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Ecological Impact



## **6. ECOLOGICAL IMPACT**

### **6.1 INTRODUCTION**

6.1.1 This section of the EIA describes the ecosystems of the study area and assesses and evaluates the potential ecological impact of the project, taking into account the importance of the natural habitats and their associated flora and fauna. In order for this to be achieved, the following objectives were defined:

- Collate and revise existing literature / field surveys to provide an updated ecological baseline profile of the site to enable the identification of all SRs potentially affected by the project;
- Determine potential detrimental impacts to the study area environment, including cumulative impacts;
- Assess and evaluate the potential impacts and where possible propose practicable alternatives;
- Recommend mitigation measures to limit impacts to acceptable levels; and
- Assess the need for and recommend the scope of an appropriate monitoring and audit programme.

### **6.2 RELEVANT LEGISLATION**

6.2.1 Local legislation relevant to ecological impact is listed below:

- i. The Forests and Countryside Ordinance (Cap. 96) which protects both natural and planted forests, including mangroves;
- ii. The Forestry Regulations which provide for protection of specified local wild plant species;
- iii. The revised Town Planning Ordinance contains measures for the protection of Sites of Special Scientific Interest (SSSI's), 'coastal protection areas', and other specified uses which aim to conserve or protect the environment;
- iv. The Wild Animals Protection Ordinance (Cap. 170) 1980 which provides for the protection of listed species of wild animals (excluding fish and marine invertebrates) by prohibiting the disturbance, taking or removal of such animals, their nests and eggs; and
- v. The Fisheries Protection Ordinance (Cap. 171) 1987 which is intended to promote the conservation of fish and other forms of aquatic life within the waters of Hong Kong, to regulate fishing practices and to prevent activities detrimental to the fishing industry.
- vi. The Marine Fish Culture Ordinance 1983 (Cap. 353) regulates and protects marine fish culture zones (FCZ) which are specifically designated under the Ordinance. It is an offence to deposit substances which could pollute a FCZ.

vii. The Environmental Impact Assessment Ordinance (EIAO)

Reference is made to Annex 8 of the EIAO Technical Memorandum (TM), which sets out general criteria for evaluating the ecological importance of, and therefore the significance of potential impacts upon, a particular site and / or species. Annex 16 of the TM details guidelines for ecological assessment.

### 6.3 BASELINE CONDITIONS

- 6.3.1 The following baseline description of the ecological components within the study area which may potentially be affected by the proposed extension is compiled based upon existing information and knowledge of the study area. This information is supplemented by an ecological field survey which was carried out during July 1998.
- 6.3.2 Within the study area there exist a variety of coastal habitats with varying wind and wave influences. At the mouth of the Haven are stretches of rocky shore, further into the inlet are boulder and sandy shores, whilst the back shore habitats and small coves are comprised of silt and mud substrates.
- 6.3.3 Fringing the Haven, particularly along the Pak Sha Wan peninsula, are terrestrial habitats encompassing secondary woodland and scrub / rough grassland. Part of the Pak Sha Wan peninsula is a designated Site of Special Scientific Interest (SSSI), and almost all of the peninsula is within the Ma On Shan Country Park Extension. There is also a Conservation Area at the north of the same peninsula.
- 6.3.4 The Haven is fed by several streams, which, along with the shallow marine water depth, produce greatly varying conditions of salinity. The largest (and most significant for this Study) of the freshwater streams is Ho Chung Stream. The presence of the streams dictates that the sediment in the most sheltered area in the north of the Haven comprise fine muds of terrestrial origin, rich in organic matter. Those within the immediate vicinity of the reclamation area are generally more sandy with a grey anaerobic layer at about 10cm below the surface.
- 6.3.5 There is no natural shoreline in front of the Hebe Haven Yacht Club, nor for several hundred of metres to the north and south of the club. The tidal and shallow, subtidal seabed in front of the club is impacted by general pollution from several sources. As such the sediments are considered to be anoxic just below the surface and do not support any benthic organisms of ecological value. The natural areas of shoreline around the Haven are limited, but represent a diverse range of habitats. There are three mangals in the Haven located at Sai Kung Hoi; Ho Chung, and Pak Sha Wan (Figure 6.1).
- 6.3.6 A survey of the Pak Sha Wan mangal, the closest mangal to the Club (around 300 metres) and the least sheltered, identified the habitat to be of fairly poor condition. This is supported by a recent survey, Tam N.F.Y and Y.S Wong - *Ecological Study of Mangrove Stands in Hong Kong (November 1997)*. The surface fauna in the Pak Sha Wan mangal consists mainly of gastropods and isopods, with relatively few fiddler crabs in evidence compared to the Sai Kung Hoi mangal. The same species

