



吉寶西格斯 - 振華聯營公司
KEPPEL SEGHERS - ZHEN HUA JOINT VENTURE

Detailed Monitoring Programme on Finless Porpoise

(Clause 2.9, Further Environmental Permit FEP-01/429/2012/A)

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1) Introduction

- 1.1) The Government of Hong Kong SAR will develop the Integrated Waste Management Facilities (IWMF) Phase 1 (hereafter referred to the Project) with incineration to achieve substantial bulk reduction for unavoidable Municipal Solid Waste (MSW) and to recover energy from incineration process. The IWMF will be on an artificial island to be formed by reclamation at the south-western coast of Shek Kwu Chau (SKC). An Environmental Impact Assessment (EIA) for the Project was conducted according to the EIA Study Brief No. ESB-184/2008. The EIA report (Register No: AEIAR-163/2012) was approved on 17 January 2012 under the Environmental Impact Assessment Ordinance (EIAO). An Environmental Permit (EP) (EP No.: EP-429/2012) was granted on 19 January 2012 for the construction and operation of the Project. A variation of environmental permit (VEP) was subsequently applied and the latest VEP (EP No: EP-429/2012/A) was issued by the Environmental Protection Department (EPD) on 14 October 2016. Application for further environmental permit (FEP) was made on 28 November 2017 and the FEP was granted on 27 December 2017.
- 1.2) Keppel Seghers – Zhen Hua Joint Venture (“the JV”) has been awarded the Project to carry out reclamation works (including associated dredging works) which is located near the south-western coast of Shek Kwu Chau, and the JV will construct an incinerator and its relevant facilities on the reclaimed land. The tentative construction programme of the IWMF project is shown as Table 1 for reference.

Table 1 Tentative Construction Programme of the IWMF Project

Description	Date
Award of Contract	22 Nov 2017
Phase I – Construction of Perimeter Seawalls	10 Jan 2018 – 21 Jan 2020
Seawall at DCM Area	15 Mar 2018 – 21 Jan 2020
Seawall at Dredging Area	22 Aug 2018 – 09 Sept 2019
Phase II – Reclamation, Breakwater and Berth Construction	22 Sept 2019 – 27 Jun 2021
Reclamation	22 Sept 2019 – 27 Jun 2021
Breakwater	22 Sept 2019 – 07 Mar 2021
Foundation Works	12 Apr 2021 – 13 May 2022
Superstructure Works	12 Aug 2021 – 12 Jan 2023
Architectural Builders Works and Finishes	07 Nov 2021 – 09 Sept 2023
Building Services Installation	20 Feb 2022 – 20 Oct 2023
Process Equipment Installation	27 Jan 2022 – 04 Nov 2023
Landscape, External Road and Drains Works	07 Nov 2021 – 26 Apr 2024

- 1.3) According to the Condition 2.9 of the FEP, a Detailed Monitoring Programme on Finless Porpoise monitoring plan shall be prepared at least one month before the commencement of construction of the Project to propose the monitoring frequency and mitigation measures to be taken to avoid disturbance to Finless Porpoise.
- 1.4) The EIA Report revealed that the reclamation and relevant marine works of the Project will adversely affect the existing Finless Porpoise near or within the Project site as they have been frequently and consistently found between the waters of Soko Islands and Shek Kwu Chau according to the Final Reports of Agriculture, Fisheries and Conservation Department (AFCD) for Monitoring of Marine Mammals in Hong Kong Waters – Data Collection (from 2014 to 2017). The Finless Porpoise is one of the protected marine mammal in Hong Kong. In order to prevent adverse impacts arising from the Project on marine mammals, the EIA Study has recommended the implementation of a marine mammal monitoring programme during pre-construction, construction and operation phases of the Project.
- 1.5) In order to implement the EIA recommendation, our company ASCL partners with the experienced Marine Ecologist, Dr. Samuel Hung, Dr. Lindsay Porter, Ms. Julia Chan or someone with equivalent qualifications as the marine mammal specialist of the ET. Each of them has more than 15 years' professional experience on Marine Mammal Monitoring Surveys in Hong Kong Waters. Marine mammal specialist of the ET of the Project will assist to plan and advise the monitoring of Finless Porpoise in pre-construction phase, construction phase and operation phase of the Project.

2) Construction Phase Monitoring Programme for Finless Porpoise

2.1) Background Information

- 2.1.1) The marine mammal monitoring programme would focus on Finless Porpoise, as the study area near Shek Kwu Chau has been identified as a hotspot for this species, while the Chinese White Dolphins rarely occurred there in the past. The monitoring would verify the predicted impacts on marine mammals, and examine whether the mitigation measures recommended in the EIA report have been effectively implemented to protect marine mammals from negative impacts from construction activities. The marine mammal monitoring programme should cover pre-construction phase, construction phase, and operation phase.
- 2.1.2) The pre-construction monitoring (i.e. baseline survey before construction) have been conducted with three parts of baseline marine mammal monitoring conducted prior to the commencement of works and agreed with AFCD, namely the Vessel-based Line-transect Survey, Passive Acoustic Monitoring and Land-based Theodolite Tracking, which were carried out between 30 January 2018 and 14 May 2018, covering the several months within the peak season for Finless Porpoise occurrence (i.e. December to May). In total, 56 groups of finless porpoise, numbering 148 individuals, and only two groups of two Chinese White Dolphins were observed in Southeast Lantau waters during the three-month Vessel-based Line-transect Survey from February to April 2018, the porpoises were sighted evenly throughout most of the Southeast Lantau survey area, with the

exception of the southeastern portion of offshore waters where no porpoise was sighted. More porpoises apparently occurred to the eastern and southern sides of Shek Kwu Chau, and in the waters between Shek Kwu Chau and the Soko Islands. On the contrary, they were less frequently sighted in the inshore waters of Lantau Island (i.e. Pui O Wan) as well as between the waters between Cheung Chau and Shek Kwu Chau.

- 2.1.3) The Vessel-based Line-transect Survey, the Passive Acoustic Monitoring and the Land-based Theodolite Tracking will be conducted to provide systematic, quantitative measurements of occurrence, encounter rate, habitat use, movement and behavioral patterns of marine mammals within or near the Project Area during construction and operational phases.

3) Proposed Marine Mammal Monitoring Programme during Construction Phases

3.1) Objectives of Construction Phase Marine Mammal Monitoring

3.1.1) The mammal monitoring works during construction consist of the following three survey methods:

- a) Vessel-based Line-transect Survey – to monitor the occurrence of Finless Porpoises (and Chinese White Dolphins) in the study area during construction works, by comparing with the findings of the pre-construction marine mammal monitoring;
- b) Passive Acoustic Monitoring – to study the usage of the Project Area and two control sites in South Lantau Waters by Finless Porpoise during construction works, in reference with the baseline findings of the pre-construction marine mammal monitoring; and
- c) Land-based Theodolite Tracking – to study the movement and behavioural pattern of Finless Porpoise within and around the Project Area during construction works.

3.2) Vessel-based Line-transect Survey

3.2.1) For the vessel-based marine mammal surveys, the monitoring team adopted the standard line-transect method (Buckland et al. 2001) as same as that adopted during the EIA study and pre-construction phase monitoring to allow fair comparison of marine mammal monitoring results. The collected survey data would then be compatible with the long-term marine mammal monitoring programme commissioned by AFCD to allow potential comparisons and pooling data for various analyses.

3.2.2) Eight transect lines are set at Southeast Lantau survey area, including Shek Kwu Chau, waters between Shek Kwu Chau and the Soko Islands, inshore waters of Lantau Island (e.g. Pui O Wan) as well as southwest corner of Cheung Chau as shown in **Figure 3.1** below:

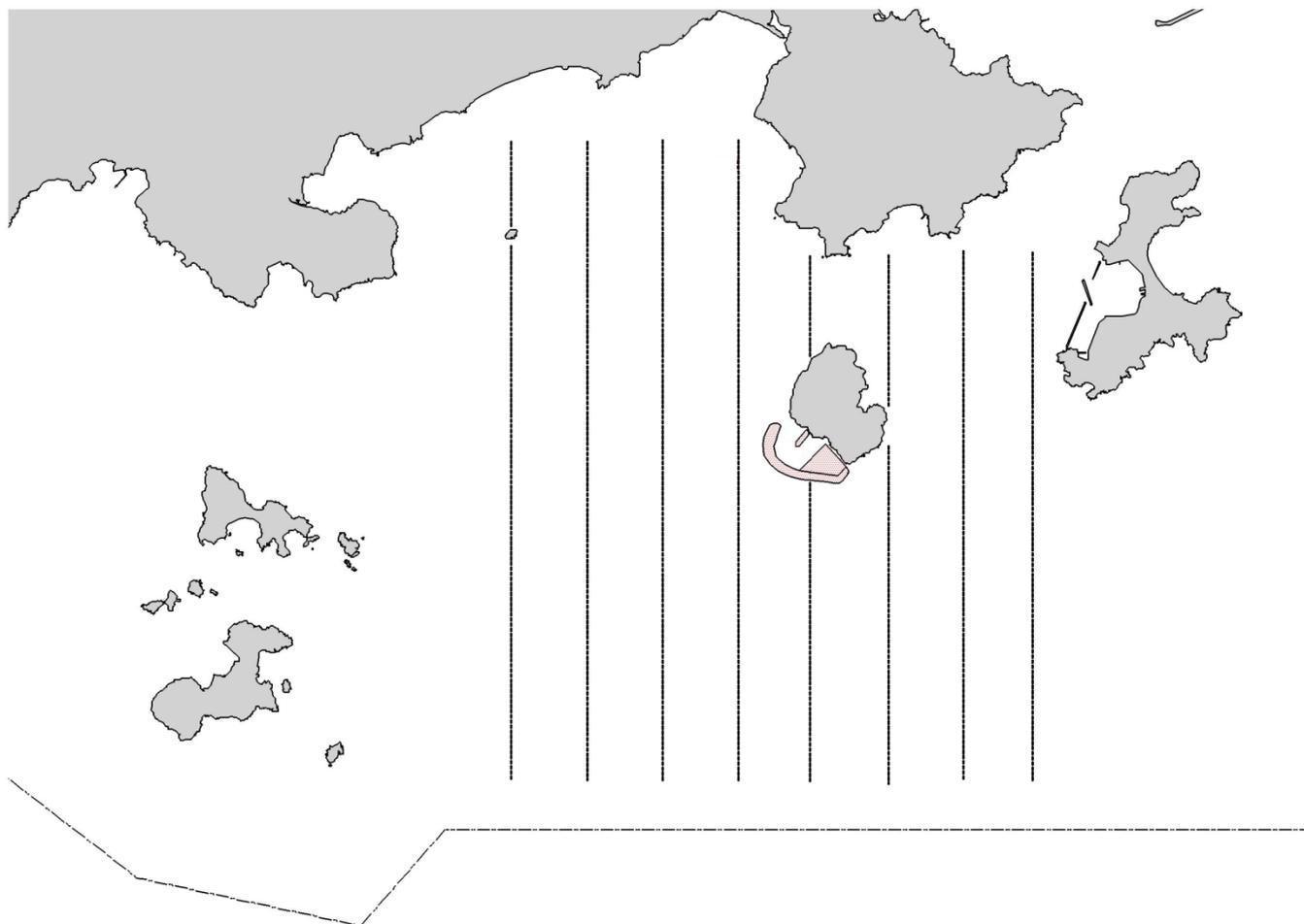


Figure 3.1 Line Transects for Marine Mammal Surveys

3.2.3) The surveys should cover all 4 seasons in order to take natural fluctuation and seasonal variations into account for data analysis of distribution, encounter rate, density and habitat use of both porpoises and dolphins (if any). In comparison to the baseline monitoring results, results from the analyzed construction phase monitoring data would allow the detection of any changes of their usage of habitat, in response to the scheduled construction works. The monitoring surveys shall be conducted throughout the construction phase involving marine construction works, with the frequency shown in **Table 3.1** below:

Table 3.1 Vessel-based Line-transect Survey Frequency

Season	Months	Frequency
Peak Season	December, January, February, March, April & May	Twice per month
Non-peak Season	June, July, August, September, October & November	Once per month

- 3.2.4) For each vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) would be used to make observations from the flying bridge area. Two experienced marine mammal observers (a data recorder and a primary observer) would make up the on-effort survey team, and the survey vessel would transit different transect lines at a constant speed of 13-15 km per hour. The data recorder shall search with unaided eyes and fill out the datasheets, while the primary observer shall search for dolphins and porpoises continuously through 7 x 50 marine binoculars. Both observers shall search the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°). Two additional experienced observers shall be available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers shall be experienced in small cetacean survey techniques and identifying local cetacean species with extensive training by marine mammal specialist of the ET
- 3.2.5) During on-effort survey periods, the survey team shall record effort data including time, position (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS (Garmin eTrex Legend). Data including time, position and vessel speed would also be automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.
- 3.2.6) When porpoises or dolphins are sighted, the survey team shall end the survey effort, and immediately record the initial sighting distance and angle of the porpoise or dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel shall be diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, behavioural observations, and collection of identification photos (feasible only for Chinese White Dolphin). The perpendicular distance (PSD) of the porpoise or dolphin group to the transect line would then be calculated from the initial sighting distance and angle, which shall be used in the line-transect analysis for density and abundance estimation.
- 3.2.7) The line-transect survey data shall be integrated with a Geographic Information System (GIS) to visualize and interpret different spatial and temporal patterns of porpoise and dolphin distribution using their sighting positions collected from vessel surveys. Location data of porpoise and dolphin groups would be plotted on map layers of Hong Kong using a desktop GIS (e.g. ArcView© 3.1) to examine their distribution patterns in details. The encounter rate could be used as an indicator to determine areas or time periods of importance to porpoises within the study area. For encounter rate analysis of finless porpoises, only survey data collected under Beaufort 2 or below condition would be used for encounter rate analysis.
- 3.2.8) To take into account of the variations of survey effort across different sections within survey area, the quantitative grid analysis of habitat use would be conducted to examine finless porpoise usage among 1-km² grids within the Southeast Lantau survey area. For the grid analysis, SPSE (sighting density) and DPSE (porpoise density) values would be deduced for evaluation on level of porpoise usage. First, positions of on-effort porpoise sightings from the study period are plotted onto 68 grids (1 km x 1 km each) within the survey area. Sighting density grids and porpoise density grids shall then be normalized with the amount of survey effort conducted within each grid. The total amount of survey effort spent on each grid shall be calculated by examining the survey coverage on each line-transect survey to determine how many times the grid had been surveyed during study period. With the amount of survey effort calculated for each grid, the sighting density and porpoise density of each grid shall be further normalized (i.e. divided by the unit of survey effort).

