

Annex 10A

Fisheries - Literature Review

10A.1 LITERATURE REVIEW

10A.1.1 INTRODUCTION

A literature review was conducted to review the baseline fisheries conditions within the Assessment Area and to identify information gaps to determine whether field surveys are required to provide sufficient information for the Fisheries Impact Assessment. This *Annex* presents the findings of this literature review.

10A.1.2 INFORMATION REVIEWED

Baseline information for the fishing grounds, fisheries resources and habitats, spawning or nursery grounds, and fisheries sensitive receivers such as fish culture zones (FCZs) and artificial reefs (ARs) within the Assessment Area for the Fisheries Impact Assessment is available from the following key sources:

- ERM (1998) Fisheries Resources and Fishing Operations in Hong Kong Waters: Unpublished Report;
- AFCD (2006) Port Survey 2005/2006;
- ERM (2006) Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities: EIA Study (EIA Report Registered No. AEIAR-106/2007);
- ERM (2010) Black Point Gas Supply Project: EIA Study (EIA Report Registered No. AEIAR-150/2010);
- ERM (2010) Development of a 100MW Offshore Wind Farm in Hong Kong: EIA Study (EIA Report Registered No. AEIAR-152/2010);
- Mott MacDonald (2014) Expansion of Hong Kong International Airport into a Three-Runway System (3RS): EIA Study (EIA Report Registered No. AEIAR-185/2014);
- ERM (2016) Provision of Service on Detailed Study of the Southwest Lantau and Soko Islands Marine Parks – Design, Consultation and Implementation (Quotation Ref. AFCD/SQ/127/14): Unpublished Report;
- ERM (2016) Environmental Monitoring and Audit for Contaminated Mud Pits to the South of The Brothers and at East of Sha Chau (2012-2020) – Investigation (Agreement No. CE 23/2012(EP) and CE 63/2016 (EP)); and
- ERM (2016) Additional Gas-fired Generation Units Project: EIA Study (EIA Report Registered No. AEIAR-197/2016).

10A.2 OVERVIEW OF HONG KONG FISHERIES

Commercial fishing operations in Hong Kong are broadly classified into culture and capture fisheries.

10A.2.1 CULTURE FISHERIES OF HONG KONG

The pond fish culture industry is centred in the northwest New Territories. Fish ponds are either freshwater or brackish and a vast majority of pond farms are engaged in polyculture of carps with tilapia or grey mullet.

Marine-based culture fishery operations occur at 26 FCZs which altogether occupy about 209 ha of Hong Kong waters. They involve rearing of marine fish from fry or fingerlings to marketable size in cages suspended by floating rafts usually in sheltered coastal areas/ embayments. Fish farms are typically small scale, family-run operations comprising only one or two rafts with an average size of about 290 m².

With effect from June 2002, the marine fish culture licence is transferable. The existing moratorium for FCZs has been reviewed and three new measures are proposed to promote the sustainable development of the local fisheries industry ⁽¹⁾, including:

- Issue new marine fish culture licences in three FCZs (i.e. O Pui Tong, Wong Wan and Sham Wan FCZs) with approximately 30 new marine fish culture license to be issued at the initial stage;
- Expand the existing FCZ at Yim Tin Tsai; and
- Identify any potential area for designation of new FCZs.

In 2016, the marine fish culture industry produced about 1,031 tonnes of fish valued at HK\$86 million which accounts for about 5% of local demand for live marine fish. Some recent figures on the local marine culture fisheries are presented in *Table 10A.2.1*.

Table 10A.2.1 Marine Culture Fisheries Summary Statistics 2007 - 2016 (Source: AFCD)

AFCD Estimate	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Licensed Mariculturists	1,072	1,060	1,050	1,035	1,010	1,008	987	968	969	949
Production (tonnes)	1,530	1,370	1,437	1,512	1,185	1,299	1,005	1,255	1,219	1,031
Value (HK\$ million)	99	82	92	118	94	117	94	115	105	86

(1) Legislative Council Panel on Food Safety and Environmental Hygiene - Marine Fish Culture in Hong Kong on 11 June 2013. Available at: <http://www.legco.gov.hk/yr12-13/english/panels/fseh/papers/fe0611cb2-1284-5-e.pdf>

Capture fisheries is primarily concentrated in the waters of Hong Kong, the Pearl River Estuary and the adjacent continental shelf of the South and East China Seas ⁽¹⁾. The Agriculture, Fisheries and Conservation Department (AFCD) reported that in 2016 an estimated 142,775 tonnes of fish was produced, which was equivalent to an economic value of about HK\$2,565 million ⁽²⁾. In addition, 10,800 local fishermen with approximately 5,160 vessels were servicing in the fishing industry ⁽³⁾. The major fishing methods include trawling, long-lining, gill-netting and purse-seining with the majority of the total catch obtained through trawling.

The AFCD carries out port surveys periodically to collect information on the fisheries production and operation in Hong Kong waters. In 2006, AFCD carried out the latest round of port survey to collect updated data for 2005. Based on the latest data from AFCD Port Survey 2006, the highest fisheries production (600 to 1,000 kg ha⁻¹) in Hong Kong was recorded in the vicinity of the Ninepin Island Group, Po Toi and Tap Mun ⁽⁴⁾. These areas also recorded the highest number of fishing vessels. Scad (Carangidae), shrimp, rabbit fish (Siganidae), squid, croaker (Sciaenidae), crab, mullet (Mugilidae), sardine (Clupeidae), seabream (Sparidae) and anchovy (Engraulidae) were the top 10 families captured in Hong Kong waters.

Previous studies indicated that fry collection has become very limited throughout Hong Kong waters ⁽⁵⁾. Fish fry production was concentrated in the eastern waters, although minor production was also reported in the East Lamma Channel.

To promote the sustainable development of fishing industry and to conserve fisheries resources in Hong Kong waters, AFCD has implemented a number of fisheries management and conservation measures. On 31 December 2012, an outright trawling ban (including pair, stern, shrimp and hang trawling) was put into effect in an attempt to restore the seabed and the depleted fisheries resources ⁽⁶⁾. To complement the trawl ban and bring local fisheries industry back to a sustainable path, the government seeks to implement other fisheries management measures. These measures include:

- Setting up a registration system for local fishing vessels;
- Limiting new entrants to control the fishing effort;

(1) Sumaila, U. R., Cheung, W. and I. Teh (2007) Rebuilding Hong Kong's Marine Fisheries: An Evaluation of Management Options. Fisheries Centre Research Reports 15 (3). pp.112.