predominate the boulder shore to the north and the rocky shore to the west of the Haven.

- 6.3.7 With respect to the intertidal benthos, the cockle *Anomalocardia* and the tiny crabs *Scopimera* are the most characteristic species found on the exposed mudflats of Hebe Haven during low tide. It is unlikely that these species are distributed beyond the inter-tidal zone.
- 6.3.8 The mangal / mudflat at Sai Kung Hoi to the north-west is relatively well developed, thriving on fine sediment carried downstream by the freshwater channel. Many mudskippers (*Periophthalmus cantonensis*) and fiddler crabs (*Uca* sp.) were observed at Sai Kung Hoi mangal which also provides refuge for a range of fish fry in the small feeder streams.
- 6.3.9 The more exposed Ho Chung mangal fringes the mouth and the banks of the Ho Chung stream, the bankside sediment of which is excavated into hollows by large fish (species unknown) for breeding. Benthic macrofauna here is sparse and not diverse, dominated by the mollusc *Cerithidea* sp. The fiddler crab was observed only in the downstream section of the mangal.
- 6.3.10 The ecological sensitive receivers in the study area include three mangrove stands, including those labelled in Figure 6.1 as Pak Sha Wan, Sai Kung Hoi and Ho Chung. (Tam, N.F.Y and Y.S. Wong - Ecological Study on Mangrove Stands in Hong Kong (1997), A report submitted to Agriculture and Fisheries Department, Hong Kong SAR).

#### **6.4 IMPACT IDENTIFICATION**

- 6.4.1 The key ecological issues with respect to the proposed reclamation and dredging at the Club could be both direct and indirect on a range of habitat and communities. Impacts may arise from destruction of the sea bed during reclamation (Figure 2.4); the operation of the grab dredging process; from release of contaminants within the dredged area and also from sediment release. Direct impacts arise from the reclamation of 2,619m<sup>2</sup> of Hebe Haven for boat storage and repair and areas of hard standing and the deepening of an adjacent area of 14,400m<sup>2</sup> for pontoons, moorings and boat access.
- 6.4.2 Upon impact of the grab with the marine sediment there may be incidences of habitat and species excavation. It is considered that the sedentary benthic species in this location are pollution tolerant and therefore of limited ecological value. This scenario would apply to sedentary benthic species and to a lesser extent to planktonic species which would generally be dispersed by the current eddies generated as the grab entered the water column.
- 6.4.3 During removal of the filled grab through and out of the water column there may be disturbance and release of sediment at the sea bed leading to increased levels of suspended solids. At the sea bed such increases in suspended solids levels may smother benthic species, particularly sedentary species. Sedentary species may also be affected by incidences of reduced dissolved oxygen which often

accompany elevated suspended solid levels. Increased suspended solids will reduce the sunlight penetration into the water column, thus potentially decreasing the light climate for phytoplankton and algal photosynthesis.