3.2.9) The newly-derived unit for sighting density was termed SPSE, representing the number of on-effort sightings per 100 units of survey effort. In addition, the derived unit for actual porpoise density was termed DPSE, representing the number of dolphins/porpoise per 100 units of survey effort. Among the 1-km² grids that were partially covered by land, the percentage of sea area was calculated using GIS tools, and their SPSE and DPSE values were adjusted accordingly. The following formulae shall be used to estimate SPSE and DPSE in each 1-km² grid within the study area:

$$\text{SPSE} = ((S / E) \times 100) / \text{SA\%}$$
$$\text{DPSE} = ((D / E) \times 100) / \text{SA\%}$$

where S = total number of on-effort sightings
 D = total number of dolphins/porpoises from on-effort sightings
 E = total number of units of survey effort
 SA% = percentage of sea area

3.3) Passive Acoustic Monitoring (PAM)

3.3.1) The PAM aims to study the usage of an area by Finless Porpoise by using an array of automated static porpoise detectors (e.g. C-POD) which would be deployed at different locations to detect the unique ultra-high frequency sounds produced by Finless Porpoise. During the construction period, the PAM survey will be conducted including placement of two passive porpoise detectors outside the Project Area as control site (i.e. within Pui O Wan and to the south of Tai A Chau) and one porpoise detector within the Project Area (i.e. near Shek Kwu Chau) as shown in **Figure 3.2** below.

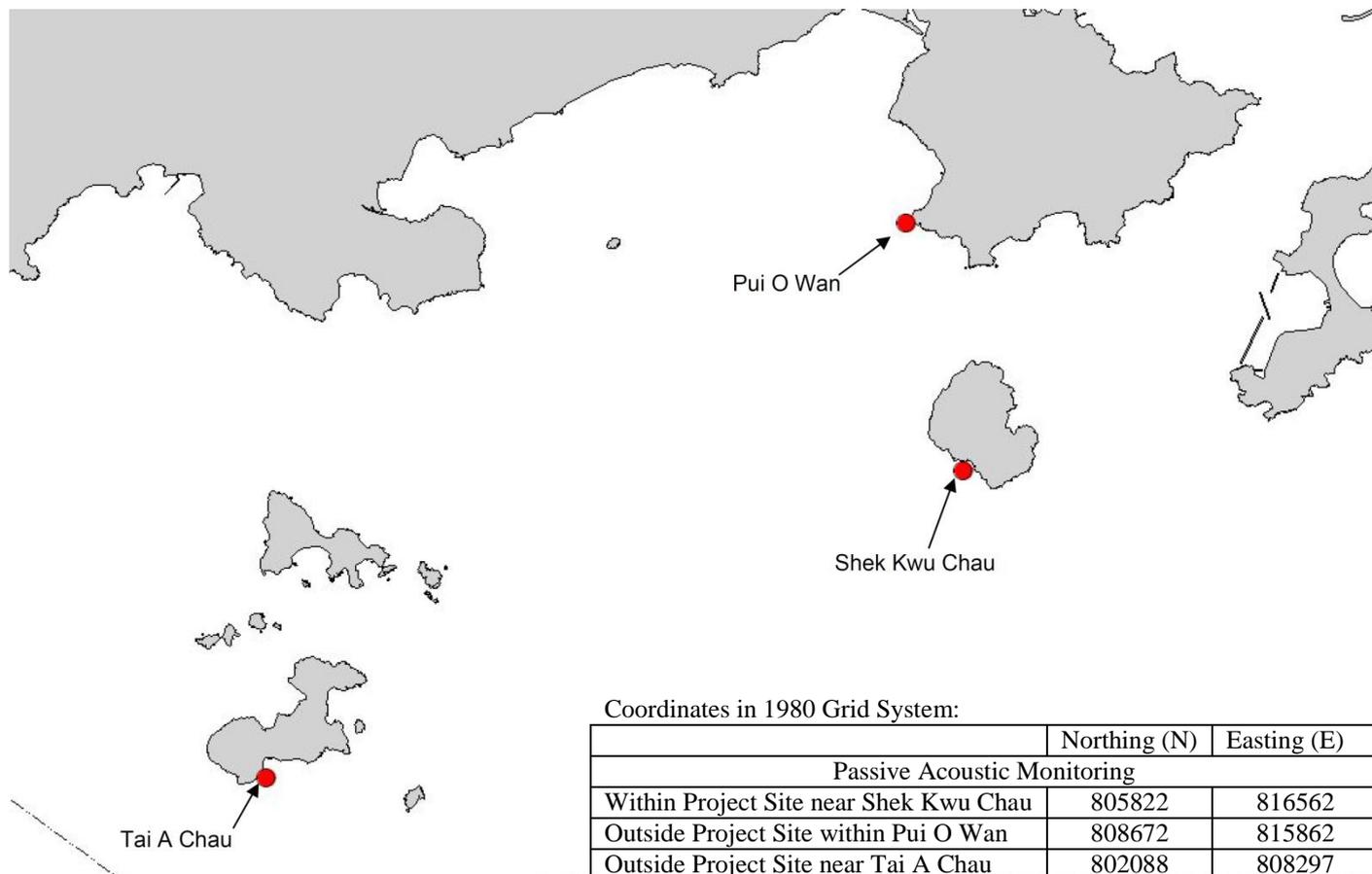


Figure 3.2 Locations of Passive Acoustic Monitoring

3.3.2) These three detectors will be deployed on-site to carry out 24-hours monitoring for a period listed as **Table 3.2** below during the construction phase.

Table 3.2 PAM Deployment Period

Season	Months	Deployment Period
Peak Season	December, January, February, March, April or May	At least 30 days during the peak months of porpoise occurrence in South Lantau waters

3.3.3) The automated static porpoise detectors shall detect the presence and number of finless porpoise and Chinese White Dolphins respectively over the deployment period, with the false signal such as boat sonar and sediment transport noise distinguished and filtered out. The detectors shall be deployed and retrieved by professional dive team on the seabed of the three selected location shown in **Figure 3.2**. During each deployment, the C-POD unit serial numbers as well as the time

and date of deployments shall be recorded. Information including the GPS positions and water depth at each of the deployment locations shall also be obtained.

3.3.4) The diel patterns (i.e. 24-hour activity pattern) of finless porpoise occurrence among the three sites at Shek Kwu Chau, Tai A Chau and Pui O Wan shall be analyzed. Peaks and troughs of finless porpoise occurrence per hour of day would be identified and compared with the results obtained from pre-construction monitoring.

3.4) Land-based Theodolite Tracking

3.4.1) The Land-based Theodolite Tracking study would use the same station as in the AFCD monitoring study (same as the baseline monitoring location), which is situated at the southwest side of Shek Kwu Chau (GPS position: 22°11.47' N and 113°59.33' E) as shown in below **Figure 3.3**. The station was selected based on its height above sea level (at least 20 metres), close proximity to shore, and relatively unobstructed views of the entire Project Area to the southwest of Shek Kwu Chau. The height of the Shek Kwu Chau Station established by the HKCRP team is 74.6 m high at mean low water, and only a few hundred metres to the IWMF reclamation site, which is ideal for the purpose for the present behavioural and movement monitoring of finless porpoises as well during construction phase considering there as an un-obstructed vantage point at a height above the Project Site.

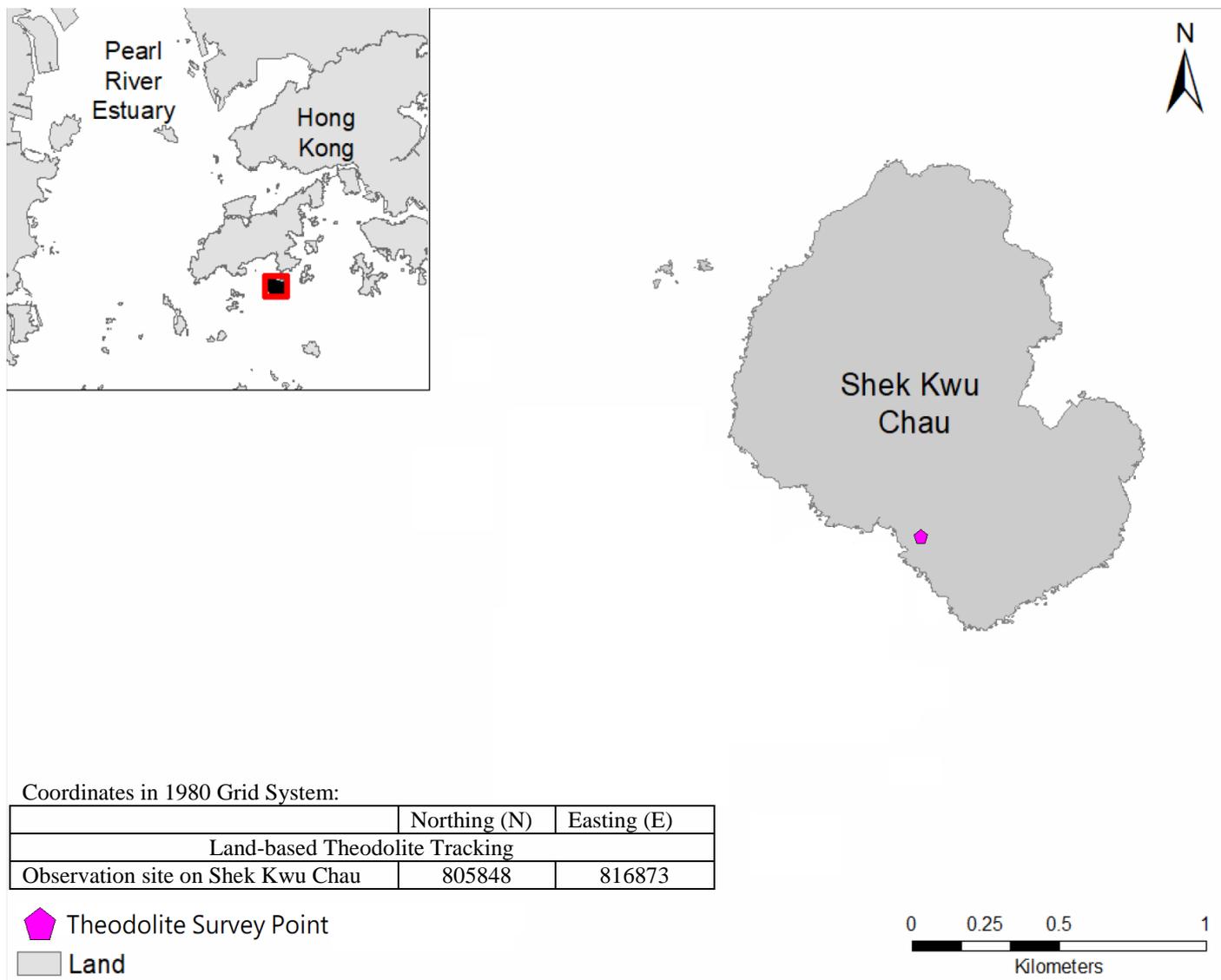


Figure 3.3 Locations of Land-based Theodolite Tracking

3.4.2) During the construction phase, Land-based Theodolite Tracking will be carried out for approximately six hours of tracking for each day of field work for a period listed as **Table 3.3** below, preferably at the initial stage of the construction period (i.e. December 2018 to May 2019).

