Agreement No. CE 30/2009 (GE)
Landslip Prevention and Mitigation Programme, 2009, Package D
Natural Terrain Hazard Mitigation Works
Hong Kong Island and Sai Kung –
Investigation, Design and Construction

Natural Terrain Hazard Mitigation Works at Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Project Profile

Job Ref.: 11/600/240 FHK-302009
Date: April 2014

Civil Engineering and Development Department

AEC Limited
In association with SMEC Asia Limited

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(Issue 11)

April 2014

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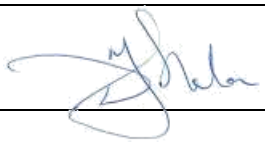
Reviewed by:	**David Stanton**	
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Job Ref.: 11/600/240 FHK-302009

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1 BASIC INFORMATION

1.1 Project Title

1.1.1 The Project title is Natural Terrain Hazard Mitigation Works at Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung (hereinafter referred to as "the Project"). The Project is under Agreement No. CE 30/2009 (GE) Landslip Prevention and Mitigation Programme, 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai Kung – Investigation, Design and Construction.

1.2 Purpose and Nature of Project

1.2.1 In 2010, the 10-year Extended Landslip Preventive Measures (LPM) Programme, which focused on known high-risk man-made slopes affecting major roads and developments in Hong Kong, was completed. To dovetail with the Extended LPM Programme, the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD) launched a rolling Landslip Prevention and Mitigation Programme (LPMitP) to deal with those man-made slopes of moderate risk and also to carry out mitigation works for natural slopes. The objective of the LPMitP is to contain the landslide risks in Hong Kong within an "as low as reasonably practicable" level that is commensurate with the international best practice in risk management.

1.2.2 Under the LPMitP, natural hillside catchments are for the first time being systematically selected for detailed studies and subsequent implementation of risk mitigation works if found necessary. Following the "react-to-known-hazard" principle, the LPMitP focuses on natural hillside catchments with a history of failure and posing a known hazard to existing buildings or important transport corridors. These hillside catchments are referred to as "historical landslide catchments" (HLC).

1.2.3 The Study Area 12SW-A/SA1 (hereinafter referred to as "the Study Area") on Tai Wan Tau Road in Sai Kung is near the southern end of Tai Wan Tau Road (**Figure 1**). The Study Area falls within the Conservation Area (CA), as shown in **Figures 1 & 3**.

1.2.4 Natural hillside landslide risk is typically dealt with by mitigation measures instead of extensive slope stabilization works. Steel flexible barriers and concrete check-dams are the two most commonly used measures for mitigation of natural hillside landslide risk. Natural terrain landslides occur as part of the on-going, natural processes of erosion and landform evolution. While the mitigation measures may not reduce the number or scale of natural terrain landslides, their provision at required locations would reduce the consequences of landslides on, for example, existing buildings or major transportation corridors.

1.3 Name of Project Proponent

1.3.1 The Project Proponent is the Geotechnical Engineering Office (GEO), Civil Engineering and Development Department (CEDD) of the Hong Kong Special Administrative Region (HKSAR).

1.3.2 Fugro (Hong Kong) Limited (FHK) is the appointed Consultant of GEO/CEDD under Agreement No. CE30/2009 (GE). AEC Ltd., in association with SMEC Asia Ltd., has been commissioned to prepare this Project Profile for permission to apply directly for an Environmental Permit (EP) under the Environmental Impact Assessment Ordinance (EIAO).

1.4 Location and Scale of Project

1.4.1 The Project includes proposed hazard mitigation works at the Study Area located on Tai Wan Tau Road, Sai Kung (**Figure 1**). **Figures 2** and **3** show the general location of the Works Area (approx. 3058.9m^2) and the approximate extent of the proposed hazard mitigation works respectively. The Works Area covers approximately approx. 2692.2m^2 of Conservation Area (CA) and approximately 366.7m^2 Village zone under Clear Water Bay Peninsula South OZP (OZP No. S/SK-CWBS/2). **Plates 1** and **2** shows an overview of the surrounding environment of the Study Area and views around the Works Area respectively. **Figure 4** shows a typical section across the Study Area. **Appendix A** illustrates the proposed design for hazard mitigation works. There will be no works or disturbance outside the Works Area.

1.4.2 The proposed hazard mitigation works include the following:

- Installation of about 182 nos. soil nails with 2.5m spacing and 0.15m in diameters at the toe of the natural terrain;
- Provision of about 150m long, 5-6m high flexible barriers across the toe of the hillside catchments;
- Installation of about 50 nos. anchors for flexible barriers;
- Construction of about 200m long, 600mm wide maintenance access to the flexible barriers; and
- Landscaping works.

1.4.3 **Plate 4** shows the illustration of hazard mitigation works with implemented mitigation measures.

1.4.4 A flexible barrier is a tensioned steel mesh supported by erected steel posts for retaining the landslide debris. The flexible barriers will be approximately 6m tall and constructed in bays. A single layer of flexible barrier will be installed. Steel posts will be installed at intervals to support the barriers and drilling works will be required. The size of the drillholes is 150mm in diameters and the drilling depth is about 5 - 6 m. Soil nails are to be installed to stabilize the hillside at the lower section of the secondary woodland. Drilling works will involve a 150mm drillhole with each of the completed soil nail heads approximately 800mm x 800mm. Provision of maintenance access / stairways is also

required. The maintenance access will be 600mm wide and constructed within the proposed Works Areas. All the mitigation works will be conducted within the Works Area.

1.5 Number and Type of Designated Project covered by the Project Profile

1.5.1 The Works Area of the Project falls within the boundary of Conservation Area (CA). In accordance with Item Q.1. in Part I of Schedule 2 to the Environmental Impact Assessment Ordinance (EIAO), the Project is classified as a Designated Project (DP) and an EP is required prior to commencement of the construction works.

1.6 Name and Telephone Number of Contact Person

1.6.1 All queries regarding the Project can be addressed to the Project Proponent (GEO/CEDD) or its Consultant (FHK) appointed under the above-mentioned Agreement.

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2 OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

2.1 Project Planning and Implementation

2.1.1 The proposed natural terrain hazard mitigation works in the Works Area will be implemented as part of the Agreement No. CE 30/2009 (GE). GEO/CEDD is the Project Proponent with overall responsibility for the planning, design and construction works. FHK, as the appointed Consultant of GEO, will undertake the detailed design, tendering and construction supervision of the proposed natural terrain hazard mitigation works. The proposed works will be implemented by a Contractor to be appointed by CEDD.

2.1.2 Unlike landslip preventive works at substandard man-made slopes, extensive slope stabilization will not be required for implementation of mitigation measures for containing natural hillside landslide risk. Preliminary engineering design of the proposed natural terrain hazard mitigation measures at the Works Area is as shown in **Figure 3** and illustrated in **Appendix A**. It is envisaged that the proposed hazard mitigation works in the Works Area will involve the following main activities:

(a) **Site establishment**: this will involve minor earthworks, including that required for removal of slope debris and for general site clearance and erection of hoarding;

(b) **Installation of soil nails at toe of hillside**: this will involve drilling within soil/rock, followed by installation of steel bar and grouting at required locations;

(c) **Construction of flexible barriers and maintenance access**: The construction of flexible barrier will involve the erection of tensioned wire mesh fences across posts supported on anchor foundation for mitigating open hillslope landslides. The anchor foundation will be formed by drilling within soil/rock using portable drilling tools, followed by installation of anchor and grouting. The construction of maintenance access will involve concreting and masonry laying along/ to the proposed flexible barriers; and

(d) **Landscaping Works:** this will involve the possible provision of aesthetic and landscape treatments to the flexible barriers and soil nailed areas such as hydroseeding, planting of native seedlings and provide subdue colour painting to the concrete surface.

2.1.3 Public consultation with the Village Representatives of Tai Wan Tau Village had been carried out and the circulation papers of the proposed mitigation works had been submitted to the District Council. No objection in principle to the proposed hazard mitigation works were received from the Village Representatives of Tai Wan Tau Village and members of District Council.

2.2 Tentative Project Timetable

2.2.1 The proposed natural terrain hazard mitigation works in the Works Area is tentatively scheduled to commence in end 2014 for completion in end 2016. **Appendix B** presents a tentative construction programme of the proposed works for the Works Area. The approximate periods required for the various construction activities are summarized in **Table 2-1**.

2.2.2 As shown in the tentative construction programme, it can be noted that some of the construction activities, such as the installation of soil nails and construction of flexible barriers may be carried out concurrently at the different catchments.

Table 2-1 Duration of Construction Activities

Item	Construction Activities	Estimated Duration (months)
1.	Site Establishment	4
2.	Installation of soil nails at toe of natural terrain	19
3.	Construction of flexible barriers and provision of maintenance access	12
4.	Landscaping Works	4

2.3 Interactions with Other Projects

2.3.1 Implementation of the proposed hazard mitigation works in the Works Area will be integrated into the overall construction programme designed for hazard mitigation works identified under Agreement No. CE 30/2009 (GE).

2.3.2 The Works Area is located on Tai Wan Tau Road in Sai Kung, which is located at significant distance (over 1,900m) away from the Study Area 12NW-C/SA2 (located opposite to Sheung Yeung Village) under Agreement No. CE 30/2009 (GE) such that potential cumulative environmental impact from concurrent construction works is not a concern.

2.3.3 The proposed hazard mitigation works will not have any interactions with other ongoing or planned projects in the vicinity of the Works Area. Located at more than 1,000m to the northwest of the Works Area there is another works area (Study Area 12NW-C/SA1, as shown in **Appendix C**) for which the natural terrain hazard associated with the hillside catchments above Leung Fai Tin along Clear Water Bay Road are being studied under Agreement No. CE37/2008. According to the Project Profile for the Natural Terrain Hazard Mitigation Works at Study Area No. 12NW-C/SA1 above Leung Fai Tin along Clear Way Road, Sai Kung submitted under the EIAO for application for permission to apply directly for an Environmental Permit, the construction works at Study Area No. 12NW-C/SA1 is scheduled to commence from September 2013 to November 2014. Given that the available separate distance between the Works Area and 12NW-C/SA1 is over 1,000m, no significant cumulative impacts on nearby sensitive receivers are expected.

2.3.4 **Appendix C** displays the locations of the Works Area in Study Area 12SW-A/SA1 and other possible concurrent construction works in the vicinity.

2.3.5 It is not envisaged that the construction of the proposed hazard mitigation works will require any road closure. The need for any temporary traffic management measures such as temporary lane closure and/or diversion when the proposed works are carried out will be developed with the appointed Contractor.

3 MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT

3.1 General

3.1.1 This section presents an outline of the major elements of the surrounding environment which might have an effect on the existing environmental condition of the Works Area and its vicinity. It also identifies the existing and planned sensitive receivers and sensitive parts of the natural environment that might be affected by the proposed Project.

3.2 Noise

3.2.1 The Works Area on Tai Wan Tau Road which is a quiet cul-de-sac that is connected to Clear Water Bay Road via Tai Au Mun Road on its northern end. Its southern end leads to some village houses located in Tai Wan Tau. Traffic movement on Tai Wan Tau Road and hence the associated traffic noise levels are expected to be low. There are no other noise pollution sources identified in the vicinity of the Works Area.

3.2.2 There are a number of village houses situated along the southern end of Tai Wan Tau Road. These are the NSRs of interest within 300m from the Works Area. The representative NSRs have been identified and these are summarized in **Table 3-1**. **Figure 2** shows the locations of the representative NSRs.

Table 3-1 Representative Noise Sensitive Receivers

NSR	Description	Land use	Existing/ Planned NSR	No. of Storeys	Distance from Site* (m)
N1a/b	Village House No. 40, Tai Wan Tau village	Residential	Existing	3	9
N2	Village House No. 45, Tai Wan Tau Village	Residential	Existing	3	15

*Distance is the distance between notional source position and NSR.

3.3 Air Quality

3.3.1 As already pointed out above under the section on noise, traffic movement on Tai Wan Tau Road, which is a cul-de-sac, is very low and so is the expected traffic air quality impact. There are no other air pollution sources in the vicinity of the Works Area.

3.3.2 The average values of the annual Respirable Suspended Particulates (RSP or PM_{10}) and Fine Suspended Particulates (FSP or $PM_{2.5}$) recorded at EPD's Tai Po Station from Year 2008 to 2012 were used to calculate the 5-years average background RSP and FSP. Tai Po Station was chosen because this is the closest EPD monitoring station to the Works Area and the most recent available monitoring data from this station has been utilised as being representative of background conditions.

3.3.3 The latest 5-year average RSP and FSP data (2008 - 2012) of Tai Po air quality monitoring station are tabulated in **Table 3-2**.

Table 3-2 The Latest 5-year Average RSP and FSP Data

Pollutant	Annual Concentration (μg/m^3)						
	2008	2009	2010	2011	2012	Average	AQOs[Note 4]
Respirable Suspended Particulates (RSP) [Note 1]	50	46	45	46	41	46	50
Fine Suspended Particulates (FSP) [Note 2&3]	-	-	-	-	28	28	35

Notes:
1. Respirable Suspended Particulates (also known as PM_{10}) are suspended particulates in air with a nominal aerodynamic diameter of 10μm or smaller.
2. Fine Suspended Particulates (also known as $PM_{2.5}$) are suspended particulates in air with a nominal aerodynamic diameter of 2.5 μm or smaller.
3. The annual FSP data at Tai Po air quality station is available upon 2012.
4. The annual concentration limits of RSP and FSP of the Air Quality Objectives (AQOs).

3.3.4 Air Sensitive Receivers (ASRs) of interest are the same as that identified from the noise perspective and listed in **Table 3-3** and their locations are as shown in **Figure 2**.

Table 3-3 Representative Air Sensitive Receivers

ASR	Description	Land use	Existing/ Planned NSR	No. of Storeys	Distance from Site (m)
A1a/b	Village House No. 40, Tai Wan Tau Village	Residential	Existing	3	8
A2	Village House No. 45, Tai Wan Tau Village	Residential	Existing	3	15

3.4 Water Quality

3.4.1 There is no existing stream or sensitive water body identified within the Works Area. Surface runoff from the Works Area is collected by the peripheral u-channel along Tai Wan Tau Road, flows towards the eastern end of Tai Wan Tao Road, across surface channel Tai Wan Tau Road, then discharging into natural streams to the south of Tai Wan Tau Road and ultimately into the sea at the bay area near Tai Wan Tau Village. The Clear Water Bay First Beach is located nearby the downstream of the works area at approximate 200m from the bay at Tai Wan Tau.

3.5 Ecology

Methodology

3.5.1 Ecological surveys were conducted within the Works Area from February 2012 to May 2012. The surveys consisted of the following aspects:

- Flora was surveyed once during May 2012. The dominant and notable plant species, relative abundance and growth forms were recorded. Identification of species and distribution status in Hong Kong were made with reference to Xing *et al*. (2000), AFCD (2007), AFCD (2008), AFCD (2009), AFCD (2011) and Hong Kong Herbarium (2012).

- Surveys for fauna were conducted once per month during the survey period to cover the dry and wet seasons. Wildlife including mammals, birds, herpetofauna (reptiles and amphibians), dragonflies, butterflies and stream fauna was surveyed by direct sighting and hearing of animal calls. Active searching for the potential habitats of herpetofauna, and tracks and signs of mammals (including droppings, scats, footprints, etc.) was performed.

Sites of Conservation Importance

3.5.2 According to Nos. 2 and 9 of Note 1, Appendix A, Annex 16 of TM-EIAO, one site of conservation importance was identified within the Works Area (see **Figure 1**):

- Conservation Area (CA) under Clear Water Bay Peninsula South OZP (OZP No. S/SK-CWBS/2): Approximately 2692.2 m^2 (or approx. 88%) of the Works Area is located within this CA. Works including construction of soil nails and flexible barriers will be conducted within this area. The CA zoning is intended to protect and retain the existing natural landscape, ecological or topographical features of the area and to separate sensitive natural environment such as Site of Special Scientific Interest or Country Park from the adverse effects of development. The CA is a highly diverse woodland habitat with mature and rich lowland forest.

3.5.3 Due to the limited footprint of the works, no direct impact to the area outside the Works Area is expected.

Key Findings

3.5.4 The Works Area (approx. 3058.9m^2) itself is located at the hill slope next to Tai Wan Tau Road. Approximately (2692.2 m^2) of the Works Area falls within the Conservation Area (CA) under Clear Water Bay Peninsula South OZP (OZP No. S/SK-CWBS/2). A total of three habitat types were identified within or adjacent to the Works Area, including native secondary woodland, developed area and dry agricultural land. The majority of the Works Area belongs to secondary woodland with small patches of developed areas close to the slope toe and on the opposite side of the road respectively. **Figure 5** displays the distribution of habitats within the Works Area. Representative photographs of habitats identified are provided in **Plate 6**.

3.5.5 The native secondary woodland (approx. 2797.5m^2) is the key habitat type identified within the Works Area. It is located largely within the Conservation Area (CA) under Clear Water Bay Peninsula South OZP (OZP No. S/SK-CWBS/2). The woodland is largely covered with a closed canopy of native trees, including some montane forest species, such as

Aporusa dioica, *Syzygium hancei*, *Lithocarpus glaber*, *Castanopsis fissa*, *Machilus chekiangensis* and *Alangium chinense*. Dominant species underneath the tree canopy include shrubs (*Psychotria asiatica* and *Ardisia crenata*), herbs (*Microstegium ciliatum* and *Alocasia macrorrhizos*), and climbing herbs (*Tetracera asiatica*, *Melodinus suaveolens* and *Mucuna birdwoodiana*). Five floral species of conservation importance were recorded within this woodland area, including woody climber *Gnetum luofuense*, shrubs *Pavetta hongkongensis* and *Diospyros vaccinioides*, and trees *Aquilaria sinensis* and *Ormosia pachycarpa*. The area supports moderate plant diversity (90 species identified) when compared to other similar habitats in Hong Kong. All other plant species recorded are common and widespread in Hong Kong. Due to the moderate plant diversity and the fact that this habitat is largely natural (although it is secondary in nature), the ecological value of the native secondary woodland is considered to be moderate to high.

3.5.6 Approximate 248 trees were located within the Works Area. A total of 90 flora species were identified within the Works Area (**Appendix D**). Five floral species of conservation importance were recorded within or close to the Works Area, including the woody climber *Gnetum luofuense*, shrubs *Pavetta hongkongensis* and *Diospyros vaccinioides*, and trees *Aquilaria sinensis* and *Ormosia pachycarpa*. *Gnetum luofuense* and *Pavetta hongkongensis* were recorded close to but outside of the Works Area. All other plant species recorded are common and widespread in Hong Kong. The locations of the identified flora species of conservation importance are displayed in **Figure 3** and **Appendix A**. Details of the species of conservation importance identified are described below:

3.5.7 A total of 2 trees and 19 seedlings of *Aquilaria sinensis* were recorded within the secondary woodland habitat within the Works Area. The heights of most of the seedlings range from 0.5m to 1.5m and those of the trees range from 7m to 9m. One tree of *A. sinensis* just outside Works Area (AT-1) had been topped. This species is used for medicinally and ornamental purposes. Potential threats include destruction of habitats and over-exploitation, but the species is common in lowland areas in Hong Kong (AFCD 2003). This species is listed as Near Threatened (NT) in the China Red Data Book and is under State protection (Category II) in China (AFCD 2003). It is also classified as Vulnerable (VU) on the IUCN Red List of Threatened Species (IUCN 2012). The wild population of this species is protected by the Protection of Endangered Species of Animals and Plants Ordinance, Cap. 586 in Hong Kong.

3.5.8 Two individuals of the shrub *Pavetta hongkongensis* with height around 2m were recorded within the secondary woodland close to but outside the Works Area. *Pavetta hongkongensis* is a common shrub species found in tall thicket and forest in Hong Kong (AFCD 2009). The wild population of this species is protected under Forestry Regulations (Cap. 96A) in Hong Kong.

3.5.9 Approximately 55 seedlings/ saplings and 5 trees of *Ormosia pachycarpa* were recorded within the secondary woodland within the Works Area. The heights of most of the seedlings/sapling range from 0.5m to 2m and those of the trees range from 6m to 8m. As the wood of this species is durable and strong, it is always used as timber in other countries (AFCD 2003). This species is listed as Endangered (EN) in China Red Data Book (AFCD 2003) but is not protected under Cap.96A or Cap 586 in Hong Kong.

3.5.10 Two small clumps of the shrub species *Diospyros vaccinioides* were recorded within the secondary woodland within the Works Area. All the individuals recorded were in seedling form with height around 0.3m. This species is classified as Critically Endangered (CR) on the IUCN Red List of Threatened Species (IUCN 2012). According to the IUCN Red List, the wild population of *D. vaccinioides* has been heavily-exploited and collected as an ornamental species in Taiwan, leading to the complete absence of mature trees in the wild. However, it is regarded as common to very common species found in shrubland, thin forest and thickets in ravines or hillslope habitats in Hong Kong (Xing et al. 2000; AFCD 2007).

3.5.11 Two patches of the woody climber *Gnetum luofuense* were recorded at the lower part of the secondary woodland adjacent to (outside of) the Works Area. This species is listed as "Near Threatened" in IUCN Red list (IUCN 2012) due to the potential declining threat caused by habitat loss. However, it is not protected under Cap. 96A nor Cap. 586 and is common in the forest in Hong Kong (AFCD 2007).

3.5.12 Except for the above five flora species of conservation importance, no rare/ protected plant species were recorded during survey. All other plant species recorded are common and widespread in Hong Kong.

Birds

3.5.13 A total of twelve bird species were recorded in the Works Area. Only one species recorded, Black Kite, is of conservation importance under EIAO and protected under Cap 170 and Ca. 586 in Hong Kong. It is listed as Regional Concern by Fellowes et al. (2002); however this listing is related to breeding birds/nests sites and Black Kite is very common in Hong Kong. This species was recorded flying over the Works Area and likely to be an occasional visitor to the Project site; this observation is of no conservation significance. A summary of the findings is provided in **Appendix D**.

Mammals

3.5.14 No mammals were recorded in the survey period.

Herpetofauna

3.5.15 No herpetofauna species was recorded within the Works Area during the survey period.

Butterflies

3.5.16 Eight butterfly species were recorded in the Works Area. All butterfly species are common or very common in Hong Kong. A summary of the findings is provided in **Appendix D**.

