9 ECOLOGY

9.1 Introduction

9.1.1 The objective of the ecological impact assessment is to assess the existing ecological value of the Study Area, the potential impacts of the proposed residential development, associated geotechnical and drainage works, and to propose mitigation measures that will reduce the scale of identified impacts. The ecological impact assessment presented here has been carried out in accordance with Annexes 8 and 16 of the Technical Memorandum of Environmental Impact Assessment Process (EIA Ordinance, Cap 499, S16).

9.2 Description of the Baseline Ecology

9.2.1 Literature Review

Terrestrial

9.2.1.1 A review of existing ecological data has been undertaken drawing on available published information from Government and non-Government sources. The ecological impact assessment carried out for the Design and Construction of the Interchange at the Junction of Pok Fu Lam Road and Sassoon Road (OAP/ERM for Highways Department, 1998) was reviewed.

9.2.1.2 There are two wooded areas at the Pok Fu Lam Road/Sassoon Road Junction, both of which have trees ranging from 4 to 20 metres tall, with *Ficus microcarpa* and *Celtis sinensis* (species that are common and widespread in Hong Kong) as the dominant species in the canopy layer. It is believed that these wooded areas have been affected by long-term disturbance. There is a sparse understorey with limited floral diversity, dominated mainly by *Alocasia macrorrhiza*, as well as weedy climbers; *Mikania micrantha* and *Ipomoea carica*. Other pioneer species including *Litsea glutinosa*, *Bridelia tomentosa*, *Macaranga tanarius* and *Mallotus paniculatus* are also present.

Marine

9.2.1.3 The shoreline is not known to have any established hard or soft coral communities. According to the Coastal Ecology Studies undertaken by Binnie for CED (1994), the rocky shores to the north and to south of the study area are dominated by sea urchins, gastropods and bryozoa. The muddy subtidal slope is quite barren with few sea whips. Appendix 9.5 (Table 1 and Figure 1) contains a quantitative comparison of coral distribution at Telegraph Bay and other selected areas around Hong Kong, which shows that there is no coral interest in the immediate vicinity of the study area.

9.2.1.4 The richest coral communities in Hong Kong are located in the clearer waters to the north east. The more silty western waters, which are influenced by the Pearl River, are less suitable for coral growth. The coral community in the southern part of Lamma Island at Sham Wan is protected by the island from silty waters and consequently has larger hard coral communities compared with the soft coral communities which dominate the northern part of Lamma Island (Scott 1984).

9.2.2 Survey Methodology

9.2.2.1 A series of systematic surveys, based on the requirements of the Technical Memorandum (Annexes 8 and 16), has been used to evaluate the ecological importance of the study site, the species present within the terrestrial and intertidal habitats, and potential ecological impacts. Botanical, stream, bird, mammal, dragonfly, butterfly, and marine intertidal surveys were conducted as outlined in the following text.

Botanical Survey

9.2.2.2 Qualitative botanical data (relative abundance and species diversity) were collected by line transects. Quantitative data were collected by the point-centered quarter technique (Cottam & Curtis, 1956), which calculates the density of trees from the average distance between them. The belt transect method was employed to survey shrubland, and the plot method was employed to survey the orchard. The sampling method used was determined on site with reference to the habitat being investigated. Rare, protected or endangered species in the Study Area were also recorded.

9.2.2.3 The focus of the survey was on community structure and species composition, rather than on the status of individual trees. A tree survey for felling applications (as defined in Works Branch Technical Circular 24/94 – Tree Preservation) was not within the scope of the ecological survey.

Stream Benthic Survey

9.2.2.4 A survey of stream macrobenthos was conducted in August 1998. Two sampling methods were employed to collect aquatic animals from the heterogeneous habitats in the Study Area:

- Benthic invertebrate samples were collected by kick sampling at three locations in each of the two streams in the Study Area. Kick sampling involves placing a D-frame net of 0.2 mm mesh size onto the stream-bed with the mouth of the net facing the water current. An area directly upstream of the net is disturbed by foot for a fixed time period, e.g. five minutes. All of the animals dislodged by the disturbing action are collected in the net for subsequent preservation and identification.

- Aquatic sweep-nets were used to collect animals in stream habitats where water flow was minimal and kick sampling not appropriate.

9.2.2.5 All collected animals were sorted, and identified to the lowest practicable taxonomic unit (taxon) using a stereo microscope in the laboratory.

Bird and Mammals

9.2.2.6 A survey of birds present on site was conducted on the 4th September 1998, in addition to an earlier site visit made on the 14th July 1998 during the breeding season. Bird species presence and abundance were recorded by walking across the site, through each of the identified habitats. Observations were also made of any birds using the site for nesting/breeding. Signs indicating the presence of mammals were also noted.

Dragonflies and Butterflies

9.2.2.7 Dragonflies and butterflies were surveyed in August 1998 and data collected on species,

abundance and habitat use. Where necessary, individuals were captured for accurate identification and released immediately or were photographed for later confirmation of field identification.

Intertidal Survey

9.2.2.8 Surveys were undertaken at both natural and reclaimed coastlines to identify the variety of fauna present. Between high and low tide marks, transect surveys were employed with quadrat sampling at 2 m intervals. A 0.25 m^2 quadrat was used in the survey, with the presence and abundance of species recorded in each quadrat. The lengths of the transects varied between sites with a 10 m transect at the northern shoreline of Telegraph Bay; an 8 m transect at the reclamation sea wall and a 6 m transect at the southern shoreline of Waterfall Bay.

9.2.2.9 Owing to the constraints of the EIA programme, a detailed intertidal survey could only be conducted during the summer. Subtidal habitats were not surveyed because final design details for the outfalls from the proposed development were not available.

9.2.3 Description of Baseline Terrestrial Ecology

9.2.3.1 Baseline ecological surveys covered the proposed development area and the surrounding area between Pok Fu Lam and Victoria Road. These surveys were conducted on August 12, 13, 14, 18, 19 and 26 1998. Bird surveys were carried out on July 14th and September 4th 1998.

9.2.3.2 The habitats of the development site and adjacent land include woodland, *Fung shui* wood, shrubland, grassland, orchard, a small garden, surface water bodies (formed after reclamation), natural streams and intertidal habitats (rocky shore and reclamation seawall). The location of these habitats is shown in Figure 9.1 and each is described below. Photographs of the habitats are included in Appendices 9.1 (Terrestrial) and 9.2 (Intertidal).

Woodland

9.2.3.3 Mature secondary woodland was the most widespread habitat within the study area, occupying an area of approximately 31 hectares on the slopes of Telegraph Bay and Waterfall Bay. The woodland was found to be relatively species rich and typical of local woodland habitats. Despite being a relatively common habitat type, the age and species richness of the woodland cause it to be considered as having high ecological value. Although the woodland areas of Telegraph Bay and Waterfall Bay had similar species diversity, the dominant species were different and consequently the two areas are discussed separately.

9.2.3.4 At Telegraph Bay, there was a complex matrix of woodland and shrubland habitats. The species recorded are shown in Table 9.1. The Woodland at the top of the valley was mature, with trees as tall as 12 m and up to 40 cm diameter (Table 9.4) and there was a diverse understorey/herb layer. The point-centre quarter method indicated that the most abundant species in this woodland were *Leucaena leucocephala* (a shrub species), *Litsea glutinosa* and *Microcos paniculata* (trees). Average density was approximately seven trees per 100 m^2 area, with a mean distance on 3.7 m between trees. On the lower slopes, shrub species were more common.

9.2.3.5 The dominant species in the woodland at Waterfall Bay were *Leucaena leucocephala, Celtis sinensis, Microcos paniculata* and *Mallotus piniculatus* (Table 9.2) (Photo 3, Appendix 9.1). Some large trees were also recorded in this woodland, with diameters up to 35 cm. There were abundant climbers present, including *Mikania micrantha* and *Ipomoea cairica* (Table 9.3).

9.2.3.6 *Lagerstroemia speciosa, L. indica* and *Michelia alba* were the only species observed that are protected by the Forests and Countryside Ordinance. There were three specimens of *Lagerstroemia indica* in Kong Shin Wan Tsuen, the village within the woodland at Telegraph Bay. One was located in a small garden and the other two were located close to village houses. At Waterfall Bay there were fifteen plants of *Lagerstroemia speciosa* established at the roadside of Wah King Street. They appear to have been planted by the villagers. *Michelia alba* (magnolia) is an introduced species that is often planted around village houses. *Artocarpus hypagyreus* was recorded in the Study Area and is listed in the China Plant Red Data Book as vulnerable (Fu and Jin 1992). These trees are outside the development area and their location can be seen in Figure 9.1.

9.2.3.7 Young secondary woodland is developing on the reclamation area, with the trees present all less than 10 years old. Colonisation of this area started at the boundary with the existing woodland of Telegraph Bay and Waterfall Bay and has progressed across a significant part of the reclamation area (approximately 10 ha), grading into shrubland and open grassland at the seaward extreme. The most abundant tree species in this area was *Leucaena leucocephala.* The species recorded in the reclamation area are listed in Table 9.5. This habitat has far lower ecological value than the mature secondary woodland because of the young age of the trees and the low species diversity present.

