

3 ECOLOGICAL IMPACT

3.1 Introduction

3.1.1 Purpose of this Chapter

This chapter aims at establishing terrestrial ecological baseline for the surrounding area along the powerline alignment and assessing the potential ecological impact from the Project. The objectives of the ecological impact assessment study are as follows:

- to identify the composition and distribution of existing ecological resources;
- to predict and evaluate potential ecological impacts associated with the construction of the powerline along the proposed route; and
- to recommend avoidance/mitigation measures to avoid/minimize adverse potential impacts from the Project.

3.1.2 Organisation of this Chapter

The remainder of this Chapter is structured as follows:

- *Section 3.2* provides a list of relevant international and local regulations, legislation and guidelines for ecological assessment;
- *Section 3.3* presents the methodology employed in the ecological assessment;
- *Section 3.4* presents the baseline condition of the terrestrial ecology;
- *Section 3.5* presents the impact assessment;
- *Section 3.6* provides the recommendations on mitigation measures; and
- *Section 3.7* presents the residual ecological impact.

3.2 Environmental Legislation and Criteria

A number of international and local regulations, legislation and guidelines provide the framework for the protection of species and habitats of ecological importance and those related to the Project are:

- *Country Parks Ordinance* (Cap 208);
- *Forests and Countryside Ordinance* (Cap 96);
- *Wild Animals Protection Ordinance* (Cap 170);

- *Town Planning Ordinance* (Cap 131);
- *Hong Kong Planning Standards and Guidelines Chapter 10* (HKPSG);
- *Technical Memorandum for the Environmental Impact Assessment Ordinance* (Cap. 499) (*EIAO TM*); and
- *United Nations Convention on Biodiversity* (1992).

The *Country Parks Ordinance* (Cap. 208) provides for the designation and management of country parks and special areas. Country parks are designated for the purpose of nature conservation, countryside recreation and outdoor education. Special Areas are created mainly for the purpose of nature conservation.

The *Forests and Countryside Ordinance* (Cap 96) prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on Government land. Related subsidiary Regulations prohibit the selling or possession of listed rare and protected plant species. The list of protected species in Hong Kong which comes under the Forestry Regulations was last amended on 11 June 1993 under the *Forestry (Amendment) Regulation 1993* made under *Section 3* of the *Forests and Countryside Ordinance*.

Under the *Wild Animals Protection Ordinance* (Cap 170), designated wild animals are protected from being hunted, whilst their nests and eggs are protected from injury, destruction and removal. All birds and most mammals are protected under this Ordinance. The Second Schedule of the Ordinance which lists all the animals protected was last revised in June 1992.

The recently amended *Town Planning Ordinance* (Cap 131) provides for the designation of coastal protection areas, Sites of Special Scientific Interest (SSSIs), Green Belt or other specified uses that promote conservation or protection of the environment, eg conservation areas. The authority responsible for administering the *Town Planning Ordinance* is the Town Planning Board.

Chapter 10 of the *HKPSG* covers planning considerations relevant to conservation. This chapter details the principles of conservation, the conservation of natural landscape and habitats, historic buildings, archaeological sites and other antiquities. It also addresses the issue of enforcement. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong and government departments involved in conservation.

Annex 16 of the *EIAO TM* (Cap 499) sets out the general approach and methodology for assessment of ecological impacts arising from a project or proposal, to allow a complete and objective identification, prediction and evaluation of the potential ecological impacts. *Annex 8* of the *EIAO TM* recommends the criteria that can be used for evaluating ecological impact.

The Peoples' Republic of China (PRC) are one of the Contracting Parties to the *United Nations Convention on Biological Diversity* of 1992. The Convention requires signatories to make active efforts to protect and manage their biodiversity resources. Hong Kong Government has stated that it will be 'committed to meeting the environmental objectives' of the Convention (PELB 1996).

3.3 Assessment Methodology

Field surveys were undertaken during the period July to November 1998 to establish the baseline ecological profile of the Project area. The surveys were undertaken by experienced ecologists, covering areas along the alignment corridor (referred to as the Study Area). Natural habitat types were identified with description of habitat characteristics including vegetation size, structure, naturalness and typicalness given. The floral community along the proposed powerline alignment was investigated, with plant species listed and rare/protected species highlighted. Information on other fauna encountered during the field surveys was also recorded. A stream survey was also undertaken to investigate streams which are in the proximity of the Study Area, with physical characteristics of the streams noted and stream fauna sampled. Habitat maps were produced, with distribution and location of rare or protected species shown. Permanent/temporary habitat loss due to this Project is estimated by calculating areas loss due to excavation of footings and temporary vegetation clearance during construction phase. The ecological conditions of the site and species recorded are evaluated based on the EIAO TM Annex 8 criteria.

Any potential impacts on existing terrestrial ecological resources are identified, quantified as far as possible and evaluated following the criteria stated in *EIAO TM Annex 8*. Practical and feasible mitigation measures to mitigate the impact with reference to flora and fauna community are recommended wherever applicable.