Dragonflies

3.5.17 No dragonfly species was recorded within the Works Area during the survey period.

3.6 Landscape and Visual

Baseline Review Methodology

3.6.1 A review of baseline of the existing landscape resources (LRs) and landscape character areas (LCAs) was conducted based on desktop study and field surveys conducted in May 2012 to identify available landscape elements which would contribute to landscape characters of the Assessment Area (including the Works Area and area within 100m from the boundary of the Works Area). Possible landscape elements include local topography, natural landscapes form and patterns of settlement of built features, land use, streetscapes, and any cultural, historical and/or religious identity.

3.6.2 The LCAs formed by various broadly homogenous units of similar landscape characters within the study area were mapped and annotated on a plan.

3.6.3 The sensitivity of the LRs/ LCAs were rated as 'high', 'medium' or 'low' and are influenced by rarity or importance, quality and condition and maturity of the landscape elements, statutory or regulatory limitations/ requirements related to the LRs/ LCAs and the ability of the LRs/ LCAs to accommodate change, together with the significance of the change in local and regional context.

3.6.4 The visual impact assessment area was defined as the Visual Envelope (VE) which includes all areas from which the proposed scheme can be seen or the viewshed formed by natural/ manmade features such as existing ridgelines, built development or woodland. The visibility of the Project from key groups of Visually Sensitive Receivers (VSRs) was determined through site surveys and desktop study of topographical plans and aerial photographs.

3.6.5 The sensitivity of the VSRs to change was rated as 'high', 'medium' and 'low' as influenced by the value and quality of existing views, availability and amenity of alternative views, type and estimated receiver population, duration or frequency of view and degree of visibility.

3.6.6 Typical viewpoints (vantage points) were identified and photographs showing their current views were taken to demonstrate the typical views of the VSRs.

Landscape Resources (LRs) and Landscape Character Areas (LCAs)

3.6.7 The proposed natural terrain hazard mitigation works involve the construction of flexible barriers and installation of soil nails on a densely vegetated natural slope to the northwest of Tai Wan Tau Village. The proposed Works Area covers three separate areas (the largest one on slope (Area "A"), and two smaller areas to the southeast (Area "B") and southwest (Area "C") of Tai Wan Tau Village respectively for temporary storage of construction materials and operating construction equipment (**Figure 3**). All proposed works areas and hazard mitigation works are located far away (at least 200m) from the nearest boundary of Clear Water Bay Country Park.

3.6.8 The locations of the Works Area and the proposed hazard mitigation works are very localized and close to approximately 15 village houses of Tai Wan Tau Village. The major landscape elements of the area are the extensive natural hillside woodland together with vegetated man-made slopes forming the backdrop for the Tai Wan Tau area, and the developed area which includes the existing paved Tai Wan Tau Road and Tai Wan Tau Village. These landscape elements are typical landscape resources commonly found in the village environs of Sai Kung area. Three key Landscape Resources (LRs) within the Assessment Area (which covers the Works Area and the area within 100m from the

boundary of Works Area) including woodland, developed area and agricultural land were identified. There is a very small portion of rocky shore located on the southern margin of the 100m Assessment boundary adjoining the existing village type development in Tai Wan Tau Village and would not be affected by the Project due to the long separation distance from the Works Area. Approximately 372 trees have been surveyed, of which 248 trees are located within the Works Area.

LR1 – Woodland: This type of landscape resources largely includes the extensive natural secondary woodland located on a hillside within the Conservation Area to the southwest of Clear Water Bay Country Park. This hillside woodland is dominated by continuous canopies of native trees (including *Aporusa dioica*, *Syzygium hancei*, *Lithocarpus glaber*, *Castanopsis fissa* and *Machilus chekiangensis*) and a rich understory dominated by common shrubs species (such as *Ardisia crenata* and *Psychotria asiatica*). As described in **Section 3.5**, the woodland belongs to native secondary woodland of moderate plant diversity. Five floral species of conservation importance were recorded within this woodland area, including woody climber *Gnetum luofuense*, shrubs *Pavetta hongkongensis* and *Diospyros vaccinioides*, and trees *Aquilaria sinensis* and *Ormosia pachycarpa* (details of the recorded plants species of conservation importance are described under **Section 3.5**). In view of its naturalness and relatively high maturity, and the presence of plant species of conservation importance, the landscape value and sensitivity to change of LR1 are considered to be high.

LR2 – Developed Area: This is a typical type of landscape resources in the village environs in Hong Kong. Within the Assessment Area, LR2 mainly consists of village houses in Tai Wan Tau Village, on Tai Wan Tau Road and several scattered man-made slopes (including two soil and soil/rock slopes located immediately to the south of the proposed soil nailed area). The greening element of LR2 is limited and largely involves some isolated ornamental plants planted within the gardens of individual houses or in the open area of the village. In view of its commonness and low amenity value, LR2 is considered of low landscape value and sensitivity to change.

LR3 – Agricultural Land: A small piece of dry agricultural land identified within the village only offered limited and temporary greening element (with a few planted trees *Psidium guajava*, *Carica papaya* and crop *Ipomoea batatas*) to the surrounding environment. LR3 is considered of low landscape value and sensitivity to change due to its small size and low amenity value.

3.6.9 Two Landscape Character Areas (LCAs) were formed by integration of various broadly homogenous units of similar landscape characters within the Assessment Area. Details of each LCA are described below.

LCA1 – Coastal Hillside Landscape. The major element of this LCA includes the extensive natural secondary woodland located on the hillside slope. This landscape character area is rich in floristic diversity and dominated by common plant species that are typical in hillside woodland in Hong Kong. Five floral species of conservation importance (including woody climber *Gnetum luofuence*, shrub *Pavetta hongkongensis* and *Diospyros vaccinioides*m, and trees *Aquilaria sinensis* and *Ormosia pachycarpa*) were recorded within this woodland area (details of the baseline conditions and ecological value of the species are described under **Section 3.5**). This extensive natural hillside woodland forms the backdrop for the Tai Wan Tau area. The landscape value and sensitivity to change of this LCA are considered to be high.

LCA2 – Village Landscape. This is a typical landscape character area in Sai Kung area and its major elements are the developed village houses in the Tai Wan Tau area, paved access road, scattered man-made slopes, and the small piece of agricultural land within the village. Landscape elements within this LCA are very limited and largely restricted to a few localized plant groups within the private gardens of individual village houses, open area of the village, self-sown vegetation on the shotcreted or soil/rock slopes and crops/fruit trees in the small agricultural land. The landscape value and sensitivity of change of this LCA are considered to be low with regard to its rather disturbed, highly modified and common landscape features in the area.

3.6.10 In terms of visual aspect, the extensive hillside woodland to the north of the Assessment Area forms a scenic backdrop and is the major visual element in Tai Wan Tau area. The proposed flexible barriers and soil nailed area will be located within the dense hillside woodland to the north of the selected village houses of Tai Wan Tau Village. However, this hillside woodland is located at the crest of two man-made slopes, namely 12SW-A/CR 45 and 12SW-A/C 46, with the maximum height of the slope parts of 16m and 8.3m respectively. The existing topography of the slopes in compare with the maximum height of the adjacent village houses (3-storey high) and the presence of the vegetation along the slope crest and woodland edge imply that the proposed hazard mitigation works would be largely screened. The visual envelope of the Project is restricted to only the residents of localized village houses of Tai Wan Tau Village and the drivers and pedestrians using Tai Wan Tau Road. Two key Visually Sensitive Receivers (VSRs) are identified and described as below.

VSR1 – Residents of Tai Wan Tau Village: Only localized village houses (about 15 houses) in the northwestern part of the Tai Wan Tau area may experience a glimpse view of the proposed hazard mitigation works areas. However, the existing two steep man-made slopes (12SW-A/CR 45 and 12SW-A/C 46) with tall height (with the maximum height of the slope parts of 16m and 8.3m respectively) located immediately to the north of these village houses imply that most of the resident's view will be screened off by the existing vegetated or rock surfaces of the slopes. The existing trees and other dense vegetation along the slope crest and woodland edge of the concerned woodland will further block the resident's view to the proposed landslide mitigation works within the woodland. Hence, only a few residents located on the top floor or roof of the several village houses can have a glimpse view of the proposed works and the VSRs are relatively few in number. The sensitivity of this VSR to visual change to the proposed landslide mitigation works is considered to be low.

VSR2 – Travellers using Tai Wan Tau Road: This VSR comprises transient passers-by including predominantly occasional drivers and pedestrians using Tai Wan Tau Road. Due to the site topography, Tai Wan Tau Road descends towards Tai Wan Tau Village and the views from these transient passers-by to the proposed hazard mitigation works will be totally blocked by the village houses and wooded area along the road. However, these occasional drivers and pedestrians will have a brief view of the temporary stored construction materials or operating construction equipment at the proposed works areas outside the Works Area. As there are a variety of alternative views considered to be of much higher amenity value than the stored or operating construction equipment, the sensitivity of this VSR to visual change to these proposed works area is considered to be very low.

3.6.11 **Plate 7** shows the representative photos of the identified LRs and VSRs. **Figure 6** shows the locations of VSRs. **Figure 7** and **Plate 8** show the locations and photos of the vantage

points within the assessed areas for which the proposed hazard mitigation works are visible to the identified VSRs. **Figure 8** shows the locations of LRs and LCAs within the 100m Assessment Area.

3.7 Cultural Heritage

3.7.1 No declared monument and heritage site are located within or in the vicinity of the Works Area.

4 POSSIBLE IMPACT ON THE ENVIRONMENT

4.1 General

4.1.1 The potential environmental impacts from the proposed hazard mitigation measures during the construction and operational phases are reviewed below.

4.2 Potential Environmental Impact During Construction Phase

Noise

4.2.1 A tentative construction programme of the proposed hazard mitigation measures at the Works Area is presented in Appendix B. Construction of the hazard mitigation works will be carried out during Monday to Saturday between 7:00 am and 7:00 pm, the working hours will be specified in the Contract Documents. Currently, it is not envisaged that any construction works will need to be carried out outside the non-restricted hours. However, if at a later stage the appointed Contractor finds that it is necessary to carry out nighttime work, he must apply a Construction Noise Permit (CNP) and ensure full compliance with the requirements under the Noise Control Ordinance (NCO).

4.2.2 Potential noise impact on nearby NSRs during the construction phase is associated with the use of Powered Mechanical Equipment (PME) and vehicular visits for transportation of equipment. The items of PME that are likely to be required for the proposed works at the Works Area has been identified and these are summarized in **Appendix E**. The noise impact from vehicular visits to the site is not considered significant as only up to 5 vehicles visits are expected per day, and therefore not assessed. To avoid tree felling, large sized machineries will not be placed on hillside. After liaising with the local villagers' representative, construction machines shall be placed on flat ground. The feasible locations for noisy immobile PME supporting the construction works at Area "A" are a portion of the carpark nearest to house no. 45 (Area "C") and a platform opposite house no. 40 (Area "B"). As Area C is not large enough for placing all the machineries, it is proposed that the frequently used PME (Air Compressor) will be placed at the Area "C" and the less frequently used PME (generator, grout mixer, grout pump, agitator, concrete mixer and shotcrete pump) will be placed at Area "B" in order to minimize the adverse effect to the NSRs of house no. 40. The elongated Works Area between House no. 39 and House no. 40 will be mainly used for establishment of temporary construction access leading to the upslope Works Area and no heavy machinery or PME will be placed within this area. Locations of the NSRs and Works Area "A", "B", and "C" could be refer to **Figures 2** and **3**.

4.2.3 The Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM) has been referred to in identifying the Sound Power Levels (SWL) of the PME used in the assessment. Where no relevant SWL could be found in GW-TM, reference has been made to the guidance "Sound power levels of other commonly used PME" published by EPD. The assessment methodology outlined in GW-TM has been followed in predicting the construction noise levels at the representative NSRs. **Table 4-1** presents the range of the unmitigated noise levels predicted at the representative NSRs for construction works at the Works Area. Construction noise from Works Area "A", "B", and "C" were taken into account for noise assessment at the corresponding NSRs.

Detailed assessment results are presented in **Appendix E**. While no major civil engineering works will be required for implementation of the proposed hazard mitigation measures, given the proximity of the NSRs to the Works Area, it will be necessary to ensure that construction noise control measures are in place to alleviate the noise impact to acceptable levels. The construction noise mitigation measures are recommended in **Section 5**.

Table 4-1 Range of Predicted Construction Noise Levels (Unmitigated Scenario)

NSR	Description	Predicted Noise Levels, $Leq_{(30min)}$ dB(A)	EIAO-TM Noise Criterion, $Leq_{(30min)}$ dB(A)	Exceedance
N1a	Village House No. 40, Tai Wan Tau Village	81-84	75dB(A) during 0700 to 1900 hours on any day not being a Sunday or general holiday	Y
N1b	Village House No. 40, Tai Wan Tau Village	71-86		Y
N2	Village House No. 45, Tai Wan Tau Village	74-81		Y

4.2.4 Visitors to the Clear Water Bay Country Park would also be potentially impacted by the proposed works at Works Area. However, given the transient nature of visitors to the Country Parks, no insurmountable construction noise impact is anticipated. The implementation of the noise mitigation measures recommended in **Section 5** will also reduce the noise impact on visitors to the Country Park.

Air Quality

4.2.5 There will be dust emissions from excavation works as well as gaseous emissions from construction plant and vehicles when the hazard mitigation works are carried out. The main sources of fugitive dust emissions include site excavation, drilling operation, truck movement and material handling.

4.2.6 Given the nature of proposed natural terrain hazard mitigation works, no major earthworks or open excavation will be required. Only some minor open excavation and concrete casting would be required for construction of the flexible barriers and soil nail installation. Number of construction plant on site would also be limited such that gaseous emissions from the operation of construction plant should not be a concern and the dust impact would be low.

4.2.7 However, given the proximity of nearby ASRs to the proposed work sites, potential dust emission impact is a concern. Therefore, it will be important to ensure that sufficient dust control measures as required in the Air Pollution Control (Construction Dust) Regulation are implemented to alleviate any potential dust emission impact on the ASRs to acceptable levels. The specific measures required are as set out in **Section 5**.

Water Quality

4.2.8 Although no existing stream or sensitive water body was identified within the Works Area, the Clear Water Bay and the Clear Water Bay First Beach are nearby the downstream of the works area. Minimal water quality impact is anticipated, however, any uncontrolled discharge from the Works Area in could affect the water quality in the

existing drainage system (including the u-channel and catchpits) found within the Works Area.

4.2.9 Potential sources of pollution include runoff and erosion from exposed soil surface and stockpiles, release of grouting and cement materials during rainfall, wash water from dust suppression facilities and fuel and lubricants from onsite maintenance of vehicles and equipment. Sewage generated from onsite construction workforce would also be another potential source of pollution.

Waste Management

4.2.10 The proposed hazard mitigation works at the Works Area will generate the following types of waste:

- Construction and demolition (C&D) materials: mainly comprising inert excavated materials (e.g. soil, broken concrete) generated from construction of the flexible barriers and soil nailing works. A small quantity of non-inert C&D materials (C&D waste) that consist of timber, plastic and other solid waste would also be generated;
- General refuse mainly consists of packaging waste from construction materials and food waste from onsite workers;
- Any chemical waste such as lubricating oils generated from maintenance of construction equipment and vehicles

4.2.11 Since only some minor excavation will be required for the proposed hazard mitigation works, the Project will not generate a large quantity of C&D materials. The volumes of excavated materials are estimated in **Table 4-2**.

Table 4-2 Estimated Quantities of Waste Materials Generated from the Project

Type *of Waste*	**Source**	**Estimated Volume (m^3)**	**Designated Waste Handling Facilities**
Soil/rock	Drilling and excavation of foundation of flexible barriers	310	Public Fill at TKO Area 137
	Drilling and grouting of soil nails	520	
Non-inert C&D materials (C&D waste)	Site clearance	170	SENT Landfill
	Total	1,000	

Note: SENT Landfill (Southeast New Territories Landfill), TKO 137 (Tseung Kwan O Area 137 Fill Bank)

4.2.12 Where practicable, the excavated C&D materials should be reused in-situ to minimise the amount of C&D materials requiring disposal. In accordance with the requirements specified in the Development Bureau Technical Circular (Works) No. 6/2010 Trip Ticket System for Disposal of Construction & Demolition Materials (DEVB TC(W) No. 6/2010), prior agreement shall be obtained from the Public Fill Committee (PFC) through the Secretary of the PFC to request a designated disposal ground for incorporation into the tender documents for the construction works. Surplus inert C&D material may be disposed of to the Public Fill Reception Facility in Tseung Kwan O managed by CEDD, while any non-inert C&D materials (C&D waste) would require disposal at SENT landfill managed by EPD.

4.2.13 The quantities of general refuse and chemical waste arising from the proposed works in the Works Area is expected to be insignificant. Recyclable materials such as metals, papers and plastics in the general refuse (and in the construction waste) shall be segregated for recycling.

4.2.14 Provided that the wastes generated from the construction works are handled, transported, recycled as far as possible, and disposed of in accordance with the good site practices (as recommended in **Section 5**), it is not expected that the proposed works will generate any adverse environmental impact or waste management implications.

Ecology

4.2.15 The proposed landslip prevention and mitigation works including installation of soil nails, flexible barriers and provision of maintenance access will be carried out within the native secondary woodland within the Works Area (**Figure 5**). Some of these works may result in ecological impacts. The potential ecological impact anticipated would be:

- Loss or disturbance of the woodland habitat;
- Loss or disturbance of individuals of the five floral species of conservation importance recorded.

4.2.16 A flexible barrier is a tensioned steel mesh supported by erected steel posts for retaining the landslide debris. The flexible barriers will be approximately 5m to 6m tall and constructed in bays. A single layer of flexible barrier will be installed within the secondary woodland along the toe of natural terrains within the Works Area. Steel posts will be installed at intervals to support the barriers and drilling works of anchor will be required. The sizes of the drillholes are 150mm in diameters and the drilling depth is about 5 - 6 m. The proposed works will also involve provision of maintenance access of around 600mm wide to the proposed flexible barriers. A total area of 434.3m^2 of the secondary woodland within the Works Area will be affected for the construction of flexible barriers and maintenance access (including area within 3m setback from the proposed structures that may be temporarily disturbed during construction phase).

4.2.17 Soil nails are to be installed to stabilize the hillside at the lower section of the secondary woodland within the Works Area. Drilling works will involve a 150mm drillhole with the completed soil nail head will be 800mm x 800mm. An area of 1,390m^2 will be affected by soil nailing works.

4.2.18 There is flexibility to adjust the exact locations of the flexible barriers, maintenance access and installation of soil nails in accordance with the findings of the topographical surveys to avoid tree felling. The locations and the footprint of the works have been adjusted to avoid any plant species of conservation importance. A 1.5m setback from any existing trees will be kept as far as possible. A minimum 1.5m setback from stems for mature specimens and 1m radius for seedlings of identified species of conservation importance will be kept to avoid potential impacts on the root system and damage to species of conservation importance. Tree loss and woodland loss due to these proposed landslide mitigation works will therefore be avoided. Alternative construction methods, including construction of metal staircase to “bridge over” extensive tree roots on slope (i.e. to avoid direct encroachment upon the tree roots) for the construction of the

maintenance access will be adopted wherever necessary and practical. As the flexible barriers are 6m tall, some canopies of the retained trees may have direct conflict with the barriers. Limited pruning of the retained trees along the alignment of the flexible barriers may be required. With proper pruning practice, the resulting impact to the trees and existing woodland habitat is expected to be low to moderate.

4.2.19 In order to minimize the impacts on the roots of the existing trees, a setback of 1.5m from trees to the steel stand posts and soil nails will be maintained as far as possible. All the identified plants of species of conservation importance will be enclosed within the protection zones/ exclusion zones which should include 1.5m setback from stems of mature individuals, and areas within 1m radius from the seedlings to be preserved on site. Detail for the protection zones/exclusion zones as shown in **Section 5.5.6** and **Plate 9**.

4.2.20 Localized trimming of the ground vegetation within the proposed works areas of the flexible barriers and/or maintenance access and the soil nail area will be needed with associated anchors and maintenance access (including area within 3m from proposed flexible barriers and maintenance access). The proposed clearance will lead to approximately of 1,824.3m^2 loss of native secondary woodland during construction phase. Due to the limited footprint of the flexible barriers and soil nails, limited opportunities for wildlife use and all the plant species of conservation importance will be preserved, the potential adverse ecological impacts resulting from the possible vegetation clearance and minor excavation are considered to be low.

4.2.21 The plan area of the entire Works Area is 3058.9m^2, in which a total area of 1,614.3m^2 will be temporarily disturbed for the construction of soil nail heads (1,390.0m^2) and flexible barriers (224.3m^2). As detailed in **Section 5.6**, landscaping works will be provided in the form of hydroseeding and planting of shrub seedlings to reinstate vegetation in all temporarily disturbed areas. There will also be a small area of permanent vegetation loss for the construction of maintenance staircase (210.0m^2). This is proposed to be mitigated by compensatory revegetation of the existing disturbed ground within the Works Area as far as practicable. Opportunities will also be sought for the compensatory re-vegetation on the existing disturbed area outside the Works Area.

4.2.22 One bird species of conservation importance, Black Kite, was recorded only flying over the Works Area. This species is of conservation importance under EIAO and protected under Cap 170 and Ca. 586 in Hong Kong. It is listed as Regional Concern by Fellowes *et al*. (2002); however this listing is related to breeding birds/nests sites and it is very common in Hong Kong. This species was recorded flying over the Works Area and likely to be an occasional visitor to the Project site; this observation is of no conservation significance and the impact to this species is expected to be negligible.

4.2.23 Other indirect disturbance to habitats and associated fauna adjacent to the proposed works areas would result from increased human activity and noise-generating construction plant. However, the Works Area mainly supports common fauna species of high mobility, and the use of the Works Area by these fauna species will be transient. Given their high mobility, the abundance of similar habitat in adjacent areas, and the fact that such impact would be temporary in nature, it is considered that the severity of disturbance impacts to local wildlife species would be negligible. With the

implementation of the mitigation proposed in **Section 5.5**, the impact is expected to be minimal.

