the assessment area of the project. Two floral species of conservation concern were recorded within the HKU1 study area near Pok Fu Lam included one tree species *Artocarpus hypargyreus* and one shrub *Pavetta hongkongensis*. These species are locally common and are protected by legislation in China and Hong Kong respectively.
- 3.33 Po Shan Project Profile (Maunsell, 2005) identified that secondary woodland habitat with the assessment area supported seven plant species of conservation interest. The fern Lamb to Tartary (*Cibotium barometz*) is listed as a Wild plant under State Protection (Category II) under Mainland Legislation, and is scheduled under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). Hong Kong Pavetta (*Pavetta hongkongensis*), Bird's-nest Fern (*Neottopteris nidus*) and Rhododendron (*Rhododendron* spp.) are all listed under Forestry Regulation of Forests and Countryside Ordinance (Cap. 96). Chinese Pholidota (*Pholidota chinensis*) is listed under Forestry Regulation of Forests and Countryside Ordinance (Cap. 96) and scheduled under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). The locally common Small Persimmon (*Diospyros vaccinioides*) and Silver-back Artocarpus (*Artocarpus hypargyreus*) are classified as Critically Endangered (CR) and Vulnerable (VU) respectively in the

IUCN Red Data List (Lu & Pan, 1998; Sun, 1998b). While Silver-back Artocarpus is also listed under State Protection (Category III) under Mainland Legislation.

Fauna

- 3.34 Six avifauna species of conservation importance were recorded from the study area of Po Shan Project Profile (Maunsell, 2005) including Yellow-crested Cockatoo (*Cacatua sulphurea*) which is listed as critically endangered in the IUCN Red Data List and CITES Appendix I. Other species recorded from either woodland habitat or at flight over the study area including Lesser Coucal (*Centropus bengalensis*), Greater Coucal (*Centropus sinensis*) and Hwamei (*Garrulax canorus*), Peregrine Falcon (*Falco peregrinus*) and Black Kite (*Milvus migrans*) are locally common and native to Hong Kong, but are protected under Mainland Chinese and Hong Kong legislation.
- 3.35 Fauna of conservation concern recorded in Hong Kong West Drainage Tunnel EIA (Black & Veatch, 2006) included Belly-banded Squirrel (*Callosciurus erythraeus styani*) and Black Kite (*Milvus lineatus*) from study area W11(P), HKU1(P) and W10 near Pok Fu Lam. These species are locally protected.
- 3.36 It is reported that an endemic shrimp species, *Caridina serrata*, was also present at mid-level (Lung Fu Shan) on Hong Kong Island. It has been found from a small mountain stream at a hill above Belcher's and a stream on the Peak (Yam, 2003; Cai & Ng, 1999). Although it is not protected under local and international legislations, *C. serrata* is endemic in Hong Kong and, therefore, of conservation importance.

Summary of Current Survey

- 3.37 A habitat map of the assessment area is given in **Figure 3.2**. Representative photographs of habitats are given in **Appendix 3.1**. Photographs of plant species of conservation importance are illustrated in **Appendix 3.2**. Species recorded from the assessment area are listed in **Appendix 3.3**. More detailed descriptions of habitats and vegetation communities in the assessment area are given in the following paragraphs.

Habitat and Vegetation

- 3.38 Habitats found within the assessment area include natural woodland, shrubland, developed area and freshwater habitat. About 80% of the assessment area, particularly the area to be directly affected by the proposed Project, is natural woodland. A total of 163 plant species were recorded within the assessment area, about 82% of which are native. *Aquilaria sinensis*, *Aristolochia championii*, *Artocarpus hypargyreus*, *Cibotium barometz*, *Diospyros vaccinioides*, *Pavetta hongkongensis*, *Rhododendron championiae* and *Tutcheria spectabilis* were recorded within the assessment area. These species are either rare species or protected in China and Hong Kong. **Table 3.1** lists the number of plant species recorded in each habitat type.

Table 3.1 Number of Plant Species Recorded at Various Habitat Types within the Assessment Area

Habitat Type	Size	Number of Plant Species Recorded
Natural Woodland	~109 ha	141
Shrubland	~2 ha	36
Developed Area	~25 ha	39
Freshwater Habitat	~1200 m	-

Natural Woodland

- 3.39 About 109 ha of natural woodland was distributed at the south fringe of the assessment area. The woodland habitats are medium in age and have developed close canopy. Tree species reached a

height of 10-15 m and some of them were mature trees including *Machilus chekiangensis* which is commonly recorded in the woodland. Understorey species consisted of a variety of tree, shrub and herb species.

- 3.40 A total of 141 floral species were found in the natural woodland during the surveys. Eight plant species of conservation importance were recorded, comprising shrub species Hong Kong Pavetta (*Pavetta hongkongensis*), Champion's Rhododendron (*Rhododendron championiae*), Long-leaved Birthwort (*Aristolochia championii*) and Small Persimmon (*Diospyros vaccinioides*), tree species Silver-back Artocarpus (*Artocarpus hypargyreus*), Incense Tree (*Aquilaria sinensis*) and Common Tutcheria (*Tutcheria spectabilis*), and fern Lamb of Tartary (*Cibotium barometz*). The locations of these plant species of conservation importance were indicated in **Figure 3.2**. However, the previously recorded *Neottopteris nidus* and *Pholidota chinensis* (Maunsell, 2005) were not observed during the current surveys.
- 3.41 Hong Kong Pavetta (*Pavetta hongkongensis*) is native and common plant in Hong Kong. It is scheduled under the Forestry Regulations of the Forests and Countryside Ordinance (Cap. 96).
- 3.42 Champion's Rhododendron (*Rhododendron championiae*) is native but rare in Hong Kong. It is scheduled under the Forestry Regulations of the Forests and Countryside Ordinance (Cap. 96) and stated as Least Concern (LC) in China (Hu *et al.*, 2003).
- 3.43 Long-leaved Birthwort (*Aristolochia championii*) is native and rare species in Hong Kong. Its status in China is Endangered (EN) (Hu *et al.*, 2003).
- 3.44 Small Persimmon (*Diospyros vaccinioides*) is native species and highly abundant in shrubland and woodland habitats in Hong Kong. Despite of its local abundance, Small Persimmon is listed as Critically Endangered (CR) in the IUCN Red List of Threatened Species (Lu & Pan, 1998), as it is facing an extremely high risk of extinction in the wild in the immediate future.
- 3.45 For tree species, Silver-back Artocarpus (*Artocarpus hypargyreus*) is common in Hong Kong, but is classified as Vulnerable (VU) in the IUCN Red List of Threatened Species (Sun, 1998b), it indicates that Silver-back Artocarpus is facing a high risk of extinction in the wild in the medium-term future. In China, its status is Near Threatened (nt) and under State protection (Category III) (Hu *et al.*, 2003).
- 3.46 Incense Tree (*Aquilaria sinensis*) is a native and locally common species in Hong Kong. However, it is classified as Vulnerable (VU) in the IUCN Red List of Threatened Species (Sun, 1998a). In China, Incense Tree is also categorized as Endangered (EN) and Class II protected plant (Near Threatened) in the List of Wild Plants under State Protection (Hu *et al.*, 2003).
- 3.47 Common Tutcheria (*Tutcheria spectabilis*) is a native plant species in Hong Kong with restricted distribution. It is protected under the Forestry Regulations of the Forests and Countryside Ordinance (Cap. 96).
- 3.48 The fern Lamb of Tartary (*Cibotium barometz*) is a native and common species in Hong Kong. It is protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and its status in China is Vulnerable (VU). The wild plants are under State protection (Class II) (Hu *et al.*, 2003).

Shrubland

- 3.49 Shrubland, with the size of 2 ha, was mainly distributed at northeastern side of the proposed works area and small patches at the east of the assessment area. Generally, shrubland is covering part of the hillside and engineered slope. Plant species diversity in this habitat was low, with only a total of 36 species of plant recorded during the surveys. It was mostly dominated by *Miscanthus sinensis* and no rare or protected plant species was recorded.

Developed Area

- 3.50 A total of 25 ha of developed area was recorded in the assessment area included roads, car parks, residential area and landscape plantation areas. This habitat supports little or no vegetation aside from planted trees. Thirty-nine plant species was recorded during the surveys, with about 52% of the vegetation as exotic species planted for landscaping purposes. Species commonly found include *Litsea monopetala*, *Ficus microcarpa*, *Acacia* sp. and *Bauhinia* sp. This habitat is highly disturbed in nature with limited ecological interest. No rare or protected plant species was recorded.

Freshwater Habitat

- 3.51 There were only two small and seasonal stream courses within the assessment area, with total length of 1200 m. These stream courses were located at eastern and western side of the proposed works area and flow from south to north. Substrate was largely comprised of boulders in the upstream section and channelised in the downstream near Po Shan Road. Water flow in these streams was very limited during dry season. No aquatic vegetation was recorded.
- 3.52 Apart from seasonal streams, one small open drainage culvert was found at the north of the proposed works area. The culvert was made by cement with very small amount of water flow.

Fauna

- 3.53 Fauna recorded in the assessment area during surveys is listed in **Appendix 3.4**. The locations of the faunal species of conservation importance were indicated in **Figure 3.2**.

Avifauna

- 3.54 Twenty-five avifaunal species were recorded in the assessment area. Typical urban species such as Eurasian Tree Sparrow (*Passer montanus*), Oriental Magpie Robin (*Copsychus saularis*) and Japanese White eye (*Zosterops japonica*) were recorded from the developed area. Commonly recorded species in the shrubland habitat included Chinese Bulbul (*Pycnonotus sinensis*), Red-whiskered Bulbul (*Pycnonotus jocosus*) and Masked Laughing Thrush (*Garrulax perspicillatus*). Among all these species, Hwamei (*Garrulax canorus*), Large Hawk Cuckoo (*Hierococcyx sparveriioides*), Arctic Warbler (*Phylloscopus borealis*) and Red-billed Leiothrix (*Leiothrix lutea*) are uncommon species in Hong Kong (Carey *et al.*, 2001). In total, three of the recorded species are considered of conservation importance, as described in the following paragraphs:

Raptors

- 3.55 Up to 26 Black Kite (*Milvus migrans*) were recorded at flight above the assessment area throughout the survey period. The Breeding Bird Survey recorded breeding of Black Kite to occur in widespread coastal areas, including Hong Kong Island (Carey *et al.*, 2001). Although locally very common, Black Kite is considered of conservation importance in Hong Kong and of Regional Concern (RC) due to the restricted number of nesting and roosting sites (Fellowes *et al.*, 2002), with the current breeding population believed to be about 30 pairs. It is protected under the Wild Animals Protection Ordinance (Cap. 170) and the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). It is also a Class II protected species under Mainland Chinese Legislation.
- 3.56 One individual of Collared Scops Owl (*Otus bakkamoena*) was recorded in the natural woodland habitat during a day survey in May 2006. Collared Scops Owl is common and widespread in Hong Kong (Carey *et al.*, 2001). This nocturnal species is recorded throughout the year from widespread areas and utilises a variety of wooded habitats including shrubland with scattered large trees and city parks. Collared Scops Owl is of conservation importance, and it is protected under the Wild Animals Protection Ordinance (Cap. 170) and the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). It is a Class II protected species under Mainland Chinese Legislation.

Other Birds

- 3.57 Two Greater Coucals were recorded from the natural woodland habitat in April and July 2006. Greater Coucal (*Centropus sinensis*) is relatively common and widespread in Hong Kong, and is not considered of conservation interest by Fellowes *et al.* (2002). All Coucal species, however, are Class II protected species in Mainland China, where they are thought to be under threat from over-hunting (Zheng & Wang, 1998). It is categorized as Vulnerable (VU) in the China Red Data Book of Endangered Animals (Zheng & Wang, 1998) and also protected under the Wild Animals Protection Ordinance (Cap. 170).

Herpetofauna

- 3.58 Herpetofauna survey was conducted at three survey days, in March and May 2006, with no species recorded in March. Generally, herpetofauna were recorded in streams, natural woodland and developed area.
- 3.59 Four species of amphibians were recorded in the assessment area during the survey period, including Asian Common Toad (*Bufo melanostictus*), Green Cascade Frog (*Rana livida*), Lesser Spiny Frog (*Rana exilispinosa*) and Hong Kong Cascade Frog (*Amolops hongkongensis*). Green Cascade Frog was recorded at both eastern and western streams. Lesser Spiny Frog and Hong Kong Cascade Frog were recorded at eastern stream and western stream, respectively. Apart from amphibian in adult form, tadpoles of Hong Kong Cascade Frog (*Amolops hongkongensis*) were found at both eastern and western streams during the freshwater habitat surveys from March to May 2006.
- 3.60 The former two species, Asian Common Toad and Green Cascade Frog, are common and widely distributed in Hong Kong, and widely distributed in mountain streams in Hong Kong, respectively.
- 3.61 Lesser Spiny Frog (*Rana exilispinosa*) is common and widely distributed in Hong Kong hill streams. However, because of an observed population decline, estimated to be more than 30% over the last three generations, inferred from over-harvesting, observed shrinkage in distribution and ongoing habitat destruction and degradation, Lesser Spiny Frog is classified as Vulnerable (VU) in the IUCN Red List of Threatened Species (Lau & Baorong, 2004). It is also categorized as Potential Global Concern. Large, secure populations in Hong Kong are of global significance (Fellowes *et al.*, 2002).
- 3.62 Hong Kong Cascade Frog (*Amolops hongkongensis*) can be found in fast-flowing mountain streams on Hong Kong Island and in New Territories only. No individual was reported on Lantau Island and outlying islands (Lau & Dudgeon, 1999). As the species depends on unpolluted, forest-fringed hill streams, and so its area of occupancy is probably not much greater than 2,000 km², and the extent and quality of its habitat is declining, Hong Kong Cascade Frog is classified as Near Threatened (NT) in the IUCN Red List of Threatened Species (Baorong & Chan, 2004). It is also protected under Wild Animal Protection Ordinance (Cap. 170). The Hong Kong population is therefore of global importance (Fellowes *et al.*, 2002).
- 3.63 One species of reptile, Changeable Lizard (*Calotes versicolor*), was recorded from woodland habitat of the assessment area during the surveys, which is a common and widespread native species. No rare or protected reptile species was recorded.

Mammals

- 3.64 Two species of mammals, Pallas's Squirrel (*Callosciurus erythraeus*) and Short-nosed Fruit Bat (*Cynopterus sphinx*), were recorded in the assessment area. Two individuals of Pallas's Squirrel (*Callosciurus erythraeus*) were recorded at tree crown of a road tree at Po Shan Road in day surveys, whilst a small population (approximately 10 individuals) of Short-nosed Fruit Bat (*Cynopterus sphinx*) was recorded roosting under two palm trees in the natural woodland.
- 3.65 Pallas's Squirrel (*Callosciurus erythraeus*) is a common and introduced species in Hong Kong. It is fairly widespread in Hong Kong and recorded in Tai Lam, Shing Mun, Tai Po Kau and on Hong Kong Island, such as Tai Tam and Pok Fu Lam (Shek, 2006). Although widely distributed in Hong Kong, it

is considered of conservation importance in Hong Kong (Fellowes *et al.*, 2002) and protected under the Wild Animals Protection Ordinance (Cap. 170).

- 3.66 Short-nosed Fruit Bat (*Cynopterus sphinx*) is a very common fruit bat found in urban areas of Hong Kong. In bat roost census, over 170 roosts with 800 individuals were recorded in parks and playgrounds with omnipresent human disturbance. It lives in a wide range of habitats, from woodlands, to lowlands to hills, and even urban areas. Roosts area usually locates in trees with dense clumps of leaves, especially for the two common ornamental trees, the Chinese Fan-palm and Petticoat Palm, and banana plantation (Shek, 2006; Ades, 1999).
- 3.67 Although Short-nosed Fruit Bat is widespread in Hong Kong, even in urban areas, it is of conservation importance (Fellowes *et al.*, 2002). It is also protected under the Wild Animals Protection Ordinance (Cap. 170) and listed as Indeterminate under the China Red Data Book of Endangered Animals (Wang, 1999).

Terrestrial Invertebrates

- 3.68 During the field surveys, one odonate species, Wandering Glider (*Pantala flavescens*) and 7 butterfly species, including Indian Cabbage White (*Pieris canidia*), Red Helen (*Papilio helenus*) and Paris Peacock (*Papilio paris*) were recorded from natural woodland, shrubland and developed area of the assessment area. All recorded species are common and widespread in Hong Kong. No rare or protected species was recorded.

Freshwater Communities

- 3.69 Freshwater communities recorded in the surveys tended to be species poor because of the small size of the stream courses. Dominant species recorded including Chironomid larvae, indicating some degree of organic pollution. Other species recorded such as Gastropoda (*Radix plicatulus* and *Biomphalaria straminea*), Odonata (*Ophiogomphus sinicus*) and Heteroptera (*Buena sp.* and *Notomecta sp.*). As mentioned in the result of herpetofauna survey, Anura (tadpole of *Amolops hongkongensis*) was also recorded at the eastern and western streams. However, no fish was recorded from the streams during the surveys. While, no endemic shrimp, *Caridina serrata*, was recorded during the current surveys.
- 3.70 In addition, two individuals of Mountain Crab (*Nanhaipotamon hongkongense*) were observed hiding beneath stones adjacent to drainage culvert located at the northern side of the proposed works area. Mountain Crab is semi-terrestrial freshwater crab. It normally appears at the hillstream clean water habitat (Dudgeon & Corlett, 1994). Although locally common in Hong Kong, Mountain Crab has an extremely restricted regional and global distribution, and local populations in Hong Kong, is therefore considered of potential global conservation concern. Large, secure populations in Hong Kong are of potential global significance (Fellowes *et al.*, 2002).

Ecological Value

- 3.71 In accordance with the *EIAO TM Annex 8* criteria, the ecological importance of recorded habitats has been evaluated in **Tables 3.2a - c** below.

Table 3.2a Ecological Value of Natural Woodland and Shrubland in the Assessment Area

Criteria	Natural Woodland	Shrubland
Naturalness	Natural.	Natural.
Size	Area of this habitat within assessment area is approximately 109 ha.	Area of this habitat within assessment area is approximately 2 ha.
Diversity	Moderate floral and faunal diversity (140 plant species recorded), moderate structural complexity. Dominated with native species.	Low floral and faunal diversity (36 plant species recorded).
Rarity	Eight floral species (Hong Kong Pavetta, <i>Pavetta hongkongensis</i> ; Champion's Rhododendron, <i>Rhododendron championiae</i> ; Long-leaved Birthwort, <i>Aristolochia championii</i> ; Small Persimmon, <i>Diospyros vaccinioides</i> ; Silver-back Artocarpus, <i>Artocarpus hypargyreus</i> ; Incense Tree, <i>Aquilaria sinensis</i> ; Common Tutcheria, <i>Tutcheria spectabilis</i> ; and Lamb of Tartary, <i>Cibotium barometz</i>) and five faunal species (Collared Scops Owl, <i>Otus bakkamoena</i> ; Greater Coucal, <i>Centropus sinensis</i> ; Pallas's squirrel, <i>Callosciurus erythraeus</i> ; Short-nosed Fruit Bat, <i>Cynopterus sphinx</i> ; and Mountain Crab, <i>Nanhaipotamon hongkongense</i>) of conservation importance recorded from this habitat type.	No faunal and floral species of conservation importance recorded from this habitat type during the surveys.
Recreatability	Habitat characteristics and species composition are difficult to recreate. It will take 40-50 years for the natural woodland to develop.	Readily re-creatable.
Fragmentation	Fragmented by urban developments and foot paths.	Habitat is not fragmented.
Ecological linkage	Habitat is not structurally or functionally linked to any high ecological value resources.	Habitat is not structurally or functionally linked to any high ecological value resources.
Potential Value	Moderate to high.	Low.
Nursery Ground	Provide potential breeding habitats for fauna such as bats.	No record of significant nursery or breeding ground was found during the surveys.
Age	About 50-60 years, vegetation naturally restored after the World War II.	Young.
Abundance/ Richness of Wildlife	Moderate species diversity.	Low species diversity.
Ecological Value	Moderate to High.	Low.

Table 3.2b Ecological Value of Freshwater Habitat in the Assessment Area

Criteria	Stream Course (East)	Stream Course (West)
Naturalness	Largely natural at upper stream but the substrate was covered by cement near Po Shan road section. In addition, both are seasonal streams.	
Size	The total length of stream is about 450 m.	The total length of stream is about 750 m.
Diversity	Low stream floral and faunal diversity.	
Rarity	Two faunal species, comprising Lesser Spiny Frog, (<i>Rana exilispinosa</i>) and Hong Kong Cascade Frog (<i>Amolops hongkongensis</i>) (in form of tadpole), of conservation importance recorded from the stream.	One faunal species (Hong Kong Cascade Frog, <i>Amolops hongkongensis</i>) of conservation importance recorded from the stream.
Re-creatability	Readily re-creatable.	
Fragmentation	Fragmented by urban facilities.	
Ecological Linkage	Habitat is not structurally or functionally linked to any high ecological value resources.	
Potential Value	Moderate.	
Nursery ground	Nursery/breeding ground for fauna such as amphibians.	
Age	Not applicable.	
Abundance/ Richness of Wildlife	Low stream floral and faunal diversity	
Ecological Value	Moderate.	Moderate.

Table 3.2c Ecological Value of Developed Area in the Assessment Area

Criteria	Developed Area
Naturalness	Created habitat, most trees are planted.
Size	Area of this habitat within assessment area is approximately 25 ha, the plantations were mainly along the road within the assessment area.
Diversity	Low floral and faunal diversity (39 plant species recorded), low structural complexity.
Rarity	No floral and faunal species of conservation importance recorded from this habitat.
Re-creatability	Readily re-creatable.
Fragmentation	Habitat is fragmented.
Ecological Linkage	Habitat is not structurally or functionally linked to any high ecological value resources.
Potential Value	Low.
Nursery Ground	No record of significant nursery or breeding ground was found in the survey.
Age	Not applicable.
Abundance/ Richness of Wildlife	Low floral and faunal diversity.
Ecological Value	Low.

- 3.72 Natural woodland habitat within the assessment area was considered of moderate to high ecological value because of moderate floral and faunal species diversity, moderate structural complexity and also the presence of plant and animal species of conservation interest.
- 3.73 Shrubland habitat was considered of low ecological value, because of low floral and faunal diversity and most of the species identified are common, widespread and typical of such habitat in Hong Kong.
- 3.74 Streams in the assessment area were generally small and seasonal in nature. These freshwater habitats were considered of moderate ecological value, as they supported stream faunal species of conservation interest and highly natural in nature.
- 3.75 Developed area was highly modified habitat supporting low diversity of plants and animals, and most of the species identified are common, widespread and typical of such habitat in Hong Kong. This habitat was considered of low ecological value.
- 3.76 In accordance with the *EIAO TM Annex 8* criteria, the species of conservation interest are evaluated in **Tables 3.3a** and **3.3b** below.

Table 3.3a Evaluation of Floral Species of Conservation Interest Recorded within the Assessment Area

Common Name	Scientific Name	Growth Form	Status*	Distribution
Hong Kong Pavetta	<i>Pavetta hongkongensis</i>	Shrub	Protected ^[1]	Locally common
Champion's Rhododendron	<i>Rhododendron championiae</i>	Shrub	Protected ^[1]	Rare
Long-leaved Birthwort	<i>Aristolochia championii</i>	Shrub		Rare
Small Persimmon	<i>Diospyros vaccinioides</i>	Shrub	Critically endangered ^[3]	Locally very common
Silver-back Artocarpus	<i>Artocarpus hypargyreus</i>	Tree	Class III protected ^[2] Vulnerable ^[3]	Locally common
Incense Tree	<i>Aquilaria sinensis</i>	Tree	Class II protected ^[2] Vulnerable ^[3]	Locally common
Common Tutcheria	<i>Tutcheria spectabilis</i>	Tree	Protected ^[1]	Rare
Lamb of Tartary	<i>Cibotium barometz</i>	Fern	Class II protected ^[2] Protected ^[4]	Locally common

*Sources: [1] Cap. 96 Forestry Regulation of the Forests and Countryside Ordinance. [2] List of Wild Plants under State Protection, SEPA, PRC (1999). [3] 2006 IUCN Red List of Threatened Species. [4] Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance.

Table 3.3b Evaluation of Faunal Species of Conservation Interest Recorded Within Assessment Area

Common Name	Scientific Name	Conservation Status*	Protection Status**, Distribution
Avifauna			
Black Kite ***	<i>Milvus migrans</i>	RC	Class II protected species under mainland legislation. Locally common and widespread but with restricted roosting and breeding sites. Also protected in Cap. 586.
Collared Scops Owl ***	<i>Otus bakkamoena</i>	-	Class II protected species under mainland legislation. Locally common and widespread. Also protected in Cap. 586.
Greater Coucal ***	<i>Centropus sinensis</i>	-	Class II protected species under mainland legislation. Classified as Vulnerable (VU) in the China Red Data Book of Endangered Animals. Locally common and widespread.
Herpetofauna			
Lesser Spiny Frog	<i>Rana exilispinosa</i>	PGC	Classified as Vulnerable (VU) in the IUCN Red List of Threatened Species. Locally common and widespread.
Hong Kong Cascade Frog ***	<i>Amolops hongkongensis</i>	PGC	Classified as Near Threatened (NT) in the IUCN Red List of Threatened Species. Locally uncommon.
Mammals			
Pallas's Squirrel ***	<i>Callosciurus erythraeus</i>	-	Common and widespread.
Short-nosed Fruit Bat ***	<i>Cynopterus sphinx</i>	LC	Common and widespread. Classified as Indeterminate in China Red Data Book of Endangered Animals.
Crustaceans			
Mountain Crab	<i>Nanhaipotamon hongkongense</i>	PGC	Common and widespread but with restricted regional and global distribution.

- * LC – Local Concern (Habitat loss/damage in Hong Kong would pose significant threat to local survival).
 RC – Regional Concern (Habitat loss/damage in Hong Kong would pose significant threat to regional survival).
 PGC – Potential Global Concern (Large, secure populations in Hong Kong are of global significance).
 Refer to Fellowes *et al.* (2002) for further explanation of status.
- ** Information taken from various sources including Karsen *et al.* (1998), Carey *et al.* (2001), and Fellowes *et al.* (2002). Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
- ***Protected under the *Wild Animals Protection Ordinance (Cap.170)*.

Environmental Impact Identification, Prediction and Evaluation

Identification and Prediction of Ecological Impacts

- 3.77 Potential ecological impacts resulting from construction and operation phase activities have been identified, and are outlined in the following paragraphs.

Construction Phase

Direct Impacts

- 3.78 The primary potential impact resulting from the proposed works would be the direct impact to natural woodland habitat in the country park area due to construction of soil nailing and raking drains. The area of directly affected habitats is approximately 0.65 ha.
- 3.79 With on-site adjustment of the soil nail position, no tree felling would be required in the processes of drilling, and installation of soil nails and nail heads. For mature trees, however, potential impact on the plant rooting system would be resulted. Individuals of understorey plants are expected to be more susceptible to the potential damage during the drilling, installation of soil nails and nail heads, and construction of raking drains.
- 3.80 Two plant species of conservation importance, a number of Small Persimmon (*Diospyros vaccinioides*) and one individual of Common Tutcheria (*Tutcheria spectabilis*), were recorded in the proposed works area and would be directly impacted by the proposed works during the construction phase. Potential damage of individuals (Small Persimmon), damage of root systems and branches would possibly be resulted due to soil nail and nail head installation and raking drains construction.
- 3.81 Site access would be provided by scaffolding & steps formed by steel. A schematic diagram of the scaffolding is shown in **Figure 5.4**. The width of site access would be approximately 0.6m and length of the access would depend on the works locations and the actual site condition (such as the slope angle, vegetation density, safety etc). The construction of the access would not involve any slope cutting and the access is planned to avoid trees, no tree felling would be required. The equipment would be transported and the workers would access to the works area from the main entrance at Po Shan Road (**Figure 1.2** refers).
- 3.82 A site office, two-storey container with approximately 5m high and 6m long, would be built in a developed area near Po Shan Mansions along Po Shan Road (**Figure 1.2**). No car parking area is required under this project.
- 3.83 In addition to direct impacts to habitats and vegetation, the proposed works have the potential to cause injury/mortality to wildlife. Although no substantial direct impacts to wildlife with high levels of mobility (e.g. avifauna and bats) are anticipated, animals with lower mobility such as frogs and crabs with a higher level of risk, and could potentially be injured/killed by construction phase activities.

Indirect Impacts

- 3.84 Noise, generated by the operation of air compressor, drill rig, grouting machine, generator and concrete mixer during the soil nail installation, rock slope stabilization and raking drain installation, would cause disturbance to the wildlife nesting/inhabiting within and in the vicinity of the proposed works area. Of particular concern would be potential disturbance impacts to bat roost of Short-nosed Fruit Bat (*Cynopterus sphinx*) recorded from the western margin of the proposed works areas.
- 3.85 Indirect impacts to habitats and associated fauna adjacent to proposed works areas could be also resulted from increased human activities/disturbance. General increase in human activity could disturb wildlife utilising habitats close to the proposed works areas. Potential disturbance effects may include the avoidance of areas adjacent to the proposed works area, and reductions in wildlife density close to sources of disturbance.

- 3.86 Associated impacts to wildlife would arise, including restriction of wildlife utilisation (i.e. transit, feeding and roosting), degradation of habitat quality/ ecological function, as a result of temporary and permanent loss, isolation and fragmentation of ecological habitat. Habitats adjacent to the proposed works area could also be disturbed as a result of improper storage or dumping of construction materials
- 3.87 Potential impacts arising from the construction of the proposed landslide preventive works would also include the generation of construction dust. It is anticipated that dust would be generated mainly from soil nailing works, materials handling and wind erosion from the site. Dusts covering leaves could lead to lethal/non-lethal impacts due to a reduction in photosynthetic rates, abrasion and blocking of stomata.
- 3.88 Potential impacts would arise from uncontrolled dumping of construction waste, potential spillage of fuel, site run-off due to the installation of soil nails, rock slope stabilization works and construction of raking drains in the construction stage. The construction waste and runoff would contaminate the soil and hence cause impacts on the vegetation and the plant species of conservation importance.
- 3.89 Water-bodies potentially affected by the proposed landslide preventive works include a drainage culvert at the northern side and the eastern stream course in the vicinity of the proposed works area. Site runoff and drainage from the proposed works area, if uncontrolled, would enter the drainage culvert and stream causing potential water pollution and impact and hence impacts to the wildlife inhabiting.
- 3.90 Increased siltation could impact aquatic communities in watercourse (in particular the eastern stream course) adjacent the proposed works areas. Increased siltation would have a number of adverse effects on aquatic communities. In addition to direct physical damage (particularly to small invertebrate taxon) caused by larger particles (e.g., sand/gravel), small particles (e.g., silt) can clog the respiratory and feeding organs of invertebrates.

Operation Phase

- 3.91 No direct and indirect impacts to ecological sensitive receivers would result from operation of the proposed landslide preventive works.

Evaluation of Ecological Impacts

- 3.92 Potential ecological impacts to habitats in the assessment area resulting from the proposed works have been evaluated according to Table 1 of Annex 8 of the *EIAO TM*. The evaluation are summarised in **Tables 3.4a-d** below.

Table 3.4a Overall Impact Evaluation of Natural Woodland

Evaluation Criteria	Natural Woodland
Habitat quality	Moderate to High.
Species	Eight floral and five faunal species of conservation importance recorded from this habitat type. There would be potential direct impacts to individuals of 2 floral species (Small Persimmon, <i>Diospyros vaccinioides</i> and Common Tutcheria, <i>Tutcheria spectabilis</i>) and one faunal species (Short-nosed Fruit Bat, <i>Cynopterus sphinx</i>) recorded on the fringe of the proposed works area.
Size/Abundance	Direct impact to approximately 0.65 ha of woodland by the proposed works, but no tree felling would be required.
Duration	Direct impacts would be short term.
Reversibility	Direct impacts to understorey vegetation would be reversible and temporary, as compensatory planting of shrub would be provided and the disturbed area is also subject to recolonization by the surrounding vegetation.
Magnitude	Moderate.
Overall Impact Conclusion	Low to Moderate.

Table 3.4b Overall Impact Evaluation of Shrubland

Evaluation Criteria	Shrubland
Habitat quality	Low.
Species	No significant records.
Size/Abundance	Direct impact to a very small scale of such habitat by the construction of site access would be required.
Duration	Direct and indirect impact to the shrubland is short term.
Reversibility	Direct and indirect impact to the shrubland is reversible and temporary.
Magnitude	Minor.
Overall Impact Conclusion	Low.

Table 3.4c Overall Impact Evaluation of Freshwater Habitat

Evaluation Criteria	Freshwater Habitat
Habitat quality	Moderate.
Species	Two amphibian species of conservation importance (Lesser Spiny Frog, <i>Rana exilispinosa</i> and Hong Kong Cascade Frog, <i>Amolops hongkongensis</i>) recorded from this habitat type. There would be potential indirect impacts to individuals of these two species recorded in the stream course at the eastern side of the proposed works area.
Size/Abundance	No direct impact to such habitat by the proposed works.
Duration	Indirect impact to the stream courses is short term.
Reversibility	Indirect impact to the stream courses is reversible and temporary.
Magnitude	Minor.
Overall Impact Conclusion	Low.

Table 3.4d Overall Impact Evaluation of Developed Area

Evaluation Criteria	Developed Area
Habitat quality	Low.
Species	No significant records.
Size/Abundance	Direct impact to a very small scale of such habitat by the construction of site access and site accommodation would be required.
Duration	Direct and indirect impact to the developed area is short term.
Reversibility	Direct and indirect impact to the developed area is reversible and temporary.
Magnitude	Very Minor.
Overall Impact Conclusion	Low.

Construction Phase Impacts

Impacts to Habitats

- 3.93 The proposed landslide preventive work would be conducted within a natural woodland habitat in the country park area. Although the natural woodland habitat is considered of moderate to high ecological value, and provides roosting site for bats, the area of habitat affected is small in scale (0.65 ha). Besides, with on-site adjustment of the location of scaffolding, installation of soil nails and nail heads, and the construction of raking drains, no tree felling and slope cutting would be required. The impact to the natural woodland and the country park area is hence considered low to moderate.
- 3.94 For the construction of site access and site office, a small area of developed area and shrubland adjacent to the proposed works area would be directly impacted. These habitats are considered of low ecological value and the potentially impacted area due to the construction is very small in scale, the impacts are hence considered limited.

Impacts to Vegetation

- 3.95 In the processes of drilling, installation of soil nails and nail heads, potential damage on the vegetation within the proposed works area would possibly be resulted. However, with the on-site adjustment on the location of the installation of soil nails and nail heads, no tree felling would be required. Meanwhile, the potential damage to the root system of the vegetation would also be avoided and minimized by carefully placing of the soil nailing and raking drains on site. The impact to the vegetation is therefore considered minor.
- 3.96 The understorey vegetation including individuals of the a shrub species of conservation interest, Small Persimmon (*Diospyros vaccinioides*) and a tree Common Tutcheria (*Tutcheria spectabilis*), fall within the proposed works area under this Project might be directly impacted by the proposed works (refer to **Figure 3.2**). The aforesaid species would be identified by detail vegetation surveys, the identified individuals would be labelled on site prior to the commencement of works. The soil nails near the individuals of these species would be carefully adjusted to avoid or minimize the potential damages. Given that Small Persimmon are locally common and widespread, and are not threatened in Hong Kong, the potential loss or damage of a relatively small number of individuals of the Small Persimmon would be a minor impact and no transplantation for Small Persimmon would be required. Nevertheless, the loss of this shrub in the understorey of the woodland habitat would be compensated by planting of suitable shrubs, including Small Persimmon, in the impacted areas under the Project. Furthermore, no tree felling of Common Tutcheria would be required. The potential impacts for both protected species are therefore considered minor.

Disturbance Impacts

- 3.97 Indirect impacts to habitats and associated communities, such as avifauna and terrestrial invertebrates, adjacent to the proposed works areas would be resulted from increased human activities/disturbance during the construction phase. Such impacts could arise from noise-generating machinery during soil nail installation, rock slope stabilization and raking drain installation, and general increases in human activity. With the use of effective quiet machinery, construction phase disturbance to the natural woodland in the country park area, other adjacent habitats and the wildlife inhabiting within and adjacent to the proposed works area is relatively minor in scale. Also, alternative woodlands are available in the Pok Fu Lam Country Park and Lung Fu Shan Country Park, the highly mobile fauna, such as birds, would simply re-locate alternative woodlands if disturbed. Hence, the disturbance impacts are considered minor.

Dumping/Dust Deposition

- 3.98 Impacts resulting from improper dumping of construction materials/wastes and deposition of dust on vegetation adjacent to works areas can be avoided and minimized to acceptable levels through the implementation of standard good site practice. The impact to the vegetation is considered minor.

Sedimentation/Water Quality Impacts

- 3.99 Sediment and runoff if uncontrolled, would carry pollutants (adsorbed onto the particle surfaces) into the streams and drainage culvert in the vicinity of the proposed works area. However, the impacts are considered limited as the two streams and drainage culvert are not within the proposed works area. Mitigation measures would be implemented to control construction site runoff and drainage from the works areas, and to prevent runoff and drainage water with high levels of suspended solids from entering nearby water bodies. With the implementation of adequate construction site drainage and provision of sediment removal facilities, it is anticipated that unacceptable water quality impacts on the two streams and drainage culvert would not arise.

Impacts to Fauna

- 3.100 The natural woodland habitat affected is considered of moderate to high ecological value and provides a potential roosting habitat for Short-nosed Fruit Bat. Only a small amount (about ten individuals) of bats recorded in the palm trees at the margin of the proposed works area would be impacted by the construction phase disturbance. The most probable cause of disturbance to Short-nosed Fruit Bat would be disturbance impact by noise generating construction works and increased human activities. With the use of effective quiet machinery, construction phase noise disturbance would be minimised. Although the bat roost (i.e. the two palm trees) would be retained, in the worse-case scenario, the construction phase disturbance may cause roosting bats to move away and result in the abandonment of roosting site. This outcome would still be regarded as a relatively minor impact, as the preferred roosting habitat (Palm trees) of this bat species is relatively common in Hong Kong even in parks and urban areas. Within 500m from the location of the existing roosting site (the two palm trees), a large number (about 100 individuals) of palm trees (the Chinese Fan-palm) could be found, in particular along University Drive and Kotewall Road. Additionally, there are also abundant (about 90 individuals) banana tree stands nearby (fruit bats are sometimes known to roost in these trees as well (Ades, 1999). The nearest palm trees (22 individuals) located 350 m away from the roosting site, in the Conduit Road Rest Garden, whilst the nearest banana trees (15 individuals) located 250 m away from the roosting site, just behind the Haddon Court in Conduit Road. It is probable that the bats would simply re-locate alternative roost sites if disturbed. Hence the impact to the bat is considered low.
- 3.101 Apart from bats, three avifauna species of conservation importance, including Black Kite, Collared Scops Owl and Greater Coucal, were also recorded during the surveys. The former one was recorded at flight above the assessment area, while the latter two were recorded in the natural woodland habitat. The most probable cause of disturbance to the bird populations would be disturbance impact by noise generating construction works and increased human activities. With the

use of effective quiet machinery, construction phase noise disturbance would be minimised. In the worse-case scenario, the construction phase disturbance may cause moving away of the birds, however, this outcome would still be regarded as a relatively minor impact, as an alternative woodland is nearby at the uphill in the Lung Fu Shan Country Park and Pok Fu Lam Country Park. Hence the impact to the bird populations is considered low.

- 3.102 Two amphibians of conservation importance, Lesser Spiny Frog, (*Rana exilispinosa*) and Hong Kong Cascade Frog (*Amolops hongkongensis*) (in form of tadpole), were recorded from the eastern stream in the vicinity of the proposed works area. Site runoff and increased siltation would cause impacts and change the aquatic community structure of the inhabiting stream of these two species of amphibians. With the implementation of adequate construction site drainage and provision of sediment removal facilities, it is anticipated that there would be no discharge of site runoff and drainage into these natural streams and unacceptable water quality impacts on the stream would not arise, hence the impacts to the two amphibian species are considered minor.
- 3.103 Individuals of the Mountain Crab (*Nanhaipotamon hongkongense*), a semi-terrestrial crab, of conservation importance were recorded adjacent to the drainage culvert located near the proposed works area. Although the crab was recorded only 10m away from the proposed works area, in the worst worse-case scenario, the crab would move away from the potential foraging place in the proposed works area, this outcome would still be regarded as a relatively minor impact, as an alternative woodland habitat is nearby. Site runoff and drainage from the works area entering to the drainage culvert is another potential impact to the crab. However, with the implementation of adequate construction site drainage and provision of sediment removal facilities, it is anticipated that there would be no discharge of site runoff and drainage into this drainage culvert and unacceptable water quality impacts on the drainage culvert would not arise. Hence the overall impact to Mountain Crab is considered minor.
- 3.104 Atyid shrimp *Caridina serrata* of conservation importance was previously recorded from the streams in the mid-level of Hong Kong Island, although it was not observed during the surveys of this study. Site runoff and increased siltation would cause impacts and change the aquatic community structure of their habitats. With the implementation of adequate construction site drainage and provision of sediment removal facilities, it is anticipated that there would be no discharge of site runoff and drainage into these natural streams and unacceptable water quality impacts on the drainage culvert would not arise, hence the impact to *C. serrata* is considered minor.

Operation Phase Impacts

- 3.105 No direct and indirect impacts to ecological sensitive receivers would result from operation of the proposed landslide preventive works.

Impacts to Species of Conservation Importance

- 3.106 Key impacts to species of conservation importance recorded from the assessment area have been described above. A summary of potential construction and operation phase impacts to all species of conservation importance recorded from the assessment area is provided in **Table 3.5**.

Table 3.5 Overall Impacts to Species of Conservation Interest.

Species of Conservation Interest		Construction Phase Impacts		Operation Phase Impacts	
Common Name	Scientific Name	Description	Evaluation	Description	Evaluation
Flora					
Hong Kong Pavetta	<i>Pavetta hongkongensis</i>	Individuals of this species fall outside but adjacent to the proposed works areas would face potential indirect impacts, such as construction dust, which are considered minor.	Very Low.	No impact.	No Impact.
Champion's Rhododendron	<i>Rhododendron championiae</i>	Individuals of this species fall outside of the proposed works area, no impacts predicted.	No Impact.	No impact.	No Impact.
Long-leaved Birthwort	<i>Aristolochia championii</i>	Individuals of this species fall outside of the proposed works area, no impacts predicted.	No Impact.	No impact.	No Impact.
Small Persimmon	<i>Diospyros vaccinioides</i>	Individuals of this species recorded within the proposed works area. Individuals within the area of soil nail installation would be directly impacted.	Low.	No impact.	No Impact.
Silver-back Artocarpus	<i>Artocarpus hypargyreus</i>	Individuals of this species fall outside of the proposed works areas, no impacts predicted.	No Impact.	No impact.	No Impact.
Incense Tree	<i>Aquilaria sinensis</i>	Individuals of these species fall outside of the proposed works areas, no impacts predicted.	No Impact.	No impact.	No Impact.
Common Tutcheria	<i>Tutcheria spectabilis</i>	Individuals of this species recorded within the proposed works area. Individuals within the area of soil nail installation would be directly impacted.	Low.	No impact.	No Impact.
Lamb of Tartary	<i>Cibotium barometz</i>	Individuals of this species fall outside but adjacent to the proposed works areas would face potential indirect impacts, such as construction dust, which are considered minor.	Very Low.	No impact.	No Impact.

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Species of Conservation Interest		Construction Phase Impacts		Operation Phase Impacts	
Common Name	Scientific Name	Description	Evaluation	Description	Evaluation
Fauna					
Avifauna					
Black Kite	<i>Milvus migrans</i>	Recorded at flight above various habitats throughout the survey period. Indirect impacts may result from disturbance caused by increased human activity and noisy construction phase activities.	Low.	No impact.	No Impact.
Collared Scops Owl	<i>Otus bakkamoena</i>	A single Collared Scops Owl recorded in the natural woodland habitat outside of the proposed works area. Minor indirect impacts may result from disturbance caused by increased human activity and noisy construction phase activities.	Very Low.	No impact.	No Impact.
Greater Coucal	<i>Centropus sinensis</i>	Two individuals of Greater Coucal recorded in the natural woodland habitat outside of the proposed works area. Minor indirect impacts may result from disturbance caused by increased human activity and noisy construction phase activities.	Very Low.	No impact.	No Impact.
Herpetofauna					
Lesser Spiny Frog	<i>Rana exilispinosa</i>	Lesser Spiny Frog was recorded from stream habitats at the east of the proposed works area. Potential indirect impacts may result from disturbance, site runoff and increase sedimentation to the stream course.	Low.	No Impact.	No Impact.
Hong Kong Cascade Frog	<i>Amolops hongkongensis</i>	Hong Kong Cascade Frog was recorded from stream habitats at the east of the proposed works area. Potential indirect impacts may result from disturbance, site runoff and increase siltation to the stream course.	Low.	No Impact.	No Impact.

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Species of Conservation Interest		Construction Phase Impacts		Operation Phase Impacts	
Common Name	Scientific Name	Description	Evaluation	Description	Evaluation
Mammals					
Short-nosed Fruit Bat	<i>Cynopterus sphinx</i>	Bat roost was recorded within the proposed works area. Although palm trees with bat colony would be retained on site, individuals within the works area would be impacted by construction disturbance.	Low.	No impact.	No Impact.
Pallas's Squirrel	<i>Callosciurus erythraeus</i>	Pallas's Squirrel was recorded outside of the proposed works area. Minor indirect impacts may result from disturbance caused by increased human activity and noisy construction phase activities.	Very Low.	No Impact.	No Impact.
Crustaceans					
Mountain Crab	<i>Manhaiopotamon hongkongense</i>	Mountain crab was recorded near the drainage culvert adjacent to the proposed works area. Potential indirect impacts may result from disturbance, land contamination, site runoff and drainage to the culvert.	Low.	No Impact.	No Impact.

Cumulative Impacts

- 3.107 As discussed in Section 2.18 of this Report, only one project “Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction” (under Environmental Permit EP-235/2005/A) has been confirmed at the time of writing to coincide with the proposed landslide preventive works. Landslide Preventive Works at Po Shan (under EP-235/2005/A) would involve installation of underground drainage adits, flexible barriers, soil nails and raking drains. The anticipated programme for the slope works is from June 2006 to June 2008, which would be concurrent with the Project which is scheduled to begin in August 2007. Landslide Preventive Works at Po Shan (under EP-235/2005/A) are not anticipated to directly impact high value ecological habitats. However, construction phase activities and increased human presence have the potential to disturb wildlife in the adjacent woodland habitats. This would add to general disturbance levels in the area resulting from the Project.
- 3.108 Overall, cumulative disturbance impacts resulting from the two projects are expected to have only temporary and minor ecological impact as the Landslide Preventive Works at Po Shan (under EP-235/2005/A) would affect habitats comprised of man-made slopes and a small area (0.02ha) of woodland habitats and most of the works would be conducted largely underground.

Mitigation of Adverse Environmental Impacts

- 3.109 Following *EIAO-TM Annex 16* guidelines, mitigation measures are discussed in this section to avoid, minimise and compensate for identified ecological impacts.

Avoid

- 3.110 The location of the soil nail installation would be carefully selected and adjusted to avoid/minimise the damage of root system to the existing plants on slope surface. No tree felling would be required.

Minimise

- 3.111 Fences would be erected and installed along the boundary of the proposed works area before the commencement of works in order to minimise the disturbance to the natural woodland and shrubland habitats by preventing tipping, vehicle movements and encroachment of personnel onto the adjacent areas.
- 3.112 In order to avoid or minimize the damage to the plant species of conservation interest, including but not limited to Small Persimmon, Common Tutcheria, Bird-nest Fern and Chinese Pholidota, within the works area, a detail vegetation survey conducted by a suitably qualified botanist/ecologist with over 7 years relevant experience would be required to identify the individuals potentially affected by the proposed works. These identified individuals would be labelled on site prior to the commencement of works for better protection during construction phase.
- 3.113 Mitigation measures would be implemented to minimise the indirect impacts to the nearby stream course and drainage culvert by controlling construction site runoff and drainage from the proposed works areas to prevent any runoff and drainage water with high levels of suspended solids from entering the nearby water-bodies. Site runoff would be directed towards regularly cleaned and maintained sand traps, silt traps and where appropriate, oil/grease separators to minimise risk of sedimentation and pollution to the nearby stream course and drainage culvert. An outlet pipe extending above the slope surface would be installed to facilitate collection of discharge of air, water and grout from the drillhole inserted with soil nail during grouting. With this appropriate setup, spillage of grout during the grouting operation will be effectively controlled. Furthermore, debris and rubbish generated on-site would be collected, handled and disposed of properly. Hence, no site runoff and discharge to the nearby stream course and drainage culvert would be resulted.

