



土木工程拓展署
Civil Engineering and
Development Department

Agreement No. CE 72/2019 (EP) Contaminated Sediment Disposal Facility at West of Lamma Island - Investigation

Method Statement for Fisheries Impact
Assessment

20 January 2021

Project No.: 0567994

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1. INTRODUCTION

1.1 Background

Since 1992, the Civil Engineering and Development Department (CEDD) of the Hong Kong Special Administrative Region (HKSAR) Government has been managing a number of contaminated sediment disposal facilities in the Hong Kong waters, including the contaminated mud pits (CMPs) to the east of Sha Chau (ESC) and the south of The Brothers (SB). These facilities consist of some series of seabed pits, formed by the removal of existing marine sediments, for disposal of contaminated dredged/ excavated sediment generated from works within Hong Kong. According to the latest estimate, the total remaining capacity of the existing disposal facilities at ESC can only cope with the demand up to 2027 for the public and private projects. A new sediment disposal facility has to be planned for in order to meet the sediment disposal demand after 2027 arising from routine harbour / channel / river maintenance dredging works and other projects.

To address the sediment disposal requirements upon the exhaustion of the existing CMPs, CEDD commissioned a preliminary study to assess the potential sites suitable for development into future CMPs. The study has identified that a portion of the seabed in the West Lamma Channel, between Cheung Chau and Lamma Island, will have good potential for development into a new contaminated sediment disposal facility. It was recommended to develop a new disposal facility consisting of three CMPs with a total capacity of approximate 6 million m³ to the west of Lamma Island (“the Project”).

The Project covers a new marine contaminated sediment disposal facility involving marine dumping and dredging operation (with quantity more than 500,000 m³). In accordance with Items C.10 and C.12, Part I of Schedule 2 under the Environmental Impact Assessment Ordinance (EIAO), the Project is classified as a designated project and therefore a statutory environmental impact assessment (EIA) is required. In accordance with the requirements of Section 5(1) of the EIAO, application for EIA study brief with the Project Profile for the New Contaminated Sediment Disposal Facility to the West of Lamma Island (No. PP-594/2019) was submitted to the Environmental Protection Department (EPD) on 9 December 2019. The EIA Study Brief of the Project (No. ESB-328/2019) were then issued by EPD on 20 January 2020. The Study Area is indicatively shown in *Figure 1.1*.

1.2 Objectives and Scopes of this Method Statement

With reference to Clause 3.4.5.2 of the EIA Study Brief of the Project (ESB-328/2019), the Assessment Area for the purpose of the fisheries impact assessment shall be the same as the Assessment Area for water quality impact assessment, covering the Southern Water Control Zone (WCZ) and Western Buffer WCZ as designated under the Water Pollution Control Ordinance (Cap. 358) (*Figure 1.2*). Baseline information within the Assessment Area is available from the following key sources:

- AFCD Port Survey 2016/17;
- EIA Report for Development of a 100MW Offshore Wind Farm in Hong Kong (Register No.: AEIAR-152/2010);
- EIA Report for Development of the Integrated Waste Management Facilities Phase 1 (Register No.: AEIAR-163/2012);
- EIA Report for Hong Kong Offshore LNG Terminal (Register No.: AEIAR-218/2018);
- EIA Report for Improvement Dredging for Lamma Power Station Navigation Channel (Register No.: AEIAR-212/2017);
- Fisheries Baseline Review Report for Lamma Power Station Navigation Channel (Environmental Permit No. EP-535/2017);
- EIA Report for Outlying Islands Sewerage Stage 2 - South Lantau Sewerage Works (Register No.: AEIAR-210/2017);

- Provision of Compensatory Marine Park for Integrated Waste Management Facilities at an Artificial Island near Shek Kwu Chau – Investigation (Agreement No. CE 14/2012 (EP));
- ERM (1998). Fisheries Resources and Fishing Operations in Hong Kong Waters. Final Report. Prepared for the Agriculture, Fisheries and Conservation Department;
- South China Sea Fisheries Research Institute (SCSFRI) (2017). Hong Kong Fisheries Resources Monitoring Report (2010-2015). Prepared for the Agriculture, Fisheries and Conservation Department;
- Hong Kong Artificial Reef Project. Access via <<https://www.artificial-reef.net/English/main.htm>>; and
- Available Published Scientific Literature