4.2.24 The potential ecological impacts resulting from construction phase activities have been evaluated according to Table 1 of Annex 8 of the EIAO-TM. **Table 4-3** below presents the overall impact evaluation of the native secondary woodland within the Works Area.

Table 4-3 Overall Impact Evaluation of the Native Secondary Woodland within the Works Area

Criteria	Remarks
Habitat quality	Moderate, due to the moderate plant diversity and the fact that the woodland is largely natural.
Species	Largely dominated by common and widespread plant species, with the records of five floral species of conservation importance, including woody climber *Gnetum luofuense,* shrubs *Pavetta hongkongensis* and *Diospyros vaccinioides,* and trees *Aquilaria sinensis* and *Ormosia pachycarpa.* All the identified species of conservation importance will be protected within the designated protection zones and will not be adversely impacted by the Project.
Size/ abundance	A total of around 1,824.3m^2 of the understorey of woodland would be affected by vegetation clearance. Limited pruning of the retained trees along the alignment of the flexible barriers may be needed. Tree felling will be avoided.
Duration	Habitat loss of the understory woodland (around 210m^2) will be permanent where footings are installed and along maintenance access; elsewhere vegetation will recover in time. With proper pruning, the retained trees are expected not to be affected in the long term.
Reversibility	Habitat loss of the understory woodland (around 210m^2) will be irreversible where footings are installed and along maintenance access; elsewhere natural regeneration will reverse effects. With proper pruning, the retained trees are expected not to be affected in the long term.
Magnitude	Minor as only localized trimming of understorey vegetation and probably limited pruning of some canopies of retained trees. Tree felling will be avoided
Overall impact conclusion	Low to Moderate

Landscape and Visual

Impact Assessment Methodology

4.2.25 The magnitude of change of LRs/ LCAs resulting from construction/ and or operation of the Project depends on compatibility of the Project with the surrounding landscape, duration of impacts, scale of development and reversibility of change.

4.2.26 The magnitude of visual changes depends on the compatibility of the Project with the surrounding landscape, duration of impacts, scale of development, reversibility of change, viewing distance, and potential blockage of view.

4.2.27 The degree of significance of landscape and visual impacts is derived from the combination of the magnitude of change and the sensitivity/ tolerance of the sensitive receiver(s) to the change, as shown in the evaluation matrix in **Table 4-4** below.

Table 4-4 Matrix of Significance of Landscape and Visual Impacts

Magnitude of Change	**Large**	Moderate Impact	Moderate/ Significant Impact	Significant Impact
	Intermediate	Slight/ Moderate Impact	Moderate Impact	Moderate/ Significant Impact
	Small	Slight Impact	Slight/ Moderate Impact	Moderate Impact
	Negligible	Negligible Impact	Negligible Impact	Negligible Impact
		Low	**Medium**	**High**
	Sensitivity			

Landscape Impact

4.2.28 During the construction phase, temporary working platforms and scaffolding will be erected to cover the entire Works Area for the construction of flexible barriers and maintenance access, and installation of soil nailing works. Site hoarding will be erected along the slope toe of the Works Area and to surround the two proposed temporary storage areas. Movable noise enclosure/ barriers will be erected for the use of PME (as listed in **Table 5-2)**. Tree felling will be avoided and only minimal site clearance may be required for establishment of these temporary features during construction works. The proposed alignment of the flexible barrier (including a 3m corridor either side of the alignment), maintenance access and installation of soil nails will fall within the natural woodland (i.e. within LR1 and LCA1). Approximately 372 trees have been surveyed, of which 248 trees are located within the Works Area. However, the proposed design for hazard mitigation works will adopt the approach of 'no tree felling' that a minimum of 1.5m setback will be maintained from any existing trees as far as practicable, and the installation of the steel posts and concrete pads of the flexible barriers, and soil nails and maintenance access will be adjusted based on detailed topographical and tree survey to be conducted at later stage and on-site conditions to prevent any loss of trees as far as practicable. In any densely wooded locations, the spacing of the soil nails can be adjusted horizontally and/ or vertically on site in order not to interfere with the existing tree root systems. Alternative construction methods, including construction of metal staircase to "bridge over" extensive tree roots on slope (i.e. to avoid direct encroachment upon the tree roots) for the construction of the maintenance access will be adopted wherever necessary and practical. Potential landscape impact on LR1 (the woodland) will be limited to pruning of selected existing trees to facilitate the erection of the barriers and the soil nailing work. The pruning works will be performed in accordance with the guidelines stipulated in **Section 5.6**. Localized trimming and removal of ground vegetation within the Works Area will be required, but any identified plant species of conservation importance (as reported in **Section 3.5**) will be located, tagged, fenced-off and protected from the damage and disturbance of the proposed works. All protected plant species will be enclosed within the protection zones/ exclusion zones which should

include 1.5m setback from stems of mature individuals, and areas within 1m radius from the seedlings to be preserved on site. Details for the protection zones/exclusion zones are shown in **Section 5.5.6** and **Plate 9**. As the proposed works will avoid tree felling, and only involve limited pruning works of localized existing trees and trimming of ground vegetation, the magnitude of change to LR1 and LCA1 is considered small. The resulting impact on existing LR1 and LCA1 arising from the Project during the construction phase is expected to be localized and will be 'moderate'.

4.2.29 The Works Area located mainly on existing parking or paved areas close to Tai Tau Wan Road and paved areas within the village environs will be used for temporary storage of construction materials and construction equipment, and they will be suitably located to avoid disturbance to any existing trees close to the woodland edge or on the agricultural land. The magnitude of change in the developed area (LR2) and village landscape (LCA2) as a result of the Project will be negligible and the landscape impact during construction is therefore considered to be negligible. The small piece of agricultural land (LR3) is located away from the Works Area and will not be impacted by the proposed works.

Visual Impact

4.2.30 Construction phase visual impacts will result from minor earthworks, construction of flexible barriers, maintenance access, installation of soil nails, temporary working platform and access, and storage and use of construction equipment. The proposed natural terrain hazard mitigation works are tentatively scheduled to commence by end of 2014 and to be completed by end of 2016.

4.2.31 Given the limited footprint of the proposed works, no significant impacts on the identified landscape resources and landscape character areas would be anticipated. The proposed works will not result in any significant impacts on the visual quality and amenity available to the identified key VSRs since the proposed works will be largely screened by the existing vegetation or blocked by the existing topography of the adjacent man-made slopes. Only a few residents (VSR1) on the top floor or roof of the localized village houses in the Tai Wan Tau area will have temporary visual impact from the proposed slope work, while no adverse visual impact is anticipated for the travellers of Tai Wan Tau Road (VSR2) as almost all the visual views are blocked by the existing vegetation and village houses. The magnitude of visual changes for VSR1 and VSR2 is expected to be small and negligible respectively due to the limited footprint of the proposed works. The resulting visual impacts to the identified VSR1 and VSR2 during construction are considered to be slightly adverse and negligible respectively. Construction of the proposed hazard mitigation works will also be appropriately programmed to further minimize the possible visual impacts to the identified VSRs and the environment.

Cultural Heritage

4.2.32 No heritage site will be affected by the proposed hazard mitigation works.

4.3 Potential Environmental Impact during Operational Phase

General

4.3.1 There will be no adverse environmental impact that may arise from the proposed hazard mitigation measures at the Works Area during the operational phase.

4.3.2 As the flexible barriers will be constructed in bays, the gaps between each bay would provide ecological pathways for the fauna.

Landscape and Visual

4.3.3 Due to the limited footprint of the Project, the proposed works will not cause significant landscape change to the landscape character areas. There will only be slightly adverse impacts on the landscape aspect (mainly for the removed ground vegetation and limited pruning of selected trees within the proposed footprint) and visual aspect due to the erection of the flexible barriers, construction of maintenance access, and soil nails within the woodland at the commencement of the operation phase. These impacts will be negligible after the establishment of the hydroseeded grasses and planted shrubs as compensatory planting. The close proximity of the proposed hazard mitigation works areas with the surrounding densely vegetated woodland in the Conservation Area and the Clear Water Bay Country Park will favour natural establishment of self-seeded woody plant species by providing abundance seed sources. To further minimize the visual impact of the proposed works on the surrounding environment, the proposed concrete and steel post furniture of the flexible barriers will be painted in subdued colour so as to blend with the surrounding environment. Hence, no adverse landscape and visual impacts on the surrounding environment and identified key VSRs are anticipated in the long term.

4.3.4 **Tables 4-5** and **4-6** below summarize the magnitude of change and the significance of impacts on the landscape resources, landscape character areas and identified key VSRs during the construction and operation phases.

Table 4-5 Magnitude of Change for LRs and LCAs and Significance of Landscape Impacts during the Construction and Operation Phases

Landscape Resources/ Landscape Character Areas	Sensitivity (Low, Medium, High)	Magnitude of Change (Negligible, Small, Intermediate, Large)	Landscape Impact (During Construction)	Landscape Impact (During Operation)
LR1 –Woodland	High	Small	Moderate	Negligible
LR2 – Developed Area	Low	Negligible	Negligible	Negligible
LR3 – Agricultural Land	Low	Negligible	Negligible	Negligible
LCA1 – Coastal Hillside Landscape	High	Small	Moderate	Negligible
LCA2 – Village Landscape	Low	Negligible	Negligible	Negligible

Table 4-6 Magnitude of Change for Identified Key VSRs and Significance of Visual Impacts during the Construction and Operation Phases

VSRs	View Distance	Potential Blockage of View (Large/ Intermediate / Small/ Negligible)	Magnitude of Change (Large/ Intermediate/ Small/ Negligible	Sensitivity of VSRs to change	Visual Impact (During Construction)	Visual Impact (During Operation)
VSR1 – Residents of Tai Wan Tau Road	Close	Negligible - Small	Small	Low	Slight	Negligible
VSR2 – Travellers using Tai Wan Tau Road	Close	Negligible	Negligible	Low	Negligible	Negligible

5 ENVIRONMENTAL PROTECTION MEASURES

During the construction works, the requirements specified in EPD's " Recommended Pollution Control Clauses for Construction Contracts" will be followed. This document has covered areas of noise control, air pollution control, water pollution control and waste management. Specific control requirements during construction are reviewed and presented below.

5.1 Noise

5.1.1 As revealed from the quantitative noise impact assessment presented in **Section 4**, while the proposed works at the Works Area will not require any major civil engineering works, there could still be potential construction noise impact on the nearby NSRs given their proximity to the Site. Therefore, it will be important to ensure that sufficient noise mitigation measures are implemented to alleviate the predicted noise impact to acceptable levels. The recommended construction noise mitigation measures are described below.

Good Site Practices

5.1.2 Good site practices will considerably reduce any potential noise impact from the construction works on NSRs, including the nearby village houses and visitors to the Clear Water Bay Country Park. The following measures shall be implemented during the construction phase for the proposed works in the Works Area:

- Before commencement of any construction works, the contractor shall submit to the Project engineer for approval the method of work, including the PME and sound-reducing measures intended to be used;
- The number of PME operating shall be kept to a minimum. Only well-maintained plant shall be used;
- Regular maintenance shall be provided to all plant and equipment;
- Equipment that may be in intermittent use shall be shut down or throttled down to a minimum between work periods;
- Silencer, on the construction equipment to reduce noise without impairing machine efficiency, quiet plant and/or purpose-built movable noise barriers shall be used as necessary;
- No construction activities would be allowed during 7pm to 7am.

Use of Quiet PME

5.1.3 Use of quiet PME is recommended for reducing the excessive construction noise predicted at the affected NSRs. Quiet PME have been identified based on the inventory on Quality Powered Mechanical Equipment (QPME) established by EPD. It should be noted that the types of quieter PME adopted in the assessment have been selected for the purpose of the quantitative assessment only. The Contractor may use other types of PME, which have the same or lower total sound power levels (SWLs), to meet its needs.

5.1.4 The various types of PME assumed in the construction noise assessment are summarized in **Table 5-1**.

Table 5-1 List of PME to be Used for the Project

PME	ID code	SWL, dB(A)
Breaker, Hand-held, mass 10kg and < 20kg	CNP 024	108
Generator, silenced, 70dB(A) at 7m	CNP 103	95
Dump Truck, with grab, 5.5 tonne<gross vehicle weight < 38 tonnes	See Note 1	105
Drill rig, rotary type (diesel)	See Note 1	110
Lorry, with crane, 5.5 tonnes < gross vehicle weight < 38 tonnes	See Note 1	105
Grout mixer	See Note 1	90
Grout pump	See Note 1	105
Air Compressor, Air Flow <10m^3/min	CNP 001	100
Shotcrete Pump	See Note 1	109

Note:

1. The Sound Power Levels (SWLs) of the PMEs presented are based on the Technical Memorandum on Noise from Construction Work Other Than Percussive Piling (TM-GW), except for those marked "See Note 1", which are based on the EPD's guidance "Sound power levels of other commonly used PME" available athttp://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf.

Use of Enclosure/ Temporary Noise Barrier

5.1.5 Use of movable barrier, noise enclosure and silencer are recommended to further reduce the construction noise impacts at the affected NSRs. In order to minimize adverse effects to the nearby NSRs, noise enclosure is recommended to provide at the works area B and C for placing machineries. Drilling rigs, excavator, breaker, dump truck and lorry shall be operated behind movable barriers while generator, concrete mixer, grout mixer, grout pump, agitator, air compressor and shortcrete pump shall be operated in noise enclosure. In general, movable barrier can achieve a 5dB(A) reduction for movable PME, 10dB(A) reduction for stationary PME while noise enclosure can achieve a 15dB(A) reduction for PME depending on the design of the movable noise barrier and noise enclosure. Noise barrier and noise enclosure shall be made of acoustic barrier material with a minimum of 10mm thick plywood (or 1mm thick steel outer skin) and a minimum of 50mm thick sound absorbing lining. The surface density of barrier materials shall be at least 10kg/m^2 to achieve maximum screening effect.

5.1.6 For a notional noise source of 2m high, the movable noise barrier shall be of a minimum height of 2m for N1a and N2. The minimum length of the barrier should be such that the noise source will not be visible from the sensitive receivers. The Contractor may adopt alternative design of movable noise barrier which has demonstrated success to achieve same at least same screening effects upon approved by the Engineer.

5.1.7 A schematic configuration of the proposed noise barrier and a sample sectional drawing showing the location of the proposed noise barrier and the identified NSRs are shown in **Appendix F**.

5.1.8 The environmental protection measures for various types of PME assumed in the construction noise assessment is proposed in **Table 5-2**.

Table 5-2 Proposed Mitigation Measures for Different PMEs

PME	Proposed Mitigation Measures	Reduction, dB(A)[1]
Breaker, Hand-held, mass 10kg and < 20kg	Movable Barrier	10
Generator, silenced, 70dB(A) at 7m	Noise Enclosure	15
Dump Truck, with grab, 5.5 tonne <gross vehicle weight < 38 tonnes	Movable Barrier	5
Drill rig, rotary type (diesel)	Movable Barrier	10
Lorry, with crane, 5.5 tonnes < gross vehicle weight < 38 tonnes	Movable Barrier	5
Grout mixer	Noise Enclosure	15
Grout pump	Noise Enclosure	15
Air Compressor, Air Flow <10m^3/min	Noise Enclosure	15
Shotcrete Pump	Noise Enclosure	15

Note:

2. The noise reductions of typical movable barrier and noise enclosure are referred to EIAO Guidance Note No. 9/2010, Preparation of Construction Noise Impact Assessment under the Environmental Impact Assessment Ordinance, http://www.epd.gov.hk/eia/hb/materials/GN9.pdf.

5.1.9 The enclosure should either be provided with acoustic door for access purpose which should be kept closed during the construction works or should be designed with no direct line of sight from the open side to the NSRs so that all NSRs will be adequately protected throughout construction period.

5.1.10 With implementation of the recommended noise mitigation measures, **Table 5-3** set out the range of the mitigated noise levels predicted at the same representative NSRs for the construction works at the Works Area. Detailed assessment results are presented in **Appendix E**. As shown, the mitigated noise levels predicted at all representative NSRs are within the day-time noise criterion of $Leq_{(30min)}$ 75dB(A) with the implementation of the noise mitigation measures.

Table 5-3 Range of Predicted Construction Noise Levels (Mitigated Scenario)

NSR	Description	Predicted Noise Levels, $Leq_{(30min)}$ dB(A)	EIAO-TM Noise Criterion, $Leq_{(30min)}$ dB(A)	Exceedance
N1a	Village House No. 40, Tai Wan Tau Village	71-74	75dB(A) during 0700 to 1900 hours on any day not being a Sunday or general holiday	N
N1b	Village House No. 40, Tai Wan Tau Village	56-71		N
N2	Village House No. 45, Tai Wan Tau Village	69-74		N

5.2 Air Quality

5.2.1 The dust control requirements stipulated in the Air Pollution Control (Construction Dust) Regulation shall be implemented to control fugitive dust emissions during the construction phase of the proposed hazard mitigation works at the Works Area. These dust control measures are standard measures and the most relevant dust control measures are listed below.

- Erection of hoarding of not less than 2.4m high from ground level along the Works Area that adjoins a road or other area accessible to the public, where appropriate;
- The work area of any excavation or earth moving operation shall be sprayed with water to maintain the entire surface wet;
- All dusty materials shall be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet;
- Cover stockpile of dusty materials by impervious sheeting or sprayed with water so as to maintain the entire surface wet; and
- Any debris shall be covered entirely by impervious sheeting or stored in a debris collection area sheltered on the top and the 3 sides.

5.3 Water Quality

5.3.1 The Contractor shall comply with the Water Pollution Control Ordinance (WPCO) and its subsidiary regulations. Site runoff shall be controlled in accordance with the guidelines stipulated in EPD's Professional Persons Environmental Consultative Committee Practice Note (ProPECC PN 1/94) "Construction Site Drainage".

5.3.2 In particular, the following measures should be implemented by the Contractor:

- All surface runoff from the Works Area generated from construction works, dust control and vehicle washing etc, shall be collected and directed towards de-silting facilities for treatment before discharging into stormwater drains or natural streams.
- Channels, earth bunds or sand bag barriers shall be provided onsite to properly direct storm water to the silt removal facilities provided.
- Perimeter channels should be provided at site boundaries of Works Area where necessary to intercept storm runoff from outside the Works Area.
- No excavated material, silt, debris, rubbish, cement slurry or construction waste shall be deposited into natural stream.
- All trade effluent, foul, contaminated water, cooling water or hot water shall not be discharged into any public sewers, stormwater drains, channels, stream courses or the sea.
- Open stockpiles of construction materials should be avoided as far as practicable or, where unavoidable, should be covered with impervious sheeting such as tarpaulin or fabric during rainstorms.
- All site discharges shall comply with the terms and conditions of a valid discharge license issued by EPD.
- Portable chemical toilet facilities shall be provided on site and a licensed water collector will be appointed by the Contractor for regular collection of foul water.
- Contractor will be required to carry out regular site cleaning and tidying throughout the construction period. Regular environmental inspections will be carried out during the construction period to ensure the site cleanliness and tidiness.
- It is recommended that tool box talk on site run-off control be carried out by the Contractor to increase the awareness of the workers.

5.4 Waste

5.4.1 The Contractor shall comply with the Waste Disposal Ordinance and its subsidiary regulations and the Waste Disposal (Chemical Waste) (General) Regulation. Provided that good site practices are strictly followed, adverse environmental impacts related to waste management are not expected from the proposed works at the Works Area. The following good waste management practices are recommended:

- The Contractor shall submit to the Project Engineer for approval a waste management plan with appropriate mitigation measures;
- The possible reuse of waste materials onsite shall be investigated and exhausted by the Contractor prior to consideration of treatment or disposal off-site;
- The Contractor shall be responsible for identifying what materials could be reused or recycled, where onsite or offsite. For offsite reuse or recycling, the contractor shall arrange for the collection of the recyclable materials;
- Surplus C&D materials (inert and non-inert) generated from the proposed works requiring disposal shall be properly transported to the designated disposal facilities managed by CEDD and EPD. In order to monitor the proper disposal of C&D materials and to control fly-tipping, a trip-ticket system shall be implemented by the Contractor and monitored as a standard item in the relevant technical audit, in accordance with the requirements specified in DEVB TC(W) No. 6/2010 Trip Ticket System for Disposal of Construction & Demolition Materials;
- The Contractor shall register as a Chemical Waste Producer if chemical wastes such as spent lubricants are generated onsite. All chemical waste shall be properly handled, stored, labelled, packaged and collected in accordance with the requirements of the Waste Disposal (Chemical Waste) (General) Regulation;
- The Contractor shall ensure that a sufficient number of covered bins are provided onsite for containment of general refuse. These bins shall be emptied on a daily basis and collected waste shall be disposed of properly;
- The Contractor shall not permit any sewage, waste water or effluent containing sand, cement, silt or any other suspended or dissolved material to flow from the Works Area onto any adjoining land; and
- The Contractor shall provide toolbox talks to workers on relevant topics including site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling.

5.5 Ecology

5.5.1 As discussed in **Section 4**, the major potential ecological impact would be the loss of woodland habitats and loss or disturbance to identified species of conservation importance. The mitigation measures to be incorporated to reduce the severity of any negative impacts identified are as follows.

Avoidance

5.5.2 Approximately 248 trees have been recorded within the Works Area in a topographical survey. During the design stage, the findings of the topographic survey and the locations

of the plant species of conservation importance have been taken into account to avoid tree loss and loss of species of conservation importance. No species of conservation importance was found close to the proposed alignment (i.e. 1.5m setback for mature tree and 1m setback for seedlings respectively from the alignment) and likely to be affected by the proposed works. The proposed locations of the works have been adjusted to avoid any tree loss and loss of those species of conservation importance. As mentioned in **Section 4.2.18**, in order to minimize the impacts on the roots of the existing trees, a setback of 1.5m from trees to the steel stand posts and soil nails will be maintained as far as possible. For any existing trees located close to the proposed works, the tree trunks will be wrapped in hessian (as a form of protective wrapping) in accordance with GEO Publication No. 1/2011 to avoid mechanical damage to the tree trunks.