- 3.114 To avoid/minimise the impacts to the groundwater, some special measures would also be applied during the drilling operation for the soil nailing works. Air would be used as the flushing medium instead of water. Hence, the groundwater would not be affected by the flushing medium of the drilling equipment. In addition, permanent casing would be provided to the drillhole of soil nail within the permeable colluvium layer as instructed by the Engineer, in order to minimize the impact to the groundwater table situated at the permeable soil stratum.
- 3.115 Noise mitigation measures include the use of quiet powered mechanical equipment and insulating fabric for drill rigs. Implementing such measures would minimise disturbance to habitats within and adjacent to the proposed works area, and the wildlife inhabiting. All construction activities would be implemented at daytime only. Measures such as noise barriers should be used to minimise disturbance to the bat roost identified close to the western side of the works area.
- 3.116 Good site practices should be incorporated into the contract clauses to minimise the construction dust impact to the vegetation within and in vicinity of the proposed works area. A number of practical measures would be implemented, comprising the use of regular watering, with complete coverage of any aggregate or dusty material storage piles, and re-schedule of dusty activities if high-wind conditions encountered.
- 3.117 Standard good site practice measures would be implemented and would include:
- Placement of equipment in designated works areas and access routes selected on existing disturbed land to minimise disturbance to natural woodland habitat.
 - Construction activities would be restricted to the proposed works area that would be clearly demarcated.
 - The proposed works area would be reinstated immediately after completion of the works.
 - Open burning on proposed works sites is illegal, and will be strictly enforced.
 - Waste skips would be provided to collect general refuse and construction wastes. The wastes would be disposed of timely and properly off-site.
 - Any soil contamination with fuel leaked from construction plants should be removed off-site.
 - Disturbance to existing vegetation should be minimised wherever possible. In particular, adequate protection should be provided for mature trees located within or adjacent to the proposed works area.

Compensate

- 3.118 The understorey vegetation of the woodland habitats that affected by the proposed works would be reinstated by planting of suitable shrubs/herbs, including the Small Persimmon, within the impacted areas under this Project. Chinese Fan-palm (*Livistona chinensis*) would be planted near the existing bat roost to provide suitable habitat for the Short-nosed Fruit Bat after the completion of landslide preventive works.

Evaluation of Residual Impacts

- 3.119 With the proposed mitigation measures in place, no adverse residual impacts resulting from the construction and operation works of the landslide preventive works is expected.

Environmental Monitoring and Audit

- 3.120 An Environmental Monitoring and Audit (EM&A) programme is recommended to be established to check compliance with legislative requirements. All the recommended mitigation measures should be incorporated into the EM&A programme for implementation during construction.

- 3.121 A specific monitoring programme of the plant individuals of conservation interest identified within the proposed works area during the detailed vegetation survey should be carried out by a suitably qualified local ecologist(s) with over 7 years relevant ecological experience. Regular monitoring of the trees, shrubs and herbs should be conducted to check on the health and condition of the plants. Monitoring should be conducted twice a month covering the whole construction period.

Conclusion

- 3.122 The results of ecological surveys undertaken in this study identified 4 habitat types within the assessment area comprising natural woodland, shrubland, freshwater habitat and developed area. The identified natural woodland habitat is considered to have moderate to high ecological value. The freshwater habitat was regarded as of moderate value, and all other habitats, shrubland and developed area, of low value.
- 3.123 Eight species of flora and 8 fauna of conservation interest have been recorded from the assessment area during the surveys.
- 3.124 The key issue in terms of ecological impacts would include the direct impact on plant species of conservation interest and the disturbance impacts to woodland habitat and associated communities within/adjacent to the proposed works areas arising from the landslide preventive works during the construction stage.
- 3.125 Two plant species of conservation interest, Small Persimmon and Common Tutcheria, would be directly affected by the Project. Detail vegetation surveys should be conducted to identify the individuals of plant species of conservation interest within the proposed works area. The identified individuals would then be labelled on site prior to the commencement of works. The soil nails near these individuals would be carefully adjusted to avoid or minimize the potential damages. Since the shrub Small Persimmon is locally common and widespread and is not threatened in Hong Kong, the potential loss or damage of a relatively small number of individuals would be a minor impact and hence no transplantation would be required. Nevertheless, planting of suitable plant species including Small Persimmon would be provided to reinstate the impact understorey habitat. Furthermore, no tree felling of Common Tutcheria would be required. The potential impacts for both protected species are therefore considered minor.
- 3.126 To avoid and minimize the impact to the vegetation, in particular understorey vegetation and root system of trees, the location of the soil nail and raking drain installation would be carefully selected. No tree felling would be required. The direct impact to woodland habitat is therefore considered low to moderate.
- 3.127 Other potential sources of ecological impact would comprise disturbance impacts to habitats and associated communities adjacent to the proposed works areas that would result from increased human activities/disturbance during the construction phase. Noise mitigation measures would be implemented to minimise the disturbance to habitats adjacent to the proposed works areas. In the worse-case scenario, the construction phase disturbance may cause moving away of the bats and birds, however, alternative bat roosting habitat and woodlands are nearby, hence the disturbance impact is considered low.
- 3.128 For the indirect impacts to the nearby stream course and drainage culvert, by controlling construction site runoff and drainage from the proposed works areas, runoff and drainage water with high levels of suspended solids would be prevented from entering the nearby water-bodies. Debris and rubbish generated on-site would be collected, handled and disposed of properly. Hence, no site runoff and discharge to the nearby stream course and drainage culvert would be resulted. The indirect impact to the watercourse and associated faunal community is considered low.
- 3.129 Impacts resulting from improper dumping of construction materials/wastes, construction site run-off and deposition of dust on vegetation adjacent to the proposed works areas would be avoided and minimised to acceptable levels through the implementation of standard good site practices.

- 3.130 With the implementation of the recommended mitigation measures, the construction works for the proposed works would not result in unacceptable impacts on ecological sensitive receivers. The implementation of all mitigation measures would be subject to regular audit.
- 3.131 Further operation of the landslide preventive work would not result in substantial increases in direct and indirect ecological impacts.
- 3.132 A specific monitoring programme of the plant individuals of conservation interest identified within the proposed works area during the detailed vegetation survey should be carried out by a suitably qualified local ecologist(s) with over 7 years relevant ecological experience. Regular monitoring of the trees, shrubs and herbs should be conducted to check on the health and condition of the plants. Monitoring should be conducted twice a month cover the whole construction period.

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4. LANDSCAPE AND VISUAL IMPACT

Introduction

4.1 This section assesses the potential landscape and visual impacts arising from the landslide preventive works on the natural hillside located above Po Shan Road, in accordance with the criteria and guidelines as stated in Annexes 10 and 18 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). Landscape and visual impacts of any above ground structures and work areas associated with the project during both construction and operation stages within the study area will be assessed. Key elements of the proposed works are described below:

- Installation of about 700 numbers of soil nails and about 60 numbers of raking drains. The length of the soil nails is about 20m with a spacing of 2m horizontally and 3m vertically. The length of raking drains is about 10m with a spacing of 5m horizontally and 15m vertically (**Figure 1.4**);
- Rock slope stabilization works for rock outcrop / boulders at the upper portion of the natural terrain. Measures such as scaling, rock bolts / dowels, concrete buttress and wire mesh protection will be provided where necessary.

Project Overview

- 4.2 Following a shallow landslide on the hillside in June 2005, CEDD carried out a natural terrain landslide risk assessment at Po Shan, Mid-levels. The assessment concluded that natural terrain risk mitigation works is necessary on the hillside above Po Shan Road. On 28 November 2005, CEDD entered into agreement with MGSL for carrying out the design of the natural terrain risk mitigation works.
- 4.3 The proposed works are scheduled to commence in August 2007 with construction periods of 10 months. Preliminary construction programme is shown in **Table 2.1**.
- 4.4 The proposed landslide preventive works is located in the country park which is considered as a designated project (DP) under item Q1 in Schedule 2 of the EIAO – all projects including earthworks and other building works partly or wholly in an existing or gazetted proposed country park.

Review of Planning and Development Control Framework

- 4.5 A review of the existing and planned development framework of the proposed works and surrounding area are undertaken as input to the Landscape and Visual Impact Assessment (LVIA). The aim is to identify any issues within the neighbouring planned land uses, and therefore to identify potential VSRs, and to ensure a high compatibility between the proposed project and the surroundings.
- 4.6 Reference is made to the Mid-levels West OZP No. S/H11/13 and the site layout plan of the proposed landslide preventive works.
- 4.7 The project is located above the Po Shan Road which is zoned “Green Belt” on the Mid-levels West Outline Zoning Plan (OZP) No. S/H11/13.

Environmental Legislation and Standards

- 4.8 The methodology for undertaking the LVIA takes reference from Annexes 3, 10 and 18 of EIAO–TM, and in accordance with EIAO Guidance Note No. 8/2002.
- 4.9 Other landscape documents relevant for the preparation of the LVIA include:
- Government General Regulation 740 – restrictions on the preservation and felling of trees in Hong Kong
 - The Forests and Countryside Ordinance (Cap96) – prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on government land. Its subsidiary regulations prohibit the picking, felling or possession of listed rare and protected plant species
 - The Forestry Regulations – made under Section 3 of the Forests and Countryside Ordinance (Cap. 96), defined the list of protected species in Hong Kong
 - ETWBTC No. 2/2004 – sets out the government departmental responsibilities for maintenance of vegetation and hard landscape features
 - WBTC No. 3/2006 – Tree Preservation, which defines and outlines the management and maintenance responsibilities for natural vegetation and landscape works, and the authorities for tree preservation and felling
 - WBTC No. 25/93 – Control of Visual Impact of slopes, outlines the design principles recommended to be used in designing man-made slopes for Public Works projects in order to reduce their adverse visual impact
 - WBTC 17/2000 – Improvement to appearance of slopes, outlines the principles and procedures recommended for all departments involved in new slope works and maintenance of existing slopes for improving aesthetic and environmental impact of slope works
 - WBTC No. 7/2002 Tree planting in Public Works, affirms the advocated policy on tree planting which adopts a flexible and balanced approach in the planning and design of public works
 - WBTC No. 29/2004 Registration of Old and Valuable Trees, and Guidelines for their Preservation
 - GEO publication No. 1/2000 ‘Technical Guidelines on landscape treatment and Bio-engineering for Man-Made Slopes and Retaining Walls
 - AFCD Natural Conservation Practice Note No. 02 – Measurement of Diameter at Breast Height (DBH) which provide technical guidance on the tree trunk measurement
 - Hong Kong Planning Standards and Guidelines Chapter 4, “Open Space”
 - Hong Kong Planning Standards and Guidelines Chapter 10 “Conservation”
 - Technical Reports of Landscape Value Mapping in Hong Kong by Planning Department – establishes the essential landscape baseline information which provides a systematic reference framework to facilitate landscape assessment

Assessment Methodology

- 4.10 The Project is a designated project (DP) under the EIAO and the methodology adopted for the Project conforms to the requirements of the EIAO. The methodology consists of the following tasks:

- Baseline study of landscape and visual resources
- Landscape impact assessment
- Visual impact assessment
- Recommendation on landscape and visual mitigation measures
- Identification of residual impacts

Baseline Study of Landscape and Visual Resources

- 4.11 The study area for the landscape impact assessment shall include all areas within 500 meters from the Project. The study area for the visual impact assessment shall be defined by the visual envelope of the Project. The defined visual envelope is shown on **Figure 4.4.1**.
- 4.12 The baseline study identified and examined the existing landscape and visual resources within the study area. An aerial photograph is used to show the overall study area and labelled to indicate the Landscape Character Areas (LCAs), while photographs would be given to demonstrate the Landscape Resources (LRs).

Landscape Resources (LRs)

- 4.13 Landscape Resources (LRs) considered the following elements:
- Natural and secondary woodland
 - Amenity planting
 - Scrubland and grassland
 - Natural topography
 - Significant planning designation, e.g. Country Park, Green Belt
 - Heritage or cultural features

Landscape Character Area (LCA)

- 4.14 Field and desk surveys of topographical maps, information databases and photographs would identify the landscape character (LCA) of the study area. The character of the landscape is derived from its physical components related to its visual amenity, cultural association and heritage value. Elements to be considered include:
- Land use
 - Public use of land
 - Extent of vegetation
 - Age of landscape
 - Cultural, heritage and religious elements
 - Scale and type of buildings

- Pattern of settlement
- Location and topography
- Extent of natural vs manmade

4.15 The baseline study describes the LRs by identifying broadly homogenous Landscape Character Areas (LCAs) of a similar character. The sensitivity of LR / LCAs are rated low, medium or high. This is influenced by a number of factors including whether the resources / character is common or rare, whether it is considered to be of local, regional, national or global importance, whether there are any statutory limitations / requirements relating to the resource/ character, the quality of the resource / character, the maturity of the resource, and the ability of the resource / character to accommodate change.

Sensitivity	Definition
High	Important components of landscape of particularly distinctive character susceptible to relatively small changes
Medium	A landscape of moderately valued characteristics reasonably tolerant of change
Low	A relatively unimportant landscape, the nature of which is largely tolerant to change

Visual Resources

Zone of Visual Influence/ Visual Envelope (ZVI)

4.16 Visual resources are considered as typical viewpoints, with location and direction of views towards the proposed works. A Zone of Visual Influence/ Visual Envelope is established which approximately defines the extent of visual influence of the proposed works, and therefore, of the potential visual impacts. This is achieved by site visit and desk-top study of topographic maps and photographs, and preparation of cross-sections to determine visibility of the project from various locations.

Visually Sensitive Receivers (VSRs)

4.17 Visually Sensitive Receivers (VSRs) who would be present at typical viewpoints and key views, and likely to be affected by the proposed works, are identified within the visual envelope. VSRs are defined as individuals or groups of whom are sensitive to changes in the visual environment. Residents, users of open space/recreational facilities, road users (private and public transport users), schools, tourists and people working within the visual envelope shall be considered as VSRs.

4.18 Each type of VSR is assigned with a number. Description of the view from each VSR towards the proposed works in terms of location of VSRs, type of VSRs, and direction of view towards the proposed works, are given and assigned in accordance with the relative tolerance to change of the VSRs.

4.19 The sensitivity of VSRs are determined by considering:

- Value and quality of existing views, e.g. urban high-rise, natural hills, sea view
- Presence of alternative views
- Type and estimated number of receiver population
- Duration or frequency of view

- Degree of visibility of the proposed project, e.g. no view, glimpse, partial view, vista, open view, and panorama view)

4.20 The ratings of sensitivity are High, Medium and Low, and illustrated as follows:

Sensitivity	Definition
High	Important views from e.g. residential areas, open space, etc. with open views over the sea or of natural areas. These views would be of particularly distinctive character susceptible to relatively small changes
Medium	Views from commercial areas with some visual amenity, which would be able to tolerate a moderate level of change
Low	Relatively unimportant views from viewers whom are largely tolerant to change

4.21 Both present and future VSRs, i.e. from planned developments, would be considered. The survey information shall be tabulated in a table and summarised in the text. Drawings to show the location of VSRs and photographs showing typical views would be included.

Assessment Methodology - Landscape Impacts

4.22 The assessment of the potential landscape impacts would result from:

- Identification of the source of impact, their magnitude, that would be generated during construction and operation of the project; and
- Identification of principal impacts, primarily in consideration of the degree of change to the baseline conditions.

4.23 The magnitude of change for landscape impact assessment would be determined by the following factors:

- Compatibility of the project with the surrounding landscape
- Duration of impacts under construction and operation phases
- Scale of the impact
- Reversibility of change

4.24 The impacts are considered systematically as a product of the sensitivity of the LCAs and the magnitude of change of the impacts to the landscape. The magnitude of the change in the landscape is rated large, intermediate, small and negligible as follows:

Magnitude of Change	Definition
Large	Notable permanent change in the landscape characteristics over an extensive area ranging to very intensive changes over a more limited area
Intermediate	Moderate changes in a localized area
Small	Virtually imperceptible change or temporary change
Negligible	Virtually no changes in the area

4.25 The following factors are considered to the judgement of the overall landscape impacts:

- The landscape character and its quality
- The sensitivity of the landscape in accommodating change
- Source, nature and magnitude of potential impacts
- Construction and operation phases impacts
- Degree of change caused by each of the impacts to the existing LCAs
- Significance of this change in the local and regional context and in relation to other developments
- Cumulative effects on the landscape of this and neighbouring projects

4.26 The overall impact likely to occur to LCAs, is derived from the magnitude of change which the project would cause to the existing landscape and ability to tolerate the change. A matrix shall be used to demonstrate the relationship between receptor sensitivity and impact magnitude in defining significance:

		Sensitivity / Quality of the landscape		
		Low	Medium	High
Magnitude of Change	Large	<i>Slight / moderate</i>	<i>Moderate / Substantial</i>	<i>Substantial</i>
	Intermediate	<i>Slight / Moderate</i>	<i>Moderate</i>	<i>Moderate / Substantial</i>
	Small	<i>Insubstantial / Slight</i>	<i>Slight / Moderate</i>	<i>Moderate / slight</i>
	Negligible	<i>Insubstantial</i>	<i>Insubstantial</i>	<i>Insubstantial</i>

4.27 Furthermore the impacts need to be identified as Adverse, Beneficial or Neutral, which indicate the impact on the existing landscape context as follows:

Identification of the Landscape Impact	Definition
Adverse	An impact which will be detrimental to the existing landscape context
Beneficial	An impact which will improve the existing landscape context
Neutral	An impact which will alter the existing landscape context but not to improve or destroy it

4.28 The product of the LIA is termed the Significance Threshold, and shall be considered as follows:

Impacts	Definition
Substantial	Adverse/beneficial impact where the proposal would cause significant deterioration or improvement in existing landscape quality
Moderate	Adverse/beneficial impact where the proposal would cause a noticeable deterioration or improvement in existing landscape quality
Slight	Adverse/beneficial impact where the proposal would cause a barely perceptible deterioration or improvement in the existing landscape quality
Insubstantial	No discernible change in the existing landscape quality

Assessment Methodology - Visual Impacts

4.29 The baseline survey forms the basis of the visual impact assessment, and shall result from:

- Identification of the source of visual impacts, their magnitude of change and sensitivity of the receivers, that would be generated during construction and operation of the project, and;
- Identification of principal visual impacts, primarily in consideration of the degree of change to the baseline conditions

4.30 The magnitude of change for visual impact assessment would be determined by the following factors:

- Compatibility of the proposed project with the surrounding landscape
- Duration of impacts during construction and operation stages
- Scale of impact and distance of the source of impact from the viewer
- Reversibility of impact
- Potential blockage of the view

4.31 The impacts are considered systematically as a product of the sensitivity of the VSRs and the magnitude of change of the impacts to the visual quality. The magnitude of visual impacts are rated large, intermediate, small and negligible as follows:

Magnitude of Change	Definition
Large	Majority of viewers affected or major changes in view
Intermediate	Many viewers affected or moderate changes in view
Small	Few viewers affected or minor changes in view
Negligible	Very few or no viewers affected or visually no changes in view

4.32 The overall impact likely to occur to VSRs, is derived from the magnitude of change which the project would cause to the existing visual context and its ability to tolerate the change. A matrix shall be used to demonstrate the relationship between receptor sensitivity and impact magnitude in defining significance:

		Sensitivity / Quality of the Visual Receivers		
		Low	Medium	High
Magnitude of Change	Large	<i>Slight / moderate</i>	<i>Moderate / Substantial</i>	<i>Substantial</i>
	Intermediate	<i>Slight / moderate</i>	<i>Moderate</i>	<i>Moderate / Substantial</i>
	Small	<i>Insubstantial / Slight</i>	<i>Slight / Moderate</i>	<i>Slight / moderate</i>
	Negligible	<i>Insubstantial</i>	<i>Insubstantial</i>	<i>Insubstantial</i>

4.33 Furthermore the impacts need to be identified as Adverse, Benefit or Neutral, which indicate the impact on the existing visual context as follows:

Identification of the Visual Impact	Definition
Adverse	An impact which will be detrimental to the existing views
Beneficial	An impact which will improve the existing views
Neutral	An impact which will alter the existing views but not to improve or destroy it

4.34 The product of the VIA is termed the Significance Threshold, and shall be considered as follows:

Impacts	Definition
Significant	Adverse/beneficial impact where the proposal would cause significant deterioration or improvement in existing views
Moderate	Adverse/beneficial impact where the proposal would cause a noticeable deterioration or improvement in existing views
Slight	Adverse/beneficial impact where the proposal would cause a barely perceptible deterioration or improvement in the existing views
Insubstantial	No discernible change in the existing views

Identification of Potential Landscape and Visual Impact Mitigation Measures

4.35 After assessing the landscape and visual impacts of the proposed works which likely to occur and how significant these impacts would be, recommendations would then be formulated to reduce or alleviate these impacts both during the construction and operation stages. Identified impacts would be described and mitigation measures recommended. The agencies responsible for the funding, implementation, management and maintenance of the mitigation measures have been identified and their approval-in-principle will be sought.

Identification of Residual Impacts

4.36 This is a further assessment to establish residual impacts that persist after the implementation of mitigation measures.

4.37 The principles for undertaking the residual impact assessment are similar to the landscape and visual impact assessments. Significance threshold for the residual impacts would be established to consider the impacts against the successfulness of the recommended mitigation measures to alleviate such impacts.

Baseline Study

Landscape Resources (LR)

4.38 Landscape resources are identified and mapped in **Figure 4.2.1**. Photo views illustrating the landscape resources are illustrated in **Figures 4.2.2** and **4.2.3**. This has been achieved by site visit and desk-top study of topographical maps, information databases and photographs. Landscape resources (LR) are listed and a description of each LR is summarized in **Table 4.1** and as follows:-

LR1 – Woodland (including tall scrub)

4.39 Woodland areas are located within the Pok Fu Lam Country Park / Green belt above the Po Shan Road. These woodlands, together with the grassland / shrub area create a lush green backdrop to the whole mid-levels district and are an important visual amenity. Much of the woodland in the lower Green Belt areas above the Po Shan Road is interspersed with low-density residential development and their associated slope stabilization works. Typical tree species identified include *Acacia confuse*, *Celtis sinensis*, *Mallotus paniculatus*, *Litsea glutinosa*, *Sterculia lanceolata*, *Ficus variegata*, *Macaranga tanarius* and *Schefflera octophylla*. These woodlands contribute significantly to the country park character within the mid-levels district. The landscape sensitivity to change of this area is judged to be high.

LR2 – Pocket Open Space

- 4.40 There are several public open space within the study area, which are located 1) in the Kotewall Road next to the Kotewall Fire station, 2) in the Conduct Road Children's Playground next to the Scenic Garden. All are formed by hard paved area with small planters for amenity trees. Typical tree species includes *Aleurites moluccana*, *Bombax malabaricum*, *Cinnamomum camphora*, *Garcinia spicata*, *Delonix regia*. The landscape sensitivity to change of this area is judged to be medium.

LR3 – Manmade Slope

- 4.41 There are many manmade slope within the study area, which are located along the Po Shan Road on the southern side of Po Shan Mansions and Piccadilly Mansion. The manmade slope close to the Po Shan Mansions has both hard and soft cover, whereas the manmade slope close to the Piccadilly Mansion are covered with sprayed concrete. Semi-natural vegetation and some isolated trees in tree rings in sprayed concrete on face are identified. Typical tree species includes *Acacia confuse*, *Mallotus paniculatus*, *Schefflera octophylla*, *Sapium discolor*. The landscape sensitivity to change of this area is judged to be low.

LR4 – Residential Development

- 4.42 High classed residential development consists of small house and low-rise to high-rise residential blocks. The character of mid-levels high classed residential development is represented by its low density and plot ratio development, which are built in 70s or 80s. Those within the landscape study area include Hatton Place, Piccadilly Mansion, Hamiton Court, Po Shan Mansions which along the Po Shan Road and the Skyline Mansion, Skyview Cliff and Mirror Marina located along the Conduit Road. Besides, the Stone House located in 15 Kotewall Road are classified as Grade III Historical building and structure, which also contribute to the mid-levels residential development. Typical tree species includes *Bauhinia blakeana*, *Ficus heteropleura*, *Juniperus chinensis*, *Thuja orientalis* and *Caryota ochlandra*. This result in sharp contrast to the high-rise, modern and high classed residential tower along Robinson Road and Bonham Road. The landscape sensitivity to change of this area is judged to be medium.

LR5 – Roadside Planting along Kotewall Road, Hatton road and Po Shan Road

- 4.43 Mature roadside planting are located along the Conduit Road, Kotewall Road and Po Shan Road. Typical tree species includes *Aleurites moluccana*, *Cinnamomum camphora*, *Livistona chinensis*, *Bombax malabaricum*, *Ficus microcarpa* and *Ficus elastica*. The combination of these mature vegetation and topography act as a transition to the Pok Fu Lam Country Park and Lung Fu Shan Country Park. The mature roadside tree planting also contribute significantly to the mid-levels low-rise residential character of this area. The landscape sensitivity to change of this area is judged to be high.

Landscape Character Area (LCA)

- 4.44 The study area consists of four distinct landscape character zones. These are described below and indicated in **Figures 4.3.1** and **4.3.2**. A summary is provided in **Table 4.1**.

LCA 1 – Greenbelt / Country Park Character Area

- 4.45 The greenbelt / country park area are characterised by the natural slopes primarily vegetated by woodland species. The natural quality of this character area is mixed with the country park walking trail linking to Lung Fu Shan Country Park, High West and Pok Fu Lam Country Park, which is part of the Peak Trail. This district also famous for the Hong Kong Eagle's Claw, Hong Kong Camellia, Liverworts and Mosses. This LCA forms a scenic backdrop surrounding the Pok Fu Lam and are an important visual resource. The landscape sensitivity to change of this LCA is judged to be high.

LCA 2 – Mid-levels Residential Character Area

4.46 This character area is characterized by the low density, high class residential developments with low vehicular traffic flow and mature roadside tree planting along Po Shan Road, Hatton Road, and Kotewall Road. These high-class residential developments are located along Po Shan Road, Hatton Road and Kotewall Road. These include: Hatton Place, Piccadilly Mansion, Po Shan Mansions, No. 23 Po Shan Road, No. 24 Po Shan Road, Wisdom Court, Hatton House and the University Lodge. The landscape sensitivity to change of this area is judged to be high.

Table 4.1 List of the Landscape Resources and Landscape Character Area affected during Construction & Operation Phases

LR	Landscape Resources	Dominant Tree Species	Area(Ha) within Study Area	Sensitivity
LR 1	Woodland (including tall scrub)	<i>Acacia confuse, Celtis sinensis, Mallotus paniculatus, Litsea glutinosa, Sterculia lanceolata, Ficus variegata, Macaranga tanarius and Schefflera octophylla</i>	16.4	High
LR 2	Pocket open space	<i>Aleurites moluccana, Bombax malabaricum, Cinnamomum camphora, Garcinia spicata, Delonix regia</i>	0.2	Medium
LR 3	Manmade slope	<i>Acacia confuse, Mallotus paniculatus, Schefflera octophylla, Sapium discolour</i>	3.1	Low
LR 4	Residential development	<i>Bauhinia blakeana, Ficus stenophylla, Juniperus chinensis, Thuja orientalis and Caryota ochlandra</i>	1.7	Medium
LR 5	Roadside planting along Kotewall Road, Hatton Road and Po Shan Road	<i>Aleurites moluccana, Cinnamomum camphora, Livistona chinensis, Bombax malabaricum, Ficus microcarpa and Ficus elastica</i>	0.8	High

LCA	Landscape Character Area	Area(Ha) within Study Area	Sensitivity
LCA1	Greenbelt / Country Park Character Area	20.0	High
LCA2	Mid-levels residential development	2.7	High

Visually Sensitive Receivers (VSRs)

4.47 The Zone of Visual Influence (ZVI) does not vary between construction and operation phase. The ZVI for both phases is indicated in **Figure 4.4.1**. Due to the steep area, the ZVI is quite extensive and is generally defined by the following:-

- In the south by the ridgeline of High West;
- In the north by the high rise institutional complex;
- In the east by the High rise residential development along Babington path and Kotewall Road.
- In the west by the ridgeline of Lung Fu Shan.

4.48 **Table 4.2** indicates the key Visually Sensitive Receivers (**VSRs**) found within the ZVI's for the construction phase and operation phases. For ease of reference, each VSR is given an identity number, and mapped in **Figure 4.4.1** and with photographic record in **Figures 4.4.2 & 4.4.3**.

Table 4.2 Identity of key Visually Sensitive Receivers (VSRs) during construction and operation phases

VSR	Location of Receiver	Type of viewer	Number of Receivers (very few / few / many / very many)	Duration of View (Constant / Periodic / Infrequent)	Approx. Minimum Distance to Site (meters)
Residential Receivers					
R1A	Po Shan Mansions	Resident	Many	Constant	10
R1B	Piccadilly Mansion	Resident	Many	Constant	10
R1C	No.23 Po Shan Road	Resident	Many	Constant	50
R1D	Hatton Place, Hatton House, Wisdom Court	Resident	Many	Constant	50
R1E	Skyline Mansion, Skyview Cliff, Medallion Heights, Haddon Court	Resident	Many	Constant	50
R1F	University Heights, Emerald Gardens, Greenview Gardens, Kingsford Height	Resident	Very Many	Constant	120
R2	No. 21, 24, 30 Po Shan Road and No. 41B and 43A Conduit Road	Resident	Few	Constant	30
R3	Alpine Court, Belmont Court, Scenic Garden, Villa Veneto, Richmond Court, Imperial Court, Realty Gardens, Peace Court, Dragonview Court, Kings Garden, Wah Sen Court, Kiu Sen Court, 1A Robinson Road	Resident	Very Many	Constant	160
Occupational Receivers					
GIC1	Users of the University of Hong Kong	Working Staff, students	Many	Infrequent / Constant	200
Recreational Receivers					
O1	Walkers in Hatton Road Morning Trail	Recreational user	Few	Infrequent	80
Traveling Receivers					
T1	Travellers on the Po Shan Road	Traveller	Many	Infrequent	0

Residential Receivers

VSR – R1A

- 4.49 This VSR refer to the residents in Po Shan Mansions. It will have a full, close view to the proposed work. Both the quality of view from this VSR and the receiver population are high. The overall sensitivity is high.

VSR – R1B

- 4.50 This VSR refer to the residents in Piccadilly Mansion. It will have a partial, close view to the proposed work. Both the quality of view from this VSR and the receiver population are high. The overall sensitivity is high.

VSR – R1C

- 4.51 This VSR refer to the residents in No. 23 Po Shan Road. It will have a partial, close view to the proposed work. Both the quality of view from this VSR and the receiver population are high. The overall sensitivity is high.

VSR – R1D

- 4.52 This VSR refers to residents in medium-rises at western Po Shan Road. Since their view towards south is blocked by Piccadilly Mansion and Po Shan Mansions, views from this VSR to the proposed works area are very limited. They will have partial view to the upper portion of the works area. The quality of view from this VSR is high and the receiver population is very high. The overall sensitivity is high.

VSR – R1E

- 4.53 This VSR consists of mostly residents of medium-rises along southern side of Conduit Road. Due to the dense existing vegetation and surrounding buildings, views from this VSR at ground level to the surrounding are very limited. However, receivers at upper level of the buildings towards south will have partial view to the proposed works area. The quality of view from this VSR is medium and the receiver population is high. The overall sensitivity is high.

VSR – R1F

- 4.54 This VSR consists of mostly residents of high-rises adjacent to the HKU. Due to the level difference, among the dense residential blocks, one at ground level has generally no views to the proposed works area. Only receivers at upper level of the buildings towards south will have partial view to the proposed works area. The quality of view from this VSR is high and the receiver population is high. The overall sensitivity is high.

VSR – R2

- 4.55 This VSR consists of mostly residents of 2 to 3 stories-height low-rises in Po Shan Road. With numbers of building and trees surrounding, views from this VSR to the surrounding are very limited. They will have partial view to the upper portion of the works area. The receiver population is low and the overall sensitivity is high.

VSR – R3

- 4.56 This VSR refers to residents in medium-rises to high-rises at northern Conduit Road. Since their views to the south are partially blocked by **R1E**, views from this VSR to the works area are very limited. Only receivers at upper level of the buildings towards southwest will have partial view to the

upper portion of the works area. The quality of view from this VSR is high and the receiver population is very high. The overall sensitivity is high.

Landscape Impact Assessment (LIA)

4.57 The nature and extent of the landslide preventive works on the natural hillside located above Po Shan Road, works areas and the construction methodologies are described in detail in Chapter 2. For easy of reference, the extent of works at ground level, including all contractors' temporary works area, are shown on all the plans illustrating landscape and visual impacts in this section.

4.58 The sources of landscape and visual impacts in the construction phase will include:-

- construction works involving the removal of existing vegetation;
- construction of site access;
- excavation works for the installation of soil nails and raking drains;
- stockpiling of excavated materials;
- haulage off-site of excavated materials
- stockpiling of construction materials;
- importation and storage of construction equipment and plant;
- contractor's temporary works areas, including site accommodation and parking area;
- night lighting;

4.59 During the operation stage, potential landscape and visual impacts would be related to the following visible above ground structures:

- About 700 numbers of soil nails with a spacing of 2m horizontally and 3 m vertically;
- About 60 numbers of raking drains with a spacing of 5m horizontally and 15m vertically;
- Rock slope stabilization works for the rock outcrop / boulders at the upper portion of natural terrain.

Nature and Magnitude of Landscape Change Before Mitigation in Construction Phase

4.60 The magnitude of the impacts, before implementation of mitigation measures, on the landscape resources and LCA that would occur in the construction phase are described below and tabulated in **Table 4.3**. All impacts are adverse unless otherwise stated.

LR1 – Woodland

4.61 There is expected to be some minor impact upon the existing woodland tree species within the works area. This will be due to the installation of the soil nails. The impact significance before mitigation is expected to be moderate. An area of approximately 2000 square metres could be affected (Refers to appendix of the tree survey report). However, the Engineer confirmed that no trees will be felled or transplanted due to the proposed landslide preventive works. The sensitivity of this resource is high. The magnitude of the change here is considered intermediate and unmitigated impact significance is moderate.

LR3 – Manmade slope

- 4.62 Approximately 600 square meters of existing groundcover / shrub area is expected to be impacted upon. However, no trees will be affected by the slope stabilization works. The magnitude of the change here is considered small and unmitigated impact significance is slight.

LCA1 – Greenbelt / Country Park Character Area

- 4.63 The character of the Greenbelt / Country Park character will be modified by loss of groundcover vegetation and the installation of soil nails, temporary works areas, additional construction traffic and storage of construction material. The sensitivity of this resource is high. The magnitude of the change here is considered intermediate and unmitigated impact significance is moderate.
- 4.64 There would be negligible magnitude of impact on all the remaining landscape resources and landscape character area.

Table 4.3 Significance of landscape impacts in the construction and operation phases (Note: All impacts adverse unless otherwise noted. Only those resources or character areas that are impacted are listed in the table – resources not impacted are not listed.)

Part 1 – Physical Landscape Resources (Topography, Vegetation, Soil, Open Space, Special Features, etc)

ID No.	Landscape Resources (LR)	Sensitivity to Change (Low, Medium, High)	Magnitude of Change before Mitigation (Negligible, Small, Intermediate, Large)		Impact significance Threshold Before Mitigation (Insubstantial, Slight, Moderate, Substantial)		Recommended Mitigation Measures	Residual Impact Significance Threshold After Mitigation (Insubstantial, Slight, Moderate, Substantial)		
			Construction	Operation	Construction	Operation		Construction	DAY 1	YEAR 10
LR1	Woodland (including tall scrub)	High	Intermediate	Intermediate	Moderate	Moderate	CM1, CM2, CM3, CM4, CM5, CM6 OM1, OM3, OM4, OM5, OM6	Slight	Slight	Insubstantial
LR2	Pocket open space	Medium	Negligible	Negligible	Insubstantial	Insubstantial	CM1, CM2, CM3, CM5 OM1, OM3, OM4, OM5	Insubstantial	Insubstantial	Insubstantial
LR3	Manmade slope	Low	Small	Small	Slight	Slight	CM1, CM2, CM3, CM4, CM5, CM6 OM1, OM3, OM4, OM5, OM6	Slight	Slight	Insubstantial
LR4	Residential development	Medium	Negligible	Negligible	Insubstantial	Insubstantial	CM1, CM2, CM4, CM5, CM6, OM5	Insubstantial	Insubstantial	Insubstantial
LR5	Roadside planting along Kotewall Road, Hatton Road and Po Shan Road	High	Negligible	Negligible	Insubstantial	Insubstantial	CM1, CM2, CM3, CM4, CM5, CM6 OM1, OM3, OM4, OM5	Insubstantial	Insubstantial	Insubstantial

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Part 2 – Landscape Character Areas

ID No.	Landscape Character Area (LCA)	Sensitivity to Change (Low, Medium, High)	Magnitude of Change before Mitigation (Negligible, Small, Intermediate, Large)		Impact significance Threshold Before Mitigation (Insubstantial, Slight, Moderate, Substantial)		Recommended Mitigation Measures	Residual Impact Significance Threshold After Mitigation (Insubstantial, Slight, Moderate, Substantial)		
			Construction	Operation	Construction	Operation		Construction	DAY 1	YEAR 10
LCA1	Greenbelt / Country Park Character Area	High	Intermediate	Intermediate	Moderate	Moderate	CM1, CM2, CM3, CM4, CM5, CM6 OM1, OM3, OM4, OM5, OM6	Slight	Slight	Insubstantial
LCA2	Mid-levels residential development	High	Negligible	Negligible	Insubstantial	Insubstantial	CM1, CM2, CM4, CM6, OM5	Insubstantial	Insubstantial	Insubstantial

Table 4.4 Significance of visual impacts in the construction and operation phases
 (Note: All impacts adverse unless otherwise noted.)

VSR Type & ID	Key Visually Sensitive Receiver (VSR)	Degree of Visibility of Source(s) of Visual Impact (Full, partial, glimpse)	Minimum distance between VSR & Source(s) of Impact	Magnitude of Change in View before Mitigation (negligible, small, intermediate, large)		Receptor Sensitivity (Low, medium, High)		Impact significance threshold before mitigation (insubstantial, slight, moderate, substantial)		Recommended Mitigation Measures	Residual Impact Significance Threshold after Mitigation (insubstantial, slight, moderate, substantial)		
				Construction	Operation	Construction	Operation	Construction	Operation		Construction	Operation	
	Residential												
R1A	Po Shan Mansions	Full	10m	Intermediate	Intermediate	High	High	Moderate	Moderate	CM1, CM2, CM3, CM4, CM6 OM3, OM5, OM6	Moderate	Slight	Insubstantial
R1B	Piccadilly Mansion	Partial	10m	Intermediate	Intermediate	High	High	Moderate	Moderate	CM1, CM2, CM3, CM4, CM6 OM3, OM5, OM6	Moderate	Slight	Insubstantial
R1C	No.23 Po Shan Road	Partial	50m	Intermediate	Intermediate	High	High	Moderate	Moderate	CM1, CM2, CM3, CM4, CM6 OM3, OM5, OM6	Moderate	Slight	Insubstantial
R1D	Hatton Place, Hatton House, Wisdom Court	Partial	50m	small	small	High	High	Slight	Slight	CM1, CM2, CM3, CM4, CM6 OM3, OM5, OM6	Slight	Slight	Insubstantial
R1E	Skyline Mansion, Skyview Cliff, Medallion Heights, Haddon Court	Partial	50m	Intermediate	Intermediate	High	High	Moderate	Moderate	CM1, CM2, CM3, CM4, CM6 OM3, OM5, OM6	Moderate	Slight	Insubstantial
R1F	University Heights, Emerald Gardens, Greenview Gardens, Kingsford Height	Partial	120m	Intermediate	Intermediate	High	High	Moderate	Moderate	CM1, CM2, CM3, CM4, CM6 OM3, OM5, OM6	Moderate	Slight	Insubstantial
R2	No. 21, 24, 30 Po Shan Road and No. 41B and 43A Conduit Road	Partial	30m	Small	negligible	High	High	Slight	Slight	CM1, CM2, CM3, CM4, CM6 OM3, OM5, OM6	Slight	Insubstantial	Insubstantial
R3	Alpine Court, Belmont Court, Scenic Garden, Villa Veneto, Richmond Court, Imperial Court, Realty Gardens, Peace Court, Dragonview Court, Kings Garden, Wah Sen Court, Kiu Sen Court, 1A Robinson Road	Glimpse	160	Small	small	High	High	Slight	Slight	CM1, CM2, CM3, CM4, CM6 OM3, OM5, OM6	Slight	Slight	Insubstantial

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VSR Type & ID	Key Visually Sensitive Receiver (VSR)	Degree of Visibility of Source(s) of Visual Impact (Full, partial, glimpse)	Minimum distance between VSR & Source(s) of Impact	Magnitude of Change in View before Mitigation (negligible, small, intermediate, large)		Receptor Sensitivity (Low, medium, High)		Impact significance threshold before mitigation (insubstantial, slight, moderate, substantial)		Recommended Mitigation Measures	Residual Impact Significance Threshold after Mitigation (insubstantial, slight, moderate, substantial)	
				Construction	Operation	Construction	Operation	Construction	Operation		Construction	Operation
	Occupational											
GIC1	Users of the University of Hong Kong	Full	200m	Small	negligible	Medium	Medium	Slight	Insubstantial	CM2, CM3, CM4, CM6 OM3, OM5, OM6	Slight	Insubstantial
	Recreational											
O1	Walkers in Hatton Road Morning Trail	Full	80m	slight	negligible	Medium	Medium	slight	Insubstantial	CM2, CM3, CM4, CM6 OM3, OM5, OM6	Slight	Insubstantial
	Traveller											
T1	Travellers on the Po Shan Road	Glimpse	0m	Small	Small	Low	Low	Slight	Insubstantial	CM2, CM3, CM4, CM6 OM3, OM5, OM6	Slight	Insubstantial

Recommended Landscape & Visual Mitigation Measures in Construction and Operation Phases

4.65 The proposed landscape and Visual mitigation measures in the construction and operation phases are listed in **Tables 4.5 & 4.6** below, together with an indication of Funding, Implementation, and Management and Maintenance agencies.

Table 4.5 Proposed Landscape and Visual Mitigation Measures in Construction Phase

ID No.	Nature / Type	Visual Mitigation Measure	Funding / Implementation	Management / Maintenance
CM1	Design / construction Planning	<p><u>No-intrusion Zone</u> To maximize protection to existing trees, woodland, plantation areas and ground vegetation, construction contracts may designate “No-intrusion Zone” to various areas within the site boundary with rigid and durable fencing for each individual no-intrusion zone. The contractor should closely monitor and restrict the site working staff not to enter the “no-intrusion zone”, even for non-direct construction activities and storage of equipment.</p>	CEDD	CEDD
CM2	Design / construction Planning	<p><u>Hoarding</u> Hoarding or boundary fencing for construction shall be considered. It should be sensitively designed, subtle, camouflaged and more ‘permeable’ so that they fit into the existing country park character when looking from outside.</p>	CEDD	CEDD
CM3	Site Practice	<p><u>Minimize disturbance of construction workers</u> To ensure minimum disturbance to existing country park walking trail users and the HKU complex users, construction workers may only enter these areas with their helmets and safety vests properly stored or carried in non-transparent bags. They shall also properly and cleanly dress. The construction contract should require the main contractor to issue guideline to the construction works to minimize disturbance to existing country park users.</p>	CEDD	CEDD
CM4	Site Practice	<p><u>Dust and Erosion Control for Exposed Soil</u> Installation of soil nails and raking drains will be highly visible from surrounding areas should be well planned and with precautions to suppress dust. Exposed soil shall be covered or ‘camouflaged’ and watered often. Areas that are expected to be left with bare soil for a long period of time after excavation shall be properly covered with suitable protective fabric. Silt and erosion shall be</p>	CEDD	CEDD

ID No.	Nature / Type	Visual Mitigation Measure	Funding / Implementation	Management / Maintenance
		controlled by ground barriers around the slope cutting area.		
CM5	Site Supervision	<u>Existing Tree Record Inventory and tree monitoring system</u> All retained trees should be recorded photographically at the commencement of the Contract, and carefully protected during the construction period. Detailed tree protection specification shall be allowed and included in the Contract Specification, which specifying the tree protection requirement, submission and approval system, and the tree monitoring system.	CEDD	CEDD
CM6	Site Practice	<u>Construction Light</u> All security floodlights for construction sites shall be equipped with adjustable shield, frosted diffusers and reflective covers, and be carefully controlled to minimize light pollution and night-time glare to nearby residents. The Contractor shall consider other security measures which shall minimize the visual impacts.	CEDD	CEDD
CM7	Site Practice	<u>Soil Nails</u> To ensure minimum disturbance to existing trees, allowance shall be made for adjustment of soil nails on site for avoidance of tree trunks and tree roots.	CEDD	CEDD

Table 4.6 Proposed Landscape and Visual Mitigation Measures in Operation Phase

ID No.	Nature / Type	Landscape Mitigation Measure	Funding / Implementation	Management / Maintenance
OM3	Design / construction Planning	<u>Re-use of Existing Soil</u> Existing topsoil shall be re-used where possible for new planting areas within the project. The construction program shall consider using the soil removed from one phase for backfilling another. Suitable storage ground, gathering ground and mixing ground may be set up on-site as necessary.	CEDD	CEDD
OM4	Site Supervisions	<u>Establishment Period</u> 12 month establishment period for the soft landscape works will be allowed in the main contract. Most construction contracts in Hong Kong require the Contractor to carry out routine horticultural operations, including watering, pruning, weeding, pest control,	CEDD	CEDD

ID No.	Nature / Type	Landscape Mitigation Measure	Funding / Implementation	Management / Maintenance
		grass cutting, fertilizing, replacement of dead plants etc. to ensure healthy establishment of new planting during a 12 month establishment period. This period also serves as a kind of warranty / guarantee on the quality of the plants supplied and installed by the Contractor.		
OM5	Design / construction Planning	<u>Re-instatement of excavated Area</u> All excavated area and disturbed area for utilities diversion, temporary road diversion, and pipeline works will be reinstated to former conditions, subject to applicable Government Standards.	CEDD	CEDD
OM6	Design / construction Planning	<u>Woodland Mix</u> Woodland mix is proposed to screen sensitive views, to match surrounding vegetation, to provide greenery to the surrounding area. Woodland planting mix should include the following planting type:- <ul style="list-style-type: none"> ▪ Pioneer tree species ▪ Canopy tree species ▪ Understorey trees / shrubs All woodland mix to be pit planted as seedling trees or shrubs (typically 300-900mm high) into an existing or placed soil body (min. 600mm deep). Plants should be planted in group of 3-5 plants of the same species at 1.0 -1.5m centres. Pioneer, canopy and understorey species should be distributed evenly throughout the planted area.	CEDD	CEDD

Predication of Significance of Landscape Impacts

- 4.66 The potential significance of the landscape impacts during the construction and operation phases, before and after mitigation, are provided in **Table 4.3**. This assessment follows the stated methodology and assumes that the appropriate mitigation measures identified in previous section would be implemented, and that the full effect of the soft landscape mitigation measures would be realised after ten years.

Operation Phase Landscape Impacts

- 4.67 Residual landscape impacts on landscape resources in the operation phase are mapped in **Figure 4.5.2**. Residual landscape impacts on LCA in the operation phase are mapped in **Figure 4.5.4**.
- 4.68 All residual adverse landscape impacts in the operation phase of Day 1 will be of insubstantial significance. After all landscape mitigation measures are implemented and have matured over 10 years, there would be no residual adverse landscape impacts of any significance in Year 10.

Visual Impact Assessment (VIA)

Potential sources of Visual Impacts

- 4.69 The potential sources of landscape and visual impacts are described above in Sections 4.58 and 4.59.

Recommended Landscape & Visual Mitigation Measures in Construction and Operation Phases

- 4.70 Recommended landscape and visual mitigation measures for impacts caused during the construction process are described in **Tables 4.5** and **4.6** together with the associated implementation agency.

Prediction of Significance of Visual Impacts in Construction Phase

- 4.71 The potential significance of the residual visual impacts during the construction phase, before and after mitigation, are briefly described below, provided in detail in **Table 4.4**, and illustrated in **Figure 4.5.5**. This assessment follows the methodology outlined in Section 4.10 and assumes that the appropriate mitigation measures identified in **Table 4.5** above would be implemented.

Residential

- 4.72 Residents in the medium rise residential development Po Shan Mansions (**R1A**), Piccadilly Mansion (**R1B**) and No.23 Po Shan Road (**R1C**) along Po Shan Road will have short range, partial to full views to the construction works which is immediately adjacent or very close to several receivers. The sensitivity of this VSR is high. There is expected to be an intermediate magnitude of change after mitigation with residual impact significance being moderate.
- 4.73 Due to the dense existing vegetation and surrounding buildings, views of residents in the medium rise residential development along Conduit Road (**R1E**) at ground level are very limit. Upper level of this VSR towards south will have partial view to the proposed works area. The sensitivity of this VSR is high. There is expected to be an intermediate magnitude of change after mitigation with residual impact significance being moderate.