3.4 Baseline Conditions

3.4.1 Habitat/Vegetation

The proposed 132kV powerline will pass through relatively natural and undisturbed Conservation Areas of the Draft Outline Zoning Plans (OZP): Tseng Lan Shue OZP (No. S/SK-TLS/4), Ho Chung OZP (No. S/SK-HC/2), as well as Pak Kong and Sha Kok Mei OZP (No. S/SK-PK/3) in the southern section. A small section of the northern part of the powerline will be within the Ma On Shan Country Park. The habitat types within the Study Area included forest (including secondary forest and *feng-shui* wood behind villages), shrubland and tall shrubland, fire-maintained grassland, landscape plantation as well as open agricultural land which have been mostly altered into orchard, garden or abandoned wasteland. Habitat maps are presented in *Figure 3.1a-g*.

Description of each habitat type and their habitat characteristics are given below, and lists of plant species recorded in these habitats are given in *Annex A*.

Grassland

The hillside between pole A53 and A55 is covered by grassland (see *Figure 3.1f & 3.1k*). The floral community is dominated by *Cymbopogon goeringii*, *Dicranopteris linearis*, *Miscanthus sinensis* and *Arundinella nepalensis*, while shrubs that are common in shrubland habitat (e.g. *Adinandra millettii*, *Baeckea frutescens* and *Rhodomyrtus tomentosa*) were also found. This grassland habitat is therefore similar in species composition to shrubland but it tends to have more grassy species and lower structural complexity. The presence of *Dicranopteris linearis* as a dominant species suggested that the vegetation has suffered from frequent hill-fires. In terms of species composition, all species observed were common and wide-spread in Hong Kong. This habitat type is simple in structure and poor in floristic diversity.

Shrubland and Tall Shrubland

Shrubland is defined here as vegetation dominated by woody plant less than 1.5m tall, whereas tall shrubland is defined as similar vegetation with plant ranges from 2.0 to 5.0m tall. In terms of species composition, these two habitat types are very similar in the study area except grass and fern species which tend to be more dominant in shrubland. These two habitat types are the dominant vegetation within the Study Area. These shrublands (*Figure 3.1k*) occupy the hillsides from A5 to A10, A11 to A14, and A27 to A48 (see *Figure 3.1a, 3.1b, 3.1e, 3.1d & 3.1f*).

In terms of species composition, the shrublands in the Study Area are very typical Hong Kong shrublands, dominated by species such as *Rhodomyrtus tomentosa*, *Eurya nitida*, *Baeckea frutescens*, *Cratoxylum cochinchinense*, *Schefflera octophylla*. Although fruit bearing plants may provide food for birds and mammals, the simple structural complexity of these shrublands is considered to provide only limited habitats for wildlife. Shrublands are mostly maintained by hillfires in Hong Kong and if leave unburned will succeed to secondary forests. One individual of *Ailanthus fordii* which is rare and protected in Hong Kong under the Forestry Regulations of the *Forests and Countryside Ordinance*, was found between pole A34 and A35, and one individual of locally rare *Xylosma longifolium* was found between pole A30 and A31 (*Figure 3.1d*). However, these trees will not be affected by this Project.

Forest

Forest is dominated by woody plants with a minimum height of 5m. This habitat type can be further divided into secondary forest and *feng-shui* wood. However, distinction between the two is not always obvious, particularly for the continuous forest between pole A14 and pole A22, which is regarded as a *feng-shui* wood.

Secondary Forest

Secondary forest is referred to forest recently regenerated (since the last 30-50 years) from grassland or shrubland which are usually formed and maintained by disturbance such as hill

fires or firewood harvesting. Therefore, it usually has similar species composition as nearby tall shrubland, but possesses much fewer grassy species. Secondary forest is represented in the study area by isolated patches of forest between pole 27 and 52 (see *Figure 3.1d-3.1f & 3.1k*). Average height of the trees is approximately 5 - 8m, with *Schefflera octophylla*, *Cinnamomum camphora*, *Sterculia lanceolata*, *Persea chinensis* and *Acronychia pedunculata* being dominant. For the understorey layer, *Psychotria rubra* and *Sarcandra glabra* are the major components. The relatively low species richness of the understorey is probably due to the young age of the forest.

As a whole, the structural complexity of this forest type is relatively low owing to its young age and small height when compared with other well grown forest in Hong Kong. Secondary forest within the Study Area occurs in small semi-isolated patches or stripe which further reduce its value as wildlife habitat. Nevertheless, the presence of some fruit bearing species (e.g. *Acronychia pedunculata*, *Adinandra millettii*, *Choerospondias axillaris*, *Cinnamomum parthenoxylon*) may provide food source and the canopy may provide habitats for some birds. Species composition of these secondary forest patches are similar to typical secondary forest habitats elsewhere in Hong Kong. No rare or protected species were found in the secondary woodland patches during this study. Although protected in Mainland China, *Aquilaria sinensis* is found common in the secondary forest within the Study Area as in habitats of similar type in Hong Kong.

Feng-shui Wood

Feng-shui woods are found between pole A14 to A22 (see *Figure 3.1b & 3.1c*), behind Ho Chung Village (between pole A25 and A27) (see *Figure 3.1d* and *3.1l*) and behind Pak Kong Village (between pole A55 and pole A56) (see *Figure 3.1f* and *3.1k*). *Feng-shui* woods refer to the forests found behind villages. These forests are usually protected by villagers and therefore relatively undisturbed for long period of time, and hence more species have accumulated when compared with secondary forests. As a result of their older age, trees in *feng-shui* wood reach greater height and the structural complexity is relatively higher than most secondary forests.