Table 3.3 Land-based Theodolite Tracking Survey Period

Season	Months	Survey Period
Peak Season	December, January, February, March, April or May	30 days during the peak months of porpoise occurrence in South Lantau waters

- 3.4.3) The monitoring period for land-based theodolite tracking will be proposed to be overlapped with the PAM. The monitoring team consists of one experienced theodolite operator and at least two field observers for assistance. To conduct theodolite tracking, our observers will search systematically for Finless Porpoise using the unaided eye and 7 x 50 handheld binoculars on each survey day throughout the study area. When an individual or group of porpoises is located, a theodolite tracking session will be initiated and focal follow methods will be used to track the porpoise(s). Behavioural state data (i.e. resting, milling, travelling, feeding and socializing) shall also be recorded every 5 minutes for the focal individual or group. Positions of porpoises and boats shall be measured using a digital theodolite connected to a laptop computer. This tracking survey will be conducted during the peak season between December 2018 and May 2019 for 30 surveys spanning across 15-16 weeks during the peak season to provide good temporal coverage during the initial stage of the construction period.
- 3.5) The proposed monitoring schedule for the above three finless porpoise survey method and the two mitigation measures, namely Marine Mammal Exclusion Zone and Marine Mammal Watching Plan, are illustrated in **Figure 3.4** below. Details for the two mitigation measures would be given in Section 5 of this plan.

4) Proposed Marine Mammal Monitoring Programme during Operational Phase

4.1) Objectives of Operational Phase Marine Mammal Monitoring

4.1.1) The mammal monitoring works during 1st year of operation of IWMF consist of the following five survey methods:

- a) Vessel-based Line-transect Survey – to monitor the occurrence of Finless Porpoises (and Chinese White Dolphins) in the study area during operation, based on the findings of the pre-construction and construction marine mammal monitoring;
- b) Passive Acoustic Monitoring – to study the usage of the Project Area and two control sites in South Lantau Waters by Finless Porpoise during operation, in reference with the baseline findings of the pre-construction and construction marine mammal monitoring; and
- c) Land-based Theodolite Tracking – to study the movement and behavioural pattern of Finless Porpoise within and around the Project Area during operation phase.
- d) Active Acoustic Monitoring – to study the acoustic behaviour of Finless Porpoise in relation to the presence and absence of vessels, and their associated underwater acoustic disturbance.
- e) Precautionary Land-based Monitoring of Channel – to verify the impact predication of absence of potential trapping of marine mammals within the channel during operational phase.

4.2) Vessel-based Line-transect Survey

4.2.1) For the vessel-based marine mammal surveys, the monitoring team adopted the standard line-transect method (Buckland et al. 2001) as same as that adopted during the EIA study, pre-construction phase and construction phase monitoring to allow fair comparison of marine mammal monitoring results. The collected survey data would then be compatible with the long-term marine mammal monitoring programme commissioned by AFCD to allow potential comparisons and pooling data for various analyses.

4.2.2) Eight transect lines are set at Southeast Lantau survey area, including Shek Kwu Chau, waters between Shek Kwu Chau and the Soko Islands, inshore waters of Lantau Island (e.g. Pui O Wan) as well as southwest corner of Cheung Chau, as same as that adopted during pre-construction phase and construction phase as shown in **Figure 4.1**.

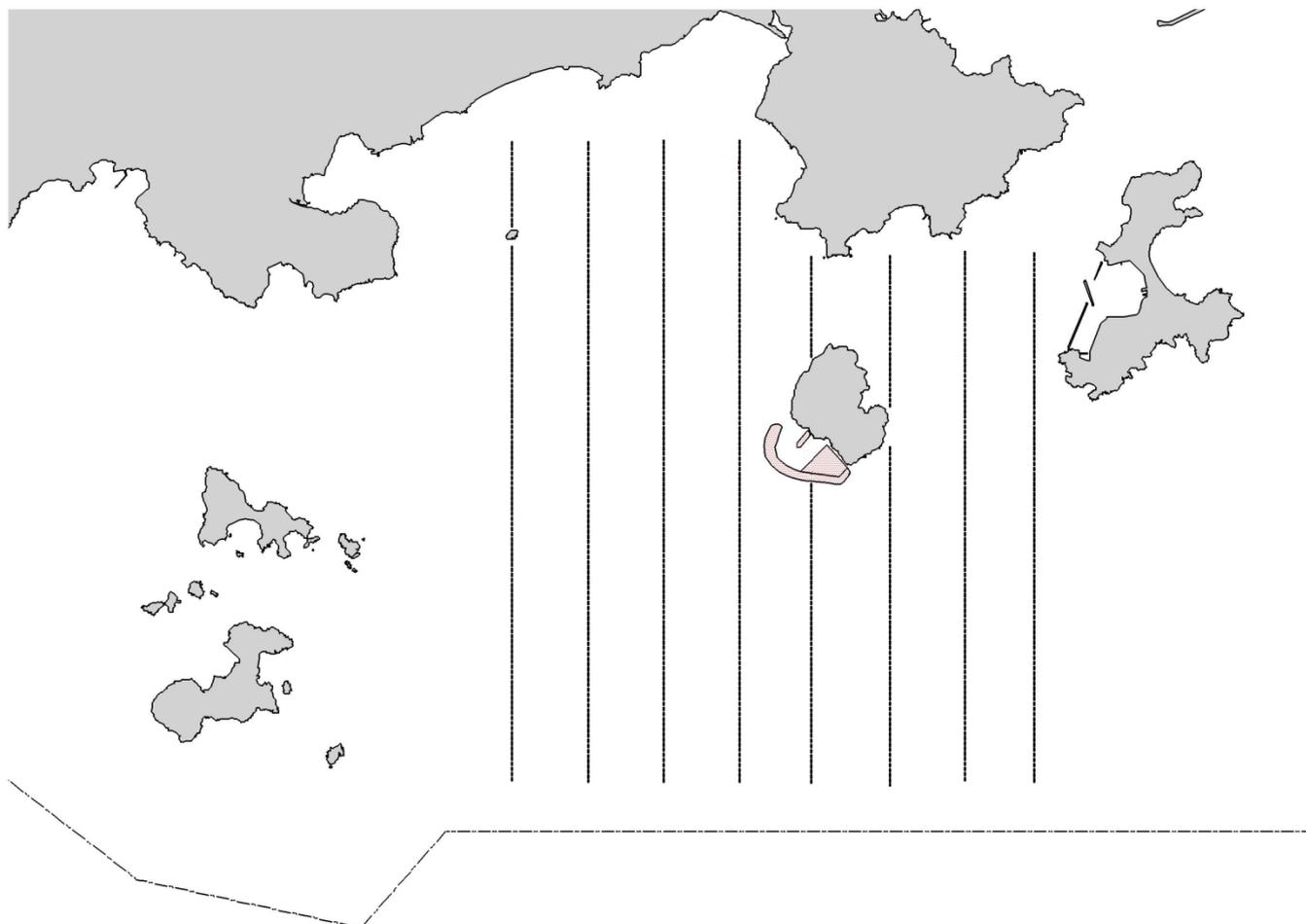


Figure 4.1 Line Transects for Marine Mammal Surveys

4.2.3) The surveys should cover all 4 seasons during 1st year of operation of IWMF in order to take natural fluctuation and seasonal variations into account for data analysis of distribution, encounter rate, density and habitat use of both porpoises and dolphins (if any). In comparison to the baseline and construction phase monitoring results, results from the analyzed operational phase monitoring data would allow the detection of any changes of their usage of habitat, in response to the scheduled construction works. The monitoring surveys shall be conducted throughout the 1st year of operation period with the frequency as same as that adopted during pre-construction phase and construction phase as shown in **Table 4.1**.

Table 4.1 Vessel-based Line-transect Survey Frequency

Season	Months	Frequency
Peak Season	December, January, February, March, April & May	Twice per month
Non-peak Season	June, July, August, September, October & November	Once per month

- 4.2.4) The methodology of the operational phase Vessel-based Line-transect Survey will remain the same as those employed during the baseline and construction phases as listed from Section 3.2.4 to 3.2.6 of this plan.
- 4.2.5) The line-transect survey data shall be integrated with a GIS to visualize and interpret different spatial and temporal patterns of porpoise and dolphin distribution using their sighting positions collected from vessel surveys. Location data of porpoise and dolphin groups would be plotted on map layers of Hong Kong using a desktop GIS to examine their distribution patterns in details. The encounter rate could be used as an indicator to determine areas or time periods of importance to porpoises within the study area. For encounter rate analysis of finless porpoises, only survey data collected under Beaufort 2 or below condition would be used for encounter rate analysis.
- 4.2.6) To take into account of the variations of survey effort across different sections within survey area, the quantitative grid analysis of habitat use would be conducted to examine finless porpoise usage among 1-km² grids within the Southeast Lantau survey area. For the grid analysis, SPSE (sighting density) and DPSE (porpoise density) values would be deduced for evaluation on level of porpoise usage. First, positions of on-effort porpoise sightings from the study period are plotted onto 68 grids (1 km x 1 km each) within the survey area. Sighting density grids and porpoise density grids shall then be normalized with the amount of survey effort conducted within each grid. The total amount of survey effort spent on each grid shall be calculated by examining the survey coverage on each line-transect survey to determine how many times the grid had been surveyed during study period. With the amount of survey effort calculated for each grid, the sighting density and porpoise density of each grid shall be further normalized (i.e. divided by the unit of survey effort).
- 4.2.7) The newly-derived unit for sighting density was termed SPSE, representing the number of on-effort sightings per 100 units of survey effort. In addition, the derived unit for actual porpoise density was termed DPSE, representing the number of dolphins/porpoise per 100 units of survey effort. Among the 1-km² grids that were partially covered by land, the percentage of sea area was calculated using GIS tools, and their SPSE and DPSE values were adjusted accordingly. The following formulae shall be used to estimate SPSE and DPSE in each 1-km² grid within the study area:

$$\text{SPSE} = ((S / E) \times 100) / \text{SA}\%$$

$$\text{DPSE} = ((D / E) \times 100) / \text{SA}\%$$

where S = total number of on-effort sightings
 D = total number of dolphins/porpoises from on-effort sightings
 E = total number of units of survey effort
 SA% = percentage of sea area

4.3) Passive Acoustic Monitoring (PAM)

- 4.3.1) During the operational phase of the Project, the PAM survey will be conducted including placement of two passive porpoise detectors outside the Project Area as control site (i.e. within Pui O Wan and to the south of Tai A Chau) and one porpoise detector within the Project Area (i.e. near Shek Kwu Chau) as same as that adopted during pre-construction phase and construction phase as shown in **Figure 4.2** below.