- 4.74 Residents in the high rise residential development Kingsford Height, University Heights and Emerald Gardens (**R1F**) at ground level have generally no views to the proposed works area. Only receivers at upper level of the buildings towards south will have partial view to the proposed works area. The sensitivity of this VSR is high. There is expected to be an intermediate magnitude of change after mitigation with residual impact significance being moderate.
- 4.75 Residents in medium-rises at western Po Shan Road such as Hatton Place, Hatton House and Wisdom Court (**R1D**) will have limit and partial view to the works area as their view towards south will be partly blocked by Piccadilly Mansion and Po Shan Mansions. The sensitivity of this VSR is high. There is expected to be a small magnitude of change after mitigation with residual impact significance being slight.
- 4.76 Residents in the residential development (No. 21, 24, 30 Po Shan Road and No. 41B and 43A Conduit Road) along Po Shan Road (**R2**) are 2 to 3 stories height building, They will have short range, partial views to the construction works which is immediately adjacent or very close to several receivers. The sensitivity of this VSR is high. There is expected to be a small magnitude of change after mitigation with residual impact significance being slight.
- 4.77 Residents in the medium rise to high rise residential development (Alpine Court, Belmont Court, Scenic Garden, Villa Veneto, Richmond Court, Imperial Court, Realty Gardens, Peace Court, Dragonview Court, Kings Garden, Wah Sen Court, Kiu Sen Court, 1A Robinson Road) along Conduit Road (**R3**) will have glimpse views to the construction works which will be partly screened by the R2. The sensitivity of this VSR is high. There is expected to be a small magnitude of change after mitigation with residual impact significance being slight.

Occupational

- 4.78 Users of the University of Hong Kong (**GIC1**) located in high rise level of building complex will have full views to the construction works, while users located in the ground floor or lecture room will not be subjected to the construction works which will be screened by Hatton House, Wisdom Court and No.1 Po Shan Road. The sensitivity of this VSR is medium. There is expected to be a small magnitude of change after mitigation with residual impact significance being slight.

Recreational

- 4.79 Walkers in Hatton Road Morning Trail (**O1**) will have partial views to the construction works which will be mostly screened by Piccadilly Mansion. The sensitivity of this VSR is medium. There is expected to be a small magnitude of change after mitigation with residual impact significance being slight.

Traveller

- 4.80 Travellers on the Po Shan Road (**T1**) will have glimpse views to the construction works, which will be mostly screened by Piccadilly Mansion and Po Shan Mansions. However, views in Po Shan Road, Kotewall Road and Conduit Road will be interrupted by additional construction works' traffic. The sensitivity of this VSR is low. There is expected to be a small magnitude of change after mitigation with residual impact significance being slight.

Prediction of Significance of Visual Impacts in Operation Phase

- 4.81 Residual visual impacts in the construction phase and Operation Phase are mapped in **Figures 4.5.5** and **4.5.6**. After the proposed mitigation measures have been implemented and the proposed tree planting has matured over 10 years, all residual adverse visual impacts in the operation phase in year 10 will be of insubstantial significance.

Environmental Monitoring and Audit

- 4.82 The implementation and maintenance of the landscape compensatory planting measures is a key aspect and should be checked to ensure that the proposal are fully realised. It is recommended that implementation and operation maintenance of all the proposed landscape and visual mitigation measure are included within the EM&A. During the Construction and operation stages, EM&A will comprise auditing of the compensatory planting and 12 months planting establishment in the form of monthly site inspection. The operation stage auditing shall be undertaken for one year during the Contractor's maintenance period.
- 4.83 All mitigation measures proposed in the EIA and implemented by the Contractor should be audited by a registered landscape architect, as a member of the Environmental Team, on a monthly basis to ensure compliance with the intended aims of the measures. Site inspection should be undertaken on a monthly basis throughout the construction period to ensure the recommended mitigation measures are properly implemented.
- 4.84 Monthly site inspections should be undertaken to ensure the compensatory planting and horticultural maintenance operations are properly established during the 12 month establishment period.

Conclusions

Summary of Predicated Residual Landscape and Visual Impacts

- 4.85 Residual landscape impacts in the construction phase are listed in **Table 4.3** and mapped in **Figures 4.5.1** and **4.5.3**. Residual visual impacts in construction phase are listed in **Table 4.4** and mapped in **Figure 4.5.5**.
- 4.86 Residual landscape impacts in the operation phase are listed in **Table 4.3** and mapped in **Figures 4.5.2** and **4.5.4**. Residual visual impacts in operation phase are listed in **Table 4.4** and mapped in **Figure 4.5.6**.
- 4.87 Photomontages showing the views of the subject site from Po Shan Mansions are illustrated in **Figure 4.6.1**.
- 4.88 There is expected to be some minor impact upon the existing woodland, which is approximately 2000 square metres, within the works area. There are a total of approximately 362 trees within the soil nails and raking drains working boundary (Refers to the tree survey report). However, the Engineer confirmed that no trees will be felled or requires transplanting due to the proposed landslide preventive works. The rest of groundcover / scrub will be affected. Proposed woodland and native shrub planting is proposed to compensate for these areas. This planting should be well established after 10 years. Residual impact is expected to be insubstantial.
- 4.89 Residents in the medium rise development along Po Shan Road (**R1A, R1B, R1C**) are immediately adjacent or very close to the proposed landslide preventive works. They will have short range views to the proposed works. Residents in the medium rise development along Conduit Road (**R1E**) and in high rise development adjacent to HKU (**R1F**) will have partial views to the proposed landslide preventive works. Mitigation in the form of woodland planting will help in reducing impacts. Planting is expected to be well established at Year 10. Residual impacts are expected to be insubstantial.
- 4.90 After the proposed mitigation measures have been implemented and the proposed tree planting has matured over 10 years, all residual adverse landscape and visual impacts in operation phase will be of insubstantial significance.

5. CONSTRUCTION NOISE IMPACT

Introduction

- 5.1 This section presents the potential noise impacts arising from the proposed Project during construction phase. It is expected that construction noise impact will arise from the proposed Project as well as the nearby concurrent project (i.e. Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction). Cumulative daytime construction noise impacts are assessed in this study.

Environmental Legislation, Policies, Plans, Standards and Criteria

General

- 5.2 Noise impacts generated by the construction of this Project have been assessed in accordance with the criteria and methodology given in the Technical Memoranda (TMs) under the Noise Control Ordinance (NCO), and the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM).
- 5.3 The NCO and EIAO provide the statutory framework for noise control. Applicable assessment procedures and standards are set out in three TMs listed below:
- EIAO-TM
 - TM on Noise from Construction Work other than Percussive Piling (GW-TM)
 - TM on Noise from Construction Work in Designated Areas (DA-TM)

Construction Noise – General Construction Works

- 5.4 The NCO provides the statutory framework for noise control of construction work, other than percussive piling, using powered mechanical equipment (PME) between the hours of 1900 and 0700 hours or at any time on Sundays and general holiday (that is, restricted hours). Noise control on construction activities taking place at other times is subject to the *Criteria for Evaluating Noise Impact* stated in Table 1A of Annex 5 in the EIAO-TM. The noise limit is $L_{eq(30\text{ minutes})}$ 75 dB(A) at the façades of dwellings and 70 dB(A) at the façade of schools (65 dB(A) during examinations). The EIAO-TM construction noise criteria are summarised in **Table 5.1**.

Table 5.1 Daytime Construction Noise Criteria

Use	Noise Level in $L_{eq(30\text{-minutes})}$, dB(A)
Residential	75
Educational Institution	70
Educational Institution (during examination)	65

- 5.5 Between 1900 and 0700 hours and all day on Sundays and public holidays, activities involving the use of PME for the purpose of carrying out construction work is prohibited unless a construction noise permit (CNP) has been obtained. A CNP may be granted provided that the Acceptable Noise Level (ANL) for the noise sensitive receivers can be complied with. ANLs are assigned depending upon the area sensitive rating (ASR). The corresponding ANLs for evening and night time periods are given in **Table 5.2**.

Table 5.2 Acceptable Noise Levels

Time Period	Acceptable Noise Level in Leq(5-minutes), dB(A)		
	ASR A	ASR B	ASR C
Evening (1900 to 2300 hours) ⁽¹⁾	60	65	70
Night (2300 to 0700 hours)	45	50	55

Note: (1) Includes Sundays and Public Holidays during daytime and evening

- 5.6 Despite any description or assessment made in this EIA Report on construction noise aspects, there is no guarantee that a Construction Noise Permit (CNP) will be issued for the project construction. The Noise Control Authority will consider a well-justified CNP application, once filed, for construction works within restricted hours as guided by the relevant Technical Memoranda issued under the Noise Control Ordinance. The Noise Control Authority will take into account of contemporary conditions / situations of adjoining land uses and any previous complaints against construction activities at the site before making his decision in granting a CNP. Nothing in this EIA Report shall bind the Noise Control Authority in making his decision. Failure to comply with any such conditions will lead to cancellation of the CNP and prosecution action under the NCO.
- 5.7 Under the DA-TM, the use of five types of Specified Powered Mechanical Equipment (SPME) and three types of Prescribed Construction Work (PCW) within a designated area during restricted hours would require a valid CNP. The SPME includes hand-held breaker, bulldozer, concrete lorry mixer, dump truck and hand-held vibratory poker. The PCW are:
- erecting or dismantling of formwork or scaffolding
 - loading, unloading or handling of rubble, wooden boards, steel bars, wood or scaffolding material
 - hammering
- 5.8 In general, it should not be presumed that a CNP would be granted for carrying out PCW within a designated area during the restricted hours. The CNP may be granted for the execution of construction works during restricted hours involving the use of PME and / or SPME if the relevant Acceptable Noise Levels and criteria stipulated in the GW-TM and DA-TM can be met.
- 5.9 It is envisaged that no construction works will be conducted during restricted hours (i.e. time between 1900 and 0700 hours and any time on a general holiday, including Sunday) according to the preliminary construction programme.

Noise Sensitive Receivers

- 5.10 Based on the criteria set out in the EIAO-TM, representative noise sensitive receivers (NSRs) have been identified close to the Project site. **Table 5.3** presents descriptions of these selected NSRs. Locations of NSRs and the proposed works areas are illustrated in **Figure 5.1**.
- 5.11 As shown in **Figure 5.1**, Pok Fu Lam Country Park lies to the south of the Project site and would be regarded as NSRs according to the EIAO-TM. Visitors to the country park would potentially be impacted by the proposed construction works.

Table 5.3 Summary of Representative Existing Noise Sensitive Receivers

NSR	Location	Horizontal Separation from Closest Works Area Boundary (m)	Land Use
N1	Block A, Po Shan Mansions	7	Residential

NSR	Location	Horizontal Separation from Closest Works Area Boundary (m)	Land Use
N2	Block A, Po Shan Mansions	35	Residential
N3	Hamilton Court	145	Residential
N4	Piccadilly Mansion	165	Residential
N5	No. 21 Po Shan Road	45	Residential
N6	No. 53 Conduit Road	55	Residential
N7	Pok Fu Lam Country Park	(1)	Country Park

Note: (1) The landslide preventive works fall partially within the Pok Fu Lam Country Park

Assessment Methodology

- 5.12 The proposed works are scheduled to complete within 10 months. The preliminary construction activities involved in the Project is shown in **Table 5.4**.

Table 5.4 Construction Activities Involved

Item	Activity
1	Site clearance and set up
2	Soil nail installation
3	Soil nail head construction
4	Rock slope stabilization works
5	Raking drain installation
6	Landscaping works
7	Site reinstatement works

- 5.13 The construction plant inventory for all construction activities and planned works areas relevant to this Project are given in **Table 5.5**.

Table 5.5 Proposed Construction Plant Inventory

PME	Number	To be used in activity	Works Area ⁽¹⁾
Dump truck	1	Site clearance and set up	B
Air compressor	4	Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation	2 in A and 2 in G
Drill rig	6		E and F
Grouting machine	3		1 in A and 2 in G
Generator	2		1 in A and 1 in G
Concrete mixer	3		1 in A and 2 in G

Note: (1) Refer to Figure 5.1

- 5.14 In accordance with the EIAO, the methodology outlined in the GW-TM has been used for the assessment of construction noise (excluding percussive piling). Sound Power Levels (SWLs) of the equipment were taken from Table 3 of this TM. Where no SWL was supplied in the GW-TM, reference was made to BS 5228, previous similar studies or from measurements taken at other sites in Hong Kong. Schedule of powered mechanical equipment (PME) for the different construction tasks during normal daytime working hours is presented in **Appendix 5.1**.
- 5.15 It was assumed that air compressors, grouting machines, generators and concrete mixers would be located at particular locations as far as possible from NSRs at construction site. The assessment is based on the cumulative SWL of PME likely to be used for each location, taking into account the

construction period in the vicinity of the receiver location. To predict the noise level, PME was divided into groups required for each discrete construction task. The objective was to identify the worst case scenario representing those items of PME that would be in use concurrently at any given time. The sound pressure level of each construction task was calculated, depending on the number of plant and distance from receivers. The noise levels at NSRs were then predicted by adding up the SWLs of all concurrent construction tasks.

- 5.16 A positive 3 dB(A) façade correction was added to the predicted noise levels in order to account for the facade effect at each NSR.

Identification of Environmental Impacts

- 5.17 The scope of this Project includes the installation about 700 numbers of soil nails and about 60 numbers of ranking drains on the natural terrain within the concerned areas as shown in **Figure 1.4**. The length of the soil is about 20m with spacing of 2m horizontally and 3m vertically; the length of ranking drains is about 10m with spacing of 5m horizontally and 15m vertically. Potential construction impacts of the Project may arise from the following activities:

- Transportation on access road by dump truck for site clearance;
- Air compressor, drill rig, grouting machine, generator and concrete mixer for soil nail installation, soil head construction, rock slope stabilization and ranking drain installation.

- 5.18 The Project (Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction) would also contribute to the cumulative construction noise impacts.

Prediction and Evaluation of Environmental Impacts

- 5.19 For normal daytime working hours, exceedences of the construction noise criteria i.e. $L_{eq(30\text{ minutes})}$ 75 dB(A) for residential uses are predicted at representative NSRs in the absence of mitigation measures.
- 5.20 Based on the proposed plant inventory as shown in **Table 5.5**, construction noise impacts from various construction activities were predicted. It was assumed that drill rigs were located closest to the NSRs in Works Area C as a worst case scenario for prediction. Due to engineering consideration, the drill rigs have to be located 15m apart from each other.
- 5.21 Details of construction noise calculations and results are presented in **Appendix 5.2**. Results show that the predicted noise levels at NSRs N1 to N6 are in the range of 52 to 82 dB(A). A summary of the unmitigated construction noise levels of the representative NSRs during normal daytime working hours within the construction period of the Project is listed in **Table 5.6**. Noise mitigation measures would therefore be required to reduce noise levels to the stipulated standard.

Table 5.6 Unmitigated Construction Noise Levels

NSR	Predicted Noise Levels, dB(A)	Daytime Construction Noise Criteria, dB(A)
N1	62 – 82	75
N2	61 – 79	75
N3	53 – 69	75
N4	52 – 68	75
N5	64 – 72	75
N6	60 – 72	75

- 5.22 Visitors to the Country Park (NSR N7) would potentially be impacted by the proposed construction works. Taking into account the transient nature of visitors to the Country Park, insurmountable construction noise impact on the NSR N7 would not be envisaged.

Mitigation of Adverse Environmental Impacts

- 5.23 In order to reduce the excessive noise impacts at the affected NSRs N1 and N2 during normal daytime working hours, mitigation measures such as adopting quiet powered mechanical equipment, movable noise barrier, noise enclosure and noise insulating fabric for drill rigs are recommended. The above mitigation measures have been vetted and confirmed by the Engineer as being practicable in completing the works within scheduled timeframe.
- 5.24 Construction plants located in Works Area A are in close proximity to the NSRs. Noise mitigation measures have to be implemented for plants operating in Works Area A in order to comply with the noise criteria. Movable noise barrier is proposed to mitigate the noise generated from concrete mixer. Noise enclosure is proposed to mitigate the noise generated from air compressor, grouting machine and generator. It is assumed that the proposed noise barrier could give a noise attenuation of at least 5 dB(A) and the noise enclosure could give a noise attenuation of at least 10 dB(A).
- 5.25 The typical section of the proposed moveable noise barrier is shown in **Figure 5.2**. The typical section of the proposed noise enclosure is shown in **Figure 5.3**.
- 5.26 In order to ensure the compliance of the noise criteria, two operation modes had been derived as follows:
- (i) During the construction period, no more than 2 drill rigs could be operated in Works Area E. The rest of the operating drills must be operated in Works Area F. Mitigation measures in terms of noise insulating fabric have to be in place for drill rigs operating in Works Area E.
 - (ii) No more than 6 drill rigs could be operated at the same time in Works Area F. Mitigation measures in terms of noise insulating fabric is not required. However, no drill rig could be operated in Works Area E.
- 5.27 These two operation modes have been confirmed by the Engineer as being practicable in completing the works within scheduled timeframe. It is assumed that the noise insulating fabric could give a noise attenuation of at least 5 dB(A). The configuration of the proposed noise insulating fabric is shown in **Figure 5.4**.
- 5.28 Operation Mode (i) is considered as the worst scenario as drill rigs would be operated in Works Area E which is closer to the existing NSRs than Works Area F. It is assumed that 2 drill rigs in Works Area E and 4 drill rigs in Works Area F were operating at the same time would be the worst case scenario for Operation Mode (i), with the six drill rigs located closest to the NSRs with about 15m horizontally apart from each other.
- 5.29 The mitigated noise levels for Operation Mode (i) with worst case scenario were estimated as shown in **Appendix 5.3**. A summary of the mitigated construction noise levels of the representative NSRs during normal daytime working hours within the construction period of the Project is shown in **Table 5.7**.

Table 5.7 Mitigated Construction Noise Levels - Operation Mode (i)

NSR	Predicted Noise Levels, dB(A)	Daytime Construction Noise Criteria, dB(A)
N1	57 – 74	75
N2	56 – 72	75
N3	47 – 64	75
N4	46 – 64	75
N5	59 – 67	75
N6	55 – 66	75

5.30 For Operation Mode (ii), drill rigs would be allowed to operate only in Works Area F. Due to the long distance from this Works Area to the NSRs (more than 110m to the closest NSRs N1 and N2), it is considered that no noise insulating fabric would be required as mitigation measures. The worst scenario of this operation mode is that all six drill rigs operated in Works Area F located closest to the existing NSRs, with 15m horizontally apart from each other. The mitigated noise levels for Operation Mode (ii) with worst case scenario were estimated as shown in **Appendix 5.4**. A summary of the mitigated construction noise levels of the representative NSRs during normal daytime working hours within the construction period of the Project is shown in **Table 5.8**.

Table 5.8 Mitigated Construction Noise Levels - Operation Mode (ii)

NSR	Predicted Noise Levels, dB(A)	Daytime Construction Noise Criteria, dB(A)
N1	57 – 73	75
N2	56 – 70	75
N3	47 – 64	75
N4	46 – 64	75
N5	59 – 68	75
N6	55 – 66	75

5.31 It is found that the maximum construction noise levels of Operation Mode (ii) at all the representative NSRs are equal to or less than that of Operation Mode (i), except NSR N5. The maximum predicted construction noise level at N5 is 1 dB(A) higher in Operation Mode (ii) i.e. 68 dB(A). The estimated construction noise impacts of the two operation modes at all the representative NSRs with implementation of mitigation measures would comply with the stipulated noise criteria.

Cumulative Noise Impacts

5.32 There are interactions with another designated project “Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction” (under Environmental Permit EP-235/2005/A) on-going during the construction period of the Project (hereafter the “Concurrent Project”). Cumulative noise impact at the NSRs would be expected.

5.33 According to the latest information available from the Contractor at the time when preparing this EIA Report, construction programme of the Concurrent Project presented in **Appendix 5.5** is the most updated one. It is found that the work tasks “Tunnel No.2 excavation” and “Installation of vertical drains” of the Concurrent Project to be carried out after November 2007 would be overlapped with the works of this Project (see **Appendix 2.1**).

5.34 To predict the cumulative noise impact, the predicted maximum construction noise levels at the NSRs from this Project and that of the Concurrent Project were combined to obtain the overall noise levels of the worst case scenario. The cumulative construction noise impacts at the NSRs were

predicted as shown in **Appendix 5.6**. A summary of the cumulative construction noise levels at the representative NSRs during daytime hours with mitigation measures in place are listed in **Table 5.9**.

Table 5.9 Cumulative Construction Noise Levels

NSR	Maximum Predicted Noise Levels, dB(A)	Daytime Construction Noise Criteria, dB(A)
N1	75	75
N2	72	75
N3	66	75
N4	65	75
N5	70	75
N6	70	75

5.35 As shown in Table 5.9, the predicted cumulative construction noise levels at NSRs N1 to N6 would comply with the stipulated noise criteria with recommended mitigation measures in place.

5.36 Hence it is concluded that the estimated cumulative construction noise levels at all NSRs would comply with the stipulated noise criteria.

Project-induced Traffic Noise

5.37 The construction of the Project would induce additional traffic to the existing Po Shan Road. However, it is envisaged that only about two construction vehicles per day (on average) would be induced by the proposed Project. No insurmountable noise impact due to project-induced traffic during construction phase would be expected.

Environmental Monitoring and Audit

5.38 An EM&A programme is recommended to be established according to the predicted occurrence of noisy activities. All the recommended mitigation measures for daytime normal working activities should be incorporated into the EM&A programme for implementation during construction. Details of the programme are provided in the stand-alone EM&A Manual.

Conclusion

5.39 This assessment has predicted the construction noise impacts of the Project during normal daytime working hours, taking into account the concurrent project, namely the “Agreement No.CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction”. With the use of quiet PME and insulating fabric for drill rigs for construction tasks under the Project, the noise levels at all representative residential NSRs would comply with the EIAO-TM construction noise criteria.

6. CONSTRUCTION WATER QUALITY IMPACT

6.1 This section presents the water quality impact assessment for the construction phase of the Project. As the construction activities of the Project will be land-based, direct impacts on water bodies will not arise. Nevertheless, the construction activities at the works area may generate surface run-off which may cause adverse water quality impacts if not properly controlled or mitigated. Recommendations for mitigation measures have been made, where necessary, to reduce the identified water quality impacts to an acceptable level.

Environmental Legislation And Standards

Water Pollution Control Ordinance (WPCO)

6.2 The Water Pollution Control Ordinance (Cap. 358), in existence since 1980, is the major legislation relating to the protection and control of water quality in Hong Kong. According to the Ordinance and its subsidiary legislation, Hong Kong waters are divided into ten water control zones (WCZ). Corresponding statements of Water Quality Objectives (WQO) are stipulated for different water regimes (marine waters, inland waters, bathing beaches subzones, secondary contact recreation subzones and fish culture subzones) in each of the WCZ based on their beneficial uses. The study area is located within the Victoria Harbour WCZ and the corresponding WQO are listed in **Table 6.1**.

Table 6.1 Summary of Water Quality Objectives for Victoria Harbour WCZ

Parameters	Objectives	Sub-Zone
Offensive odour, tints	Not to be present	Whole zone
Visible foam, oil scum, litter	Not to be present	Whole zone
Dissolved oxygen (DO) within 2 m of the seabed	Not less than 2.0 mg/L for 90% of samples	Marine waters
Depth-averaged DO	Not less than 4.0 mg/L for 90% of samples	Marine waters
PH	To be in the range of 6.5 - 8.5, change due to human activity not to exceed 0.2	Marine waters
Salinity	Change due to human activity not to exceed 10% of ambient	Whole zone
Temperature	Change due to human activity not to exceed 2 °C	Whole zone
Suspended solids (SS)	Not to raise the ambient level by 30% caused by human activity	Marine waters
Unionised ammonia (UIA)	Annual mean not to exceed 0.021 mg/L as unionised form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters
Total inorganic nitrogen (TIN)	Annual mean depth-averaged inorganic nitrogen not to exceed 0.4 mg/L	Marine waters
Toxic substances	Should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone
	Human activity should not cause a risk to any beneficial use of the aquatic environment.	Whole zone

Source: Statement of Water Quality Objectives (Victoria Harbour (Phases One, Two and Three) Water Control Zone).

Technical Memorandum

- 6.3 Besides setting the WQOs, the WPCO controls effluent discharging into the WCZs through a licensing system. Guidance on the permissible effluent discharges based on the type of receiving waters (foul sewers, storm water drains, inland and coastal waters) is provided in the *Technical Memorandum (TM) on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters*. The limits given in the TM cover the physical, chemical and microbial quality of effluents. Any effluent discharge during the construction stage should comply with the standards for effluents discharged into the inshore waters of the Victoria Harbour WCZ, as shown in Table 9a of the TM.

Practice Notes

- 6.4 A practice note (PN) for professional persons was issued by the EPD to provide environmental guidelines for handling and disposal of construction site discharges. The ProPECC PN 1/94 “*Construction Site Drainage*” provides good practice guidelines for dealing with various types of discharge from a construction site. Practices outlined in the PN should be followed as far as possible during construction to minimize the water quality impact due to construction site drainage.

Assessment Methodology

- 6.5 The study area for the water quality impact assessment covers the Victoria Harbour WCZ and all areas within 500m from the works site boundary.
- 6.6 The water sensitive receivers that may be affected by the construction activities for the Project have been identified. Potential sources of water quality impact that may arise during the construction phase of the Project were described. This task included identifying pollutants from point discharges and non-point sources that could affect the quality of surface water run-off. All the identified sources of potential water quality impact were then evaluated and their impact significance determined. The need for mitigation measures to reduce any identified adverse impacts on water quality to acceptable levels was determined.

Identification of Water Sensitive Receivers

- 6.7 Water-bodies identified within the study area include a drainage culvert on the hillslope between Po Shan Mansions and Hamilton Court and a temporary stream to the east of the proposed works area (see **Figure 3.2**). Both the drainage culvert and the stream lie outside the site boundary of the proposed landslide preventive works.

Evaluation of Potential Water Quality Impacts

- 6.8 Potential sources of water quality impact associated with the proposed construction activities at the works areas of the Project have been identified and include:
- construction site runoff and drainage
 - general construction activities
 - sewage effluent produced by on-site workforce.

Construction Runoff and Drainage

- 6.9 During site clearance, runoff and drainage from the works area would be the main sources of potential water quality impact. Site runoff and drainage may contain increased loads of suspended solids and contaminants. Potential sources of pollution from site drainage include: runoff and erosion from exposed soil surfaces, earth working areas and stockpiles; release of grouting and cement materials with rain wash; wash water from dust suppression sprays; and fuel and lubricants from maintenance of construction vehicles and mechanical equipment. Site runoff and drainage from the works area on the upper hillslope, if uncontrolled, could enter the drainage culvert.
- 6.10 The installation of the soil nails and raking drains would not involve any pumping or discharge of groundwater, and hence no alteration of the existing ground water level would be expected during these construction activities. Also, air would be used as the flushing medium. Hence, the groundwater would not be affected by the flushing medium of the drilling equipment. In addition, permanent casing may be provided to the drillhole of soil nail within the permeable colluvium layer as instructed by the Engineer. This extra measure would also minimize the impact to the groundwater table situated at the permeable soil stratum.
- 6.11 Potential sources of pollution from the construction and installation of the soil nails may include: effluent discharge during grouting and wash water from dust suppression sprays. An outlet pipe extending above the slope surface would be installed to facilitate collection of discharge of air, water and grout from the drillhole inserted with soil nail during grouting. With this appropriate setup, spillage during the grouting operation would be effectively controlled.
- 6.12 As a good site practice, mitigation measures should be implemented to control site runoff and drainage from the works area, and to prevent runoff and drainage water with high levels of suspended solids from entering the drainage culvert. With the implementation of adequate construction site drainage and provision of sediment removal facilities as described in Section 6.22, it is anticipated that unacceptable water quality impacts would not arise. The construction phase discharge would be collected by the temporary drainage system installed by the Contractor and then treated or desilted on-site before discharge to the licensed point near the tunnel portal of the concurrent landslide preventive works at Po Shan under Agreement No. CE28/2004 (GE).
- 6.13 The Contractor has been granted a license from the Environmental Protection Department (EPD) for the discharge of site run-off and drainage water after sedimentation process. As authorized by EPD, the treated wastewater shall be discharged into the storm water drain via the catch-pit located adjacent to the tunnel portal. The quantity and composition of the treated wastewater from the premises shall not exceed the following discharge limits specified by EPD:
- Maximum flow rate is 30 m³/day.
 - Maximum concentration of suspended solids is 30 mg/L.
 - Maximum concentration of Chemical Oxygen Demand is 80 mg/L.
 - The range of pH level is 6 to 9 units.
- 6.14 Given that the works would be concurrent with the landslide preventive works under Agreement No. CE28/2004 (GE), it will be important that the above recommended mitigation measures to control site runoff and drainage water are properly implemented. The identified water sensitive receivers lie outside the site boundary, and therefore there is very limited potential for cumulative impacts on water quality to result. It is recommended that regular site inspections be undertaken to inspect the works area in order to ensure the recommended mitigation measures are properly implemented.

General Construction Site Activities

- 6.15 On-site construction activities may cause water pollution from the following:

- Uncontrolled discharge of debris and rubbish such as packaging, construction materials and refuse etc; and
- Spillages of liquid stored on-site, such as oil, diesel and solvents etc.

6.16 However, the effects on water quality from the construction activities are likely to be minimal, provided that site boundaries are well maintained and good construction practices are implemented to ensure that litter, fuel and solvents are stored and handled properly, as detailed in Section 6.22.

Sewage Effluent

6.17 Domestic sewage would be generated from the workforce during the construction phase. Portable chemical toilets will be provided for the site workers. The Contractor will have the responsibility to ensure that chemical toilets are used and properly maintained, and that licensed contractors are employed to collect and dispose of the waste off-site at approved locations. Therefore, no adverse water quality impacts are anticipated.

Cumulative Impact from Concurrent Projects

6.18 A designated project “Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction” (under Environmental Permit EP-235/2005/A) will still on-going during the construction period of this Project. As detailed in Section 6.13, the cumulative impact at the water sensitive receivers is expected to be minimal given that the recommended mitigation measures to control site runoff and drainage water are properly implemented.

6.19 Another designated project “Drainage Improvement in Northern Hong Kong Island – Hong Kong West Drainage Tunnel” (under Environmental Permit EP-272/2007) proposed by Drainage Services Department will be carried out during the construction period of this Project. A small portion of the proposed drainage tunnel is beneath the subject site of this Project at about +20mPD (or more than 200m below the subject site of this Project). As this concurrent tunnelling works will be carried out underground and the vertical distance is far away from the works area of this Project, cumulative water quality impact due to the concurrent tunnelling works is not anticipated.

6.20 According to the latest available information of this concurrent drainage improvement project (DSD Contract No. DC/2007/10), tunnelling works and two portal formation works (one at Cyberport and one at Tai Hang) will begin in 2008. All other shaft works will be carried out not earlier than second quarter of 2009. As the portal works are far from the subject site of this Project and other works will be carried out after the completion of this Project, no cumulative water quality impact is expected from this concurrent project.

Mitigation Measures

6.21 Recommended mitigation measures for containing and minimizing potential water quality impacts during the construction activities are described below.

Construction Site Runoff and Drainage

6.22 Construction site runoff and drainage should be prevented or minimized in accordance with the guidelines stipulated in ProPECC PN 1/94 “Construction Site Drainage”. The specified mitigation measures and practices include the following:

- Provision of perimeter drains to intercept storm-runoff from outside the works area. These shall be constructed in advance of site formation works and earthworks. Earth bunds or sand bag barriers should be provided on-site to direct storm water to silt removal facilities. The design of

the temporary on-site drainage system will be undertaken by the Contractor prior to the commencement of construction.

- Sand/silt removal facilities such as sand/silt traps and sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standard under the Water Pollution Control Ordinance. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions. The detailed design of the sand/silt traps will be undertaken by the Contractor prior to the commencement of construction.
- Air would be used as the flushing medium of the drilling equipment to avoid the groundwater being affected by the flushing medium. In addition, permanent casing may be provided to the drillhole of soil nail within the permeable colluvium layer as instructed by the Engineer to minimize the impact to the groundwater table situated at the permeable soil stratum.
- An outlet pipe extending above the slope surface would be installed to facilitate collection of discharge of air, water and grout from the drillhole inserted with soil nail during grouting.
- All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit should be regularly removed, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times.
- Exposed slope/soil surface should be covered by tarpaulin as soon as possible to reduce the potential of soil erosion. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm. Other measures that need to be implemented before, during and after rainstorms are summarized in ProPECC PN 1/94.
- Open stockpiles of construction materials or construction wastes on-site of more than 50m³ should be covered with tarpaulin or similar fabric during rainstorms.

6.23 The Contractor should ensure that all site runoff and drainage arising from the works area are properly treated by the use of sedimentation tank, and that the discharge standards as stipulated in the “Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters” are met. The treated site runoff and drainage water should be discharged to the licensed point near the tunnel portal of the concurrent landslide preventive works at Po Shan under Agreement No. CE28/2004 (GE).

General Construction Site Activities

6.24 Debris and rubbish generated on-site should be collected, handled and disposed of properly to avoid being flushed or blown by wind into the drainage culvert. Stockpiles of cement and other construction materials should be kept covered when not being used.

6.25 Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents, all fuel tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event.

Sewage from Workforce

6.26 Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site where necessary to handle sewage from the workforce. A licensed contractor would be responsible for appropriate disposal of waste matter and maintenance of these facilities.

Evaluation Of Residual Impacts

- 6.27 With the full implementation of the recommended mitigation measures for the construction phase of the proposed Project, no unacceptable residual impacts on water quality are expected. It is recommended that regular audit of the implementation of the recommended mitigation measures at the work area be carried out during the construction phase.

Environmental Monitoring And Audit

- 6.28 Water quality monitoring is not considered necessary during the construction phase as no unacceptable water quality impact is expected. However, it is recommended that regular site inspections be undertaken to inspect the construction activities and works area in order to ensure the recommended mitigation measures are properly implemented. Any effluent discharges from the site would be required to comply with the terms and conditions of a discharge licence, issued by EPD, under the WPCO.

Conclusions

- 6.29 The key issue in terms of water quality during the construction phase of the Project would be the potential for release of sediment-laden water from works areas during site clearance and the proposed soil nailing and rock slope stabilization works. Minimisation of water quality deterioration could be achieved through implementing adequate mitigation measures such as control measures on site runoff and drainage from the works areas to minimise construction runoff, and on-site treatment of site runoff and drainage prior to discharge. Proper site management and good housekeeping practices would also be required to ensure that construction wastes and other construction-related materials would not enter the drainage culvert. Sewage effluent arising from the construction workforce would also be handled through provision of portable toilets.
- 6.30 With the implementation of these recommended mitigation measures, the construction works for the Project would not be expected to result in unacceptable impacts on water quality. Site inspections should be undertaken routinely to inspect the works areas in order to ensure the recommended mitigation measures are properly implemented.

7. CONSTRUCTION AIR QUALITY IMPACT

Introduction

- 7.1 Potential air quality impacts associated with the construction phase of the Project are presented in this section. Representative Air Sensitive Receivers (ASRs) have been identified. The potential air quality impacts on these receivers likely to result from the construction of the Project have been identified and evaluated. Potential impacts have been avoided wherever possible and appropriate mitigation measures have been proposed to minimise the potential air quality impact.

Environmental Legislation, Standards and Guidelines

- 7.2 The criteria for evaluating air quality impacts and the guidelines for air quality assessment are set out in Annex 4 and Annex 12 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM).

Air Quality Objective & EIAO-TMs

- 7.3 The Air Pollution Control Ordinance (APCO) provides the statutory authority for controlling air pollutants from a variety of sources. The Hong Kong Air Quality Objectives (AQOs), which must be satisfied, stipulate the maximum allowable concentrations over specific periods for typical pollutants. The relevant AQOs are listed in **Table 7.1**.

Table 7.1 Hong Kong Air Quality Objectives

Pollutant	Maximum Concentration ($\mu\text{g}/\text{m}^3$) ⁽¹⁾			
	Averaging Time			
	1 hour ⁽²⁾	8 hour ⁽³⁾	24 hour ⁽³⁾	Annual ⁽⁴⁾
Total Suspended Particulates (TSP)	-	-	260	80
Respirable Suspended Particulates (RSP) ⁽⁵⁾	-	-	180	55
Sulphur Dioxide (SO ₂)	800	-	350	80
Nitrogen Dioxide (NO ₂)	300	-	150	80
Carbon Monoxide (CO)	30,000	10,000	-	-
Photochemical Oxidants (as Ozone, O ₃) ⁽⁶⁾	240	-	-	-

Note:

- (1) Measured at 298 K and 101.325 kPa.
- (2) Not to be exceeded more than three times per year.
- (3) Not to be exceeded more than once per year.
- (4) Arithmetic mean.
- (5) Suspended particulates in air with a nominal aerodynamic diameter of 10 μm or smaller.
- (6) Photochemical oxidants are determined by measurement of ozone only.

- 7.4 The EIAO-TM stipulates that the hourly TSP level should not exceed 500 $\mu\text{g}/\text{m}^3$ (measured at 25°C and one atmosphere) for construction dust impact assessment. Standard mitigation measures for construction sites are specified in the Air Pollution Control (Construction Dust) Regulations.

Air Pollution Control (Construction Dust) Regulation

7.5 Notifiable and regulatory works are under the control of Air Pollution Control (Construction Dust) Regulation. Notifiable works are site formation, reclamation, demolition, foundation and superstructure construction for buildings and road construction. Regulatory works are building renovation, road opening and resurfacing slope stabilisation, and other activities including stockpiling, dusty material handling, excavation, concrete production, etc. This Project is expected to include regulatory works. Contractors and site agents are required to adopt construction dust suppression measures to reduce dust emission to the acceptable level.

Description of the Environment

7.6 The existing air quality near the proposed project site would be mainly contributed by emissions from vehicular traffic on nearby road works. In the absence of in-situ monitoring data, reference is made to the annual average concentrations of major air pollutants measured at EPD’s nearest monitoring stations (i.e. Central/Western Station) for the last 5 years. The latest 5-year annual average TSP levels at Central/Western station is 77µg/m³ according to *Air Quality 1999-2005* (annual averages of year 2001 and 2002 do not meet the minimum data requirement).

7.7 However the Central/Western Air Quality Monitoring Station is located in an urban area at a lower level (the sampling point is about +80 mPD) than the subject site (the level of Po Shan Road close to the subject site is about +180 mPD) and the traffic of the surrounding roads are more busy in compare with that of Po Shan Road. Hence it is expected that the annual average TSP level in the area of the subject site should be lower than 77µg/m³.

Air Sensitive Receivers

7.8 Based on the criteria set out in *Annex 12* of the EIAO-TM, representative air receivers (ASRs) have been identified close to the Project site. A brief description of the representatives ASRs is summarized in **Table 7.2** and the ASR locations are shown on **Figure 7.1**.

Table 7.2 Summary of Representative Air Sensitive Receivers

ASR	Description	Horizontal Separation from Closest Works Area Boundary (m)	Height of ASR (storeys)	Land Use
A1	Block A, Po Shan Mansions	7	20	Residential
A2	Hamilton Court	145	20	Residential
A3	Piccadilly Mansion	165	20	Residential
A4	Ching Yuen Garden	320	1	Residential
A5	No. 21 Po Shan Road	45	2	Residential
A6	No. 53 Conduit Road	55	3	Residential
A7	No. 23 Po Shan Road	80	8	Residential
A8	No. 24 Po Shan Road	95	3	Residential
A9	No. 30 Po Shan Road	225	3	Residential
A10	Pok Fu Lam Country Park	_(1)	n/a	Country Park

Note: (1) The landslide preventive works fall partially within the Pok Fu Lam Country Park

Identification of Pollutant Sources

- 7.9 Potential impacts arising from the construction of the proposed landslide preventive work would include dust nuisance and gaseous emissions from the construction plant and vehicles. The major construction activities would generate potential sources of construction dust in the Study Area include soil nail installation, rock slope stabilization and raking drain installation. It is anticipated that dust would be generated from excavation, materials handling and wind erosion from the site.
- 7.10 The construction of the Project would induce additional traffic to the existing Po Shan Road. Based on the preliminary construction programme, it is envisaged that only about two construction vehicles per day (on average) would be induced by the proposed Project. Air quality impact due to project induced traffic emissions would be expected to be minor.
- 7.11 As discussed in Sections 2.9 to 2.16, the proposed construction method of this Project is optimized with both engineering practicability and minimal environmental impacts.

Assessment Methodology

- 7.12 As the scale of works including excavation would be minor, it is expected that, with implementation of dust suppression measures as stipulated in the Air Pollution Control (Construction Dust) Regulation and proposed mitigation measures, significant dust impact would not arise. A qualitative approach to evaluate the air quality impact pertinent to the construction of the Project is therefore adopted.

Evaluation of Impacts

- 7.13 Construction activities would be carried out in Works Areas E and F with no more than 6 drill rigs. The quantity of dust generated by the soil nail installation, soil nail and raking drain installation would be limited. In view of the limited number of equipment operating on site and the scale of the works to be carried out, air quality impact during construction phase is not expected. With the implementation of standard dust suppression measures as stipulated in the Air Pollution Control (Construction Dust) Regulation and recommended measures in Section 7.16, there would be no adverse dust impacts on the ASRs in the vicinity of the construction sites. Additionally, an environmental monitoring and audit programme will be implemented during construction to ensure all the proposed mitigation measures would be properly in place.

Cumulative Impacts

- 7.14 There is another designated project “Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction” (under Environmental Permit EP-235/2005/A) on-going during the construction period of the Project. As the majority of the construction works of this concurrent project is carried out inside tunnel and the scale of other proposed works is small with limited number of plants, it is concluded in the Project Profile of this concurrent project that adverse air quality impacts would not be expected. Standard dust suppression measures as stipulated in the Air Pollution Control (Construction Dust) Regulation are also recommended to be implemented for the concurrent project.
- 7.15 In the light of the above, adverse cumulative air quality impacts on the ASRs in the vicinity of the construction sites would not be envisaged.

Mitigation of Adverse Environmental Impacts

Good Site Practice

- 7.16 To ensure compliance with the guideline level and AQO, the Air Pollution Control (Construction Dust) Regulation should be implemented and good site practices should be incorporated into the contract clauses to minimize construction dust impact. A number of practical measures are listed below:
- Covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines.
 - Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs.
 - Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations.
 - Use of vehicle wheel and body washing facilities at the exit points of the site.
 - Dusty activities should be re-scheduled where possible if high-wind conditions are encountered.
 - Instigation of an environmental monitoring and auditing program to monitor the construction process in order to enforce controls and modify method of work if dusty conditions arise.

Evaluation of Residual Impacts

- 7.17 With the implementation of the Air Pollution Control (Construction Dust) Regulation and proposed mitigation measures, adverse residual impact is not expected.

Environmental Monitoring and Audit

- 7.18 An Environmental Monitoring and Audit (EM&A) programme is recommended to be established to check compliance with legislative requirements. All the recommended mitigation measures should be incorporated into the EM&A programme for implementation during construction. Details are provided in a stand-alone EM&A Manual.

Conclusion

- 7.19 With the implementation of effective dust suppression measures, no adverse construction dust impact would be expected in the vicinity of the project.

8. WASTE MANAGEMENT

Introduction

- 8.1 This section identifies the types of solid wastes that are likely to be generated during the construction phase of the Project and evaluates the potential environmental impacts that may result from these wastes. The main solid waste would be construction and demolition (C&D) material generated from site clearance, soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation. Mitigation measures and good site practices, including measures for waste handling, storage and disposal, are recommended with reference to the applicable waste legislation and guidelines.

Environmental Legislation and Standards

- 8.2 The criteria and guidelines for assessing waste management implications are set out in Annex 7 and Annex 15 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), respectively.
- 8.3 The following legislation relates to the handling, treatment and disposal of wastes in the Hong Kong SAR and has been used in assessing potential impacts:
- Waste Disposal Ordinance (Cap. 354)
 - Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354)
 - Land (Miscellaneous Provisions) Ordinance (Cap. 28)
 - Public Health and Municipal Services Ordinance (Cap. 132) - Public Cleansing and Prevention of Nuisances Regulation

Waste Management

- 8.4 The Waste Disposal Ordinance (WDO) prohibits the unauthorised disposal of wastes. Construction waste is defined as any substance, matter or thing that is generated from construction work and abandoned, whether or not it has been processed or stockpiled before being abandoned, but does not include any sludge, screenings or matter removed in or generated from any desludging, desilting or dredging works. Under the WDO, wastes can be disposed of only at designated waste disposal facilities.
- 8.5 Under the WDO, the Chemical Waste (General) Regulation 1992 provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes. The Environmental Protection Department (EPD) has also issued a 'guideline' document, the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), which details how the Contractor should comply with the regulations on chemical wastes.
- 8.6 The Public Cleansing and Prevention of Nuisances Regulation provides control on illegal tipping of wastes on unauthorised (unlicensed) sites.

Construction and Demolition (C&D) Materials

- 8.7 The current policy related to the disposal of C&D material is documented in the Works Branch Technical Circular No. 2/93, 'Public Dumps'. Construction and demolition materials that are wholly inert, namely public fill, should not be disposed of to landfill, but taken to public filling areas, which usually form part of reclamation schemes. The Land (Miscellaneous Provisions) Ordinance requires

that dumping licences be obtained by individuals or companies who deliver public fill to public filling areas. The Civil Engineering & Development Department (CEDD) issues the licences under delegated powers from the Director of Lands.

- 8.8 Under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation, enacted in January 2006, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert material, and construction waste delivered to a public fill reception facility for disposal must consist entirely of inert material.
- 8.9 Measures have been introduced under Environment, Transport and Works Bureau (ETWB) TCW No. 33/2002, "Management of Construction and Demolition Material Including Rock" to enhance the management of construction and demolition material, and to minimize its generation at source. The enhancement measures include: (i) drawing up a Construction and Demolition Material Management Plan (C&DMMP) at the feasibility study or preliminary design stage to minimize C&D material generation and encourage proper management of such material; (ii) vetting of the C&DMMP prior to upgrading of the project to Category A in the Public Works Programme; and (iii) providing the contractor with information from the C&DMMP in order to facilitate him in the preparation of the Waste Management Plan (WMP) and to minimize C&D material generation during construction. Projects generating C&D material less than 50,000 m³ or importing fill material less than 50,000 m³ are exempt from the C&DMMP.

Assessment Methodology

- 8.10 The criteria for assessing waste management implications are outlined in Annex 7 of the EIAO-TM. The methods for assessing potential waste management impacts during the construction phase follow those presented in Annex 15 of the EIAO-TM and include the following:
- Estimation of the types and quantities of the wastes to be generated.
 - Assessment of potential impacts from the management of solid waste with respect to potential hazards, air and odour emissions, noise, wastewater discharge and transport.
 - Assessment of impacts on the capacity of waste collection, transfer and disposal facilities.

Prediction and Evaluation of Environmental Impacts

- 8.11 The construction activities to be carried out for the proposed Project would generate a variety of wastes that can be divided into distinct categories based on their composition and ultimate method of disposal. The identified waste types include:
- Construction and demolition (C&D) material
 - General refuse
 - Chemical waste
- 8.12 Each type of waste arising is described below, together with an evaluation of the potential environmental impacts associated with generation, handling, storage and transport of the waste.

Construction and Demolition Materials

8.13 Construction and demolition (C&D) material would be generated from site clearance, soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation. The estimated total volume of C&D material is approximately 995 m³. The C&D material would comprise approximately 93% soil. A breakdown of the volume of C&D material generated from the various works items is given in **Table 8.1**. Given the nature of the construction activities for the Project, it is anticipated that there would not be any opportunity for the reuse of C&D material on-site.

Table 8.1 Estimated Quantities of C&D Material

Construction works	Soil, m ³	Rock, m ³	Total, m ³
Site Clearance and Set up	100	-	100
Soil Nail Installation	250	-	250
Soil Nail Head Construction	500	-	500
Raking Drain Installation	10	-	10
Scaling	50	50	100
Rock bolts / dowels	10	10	20
Landscape Works	10	5	15
			995

8.14 The C&D material would require disposal at the designated public fill reception facility, as agreed with the Secretary of the Public Fill Committee, for other beneficial uses. Provided that a trip-ticket system is established for the disposal of the C&D material, as recommended in Section 8.24, and that good site practices are adhered to, adverse environmental impacts and nuisance would not be expected.