Pik Uk (Between Pole A14 to A22)

The Hillsides between Pole A 14 and Pole A22 (*Figure 3.1b & 3.1c*) was found to be covered by continuous forest dominated by *Cinnamomum camphora*, *Persea chinensis* (*Machilus c.*), *Syzygium hancei*, *Symplocos glauca* and *Endospermum chinense* at the overstorey, and *Cibotium barometz*, *Psychotria rubra* as well as *Ardisia quinquegona* in the understorey layer. The liana community was only moderately developed and was dominated by *Byttneria aspera*, *Pericampylus glaucus* and *Tetracera asiatica*. This continuous forest was heterogenous in terms of structure and was identified to be a *feng-shui* wood due to the presence of abandoned village houses and terrace fields near pole A16, A17 and A20 and the occurrence of *feng-shui* wood species (e.g. *Cinnamomum camphora*, *Endospermum chinense* and *Syzygium hancei*). The trees of the forest between pole A20 and A22 ranged from 8 - 15m in average height, whereas trees between pole A14 and A17 ranged from 8 - 20m on average. Although the trees are of considerable height, the liana community was only moderately developed, forest structure was also considered moderate in these two forests. The trees between pole A17 and A20 were near forest margin and

therefore of smaller height (ranged from 6 - 8m), and the forest structure was not well developed. The whole continuous forest was also quite species rich (a total of 101 species) because it has heterogenous floral composition. In terms of species composition, patches between pole A18 and A20 was close to secondary forest and comprised species such as *Schefflera octophylla* and *Cratoxylum cochinchinense*. Despite its heterogenous composition, these three forest patches are considered as a whole because they formed a continuous forest.

Two species of orchids, *Ania hongkongensis* and *Liparis nervosa*, which are protected in Hong Kong under *Forestry Regulations of the Forests and Countryside Ordinance*, were found abundant in forest between pole A14 and A17. These two species are also common in Hong Kong. Five rare plant species were found in the forest between pole A14 and A17, they were *Ilex kwangtungensis*, *Ormosia indurata*, *Artocarpus tonkinensis*, *Casearia villilimba* and *Hypolytrum hainanense*. *Ilex kwangtungensis* is rare in Hong Kong and restricted to well-grown forest at Ma On Shan, Tai Mo Shan and Sunset Peak. This species was locally abundant in the forest between pole A14 and A17 and reaches a height of 8 - 10m. Fruiting individual and sapling were not uncommon and hence suggesting a stable and healthy population there. *Ormosia indurata* is also rare locally in Hong Kong and globally (only recorded in Guangdong province). Although it has been seen in a number of localities (Tai Mo Shan, Ma On Shan, Wu Kau Tang, Lantau), wherever occur, there were usually single small individual. Although only a single individual were seen in the study area, the tree was very tall (>15m) and have multiple trunks. *Artocarpus tonkinensis* is very rare in Hong Kong and has only been seen in *feng-shui* wood in Shing Mun and Lam Tsuen. Only one 9 m tall individual, was seen in forest between pole A21 and A20. *Casearia villilimba* is a rare shrub in Hong Kong and restricted to well grown forest in Ma On Shan, Tai Mo Shan and Ho Chung area and is regionally restricted to South China. This species is approximately 3-6m in height. As the species was found to be fairly abundant, its locations are not shown. *Hypolytrum hainanense* is also rare locally and endemic to South China as described above. Three individual of this species were found in the forest near the stream between pole A16 & A17. One individual of *Artocarpus hypargyeus* was found in forest near pole A14. This species is protected under Category 2, National Protection in Mainland China but is fairly abundant in Hong Kong. Locations of rare/protected plants are shown in *Figure 3.1h*.

In general, the forest between pole A14 and pole A22 is large, continuous and moderately species rich. The patches between pole A14 and A17 and between pole A20 and A22 are very tall and have moderately good forest structure. Presence of tall individual of *Endospermum chinense* suggest the forest is of considerable age. Forest between pole A14 and A17 is particularly species rich and contain many rare plant species.

Ho Chung (Between Pole A25 and A27)

The forest behind Ho Chung village (*Figure 3.1l*) is dominated by *Endospermum chinense*, *Aquilaria sinensis*, *Osmanthus matsumuranus*, *Persea chinensis* (*Machilus c.*) and *Tutcheria championii* (*Pyrenaria championii*), with the understorey dominated by *Ardisia quinquegona*, *Psychotria rubra* and *Cibotium barometz*. Liana community was also well developed and dominated by *Byttneria aspera*, *Bowringia callicarpa* and *Strychnos angustiflora*. The forest structure is good with average height of tree range from 5 - 20m.

Although similar number of species were recorded in this forest (a total of 92 species) as in Pak Kong, it composes of many species that are characteristic of well-grown lowland forest such as *Endospermum chinense*, *Osmanthus matsumuranus*, *Cryptocarya cocinna*, *Ficus championii* (*F. vasculosa*). The forest is large in size and connected to other nearby forests although to some extent fragmented by tall shrub on ridge top and plantation.