The desktop information from the above relevant previous studies has been reviewed and it is considered sufficient to evaluate the importance of potentially impacted fisheries resources and fishing operations within the Assessment Area. In addition, the fisheries interview surveys conducted by the AFCD and reported in the AFCD Port Survey 2016/17 are sufficiently comprehensive to provide an up-to-date and representative baseline for fisheries impact assessment. The approach to use AFCD Port Survey data as baseline data, supplemented by other desktop information, in EIA studies is an acceptable practice ^{(1) (2) (3) (4) (5) (6)}. Some of the baseline information was collected very recently in 2016-2018 and is considered to be up-to-date and representative of the existing conditions in the vicinity of the Study Area (*Figure 1.3*). Therefore, no information gap within the Assessment Area is identified. Despite this, to better understand the fisheries resources and fishing operations within and in the vicinity of the Study Area, field surveys at selected locations within and in the vicinity of the Study Area where potential impact could occur are proposed to be conducted to update the latest fisheries baseline in these locations.

This *Method Statement* presents the methodology of fisheries field surveys, in particular sampling gear type and gear specification, number and location of sampling stations, and data analysis, duration and timing for the fisheries field surveys. Reference has been made to the guidelines of fisheries impact assessment in *Annex 17* of *EIAO-TM* and approved EIA reports on the EIA Register.

1.3 Structure of this Method Statement

Following this introductory section, the remainder of this *Method Statement* is arranged as follows:

- *Section 2* presents the methodologies for the fisheries field surveys, including adult fish production survey, ichthyoplankton and fish post-larvae survey as well as vessel survey to assess fishing operations.

-
- (1) ERM (2003). The Proposed Submarine Gas Pipeline From Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production Plant, Hong Kong. EIA Study (EIA-089/2003). Prepared for The Hong Kong and China Gas Company Limited.
 - (2) Mott Connell Ltd. (2005). Drainage Improvement in Tsuen Wan and Kwai Chung – Tsuen Wan Drainage Tunnel. EIA Study (EIA-108/2005). Prepared for The Drainage Services Department.
 - (3) Black & Veatch Hong Kong Ltd. (2008). Hang Hau Tsuen Channel at Lau Fau Shan. EIA Study (EIA-163/2008). Prepared for the Civil Engineering and Development Department.
 - (4) ARUP (2009). Hong Kong – Zhuhai – Macao Bridge Hong Kong Boundary Crossing Facilities – Investigation. EIA Study (EIA-173/2009). Prepared for The Highways Department.
 - (5) ERM (2010). Development of a 100MW Offshore Wind Farm in Hong Kong. EIA Study (AEIAR-152/2010). Prepared for Hong Kong Electric.
 - (6) Black & Veatch Hong Kong Ltd. (2016) Outlying Islands Sewerage Stage 2 – South Lantau Sewerage Works. EIA Study (AEIAR-210/2017). Prepared for Drainage Services Department.

