

9.1

INTRODUCTION

This Section presents an assessment of potential impacts to the fisheries resources associated with the proposed Sham Tseng Development. Potential sources of impact associated with the reclamation have been identified and assessed with preliminary requirements for mitigation and monitoring recommended, where appropriate. The assessment focuses on an identification and evaluation of impacts to fisheries resources, fishing operations and culture fisheries.

The objectives of the assessment are as follows:

- to establish the fisheries importance of the habitats affected by the construction works;
- to identify fisheries sensitive receivers;
- to assess the scale of possible impacts to fisheries from the proposed Sham Tseng Development;
- to highlight any insurmountable impacts to fisheries due to the proposed project;
- to identify any mitigation measures and residual impacts; and,
- to assess the need for a fisheries monitoring and audit programme.

9.2

GOVERNMENT LEGISLATION AND GUIDELINES

The criteria for evaluating fisheries impacts are laid out in the *Technical Memorandum on Environmental Impact Assessment Process of the Environmental Impact Assessment Ordinance (Cap 499) (EIAO TM)*. Annex 17 sets out the general approach and methodology for assessment of fisheries impacts arising from a project or proposal. This assessment allows a complete and objective identification, prediction and evaluation of the potential fisheries impacts. Annex 9 recommends some criteria that can be used for evaluating fisheries impacts.

Other legislation which applies to fisheries includes:

- *The Fisheries Protection Ordinance (Cap 171) 1987* which provides for the conservation of fish and other aquatic life and regulates fishing practices.
- *Marine Fish Culture Ordinance (Cap 353) 1983* regulates and protects marine fish culture and other related issues.

9.3 BASELINE INFORMATION

9.3.1 Introduction

In Hong Kong, the commercial marine fishery industry is divided into capture and culture fisheries. To assess the capture fishery within the Study Area, previous fishery reports from AFD were consulted as well as the results from the AFD Study of Fishing Operations and Fisheries Resources in Hong Kong Waters ⁽¹⁾. Mariculture information was obtained from the AFD annual report 1997-98.

Although the proposed reclamation may not lead to any large loss of fishing grounds or nursery areas, the potential impacts to water quality upon the commercial fishing grounds and nursery areas around Ma Wan will be discussed.

9.3.2 Capture Fisheries

In 1997, the estimated fisheries production in Hong Kong waters from both capture and culture fisheries amounted to 186,000 tonnes, valued at HK\$ 2,459 million ⁽²⁾. Capture fisheries accounted for 96 % by weight of the total production while the remaining 4 % corresponded to the culture sectors of the industry. Within Hong Kong waters, the highest yields for local fisheries were mainly derived from the eastern and north-eastern coasts ⁽³⁾.

Fishing Operations

The proposed reclamation area is within AFCD fishery area zone Shum Tseng (0037). The waters of this zone shall, within this Section, be referred to as the reclamation area. The fishery operations and resources within the adjacent fishery areas (Fa Peng, 0001; Yam O, 0023; Tsing Chau Tsai, 0024; Ma Wan, 0025; Tsing Yi, 0034; Ting Kau, 0036; Tsing Lung Tau, 0038) will also be potentially affected and will be discussed. These seven zones, combined with the zone of reclamation area, make up the Study Area (*Figure 9.3a*) as referred to in this Section.

(1) ERM (1998). Fisheries Resources & Fishing Operations in Hong Kong Waters. Final Executive Summary, submitted to AFD.

(2) Agriculture and Fisheries Department (1998), Annual Departmental Report 1997-1998

(3) ERM (1998) *op cit.*

Table 9.3a Total Value (\$), Adult Catch (kg) and Fry Catch (tails) Displayed on a Total Production, Production per Hectare and Rank (per Hectare) Basis for the Fishing Zones in the Study Area (All Fishing Vessels) ⁽⁴⁾

