



**Agreement No. CE 62/2017 (EP)**

# **Ecological Study for Pui O, Shui Hau, Tai O and Neighbouring Areas – Feasibility Study**

## **Executive Summary**

October 2021



土木工程拓展署  
Civil Engineering and  
Development Department



## CONTENTS

<b>1.</b>	<b>INTRODUCTION</b> .....	<b>1</b>
1.1	Background to the Study .....	1
1.2	Study Scope and Study Area .....	1
1.3	Purpose of This Executive Summary .....	1
<b>2.</b>	<b>THE THREE PRIORITY SITES</b> .....	<b>2</b>
2.1	Ecological Baseline of Priority Sites.....	2
2.2	Ecological Significance of Priority Sites .....	3
2.2.1	Pui O .....	3
2.2.2	Shui Hau .....	4
2.2.3	Tai O.....	5
2.3	Prevailing Ecological Threats to Priority Sites and Existing Measures .....	5
2.4	Recommended Conservation Measures for Priority Sites .....	6
2.4.1	Summary of Proposed Conservation Measures .....	6
2.4.2	Next-step Investigations Required .....	11
2.5	The “Nature Park” Concept – A Possible Institutional Arrangement .....	13
2.5.1	The “Nature Park” Concept .....	13
2.5.2	Key Elements of the “Nature Park” .....	14
2.5.3	Need for a Suitable Authority to Manage the “Nature Park” .....	14
2.5.4	Treatment to Tai O Priority Site .....	15
2.6	Possible Mechanisms for Implementation of Recommended Conservation Measures .....	15
2.6.1	Statutory Measures .....	15
2.6.2	Legislative Amendment.....	15
2.6.3	Possible Mechanisms to deal with the Private Land Ownership Issue .....	15
2.6.4	Summary .....	16
<b>3.</b>	<b>STUDY AREA (EXCLUDING PRIORITY SITES)</b> .....	<b>18</b>
3.1	Ecological Profile of Study Area (Excluding Priority Sites) .....	18
3.1.1	Sites / Features of Conservation Importance within Study Area .....	18
3.1.2	Major Habitats .....	18
3.1.3	Previously Reported Species of Conservation Importance .....	18
3.2	Habitat Evaluation .....	21
3.3	Prioritization of Ecological Surveys and Studies for Study Area Excluding Priority Sites .....	22

## APPENDIX A PROPOSED TARGET SPECIES AND GROUPS FOR PRIORITY SITES

## 1. INTRODUCTION

### 1.1 Background to the Study

With the commencement and planning of a number of strategic infrastructure and development projects in north Lantau, the role of Lantau in Hong Kong will be further strengthened, which will also bring tremendous changes to the functions it serves. At the same time, Lantau possesses huge natural assets that need to be conserved and managed in a holistic manner for public appreciation and enjoyment. In January 2014, the Hong Kong Special Administrative Region (HKSAR) Government set up the Lantau Development Advisory Committee (LanDAC) to advise on the initiatives and specific proposals which are conducive to realising the sustainable development and conservation of Lantau from a holistic perspective.

In collaboration with the LanDAC and taking into account public's view gathered during the public engagement exercise, a Sustainable Lantau Blueprint guiding the future development and conservation for Lantau was promulgated in June 2017. The Blueprint maps out the future direction of “Development in the North, Conservation for the South” for Lantau. It states that the predominant part of Lantau, particularly in the South, would be for conservation, with sustainable leisure and recreation uses. The Blueprint also puts forward a number of conservation initiatives including conservation of various wetland habitats in Pui O, Shui Hau and Tai O.

In this connection, the **Sustainable Lantau Office (SLO) of Civil Engineering and Development Department (CEDD)**, HKSAR Government commissioned **ERM-Hong Kong, Limited (ERM)** to undertake the subject study, namely “*Ecological Study for Pui O, Shui Hau, Tai O and Neighbouring Areas – Feasibility Study*” (“the Study”) in December 2017.

### 1.2 Study Scope and Study Area

The Study Area for the Study is shown on **Figure 1.1**. It covers the three Priority Sites, i.e. Pui O, Shui Hau and Tai O, as identified in the Sustainable Lantau Blueprint, and their adjoining areas. Areas within the existing country parks, which are already under statutory protection, are not included in the Study Area.

The Study aims to:

- (a) Review the extent of existing ecological surveys for the three Priority Sites, conduct ecological surveys and assess the ecological significance and ecological threats in the three sites;
- (b) Propose feasible conservation measures for the three Priority Sites;
- (c) Conduct preliminary assessment on the ecological significance of other sites within the Study Area and the needs of conducting ecological surveys; and
- (d) Prioritise the other sites that necessitate ecological surveys and devise the implementation strategies.

### 1.3 Purpose of This Executive Summary

This *Executive Summary* is prepared to present a brief account on the important findings of the assessments, evaluation and recommendations under the Study.

## 2. THE THREE PRIORITY SITES

### 2.1 Ecological Baseline of Priority Sites

The three Priority Sites mainly comprise a network of lowland wetlands and watercourses. Most of the seaward boundaries of the Priority Sites are fringed by natural coastline (except for the artificial sea wall at Po Chue Tam of Tai O), while along the landward boundaries, woodlands and shrubland/grasslands area found forming the vegetated mountainous foothill extension. Developed and urban/village fringe areas are scattered within and/ or near the Priority Sites, which impose various types and extents of past and present anthropogenic impacts on the wetlands and coastal areas.

A number of sites/ features of conservation importance are present or have been recorded within or in the close vicinity of the Priority Sites. They include but not limited to Conservation Area (CA), Coastal Protection Area (CPA), intertidal sandflat, mangrove stands, ecologically important stream, fung shui wood, Tai O egret (abandoned), as well as sites of conservation importance for amphibians, butterflies and freshwater fish. Their locations are shown on **Figure 2.1**.

A 12-month ecological baseline survey was conducted from March 2018 to February 2019 to update the ecological baseline information of the three Priority Sites. Fourteen habitats were confirmed present within the Priority Sites and their estimated sizes are in **Table 2.1**. The habitat maps for the three Priority Sites are in **Figures 2.2 – 2.4**.

**Table 2.1: Major Habitats and Areas (Hectares) of Priority Sites**

Habitat	Pui O	Shui Hau	Tai O
Sandflat	-	23.30	-
Mudflat	1.76	-	-
Mangrove	0.77	1.60	12.44
Reedbed	-	-	4.40
Marsh	3.95	2.06	1.90
Seasonally Wet Grassland	8.77	0.39	-
Agricultural Land (Active and Inactive)	1.76	0.77	-
Pond	-	-	8.56
Watercourse	3.15	0.65	1.74
Woodland	10.63	5.82	1.44
Plantation	3.52	-	-
Shrubland	-	7.08	-
Developed/ Disturbed Area	9.92	0.31	2.08
Sandy Shore (Gazetted Beach)	2.21	-	-
<b>TOTAL</b>	<b>46.44</b>	<b>41.98</b>	<b>32.56</b>

In terms of biodiversity, Pui O Priority Site supports a large number of flora and fauna species. A total of 252 plant species, 8 mammal species, 88 bird species, 11 amphibian species, 10 reptile species, 59 butterfly species, 31 odonate species, 36 fish species, 19 other freshwater fauna species, and 39 taxa of intertidal fauna were recorded during the 12-month ecological survey and subsequent site visits. The findings together with the data derived from literature review reveal that 130 species in total are of conservation importance (i.e. 8 plant species, 3 mammal species, 90 bird species, 5 reptile species, 4 amphibian species, 11 butterfly species, 1 odonate species, 6 fish species, and 2 crab species).

At Shui Hau Priority Site, a total of 308 plant species, 9 mammal species, 84 bird species, 11 amphibian species, 12 reptile species, 65 butterfly species, 29 odonate species, 42 fish species, 14 other freshwater fauna species and 61 taxa of intertidal fauna were recorded during the current 12-month ecological survey and subsequent site visits. The findings together with the data derived from literature review reveal 84 species in total are of conservation importance (i.e. 7 plant species, 4 mammal species, 35 bird species, 5 reptile species, 4 amphibian species, 16 butterfly species, 4 odonate species, 6 fish species, 1 mangrove crab species and 2 horseshoe crab species).

At Tai O Priority Site, a total of 213 plant species, 6 mammal species, 64 bird species, 7 amphibian species, 9 reptile species, 53 butterfly species, 23 odonate species, 34 fishes, 4 other freshwater fauna species and 24 taxa of intertidal fauna were recorded during the 12-month survey. The findings together with the data derived from literature review reveal 53 species in total are of conservation importance (i.e. 3 plant species, 1 mammal species, 29 bird species, 4 reptile species, 2 amphibian species, 6 butterfly species, 4 odonate species and 4 fish species).

## 2.2 Ecological Significance of Priority Sites

### 2.2.1 Pui O

Whilst most habitats in Pui O are not pristine, the biodiversity in wetlands, streams and woodland areas are high, interconnected, and of significant ecological value. This is especially true in the continuous freshwater marshes to the south of Chi Ma Wan Road (i.e. the southern portion). These habitats support several rare and protected plant species, and are of particular conservation significance for a number of avifauna, amphibian and fish species. Even some man-made habitats such as plantations and disturbed grounds have provided roosting sites for wildlife, including the Short-nosed Fruit Bat and Eastern Cattle Egret. In addition, the site is most likely a pre-wintering/ wintering site for danaiidae butterflies.

Although there are signs of various levels of anthropogenic alterations and fragmentations, the marsh and, to a lesser extent, seasonally wet grassland habitats, are of ecological significance, particularly for amphibians, fish, and dragonflies. In addition, aquatic and wetland plants including several rare species such as Water Fern, Mosquito Fern and Water Shamrock flourish in the wetlands.

The most ecologically important areas are in the southern portion of the Priority Site, where the marsh is permanently flooded and contains rich decaying organic matter. Seasonally wet grassland in this area shares the same origin with the marsh and therefore has very strong ecological linkage with the latter. Marsh and seasonally wet grassland, as a whole, nurtures a high diversity of macroinvertebrates, of which many are rare <sup>(1)(2)</sup>; this is an important reason for the high number of resident and visiting avifauna species that have been recorded foraging here. The ecological features of Pui O make the freshwater marsh and adjoining habitats one of the most important sites for visitor and resident water birds on Lantau <sup>(3)</sup>.

Having both freshwater and brackish habitats, Pui O Ecologically Important Stream (EIS) is rich in aquatic plants and animals. It joins other smaller streams, and is connected to a variety of wetlands (e.g. marsh and mudflat) in Pui O, both hydrologically and ecologically. These habitats help nourish a great diversity of odonates, fish and amphibians. A large number of birds, including the Great Egret, Intermediate Egret, Little Egret and Striated Heron spend part or all of their life in this stream.

The woodlands in the Pui O Priority Site are small in size, but those on the peripheral areas are an extension of (and therefore is strongly connected to) the continuous woodland within Lantau South Country Park. They are fairly mature and floristically diverse. They also support several rare and protected plant species, and are equally important to several woodland bird species and amphibians of conservation value, the latter including a population of the Hong Kong's endemic Romer's Tree Frog.

Key findings of the comprehensive literature review and the 12-month survey of Pui O's flora and fauna are summarised in **Section 2.1**. In view of the above, the overall ecological value of Pui O Priority Site is considered as of **High**.

(1) Noffke, C. & Yip, P. (2014). Lantau Hong Kong's Jewel: A Biodiversity Study of Lantau

(2) Dudgeon, D. & Chan, E.W.C. (1996). Ecological Study of Freshwater Wetland Habitats in Hong Kong. The Agriculture Fisheries Department, Hong Kong Government

(3) Noffke, C. & Yip, P. (2014). *Op cit*.

### 2.2.2 Shui Hau

The soft, sheltered nature of the intertidal sandflat at Shui Hau, together with an accumulation of organic detritus, provides habitats and food sources to support a rich marine intertidal community not seen elsewhere in Hong Kong <sup>(4)</sup>. This makes Shui Hau sandflat the only living example of a habitat of its kind in Hong Kong. Besides, the marsh, stream and woodland habitats in Shui Hau contain numerous rare species or concentration of biodiversity. They connect with each other to constitute a biologically rich yet delicate ecosystem that is very rare in Hong Kong to date.

The beauty of Shui Hau Priority Site also lies in its uninterrupted linkage between the terrestrial and marine habitats and the complete natural landscape transition from land to sea. Terrestrial habitats, including freshwater marsh, natural stream, woodland and backshore shrubland, occur in a series behind the shoreline dotted with mangroves, ecologically linking to the unique sandflat. These terrestrial habitats do not only play a supporting role to the marine environment, but also have considerable ecological value *per se*.

Terrestrial inputs of organic matter on the coastal water of Shui Hau enrich its unique sandflat with large amounts of detritus and nutrients. These are the food source to support a vibrant marine intertidal community where the endangered “living fossil”, horseshoe crab, *Tachypleus tridentatus*, is a conspicuous component. The existence of juvenile *T. tridentatus* of a range of prosomal width indicates a sign of recruitment of its population and reconfirms the importance of the Shui Hau sandflat as a nursery ground for this endangered species. Because of the abundant intertidal fauna, the sandflat is also the feeding ground for an array of migrating and/ or resident shorebirds and raptors including Kentish Plover, Lesser Sand Plover, Little Ringed Plover, Ruddy Turnstone, Peregrine Falcon and White-bellied Sea Eagle; all of which are of conservation importance. The sheltered sandflat is probably an important stop over point for passage migrant/ winter visitors including Grey Plover, Whimbrel and Ruddy Turnstone, of which they are mainly recorded from the Deep Bay Area. At the backshore, the mangrove stands are also an important perching and foraging site for water birds and waders such as ardeids and kingfishers.