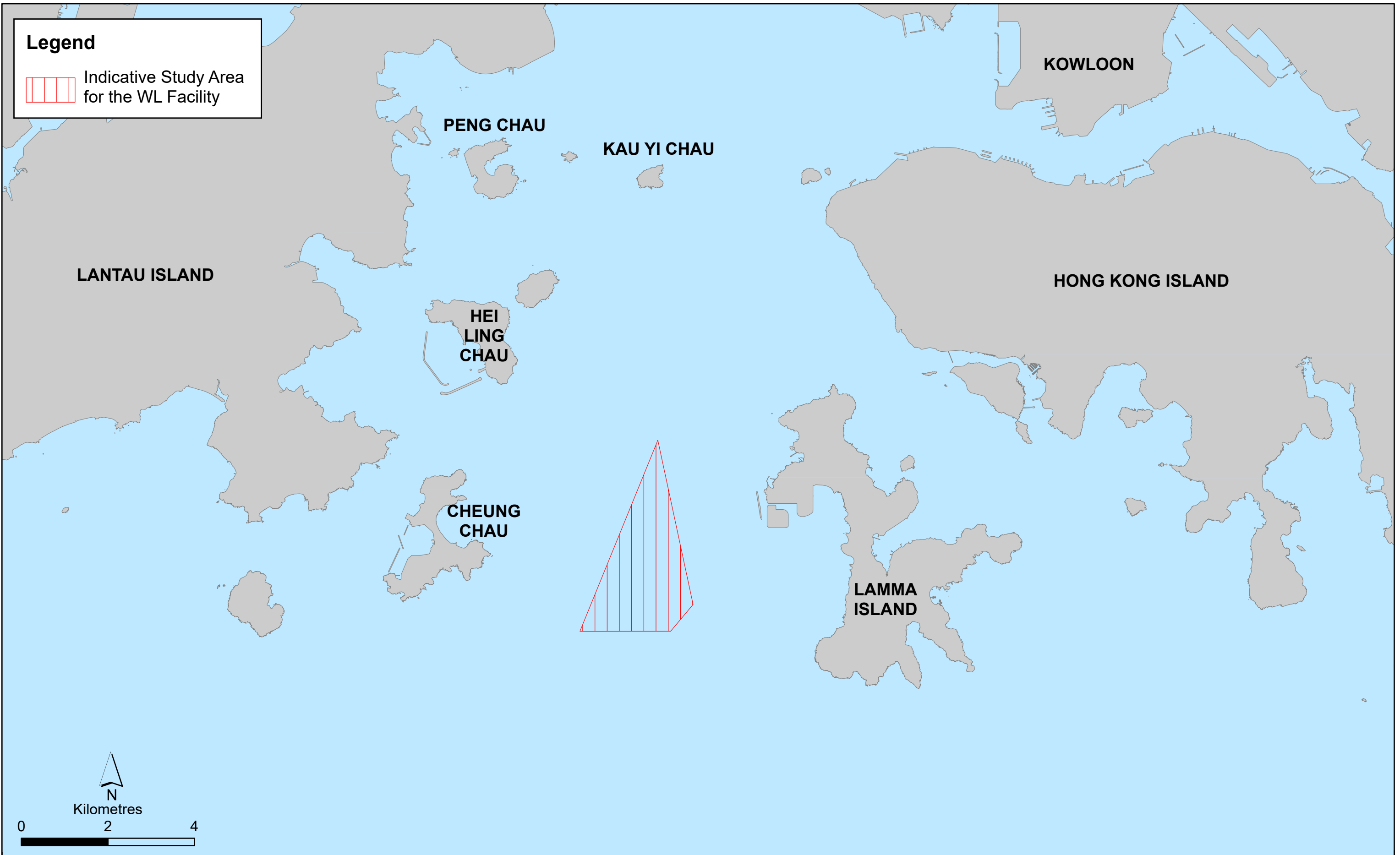


Figure 1.1

Indicative Study Area for the Contaminated Sediment Disposal Facility at West of Lamma Island (WL Facility)