Fishing Area and AFCD Code	Total Production			Production (ha ⁻¹)			Rank (Production ha ⁻¹)		
	Adult Fish (kg)	Value (\$)	Fry (tails)	Adult Fish (kg)	Value (\$)	Fry (tails)	Adult Fish	Value	Fry
Reclamation Area									
0037 Shum Tseng	1,251	7,661	-	15	89	-	157	172	-
Other Fishing Areas									
0001 Fa Peng	12,384	492,411	-	42	1,661	-	131	118	-
0023 Yam O	63,009	1,699,973	-	119	3,208	-	82	85	-
0024 Tsing Chau Tsai	38,943	1,825,481	7,661	229	10,718	45	39	15	46
0025 Ma Wan	81,988	4,496,689	7661	196	10,672	18	48	16	68
0034 Tsing Yi	47,426	1,888,784	-	36	1,424	-	139	127	-
0036 Ting Kau	36,042	1,408,040	-	161	6,279	-	63	36	-
0038 Tsing Lung Tau	35,179	1,801,583	7,661	161	8,235	35	62	25	58

On the basis of their ranking (see Table 9.3a), the fishing zones of the Study Area are of varied importance (from low to medium-high) to the Hong Kong fishing industry. The fishing zones of low ranking include Fa Peng (0001), Tsing Yi (0034) and Shum Tseng (0037), whereas the fishing zones of medium-high ranking include Tsing Chau Tsai (0024), Yam O (0023), Ma Wan (0025), Ting Tau (0036) and Tsing Lung Tau (0038).

The proposed reclamation works will affect only one fishing zone Shum Tseng (0037). The reclamation was estimated to cover an area of 15.2 ha which constitutes only 19% of the total area (85.98 ha). However, as Shum Tseng is of very low ranking (ranked 172nd out of 179 fishing areas), the reclamation undertaken there is predicted to exert minimal impact (a loss of HK\$ 1,452) to Hong Kong fishing industry. The low production values are also reflected in the few vessels ⁽⁵⁾ (average 4.6, not exceeding 15 m) fishing in the reclamation area, confirming that these waters are of low importance to the Hong Kong fishing fleet. No fry capture operations have been reported from Shum Tseng fishing zone.

The most abundant organisms in the catch from five out of the nine fishery zones were classified under the mixed fish species category (Table 9.3b). The mixed fish species mainly composed of juveniles of scad (*Caranx kalla*), rabbit fish (*Siganus canaliculatus*), sardine (*Sardinella* sp), pony fish, (*Leiognathus brevisrostris*) and gizzard shad (*Clupanodon punctatus*). The mixed species are of very low commercial value (HK\$ 1.6 kg⁻¹) and are sold as fish feed for the mariculture industry. From the species list presented in Table 9.3b, the yellow croaker (*Pseudosciaena crocea*) and the silver shrimp (*Acetes* sp) are high value species (>HK\$ 15 kg⁻¹) while croaker (*Argyrosomus* sp) are medium value species (HK\$ 10-15 kg⁻¹). The remainder of the catches were of low value at <HK \$10 kg⁻¹.

(4) AFD (1998). Port Survey 96/97, Capture Fisheries Division, Agriculture & Fisheries Department, August 1998.

(5) *Ibid.*

Table 9.3b *Five Most Abundant Fisheries Resources Caught within the Study Area. High and Medium Value Species are Underlined.*