The protected tree species *Tutcheria championii* and *Cyathea podophylla* recorded are rare and restricted to well-grown forest in Hong Kong. Other six rare to very rare species were also found in the study area, they are *Acmena acuminatissima*, *Osmanthus matsumuranus*, *Hypolytrum hainanense*, *Mapania sinensis*, *Hemigramma decurrens*, and *Pleocnemia conjugata*. *Acmena acuminatissima* is a very rare tree species in Hong Kong and has only been found in forests at Ma On Shan and Wong Chuk Yueng recently. This species is found to be quite abundant in the Study Area and there were large individuals with a height greater than 6m, as well as saplings of a whole range of size, suggesting a healthy and stable population. *Hypolytrum hainanense* and *Mapania sinensis* are rare forest herbs that were restricted to understorey of well-growth forest. Both of them are species new to Hong Kong and were not discovered until recently. *Hypolytrum hainanense* has only been seen recently in Tai Po Kau Reserve and She Shan *feng-shui* wood. It should also be noted that this species is endemic to South China and is originally recorded in Hainan Province only. *Mapania sinensis* is also rare and has only been seen in Tai Po Kau, Ma On Shan & Tai Mo Shan. *Hemigramma decurrens* and *Pleocnemia conjugata* are both rare fern restricted in dense forest. *Pleocnemia conjugata* is locally rare in Hong Kong. Up to four colonies were identified in the Study Area. *Hemigramma decurrens* is rare and has been found under forests at Wu Kau Tang, Luk Keng and Butterfly Valley. Locations of rare/protected plants are shown in *Figure 3.1i*. Individuals of the rare plant *Osmanthus matsumuranus* scatters in the Study Area and thus the locations are not shown.

In general, the forest behind Ho Chung is well-grown, possesses high structural complexity and continuous with nearby ravine and therefore provides habitats for wildlife in the area. The species composition and presence of a number of rare species suggest that the forest is not typical of secondary forest in Hong Kong and it probably represents remnant of old-grown lowland forest which is rare in Hong Kong as well as in South China region. Presence of large and tall tree species *Endospermum chinense* in the study area suggested that the forest is of rather old age.

Pak Kong (Between Pole A55 and A56)

The forest behind Pak Kong village (*Figure 3.1k*) was dominated by *Persea chinensis* (*Machilus c.*), *Cinnamomum camphora*, *Choerospondias axillaris*, *Symplocos glauca* and *Schefflera octophylla* in the overstorey and *Psychotria rubra*, *Sarcandra glabra*, *Uvaria microcarpa* and *Glochidion eriocarpum* for the understorey layer. Liana community was also well developed and contains *Ampelopsis cantonioensis*, *Bowringia callicarpa* and *Broussonetia kazinoki* (*B. kaempferi*) as major components. Average height of tree ranged from 10 to 20m. The forest is continuous and large in size and have good structure as a whole. Presence of some naturalised trees which were originally introduced for growing fruit (*Dimocarpus longan* and *Litchi chinensis*) suggests some human influence. In terms of species composition, the species richness of the forest was only moderate (a total of 75 species) and to some extent similar to secondary forests nearby.

A protected plant species *Pavetta hongkongensis* was found inside the forest within the Study Area. This species, although protected under the *Forestry Regulations of the Forests and Countryside Ordinance*, is quite common in Hong Kong. Two rare tree species, *Dalbergia balanse* and *Osmanthus matsumuranus*, were also found. Although *Dalbergia balanse* is widely planted in Hong Kong, it is rare in the wild, while *Osmanthus matsumuranus* is restricted in Hong Kong to well grown lowland forest. Locations of rare/protected plants are shown in *Figure 3.1j*.

In general, the forest although only moderately species rich and to some extent similar to secondary forest, has good forest structure and its large size may provide habitat for wildlife. The presence of tall tree species *Persea chinensis* and *Choerospondias axillaris* suggests that the forest is rather mature.

Agricultural Land

Agricultural land habitats are represented by areas between pole A24 and pole A25 in Ho Chung valley and also in area next to Pak Kong village after pole A56 where the powerline would pass through as underground cable. Most of these agricultural land has been abandoned and now become waste land while those still under active management by villagers were mostly either orchard or garden.

Orchards (*Figure 3.1n*) are mainly planted with *Dimocarpus longan*, *Psidium guajava*, *Citrus maxima*, *Litichi chinensis* and *Musa paradisiaca* var. *sapientum*. Whereas gardens are mainly planted with *Archontophoenix alexandrae* and *Murraya exotica*. Understoreys of actively managed gardens and orchards are sparse and were dominated by *Microstegium ciliatum* and *Mikania micrantha*. Trees in garden and orchard were also evenly spaced out and hence the habitat are rather uniform and poor in habitat diversity. Such habitat types are therefore unlikely to be of any ecological importance to wildlife.

Wasteland

Wasteland (*Figure 3.1n*) are completely dominated by *Microstegium ciliatum*, *Mikania micrantha*, *Miscanthus floridulus*, *Pueraria lobata* and *Hedychium coronarium* forming a habitat of simple floristic structure and poor in micro-habitat diversity. *Mikania micrantha* as well as other common species in this habitat like *Bidens alba*, *Ipomea batatas*, *Lantana camara* and *Panicum maximum* are exotic species. Other species like *Hedychium coronarium* and *Dimocarpus longan* are introduced crops plants that has gone wild. This habitat type are therefore unlikely to be of any ecological importance to animal wildlife.

Plantation

Plantation is represented in the study area by a small patch of *Tristania conferta* (Figure 3.1n) near pole A46 and another patch of *Pinus massoniana* on the engineering slope behind the water service building at Ho Chung. There were also plantation of *Tristania conferta*, *Eucalyptus robusta*, *E. tereticornis*, *E. citriodora* and *Acacia confusa* at both sides along the proposed route from Pak Kong substation to Tui Min Hoi substation. These tree species are introduced and non-native to this region. The vegetation in these plantations is dense with trees ranged from 6 - 20m in height on average, forming a closed canopy. Understorey growth was very poor and monotonous, if present, and liana community was almost absent. With respect to its origin, nature and structure, it is considered unlikely that such habitat is of any ecological importance to wildlife.