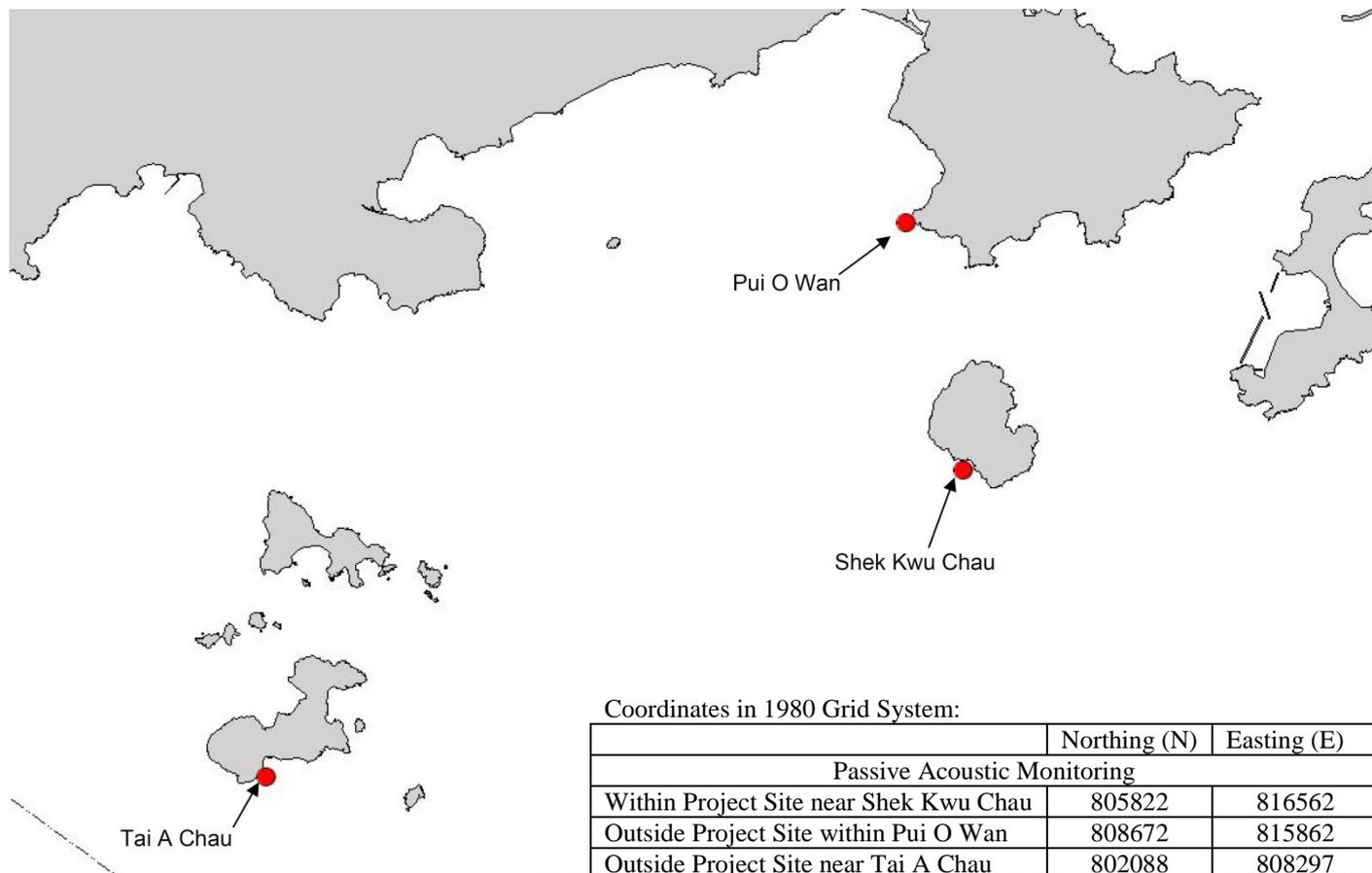


Figure 4.2 Locations of Passive Acoustic Monitoring

4.3.2) These three detectors will be deployed on-site to carry out 24-hours monitoring for a period listed as **Table 4.2** below during 1st year of the operational period.

Table 4.2 PAM Deployment Period

Season	Months	Deployment Period
Peak Season	December, January, February, March, April or May	At least 30 days during the peak months of porpoise occurrence in South Lantau waters

4.3.3) The methodology of the passive acoustic monitoring survey will remain the same as those used during baseline and construction phases. The recorded data should provide an overview on utilization of the area by marine mammals, as well as to identify any differences between different work stages.

- 4.3.4) The diel patterns (i.e. 24-hour activity pattern) of finless porpoise occurrence among the three sites at Shek Kwu Chau, Tai A Chau and Pui O Wan shall be analyzed. Peaks and troughs of finless porpoise occurrence per hour of day would be identified and compared with the results obtained from pre-construction and construction phase monitoring.
- 4.4) Land-based Theodolite Tracking
- 4.4.1) Thirty days of Land-based Theodolite Tracking Surveys will be conducted during the operational phase to monitor movement and behavioural pattern of Finless Porpoises within and near the Project Area as compared to those results collected during both pre-construction and construction phases to verify the predicted marine traffic impacts on Finless Porpoise, as well as the effectiveness of the proposed mitigation measures during the IWMMF operation.
- 4.4.2) The Land-based Theodolite Tracking study would use the same station as in the AFCD monitoring study, pre-construction and construction phase monitoring as shown in below **Figure 4.3**. Review and alternative would be considered for the monitoring station location if the marine mammal team of ET found that the observation has been obstructed seriously by the structure of IWMMF (e.g. chimney), AFCD and EPD shall be consulted for the proposed change if considered necessary.

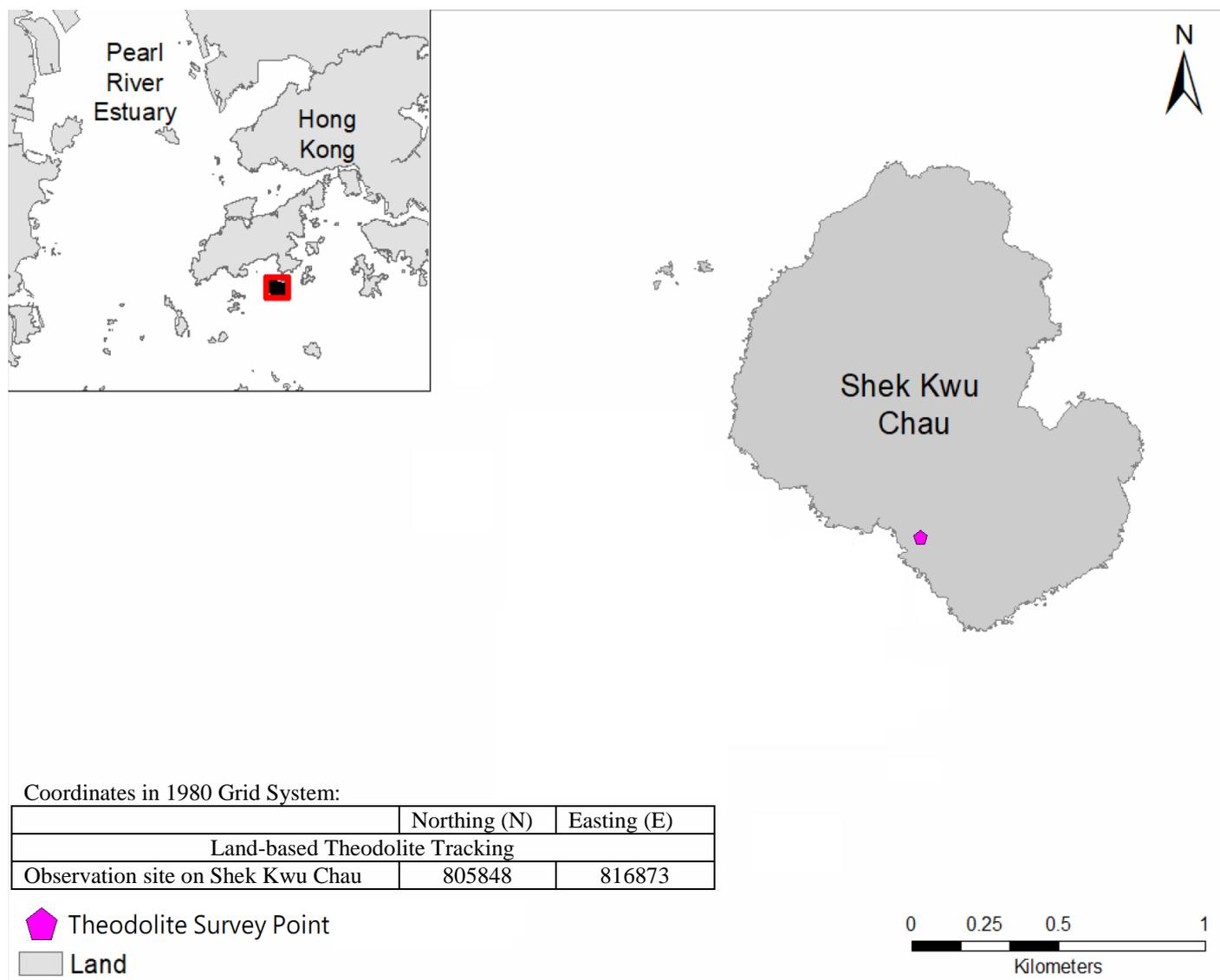


Figure 4.3 Locations of Land-based Theodolite Tracking

4.4.3) During the 1st year of operational phase, Land-based Theodolite Tracking will be carried out for approximately six hours of tracking for each day of field work for a period listed as **Table 4.3** below.

Table 4.3 Land-based Theodolite Tracking Survey Period

Season	Months	Survey Period
Peak Season	December, January, February, March, April or May	30 days during the peak months of porpoise occurrence in South Lantau waters

- 4.4.4) The methodology of the land-based monitoring surveys will remain the same as those used during pre-construction and construction phases. The monitoring period for land-based theodolite tracking will be proposed to be overlapped with the PAM survey during the peak season of porpoise occurrence.
- 4.5) Active Acoustic Monitoring
- 4.5.1) During 1st year of the operational phase, Active Acoustic Monitoring would be conducted to study the acoustic behaviour of Finless Porpoise in relation to the presence and absence of vessels, and their associated underwater acoustic disturbance.
- 4.5.2) Active Acoustic Monitoring will be conducted by using the latest porpoise detector technology with a hydrophone component to record both background noise of vessel traffic and vocalizations of finless porpoises. Field work should be carried out at locations where traffic of MSW vessels and visitor/staff shuttle ferry is regular as shown in **Figure 4.4** of the proposed marine travel routes during operational stage below. As evaluation on the marine travel routes design is still in progress in this stage, further confirmation on the monitoring locations for Active Acoustic Monitoring would be made in later stage of the Project, where AFCD and EPD shall be consulted before conducting the survey works.

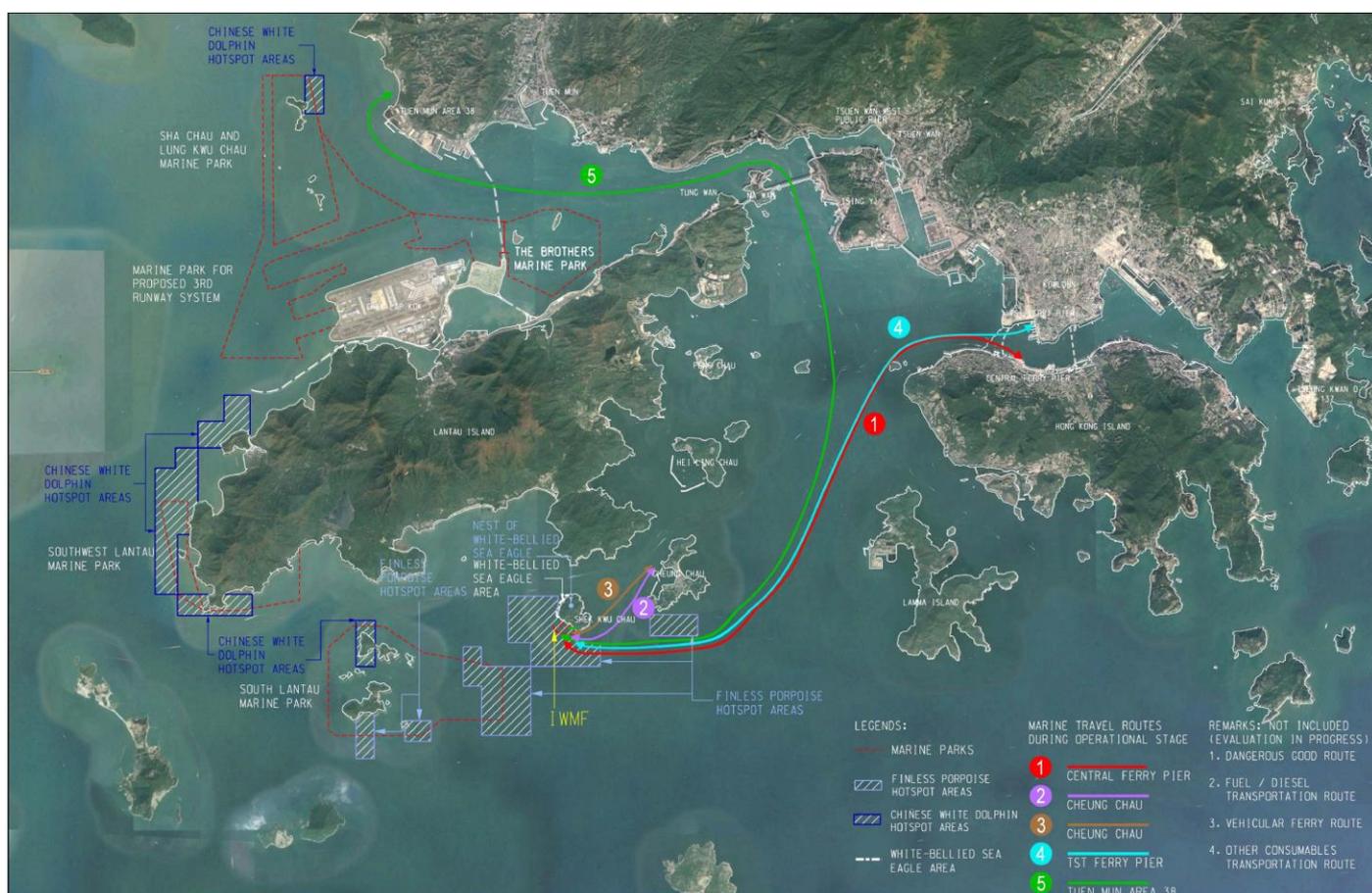


Figure 4.4 Marine Travel Routes During Operational Stage

- 4.5.3) Approximately 30 days of field work should be carried out during the peak months of occurrence of Finless Porpoise (December to May) The active acoustic monitoring service will be proposed to conduct concurrently with the land-based theodolite tracking and PAM survey during the same peak season of porpoise occurrence during operational phase. Details of the active acoustic monitoring methodology and frequency should be agreed with AFCD before the service is proceeded.
- 4.5.4) With the recorded data, analysis on whether the presence of, and distance from vessel traffic, would cause acoustic behavioural changes in Finless Porpoise, or changes in use of frequency range etc. could be determined. The results should be used to verify the predicted impacts and the effectiveness of the proposed mitigation measures to be implemented during the operational phase.
- 4.6) Precautionary Land-based Monitoring of Channel
- 4.6.1) Although the trapping of marine mammals within the open channel between IWMF and Shek Kwu Chau was predicted to be unlikely in the EIA report, in view of their conservation importance, the precautionary land-based monitoring of channel for potential trapping of marine mammals by site staff during the operational phase should be adopted to verify the impact prediction.
- 4.6.2) The monitoring location shall be selected on the IWMF facilities with unobstructed view on the entire channel. As the detail operational design of IWMF is still in progress in this stage, further confirmation on the monitoring location for Precautionary Land-based Monitoring of Channel would be made in later stage of the Project, where AFCD and EPD shall be consulted before conducting the monitoring works.
- 4.6.3) During 1st year of operational phase of the IWMF, the monitoring shall be conducted once per week. Should any trapping occurs, the site staff must contact responsible parties immediately, i.e. AFCD and marine mammal specialist of the ET, for response and rescue.
- 4.6.4) The newly adopted construction option for seawall/breakwater in the application of VEP can also enhance the environmental performance by widening the open channel by 25% to 100% to improve the water circulation and hence the ecology of the surrounding waters.