(2) AFCD (2017), available at: https://www.afcd.gov.hk/english/fisheries/fish_cap/fish_cap_latest/fish_cap_latest.html

(3) AFCD (2017), available at: https://www.afcd.gov.hk/english/fisheries/fish_cap/fish_cap_latest/fish_cap_latest.html

(4) AFCD (2017), available at: https://www.afcd.gov.hk/english/fisheries/fish_cap/fish_cap_latest/fish_cap_latest.html

(5) ERM (1998) Study of Fisheries Resources and Fishing Operations in Hong Kong Waters, AFD.

(6) AFCD (2017), available at: http://www.afcd.gov.hk/english/fisheries/fish_cap/fish_cap_con/fish_cap_con.html

- Restricting fishing activities of non-fishing vessels and prohibiting fishing activities of non-local fishing vessels;
- Designating fisheries protection areas;
- Habitat enhancement and restoration (i.e. artificial reefs); and
- Fish restocking trials.

Since 1999, Mainland Authorities have implemented a fishing moratorium for the South China Sea fishing ground during mid-summer. In 2017, the fishing moratorium lasted for about 3.5 months (between 1 May and 16 August). The moratorium prohibits fishing activity by the Hong Kong fleet outside of Hong Kong waters except by long-lining and hand-lining.

10A.3 BASELINE FISHERIES CONDITIONS OF THE ASSESSMENT AREA

Baseline information for culture fisheries, capture fisheries, fisheries resources and habitats, spawning or nursery grounds, and ARs within the Assessment Area is summarised in this *Section*.

10A.3.1 CULTURE FISHERIES

There is no FCZ or fish pond located close to the Project (*Figure 10A.1*). Three FCZs are located in the Assessment Area and their separation distances to the Project (by sea) are presented in *Table 10A.3.1*. It should be noted that the Ma Wan FCZ is outside the Assessment Area and is over 16 km from the Project.

Table 10A.3.1 Separation Distances between the FCZs in the Assessment Area and the Project

Fish Culture Zone	Shortest Separation Distance by Sea (km)
Sok Kwu Wan	9.0 km from the LPS Pipeline
Lo Tik Wan	7.1 km from the LPS Pipeline
Cheung Sha Wan	7.8 km from the LPS Pipeline

Existing pond fish culture activities in Hong Kong are centred in the northwest New Territories extended from the Inner Deep Bay Ramsar Site, which is over 10 km from the Project.

Despite the long established oyster farming practice on the Deep Bay mudflats, there are no gazetted oyster farming locations in Hong Kong. The oyster production area located along the shore from Tsim Bei Tsui to Pak Nai (*Figure 10A.1*) is about 3.6 km from the proposed Project.

10A.3.2 CAPTURE FISHERIES

It should be noted that starting from 31 December 2012, trawling is banned in Hong Kong waters. Therefore only some published information after the trawl ban was available for review.

The most systematic information on commercial fishing operation, fisheries production and fisheries resources of the Assessment Area was obtained primarily from the AFCD Port Survey 2006 (*Figure 10A.2* to *Figure 10A.4*). It should be noted that trawling was still allowed at time when the AFCD Port Survey 2006 was conducted in 2005. Other recent approved EIA and fisheries studies undertaken in the Assessment Area have also been reviewed (*Figure 10A.5*).

10A.3.2.1 *Fishing Operations*

The area and number of vessels operating in the Assessment Area during 2005 are presented in *Figure 10A.2* ⁽¹⁾. The majority of fishing vessels that operated throughout the Assessment Area were sampans, shrimp trawlers and gill-netters. Most vessels that operated near the Sha Chau and Lung Kwu Chau Marine Park (SCLKCMP), Tai O and southwest Lantau were < 15m in length, whereas vessels below or exceeding 15m in length operated near Soko Islands, Cheung Chau and Lamma Island.

Very low numbers of fishing vessels (10 – 50 vessels) operated off the BPPS and in outer Deep Bay. Elsewhere in Black Point, Tuen Mun and North Lantau, low numbers of vessels (50 – 100 vessels) were recorded in Lung Kwu Tan, off Castle Peak and in northern and western Chek Lap Kok waters, whereas moderate numbers of vessels (100 – 400 vessels) were recorded near the SCLKCMP, The Brothers Marine Park (BMP) and Tai O. Moderate numbers of vessels (100 – 400 vessels) were also recorded near southwest Lantau, Soko Islands and in the waters between Shek Kwu Chau and Lamma Island. Moderate to high numbers of vessels (400 – 700 vessels) were recorded south of Lamma Island (*Figure 10A.2*).

Opportunistic vessel-based observations of active fishing vessels were undertaken from July to October 2008 and January to June 2009 for the EIA study for the 100MW Offshore Wind Farm ⁽²⁾. Over the 10-month period, a total of six different types of fishing vessels were recorded with a mean total number of ~10 vessels sighted in study area around Lamma Island per day. The results from the vessel-based observations suggested that the predominant type of fishing vessels recorded in southeast of Cheung Chau/ southwest of Lamma Island were small P4s ⁽³⁾ undertaking hand-lining or gill-netting activities, followed by shrimp trawling and stern trawling vessels.

As part of the 3RS EIA study, fisheries homeport interview surveys were conducted between January and November 2013 ⁽⁴⁾. It was recorded that the major type of operation in North Lantau was by sampans comprising 61% of the interviewees. The survey has also identified moderate numbers of vessels (approximately 100 – 110) frequently operated around The Brothers and around northern Chek Lap Kok waters, whereas low numbers of vessels (approximately 20 – 30) frequently operated within and around SCLKCMP and around western Chek Lap Kok waters.

For this Project, the BPPS Pipeline traverses waters with very low to moderate level of fishing operation (10 – 400 vessels). The LNG Terminal is located in waters with low level of fishing operation (50 – 100 vessels), while the LPS

(1) AFCD (2017), available at: https://www.afcd.gov.hk/english/fisheries/fish_cap/fish_cap_latest/fish_cap_latest.html

(2) ERM (2010) Development of a 100MW Offshore Wind Farm in Hong Kong: EIA Study (EIA Report Registered No. AEIAR-152/2010)

(3) Defined as vessels are defined as those licensed to carry no more than four passengers

(4) Mott MacDonald (2014) Expansion of Hong Kong International Airport into a Three-Runway System: EIA Study (EIA Report Registered No. AEIAR-185/2014)

Pipeline traverses waters with moderate level of fishing operation (100 – 400 vessels).