The marsh in Shui Hau is precious as it displays high diversity of typical wetland and wetland-associated plants, among which there are several rare and/ or protected species, such as *Ceratopteris thalictroides*, *Sphenoclea zeylanica*, and the orchid, *Spiranthes sinensis*. In terms of wildlife, the habitat is of ecological significance to many amphibians and odonates as breeding/ nursery ground; it hosts species of conservation importance including the frogs Chinese Bullfrog, Three-striped Grass Frog, Romer’s Tree Frog and the dragonfly Scarlet Basker. In addition, the marsh habitat in Shui Hau is also widely utilised as foraging ground for avifauna, with an inclusive of egrets and some recorded avian species of conservation importance, including Besra, Black Kite, Greater Coucal and Red-throated Pipit. As a “managing agent” of the wetland habitat, water buffaloes graze in the marsh in a similar way as they do in Pui O, which benefits Eastern Cattle Egrets and other water birds that forage around the herd in a relationship known as commensalism.

Shui Hau stream provides vital freshwater input to the lowland marsh and further down to the sandflat. Within the Priority Site, it is mostly natural with limited human alternation, which renders a good linkage of the stream from its upstream section to estuary. A large number of odonate species inhabit and breed along the stream. In addition to a number of fish and crab species of conservation importance living in the stream, the presence of several catadromous species (i.e. those which move between fresh and brackish/ saline water bodies at different stages in their life cycles), such as Philippine Neon Goby *Stiphodon atropurpureus*, Japanese Eel and Rock Flagtail, demonstrates the important ecological function of the stream as an essential movement corridor for these fish species. In May 2018, AFCD’s Freshwater Fish Working Group has discovered a Bellybarred Pipefish *Hippichthys spicifer* at the lower reaches of the stream, which is a new species record to Hong Kong.

---

(4) Morton, B. & Morton, J. (1983) The Seashore Ecology of Hong Kong. Hong Kong: Hong Kong University Press.

Although the previously reported wintering aggregation site for danainae butterflies at Shui Hau <sup>(5)</sup> may not be within the Priority Site, the woodland associated with Shui Hau stream fringing the marsh forms a habitat mosaic for a wide variety of butterfly species. Butterflies of high diversity were recorded in the woodland, where 51 species out of the 65 species recorded in Shui Hau were recorded in this habitat. The woodland is strongly connected to the continuous woodland within Lantau South Country Park. It is mature and floristically diverse, with several large thriving Incense Trees. It also supports several rare and protected woodland bird species (e.g. Collared Scops Owl and Black-naped Oriole) and reptile amphibians of conservation significance, the latter including a population of the Hong Kong endemic Romer's Tree Frog.

Key findings of the comprehensive literature review and the 12-month survey of Shui Hau's flora and fauna are summarised in **Section 2.1**. In view of the above, the overall ecological value of Shui Hau Priority Site is considered as of **Very High**.

### 2.2.3 Tai O

Tai O is surrounded by serene water and the mountainous Lantau North Country Park. The periphery areas of the village comprise ecologically valuable habitats that nurture a wide variety of flora and fauna.

Mangrove stands can be found in several locations in the Priority Site. Two continuous and relatively larger mangrove patches are opposite to Po Chue Tam and to the northwest of Yim Tin. In particular, the mangrove stand opposite to Po Chue Tam has a potential for further expansion. Higher abundance of water birds and wetland-associated birds frequently occurred on these mangroves, among which Black-crowned Night Heron, Chinese Pond Heron, Grey Heron, Intermediate Egret, Little Egret, Striated Heron, White-shouldered Starling and White-throated Kingfisher are of conservation importance. The ecological value of this mangrove stand would likely to increase if appropriate conservation measures are applied.

Although the freshwater marsh present on the north of Yim Tin is not considered large in area (approximately 1.9 hectare), it has a low level of disturbance. The marsh is considered having a moderate level of ecological value as it supports moderate diversity of flora and fauna species. It is ecologically linked with adjacent mangrove and pond habitats, and has a high potential for ecological enhancement through appropriate wetland conservation management plan.

The woodland habitat within the Priority Site is small and only occurs on the fringes or in the stream riparian zone, but the patches are a continuous part of their adjacent extensive woodland outside the Priority Site in Lantau North Country Park.

The sizable area of inundated bed of reedgrass *Phragmites australis*, commonly known as Tai O Reedbed, is one of the largest *Phragmites* beds in Hong Kong. A damselfly of conservation importance, the Four-spot Midget, was recorded in the reedbed.

The Priority Site also supports a large number of flora and fauna species. Key findings of the comprehensive literature review and the 12-month survey of Tai O's flora and fauna are summarised in **Section 2.1**. In view of the above, the overall ecological value of Tai O Priority Site is considered as of **Moderate to High**.

## 2.3 Prevailing Ecological Threats to Priority Sites and Existing Measures

The three Priority Sites are facing a number of ecological threats. Among the identified ecological threats, vandalism to ecologically sensitive habitats (esp. landfilling, dumping, excavation, vegetation clearance on wetlands) and drying up of wetlands are considered as the key threats to Pui O. In Shui Hau, vandalism to ecologically sensitive habitats (esp. dumping and landfilling on wetlands), drying up

---

(5) Yuen, P.Y. (2011). Genetic variation in *Euploea* (Lepidoptera: Nymphalidae) populations in South China. Mphil thesis. The University of Hong Kong.

of wetlands, unrestrained clam digging and marine littering (esp. after storm events) are the key threats. Compared with the Priority Sites in Pui O and Shui Hau, Tai O is not facing immediate and direct ecological threats arising from development pressure. Most of the areas in the Priority Site is government land and is also subject to the enforcement by the Planning Authority under the Tai O Fringe OZP (covering most of the Tai O Priority Site). However, it is noted that disturbances caused by leisure and recreational activities (mainly during weekends and holidays) and the invasion of exotic species (especially *Sonneratia* sp.) are the key threats.

The existing statutory/ administrative measures that can directly and indirectly conserve the natural resources of the three Priority Site were reviewed under the Study. However, some activities in the private land such as paving, depositing of construction material on private land in compliance with current statutory requirement, occasional recreational uses without fixed structures erected, etc., which may cause degradation to the wetland habitats, may be non-enforceable or non-illegal. It means that these existing statutory/ administrative measures may not be able to provide adequate power/ protection in sustaining the ecological values of the important habitats, such as wetlands.

Despite a number of well-established ordinances, policies, administrative measures and on-going environment improvement projects that are relevant to the nature conservation of the three Priority Sites or benefit the ecologically valuable habitats and biodiversity, they have certain limitations when being applied to the Priority Sites and therefore cannot effectively conserve the ecological resources in the area in a holistic manner. Moreover, many of these existing nature conservation policies and measures, especially those that are applicable to the Priority Sites, are reactive and unable to curb the general decline in the local ecological conditions. To reverse the trend and increase local ecological carrying capacity, pro-active and site-specific measures should be put in place to re-create a positive trend and to restore and enhance the ecologically valuable habitats before they degrade any further.

## 2.4 Recommended Conservation Measures for Priority Sites

### 2.4.1 Summary of Proposed Conservation Measures

Based on findings of the comprehensive literature review, the 12-month ecological survey, and understanding of the site opportunities and constraints, a number of conservation schemes are proposed. They aim to restore and recover the damaged/ deteriorated wetlands and non-wetland habitats, re-establish their impaired ecological functions and enhance the ecological integrity of the Priority Site as a whole. The habitats to be restored or enhanced have taken into account the requirements of a number of identified target species (**Appendix A**), which are dynamic and are subject to review whenever appropriate.

The proposed conservation schemes are conceptual in nature mainly considering the ecological factors only. Detailed design of the proposed habitats in these schemes is still required at a later stage, with available topographic and hydrological information etc. to refine or confirm the feasibility of the current conceptual design.

Whilst nature conservation is the primary goal of these schemes, they need not preclude compatible components as long as they are ecologically friendly. It is important to engage and consult public at an early stage on the conservation schemes, with a view to achieving the nature conservation goal through a sustainable approach.

#### Pui O Priority Site

The existing habitats in Pui O Priority Site need to be restored or enhanced to meet the habitat requirements of the selected targeted species/ groups, whilst the configuration of existing habitats should be followed as much as possible to minimise the disturbance caused by such works.



### Three Elements of Pui O Conservation Measures

To achieve the proposed conservation objectives and habitat requirements, several habitats in the Priority Site will need to be restored and/ or modified, especially the current permanent and seasonal wetlands to the north and south of Chi Ma Wan Road (i.e. the Southern Portion and Northern Portion). After the modification, a series of management strategies, based on the foundation of further investigations listed in **Section 2.4.2**, should be set forth for maintaining the quality of the habitats in the long run. In addition, some ecologically friendly and compatible land uses like eco-farming and education related facilities could be added in, so as to engage the local community and hence to achieve the nature conservation goal through a sustainable approach. Details of the three elements of the proposed Pui O conservation measures are set out below:

#### (1) Nature conservation

The conservation measures include restoration and conservation of the currently degraded marsh and seasonally wet grassland habitats in the Northern and Southern Portions, ecological enhancement of Pui O EIS by establishing riparian buffer wherever practicable, enhancement of non-wetland habitats such as plantation and backshore vegetation, and protection of woodland and mangrove.

#### (2) Management

Management strategies, which need to be re-confirmed based on further investigations, are proposed to include the active habitat management and long-term monitoring for the Northern and Southern Portions, removal of invasive flora and fauna species, water quality monitoring to Pui O EIS and other watercourses potentially supplying water to the marshes upon restoration.

#### (3) Elements of additional values other than nature conservation

While conservation is the primary goal of managing Pui O Priority Site, it has great potential to embrace compatible land uses or activities such as eco-recreation, public education (by establishing nature classroom and bird hide) and continuation of existing small-scale agriculture (in an eco-farm manner). Inclusion of these compatible components would make the proposal sustainably beneficial to various groups, and hence gain wider support from different stakeholders.

The above-mentioned measures proposed for Pui O Priority Site are illustrated on **Figure 2.2** and summarised in **Table 2.2**. **Table 2.2** also indicates the proposed measures that should be prioritised, mainly those that could help tackle the identified key ecological threats in the Priority Site.

**Table 2.2: Proposed Conservation Measures for Pui O Priority Site**

No.	Measures	Prioritised?
<b>Nature Conservation - Marsh restoration</b>		
POCM1	Restore existing marsh and seasonally wet grassland habitats to achieve both permanent and/ or seasonal marshy conditions with a variety of microhabitats in a long-term	Y
POCM2	Remove existing ecologically disturbing land uses and rehabilitate to marsh	Y
POCM3	Restore the isolated agriculture fragments to marsh, and/ or move them to and combine with the very northern large agricultural land	Y
POCM4	Prevent further expansion of the paved areas along South Lantau Road and Chi Ma Wan Road, control pollution to/ impacts on the adjacent wetlands to be restored, i.e. sewage/ waste water discharge and dumping/ littering, with proper drainage system	Y
POCM5	Conserve the restored marshes to provide habitats for fauna and flora, especially the target species and groups	Y
POCM6	Reduce the size of lowland woodland on the peripheries of the marshes in the northern portion (i.e. marshes to the north of Chi Ma Wan Road)	Y

No.	Measures	Prioritised?
<b>Nature Conservation - Enhancement of Pui O EIS</b>		
POCM7	Establish riparian buffer for Pui O EIS to control development, pollution and to provide habitats for the identified target species and groups	
<b>Nature Conservation - Non-wetland habitat enhancement</b>		
POCM8	Thin the aging exotic tree species (especially for the plantation patch along Chi Ma Wan Road), plant native trees and conduct post-planting maintenance (weeding, fertilizing and pruning, etc.)	
POCM9	Provide potential roosting site for Short-nosed Fruit Bats	
POCM10	Enhance backshore vegetation to provide ground for wintering Danaids	
POCM11	Protect woodland and mangrove to maintain the low-levelled disturbance, and to promote breeding of Romer's Tree Frog	
<b>Management</b>		
POCM12	Active habitat management and long-term monitoring of the wetlands in Southern and Northern Portions (i.e. wetlands to the south and north of Chi Ma Wan Road, respectively) upon restoration	Y
POCM13	Control and remove invasive, exotic fauna and flora species	
POCM14	Set up water quality monitoring station(s) and control water pollution	
<b>Element of Additional Value</b>		
POCM15	Use as a nature classroom to promote public awareness on wetland conservation	
POCM16	Build a bird hide adjacent to the southern portion of marshes for birdwatching and nature appreciation	
POCM17	Practise eco-farming and ensure no excessive fertilizers and pesticides be transferred to Pui O EIS	

### Proposed Core Conservation Zone in Pui O

The above proposed conservation measures intrinsically divides the Priority Site into two zones:

- **Core Conservation Zone** refers to the areas mainly for conservation purposes. It covers habitats of higher ecological value, areas where active conservation management work such as habitat restoration and enhancement is proposed, and also areas to accommodate necessary supporting facilities for the proposed conservation management work.

Based on the findings of the Study, the Core Conservation Zone of Pui O Priority Site is proposed to include the southern and northern portions of marshes and their supporting areas, as well as Pui O EIS. Apart from the nature conservation perspectives, the indicative boundary of the Core Conservation Zone shown on **Figure 2.2** has taken into account the following considerations:

- Considering the need for various ecological and cultural conservation initiatives and activities, and other recreational/ educational facilities in support of the Core Conservation Zone, the part of developed/ disturbed area to the west of Chi Ma Wan Road and south of Pui O Public School is proposed to be included in the Zone. Being in the central position of the Priority Site adjoining the wetland habitats in the southern portion and is accessible by the existing vehicular road, the proposed area is considered suitable for developing a conservation centre and other supporting facilities without the need to take up the wetland area. Such arrangement can also help deter it from further expansion which would in turn pose impacts on the adjoining ecologically important habitats.
- Besides, to conserve the landscape significance where the freshwater of the EIS meets the sea water and also provide better control against pollution and disturbance of the gazetted beach, an area at the south-eastern corner of the Priority Site is also included in the Core

Conservation Zone. The said area mainly include the EIS, the adjoining mudflat and mangrove, part of sandy shore to the east of the Pui O Campsite and the Gazetted Beach area.