Chemical Waste

8.15 The maintenance and servicing of construction plant and equipment may generate some chemical wastes such as cleaning fluids, solvents, lubrication oil and fuel. It is difficult to quantify the amount of chemical waste that will arise from the construction activities since it will be dependent on the Contractor's on-site maintenance requirements and the amount of plant utilised. However, it is anticipated that the quantity of chemical waste, such as lubricating oil and solvent produced from plant maintenance, would be small and in the order of a few cubic metres per month. The amount of chemical waste to be generated will be quantified in the site Waste Management Plan to be prepared by the Contractor.

8.16 Chemical wastes arising during the construction phase may pose environmental, health and safety hazards if not stored and disposed of in an appropriate manner as stipulated in the Waste Disposal (Chemical Waste) (General) Regulations. The potential hazards include:

- Toxic effects to workers
- Adverse impacts on water quality from spills
- Fire hazards

8.17 Materials classified as chemical wastes will require special handling and storage arrangements before removal for appropriate treatment at the Chemical Waste Treatment Facility (CWTF) or other licensed facility. Wherever possible opportunities should be taken to reuse and recycle materials. Mitigation and control requirements for chemical wastes are detailed in Section 8.23. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, adverse environmental impacts would not be expected to result.

General Refuse

- 8.18 The construction workforce would generate general refuse comprising food scraps, waste paper, empty containers, etc. Such refuse should be properly managed so intentional or accidental release to the surrounding environment does not occur. Disposal of refuse at sites other than approved waste transfer or disposal facilities shall be prohibited. Effective collection of site wastes would be required to prevent waste materials being blown around by wind or creating an odour nuisance or pest and vermin problem. Waste storage areas should be well maintained and cleaned regularly. With the implementation of good waste management practices at the site, adverse environmental impacts would not be expected from the storage, handling and transportation of workforce wastes.

Mitigation Measures

Good Site Practices

- 8.19 Adverse impacts related to waste management are not expected to arise, provided that good site practices are strictly followed. Recommendations for good site practices during the construction activities include:
- Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site.
 - Training of site personnel in proper waste management and chemical waste handling procedures.
 - Provision of sufficient waste disposal points and regular collection for disposal.
 - Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers.
 - Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors.

Waste Reduction Measures

- 8.20 Good management and control can prevent the generation of a significant amount of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:
- Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal.
 - Encourage collection of aluminium cans, PET bottles and paper by providing separate labelled bins to enable these wastes to be segregated from other general refuse generated by the work force.
 - Any unused chemicals or those with remaining functional capacity shall be recycled.
 - Proper storage and site practices to minimise the potential for damage or contamination of construction materials.
 - Plan and stock construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste.
- 8.21 In addition to the above measures, specific mitigation measures are recommended below for the identified waste arisings to minimise environmental impacts during handling, transportation and disposal of these wastes.

General Refuse

- 8.22 General refuse should be stored in enclosed bins or compaction units separate from C&D material. A licensed waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.

Chemical Wastes

- 8.23 After use, chemical wastes (for example, cleaning fluids, solvents, lubrication oil and fuel) should be handled according to the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Spent chemicals should be collected by a licensed collector for disposal at the CWTF or other licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

Construction and Demolition Material

- 8.24 In order to monitor the disposal of public fill at public fill reception facilities and to control fly tipping, a trip-ticket system should be established in accordance with ETWB TCW No. 31/2004.

Evaluation of Residual Impacts

- 8.25 With the implementation of the recommended mitigation measures for the handling, transportation and disposal of the identified waste arisings, no residual impact is expected to arise during the construction of the proposed Project.

Environmental Audit

- 8.26 Waste management will be the contractor's responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and EPD's regulations and requirements. The recommended mitigation measures should form the basis of the site Waste Management Plan to be developed by the Contractor in the construction stage and deposit with EPD.
- 8.27 It is recommended that the waste arisings generated during the construction activities be audited periodically to determine if wastes are being managed in accordance with approved procedures and the site Waste Management Plan. In addition, the routine site inspections should check the implementation of the recommended good site practices and other waste management mitigation measures.

Conclusion

- 8.28 Wastes generated by the construction activities are likely to include C&D material, general refuse from the workforce and chemical waste from the maintenance of construction plant and equipment. Provided that these identified waste arisings are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts would not be expected during the construction phase.

9. ENVIRONMENTAL MONITORING AND AUDIT (EM&A) REQUIREMENTS

Introduction

- 9.1 This EIA Study has focused on the assessment of the identified potential impacts and recommended necessary mitigation measures associated with the construction and operation of the Project.
- 9.2 According to EPD's *EM&A Guidelines for Development Projects in Hong Kong*, the need of an EM&A programme for this Project is concluded with the following reasons:
- the project has the potential of causing environmental impacts which are or are likely to be prejudicial to the health or well being of the flora, fauna if the recommended mitigation measures are not properly implemented; and
 - the project is situated in area of high conservation value.
- 9.3 To ensure effective and timely implementation of the recommended mitigation measures, it is considered necessary to develop EM&A procedures and mechanisms in order to alleviate those residual impacts to comply with the requirements of the EIAO-TM.
- 9.4 This chapter provides an outline of the EM&A requirements for the Project. A detailed scope of work will be provided in the EM&A Manual, prepared in accordance with Annex 21 of the EIAO-TM and EPD's *EM&A Guidelines for Development Projects in Hong Kong*.
- 9.5 The objectives of carrying out EM&A for the Project include the following:
- to provide a database against which any short or long term environmental impacts of the Project can be determined
 - to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards
 - to monitor the performance of the Project and the effectiveness of mitigation measures
 - to verify the environmental impacts predicted in this EIA
 - to determine project compliance with regulatory requirements, standards and government policies
 - to take remedial action if unexpected problems or unacceptable impacts arise
 - to provide data to enable an environmental audit.
- 9.6 The following sections summarise the recommended EM&A requirements. Details of EM&A are provided in a stand-alone EM&A Manual.

Ecological Impact

Construction Phase

- 9.7 An EM&A programme is recommended to be established to check compliance with legislative requirements. All the recommended mitigation measures should be incorporated into the EM&A programme for implementation during construction.

Operation Phase

- 9.8 No mitigation measures or environmental monitoring are considered necessary during the operation phase of the Project.

Landscape and Visual Impact

- 9.9 The implementation and maintenance of the landscape compensatory planting measures is a key aspect and should be checked to ensure that the proposal are fully realised. It is recommended that implementation and operation maintenance of all the proposed landscape and visual mitigation measure are included within the EM&A. During the Construction and operation stages, EM&A will comprise auditing of the compensatory planting and 12 months planting establishment in the form of monthly site inspection. The operation stage auditing shall be undertaken for one year during the Contractor's maintenance period.

Construction Phase

- 9.10 All mitigation measures proposed in the EIA and implemented by the Contractor should be audited by a registered landscape architect, as a member of the Environmental Team, on a monthly basis to ensure compliance with the intended aims of the measures. Site inspection should be undertaken on a monthly basis throughout the construction period to ensure the recommended mitigation measures are properly implemented, and should focus on the following items:

- Protection of existing vegetation, erection of protective measures
- Soil erosion control
- Tree planting operations, checking method statement against specification requirements

- 9.11 In particular, all retained trees within the working boundary should be regularly checked during the construction phase. Any trespass by the main contractor, including damage to the tree canopy edge, should be reported to the Engineer.

Operation Phase

- 9.12 Monthly site inspections should be undertaken to ensure the compensatory planting and horticultural maintenance operations are properly established during the 12 month establishment period. Inspection auditing should focus on the following horticultural maintenance operations:-

- Inspection for fungal / viral attacks and pest infestations
- Litter collection
- Watering
- Weeding removal
- Replacement of defective planting material
- Grass cutting / groundcover trimming and removal of arisings
- Fertilising application as required in specification
- Aeration / mulching application

Construction Noise Impact

- 9.13 Construction works of this Project, in addition to the concurrent construction with another Project “Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction” on-going during the same period within the captioned area which will also be carried out by the Project Proponent, would cause potential cumulative construction noise impacts at some noise sensitive receivers identified in this EIA Study.
- 9.14 Appropriate mitigation measures would be required in order to alleviate the impacts to meet the EIAO-TM criteria. Noise monitoring during construction phase would be considered necessary to ensure that such mitigation measures would be implemented properly. Details of EM&A are provided in a stand-alone EM&A Manual.

Construction Water Quality Impact

- 9.15 The water quality assessment concluded that the identified water quality impacts could be minimized by implementing the recommended mitigation measures for the construction works, such as control measures on site runoff and drainage from the works areas and proper site management and good housekeeping practices. No unacceptable residual water quality impact was expected and hence water quality monitoring was considered not necessary during the construction phase. Any effluent discharges from the site would be required to comply with the terms and conditions of a discharge licence, issued by EPD, under the WPCO. It would be recommended that regular site inspections be undertaken to inspect the construction activities and works areas in order to ensure the recommended mitigation measures are properly implemented.

Construction Air Quality Impact

- 9.16 With implementation of the proposed dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation, good site practices and regular dust monitoring and audit, the potential dust impact would be minimized and comply with HKAQO.
- 9.17 Dust monitoring requirements are recommended in the EM&A Manual to ensure the efficacy of the control measures.

Waste Management

- 9.18 Waste management will be the contractor’s responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with the recommended good waste management practices and EPD’s regulations and requirements. The mitigation measures recommended in Section 8 should form the basis of the site Waste Management Plan to be developed by the Contractor at the construction stage.
- 9.19 It is recommended that the waste arisings generated during the construction activities should be audited periodically to determine if wastes are being managed in accordance with approved procedures and the site Waste Management Plan. The audits should look at all aspects of waste management including waste generation, storage, transport and disposal. An appropriate audit programme would be to undertake the first audit near the commencement of the construction works, and then to audit on a quarterly basis thereafter. In addition, the routine site inspections should check the implementation of the recommended good site practices and other waste management mitigation measures.

10. IMPACTS SUMMARY

Introduction

- 10.1 This EIA study has provided an assessment of the potential environmental impacts associated with the construction and operation of the Project according to the latest information available.
- 10.2 The environmental issues below have been assessed in the EIA Study, in accordance with the EIA Study Brief (No. ESB-158/2006) registered under the EIAO for the Project:
- Ecological Impact
 - Landscape and Visual Impacts
 - Construction Noise Impact
 - Construction Water Quality Impact
 - Construction Air Quality Impact
 - Waste Management Implications
- 10.3 Specific mitigation measures necessary for avoiding or reducing impacts from the Project to acceptable levels, as well as environmental monitoring auditing procedures to ensure full implementation of all mitigation measures, as well as compliance with relevant standards and guidelines, have been developed during the detailed assessments.
- 10.4 A summary of the environmental impacts associated with the Project are presented in **Appendix 10.1**. For each key environmental issue, the predicted impact level, relevant criteria, recommended mitigation measures and residual impact at the sensitive receivers have been clearly summarised.
- 10.5 The key assessment assumptions, limitation of assessment methodologies and all relevant prior agreements with the EPD on individual environmental media assessment components are given in **Appendix 10.2**.

Ecological Impact

- 10.6 The key issue arising from the landslide preventive works during the construction stage would include the direct impact on 2 plant species of conservation interest, Small Persimmon and Common Tutcheria, the disturbance impacts to habitats and associated communities within and adjacent to the proposed works areas, particular the bat roost of Short-nosed Fruit Bat within the proposed works area, dumping of construction wastes and dust deposition, and sediment and water quality impacts.
- 10.7 To avoid/minimize potential impacts on plant species of conservation interest, the construction design has been considered to avoid impact to these species. Also, given that the Small Persimmon are locally common and widespread and are not threatened in Hong Kong, the potential loss or damage of a relatively small number of individuals would be a minor impact and hence no transplantation works was required. Nevertheless, planting of suitable plant species including Small Persimmon would be provided to reinstate the impact understory habitat.
- 10.8 A detailed search for the floral species of conservation concern, including but not limited to Small Persimmon, Common Tutcheria, Bird-nest Fern and Chinese Pholidota, would be conducted. These

species would be labelled on site prior to the commencement of works to avoid or minimize the damage to the floral species of conservation importance present in the proposed works area.

- 10.9 With the implementation of the recommended mitigation measures including the use of effective quiet machinery, the control of soil nail installation work hours, construction works would not result in unacceptable disturbance impacts on the bat and bird populations.
- 10.10 With the implementation of standard good site practice, construction works would not result in unacceptable impacts of dumping and dust deposition on vegetation adjacent to the proposed works area.
- 10.11 With the implementation of the recommended mitigation measures including adequate construction site drainage and provision of sediment removal facilities, construction works would not result in unacceptable water quality impacts on the two streams, drainage culvert and the associated fauna including Lesser Spiny Frog, Hong Kong Cascade Frog and Mountain Crab.
- 10.12 Fences would be erected and installed along the boundary of the proposed works area before the commencement of works in order to minimise the disturbance to the natural woodland and shrubland habitats by preventing tipping, vehicle movements and encroachment of personnel onto the adjacent areas.
- 10.13 No substantial increases in direct and indirect ecological impacts during operation stage are expected.
- 10.14 A specific monitoring programme of the plant individuals of conservation interest identified within the proposed works area during the detailed vegetation survey should be carried out by a suitably qualified local ecologist(s) with over 7 years relevant ecological experience. Regular monitoring of the trees, shrubs and herbs should be conducted to check on the health and condition of the plants. Monitoring should be conducted twice a month cover the whole construction period.

Landscape and Visual Impact

- 10.15 There is expected to be some minor impact upon the existing woodland, which is approximately 2000m², within the works area. The Engineer confirmed that no trees will be felled or requires transplanting due to the proposed landslide preventive works. However, the rest of groundcover / scrub will be affected. With the proposed mitigation measures, residual impacts are expected to be insubstantial after year 10.
- 10.16 Residents in the medium rise development along Po Shan Road (R1A, R1B, R1C) are immediately adjacent or very close to the proposed landslide preventive works. They will have short range views to the proposed works. Residents in the medium rise development along Conduit Road (R1E) and in high rise development adjacent to HKU (R1F) will have partial views to the proposed landslide preventive works. Mitigation in the form of woodland planting will help in reducing impacts. Planting is expected to be well established at Year 10. Residual impacts are expected to be insubstantial.
- 10.17 After the proposed mitigation measures have been implemented and the proposed tree planting has matured over 10 years, all residual adverse landscape and visual impacts in operation phase will be of insubstantial significance.

Construction Noise Impact

- 10.18 The potential noise impact arising from daytime construction activities on the noise sensitive receivers (NSRs) located in the vicinity of the work sites was assessed. Noise generated from the use of powered mechanical equipment (PME) associated with the construction activities proposed for the Project would be the main concern.

- 10.19 The assessment results indicated that in the absence of mitigation measures, cumulative noise levels at the NSRs at Po Shan Mansions would likely exceed the EIAO-TM noise criterion during construction.
- 10.20 In order to alleviate the predicted construction noise impacts, noise reduction measures including the adoption of good site practices, the use of quieter plant, noise barrier/enclosure and noise insulating fabric would be necessary. With the recommended mitigation measures in place, noise levels at all NSRs are predicted to comply with the EIAO-TM daytime construction noise criterion. No adverse residual construction noise impact is expected.

Construction Water Quality Impact

- 10.21 The key issue in terms of water quality during the construction phase of the Project would be the potential for release of sediment-laden water from works areas during site clearance and the proposed soil nailing and rock slope stabilization works. Minimisation of water quality deterioration could be achieved through implementing adequate mitigation measures such as control measures on site runoff and drainage from the works areas to minimise construction runoff, and on-site treatment of site runoff and drainage prior to discharge. Proper site management and good housekeeping practices would also be required to ensure that construction wastes and other construction-related materials would not enter the drainage culvert. Sewage effluent arising from the construction workforce would also be handled through provision of portable toilets.
- 10.22 The installation of the soil nails and raking drains would not involve any pumping or discharge of groundwater and air would be used as the flushing medium. Hence, the groundwater would not be affected by the flushing medium of the drilling equipment. In addition, permanent casing may be provided to the drillhole of soil nail within the permeable colluvium layer as instructed by the Engineer. This extra measure would also minimize the impact to the groundwater table situated at the permeable soil stratum.
- 10.23 Potential sources of pollution from the construction and installation of the soil nails may include: effluent discharge during grouting and wash water from dust suppression sprays. An outlet pipe extending above the slope surface would be installed to facilitate collection of discharge of air, water and grout from the drillhole inserted with soil nail during grouting. With this appropriate setup, spillage during the grouting operation would be effectively controlled.
- 10.24 With the implementation of these recommended mitigation measures, the construction works for the Project would not be expected to result in unacceptable impacts on water quality. Site inspections should be undertaken routinely to inspect the works areas in order to ensure the recommended mitigation measures are properly implemented.

Construction Air Quality Impact

- 10.25 With the implementation of effective dust suppression measures, no adverse construction dust impact would be expected in the vicinity of the project.

Waste Management Implications

- 10.26 Wastes generated by the construction activities are likely to include C&D material, general refuse from the workforce and chemical waste from the maintenance of construction plant and equipment. Provided that these identified waste arisings are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts would not be expected during the construction phase.

11. CONCLUSIONS AND RECOMMENDATIONS

- 11.1 This EIA Report has provided an assessment of the potential environmental impacts associated with the construction and operation phases of the landslide preventive works at Po Shan, Mid-levels.
- 11.2 The identified key environmental issues below have been assessed in this EIA report, in accordance with the EIA Study Brief (No. ESB-158/2006) registered under the EIAO for the Project:
- Ecological impact
 - Landscape and visual impact
 - Construction noise impact
 - Construction water quality impact
 - Construction air quality impact
 - Waste management impact
- 11.3 The findings of this EIA study have determined the likely nature and extent of environmental impacts predicted to arise from the construction and operation of the Project. The EIA has, where appropriate, identified mitigation measures to ensure compliance with environmental legislation and standards.
- 11.4 Overall, the EIA study for the proposed Project, with the implementation of the proposed mitigation measures for construction and operation phases, would comply with all applicable environmental standards and legislation. **Table 11.1** summarises the environmental outcomes that have accrued from environmental considerations and analysis during the EIA process and implemented in design of the Project and the recommended mitigation measures. Environmental monitoring and audit mechanisms have been recommended, where necessary, to verify the accuracy of the EIA predictions and the effectiveness of recommended mitigation measures.

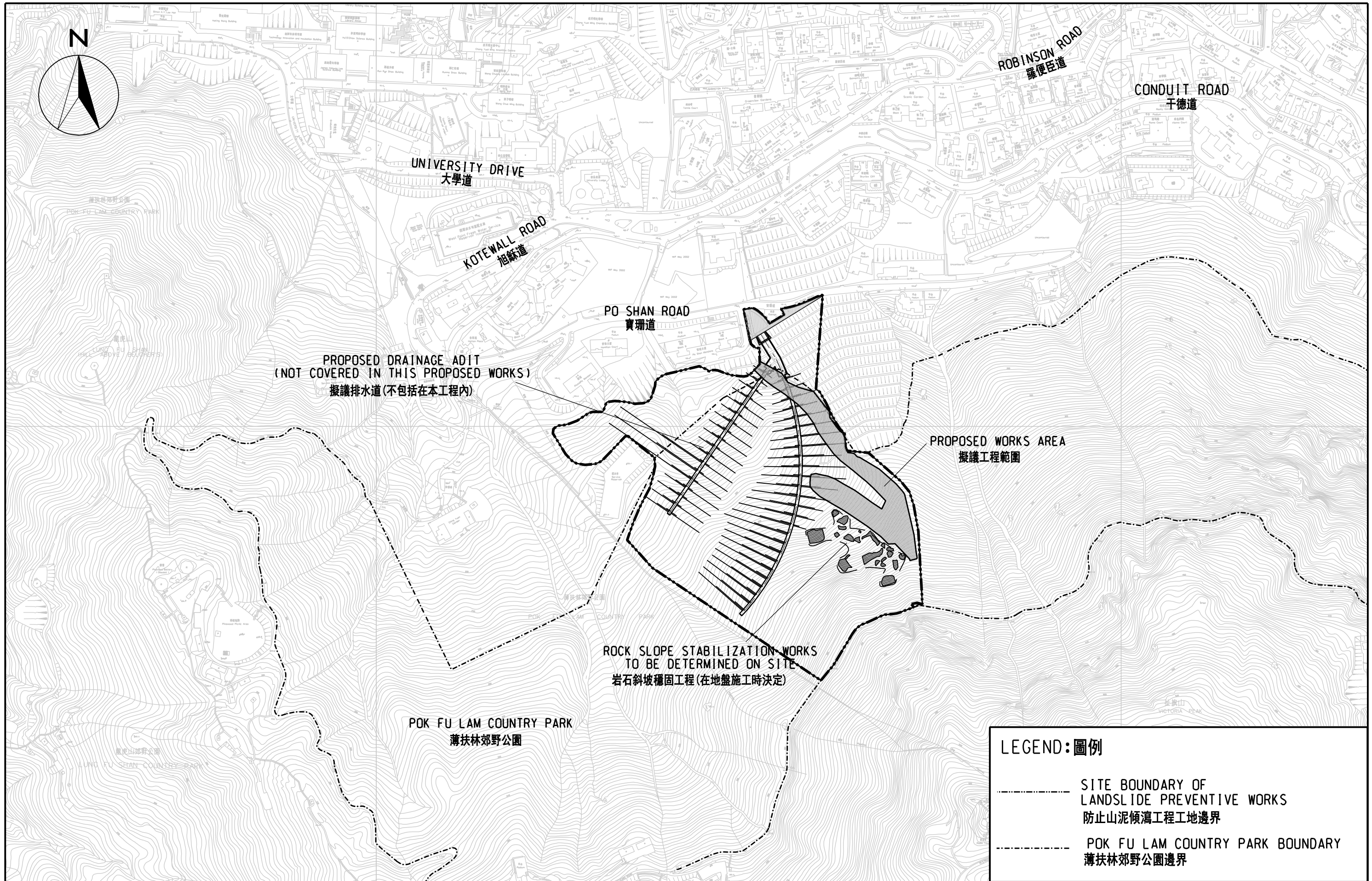
Table 11.1 Summary of Key Environmental Outcomes

Key Environmental Issue	Environmental Outcomes and Mitigation Measures
Ecology	<p>No tree felling would be required under the current proposed scheme.</p> <p>Ecological impacts on plant species of conservation interest, Small Persimmon and Common Tutcheria, would be minor and acceptable with careful selection of the location of scaffolding, drilling, soil nail and nail head installation.</p> <p>A detailed search for the floral species of conservation concern, including but not limited to Small Persimmon, Common Tutcheria, Bird-nest Fern and Chinese Pholidota, would be conducted in the works area. The damage to the floral species of conservation importance would be avoided or minimized with well labelling on site prior to the commencement of works.</p> <p>The understorey vegetation of the woodland habitats that affected by the proposed works would be reinstated by planting of suitable shrubs/herbs, including the Small Persimmon, within the impacted</p>

Key Environmental Issue	Environmental Outcomes and Mitigation Measures
	<p>areas under this Project.</p> <p>Ecological impact on Short-nosed Fruit Bat was most probably caused by disturbance impact. With the use of quiet construction plant and insulating fabric for drill rigs, construction phase noise disturbance would be minimised. The worse-case scenario, it may cause roosting bats to move away and result in the abandonment of roosting site. This outcome would still be regarded as a relatively minor impact. Within 500m from the location of the roosting site (the two palm trees), a large number of preferred roosting habitats, palm trees and banana plantation could be found, it is probable that the bats would simply re-locate alternative roost sites if disturbed.</p> <p>Chinese Fan-palm (<i>Livistona chinensis</i>) would also be planted near the existing bat roost to provide suitable habitat for the Short-nosed Fruit Bat after the completion of landslide preventive works.</p> <p>With implementation of standard good site practice, impacts resulting from improper dumping of construction materials/wastes and deposition of dust on vegetation adjacent to works areas can be avoided and minimized to acceptable levels. The impact to the vegetation was considered minor.</p> <p>By controlling construction site runoff and drainage from the proposed works areas, cleaning and maintaining sand traps, silt traps and where appropriate, the risk of sedimentation and pollution to the nearby stream course and drainage culvert were minimised. No discharge of site runoff and drainage into the nearby stream courses, drainage would be resulted. Hence, the impacts on the watercourses and the associated fauna considered minor and acceptable.</p> <p>Fences would be erected and installed along the boundary of the proposed works area before the commencement of works in order to minimise the disturbance to the natural woodland and shrubland habitats by preventing tipping, vehicle movements and encroachment of personnel onto the adjacent areas.</p> <p>A specific monitoring programme of the plant individuals of conservation interest identified within the proposed works area during the detailed vegetation survey should be performed. Regular monitoring of the trees, shrubs and herbs should be conducted to check on the health and condition of the plants. Monitoring should be conducted twice a month cover the whole construction period.</p>
Landscape and Visual	<p>Groundcover / scrub within the works area will be affected due to the proposed landslide preventive works. The impacts would be acceptable with the implementation of woodland and native shrub planting as the mitigation measures.</p>

Key Environmental Issue	Environmental Outcomes and Mitigation Measures
	Residents in the medium rise development along Po Shan Road (R1A, R1B, R1C) will have short range views to the proposed landslide preventive works. Residents in the medium rise development along Conduit Road (R1E) and in high rise development adjacent to HKU (R1F) will have partial views to the proposed landslide preventive works. Mitigation in the form of woodland planting will help in reducing impacts.
Construction Noise	NSRs at Po Shan Mansions could be affected by noise arising from the construction of the Project. With the adoption of quieter plant, movable noise barrier, noise enclosure and noise insulating fabric and good site practices, all representative NSRs in the vicinity of the project site would comply with the noise criterion. No adverse residual construction noise impact would be expected.
Construction Water Quality	Water quality impacts from construction activities would be controlled by implementing the recommended mitigation measures.
Construction Air Quality	The construction air quality impact is expected to be minimal according to the nature of the proposed construction activities. No adverse dust impacts would be expected on the identified ASRs with the implementation of dust suppression measures.
Waste Management	Construction waste arisings have been identified based on the proposed construction activities and would comprise C&D material, general refuse and chemical waste. Provided that the identified waste arisings are to be handled, transported and disposed of using approved methods and the recommended good site practices are to be strictly followed, adverse environmental impacts would not be expected during the construction phase.

- 11.5 The implementation schedule of the proposed mitigation measures for the Project is presented in **Appendix 11.1**. For recommended mitigation measures of each key environmental issue, the location and timing for the measures have been clearly identified as well as the parties responsible for implementing the measures.



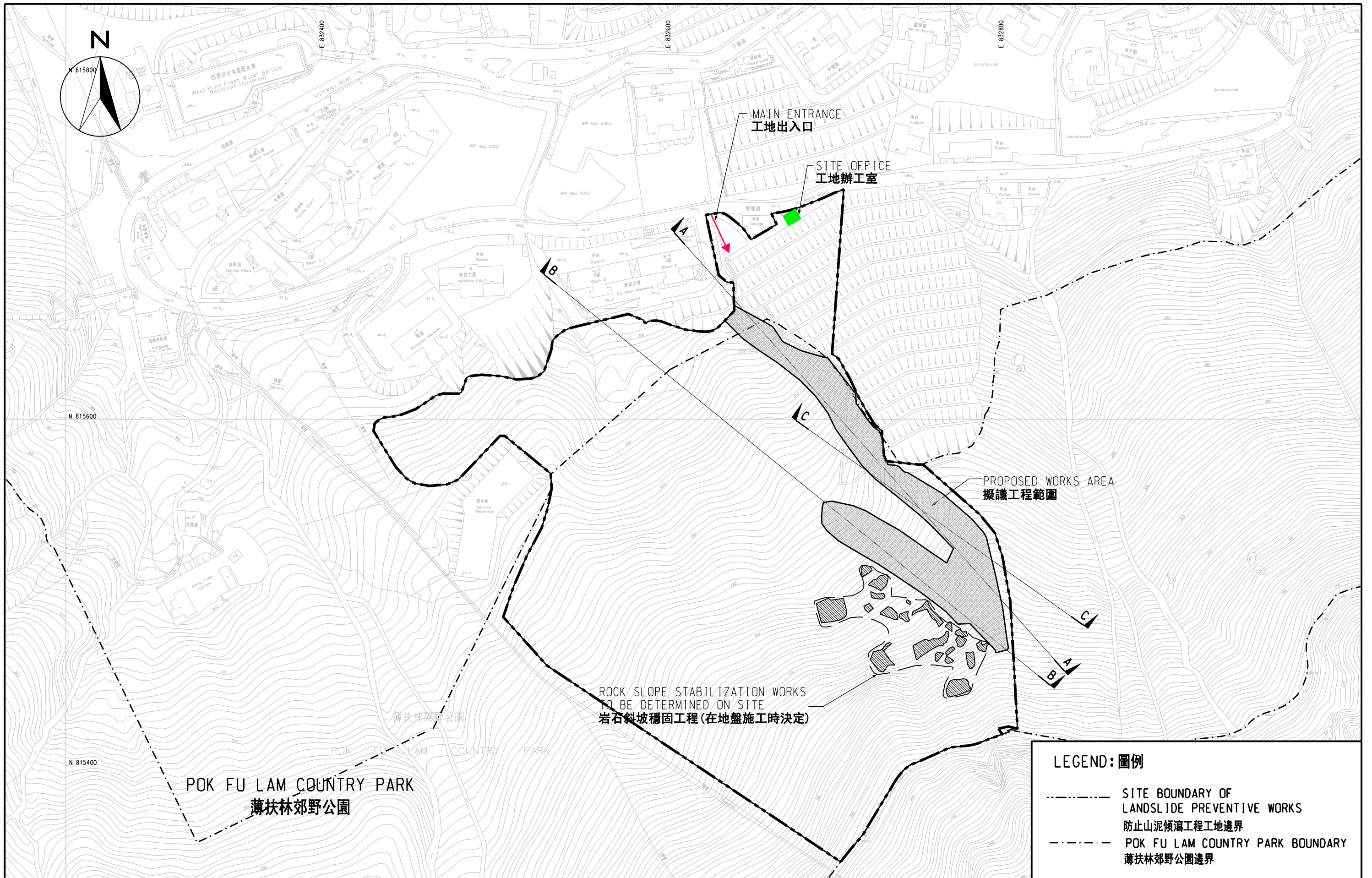
LEGEND: 圖例

	SITE BOUNDARY OF LANDSLIDE PREVENTIVE WORKS 防止山泥傾瀉工程工地邊界
	POK FU LAM COUNTRY PARK BOUNDARY 薄扶林郊野公園邊界

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LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID LEVEL - NATURAL TERRAIN RISK MITIGATION WORKS
半山區寶珊地段防止山泥傾瀉工程 - 天然山坡滑坡災害緩減工程
LOCATION PLAN FOR THE PROJECT
工程項目位置圖

SCALE	A3 1:3500	DATE	MAY 07
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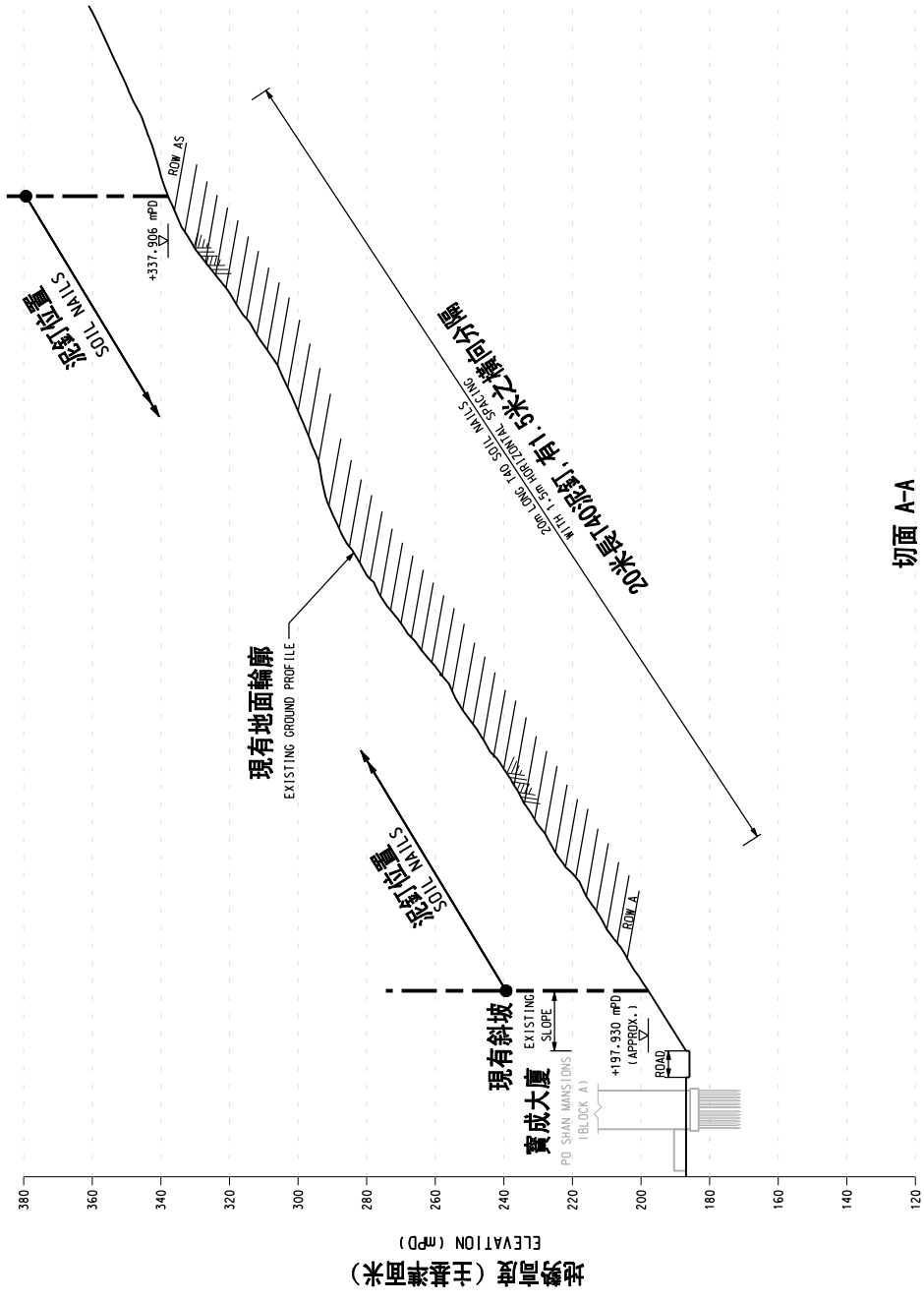
LEGEND: 圖例

	SITE BOUNDARY OF LANDSLIDE PREVENTIVE WORKS 防止山泥傾瀉工程工地邊界
	POK FU LAM COUNTRY PARK BOUNDARY 薄扶林郊野公園邊界

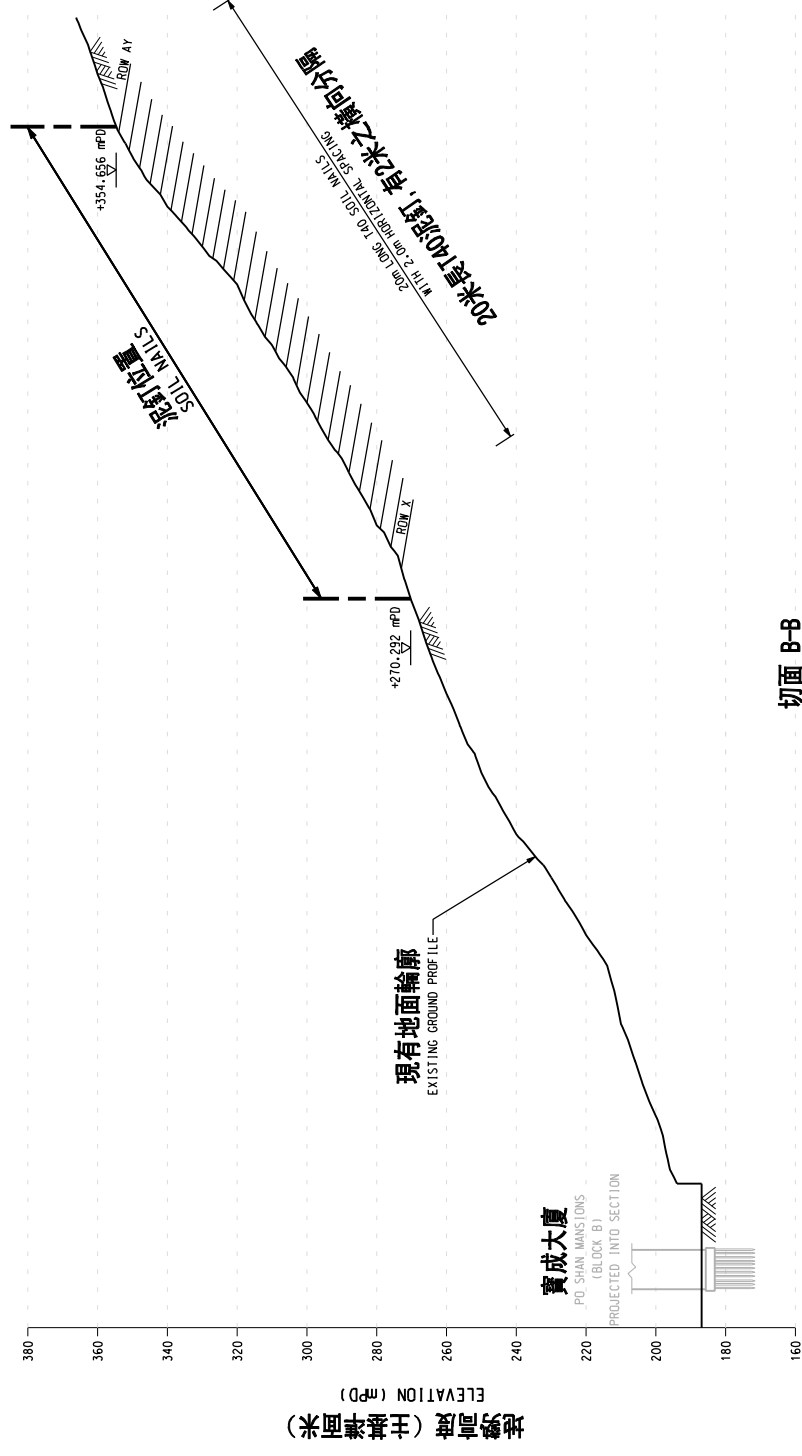
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LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID LEVEL - NATURAL TERRAIN RISK MITIGATION WORKS
半山區寶珊地段防止山泥傾瀉工程 - 天然山坡滑坡災害緩減工程
GENERAL LAYOUT PLAN
整體平面圖

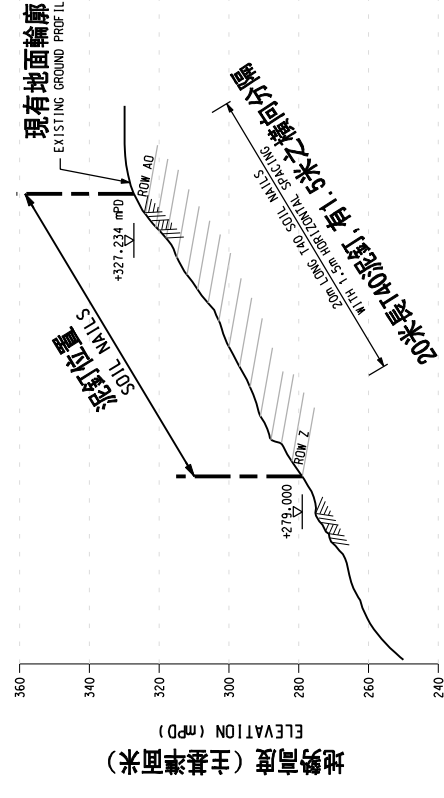
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切面 A-A
SECTION A-A
SCALE 1 : 1000



切面 B-B
SECTION B-B
SCALE 1 : 1000

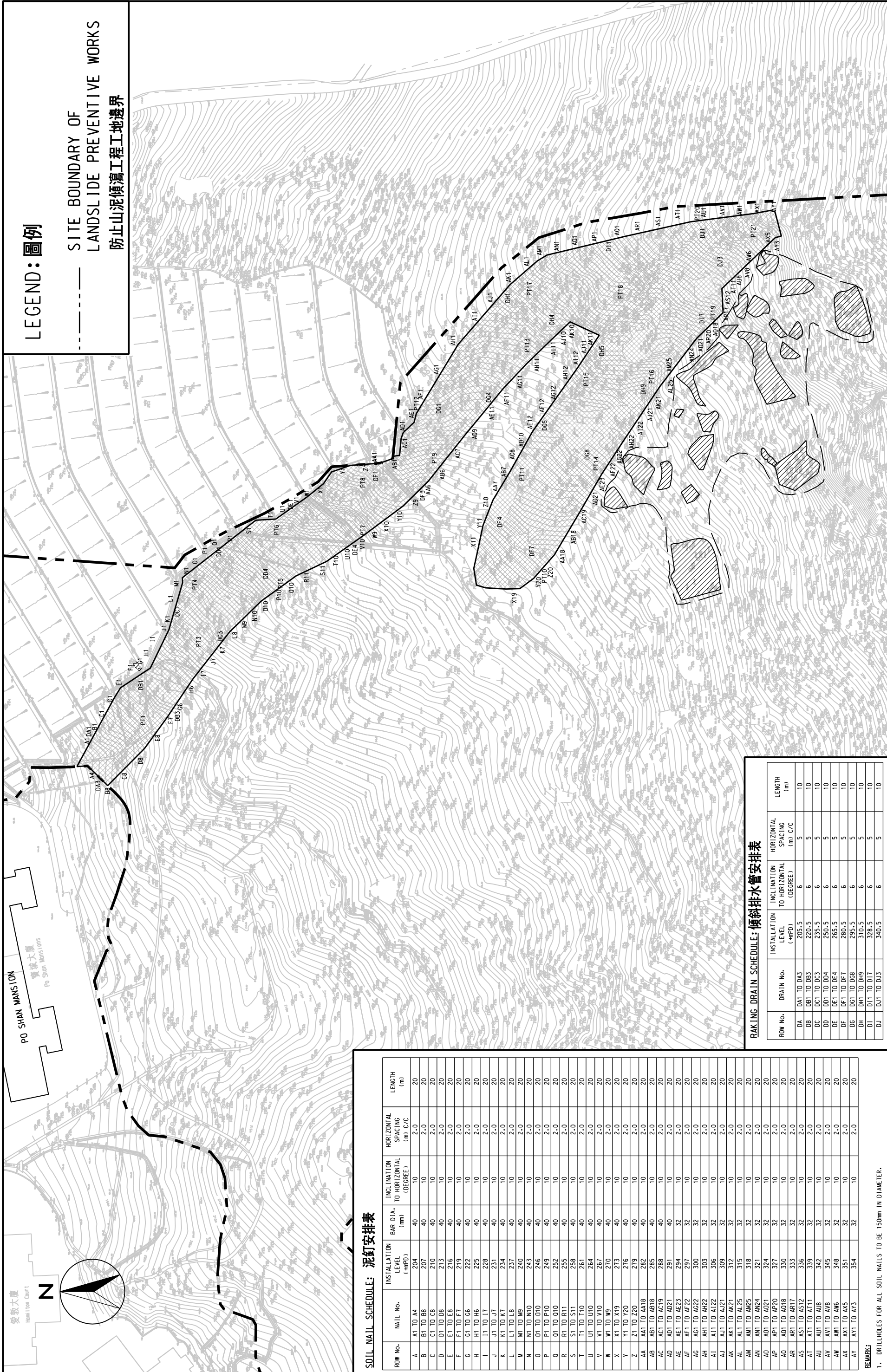


切面 C-C
SECTION C-C
SCALE 1 : 1000

LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID LEVEL - NATURAL TERRAIN RISK MITIGATION WORKS
 半山區實珊地段防止山泥傾瀉工程 - 天然山坡滑坡災害緩減工程

SOIL NAILING SECTIONS
 泥釘工程切面圖

SCALE	N.T.S	DATE	MAR 07
CHECK	FKKN	DRAWN	
JOB NO.	60017196(2.1)	DRAWING No.	1.3
REV			-



LEGEND: 圖例

--- SITE BOUNDARY OF LANDSLIDE PREVENTIVE WORKS
防止山泥傾瀉工程工地邊界

SOIL NAIL SCHEDULE: 泥釘安排表

ROW No.	NAIL No.	INSTALLATION LEVEL (+HFD)	BAR DIA. (mm)	INCLINATION TO HORIZONTAL (DEGREE)	HORIZONTAL SPACING (m) C/C	LENGTH (m)
A	A1 TO A4	204	40	10	2.0	20
B	B1 TO B8	207	40	10	2.0	20
C	C1 TO C8	210	40	10	2.0	20
D	D1 TO D8	213	40	10	2.0	20
E	E1 TO E8	216	40	10	2.0	20
F	F1 TO F7	219	40	10	2.0	20
G	G1 TO G6	222	40	10	2.0	20
H	H1 TO H6	225	40	10	2.0	20
I	I1 TO I7	228	40	10	2.0	20
J	J1 TO J7	231	40	10	2.0	20
K	K1 TO K7	234	40	10	2.0	20
L	L1 TO L8	237	40	10	2.0	20
M	M1 TO M9	240	40	10	2.0	20
N	N1 TO N10	243	40	10	2.0	20
O	O1 TO O10	246	40	10	2.0	20
P	P1 TO P10	249	40	10	2.0	20
Q	Q1 TO Q10	252	40	10	2.0	20
R	R1 TO R11	255	40	10	2.0	20
S	S1 TO S11	258	40	10	2.0	20
T	T1 TO T10	261	40	10	2.0	20
U	U1 TO U10	264	40	10	2.0	20
V	V1 TO V10	267	40	10	2.0	20
W	W1 TO W9	270	40	10	2.0	20
X	X1 TO X19	273	40	10	2.0	20
Y	Y1 TO Y20	276	40	10	2.0	20
Z	Z1 TO Z20	279	40	10	2.0	20
AA	AA1 TO AA18	282	40	10	2.0	20
AB	AB1 TO AB18	285	40	10	2.0	20
AC	AC1 TO AC19	288	40	10	2.0	20
AD	AD1 TO AD21	291	40	10	2.0	20
AE	AE1 TO AE23	294	32	10	2.0	20
AF	AF1 TO AF22	297	32	10	2.0	20
AG	AG1 TO AG22	300	32	10	2.0	20
AH	AH1 TO AH22	303	32	10	2.0	20
AI	AI1 TO AI22	306	32	10	2.0	20
AJ	AJ1 TO AJ21	309	32	10	2.0	20
AK	AK1 TO AK21	312	32	10	2.0	20
AL	AL1 TO AL25	315	32	10	2.0	20
AM	AM1 TO AM25	318	32	10	2.0	20
AN	AN1 TO AN24	321	32	10	2.0	20
AO	AO1 TO AO20	324	32	10	2.0	20
AP	AP1 TO AP20	327	32	10	2.0	20
AQ	AQ1 TO AQ18	330	32	10	2.0	20
AR	AR1 TO AR17	333	32	10	2.0	20
AS	AS1 TO AS12	336	32	10	2.0	20
AT	AT1 TO AT11	339	32	10	2.0	20
AU	AU1 TO AU8	342	32	10	2.0	20
AV	AV1 TO AV8	345	32	10	2.0	20
AW	AW1 TO AW6	348	32	10	2.0	20
AX	AX1 TO AX5	351	32	10	2.0	20
AY	AY1 TO AY3	354	32	10	2.0	20

RAKING DRAIN SCHEDULE: 傾斜排水管安排表

ROW No.	DRAIN No.	INSTALLATION LEVEL (+HFD)	INCLINATION TO HORIZONTAL (DEGREE)	HORIZONTAL SPACING (m) C/C	LENGTH (m)
DA	DA1 TO DA3	205.5	6	5	10
DB	DB1 TO DB3	220.5	6	5	10
DC	DC1 TO DC3	235.5	6	5	10
DD	DD1 TO DD4	250.5	6	5	10
DE	DE1 TO DE4	265.5	6	5	10
DF	DF1 TO DF7	280.5	6	5	10
DG	DG1 TO DG8	295.5	6	5	10
DH	DH1 TO DH9	310.5	6	5	10
DI	DI1 TO DI7	328.5	6	5	10
DJ	DJ1 TO DJ3	340.5	6	5	10

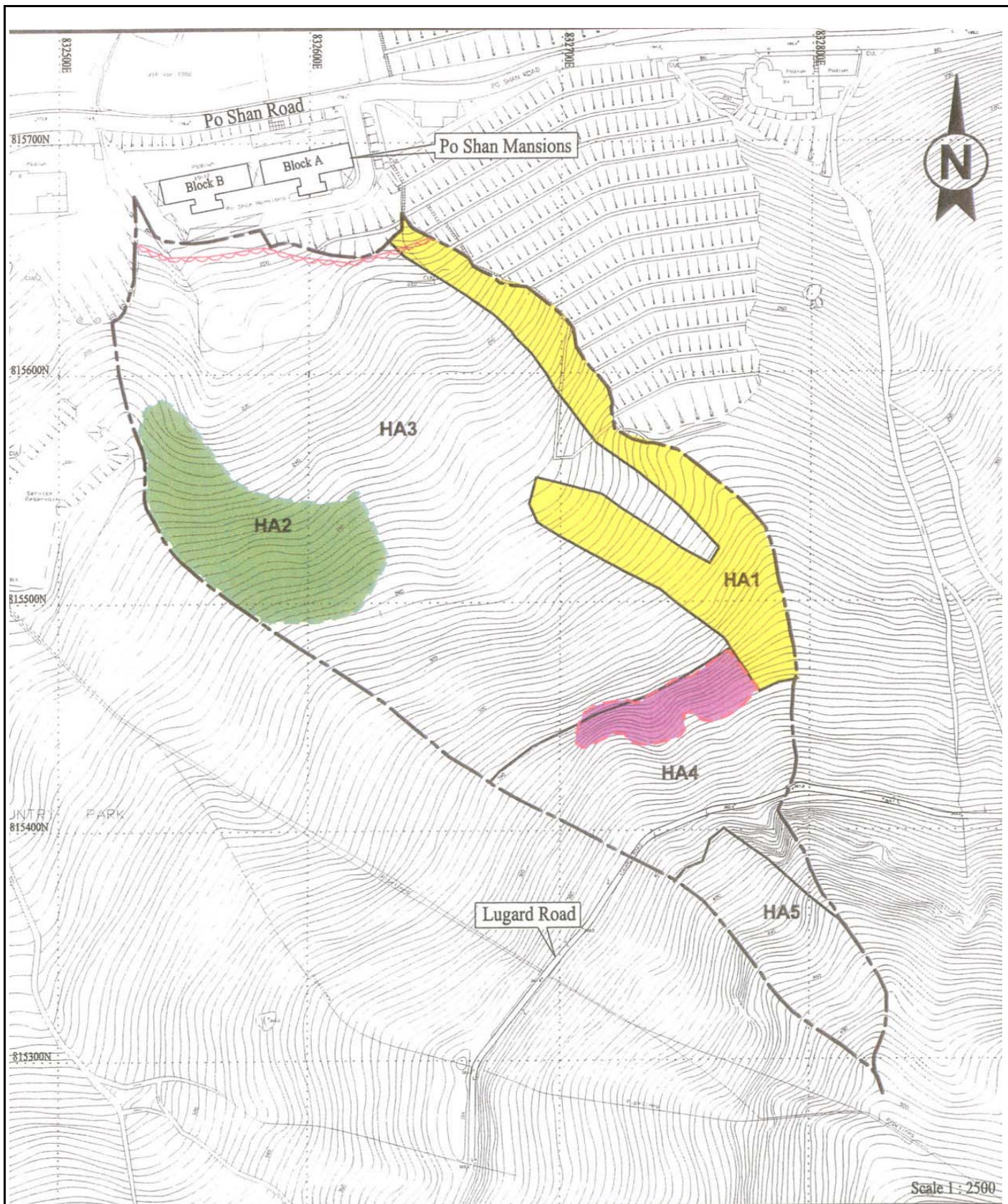
REMARKS:
1. DRILLHOLES FOR ALL SOIL NAILS TO BE 150mm IN DIAMETER.

LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID LEVEL - NATURAL TERRAIN RISK MITIGATION WORKS
 半山區實珊地段防止山泥傾瀉工程 - 天然山坡滑坡災害緩解工程

SOIL NAILS ON NATURAL TERRAIN LAYOUT PLAN & SCHEDULE
 泥釘在天然地形平面圖及安排表

SCALE	A3 1:1000	DATE	MAR 07
CHECK	FKKN	DRAWN	
JOB No.	60017196(2.1)	DRAWING No.	1.4
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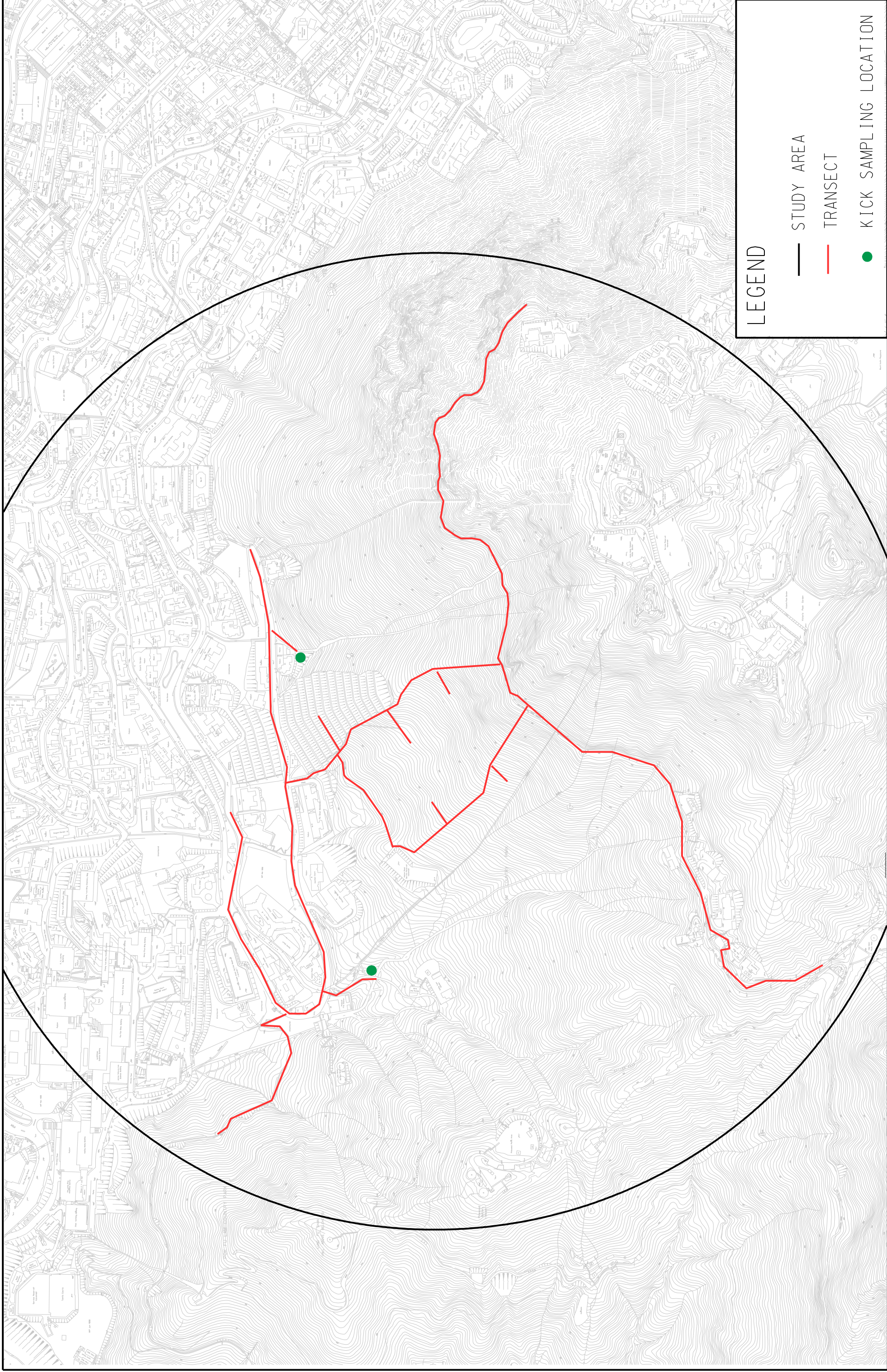


Legend :

- Study area boundary
- Soil nailing zone
- Flexible debris barrier
- HA3** Hazard Area 3
- Prescriptive minor rock slope treatment/boulder stabilisation works
- Prescriptive bio-engineering measures

Title Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels - EIA Study Schematic Arrangement of Proposed Natural Terrain Landslide Risk Mitigation Measures	Scale	N.T.S.	Project No.	A02005(001)
	Date	Jun, 2007	Figure No.	2.1

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LEGEND

- STUDY AREA
- TRANSECT
- KICK SAMPLING LOCATION

SCALE	A3 1:5000	DATE	MAY 07
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JOB No.	A02005(001)	DRAWING No.	3.1
		REV	—

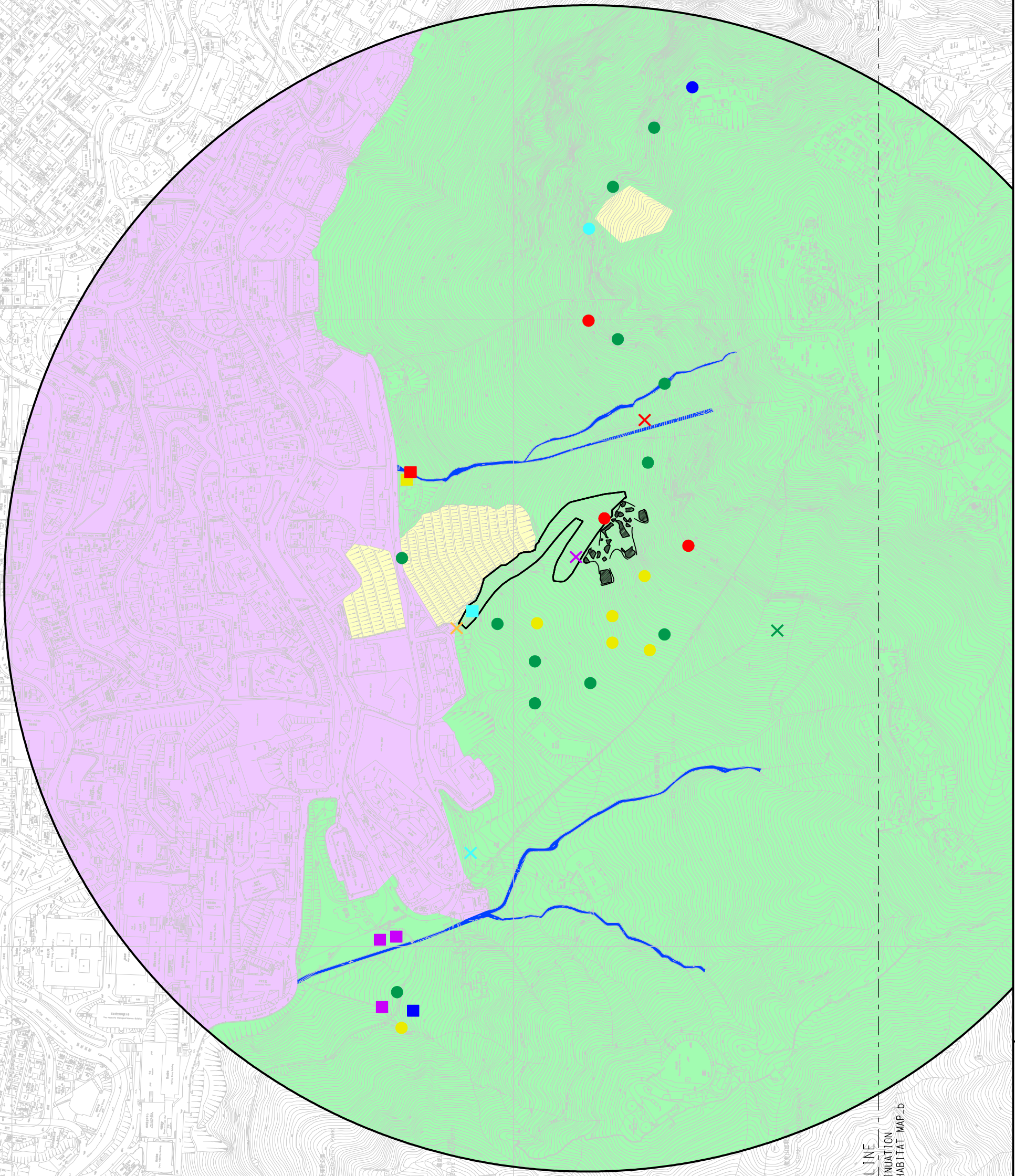
AGREEMENT NO. CE 28/2004 (GE)
 LANDSLIDE PREVENTIVE WORKS AT PO SHAN ROAD, MID-LEVELS - DESIGN AND CONSTRUCTION
TRANSECT AND SAMPLING LOCATIONS

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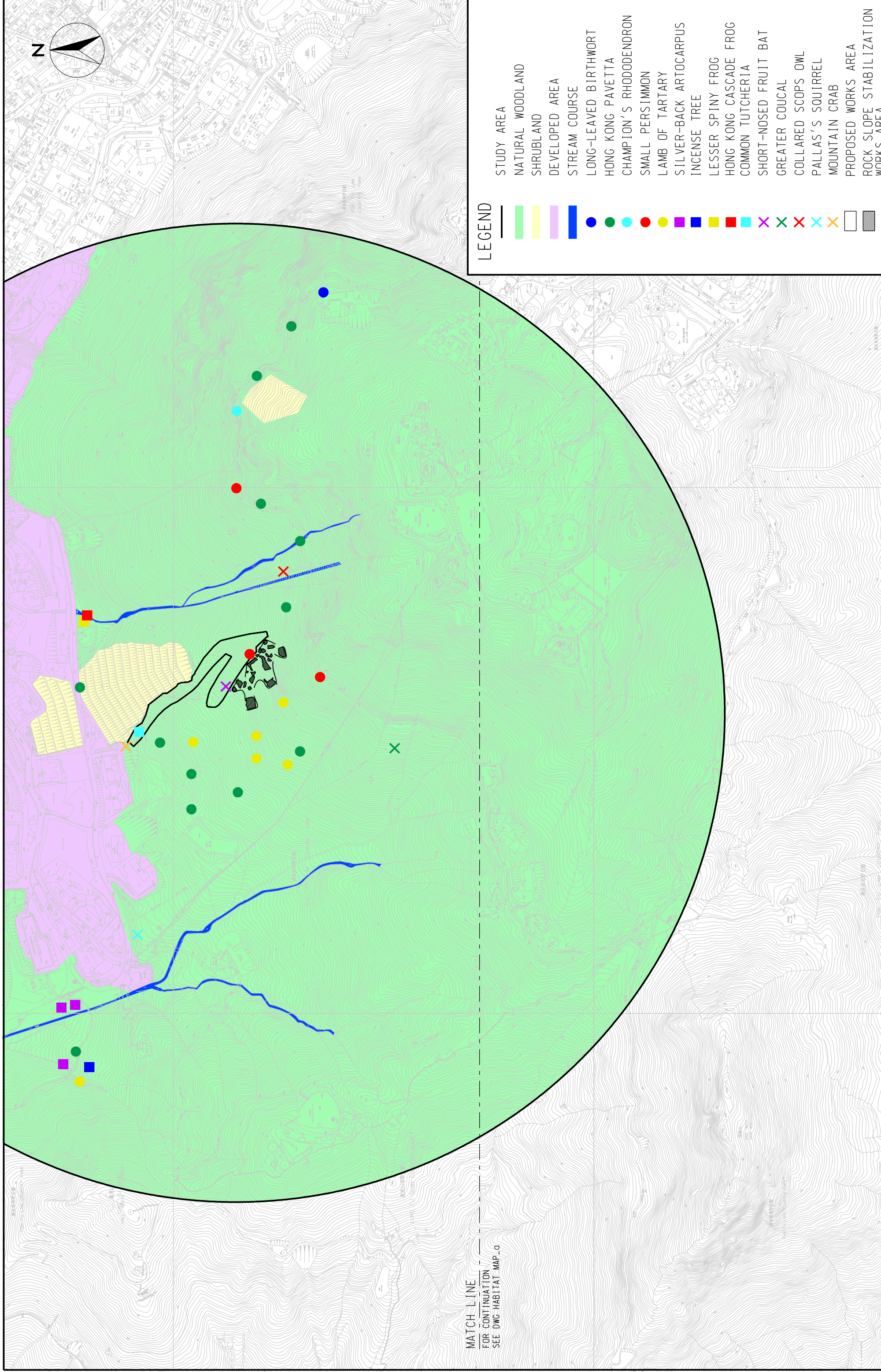


LEGEND

- STUDY AREA
- NATURAL WOODLAND
- SHRUBLAND
- DEVELOPED AREA
- STREAM COURSE
- LONG-LEAVED BIRTHWORT
- HONG KONG PAVETTA
- CHAMPION'S RHODODENDRON
- SMALL PERSIMMON
- LAMB OF TARTARY
- SILVER-BACK ARTOCARPUS
- INCENSE TREE
- LESSER SPINY FROG
- HONG KONG CASCADE FROG
- COMMON TUTCHERIA
- SHORT-NOSED FRUIT BAT
- GREATER COUCAL
- COLLARED SCOPS OWL
- PALLAS'S SQUIRREL
- MOUNTAIN CRAB
- PROPOSED WORKS AREA
- ROCK SLOPE STABILIZATION WORKS AREA



SCALE	A3 1:5000	DATE	FEB 07
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JOB No.	60017196(2.1)	DRAWING No.	3.2
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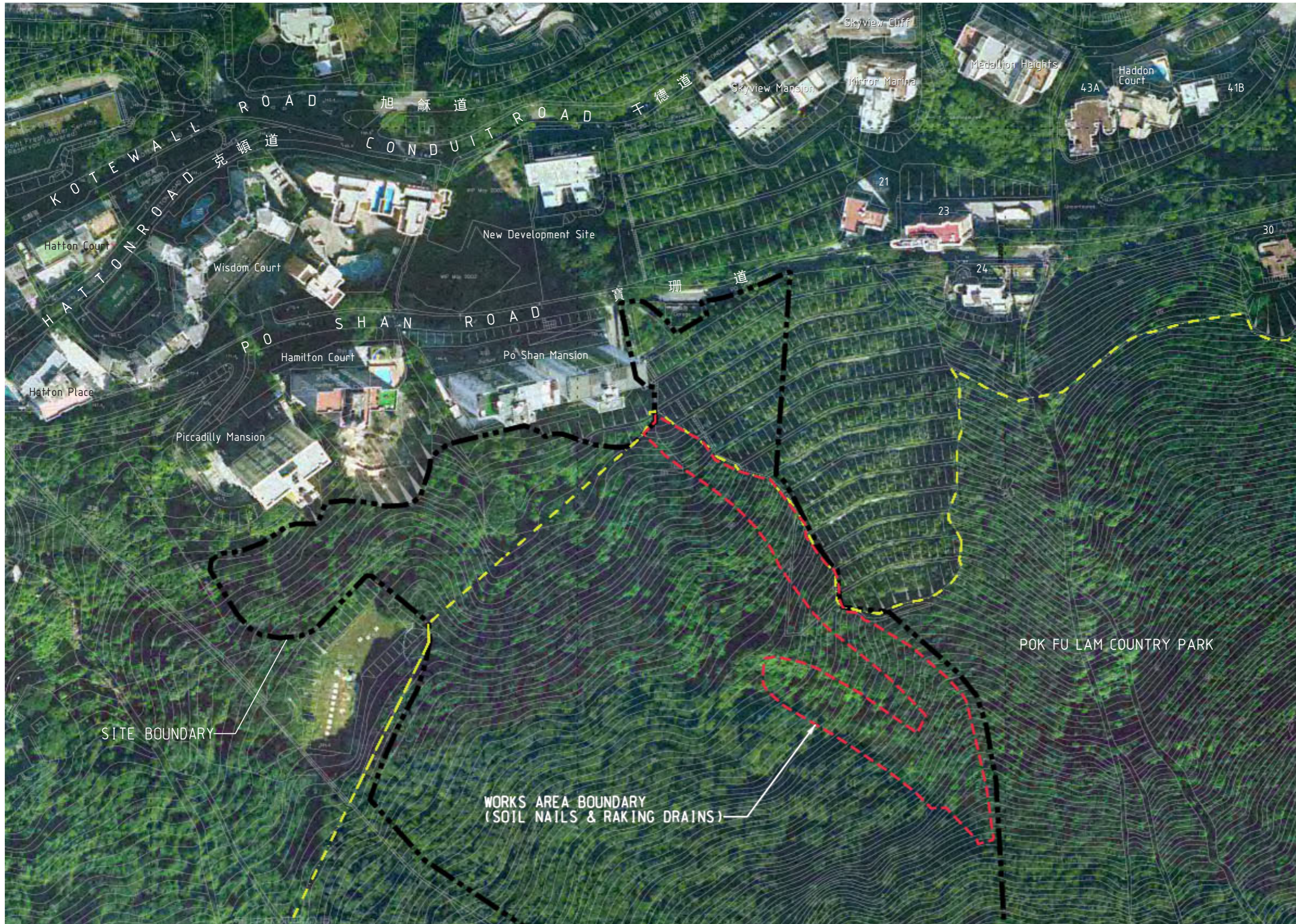


MATCH LINE
FOR CONTINUATION
SEE DWG HABITAT MAP_0

LEGEND

- STUDY AREA
- NATURAL WOODLAND
- SHRUBLAND
- DEVELOPED AREA
- STREAM COURSE
- LONG-LEAVED BIRTHWORT
- HONG KONG PAVETTA
- CHAMPION'S RHODODENDRON
- SMALL PERSIMMON
- LAMB OF TARTARY
- SILVER-BACK ARTOCARPUS
- INCENSE TREE
- LESSER SPINY FROG
- HONG KONG CASCADE FROG
- COMMON TUTCHERIA
- SHORT-NOSED FRUIT BAT
- GREATER COUCAL
- COLLARED SCOPS OWL
- PALLAS'S SQUIRREL
- MOUNTAIN CRAB
- PROPOSED WORKS AREA
- ROCK SLOPE STABILIZATION WORKS AREA

SCALE	A3 1:5000	DATE	FEB 07
CHECK	CHECK	DRAWN	ILPY
JOB NO.	60017196(2.1)	DRAWING NO.	3.2
REV			-



LEGEND:

	SITE BOUNDARY
	POK FU LAM COUNTRY PARK BOUNDARY
	WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS

REV.	DESCRIPTION	DATE	BY	CHK.	APPROVED	DATE

CEDD Civil Engineering and Development Department

CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

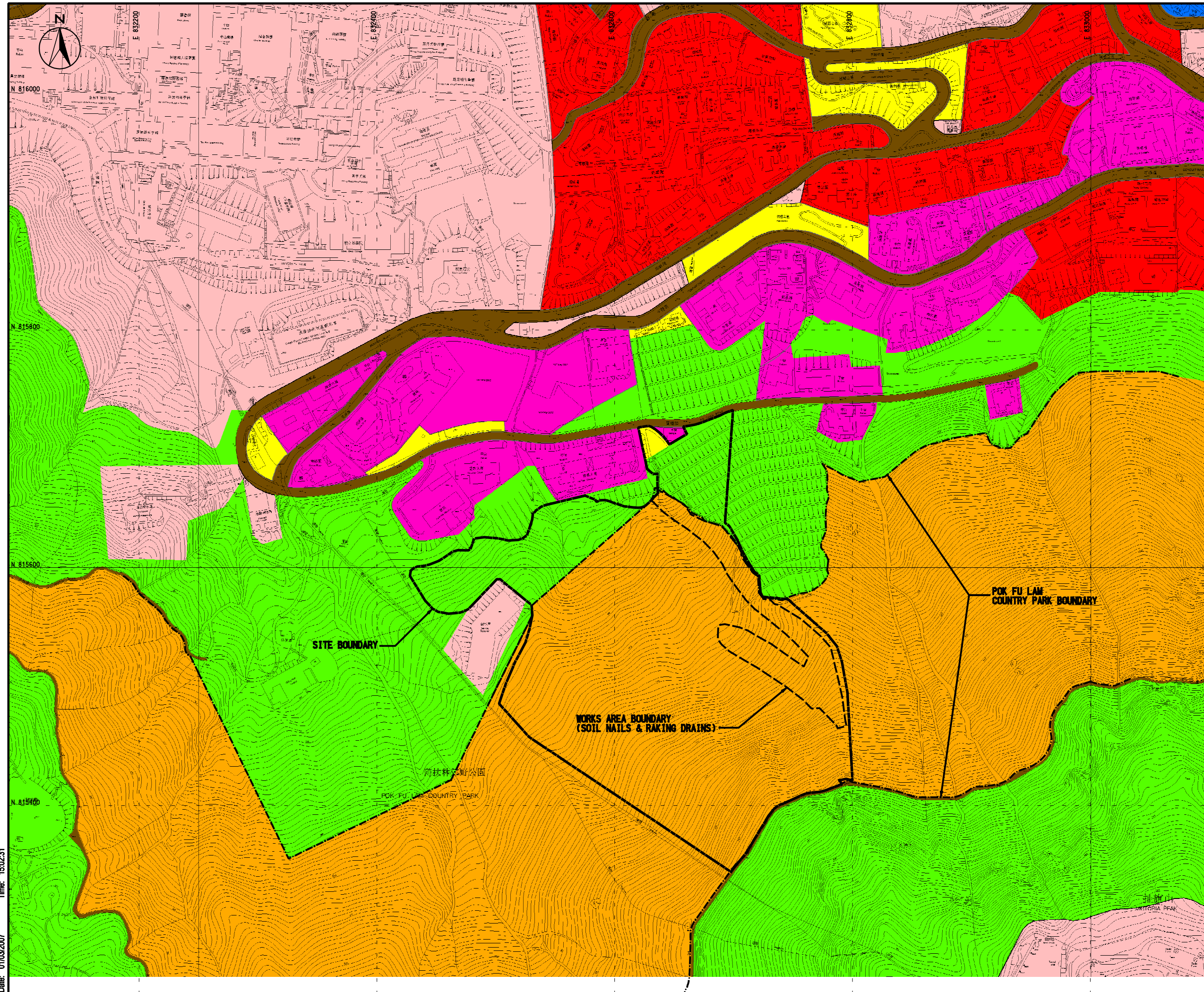
Existing Aerial Photo

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SCALE 比例 NTS	STATUS 狀態 -
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- LEGEND:**
- SITE BOUNDARY
 - - - POK FU LAM COUNTRY PARK BOUNDARY
 - - - WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS
 - UNKNOWN
 - GOVERNMENT, INSTITUTION OR COMMUNITY
 - GREEN BELT
 - MAIN ROAD
 - OPEN SPACE
 - RESIDENTIAL (A)
 - RESIDENTIAL (B)
 - RESIDENTIAL (C)
 - COUNTRY PARK

Date: 01/03/2007
Time: 15:02:31

REV.	DESCRIPTION	DATE	BY	CHKD.	APP'D.	DATE

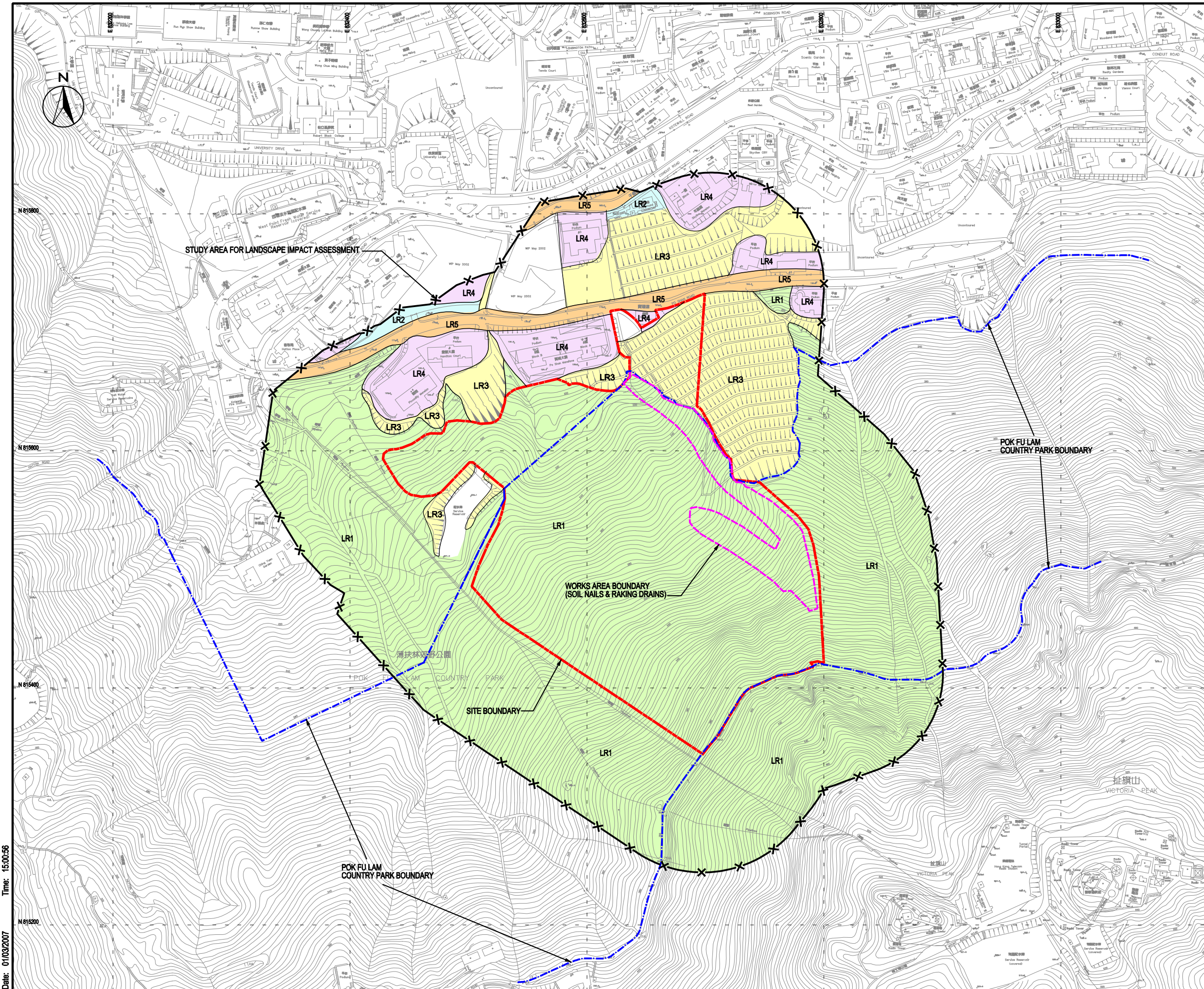
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CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

PLANNING & DEVELOPMENT
FRAMEWORK (OZP)

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- LEGEND:**
- SITE BOUNDARY
 - - - POK FU LAM COUNTRY PARK BOUNDARY
 - - - WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS
 - x x x STUDY AREA FOR LANDSCAPE IMPACT ASSESSMENT

- LANDSCAPE RESOURCES:**
- LR1 WOODLAND (INCLUDING TALL SCRUB)
 - LR2 POCKET OPEN SPACE
 - LR3 MANMADE SLOPE
 - LR4 RESIDENTIAL DEVELOPMENT
 - LR5 ROADSIDE PLANTING

REV. NO.	DESCRIPTION	DATE	BY	CHKD.	APPROVED	DATE

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CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

LANDSCAPE RESOURCES

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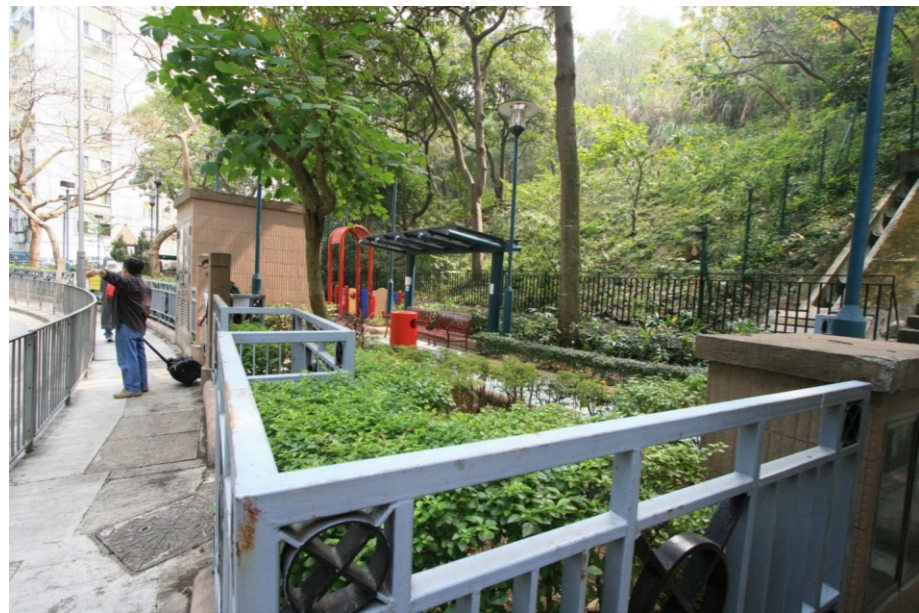
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LR1 Woodland (including tall scurb)



LR1 Woodland (including tall scurb)



LR2 Pocket open space




LR2 Pocket open space



LR3 Manmade Slope



LR3 Manmade Slope

REV.	DESCRIPTION	DATE	BY	CHK.	APPROVED	DATE
修訂	內容摘要	日期	製圖	校核	批准人	日期
 Civil Engineering and Development Department						
CONTRACT No. GE/2005/45 LANDSLIDE PREVENTIVE WORKS AT PO SHAN ROAD, MID-LEVELS						
PHOTO OF LANDSCAPE RESOURCES (SHEET 1 OF 2)						
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SCALE	NTS	-				
比例	NTS	-				
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LR4 Residential Development



LR4 Residential Development



LR5 Roadside Planting



LR5 Roadside Planting

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修訂	內容摘要	日期	繪圖	查核	批准人	日期

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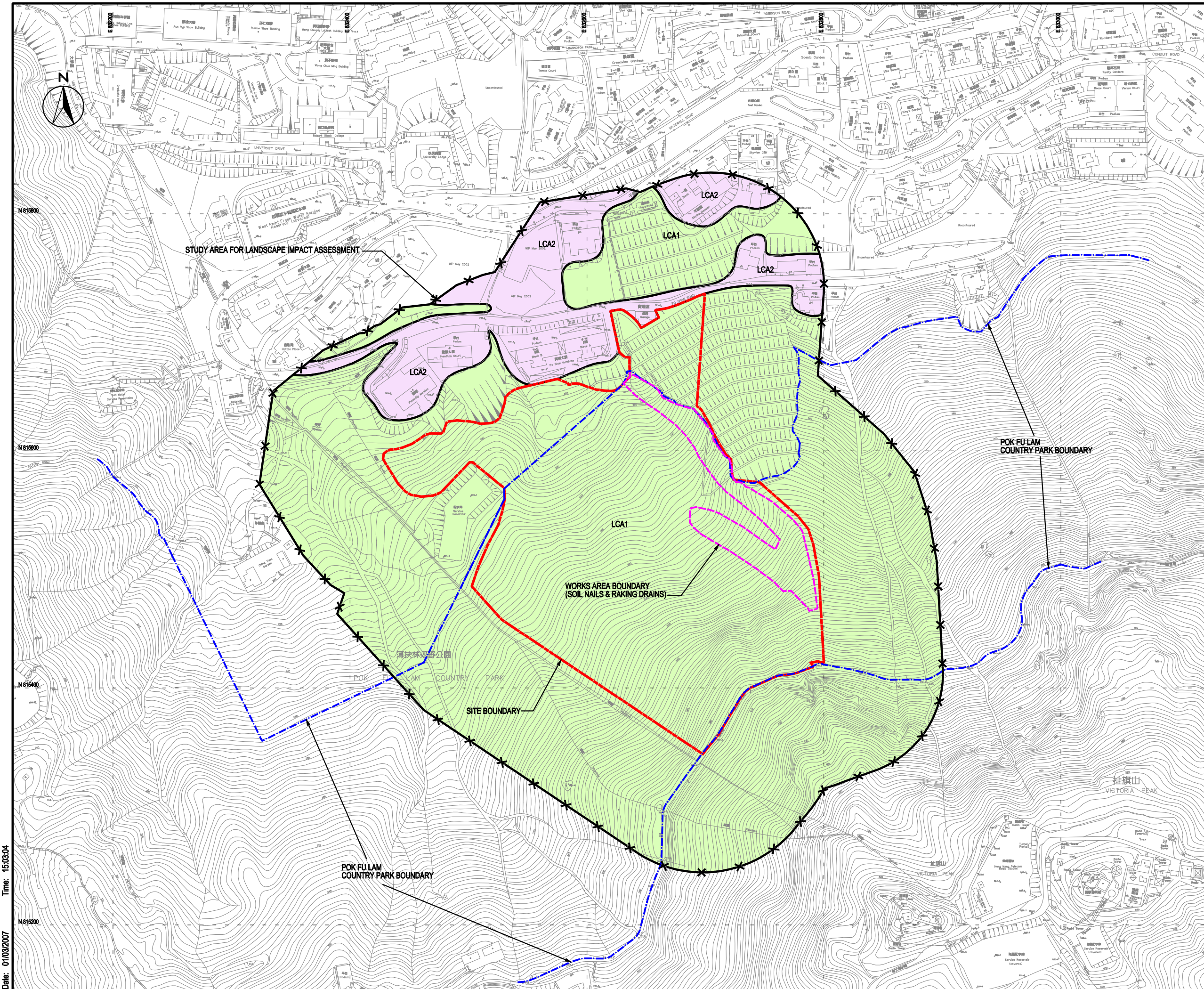
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LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

PHOTO OF LANDSCAPE RESOURCES
(SHEET 2 OF 2)

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SCALE 比例 NTS	-
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- LEGEND:**
- SITE BOUNDARY
 - - - POK FU LAM COUNTRY PARK BOUNDARY
 - - - WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS
 - STUDY AREA FOR LANDSCAPE IMPACT ASSESSMENT
- LANDSCAPE CHARACTER AREA:**
- LCA1 GREENBELT / COUNTRY PARK CHARTER AREA
 - LCA2 MID-LEVELS LOW-RISE RESIDENTIAL DEVELOPMENT

Date: 01/03/2007 Time: 15:03:04

REV. NO.	DESCRIPTION	DATE	BY	CHKD.	APPROVED	DATE

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LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

LANDSCAPE CHARACTER AREA

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LCA1 Greenbelt / Country Park Character Area



LCA1 Greenbelt / Country Park Character Area



LCA2 Mid-levels Residential Development



LCA2 Mid-levels Residential Development

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CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

PHOTO OF LANDSCAPE CHARACTER AREA

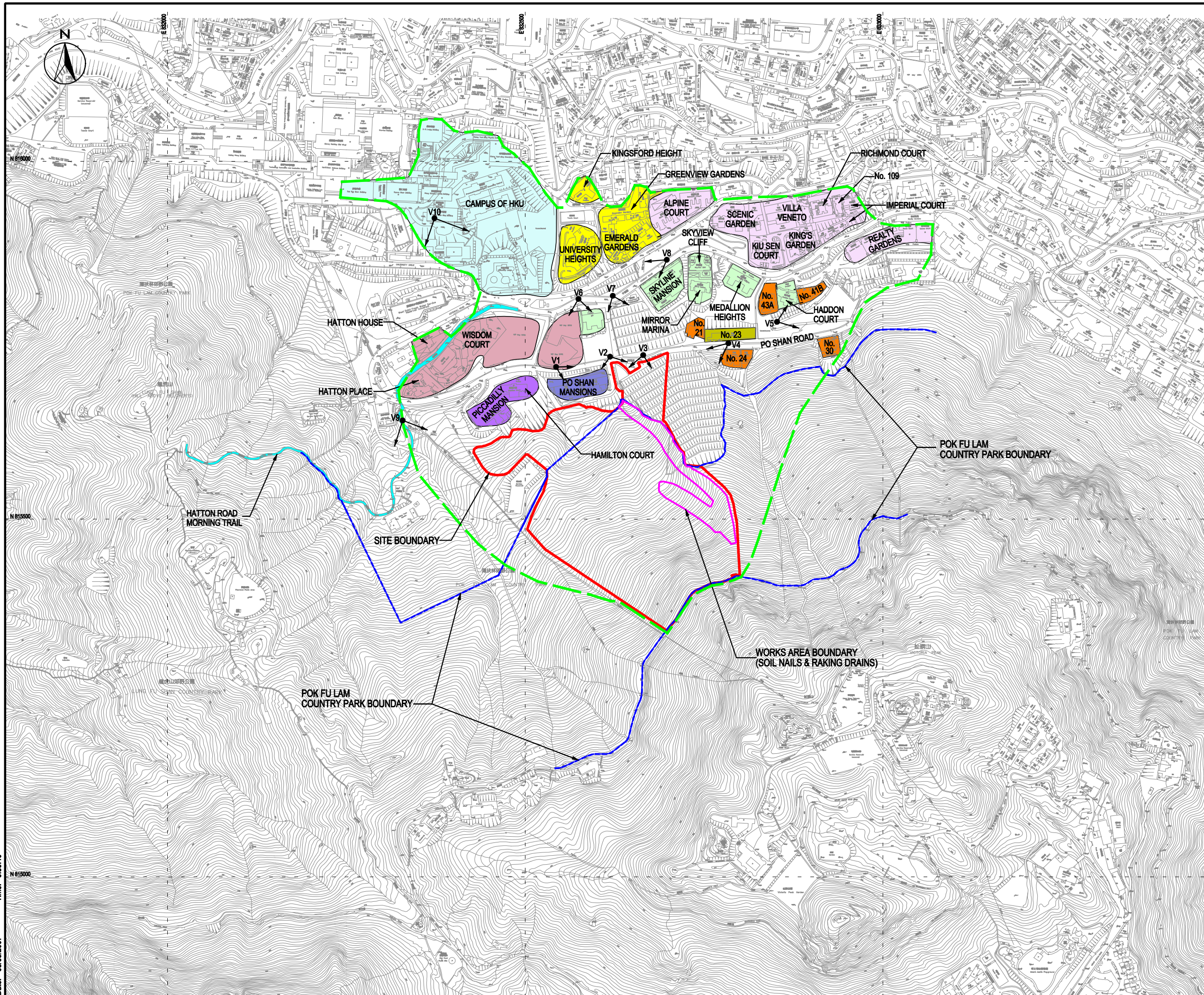
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LEGEND:

- SITE BOUNDARY
- POK FU LAM COUNTRY PARK BOUNDARY
- WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS
- PRIMARY ZONE OF VISUAL INFLUENCE
- HATTON ROAD MORNING TRAIL
- PHOTO VIEW POINTS

VISUAL SENSITIVE RECEIVERS:

- R1A
- R1B
- R1C
- R1D
- R1E
- R1F
- R2
- R3
- G/C 1

REV.	DESCRIPTION	DATE	APPROVED	DATE

CEDD Civil Engineering and Development Department

CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

**ZONE OF VISUAL INFLUENCE
& VISUAL SENSITIVE RECEIVERS**

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DRG. NO. 圖紙編號	4.4.1
DRAWN BY 繪圖人	PCKM
SCALE 比例尺	A3 1 : 5000
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Date: 08/05/2007 Time: 9:58:40



PO SHAN MANSIONS

R1A



PICCADILLY MANSION

R1B



NO.23 PO SHAN ROAD

R1C



WISDOM COURT

No.1 Po Shan Road

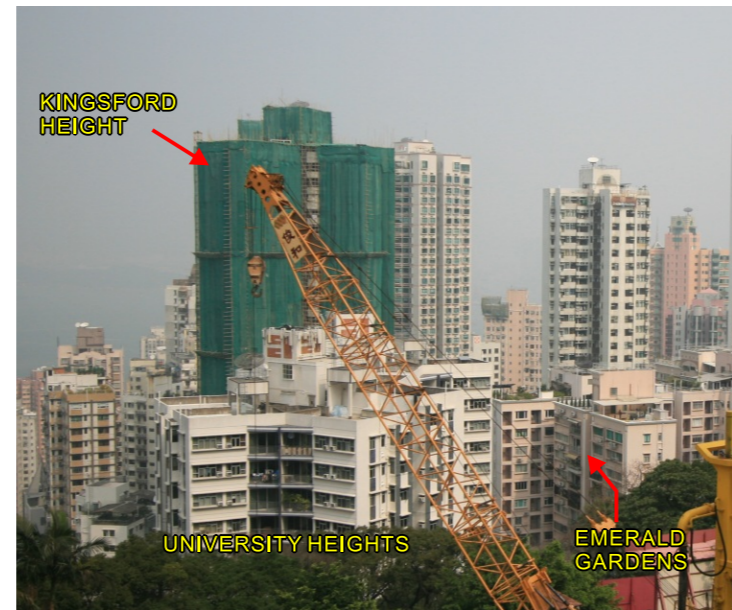
R1D



SKYLINE MANSION

CONDUIT ROAD

R1E



KINGSFORD HEIGHT

UNIVERSITY HEIGHTS

EMERALD GARDENS

R1F



NO.21 PO SHAN ROAD

R2



RICHMOND COURT

IMPERIAL COURT

REALTY GARDENS

R3




GIC1 USERS OF THE UNIVERSITY OF HONG KONG



O1 WALKERS IN HATTON ROAD MORNING TRAIL



T1 TRAVELERS ON PO SHAN ROAD

REV.	DESCRIPTION	DATE	BY	APPROVED	DATE
 Civil Engineering and Development Department					
CONTRACT No. GE/2005/45 LANDSLIDE PREVENTIVE WORKS AT PO SHAN ROAD, MID-LEVELS					
PHOTO OF VISUAL SENSITIVE RECEIVERS GROUP					
MAUNSELL AECOM Maunsell Geotechnical Services Ltd. 茂盛土力工程顧問有限公司					
DRG.NO.		4.4.2			
圖紙編號		4.4.2			
DESIGNED BY	ETLM	STATUS			
SCALE	NTS	-			
北列	NTS				
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V1



V2



V3



V4



V5

REV.	DESCRIPTION	BY	CHK.	APPROVED	DATE

CEDD Civil Engineering and Development Department

CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

VIEW FOR VISUAL SENSITIVE RECEIVERS (SHEET 1 OF 2)

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茂盛土力工程顧問有限公司

DRG.NO. 圖紙編號 4.4.3

DESIGNED BY ETLM STATUS
SCALE: NTS

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PO SHAN MANSIONS

V6



PO SHAN MANSIONS

V7



SKYLINE MANSION

CONDUIT ROAD

V8



WALKERS IN HATTON ROAD MORNING TRAIL

V9



NO.1 PO SHAN ROAD

WISDOM COURT

HATTON HOUSE

ROBERT BLACK COLLEGE

V10

REV.	DESCRIPTION	DATE	BY	APP. BY

REV.	DESCRIPTION	DATE	BY	APP. BY

CEDD Civil Engineering and Development Department

CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

VIEW FOR VISUAL SENSITIVE
RECEIVERS (SHEET 2 OF 2)

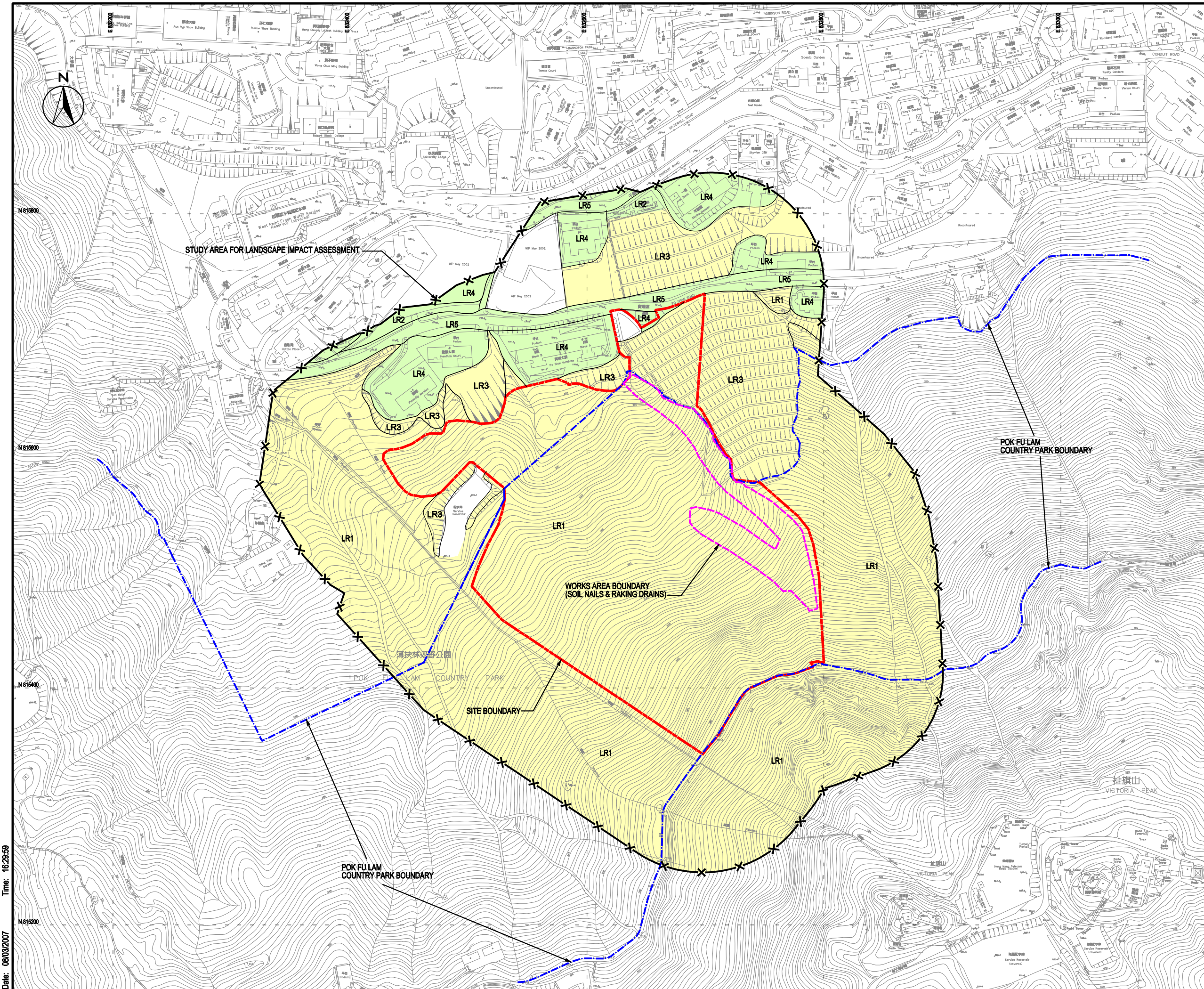
MAUNSELL | AECOM
Maunsell Geotechnical Services Ltd.
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DRG.NO. 4.4.4
圖紙編號