Table 9.1 Tree and Shrub Species Recorded in the Woodland of Telegraph Bay

Species	**Family**	**Species Type[1]**	**Status[2]**	**Relative abundance[3]**
Acacia confusa	(Mimosaceae)	T	E	C
Albizia lebbeck	(Mimosaceae)	T	N	R
Aporusa dioica	(Emphorbiaceae)	T	N	C
Antirhoea chinensis	(Rubiaceae)	S	N	R
Aporusa dioica	(Euphorbiaceae)	T	N	C
Araucaria heterophylla	(Araucariaceae)	T	E	C
Artocarpus hypargyreus	(Moraceae)	T	N	R
Atalantia buxifolia	(Rutaceae)	C	N	C
Bauhinia championi	(Caesalpiniaceae)	C	N	R
Bridelia tomentosa	(Euphorbiaceae)	T	N	A
Cassia surattensis	(Caesalpiniaceae)	ST	E	C
Castanopsis fissa	(Fagaceae)	T	N	R
Cerbera manghas	(Apocynaceae)	T	N	R
Celtis sinensis	(Ulmaceae)	T	N	C
Cleidion brevipetiolatum	(Euphorbiaceae)	T	N	R
Clerodendrum cyrtophyllum	(Verbenaceae)	S	N	C
Clerodendrum inerme	(Verbenaceae)	S	N	C
Cleistocalyx operculata	(Myrtaceae)	T	N	C
Cratoxylum cochinchinense	(Hypericaceae)	ST	N	C
Dalbergia benthami	(Papilionaceae)	C	N	C
Desmos cochinchinensis	(Annonaceae)	S	N	C
Eucalyptus citriodora	(Myrtaceae)	T	E	C
Euphorbia hirta	(Euphorbiaceae)	H	E	C

Species	Family	Species Type[1]	Status[2]	Relative abundance[3]
Ficus hirta	(Moraceae)	T	N	C
Ficus hispida	(Moraceae)	ST	N	C
Ficus microcarpa	(Moraceae)	T	N	C
Ficus virens	(Moraceae)	T	N	C
Garcinia oblongifolia	(Clusiaceae)	T	N	C
Gossampinus malabarica	(Bombacaceae)	T	E	C
Ilex asprella	(Aquifoliaceae)	S	N	C
Ilex pubescens	(Aquifoliaceae)	S	N	C
Lagerstroemia indica	(Lythraceae)	T	E	R
Leucaena leucocephala	(Mimosaceae)	T	N	A
Litsea glutinosa	(Lauraceae)	T	N	A
Livistona chinensis	(Palmae)	T	E	C
Lophatherum gracile	(Verbenaceae)	G	N	A
Macaranga tanarius	(Euphorbiaceae)	T	N	A
Mallotus apelta	(Euphorbiaceae)	T	N	R
Mallotus paniculatus	(Euphorbiaceae)	T	N	C
Michelia alba	(Magnoliaceae)	T	E	C
Microcos paniculata	(Tiliaceae)	T	N	C
Pinus massoniana	(Pinaceae)	T	N	R
Psychotria rubra	(Rubiaceae)	S	N	A
Rhaphiolepis indica	(Rosaceae)	S	N	C
Rhodomyrtus tomentosa	(Myrtaceae)	S	N	C
Rhus succedanea	(Anacardiaceae)	T	N	C
Stachytarpheta jamaicensis	(Verbenaceae)	S	N	C
Strychnos angustiflora	(Strychnaceae)	S	N	C
Tetradium glabrifolia	(Rutaceae)	T	N	R
Thevetia peruviana	(Apocynacea)	ST	E	C
Triumfetta bartramia	(Tiliaceae)	S	N	C

Note[1] Species Type: C, Climber; F, Fern; G, grass; H, herb; T, tree; S, shrub; ST, small tree
Note[2] Status: N, native; E, exotic.
Note[3] Relative Abundance: A, abundant; C, common; R, rare.

Table 9.2 Tree and Shrub Species Recorded in the Woodland of Waterfall Bay

Species	Family	Species Type[1]	Status[2]	Relative abundance[3]
Acacia confusa	(Mimosaceae)	T	E	C
Arctocarpus hypargyreus	(Moraceae)	T	N	R
Bauhinia sp.	(Caesalpiniaceae)	T	E	C
Callistemon viminalis	(Myrtaceae)	S	E	R
Celtis sinensis	(Ulmaceae)	T	N	A
Cinnamomum burmanni	(Lauraceae)	T	N	C
Cratoxylum cochinchinense	(Hypericaceae)	ST	N	C
Euphorbia indica	(Euphorbiaceae)	T	N	R
Ficus elastica	(Moraceae)	T	E	R
Ficus hispida	(Moraceae)	T	N	C
Ficus microcarpa	(Moraceae)	T	N	C
Ficus virens	(Moraceae)	T	N	C
Gossampinus malabarica	(Bombacaceae)	T	E	C
Hibiscus tiliaceus	(Malvaceae)	T	N	C
Lagerstroemia speciosa	(Lythraceae)	T	E	C
Leucaena leucocephala	(Mimosaceae)	T	N	A

Species	Family	Species Type[1]	Status[2]	Relative abundance[3]
Litsea glutinosa	(Lauraceae)	T	N	C
Macaranga tanarius	(Euphorbiaceae)	T	N	C
Mallotus apelta	(Euphorbiaceae)	T	N	C
Mallotus paniculatus	(Euphorbiaceae)	T	N	A
Microcos paniculata	(Tiliaceae)	T	N	A
Morus alba	(Moraceae)	T	N	C
Phyllanthus cochinchinensis	(Eurphrobiaceae)	S	N	C
Psychotria rubra	(Rubiaceae)	S	N	C
Sterculia lanceolata	(Sterculiaceae)	T	N	C
Symplocos lancifoliia	(Symplocaceae)	T	N	C
Tetradium glabrifolium	(Rutaceae)	T	N	C

Note[1] Species Type: C, Climber; F, Fern; G, grass; H, herb; T, tree; S, shrub; ST, small tree
Note[2] Status: N, native; E, exotic.
Note[3] Relative Abundance: A, abundant; C, common; R, rare.

Table 9.3 Creepers, Ferns and Herbs recorded in the Woodland of the Study Area

Species	Family	Species Type[1]	Status[2]	Relative abundance[3]
Alocasia macrorrhiza	(Araceae)	H	N	A
Acorus gramineus	(Araceae)	H	N	C
Amorphophullus rivieri	(Araceae)	H	N	C
Asparagus cochinchinensis	(Liliaceae)	H	N	C
Blumea megacephala	(Compositae)	H	N	C
Cassytha filiformis	(Lauraceae)	C	N	C
Cyclea hypoglauca	(Menispermaceae)	C	N	C
Elephantopus tomentosa	(Compositae)	H	N	C
Gnetum montanum	(Gnetaceae)	C	N	C
Gymnema sylvestre	(Asclepiadaceae)	C	N	C
Ipomoea cairica	(Convolvulaceae)	C	N	C
Lophatherum gracile	(Gramineae)	G	N	C
Lygodium dichotomum	(Schizaeaceae)	F	N	C
Lygodium japonicum	(Schizaeaceae)	F	N	C
Mikania micrantha	(Compositae)	C	E	C
Passiflora suberosa	(Passifloraceae)	C	E	R
Pteris fauriei	(Pteridaceae)	F	N	C
Sageretia theezans	(Rhamnaceae)	C	N	R
Scleria levis	(Cyperaceae)	G	N	C
Strophanthus divaricatus	(Apocynaceae)	C	N	R
Tetracera asiatica	(Dilleniaceae)	C	N	C
Vernonia cinerea	(Compositae)	H	N	C
Wedelia trilobata	(Compositae)	H	E	C
Xanthium sibiricum	(Compositae)	H	N	R

Note[1] Species Type: C, Climber; F, Fern; G, grass; H, herb; T, tree; S, shrub; ST, small tree
Note[2] Status: N, native; E, exotic.
Note[3] Relative Abundance: A, abundant; C, common; R, rare.

Table 9.4 Woodland Data for Telegraph Bay collected by the Point Centre Quarter Method

Quarter No	Species Name	Distance (m)	Diameter (cm)	Height (m)	Spread (m)

Quarter No	Species Name	Distance (m)	Diameter (cm)	Height (m)	Spread (m)
1	*Leucaena leucocephala*	1.70	25.0	8.0	2.0
	Leucaena leucocephala	1.30	28.0	8.0	2.0
	Leucaena leucocephala	1.60	22.0	8.0	2.0
2	*Leucaena leucocephala*	1.90	23.0	8.0	2.0
	Microcos paniculata	2.10	9.5	8.0	7.0
	Litsea glutinosa	2.50	8.0	8.0	5.0
	Macaranga tanarius	4.23	8.0	3.0	1.3
3	*Litsea glutinosa*	2.50	10.0	5.0	6.0
	Macaranga tanarius	1.45	10.0	8.0	3.0
	Pinus massoniana	2.80	40.0	12.0	8.0
	Litsea glutinosa	5.50	15.0	6.0	8.0
4	*Litsea glutinosa*	3.50	15.0	10.0	4.0
	Macaranga tanarius	2.70	25.0	8.0	8.0
	Leucaena leucocephala	10.00	18.0	7.0	8.0
	Litsea glutinosa	4.60	28.0	6.0	10.0
5	*Litsea glutinosa*	3.10	30.0	5.0	8.0
	Microcos paniculata	2.70	35.0	3.0	4.0
	Albizia lebbeck	3.70	10.0	6.0	2.0
	Microcos paniculata	2.70	10.0	4.0	2.0
6	*Unindentified sp. (Dead)*	2.00	10.0	8.0	4.0
	Litsea glutinosa	3.50	20.0	10.0	1.0
	Macaranga tanarius	1.70	12.0	10.0	5.0
	Leucaena leucocephala	2.50	10.0	8.0	4.0
7	*Leucaena leucocephala*	2.70	8.0	9.0	3.0
	Microcos paniculata	2.00	23.0	8.0	8.0
	Microcos paniculata	4.60	25.0	10.0	6.0
	Microcos paniculata	1.40	15.0	10.0	6.0
8	*Microcos paniculata*	5.70	20.0	7.0	6.0
	Leucaena leucocephala	4.00	10.0	8.0	6.0
	Microcos paniculata	3.40	12.0	10.0	6.0
	Microcos paniculata	7.00	15.0	8.0	8.0
9	*Microcos paniculata*	2.80	18.0	8.0	8.0
	Michelia alba	6.20	30.0	10.0	8.0
	Macaranga tanarius	4.00	10.0	7.0	8.0
	Dimocarpus longnan	4.50	12.0	8.0	7.0
10	*Psidium guajava*	2.60	12.0	6.0	3.0
	Microcos paniculata	1.20	20.0	6.0	5.0
	Aporusa dioica	1.40	18.0	6.0	3.0
	Litsea glutinosa	3.50	18.0	7.0	3.0
11	*Bridelia tomentosa*	4.00	22.0	6.0	5.0
	Dimocarpus longnan	2.20	40.0	12.0	6.0
	Leucaena leucocephala	8.00	14.0	6.0	3.0
	Microcos paniculata	3.50	15.0	6.0	4.0
12	*Bridelia tomentosa*	3.20	22.0	8.0	5.0
	Aporusa dioica	1.50	9.0	7.0	2.0
	Bridelia tomentosa	2.60	9.0	10.0	3.0
	Mallotus paniculatus	2.80	9.5	9.0	2.0
13	*Cratoxylum cochinchinense*	3.50	16.0	10.0	4.0
	Bridelia tomentosa	6.00	13.0	5.0	5.0
	Mallotus paniculatus	2.80	9.0	10.0	2.0
	Litsea glutinosa	5.50	13.0	11.0	3.0