- 6.4.4 The potential impacts of high elevations of suspended solids on fish (and benthos) may be physiological and visual. Excessive concentrations of suspended solids may induce gill abrasion which may lead to loss of protective mucus coatings and the onset of disease, whilst reduced visibility may affect feeding activities and reproduction. Impacts on juveniles will typically be greater than for adults. However, with regard to fish, these impacts depend on either an unconfined species being exposed to a large widespread plume, or a confined species being unable to avoid any plume, however localised - as would be the case with species inside the Ma Nam Wat FCZ. Potential impacts on mangrove stands and the FCZ are key concerns.
- 6.4.5 Indirect impacts may potentially arise through a direct impact on a species which may subsequently affect the ecosystem structure. For example, reduced light incidence may affect planktonic productivity and hence food supply up a food chain, or coarser sediment transported and deposited in a mangal may be less organically rich and thus less suitable than existing sediment for detritivores.

## **6.5 ASSESSMENT METHODOLOGY**

- 6.5.1 Direct impacts from reclamation and dredging are assessed on the ecological value of the impacted habitats and the degree and type of change incurred.
- 6.5.2 The assessment methodology for the evaluation of the remaining potential ecological impacts combines a knowledge of the dispersion of key water quality parameters, as discussed in Section 4 of this report.
- 6.5.3 The water quality model provides information as to the spatial distribution and concentration of key water quality parameters (suspended solids, TBT, dissolved oxygen and nitrate) which may potentially affect the aquatic ecosystem. Thus, the results plots from model simulations enables the zone of ecological impact to be identified.
- 6.5.4 Once the spatial coverage of impacts has been defined, an evaluation of those habitats / species which could potentially be subjected to a significant ecological impacts will be undertaken based on the evaluation criteria provided in Annex 8 of the EIAO TM.
- 6.5.5 Impacts of the biochemical oxygen demand of the sediment on the dissolved oxygen levels in the water were also considered in Section 4. The expected levels of sediment generated in the water column over a tidal cycle would not reduce DO to levels which cause an exceedance of the WQOs. Compliance with the WQO is considered sufficient evidence that there would be no adverse impact on the ecosystem, although very localised incidences of reduced dissolved oxygen may occur at the dredging point.

6.5.6 When determining the significance of an ecological impact a range of factors require consideration as detailed in Annex 8 of the TMEIAO. Examples include habitat quality, species importance, habitat size/ species abundance, duration of impact, reversibility of impact and magnitude of impact. In addition, the quality of a habitat can be evaluated using a range of criteria including: naturalness, size, diversity, rarity, recreativity, fragmentation, ecological linkage, potential value, nursery/breeding grounds, age and wildlife abundance/richness.

## 6.6 EVALUATION

6.6.1 An area of 2,619m<sup>2</sup> of inter-tidal and sub-tidal soft seabed will be reclaimed and an adjacent area of 14,400m<sup>2</sup> of subtidal soft seabed will be made deeper by dredging to a depth of approximately 2.0 metres. The shallow area affected is heavily impacted by present coastal activities along the shores of the Haven with evidence of oil pollution and TBT from local shipyards. Based on existing water quality data, sediment quality, microtoxicity studies, surrounding land-use and knowledge of the study area, the sediments are not considered to be ecologically significant. No organisms of conservation value are considered to inhabit the area. The area lost to reclamation would be only a very small proportion of shallow soft habitat in the Haven and its loss is therefore considered to be acceptable. A similar evaluation is made for the 14,400m<sup>2</sup> of shallow waters which would be made deeper by dredging. In this case the ecological significance is reduced further by the fact that following dredging, a benthic community would eventually be able to recolonise the area of seabed devoted to pontoons and boat moorings.

6.6.2 Model simulations reveal that additional sediment deposition from dredging will be restricted immediately around the dredging operation. It is considered that mobile benthic species would vacate such areas under impact and move to an undisturbed or less disturbed location. Baseline studies did not identify any benthic species of conservation value within the direct dredging impact zone. Increased suspended solids levels may temporarily, and very locally, affect plankton activity, although the magnitude of the works is generally insignificant. The ecological SRs located some 300 metres away will therefore not be impacted by the works.