DRAWN BY 繪圖	ETLM	STATUS 圖狀	
SCALE 比例	NTS		

DIMENSIONS ARE IN METRES
尺寸單位: METRES

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- LEGEND:**
- SITE BOUNDARY
 - POK FU LAM COUNTRY PARK BOUNDARY
 - WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS
 - x— STUDY AREA FOR LANDSCAPE IMPACT ASSESSMENT

- LANDSCAPE RESOURCES:**
- LR1 WOODLAND (INCLUDING TALL SCRUB)
 - LR2 POCKET OPEN SPACE
 - LR3 MANMADE SLOPE
 - LR4 RESIDENTIAL DEVELOPMENT
 - LR5 ROADSIDE PLANTING

- INTENSITY OF LANDSCAPE IMPACT:**
- SUBSTANTIAL - POSITIVE
 - MODERATE - POSITIVE
 - SLIGHT - POSITIVE
 - INSUBSTANTIAL
 - SLIGHT - NEGATIVE
 - MODERATE - NEGATIVE
 - SUBSTANTIAL - NEGATIVE

REV. NO.	DESCRIPTION	DATE	BY	CHKD.	APPROVED	DATE

CEDD Civil Engineering and Development Department

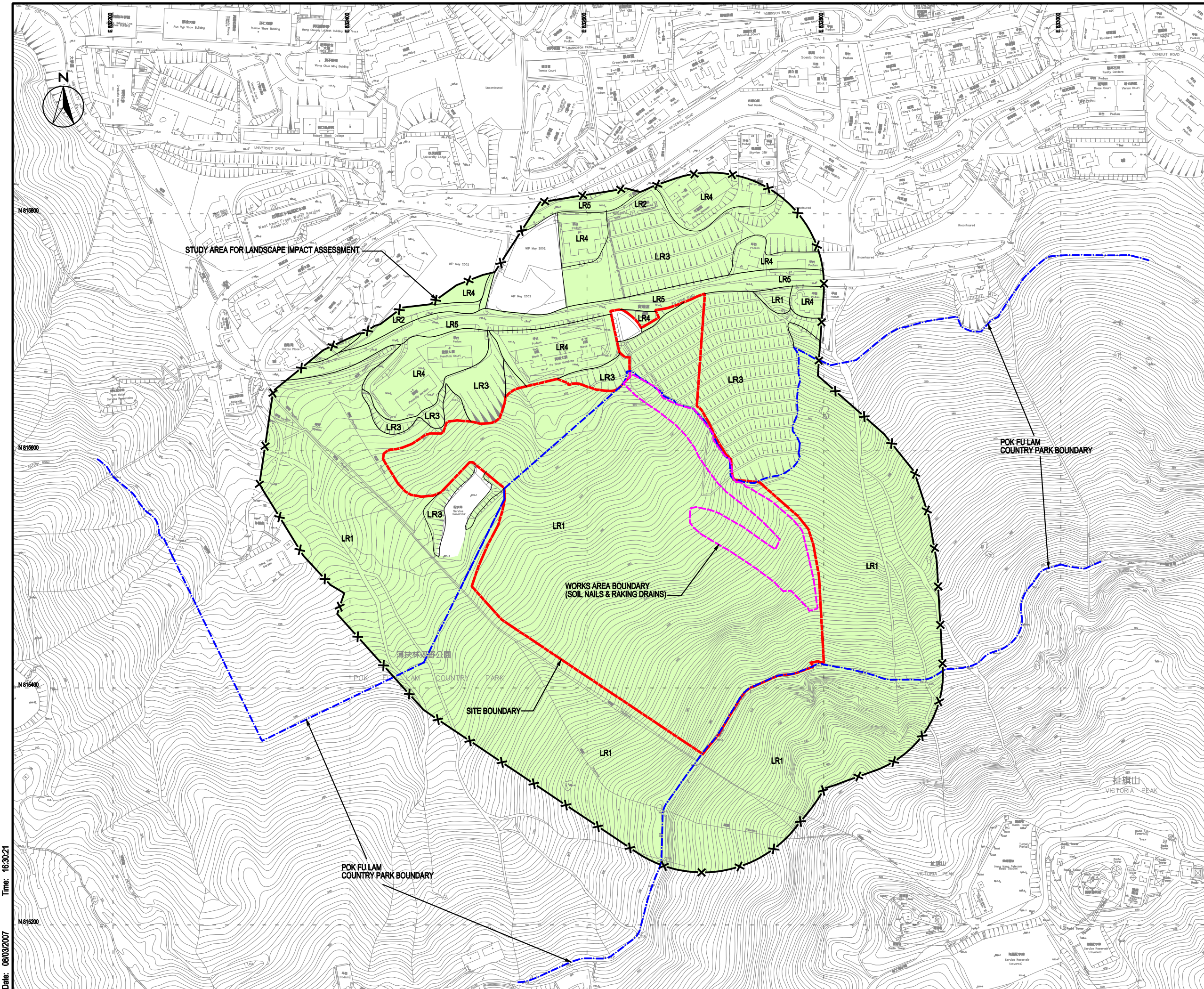
CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

RESIDUAL LANDSCAPE RESOURCE
IMPACTS IN CONSTRUCTION PHASE

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DRGNO. 圖紙編號	4.5.1
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SCALE 比例尺	A3 1 : 3000
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STATUS 圖況	—
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Date: 08/03/2007 Time: 16:29:59



LEGEND:

- SITE BOUNDARY
- - - POK FU LAM COUNTRY PARK BOUNDARY
- - - WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS
- x x x STUDY AREA FOR LANDSCAPE IMPACT ASSESSMENT

LANDSCAPE RESOURCES:

- LR1 WOODLAND (INCLUDING TALL SCRUB)
- LR2 POCKET OPEN SPACE
- LR3 MANMADE SLOPE
- LR4 RESIDENTIAL DEVELOPMENT
- LR5 ROADSIDE PLANTING

INTENSITY OF LANDSCAPE IMPACT:

- SUBSTANTIAL - POSITIVE
- MODERATE - POSITIVE
- SLIGHT - POSITIVE
- INSUBSTANTIAL
- SLIGHT - NEGATIVE
- MODERATE - NEGATIVE
- SUBSTANTIAL - NEGATIVE

REV. NO.	DESCRIPTION	DATE	BY	CHKD.	APPROVED	DATE

CEDD Civil Engineering and Development Department

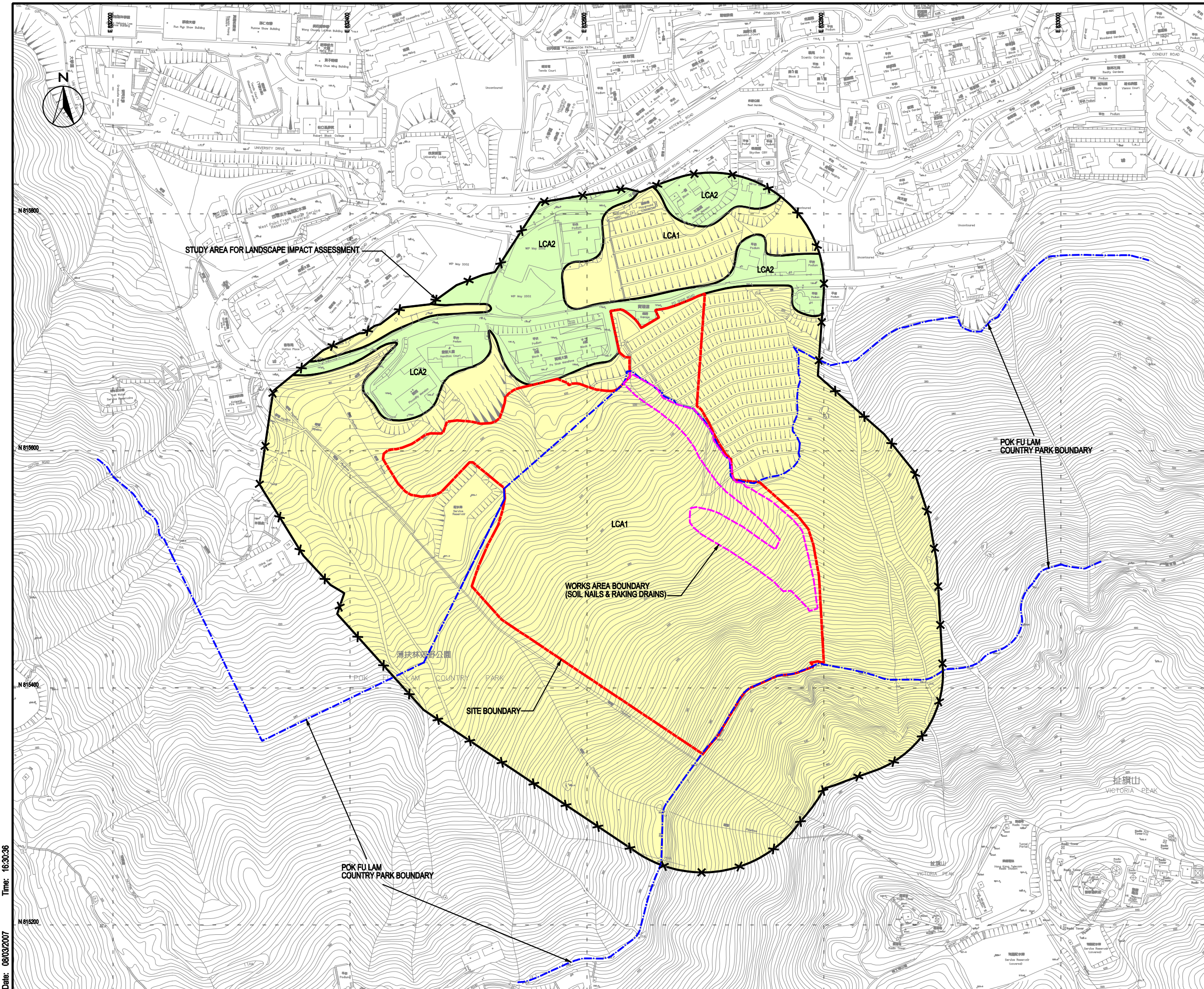
CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

RESIDUAL LANDSCAPE RESOURCE
IMPACTS IN OPERATION PHASE

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DRGNO. 圖紙編號	4.5.2
DRAWN BY 繪圖人	PCKM
SCALE 比例尺	A3 1 : 3000
DIMENSIONS ARE IN 尺寸單位	METRES
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Date: 08/03/2007 Time: 16:30:21



LEGEND:

- SITE BOUNDARY
- - - POK FU LAM COUNTRY PARK BOUNDARY
- - - WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS
- STUDY AREA FOR LANDSCAPE IMPACT ASSESSMENT

LANDSCAPE CHARACTER AREA:

- LCA1 GREENBELT / COUNTRY PARK CHARTER AREA
- LCA2 MID-LEVELS LOW-RISE RESIDENTIAL DEVELOPMENT

INTENSITY OF LANDSCAPE IMPACT:

- SUBSTANTIAL - POSITIVE
- MODERATE - POSITIVE
- SLIGHT - POSITIVE
- INSUBSTANTIAL
- SLIGHT - NEGATIVE
- MODERATE - NEGATIVE
- SUBSTANTIAL - NEGATIVE

REV. NO.	DESCRIPTION	DATE	BY	CHKD.	APP'D.	DATE

CEDD Civil Engineering and Development Department

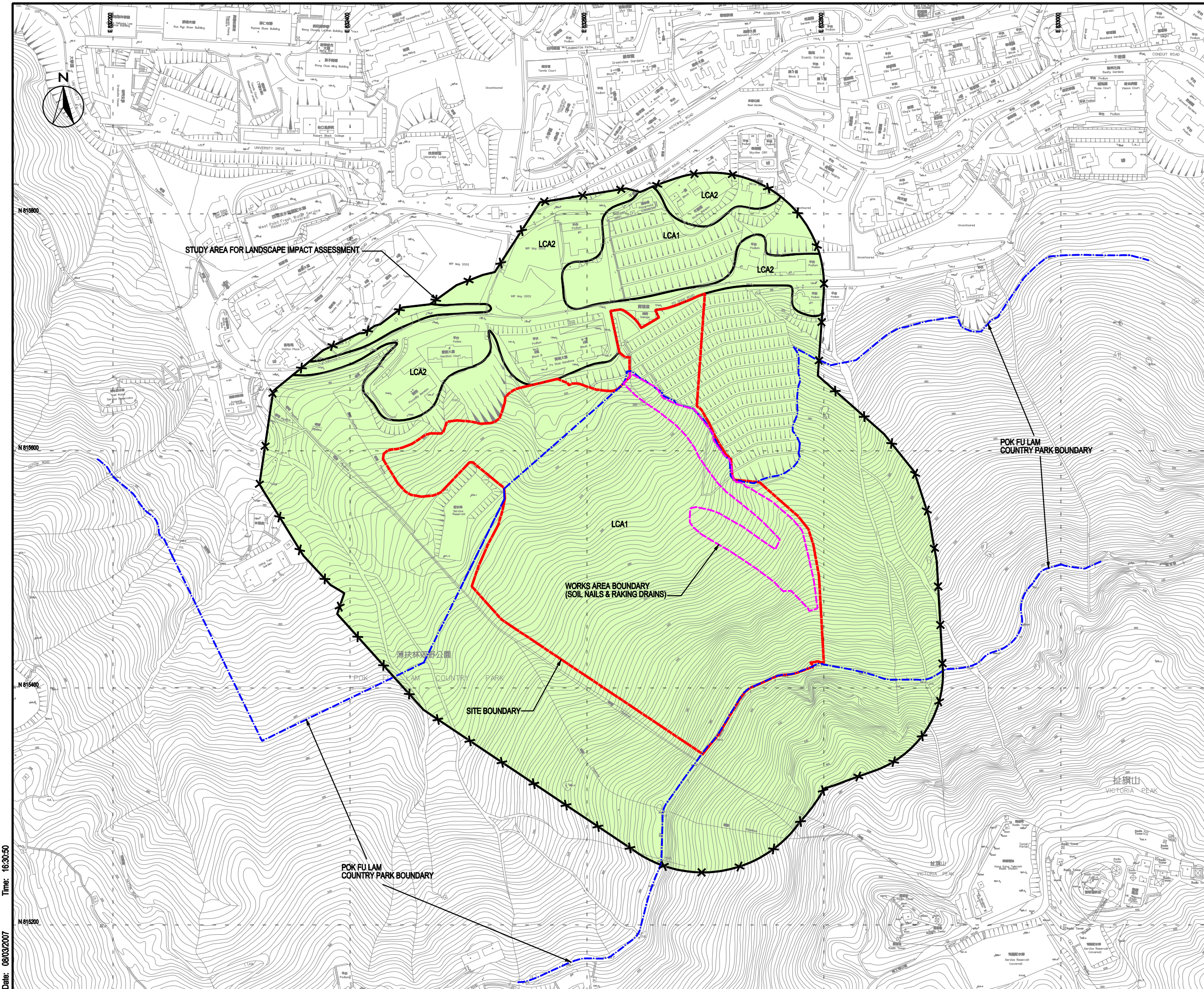
CONTRACT No. GE/2005/45
 LANDSLIDE PREVENTIVE WORKS
 AT PO SHAN ROAD, MID-LEVELS

RESIDUAL LANDSCAPE CHARACTER AREA IMPACTS IN CONSTRUCTION PHASE

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 茂盛士力工程顧問有限公司

DRGNO. 圖紙編號	4.5.3
DRAWN BY 繪圖人	PCKM
SCALE 比例尺	A3 1 : 3000
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Date: 08/03/2007 Time: 16:30:36



- LEGEND:**
- SITE BOUNDARY
 - - - POK FU LAM COUNTRY PARK BOUNDARY
 - - - WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS
 - x STUDY AREA FOR LANDSCAPE IMPACT ASSESSMENT

- LANDSCAPE CHARACTER AREA:**
- LCA1 GREENBELT / COUNTRY PARK CHARACTER AREA
 - LCA2 MID-LEVELS LOW-RISE RESIDENTIAL DEVELOPMENT

- INTENSITY OF LANDSCAPE IMPACT:**
- SUBSTANTIAL - POSITIVE
 - MODERATE - POSITIVE
 - SLIGHT - POSITIVE
 - INSUBSTANTIAL
 - SLIGHT - NEGATIVE
 - MODERATE - NEGATIVE
 - SUBSTANTIAL - NEGATIVE

REV. NO.	DESCRIPTION	DATE	BY	CHKD.	APPROVED	DATE

CEDD Civil Engineering and Development Department

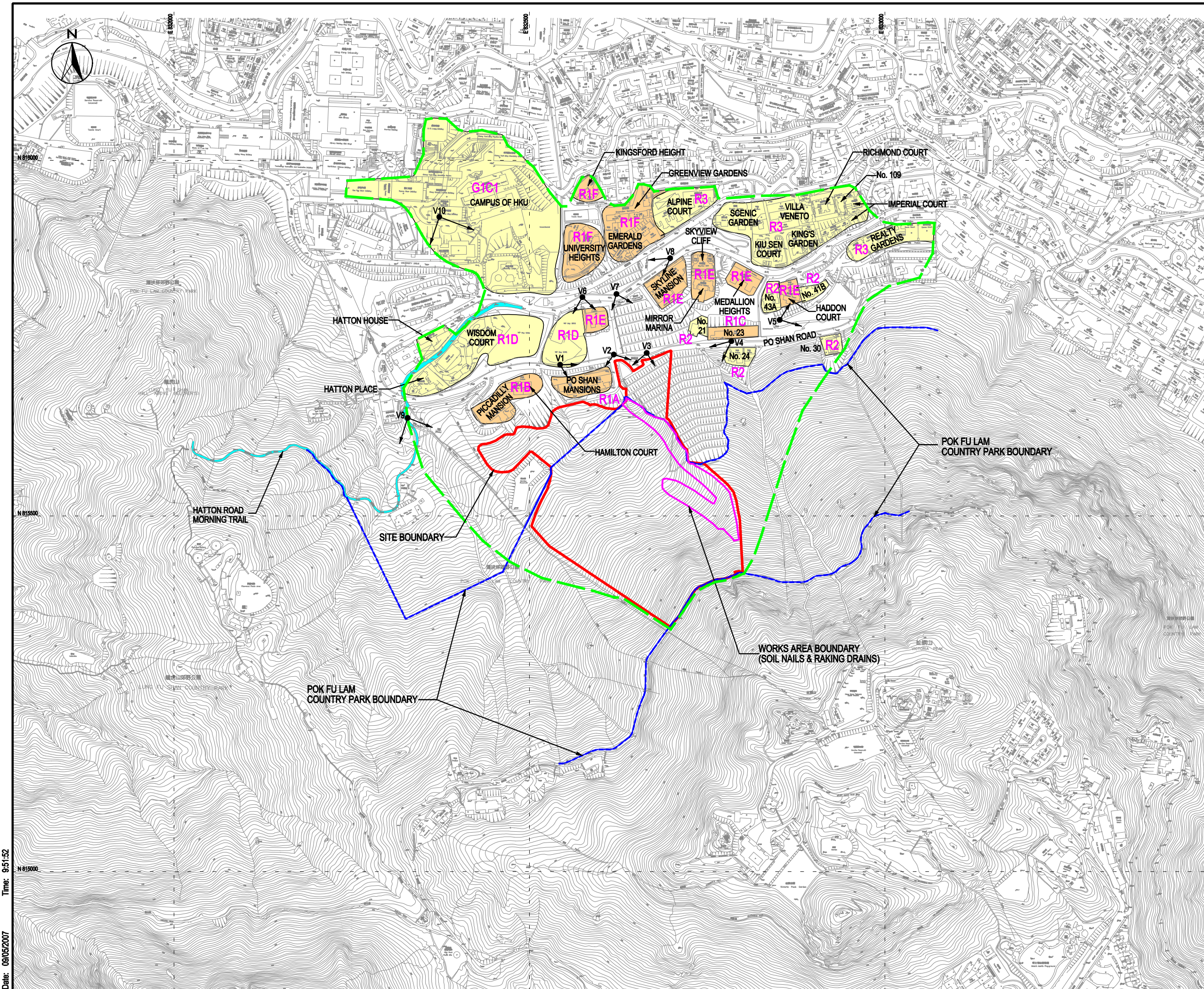
CONTRACT No. GE/2005/45
 LANDSLIDE PREVENTIVE WORKS
 AT PO SHAN ROAD, MID-LEVELS

RESIDUAL LANDSCAPE CHARACTER AREA IMPACTS IN OPERATION PHASE

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 茂盛士力工程顧問有限公司

DRGNO. 圖紙編號	4.5.4
DRAWN BY 繪圖	PCKM
SCALE 比例	A3 1 : 3000
DIMENSIONS ARE IN 尺寸單位	METRES
STATUS 圖況	—
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Date: 08/03/2007 Time: 16:30:50



LEGEND:

- SITE BOUNDARY
- POK FU LAM COUNTRY PARK BOUNDARY
- WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS
- PRIMARY ZONE OF VISUAL INFLUENCE
- HATTON ROAD MORNING TRAIL
- PHOTO VIEW POINTS

INTENSITY OF VISUAL IMPACT:

- SUBSTANTIAL - POSITIVE
- MODERATE - POSITIVE
- SLIGHT - POSITIVE
- INSUBSTANTIAL
- SLIGHT - NEGATIVE
- MODERATE - NEGATIVE
- SUBSTANTIAL - NEGATIVE

REV.	DESCRIPTION	DATE	BY	CHKD.	APPROVED	DATE

CEDD Civil Engineering and Development Department

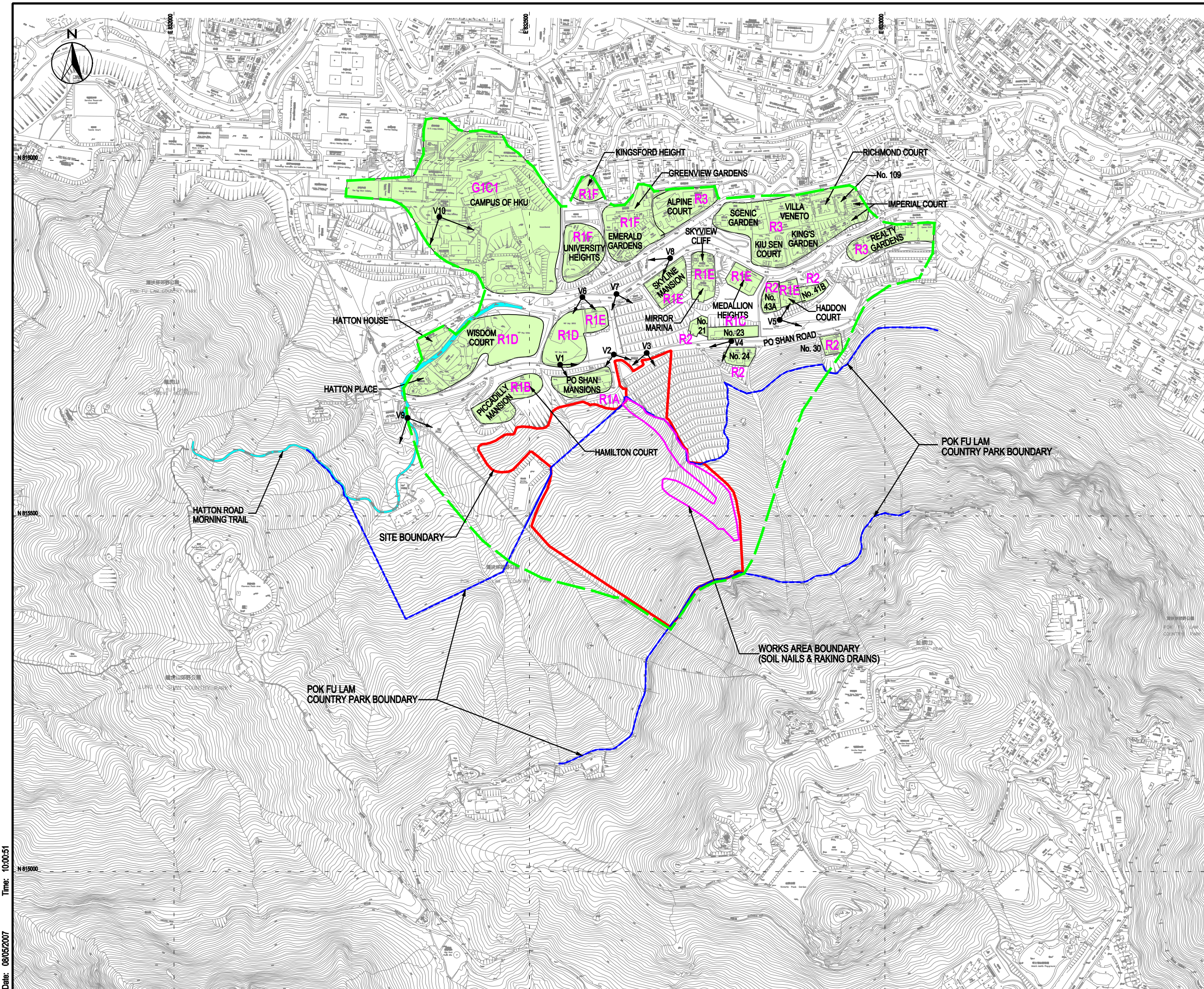
CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

RESIDUAL VISUAL IMPACTS
IN CONSTRUCTION PHASE

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DRG. NO. 圖紙編號	4.5.5
DESIGNED BY 設計	PCKM
SCALE 比例尺	A3 1 : 5000
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Date: 09/05/2007 Time: 9:51:52



LEGEND:

- SITE BOUNDARY
- POK FU LAM COUNTRY PARK BOUNDARY
- WORKS AREA BOUNDARY FOR SOIL NAILS & RAKING DRAINS
- PRIMARY ZONE OF VISUAL INFLUENCE
- HATTON ROAD MORNING TRAIL
- PHOTO VIEW POINTS

INTENSITY OF VISUAL IMPACT:

- SUBSTANTIAL - POSITIVE
- MODERATE - POSITIVE
- SLIGHT - POSITIVE
- INSUBSTANTIAL
- SLIGHT - NEGATIVE
- MODERATE - NEGATIVE
- SUBSTANTIAL - NEGATIVE

REV.	DESCRIPTION	DATE	BY	CHK.	APP.	DATE

CEDD Civil Engineering and Development Department

CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

RESIDUAL VISUAL IMPACTS
IN OPERATION PHASE

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DRG. NO. 圖紙編號	4.5.6
DRAWN BY 繪圖人	PCKM
SCALE 比例尺	A3 1 : 5000
DIMENSIONS ARE IN 尺寸單位	METRES
STATUS 圖則	—
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Date: 08/05/2007 Time: 10:00:51



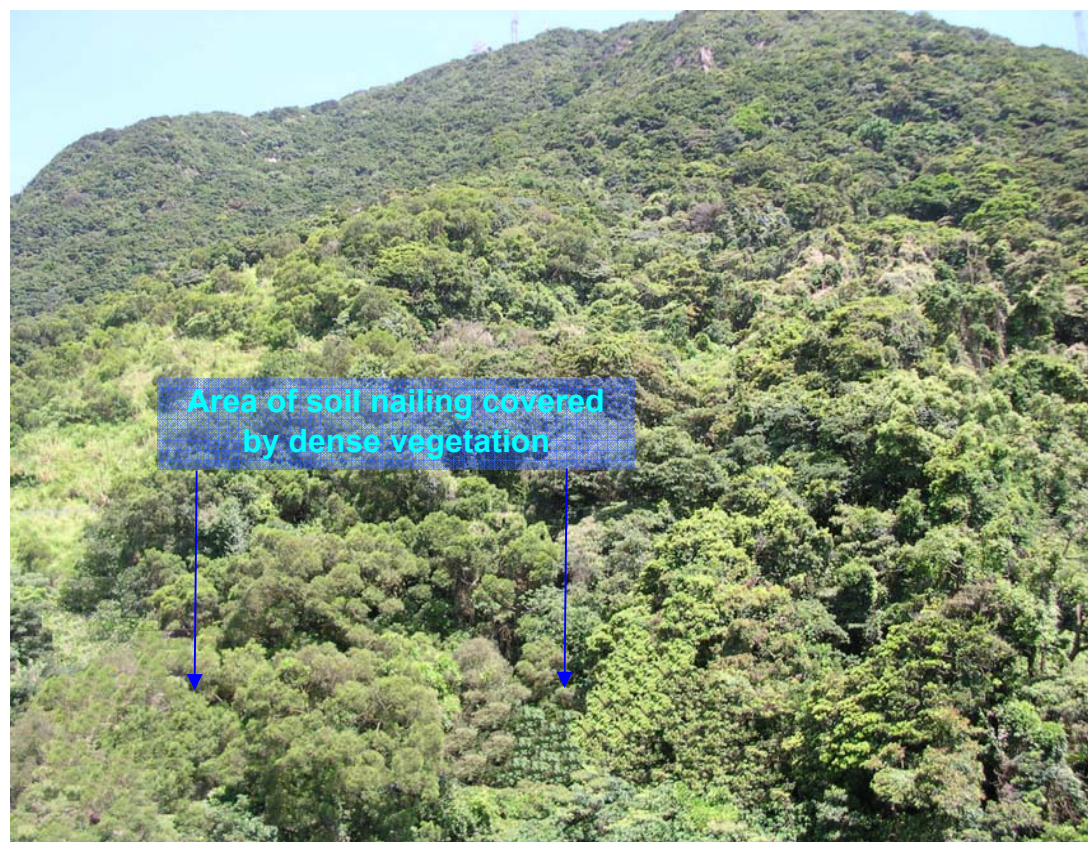
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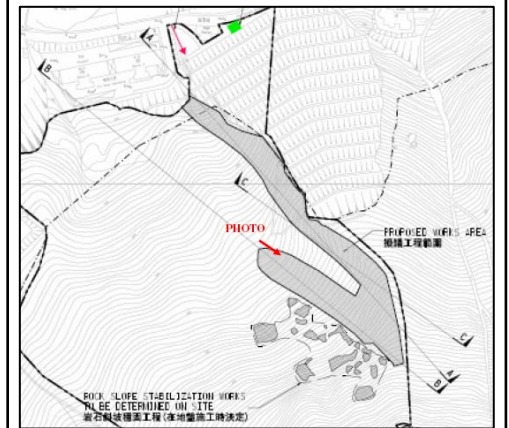
DAY 1 WITHOUT MITIGATION



DAY 1 WITH MITIGATION



YEAR 10 WITH MITIGATION



VIEWPOINT LOCATION

CEDD Civil Engineering and Development Department

CONTRACT No. GE/2005/45
LANDSLIDE PREVENTIVE WORKS
AT PO SHAN ROAD, MID-LEVELS

PHOTOMONTAGE SHOWING VIEWS
FROM PO SHAN MANSIONS

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Maunsell Geotechnical Services Ltd.
茂盛土力工程顧問有限公司

DRG. NO. FIGURE 4.6.1

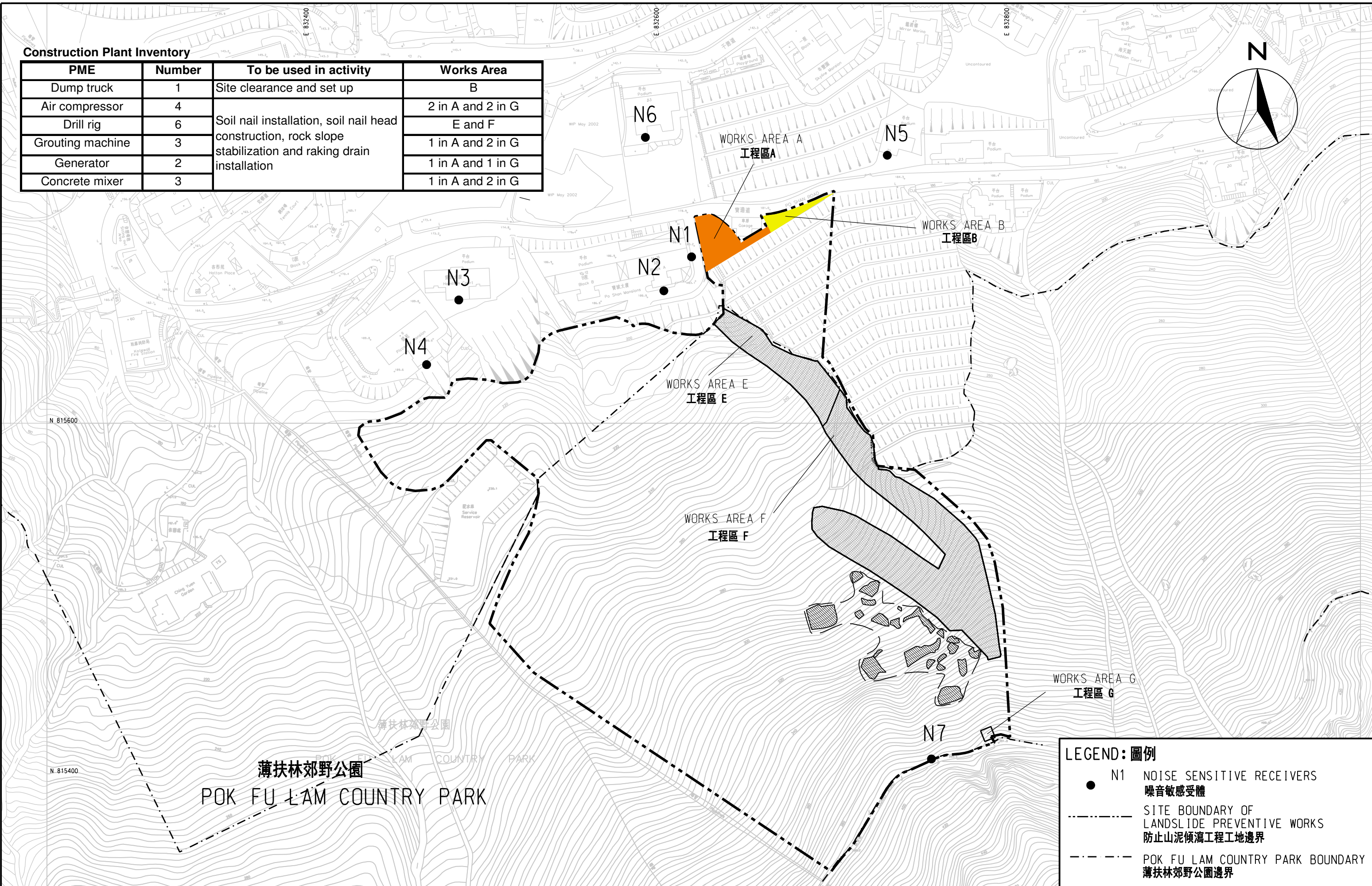
DRAWN BY JKWT	STATUS CONTRACT
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SCALE	
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Construction Plant Inventory

PME	Number	To be used in activity	Works Area
Dump truck	1	Site clearance and set up	B
Air compressor	4	Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation	2 in A and 2 in G
Drill rig	6		E and F
Grouting machine	3		1 in A and 2 in G
Generator	2		1 in A and 1 in G
Concrete mixer	3		1 in A and 2 in G



LEGEND: 圖例

- N1 NOISE SENSITIVE RECEIVERS
噪音敏感受體
- SITE BOUNDARY OF LANDSLIDE PREVENTIVE WORKS
防止山泥傾瀉工程工地邊界
- - - - - POK FU LAM COUNTRY PARK BOUNDARY
薄扶林郊野公園邊界

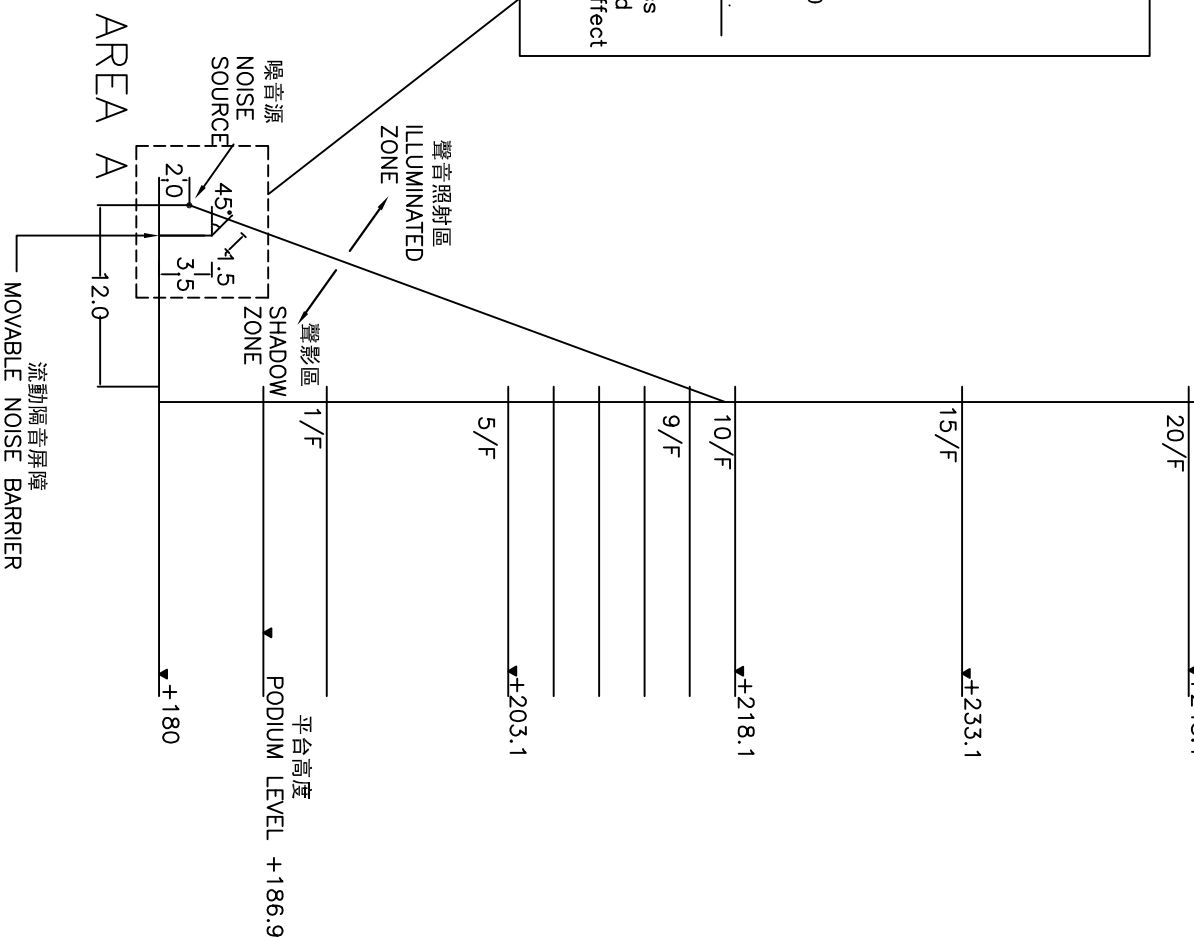
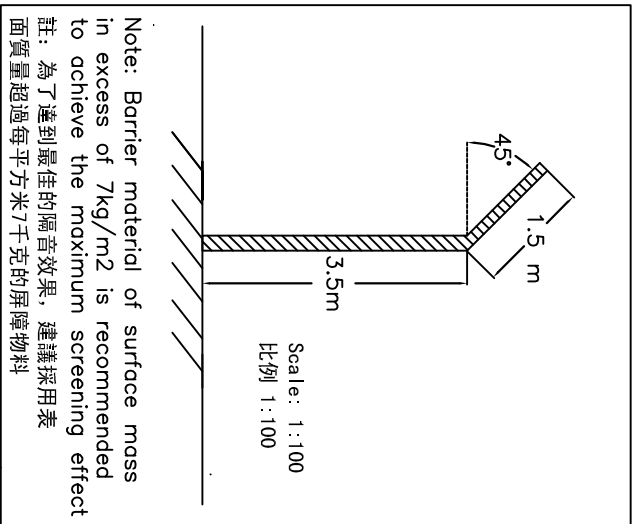
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Maunsell Environmental Management Consultants Ltd

LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID LEVEL - NATURAL TERRAIN RISK MITIGATION WORKS
半山區實珊地段防止山泥傾瀉工程 - 天然山坡滑塌災害緩減工程

LOCATIONS OF REPRESENTATIVE NOISE SENSITIVE RECEIVERS
具代表性的噪音敏感受體位置圖

SCALE	A3 1:2000	DATE	MAY 07
CHECK	FKKN	DRAWN	LCWK
JOB No.	60017196(2.1)	DRAWING No.	5.1
		REV	-

NSR: N1 PO SHAN MANSIONS 噪音敏感受體: N1 貴城大廈



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LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID-LEVELS - NATURAL TERRAIN RISK MITIGATION WORKS

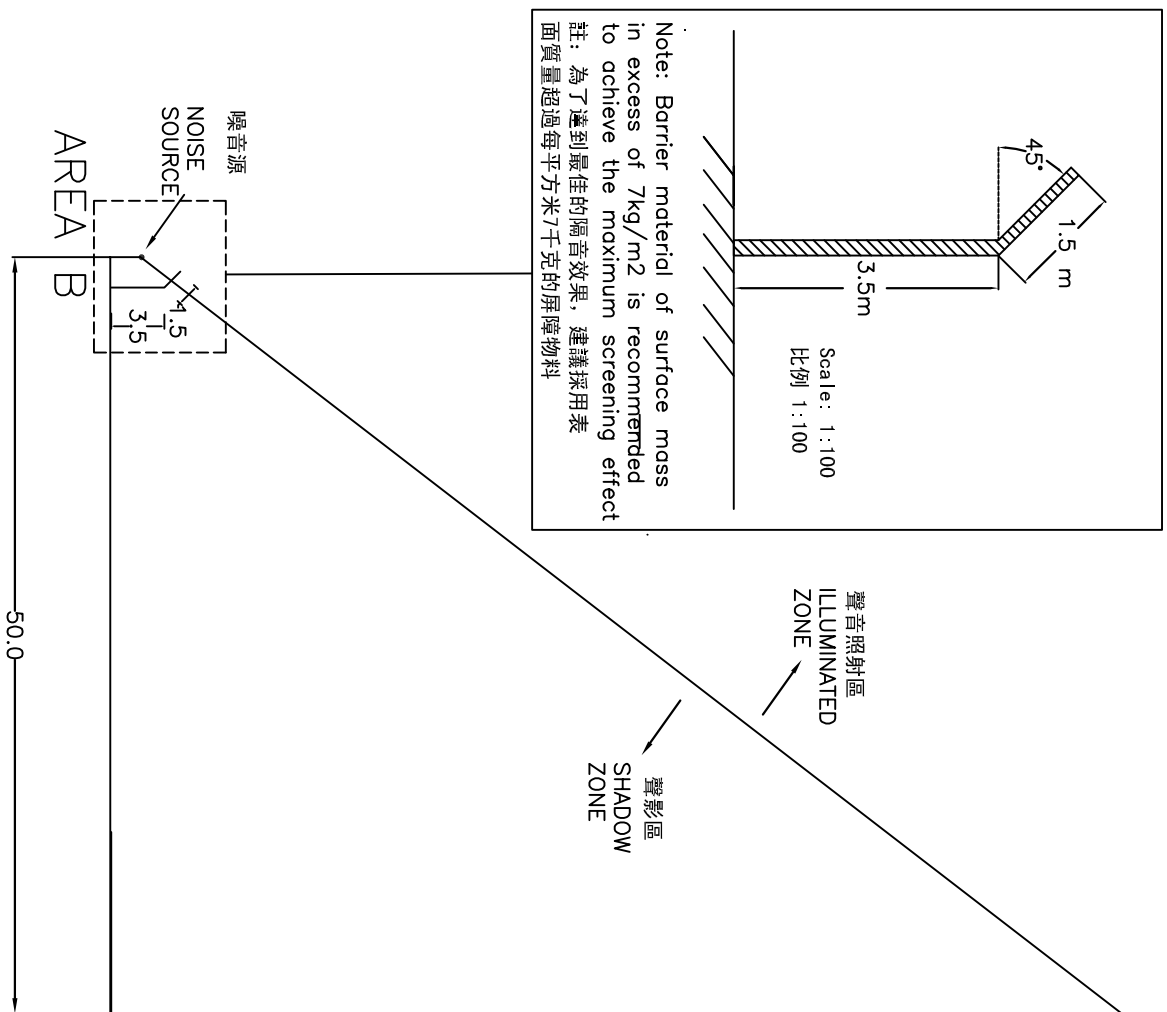
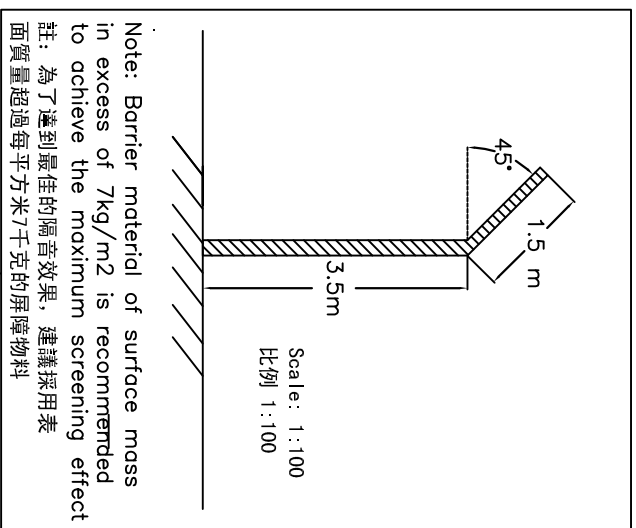
半山貴城地段防止山泥傾瀉工程-天然山坡滑坡坡災雪繩減工程

TYPICAL SECTION OF MOVABLE NOISE BARRIER

流動噪音屏障的切面圖

(SHEET 1 OF 2)