5) Recommended Mitigation Measures to Avoid Disturbance to Marine Mammal.

- 5.1) The specific mitigation measures recommended in the approved EIA report shall be fully and properly implemented for the Project to minimize disturbance on Finless Porpoise during construction and operational phases.
- 5.2) Avoidance of peak season for Finless Porpoise occurrence
- 5.2.1) In order to minimize potential acoustic disturbance from construction activities on Finless Porpoise, the construction works that may produce underwater acoustic disturbance, if any, should be scheduled outside the peak months of occurrence of Finless Porpoise (December to May).

- 5.2.2) The construction works that may produce underwater acoustic disturbance shall be restricted within June to November. This approach would not only avoid the peak season for Finless Porpoise occurrence, but the magnitude of impacts arise from acoustic disturbance would also be minimized.
- 5.2.3) All specific construction activities that require avoidance of peak season for finless porpoise as mentioned in Clause 2.27 of the FEP of the Project has been replaced by less acoustically disturbing construction methods such as Deep Cement Mixing and Precast Concrete Blocks Installation.
- 5.3) Opt for quieter construction methods and plants
- 5.3.1) Considering the sensitivity of marine mammals to underwater acoustic disturbance, instead of the previously proposed conventional breakwater and reclamation peripheral structure, which requires noisy piling works, the current precast concrete structure is proposed as an alternative option in addition to the steel cellular cofferdam method for the construction of seawalls and breakwaters, and DCM ground treatment will be adopted to provide stabilised and strengthened foundations to the seawalls and breakwaters of the Artificial Island.
- 5.3.2) It is anticipated that the ground treatment of DCM and the installation of precast concrete seawall and breakwater would not induce any underwater acoustic disturbance to finless porpoise. According to the results of the site trials for the Expansion of Hong Kong International Airport into a Three-Runway System, the DCM work is relatively quiet compared to other marine construction techniques, and the underwater noise generated was typically below 200Hz which is a frequency of low sensitivity for Finless Porpoises. According to Gould and Jefferson (2002), Finless Porpoises use narrowband and high-frequency ultrasonic pulses with peak energy of 142kHz. The underwater noise generated by the DCM ground treatment is well below the acoustic range of Finless Porpoises. Therefore, any noise generated by the DCM ground treatment would be negligible to finless porpoises.
- 5.3.3) Also, the precast concrete seawall and breakwater does not rely on embedment depth for structural strength and stability, therefore vibratory driving of the precast concrete seawall and breakwater into seabed is not required. In other words, unlike that of steel cellular cofferdam, the installation of precast concrete seawall and breakwater for the Artificial Island involves no use of vibratory hammer or hydraulic hammer and hence cause no underwater acoustic disturbance to finless porpoises.
- 5.3.4) Since the DCM ground treatment and the installation of precast seawalls and breakwaters should generate no underwater acoustic disturbance to Finless Porpoise, no specific mitigation measures are required.
- 5.3.5) Non-percussive bore piling method for the installation of tubular piles for the berth construction has also been avoided with the newly adopted installation of precast concrete structures.
- 5.4) Monitored exclusion zones
- 5.4.1) A monitored exclusion zone of 250 m radius from silt curtain or from the boundary of a work area should be implemented under the following situations (where applicable, Marine Mammal Watching Plan shall be conducted at the meantime):
1. 30 minutes before commencement of and during silt curtain installation/re-installation/relocation, deep cement mixing injection works or noisy construction works (as stipulated in FEP Clause 2.25 and 2.27); or

2. During implementation of MMEZ cluster plan with 3 or more construction vessels requiring MMO's duty operating simultaneously in close proximity.

The marine mammal exclusion zone (MMEZ) will be carried out in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains or works area and minimize underwater acoustic disturbance, so as for precautionary purpose for DCM works. If a marine mammal is noted within the exclusion zone, all marine works should stop immediately and remain idle for 30 minutes, or until the exclusion zone is free from marine mammals. The experienced marine mammal observer should be well trained to detect marine mammals. Binoculars should be used to search the exclusion zone from an elevated platform with unobstructed visibility. The marine mammal observer(s) shall be independent of the construction contractor and shall form part of the Environmental Team and have the power to call-off construction activities.

- 5.4.2) In addition, as marine mammals cannot be effectively monitored within the proposed monitored exclusion zone at night, or during adverse weather conditions (i.e. Beaufort 5 or above, visibility of 300 meters or below), marine works requiring the exclusion zone monitoring, should be avoided under weather conditions with low visibility as much as possible. For the night-time marine mammal monitoring, spotlight will be used to provide sufficient brightness to assist the inspection in dark condition. In case of inadequate of brightness, night vision device will be used. For the marine mammal monitoring during adverse weather, the MMO shall confirm the visibility of lookout point for effective implementation of the exclusion zone monitoring, whilst contractor shall confirm safety of MMO and practicability of deployment of silt curtain, otherwise marine works requiring the exclusion zone monitoring shall be ceased.
- 5.4.3) Marine Mammal Exclusion Zone (MMEZ) Plan is available in **Appendix A**, which has included details of exclusion zone monitoring works such as response plan for handling situation of spotting marine mammal by the MMO.
- 5.5) Marine mammal watching plan
 - 5.5.1) Upon the completion of silt curtain installation/re-installation/relocation, the marine works would be conducted within an enclosed environment within the silt curtain. Subsequently, Visual Inspection of the Waters Surrounded by Silt Curtains (Section 2.1, MMWP) and Regular Inspection of Deployed Silt Curtain (Section 2.2, MMWP) inspection under Marine Mammal Watching Plan (MMWP) would be implemented (where applicable, Marine Mammal Exclusion Zone shall be conducted at the meantime).

As per EP requirement from Clause 2.13 of the VEP, a Marine Mammal Watching Plan has been prepared and submitted separately to EPD, where the plan has included details of marine mammal watching actions such as regular inspection of silt curtains and visual inspection of the waters surrounded by the curtains. All measures recommended in the Marine Mammal Watching Plan shall be fully and properly implemented for the Project.

- 5.5.2) Special attention would be paid to Phase 2 (reclamation) where the floating type still curtain would be opened occasionally for vessel access, leaving a temporary opening. An action plan has been devised to cope with any unpredicted incidents such as the case when marine mammals are found within the waters surrounded by the silt curtains as below **Figure 5.1**:



Figure 5.1 Response Procedures for Occurrence of Marine Mammal within Silt Curtain

5.6) Small openings at silt curtains

- 5.6.1) In order to avoid the entrance of marine mammals into the works area through the opening at silt curtains for vessel access, and the subsequent potential impacts including increase in stress level in marine mammals due to underwater noise and chance of collision with working vessels, the openings for vessel access at the silt curtains should be restricted to be from 50m-100m to minimize

the risk of accidental entrance by marine mammal. **Figure 5.2** below has illustrated the proposed location of installation of floating type silt curtain for vessel access during construction phase.

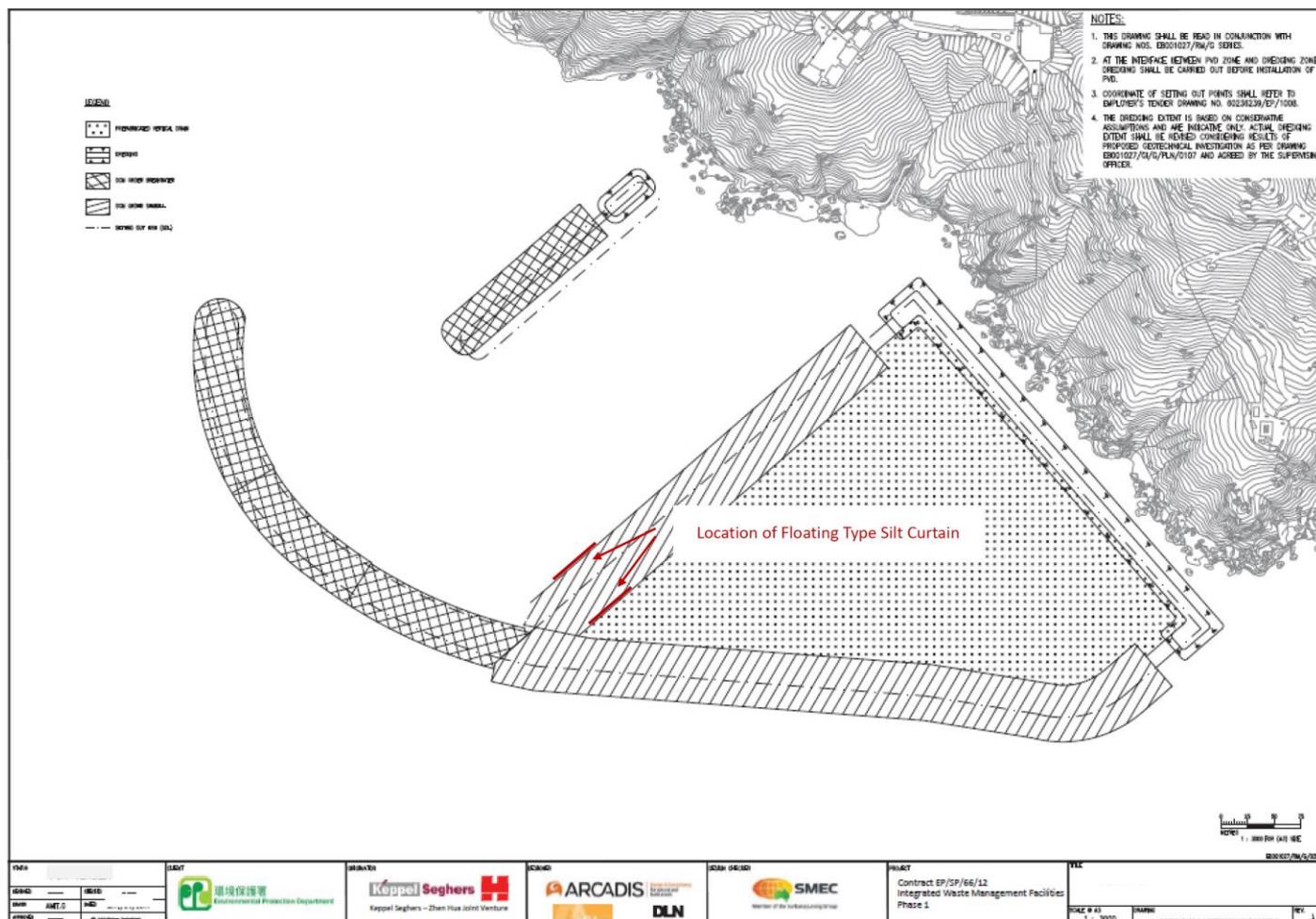


Figure 5.2 Location of Installation of Floating Type Silt Curtain

5.7) Adoption of regular travel route

5.7.1) In order to minimize the disruption on marine mammal's behavioural pattern during construction and operational phases, and minimize the chance of vessel collision with marine mammals, which may otherwise result in damage to health or mortality, captains of all vessels should adopt regular travel route. As per EP requirement from Clause 2.14 of the VEP, a Vessel Travel Details has been prepared and submitted separately to EPD, where the plan has included details of regular marine travel routes of vessels moving to and from the Project site during construction and operation stages.