5.5.3 The locations of those plant species of conservation importance have been mapped, as shown in **Figure 3** and **Appendix A**, and the individuals would be tagged with eye catching tapes to avoid any damage that may be caused during the construction phase. Prior to commencement of construction works, a baseline survey will be conducted by a qualified plant ecologist to identify and update the conditions of all plant species of conservation importance within the Works Area. A detailed baseline tree survey will also be conducted in accordance with Development Bureau's Technical Circular (Works) No. 10/2013 on "Tree Preservation" to update the number, locations and conditions of all existing trees within the Works Area prior to commencement of construction works. Upon completion of the works, the species of conservation importance that will potentially be affected by the construction works will be surveyed to assess the condition.

5.5.4 Introduction and training will be provided to all staff in order to make sure that every staff will fully understand the preservation method and the locations of those species of conservation importance.

5.5.5 The resident site supervisor will closely monitor the condition of those species of conservation importance and all existing trees within the Works Area during the construction period. The monitoring will be conducted on a monthly basis. The monthly monitoring reports shall include photographic records to present the updated conditions of the protected plant specimens and all existing trees within the Works Area. All the baseline survey reports (prepared prior to commencement of construction works) and the monitoring reports (prepared over the construction phase of the Project) shall be endorsed by an Independent Environmental Checker (IEC) before submission to relevant government department(s).

5.5.6 In order to avoid damage to those plant species of conservation importance recorded on-site, tree protection zone(s)/ works exclusion zone(s) will be established throughout the construction period to separate the identified protected plant individuals from any proposed works area. Protection fences of at least 1m height should be established to surround the protection zones/ exclusion zones which should include the 1.5m setback from stems of mature trees, and areas within 1m radius from the seedlings, and 0.5-1m setback from crown spread of the climbing species *Gnetum luofuense* to be preserved respectively within/ close to the Works Area, as illustrated in **Plate 9**. All the identified individuals likely to be affected by the works will be protected by the protection fences. The same protection measures will also be implemented to protect any additional individuals of protected species identified and likely to be affected during the construction period.

5.5.7 The flexible barriers will be constructed in bays, the gaps between each bay would provide ecological pathways for the fauna. In addition, the guidelines on planning for construction works in natural streams provided in ETWB TC(W) No. 5/2005 will be followed.

Minimization

5.5.8 In order to minimize the damage to the root system of the existing trees during the drilling works, a minimum of 1.5m setback from proposed works will be maintained for all existing trees as far as possible. A suitably qualified arborist will be appointed to provide on-site supervision and monitoring of any tree pruning works to ensure that no trees' canopies or tree roots will be over-pruned or adversely impacted due to malpractice of tree works. The pruned trees (either root-pruned or crown-pruned) will be closely and regularly monitored by qualified site staff during construction of the Project. For any trees deteriorate after pruning and could not be safely retained on site during construction of the Project, formal tree removal application with compensatory planting proposal(s) should be prepared in accordance with Development Bureau's Technical Circular (Works) No. 10/2013 on "Tree Preservation" and submitted to relevant authorities for approval before removal of any trees on site.

5.5.9 In order to protect the retained trees, temporary protective hessian and plant armouring around the tree trunks (as shown in **Plate 5**) will be provided by the Contractor prior to the commencement of the site clearance, demolition and construction of the hazard mitigation works.

5.5.10 As the tree density of the Works Area is relatively high and some trees are with wide spread, tree pruning may be required. The extent of tree pruning will be determined on site by the Engineer as advised by the Certified Arborist. Reference will be made to Development Bureau's General Guidance on Tree Pruning. The tree pruning will be carried out by appropriate qualified personnel in accordance with local and international guidelines as presented in **Section 5.6.1**. Other retained trees in the close proximity of the construction works will also be protected by providing a protective wrapping around the tree trunks as illustrated in **Plate 5**. The contractor will be required to comply with the General Specification for Civil Engineering Works (GS), which include specifications on Preservation and Protection of Trees. Reference will also be made to Development Bureau's Technical Circular (Works) No. 10/2013 on "Tree Preservation".

5.5.11 To avoid unnecessary removal of the understory vegetation, the vegetation clearance will be closely monitored by the resident site supervisor. The conditions of existing trees will be regularly monitored by suitably qualified site staff to ensure that no trees will be adversely impacted during construction works.

Compensation

5.5.12 Planting of shrubs within the soil nailing area, and hydroseeding with shrub seed mix to the area affected by vegetation clearance will be provided upon completion of works to enhance the recovery of the woodland habitat. Details of the landscape measures proposed are discussed in **Section 5.6**.

Good Site Practice

5.5.13 Standard good site practice shall be implemented to avoid and minimize the potential disturbance to the surrounding habitats include:

- Placement of equipment or stockpile in the Works Area and access routes shall be selected at existing disturbed land where possible to minimize disturbance to vegetation, or at the locations most convenient to gain access to the slope area. The chosen temporary stockpiling area and access routes shall be far away from the identified plant species of conservation importance;
- Construction activities shall be restricted to the clearly demarcated works area;
- Temporary works area shall be reinstated immediately after completion of the construction work;
- Open fires shall be strictly prohibited on the works site;
- Waste generated from the Works Area shall be disposed of in a timely and proper manner;
- Fire fighting equipment shall be provided in the Works Area before the commencement of works;
- The Resident Site Staff shall monitor the proper implementation of the above mitigation measures

5.6 Landscape and Visual

5.6.1 The proposed hazard mitigation works will be carried out within the natural secondary woodland in the Tai Wan Tau Area. However, due to the limited footprint of the proposed project and the flexibility in the design which can allow adjustment of the locations and layout of proposed permanent features based on actual site conditions, tree felling of the trees on the slopes will be avoided as far as practicable. The proposed areas within Tai Wan Tau Village and on opposite side of Tai Wan Tau Road will be used for temporary storage of construction materials and operating construction equipment, and their locations will be adjusted on-site so as to prevent any damage or disturbance to the existing trees at the woodland edge or on the agricultural land. The exact locations of the steel post and associated structures of the flexible barriers will be adjusted to avoid tree felling. Limited pruning on some of the existing trees may be required so as to facilitate the erection of the flexible barriers and installation of soil nails. Appropriate tree protection zone by at least 1.5m setback from the trunks of the existing trees to the exact locations of the steel posts and concrete pads of the flexible barriers will be maintained as far as possible. As mentioned in **Section 5.5**, all pruning works (either root pruning or crown pruning) will be supervised by a qualified arborist to ensure that no trees will be hard pruned or adversely impacted due to malpractice of tree works. For any trees deteriorate after pruning and could not be safely retained on site during construction of the Project, formal tree removal application with compensatory planting proposal(s) should be prepared in accordance with Development Bureau's Technical Circular (Works) No. 10/2013 on "Tree Preservation" and submitted to relevant authorities for approval before removal of any trees on site. The following guidelines should be adopted by the Contractor when undertaking the tree pruning work:

- American National Standard for Tree Care Operations (ANSI A300 (Part 1)) – Tree, Shrub, and Other Woody Plant Maintenance – Standard Practice (Pruning));

- American National Standard for Arboricultural Operations (ANSI Z133) – Safety Requirements;
- British Standard for Tree Works (BS 3998:1989);
- "General Guidelines on Tree Pruning" (Development Bureau);
- "Pictorial Guide for Tree Maintenance" (Development Bureau);
- "Do's and Don'ts in Pruning (Fact Sheet)" (Development Bureau);
- "Do's and Don'ts in Pruning (Leaflet)" (Development Bureau)

5.6.2 Other protection measures on the existing trees and plant species of conservation importance are also detailed in **Section 5.5**.

5.6.3 The proposed engineering works areas will be largely screened by the slope topography of the two man-made slopes and screened off by the existing hillside vegetation, and hoarding in subdued colour will be erected around the wooded hillside area with proposed hazard mitigation works facing the village houses during the construction period. These could minimize landscape/ visual impacts to the VSR1 at localized village houses during the construction period.

5.6.4 To further minimize the visual impact to the VSRs in the long term, all proposed concrete and steel post furniture of the flexible barriers shall be painted in subdued colour so as to blend these artificial structures with the surrounding environment. The landscape treatment to reduce the landscape/ visual impacts to the VSRs and the existing environment as a whole will include planting shrubs seedlings and hydroseeding with erosion control mat at the vegetation clearance areas and proposed slope engineering work areas. Biodegradable erosion control mat will be proposed on the soil nailing area of the natural slope, while steel wire mesh would be installed at some portion of the slope with gradient larger than 45°. An outline of the compensatory planting/ landscape proposal to enhance the greening elements is detailed in the followed section.

Proposed Landscape Proposal

5.6.5 A total of about 248 trees are located within the Works Area. As detailed in **Section 4.2**, the exact locations of the steel posts and concrete pads of the flexible barriers and locations of the maintenance access and soil nails will be adjusted so that tree felling will be avoided. Only limited pruning of some selected trees may be required to facilitate the erection of the flexible barriers and installation of soil nails, while localized trimming of ground vegetation within the same proposed works areas will also be needed. For any trees deteriorate after pruning and could not be safely retained on site during construction of the Project, formal tree removal application with compensatory planting proposal(s) should be prepared in accordance with Development Bureau's Technical Circular (Works) No. 10/2013 on "Tree Preservation" and submitted to relevant authorities for approval before removal of any trees on site.

5.6.6 The loss of ground vegetation underneath the tree canopy will be compensated by hydroseeding at the areas with vegetation clearance along the alignment of flexible barriers and maintenance access. The soil nailed area will be covered with biodegradable erosion control mat and hydroseeded with shrub planting. The area of approximately 1,614.3m^2 to be temporarily disturbed during the construction phase will be fully reinstated with vegetation. Only a small area of 210m^2 of woodland will be lost due to footprint of the flexible barriers and maintenance access.

5.6.7 The soil nailed slope and areas with flexible barriers will be hydroseeded with common grass seed mix. Seedlings of native shrubs, including *Ardisia crenata*, *Gardenia jasminoides*, *Ilex asprella*, *Litsea rotundifolia* var. *oblongifolia* and *Psychotria asiatica*, will be planted individually in the soil nailing areas and close to the toe of the flexible barriers. Given that the proposed engineering works areas are located in close proximity to the natural woodland which has diverse seed sources for vegetation recovery, it is anticipated that the vegetation of the affected areas (i.e. areas that will be temporarily disturbed during construction stage) would recover progressively by natural succession. The abovementioned landscape treatments aim to enhance the vegetation recovery after the completion of the proposed hazard mitigation works and minimize the visual impacts to the identified VSRs and the surrounding environments. **Table 5-4** shows the details of the soft landscape treatments as landscape mitigation measures. The landscape design should follow GEO Publication No. 1/2011. In addition, opportunities will be sought to enhance the landscape and visual value of the existing disturbed area due to human disturbance by re-vegetation as far as practicable.

5.6.8 Upon completion of compensatory plantings, the appointed landscape contractor shall carry out regular monitoring and appropriate maintenance (e.g. replacement for unsatisfactory plant specimens) for the compensatory plantings during a 12-month establishment period. The monitoring reports shall be endorsed by the IEC before submission to relevant government department(s).

Table 5-4 Details of the Proposed Landscape Mitigation Measures

1. Hydroseeding will be applied at the alignment of flexible barriers and maintenance access (224.3m^2) and soil nailing areas (1,390m^2). Native grass species shall be used in the hydroseeding mix as far as possible.

Hydroseeding mix	Specification
Between April and August: a. *Cynodon dactylon* b. *Paspalum notatum* *c. Chloris gayana* d. *Eragrostis curvula* (2% maximum) *e. Eremochloa ophiuroides* *f. Eremochloa ciliaris* *g. Cenchrus echinatus*	Composition (%) by rate (min. seed mix in total of 30g/sq. meters)* a. 40% b. 35% c. 10% d. 2% e. 4% f. 5% g. 4%
Between September and March: a. *Cynodon dactylon* b. *Paspalum notatum* c. *Lolium perenne* d. *Chloris gayana* e. *Eremochloa ciliaris* f. *Eremochloa ophiuroides*	Composition (%) by rate (min. seed mix in total of 35g/sq. meters)* a. 40% b. 30% c. 20% d. 6% e. 2% f. 2%

Note:
* Native grass species shall be used as far as possible. The composition of grass mix is recommendation only and the actual composition of grass seed mix may be adjusted based on the availability of nursery shock during the detailed design stage.

2. Native shrub species will be planted in the planting holes within the two soil nailing areas, with total areas of approximately 1,390m^2.

Shrub mix	Spacing (mm)	Size (mm)	Proportion of mix	Quantity (no.)	Remarks
a. *Ardisia crenata*	1000	350(H) x 200(S)	20%	500	Potted
b. *Gardenia jasminoides*	1000	350(H) x 200(S)	10%	250	Potted
c. *Ilex asprella*	1000	350(H) x 200(S)	10%	250	Potted
d. *Litsea rotundifolia* var. *oblongifolia*	1000	350(H) x 200(S)	30%	750	Potted
e. *Psychotria asiatica*	1000	350(H) x 200(S)	30%	750	Potted

5.7 Cultural Heritage

5.7.1 No mitigation measures are required as no heritage site will be affected by the proposed hazard mitigation works.

5.8 Severity, Distribution and Duration of Environmental Effects

5.8.1 With the implementation of the recommended mitigation measures, no adverse residual environmental impacts are anticipated from the proposed works for the Project.

5.9 Further Implications

5.9.1 No further environmental implications are anticipated for both the construction and operational phases of the Project.

6 USE OF PREVIOUSLY APPROVED PROJECT PROFILES

6.1.1 No EIA report was prepared before for a project of similar nature. However, there are a number of relevant Project Profiles that were submitted before for application for permission to apply directly for an Environmental Permit for similar landslip preventive works, including the following which is also situated in Sai Kung:

- Agreement No. CE 93/2001 (GE) *Landslide Mitigation Works at Pak Sha Wan and Tsing Shan Trail above 19 – Design and Construction, Project Profile for Pak Sha Wan Landslipe Mitigation Works* (Application No: DIR-93/2003 submitted in November 2003; EP granted in January 2004); and
- Agreement No. CE 37/2008 (GE) *Landslide Prevention and Mitigation Programme, 2008, Package J, Natural Terrain Hazard Mitigation Works, Kowloon, New Territories and Outlaying Island – Investigation, Design and Construction, Project Profile for Study Area above Leung Fai Tin along Clear Water Bay Road.* (Application No: AEP-448/2013) submitted in March 2013; EP granted in March 2013); and

7 CONCLUSION

7.1.1 The potential environmental impacts arising from the Project and the proposed mitigation measures are summarised in **Table 7-1**.

Table 7-1 Summary of the Potential Environmental Impacts and Proposed Mitigation Measures

Potential Impacts	Proposed Mitigation Measures
Noise	
Construction Phase: Noise generated from the construction activities Operation Phase: No Impact	Construction Phase: Movable noise barrier Noise enclosure Use quiet PME Implement good site practice Operation Phase: Not required
Air Quality	
Construction Phase: Dust generated from the construction activities and stockpiling of soil/ rock Operation Phase: No Impact	Construction Phase: Dust suppression measures, cover stockpiles & implement good site practice Operation Phase: Not required

Potential Impacts	Proposed Mitigation Measures
Water Quality	
Construction Phase: No impact as no sensitive receivers identified Operation Phase: No impact	Construction Phase: Implement good site practice to control run-off from Works Area Operation Phase: Not required
Waste	
Construction Phase: 170 m^3 of C&D waste and 830 m^3 of C&D materials are estimated to be generated from the Project Operation Phase: No impact	Construction Phase: On-site sorting of waste, implement trip ticket system, implement waste management plan Operation Phase: Not required
Ecology	
Construction Phase: 1,824.3m^2 vegetation will be disturbed due to site clearance for proposed works Operation Phase: No significant impact	Construction Phase: Compensation by re-vegetation of 1,614.3m^2 to reinstate vegetation in the areas temporarily disturbed due to the proposed works. Fence off identified plant species of conservation importance within the Works Area. Operation Phase: Not required
Landscape and Visual	
Construction Phase: Sources of Impacts Unsightly construction activities Localized and limited loss of vegetation Impacts on Sensitive Receivers: • Moderate impacts on LR1 (Woodland) and LCA1 (Coastal Hillside Landscape) due to localized trimming and clearance of vegetation • Negligible impacts on other identified LRs and LCA. • Slightly adverse impacts on VSR1 (Residents of Tai Wan Tau Village); negligible impacts on VSR2 (Travellers using Tai Wan Tau Road)	Construction Phase: Hoarding for screening, minimize the construction period as possible Compensatory planting and re-vegetation Implement tree protection measures including protective wrapping and designation of tree protection zones within Works Area Implement good site practice to control run-off

Potential Impacts	Proposed Mitigation Measures
Operation Phase: Sources of Impacts: Permanent erection of flexible barriers and maintenance access. Soil nail heads are almost invisible as they will be covered by reinstated/ recovered vegetation cover Impacts on Sensitive Receivers: • Slightly adverse impacts on LR1 and LCA1 at the beginning of operation phase but the impacts will progressively become negligible after establishment of compensatory plantings • Negligible impacts on other identified LRs and LCA • Slightly adverse impacts on VSR1 at the beginning of operation phase but the impacts will progressively become negligible after establishment of compensatory plantings; negligible impacts on VSR2	Operation Phase: Proposed concrete and steel post furniture of the flexible barriers will be painted in subdued colours to reduce visual obstruction
Cultural Heritage	
No impact	Not required

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List of Figures

848200

848400

817200

817000

蕉窩
TSIU WO

Village Type Development

墓地
Graves

清水灣道

CLEAR WATER BAY ROAD

TAI WAN TAU ROAD

Green Belt

Study Area
12SW-A/SA1

Extent of Works Area
(Designated Project)

Conservation Area

Tai Wan Tau Village

Village Type Development

Recreation

Open Space

更衣室
Changing Room

岩地
Rocky Area

海灘
Beach

清水灣第一灣泳灘
FIRST BEACH

Flat Rock

大環頭
TAI WAN TAU

Location of the Designated Project

Kowloon

Hong Kong Island

Sai Kung

N

0 25 50
Scale (m)

Legend

- Natural Terrain Study Area
- Works Area
- Temporary Storage Area
- OZP Zoning

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Project

AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009,
Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Figure Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Location Plan of the Designated Project

Note: Base map is 1,000 scale (2006), 2 meter contour intervals; sheet 12sw3c.

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Figure 1

SCALE 1:1,500

PROJECT No. 090871

848200

848400

N

817000

Extent of Works Area
(Designated Project)

A

A

N1a, A1a

N1b, A1b

N2, A2

Tai Wan Tau Village

TAI WAN TAU ROAD

Flat Rock

平岩

海堤 Seawall

大環頭路

道路

Road

TAI

Legend

- Works Area
- Temporary Storage Area
- Cross-Section
- Noise Sensitive Receivers and Air Sensitive Receivers

0 25 50

Scale (m)

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Project

AGREEMENT NO. CE30/2009 (GE)
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Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Figure Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Location of Noise and Air Sensitive Receivers

Note: Base map is 1,000 scale (2006), 2 meter contour intervals; sheet 12sw3c.

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Figure 2

SCALE 1:1,000

PROJECT No. 090871

848250
848300
848350
848400
817050
817000
816950
100
80
60
56
Conservation Area
Works Area "A"
Village Type Development
Tai Wan Tau Village
TAI WAN TAU ROAD
道路
Road
Works Area "C"
Works Area "B"
Green Belt
TS
ET
CUL
FP
35A
35
36
37
38
39
40
41
42
43
45
54.2
52.4
52.0
51.6
49.1
49.7
46.1
58.8
52.8
52.5
51.0
48.2
54.6
53.2
52.6
50.6
45.7
39.5
34.5
31.6
30.7
0
25
50
Scale (m)

Legend

- Works Area
- Temporary Storage Area
- OZP Zoning
- Proposed Flexible Barrier
- Proposed Maintenance Access
- Proposed Soil Nailing Area

Species of conservation importance Location

- *Diospyros vaccinioides*
- *Aquilaria sinensis*
- *Aquilaria sinensis seedling*
- *Ormosia pachycarpa seedling*
- *Ormosia pachycarpa*
- *Pavetta hongkongensis*
- *Aquilaria sinensis (Damaged)*
- *Gnetum luofuense*

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Project

AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009,
Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Figure Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Proposed Natural Terrian Hazard Mitigation Woks

Note: Base map is 1,000 scale (2006), 2 meter contour intervals; sheet 12sw3c.