SCALE	1:500	DATE	MAR07
CHECK	MCTY	DRAWN	YPK
JOB No.	60017196(2.1)	DRAWING No.	5.2
		REV	-

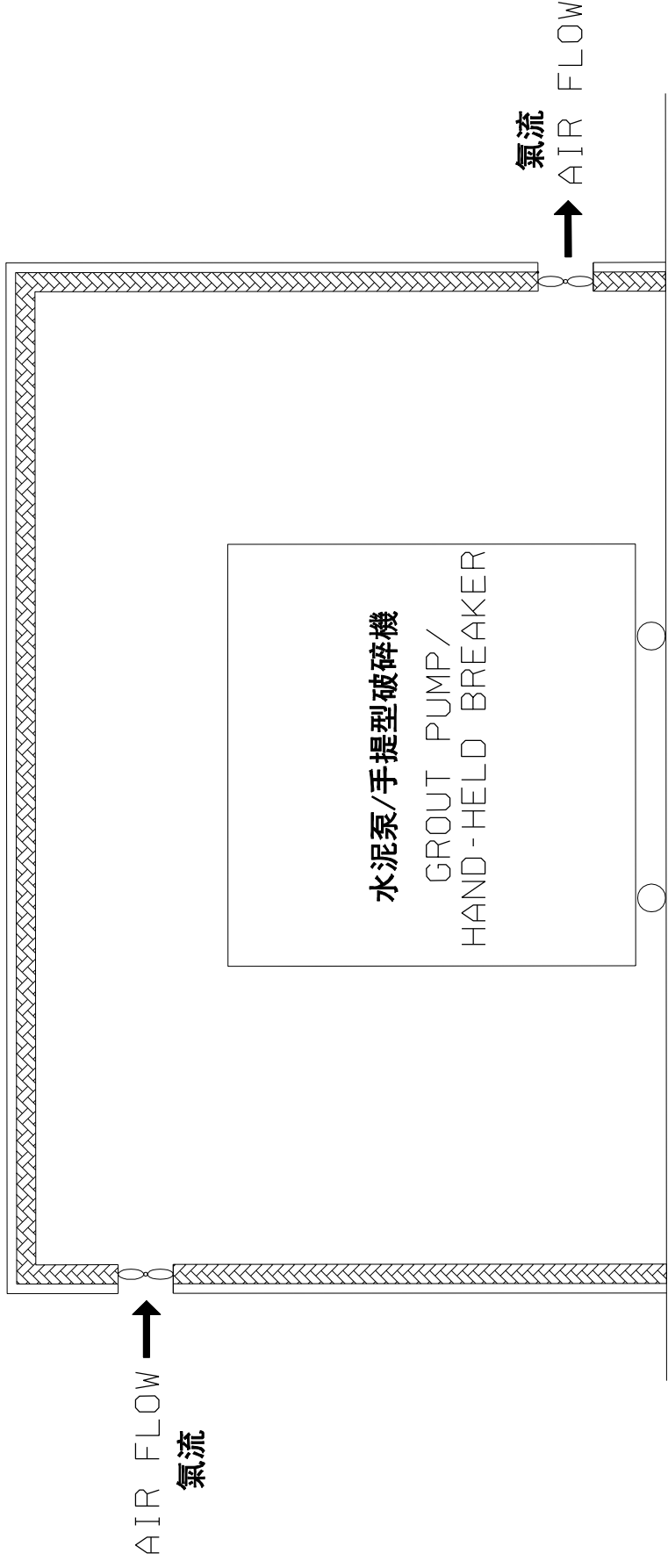


20/F	▼+248.1
15/F	▼+233.1
10/F	▼+218.1
9/F	
5/F	▼+203.1
1/F	平台高度 ▼ PODIUM LEVEL +186.9
	▼+180

LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID-LEVELS - NATURAL TERRAIN RISK MITIGATION WORKS
半山實棚地段防止山泥傾瀉工程-天然山坡滑坡災害緩減工程
TYPICAL SECTION OF MOVABLE NOISE BARRIER
(SHEET 2 OF 2)

流動隔音屏障的切面圖

SCALE	1:500	DATE	MAY 07
CHECK	MCTY	DRAWN	YPK
JOB No.	60017196(2.1)	DRAWING No.	5.2
		REV	-



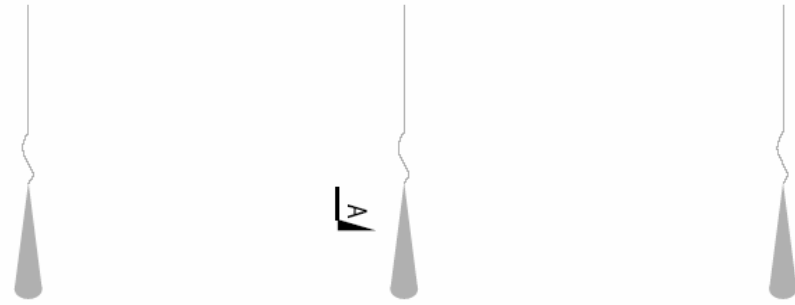
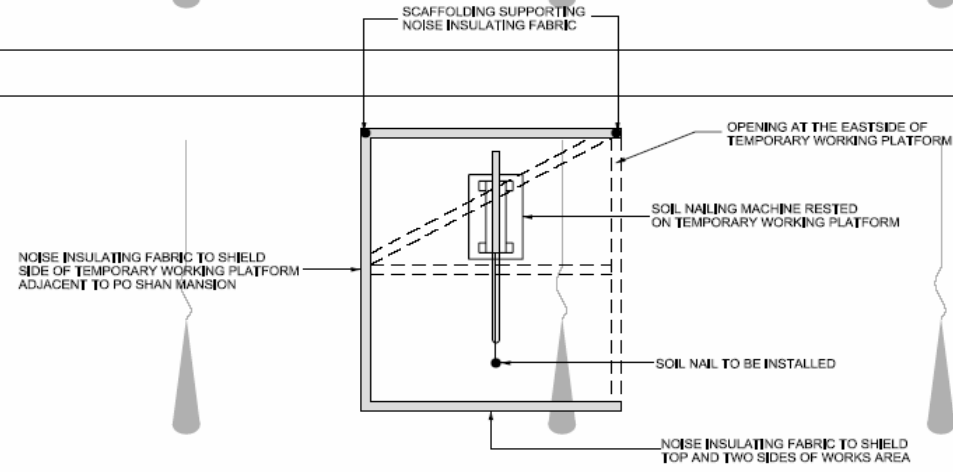
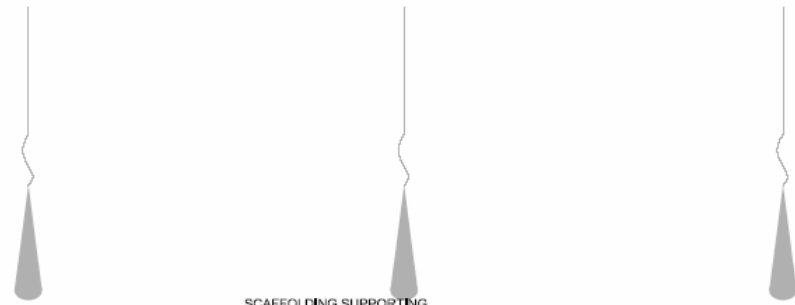
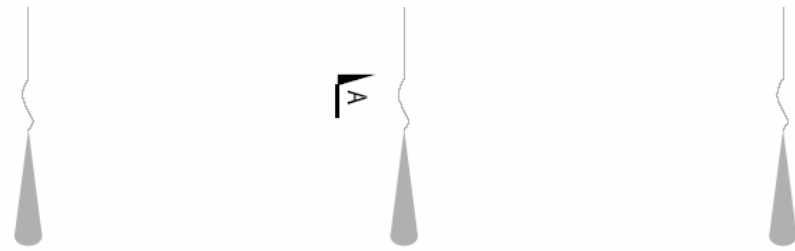
密封式隔音屏障

NOISE ENCLOSURE

NOTE: BARRIER MATERIAL OF SURFACE MASS IN EXCESS OF 7KG/M² IS RECOMMENDED TO ACHIEVE THE MAXIMUM SCREENING EFFECT

註：為了達到最佳的隔音效果，建議採用表面質量超過每平方米7千克的屏障物料

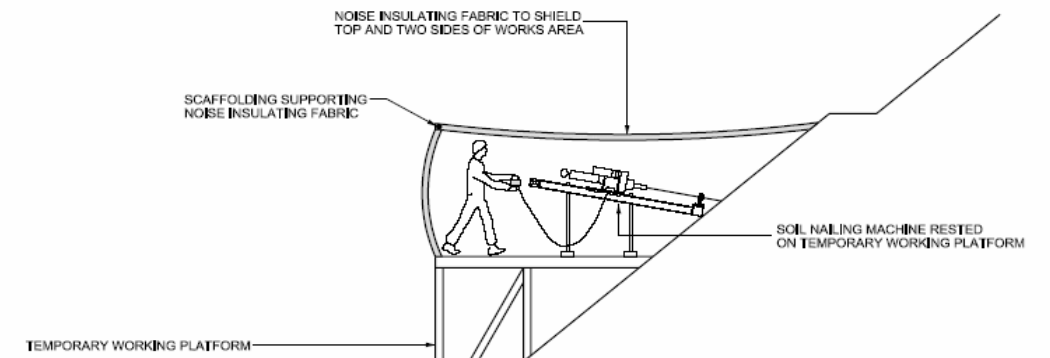
MAUNSELL AECOM Maunsell Environmental Management Consultants Ltd	LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID-LEVELS - NATURAL TERRAIN RISK		SCALE	N.T.S.	DATE	MAR 2007
	MITIGATION WORKS 半山實珊地段防止山泥傾瀉工程-天然山坡滑坡災害緩減工程		CHECK	LWYL	DRAWN	
	TYPICAL SECTION OF NOISE ENCLOSURE 密封式隔音屏障的切面圖		JOB No.	60017196(2.1)	DRAWING No.	5.3



SCHEMATIC LAYOUT
N.T.S.

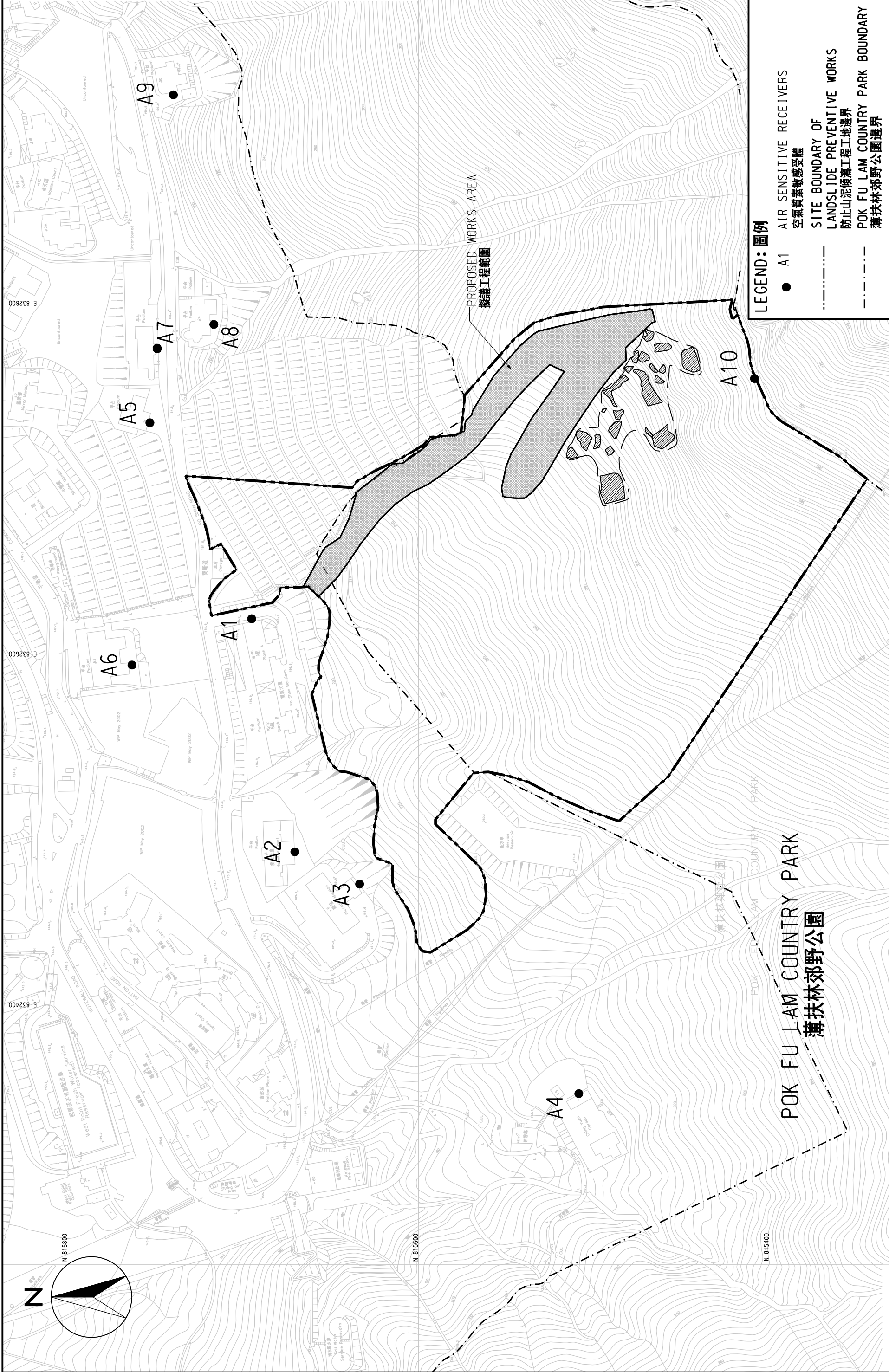
NOTE:

1. SUITABLY DESIGNED NOISE INSULATING FABRIC SHOULD ACHIEVE AT LEAST 5 dB(A) NOISE REDUCTION.
2. THE NOISE INSULATING FABRIC SHOULD BE PROPERLY INSTALLED TO ENSURE NO OPENING/GAP AT THE JOINTS.



SECTION A-A
N.T.S.

SCALE	N.T.S.	DATE	May-07
CHECK	KCWL	DRAWN	KCWL
JOB NO.	60017196 (2.1)	DRAWING No.	5.4
		Rev	-



LEGEND: 圖例

- A1 AIR SENSITIVE RECEIVERS
空氣質素敏感受體
- SITE BOUNDARY OF
防止山泥傾瀉工程工地邊界
- - - - - POK FU LAM COUNTRY PARK BOUNDARY
薄扶林郊野公園邊界

SCALE	A3 1:2000	DATE	MAR 07
CHECK	LWYL	DRAWN	
JOB No.	60017196(2.1)		
DRAWING No.	7.1		
REV	-		

LANDSLIDE PREVENTIVE WORKS AT PO SHAN, MID LEVEL - NATURAL TERRAIN RISK MITIGATION WORKS
 半山區實地防止山泥傾瀉工程 - 天然山坡滑坡災害緩減工程

LOCATIONS OF REPRESENTATIVE AIR SENSITIVE RECEIVERS
 具代表性的空氣質素敏感受體位置圖

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 Maunsell Environmental
 Management Consultants Ltd

Appendix 2.1 Preliminary Construction Programme

Activity	2007			2008								
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Site Clearance and Setup		■										
Soil Nail Installation			■	■	■	■	■	■	■	■	■	
Soil Nail Head Construction			■	■	■	■	■	■	■	■	■	
Rock Slope Stabilization Works		■	■	■	■	■	■	■	■	■	■	
Raking Drain Installation						■	■	■	■	■	■	
Landscaping Works											■	■
Site Reinstatement Works											■	■



Natural Woodland



Shrubland



Eastern Stream

Title	Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels - EIA Study Representative Photographs of Habitats Recorded in the Assessment Area (Sheet 1 of 2)	Scale	N.T.S.	Project No.	A02005(001)
		Date	Feb. 2007	Figure No.	Appendix 3.1

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MAUNSELL ENVIRONMENTAL
MANAGEMENT CONSULTANTS LTD




Western Stream



Developed Area



Proposed Works Area

Title Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels - EIA Study Representative Photographs of Habitats Recorded in the Assessment Area (Sheet 2 of 2)	Scale N.T.S.	Project No. A02005(001)	
	Date Feb. 2007	Figure No. Appendix 3.1	




Pavetta hongkongensis



Rhododendron championiae

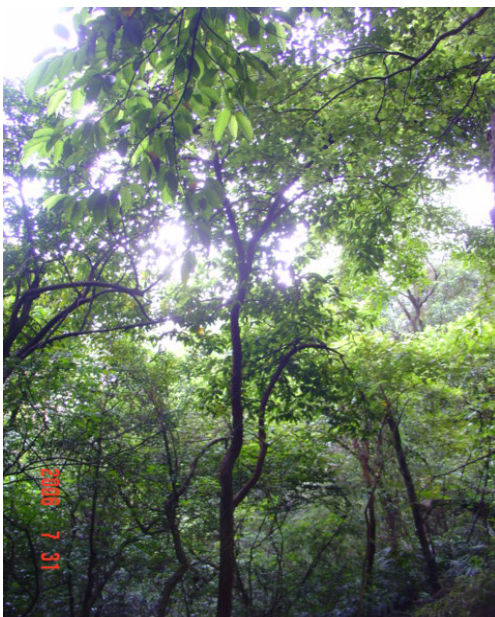


Aristolochia championii

Title Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels - EIA Study Photographs of Species of Conservation Interest Recorded from the Assessment Area (Sheet 1 of 4)	Scale N.T.S.	Project No. A02005(001)	
	Date Feb. 2007	Figure No. Appendix 3.2	




Diospyros vaccinioides



Artocarpus hypargyreus



Aquilaria sinensis

Title Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels - EIA Study Photographs of Species of Conservation Interest Recorded from the Assessment Area (Sheet 2 of 4)	Scale N.T.S.	Project No. A02005(001)	
	Date Feb. 2007	Figure No. Appendix 3.2	



Tutcheria spectabilis

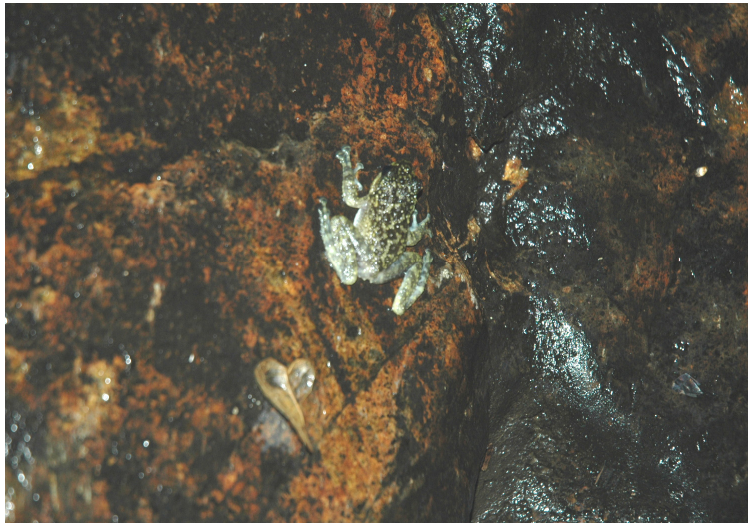


Cibotium barometz



Paa exilispinosa

Title Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels - EIA Study Photographs of Species of Conservation Interest Recorded from the Assessment Area (Sheet 3 of 4)	Scale	N.T.S.	Project No.	A02005(001)	
	Date	Feb. 2007	Figure No.	Appendix 3.2	



Amolops hongkongensis



Cynopterus sphinx



Nanhaiopotamon hongkongense

Title	Agreement No. CE 28/2004 (GE)		Scale	N.T.S.	Project No.	A02005(001)	
	Landslide Preventive Works at Po Shan, Mid-levels - EIA Study		Date	Feb. 2007	Figure No.	Appendix 3.2	
Photographs of Species of Conservation Interest Recorded from the Assessment Area (Sheet 4 of 4)							

Appendix 3.3 - Vegetation Recorded within the Assessment Area

Plant Species	Status in Hong Kong	Developed Area	Shrubland	Natural Woodland	Proposed Works area
<i>Acacia confusa</i>	Exotic	+	+	+	+
<i>Acronychia pedunculata</i>	Native			+	+
<i>Adiantum capillus-veneris</i>	Native			+	+
<i>Ageratum conyzoides</i>	Exotic	+	+		
<i>Alocasia odora</i>	Native	+		+	+
<i>Alpinia hainanensis</i>	Native			+	++
<i>Aporosa dioica</i>	Native			+	+
<i>Aquilaria sinensis</i> *	Native			+	
<i>Archidendron clypearia</i>	Native			+	+
<i>Ardisia crenata</i>	Native	+		+	+
<i>Ardisia lindleyana</i> D. Dietr.	Native			+	+
<i>Aristolochia championii</i> #	Native			+	
<i>Artocarpus hypargyreus</i> *	Native			+	
<i>Asparagus cochinchinensis</i>	Native	+		+	
<i>Aster baccharoides</i>	Native			+	
<i>Bauhinia</i> sp.	Native	++		+	+
<i>Berchemia floribunda</i>	Native		+	+	+
<i>Bidens alba</i>	Exotic	+	+		
<i>Blechnum orientale</i>	Native			+	+
<i>Boehmeria nivea</i>	Exotic			+	
<i>Boehmeria penduliflora</i>	Native			+	+
<i>Borreria stricta</i>	Native		+		
<i>Breynia fruticosa</i>	Native			+	+
<i>Bridelia tomentosa</i>	Native		+	+	+
<i>Broussonetia kaempferi</i>	Native			+	
<i>Broussonetia papyrifera</i>	Native	+	+	+	+
<i>Caesalpinia crista</i>	Native			+	+
<i>Cajanus scarabaeoides</i>	Native		+		
<i>Canarium trandenum</i>	Exotic			+	+
<i>Carica papaya</i>	Exotic	+		+	+
<i>Caryota mitis</i>	Exotic	+			
<i>Cayratia corniculata</i>	Native		+	+	+
<i>Celtis sinensis</i>	Native		+	+	+
<i>Chrysalidocarpus lutescens</i>	Exotic	++			
<i>Cibotium barometz</i> *	Native			+	+
<i>Cinnamomum burmannii</i>	Native	+			
<i>Cinnamomum camphora</i>	Native	+			
<i>Cinnamomum parthenoxylon</i>	Native		+	+	+
<i>Clematis meyeniana</i>	Native			+	
<i>Clerodendrum fortunatum</i>	Native			+	
<i>Cratoxylum cochinchinense</i>	Native	+		+	+
<i>Cyclobalanopsis neglecta</i>	Native			+	
<i>Dalbergia hancei</i>	Native			+	+
<i>Dendropanax proteus</i>	Native			+	+
<i>Desmos chinensis</i>	Native			+	+
<i>Dicranopteris pedata</i>	Native			+	+
<i>Dimocarpus longan</i>	Exotic	+		+	+
<i>Dioscorea</i> sp.	Native			+	+
<i>Diospyros vaccinioides</i>	Native			+	+
<i>Diplospora dubia</i>	Native			+	+
<i>Elaeocarpus sylvestris</i>	Native			+	+
<i>Embelia ribes</i>	Native			+	+
<i>Endospermum chinense</i>	Native			+	+
<i>Erechtites hieracifolius</i>	Exotic	+	+		
<i>Erigeron karvinskianus</i>	Exotic				
<i>Eupatorium catarium</i>	Exotic	+		+	+
<i>Eurya nitida</i>	Native			+	+
<i>Ficus fistulosa</i>	Native			+	
<i>Ficus hispida</i>	Native			+	+
<i>Ficus microcarpa</i>	Native	++			
<i>Ficus pumila</i>	Native	+		+	+
<i>Ficus simplicissima</i>	Native			+	+
<i>Ficus superba</i>	Native	+		+	+
<i>Ficus variegata</i>	Native	+		+	+
<i>Ficus variolosa</i>	Native			+	+

Appendix 3.3 - Vegetation Recorded within the Assessment Area

Plant Species	Status in Hong Kong	Developed Area	Shrubland	Natural Woodland	Proposed Works area
<i>Ficus virens</i>	Native	+		+	
<i>Glochidion eriocarpum</i>	Native			+	+
<i>Gnetum luofuense</i>	Native		+	+	+
<i>Gordonia axillaris</i>	Native			+	+
<i>Gynura divaricata</i>	Native			+	
<i>Hedyotis acutangula</i>	Native			+	+
<i>Hedyotis hedyotidea</i>	Native			+	+
<i>Heterosmilax japonica var gaudichaudiana</i>	Native			+	+
<i>Homalium cochinchinensis</i>	Native			+	+
<i>Ilex asprella</i>	Native			+	+
<i>Ilex cinerea</i>	Native			+	+
<i>Ilex pubescens</i>	Native			+	+
<i>Ipomoea cairica</i>	Exotic	+		+	+
<i>Lagerstroemia speciosa</i>	Exotic	+			
<i>Lantana camara</i>	Exotic		+	+	+
<i>Lasianthus chinensis</i>	Native			+	+
<i>Lemmaphyllum microphyllum</i>	Native			+	+
<i>Lepidogrammitis rostrata</i>	Exotic			+	
<i>Leucaena leucocephala</i>	Exotic	+	+	+	+
<i>Ligustrum sinense</i>	Native		+		
<i>Liquidambar formosana</i>	Native		+	+	+
<i>Liriope spicata</i>	Native			+	+
<i>Litsea cubeba</i>	Native			+	+
<i>Litsea glutinosa</i>	Native	+	+	+	+
<i>Litsea monopetala</i>	Native	++		+	+
<i>Litsea rotundifolia</i>	Native	+		+	
<i>Lophatherum gracile</i>	Native			+	+
<i>Lophostemon confertus</i>	Exotic	+	+		
<i>Lygodium japonicum</i>	Native		+	+	+
<i>Macaranga tanarius</i>	Native	+		+	+
<i>Machilus chekiangensis</i>	Native		+	++	+++
<i>Machilus velutina</i>	Native			+	+
<i>Maesa perlaris</i>	Native			+	+
<i>Mallotus paniculatus</i>	Native	+	+	+	+
<i>Melaleuca quinquenervia</i>	Exotic	+			
<i>Melastoma candidum</i>	Native	+		+	+
<i>Melastoma sanguineum</i>	Native		+	+	+
<i>Melia azedarach</i>	Exotic		+		
<i>Melicope pteleifolia</i>	Native			+	+
<i>Melodinus suaveolens</i>	Native			+	+
<i>Michelia figo</i>	Exotic	+			
<i>Microstegium ciliatum</i>	Native			+	+
<i>Mikania micrantha</i>	Exotic	+	+	+	+
<i>Millettia dielsiana</i>	Native			+	+
<i>Mimosa pudica</i>	Exotic			+	+
<i>Miscanthus floridulus</i>	Native			+	+
<i>Miscanthus sinensis</i>	Native		+++		
<i>Musa paradisiaca</i>	Exotic	+			
<i>Mussaenda erosa</i>	Native			+	+
<i>Mussaenda pubescens</i>	Native			+	+
<i>Myrsine seguinii</i>	Native			+	+
<i>Oxalis corymbosa</i>	Exotic			+	+
<i>Paederia scandens</i>	Native		+	+	+
<i>Pandanus furcatus</i>	Native			+	+
<i>Paraixeris denticulata</i>	Native		+		
<i>Pavetta hongkongensis *</i>	Native			+	+
<i>Phyllanthus urinaria</i>	Native			+	+
<i>Piper hancei</i>	Native			+	+
<i>Polygonum chinense</i>	Native		+	+	+
<i>Pothos chinensis</i>	Native			+	+
<i>Pronephrium simplex</i>	Native			+	+
<i>Psychotria asiatica</i>	Native			+	+
<i>Pteris biaurita</i>	Native			+	+
<i>Pteris ensiformis</i>	Native		+		
<i>Pteris semipinnata</i>	Native			+	+

Appendix 3.3 - Vegetation Recorded within the Assessment Area

Plant Species	Status in Hong Kong	Developed Area	Shrubland	Natural Woodland	Proposed Works area
<i>Pueraria lobata</i>	Native			+	+
<i>Pyrosia adnascens</i>	Native			+	
<i>Rhaphiolepis indica</i>	Native		+	+	+
<i>Rhododendron championiae</i> * #	Native			+	
<i>Rhodomyrtus tomentosa</i>	Native			+	+
<i>Rhus hypoleuca</i>	Native			+	
<i>Rhus succedanea</i>	Native		+	+	
<i>Rosa laevigata</i>	Native			+	
<i>Rubus reflexus</i>	Native		+	+	+
<i>Sapium discolor</i>	Native			+	+
<i>Sarcandra glabra</i>	Native			+	+
<i>Sarcosperma laurinum</i>	Native			+	+
<i>Schefflera heptaphylla</i>	Native	+	+	+	+
<i>Scoparia dulcis</i>	Exotic			+	
<i>Smilax glabra</i>	Native			+	+
<i>Solena amplexicaulis</i>	Native			+	+
<i>Sonchus arvensis</i>	Native		+		
<i>Stephania longa</i>	Native			+	+
<i>Sterculia lanceolata</i>	Native			+	+
<i>Strophanthus divaricatus</i>	Native			+	+
<i>Symplocos lancifolia</i>	Native			+	
<i>Synedrella nodiflora</i>	Exotic	+		+	+
<i>Syzygium hancei</i>	Native			+	+
<i>Taxillus chinensis</i>	Native			+	+
<i>Tetracera asiatica</i>	Native			+	+
<i>Tutcheria spectabilis</i> * #	Native			+	+
<i>Uvaria macrophylla</i>	Native			+	+
<i>Viburnum odoratissimum</i>	Native			+	+
<i>Wedelia trilobata</i>	Exotic	+		+	+
<i>Wikstroemia indica</i>	Native			+	
<i>Wikstroemia nutans</i>	Native			+	+
<i>Youngia japonica</i>	Native			+	+
<i>Zanthoxylum avicennae</i>	Native		+	+	+

Note: *, Protected species in Hong Kong or China

#, Rare plant species in Hong Kong

"+" represent species occurred in the study area

"++" represent species is common in the study area

"+++ " represent species very common in the study area

Appendix 3.4 - Fauna Recorded within the Assessment Area

Avifauna

Common Name	Scientific Name	Rarity/Conservation Status
Arctic Warbler	<i>Phylloscopus borealis</i>	Uncommon
Black Kite	<i>Milvus migrans</i>	Common (RC)
Blue Magpie	<i>Urocissa erythrorhyncha</i>	Common
Blue Whistling Thrush	<i>Myiophoneus caeruleus</i>	Common
Chinese Bulbul	<i>Pycnonotus sinensis</i>	Common
Collared Scops Owl	<i>Otus lettia</i>	Common
Common Koel	<i>Eudynamys scolopacea</i>	Common
Common Tailorbird	<i>Orthotomus sutorius</i>	Common
Eurasian Tree Sparrow	<i>Passer montanus</i>	Common
Great Tit	<i>Parus major (commixtus)</i>	Common
Greater Coucal	<i>Centropus sinensis</i>	Common
Hwamei	<i>Garrulax canorus</i>	Uncommon
Japanese White Eye	<i>Zosterops japonica (simplex)</i>	Common
Large Hawk Cuckoo	<i>Hierococcyx sparveriioides</i>	Uncommon
Large-billed Crow	<i>Corvus macrorhynchos</i>	Common
Masked Laughing Thrush	<i>Garrulax perspicillatus</i>	Common
Oriental Magpie Robin	<i>Copsychus saularis</i>	Common
Pacific Swift	<i>Apus pacificus</i>	Common
Red-billed Leiothrix	<i>Leiothrix lutea</i>	Uncommon
Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	Common
Rock Dove	<i>Columba livia</i>	Common
Siberian Rubythroat	<i>Luscinia calliope</i>	Common
Silver-eared Mesia	<i>Leiothrix argenteauris</i>	Uncommon
Spotted Dove	<i>Streptopelia chinensis</i>	Common
Yellow-crested Cockatoo	<i>Cacatua sulphurea</i>	Common

* RC – Regional Concern (Habitat loss/damage in Hong Kong would pose significant threat to regional survival).

Refer to Fellowes *et al.* (2002) for further explanation of status.

Herpetofauna

Common Name	Scientific Name	Rarity/Conservation Status
Reptiles		
Changeable Lizard	<i>Calotes versicolor</i>	Common and widespread
Amphibians		
Lesser Spiny Frog	<i>Paa exilispinosa</i>	Common and widespread (PGC)
Hong Kong Cascade Frog	<i>Amolops hongkongensis</i>	Uncommon (PGC)
Green Cascade Frog	<i>Rana livida</i>	Common and widespread
Asian Common Toad	<i>Bufo melanostictus</i>	Common and widespread

* PGC – Potential Global Concern (Large, secure populations in Hong Kong are of global significance).

Refer to Fellowes *et al.* (2002) for further explanation of status.

Terrestrial Insect

Common Name	Scientific Name	Rarity/Conservation Status
Dragonflies		
Wandering Glider	<i>Pantala flavescens</i>	Very common
Butterflies		
Indian Cabbage White	<i>Pieris canidia</i>	Common
Red Helen	<i>Papilio helenus</i>	Common
Paris Peacock	<i>Papilio paris</i>	Common
Spangle	<i>Papilio protenor</i>	Common
Dark Brand Bush Brown	<i>Mycalesis mineus</i>	Common
Large Faun	<i>Faunis eumeus</i>	Common
Blue Tiger	<i>Tirumala limniace</i>	Common

Freshwater Community

Taxa	Eastern Stream	Western Stream
Gastropoda		
<i>Radix plicatulus</i>	x	x
<i>Biomphalaria straminea</i>	x	x
Hemiptera		
<i>Buena</i> sp.	x	x
<i>Notomecta</i> sp.		x
Odonata		
<i>Ophiogomphus sinicus</i>	x	x
Diptera		
Chironomidae	x	x
Anura		
<i>Amolops hongkongensis</i> (tadpole)	x	x
Total Taxa	6	7

Appendix 5.1
Schedule of Powered Mechanical Equipment
Landslide Preventive Works at Po Shan Mid-Levels

Powered Mechanical Equipment	TM Ref./ other Ref.	Number	SWL/ item dB(A)
Dump Truck	BS C9/39	1	103
Air Compressor	CNP002	4	102
Drill Rig	CNP02	6	110
Grout Mixer	CNP105	3	90
Grout Pump	CNP106	3	105
Generator	CNP102	2	100
Concrete Mixer	CNP045	3	96

1 Grouting Machine = 1 Grout Mixer(CNP 105) + 1 Grout Pump(CNP 106)
 SWL of 1 Grouting Machine = 105 dB(A)

Appendix 5.2 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Unmitigated Landslide Preventive Works at Po Shan, Mid-levels

NSR : N1 (1/F to 9/F)

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	on-time %	^Distance m	SPL dB(A)
Site clearance and set up							
B	Dump Truck	103	1	103	100	51	64
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation							
A	Air Compressor	102	2	105	100	15	76
G	Air Compressor	102	2	105	100	310	50
E	Drill Rig	110	1	110	100	38	73
E	Drill Rig	110	1	110	100	51	71
E	Drill Rig	110	1	110	100	67	68
E	Drill Rig	110	1	110	100	78	67
E	Drill Rig	110	1	110	100	91	66
E	Drill Rig	110	1	110	100	103	65
A	Grouting Machine	105	1	105	100	15	76
G	Grouting Machine	105	2	108	100	310	53
A	Generator	100	1	100	100	15	71
G	Generator	100	1	100	100	310	45
A	Concrete Mixer	96	1	96	100	15	67
G	Concrete Mixer	96	2	99	100	310	44
Total SPL (without Dump Truck) dB(A)							82

NSR : N1 (10/F or above)

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	on-time %	^Distance m	SPL dB(A)
Site clearance and set up							
B	Dump Truck	103	1	103	100	62	62
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation							
A	Air Compressor	102	2	105	100	38	68
G	Air Compressor	102	2	105	100	310	50
E	Drill Rig	110	1	110	100	38	73
E	Drill Rig	110	1	110	100	51	71
E	Drill Rig	110	1	110	100	67	68
E	Drill Rig	110	1	110	100	78	67
E	Drill Rig	110	1	110	100	91	66
E	Drill Rig	110	1	110	100	103	65
A	Grouting Machine	105	1	105	100	38	68
G	Grouting Machine	105	2	108	100	310	53
A	Generator	100	1	100	100	38	63
G	Generator	100	1	100	100	310	45
A	Concrete Mixer	96	1	96	100	38	59
G	Concrete Mixer	96	2	99	100	310	44
Total SPL (without Dump Truck) dB(A)							78

Appendix 5.2 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Unmitigated Landslide Preventive Works at Po Shan, Mid-levels

NSR : N2

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	on-time %	^Distance m	SPL dB(A)
Site clearance and set up							
B	Dump Truck	103	1	103	100	70	61
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation							
A	Air Compressor	102	2	105	100	35	69
G	Air Compressor	102	2	105	100	300	50
E	Drill Rig	110	1	110	100	38	73
E	Drill Rig	110	1	110	100	49	71
E	Drill Rig	110	1	110	100	66	69
E	Drill Rig	110	1	110	100	80	67
E	Drill Rig	110	1	110	100	94	66
E	Drill Rig	110	1	110	100	108	64
A	Grouting Machine	105	1	105	100	35	69
G	Grouting Machine	105	2	108	100	300	53
A	Generator	100	1	100	100	35	64
G	Generator	100	1	100	100	300	45
A	Concrete Mixer	96	1	96	100	35	60
G	Concrete Mixer	96	2	99	100	300	44
Total SPL (without Dump Truck) dB(A)							79

NSR : N3

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	on-time %	^Distance m	SPL dB(A)
Site clearance and set up							
B	Dump Truck	103	1	103	100	185	53
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation							
A	Air Compressor	102	2	105	100	145	57
G	Air Compressor	102	2	105	100	370	49
E	Drill Rig	110	1	110	100	151	61
E	Drill Rig	110	1	110	100	158	61
E	Drill Rig	110	1	110	100	173	60
E	Drill Rig	110	1	110	100	186	60
E	Drill Rig	110	1	110	100	200	59
E	Drill Rig	110	1	110	100	211	59
A	Grouting Machine	105	1	105	100	145	57
G	Grouting Machine	105	2	108	100	370	52
A	Generator	100	1	100	100	145	52
G	Generator	100	1	100	100	370	44
A	Concrete Mixer	96	1	96	100	145	48
G	Concrete Mixer	96	2	99	100	370	43
Total SPL (without Dump Truck) dB(A)							69

Appendix 5.2 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Unmitigated Landslide Preventive Works at Po Shan, Mid-levels

NSR : N4

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	on-time %	^Distance m	SPL dB(A)
Site clearance and set up							
B	Dump Truck	103	1	103	100	210	52
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation							
A	Air Compressor	102	2	105	100	175	55
G	Air Compressor	102	2	105	100	360	49
E	Drill Rig	110	1	110	100	172	60
E	Drill Rig	110	1	110	100	176	60
E	Drill Rig	110	1	110	100	189	59
E	Drill Rig	110	1	110	100	201	59
E	Drill Rig	110	1	110	100	212	58
E	Drill Rig	110	1	110	100	222	58
A	Grouting Machine	105	1	105	100	175	55
G	Grouting Machine	105	2	108	100	360	52
A	Generator	100	1	100	100	175	50
G	Generator	100	1	100	100	360	44
A	Concrete Mixer	96	1	96	100	175	46
G	Concrete Mixer	96	2	99	100	360	43
Total SPL (without Dump Truck) dB(A)							68

NSR : N5

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	on-time %	^Distance m	SPL dB(A)
Site clearance and set up							
B	Dump Truck	103	1	103	100	50	64
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation							
A	Air Compressor	102	2	105	100	75	63
G	Air Compressor	102	2	105	100	332	50
E	Drill Rig	110	1	110	100	126	63
E	Drill Rig	110	1	110	100	123	63
E	Drill Rig	110	1	110	100	126	63
E	Drill Rig	110	1	110	100	126	63
E	Drill Rig	110	1	110	100	125	63
E	Drill Rig	110	1	110	100	131	63
A	Grouting Machine	105	1	105	100	75	62
G	Grouting Machine	105	2	108	100	332	53
A	Generator	100	1	100	100	75	57
G	Generator	100	1	100	100	332	45
A	Concrete Mixer	96	1	96	100	75	53
G	Concrete Mixer	96	2	99	100	332	44
Total SPL (without Dump Truck) dB(A)							72

Appendix 5.2 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Unmitigated Landslide Preventive Works at Po Shan, Mid-levels

NSR : N6

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	on-time %	^Distance m	SPL dB(A)
Site clearance and set up							
B	Dump Truck	103	1	103	100	75	60
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation							
A	Air Compressor	102	2	105	100	60	64
G	Air Compressor	102	2	105	100	380	48
E	Drill Rig	110	1	110	100	114	64
E	Drill Rig	110	1	110	100	127	63
E	Drill Rig	110	1	110	100	139	62
E	Drill Rig	110	1	110	100	151	61
E	Drill Rig	110	1	110	100	162	61
E	Drill Rig	110	1	110	100	173	60
A	Grouting Machine	105	1	105	100	60	64
G	Grouting Machine	105	2	108	100	380	51
A	Generator	100	1	100	100	60	59
G	Generator	100	1	100	100	380	43
A	Concrete Mixer	96	1	96	100	60	55
G	Concrete Mixer	96	2	99	100	380	42
Total SPL (without Dump Truck) dB(A)							72

Note: (^) The distance between drill rig locations and the NSR is measured horizontally as worst case consideration. Slant distance is used for calculating noise levels at NSR N1.

**Appendix 5.3 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Mitigated, Operation Mode (i)
Landslide Preventive Works at Po Shan, Mid-levels**

NSR : N1 (1/F to 9/F)

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	51	59
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	15	66
G	Air Compressor	102	2	105	0	100	105	310	50
E	Drill Rig	110	1	110	5	70	103	38	67
E	Drill Rig	110	1	110	5	70	103	51	64
F	Drill Rig	110	1	110	0	70	108	111	63
F	Drill Rig	110	1	110	0	70	108	125	62
F	Drill Rig	110	1	110	0	70	108	138	61
F	Drill Rig	110	1	110	0	70	108	153	60
A	Grouting Machine	105	1	105	10	100	95	15	66
G	Grouting Machine	105	2	108	0	100	108	310	53
A	Generator	100	1	100	10	100	90	15	61
G	Generator	100	1	100	0	100	100	310	45
A	Concrete Mixer	96	1	96	5	100	91	15	62
G	Concrete Mixer	96	2	99	0	100	99	310	44
Total SPL (without Dump Truck) dB(A)									74

NSR : N1 (10/F or above)

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	62	57
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	38	58
G	Air Compressor	102	2	105	0	100	105	310	50
E	Drill Rig	110	1	110	5	70	103	38	67
E	Drill Rig	110	1	110	5	70	103	51	64
F	Drill Rig	110	1	110	0	70	108	111	63
F	Drill Rig	110	1	110	0	70	108	125	62
F	Drill Rig	110	1	110	0	70	108	138	61
F	Drill Rig	110	1	110	0	70	108	153	60
A	Grouting Machine	105	1	105	10	100	95	38	58
G	Grouting Machine	105	2	108	0	100	108	310	53
A	Generator	100	1	100	10	100	90	38	53
G	Generator	100	1	100	0	100	100	310	45
A	Concrete Mixer	96	1	96	5	100	91	38	54
G	Concrete Mixer	96	2	99	0	100	99	310	44
Total SPL (without Dump Truck) dB(A)									72

**Appendix 5.3 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Mitigated, Operation Mode (i)
Landslide Preventive Works at Po Shan, Mid-levels**

NSR : N2

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	70	56
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	35	59
G	Air Compressor	102	2	105	0	100	105	300	50
E	Drill Rig	110	1	110	5	70	103	38	67
E	Drill Rig	110	1	110	5	70	103	49	65
F	Drill Rig	110	1	110	0	70	108	114	62
F	Drill Rig	110	1	110	0	70	108	127	61
F	Drill Rig	110	1	110	0	70	108	139	61
F	Drill Rig	110	1	110	0	70	108	153	60
A	Grouting Machine	105	1	105	10	100	95	35	59
G	Grouting Machine	105	2	108	0	100	108	300	53
A	Generator	100	1	100	10	100	90	35	54
G	Generator	100	1	100	0	100	100	300	45
A	Concrete Mixer	96	1	96	5	100	91	35	55
G	Concrete Mixer	96	2	99	0	100	99	300	44
Total SPL (without Dump Truck) dB(A)									72

NSR : N3

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	185	47
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	145	47
G	Air Compressor	102	2	105	0	100	105	370	49
E	Drill Rig	110	1	110	5	70	103	151	55
E	Drill Rig	110	1	110	5	70	103	158	54
F	Drill Rig	110	1	110	0	70	108	219	57
F	Drill Rig	110	1	110	0	70	108	228	56
F	Drill Rig	110	1	110	0	70	108	239	56
F	Drill Rig	110	1	110	0	70	108	239	56
A	Grouting Machine	105	1	105	10	100	95	145	47
G	Grouting Machine	105	2	108	0	100	108	370	52
A	Generator	100	1	100	10	100	90	145	42
G	Generator	100	1	100	0	100	100	370	44
A	Concrete Mixer	96	1	96	5	100	91	145	43
G	Concrete Mixer	96	2	99	0	100	99	370	43
Total SPL (without Dump Truck) dB(A)									64

**Appendix 5.3 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Mitigated, Operation Mode (i)
Landslide Preventive Works at Po Shan, Mid-levels**

NSR : N4

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	210	46
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	175	45
G	Air Compressor	102	2	105	0	100	105	360	49
E	Drill Rig	110	1	110	5	70	103	172	54
E	Drill Rig	110	1	110	5	70	103	176	54
F	Drill Rig	110	1	110	0	70	108	227	56
F	Drill Rig	110	1	110	0	70	108	236	56
F	Drill Rig	110	1	110	0	70	108	246	56
F	Drill Rig	110	1	110	0	70	108	239	56
A	Grouting Machine	105	1	105	10	100	95	175	45
G	Grouting Machine	105	2	108	0	100	108	360	52
A	Generator	100	1	100	10	100	90	175	40
G	Generator	100	1	100	0	100	100	360	44
A	Concrete Mixer	96	1	96	5	100	91	175	41
G	Concrete Mixer	96	2	99	0	100	99	360	43
Total SPL (without Dump Truck) dB(A)									64

NSR : N5

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	50	59
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	75	53
G	Air Compressor	102	2	105	0	100	105	332	50
E	Drill Rig	110	1	110	5	70	103	126	56
E	Drill Rig	110	1	110	5	70	103	123	57
F	Drill Rig	110	1	110	0	70	108	136	61
F	Drill Rig	110	1	110	0	70	108	148	60
F	Drill Rig	110	1	110	0	70	108	157	60
F	Drill Rig	110	1	110	0	70	108	172	59
A	Grouting Machine	105	1	105	10	100	95	75	52
G	Grouting Machine	105	2	108	0	100	108	332	53
A	Generator	100	1	100	10	100	90	75	47
G	Generator	100	1	100	0	100	100	332	45
A	Concrete Mixer	96	1	96	5	100	91	75	48
G	Concrete Mixer	96	2	99	0	100	99	332	44
Total SPL (without Dump Truck) dB(A)									67

**Appendix 5.3 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Mitigated, Operation Mode (i)
Landslide Preventive Works at Po Shan, Mid-levels**

NSR : N6

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	75	55
Soil nail installation, soil nail head construction, rock slope stabilizing and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	60	54
G	Air Compressor	102	2	105	0	100	105	380	48
E	Drill Rig	110	1	110	5	70	103	114	57
E	Drill Rig	110	1	110	5	70	103	127	56
F	Drill Rig	110	1	110	0	70	108	183	58
F	Drill Rig	110	1	110	0	70	108	198	58
F	Drill Rig	110	1	110	0	70	108	211	57
F	Drill Rig	110	1	110	0	70	108	226	56
A	Grouting Machine	105	1	105	10	100	95	60	54
G	Grouting Machine	105	2	108	0	100	108	380	51
A	Generator	100	1	100	10	100	90	60	49
G	Generator	100	1	100	0	100	100	380	43
A	Concrete Mixer	96	1	96	5	100	91	60	50
G	Concrete Mixer	96	2	99	0	100	99	380	42
Total SPL (without Dump Truck) dB(A)									66

Note: (^) The distance between drill rig locations and the NSR is measured horizontally as worst case consideration.
Slant distance is used for calculating noise levels at NSR N1.