5.7.2) The regular travel route should avoid areas with high sighting density of Finless Porpoise, as indicated in the latest Monitoring of Marine Mammals in Hong Kong Waters (AFCD, 2017), where no project vessel will travel, anchor and stopover the marine park and the hotspot area of Chinese White Dolphin and Finless Porpoise, except the area within IWMF construction site and its adjacent areas to traverse to and from the construction site. With the adoption of regular travel route,

potential alteration in behavioural pattern of marine mammals due to increase in marine traffic is considered to be acceptable.

5.7.2) The setting of regular travel route should make reference to the sighting density of Finless Porpoise from the Final Report for Monitoring of Marine Mammals in Hong Kong Waters (2016-17) of AFCD and the baseline monitoring result of the pre-construction phase Vessel-based Line-transect Survey. The traveling vessels during peak season of porpoise occurrence should be paid with extra caution based on the information on porpoise density patterns in southern waters of Hong Kong between 2007-16 and the pre-construction phase survey between February to April 2018 as shown in **Figure 5.3** and **Figure 5.4** respectively, any marine routes with at least SPSE values of 15.1 or above in the long term AFCD survey data collected during 2007-2016 would not be used as a regular travel route.

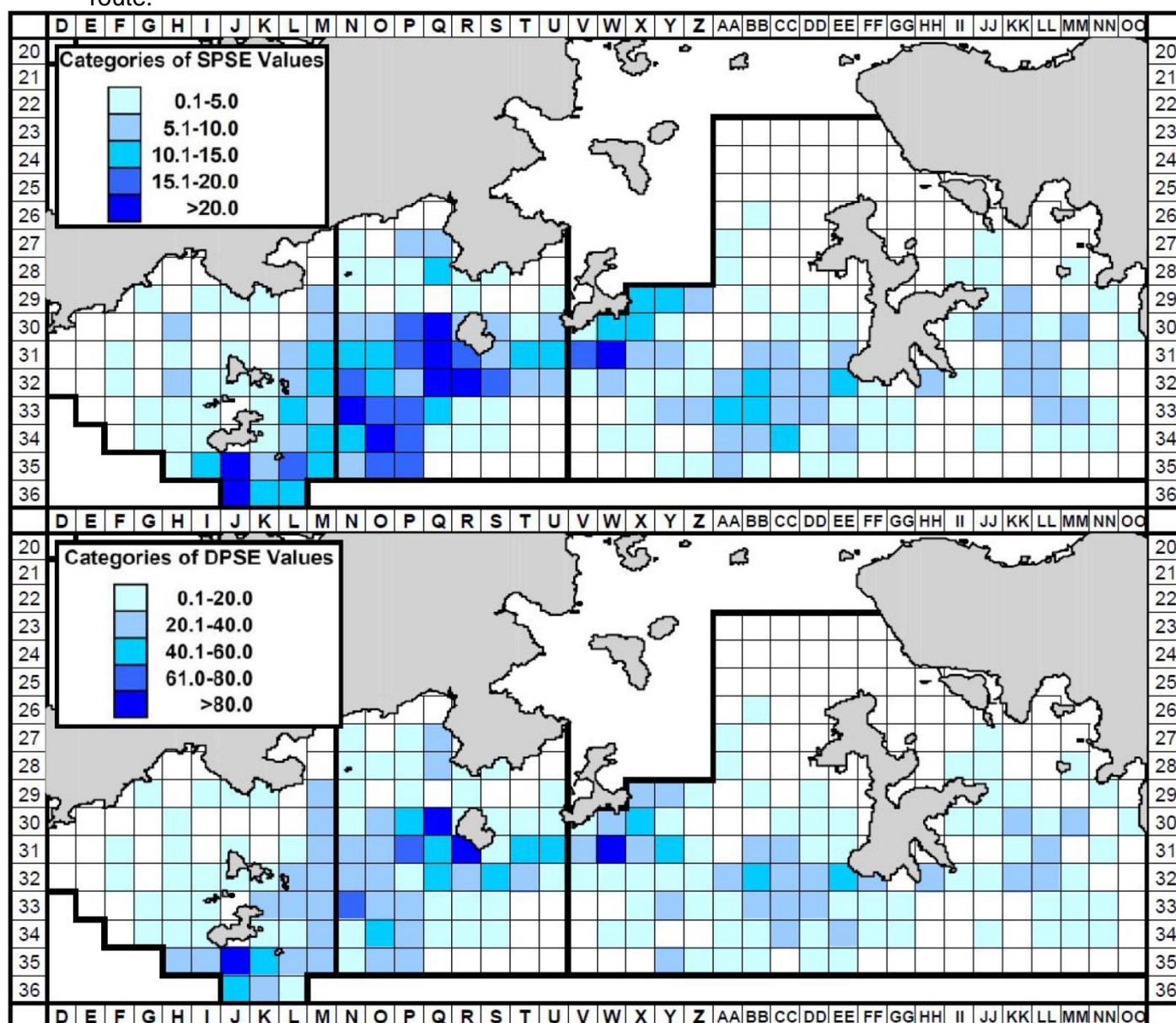


Figure 5.3 Density of finless porpoises with corrected survey effort per km² in southern waters of Hong Kong during peak season (December to May), using data collected during 2007-16

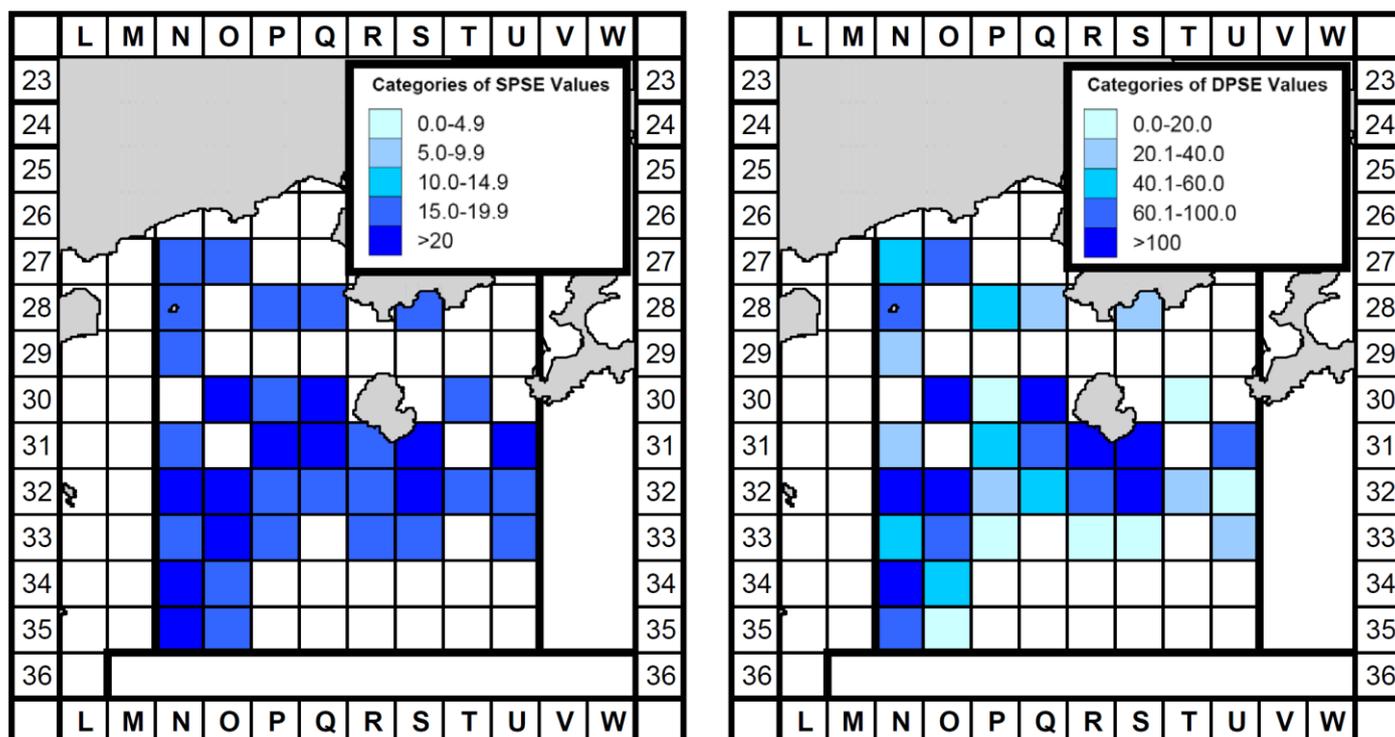


Figure 5.4 Density of finless porpoises with corrected survey effort per km² in Southeast Lantau survey area during IWMF baseline monitoring period (February-April 2018)

5.8) Vessel speed limit

5.8.1) In order to minimise potential injury and mortality of marine mammals due to collision with vessels during construction (working vessels) and operational phases (4 round trips per day for MSW vessel, and 12 round trips per day for visitor/staff shuttle ferry), a speed limit of ten knots should be strictly enforced within areas with high density of Finless Porpoise reference to **Figure 5.3** and **Figure 5.4**. The vessels contracted for the Project will not travel, anchor or stopover the marine park and the hotspot area with at least SPSE values of 15.1 or above in the long term AFCD survey data, except the area within IWMF construction site and its adjacent areas to traverse to and from the construction site.

5.8.2) The other EP submission under VEP, Vessel Travel Details, has also provided more instructions and guidelines for the vessels driver to follow, including the below rules for vessel speed limit to be included in training sessions for all contract boat under IWMF:

- All vessels will travel at a speed no greater than 10 knots in the construction site area, which is demarcated by yellow marker buoys;
- The vessel captain should always remain a vigilant for the presence of Chinese White Dolphin / Finless Porpoise and make sure they slow down prior to passing known Chinese White Dolphin / Finless Porpoise hotspot areas, and take actions, e.g. never chases and cut across the course of Chinese White Dolphin / Finless Porpoise, to avoid disturbance to or collisions with Chinese White Dolphin / Finless Porpoise, the vessel shall travel less than 10 knots within the hotspot areas of Chinese White Dolphin / Finless Porpoise if unavoidable;

- Construction and associated vessels should not travel through, anchor or stopover at all existing Marine Parks in the western waters (including Sha Chau and Lung Kwu Chau Marine Park, The Brothers Marine Park), the planned Marine Parks in the western waters (including Southwest Lantau Marine Park, South Lantau Marine Park, and the proposed marine park for three runway system), and the hotspot area of Chinese White Dolphin and Finless Porpoise with reference to the long term AFCD survey data, if traversing the hotspot area is unavoidable (e.g. area within IWMF construction site and its adjacent areas to traverse to and from the construction site/due to safety reason), the vessel shall travel less than 10 knots.
- 5.8.3) The same speed limit has been enforced within the Sha Chau and Lung Kwu Chau Marine Park, and adopted under the EIA-172/2009 Hong Kong - Zhuhai - Macao Bridge Hong Kong Link Road (HyD, 2009a), where density of Chinese White Dolphin is high. Limitation on vessel speed limit has appeared to be effective in protecting dolphins from vessel collision, as well as minimising underwater acoustic disturbance. With the adoption of these mitigation measures, the potential impact marine mammals due to injury and mortality from vessel collision would be minimized to acceptable level. Passive acoustic monitoring and land-based theodolite monitoring surveys should be adopted to verify the predicted impacts and effectiveness of the proposed mitigation measures.
- 5.9) Training of staff
- 5.9.1) For the implementation of Marine Mammal Watching Plan and Marine Mammal Exclusion Zone Plan, training sessions shall be conducted for MMO by marine mammal specialist, Dr. Samuel Hung, Dr. Lindsay Porter, Ms. Julia Chan or someone with equivalent qualifications, with briefing materials provided as guidelines, instructing adequate knowledge of all requirements for observing marine mammal and appropriate actions to be taken according to this plan. Competence checking by ET shall be provided at least once every 6 months to the trained MMO involved in implementation of this plan.
- 5.9.2) As frontline staff of the main contractor or its sub-contractors, i.e. foremen, site agent, superintendents and engineers would involve in the implementation of this plan, briefings for these personnel will be provided by the trained MMO during induction trainings to get familiar with the plans for assisting on marine mammal observations within waters surrounded by silt curtains and taking necessary action according to the plans when there is marine mammal trapped by the silt curtain or appearance of marine mammal within the MMEZ. Refresh briefings will be provided to all frontline staff once every 6 months. The briefing and training records will be provided to ETL, IEC and SO for audit and record.
- 5.9.3) The contractor shall provide training to vessel captains to ensure vessel operation poses minimal risks to Chinese White Dolphin and Finless Porpoise. The training shall include briefings on predefined routes, general education on local cetaceans and white-bellied sea eagles, the required environmental practices / measures while operating construction and associated vessels under the Project, guideline for operating vessel safely in the presence of Chinese White Dolphin and Finless Porpoise. The contractor shall also schedule the training with individual marine contractors and shall ensure all marine vessel captains working on the Project are adequately briefed and trained prior to marine construction or prior to operating vessels within the construction site area. The same arrangement shall be adopted for vessel captains during operation stage. The training record shall be kept on site / office for both construction stage and operation stage. Participant shall sign his name and title on the training record.