Quarter No	Species Name	Distance (m)	Diameter (cm)	Height (m)	Spread (m)
14	*Bridelia tomentosa*	5.00	19.0	8.0	6.0
	Mallotus paniculatus	1.50	16.0	9.0	6.0
	Microcos paniculata	2.60	15.0	11.0	7.0
	Litsea glutinosa	3.00	9.0	8.0	2.0
15	*Mallotus paniculatus*	4.00	10.0	9.0	3.0
	Leucaena leucocephala	2.40	10.0	6.0	5.0
	Unidentified sp. (Dead)	3.50	11.0	5.0	/
	Litsea glutinosa	1.50	16.0	10.0	4.0
16	*Leucaena leucocephala*	3.00	9.0	5.0	3.0
	Leucaena leucocephala (Dead)	3.50	20.0	6.0	/
	Litsea glutinosa	4.60	11.0	8.0	4.0
	Microcos paniculata	1.50	12.0	8.0	3.0
17	*Litsea glutinosa*	4.50	10.0	9.0	4.0
	Bridelia tomentosa	4.20	Missing Data		
	Celtis chinensis	2.80	13.0	10.0	7.0
	Litsea glutinosa	3.00	11.0	7.0	2.0
18	*Pyrus sinensis*	5.00	14.0	9.0	4.0
	Leucaena leucocephala	2.50	10.0	7.0	5.0
	Litsea glutinosa	3.80	9.0	7.0	4.0
	Litsea glutinosa	3.30	8.5	7.0	3.0
19	*Psidium guajava*	7.00	11.0	9.0	4.0
	Dimocarpus longan	3.00	9.0	6.0	3.0
	Mangifera indica	4.00	18.0	10.0	4.0
	Mangifera indica	4.00	22.0	10.0	5.0
20	*Litsea glutinosa*	7.00	9.5	8.0	3.0
	Microcos paniculata	1.50	10.0	8.0	3.0
	Microcos paniculata	6.00	13.0	7.0	4.0
	Microcos paniculata	2.10	11.0	6.0	4.0
21	*Leucaena leucocephala*	5.00	10.0	6.0	2.0
	Microcos paniculata	5.50	8.0	8.0	3.0
	Rhus succedanea	8.00	8.5	6.0	4.0
	Garcinia oblongifolia	2.50	15.0	9.0	4.0
	Leucaena leucocephala	17.00	11.0	8.0	4.0
	Mean	**3.70**	**15.3**	**7.8**	**4.5**
	Area	**13.68**	**m^2**		
	Density	**0.07**	**/m^2**		

Grassland/Shrubland

9.2.3.8 Shrubland and grassland covered approximately 6.9 ha within the reclamation area (see Figure 9.1), and consisted predominantly of tall grasses (>2 m tall), such as *Miscanthus* spp., and shrubs such as *Leucaena leucocephala* (a common pioneer species). This area is fairly well established but has limited ecological value, because it is an early successional stage and has low species diversity. Numerous butterfly species were observed within the shrubland area. *Leucaena leucocephala* in particular is an important food source for butterfly larvae (Table 9.5).

Table 9.5 Small Tree, Shrub Grasses recorded from the Reclamation Area

Species	Family	Species Type[1]	Status[2]	Relative abundance[3]
Acacia confusa	(Mimosaceae)	ST	E	C
Arundinaria cantorii	(Gramineae)	G	N	C
Chloris barbata	(Graminaceae)	G	E	R
Compositae spp	(Compositae)	H	N	C
Desmodium heterocarpon	(Papilionaceae)	S	N	A
Dicranopteris linearis	(Gleicheniaceae)	F	N	R
Leucaena leucocephala	(Mimosaceae)	ST	N	A
Miscanthus spp	(Gramineae)	G	N	C
Sesbania cochinchinensis	(Papilionaceae)	S	E	C

Note[1] Species Type: C, Climber; F, Fern; G, grass; H, herb; T, tree; S, shrub; ST, small tree
Note[2] Status: N, native; E, exotic.
Note[3] Relative Abundance: A, abundant; C, common; R, rare.

Garden, Orchard and *Feng Shui* Wood

9.2.3.9 Along the footpath of Victoria Road in Kong Shin Wan Tsuen is a small garden that has been cultivated by the villagers. Some common ornamental plants such as *Gardenia jasmoides, Bougainvillea glabra* and *Thuja orientalis* were recorded, and attracted many butterflies and other insects.

9.2.3.10 The boundary between the *fung shui* wood and natural woodland was difficult to determine. Plant species in the *fung shui* wood comprised native trees and cultivated species. Table 9.6 provides a list of recorded species in the *fung shui* wood, and a view of this wood can be seen in Photo 6 (Appendix 9.1).

9.2.3.11 Orchards were also located near to Kong Shin Wan Tsuen, Telegraph Bay and also in Waterfall Bay. The dominant species in these orchards were Longan, Guava, Jackfruit, Sugar-apple and Banana (Table 9.7). A 10m by 10m survey plot in the orchard of Telegraph Bay was used to assess floristic diversity and abundance with records provided in Table 9.8. The herb, *Alocasia macrorrhiza*, and Jackfruit trees, *Artocarpus heterophyllus*, dominated, with some trees well established, measuring approximately 10 m high with a diameter of up to 35 cm. All of these cultivated habitats can be recreated, and none are considered to have high ecological value.

Table 9.6 Tree and Shrub Species Recorded in the *fung shui* Wood of Telegraph Bay

Species	Family	Species Type[1]	Status[2]	Relative abundance[3]
Bambusa chungii	(Gramineae)	S	E	C
Bambusa sinospinosa	(Gramineae)	S	E	C
Bambusa ventricosa	(Gramineae)	S	E	C
Bauhinia spp	(Caesalpiniaceae)	T	N	C
Bridelia tomentosa	(Euphorbiaceae)	T	N	C
Cinnamomum camphora	(Lauraceae)	T	N	C
Celtis sinensis	(Ulmaceae)	T	N	C
Cratoxylum cochinchinense	(Hypericaceae)	T	N	C
Diospyros kaki	(Myrsinaceae)	T	E	R
Ficus benjamina	(Moraceae)	T	E	R
Ficus hirta	(Moraceae)	T	N	C
Ficus hispida	(Moraceae)	T	N	C
Ficus microcarpa	(Moraceae)	T	N	C

Species	Family	Species Type[1]	Status[2]	Relative abundance[3]
Ficus virens	(Moraceae)	T	N	C
Litsea glutinosa	(Lauraceae)	T	N	C
Litsea rotundifolia	(Lauraceae)	ST	N	C
Mallotus apelta	(Euphorbiaceae)	T	N	A
Microcos paniculata	(Tiliaceae)	T	N	A
Phyllanthus reticulatua	(Euphorbiaceae)	S	N	C
Psychotria rubra	(Rubiaceae)	S	N	C
Sapium discolor	(Euphorbiaceae)	T	N	C
Sterculia lanceolata	(Sterculiaceae)	T	N	C
Sterculia nobilis	(Sterculiaceae)	T	N	C
Tetradium glabrifolium	(Rutaceae)	T	N	C
Ulmus parvifolia	(Ulmaceae)	ST	E	R

Note[1] Species Type: C, Climber; F, Fern; G, grass; H, herb; T, tree; S, shrub; ST, small tree
Note[2] Status: N, native; E, exotic.
Note[3] Relative Abundance: A, abundant; C, common; R, rare.

Table 9.7 Fruit and Other Cultivated Plants Recorded at Telegraph Bay and Waterfall Bay

Common Name	Latin Name	Found at Telegraph Bay	Found at Water-fall Bay
Banana	*Musa paradisiaca*		+
Bouganvillea	*Bouganinvillea glabra*	++	
Cape jasmine	*Gardenia jasminoides*	++	
Chinese banyan	*Ficus microcarpa*	+	++
Chinese privet	*Ligustrum sinense*	++	
Chinese wampee	*Clausena lansium*	+	++
Crape Myrtle	*Lagerstroemia indica*	+	+
Guava	*Psidium guajava*	+++	+++
Indian-rubber Tree	*Ficus elastica*	+	
Jackfruit	*Artocarpus heterophyllus*	+++	
Lantana	*Lantana camara*	++	+
Litchi	*Litchi chinensis*	++	
Longan	*Euphoria longan*	++	+++
Loquat	*Eriobotrya japonica*	+	
Mango	*Mangifera indica*		+
Mock lime	*Aglaia odorata*	+	
Oriental arbor-vitae	*Thuja orientalis*	+	
Papaya	*Carica papaya*	+	+
Pear	*Pyrus sinensis*	+	
Pummelo	*Citrus maxima*	+	++
Rose-apple	*Syzygium jambos*	+	+
Sugar-apple	*Annona squamosa*	+++	
White jade orchid tree	*Michelia alba*	++	+
Yellow cow wood	*Cratoxylum cochinchinense*	++	++
White mulberry	*Morus alba*	+	

Note: +++, very common; ++, common; +, present.

Table 9.8 Plant Species Recorded from a 10 x 10m Survey Plot in the Orchard at Telegraph Bay

Species Name	Quantity	Plant Form	Average Diameter (cm)	Average Height (m)	Average Spread (m)
Alocasia macrorrhiza	30	Herb	4	1	0.5-1
Artocarpus heterophyllus	4	Tree	30	15	7
Ficus hirita	2	Shrub	4	3	2
Litchi chinensis	2	Small Tree	13	8	5
Litsea glutinosa	2	Shrub	4	3	2
Macaranga tanarius	1	Shrub	2	1.8	1
Microcos paniculata	1	Shrub	2	2	1.5
Psychotria rubra	2	Shrub	2	1	1
Clausena lansium	3	Shrub	15	6	8
Phyllanthus reticulatus	2	Shrub	2	1	0.5

Stream Courses and Waterbodies

9.2.3.12 There are two natural streams and associated tributaries within the study site. One stream (referred to hereafter as the 'northern stream') is located at the northern part of the area, and flows from Victoria Road, through the valley and into Kong Shin Wan Tsuen. The upper part of this stream has a high gradient, flowing in a series of waterfalls and riffles over a boulder substrate and has dense riparian vegetation (Photo 7; Appendix 9.1). Stream width is between three and five metres. This natural section of the watercourse has a relatively high ecological value. Further downstream and near to the village, the stream has a lower gradient and has been culverted (Photo 8; Appendix 9.1). At the end of the stream, lagoons have formed on the reclamation area (Photo 9; Appendix 9.1).