**Appendix 5.4 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Mitigated, Operation Mode (ii)
Landslide Preventive Works at Po Shan Mid-Levels**

NSR : N1 (1/F to 9/F)

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	51	59
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	15	66
G	Air Compressor	102	2	105	0	100	105	310	50
F	Drill Rig	110	1	110	0	70	108	111	63
F	Drill Rig	110	1	110	0	70	108	125	62
F	Drill Rig	110	1	110	0	70	108	138	61
F	Drill Rig	110	1	110	0	70	108	153	60
F	Drill Rig	110	1	110	0	70	108	166	59
F	Drill Rig	110	1	110	0	70	108	164	59
A	Grouting Machine	105	1	105	10	100	95	15	66
G	Grouting Machine	105	2	108	0	100	108	310	53
A	Generator	100	1	100	10	100	90	15	61
G	Generator	100	1	100	0	100	100	310	45
A	Concrete Mixer	96	1	96	5	100	91	15	62
G	Concrete Mixer	96	2	99	0	100	99	310	44
Total SPL (without Dump Truck) dB(A)									73

NSR : N1 (10/F or above)

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	62	57
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	38	58
G	Air Compressor	102	2	105	0	100	105	310	50
F	Drill Rig	110	1	110	0	70	108	111	63
F	Drill Rig	110	1	110	0	70	108	125	62
F	Drill Rig	110	1	110	0	70	108	138	61
F	Drill Rig	110	1	110	0	70	108	153	60
F	Drill Rig	110	1	110	0	70	108	166	59
F	Drill Rig	110	1	110	0	70	108	164	59
A	Grouting Machine	105	1	105	10	100	95	38	58
G	Grouting Machine	105	2	108	0	100	108	310	53
A	Generator	100	1	100	10	100	90	38	53
G	Generator	100	1	100	0	100	100	310	45
A	Concrete Mixer	96	1	96	5	100	91	38	54
G	Concrete Mixer	96	2	99	0	100	99	310	44
Total SPL (without Dump Truck) dB(A)									70

**Appendix 5.4 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Mitigated, Operation Mode (ii)
Landslide Preventive Works at Po Shan Mid-Levels**

NSR : N2

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	70	56
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	35	59
G	Air Compressor	102	2	105	0	100	105	300	50
F	Drill Rig	110	1	110	0	70	108	114	62
F	Drill Rig	110	1	110	0	70	108	127	61
F	Drill Rig	110	1	110	0	70	108	139	61
F	Drill Rig	110	1	110	0	70	108	153	60
F	Drill Rig	110	1	110	0	70	108	166	59
F	Drill Rig	110	1	110	0	70	108	159	59
A	Grouting Machine	105	1	105	10	100	95	35	59
G	Grouting Machine	105	2	108	0	100	108	300	53
A	Generator	100	1	100	10	100	90	35	54
G	Generator	100	1	100	0	100	100	300	45
A	Concrete Mixer	96	1	96	5	100	91	35	55
G	Concrete Mixer	96	2	99	0	100	99	300	44
Total SPL (without Dump Truck) dB(A)									70

NSR : N3

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	185	47
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	145	47
G	Air Compressor	102	2	105	0	100	105	370	49
F	Drill Rig	110	1	110	0	70	108	219	57
F	Drill Rig	110	1	110	0	70	108	228	56
F	Drill Rig	110	1	110	0	70	108	239	56
F	Drill Rig	110	1	110	0	70	108	252	55
F	Drill Rig	110	1	110	0	70	108	239	56
F	Drill Rig	110	1	110	0	70	108	256	55
A	Grouting Machine	105	1	105	10	100	95	145	47
G	Grouting Machine	105	2	108	0	100	108	370	52
A	Generator	100	1	100	10	100	90	145	42
G	Generator	100	1	100	0	100	100	370	44
A	Concrete Mixer	96	1	96	5	100	91	145	43
G	Concrete Mixer	96	2	99	0	100	99	370	43
Total SPL (without Dump Truck) dB(A)									64

**Appendix 5.4 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Mitigated, Operation Mode (ii)
Landslide Preventive Works at Po Shan Mid-Levels**

NSR : N4

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	210	46
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	175	45
G	Air Compressor	102	2	105	0	100	105	360	49
F	Drill Rig	110	1	110	0	70	108	227	56
F	Drill Rig	110	1	110	0	70	108	236	56
F	Drill Rig	110	1	110	0	70	108	246	56
F	Drill Rig	110	1	110	0	70	108	259	55
F	Drill Rig	110	1	110	0	70	108	239	56
F	Drill Rig	110	1	110	0	70	108	255	55
A	Grouting Machine	105	1	105	10	100	95	175	45
G	Grouting Machine	105	2	108	0	100	108	360	52
A	Generator	100	1	100	10	100	90	175	40
G	Generator	100	1	100	0	100	100	360	44
A	Concrete Mixer	96	1	96	5	100	91	175	41
G	Concrete Mixer	96	2	99	0	100	99	360	43
Total SPL (without Dump Truck) dB(A)									64

NSR : N5

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	50	59
Soil nail installation, soil nail head construction, rock slope stabilization and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	75	53
G	Air Compressor	102	2	105	0	100	105	332	50
F	Drill Rig	110	1	110	0	70	108	136	61
F	Drill Rig	110	1	110	0	70	108	148	60
F	Drill Rig	110	1	110	0	70	108	157	60
F	Drill Rig	110	1	110	0	70	108	172	59
F	Drill Rig	110	1	110	0	70	108	181	58
F	Drill Rig	110	1	110	0	70	108	193	58
A	Grouting Machine	105	1	105	10	100	95	75	52
G	Grouting Machine	105	2	108	0	100	108	332	53
A	Generator	100	1	100	10	100	90	75	47
G	Generator	100	1	100	0	100	100	332	45
A	Concrete Mixer	96	1	96	5	100	91	75	48
G	Concrete Mixer	96	2	99	0	100	99	332	44
Total SPL (without Dump Truck) dB(A)									68

**Appendix 5.4 Calculation of Construction Noise Levels at Representative Noise Sensitive Receivers - Mitigated, Operation Mode (ii)
Landslide Preventive Works at Po Shan Mid-Levels**

NSR : N6

Works Area	PME	SWL/item dB(A)	Number	SWL (Total) dB(A)	Measures dB(A)	on-time %	Actual SWL dB(A)	^Distance m	SPL dB(A)
Site clearance and set up									
B	Dump Truck	103	1	103	0	30	98	75	55
Soil nail installation, soil nail head construction, rock slope stabilizing and raking drain installation									
A	Air Compressor	102	2	105	10	100	95	60	54
G	Air Compressor	102	2	105	0	100	105	380	48
F	Drill Rig	110	1	110	0	70	108	183	58
F	Drill Rig	110	1	110	0	70	108	198	58
F	Drill Rig	110	1	110	0	70	108	211	57
F	Drill Rig	110	1	110	0	70	108	226	56
F	Drill Rig	110	1	110	0	70	108	239	56
F	Drill Rig	110	1	110	0	70	108	239	56
A	Grouting Machine	105	1	105	10	100	95	60	54
G	Grouting Machine	105	2	108	0	100	108	380	51
A	Generator	100	1	100	10	100	90	60	49
G	Generator	100	1	100	0	100	100	380	43
A	Concrete Mixer	96	1	96	5	100	91	60	50
G	Concrete Mixer	96	2	99	0	100	99	380	42
Total SPL (without Dump Truck) dB(A)									66

Note: (^) The distance between drill rig locations and the NSR is measured horizontally as worst case consideration.
Slant distance is used for calculating noise levels at NSR N1.

Appendix 5.6

Calculation of Cumulative Construction Noise Levels at Representative Noise Sensitive Receivers Landslide Preventive Works at Po Shan, Mid-levels

NSR : N1 (1/F to 9/F)

Concurrent Construction Activity		This Project		Cumulative Noise Level
*Task	¹ Noise Level, dB(A)	² Maximum Noise Level, dB(A)	dB(A)	
5a	70	74	75	
5b	61	74	74	
6a, 6b	70	74	75	

NSR : N1 (10/F or above)

Concurrent Construction Activity		This Project		Cumulative Noise Level
*Task	¹ Noise Level, dB(A)	³ Maximum Noise Level, dB(A)	dB(A)	
5a	68	72	73	
5b	60	72	72	
6a, 6b	67	72	73	

NSR : N2

Concurrent Construction Activity		This Project		Cumulative Noise Level
*Task	² Noise Level, dB(A)	³ Maximum Noise Level, dB(A)	dB(A)	
5a	62	72	72	
5b	51	72	72	
6a, 6b	58	72	72	

NSR : N3

Concurrent Construction Activity		This Project		Cumulative Noise Level
*Task	² Noise Level, dB(A)	³ Maximum Noise Level, dB(A)	dB(A)	
5a	60	64	66	
5b	53	64	65	
6a, 6b	57	64	65	

NSR : N4

Concurrent Construction Activity		This Project		Cumulative Noise Level
*Task	² Noise Level, dB(A)	³ Maximum Noise Level, dB(A)	dB(A)	
5a	58	64	65	
5b	52	64	64	
6a, 6b	55	64	64	

NSR : N5

Concurrent Construction Activity		This Project		Cumulative Noise Level
*Task	² Noise Level, dB(A)	³ Maximum Noise Level, dB(A)	dB(A)	
5a	65	67	69	
5b	64	67	69	
6a, 6b	66	67	70	

NSR : N6

Concurrent Construction Activity		This Project		Cumulative Noise Level
*Task	² Noise Level, dB(A)	³ Maximum Noise Level, dB(A)	dB(A)	
5a	67	66	70	
5b	61	66	67	
6a, 6b	64	66	68	

(*) 5a, 5b, 6a, 6b are tasks proposed in the Project Profile of "Agreement No. CE28/2004 (GE) Landslide Preventive Works at Po Shan,

Mid-levels - Design and Construction" (PP), where Task 5a is Tunnel No.2 excavation and Tasks 5b, 6a, 6b are installation of vertical drains

(1) Construction noise level of the concurrent tasks from Appendix 5.2B of the PP

(2) Construction noise level of the concurrent tasks from Appendix 5.2A of the PP

(3) Maximum mitigated construction noise level

Appendix 10.1 Impacts Summary

Landslide Preventive Works at Po Shan, Mid-levels – Natural Terrain Risk Mitigation Measures

Assessment Points / Sensitive Receivers	Predicted Impact Level	Relevant Criteria / Standard	Predicted Exceedance	Impact Avoidance Measures / Proposed Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
Ecological Impact					
Natural woodland habitat	Low to Moderate Although the natural woodland habitat is considered of moderate to high ecological value, and provides roosting site for bats, the area of habitat affected is small in scale (0.65 ha). Besides, with on-site adjustment of the location of scaffolding, installation of soil nails and nail heads, and the construction of raking drains, no tree felling and slope cutting would be required. The impact to the natural woodland and the country park area is hence considered low to moderate.	Not applicable	Not applicable	<ul style="list-style-type: none"> On-site adjustments of the location of scaffolding, installations of soil nails and nail heads, and the construction of raking drains. No tree felling and slope cutting would be required. 	Low
Freshwater habitat and the associated fauna	Low The impacts to the freshwater habitat and the associated fauna due to site runoff are considered limited as the two streams and drainage culvert are not within the proposed works area. With the implementation of mitigation measure, no site runoff and discharge to the freshwater habitat would be resulted.			To minimize the indirect impacts to the nearby stream course and drainage culvert, the site runoff control measures mentioned in Section of Construction Water Quality Impact should be implemented.	Low
Two plant species of conservation important, Small Persimmon (<i>Diospyros vaccinioides</i>) and Common Tutcheria (<i>Tutcheria spectabilis</i>)	Low Although these two species fall within the proposed works area under this Project might be directly impacted by the proposed works, the soil nails near the individuals of these species would be carefully adjusted to avoid or minimize			<ul style="list-style-type: none"> A detail vegetation survey conducted by a suitably qualified botanist/ecologist with over 7 years relevant experience would be required to identify the individuals potentially affected by the proposed works. These identified individuals would be labelled on site prior to 	Low

Appendix 10.1 Impacts Summary

Landslide Preventive Works at Po Shan, Mid-levels – Natural Terrain Risk Mitigation Measures

Assessment Points / Sensitive Receivers	Predicted Impact Level	Relevant Criteria / Standard	Predicted Exceedance	Impact Avoidance Measures / Proposed Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
	<p>the potential damages. Given that Small Persimmon are locally common and widespread, and are not threatened in Hong Kong, the potential loss or damage of a relatively small number of individuals of the Small Persimmon would be a minor impact and no transplantation for Small Persimmon would be required. The potential impacts for both protected species are therefore considered low.</p>			<p>the commencement of works for better protection during construction phase.</p> <ul style="list-style-type: none"> • A specific monitoring programme would be conducted to check on the health and condition of these plants during the construction phase. • Planting of suitable shrubs/herbs, including the Small Persimmon, would be provided to compensate for the loss of understorey vegetation. 	
<p>Short-nosed Fruit Bat (<i>Cynopterus sphinx</i>)</p>	<p>Low Only a small amount (about ten individuals) of bats recorded in the palm trees at the margin of the proposed works area would be impacted by the construction phase disturbance. With the use of effective quiet machinery, construction phase noise disturbance to the bats would be minimized. In the worse-case scenario, the construction phase disturbance may cause roosting bats to move away and result in the abandonment of roosting site. This outcome would still be regarded as a relatively minor impact. It is probable that the bats would simply re-locate alternative roost sites adjacent to the proposed works area if disturbed. Hence the impact to the bat is considered low</p>			<ul style="list-style-type: none"> • With the use of quiet powered mechanical equipment and insulating fabric for drill rigs, construction phase noise disturbance would be minimised. • All construction activities would be implemented at daytime only. • Measures such as noise barriers should be used to minimise disturbance to the bat roost identified close to the western side of the works area. • Bat roost (i.e. the two palm trees) would be retained. • Chinese Fan-palm (<i>Livistona chinensis</i>) would be planted near the existing bat roost to provide suitable habitat for the Short-nosed Fruit Bat after the completion of landslide preventive works. 	<p>Low</p>

Appendix 10.1 Impacts Summary

Landslide Preventive Works at Po Shan, Mid-levels – Natural Terrain Risk Mitigation Measures

Assessment Points / Sensitive Receivers	Predicted Impact Level		Relevant Criteria / Standard	Predicted Exceedance	Impact Avoidance Measures / Proposed Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
Landscape and Visual Impact						
<i>Landscape Resources</i>	<i>Construction</i>	<i>Operation</i>	Annex 3, 10 and 18 of EIAO-TM and EIAO Guidance Note No. 8/2002	Not applicable	<u>Construction Phase:</u> <ul style="list-style-type: none"> • Designation of 'no-intrusion zones' • Allowance for adjustment of soil nails on site for the avoidance of tree trunks and tree roots • Dust and erosion control for exposed soil • All retained trees should be record photographically at the commencement of Contract, and carefully protected during the construction period. 	
LR1	Intermediate	Intermediate				Insubstantial
LR2	Negligible	Negligible				Insubstantial
LR3	Small	Small				Insubstantial
LR4	Negligible	Negligible				Insubstantial
LR5	Negligible	Negligible				Insubstantial
LCA1	Intermediate	Intermediate				Insubstantial
LCA2	Negligible	Negligible				Insubstantial
<i>Visually Sensitive Receivers</i>	<i>Construction</i>	<i>Operation</i>	Annex 3, 10 and 18 of EIAO-TM and EIAO Guidance Note No. 8/2002	Not applicable	<u>Operation Phase:</u> <ul style="list-style-type: none"> • control over the appearance of construction workers, hoarding, construction plants/ machines • careful selection of security floodlights to avoid light pollution • Re-use of existing soil where possible • 12 month establishment period for soft landscape works • Re-instatement of excavated area • Woodland mix is proposed to screen sensitive views, to match surrounding vegetation, and to provide greenery to the 	
R1A	Intermediate	Intermediate				Insubstantial
R1B	Intermediate	Intermediate				Insubstantial
R1C	Intermediate	Intermediate				Insubstantial
R1D	small	small				Insubstantial
R1E	Intermediate	Intermediate				Insubstantial
R1F	Intermediate	Intermediate				Insubstantial
R2	small	negligible				Insubstantial
R3	small	small				Insubstantial
GIC1	small	negligible				Insubstantial
O1	small	negligible				Insubstantial
T1	small	small				Insubstantial

Appendix 10.1 Impacts Summary

Landslide Preventive Works at Po Shan, Mid-levels – Natural Terrain Risk Mitigation Measures

Assessment Points / Sensitive Receivers	Predicted Impact Level	Relevant Criteria / Standard	Predicted Exceedance	Impact Avoidance Measures / Proposed Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
				surrounding area.	
Construction Noise					
N1	62 – 82 dB(A)	75 dB(A) daytime	7 dB(A)	<ul style="list-style-type: none"> • Quieter plants • Movable noise barriers • Noise enclosure • Noise insulating fabric • Restriction on the number of drill rigs in different Works Areas 	None
N2	61 – 79 dB(A)		4 dB(A)		
N3	53 – 69 dB(A)		None		
N4	52 – 68 dB(A)		None		
N5	64 – 72 dB(A)		None		
N6	60 – 72 dB(A)		None		
Construction Water Quality					
Victoria Harbour Water Control Zone and all areas within 500m from the works site boundary	Water quality impacts from the land-based construction works can be controlled to comply with the WPCO standards by implementing the recommended mitigation measures. No unacceptable water quality impacts from the proposed land-based works are anticipated.	<p>Water Pollution Control Ordinance</p> <p>Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters</p> <p>Practice Note for Professional Persons ProPECC PN</p>	Not applicable	<ul style="list-style-type: none"> • Provision of perimeter drains to intercept storm-runoff from outside the works area. These shall be constructed in advance of site formation works and earthworks. Earth bunds or sand bag barriers should be provided on-site to direct storm water to silt removal facilities. The design of the temporary on-site drainage system will be undertaken by the Contractor prior to the commencement of construction • Sand/silt removal facilities such as sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standard under the 	None

Appendix 10.1 Impacts Summary

Landslide Preventive Works at Po Shan, Mid-levels – Natural Terrain Risk Mitigation Measures

Assessment Points / Sensitive Receivers	Predicted Impact Level	Relevant Criteria / Standard	Predicted Exceedance	Impact Avoidance Measures / Proposed Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
		1/94		<p>Water Pollution Control Ordinance. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions. The detailed design of the sand/silt traps will be undertaken by the Contractor prior to the commencement of construction.2 month establishment period for soft landscape works</p> <ul style="list-style-type: none"> • Air would be used as the flushing medium of the drilling equipment to avoid the groundwater being affected by the flushing medium. In addition, permanent casing may be provided to the drillhole of soil nail within the permeable colluvium layer as instructed by the Engineer to minimize the impact to the groundwater table situated at the permeable soil stratum. • An outlet pipe extending above the slope surface would be installed to facilitate collection of discharge of air, water and grout from the drillhole inserted with soil 	

Appendix 10.1 Impacts Summary

Landslide Preventive Works at Po Shan, Mid-levels – Natural Terrain Risk Mitigation Measures

Assessment Points / Sensitive Receivers	Predicted Impact Level	Relevant Criteria / Standard	Predicted Exceedance	Impact Avoidance Measures / Proposed Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
				<p>nail during grouting.</p> <ul style="list-style-type: none"> • All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit should be regularly removed, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times • Exposed slope/soil surface should be covered by tarpaulin as soon as possible to reduce the potential of soil erosion. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm. Other measures that need to be implemented before, during and after rainstorms are summarized in ProPECC PN 1/94. • Open stockpiles of construction materials or construction wastes on-site of more than 50m³ should be covered with tarpaulin or similar fabric during rainstorms. 	

Appendix 10.1 Impacts Summary

Landslide Preventive Works at Po Shan, Mid-levels – Natural Terrain Risk Mitigation Measures

Assessment Points / Sensitive Receivers	Predicted Impact Level	Relevant Criteria / Standard	Predicted Exceedance	Impact Avoidance Measures / Proposed Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
Construction Air Quality					
A1 to A7	Air quality impacts from the land-based construction works can be controlled to comply with the APCO standards by implementing the recommended mitigation measures. No unacceptable air quality impacts from the proposed works are anticipated.	TSP Concentration 260 µg/m ³ (daily) 80 µg/m ³ (annual)	Not applicable	Good Site Practice <ul style="list-style-type: none"> • Covering/watering of any aggregate or dusty material storage piles • Tarpaulin covering of all dusty vehicle loads • Use of vehicle wheel and body washing facilities at the exit points of the site • Dusty activities should be re-scheduled where possible if high-wind conditions are encountered 	None
Waste Management					
Not applicable	Adverse environmental impacts would not be expected during the construction phase, provided the identified waste arisings are handled, transported and disposed of using approved methods and the recommended good site practices are strictly followed.	Waste Disposal Ordinance (Cap. 354) Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354) Land (Miscellaneous Provisions) Ordinance (Cap. 28)	Not applicable	Good Site Practice <ul style="list-style-type: none"> • Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site • Training of site personnel in proper waste management and chemical waste handling procedures • Provision of sufficient waste disposal points and regular collection for disposal • Appropriate measures to minimize windblown litter and 	None

Appendix 10.1 Impacts Summary

Landslide Preventive Works at Po Shan, Mid-levels – Natural Terrain Risk Mitigation Measures

Assessment Points / Sensitive Receivers	Predicted Impact Level	Relevant Criteria / Standard	Predicted Exceedance	Impact Avoidance Measures / Proposed Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
		<p>Public Health and Municipal Services Ordinance (Cap. 132) - Public Cleansing and Prevention of Nuisances Regulation</p> <p>Annexes 7 & 15 of EIAO- TM</p>		<p>dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers</p> <ul style="list-style-type: none"> • Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors Use of vehicle wheel and body washing facilities at the exit points of the site <p>Waste Reduction</p> <ul style="list-style-type: none"> • Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal • Encourage collection of aluminium cans, PET bottles and paper by providing separate labelled bins to enable these wastes to be segregated from other general refuse generated by the work force • Any unused chemicals or those with remaining functional capacity shall be recycled • Proper storage and site practices to minimize the potential for damage or contamination of construction materials • Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste 	

Appendix 10.2 Key Assessment Assumptions and Methodologies

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD	
			EIA Study Brief Clause Reference	Relevant Documentation
Ecological Impact				
<p>The assessment follows the criteria and guidelines as stated in Annexes 8 and 16 of the EIAO TM and the EIA Study Brief No. ESB-158/2006</p> <p>A literature review and ecological surveys were undertaken to establish ecological baseline conditions of the Assessment Area within 500m of the works site boundary. Ecological surveys, including terrestrial ecological survey, avifauna survey, herpetofauna survey, mammal survey, terrestrial insect survey and freshwater community survey were performed. Six-month ecological surveys were conducted from February to July 2006, covering both dry and wet seasons.</p> <p>Impacts to the ecological importance of habitats/species, potentially affected by proposed works were evaluated in term of magnitude, scale and significance, following the guidelines stated in Annexes 8 of the EIAO TM. In this Project, potential impacts to natural woodland, and protected animal and plant species recorded in the Assessment Area affected by the soil nailing works were highlighted, Necessary mitigation measures were identified and suggested. Residual ecological impacts were assessed, and ecological monitoring and audit requirements</p>	<p>No tree felling is required for this Project.</p> <p>Individuals of plant species of conservation interest will be labeled on site prior to the commencement of works. It provides better protection to the protected plants during construction phase.</p> <p>With effective mitigation measures, such as sand traps, silt traps, oil/grease separators and installation of outlet pipe above the slope, runoff and drainage water with high levels of suspended solids will be prevented from entering the nearby water-bodies.</p> <p>Air as the flushing medium and permanent casing to the drillhole of soil nail will be used. The impact to the groundwater table is thus minimized.</p> <p>Quiet powered mechanical equipment, insulating fabric for drill rigs and noise barriers will be applied. It minimizes the disturbance to habitats within and adjacent to the proposed works area, and the wildlife inhabiting.</p> <p>Good site practices and effective control of dust meeting the APCO will be provided. It minimizes the construction dust impact to the vegetation within and in vicinity of the proposed works area.</p> <p>Compensatory planting of suitable shrubs/herbs, including the Small Persimmon, will be provided on site after the construction phase.</p> <p>Planting of Chinese Fan-palm (<i>Livistona chinensis</i>) will be planted near the existing bat roost to provide suitable</p>	<p>The identified ecological sensitive receivers are based on site surveys conducted in February to July 2006.</p> <p>It is assumed the proposed mitigation measures would be properly followed up and adopted on site.</p>	Not required	Not Applicable

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD	
			EIA Study Brief Clause Reference	Relevant Documentation
were identified following the guidelines stated in Annexes 16 of the EIAO TM.	habitat for the Short-nosed Fruit Bat after the completion of landslide preventive works			
Landscape and Visual Impact				
<p>The baseline survey forms the basis of the LVIA, which include the evaluation of impacts in terms of magnitude, scale and significance, following the guidelines stated in Annexes 3, 10 and 18 of the EIAO TM and in accordance with EIAO Guidance Note No. 8/2002.</p> <p>The assessment of landscape impacts would result from identification of the source of impact, their magnitude of change during construction and operation phases. The magnitude of change for landscape impact assessment would be determined by compatibility of the project with the surrounding, duration of impacts under construction and operation phases, scale of the impact and reversibility of change.</p> <p>The assessment of visual impacts would result from identification of the source of visual impacts, their magnitude of change and sensitivity of the receivers during construction and operation phases. The magnitude of change for visual impact assessment would be determined by the compatibility of the proposed project with the surrounding landscape, impact duration during construction and operation stages, scale of impact</p>	<p>A Zone of Visual Influence/ Visual Envelope is established which approximately defines the extent of visual influence of the proposed works and the potential visual impacts. This is achieved by site visit and desk-top study of topographic maps and photographs, and preparation of cross-sections to determine visibility of the project from various locations.</p> <p>Visually Sensitive Receivers (VSRs) who would be present at typical viewpoints and key views, and likely to be affected by the proposed works, are identified within the visual envelope. VSRs are defined as individuals or groups of whom are sensitive to changes in the visual environment. Residents, users of open space/recreational facilities, road users (private and public transport users), schools, tourists and people working within the visual envelope shall be considered as VSRs.</p> <p>Po Shan Mansions, Piccadilly Mansion, Hatton Place, Hatton House, Wisdom Court, Skyline Mansion, Skyview Cliff, Medallion Heights, Haddon Court, University Heights, Emerald Gardens, Greenview Gardens, Kingsford Height, No. 21, 23, 24, 30 Po Shan Road, No. 41B and 43A Conduit Road, Alpine Court, Belmont Court, Scenic Garden, Villa Veneto, Richmond Court, Imperial Court, Realty Gardens, Peace Court, Dragonview Court, Kings Garden, Wah Sen Court, Kiu Sen Court, 1A Robinson Road were identified as residential receivers.</p> <p>Users of the University of Hong Kong were identified as occupational receivers.</p> <p>Walkers in Hatton Road Morning Trail were identified as recreational receivers.</p> <p>Travellers on the Po Shan Road were identified as traveling receivers.</p>	<p>It is assumed that the proposed mitigation measures would be properly implemented during construction and operation phases.</p> <p>The identified sensitive receivers are based on site surveys conducted in February 2007.</p>	3.4.2.5 (i) & (ii)	See Annex 10.2.3

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD	
			EIA Study Brief Clause Reference	Relevant Documentation
<p>and distance of the source of impact from the viewer, reversibility of impact and potential blockage of the view.</p> <p>Mitigation measures were identified and suggested. Residual landscape and visual impacts were assessed, and monitoring and audit requirements were identified following the guidelines stated in Annexes 18 of the EIAO TM.</p>	<p>No tree felling and construction access road would be required in the Project.</p>			
Construction Noise Impact				
<p>To assess the potential noise impacts due to the Project, the noise sources and receivers were identified and the impacts were then quantified.</p> <p>The plant list was derived from similar projects carried out by the Project Proponent.</p> <p>Sound power levels of plants were made reference to Technical Memorandum on Noise From Construction Work other than Percussive Piling (GW-TM) and BS5228</p> <p>Noise sensitive receivers (NSRs) were identified according to the criteria set out in the EIAO-TM.</p> <p>The noise impact calculation follows methodology stated in GW-TM.</p>	<p>Residential noise sensitive receivers (NSRs) located along the section of Po Shan Road closest to the Project site were identified.</p> <p>Representative NSRs identified were Po Shan Mansions Block A (N1 and N2), Hamilton Court (N3), Piccadilly Mansion (N4), No.21 Po Shan Road (N5) and No.53 Conduit Road (N6). Pok Fu Lam Country Park (N7) to the south of the Project site was also identified as NSR.</p> <p>Quiet plant (Dump truck) is assumed to be adopted in Works Area B. Noise enclosure would be applied to mitigate the noise from air compressors, grouting machine and generator at Works Area A. Movable Noise barrier enclosure would be applied to mitigate the noise from concrete mixer at Works Area A. Noise sources in Works Area A is at about 15m to the closest NSR N1. Noise source in Works Area B is at about 51m to N1.</p> <p>No more than 6 drill rigs would be operating at the same time in Works Areas E and F. No more than two drill rigs could be operating in Works Area E. Noise insulating fabric would be applied for drill rigs operating in Works Area E. The closest noise source in Works Area E is at about 38m to NSR N1. The closest noise source in Works Area F is at about 111m to N1</p> <p>Air compressors, grouting machines, generator and</p>	<p>It is assumed that the recommended mitigation measures would be properly followed up and adopted on site.</p> <p>The identified sensitive receivers are based on site surveys conducted in February 2007.</p> <p>The construction programme of the concurrent project included in the cumulative impact assessment is based on information available in April 2007.</p>	<p>3.4.3.2 (iii)(b)</p>	<p>See Annex 10.2.2</p>

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD	
			EIA Study Brief Clause Reference	Relevant Documentation
<p>The results were then compared with the daytime noise criteria stipulated in the EIAO-TM.</p>	<p>concrete mixers would also be located at Works Area G. No mitigation measures were proposed as the Area is located at 300m or more to all the residential NSRs.</p> <p>Please refer to Figure 5.1 for the locations of the Works Areas.</p> <p>The concurrent and planned project included in the cumulative impact assessment is the project "Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction" (under Environmental Permit EP-235/2005/A) which will also be carried out by the Project Proponent.</p>			
Water Quality Impact				
<p>The construction activities to be involved and the potential pollution sources were derived from similar projects carried out by the Project Proponent.</p> <p>The study area covers the Vitoria Harbour Water Control Zone and areas within 500m from the works site boundary.</p> <p>The water quality impact assessment for the Project was carried out qualitatively and follows Annex 6 and Annex 14 of the EIAO-TM.</p>	<p>Water-bodies identified within the study area include a drainage culvert on the hillslope between Po Shan Mansions and Hamilton Court and a temporary stream to the east of the proposed works area. Both the drainage culvert and the stream lie outside the site boundary of the proposed landslide preventive works.</p> <p>It is assumed that all site runoff and drainage arising from the works area would be properly treated by the use of sedimentation tank, and that the discharge standards as stipulated in the "Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters" would be met. The treated site runoff and drainage water is assumed to be discharged to the licensed point near the tunnel portal of the concurrent landslide preventive works at Po Shan under Agreement No. CE28/2004 (GE).</p> <p>Air would be used as the flushing medium of the drilling equipment to avoid the groundwater being affected by the flushing medium. An outlet pipe extending above the slope surface would be installed to facilitate collection of discharge of air, water and grout from the drillhole inserted with soil nail during grouting.</p> <p>The concurrent and planned projects to be included in the cumulative impact assessment are the "Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po</p>	<p>It is assumed that the recommended mitigation measures would be properly followed up and adopted on site.</p> <p>The identified sensitive receivers are based on site surveys conducted in February to July 2006.</p> <p>The construction programme of the concurrent project (under Environmental Permit EP-235/2005/A) included in the cumulative impact assessment is based on information available in 2007.</p> <p>The construction programme of the concurrent project (under Environmental Permit EP-272/2007) included in the cumulative impact assessment is based on information available in the corresponding EIA Report.</p>	3.4.4.4 (x)	See Annex 10.2.2

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD	
			EIA Study Brief Clause Reference	Relevant Documentation
	Shan, Mid-levels – Design and Construction” (under Environmental Permit EP-235/2005/A) which will also be carried out by the Project Proponent and the "Drainage Improvement in Northern Hong Kong Island – Hong Kong West Drainage" (under Environmental Permit EP-272/2007) to be carried out by Drainage Services Department.			
Air Quality Impact				
<p>The construction activities to be involved and the potential pollution sources were derived from similar projects carried out by the Project Proponent.</p> <p>Air sensitive receivers (ASRs) were identified according to the criteria set out in the EIAO-TM.</p> <p>The baseline condition was made reference to the latest 5-year annual average TSP levels measured at the Central/Western Air Quality Monitoring Station.</p> <p>The air quality impact assessment for the Project was carried out qualitatively and follows Annex 4 and Annex 12 of the EIAO-TM.</p>	<p>Representative ASRs identified were Po Shan Mansions, Hamilton Court, Piccadilly Mansion, Ching Yuen Garden, No.21, 23, 24, 30 Po Shan Road, No.53 Conduit Road and Pok Fu Lam Country Park.</p> <p>It is assumed that the quantity of dust generated by the soil nail installation, soil nail and raking drain installation would be limited.</p> <p>It is assumed standard dust suppression measures as stipulated in the Air Pollution Control (Construction Dust) Regulation and good site practice recommended in Section 7.16 of the EIA Report would be implemented to mitigate the dust impacts on the ASRs in the vicinity of the construction sites.</p> <p>The concurrent and planned project included in the cumulative impact assessment is the project "Agreement No. CE 28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction" (under Environmental Permit EP-235/2005/A) which will also be carried out by the Project Proponent.</p>	<p>It is assumed that the recommended mitigation measures would be properly followed up and adopted on site.</p> <p>The identified sensitive receivers are based on site surveys conducted in February 2007.</p> <p>The construction programme of the concurrent project included in the cumulative impact assessment is based on information available in April 2007.</p>	Not required	Not Applicable
Waste Management				
<p>The construction activities to be involved and the potential amount of waste to be generated were derived from similar projects carried out by the Project Proponent.</p>	<p>It is assumed that good site practice, proper waste management and effective disposal meeting the Waste Disposal Ordinance and Waste disposal (Chemical Waste) (General) Regulation would be implemented.</p>	<p>It is assumed that the recommended mitigation measures would be properly followed up and adopted on site.</p>	Not required	Not Applicable

Assessment Methodologies	Assessment Assumptions	Limitations of Assessment Methodologies / Assumptions	Prior Agreements with EPD	
			EIA Study Brief Clause Reference	Relevant Documentation
The assessment of waste management implications for the Project follows Annex 7 and Annex 15 of the EIAO-TM.				

Annex 10.2.1

***Letter for Seeking Prior Agreement on
Key Assessment Methodologies***

(Figures enclosed in the letter are Figures 4.4.1 to 4.4.4 and 5.1 of this Report
and are omitted in this Annex)

Maunsell Geotechnical Services Ltd

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Your Ref: (9) in Ax(1) to EP2/H11/06

Our Ref: VLYC:dmtw:60016710 (51505)/04/04/MGS/0642

By Fax & Hand (Fax No.: 2591 0558)

Environmental Protection Department Branch Office
 28/F., Southorn Centre
 130 Hennessy Road
 Wan Chai, Hong Kong.

Attn: Mr. Steve Li

18 May 2007

Dear Sir,

Agreement No. CE 28/2004 (GE)
Landslide Preventive Works at Po Shan, Mid-levels –
Natural Terrain Risk Mitigation Measures
Environmental Impact Assessment (Draft)

We are the consultants to the Planning Division of Geotechnical Engineering Office (GEO) of Civil Engineering and Development Department (CEDD) under Agreement No. CE28/2004(GE) to carry out design and construction of Landslide Preventive Works at Po Shan, Mid-levels. Further to the Study Brief (ESB-158/2006) issued on 17Nov06 (your ref. (19) in EP2/H11/Q/06), we would like to seek your agreement on the following items according to the requirements in the Study Brief:

- (a) Assessment points for construction noise impact assessment as shown in Drawing 5.1 attached (Study Brief Section S.3.4.3.2(iii)(b));
- (b) Visual envelope and key groups of visual sensitive receivers to be included in the visual envelop as shown in Drawings 4.4.1 to 4.4.4 (Study Brief Section S.3.4.2.5(i)&(ii)); and
- (c) Concurrent and planned projects to be included in the cumulative water quality impact – “Agreement No. CE28/2004 (GE) Landslide Preventive Works at Po Shan, Mid-levels – Design and Construction” under Environmental Permit EP-235/2005/A (Study Brief Section S.3.4.4.4(x));

If you need further information, please contact the undersigned or our project environmental consultant, Mr. Fred K. K. Ng at 31058511. Thank you for your kind consideration.

Yours faithfully,



Y. C. Lam
 Project Engineer

Encl.

cc. CGE/Planning – Attn: Mr. Jerry Ho (w/e) (1 copy) (Fax No. 2714 0247)
 cc. DPO/HK, PlanD – Attn: Mr. T.C. Cheng (w/e) (1 copy) (Fax No. 2895 3957)

Maunsell AECOM Group Chief Executive : T C K Shum. President/HK : D D S Lo. Chief Financial Officer : P K L Wong.

Maunsell Geotechnical Services Ltd Chairman : Dr. L J Endicott. President : F H Y Ng. Managing Director : P A Chao.
 Executive Directors : T C T Cheung, J Y C Lo, C K W Cheung. Technical Director : R C Frew. Associates : J W Tattersall, W K Chui, S L Chiu.

Offices : Australia, Canada, China, Denmark, Egypt, Gaza, Greece, Hong Kong, India, Indonesia, Ireland, Israel, Malaysia, Netherlands, Oman, Philippines, Poland, Puerto Rico, Romania, Qatar, Singapore, South Korea, Thailand, United Arab Emirates, United Kingdom, United States of America, Vietnam.

Annex 10.2.2

***Documentation of Prior Agreement on
Construction Noise Impact Assessment Points
and
Concurrent and Planned Projects to be included
in Cumulative Water Quality Impact Assessment***

(14) in Ax(1) to EP2/H11/06

Environmental Protection Department
Branch Office

28th Floor, Southern Centre,
130 Hennessy Road,
Wan Chai, Hong Kong.



環境保護署分處

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6 June 2007

EPAGE: http://www.epd.gov.hk

Maunsell Geotechnical Services Ltd.,
20/F Grand Central Plaza, Tower 2,
138 Shatin Rural Committee Road,
Shatin, N.T., Hong Kong.

By Post & Fax : 2730 7110
(Total 2 pages)

(Attn.: Mr. Y.C. Lam, Project Engineer)

Dear Sir,

**Landslide Preventive Works at Po Shan, Mid-levels –
Natural Terrain Risk Mitigation Measures**

Draft Environmental Impact Assessment (EIA) Report - Agreement on Key Assumptions

We refer to you letter of 18.5.2007 enclosing the following assumptions for our agreement:

- (a) assessment points for construction noise impact assessment;
- (b) visual envelope and key groups of visual sensitive receivers to be included in the envelope; and
- (c) concurrent and planned projects to be included in the cumulative water quality impact assessment.

2. As advised by DPO/HK, PlanD vide his memo of 25.5.2007, copy attached, the proposed visual envelope and key groups of visual sensitive receivers as shown in item (b) above is acceptable. We have no objection to the proposed assessment points for construction noise impact assessment in item (a) above. Regarding item (c) above, please note that the project "Drainage Improvement in Northern Hong Kong Island - Hong Kong West Drainage Tunnel" should also be included in the cumulative water quality impact assessment.

3. Please be reminded that the above advisory comment are given to facilitate early focus and resolution of environmental issues in the EIA study and shall NOT be construed in anyway as to pre-empt or prejudice any statutory decisions to be made under EIA Ordinance or any other applicable legislation. Should you have any queries concerning the above, please contact me or Mr. Victor Yeung of this Department at 2835 1155.

Yours sincerely,

(Steve T.S. Li)
Environmental Protection Officer
for Director of Environmental Protection

C.C. w/encl. CGE/Planning, GEO, CEDD (Attn: Mr Jerry HO)
DPO/HK, PlanD (Attn: Mr T.C. Cheng)
AFCD (Attn: Ms Karrie WU)

Fax: 2730 0247
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Internal w/encl. S(MA)3, S(MA)4, S(MA)5,

Maunsell Geotechnical Services Ltd.			
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Annex 10.2.3

***Documentation of Prior Agreement on
Visual Envelope and
Key Groups of Visual Sensitive Receivers***

06-JUN-2007 10:16 FROM HKDPO
 in future correspondence

TO DEP

P.01/02

Urgent by Fax

3/13

MEMO

From	DPO/HK, Plan D	To	DEP
Ref.	() in HK-R/OTH/33 Pt. 30	(Attn :	Mr. Steve T.S. LI
Tel. No.	2231 4941	Your Ref.	(11) in Ax(1) to EP2/H11/06
Fax No.	2894 9502	Dated	21.5.2007 Fax No. 2591 0558
Date	25 May 2007	Total Pages	1

**Landslip Preventive Works at Po Shan, Mid-Levels –
 Natural Terrain Risk Mitigation Measures**

EIA Study Brief No. ESB-158/2006

I refer to your memo under reference and would like to advise that the visual envelop and the key groups of visual sensitive receivers as shown in item (b) of Maunsell Geotechnical Services Ltd.'s letter dated 18.5.2007 is acceptable.



(T.C. CHENG)

for District Planning Officer/Hong Kong
 Planning Department

Internal

CTP/UD&L (Attn. : Mr. NG Shui-pui and Miss Winnie CHU)

Landslide Preventive Works at Po Shan, Mid-levels – Natural Terrain Risk Mitigation Measures

Appendix 11.1 Implementation Schedule

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
Construction Noise Impact						
5.13, 5.24, 5.26		<p>No more than 6 drill rigs will be operating at the same time in Works Areas E and F. No more than two drill rigs could be operating in Works Area E.</p> <p>Noise insulating fabric has to be applied for drill rigs operating in Works Area E.</p> <p>A number of four air compressors will be used. Two at Works Area A and two at Works Area G.</p> <p>A number of three grouting machines will be used. One at Works Area A and two at Works Area G.</p> <p>A number of two generators will be used. One at Works Area A and one at Works Area G.</p> <p>A number of three concrete mixers will be used. One at Works Area A and two at Works Area G.</p> <p>Moveable Noise Barrier has to be applied for the concrete mixer operating in Works Area A.</p> <p>Noise Enclosures have to be applied for the air compressors, grouting machine and generator operating in Works Area A.</p>	Contractor	Works Area	Construction Phase	EIAO-TM, NCO

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
Construction Air Quality Impact						
7.16		<p>Good site practice</p> <ul style="list-style-type: none"> • Covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines. • Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs. • Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations. • Use of vehicle wheel and body washing facilities at the exit points of the site. • Dusty activities should be re-scheduled if high-wind conditions are encountered. • Instigation of an environmental monitoring and auditing program to monitor the construction process in order to enforce controls and modify method of work if dusty conditions arise. 	Contractor	Works Area	Construction Phase	EIAO-TM, APCO
Construction Water Quality Impact						
6.22		<ul style="list-style-type: none"> • Provision of perimeter drains to intercept storm-runoff from outside the works area. These shall be constructed in 	Contractor	Works Area	Construction Phase	ProPECC PN 1/94 Construction

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		<p>advance of site formation works and earthworks. Earth bunds or sand bag barriers should be provided on-site to direct storm water to silt removal facilities. The design of the temporary on-site drainage system will be undertaken by the Contractor prior to the commencement of construction.</p> <ul style="list-style-type: none"> • Sand/silt removal facilities such as sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standard under the Water Pollution Control Ordinance. The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions. The detailed design of the sand/silt traps will be undertaken by the Contractor prior to the commencement of construction. • Air would be used as the flushing medium of the drilling equipment to avoid the groundwater being affected by the flushing medium. In addition, permanent casing may be provided to the drillhole of soil nail within the permeable colluvium layer as instructed by the Engineer to minimize the impact to the groundwater table situated at the permeable 				<p>Site Drainage</p> <p>TM standard under the WPCO</p>

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		<p>soil stratum.</p> <ul style="list-style-type: none"> • An outlet pipe extending above the slope surface would be installed to facilitate collection of discharge of air, water and grout from the drillhole inserted with soil nail during grouting. • All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. Deposited silt and grit should be regularly removed, at the onset of and after each rainstorm to ensure that these facilities are functioning properly at all times. • Exposed slope/soil surface should be covered by tarpaulin as soon as possible to reduce the potential of soil erosion. Arrangements should always be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm. Other measures that need to be implemented before, during and after rainstorms are summarized in ProPECC PN 1/94. • Open stockpiles of construction materials or construction wastes on-site of more than 50m³ should be covered with tarpaulin or similar fabric during rainstorms. 				

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
Waste Management						
8.19, 8.20		<p>Good site practice</p> <ul style="list-style-type: none"> • Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site. • Training of site personnel in proper waste management and chemical waste handling procedures. • Provision of sufficient waste disposal points and regular collection for disposal. • Appropriate measures to minimize windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers. • Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors. <p>Waste Reduction</p> <ul style="list-style-type: none"> • Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal. • Encourage collection of aluminium cans, PET bottles and 	Contractor	Works Area	Construction Phase	

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		<p>paper by providing separate labelled bins to enable these wastes to be segregated from other general refuse generated by the work force.</p> <ul style="list-style-type: none"> • Any unused chemicals or those with remaining functional capacity shall be recycled. • Proper storage and site practices to minimize the potential for damage or contamination of construction materials. • Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste. 				
Ecological Impact						
3.110		The location of the soil nail installation should be carefully selected and adjusted on-site to avoid/minimize the damage of root system to the existing plants on slope surface. No tree felling is required.	Contractor	Works Area	Construction Phase	
3.111		Fences should be erected and installed along the boundary of the proposed works area before the commencement of works in order to minimize the disturbance to the natural woodland and shrubland habitats by preventing tipping, vehicle movements and encroachment of personnel onto the adjacent areas.	Contractor	Works Area	Construction Phase	
3.112		Specific mitigation measures for the two plant species of	Project	Works Area	Construction	

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		<p>conservation interest</p> <ul style="list-style-type: none"> • A detailed vegetation survey of the affected species of conservation interest should be conducted by a suitably qualified botanist/ecologist with over 7 years relevant experience to identify the affected individuals of the floral species of conservation concern, including but not limited to Small Persimmon, Common Tutcheria, Bird-nest Fern and Chinese Pholidota. • These species should be labeled on site prior to the commencement of works for better protection. 	Proponent		Phase	
3.113 & 3.114		<p>To minimize the indirect impacts to the nearby stream course and drainage culvert. Site runoff control measures mentioned in Section of Construction Water Quality Impact should be implemented. There should be no site runoff and discharge to the nearby stream course and drainage culvert.</p>	Contractor	Works Area	Construction Phase	
3.115		<p>Noise mitigation measures:</p> <ul style="list-style-type: none"> • Mitigation measures listed in the section Construction Noise Impact should be implemented. • Noise generating construction works should be implemented at daytime only. 	Contractor	Works Area	Construction Phase	

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		<ul style="list-style-type: none"> Measures such as noise barriers should be used to minimize disturbance to the bat roost identified close to the western side of the works area. 				
3.116		To minimize the construction dust impact to the vegetation within and in vicinity of the proposed works area, the mitigation measures listed in the section Construction Air Quality Impact should be implemented.	Contractor	Works Area	Construction Phase	
3.117		<p>Good site practice:</p> <ul style="list-style-type: none"> Placement of equipment in designated works areas and access routes selected on existing disturbed land to minimize disturbance to natural woodland habitat. Construction activities would be restricted to the proposed works area that would be clearly demarcated. The proposed works area would be reinstated immediately after completion of the works. Open burning on proposed works sites is illegal, and will be strictly enforced. Waste skips would be provided to collect general refuse and construction wastes. The wastes would be disposed of timely and properly off-site. 	Contractor	Works Area	Construction Phase	

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		<ul style="list-style-type: none"> Any soil contamination with fuel leaked from construction plants should be removed off-site. Disturbance to existing vegetation should be minimized wherever possible. In particular, adequate protection should be provided for mature trees located within or adjacent to the proposed works area. 				
3.118		<p>Compensatory planting due to the loss of trees and vegetations:</p> <ul style="list-style-type: none"> Planting of suitable shrubs/herbs, including the Small Persimmon, should be provided within the project area to compensate for the understorey vegetation of the woodland habitats affected by the landslide preventive works. Chinese Fan-palm (<i>Livistona chinensis</i>) should be planted near the existing bat roost in the project area to provide suitable habitat for the Short-nosed Fruit Bat after completion of landslide preventive works. 	Contractor	Works Area	Construction Phase	
3.121		<p>Monitoring programme:</p> <ul style="list-style-type: none"> For the plant individuals of conservation interest identified within the proposed works area, a specific monitoring programme of the plant individuals of conservation interest identified within the proposed works area during the detailed 	Contractor	Works Area	Construction Phase	

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		<p>vegetation survey should be carried out by a suitably qualified local ecologist(s) with over 7 years relevant ecological experience.</p> <ul style="list-style-type: none"> • Regular monitoring of the trees, shrubs and herbs should be conducted to check on the health and condition of the plants. • Monitoring should be conducted twice a month covering the whole construction period. 				
Landscape and visual Impact						
Table 4.5		<p>Due consideration on existing surrounding vegetation during construction:</p> <ul style="list-style-type: none"> • Designate 'no-intrusion zones' • Dust and erosion control for exposed soil • All retained trees should be record photographically at the commencement of Contract, and carefully protected during the construction period. • Allowance for adjustment of soil nails on site for the avoidance of tree trunks and tree roots <p>Appearance and view consideration:</p>	Contractor	Works Area	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Implementation Agent	Location of the Measure	When to implement	Relevant Legislation and Guidelines
		<ul style="list-style-type: none"> • Temporary hoarding barriers shall be sensitively designed, subtle, camouflaged and more 'permeable' so that they fit into the existing country park character • Careful selection of security floodlights to avoid light pollution 				
Table 4.6		<ul style="list-style-type: none"> • Existing topsoil shall be re-used where possible for new planting areas within the project • 12 month establishment period for the soft landscape works shall be allowed in the main contract. • All excavated area and disturbed area for utilities diversion, temporary road diversion, and pipeline works shall be reinstated to former conditions. • Woodland mix is proposed to screen sensitive views, to match surrounding vegetation, and to provide greenery to the surrounding area. 	Contractor	Works Area	Operation Phase	EIAO-TM