- *Other Zone*, including areas other than the Core Conservation Zone where ecologically compatible activities could be promoted.

### Shui Hau Priority Site

#### **Three Elements of Shui Hau Conservation Measures**

To achieve the conservation objectives and habitat requirements, the proposed conservation measures in Shui Hau also comprise three elements similar to that of the Pui O Priority Site, which are:

#### **(1) Nature conservation**

The conservation measures include restoration and conservation of the currently degraded marsh and seasonally wet grassland habitats to meet the needs of the selected target species, preservation of the Shui Hau stream, enrichment planting at the adjacent woodland habitat, and protection of the mangrove along the high-tide zone of Shui Hau sandflat.

#### **(2) Management**

Management strategies, which need to be re-confirmed based on several further investigations listed in **Section 2.4.2**, are proposed. They include active habitat management and long-term monitoring of Shui Hau sandflat and the wetland habitats after restoration, removal of invasive species on both seaside and landside habitats, and water quality monitoring to Shui Hau stream and other watercourses potentially supplying water to the marshes upon restoration.

#### **(3) Elements of additional values other than nature conservation**

While priority should be given to nature conservation, it needs not preclude ecologically compatible activities operated in a sustainable manner. They include a small-scaled conservation centre, bird watching facilities and eco-farming activities.

The above three elements of the proposed conservation measures together with their priorities are summarised in **Table 2.3** below. The preliminary proposed locations to implement the measures are indicated on **Figure 2.3**.

**Table 2.3: Proposed Conservation Measures for Shui Hau Priority Site**

No.	Measures	Prioritised?
<b>Nature Conservation - Marsh restoration</b>		
SHCM1	Remove existing ecologically disturbing land uses and rehabilitate to marsh	Y
SHCM2	Restore existing marsh and seasonally wet grassland habitats to achieve both permanent and/ or seasonal marshy conditions with a variety of microhabitats in a long-term	Y
SHCM3	Reduce the size of excessive lowland shrubland on previous marshy areas	Y
SHCM4	Conserve the restored marshes to provide habitats for fauna and flora, especially the target species and groups.	Y
<b>Nature Conservation - Woodland enrichment</b>		
SHCM5	Plant native species to provide food plants and nectar plants for butterflies and maintain low-level disturbance of woodland	
<b>Nature Conservation - Stream preservation</b>		
SHCM6	Preserve the stream, woodland and mangrove as a whole	
<b>Management</b>		
SHCM7	Active management, long-term monitoring of target species/ groups (such as horseshoe crabs) and species diversity and conservation education at sandflat	Y

No.	Measures	Prioritised?
SHCM8	Active management and long-term monitoring of wetland habitats after restoration	Y
SHCM9	Cleaning of marine litter	Y
SHCM10	Control and remove invasive, exotic species	
SHCM11	Set up water quality monitoring station(s) and control water pollution	
<b>Element of Additional Value</b>		
SHCM12	Provide a small-scaled conservation centre to promote conservation awareness, and facilitate management of sandflat and water pollution/ waste control	Y
SHCM13	Build bird watching facilities and footpath between the landward and seaward sides for birdwatching and nature appreciation	
SHCM14	Practise eco-farming (preferably wet rice farming) and ensure no excessive fertilizers and pesticides be transferred to restored marshes	

### Proposed Core Conservation Zone in Shui Hau

The above proposed conservation measures intrinsically divides the Priority Site into two zones:

- *Core Conservation Zone*, referring to the areas which are mainly for conservation purposes. It covers habitats of higher ecological value, areas where active conservation management work such as habitat restoration and enhancement is proposed, and also areas to accommodate necessary supporting facilities for the proposed conservation management work.

The Core Conservation Zone is proposed to include the entire Priority Site which covers habitats of higher ecological value, except the small agricultural land and the associated residential village house at the northwestern part of the Priority Site. Also, there is a need for a working area for management of Shui Hau Priority Site and facilities for recreation and education purposes, so as to raise public awareness on conservation and promote engagement in the protection of marine and terrestrial ecology as well as wet agriculture rehabilitation. The government land to the northeast of the Priority Site, including the existing soccer pitch near South Lantau Road which is also near the sandflat, is considered suitable to serve such purpose. The indicative boundary of the Core Conservation Zone is shown on **Figure 2.3**.

- *Other Zone*, including areas other than the Core Conservation Zone where ecologically compatible activities could be promoted. For Shui Hau Priority Site, the *Other Zone* includes the small agricultural land and the associated residential village house at the northwestern part of the Priority Site.

### Tai O Priority Site

To achieve the proposed conservation objectives and habitat requirements, the proposed conservation measures for Tai O also comprise three elements, which are:

#### (1) Nature conservation

The conservation measures include ecological enhancement of abandoned fishponds and other ponds by diversifying the microhabitats, ecological improvement of Tai O stream by reducing human disturbance and removing movement barriers for aquatic species, and protection of the continuous mangrove and marsh habitats of the Priority Site.

#### (2) Management

Management strategies, which need to be re-confirmed based on several further investigations listed in **Section 2.4.2**, are proposed to include active habitat management and long-term monitoring of the wetland habitats after enhancement, removal of invasive species and diversion of visitor flow/ access to less sensitive areas.

### (3) Elements of additional values other than nature conservation

To integrate cultural elements to the conservation plan and allow public enjoyment on natural resources at Tai O, consideration has been given to incorporate any ecologically compatible activities that could happen in a sustainable manner in the conservation plan. In particular, a salt pan and salt production demonstration area are proposed to be re-provided. Other visitor facilities such as education/ information hub(s), gathering points and probably also bird watching areas are also proposed to educate the public on nature conservation and culture issues of Tai O and, to some extent, help regulate visitor traffic or the range of visitor activities.

The above-mentioned proposed measures together with their priorities are summarised in **Table 2.4** below. The preliminary proposed locations to implement the measures are indicated on **Figure 2.4**.

**Table 2.4: Proposed Conservation Measures for Tai O Priority Site**

No.	Measures	Prioritised?
<b>Nature Conservation - Ecological enhancement of abandoned fishponds</b>		
TOCM1	Ecological enhancement of abandoned fishpond	Y
TOCM2	Recreation of reedbed/ brackish marsh	Y
<b>Nature Conservation - Ecological improvement of Tai O Stream</b>		
TOCM3	Improvement of Tai O Stream	
<b>Nature Conservation - Ecological enhancement of other pond</b>		
TOCM4	Ecological enhancement of other pond	
<b>Nature Conservation - Protection of continuous mangrove and marsh</b>		
TOCM5	Protection of continuous mangrove and marsh	
<b>Management</b>		
TOCM6	Active habitat management and long-term monitoring of wetland habitats after restoration	Y
TOCM7	Removal of invasive species	Y
<b>Element of Additional Value</b>		
TOCM8	Public education: display of historical salt pans and solar salt production, and other visitor facilities	Y

### Proposed Core Conservation Zone in Tai O

The entire Tai O Priority Site covers habitats of higher ecological value, areas where active conservation management work such as habitat restoration and enhancement is proposed, and also areas to accommodate necessary supporting facilities for the proposed conservation management work. Therefore, the entire Priority Sites could be treated as one zone for conservation purpose.

#### 2.4.2 Next-step Investigations Required

While most of the proposed conservation measures for the three Priority Sites are preliminarily assessed to be technically feasible, they are conceptual proposals only requiring further investigations in the next stage before taking forward the conservation measures. The key next-step investigations are summarised as follows:

### Pui O Priority Site

- Detailed topographic survey and comprehensive hydrological study for the permanent and seasonal wetlands to the south and north of Chi Ma Wan Road (i.e. the southern and northern portions) so as to (i) investigate the reasons of drying up; (ii) estimate water budget and develop a hydrological model; and (iii) recommend restoration details for sustaining water supply to the wetlands;
- The optimal width of the lowland woodland to be retained on the peripheries of the marshes in the northern portion so that the size of marshes can be maximized;
- Technical and/ or other difficulties in installing a real-time water quality monitoring system on site; and
- Locations and designs of the bird hide and other supporting facilities.

### Shui Hau Priority Site

- Implementation details on active management of Shui Hau sandflat, including the boundary, zonation, demarcation of core area and management and operational plan etc., so as to safeguard the sandflat from prevailing and potential ecological threats;
- Detailed topographic survey and comprehensive hydrological study for the landward side of the Priority Site so as to (i) investigate the reasons of drying up of wetlands; (ii) estimate water budget and develop a hydrological model; and (iii) recommend restoration details for sustaining water supply to the wetlands;
- The optimal combination/ portions of marsh (in the centre) and shrubland (on the peripheries) so that the size of marsh can be maximized;
- Technical and/ or other difficulties in installing a real-time water quality monitoring system on site; and
- Locations and designs of a small-scaled conservation centre and bird watching facilities.

### Tai O Priority Site

- Detailed enhancement plan of the abandoned fishponds and other pond, including topographic survey and/ or hydrological study if necessary;
- Feasibility study for re-provisioning of salt pan and salt production demonstration area; and
- Locations and designs of visitor facilities.

## 2.5 The “Nature Park” Concept – A Possible Institutional Arrangement

To enable implementation of the above proposed conservation measures in a comprehensive and consistent manner against the diverse and fragmented ownership of the private land in the Priority Sites, particularly the Core Conservation Zone, one possible institutional arrangement that can be further considered is to identify/ set up an appropriate agent or authority to implement and manage the conservation measures in the areas concerned (i.e. Core Conservation Zone) as “Nature Park(s)”.

The whole South Lantau has rich and diversified natural resources with high scenic and cultural value and marine resources with high educational value. The South Lantau Coast has the potential to meet the ever-increasing needs of Hong Kong people for recreation and promote sustainable development. Both Pui O and Shui Hau Priority Sites, situating at the eastern and western sides respectively, form important parts of the South Lantau Coast, and hence able to create a synergy effect in promoting the recreational and educational activities with the other parts of South Lantau in the future.

Apart from their strategic locations, Pui O and Shui Hau Priority Sites are the remaining rare wetlands in Hong Kong. However, the various types of human activities and threats have caused habitat loss (esp. wetland loss), affecting inhabitant plants and animals and reducing the areas’ ecological carrying capacity. There is a need to eliminate and/ or manage these activities to ensure long-term benefits led by the “Conservation for the South” principle in the Sustainable Lantau Blueprint. Therefore, a holistic conservation scheme consisting of a series of conservation measures has been proposed for the Priority Sites. This is also in line with the Lantau Conservation and Recreation Masterplan (the Masterplan) formulated by the Sustainable Lantau Office in 2020 which serves as a framework guiding the conservation and recreation initiatives, and orchestrate public and private projects better for achieving synergy in conservation of South Lantau.

To echo the proposed “South Lantau Eco-Recreation Corridor” under the Masterplan, it is desirable to formulate a scheme for conserving the Priority Sites in Pui O and Shui Hau including not only nature conservation but also culture, recreation and education elements. These elements should be ecologically compatible, such as eco-recreation, public education and continuation of existing small-scale agriculture. This would make the plan sustainably beneficial to various groups of the society. With the above elements, all these can be conglomerated under a holistic “Nature Park” concept.

### 2.5.1 The “Nature Park” Concept

Against the above backdrop, the Pui O and Shui Hau Priority Sites could be the starting point to realize “Conservation for the South” and to create a synergy effect in conserving the other parts of South Lantau in the coming future. There is a potential to formulate a “Nature Park” for the Core Conservation Zones in these two Priority Sites with the following objectives:

- (1) Conserve and enhance habitats of higher ecological value through
  - prevention of impacts in particular anthropogenic disturbances; and
  - active management to protect habitats and prevent their deterioration/ degradation especially wetlands and sandflat;
- (2) Provide compatible eco-recreational and educational uses in a controlled manner through
  - managing visitor access to certain ecologically sensitive habitats;
  - promoting nature and cultural conservation and appreciation;
  - allowing compatible recreational and educational uses for public enjoyment and appreciating the nature, as well as the cultural elements;
  - facilitating wet agricultural practices at suitable locations adjacent to the Core Conservation Zone for educational and conservation purposes;
  - ensuring no insurmountable pollution affecting the wetlands; and

- encouraging stakeholders participation (e.g. land owners, NGOs) in taking forward appropriate conservation, recreation and education projects.

Specifically for Pui O, while the Priority Site has already been an established recreational spot for both local and overseas visitors, it has a greater potential to be developed as an “eco-recreational hub” in South Lantau, and therefore has the potential to provide more supporting facilities such as an education/conservation centre, display corner for nature interpretation, management office and other supporting recreational/ educational facilities as appropriate. The conversion of developed/ disturbed area for these facilities is also conducive to overall improvement to the environment at Pui O.

Compared to Pui O Priority Site, Shui Hau Priority Site has maintained a higher degree of naturalness and is a less popular destination for outdoor activities along South Lantau Coast apart from clam digging. While supporting facilities such as smaller-scaled conservation centre, display corner for nature interpretation and management office should be provided to manage and regulate the existing recreational activities including but not limited to clam digging and kite boarding, passive eco-recreational activities (e.g. nature appreciation) to place minimal stress on the Priority Site’s ecological resources should be the mainstream of the future nature park at Shui Hau.

### **2.5.2 Key Elements of the “Nature Park”**

The proposed key elements for the “Nature Park” concept in these two Priority Sites include:

- Conservation:
  - Nature conservation of the wetland *per se* through wetland restoration and relevant conservation measures; and
  - Cultural conservation such as conserving farming history and village history of the area through promoting wet agriculture practice and promoting the appreciation of cultural heritage and elements of the local villages.
- Recreation:
  - Enabling compatible recreational activities and water sports to take place in a controlled manner in these two established recreational hot spots, such as wildlife watching, eco-tour, nature appreciation activities and camping at suitable location/ non-ecologically sensitive area.
- Education:
  - Providing Conservation Centres/ display corners to promote conservation of the ecological and cultural assets of Pui O and Shui Hau;
  - Enabling and organising eco(-cultural) tours for public enjoying and appreciating the wetland habitat, the wildlife, wet agriculture practice, history of the local villages, etc.;
  - Enabling and promoting events related to eco-cultural conservation to be explored by suitable organisations; and
  - Encourage stakeholder participation in taking forward education projects.