Freshwater Stream

There are six freshwater streams in the proximity of the proposed powerline alignment: one behind pole A52 (Stream 1), two west to Uk Cheung (near pole A49 (Stream 2) and A46 (Stream3)), one between pole A42 and A43 north to Kei Pik Shan (Stream 4), one near Pik Uk (Stream 5), as well as Ho Chung Stream near Shui Hau (Stream 6) (see Figure 3.1b, 3.1c 3.1e & 3.1f).

Stream 1 was low-gradient, rather exposed with vegetation limited to grasses and small shrubs along the stream bank. Man-made water tunnel was noted to allow unrestricted movement of water downstream, despite the presence of a road impounding it. Stream 2 also had a water-tunnel allowing flow downstream. It was more shaded with secondary forests surrounding the stream bank. Stream 3 was a small stream south of Stream 2. Water flow of Stream 3 was with shrubby to medium-sized trees lining the stream banks. Stream 4 bisected a bamboo forest and therefore was partly shaded. Stream 5 was quite remote and therefore the water was clean. It was shaded mostly by secondary forests and small shrubs lined the stream banks. Stream 6 flowed through wasteland with shrubs and small trees lined the stream banks. Except Stream 4 within which the sediment was fine and silty, the stream-beds of the other streams were similar, with coarse pebbles and large boulders comprising the substratum.

3.4.2 Animal Wildlife

Mammal

Signs of mammals found within the Study Area during the field surveys included burrows and animal faeces. Large burrows were commonly seen in tall shrubland and secondary forest between pole A52 and A48 (Figure 3.1f) and in Ho Chung forest between pole A25 and A27 (Figure 3.1d). The size of the entrance measured 35cm in height by 35cm in width as illustrated in Figure 3.2a. The dimension of the hole and the semi-open habitat nearby suggested that the animal may be Small Indian Civets (*Viverricula indica*). Civet faeces were also noted on path near pole A7 and A6 at Junk Bay (Figure 3.1a). In addition, faeces of Barking Deer (*Muntiacus reevesi*) were also observed near pole A50 and A51 (Figure 3.1f). Small Indian Civets and Barking Deer are protected in Hong Kong under

Wild Animals Protection Ordinance. However, they are not rare and are wide-ranging omnivores which can survive in most wild habitat.

Shallower holes with larger dimension (40 - 60cm diameter, and <50cm deep) made by Wild Boar were found on the forest floor behind Pak Kong village (*Figure 3.1g*), Ho Chung village (*Figure 3.1d*), between pole A15 and A18 (*Figures 3.1b & 3.1c*) as well as in tall shrubland and secondary forest between pole A52 and A48 (*Figure 3.1f*). Wild Boar tracks were also noted in tall shrubland and secondary forest between pole A52 and A48 (*Figure 3.1f*). Wild Boar are not protected by laws in Hong Kong. They are also omnivores which are very common in rural areas in Hong Kong.

In addition, smaller burrows which may be made by rodents were commonly seen in forest between pole A18 and A20 in forest behind Ho Chung (*Figure 3.1c*) and between pole A52 and A48 (*Figure 3.1f*).

Avifauna

A total of 12 locally common bird species were recorded in shrubland and woodland habitats during the field surveys. A list of bird species recorded is given in *Table 3.1*. The presence of Chestnut Bulbul south of the Ho Chung Valley indicated the maturity of the woodland and hence important for birds in addition to its close proximity to the Ho Chung Valley and the water catchment located next to the area A47 to A56.

Table 3.1 List of Bird Species Recorded Within the Study Area

Common name	Scientific name
Little Egret	<i>Egretta garzetta</i>
Crested Goshawk	<i>Accipiter trivirgatus</i>
Spotted Dove	<i>Streptopelia chinensis</i>
Grey Wagtail	<i>Motacilla cinerea</i>
Crested Bulbul	<i>Pycnonotus jocosus</i>
Chinese Bulbul	<i>Pycnonotus sinensis</i>
Chestnut Bulbul	<i>Hypsipetes castanonotus</i>
Yellow-browed Warbler	<i>Phylloscopus inornatus</i>
Great Tit	<i>Parus major</i>
Violet Whistling Thrush	<i>Myiophoneus caeruleus</i>
Fork-tailed Sunbird	<i>Aethopyga christinae</i>
White Eye	<i>Zosterops japonica</i>

Reptile

One Crested Tree Lizard (*Calotes versicolor*) was observed in shrubland habitat along the footpath near Pole A51. This species is very common in shrubland habitat in Hong Kong and is not protected locally.

Stream Community

Among the six stream sites (Streams 1-6) investigated, the more natural Streams 2,3,4,5 and 6 show higher species diversity. Stream 2 recorded the highest abundance of individuals and taxa, while Stream 1 showed the lowest taxa diversity. No rare, endangered or endemic fauna was found during the survey and the presence of the stonefly *Amphinemura chiu* in Stream 4 indicated that the stream is relatively free from pollution. A species list of stream fauna recorded is given in *Annex B*.