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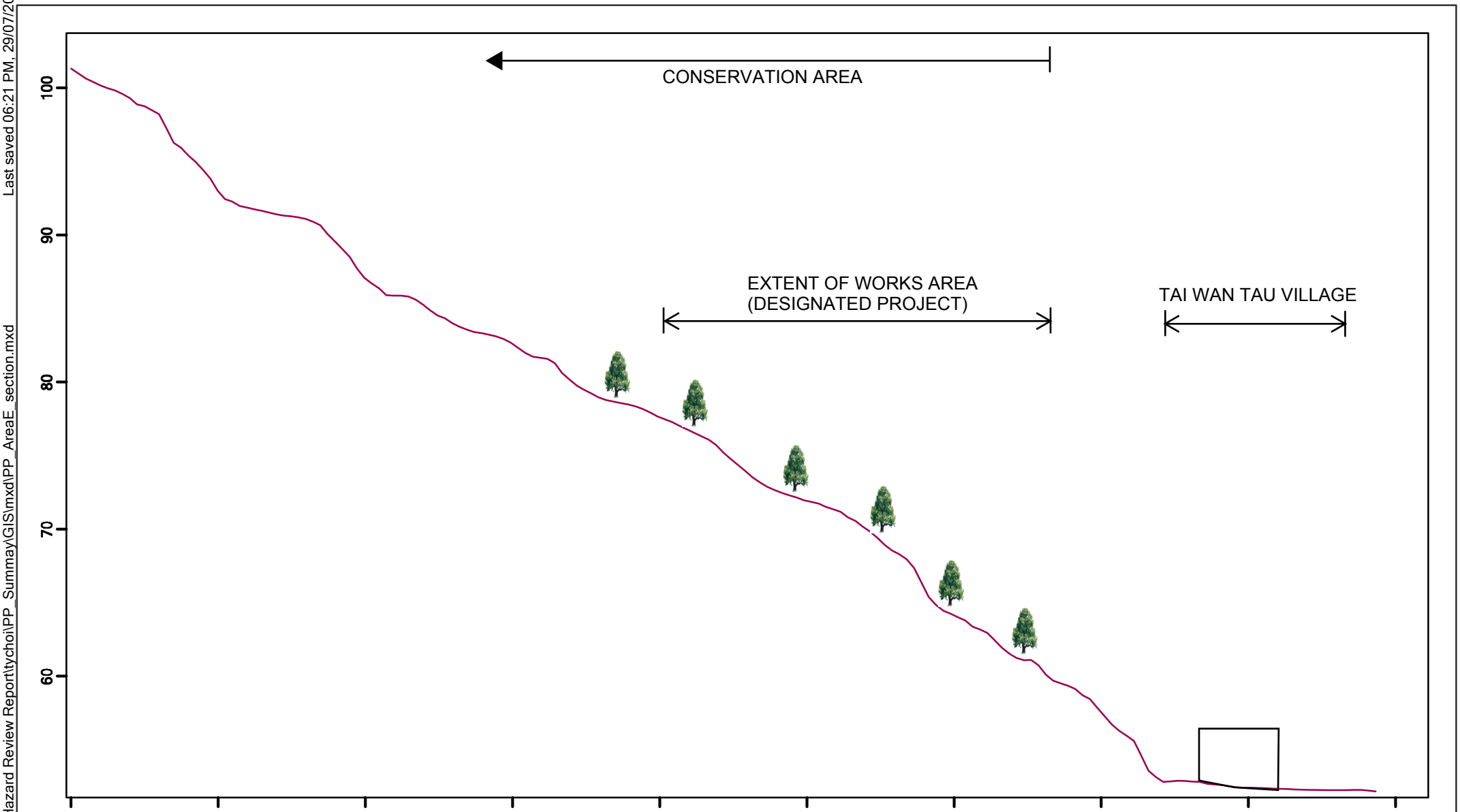
Figure 3

SCALE 1:500

PROJECT No. 090871



Job Title

AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009, Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Drawing Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Section A-A

Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.

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Scale: 1:350

Drawn by: Date: JUL 2013 Checked: Approved:

Job No. 090871

Figure No. Figure 4

N

Extent of Works Area
(Designated Project)

Tai Wan Tau Village

TAI WAN TAU ROAD

CUL

Flat Rock

0 20 40 Meters

Legend

- Works Area
- Native Secondary Woodland
- Developed Area

Project

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Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Figure Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Habitats within Works Area

Note: Base map is 1,000 scale (2006), 2 meter contour intervals; sheet 12sw3c

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Figure 5

SCALE 1:1,000 | PROJECT No. 090871

N

Extent of Works Area
(Designated Project)

Tai Wan Tau Village

TAI WAN TAU ROAD

CUL

Flat Rock

0 20 40 Meters

Legend

- Works Area
- Visible Area of VSR-1
  Residents of Tai Wan Tau Village
- Visible Area of VSR-2
  Travellers using Tai Wan Tau Road

Project

AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009,
Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Figure Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Locations of the Visually Sensitive Receivers

Note: Base map is 1,000 scale (2006), 2 meter contour intervals; sheet 12sw3c

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Figure 6

SCALE 1:1,000

PROJECT No. 090871

N

Extent of Works Area
(Designated Project)

VP1
VP2
VP3
VP4
VP5
VP6
VP7
VP8
VP9
VP10
VP11
VP12

Tai Wan Tau Village

TAI WAN TAU ROAD

CUL

Flat Rock

0 20 40 Meters

Legend

Works Area

Vantage Point

Project

AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009,
Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Figure Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Locations of the Vantage Points

Note: Base map is 1,000 scale (2006), 2 meter contour intervals; sheet 12sw3c

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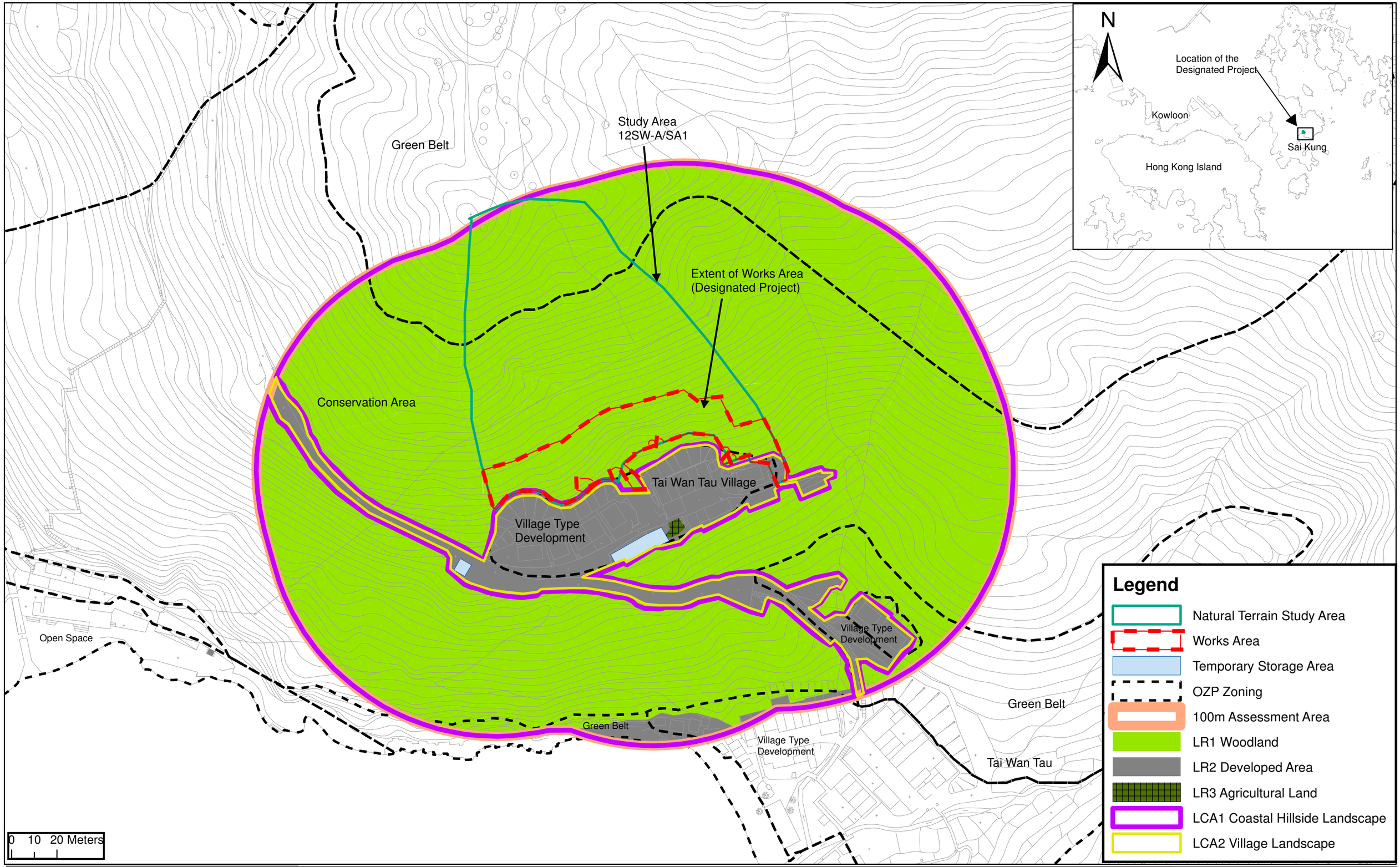
Figure 7

SCALE 1:1,000

PROJECT No. 090871



Project

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Landslip Prevention and Mitigation Programme 2009,
Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Figure Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Locations of Landscape Resources (LRs) and Landscape Character Areas (LCAs)

Note: Base map is 1,000 scale (2006), 2 meter contour intervals; sheet 12sw3c

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Figure 8

SCALE 1:1,500 | PROJECT No. 090871

List of Plates

Close up view of the works area

Job Title

AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009, Package D,
Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction

Drawing Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Overview of the Surrounding Environment of the Designated Project

Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.

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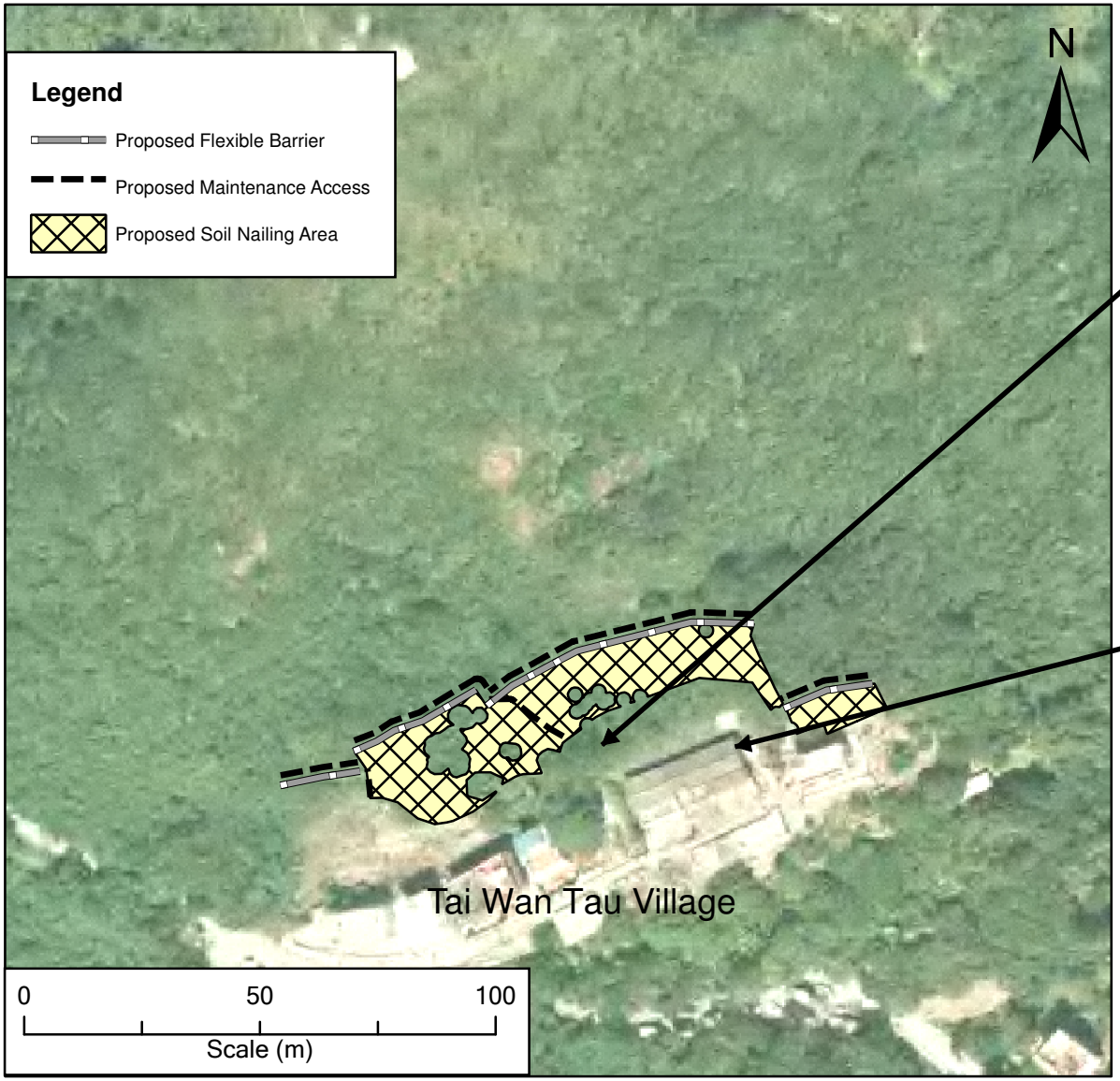
Scale: 1:3,000

Drawn by: Date: JUL 2013 Checked: Approved:

Job No. 090871

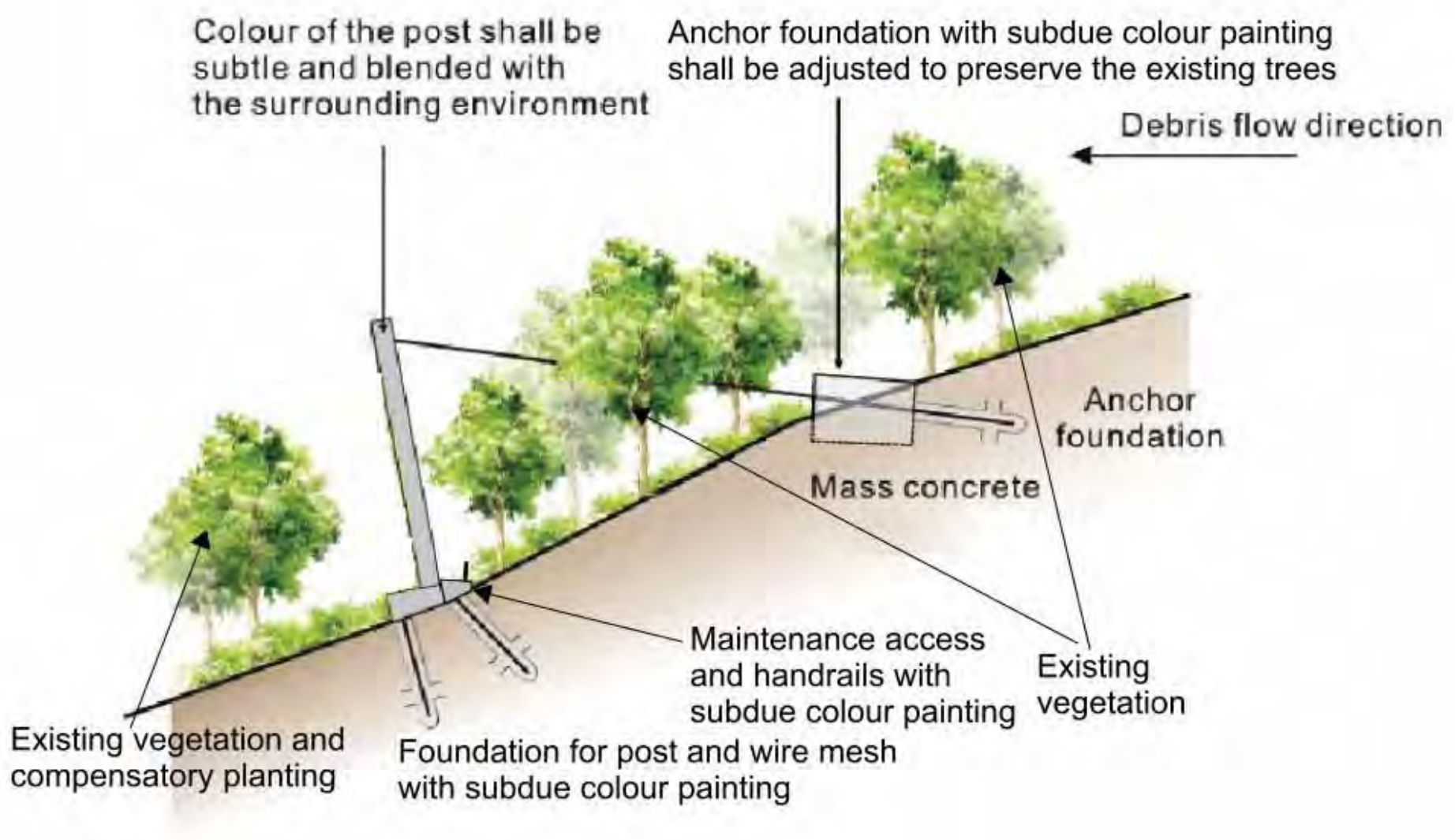
Figure No. Plate 1



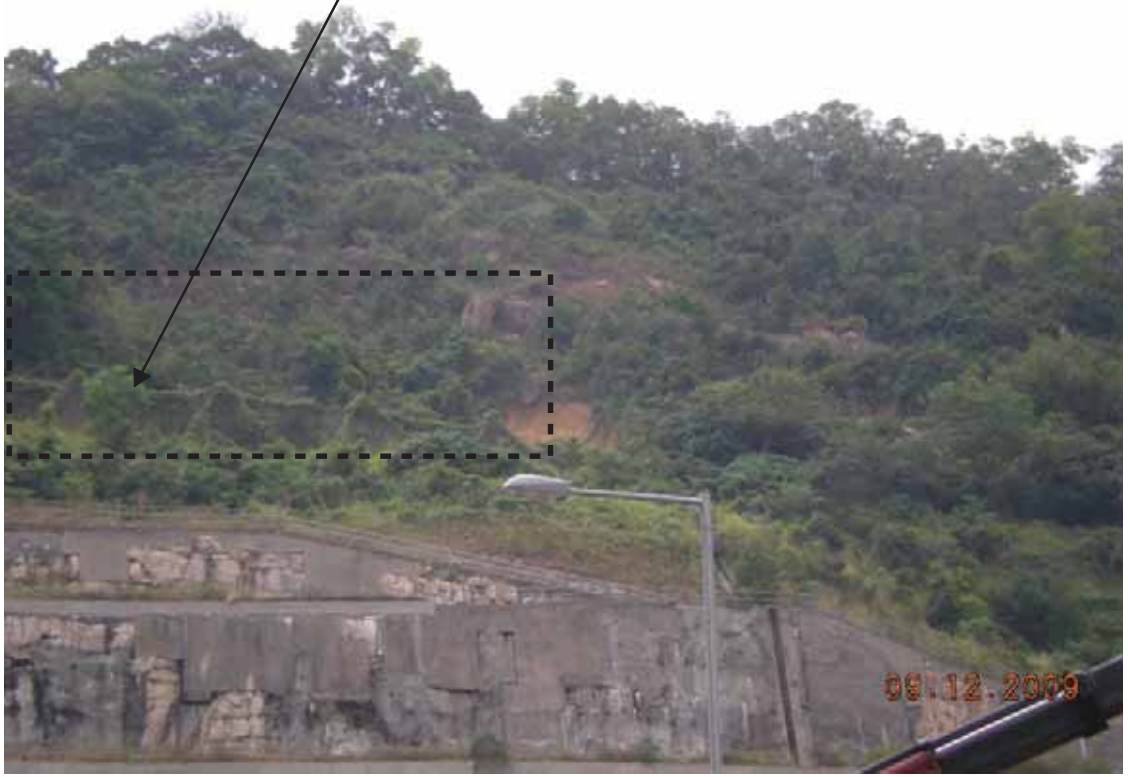
Located to the south of the Study Area above Tai Wan Tau Village (Looking northeast)

Located to the south of the Study Area above Tai Wan Tau Village (Looking northwest)

Job Title	Drawing Title	
AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Approximate Location of the Proposed Alignment of the Flexible Barrier and Views around the Works Area Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: 1:1,500 Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate 2



Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Schematic Diagram of Landscape Treatment Works for Flexible Barrier Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to Scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate 3



General View of the flexible barrier

Illustrations of successful establishment of native plant species and natural dispersal of vegetation over time along Clear Water Bay Road (Source: GEO Publication No. 1/2011)

Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Illustrations of Mitigation Measures Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate 4-1

Example of Completion of Soil Nail (Head)

Slope installed with Soil Nails (at completion of upgrading works)

2 years after completion of upgrading works

Illustrations of successful establishment of vegetation after the slope upgrading works
(Source: GEO Publication No. 1/2011)

Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Illustrations of Mitigation Measures Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate 4-2

Protective weapping around tree trunks
(Source: GEO Publication No. 1/2011)

Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Illustration of Protective Wrapping around Tree Trunks Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to Scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate 5

Native Secondary Woodland (Works Area)

Native Secondary Woodland (Area Adjacent to Works Area)

Developed Area (Area Adjacent to Works Area)

Dry Agricultural Land (Area Adjacent to Works Area)

Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Representative Photographs of Habitats Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to Scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate 6

LR1 – Natural Hillside Woodland

LR2 – Developed Area

VSR1 – Residents of Tai Wan Tau Village

VSR2 – Travellers using Tai Wan Tau Road

Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Representative Photographs of the LRs and VSRs Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to Scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate 7

VP1 – Located next to Tai Wan Tau Road and next to Lamppost # EB9732

VP2 – Located at the entrance of Tai Wan Tau Road. One of the Works Areas will be located at the corner of this paved parking area

Job Title

AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009, Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Drawing Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung

Photos at the Identified Vantage Points

Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.

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Scale: Not to Scale

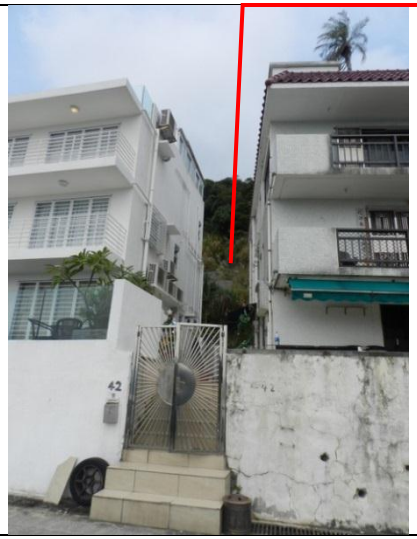
Drawn by: Date: JUL 2013 Checked: Approved:

Job No. 090871 Figure No. Plate 8-1

VP3 – Located at the entrance of Tai Wan Tau Road. The existing wooded area completely block the view of the proposed works within the woodland

VP4 – Overall view of the western part of the proposed slope work within the woodland area. The maximum height of the slope (Slope Feature No.: 12SW-A/CR 45) adjacent to the village house is 16m and the presence of the existing vegetation also block the view of the slope works within the woodland

Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Photos at the Identified Vantage Points Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to Scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate 8-2



VP5 – View of the existing man-made slope (Slope Feature No.: 12SW-A/CR 45) between the village houses nos. 42 and 41 in Tai Wan Tau Village

VP6 - Located to the south of the Works Area within Tai Wan Tau Village

Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Photos at the Identified Vantage Points Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to Scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate 8-3

VP7 – Located to the south of the Project Area. One of the Works Area will be located at this built area

VP8 – General view of the Tai Wan Tau Village area

Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Photos at the Identified Vantage Points Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to Scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate 8-4

VP9 – Located close to the southern part of the Works Area, with dense vegetation found along the woodland edge blocking the proposed slope work area within the woodland

VP10 – Located close to the southeast of the Works Area

Job Title

AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009, Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Drawing Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung

Photos at the Identified Vantage Points

Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.