10A.3.2.2 *Fisheries Production*

Fisheries production of the Assessment Area during 2005 in terms of weight is presented in *Figure 10A.3*⁽¹⁾. Data from the AFCD Port Survey 2006 indicated that fisheries production off the BPPS and in outer Deep Bay was very low, with 50 kg ha⁻¹ for adult fish (*Figure 10A.3*). Elsewhere in Black Point, Tuen Mun and North Lantau, very low to low level of adult fisheries production (50 – 200 kg ha⁻¹) was recorded in Lung Kwu Tan, off Castle Peak and in northern and western Chek Lap Kok waters. Moderate levels of adult fisheries production (200 – 400 kg ha⁻¹) were recorded near the SCLKCMP, the BMP, north of Tai O, north of North Soko and in the waters north of Cheung Chau (*Figure 10A.3*). Moderate to high levels of adult fisheries production (400 – 600 kg ha⁻¹) were recorded near Tai O, around Soko Islands, south of Cheung Chau and south and southwest of Lamma Island (*Figure 10A.3*).

No fish fry production was recorded in the Assessment Area, with the exception of low densities of fry production (less than 100 tails ha⁻¹) reported in waters around central and northeast Lamma Island (*Figure 10A.4*).

For this Project, the BPPS Pipeline traverses waters with very low to moderate to high fisheries production (50 – 600 kg ha⁻¹). The LNG Terminal is located in waters with low fisheries production (100 – 200 kg ha⁻¹), while the LPS Pipeline traverses waters with low to moderate to high fisheries production (100 – 600 kg ha⁻¹).

10A.3.3 *FISHERIES RESOURCES*

10A.3.3.1 *Deep Bay, North Western and North Western Supplementary WCZs*

Historically, a majority of species captured in outer Deep Bay were prawn (*Trachysalambria curvirostris*), croaker (*Collichthys lucidus*) and mantis shrimp (*Oratosquilla oratoria*, *Dictyosquilla foveolata*). High biomass of Squillidae (mantis shrimp) were recorded in western waters near Lung Kwu Chau and The Brothers, and many of other families, including Penaeidae (Prawn), Siganidae (rabbit fish), Sciaenidae (croaker), Gobiidae (goby) and Apogonidae (cardinal fish) were also captured in these waters. Approximately 70% of the captured species were fishes, 20% were crustaceans and 10% were molluscs of low commercial value in Lung Kwu Chau and The Brothers. The most captured species in Lung Kwu Chau by shrimp trawling were mantis shrimp (*Harpalosquilla harpax*) and croaker (*Johnius belangerii*), whereas croaker (*Johnius belangerii*) and pony fish (*Leiognathus brevirostris*) were the major catch at The Brothers⁽²⁾. In gill-netting surveys of the same study, the most abundant fisheries resources captured (by weight) in outer Deep Bay were shad

(1) AFCD (2017), available at:
https://www.afcd.gov.hk/english/fisheries/fish_cap/fish_cap_latest/fish_cap_latest.html

(2) ERM (1998) Study of Fisheries Resources and Fishing Operations in Hong Kong Waters, AFD.

(*Clupanodon (Konosirus) punctatus*), flathead (*Platycephalus indicus*), croaker (*Collichthys lucidus*), anchovy (*Thryssa hamiltonii*) and puffer fish (*Takifugu alboplumbeus*). Similar findings were reported in the AFCD Port Survey 2006, with catch in the SCLKCMP, BMP and Tai O dominated by scad, shrimp and croaker ⁽¹⁾.

Hand-lining and gill-netting surveys conducted near Tai O and Yi O waters recorded a total of 25 fish and 12 crustacean species ⁽²⁾. Species recorded were mostly common species recorded in western or northwestern waters of Hong Kong. Dominant species recorded were anchovy (*Thryssa mystax*), pony fish (*Leiognathus daura*), wrasse (*Halichoeres nigrescens*) and three-spotted crab (*Portunus sanguinolentus*).

More recent fisheries surveys were carried out in 2013 in North Lantau waters and SCLKCMP by the 3RS EIA study ⁽³⁾. The 3RS EIA concluded that the North Lantau waters were of moderate fisheries production with species mainly of no or low commercial values, namely anchovy (*Thryssa kammalensis*) and sardine (*Sardinella albella*). In the SCLKCMP, moderate to high fisheries production with species of no to high commercial values were recorded, in which the dominant species were shad (*Nematalosa nasus*) and sardine (*Sardinella albella*).

The routine marine biota monitoring for the Environmental Monitoring & Audit (EM&A) of the Dredging, Management and Capping of Contaminated Sediment Disposal Facility to the South of the Brothers and East of Sha Chau ⁽⁴⁾ suggested that the fisheries resources of North Lantau and SCLKCMP consisted of species with low or no commercial values, namely the snail *Turritella terebra*, the sea urchin *Temnopleurus toreumaticus* and the crab *Charybdis* spp.. In terms of fish resources, pony fish, croakers and gobies were commonly recorded, and mantis shrimp, mainly *Oratosquilla interrupta*, and shrimps (*Metapenaeus* spp. and *Penaeus* spp.) were also abundant.

Hand-lining and gill-netting surveys conducted by AFCD in 2014 and 2015 recorded 23 species in southwest Lantau with common species of rockfish *Sebastes marmoratus*, crab *Charybdis* sp., anchovy *Thyssa hamiltonii* and crab *Portunus sanguinolentus* ⁽⁵⁾.

10A.3.3.2 Southern and Second Southern Supplementary WCZs

Historically, the majority of species captured in the southern waters (South Lamma, South Cheung Chau, Soko Islands, South Lantau, North Lamma) were mantis shrimp (Squillidae). The most common species recorded in Soko

(1) AFCD (2017), available at:

https://www.afcd.gov.hk/english/fisheries/fish_cap/fish_cap_latest/fish_cap_latest.html

(2) Scott Wilson (2000) Tai O Sheltered Boat Anchorage: EIA Study (EIA Report Registered No. AEIAR-036/2000)

(3) Mott MacDonald (2014) Expansion of Hong Kong International Airport into a Three-Runway System: EIA Study (EIA Report Registered No. AEIAR-185/2014)

(4) CEDD (2014 - 2015) Dredging, Management and Capping of Contaminated Sediment Disposal Facility to the South of The Brothers and at East of Sha Chau. Available at: <http://www.cmp-monitoring.com.hk/>

(5) ERM (2016) Provision of Service on Detailed Study of the Southwest Lantau and Soko Islands Marine Parks - Design, Consultation and Implementation (Quotation Ref. AFCD/SQ/127/14): Unpublished Report

Islands by shrimp trawling were mantis shrimp (*Oratosquilla nepa*, *Harpisquilla harpax*) and croaker (*Collichthys lucidus*), whereas mantis shrimp (*Oratosquilla anomala*) and bloody cockle (*Anadara granosa*) were the major catch at South Lantau ⁽¹⁾. Other common species included goby (*Trypauchen vagina*), cardinal fish (*Apogon (Ostorhinchus) fasciatus*), crab (*Eucrate crenata*), rabbit fish (*Siganus canaliculatus*), croaker (*Johnius belangerii*) and sole (*Solea ovata*). Results of gill-netting survey in the same study indicated high biomass of croaker (Sciaenidae) were recorded at Shek Kwu Chau, South Lamma and Peng Chau.