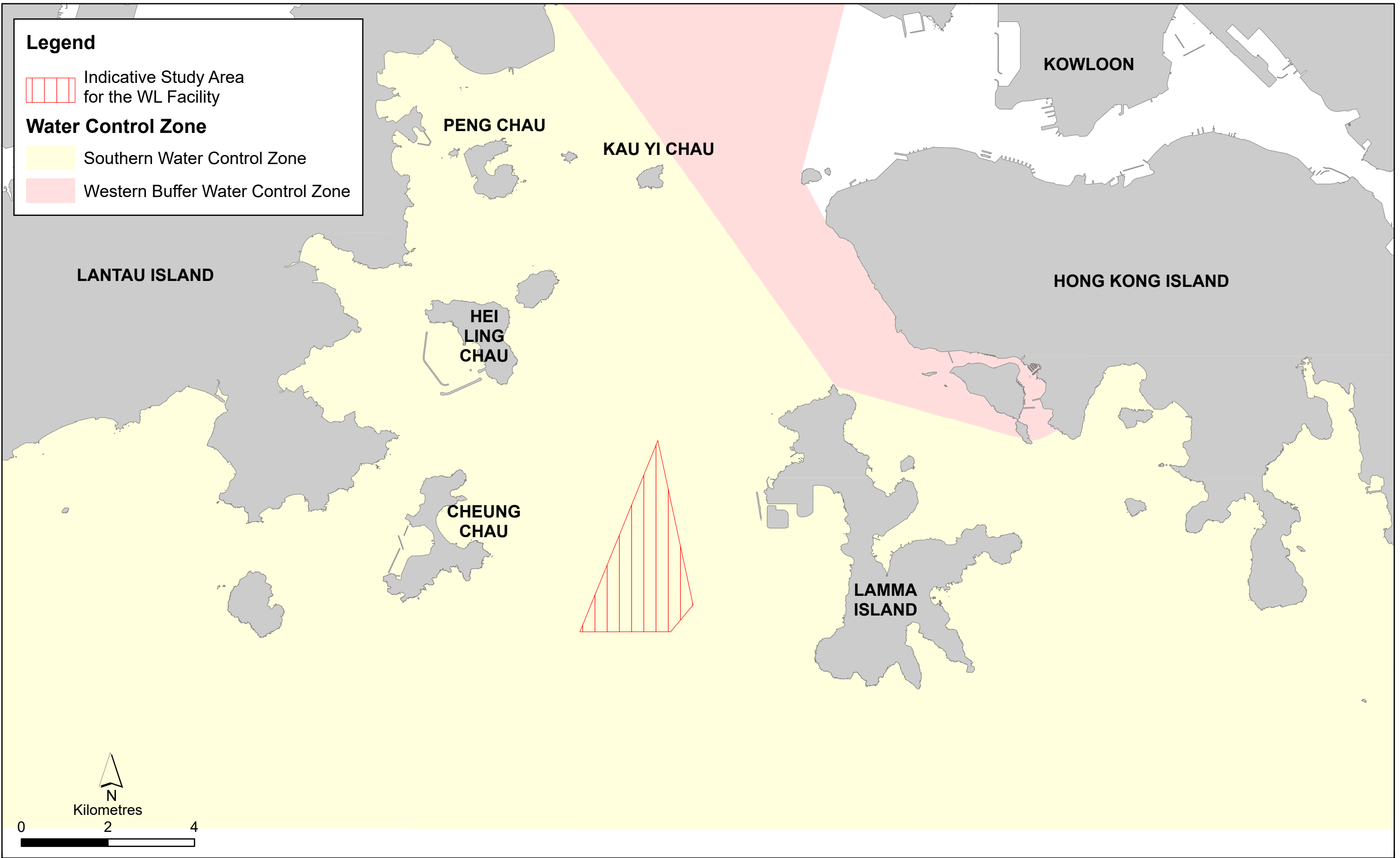


Figure 1.2

Relevant Water Control Zones for the Project

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Date: 7/12/2020

**Environmental
Resources
Management**



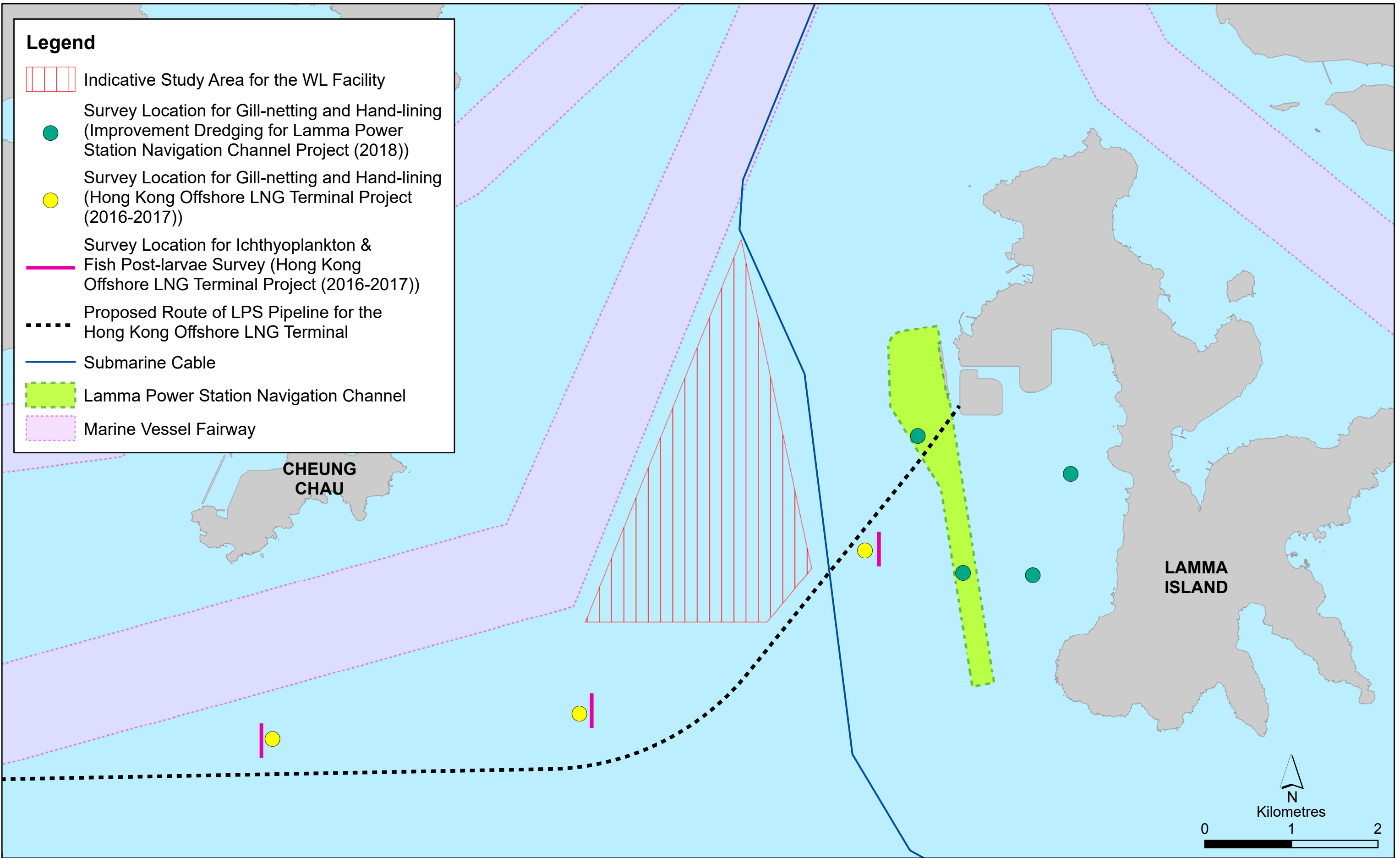


Figure 1.3

Previous Fisheries Surveys Conducted in the vicinity of the Study Area

2. FISHERIES FIELD SURVEYS

2.1 Adult Fish Production Survey

Adult fish production surveys will be conducted as described below to characterize the existing conditions of fisheries resources at selected locations within and in the vicinity of the Study Area, to provide data on abundance, composition and spatial distribution of adult fish stock.

2.1.1 Survey Locations

Three (3) survey locations within and in the vicinity of the Study Area are proposed for the adult fish production survey (*Figure 2.1*). These locations are proposed to avoid the areas of heavy marine traffic and concurrent construction activities, such as marine vessel fairways, the proposed works for the subsea gas pipeline for Lamma Power Station (LPS) for the Hong Kong Offshore LNG Terminal project and the improvement dredging for LPS Navigation Channel, in order to minimise potential confounding factors which may affect the survey results and to ensure that surveys can be undertaken in a safe manner.

Actual survey locations will be recorded using global positioning system (GPS) and water depth will be measured using portable sonar system.

2.1.2 Methodology

Two fishing methods, gill-netting and hand-lining, will be used to sample pelagic and demersal fisheries resources at each survey location. All these methods are commonly used by local fishermen in Hong Kong.