3.4.3 Evaluation of Ecological Importance

The ecological importance of the habitats within the Study Area affected by the proposed powerline is determined based on the following considerations, in accordance with the *EIAO TM Annex 8 Table 2* criteria:

Grassland

- *Naturalness*: The grassland is natural in nature.
- *Size*: The size of grassland is relatively small when compared with shrubland and forest.
- *Diversity*: This habitat is simple in structure and poor in floristic diversity.
- *Rarity*: All plant species observed are common and widespread in Hong Kong, without rare/protected species.
- *Re-creatability*: This habitat can be re-created and it is maintained by hill-fires as it used to be.
- *Fragmentation*: The grassland is intact and not fragmented.
- *Ecological Linkage*: The present habitats are not functionally linked to any highly valued habitat in close proximity in a significant way, but may provide movement corridor to wildlife.

Shrubland and Tall Shrubland

- *Naturalness*: These habitats are natural with limited disturbance.
- *Size*: These are the dominant habitat types along the alignment.

- *Diversity*: These habitat are considered of moderate floristic diversity.
- *Rarity*: 1 rare and protected species *Ailandthus fordii* was found.
- *Re-creatability*: This habitat can be re-created and it is maintained by hill-fires as it used to be.
- *Fragmentation*: The shrubland is not fragmented.
- *Ecological Linkage*: The present habitats are not functionally linked to any highly valued habitat in close proximity in a significant way, but may provide movement corridor to wildlife.

Feng-Shui Wood

- *Naturalness*: *Feng-shui* woods at Pik Uk, Ho Chung and Pak Kong have been protected by villages and thus remains undisturbed for a long time.
- *Size*: The three *feng-shui* woods occupy large areas behind villages.
- *Diversity*: These habitats are considered of high floristic and structural diversity.
- *Rarity*: A total of 16 rare/protected species were recorded in *feng-shui* woods (see *Table 3.2*), among which 8 species in Ho Chung, 3 species in Pak Kong and 7 species in Pik Uk.
- *Re-creatability*: These habitats are difficult to be re-created.
- *Fragmentation*: Besides Ho Chung *feng-shui* wood was fragmented by tall shrub on ridge top and plantation to some extent, *feng-shui* woods at Pak Kong and Pik Uk were not fragmented due to protection by villages.
- *Ecological Linkage*: The present habitats are not functionally linked to any highly valued habitat in close proximity in a significant way, but may provide movement corridor to wildlife.

Secondary Forest

- *Naturalness*: The secondary forest within the Study Area is naturally regenerated from grassland and shrubland habitats. Since this habitat is remote and hence disturbance is limited.
- *Size*: The secondary forest occurs in small patches.
- *Diversity*: This habitat is considered of moderate floristic and structural diversity.

- *Rarity*: No rare/protected species was found.
- *Re-creatability*: This habitat are difficult to be re-created.
- *Fragmentation*: There is evidence that the secondary forest is fragmented as they occur in patches.
- *Ecological Linkage*: The present habitat is not functionally linked to any highly valued habitat in close proximity in a significant way, but may provide movement corridor to wildlife.

Agricultural Land and Plantation

- *Naturalness*: These habitats are human created and managed.
- *Size*: These habitat types occur in small patches.
- *Diversity*: These habitats are considered of low floristic diversity.
- *Rarity*: No rare/protected species were found.
- *Re-creatability*: This habitat can be re-created easily.
- *Fragmentation*: The agricultural land and plantation are not fragmented.
- *Ecological Linkage*: The present habitats are not functionally linked to any highly valued habitat in close proximity in a significant way.

Freshwater Stream

- *Naturalness*: Stream 1 has been subjected to severe disturbance. The other five streams are considered to be relatively natural.
- *Size*: The total length of the natural stream sections extend for approximately 4.5 km.
- *Diversity*: Low to moderate diversity of wildlife observed. Stream 1 has the lowest diversity.
- *Rarity*: Neither the habitat nor species found are rare.
- *Re-creatability*: The natural stream course could be recreated physically but colonisation by stream fauna is not guaranteed.
- *Fragmentation*: Not applicable.

- *Ecological Linkage*: The streams are not functionally linked to any highly valued habitat in close proximity in a significant way.

The Study Area passes through three Conservation Areas (Tseng Lan Shue, Ho Chung and, Pak Kong and Sha Kok Mei), and Ma On Shan Country Park, which comprise various natural habitat types. Based on the discussions presented above, the secondary forest and *feng-shui* woods are of high ecological importance because of their high diversity in species richness and structural complexity as well as the presence of rare/protected plant species which are considered in *Table 3.2* following the *EIAO TM* Annex 8 Table 3 criteria. Streams 2, 3, 4, 5 and 6 are considered to have moderate to low ecological value owing to their naturalness and unpolluted status. The other habitat types (i.e. grassland, shrubland/tall shrubland, agricultural land, wasteland and plantation) are considered to have low ecological importance.