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Scale: Not to Scale

Drawn by: Date: JUL 2013 Checked: Approved:

Job No. 090871 Figure No. Plate 8-5

VP11 – Located to the southeast of the Works Area and the topography of the existing man-made slope is higher than the adjacent village houses

VP12 – Located close to the southeast corner of the Works Area. The existing vegetation block most of the view to the proposed soil nailing work within the woodland

Job Title

AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009, Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Drawing Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Photos at the Identified Vantage Points

Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.

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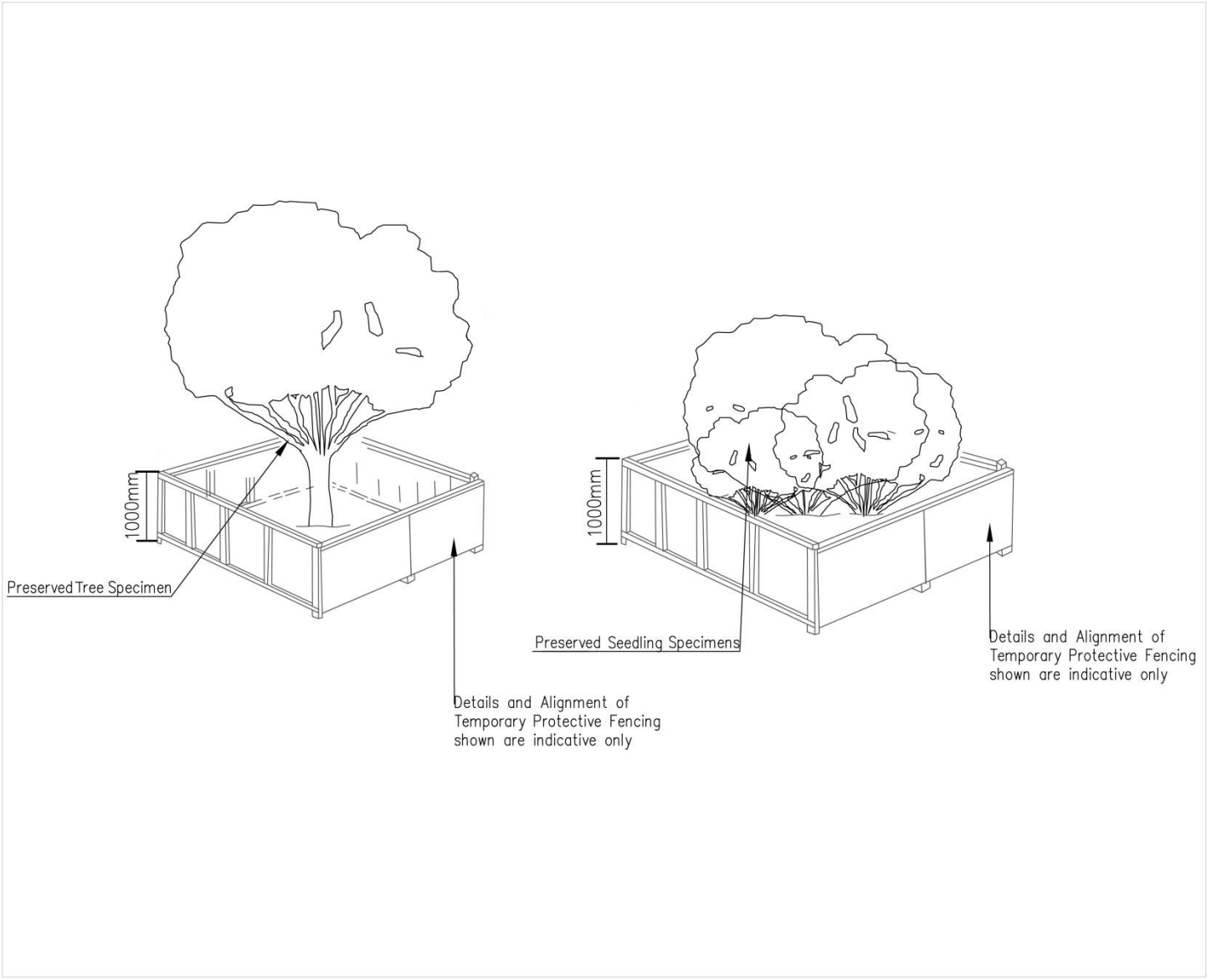
Scale: Not to Scale

Drawn by: Date: JUL 2013 Checked: Approved:

Job No. 090871 Figure No. Plate 8-6



Job Title

AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009, Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Drawing Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung

Illustration of Temporary Protective Fencing for the Protected Species

Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.

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Scale: Not to Scale

Drawn by: Date: JUL 2013 Checked: Approved:

Job No. 090871

Figure No. Plate 9

List of Appendices

Appendix A – Proposed Natural Terrain Hazard Mitigation Design

Appendix B – Tentative Construction Programme of Proposed Hazard Mitigation Works at Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung

Appendix C – Locations of the Study Area 12SW-A/SA1 and Other Concurrent Natural Terrain Hazard Mitigation Works in the Vicinity

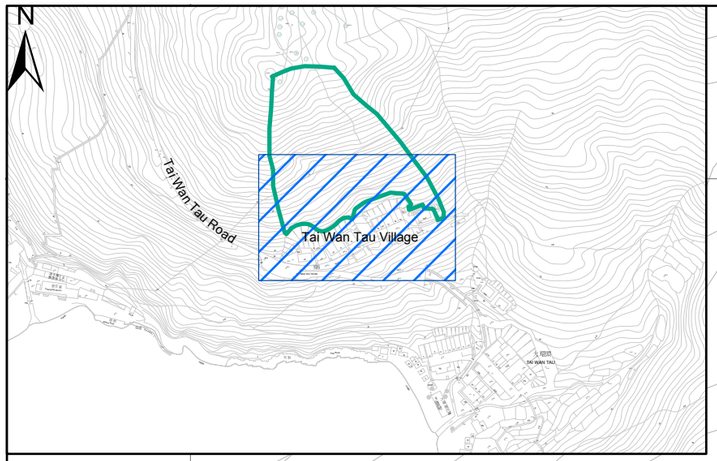
Appendix D – Ecological Survey Data

Appendix E – Construction Noise Assessment

Appendix F – Proposed Noise Barrier and Enclosure

Appendix A

Proposed Natural Terrain Hazard Mitigation Design



KEY PLAN
Scale 1:5000

848300
848350
817000
Tai Wan Tau Village
Road
道路
TS
FP
35A
35
36
37
38
39
40
41
42
43
45
56
60
80
54.2
52.4
52.0
51.6
49.1
49.7
58.8
52.8
51.0
48.2
52.5
54.6
53.2
52.6
50.6
45.7
34.5
31.6
L
E
ET
CUL

0 25 50
Scale (m)

Legend

- Works Area
- Temporary Storage Area
- Proposed Flexible Barrier
- Proposed Maintenance Access
- Proposed Soil Nailing Area
- Txxx — Existing Tree

Species of conservation importance

- DV-xx — *Diospyros vaccinioides*
- AT-xx — *Aquilaria sinensis*
- AS-xx — *Aquilaria sinensis seedling*
- OS-xx — *Ormosia pachycarpa seedling*
- OT-xx — *Ormosia pachycarpa*
- PH-xx — *Pavetta hongkongensis*
- ▲ — *Aquilaria sinensis (Damaged)*
- *Gnetum luofuense*

Project
AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009,
Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Figure Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Layout of Proposed Natural Terrian Harzard Mitigaiton Measures

Note: Base map is 1,000 scale (2006), 2 meter contour intervals; sheet 12sw3c.

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Appendix A

SCALE 1:400 | PROJECT No. 090871

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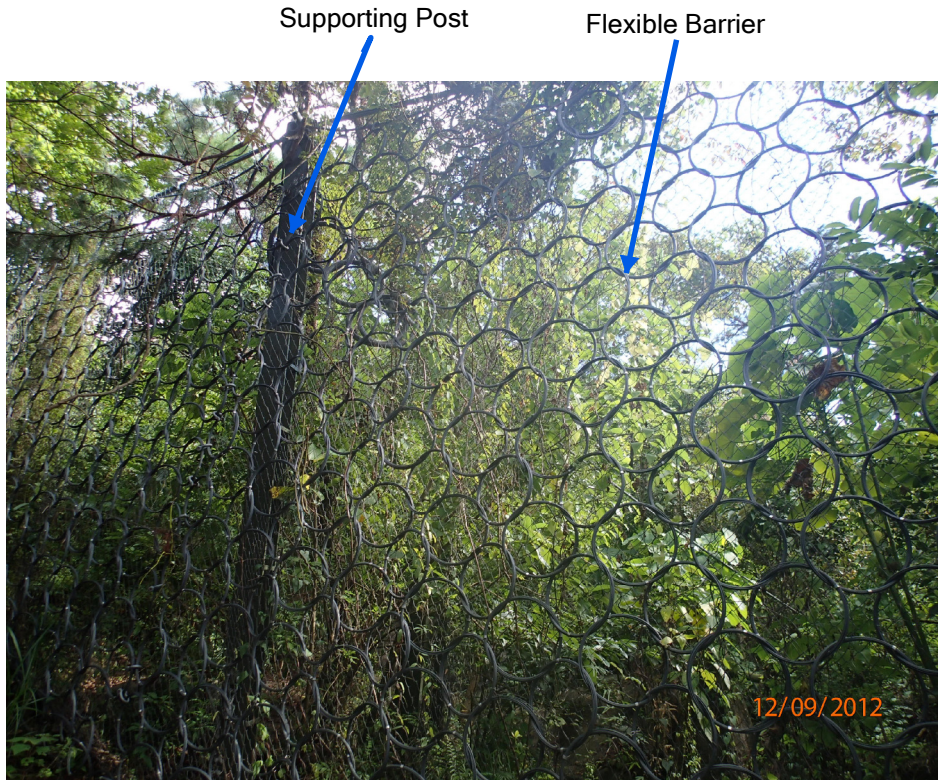
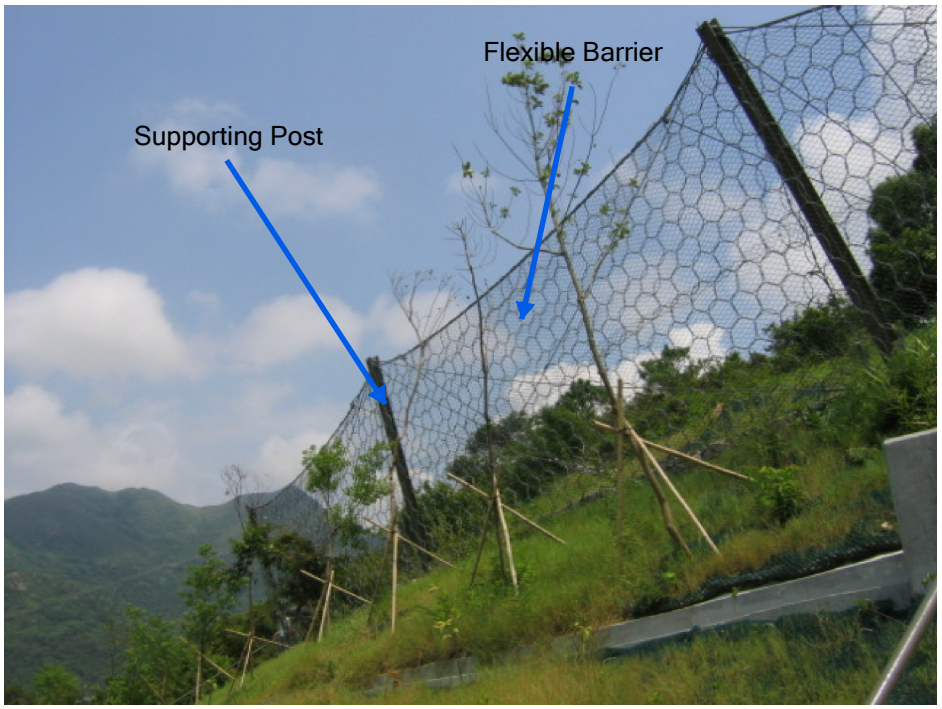


Close-up View of Flexible Barrier and Supporting Post



Details of Flexible Barrier

Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Previous Examples of Flexible Barrier for Natural Terrain Hazard Mitigation Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to Scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate A1-1

View of Flexible Barriers and access with painted handrails

View of Flexible Barriers above Tung Chung Road

Job Title

AGREEMENT NO. CE30/2009 (GE)
Landslip Prevention and Mitigation Programme 2009, Package D,
Natural Terrain Hazard Mitigation Works,
Hong Kong Island and Sai King -
Investigation, Design and Construction

Drawing Title

Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung
Previous Examples of Flexible Barrier for Natural Terrain Hazard Mitigation

Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.

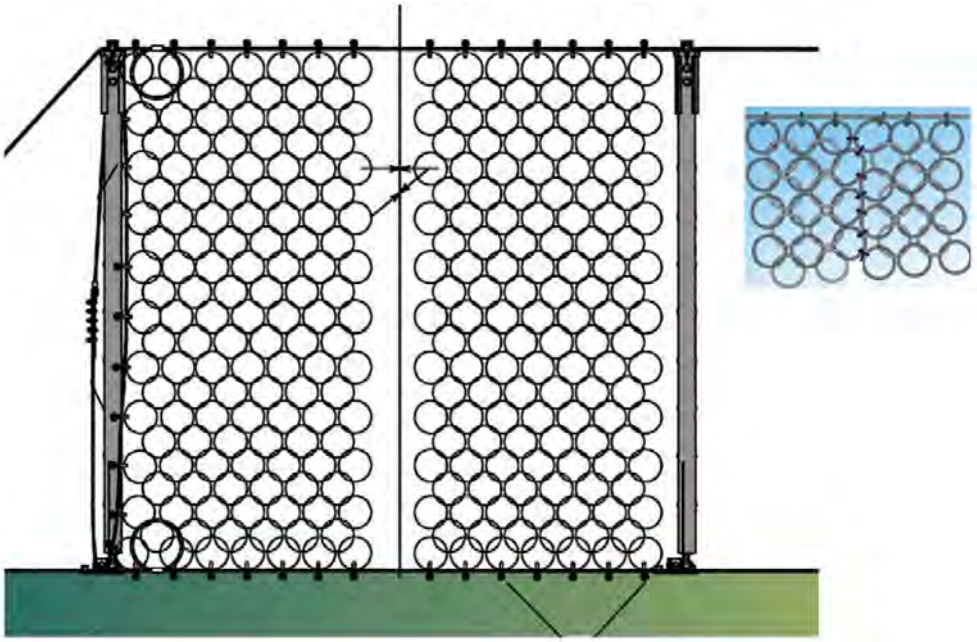
FUGRO (HONG KONG) LTD

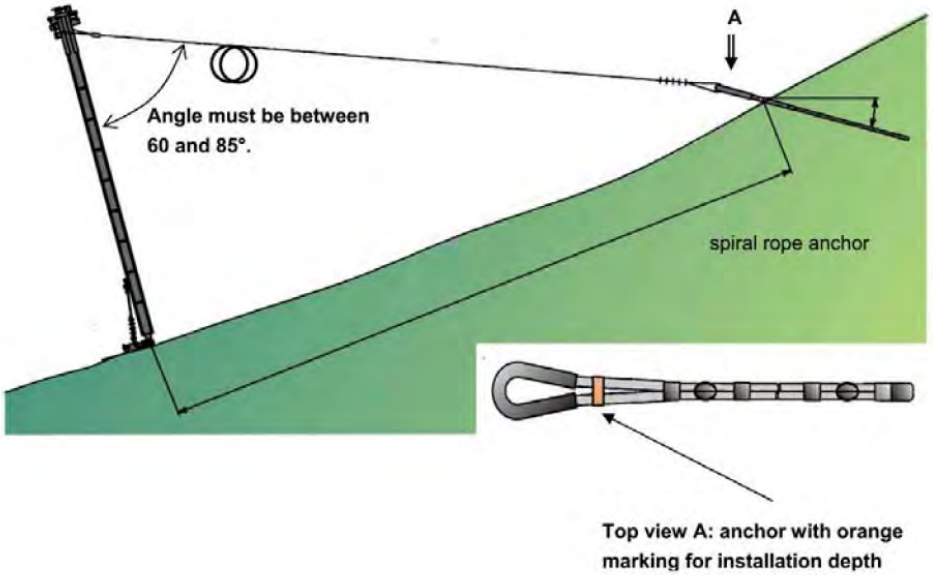
Scale: Not to Scale

Drawn by: Date: JUL 2013 Checked: Approved:

Job No. 090871

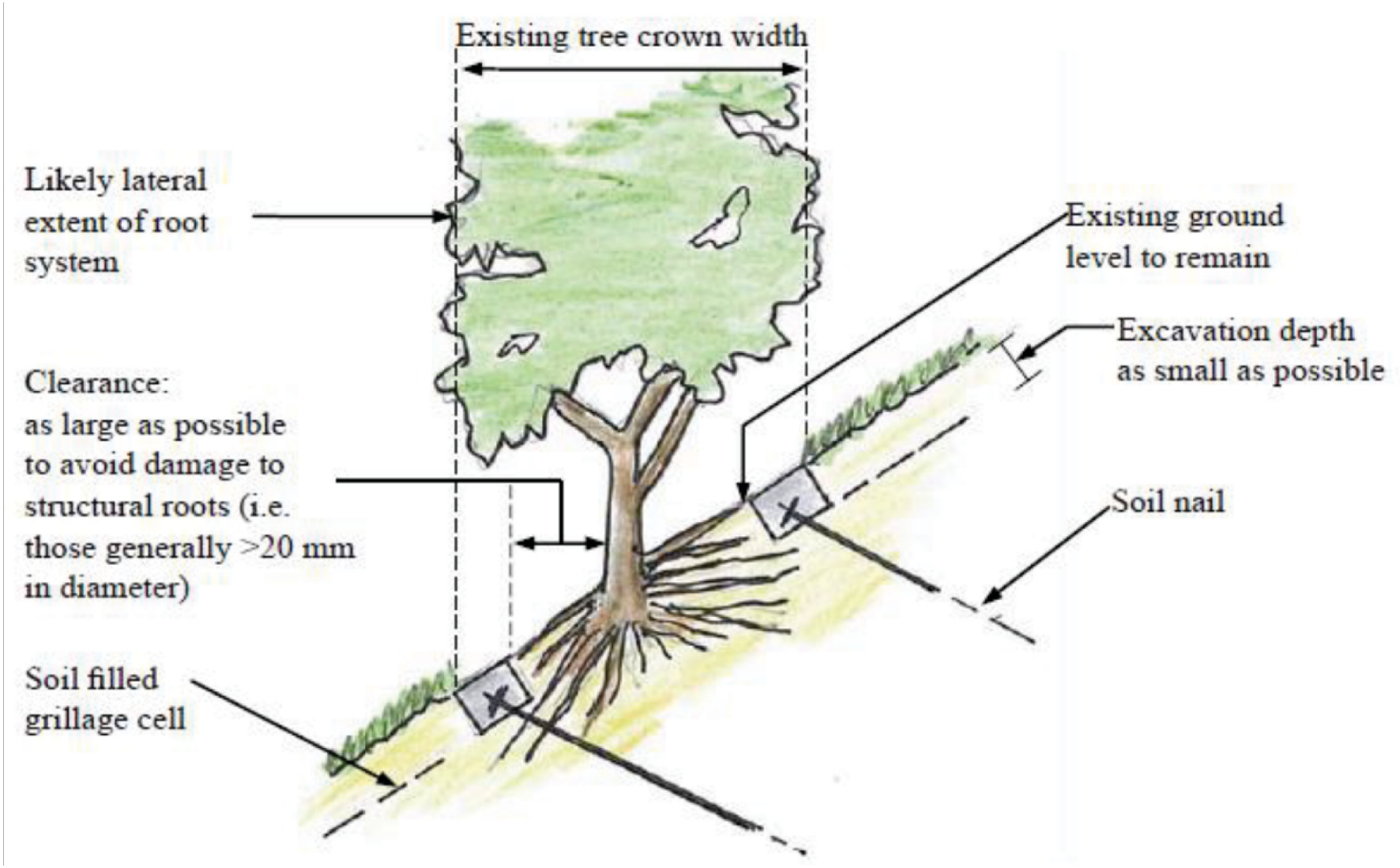
Figure No. Plate A1-2





Installation of Flexible Barrier

Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Example of the Installation of a Flexible Barrier Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to Scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate A2



Installation of Soil Nail in Vicinity of Existing Tree Roots
(Extracted from GEO Publication No.1/2011)

Job Title AGREEMENT NO. CE30/2009 (GE) Landslip Prevention and Mitigation Programme 2009, Package D, Natural Terrain Hazard Mitigation Works, Hong Kong Island and Sai King - Investigation, Design and Construction	Drawing Title Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung Example of the Installation of Soil Nails Note: Topographic base map is 1:1,000 scale (2010), 2 m contour intervals; mapsheets SHEET NUMBER.	FUGRO (HONG KONG) LTD Scale: Not to Scale Drawn by: Date: JUL 2013 Checked: Approved: Job No. 090871 Figure No. Plate A3

Appendix B

Tentative Construction Programme of Proposed Hazard Mitigation Works at Study Area 12SW-A/SA1, Tai Wan Tau Road, Sai Kung

Tentative Construction Programme of Proposed Hazard Mitigation Works at Study Area 12SW-A/SA1, Tai Wan Tai Road, Sai Kung