### **2.5.3 Need for a Suitable Authority to Manage the “Nature Park”**

Whether and how the “Nature Park” concept can be taken forward should be further considered and reviewed by the relevant bureaux and departments. In particular, land ownership constraint is one of the key issues to be carefully considered and resolved under the concept of “Nature Park”.

If the concept is to be taken forward, there is a need to identify a suitable authority having experience in undertaking the proposed active management and other conservation measures, as well as having adequate human and financial resources to accomplish the work.



## 2.5.4 Treatment to Tai O Priority Site

Tai O is currently a prosperous tourism destination where its traditional fishing village culture attracts both domestic and international tourists. The local tourism industry has been developed for decades in Tai O. While the proposed conservation measures and elements of additional values could broaden the range of visitor attractions and balance the need for Tai O's tourism and nature conservation, the application of the "Nature Park" concept at Tai O would not be necessary.

Materialisation of the proposed measures for Tai O (**Section 2.4.1**), as well as their long-term management and maintenance, could be well incorporated in the Masterplan and integrated into the various improvement works in Tai O and implemented phase by phase.

## 2.6 Possible Mechanisms for Implementation of Recommended Conservation Measures

### 2.6.1 Statutory Measures

#### (A) Rezoning

It is considered that suitable areas in Pui O and Shui Hau Priority Sites should be rezoned to tailor-made zoning in the relevant town plan. This would enable the comprehensive implementation of appropriate land uses and facilities in support of the proposed conservation measures, as well as effective land use control in the future.

#### (B) Introduction of Active Management Scheme

Taking into account the high nature conservation, public education and recreational values of the sandflat and its adjoining marine area of Shui Hau Priority Site starting from its high water mark towards the seaward side, a suitable scheme, to be supported by relevant legislations or other effective means of control, should be explored in the next stage with a view to better managing this area.

### 2.6.2 Legislative Amendment

Apart from designating the areas to appropriate zonings or introduction of management scheme under the relevant legislations, there are implementation options involving legislative amendments to enhance enforcement on non-conforming uses and better control of the disposal of materials.

There is limitation under the TPO on controlling the non-conforming uses/ activities within the South Lantau Coast as the Priority Sites, in particular, in Pui O and Shui Hau were not or are not within DPA<sup>(6)</sup>. TPO amendment would be one of the measures to have significant effect in enhancing protection of the Priority Sites. With the enhanced enforcement mechanism, it would effectively help prevent intensification of existing non-conforming uses/ activities and deter any non-conforming uses/ activities in the future. This is an essential and fundamental step to protect the sensitive habitats.

### 2.6.3 Possible Mechanisms to deal with the Private Land Ownership Issue

#### (A) Use of Lantau Conservation Fund (LCF)

By encouraging the participation of private landowners to implement the proposed conservation measures in their land as well as the participation of the community to promote or implement conservation through provision of financial incentives is a mechanism that has been proved to be useful.

The Government has set up a \$1 billion Lantau Conservation Fund (LCF) in 2020 to support conservation and related projects as well as minor local improvement works in rural Lantau. Half of the LCF (i.e. \$500 million) has been dedicated to providing financial support to local communities,

(6) While Planning Authority does not have enforcement power outside the Development Permission Area (DPA), the enforcement mainly rests with the Buildings Department, the Lands Department and various licensing authorities.

landowners and non-profit-making-organisations (NPOs) etc., to carry out conservation projects involving private land, research projects and projects that promote community involvement and education in Lantau. This approach would nurture partnership between landowners, NPOs and the public with support of the Government.

### *(B) Land Ownership taken over by the Government*

For Pui O and Shui Hau Priority Sites, there is a large amount of private land within the proposed Core Conservation Zones. The scattered and diversified private ownership pattern of the two Priority Sites makes it difficult, if not impossible, for active management and implementation of long-term, comprehensive conservation programmes. To achieve effective conservation of these Priority Sites, taking over of private land ownership by the Government (e.g. land resumption) is clearly an option but it would require more in-depth and thorough consideration. For Tai O Priority Site, since most of the proposed conservation measures are located on government land, the constraint on private land ownership is considered relatively less essential.

By pursuing land resumption as an implementation tool, the Government would be able to execute direct intervention and control to the land concerned, implement the conservation measures, impose restrictive land use control and allow public access to particular areas for public education/ nature appreciation etc.. The proposed conservation measures with active and direct management can be guaranteed.

### **2.6.4 Summary**

By reviewing the relevant mechanisms, it is considered that a multi-pronged approach with a mix of implementation mechanisms for the proposed conservation measures would be the most effective way to address the ecological threats while conserving and enhancing the ecological conditions of the Priority Sites.

For Conservation MA/ education and engagement projects through LCF, while they cannot ensure direct intervention, direct control of incompatible uses, active conservation and management by the Government and are on voluntary basis, it is recommended that they should be promoted as far as possible to facilitate early implementation of any possible conservation measures and any programs promoting public education in conservation in the Priority Sites. These are the actions that the Government could take forward immediately.

To tackle the environmental vandalism issue, the Government has agreed to review the TPO which can strengthen the protection of the ecological sensitive areas within the Priority Sites.

The high ecological value of Shui Hau sandflat has been re-confirmed by the Study. Besides, the rich marine ecological resources of the sandflat and its nearby sea waters, together with the unique environmental setting of Shui Hau, provide great opportunities for educational and scientific studies. As the area becomes a popular site for clam digging and water sports such as kiteboarding, to better control these recreational activities in a sustainable manner, and taking into account the high nature conservation, public education and recreational values of the sandflat and adjoining marine area, a suitable scheme for better management of such area should be further explored in the next stage after the Study.

The above implementation options are important but not adequate to guarantee direct implementation of the active conservation measures to the concerned areas. For the proposed Core Conservation Zones in Pui O and Shui Hau which involve private land of high ecological value, it is considered that in the long run, the Government may wish to consider means of having direct intervention and active management of the area to secure control of incompatible uses, stopping current incompatible uses, managing public access, applying active conservation, management and regular maintenance, as well as continuation of the implementation over time. In addition, an institutional arrangement for the Core Conservation Zones in the Pui O and Shui Hau Priority Sites in the form of the “Nature Park” concept could be further examined as a long term target.

The proposed Nature Park concept has involved land administration, nature conservation, cultural, recreation and education elements; and thus would need wider considerations by relevant Government bureaux and departments, which is beyond the scope of this study. To facilitate the Government's further consideration on the way forward like the Nature Park concept and how it could be implemented in detail, further study may be required. The implementation of more effective conservation measures in the Priority Sites should also be further studied.

### 3. STUDY AREA (EXCLUDING PRIORITY SITES)

Unless stated otherwise, “Study Area” in this section and onward refers to the Study Area excluding the three Priority Sites at Pui O, Shui Hau and Tai O.

#### 3.1 Ecological Profile of Study Area (Excluding Priority Sites)

Review of relevant scientific papers, reports, EIAs and Outline Zoning Plans were conducted to collect the baseline ecological information for Study Area.

##### 3.1.1 Sites / Features of Conservation Importance within Study Area

There are a number of sites of ecological importance identified within and/ or in close vicinity of the Study Area. These include but are not limited to Site of Special Scientific Interest (SSSI), intertidal mudflat, seagrass beds, mangrove stands, Ecologically Important Streams (EIS), fung shui woods, amphibian key areas, butterfly key areas, aggregation sites for danainae butterflies and freshwater fish key areas. Details of these sites/ features are shown in **Figure 3.1**.

##### 3.1.2 Major Habitats

In view of the vast coverage of the Study Area, it was divided into 16 sub-areas to facilitate further discussion. Coverage of these sub-areas under the Study are shown in **Figure 3.2**. **Table 3.1** summarises the major habitats and their areas (ha). A board-brush habitat map of these sub-areas based on recent aerial photos review and preliminary on-site verification (conducted between April and May 2018) is shown in **Figure 3.3**.

##### 3.1.3 Previously Reported Species of Conservation Importance

###### 3.1.3.1 Terrestrial Flora and Fauna

More than 40 the flora species of conservation importance were previously recorded within the Study Area. For terrestrial fauna species of conservation importance, their species numbers are summarised in **Table 3.2**.

**Table 3.1: Major Habitats and Area (Hectares) within the Study Area**

Habitat	SSS	SW	TO (excl. Priority Site)	YO	TYW	FL	S. Pik	LTNY & MCP	KS	NP	TTT	YTS	MW	S. Long	SL (excl. Priority Site)	CMW	Sub-Total
Fung Shui Woodland	2.6	-	-	-	-	-	-	-	-	-	-	-	2.5	-	2.2	-	<b>7.3</b>
Woodland	63.8	90.0	62.2	15.8	7.7	15.0	33.6	2.6	105.7	60.0	10.6	0.1	188.0	68.9	424.1	34.9	<b>1183</b>
Plantation	10.7	-	4.6	-	-	-	4.3	-	-	2.4	-	-	3.5	-	0.9	-	<b>26.4</b>
Shrubland	66.2	-	59.6	-	0.2	2.0	36.3	0.1	22.4	13.3	2.5	-	-	1.3	-	1.7	<b>205.6</b>
Shrubland/ Grassland	16.8	28.7	-	0.5	-	-	-	-	-	-	-	-	141.7	-	9.6	-	<b>197.3</b>
Grassland	-	23.1	9.1	1.5	0.4	4.0	-	0.3	8.0	1.6	-	5.9	-	7.9	1.3	1.8	<b>64.9</b>
Watercourse	1.6	2.7	6.4	0.1	<0.1	<0.1	0.4	<0.1	2.4	0.4	0.1	<0.1	7.1	0.2	6.5	0.2	<b>28.1</b>
Pond	-	-	0.2	-	-	-	-	-	-	-	-	-	1.6	-	-	-	<b>1.8</b>
Reedbed	-	-	-	0.8	-	-	-	-	-	-	-	-	-	-	-	-	<b>0.8</b>
Marsh	-	0.8	-	-	-	-	-	-	-	-	-	-	22.0	-	-	4.6	<b>27.4</b>
Seasonally Wet Grassland	1.4	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	<b>1.7</b>
Wet Agricultural Land	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	<b>1.1</b>
Dry Agricultural Land	4.6	1.5	-	1.0	-	-	-	-	-	-	-	-	0.6	-	1.0	1.4	<b>10.1</b>
Village/ Agriculture/ Seasonally Wet Grassland	-	-	-	-	-	-	-	-	-	-	-	-	28.4	-	-	-	<b>28.4</b>
Orchard	-	1.2	-	-	-	-	-	-	-	-	-	-	-	-	2.1	-	<b>3.3</b>
Developed Area	9.1	3.7	46.0	0.9	-	0.7	32.6	0.5	28.5	23.1	1.2	<0.1	64.6	9.1	77.8	3.4	<b>301.2</b>
Cleared Ground	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	-	-	<b>2.2</b>
Mangrove	-	-	10.7	-	-	-	-	-	-	-	-	-	1.7	-	<0.1	-	<b>12.4</b>
Mudflat	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	0.4	-	<b>0.6</b>
Sandy Shore	-	-	-	0.9	-	-	2.7	-	-	-	-	-	2.3	1.3	9.7	-	<b>16.9</b>
Rocky Shore	1.6	-	-	-	-	-	0.6	-	-	-	-	-	0.6	-	2.8	1.0	<b>6.6</b>
<b>Sub-total</b>	<b>178.4</b>	<b>151.7</b>	<b>199</b>	<b>22.6</b>	<b>8.3</b>	<b>21.7</b>	<b>110.5</b>	<b>3.5</b>	<b>167.3</b>	<b>100.8</b>	<b>14.4</b>	<b>6</b>	<b>466.8</b>	<b>88.7</b>	<b>538.4</b>	<b>49</b>	<b>2127.1</b>

Note:

1. Study Area abbreviation: SSS = San Shek Wan, Sha Lo Wan & San Tau, SW = Sham Wat, TO = Tai O, YO = Yi O, TYW = Tsin Yue Wan, FL = Fan Lau, S. Pik = Shek Pik, LTNY & MCP = Lung Tsai Ng Yuen & Man Cheung Po, KS = Keung Shan, NP = Ngong Ping, TTT = Tei Tong Tsai, YTS = Yi Tung Shan, MW = Mui Wo, S. Long = Shap Long, SL = South Lantau, CMW = Chi Ma Wan

**Table 3.2: Number of Terrestrial Fauna Species of Conservation Importance Recorded in the Study Area from Literature Review**

Study Area	Mammal	Avifauna	Reptile	Amphibian	Odonate	Butterfly	Freshwater Fish	Freshwater Invertebrates	Total
San Shek Wan, Sha Lo wan & San Tau	-	28	6	4	5	36	10	-	<b>89</b>
Sham Wat	11	6	9	3	2	1	6	-	<b>38</b>
Tai O	-	24	4	1	3	15	5	-	<b>52</b>
Yi O	1	7	1	2	-	2	2	-	<b>15</b>
Tsin Yue Wan	1	3	-	1	-	-	-	-	<b>5</b>
Fan Lau	1	-	-	1	-	11	-	-	<b>13</b>
Shek Pik	1	5	3	3	-	2	1	-	15
Lung Tsai Ng Yuen and Man Cheung Po	-	-	1	-	-	-	-	-	<b>1</b>
Keung Shan	11	10	12	4	6	14	-	2	<b>59</b>
Ngong Pong	2	16	9	4	-	15	-	1	<b>47</b>
Tei Tong Tsai	-	3	2	3	3	1	-	-	<b>12</b>
Yi Tung Shan	-	3	-	4	-	-	-	-	<b>7</b>
Mui Wo	12	24	10	5	8	13	12	4	<b>88</b>
Shap Long	1	2	4	2	-	-	4	-	<b>13</b>
South Lantau	5	39	15	5	5	18	10	1	<b>98</b>
Chi Ma Wan	-	2	1	2	-	-	-	-	<b>5</b>
Tong Fuk	1	5	3	2	2	2	2	-	<b>17</b>

### 3.1.3.2 Intertidal Fauna

Based on AFCD biodiversity data and data in EIA reports and other literatures, except the horseshoe crabs in San Tau, Sam Wat and Yi O <sup>(7)(8)(9)(10)</sup>, the reported intertidal fauna of the Study Area consist of common and widespread species with no notable conservation importance.