AFCD Fishery Area	AFCD Fishery Area Code	Most Abundant Organisms in decreasing order	Common name
Fa Peng	0001	<i>Muraenosox cinereus</i>	Conger pike eel
		Mixed fish species*	
		<i>Sebasticus marmoratus</i>	Rockfish
		<i>Platycephalus indicus</i>	Flathead
Yam O	0023	<i>Oratosquilla</i> species	Mantis shrimp
		Mixed fish species*	
		<i>Sebasticus marmoratus</i>	Rockfish
		<i>Clupanodon punctatus</i>	Gizzard shad
Tsing Chau Tsai	0024	<i>Mugil affinis</i>	Mullet
		<i>Sparidae</i> species	Sea bream
		Mixed fish species*	
		<i>Sebasticus marmoratus</i>	Rockfish
Ma Wan	0025	<i>Argyrosomus</i> species	Croaker
		<i>Muraenosox cinereus</i>	Conger pike eel
		<i>Sparidae</i> species	Sea breams
		<i>Siganus canaliculatus</i>	Rabbit fish
Tsing Yi	0034	<i>Sebasticus marmoratus</i>	Rockfish
		Mixed fish species*	
		<i>Argyrosomus</i> species	Croaker
		<i>Sparidae</i> species	Sea breams
Ting Kau	0036	<i>Siganus canaliculatus</i>	Rabbit fish
		<i>Acetes</i> species	Silver shrimp
		<i>Muraenosox cinereus</i>	Conger pike eel
		Mixed fish species*	
Shum Tseng	0037	<i>Acetes</i> species	Silver shrimp
		<i>Muraenosox cinereus</i>	Conger pike eel
		<i>Argyrosomus</i> species	Croaker
		<i>Siganus canaliculatus</i>	Rabbit fish
Tsing Lung Tau	0038	<i>Siganus canaliculatus</i>	Rabbit fish
		<i>Pseudosciaena crocea</i>	Yellow Croaker
		<i>Leiognathus brevisrostris</i>	Pony fish
		Mixed crab species	
		<i>Sillago sihama</i>	Sand borer
		<i>Siganus canaliculatus</i>	Rabbit fish
		<i>Pseudosciaena crocea</i>	Yellow Croaker
		<i>Leiognathus brevisrostris</i>	Pony fish
		Mixed fish species*	
		<i>Sebasticus marmoratus</i>	Rockfish
		<i>Argyrosomus</i> species	Croaker
		<i>Siganus canaliculatus</i>	Rabbit fish
		<i>Acetes</i> species	Silver shrimp

*Mixed fish species composed of juveniles of *Caranx kalla*, *Siganus canaliculatus*, *Sardinella* sp, *Leiognathus brevisrostris* and *Clupanodon punctatus*

Fisheries Resources

Recent construction works for the Airport Core Programme projects, such as the North Lantau Development and Expressway, are likely to have caused disturbance to previously existing fisheries habitat in the area. These disturbances may have led to a reduction in the importance of the North Lantau coastline as a nursery area. The main commercial fisheries in the vicinity of North Lantau are shrimping and purse seining for migratory croaker (6).

(6) ERM-Hong Kong Ltd (1995) *op cit*.

All fish and macro-invertebrate species recorded in a trawl survey undertaken in the South Tsing Yi area as part of the EIA for Backfilling of South Tsing Yi and North Lantau ⁽⁷⁾ were commonly found in the coastal waters of Hong Kong. Their numbers and abundances were low. Key fisheries resources consist of rocky substrate around Ma Wan which provides important fisheries habitat and potential fish fry nursery areas along the east Lantau coast.

9.3.3 *Culture Fisheries*

Only one Fish Culture Zone, Ma Wan, is identified in the Study Area. Information from the AFD Annual Report for 1997 ⁽⁸⁾ indicates that the fish culture zone (FCZ) at Ma Wan consists of 132 licensed rafts with a total licensed area of 14,557 m² (total gazetted area = 46,300 m²). There are no figures available for individual production at this FCZ, although Hong Kong production in 1997 totalled 2,960 tonnes valued about \$170 million ⁽⁹⁾. The main species cultured were the spotted grouper (*Epinephelus chlorostigma*), gold-lined seabream (*Rhabdosargus sarba*), mangrove snapper (*Lutjanus argentimaculatus*) and the pompano (*Trachinotus blochii*).

9.4 *SENSITIVE RECEIVERS*

Based on the preceding review of the available information on the baseline fisheries resources of the waters in the Study Area (see *Section 9.3*), the only sensitive receiver which may be affected by the proposed project has been identified as Ma Wan FCZ.

9.5 *POTENTIAL IMPACTS*

9.5.1 *Construction Impacts*

Direct Impacts

Direct impacts to fishing operations and resources occur through the loss of a seabed area (15.2 ha) which supports fisheries resources, due to dredging or reclamation works at Sham Tseng. Short term direct impacts are predicted to occur only within the reclamation area during reclamation operations.