6.6.3 As detailed in Section 5.6, no ecological impacts are predicted to arise as a consequence of TBT release from disturbed sediment. The TBT impacts, and the model predictions are mentioned in section 5.6.6 to 5.6.8. The model simulations indicate that there will be no significant contamination with respect to TBT to any of the potential SRs. Even at SR.2, which is most likely to be effected by the dredging, the TBT concentration is not expected to exceed  $2 \times 10^{-2}$  ng/l. The increases in TBT are therefore predicted to be very localised and of short duration, due to the limited period of dredging for the proposed development and the nature of TBT.

6.6.4 Nutrient releases were assessed in terms of nitrates (Section 4) and these were found to cause exceedances of the WQOs only within a few tens of metres of the dredging works. Generally releases were predicted to be undetectable and highly unlikely to affect the nutrient balance in the waters. Thus, there is no anticipated

increase in phytoplankton productivity which could lead to secondary or induced impacts.

- 6.6.5 Species within a given habitat are evaluated based on their protection status, their distribution (locally or regionally) and their rarity.

#### Findings

- 6.6.6 The loss of 2,619m<sup>2</sup> of shallow seabed is of very low ecological significance due to the low value of the community considered to consist only of pollution tolerant species and the small scale of habitat loss.

- 6.6.7 The temporary damage to 14,400m<sup>2</sup> of shallow seabed through dredging is of low ecological significance due to the impacted nature of the existing community and the small scale of the works in relation to available habitat of the same type in the Haven. Moreover, a benthic community of a similar nature is expected to recolonise the area once the works have been completed.

- 6.6.8 The modelling results indicate that impacts for all concerned parameters will be significant only within approximately 100m of the dredging operations. Due to rapid deposition, elevated suspended solids levels will be evident only during periods of active dredging at a maximum distance of 100m, whilst the nearest ecological SRs are 300m from the dredging area (see section 6.3.6). Similarly dissolved oxygen depletion and TBT contamination will have no significant impacts at the ecological sensitive receivers. The WQO would therefore be met at all ecological SRs including all identified mangrove stands and the impacts are considered acceptable.

- 6.6.9 Given that no significant ecological impacts have been identified, there are no specific mitigation measures to be applied and no ecological monitoring and audit requirements.

#### 6.7 OPERATIONAL IMPACTS

- 6.7.1 There should be no significant impact on marine ecology arising from the expanded operations of the club, provided that regulations prohibiting the use of TBT based anti fouling paints on small craft are complied with.