Hand-lining and gill-netting surveys conducted by AFCD in 2014 and 2015 recorded 40 species in Soko Islands with common species of rockfish *Sebastiscus marmoratus*, cardinal fish *Apogon (Ostorhinchus) fasciatus* and *A. pseudotaeniatus*, and sole *Solea ovata* ⁽²⁾.

10A.3.4 SPAWNING GROUNDS

The northern and southern Lantau waters were previously identified in 1998 as fisheries spawning grounds for high value commercial species (**Figure 10A.1**). In Hong Kong, spawning period differs among fisheries species with the majority of commercial species aggregate and spawn in the open waters during the period from June to September ⁽³⁾. Some fish species, including flathead (*Platycephalus indicus*) and shad (*Clupanodon (Konosirus) punctatus*), spawn in the late winter/early spring (i.e., February to April) and a few are known to spawn in January. Shrimp scad (*Alepes djedaba*) spawns in the early summer (around June) whilst pony fish (*Leiognathus brevirostris*) and croakers were found to be reproductive throughout most of the year from May to December. The spawning period of most of the crustacean species was found to be from April to November, with spawning concentrated between June and August.

The recognised northern Lantau spawning ground is approximately 10 km long (from Tai Mo To of The Brothers to Lung Kwu Chau) and 5 km wide (from Castle Peak to the northernmost tip of the airport). Pony fish (*Leiognathus brevirostris*), seabass/ perch (*Lateolabrax japonicus*) and shad (*Clupanodon (Konosirus) punctatus*) were examples of the main commercial fish species recorded in the northern Lantau spawning ground ⁽⁴⁾.

The BPPS Pipeline of the Project is located in the vicinity of the recognised northern Lantau spawning ground (**Figure 10A.1**). However, the recent ichthyoplankton and fish post-larvae surveys in this identified fisheries spawning ground (including SCLKCMP, The Brothers, and northern and western Chek Lap Kok waters) in May to August 2013 by the 3RS EIA reported that the ichthyoplankton and fish post-larvae densities (mean 0.96 – 8.46 larvae m⁻³) and family richness (mean 3.56 – 6.86) were low, and were higher in May

(1) ERM (1998) Study of Fisheries Resources and Fishing Operations in Hong Kong Waters, AFD.

(2) ERM (2016) Provision of Service on Detailed Study of the Southwest Lantau and Soko Islands Marine Parks – Design, Consultation and Implementation (Quotation Ref. AFCD/SQ/127/14): Unpublished Report

(3) ERM (1998) Study of Fisheries Resources and Fishing Operations in Hong Kong Waters, AFD.

(4) ERM (1998) Study of Fisheries Resources and Fishing Operations in Hong Kong Waters, AFD.

than in other summer months ⁽¹⁾. A total of 27 families were recorded, and the dominant ichthyoplankton and fish post-larvae families in terms of abundance were Clupeidae, Gobiidae, Ambassidae, Blenniidae and Engraulidae, accounting for about 97% of the total sample. These families identified consist of mostly low commercial value species. The results indicated that the marine area in North Lantau supported a relatively low abundance of ichthyoplankton and fish post-larvae of mainly low value commercial pelagic species.

The recognised southern Lantau spawning ground is over 30 km long and approximately 10 km wide, extending across southern waters from Fan Lau Kok all the way east pass Soko Islands and beyond Lamma Island, abutting the southern boundary of the HKSAR. Pony fish (*Leiognathus brevisrostris*), croakers (*Johnius belangerii* and *Protonibea diacanthus*), mantis shrimps (*Oratosquilla* spp.) and prawn (*Metapenaeus joyneri* and *M. affinis*) were some of the examples of major commercial species recorded in the southern Lantau spawning ground.

The BPPS Pipeline, LNG Terminal and LPS Pipeline of the Project are located within the recognised southern Lantau spawning ground (*Figure 10A.1*). Ichthyoplankton and fish post-larvae surveys were conducted from July 2005 to March 2006 as part of the proposed LNG receiving terminal and associated facilities EIA study ⁽²⁾. The study found that the fish eggs and fish post-larvae densities were generally low in both western and southern Lantau waters. Results showed that the highest fish densities were obtained between July and September and decreased significantly in October, suggesting that the peak spawning period for most fishes in southern waters of Hong Kong occurred during the summer. Samples were dominated by Ambassidae (glass perches), Engraulidae (anchovies), Gobiidae (gobies) and Sciaenidae (croakers) in the wet season. In the dry season, the major families included Callionymidae, Gobiidae, Scorpaenidae (rockfishes) and Syngnathidae (pipefishes) in the vicinity of southwestern Lantau and Soko Islands. Syngnathidae was more abundant in western Lantau samples and relatively rare in the samples in Soko Islands. A total of 40 different families have been recorded in the surveys, with mean family richness of 10.8 – 16.8. Even in the wet season when the highest fish densities were obtained, the fish densities recorded were generally low (0.21 – 1.82 larvae m⁻³) and there were no observable difference in fish or fish egg densities between waters of the identified spawning / nursery grounds for commercial fisheries of the southern waters of Hong Kong and those of western Lantau not identified as important spawning / nursery grounds.

10A.3.5

NURSERY AREA

The southern Lantau waters extending across southern waters from Fan Lau Kok all the way east pass Soko Islands and beyond Lamma Island and abutting the southern boundary of the HKSAR was also previously identified in 1998 as

- (1) Mott MacDonald (2014) Expansion of Hong Kong International Airport into a Three-Runway System: EIA Study (EIA Report Registered No. AEIAR-185/2014)
- (2) ERM (2006) Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities: EIA Study (EIA Report Registered No. AEIAR- 106/2007)

a fisheries nursery area for high value commercial species (*Figure 10A.1*). This recognised nursery area is an important habitat area for a number of commercial juvenile fish and crustacean species, with major species of mantis shrimp (*Oratosquilla anomala*, *Dictyosquilla foveolata*), Sciaenid fry, Serranid fry, *Squilla* fry, prawn (*Metapenaeopsis barbata*, *M. palmensis*) and goby (*Oxyurichthys tentacularis*). Majority of fry and juveniles were recorded during the summer months.