Indirect Impacts

Indirect impacts to fisheries resources during reclamation include sediment release associated with the above reclamation works. Potential impacts to water quality from sediment release are listed below:

- increased concentrations of suspended solids (SS);
- a resulting decrease in dissolved oxygen (DO) concentrations; and
- an increase in nutrient concentrations in the water column.

(7) *Ibid.*

(8) Agriculture and Fisheries Department (1998). Annual Departmental Report 1997-1998.

(9) *Ibid.*

Suspended sediment fluxes occur naturally in the marine environment, consequently fish have evolved behavioural adaptations to tolerate increased SS loads. These include clearing their gills by flushing water over them. When SS levels become excessive fish can move to clearer waters. Susceptibility generally decreases with age, with eggs the most vulnerable and adults the least sensitive to effects from sediments. The rate, season and duration of SS elevations will influence the type and extent of impact upon fish.

Water quality modelling results (detailed in *Section 3*) indicated that depth-averaged total SS concentrations never exceeded 20 mg L⁻¹ at the sensitive receivers under Constructions 1 and 2 for wet and dry seasons. When compared to the baseline SS concentrations of 10-20 mg L⁻¹ during wet season and of 10-15 mg L⁻¹ during dry season, the SS elevations due to construction works constituted less than 30% of the baseline SS concentrations at those sensitive receivers. Therefore, SS elevations shall be in compliance with WQO criterion. Furthermore, the sediment plume was predicted to affect the immediate southern coast of Tsuen Wan. In addition, depth-averaged SS concentrations at Ma Wan FCZ were predicted to be less than 15 mg L⁻¹ whereas DO concentrations were expected to exceed 5 mg L⁻¹. The impacts (SS elevations and DO depletion) to fisheries resources at Ma Wan FCZ were therefore, likely to be negligible and in compliance with the relevant WQOs.

Sediment testing results showed that sediments to be dredged from Sham Tseng were found to be uncontaminated (see *Section 6.6*), with the exception of the sediments at the outfall of the nullah. As the seawalls will be constructed far beyond the outfall of the nullah prior to further dredging/reclamation works, the release of contaminated sediments and dissolved contaminants would likely to be minimal and not a key issue of concern to this Study.

Based on the discussion in preceding paragraphs and conclusion in *Section 3*, there are no insurmountable water quality impacts associated with construction phase. The SS elevations and associated DO depletion are predicted to be low and environmentally acceptable as defined by the relevant WQOs to fisheries resources in the Study Area.

9.5.2 *Operational Impacts*

No operational impacts are expected to adversely influence the fisheries resources within the Study Area.

9.6 *IMPACT EVALUATION*

- **Nature of Impact:** The permanent loss of a seabed area (approximately 15.2 hectares) which supports fisheries resources due to dredging/reclamation works at Sham Tseng is predicted to occur. Temporary indirect impacts to pelagic and demersal fisheries resources as a result of minor perturbations to water quality are predicted to occur only in the vicinity of the reclamation area.

- **Size of Affected Area:** During construction operations direct impacts to fishing operations and resources are predicted to occur only within the reclamation area through killing fisheries resources by the loss of a seabed area which supports fisheries resources due to dredging/reclamation works at Sham Tseng (approximately 15.2 hectares). Small amounts of sediment release and deposition are predicted outside of the reclamation area but are considered to cover a small area.
- **Size of fisheries resources/production:** Directly impacted area at Sham Tseng is ranked low in comparison to other areas in Hong Kong in terms of catch weight and value. Indirectly impacted areas in the Study Area are ranked from low to medium-high to the Hong Kong fishing industry. However, as these dredging/reclamation impacts are predicted to be transient and localised in the reclamation area, their influence on fisheries resources/production outside the reclamation area should be minimal and therefore acceptable.
- **Destruction and disturbance of nursery and spawning grounds:** Key fisheries resources consist of rocky substrate around Ma Wan which provides important fisheries habitat. As Water Quality Objectives are predicted to be complied at this sensitive receiver, potential impacts through SS elevations and DO depletion are expected to be negligible.
- **Impact on Fishing Activity:** The area to be reclaimed at Sham Tseng translates into the loss of 19% of the Shum Tseng Fishing Zone and a potential loss of 237 kg annually of fish catches worth HK\$ 1,452. This equates to 0.0004% decrease in the value of the Hong Kong fishery and is regarded as low. No fishing vessels in the Study Area are based in Sham Tseng. Nevertheless, capture fishery may claim ex-gratia allowances due to the permanent loss of seabed after the reclamation. Based on the existing limited fishery production and activity, the impacts on fisheries resources are expected to be negligible.
- **Impact on Aquaculture Activity:** As SS elevations are predicted to be in compliance with the Water Quality Objective at the Ma Wan FCZ, impacts to this sensitive receiver are expected to be negligible.