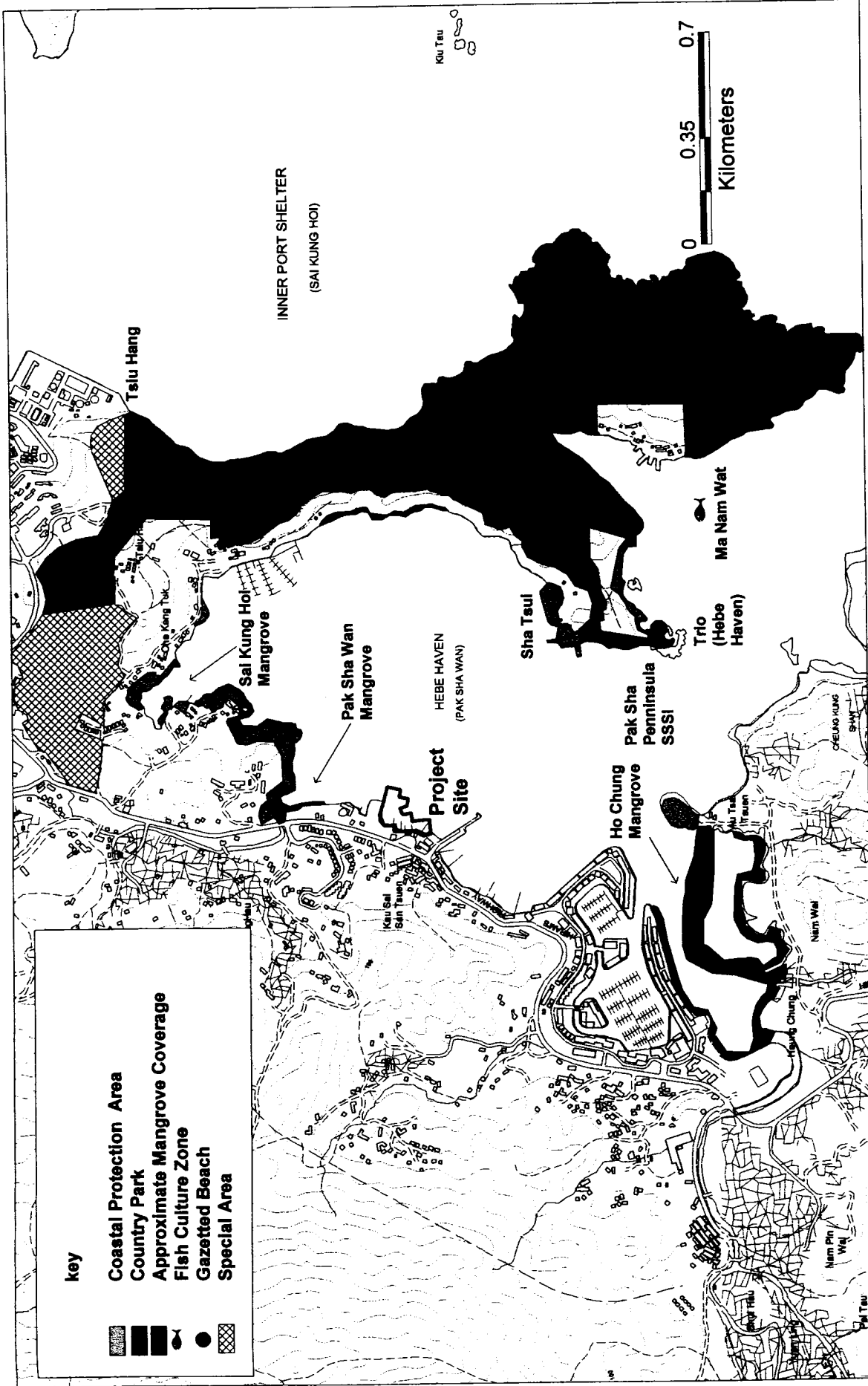
#### 6.8 CONCLUSIONS

- 6.8.1 An area of 2,619m<sup>2</sup> of inter tidal and sub tidal soft seabed will be reclaimed and an adjacent area of 14,400m<sup>2</sup> of soft subtidal seabed will be deepened by dredging to a depth of approximately -2.0mPD. The resulting impact on benthic communities is considered to be acceptable ecologically due to:

- the small proportion (Marine club area) of the haven affected by the reclamation works;
- the short duration of dredging and the capacity of the benthic community to recolonise the dredged area after works are complete;

- the disturbed nature of the benthic community in the vicinity of jetty moorings and its low ecological value, etc.
  - visible evidence of contamination of the marine environment e.g. oils, rubbish, etc.
  - sediment contamination with TBT and heavy metals (zinc).
- 6.8.2 The ecological sensitive receivers identified in this report (including established mangrove stands) are outside of the zone of influence of the reclamation and dredging operations.
- 6.8.3 Results from the plume dispersion model reveal that the predicted release of TBT and the extent of the sediment plume would not have a significant impact on any identified ecological sensitive receivers. This is due to the predicted local nature of the sediment plume generated by the dredging works.
- 6.8.4 Suspended solids deposition or secondary impacts associated with suspended solids in the marine environment (such as dissolved oxygen depletion), are also predicted to be insignificant. WQOs are exceeded only very locally for nutrients and suspended solids and overall impacts on the ecology of Hebe Haven is predicted to be minimal.
- 6.8.5 The ecological impact is therefore considered to be acceptable. No specific mitigation is required and no monitoring and audit activities are stipulated, other than those necessary for water quality management.





Hebe Haven Yacht Club Development Phase 2 - EIA  
**Figure 6.1 Study Area - Ecological Baseline**  
 Job No. EA00501