9.2.3.13 Samples of benthic macroinvertebrates were collected from the upper, middle and lower parts of the northernstream course and labelled A, B and C respectively (Figure 9.1). In total 99 individuals and eight taxa of stream fauna were recorded. The fauna consisted mainly of midge larvae (Orthocladinae), Crustacea, Mollusca and Annelida (Table 9.9; Appendix 9.3) all pollution tolerant species. Species diversity was low and declined slightly from the upstream sampling point to the lower sampling point. The marine species *Ligia exotia* and *Namalycastis aibiuma* were found in the northern stream, indicating that the stream is brackish. Water samples collected at the northern part of the north stream on the 18th August 1998, showed that salinity levels were 2 ‰ Typical stream insect larvae, such as mayflies and caddisflies cannot tolerate raised salinity and were absent from the stream.

9.2.3.14 Further investigations were carried out on the 14th October 1998, to determine the source of the saline contamination. Samples taken from the drainage pipe of Queen Mary Hospital (Photo 16; Appendix 9.1) and further downstream (S1 – S2 on Figure 9.1) were not saline. However, sample S3, taken at the wastewater discharge outlet of the Li Shu Fan Building (Medical School, HKU) (Photos 18 and 19, Appendix 9.1) had a salinity of 16.1 ‰ This discharge flows directly into the northern stream (Photo 20, Appendix 9.1). Further downstream at S4, the stream is joined by two tributaries, and a salinity of 5.1 ‰was recorded (Photos 21 and 22, Appendix 9.1).

9.2.3.15 A second stream was located in the southern part of the study area (and is referred to as the 'southern stream'). This stream is larger, with a width of four to eight metres (Photo 10; Appendix 9.1), and flows from Pok Fu Lam Reservoir through Pok Fu Lam village,

abandoned agricultural paddies and into Waterfall Bay. The stream receives domestic effluents from the village area. Oil has been added to the stream, possibly as a mosquito control measure (Photo 11; Appendix 9.1). At the furthest downstream location, the southern stream was observed to be polluted with organic discharges from the village. Samples of the invertebrate fauna were collected at three locations along the stream; sites D and E, and F. In total 10 invertebrate taxa, were recorded (Table 9.9). The most common taxa were again worms (Annelida) and some snails (Mollusca). Additionally, three fish species (*Gambusia affinis, Tilapia mossambica* and *Poecilia reticulata*), were found to be abundant (Table 9.9 and Photo 12, Appendix 9.1).

9.2.3.16 Neither of the streams was found to have a diverse or sensitive fauna and both are considered to have a low ecological value.

Waterbodies

9.2.3.17 Two lagoons (Photo 23, Appendix 9.1) on the reclaimed area appear to be fed by the streams, and are likely to be inundated at high tides. The dominant species in these waterbodies were the Reservoir Snail (*Melanoides tuberculata*) (Photo 24, Appendix 9.1) and the Sea Slater (*Ligia exotica*). The Night Heron (*Nycticorax nycticorax*) (Photo 23, Appendix 9.1), Chinese Pond Heron (*Ardeola bacchus*) and the Little Egret (*Egretta garzetta*) were seen feeding from these lagoons. A Black Eared Kite (*Milvus lineatus*) (Photo 25, Appendix 9.1) was also seen flying close to the lagoons. The ecological value of the lagoons is considered insignificant, however, because they are not natural and have low species diversity.

Birds and Mammals

9.2.3.18 The only mammals sighted were Pallas Squirrels (*Callosciurus erythreaus*); these are the only squirrels known to Hong Kong (Dudgeon and Corlett 1994) and are protected by the Wild Animals Protection Ordinance.

9.2.3.19 The preliminary walk-over visit, conducted on 14th July 1998, identified many bird species commonly found in Hong Kong woodlands, including Crested Bulbuls, Chinese Bulbuls, Magpie, Crested Mynah, Crow, Spotted Dove, Koel, Greater Coucal. All wild birds in Hong Kong are protected under the Wild Animals Protection Ordinance. All species observed during a survey on the 4th September 1998 are listed in Table 9.10, recorded according to three broad habitat classifications:

- Habitat 1 - mature secondary woodland;
- Habitat 2 - scrub/grassland;
- Habitat 3 - foreshore and the lagoons.

9.2.3.20 There were a small number of migrants, i.e. Yellow Wagtail and White Wagtail, seen in the reclamation area. There was no evidence of Little Egret or Night Heron breeding sites, and it is likely that these species were migrants or dispersing birds from breeding grounds elsewhere in the region.

Table 9.9 Results of Stream Fauna Survey at Telegraph Bay

		Semi-Quantitative Data (by Kick Sampling)						Qualitative Data (by Aquatic Net and Sighting)					
Faunal Group	**Taxa**	**Northern Stream**			**Southern Stream**			**Northern Stream**			**Southern Stream**		
	Sampling Location	**A**	**B**	**C**	**D**	**E**	**F**	**A**	**B**	**C**	**D**	**E**	**F**
Fish	*Gambusia affinis*				12	5	8				+++	+++	+++
	Tilapia mossambica									++	+++		
	Poecilia reticulata				6	3	10				+++	+++	+++
Crustacea	c.f. *Hemigrapsus sanguineus*	1	2	2				+	++	++			
	Ligia exotica							+++	++	+++			
Mollusca	*Radix swinhoei*				21	14	3						
	Gyraulus sp.				12	2	3						
	Melanoides tuberculata		5	36			3						
Annelida	*Namalycastis aibiuma*	21	4	1				+++	+	+			
	Tubifex spp.				28	3					++	++	
	Limnodrilus spp.				6	1					++	++	
	Hellobdella stagnalis				9	2					+	+	
	Glossiphonia weberi				16	5					+	+	
	Barbronia weberi				2						+		
Insecta	Orthorcladinae	16	4		13	7	5	++	+		++	++	++
	Tanipodinae	4			2	3	1	+	+		+	+	+
	Psychodidae c.f. *Pericoma* sp.	2											
	Stratiomyidae c.f. *Stratiomys* sp.	1											

Table 9.10 Bird Species Observed at Telegraph Bay, including numbers and Habitat Classification

Species	Scientific Name	Habitat classification	Numbers/notes
Night Heron	*Nycticorax nycticorax*	3	2 immature birds
Chinese Pond Heron	*Ardeola bacchus*	1	1
Little Egret	*Egretta garzetta*	3	3
Black-eared Kite	*Milvas lineatus*	1,2,3	1
Hawk sp.	*Accipiter* sp.	2	1 carrying food
Common Sandpiper	*Actitis hypoleucos*	3	1
Spotted Dove	*Streptopelia chinensis*	2	8
Greater Coucal	*Centropus sinensis*	2	2
Tree Sparrow	*Passer montanus*	1	2
Yellow Wagtail	*Motacilla flava*	2	6
White Wagtail	*Motacilla alba*	3	1
Crested Bulbul	*Pycnonotus jocosus*	1, 2	3
Chinese Bulbul	*Pycnonotus sinensis*	2	3
Magpie Robin	*Copsychus saularis*	1, 2	2
Blue Whistling Thrush	*Myiophonus caeruleus*	1	1
Yellow-bellied Prinia	*Prinia flaviventris*	2	7
Common Trilorbird	*Orthotomus sutorius*	1, 2	4
Black-faced Laughingthrush	*Garrulax perspicillatus*	1, 2	6
Japanese White-eye	*Zosterops japonica*	1, 2	6
Magpie	*Pica pica*	1, 2	3
Black-necked Starling	*Sturnus nigricollis*	1, 2	2
Crested Myna	*Acridotheres crisatellus*	1, 2	2
White-backed Munia	*Lonchura striata*	2	4

Dragonflies

9.2.3.21 Six species of dragonflies were recorded at the two streams (Table 9.11). These are all widespread and common in Hong Kong (Wilson 1995). Photographs of two of the species can be seen in Appendix 9.1; Photo 13, *Trithemis aurora*, and Photo 14, *Pantala flavescens*.

Table 9.11 Dragonflies Recorded at Various Habitats within the Study Area at Telegraph Bay and Waterfall Bay

Sub-Family	Species
Libellulinae	*Orthetrum glaucum*
Libellulinae	*Orthetrum pruinosum neglectum*
Libellulinae	*Orthetrum triangulare melania*
Trameinae	*Pantala flavescens*
Trithemistinae	*Trithemis aurora*
Trithemistinae	*Trithemis festiva*

Butterflies

9.2.3.22 Butterflies were observed in various habitats, including woodland, village, garden and grassland within the study area. A total of 17 species was recorded (Table 9.12). All are common in Hong Kong (Johnston 1980). The species and habitat diversity of the area

provides suitable adult and larval habitats for a range of butterfly species. There are also a variety of trees that provide food for the larvae of butterflies, these include *Bridelia monoica, Celtis sinensis, Cratoxylum ligustrinum, Leucaena leucocephala, Litsea glutinosa, Microcos paniculata, Musa paradisiaca* and *Strophanthus divaricatus* (Johnston 1980).

Table 9.12 Butterflies Recorded at Various Habitats within the Study Area at Telegraph Bay

No	Family	Species	Status
1	Danaidae	*Danaus genutia*	Very common
2	Danaidae	*Euploea midamus*	Very common
3	Danaidae	*Ideopsis similis*	Very common
4	Hesperiidae	*Astictopterus jama*	Common
5	Hesperiidae	*Odontoptilum angulatum*	Common
6	Lycaenidae	*Acytolepis puspa*	Common
7	Lycaenidae	*Chilades lajus*	Very common
8	Papilionidae	*Papilio polytes*	Very common
9	Nymphalidae	*Argyreus hyperbius*	Very common
10	Nymphalidae	*Cupha erymanhis*	Very common
11	Nymphalidae	*Hypalimnas bolina*	Common
12	Nymphalidae	*Rohana parisatis*	Common
13	Pieridae	*Cepora nerissa*	Common
14	Pieridae	*Catopsila pomona*	Common
15	Pieridae	*Artogeia canidia*	Common
16	Satyridae	*Mycalesis mineus*	Very common
17	Satyridae	*Lethe confusa*	Common

9.2.4 Description of Baseline Marine Intertidal Survey

9.2.2.1 The shoreline of Telegraph Bay is formed by approximately 250 metres of reclaimed land. To the north of the reclamation area is the natural coastline of Telegraph Bay, and to the south is the natural shoreline of Waterfall Bay.