Table 3.2 Rare/Protected Plant Species in Feng-Shui Woods

Species	Growth form	Local Status*	Locations	Remark
<i>Cyanthea podophylla</i>	Fern	Rare ^{3,4}	Ho Chung	Restricted to well-grown forest; protected in HK
<i>Dalbergia balanse</i>	Tree	Rare ¹	Pak Kong	Widely planted in HK
<i>Osmanthus matsumuranus</i>	Tree	Rare ^{1,2}	Ho Chung, Pak Kong	Restricted to lowland forest
<i>Pavetta hongkongensis</i>	Shrub	Common	Pak Kong	Protected in HK
<i>Tutcheria championii</i> (<i>Pyrenaria championii</i>)	Tree	Restricted ^{1,2}	Ho Chung	Protected in HK
<i>Acmena acuminatissima</i>	Tree	Rare ^{1,2}	Ho Chung	Restricted to forest.
<i>Hemigramma decurrens</i>	Fern	Rare ^{3,4}	Ho Chung	Restricted to lowland forest
<i>Hypolytrum hainanense</i>	Herb	Rare ²	Pik Uk, Ho Chung	New to HK, endemic to China (Hainan & HK)
<i>Mapania sinensis</i>	Herb	Rare ²	Ho Chung	New to HK, restricted to ravine forest
<i>Pleocnemia conjugata</i>	Fern	Locally Rare ³	Ho Chung	Restricted to ravine forest
<i>Artocarpus tonkinensis</i>	Tree	Rare ^{1,2}	Pik Uk	Restricted to lowland forest
<i>Ilex kwangtungensis</i>	Tree	Rare ^{1,2}	Pik Uk	Restricted to well-growth forest in HK
<i>Ormosia indurata</i>	Tree	Rare ^{1,2}	Pik Uk	New to HK
<i>Ania hongkongensis</i>	Herb	Common	Pik Uk	Protected in HK, restricted to forest

Species	Growth form	Local Status*	Locations	Remark
<i>Liparis nervosa</i>	Herb	Common	Pik Uk	Protected in HK, restricted to forest
<i>Casearia villilimba</i>	Shrub	Rare ^{1, 2}	Pik Uk	Restricted to montane forest in HK

*References

- 1) Zhuang, X. Y., Xing F. W. & Corlett R. T., 1997. The tree flora of Hong Kong: distribution and conservation status. *Memoirs of the Hong Kong Natural History Society* 21: 69-126
- 2) Hong Kong Biodiversity Survey, in preparation. Department of Ecology and Biodiversity, The University of Hong Kong.
- 3) Edie, Harry, 1978. *Ferns of Hong Kong*. Hong Kong University Press.
- 4) So, M. L., 1994. *Hong Kong Flora and fauna Series: Hong Kong Ferns*. The Urban Council, Hong Kong.

3.5 Impact Assessment

3.5.1 Potential Source of Impact

Potential source of impact mainly involves clearance/trimming of vegetation and habitats for the following activities as described in Section 2:

- to form a footpath (1 m in width) for construction crew and delivery of equipment;
- to construct footings (1.2m x 1.2m x 2.95m in depth) for the overhead pole line and trench for the underground cables;
- to clear the path routinely for maintenance access;
- to trim the canopy to maintain a safety distance between canopy and the conductor for safety purpose; and
- to excavate stream bed at Ho Chung stream (between Pole A24 and A25) for laying underground cable.

3.5.2 Impact Evaluation

Construction Phase

The potential impact from the proposed powerline due to construction activities would be high on the well-growth *feng-shui* wood with high ecological importance behind Ho Chung (pole A25-A27), Pak Kong (pole A55-A56) and between Pole A14 and A17, because the proposed line runs down to the bottom of the valley or the center of the forest where most rare species were found. These rare species are forest dependent (see *Table 3.2*), and would be severely affected if fragmentation and invasion of shrub and exotic species occur.

The proposed construction would also lead to direct impact on rare species along the powerline alignment. A total of 17 rare and protected species (16 in *feng-shui* woods and 1 in tall shrubland) found in this study are under the proposed powerline directly, and among which 9 herb/fern species are vulnerable to disturbance due to construction and regular maintenance (see *Table 3.2*).

The potential impact on the other habitats (i.e. grassland, shrubland/tall shrubland, agricultural land, wasteland and plantation) would be limited, given the low ecological importance and small areas affected, while the duct laying work for the underground cable at Ho Chung Valley will directly affect two stream sections between Pole A24 and A25 where stream bed will be excavated. It is expected that impact on animal wildlife is minimal owing to the small scale of the landtake and construction activities at the pole locations only.

Operational Phase

For the forest habitats (including secondary forest and well-grown *feng-shui* wood), regular maintenance work and possible increased human access would result in habitat fragmentation and may also encourage growth of shrub species as well as exotic weedy species such as *Mikania micrantha* and *Lantana camara*. Although the proposed powerline do not require clearance of the forest underneath, constant canopy trimming activities to maintain a safety distance of 3.7m between canopy and the conductor would adversely impact the rare plant species. Fragmentation of the forest would reduce the conservation value of forest. No impact on animal wildlife is expected during operational phase.

Significance of impact

Making reference to the *EIAO TM* Annex 8 Table 1 in evaluating significance of ecological impact from the Project, it is considered that:

- the forests (secondary forest and *feng-shui* wood) potentially affected are natural without disturbance and of particular ecologically important owing to the high floristic and structural diversity as well as the presence of rare plant species; the other habitat types quality is low;
- there will be 16 rare/protected species potentially affected directly/indirectly by the Project in the secondary forest and *feng-shui* woodlands;
- the potential total habitat loss due to landtake for access path, footings and underground cable trench will be approximately 0.1 ha in total, with approximately 340m² of *feng-shui* wood and secondary forest permanently affected (see *Table 3.3*);
- the impact due to landtake for access path and pole footings will be long term and permanent, as well as the on-going maintenance work in the future during operation;

- since the *feng-shui* woods and secondary forest habitats to be affected are relatively natural without disturbance, and therefore the magnitude of environmental change from this Project due to habitat loss, fragmentation and increased disturbance is considered significant.
- The impact on Ho Chung Stream due to duct laying work is considered low because it will be a short-term work and restricted to dry season.