The BPPS Pipeline, LNG Terminal and LPS Pipeline of the Project are located within this recognised nursery area (*Figure 10A.1*). Baseline ichthyoplankton and fish post-larvae information is presented in *Section 10A.3.3.2*.

10A.3.6 ARTIFICIAL REEF DEPLOYMENT

The AFCD has been undertaking a programme to enhance existing marine habitats and fisheries resources through the siting, construction and deployment of ARs. Generally ARs provide hard bottom, high profile habitat in areas without natural cover and may potentially act as fish enhancement devices.

There are three ARs within the Assessment Area, one at the northeastern area of the Hong Kong International Airport Approach Area (HKIAAA) of Chek Lap Kok waters, one at the SCLKCMP, and one at the Lo Tik Wan FCZ. The AR at the northeastern area of the HKIAAA is significantly affected by the construction of the Hong Kong Boundary Crossing Facilities (HKBCF) and as such is not considered further. The compensatory AR proposed by the HKBCF is to be deployed in the BMP; however details of this compensatory AR are not available at the time of preparing this EIA Report and hence this AR is also not considered further.

The AR in SCLKCMP was deployed in March 2000 with the key objective of enhancing the marine habitat quality and fisheries resources (*Figure 10A.1*) ⁽¹⁾. A total of 42 units of concrete-coated container and 24 units of ferro-cement river barges with a total volume of 5,580 m³ have been deployed on the seabed. They are located about 1 km from the BPPS Pipeline of the Project.

The surveys conducted at the AR at SCLKCMP in 2000 – 2001 showed an increase in fish abundance and diversity around the AR after its deployment ⁽²⁾. Species of commercial value such as Tiger-toothed Croaker (*Otolithes ruber*) was recorded in higher numbers around the AR area. A higher abundance and diversity in benthic fauna than control stations was recorded in one of the AR sites within the marine park. The results of the monitoring programme have provided evidence of the beneficial effect of AR to the marine ecology of the SCLKCMP.

(1) AFCD (2017) Hong Kong Artificial Reef Deployment Study. Available at: <http://www.artificial-reef.net/English/main.htm>

(2) Hong Kong Institute of Education (2002a) Sha Chau and Lung Kwu Chau Marine Park Monitoring Programme, Final Report, September 2002. Submitted to Country & Marine Parks Authority, Agriculture, Fisheries and Conservation Department, Government, Hong Kong SAR Government

In addition, two dive surveys were conducted in 2013 at the AR of SCLKCMP by the 3RS EIA ⁽¹⁾. The waters around the ARs were turbid and with low visibility (about 0.5m) during the surveys. Epifauna of low diversity and density including gorgonian *Guaiagorgia* sp., ahermatypic cup coral *Balanophyllia* sp., green mussel *Perna viridis*, and bryozoans were found during the surveys. This indicated the ARs do serve the function of providing hard substrates for the colonization of marine benthic fauna.

The AR at Lo Tik Wan FCZ was deployed in April 2008 and serves as biofilter reefs to enhance habitat quality and marine resources (**Figure 10A.1**) ⁽²⁾. A total of eight units of concrete-coated fibreglass unidirectional biofilters with a total volume of 330 m³ have been deployed on the seabed. Biofilters provide hard surfaces for the development of epifauna such as filter feeders which remove nutrients and suspended particles generated from fish culture activities. The AR at Lo Tik Wan FCZ is located about 7.1 km from the LPS Pipeline of the Project.

- (1) Mott MacDonald (2014) Expansion of Hong Kong International Airport into a Three-Runway System: EIA Study (EIA Report Registered No. AEIAR-185/2014)
- (2) AFCD (2017) Hong Kong Artificial Reef Deployment Study. Available at: <http://www.artificial-reef.net/English/main.htm>