9.2.2.2 Site visits were made during August 1998 and inter-tidal surveys conducted to identify the marine fauna and flora present. A single transect was laid from high to low shore at Telegraph Bay (10 m long transect), at the artificial shoreline (8 m long transect) and at Waterfall Bay (6 m long transect). Every two metres, all the fauna/flora within a $0.25m^2$ quadrat was counted and identified to species level. Abundance categories were used for numbers of individuals and an estimate made of percentage cover. Photo 4 (Appendix 9.2) shows the zonation pattern of the rocky shoreline. Table 9.13 shows the abundance scale used during the survey.

Table 9.13 Abundance Categories used for Inter-tidal Fauna Surveys at Telegraph Bay

Description	Symbol	Quantity
Abundant	(A)	More than 30 per quadrat
Common	(C)	21-30 per quadrat
Frequent	(F)	11-20 per quadrat
Occasional	(O)	1 – 10 per quadrat
Percentage cover	(P)	% of quadrat covered

Natural Shoreline at Telegraph Bay

9.2.2.3 The natural shoreline to the north of the reclaimed area of Telegraph Bay is composed mainly of steep cliffs and large boulders with wave-cut rock platforms and rockpools. There are also some small coves, with a shore of medium-sized pebbles. Table 9.14 shows the abundance of inter-tidal marine organisms. Photo 1 in Appendix 9.2 shows a profile of the coastline, and Figure 1 in Appendix 9.3 shows the actual abundance of the species observed.

9.2.2.4 The most common species observed on the upper shore were periwinkles *Nodilittorina trochoides* and *N. vidua*, which are common around Hong Kong. Other species seen abundantly, at lower stations on the transect, were the stalked barnacle (*Capitulum mitella*) Chiton (*Acanthopluera japonica*) and acmeid limpet *Pastelloida saccharina* (Figure 1, Appendix 9.3).

Table 9.14 Abundance Categories of Inter-tidal Species along the Transect at the Natural Rocky Shoreline at Telegraph Bay (North)

Intertidal Fauna	Quadrat 1 (0 m)	Quadrat 2 (2 m)	Quadrat 3 (4 m)	Quadrat 4 (6 m)	Quadrat 5 (8 m)	Quadrat 6 (10 m)	Average abundance /0.25m^2
Nodilittorina trochoides	C						3.3
Nodilittorina vidua	C						4.1
Capitulum mitella		A					10
Acanthopleura japonica			O	O	A		8.6
Patelloida saccharina			F	A	A		21.5
Tetraclita squamosa				O			0.5
Perna viridis						F	1.8
Unidentified algae						10%	N/A
Porphyra suborbiculata						2.5%	N/A

Artificial Shoreline of Telegraph Bay

9.2.2.5 The artificial shoreline forms the sea wall for the reclamation area and is located between the two natural shorelines within the project site area. The sea wall was constructed approximately ten years ago and is composed of large granite boulders. The results of the survey show that in comparison with the natural shoreline, species diversity was low and abundance of the flora and fauna was also relatively low (Table 9.15 and Figure 2, Appendix 9.3). The only epifaunal species seen at this location were limpets (*Patelloida saccharina*) and barnacles (*Tetraclita squamosa*) as well as encrusting coralline algae. Photo 2 (Appendix 9.2) shows a view from Telegraph Bay natural shoreline, across to the reclaimed shoreline, with Wah Fu in the background.

Table 9.15 Abundance of Intertidal Fauna along the Transect laid for the Reclamation Sea Wall

Intertidal fauna	Quadrat 1 (0 m)	Quadrat 2 (2 m)	Quadrat 3 (4 m)	Quadrat 4 (6 m)	Quadrat 5 (8 m)	Average abundance /0.25m^2
Patelloida saccharina			A			8.2
Tetraclita squamosa			A			9.6
Family Acmeidae					O	0.2
Porphyra suborbiculata					10%	N/A
Lithophyllum - Corallina				40%	15%	N/A

Natural Shoreline at Waterfall Bay

9.2.2.6 At Waterfall Bay, the shoreline was similar to that of Telegraph Bay, although the horizontal inter-tidal zone was less extensive and the cliff face steeper. Fewer quadrats were taken from this area because of accessibility. However, species diversity and abundance were similar to those in Telegraph Bay. Stalked barnacles *(Capitulum mitella)*, acmeid limpets (*Patelloida saccharina*) and barnacles (*Tetraclita squamosa*) were the most abundant species observed (Table 9.16 and Figure 9.3, Appendix 9.3). Photo 3 (Appendix 9.2) provides a view of the natural coastline at Waterfall Bay.

Table 9.16 Abundance of Intertidal Fauna along the Transect at Waterfall Bay

Intertidal fauna	Quadrat 1 (0 m)	Quadrat S2 (2 m)	Quadrat 3 (4 m)	Quadrat 4 (6 m)	Average abundance / 0.25m^2
Nodilittorina trochoides		O			0.25
Nodilittorina vidua		F			1.5
Capitulum mitella		A			15.75
Acanthopleura japonica			O	F	3.5
Patelloida saccharina			A	C	23.5
Tetraclita squamosa		O	A	O	19.5
Perna viridis				F	3
Lithophyllum – Corallina				P (15%)	N/A
Corallina pilulifera				P (20%)	N/A

9.3 Assessment of Ecological Impacts

9.3.1 Introduction

9.3.1.1 Ecological impacts from the proposed works will be caused by the residential development and vehicular access, slope stabilisation, construction of the access road (which may involve reclamation), landscaping and dredging for a submarine outfall. Additionally, the development will increase the level of disturbance to the surrounding habitats. A summary of the affected habitats is presented in Table 9.17.

9.3.2 Criteria and Methodology

9.3.2.1 Impact significance is determined by the magnitude and scale of an impact and the asserted importance of the species or habitat(s) likely to be affected. The criteria for assessing the impacts includes:

- naturalness and age of the woodland;
- size
- rarity of habitats and species;
- species diversity;
- re-creatability;
- fragmentation;
- species richness;
- potential value; and
- ecological linkage between the Study Area and the surrounding habitats.

9.3.2.2 Significance of impacts is rated in accordance with the guidance of the Technical Memorandum. These will be rated as minor, moderate or severe as described below.

9.3.2.3 Impacts to species or groups assessed as **'minor'** are predicted to cause a slight, and/or short-term reduction in the local population numbers or geographic distribution of a species or group, but the species or group is predicted to recover from the perturbation with no long-term adverse impacts. Habitat impacts are considered 'minor' when no species of conservation or regulatory concern are found, and when the habitat in question is widely distributed locally.

9.3.2.4 Impacts to species or groups assessed as **'moderate'** are predicted to cause local reduction of species or group population numbers. The reductions would be long-term, and probably not recoverable, but the species or groups in question are considered widely distributed or common, and abundant on a local, regional, or global scale. Habitat impacts are judged 'moderate' when the habitat in question is of limited local or regional distribution or declining in extent, and when the potential for the habitat to support fauna and flora is considered of conservation or regulatory importance.

9.3.2.5 Impacts to species or groups are assessed as **'severe'** when they are judged to adversely affect species or groups which are of conservation or regulatory concern locally, regionally, or globally due to scarcity or declining population or distribution trends. Impacts to habitats are considered 'severe' when the habitats are found to be limited or declining in geographic distribution, contain species of regulatory or conservation concern, or are generally considered by the scientific community to be of local, regional or global importance to the support of wild fauna.

9.3.2.6 If ecological impacts are found to be significant (i.e. moderate to severe) mitigation needs to be carried out in accordance with the Technical Memorandum. The policy for mitigating significant impacts on habitats and wildlife is to pursue impact avoidance, impact minimization, and impact compensation in that order of priority. Impact avoidance typically consists of modifications to the existing project design, but may in extreme cases require abandonment of the project. Impact minimization includes any means of reducing the scope or severity of a given impact, e.g. through timing of construction works, modification in design, or ecological restoration of disturbed areas following the completion of works. Impact compensation assumes that an irreversible

impact will occur upon a given habitat or species and attempts to compensate for it elsewhere, e.g. by enhancement or creation of suitable habitat. Compensation may take place on-site or off-site.

9.3.2.7 The level of impacts has been assessed in relation to the conservation value and importance of the habitats and species present within the study area. These are discussed below. The area of each habitat affected has been evaluated by overlaying the development design onto the mapped results of the habitat survey. This is shown in Figure 9.2. Impacts have been assessed with respect to the criteria listed in Appendix 8 of the Technical Memorandum on Environmental Impact Assessment.

9.3.3 Site Assessment

9.3.3.1 Naturalness and Age of Habitats

9.3.3.1.1 The secondary woodland within the development site is thought to be around 30 years old. Primary woodland is scarce in Hong Kong because of extensive logging and hill fires, and very few forest areas are more than 40 years old. The remaining fragments of primary woodland are mainly at high altitudes (greater than 500 m), with the exception of some Fung Shui wood (Dudgeon and Corlett 1994). Species composition of the woodland on the site reflects additional human influence with the presence of several exotic trees, such as *Leucaena leucocephala* and fruit species, which are the dominant species in some areas of the woodland. However, although not fully mature, the woodland is regarded as natural.

9.3.3.1.2 Woodland is developing on the reclamation area. However this habitat is less than 10 years old and has a low naturalness value. Shrubland and grassland on the reclamation site are immature but have a moderately natural species composition.

9.3.3.2 Size

9.3.3.2.1 There are approximately 31 ha of mature secondary woodland in the surveyed area at Telegraph Bay and Waterfall Bay. This is considered to be a moderately large area of continuous woodland habitat. Young woodland on the reclamation area occupies an area of approximately 10.2 ha, and has value only because it adjoins the existing mature secondary woodland. Its potential value is discussed in Section 9.3.3.7. Shrubland and grassland together occupy less than 7 ha, a relatively small area. They are considered to have value as an ecological resource largely because of their continuity with the other habitats present.

9.3.3.3 Species Richness

9.3.3.3.1 There were more than 80 plant species recorded at the study site, which is typical in other woodland and shrubland communities of Hong Kong. Whilst vegetation along the streams was dense in places it consisted mainly of species found in the adjacent woodland. However, at Telegraph Bay, the Water Banyan (*Cleistocalyx operculata*) was found, only along the northern stream bank. At Waterfall Bay, the southern stream passes mainly through abandoned agricultural land and existing orchards. Riparian vegetation species diversity was low with cultivated fruit trees being the dominant species.

9.3.3.3.2 The species richness of the fauna in Telegraph Bay is moderate. Dragonfly diversity was low although abundance was high, particularly along the stream course and adjacent to

the abandoned agricultural land. The diversity of butterfly species was high, probably because of the diversity of habitats, providing both larval and adult food resources. Macroinvertebrate diversity of in the northern and southern streams was very low compared, for example, with the Pokfulam Reservoir Stream located nearby (Shea 1993),

9.3.3.3.3 The shoreline is mainly rocky and upper shore plants are similar to those observed in the woodland. The only typical shore plant identified was *Clerodendrum inerme*, which was commonly seen at Telegraph Bay.