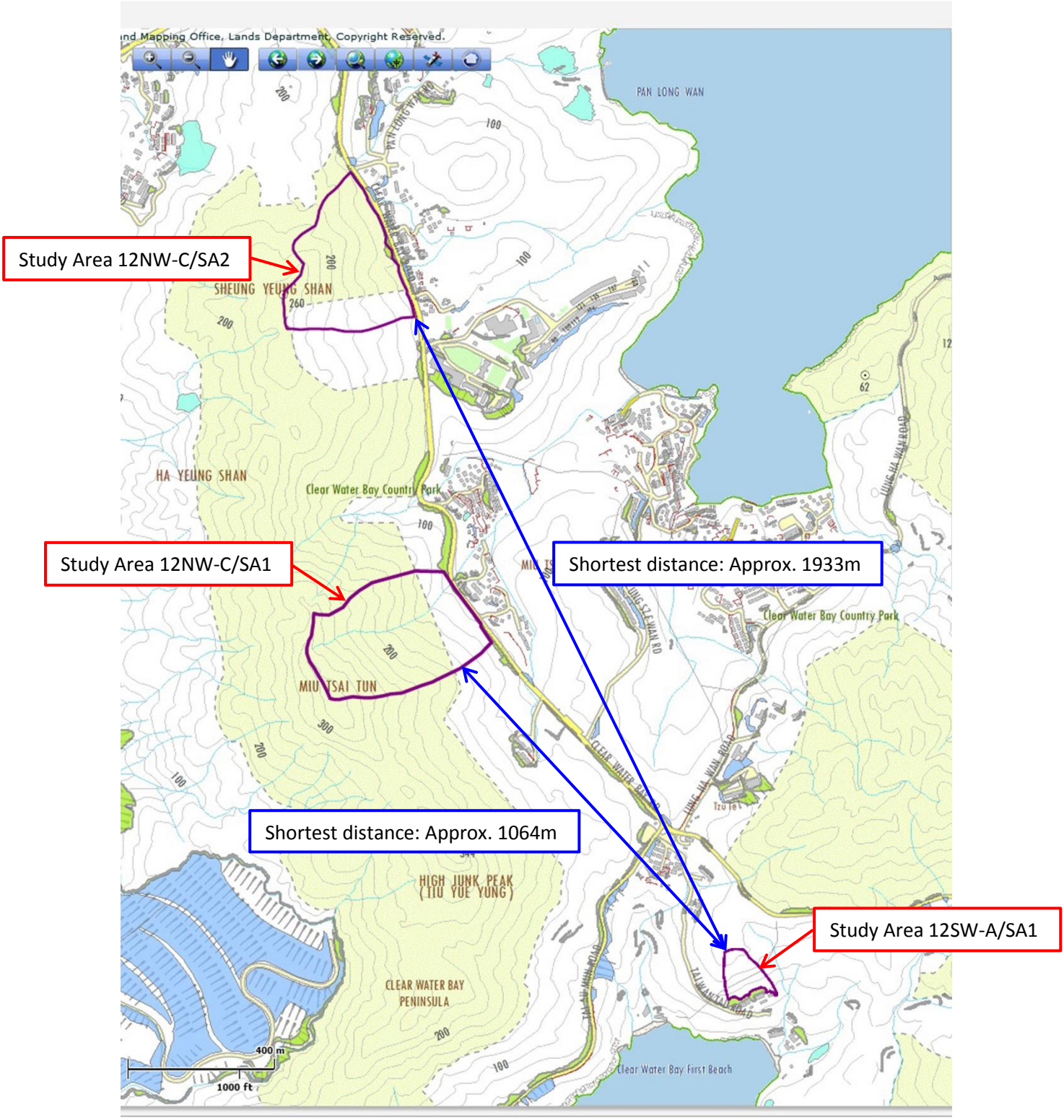
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26
1	Site Establishment																										
2	Installation of soil nails at toe of natural terrain																										
3	Construction of flexible barriers and masonry maintenance staircase																										
4	Landscaping Works																										

Appendix C

Locations of the Study Area 12SW-A/SA1 and Other Concurrent Natural Terrain Hazard Mitigation Works in the Vicinity

Appendix C

Locations of the Study Area 12SW-A/SA1 and Other Concurrent Natural Terrain Hazard Mitigation Works in the Vicinity



Source:
Hong Kong Slope Safety: http://hkss.cedd.gov.hk/hkss/eng/sis_map.aspx?hlc_s_id=12NW-C/SA1

Appendix D

Ecological Survey Data

Table D.1 Plant Species Recorded within the Works Area

Scientific Name	Chinese Common Name	Growth Form	Status and Distribution in HK^	Works Area#
				Native Secondary Woodland
Acronychia pedunculata	山油柑	Tree	Very common	*
Adiantum flabellulatum	扇葉鐵線蕨	Herb	Very common	*
Alangium chinense	八角楓	Tree	Common	**
Alocasia macrorrhizos	海芋	Herb	Very common	**
Alyxia sinensis	念珠藤	Woody climber	Common	*
Antidesma bunius	五月茶	Tree	Common	*
Aporusa dioica	銀柴	Tree	Very common	****
Aquilaria sinensis	土沉香	Tree	Common, Protected under Cap. 586, listed as Near Threatened (NT) in the China Plant Red Data Book and is under State protection (Category II) in China (AFCD 2003), classified as Vulnerable (VU) on the IUCN Red List	*
Archidendron lucidum	亮葉猴耳環	Tree	Common	*
Ardisia crenata	大羅傘	Shrub	Common	**
Ardisia lindleyana	山血丹	Shrub	Common	*
Bambosa sp.	竹屬	Bamboo	Common	*
Blechnum orientale	烏毛蕨	Herb	Very common	*
Bridelia tomentosa	土蜜樹	Tree	Very common	*
Byttneria aspera	刺果藤	Woody climber	Very common	**
Callicarpa kochiana	枇杷葉紫珠	Shrub	Common	*
Castanopsis fissa	黧蒴錐	Tree	Common	**

Scientific Name	Chinese Common Name	Growth Form	Status and Distribution in HK^	Works Area#
				Native Secondary Woodland
Celtis sinensis	朴樹	Tree	Very common	*
Cinnamomum camphora	樟	Tree	Common	**
Dalbergia benthamii	兩廣黃檀	Woody climber	Common	*
Desmos chinensis	假鷹爪	Woody climber	Common	*
Dicranopteris pedata	芒萁	Herb	Very common	**
Digitaria ciliaris	升馬唐	Herb	Very common	*
Dioscorea bulbifera	黃獨	Climber	Common	*
Diospyros vaccinioides	小果柿	Shrub	Very common, regarded as "Critically Endangered" according to IUCN Red List	*
Embelia laeta	酸藤子	Woody climber	Very common	*
Embelia ribes	白花酸藤子	Woody climber	Common	*
Epipremnum aureum	綠蘿	Climber	Exotic, Common	*
Eurya nitida	細齒葉柃	Shrub	Very common	*
Ficus hispida	對葉榕	Tree	Very common	*
Ficus variegata var. *chlorocarpa*	青果榕	Tree	Common	*
Ficus variolosa	變葉榕	Shrub or tree	Very common	*
Gardenia jasminoides	梔子	Shrub	Common	**

Scientific Name	Chinese Common Name	Growth Form	Status and Distribution in HK^	Works Area#
				Native Secondary Woodland
Glochidion eriocarpum	毛果算盤子	Shrub	Very common	*
Glochidion lanceolarium	艾膠/大葉算盤子	Shrub	Common	*
Glochidion wrightii	白背算盤子	Tree	Very common	*
Gnetum luofuense	羅浮買麻藤	Climber	Very common, regarded as "Near Threatened" according to IUCN Red list	* (close to the lower section but outside of the Works Area)
Hedyotis acutangula	方骨草	Herb	Very common	*
Hedyotis verticillata	粗葉耳草	Herb	Common	*
Ilex asprella	梅葉冬青	Shrub	Very common	*
Ilex pubescens	毛冬青	Shrub	Very common	*
Lantana camara	馬纓丹	Shrub	Exotic, Very common	*
Lindsaea heterophylla	異葉鱗始蕨	Herb	Very common	*
Lindsaea orbiculata	團葉鱗始蕨	Herb	Very common	*
Liriope spicata	山麥冬 , 麥門冬	Herb	Very common	*
Lithocarpus glaber	柯，石櫟	Tree	Common	**
Litsea rotundifolia var. *oblongifolia*	豺皮樟	Tree	Very common	***
Lophatherum gracile	淡竹葉	Herb	Very common	*
Lygodium japonicum	海金沙	Climber	Very common	*
Macaranga tanarius var. *tomentosa*	血桐	Tree	Common	*
Machilus chekiangensis	浙江潤楠	Tree	Very common	**
Maesa perlarius	鯽魚膽	Shrub	Common	**

Scientific Name	Chinese Common Name	Growth Form	Status and Distribution in HK^	Works Area#
				Native Secondary Woodland
Mallotus paniculatus	白楸	Tree	Very common	**
Melastoma sanguineum	毛蒲	Shrub	Common	*
Melodinus suaveolens	山橙	Woody climber	Common	**
Microstegium ciliatum	剛莠竹	Herb	Very common	**
Millettia championii	綠花雞血藤	Woody climber	Restricted	*
Millettia dielsiana	山雞血藤	Woody climber	Very common	*
Miscanthus sinensis	芒	Herb	Very common	*
Mucuna birdwoodiana	白花油麻藤，勃氏黧豆	Herb	Very common	**
Mussaenda pubescens	玉葉金花	Woody climber	Common	*
Ormosia pachycarpa	茸莢紅豆	Tree	Restricted, listed as Endangered (EN) in China (AFCD 2003)	**
Pavetta hongkongensis	香港大沙葉	Shrub or small tree	Common, Protected under Cap. 96A	* (close to the lower section but outside of the Works Area)
Pittosporum glabratum	光葉海桐，崖花子	Shrub	Very common	*
Praxelis clematidea	假臭草	Herb	Exotic, Very common	*
Psychotria asiatica	九節	Shrub	Very common	***

Scientific Name	Chinese Common Name	Growth Form	Status and Distribution in HK^	Works Area#
				Native Secondary Woodland
Psychotria serpens	蔓九節	Climber	Very common	*
Pteris semipinnata	半邊旗	Herb	Very common	*
Pteris vittata	蜈蚣草	Herb	Very common	*
Rhaphiolepis indica	車輪梅	Shrub or small tree	Very common	*
Rhodomyrtus tomentosa	桃金娘	Shrub	Very common	*
Rhus hypoleuca	白背鹽膚木	Tree	Common	***
Rhus succedanea	野漆樹	Tree	Common	*
Sapium discolor	山烏桕	Tree	Very common	*
Sarcandra glabra	草珊瑚	Subshrub	Common	*
Schefflera heptaphylla	鴨腳木	Tree	Very common	*
Scleria ciliaris	緣毛珍珠茅，華珍珠茅	Herb	Very common	*
Scolopia saeva	廣東刺柊	Tree	Common	*
Smilax glabra	土茯苓,光葉菝葜	Climbing shrub	Very common	*
Solanum americanum	少花龍葵	Herb	Exotic, Very common	*
Solena amplexicaulis	茅瓜，土白蘞	Herbaceous climber	Very common	*
Sterculia lanceolata	假蘋婆	Tree	Very common	*

Scientific Name	Chinese Common Name	Growth Form	Status and Distribution in HK^	Works Area#
				Native Secondary Woodland
Syzygium buxifolium	赤楠	Shrub	Common	*
Syzygium hancei	韓氏蒲桃，紅鱗蒲桃	Tree	Common	**
Syzygium jambos	蒲桃	Tree	Exotic, Common	*
Syzygium levinei	山蒲桃	Tree	Common	*
Tetracera asiatica	錫葉藤	Woody climber	Very common	**
Uvaria macrophylla	紫玉盤	Woody climber	Common	*
Zanthoxylum avicennae	簕欓花椒	Tree	Common	*
Zanthoxylum nitidum	兩面針	Climbing shrub	Very common	*

^ Status follows Xing *et al*. (2000)

Code for Relative Abundance: ****= Abundant, *** = Frequent, ** = Occasional, * = Scarce

Table D.2 Summary of Birds Recorded in the Works Area (WA) between February and May 2012.

Species	Scientific Name	Conservation status*	WA
Black Kite	*Milvus migrans*	(RC)	
Spotted Dove	*Spilopelia chinensis*	-	+
Large-billed Crow	*Corvus macrorhynchos*	-	
Cinereous Tit	*Parus cinereous*	-	+
Red-whiskered Bulbul	*Pycnonotus jocosus*	-	+
Chinese Bulbul	*Pycnonotus sinensis*	-	+
Chestnut Bulbul	*Hemixos castanonotus*	-	+
Barn Swallow	*Hirundo rustica*	-	
Pallas's Leaf Warbler	*Phylloscopus proregulus*	-	
Yellow-browed Warbler	*Phylloscopus inornatus*	-	+
Common Tailorbird	*Orthotomus sutorius*	-	+
Japanese White-eye	*Zosterops japonicus*	-	+
Blue Whistling thrush	*Myophonus caeruleus*	-	
Grey-backed Thrush	*Turdus hortulorum*	-	+
Oriental Magpie Robin	*Copsychus saularis*	-	+
Fork-tailed Sunbird	*Aethopyga christinae*	-	+
White Wagtail	*Motacilla alba*	-	
Olive-backed Pipit	*Anthus hodgsoni*	-	+
		No. of species recorded	**12**

*Conservation status follows that of Fellowes *et al*. (2002) and BirdLife International listing (2012). RC = Regional Concern

Table D.3 Summary of Butterflies Recorded in the Works Area (WA) between February and May 2012.

Species	Scientific Name	Commonness*	WA
Contiguous Swift	*Polytremis lubricans*	C	+
Red Helen	*Papilio helenus*	VC	
Common Mormon	*Papilio polytes*	VC	
Chinese Peacock	*Papilio bianor*	C	
Paris Peacock	*Papilio paris*	VC	
Red-base Jezebel	*Delias pasithoe*	VC	+
Indian Cabbage White	*Pieris canidia*	VC	+
Lemon Emigrant	*Catopsilia pomona*	C	
Common Grass Yellow	*Eurema hecabe*	VC	+
Pale Grass Blue	*Zizeeria maha*	VC	
Dark Evening Brown	*Melanitis phedima*	UC	+
Large Faun	*Faunis eumeus*	C	+
Common Duffer	*Discophora sondaica*	UC	
Rustic	*Cupha erymanthis*	VC	+
Common Sailer	*Neptis hylas*	VC	+
Colour Sergeant	*Athyma nefte*	C	
Common Mapwing	*Cyrestis thyodamas*	C	
Red-ring Skirt	*Hestina assimilis*	C	
Ceylon Blue Glassy Tiger	*Ideopsis similis*	VC	
		No. of species recorded	**8**

*Commonness follows that of Chan *et al*.(2011).VC= Very Common, C= Common, UC= Uncommon

Table D.4 List of Species of Conservation Importance Recorded within the Works Area

Tree Ref.	Species	Common English Name	Chinese Name	Origin	Remarks
AS-1	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-10	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-11	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-12	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-13	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-14	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-15	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-16	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-2	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-20	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-21	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-22	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-23	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-3	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-4	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-5	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-6	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-7	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AS-9	*Aquilaria sinensis* seedling	Incense tree	土沉香	Native	seedling individuals
AT-2	*Aquilaria sinensis*	Incense tree	土沉香	Native	
AT-7	*Aquilaria sinensis*	Incense tree	土沉香	Native	
DV-1	*Diospyros vaccinioides*	Small Persimmon	小果柿	Native	
DV-2	*Diospyros vaccinioides*	Small Persimmon	小果柿	Native	
OS-1	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-10	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-11	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-12	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-12	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-13	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-14	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-15	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-16	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-17	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-18	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-19	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-2	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-21	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-22	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-23	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-24	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-25	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-26	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-27	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-28	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-29	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals
OS-3	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸荚紅豆	Native	seedling individuals

Tree Ref.	Species	Common English Name	Chinese Name	Origin	Remarks
OS-30	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-31	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-32	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-33	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-34	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-35	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-36	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-37	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-38	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-39	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-4	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-40	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-41	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-42	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-43	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-44	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-45	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-46	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-47	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-48	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-49	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-5	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-50	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-51	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-52	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-53	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-54	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-55	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-6	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-7	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-8	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OS-9	*Ormosia pachycarpa* seedling	Hairy-fruited Ormosia	茸莢紅豆	Native	seedling individuals
OT-1	*Ormosia pachycarpa*	Hairy-fruited Ormosia	茸莢紅豆	Native	
OT-2	*Ormosia pachycarpa*	Hairy-fruited Ormosia	茸莢紅豆	Native	
OT-3	*Ormosia pachycarpa*	Hairy-fruited Ormosia	茸莢紅豆	Native	
OT-4	*Ormosia pachycarpa*	Hairy-fruited Ormosia	茸莢紅豆	Native	
OT-5	*Ormosia pachycarpa*	Hairy-fruited Ormosia	茸莢紅豆	Native	

Appendix E

Construction Noise Assessment

Unmitigated Scenario

Study Area E - Tai Wan Tau Road, Sai Kung

Works Area A

PME	ID code	SWL, dB(A)	No. of PME	Total SWL, dB(A)	% of time	% on time correction, dB(A)	Screening, dB(A)	Corrected SWL, dB(A)	Corrected SWL, dB(A)	Corrected SWL, dB(A)
1. Site Establishment										
Breaker, Hand-held, mass>10kg and <20kg	CNP 024	108	2	111	80.0%	-1.0	-	110	-	-
							Total	110	-	-
2. Installation of soil nails at toe of natural terrain-Drilling										
Drill rig, rotary type (diesel)	See Note 1	110	1	110	85.0%	-0.7	-	109	-	-
							Total	109	-	-
3. Construction of flexible barriers and masonry maintenance staircase										
Breaker, Hand-held, mass>10kg and <20kg	CNP 024	108	2	111	80.0%	-1.0	-	110	-	-
Drill rig, rotary type (diesel)	See Note 1	110	1	110	85.0%	-0.7	-	109	-	-
							Total	113	-	-
4. Landscaping Works										
-	-	-	-	-	-	-	-	-	-	-
							Total	-	-	-

Study Area E - Tai Wan Tau Road, Sai Kung

Works Area B

PME	ID code	SWL, dB(A)	No. of PME	Total SWL, dB(A)	% of time	% on time correction, dB(A)	Screening, dB(A)	Corrected SWL, dB(A)	Corrected SWL, dB(A)	Corrected SWL, dB(A)
1. Site Establishment										
Concrete Mixer	CNP 046	96	1	96	100.0%	0.0	-	96	-	-
Generator, super silenced, 70dB(A) at 7m	CNP 103	95	1	95	100.0%	0.0	-	95	-	-
							Total	99	-	-
2. Installation of soil nails at toe of natural terrain										
Generator, super silenced, 70dB(A) at 7m	CNP 103	95	1	95	100.0%	0.0	-	95	-	-
Grout mixer	See Note 1	90	1	90	100.0%	0.0	-	-	90	-
Grout pump	See Note 1	105	1	105	100.0%	0.0	-	-	105	-
Agitator	See Note 1	90	1	90	100.0%	0.0	-	-	90	-
Concrete Mixer	CNP 046	96	1	96	100.0%	0.0	-	-	-	96
Shotcrete Pump	See Note 1	109	1	109	100.0%	0.0	-	-	-	109
							Total	95	105	109
3. Construction of flexible barriers and masonry maintenance staircase										
Generator, super silenced, 70dB(A) at 7m	CNP 103	95	1	95	100.0%	0.0	-	95	-	-
							Total	95	-	-
4. Landscaping Works										
Generator, super silenced, 70dB(A) at 7m	CNP 103	95	1	95	100.0%	0.0	-	95	-	-
							Total	95	-	-

Works Area C

PME	ID code	SWL, dB(A)	No. of PME	Total SWL, dB(A)	% of time	% on time correction, dB(A)	Screening, dB(A)	Corrected SWL, dB(A)	Corrected SWL, dB(A)	Corrected SWL, dB(A)
1. Site Establishment										
Dump Truck, with grab, 5.5 tonne<gross vehicle weight < 38 tonnes	See Note 1	105	1	105	60.0%	-2.2	-	103	-	-
							Total	103	-	-
2. Installation of soil nails at toe of natural terrain										
Dump Truck, with grab, 5.5 tonne<gross vehicle weight < 38 tonnes	See Note 1	105	1	105	60.0%	-2.2	-	103	-	-
Lorry, with crane, 5.5 tonnes < gross vehicle weight < 38 tonnes	See Note 1	105	1	105	60.0%	-2.2	-	-	103	103
Air Compressor, Air Flow <10m^3/min	CNP 001	100	2	103	100.0%	0.0	-	103	103	103
							Total	106	106	106
3. Construction of flexible barriers and masonry maintenance staircase										
Lorry, with crane, 5.5 tonnes < gross vehicle weight < 38 tonnes	See Note 1	105	1	105	60.0%	-2.2	-	103	103	103
							Total	103	103	103
4. Landscaping Works										
Lorry, with crane, 5.5 tonnes < gross vehicle weight < 38 tonnes	See Note 1	105	1	105	60.0%	-2.2	-	103	-	-
							Total	103	-	-

Note
1. The Sound Power Levels (SWLs) of the PMEs presented are based on the Technical Memorandum on Noise from Construction Work Other Than Percussive Piling (TM-GW), except for those marked "See Note 1", which are based on the EPD's guidance "Sound power levels of other commonly used PME" available at http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf.
2. Movable noise barrier is the proposed mitigation measure for lorries and dump trucks with noise reduction of -5dB.
3. Movable noise barrier is the proposed mitigation measures for handheld breakers, drill rig and rock drill. A screening effect of -10dB(A) is therefore assumed.
4. Full-enclosed noise barrier is the proposed mitigation measure for grouting machine (mixer, pump, agitator), concrete mixer, shotcrete pump, generator and air compressor with noise reduction of -15dB.