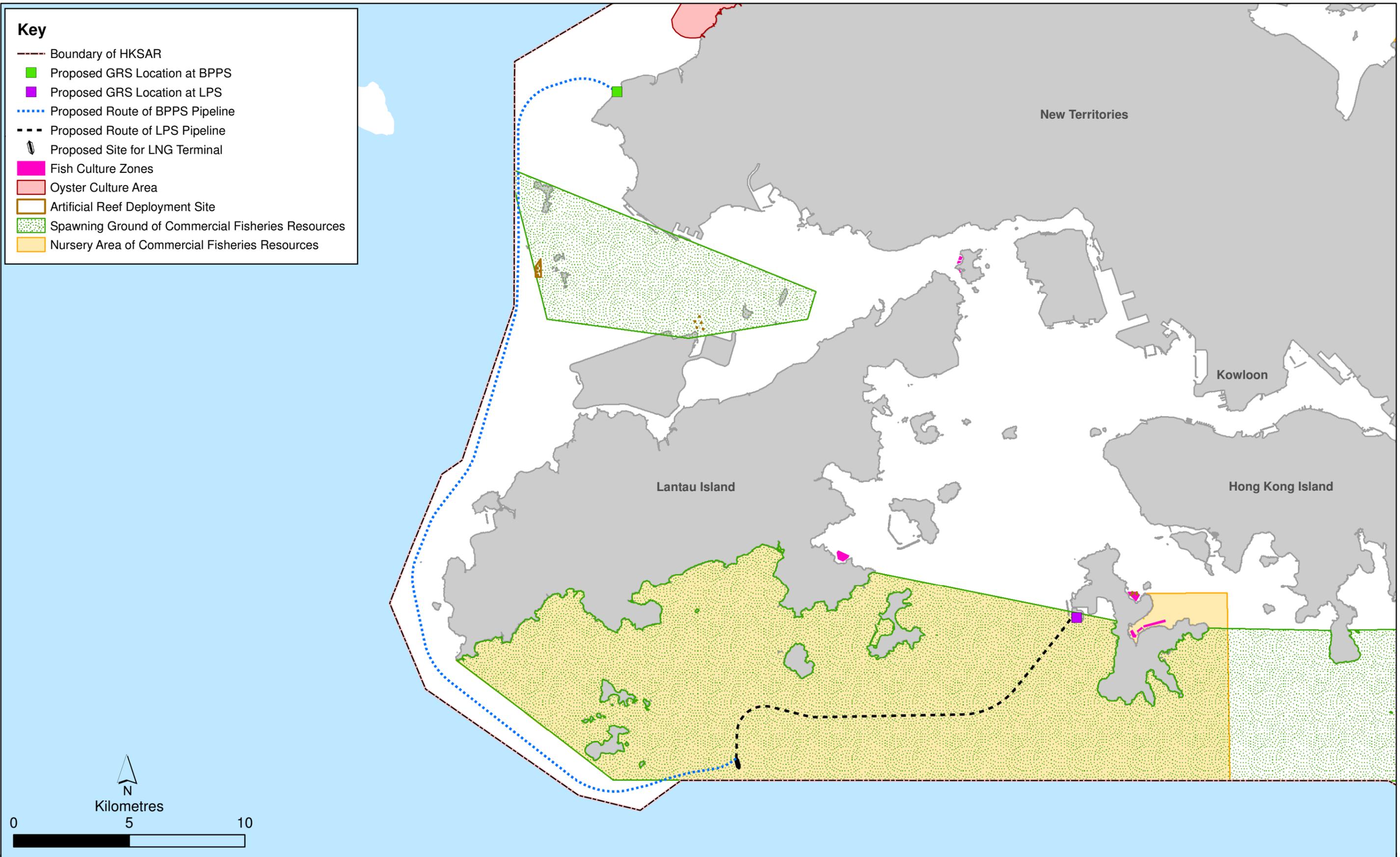


Figure 10A.1

Fisheries Sensitive Receivers in the Assessment Area

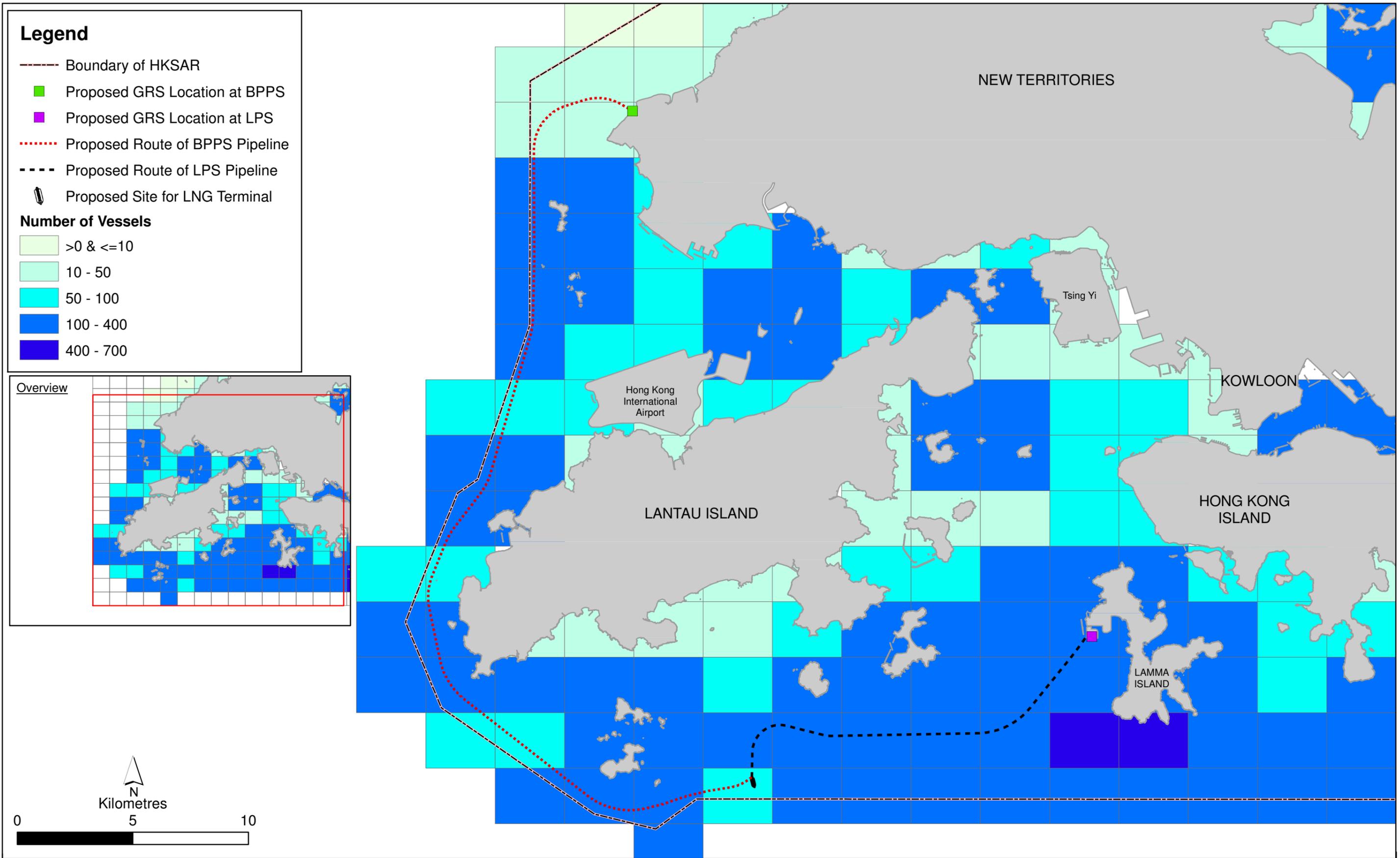


Figure 10A.2

Distribution of Fishing Operations (All Vessels) in Hong Kong Water as recorded by Agriculture, Fisheries and Conservation Department in Port Survey 2006

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Date: 18/4/2018

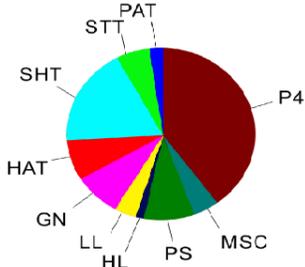
Legend

- Boundary of HKSAR
- Proposed GRS Location at BPPS
- Proposed GRS Location at LPS
- Proposed Route of BPPS Pipeline
- - - Proposed Route of LPS Pipeline
- 📍 Proposed Site for LNG Terminal

Production (kg/ha)

- >0 & ≤50
- 50 - 100
- 100 - 200
- 200 - 400
- 400 - 600
- 600 - 1000

Production by vessel type



Vessel type:	作業形式:	雙拖	單拖
PAT	Pair Trawler	雙拖	單拖
STT	Stern Trawler	雙拖	單拖
SHT	Shrimp Trawler	雙拖	單拖
HAT	Hang Trawler	雙拖	單拖
GN	Gill Netter	雙拖	單拖
LL	Long Liner	雙拖	單拖
HL	Hand Liner	雙拖	單拖
PS	Purse Seiner	雙拖	單拖
MSC	Misc. Craft	雙拖	單拖
P4	Sampan	雙拖	單拖