9.3.3.4 Rarity

9.3.3.4.1 Following research by Ashworth *et al.* (1993), the percentage cover of woodlands and shrubland in the entire territory were estimated as follows:

- tall shrub with grass – 4270ha (4.0% of Hong Kong land);
- tall shrubland – 7933 ha (7.4% of Hong Kong land); and
- woodland – 8630 ha (8.0% of Hong Kong land).

9.3.3.4.2 Hong Kong woodlands are distributed around Tai Tam Country Park and at the lower altitude around Victoria Peak, Mt. Cameron and Mt. Nicolson. Woodland is not considered a rare habitat in terms of percentage cover. There is, however, a large portion of Hong Kong woodland that lies outside Country Parks and therefore subject to increasing pressure from development. The shrub and grass habitats are common on disturbed land throughout Hong Kong.

9.3.3.4.3 There were no rare species discovered during the survey but there were two protected species of Amaranthaceae; *Lagerstroemia indica* and *L. speciosa.* It appears that these have been cultivated by the local villagers in Telegraph Bay and Waterfall Bay. These species are not located in the development area and therefore will not be affected (Figure 9.1).

9.3.3.4.4 All wild bird species are protected in Hong Kong and those that were seen at the study site were all common to the habitats identified. Egrets were seen feeding at the study site but there were no signs of an egretry. Squirrels are also protected species in Hong Kong and they were commonly seen on the site.

9.3.3.5 Re-creatability

9.3.3.5.1 Most habitats identified during this study can be re-created as they are all at an early successional stage. The exception to this is the mature secondary woodland at Telegraph Bay and Waterfall Bay, where an estimated 1 ha, in total, will be lost.

9.3.3.6 Fragmentation

9.3.3.6.1 The value of terrestrial habitats is typically greater when they are not fragmented and also increases with the area:edge ratio, and decreases as the length of the edges rise. The mature secondary woodland at the proposed development site is not fragmented. The presence of the village within the woodland at Telegraph Bay is functional fragmentation and increases the amount of 'edge'. The habitats on the reclaimed area exist as a continuous block, which results in their value not being diminished.

9.3.3.7 Potential value

9.3.3.7.1 The habitats in the area all have potential ecological value. Typical terrestrial succession will result in most habitats becoming woodland over a period of time. This is shown to be occurring at this site, with the colonisation of the reclamation area by pioneer tree species, shrubland and grasses that will eventually be succeeded by species typical of mature woodland.

9.3.3.7.2 In the absence of further development, the mature secondary woodland habitat at the site will continue to develop, but is already impacted by the presence of alien species and some disturbance from the adjacent developments. It is therefore unlikely that this woodland will have very high conservation status in the future. The shrubland and grassland habitats will increase in value over a long period, as species diversity increases and the habitats mature. The presence of a large number of exotic species, however, means that the resulting woodland/shrubland habitats will have relatively low ecological value in comparison with areas where there are no alien species. The very young age of habitats in the majority of the development area also means that it will take many years for this limited value to be realised.

9.3.3.7.3 Both streams in the development site are highly impacted by discharges from adjacent developments, and currently have very limited ecological value. In the absence of measures to improve water quality in these streams, it is unlikely that they will achieve a higher conservation status in the future.

9.3.3.8 Nursery/breeding grounds

9.3.3.8.1 The area is not considered to be an important nursery/breeding ground for any species.

9.3.3.9 Ecological Linkage

9.3.3.9.1 There are no ecologically important areas in the vicinity of the development that will be affected by this proposal. Pokfulam Country Park is the nearest area of semi-natural habitat and is already separated from the development site by existing roads and development.

9.3.4 Identification of Potential Impacts - Construction Phase

9.3.4.1 Loss of Habitats

Terrestrial

9.3.4.1.1 Clearance of woodland for road access to the housing development will permanently remove an estimated 1 ha of mature and moderately species rich woodland and 1 ha of shrubland together with associated species. This is considered to be a moderate impact that can be compensated for by creation of new woodland habitat. The re-alignment of the southern stream to make way for the access road to the development site will also involve a permanent habitat loss of approximately 20 metres of the lower part of the stream, and riparian habitat will be lost throughout the realigned stretch. Owing to the existing poor quality of the stream, the impact is considered to be minor, and relates particularly to changes in habitat caused by fluvial geomorphological processes that will arise from reducing the length of the stream.

Reclamation Area

9.3.4.1.2 The whole of the reclaimed area will be subjected to surcharging, covering an area of approximately 21 ha. This will result in the permanent loss of the young woodland, grassland and shrubland habitats, which have developed during the last ten years. Additionally, the two lagoons, which provide a feeding location for birds that are either migratory or nesting at nearby sites, will also be permanently lost. No rare or protected species have been identified within the reclaimed region and species diversity was low. This area, however, is considered of little ecological importance as it is not natural and is vegetated with pioneer species. Impacts are, therefore, considered likely to be minor.

Marine

9.3.4.1.3 Construction of the access road will result in a loss of approximately 150 m of intertidal area at Waterfall Bay. This area is of low ecological value because it is species poor. This habitat loss is therefore considered to be a minor impact. Despite a small loss of sub-tidal habitat, the impacts of quay construction on the marine environment are considered to be minor, as species diversity and habitat type in the area are not considered to be of conservation importance.

Table 9.17 Summary of the impacts in relation to the conservation value and importance of the habitats and species within the study area.

Location	Habitat	Area (ha)	Area Lost from Development	Area Lost from Road Construction	Naturalness/Age (years)	Rarity	Species Richness	Rare[1] or Protected Species[2]
Telegraph Bay	Secondary Woodland	18	None	0.5	Natural/~30	None	Moderate	*Lagerstroemia indica*
Waterfall Bay	Secondary Woodland	13	None	0.5	Natural/~30	None	Moderate	*Lagerstroemia speciosa*
	Shrubland	1	None	1	Natural/~10	None	Moderate	None
Reclamation Area	Young Woodland	10.2	10.2	None	Semi-natural/<10 years	None	Low	None
	Shrubland	3.3	3.3	None	Semi-natural/<10 years	None	Low	None
	Grassland	3.6	3.6	None	Semi-natural/<10 years	None	Low	None
Waterfall Bay	Stream course	600 (metres)	None	20 (metres)	Natural/unknown	None	Low	None
Waterfall Bay	Amenity grassland (Golf Driving Range)	Not assessed	3.3	<1	Artificial	Not assessed	Not assessed	None

Note[1] Protected species *Lagerstroemia indica* was discovered by Telegraph Bay Village and *Lagerstroemia speciosa* along the roadside of Wah King Street in Waterfall Bay.
Note[2] All wild birds and squirrels (such as *Callosciurus erythreaus*) are protected wild life in Hong Kong.

9.3.4.2 Noise, Disturbance and Dust

Terrestrial

9.3.4.2.1 Terrestrial habitats are susceptible to air pollution in the form of construction site dust, which may cause coating of vegetation and subsequent damage to photosynthetic apparatus. This would result in a deterioration of vegetative growth, which in turn may lead to a reduction of sensitive faunal species. During construction, potential noise impacts from general site activities, increased human access and traffic flows may also cause disturbance to birds and mammals in the adjacent woodlands. At this site, these impacts are considered to be minor because they will be short-term and reversible.

Marine

9.3.4.2.2 The construction of a quay will be the first activity to be carried out during the construction phase. This will involve some piling works at a section of the shoreline of the reclaimed land area. These works will be of short duration and have localised effects. However, noise-sensitive species may move to other areas during the construction phase, resulting in a temporary ecological imbalance. When construction is complete, noise-sensitive species are likely to return to the area. The impact from noise, therefore, is regarded as minor.

9.3.4.2.3 Construction dust settling onto the coastal or stream waters could cause damage to the physiology of sensitive aquatic species. Mitigation measures outlined within Chapter 4 (Air Quality) to control dust generated on site will reduce the potential impacts to coastal waters from construction dust settlement. Impacts are considered to be minor.

9.3.4.3 Site Runoff and Dredging Activities

Terrestrial

9.3.4.3.1 Site runoff from access road construction at Waterfall Bay could have an impact on the stream habitats by causing increased sedimentation and consequential loss of habitat and associated species. These impacts are ranked minor as the species diversity and richness of the stream is low.

9.3.4.3.2 There will also be an increase in the quantity of sediment entering, and being deposited in the stream, both from the re-alignment works and as a result of site drainage, which are likely to have impacts on the benthic fauna. The latter effects will be of short duration as sediment will be washed out during spates.

Marine

9.3.4.3.3 Unless controlled, there is the potential for pollutants to enter coastal waters during the site development. These may arise from general site drainage, construction of the quay and from dredging for construction of the submarine outfall. Suspended solids and settled sediments can affect marine ecology by increasing turbidity, decreasing oxygen levels and introducing contaminants such as oil, grease and solvents. Sediment within site runoff can also potentially damage sessile organisms, and will cause mobile sensitive species to move away from the area.

9.3.4.3.4 An estimated volume of $<4000m^3$ of marine muds will be dredged for the construction of

the submarine outfall. Sedimentation is natural process which occurs within a subtidal environment and most organisms have mechanisms which avoid detrimental affects. Tolerance of sediment does vary from species to species, however, and a moderate increase in sedimentation may benefit some species while harming others. The impacts can indirectly or directly effect marine organisms. Direct impacts include gill clogging, abrasion and smothering of sessile organisms. Indirect impacts include reduction of light, food sources and prevention of larval settlement. Mobile species, such as fish are able to avoid sedimentation impacts by swimming to clearer waters.

9.3.4.3.5 In view of the small volume of materials to be removed, the constant change in sediment deposition within a subtidal environment and with the mitigation measures outlined in Chapter 7 in place, the dredging activity is not expected to have an adverse impact on the marine environment.

9.3.4.4 Summary of Construction Impacts

9.3.4.4.1 A summary of the potential impacts on the terrestrial and marine habitats from the construction works, is presented in Table 9.18.