2.1.2.1 Gill-netting

At each location, two trammel (gill) nets will be deployed once for one (1) hour at each station. The nets will be 1 m deep, 30 m in length and comprised of three (3) layers, with two 20 cm mesh stretches sandwiching a 5 cm mesh stretch. This sampling gear is selected for its ability to capture pelagic fisheries resources in a wide range of sizes and is commonly used in other similar baseline fisheries surveys.

2.1.2.2 Hand-lining

At each location, hand-line fishing will be conducted by four (4) fishers (i.e. the fishing group), each using one (1) hand-line and hook, on a sampan for one (1) hour. Same group of fishers and similar fishing baits will be used in each survey to standardize the fishing techniques.

2.1.3 Specimen Processing and Data Analysis

The catches (fish and crustaceans) from the adult fish production survey will be washed and recorded immediately and will be identified to species level as far as practicable. The specimens will be analysed for species composition and diversity, abundance, size (total length, standard length or fork length as appropriate), biomass in weight, and estimated catch value of commercial species ⁽⁷⁾. Diversity of fisheries resources will be presented as species richness, Shannon-Weiner diversity (H') and Pielou's evenness (J).

Descriptive statistics for the measured parameters described above, including sum, mean value and standard deviation, will be analysed for the survey locations over the dry and wet seasons as appropriate.

(7) Value of commercial species will be estimated based on the best available data on published by Fish Marketing Organization (FMO). Available at https://www.fmo.org.hk/price?id=8&fid=9&path=12_43_56