Overview

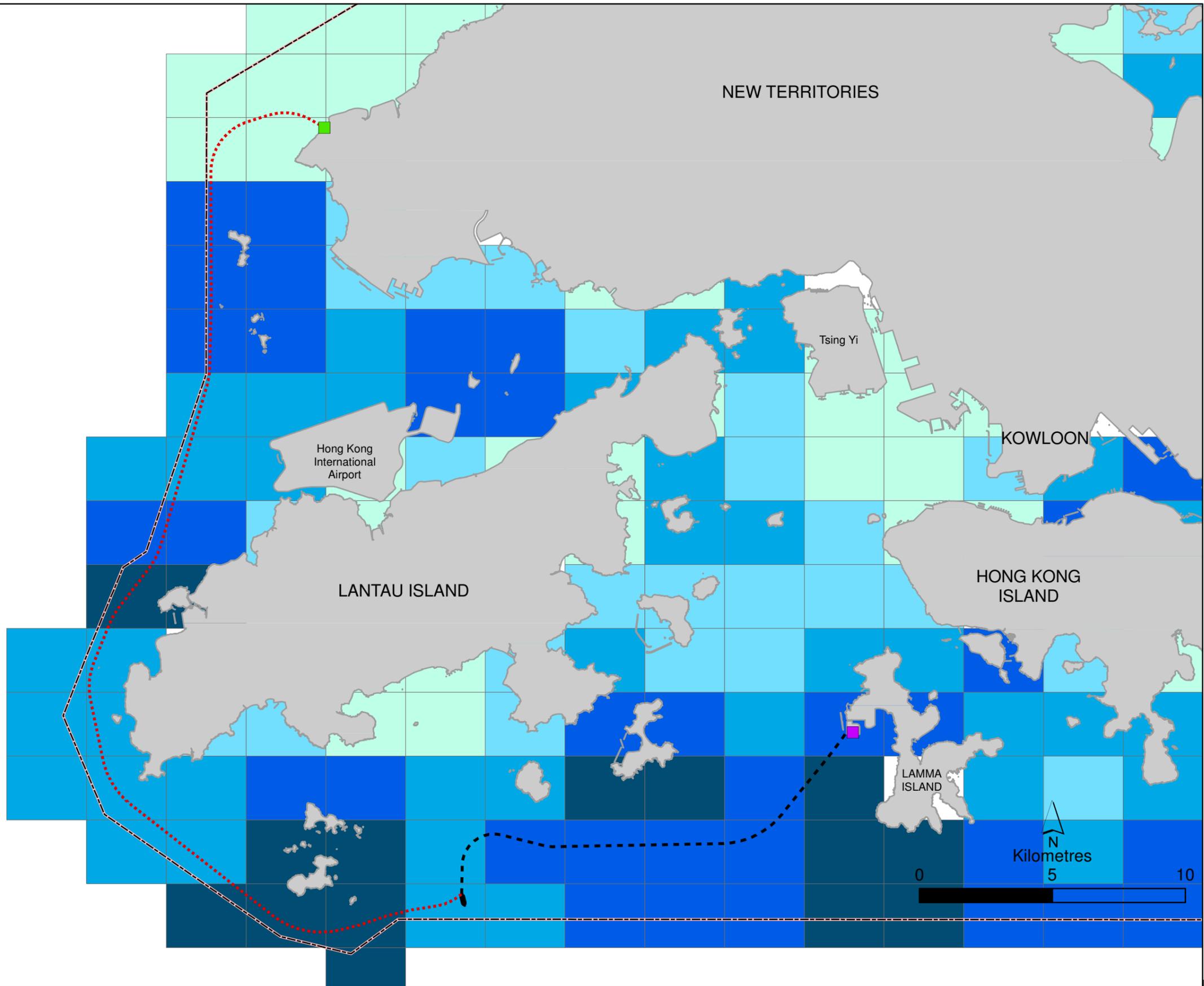
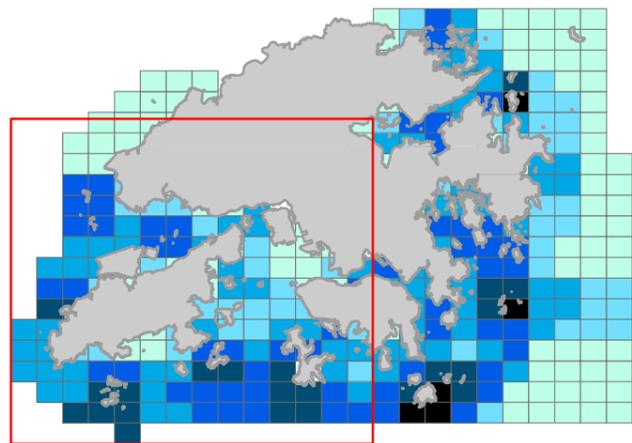


Figure 10A.3

Distribution of Fishing Production (Adult Fish) in terms of Weight(kg/ha) in Hong Kong Water as recorded by Agriculture, Fisheries and Conservation Department in Port Survey 2006