In conclusion, the impact on the secondary forest and *feng-shui* woods is expected to be high considering the above criteria.

3.6 Mitigation Measures

3.6.1 Introduction

The following mitigation measures in relation to avoiding impact and protecting the important habitat and plant species as well as good construction practice to minimise disturbance to the surrounding environment are recommended below.

3.6.2 Impact Avoidance

Change in the powerline route is necessary to avoid adverse effect on the important habitat and the associated rare species. Because of the high ecological values and presence of rare species in the well-grown *feng-shui* wood behinds Ho Chung (pole A25-A27), Pak Kong (pole A55-A56) and west of Pik Uk (Pole A14 and A17), disturbance which would lead to fragmentation of the well-established forest and adverse impact to the rare plant species have to be avoided as far as possible.

An alternative alignment for these ecological sensitive powerline sections have been recommended to move the powerline outside the *feng-shui* wood areas (see *Figure 3.1h - 3.1j*), and the changes include:

- pole A12 to A20 to be moved to tall shrubland up the Hebe Hill (pole A12a - A20a);
- pole A26 and A27 to be moved to shrubland uphill at Ho Chung Valley (pole A26a - A27a); and
- pole A55 and A56 as well as the underground cable linking Pole A56 to Pak Kong Road to be moved to the grassland on the western slope (pole A55a - A56a).

The tall shrubland, shrubland and grassland underneath the alternative alignments are typical of similar habitats within the Study Area as described in *Section 3.4.1*. The impact on these habitats is therefore considered to be limited given their low ecological importance and (See *Section 3.4.3*) small areas to be affected.

CLP Power has committed to adopt this new alignment for implementation. This alignment will avoid adverse impact on *feng-shui* wood areas with the rare plant species. Since relocation of Pole A25a out of the *feng-shui* wood to the engineering slope will have conflict with the present water works facilities, Pole A25a will have to stay within *feng-shui* wood area, and therefore its location should be adjusted to avoid impact on the two rare plant individuals, the rare tree *Acmena acuminatissima* and protected tree *Tutcheria championii* as far as possible.

The estimated total permanent habitat loss due to landtake and cable trench for the pole footing areas for each habitat type, as well as temporary habitat loss due to the alternative alignment, is as shown in *Table 3.3*.

Table 3.3 Potential Habitat Loss due to Construction of Alternative Powerline Alignment

Habitat type	Permanent area loss due to excavation of footings and underground cable trough (ha)	Temporary area loss due to vegetation clearance for work area (ha)
<i>Feng-shui</i> wood	0.033	0.007
Secondary forest	0.001	0.005
Tall Shrubland	0.012	0.013
Shrubland	0.055	0.006
Grassland	< 0.001	0.002
Stream	0	0.008

3.6.3 Mitigation measures

Further mitigation measures are recommended as follows:

- Minor on-site adjustment of pole positions, especially for Pole A25a at Ho Chung Valley, where rare tree species *Acmena acuminatissima* and protected tree *Tutcheria championii* will be directly affected, should be carried out to minimize the number of tree that would require felling, and if avoidance is not possible due to engineering constraints, collection of the rare/protected tree individuals for transplanting to similar habitats in the vicinity;
- Loss of habitats should be minimized by reducing the area of temporary disturbance within the proposed route. Any unnecessary disturbance or clearance of vegetation should not be allowed. Felling of any tree or removal of any rare or protected plant individuals has to be under close supervision;
- The 1m wide maintenance path normally required beneath the powerline should be avoided or reduced in width so as to reduce the effect of forest fragmentation. Crew access and transportation of equipment should be confined to existing paths and roads. Short path "teeing off" from nearby existing path or road should be used rather than a

long continuous path beneath the new line. The routing of the maintenance footpaths should avoid any animal burrows when encountered during access;

- Re-establishment of trees and shrubs of native species, preferably those species that were cleared for construction works, will be conducted at each pole location after the construction phase, as far as practicable, as part of the landscape restoration works as well as prevention of erosion. Periodic trimming of vegetation will be necessary for maintenance and safety thereafter. While CLP will take up the plant establishment works for a period of two years, the replanted trees and shrubs will be left to the natural growth at the completion of the establishment period.
- Duct laying work at the existing stream at Ho Chung should be carried out in the dry season to minimise disturbance, and the affected stream bed should be reinstated to its original condition using natural substratum after cable duct construction (see also Section 6.7 for measures to minimise water quality impact during construction);
- Regular checking to ensure that the work site boundaries are not exceeded and that no damage occurs to surrounding areas; and
- Prohibition and prevention of open fires within the work site boundary during construction.

The implementation of the ecological mitigation measures should be checked as part of the environmental audit procedures during the construction period by the Environmental Team (ET).

3.7 Residual Impacts

Potential impact due to the loss of 0.001ha secondary forest, 0.012ha tall shrubland, 0.055ha shrubland and < 0.001ha grassland is considered low given the small area loss. With the implementation of the above avoidance and mitigation measures, it is considered that there would be no adverse residual impact in relation to the loss and disturbance of *feng-shui* woods.