Predicted Construction Noise Level (Unmitigated Scenario)

Daytime Noise Criterion 75 dB(A)

Study Area E - Tai Wan Tau Road, Sai Kung
N1a Tai Wan Tau Village House No 40

Works Area A

Act No	Construction Element	SWL	Dist (m)	Façade Corr., dB(A)	Dist. Corr., dB(A)	SPL	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26
1	Site Establishment	110	14.7	3.0	-31.3	82	82	82	82	82																						
2	Installation of soil nails at toe of natural terrain-Drilling	109	14.7	3.0	-31.3	81			81	81	81	81	81	81	81	81	81	81	81	81												
3	Installation of soil nails at toe of natural terrain-Grouting	-	-	-	-	-																										
4	Installation of soil nails at toe of natural terrain-Shortcreting	-	-	-	-	-																										
5	Construction of flexible barriers and masonry maintenance staircase	113	14.7	3.0	-31.3	84															84	84	84	84	84	84	84	84	84	84	84	84
6	Landscaping Works	-	-	-	-	-																										
	Total SPL, dB(A)						**82**	**82**	**84**	**84**	**81**	**81**	**81**	**81**	**81**	**81**	**81**	**81**	**81**	**81**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**	**84**
	Total SPL, dB(A)						**76**																									
	Mln						**81**																									
	Max						**84**																									

N1b Tai Wan Tau Village House No 40

Works Area B

Act No	Construction Element	SWL	Dist (m)	Façade Corr., dB(A)	Dist. Corr., dB(A)	SPL	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26
1	Site Establishment	99	8.6	3.0	-26.7	75	75	75	75	75																						
2	Installation of soil nails at toe of natural terrain-Drilling	95	8.6	3.0	-26.7	71			71	71	71	71	71	71	71	71	71	71	71	71												
3	Installation of soil nails at toe of natural terrain-Grouting	105	8.6	3.0	-26.7	82				82	82	82	82	82	82	82	82	82	82	82												
4	Installation of soil nails at toe of natural terrain-Shortcreting	109	8.6	3.0	-26.7	86															86	86	86	86	86	86	86					
5	Construction of flexible barriers and masonry maintenance staircase	95	8.6	3.0	-26.7	71															71	71	71	71	71	71	71	71	71	71	71	71
6	Landscaping Works	95	8.6	3.0	-26.7	71																							71	71	71	71
	Total SPL, dB(A)						75	75	**76**	**83**	**82**	**82**	**82**	**82**	**82**	**82**	**82**	**82**	**82**	**82**	**86**	**86**	**86**	**86**	**86**	**86**	**86**	71	74	74	74	74
	Total SPL, dB(A)						75																									
	Mln						71																									
	Max						**86**																									

N2 Tai Wan Tau Village House No 45

Works Area B							M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26
Act No	Construction Element	SWL	Dist (m)	Façade Corr., dB(A)	Dist. Corr., dB(A)	SPL																										
1	Site Establishment	99	31.0	3.0	-37.8	64	64	64	64	64																						
2	Installation of soil nails at toe of natural terrain-Drilling	95	31.0	3.0	-37.8	60			60	60	60	60	60	60	60	60	60	60	60	60												
3	Installation of soil nails at toe of natural terrain-Grouting	105	31.0	3.0	-37.8	71				71	71	71	71	71	71	71	71	71	71	71												
4	Installation of soil nails at toe of natural terrain-Shortcreting	109	31.0	3.0	-37.8	74															74	74	74	74	74	74	74					
5	Construction of flexible barriers and masonry maintenance staircase	95	31.0	3.0	-37.8	60															60	60	60	60	60	60	60	60	60	60	60	60
6	Landscaping Works	95	31.0	3.0	-37.8	60																							60	60	60	60
Works Area C																																
Act No	Construction Element	SWL	Dist (m)	Façade Corr., dB(A)	Dist. Corr., dB(A)	SPL																										
1	Site Establishment	103	15.3	3.0	-31.7	74	74	74	74	74																						
2	Installation of soil nails at toe of natural terrain-Drilling	103	15.3	3.0	-31.7	74			74	74	74	74	74	74	74	74	74	74	74	74												
3	Installation of soil nails at toe of natural terrain-Grouting	106	15.3	3.0	-31.7	77				77	77	77	77	77	77	77	77	77	77	77												
4	Installation of soil nails at toe of natural terrain-Shortcreting	106	15.3	3.0	-31.7	77															77	77	77	77	77	77	77					
5	Construction of flexible barriers and masonry maintenance staircase	103	15.3	3.0	-31.7	74															74	74	74	74	74	74	74	74	74	74	74	74
6	Landscaping Works	103	15.3	3.0	-31.7	74																							74	74	74	74
					Total SPL, dB(A)		74	74	**77**	**81**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	74	**77**	**77**	**77**	**77**
					Total SPL, dB(A)		71																									
					Mln		74																									
					Max		**81**																									

Note
Bold indicates the predicted sound pressure level at NSR exceeds the daytime noise criterion, 75dB(A).
Distance is the distance betw een notional source position and NSR.

Mitigated Scenario

Study Area E - Tai Wan Tau Road, Sai Kung										
Works Area A										
PME	**ID code**	**SWL, dB(A)**	**No. of PME**	**Total SWL, dB(A)**	**% of time**	**% on time correction, dB(A)**	**Screening, dB(A)**	**Corrected SWL, dB(A)**	**Corrected SWL, dB(A)**	**Corrected SWL, dB(A)**
1. Site Establishment										
Breaker, Hand-held, mass>10kg and <20kg	CNP 024	108	2	111	80.0%	-1.0	-10.0	100	-	-
							Total	100	-	-
2. Installation of soil nails at toe of natural terrain-Drilling										
Drill rig, rotary type (diesel)	See Note 1	110	1	110	85.0%	-0.7	-10.0	99	-	-
							Total	99	-	-
3. Construction of flexible barriers and masonry maintenance staircase										
Breaker, Hand-held, mass>10kg and <20kg	CNP 024	108	2	111	80.0%	-1.0	-10.0	100	-	-
Drill rig, rotary type (diesel)	See Note 1	110	1	110	85.0%	-0.7	-10.0	99	-	-
							Total	103	-	-
4. Landscaping Works										
-	-	-	-	-	-	-	-	-	-	-
							Total	-	-	-

Study Area E - Tai Wan Tau Road, Sai Kung										
Works Area B										
PME	**ID code**	**SWL, dB(A)**	**No. of PME**	**Total SWL, dB(A)**	**% of time**	**% on time correction, dB(A)**	**Screening, dB(A)**	**Corrected SWL, dB(A)**	**Corrected SWL, dB(A)**	**Corrected SWL, dB(A)**
1. Site Establishment										
Concrete Mixer	CNP 046	96	1	96	100.0%	0.0	-15.0	81	-	-
Generator, super silenced, 70dB(A) at 7m	CNP 103	95	1	95	100.0%	0.0	-15.0	80	-	-
							Total	84	-	-
2. Installation of soil nails at toe of natural terrain										
Generator, super silenced, 70dB(A) at 7m	CNP 103	95	1	95	100.0%	0.0	-15.0	80	-	-
Grout mixer	See Note 1	90	1	90	100.0%	0.0	-15.0	-	75	-
Grout pump	See Note 1	105	1	105	100.0%	0.0	-15.0	-	90	-
Agitator	See Note 1	90	1	90	100.0%	0.0	-15.0	-	75	-
Concrete Mixer	CNP 046	96	1	96	100.0%	0.0	-15.0	-	-	81
Shotcrete Pump	See Note 1	109	1	109	100.0%	0.0	-15.0	-	-	94
							Total	80	90	94
3. Construction of flexible barriers and masonry maintenance staircase										
Generator, super silenced, 70dB(A) at 7m	CNP 103	95	1	95	100.0%	0.0	-15.0	80	-	-
							Total	80	-	-
4. Landscaping Works										
Generator, super silenced, 70dB(A) at 7m	CNP 103	95	1	95	100.0%	0.0	-15.0	80	-	-
							Total	80	-	-

Works Area C										
PME	**ID code**	**SWL, dB(A)**	**No. of PME**	**Total SWL, dB(A)**	**% of time**	**% on time correction, dB(A)**	**Screening, dB(A)**	**Corrected SWL, dB(A)**	**Corrected SWL, dB(A)**	**Corrected SWL, dB(A)**
1. Site Establishment										
Dump Truck, with grab, 5.5 tonne<gross vehicle weight < 38 tonnes	See Note 1	105	1	105	60.0%	-2.2	-5.0	98	-	-
							Total	98	-	-
2. Installation of soil nails at toe of natural terrain										
Dump Truck, with grab, 5.5 tonne<gross vehicle weight < 38 tonnes	See Note 1	105	1	105	60.0%	-2.2	-5.0	98	-	-
Lorry, with crane, 5.5 tonnes < gross vehicle weight < 38 tonnes	See Note 1	105	1	105	60.0%	-2.2	-5.0	-	98	98
Air Compressor, Air Flow <10m^3/min	CNP 001	100	2	103	100.0%	0.0	-15.0	88	88	88
							Total	98	98	98
3. Construction of flexible barriers and masonry maintenance staircase										
Lorry, with crane, 5.5 tonnes < gross vehicle weight < 38 tonnes	See Note 1	105	1	105	60.0%	-2.2	-5.0	98	98	98
							Total	98	98	98
4. Landscaping Works										
Lorry, with crane, 5.5 tonnes < gross vehicle weight < 38 tonnes	See Note 1	105	1	105	60.0%	-2.2	-5.0	98	-	-
							Total	98	-	-

Note
1. The Sound Power Levels (SWLs) of the PMEs presented are based on the Technical Memorandum on Noise from Construction Work Other Than Percussive Piling (TM-GW), except for those marked "See Note 1", which are based on the EPD's guidance "Sound power levels of other commonly used PME" available at http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf.
2. Movable noise barrier is the proposed mitigation measure for lorries and dump trucks with noise reduction of -5dB.
3. Movable noise barrier is the proposed mitigation measures for handheld breakers, drill rig and rock drill. A screening effect of -10dB(A) is therefore assumed.
4. Full-enclosed noise barrier is the proposed mitigation measure for grouting machine (mixer, pump, agitator), concrete mixer, shotcrete pump, generator and air compressor with noise reduction of -15dB.

Daytime Noise Criterion 75 dB(A)

Study Area E - Tai Wan Tau Road, Sai Kung

N1a Tai Wan Tau Village House No. 40

Works Area A

Act No	Construction Element	SWL	Dist (m)	Façade Corr., dB(A)	Dist. Corr., dB(A)	SPL	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26
1	Site Establishment	100	14.7	3.0	-31.3	72	72	72	72	72																						
2	Installation of soil nails at toe of natural terrain-Drilling	99	14.7	3.0	-31.3	71			71	71	71	71	71	71	71	71	71	71	71	71												
3	Installation of soil nails at toe of natural terrain-Grouting	-	-	-	-	-																										
4	Installation of soil nails at toe of natural terrain-Shortcreting	-	-	-	-	-																										
5	Construction of flexible barriers and masonry maintenance staircase	103	14.7	3.0	-31.3	74															74	74	74	74	74	74	74	74	74	74	74	74
6	Landscaping Works	-	-	-	-	-																										
					Total SPL, dB(A)		72	72	74	74	71	71	71	71	71	71	71	71	71	71	74	74	74	74	74	74	74	74	74	74	74	74

Total SPL, dB(A)	65
Mln	71
Max	74

N1b Tai Wan Tau Village House No. 40

Works Area B

Act No	Construction Element	SWL	Dist (m)	Façade Corr., dB(A)	Dist. Corr., dB(A)	SPL	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26
1	Site Establishment	84	8.6	3.0	-26.7	60	60	60	60	60																						
2	Installation of soil nails at toe of natural terrain-Drilling	80	8.6	3.0	-26.7	56			56	56	56	56	56	56	56	56	56	56	56	56												
3	Installation of soil nails at toe of natural terrain-Grouting	90	8.6	3.0	-26.7	67				67	67	67	67	67	67	67	67	67	67	67												
4	Installation of soil nails at toe of natural terrain-Shortcreting	94	8.6	3.0	-26.7	71															71	71	71	71	71	71	71					
5	Construction of flexible barriers and masonry maintenance staircase	80	8.6	3.0	-26.7	56															56	56	56	56	56	56	56	56	56	56	56	56
6	Landscaping Works	80	8.6	3.0	-26.7	56																							56	56	56	56
					Total SPL, dB(A)		60	60	61	68	67	67	67	67	67	67	67	67	67	67	71	71	71	71	71	71	71	56	59	59	59	59

Total SPL, dB(A)	60
Mln	56
Max	71

N2 Tai Wan Tau Village House No. 45

Works Area B							M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26
Act No	Construction Element	SWL	Dist (m)	Façade Corr., dB(A)	Dist. Corr., dB(A)	SPL																										
1	Site Establishment	84	31.0	3.0	-37.8	49	49	49	49	49																						
2	Installation of soil nails at toe of natural terrain-Drilling	80	31.0	3.0	-37.8	45			45	45	45	45	45	45	45	45	45	45	45	45												
3	Installation of soil nails at toe of natural terrain-Grouting	90	31.0	3.0	-37.8	56				56	56	56	56	56	56	56	56	56	56	56												
4	Installation of soil nails at toe of natural terrain-Shortcreting	94	31.0	3.0	-37.8	59															59	59	59	59	59	59	59					
5	Construction of flexible barriers and masonry maintenance staircase	80	31.0	3.0	-37.8	45															45	45	45	45	45	45	45	45	45	45	45	45
6	Landscaping Works	80	31.0	3.0	-37.8	45																							45	45	45	45
Works Area C																																
Act No	Construction Element	SWL	Dist (m)	Façade Corr., dB(A)	Dist. Corr., dB(A)	SPL																										
1	Site Establishment	98	15.3	3.0	-31.7	69	69	69	69	69																						
2	Installation of soil nails at toe of natural terrain-Drilling	98	15.3	3.0	-31.7	69			69	69	69	69	69	69	69	69	69	69	69	69												
3	Installation of soil nails at toe of natural terrain-Grouting	98	15.3	3.0	-31.7	70				70	70	70	70	70	70	70	70	70	70	70												
4	Installation of soil nails at toe of natural terrain-Shortcreting	98	15.3	3.0	-31.7	70															70	70	70	70	70	70	70					
5	Construction of flexible barriers and masonry maintenance staircase	98	15.3	3.0	-31.7	69															69	69	69	69	69	69	69	69	69	69	69	69
6	Landscaping Works	98	15.3	3.0	-31.7	69																										
					Total SPL, dB(A)		69	69	72	74	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	69	69	69	69	69
					Total SPL, dB(A)		64																									
					Min		69																									
					Max		74																									

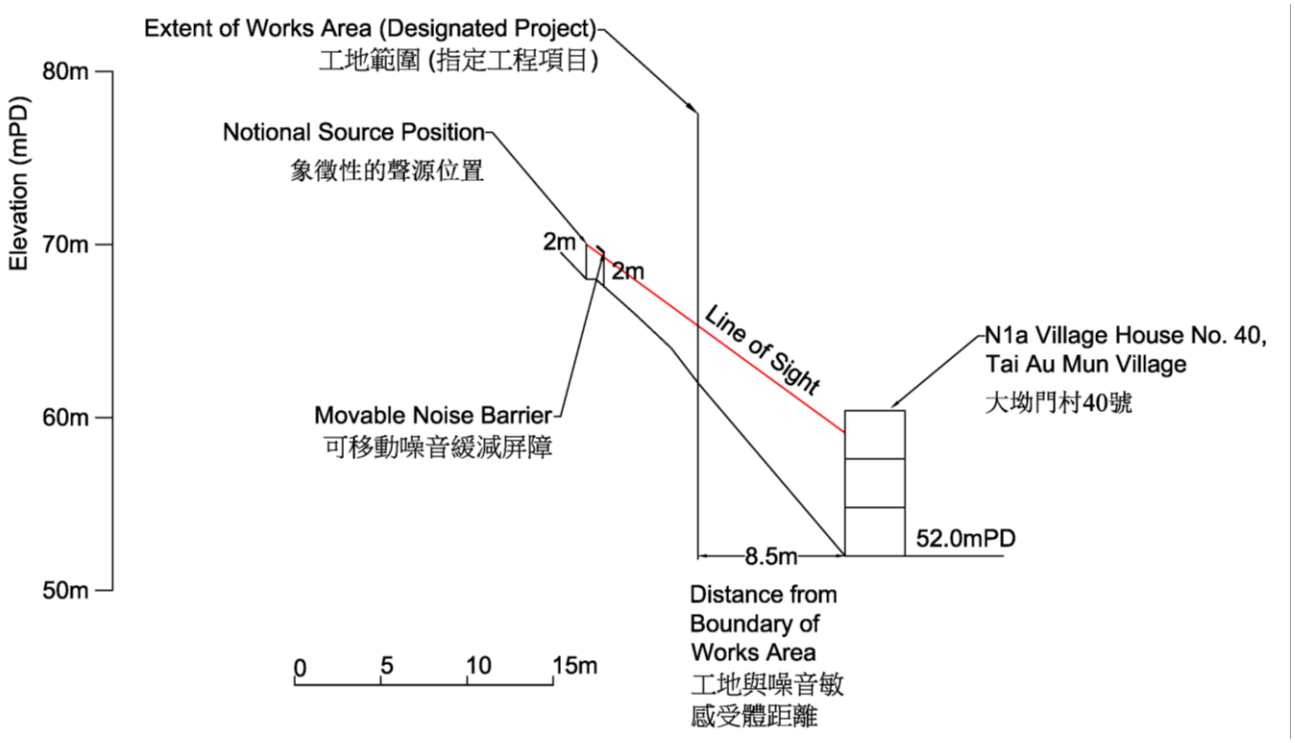
Note
Bold indicates the predicted sound pressure level at NSR exceeds the daytime noise criterion, 75dB(A).
Distance is the distance betw een notional source position and NSR.

Appendix F

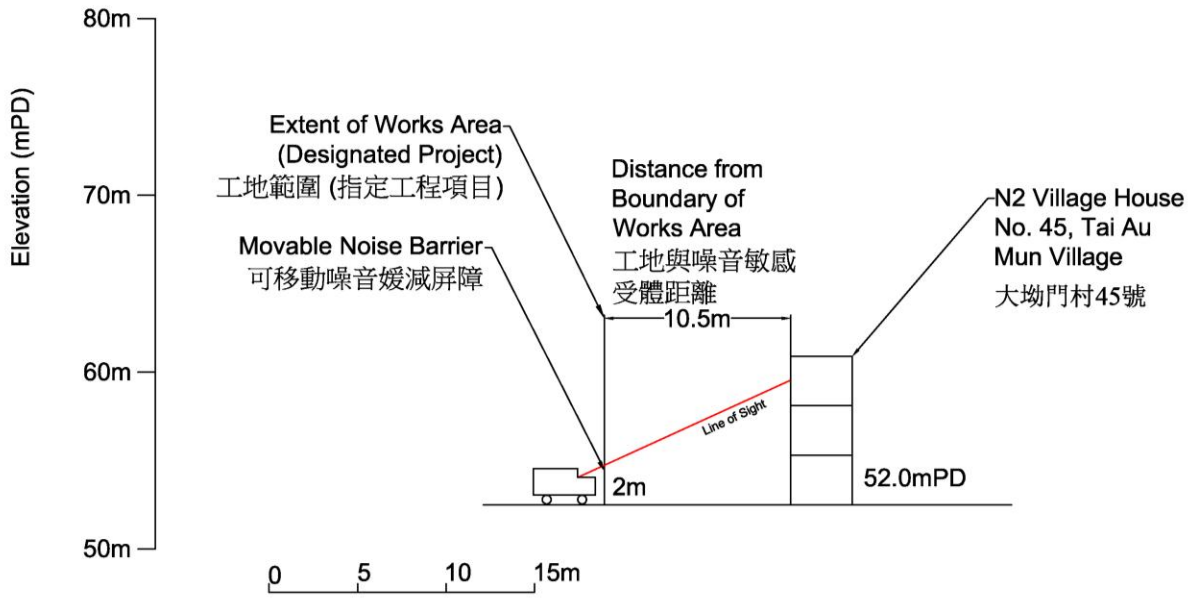
Proposed Noise Barrier and Enclosure

Cross Section of the Proposed Movable Noise Barrier for Area

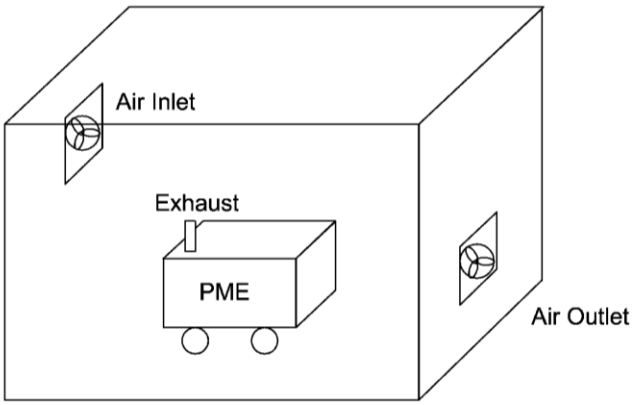
N1a- Tai Wan Tau Village House No. 40



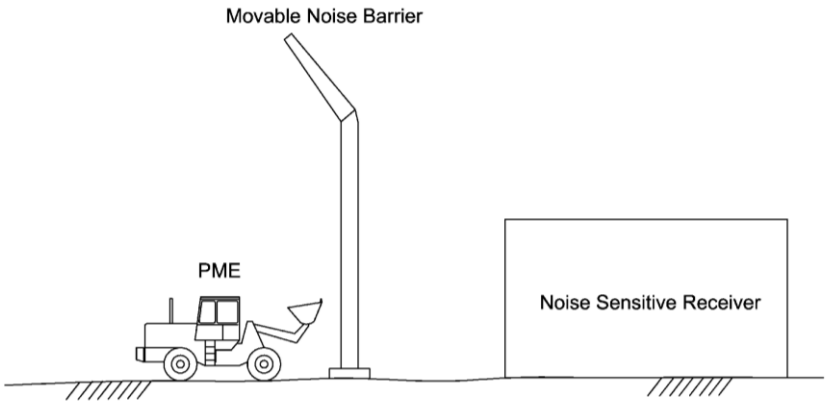
N2- Tai Wan Tau Village House No. 45



Proposed Noise Enclosure for PMEs

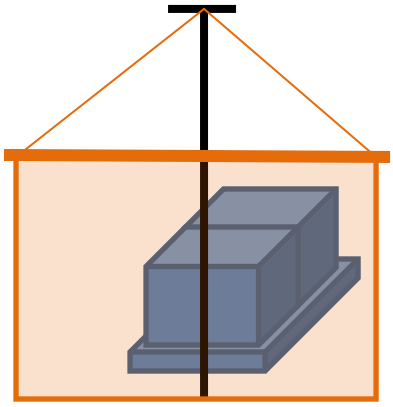


Proposed Movable Noise Barrier for PMEs



Proposed Noise Barrier for Drilling Rig

Front View



Side View