San Tau and Yi O appear to be the important nursery grounds for *Carcinoscorpius rotundicauda* within the Study Area, whilst the population of *T. tridentatus* in San Tau, Sham Wat and Yi O is much lower than in other key nursery grounds outside the Study Area, e.g. Pak Nai and Shui Hau Wan.

Although sandy shore and/ or mudflat are present in Tai O, Sha Lo Wan and Hau Hok Wan, no horseshoe crab have been reported during previous intertidal surveys <sup>(11)(12)(13)</sup>. Historical records were found in Tai O during an interview surveys with local fishermen and showed that horseshoe crabs were occasionally seen or caught inside Tai O Bay and the intertidal portion of Tai O stream <sup>(14)</sup>. In addition, adult horseshoe crabs are occasionally fished by trawlers fishing from the subtidal mud in western Hong Kong waters, along the northwest coast of the Lantau Island <sup>(15)(16)</sup>.

It is also noteworthy that three common sesarmine crab species were reported at the Study Area <sup>(17)</sup>. EIA data suggested that *Parasesarma pictum*, *Perisesarma bidens* and *Metaplex elegans* are present at the intertidal zones of San Tau <sup>(18)</sup>. Sesarmine crabs occur in natural coastal habitats, from lowland sections of streams, estuaries and marshes to mangroves and backshores; its diversity in a mangrove could be considered as an indicator of the “intactness” of that habitat and the presence of a good linkage between terrestrial and marine habitats.

## 3.2 Habitat Evaluation

The 16 sub-areas have been studied previously to various extents. Since understanding of the ecological conditions and completeness of the available ecological baseline data vary among sites, the ecological significance/ value of the 16 sub-areas is assessed differently, and the preliminary outcome is summarised in **Table 3.3**.

For the sub-areas that have been previously assessed by EIAs and/ or ecological studies and therefore with more site specific baseline data available, their habitats are evaluated with the reference to Tables 2 and 3 of Annex 8 of EIAO-TM. Such sub-areas (9 in total) include San Shek Wan, Sha Lo Wan and

- 
- (7) Chiu, H. M.C. & Morton, B. (1999). The distribution of horseshoe crabs (*Tachypleus tridentatus* and *Carcinoscorpius rotundicauda*) in Hong Kong. *Asian Marine Biology* 16, 10, 185-196.
  - (8) AFCD (n.d.-a). Horseshoe crabs in Hong Kong. Available at [http://www.afcd.gov.hk/english/conservation/con\\_mar/con\\_mar\\_hor/con\\_mar\\_hor.html](http://www.afcd.gov.hk/english/conservation/con_mar/con_mar_hor/con_mar_hor.html) website <[http://www.afcd.gov.hk/english/conservation/con\\_mar/con\\_mar\\_hor/con\\_mar\\_hor.html](http://www.afcd.gov.hk/english/conservation/con_mar/con_mar_hor/con_mar_hor.html)> Accessed on 6 November 2015.
  - (9) Chiu, H.M.C. & Morton, B. (2003). The status of horseshoe crabs in Hong Kong. In: Morton, B. (ed), *Perspectives on Marine Environmental Change in Hong Kong, 1977-2001*. Hong Kong University Press, Hong Kong, pp. 741-756.
  - (10) Shin, P.K.S., Li, H.Y. & Cheung, S.G. (2009). Horseshoe Crabs in Hong Kong: Current Population Status and Human Exploitation. In *Biology and Conservation of Horseshoe Crabs* (pp. 347-360). Boston, MA: Springer US.
  - (11) DSD (2016). Outlying Islands Sewerage Stage 2 – Upgrading of Tai O Sewage Collection, Treatment and Disposal Facilities. EIA-243/2016.
  - (12) Shin et al. (2009). *Op cit*.
  - (13) Kwan, B.K.Y., Hsieh, H., Cheung, S.G. & Shin, P.K.S. (2016). Present population and habitat status of potentially threatened Asian horseshoe crabs *Tachypleus tridentatus* and *Carcinoscorpius rotundicauda* in Hong Kong: A proposal for marine protected areas. *Biodiversity and Conservation*, 25(4), 673-692.
  - (14) Scott Wilson (Hong Kong) Ltd. (2000). AEIAR-036/2000 - Tai O Sheltered Boat Anchorage - Environmental & Drainage Impact Assessment - Environmental Impact Assessment.
  - (15) Mott MacDonald (2014) Environmental Impact Assessment of Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014). Prepared for Airport Authority Hong Kong.
  - (16) Environmental Resources Management (2017). Dredging, Management and Capping of Contaminated Sediment Disposal Facility to the South of The Brothers and East of Sha Chau. Prepared for CEDD. Available at: <http://www.cmp-monitoring.com.hk/EM&A%20Data.html>
  - (17) AFCD (2005) An Introduction to Common Sesarmine Crabs of Hong Kong. *Hong Kong Biodiversity*. AFCD Biodiversity Newsletter. Issue no. 9, September 2005.
  - (18) AFCD (n.d.-b). Hong Kong Biodiversity Database. Available at <https://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.php>

San Tau, Sham Wat, Tai O, Shek Pik, Keung Shan, Ngong Ping, Mui Wo, South Lantau (excl. Priority Sites) and Chi Ma Wan.

The other 7 sub-areas (i.e. Yi O, Tsin Yue Wan, Fan Lau, Lung Tsai Ng Yuen and Man Cheung Po, Tei Tong Tsai, Yi Tung Shan and Shap Long) have not been covered by any known in-depth studies before and are lack of ecological baseline data. Some information necessary for habitat evaluation such as species diversity and wildlife richness/ abundance of each habitat is not available at this stage, consequently rendering an evaluation for the habitats in these areas using Tables 2 and 3 of Annex 8 of EIAO-TM difficult or impossible. Therefore, the potential ecological value is estimated based on the available sub-area levelled information such as the dominated habitats, wildlife diversity of the sub-area and known species of conservation importance etc.. Because of such constraint, it should be noted that the evaluation of the potential ecological value of these previously “unstudied” sub-areas is indeed preliminary and broad-brush, with limited site/ habitat variation. If more site-specific ecological baseline becomes available in the future, more detailed habitat evaluation and understanding of the precise locations of feeding, breeding and/ or wintering grounds for birds, amphibians and butterflies etc. will be possible; ecological value of these sub-areas will evolve accordingly.

**Table 3.3 Preliminary Evaluation of Ecological Significance/ Potential Ecological Value of the Study Area**

No.	Sub-Area	Preliminary Overall Ecological Significance/ Potential Ecological Value
1	San Tau	High
2	Sha Lo Wan to Sham Wat	High
3	Tai O (excl. Priority Site)	High
4	Yi O	Moderate
5	Tsin Yue Wan	Moderate – High
6	Fan Lau	Moderate
7	Shek Pik	High
8	Lung Tsai Ng Yuen and Man Cheung Po	Moderate
9	Keung Shan	High
10	Ngong Ping	High
11	Tei Tong Tsai	Moderate – High
12	Yi Tung Shan	Moderate
13	Mui Wo	High
14	Shap Long	Moderate
15	Shui Hau (excl. Priority Site) and Tong Fuk	High
16	Chi Ma Wan	High

### 3.3 Prioritization of Ecological Surveys and Studies for Study Area Excluding Priority Sites

The purpose of this section is to present results of the prioritization of necessary ecological surveys and studies for conservation of the ecologically important habitats of the Study Area (excluding the Priority Sites), and the recommended strategy to take forward these surveys and studies.

Apart from the ecological significance of the sub-areas to be studied shown in **Table 3.3**, the need and priority of conducting ecological surveys and studies for these sub-areas are evaluated, by taking into account various factors, including the availability of the existing ecological information, the presence and potential of human activities and developments leading to adverse ecological impacts, and the need of conserving the sites so as to restore, strengthen and enhance their ecological values.

Based on these factors and upon evaluation, ecological surveys and studies for conservation of the 16 sub-areas of the Study Area are proposed to be placed into three batches in order of the following priority:



■ **First batch: 4 areas**

- San Tau, Sha Lo Wan to Sham Wat, Yi O, and Shap Long,

■ **Second batch: 5 areas**

- Tai O (excl. Priority Site), Ngong Ping, Tei Tong Tsai, Mui Wo, and Shui Hau (excl. Priority Site) and Tong Fuk,

■ **Third batch: 7 areas**

- Tsin Yue Wan, Fan Lau, Shek Pik, Lung Tsai Ng Yuen and Man Cheung Po, Keung Shan, Yi Tung Shan, and Chi Ma Wan

Following order of priority, it is recommended that the ecological studies for the sub-areas in the first batch should commence the earliest. However, the priority of individual area may be amended should there be significant changes in the prioritization consideration.