9.7

FISHERIES MITIGATION MEASURES

In accordance with the guidelines in the TM on fisheries impact assessment the general policy for mitigation impacts to fisheries, in order of priority, are avoidance, minimisation and compensation.

Permanent impacts to commercial fisheries resources have been minimised through constraints on dredging/reclamation operations. These constraints which were recommended to control water quality impacts to within acceptable levels, are also expected to control impacts to fisheries resources. Hence, no fisheries-specific mitigation measures are required. Cumulative impacts predicted to arise from the proposed dredging operations in conjunction with concurrent projects are not expected to result in greater adverse impacts to fisheries sensitive receivers than impacts arising from the concurrent projects independently.

9.8 *RESIDUAL IMPACT*

Based on the value to the fishery of the reclaimed area discussed in *Section 9.6* the residual impact can be determined as follows:

- The permanent loss of fishing ground is estimated to be 15.2 hectares of Sham Tseng Fishing Area.

The loss of this part of the fishing ground, although potentially detrimental to some fishermen, is unlikely to cause noticeable reduction in fish catches.

9.9 *FISHERIES MONITORING & AUDIT REQUIREMENTS*

The dredging/reclamation operations include constraints which act as appropriate mitigation measures to control environmental impacts to within acceptable levels. Actual impacts during dredging operations will be monitored through an EM&A programme which is specified in an EM&A Manual released as a separate document to the EIA. Monitoring and audit activities designed to detect and mitigate any unacceptable impacts to water quality will also serve to protect against unacceptable impacts to fisheries resources. The EM&A programme will provide management actions and supplemental mitigation measures to be employed should impacts arise, thereby ensuring the environmental acceptability of the project. As no permanent impacts to the fishery are expected to occur, the development and implementation of a monitoring and audit programme specifically designed to assess the effects of the dredging/reclamation works associated with the Sham Tseng Development on commercial fisheries resources is not necessary.

9.10 *CONCLUSION*

A review of existing information on commercial fisheries resources located within and around the Sham Tseng Development area has identified the area as supporting low abundances of fisheries resources and few vessels depend on the area for their catches.

Potential impacts to fisheries resources and operations may arise from disturbances to benthic habitats, changes in water quality and contaminant release. Detailed discussion of the potential water quality impacts is provided in *Section 3*. Disturbances to benthic habitats are predicted to be largely confined within the reclamation area and shall be in compliance with the relevant WQOs. Sediment deposition outside of the reclamation area is minimal and not anticipated to impact fisheries resources. As changes in water quality will be minimal and transient, adverse impacts to fisheries resources are not predicted to arise. Assessment of contaminant release has indicated that minimal concentrations will be released and are not predicted to impact fisheries resources.

As impacts arising from the proposed reclamation works are thus predicted to be largely confined to the reclamation area, they are not expected to cause adverse impacts to any fishery grounds including the nearest Fish Culture Zone, Ma Wan, or species of importance to the fishery. While no special mitigation measures are required for fisheries resources, constraints on dredging operations recommended to control impacts to water quality to within acceptable levels are also expected to mitigate impacts to fisheries resources. Cumulative impacts predicted to arise from the proposed reclamation operations in conjunction with concurrent projects are not expected to result in greater adverse impacts to fisheries resources than impacts arising from the concurrent projects independently.