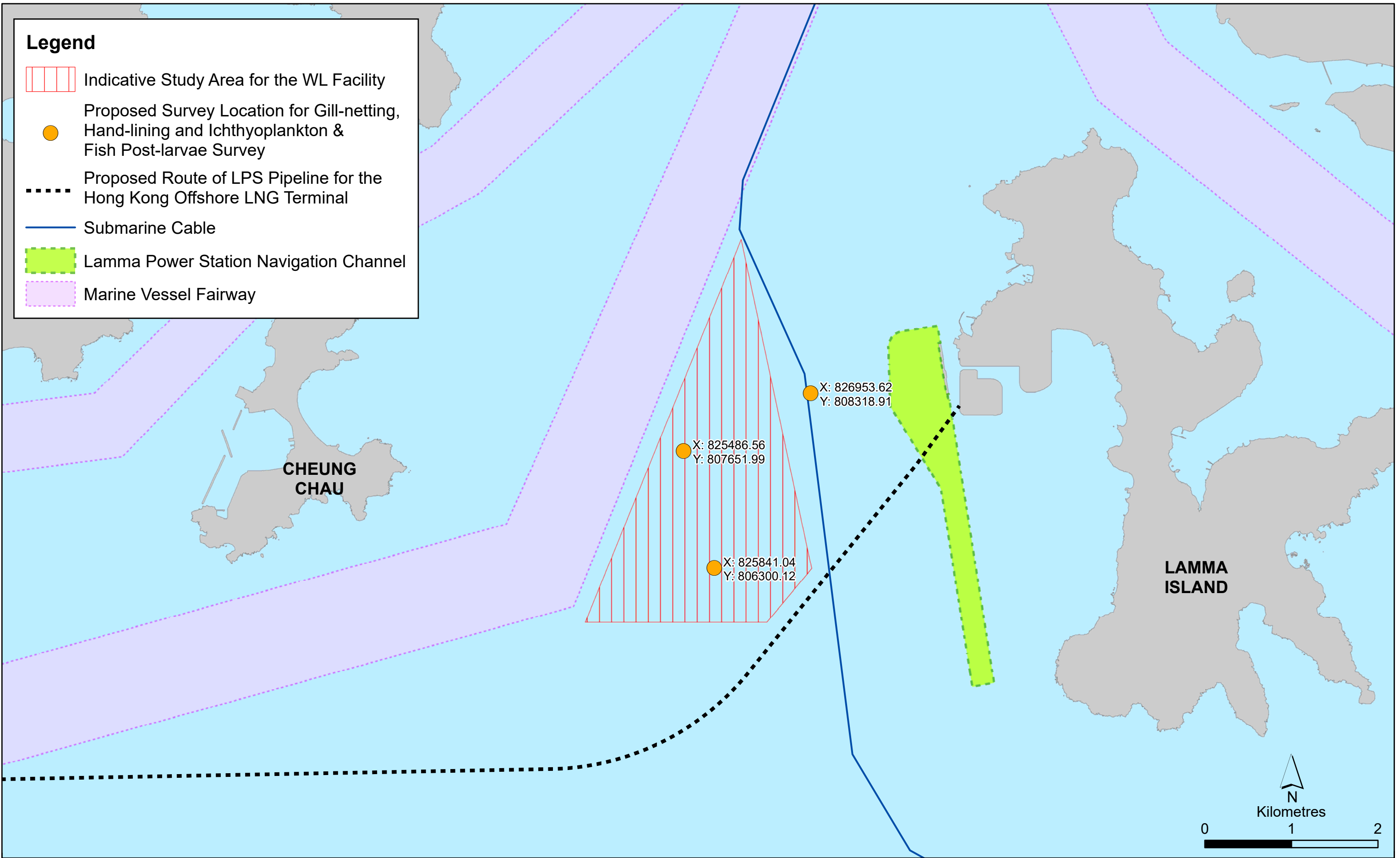


Figure 2.1

Proposed Survey Locations for the Fisheries Field Surveys

2.2 Ichthyoplankton and Fish Post-larvae Survey

Ichthyoplankton (i.e. eggs and larvae in planktonic phase and drift with the water currents) and fish post-larvae (i.e. post-settlement stages when fish have attained a larger size, are no longer planktonic and are capable of swimming against currents) surveys will be conducted as described below to determine if spawning or nursery ground important for commercial fisheries resources is present within and in the vicinity of the Study Area.

2.2.1 Survey Locations

Three (3) survey locations within and in the vicinity of the Study Area are proposed for the ichthyoplankton and fish post-larvae survey to examine the level of ichthyoplankton and fish post-larvae resources within and in the vicinity of the Study Area (*Figure 2.1*). These locations are proposed to avoid the areas of heavy marine traffic and concurrent construction activities, such as marine vessel fairways, the proposed works for the subsea gas pipeline for Lamma Power Station (LPS) for the Hong Kong Offshore LNG Terminal project and the improvement dredging for LPS Navigation Channel, in order to minimise potential confounding factors which may affect the survey results and to ensure that surveys can be undertaken in a safe manner.

Actual survey locations will be recorded using global positioning system (GPS) and water depth will be measured using portable sonar system.

2.2.2 Methodology

Ichthyoplankton and fish post-larvae survey will be conducted using plankton towing. A bongo plankton net of 50 cm mouth diameter and with 0.5 mm mesh size will be deployed for ichthyoplankton survey, while a bongo plankton net of 50 cm mouth diameter and with 1 mm mesh size will be deployed for fish post-larvae survey. A flow meter will be fitted at mouth of the net to record the volume of water filtered.

At each site, two (2) replicate tows will be conducted and each tow with a duration of at least 10 minutes. The net will be deployed in a single oblique tow to a depth of 2 m off the seabed and towed at a speed of 1-2 knots. Subsequently the net will be gradually winched up towards the water surface in order to sample the entire water column. The plankton will be immediately fixed in 70% ethanol ⁽⁸⁾ ⁽⁹⁾ ⁽¹⁰⁾.

Fish post-larvae are able to swim at a faster speed than 1-2 knots. With a coarser-mesh net of 1 mm, it is possible to tow at higher speeds of 3-4 knots to have a better chance of catching the fish post-larvae. The coarser mesh size also allowed small zooplankton to extrude through the net mesh and thus avoided the zooplankton from clogging up the net.