---

## Figures

---

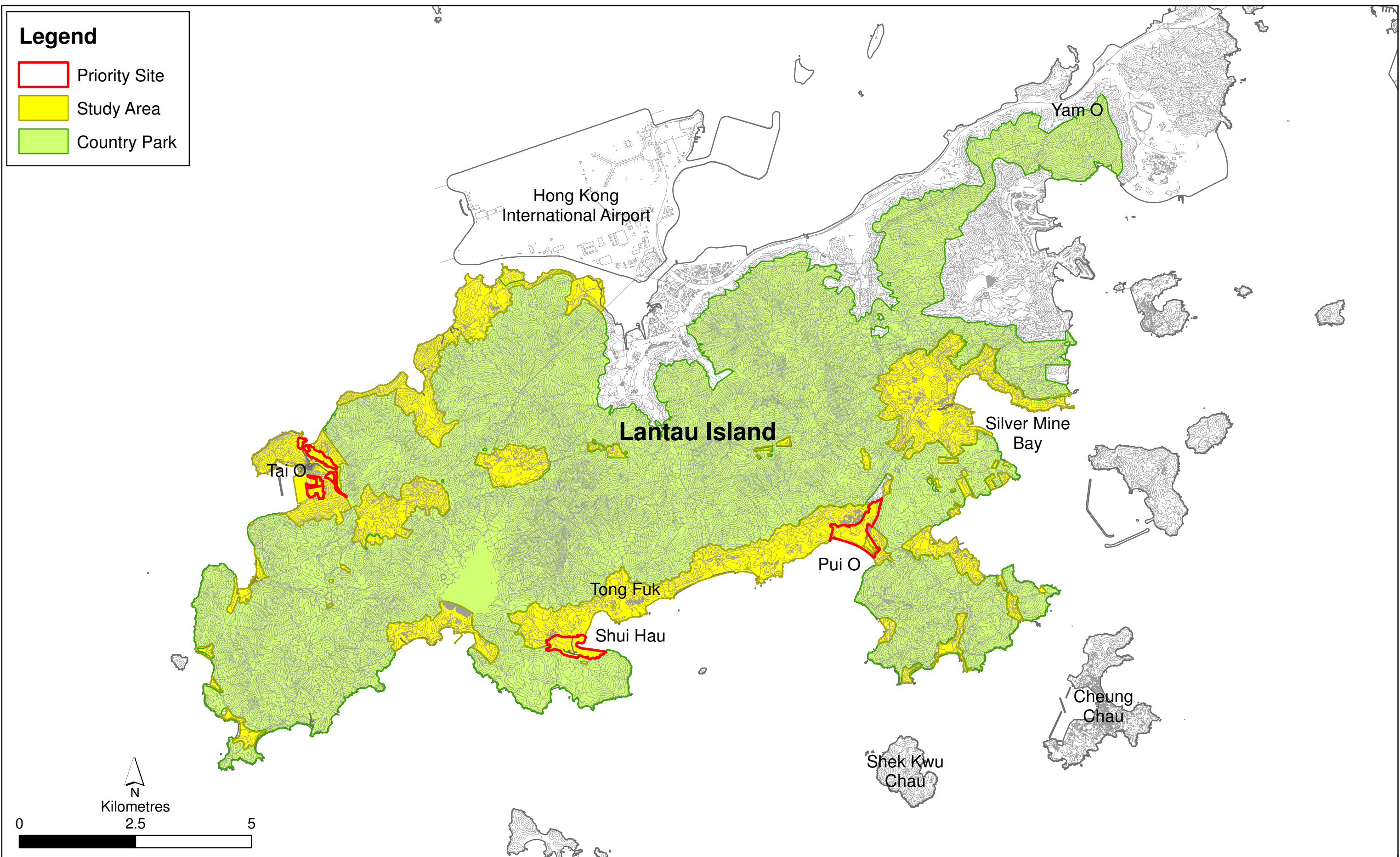


Figure 1.1

Location of Study Area and Priority Sites

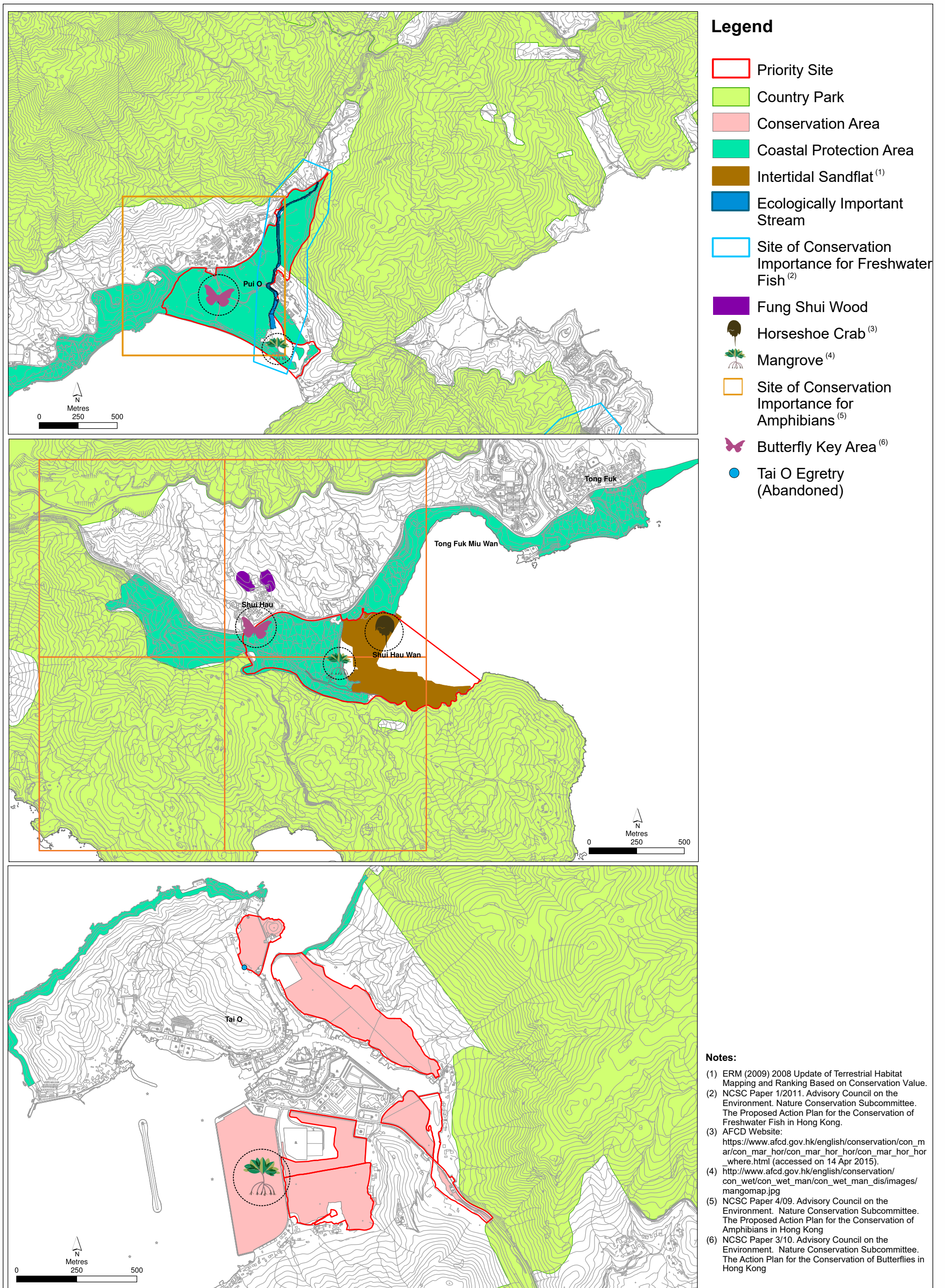


Figure 2.1

Areas of Conservation Importance within and in Close Vicinity of Priority Sites

**No. Proposed Conservation Measure**

- 1 Restore existing marsh and seasonally wet grassland habitats to achieve both permanent and/or seasonal marshy conditions with a variety of microhabitats in a long-term
- 2 Remove existing ecologically disturbing land use and rehabilitate to marsh
- 3 Restore the isolated agriculture fragments to marsh, and/or move them to and combine with the very northern large agricultural land
- 4 Prevent further expansion of the paved areas along South Lantau Road and Chi Ma Wan Road, control pollution to/ impacts on the adjacent wetlands to be restored, i.e. sewage/ waste water discharge and dumping/ littering, with proper drainage system
- 5 Conserve the restored marshes to provide habitats for fauna and flora, especially the target species and groups
- 6 Reduce the size of lowland woodland on the peripheries of the marshes in the northern portion (i.e. marshes to the north of Chi Ma Wan Road)
- 7 Establish riparian buffer for Pui O EIS to control development, pollution and to provide habitats for the identified target species and groups
- 8 Thin the aging exotic tree species (especially for the plantation patch along Chi Ma Wan Road), plant native trees and conduct post-planting maintenance (weeding, fertilizing and pruning, etc.)
- 9 Provide potential roosting site for Short-nosed Fruit Bats
- 10 Enhance backshore vegetation to provide ground for wintering Danaids
- 11 Protect woodland and mangrove to maintain the low-levelled disturbance, and to promote breeding of Romer's Tree Frog
- 12 Active habitat management and long-term monitoring of the wetlands in Southern and Northern Portions (i.e. wetlands to the south and north of Chi Ma Wan Road, respectively) upon restoration
- 13 Control and remove invasive, exotic fauna and flora species
- 14 Set up water quality monitoring station(s) and control water pollution
- 15 Use as a nature classroom to promote public awareness on wetland conservation
- 16 Build a bird hide adjacent to the southern portion of marshes for birdwatching and nature appreciation
- 17 Practise eco-farming and ensure no excessive fertilizers and pesticides be transferred to Pui O EIS

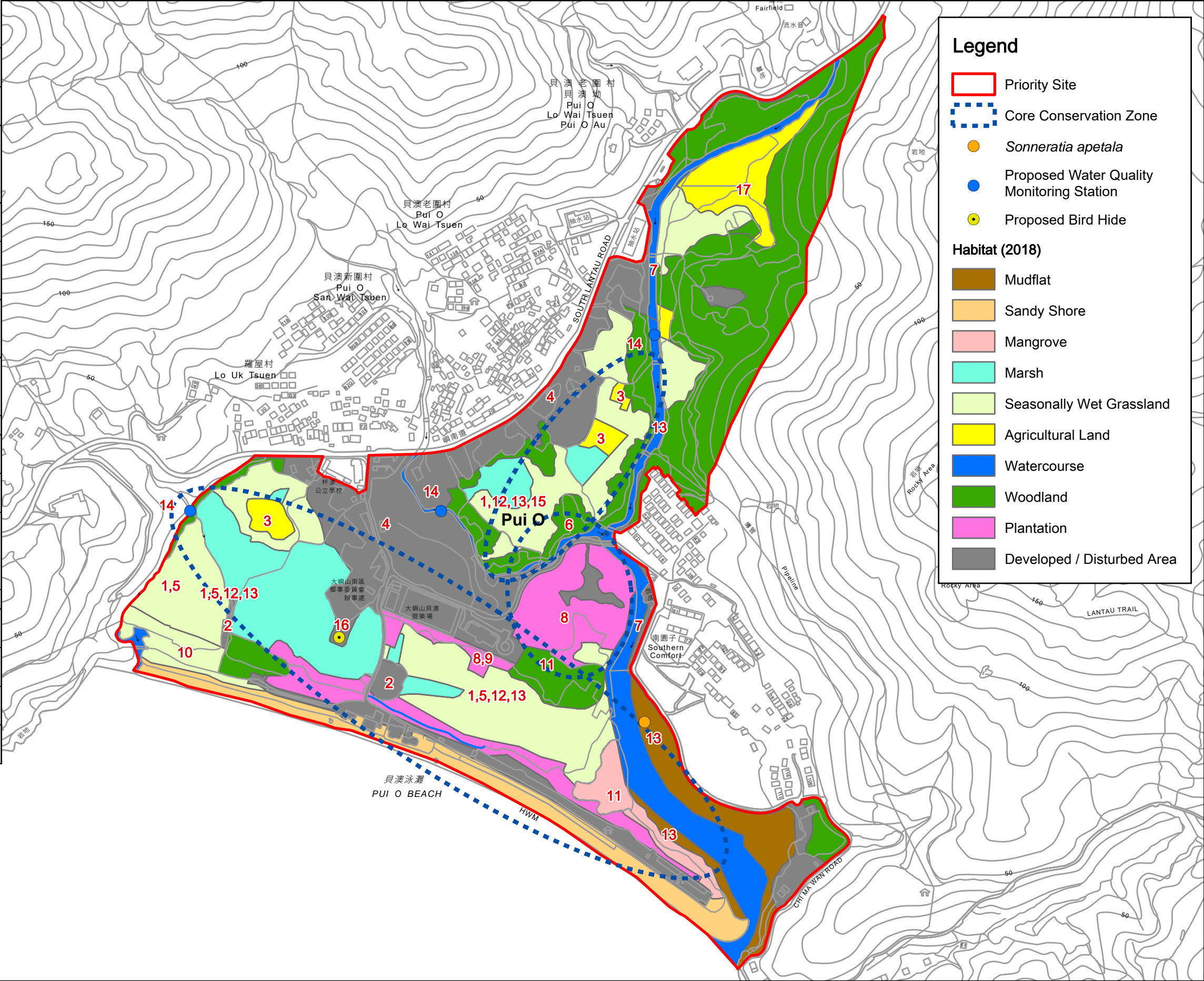


Figure 2.2

Proposed Core Conservation Zone and Conservation Measures for Pui O Priority Site (Indicative)

No.	Proposed Conservation Measure
1	Remove existing ecologically disturbing land use and rehabilitate to marsh
2	Restore existing marsh and seasonally wet grassland habitats to achieve both permanent and/or seasonal marshy conditions with a variety of microhabitats in a long-term.
3	Reduce the size of excessive lowland shrubland on previous marshy areas
4	Conserve the restored marshes to provide habitats for fauna and flora, especially the target species and groups.
5	Plant native species to provide food plants and nectar plants for butterflies and maintain low-level disturbance of woodland
6	Preserve the stream, woodland and mangrove as a whole
7	Active management, long-term monitoring of target species/groups (such as horseshoe crabs) and species diversity and conduct conservation education at sandflat
8	Active management and long-term monitoring of wetland habitats after restoration
9	Cleaning of marine litter
10	Control and remove invasive, exotic species
11	Set up water quality monitoring station(s) and control water pollution
12	Provide a small-scaled conservation centre to promote conservation awareness, and facilitate management of sandflat and water pollution/ waste control
13	Build bird watching facilities and footpath between the landward and seaward sides for birdwatching and nature appreciation
14	Practise eco-farming (preferably wet rice farming) and ensure no excessive fertilizers and pesticides be transferred to restored marshes

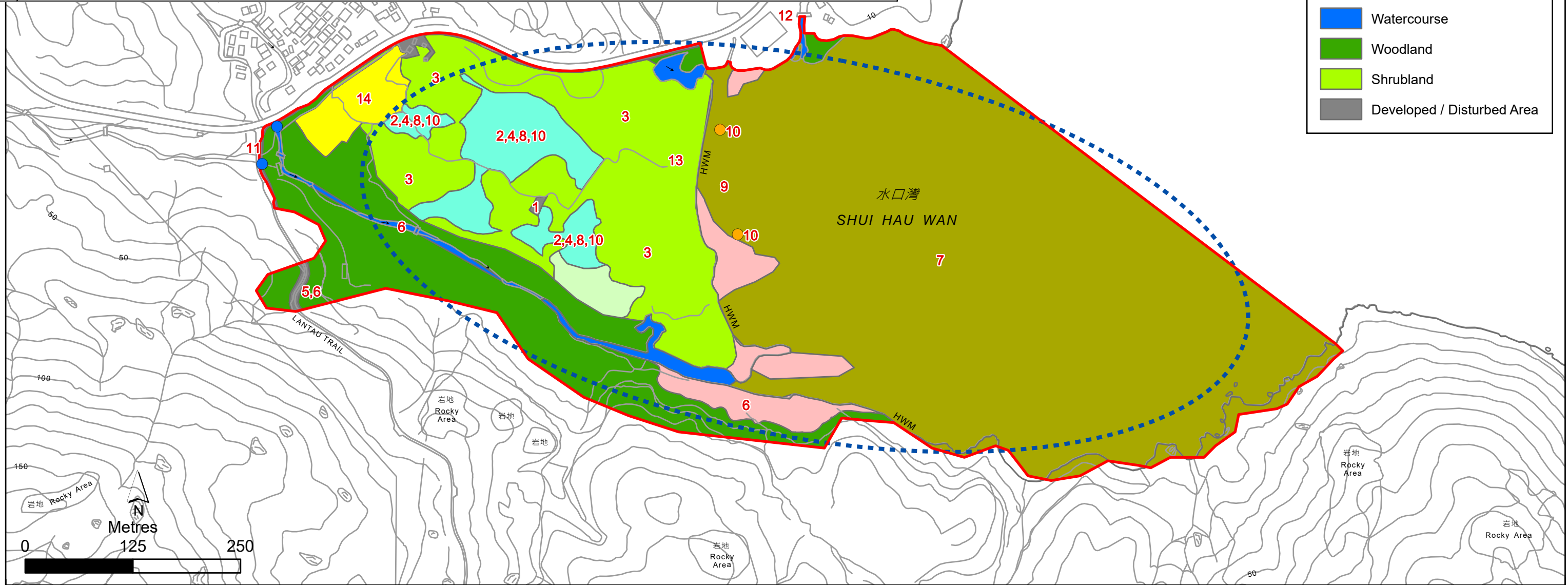


Figure 2.3  
Proposed Core Conservation Zone and Conservation Measures for Shui Hau Priority Site (Indicative)

**Legend**

- Priority Site
- Core Conservation Zone
- *Sonneratia apetala*
- Proposed Water Quality Monitoring Station

**Habitat (2018)**

- Sandflat
- Mangrove
- Marsh
- Seasonally Wet Grassland
- Agricultural Land
- Watercourse
- Woodland
- Shrubland
- Developed / Disturbed Area

No.	Proposed Conservation Measure
1	Ecological enhancement of abandoned fishpond
2	Recreation of reedbed/ brackish marsh
3	Improvement of Tai O Stream
4	Ecological enhancement of other pond
5	Protection of continuous mangrove and marsh
6	Active habitat management and long-term monitoring of wetland habitats after restoration
7	Removal of invasive species
8	Public education: display of historical saltpans and solar salt production, and other visitor facilities