Table 9.18 Summary of Construction-Stage Ecological Impacts of the Proposed Development Site

Activity	**Receiver**	**Potential Impacts**	**Severity**	**Likely need for ecological mitigation[1]**
Marine Ecology				
Access road construction	Intertidal zone at Waterfall Bay and Telegraph Bay	Loss of habitats	Minor	Ecological mitigation measures are not required.
Site run-off, sewage discharge and dredging activities	Surrounding coastal waters	Deterioration in water quality	Minor	Standard housekeeping measures will apply on site. Dredging will be conducted with a closed grab and silt curtain. No ecological mitigation measures are required.
Noise and disturbance	Adjacent marine habitats and dependent species	Disturbance of sensitive species	Minor	No ecological mitigation required.

[1] Refer to Section 9.4 for a full description of proposed mitigation measures.

Activity	**Receiver**	**Potential Impacts**	**Severity**	**Likely need for ecological mitigation[1]**
Dust	Adjacent marine habitats and dependent species	Decreased water quality and affect sensitive species	Minor	Standard housekeeping measures will apply. No ecological mitigation is required.
Terrestrial Ecology				
Housing development	Habitats in the reclamation area	Habitat loss	Minor	None
Access road construction	Woodland/ Shrubland/ at Waterfall Bay and Telegraph Bay	Loss of habitats	Moderate	Compensatory tree planting and phased removal of woodland areas.
Access road construction	Stream	Loss of habitats	Minor	The use of gabions and mimicking of existing stream course.
Sedimentation from construction	Waterfall Bay Stream	Loss of habitat, dependent species and degeneration of water quality	Minor	Prevention of sediments being released into stream during re-alignment.
Dust	Adjacent natural habitats	Inhibition of vegetation growth	Minor	Standard housekeeping will apply on site. Introduction of dust tolerant species along the perimeter of the site.
Noise and disturbance	Animals in adjacent habitats	Disturbance to sensitive species	Minor	Introduction of dust tolerant species and hoarding along the perimeter of the site. Access routes into woodlands should be the least intrusive.

9.3.5 Potential Impacts - Operational Phase

9.3.5.1 Disturbance and Noise

Terrestrial and Marine

9.3.5.1.1 Once the development has been completed, disturbance to the remaining woodland flora and fauna will be of concern. Disturbance may arise as a result of local traffic and from residents of the housing development. Other potential impacts include littering, increased

surface water runoff, the introduction of dogs and other alien species, and hill fires. The impacts will range from minor to major in the absence of mitigation measures.

9.3.5.1.2 It is not anticipated that there will be any noise or other forms of disturbance that will impact the marine environment during the operational phase of the development.

9.3.5.2 Pollution, Wastewater and Discharges

Terrestrial and Marine

9.3.5.2.1 The additional sewage output from the housing development will increase the amount of treated sewage within the coastal region. The sewage impact assessment (refer to Chapters 6 and 7) has shown that the sewage plume is very small (modelling has shown the Total Inorganic Nitrogen plume to be 96 m long, 210 m wide and 7.34 m deep). Direction of flow will be determined by currents at different times of year. Species diversity within the immediate vicinity is low and this impact is considered to be minor. Given that the local marine environment is not thought likely to be affected by the development, it is extremely unlikely that the known coral communities at Lamma or Green Islands, which are considerably further away, could suffer any impact.

9.3.5.3 Summary of Operational Impacts

9.3.5.3.1 A summary of the potential impacts on terrestrial and marine habitats during the operational stage is presented in Table 9.19.

Table 9.19 Summary of Operational Stage Ecological Impacts of the Proposed Development Site

Activity	**Receiver**	**Potential Impacts**	**Severity**	**Likely need for ecological mitigation**[2]
Noise and disturbance	Adjacent/woodland streams and associated species	Disturbance to sensitive wildlife receivers	Minor to major	Fencing and planting of dust tolerant species.
Wastewater/ sewage discharges	Adjacent coastal regions	Pollution; damage to habitats and wildlife	Minor	Sewage discharge will be treated by chemically enhanced primary treatment.

[2] Refer to Section 9.4 for details of proposed mitigation measures.

9.4 Mitigation Measures

9.4.1 Construction Phase

9.4.1.1 Loss of Habitats

Terrestrial

- The perimeter of the development site should be regarded as a particularly sensitive area and the remaining woodland should be protected from construction activities. The boundary should be fenced, a license for tree felling should be obtained, boundary area should be kept clear of fire, and there should be no lighting of fires within the working area.

- For the construction activities, an access route to the work site should be chosen, which has the least impact to surrounding woodland habitats.

- The removal of sediments and the reformation of the new stream bank should be conducted so as to prevent the release of sediments to the stream course, which would have a detrimental effect on the existing benthic communities.

- The re-alignment of the stream should mimic the existing stream course where possible to reduce further habitat loss/impacts downstream.

- It is recommended that the clearance of the woodland be taken in phases to allow for re-colonization of the affected mobile species.

- Compensatory planting should be implemented where possible and incorporated into the landscape master plan for the site. Such planting will off-set, in part, habitat loss in the mature secondary woodland/shrubland mosaic due to access road construction. In addition to on-site areas, the reconstructed slopes associated with the highways project and the buffer zone between the housing development and proposed Route 7 (in excess of 0.6 ha) could also be planted with woodland species. In total, an estimated 2.2 ha will be available on-site for compensatory tree planting. A list of suggested species, together with locations and available areas are given in Appendix 9.6.

9.4.1.2 Dredging Activities

Marine

- Dredging activities should be kept to a minimum. Controlled dredging involving the use of a contained grab and silt curtain should be implemented to reduce the excessive spread of suspended sediment.

9.4.1.3 Noise, Disturbance and Dust

Marine and Terrestrial

- Mitigation measures to reduce the impacts of construction dust should include water spraying of working area surfaces on site and covering of spoils. The erection of

hoardings around the site would also provide an extra barrier against the construction dust impacts and would restrict movement to within the construction site.

9.4.1.3 Site Runoff and Sewage Discharge

Marine and Terrestrial

- Site runoff should be de-silted and re-used on-site where possible, or otherwise discharged into the sea in accordance with the relevant standards. Oil separation should be provided for runoff from areas with potential oil or grease contamination. Sewage should be treated on-site in a package plant and discharged into the sea in accordance with the relevant standards (Chapter 7). These measures will reduce the potential for suspended sediments, organic and other contaminants to enter the local marine environment.

- Details of the measures recommended to control runoff and sewage discharge from construction activities at the site are outlined in Chapter 7 (Water Quality).

9.4.2 Operational Phase

Terrestrial Habitats

- Fences should be erected along the roadside between the woodland and the developed area to prevent residents from accessing the remaining woodland and stream habitats and causing further loss of habitat from potential hill fires, logging or dumping of unwanted waste materials. In addition to the fencing, dust tolerant shrubs/trees could be planted to act as a buffer to the more sensitive woodland habitat.

Marine Habitats

- Chapter 7 (Water Quality) refers to mitigation measures, which have been recommended to minimise sewage/waste water impacts into the coastal waters alongside the proposed development area in accordance with recommendations made by the ProPECC PN1/94.

9.5 Residual Impacts

9.5.1 Loss of Habitat

9.5.1.1 The re-alignment of the southern stream course will involve the loss of approximately 20 m of natural stream course, which would be irreversible. The watercourse will be realigned to accommodate the new access road into the new housing development area. The residual impacts of the development on the stream are considered to be minor. There will be a small loss of intertidal and subtidal habitats due to construction of the access road. This residual impact is considered acceptable since the habitat type and species diversity are not considered to be of ecological importance.

9.6 Conclusions and Recommendations

9.6.1 Given the short duration of the assessment it has not been possible to investigate seasonal differences. Nevertheless, the following has been observed:

- The study area is a mixture of a woodland habitats, with mostly small and medium size trees, shrubland and grassland. There were also two streams, one of which is located at Telegraph Bay and the other at Waterfall Bay.

- The faunal and floral element of the habitats were not identified to be rare, but two protected species of Lythraceae, which have been cultivated by villagers have been recorded. Although egrets were seen to be feeding in the area of the intertidal marine lagoon there was no evidence of an egretry or nesting sites and therefore they were thought to be either migratory or from nearby habitats.

- The intertidal zone is largely part of the reclamation, and has a low diversity of marine flora and fauna. There are also two natural rocky shore areas to the north and south of the reclaimed area which also have a low diversity of marine flora and fauna, and no rare of protected species have been identified. There will be a small loss of intertidal and subtidal habitats due to construction of the access road. This residual impact is considered acceptable since the habitat type and species diversity are not considered to be of ecological importance.

- The shoreline is not known to have an established coral community, which could be affected by the development project. The northern waters of Lamma Island have the nearest coral communities, which are dominated by soft coral and are 2.5 km away. Another soft coral community exists at Green Island, approximately 3 km away from the proposed development site. The southern waters of Lamma island have coral communities dominated by hard coral, which are more susceptible to the effects of sediment. This location, however, is approximately 8 km from the proposed development site. None of the areas with significant coral communities are expected to be affected by the proposed works.

- The potential impacts from the proposed development at Telegraph Bay will largely result in the loss of woodland/shrubland and grassland habitats within the reclaimed area. This reclaimed area is regarded as having low ecological importance because although it has colonised naturally, there is low species diversity and the habitats represent an early successional stage that is common in Hong Kong. No mitigation measures with regard to the reclaimed area are therefore necessary. Hoarding, however, should be erected to protect the remaining secondary woodland habitats located on the adjacent slopes during the construction stage and replaced with fences and dust tolerant species during the operational stage.

- There will also be some woodland/shrubland/stream loss of habitat resulting from the proposed highway construction, which will provide access roads to the proposed housing development. The total woodland habitat loss will be 1 ha (from woodlands at Telegraph Bay and Waterfall Bay) as well as 1 ha of shrubland from Waterfall Bay.

- The removal of trees should be kept to a minimum and be phased (over time and by area) to allow existing associated fauna to recolonise. Compensatory planting should be implemented where practicable and incorporated into the landscape where possible.

Suggestions of locations, area available and species suitable for compensatory planting can be seen in Appendix 9.6 Where trees are to be removed, a tree felling licence will be required from the District Lands Officer, in accordance with WBTC No. 24/94 PELB No. 3/94.

- There will also be approximately 20 metres of stream course lost. To mitigate this impact, the stream course should be realigned to mimic the natural existing course. The use of gabions wherever possible is also recommended to reduce the likelihood of further ecological impacts on the stream environment. The removal of the soils/sediments should be undertaken in such a manner so as to minimise the release of loose deposits into the stream course.