2.2.3 Specimen Processing and Data Analysis

Standard and accepted techniques will be used for sorting the ichthyoplankton and fish post-larvae in laboratory ⁽¹¹⁾. The specimens will be held in the fixative solution for a minimum of 24 hours to ensure adequate fixation of the organisms. Identification of ichthyoplankton and fish post-larvae will be made under dissecting stereomicroscopes according to the observed morphological characteristics such as body shape, cloacal location, pigmentation pattern, and other special structures. Larval fish

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- (8) Theilacker, G. H. (1980). Changes in body measurements of larval northern anchovy, *Engraulis mordax*, and other fishes due to handling and preservation. *Fishery Bulletin* 78: 685–692.
- (9) Takizawa K, Fujita Y, Ogushi Y, Matsuno S (1994) Relative change in body length and weight in several fish larvae due to formalin fixation and preservation. *Fisheries Science*, 60(4): 355-359.
- (10) Leis J.M. and Carson-Ewart B.M. (eds) (2004). *The larvae of Indo-Pacific coastal fishes: a guide to identification* (Fauna Malesiana Handbook 2, 2nd edition). Brill: Leiden. 850 pp.
- (11) Situ Y (2007) *Ichthyoplankton assemblages at Cape d'Aguilar: seasonal variability and family composition*. MPhil thesis. University of Hong Kong. pp 199.

individuals without distinctive morphological features for taxonomic identification will be examined with the aid of DNA sequencing as necessary. The DNA sequencing procedure, database alignment, and subsequent taxa establishment will follow Ko et al. (2013) ⁽¹²⁾.

The specimens will be identified to the lowest taxonomic level, where possible, using available identification keys and literatures ⁽¹³⁾, and number as well as size range will also be recorded. After taxa establishment, data will be standardized to the number of individuals per 1,000 m³ for data analyses. Species composition, abundance and diversity of taxa will be recorded.

Descriptive statistics for the measured parameters described above, including sum, mean value and standard deviation, will be analysed for the survey locations over the dry and wet seasons as appropriate.

2.3 Vessel Survey

Vessel surveys will be conducted as described below to assess the level of fishing operations within and in the vicinity of the Study Area, by recording the fishing effort of both commercial and recreational fishing activities with a view to identifying significant fishing grounds and sites of fisheries importance.

2.3.1 Survey Locations

Visual observation of fishing operations will be conducted from the three (3) survey locations proposed for the adult fish production survey (*Section 2.1*). The sea area covered within the visible range (usually a few hundred metres) from the survey location will be observed.

2.3.2 Methodology

The detailed fishing operation information on both recreational and commercial fishing activities, including the types and operating location of the fishing vessels, will be collected as far as possible during the adult fish production surveys. Vessel license number and fishing operation method will also be recorded where possible. Location will be estimated based upon GPS coordinates and position relative to the shoreline and marked on a map of the survey area.

2.4 Proposed Survey Schedule

The proposed survey schedule for fisheries field surveys to be conducted for the Project, as outlined in *Sections 2.1* to *2.3*, is presented in **Table 2.1**.

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- (12) Ko HL, Wang YT, Chiu TS, Lee MA, Leu MY, Chang KZ, Chen WY and Shao KT (2013) Evaluating the Accuracy of Morphological Identification of Larval Fishes by Applying DNA Barcoding. PLoS ONE 8(1): 1 – 7.
- (13) Leis JM, Carson-Ewart BM (2004) The larvae of Indo-Pacific coastal fishes: a guide to identification. Brill, Leiden

Table 2.1 Tentative Survey Schedule for Fisheries Field Survey

Method	Location	Survey Frequency
Gill Netting	3 locations within and in the vicinity of the Study Area (Figure 2.1)	<ul style="list-style-type: none"> ■ Two times during dry season between February and March 2021 ■ Two times during wet season between April and May 2021
Hand Lining	3 locations within and in the vicinity of the Study Area (Figure 2.1)	<ul style="list-style-type: none"> ■ Two times during dry season between February and March 2021 ■ Two times during wet season between April and May 2021
Plankton Tow by Bongo Net (0.5mm mesh size for ichthyoplankton sampling; 1 mm mesh size for fish post-larvae sampling)	3 locations within and in the vicinity of the Study Area (Figure 2.1)	<ul style="list-style-type: none"> ■ Two times during dry season between February and March 2021 ■ Two times during wet season between April and May 2021
Vessel Survey by visual observation	3 locations within and in the vicinity of the Study Area (Figure 2.1)	<ul style="list-style-type: none"> ■ Two times during dry season between February and March 2021 at the same time as the adult fish production surveys ■ Two times during wet season between April and May 2021 at the same time as the adult fish production surveys