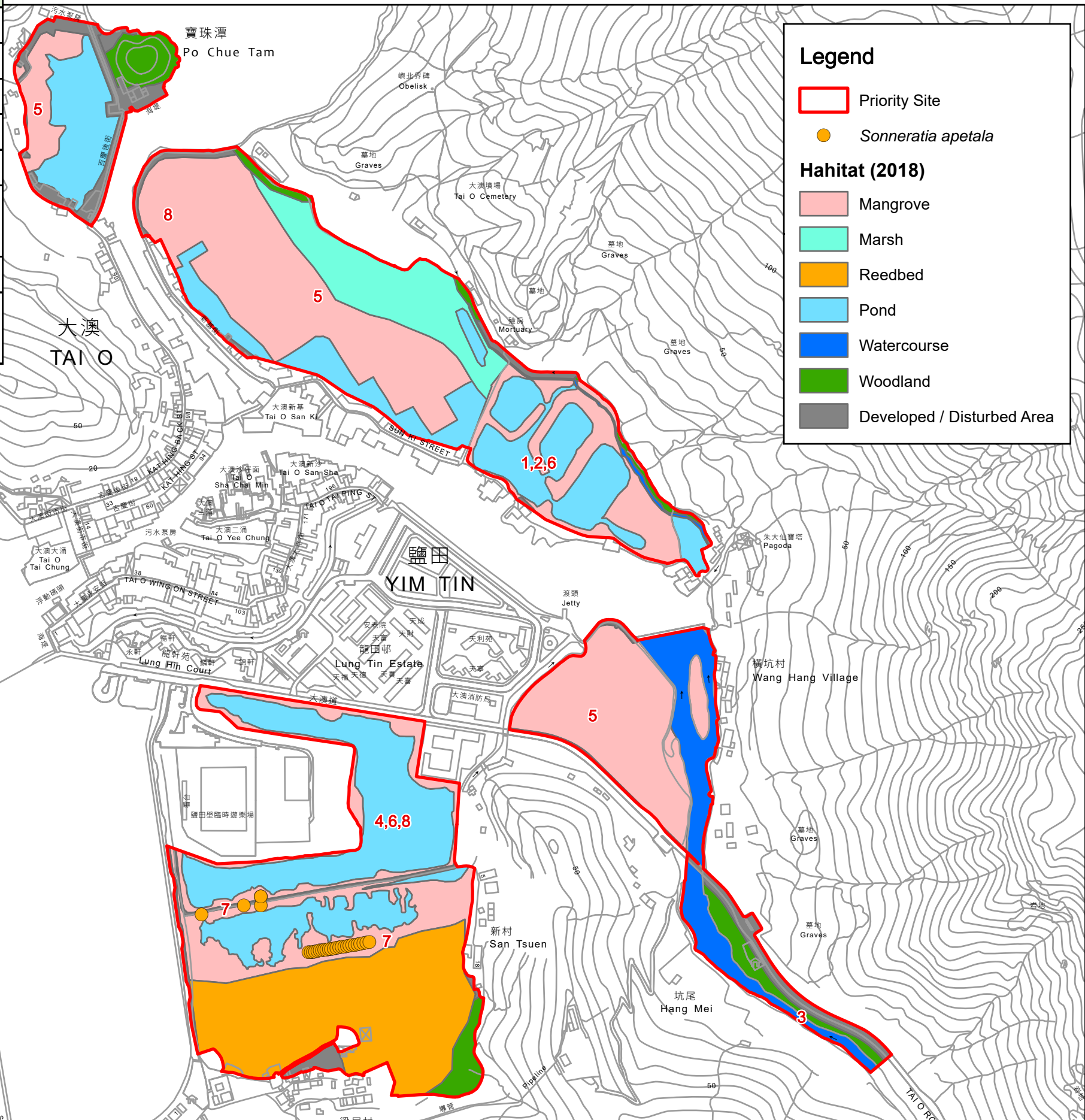


Figure 2.4

Proposed Conservation Measures for Tai O Priority Site (Indicative)

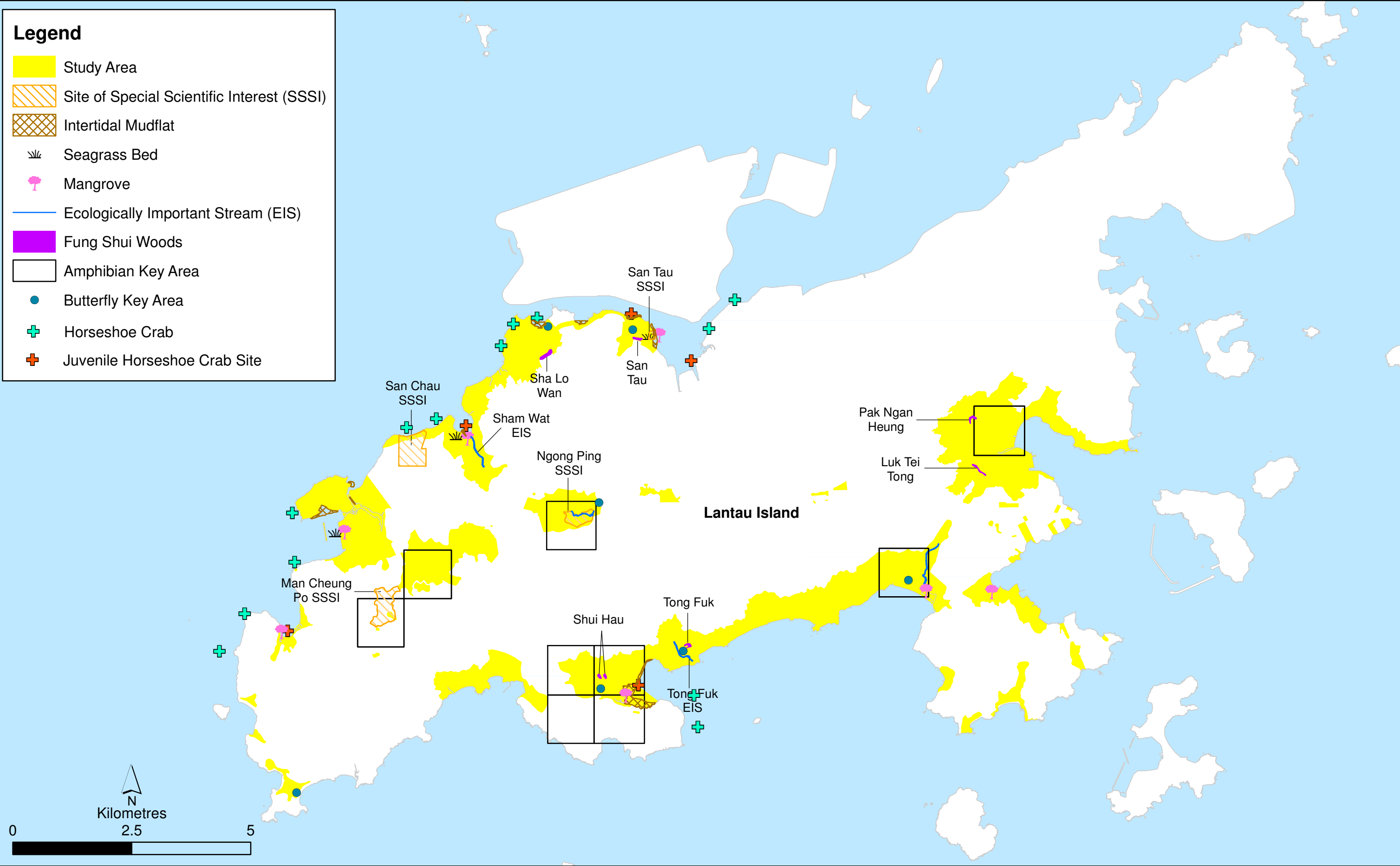


Figure 3.1

Sites of Conservation Importance within Study Area



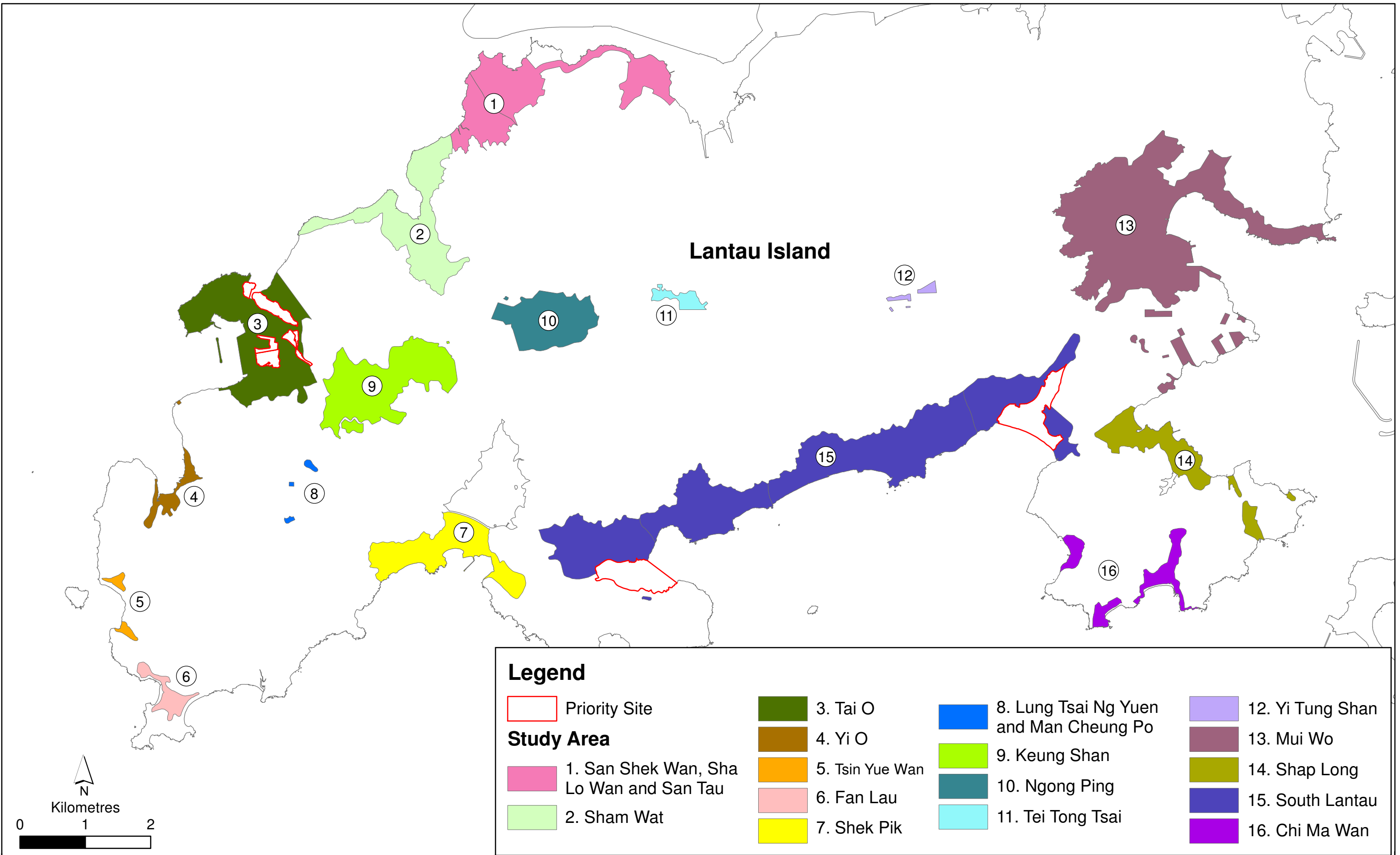


Figure 3.2

Study Area (excluding Priority Sites)