6) Reporting Works for Monitoring of Marine Mammal

- 6.1) During construction phase and 1st year of operation of the IWMF, monthly marine mammal monitoring results should be incorporated into the Monthly EM&A Report of that reporting month and submitted to EPD and AFCD for comments within 2 weeks after the end of the reporting month by the ET.
- 6.2) The report should contain a summary of the survey findings during the reporting month, and assessment on the effectiveness of the mitigation measures implemented. Evaluation of results should take natural fluctuations and accidental human-induced events into account. The monitoring results between the EIA study, AFCD long-term marine mammal monitoring programme, and the pre-construction phase baseline monitoring, should be compared. Any significant difference should be identified and evaluated to verify the impact of IWMF construction works and evaluate the effectiveness of mitigation measures.
- 6.3) Status of the implementation of mitigation measures to minimise disturbance on finless porpoise of IWMF should be compared with the implementation schedule as listed in **Appendix B** during the monthly marine mammal monitoring.

7) Staff Organization

- 7.1) To meet the staffing requirements of the Project, a team of professionals leads by our qualified environmental professionals who are conversant with marine mammal monitoring surveys and Environmental Standards and Regulations in Hong Kong will be assigned. The curriculum vitae (CV) of our environmental experts are attached as **Appendix C**. The relevant experience and qualifications of the key staff to be deployed on the Assignment are highlighted below.
- 7.2) Relevant Experience and Qualification of Key Staff

- **Ir. Dr. Gabriel Lam (CV1), BSc, MSc, PhD, FHKIE, FHKIOA, RPE, REA, CMIME.**

Dr. Lam has more than 30 years practical experience in working as Project Director overseeing environmental consultancy projects especially environmental monitoring and audit, and independent environmental checker services. He will act as the Project Director to oversee the monitoring project.

- **Mr. Kevin Li (CV2), BEng, MPhil, MHKIEIA, RAC.**

Mr. Li has more than 10 years practical experience in working as a Project Manager managing and directing environmental monitoring and audit and independent environmental checker projects. He will act as the Assistant Project Manager for the coral translocation and monitoring and WBSE monitoring in this assignment.

- **Dr. Samuel Hung (CV3), BA (Hons), MSc. PhD.**

Dr. Hung is an experienced Marine Mammal Specialist. He has more than 20 years of ecology consulting and monitoring experience specializing in marine mammal in Hong Kong waters and will act as our Marine Mammal Monitoring Specialist in this assignment. He has an extensive portfolio in providing his expertise for the AFCD. He has also undertaken AFCD monitoring projects of marine mammals in Hong Kong waters since 2002. His experiences and knowledge with the AFCD organizational structure will be beneficial in providing an efficient communication process throughout this project and getting early approval on the marine mammal watching plans from AFCD.

- **Dr. Lindsay Porter (CV4), B.Sc.(Hons), PhD.**

Dr. Porter has spent the last 20 years in Asia working on species as diverse as largest of our oceans inhabitants, the blue whale, to one of the smallest, most elusive species, the finless porpoise. She will be our Marine Mammal Specialist in Finless Porpoise vessel-based and land-based monitoring as well as Passive Acoustic Monitoring (PAM). With a particular interest in inshore tropical delphinids, a lot of Lindsay's work has focused on how these often localised populations interact and react to man and his activities. Lindsay sits on several regional and global policy and advisory boards which focus on the protection and conservation of marine mammals. With extensive experience at both NGO and government level, Lindsay sits on several regional advisory committees and is the focal point of several collaborative research projects within the South East Asian region.

- **Ms. Julia Chan (CV5), B.Sc., M.Sc., MCIWEM, MHKIQEP**

Ms. Chan has more than 19 years' experience in environmental management and ecological monitoring and specialists in ecological impact assessment and monitoring (marine and terrestrial), biodiversity conservation, fisheries survey and impact assessment as well as the development of conservation strategy for ecological sensitive projects. She has been trained by the international marine mammals' experts in conducting marine mammals survey since 2009 and experienced in conducting marine mammal impact assessment, recommendation of mitigation measures and guidelines in protecting marine mammals in Hong Kong. Julia will lead the marine mammal observers (MMO) training and ensure the performance of MMO team meets the expectation of the Authorities.

- 7.3) Adequacy of professional and technical manpower input will be arranged. Our project team has been allocated with sufficient manpower inputs to perform the tasks involved in this Assignment, deputy staff and technical officers have been assigned to cover up our project monitoring team members for construction and operational phases throughout the project period if necessary. Our Marine Mammal Specialist shall work alongside with our project team to prepare and review all EP submissions relating to marine mammal monitoring works throughout the Project.



Contract No. EP/SP/66/12
Integrated Waste Management Facilities, Phase 1

Appendix A

Marine Mammal Exclusion Zone Plan

1 Introduction

1.1 Background

The Government of Hong Kong SAR will develop the Integrated Waste Management Facilities (IWMF) Phase 1 (hereafter referred to the Project) with incineration to achieve substantial bulk reduction for unavoidable Municipal Solid Waste (MSW) and to recover energy from incineration process. The IWMF will be on an artificial island to be formed by reclamation at the south-western coast of Shek Kwu Chau (SKC).

An Environmental Impact Assessment (EIA) for the Project was conducted according to the EIA Study Brief No. ESB-184/2008. The EIA report (Register No: AEIAR-163/2012) was approved on 17 January 2012 under the Environmental Impact Assessment Ordinance (EIAO). An Environmental Permit (EP) (EP No.: EP-429/2012) was granted on 19 January 2012 for the construction and operation of the Project. A variation of environmental permit (VEP) was subsequently applied and the latest VEP (EP No: EP-429/2012/A) was issued by the Environmental Protection Department (EPD) on 14 October 2016. Application for further environmental permit (FEP) was made on 28 November 2017 and the FEP was granted on 27 December 2017. Keppel Seghers – Zhen Hua Joint Venture (“the JV”) has been awarded the Project to carry out reclamation works (including associated dredging works) which is located near the south-western coast of Shek Kwu Chau, and the JV will construct an incinerator and its relevant facilities on the reclaimed land.

According to the Condition 2.9 of the FEP, a Detailed Monitoring Programme on Finless Porpoise monitoring plan shall be prepared at least one month before the commencement of construction of the Project to propose the monitoring frequency and mitigation measures to be taken to avoid disturbance to Finless Porpoise.

In order to protect Finless Porpoise from being affected by the acoustic disturbance generated by marine construction works, one Marine Mammal Exclusion Zone Plan is considered necessary to be set up and provide a 24-hours Marine Mammal Exclusion Zone with a 250m radius from the boundary of any marine work area such that any marine mammal are free from acoustic impacts arising from the marine work.

1.2 Project Description

The project is proposed to be located on a new land formation covering a permanent footprint of 15.9 hectares near the south-western coast of Shek Kwu Chau, an island between the southwest of Cheung Chau and the south of Chi Ma Wan Peninsula. As stated in the approved EIA report, the project is mainly to:

- reclaim 15.9 hectares of land;
- construct and operate an incinerator with design capacity of 3000 tonnes per day for treating municipal solid wastes;
- construct and operate a mechanical sorting and recycling plant with design capacity of 200 tonnes per day;
- construct and operate an on-site wastewater treatment plant for the reuse of treat sewage effluent;
- construct and operate an on-site desalination plant;
- construct and operate an electricity power plant for the heat recovered from the incineration process;
- construct submarine cables for exporting surplus electricity to be power grid;
- construct and operate a berthing area; and
- construct and operate an environmental education center, supporting and community facilities.

1.3 Purpose and Scope of the Marine Mammal Exclusion Zone (MMEZ) Plan

Marine construction activities might cause behavioural disturbance (e.g., disturbance to communication and

echolocation) or even physical harm to marine mammal. This MMEZ plan is prepared as a precautionary and mitigation measures for Finless Porpoise and Chinese White Dolphin to provide detailed implementation of the exclusion zone during marine construction. The MMEZ Plan is submitted as the Appendix of the Detailed Monitoring Programme on Finless Porpoise to the Environmental Protection Department (EPD) and the Agriculture, Fisheries and Conservation Department (AFCD) for approval at least 1 month prior to commencement of construction activities requiring MMEZ. This plan provides the general specifications and requirements for the implementation of the exclusion zone monitoring which shall be adopted by all relevant Contractors under the IWMF Project.

2 Marine Mammal Exclusion Zone (MMEZ) Monitoring

2.1 Construction Activities Requiring MMEZ

According to the Condition 2.25 of the FEP, MMEZ should be implemented before 30 minutes and during the installation/re-installation/relocation process of silt curtains in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains. Also, marine construction works expected to produce underwater acoustic disturbance as per Condition 2.27 of the FEP, especially within December and May, would require the implementation of MMEZ, which currently all those specific construction activities have been replaced by less acoustically disturbing construction methods such as Deep Cement Mixing (DCM) and Precast Concrete Blocks Installation as discussed in Section 5.3 of the Detailed Monitoring Programme on Finless Porpoise, however, MMEZ would also be implemented for precautionary purpose for DCM works.

A MMEZ with 250 m distance from silt curtain shall be established during the above situation. If 3 or more construction vessels are required with MMO's duty and operating in close proximity, for the purpose of avoiding accidental entrance to the works area by Marine Mammal, a cluster MMEZ plan will be implemented to form a MMEZ with 250 m distance from the boundary of a work area as indicated in **Figure 1** for reference. A team of MMO (i.e. at least two MMOs per day/night shift teams) would be arranged at the out-lying construction vessels to form the cluster MMEZ. The MMEZ serves as a monitoring approach to provide appropriate and immediate actions once finless porpoise or Chinese White Dolphin is sighted within the MMEZ. All MMEZ will be monitored by competent Marine Mammal Observers (MMOs) to be provided by the Environmental Team (ET) for the IWMF and trained by the Marine Mammal Monitoring Specialist of the ET who is independent from JV. The situation requiring implementation of MMEZ is summarized as below:

1. 30 minutes before commencement of and during silt curtain installation/re-installation/relocation, deep cement mixing injection works or noisy construction works (as stipulated in FEP Clause 2.25 and 2.27); or
2. During implementation of MMEZ cluster plan with 3 or more construction vessels requiring MMO's duty operating simultaneously in close proximity.

For each of the construction vessel for construction activities required to implement the MMEZ plan, the Contractor shall prepare a Method Statement for the MMEZ Monitoring that follows the specifications and requirements as stated in the MMEZ plan. The Contractor's Method Statement for MMEZ Monitoring shall include the following information:

- Actual locations;
- Distribution of construction barges;
- Working vessels along with construction programme; and
- Provision and Setup of MMEZ monitoring stations on barges for ET's MMOs with unobstructed view of the MMEZ.

Should Contractor(s) propose alternative approach or plan achieving similar objectives of MMEZ monitoring, the proposed approach/plan shall be reviewed and approved by SOR, ET and IEC. The Contractor's Method Statement for MMEZ Monitoring shall be submitted to the ET Leader of the IWMF Project at least three weeks

prior to commencement of the construction activities requiring implementation of MMEZ as summarized above.

As stated in Section 5.4.2 of the Detailed Monitoring Programme on Finless Porpoise, as marine mammals cannot be effectively monitored within the proposed monitored exclusion zone at night, or during adverse weather conditions (i.e. Beaufort 5 or above, visibility of 300 meters or below), marine works should be avoided under weather conditions with low visibility as much as possible. For the night-time marine mammal monitoring, spotlight will be used to provide sufficient brightness to assist the inspection in dark condition. In case of inadequate of brightness, night vision device will be used. For the marine mammal monitoring during adverse weather, the MMO shall confirm the visibility of lookout point for effective implementation of the exclusion zone monitoring, whilst contractor shall confirm safety of MMO and practicability of deployment of silt curtain, otherwise marine works requiring the exclusion zone monitoring shall be ceased.

2.2 MMEZ Monitoring Stations

MMEZ monitoring stations shall be setup to cover the 250 m distance from the boundary of all construction activities that require the implementation of MMEZ. Each monitoring station shall be located on a stationary barge or vessel, depending on the type of construction activity or at a safe platform with an unobstructed and elevated view of the MMEZ. The barges/vessels selected for MMEZ monitoring stations shall be reviewed and updated based on actual locations of the barges/vessels relative to the distribution of works that require implementation of MMEZ at the site.