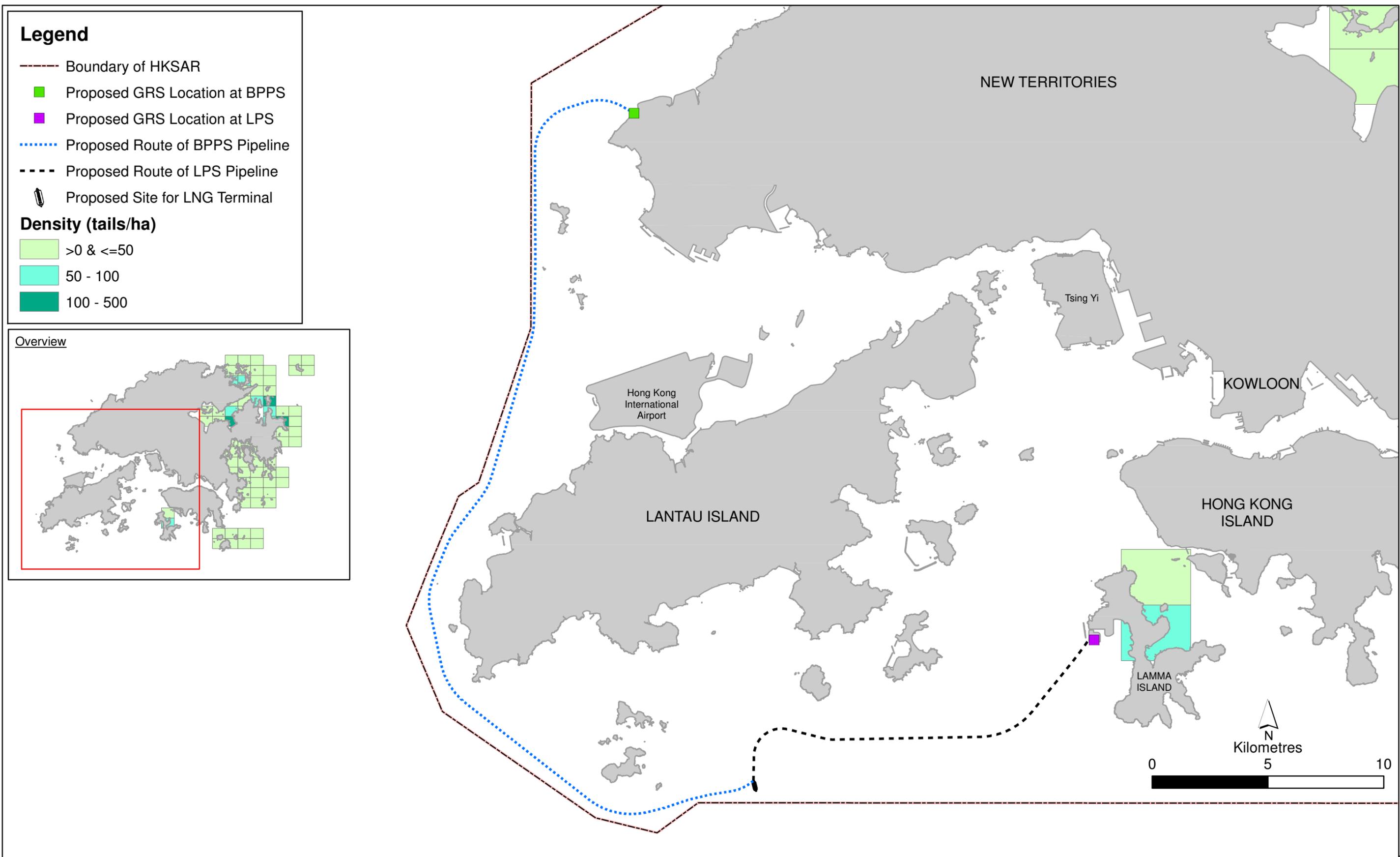


Figure 10A.4

Distribution of Fishing Production (Fish Fry) in Hong Kong Water as recorded by Agriculture, Fisheries and Conservation Department in Port Survey 2006

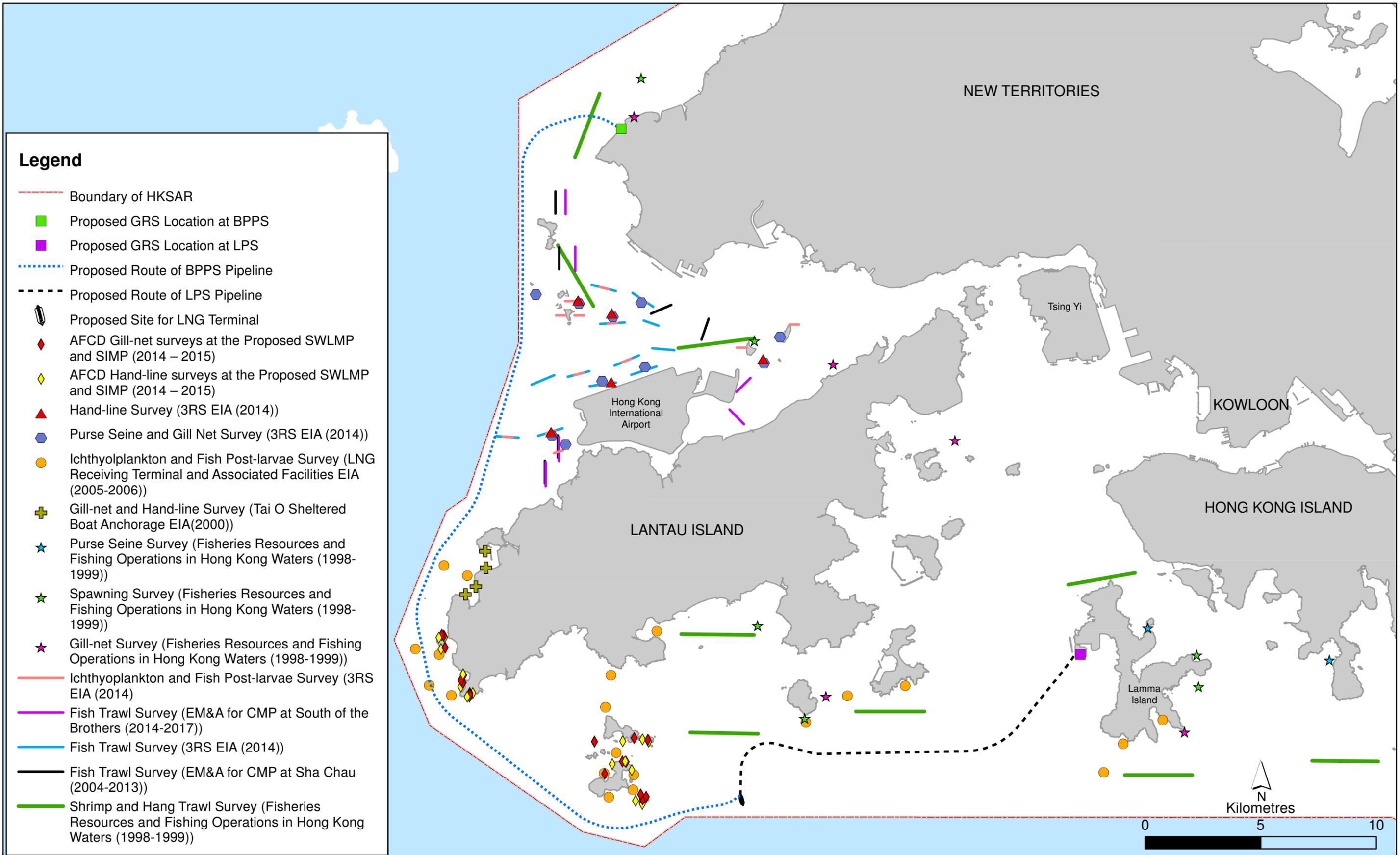


Figure 10A.5

Previous Fisheries Resources Surveys