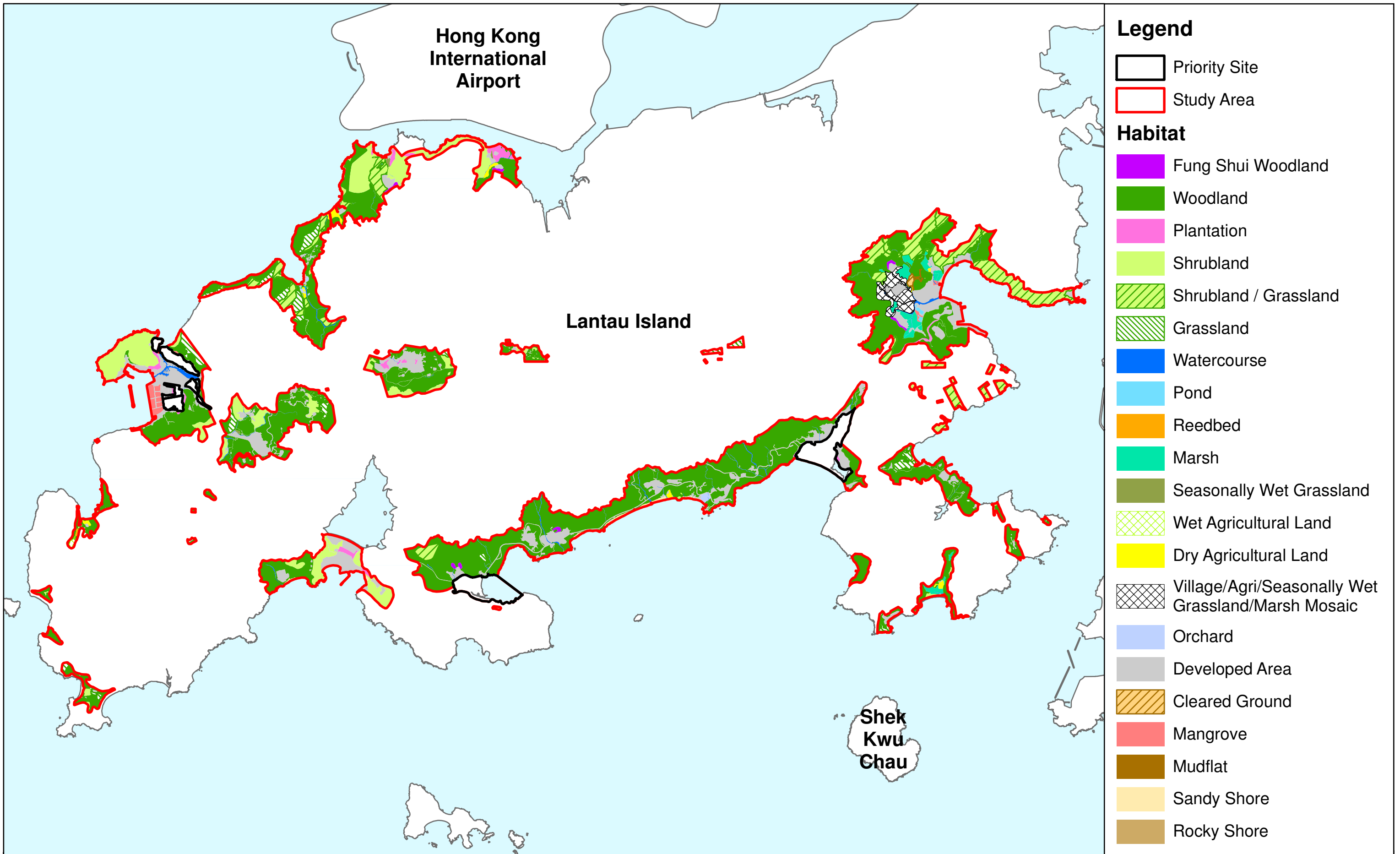


Figure 3.3

Overall Habitat Map for Study Area

**APPENDIX A      PROPOSED TARGET SPECIES AND GROUPS  
FOR PRIORITY SITES**

Table A1 : Proposed Target Species/ Groups for Pui O Priority Site

Species <sup>1</sup>	Conservation and Protection Status <sup>2</sup>	Status in Hong Kong <sup>3,4</sup>	Reason for Selection				
			Habitat Indicator	Vulnerable Species	Biodiversity Indicator	Fragmentation Indicator	Existing Knowledge
<b>Birds</b>							
Yellow Bittern* <i>Ixobrychus sinensis</i>	Fellowes: (LC)	M, Su	✓	✓			
Chinese Pond Heron <i>Ardeola bacchus</i>	Fellowes: PRC (RC)	P	✓		✓		✓
Eastern Cattle Egret <i>Bubulcus coromandus</i>	Fellowes: (LC)	P	✓				✓
Ruddy-breasted Crane* <i>Porzana fusca</i>	Fellowes: LC RLCV: NT	M, W	✓	✓			
Watercock* <i>Gallicrex cinerea</i>	Fellowes: RC	M	✓	✓			
Northern Lapwing* <i>Vanellus vanellus</i>	IUCN: NT Fellowes: LC	W	✓	✓			
Greater Painted-snipe* <i>Rostratula benghalensis</i>	Fellowes: LC	M, R	✓	✓			
Pintail/ Swinhoe's Snipe* <i>Gallinago stenura/ Gallinago megala</i>	Fellowes: LC for Swinhoe's Snipe	-	✓	✓			
Wood Sandpiper <i>Tringa glareola</i>	Fellowes: LC	M, W	✓	✓			
Red-throated Pipit <i>Anthus cervinus</i>	Fellowes: LC	M, W	✓	✓			✓
<b>Mammals</b>							
Short-nosed Fruit Bat <i>Cynopterus sphinx</i>	RLCV: NT Cap. 170	Very Common	✓		✓		✓
<b>Reptiles</b>							
Reeves' Turtle <i>Mauremys reevesii</i>	IUCN: EN Fellowes: GC RLCV: EN CITES: III Cap. 170 Cap. 586	Widespread	✓	✓			

Species <sup>1</sup>	Conservation and Protection Status <sup>2</sup>	Status in Hong Kong <sup>3, 4</sup>	Reason for Selection				
			Habitat Indicator	Vulnerable Species	Biodiversity Indicator	Fragmentation Indicator	Existing Knowledge
Plumbeous Water Snake <i>Hypsiscopus plumbea</i>	RLCV: VU	Widely distributed in aquatic lowland throughout Hong Kong	✓	✓			
<b>Amphibians</b>							
Chinese Bullfrog <i>Hoplobatrachus rugulosus</i>	Fellowes: PRC RLCV: EN	Potential Concern	✓	✓		✓	
Three-striped Grass Frog <i>Hylarana macrodactyla</i>	RLCV: NT	Least Concern	✓	✓		✓	
Romer's Tree Frog <i>Liuixalus romeri</i>	IUCN: EN Fellowes: PGC RLCV: VU Cap. 170	Immediate Concern	✓	✓		✓	
<b>Butterflies</b>							
Overwintering Danaids	-	-	✓		✓		✓
<b>Odonates</b>							
Odonates	-	-	✓	✓	✓		
<b>Fish and Invertebrates</b>							
Small Snakehead <i>Channa asiatica</i>	Fellowes: LC	Uncommon	✓	✓			
<i>Somanniathelphusa zanklon</i>	IUCN: EN Fellowes: GC	-	✓	✓		✓	

## Notes:

1. “\*” indicates the species that are reported only from literature.
2. Conservation and Protection Status:
  - a. IUCN – IUCN Red List (2017): NT = Near Threatened, EN = Endangered  
The IUCN status of Mozambique Tilapia refers to its native region and wide population, those recorded during current study is considered to be introduced population.

- b. Fellowes – Fellowes *et al.* (2002): LC = Local Concern, PRC = Potential Regional Concern, RC = Regional Concern, PGC = Potential Global Concern, GC = Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
  - c. RLCV – Red List of China’s Vertebrate (2016): NT = Near Threatened, VU = Vulnerable, EN = Endangered
  - d. CSMPS – China State Major Protection Status: Appendix I and Appendix II
  - e. CITES (II) – Under Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora
  - f. Cap. 170 – Protected under *Wild Animals Protection Ordinance*  
All birds in Hong Kong are protected under Cap. 170 – Protected under *Wild Animals Protection Ordinance*
3. Status in Hong Kong refers to Hong Kong Biodiversity Database. <http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp>  
“-” indicates that information for the corresponding species is not available on the database.
4. Status in Hong Kong refers to Carey *et al.* (2001): R = Resident, W = Winter visitor, Su = Summer visitor, M = Migrant, AM = Autumn migrant, SpM = Spring migrant, P = Present all year, exact composition unknown.

Table A2 : Proposed Target Species/ Groups for Shui Hau Priority Site

Species <sup>1</sup>	Conservation and Protection Status <sup>2</sup>	Status in Hong Kong <sup>3,4</sup>	Reason for Selection				
			Habitat Indicator	Vulnerable Species	Biodiversity Indicator	Fragmentation Indicator	Existing Knowledge
<b>Birds</b>							
Shorebirds	-	-	✓	✓(for some species)	✓		
Eastern Cattle Egret <i>Bubulcus coromandus</i>	Fellowes: (LC)	P	✓				✓
<b>Reptiles</b>							
Plumbeous Water Snake <i>Hypsiscopus plumbea</i>	RLCV: VU	Widely distributed in aquatic lowland throughout Hong Kong	✓	✓			
<b>Amphibians</b>							
Chinese Bullfrog <i>Hoplobatrachus rugulosus</i>	Fellowes: PRC RLCV: EN	Potential Concern	✓	✓		✓	
Three-striped Grass Frog <i>Hylarana macrodactyla</i>	RLCV: NT	Least Concern	✓	✓		✓	
Romer's Tree Frog <i>Liuixalus romeri</i>	IUCN: EN Fellowes: PGC RLCV: VU Cap. 170	Immediate Concern	✓	✓		✓	
<b>Butterflies</b>							
Butterflies	-	-	✓	✓(for some species)	✓		✓
<b>Odonates</b>							
Odonates	-	-	✓	✓(for some species)	✓		
<b>Fish and Invertebrates</b>							
Japanese Eel* <i>Anguilla japonica</i>	IUCN: EN RLCV: EN	-	✓	✓		✓	
Philippine Neon Goby* <i>Stiphodon atropurpureus</i>	Fellowes: GC RLCV: NT	Species of Conservation Concern	✓	✓		✓	
<i>Cryptopotamon anacoluthon</i>	IUCN: VU Fellowes: PGC	-	✓	✓			✓

Species <sup>1</sup>	Conservation and Protection Status <sup>2</sup>	Status in Hong Kong <sup>3, 4</sup>	Reason for Selection			
			Habitat Indicator	Vulnerable Species	Biodiversity Indicator	Fragmentation Indicator
<b>Intertidal Species</b>						
<i>Tachypleus tridentatus</i>	IUCN: EN	-	✓	✓		✓
<i>Carcinoscorpius rotundicauda</i>	IUCN: DD	-	✓	✓		✓
<i>Pseudosesarm patshuni</i>	-	Endemic to Hong Kong	✓			✓

## Notes:

1. “\*” indicates the species that are reported only from literature.
2. Conservation and Protection Status:
  - a. IUCN – IUCN Red List (2017): NT = Near Threatened, EN = Endangered
  - b. Fellowes – Fellowes *et al.* (2002): LC = Local Concern, PRC = Potential Regional Concern, RC = Regional Concern, PGC = Potential Global Concern, GC = Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
  - c. RLCV – Red List of China’s Vertebrate (2016): NT = Near Threatened, VU = Vulnerable, EN = Endangered
  - d. CSMPS – China State Major Protection Status: Appendix I and Appendix II
  - e. CITES (II) – Under Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora
  - f. Cap. 170 – Protected under *Wild Animals Protection Ordinance*
3. Status in Hong Kong refers to Hong Kong Biodiversity Database. <http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp>  
“-” indicates that information for the corresponding species is not available on the database.
4. Status in Hong Kong refers to Carey *et al.* (2001): P = Present all year, exact composition unknown.



Table A3 : Proposed Target Species/ Groups for Tai O Priority Site

Species <sup>1</sup>	Conservation and Protection Status <sup>2</sup>	Status in Hong Kong <sup>3, 4</sup>	Reason for Selection				
			Habitat Indicator	Vulnerable Species	Biodiversity Indicator	Fragmentation Indicator	Existing Knowledge
<b>Birds</b>							
Yellow Bittern* <i>Ixobrychus sinensis</i>	Fellowes: (LC)	M, Su	✓	✓			
Little Egret <i>Egretta garzetta</i>	Fellowes: PRC (RC)	P	✓				✓
Great Egret <i>Ardea alba</i>	Fellowes: PRC (RC)	P, W	✓				✓
Grey Heron <i>Ardea cinerea</i>	Fellowes: PRC	W	✓				✓
Chinese Pond Heron <i>Ardeola bacchus</i>	Fellowes: PRC (RC)	P	✓		✓		✓
Eastern Cattle Egret <i>Bubulcus coromandus</i>	Fellowes: (LC)	P	✓				✓
<b>Reptiles</b>							
Mangrove Water Snake* <i>Myrrophis bennettii</i>	Fellowes: LC	Recorded in the muddy coastal areas in Deep Bay area.	✓	✓			
<b>Amphibians</b>							
Romer's Tree Frog <i>Liixalus romeri</i>	IUCN: EN Fellowes: PGC RLCV: VU Cap. 170	Immediate Concern	✓	✓		✓	
<b>Odonates</b>							
Four-spot Midget * <i>Mortonagrion hirosei</i>	IUCN: NT Fellowes: GC	Common	✓	✓			✓
Odonates	-	-	✓	✓	✓		
<b>Fish</b>							
Indo-Pacific Tropical Sand Goby	IUCN: NT	Common	✓	✓		✓	

Species <sup>1</sup>	Conservation and Protection Status <sup>2</sup>	Status in Hong Kong <sup>3, 4</sup>	Reason for Selection				
			Habitat Indicator	Vulnerable Species	Biodiversity Indicator	Fragmentation Indicator	Existing Knowledge
<i>Favonigobius reichei</i>							

## Notes:

1. “\*” indicates the species that are reported only from literature.
2. Conservation and Protection Status:
  - a. IUCN – IUCN Red List (2017): NT = Near Threatened, EN = Endangered  
The IUCN status of Mozambique Tilapia refers to its native region and wide population, those recorded during current study is considered to be introduced population.
  - b. Fellowes – Fellowes *et al.* (2002): LC = Local Concern, PRC = Potential Regional Concern, RC = Regional Concern, PGC = Potential Global Concern, GC = Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
  - c. RLCV – Red List of China’s Vertebrate (2016): NT = Near Threatened, VU = Vulnerable, EN = Endangered
  - d. CSMPS – China State Major Protection Status: Appendix I and Appendix II
  - e. CITES (II) – Under Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora
  - f. Cap. 170 – Protected under *Wild Animals Protection Ordinance*  
All birds in Hong Kong are protected under Cap. 170 – Protected under *Wild Animals Protection Ordinance*
3. Status in Hong Kong refers to Hong Kong Biodiversity Database. <http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp>  
“-” indicates that information for the corresponding species is not available on the database.
4. Status in Hong Kong refers to Carey *et al.* (2001): R = Resident, W = Winter visitor, Su = Summer visitor, M = Migrant, AM = Autumn migrant, SpM = Spring migrant, P = Present all year, exact composition unknown.

---

**ERM has over 160 offices across the following countries and territories worldwide**

Argentina	The Netherlands
Australia	New Zealand
Belgium	Norway
Brazil	Panama
Canada	Peru
Chile	Poland
China	Portugal
Colombia	Puerto Rico
France	Romania
Germany	Russia
Ghana	Senegal
Guyana	Singapore
Hong Kong	South Africa
India	South Korea
Indonesia	Spain
Ireland	Sweden
Italy	Switzerland
Japan	Taiwan
Kazakhstan	Tanzania
Kenya	Thailand
Malaysia	UAE
Mexico	UK
Mozambique	US
Myanmar	Vietnam

**ERM Hong Kong**

2509, 25/F One Harbourfront  
18 Tak Fung Street  
Hunghom  
Kowloon  
Hong Kong

T: +852 2271 3000

F: +852 3015 8052

[www.erm.com](http://www.erm.com)