9.7 References

Ashton, D.H (1975). Studies of litter in *Eucalyptus regnans* forest. Australian Journal of Botany 23:413-433

Binnie Consultants Ltd. (1994). Fill Management Study - Phase IV Investigation and Development of Marine Borrow Areas. Lamma Channel Underwater Ecological Survey Report, Dec 1994, for Civil Engineering Department

Binnie Consultants Ltd. (1996). Ping Chau Quantitative Survey – Final Report. Coastal Ecological Studies. September 1996.

Cottam, G. & Curtis, J.T. (1956). The use of distance measures in phytosociological sampling. *Ecology* 37:451-460.

Dudgeon, D. and Corlett, R. (1994). Hills and Streams - An Ecology of Hong Kong. Hong Kong University Press.

Fu, L.K and J.M. Jin (1992). China Plant Red Data Book – Rare and Endangered Plants Vol 1. Science Press.

Johnston, G and B (1980). This is Hong Kong Butterflies. Hong Kong: Hong Kong Government.

OAP/ERM (1998). EIA for Design and Construction of the Interchange at the Junction of Pok Fu Lam Road and Sassoon Road, for Highways Department

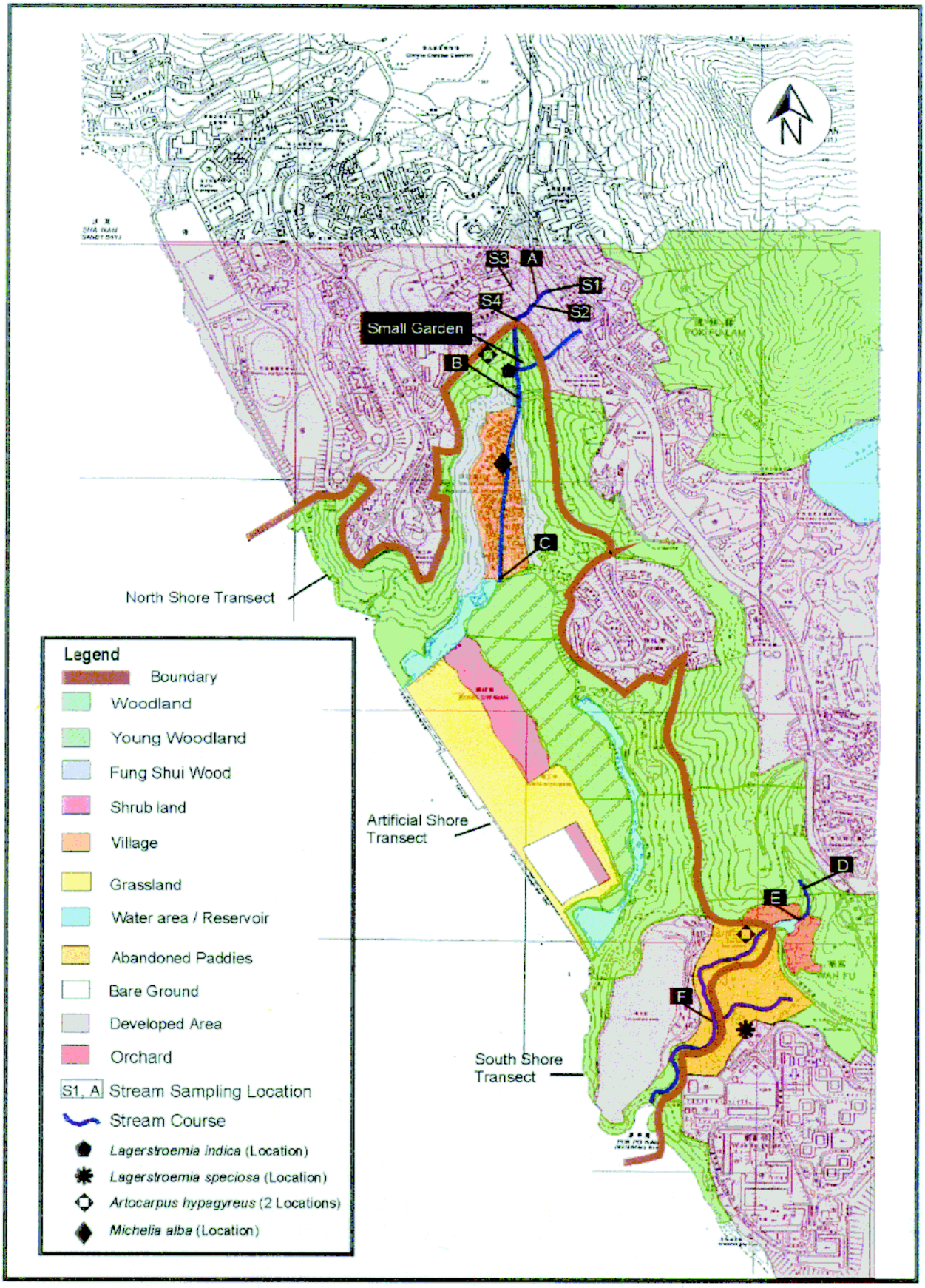
Scott, P.J.B. (1984) The Corals of Hong Kong. Hong Kong University Press, Hong Kong.

Shea, Shu-sheng (1994). Determinants of macroinvertebrate community structure on stone surfaces in Hong Kong streams. Unpublished PhD thesis, University of Hong Kong.

Hong Kong Environmental Protection Department (1998). Technical Memorandum on Environmental Impact Assessment.

Wilson, K. D. P. (1995). Hong Kong Dragonflies. Hong Kong: Urban Council.

Figures



Rev.	Description	Approved	Date

AGREEMENT NO. CE 92/97 INFRASTRUCTURAL WORKS FOR HOUSING DEVELOPMENT AT TELEGRAPH BAY - ENGINEERING FEASIBILITY STUDY

Habitat Map Showing the Proposed Development Site and Development Site and Surrounding Area

TERRITORY DEVELOPMENT DEPARTMENT, HONG KONG

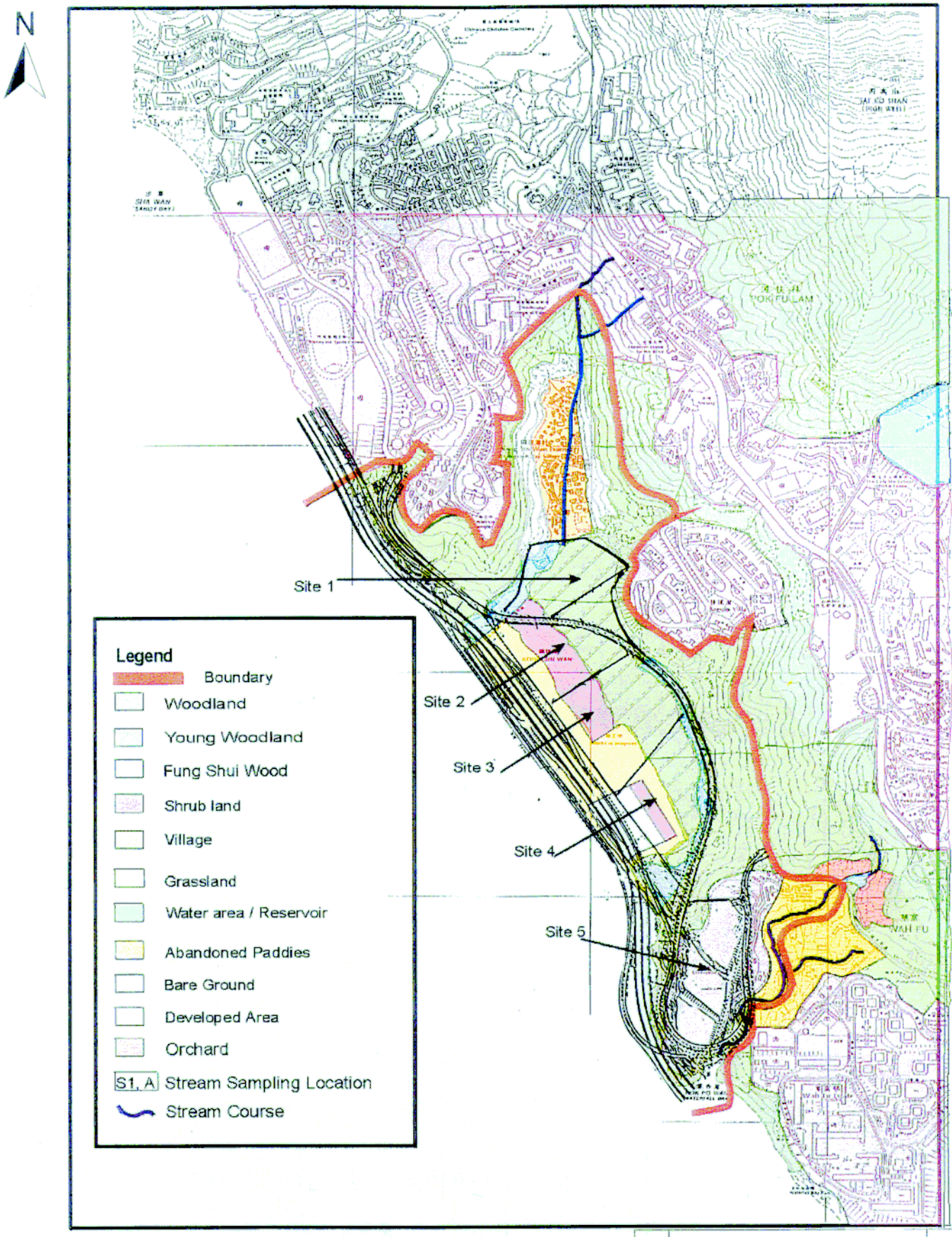
HONG KONG ISLAND AND ISLANDS DEVELOPMENT OFFICE

PYPUN / PBA JOINT VENTURE

PYPUN

PB PARSONS BRINCKERHOFF (ASIA) LTD.

Figure No. 9.1			Rev. a
Designed By		Scale NTS	
Checked By		Date Feb 99	



Rev.	Description	Approved	Date

AGREEMENT NO. CE 92/97 INFRASTRUCTURAL WORKS FOR HOUSING DEVELOPMENT AT TELEGRAPH BAY - ENGINEERING FEASIBILITY STUDY

Habitat Map Showing the Main Features of the Proposed Development Site

TERRITORY DEVELOPMENT DEPARTMENT, HONG KONG

HONG KONG ISLAND AND ISLANDS DEVELOPMENT OFFICE

PYPUN / PBA JOINT VENTURE

PYPUN

PARSONS BRINCKERHOFF (ASIA) LTD.

Figure No.	9.2		Rev.
Designed By		Scale	NTS
Checked By		Date	Feb 99