2.3 General Requirement of MMEZ Monitoring Team

A MMEZ team for the implementation of MMEZ monitoring shall be formed by at least two trained MMOs to meet the following requirements:

- 100% monitoring coverage during all periods of the construction activities aforementioned in Section 2.1 of this Plan;
- At least two shifts of the MMEZ monitoring team (e.g. at least two MMOs per day/night shift teams) for 24-hour MMEZ monitoring;
- Maximum of 12 hours of monitoring work per MMO per day; and
- At least two MMOs on duty to carry out the monitoring work in rotation (e.g. rotate observer every 30 minutes) in order to minimize fatigue.

The MMOs shall be trained by qualified specialist of ET or with certification by suitably qualified marine mammal specialist to demonstrate with relevant experience. Preferably with a degree in environmental or biological sciences or equivalent, experience in observing marine mammals, and basic knowledge of marine mammals in Hong Kong. The observers shall be appointed by ET and are independent of JV. The ET shall submit the information of every MMO candidates to IEC for review of the appointment if deemed necessary. Competence checking by ET shall be provided at least once every 6 months to the trained MMO involved in implementation of this plan. It is of crucial importance that MMOs shall have the power to call-off construction activities when any marine mammal is identified within the MMEZ.

2.4 Monitoring Equipment

The MMEZ shall be scanned by the marine mammal observer with naked eyes and occasionally with the aid of binoculars for confirmation. During night-time monitoring, night vision devices (NVDs) shall be used when little or no lighting on sea surface is available. Marine binoculars with built-in compass (e.g. Steiner Navigator 7X50 HD-stabilized Compass, Bushnell Marine Binoculars 7X50 with Compass, or model with similar or more advanced specification) shall be used during day-time monitoring. Night vision device (NVD) shall be used during night-time monitoring.

The NVD is suggested to be in the form of hand-held, head-mounted or tripod-mounted units depending on the location of the MMEZ monitoring station. NVDs from ATN, model PS15-CGTI Night Vision Goggle with 3X lens and Daking, model D-B1105 Night Vision Binocular with 5X lens, have proved practicable for night-time MMEZ monitoring. Therefore, the same model or NVDs with similar or more advanced specification and performance shall be selected

for night-time MMEZ monitoring based on availability in the market. The feasibility of using Passive Acoustic Monitoring (PAM) involving the use of hydrophones or automated cetacean detectors with real-time data capability will be explored for the Marine Mammal Exclusion Zone monitoring in case the NVD is found to be ineffective for night-time Marine Mammal detection.

2.5 General MMEZ Monitoring Response to Marine Mammal Discovery

Prior to the commencement of construction activity, our MMOs shall ensure the boundary of a marine work area and setting up of the MMEZ for the work area and get access to the monitoring location on a barge or a lookout point where there is no obstructed views for monitoring the MMEZ during the construction activity.

The MMEZ shall be scanned thoroughly by a MMO for any presence of marine mammal e.g. finless porpoise for an initial period of 30 minutes. Construction activity shall only be commenced after the MMO has confirmed that the MMEZ is clear of the marine mammal for the initial period of 30 minutes. The MMO shall then inform the construction superintendent through mobile phone or handheld transceivers to certify the commencement of construction activity. The MMEZ monitoring shall be carried on throughout the period for all active construction activities requiring implementation of MMEZ.

When any mammal marine, e.g. Finless Porpoise, is detected by the MMO within the MMEZ during construction, the MMO shall inform the construction superintendent immediately through mobile phone or handheld transceivers to cease construction activity within the MMEZ. Construction activity shall not be re-commenced until the MMO confirms that the MMEZ is continuously clear of marine mammal for a period of 30 minutes. The MMO shall then inform the construction superintendent through mobile phone or handheld transceivers to certify the re-commencement of construction activity.

As there could be a number of Contractors working at the same time within a work area for the IWMF project, a full contact list of MMEZ monitoring team members of the ET and the relevant responsible construction superintendents of the Contractor at the site shall be prepared, updated regularly and circulated to all parties involved in the MMEZ monitoring. With a full contact list, our MMOs shall be able to find out the contacts of corresponding persons in case of marine mammal sighting within and near the MMEZ or emergent occurrence of any unpredictable impact on marine mammal.

If a marine mammal is still observed in close vicinity but outside the MMEZ, the MMO shall inform the construction superintendent about the presence of marine mammal. The MMO shall remain in position and closely observe the movement of the marine mammal as well as searching for the appearance of any other marine mammal within the MMEZ. No matter the marine mammal is observed within or in close vicinity but outside the MMEZ, the construction superintendent or relevant persons shall inform all vessel captains involved in construction activities around the MMEZ to pay special attention of the presence of the marine mammal in order to reduce chance of collision with them. In case of injury or live-stranded marine mammal being found within the MMEZ, the marine mammal observer shall immediately inform the construction superintendent to suspend construction activities within the works area and contact AFCD through “1823” marine mammal stranding hotline.

Specific Response Plan for Deep Cement Mixing (DCM) Works

According to the results of the site trials for the Expansion of Hong Kong International Airport into a Three-Runway System, the DCM works is relatively quiet, and it is anticipated that ground treatment of DCM would not induce any underwater acoustic disturbance to Finless Porpoise. Nonetheless, MMEZ would also be implemented for precautionary purpose. For DCM works, as it is understood that DCM activities would take time to proceed suspending the works and not be able to cease the works immediately, **a specific response plan is outlined as an example shown in Appendix III** in the Method Statement for MMEZ Monitoring during DCM works. The response plan shall be site specific and developed based on the actual equipment for DCM and their impact. The Contractor can revise or propose the specific response plan, subject to SOR, ET and IEC’s review and approval. The specific response plan shall include the following information:

- Alert Level for MMEZ monitoring:
 - When marine mammal is spotted by the MMO near the fringe of the MMEZ around the work area for DCM works, the MMO shall inform the DCM construction superintendent on the appearance of marine mammal. The DCM construction superintendent shall check the DCM operating level and progress.
 - In the case of DCM withdrawal, i.e. cement injection and mixing underway, the DCM construction superintendent shall instruct the control operator to stop rotation of the DCM rig(s) and to prepare lifting up the DCM rig(s) above the cement layer but below the seabed within the DCM column(s) to avoid bringing out the contaminants from the contaminated mud pit.
 - In the case of DCM penetration underway, the DCM construction superintendent shall instruct the control operator to stay alert and suspend the subsequent DCM procedures after the bottom level is reached.
- Action Level for MMEZ monitoring:
 - When the MMO found that marine mammal has entered the MMEZ for DCM works, in the case of DCM withdrawal, the action of lifting up the DCM rig(s) above the cement layer (but below the seabed) shall be completed within 1 minute and all DCM activities shall be ceased.
 - In the case of DCM penetration, the rotation of DCM rig(s) shall be ceased immediately.

2.6 Data Recording

Our MMO shall fill in a **Monitoring Log Record Sheet (shown in Appendix I)** for data keeping purpose when they are on duty. General information listed below shall be recorded at the beginning of effort and every 30 minutes of the monitoring:

- Date;
- Monitoring Station;
- Names of marine mammal observers;
- Time;
- Status of monitoring;
- Marine mammal observer on effort;
- Weather;
- Beaufort Sea State;
- Visibility;
- Sun glare;
- Observation difficulty; and
- Construction activity

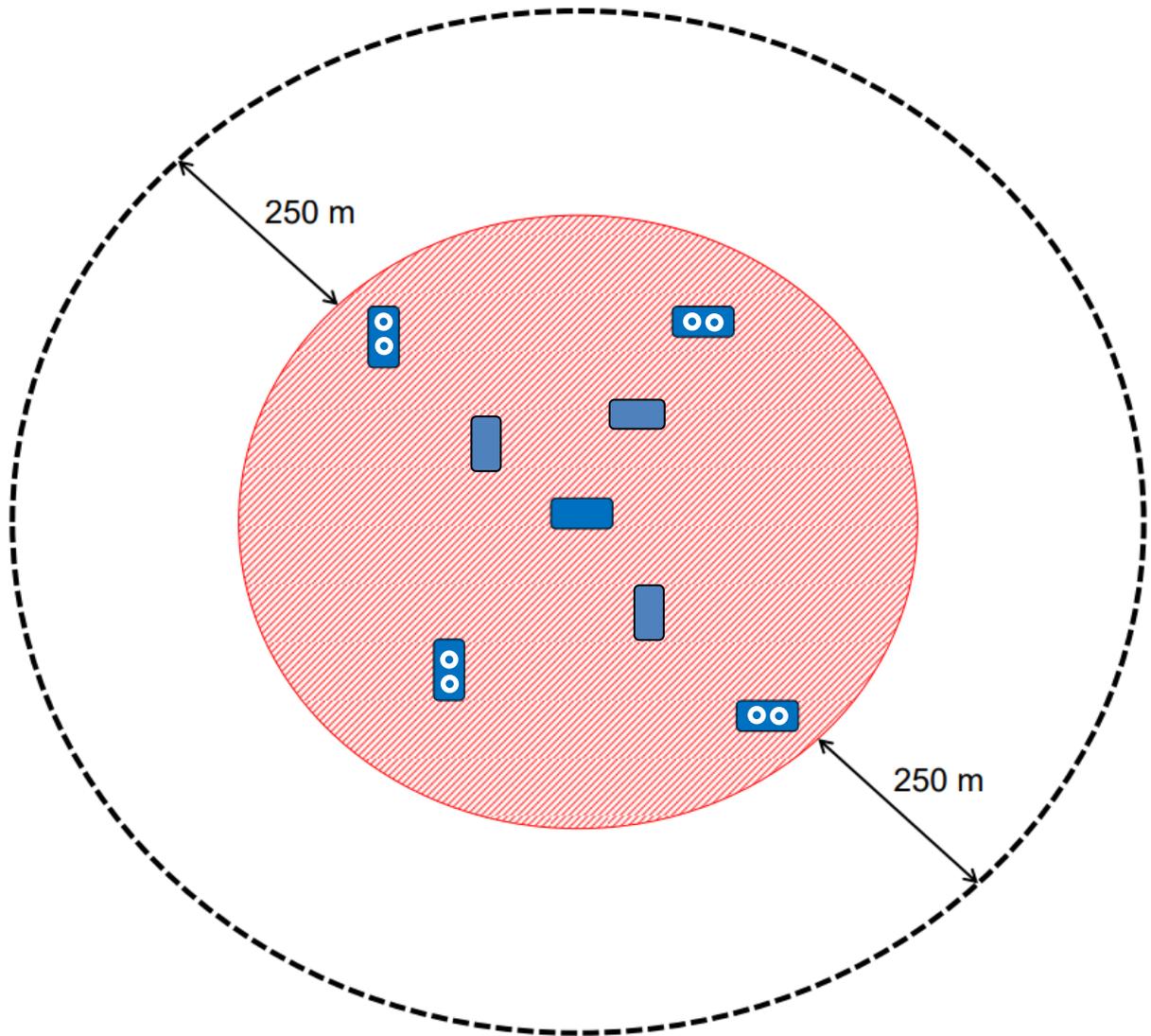
In case marine mammal e.g. Finless Porpoise or Chinese White Dolphin is detected within the MMEZ, our MMO shall fill in **the Marine Mammal Sighting Record Sheet (shown in Appendix II)** and record the following information:

- Sighting No.;
- Group Size;
- First Sighting Time within MMEZ;
- Last Sighting Time within MMEZ;
- Cessation Time of Construction Work;
- Re-start Time of Construction Work;
- Location of Marine Mammals; and
- Behavior of Marine Mammals

2.7 Regular Site Inspection / Audit of MMEZ Monitoring

Half-yearly site inspection / audit during both daytime and night-time MMEZ monitoring will be carried by the IEC jointed with the ET and other relevant parties, to monitor the effectiveness of the MMEZ implementation.

Figure 1



LEGEND:	
	CONSTRUCTION WORKS AREA (INDICATIVE ONLY)
	CONSTRUCTION VESSEL requiring MMO (INDICATIVE ONLY)
	CONSTRUCTION VESSEL with a team of 2MMOs on duty (INDICATIVE ONLY)
	MARINE MAMMAL EXCLUSION ZONE (AT LEAST 250m FROM THE CONSTRUCTION WORKS AREA OF IW MF)

Notes on Monitoring Log Record Sheet

- *Action: SVI – Start of Visual Inspection of the Waters Surrounded by Silt Curtains
- EVI – End of Visual Inspection of the Waters Surrounded by Silt Curtains
- SRI – Start of Regular Inspection of Deployed Silt Curtain
- ERI – End of Regular Inspection of Deployed Silt Curtain
- SO – Start of Observer Effort on MMEZ Monitoring
- CO – Change in Observer on MMEZ Monitoring
- EO – End of Observer Effort on MMEZ Monitoring
- SC – Start of Construction Activity
- EC – End of Construction Activity

**Beaufort Sea State descriptions:

Beaufort	Sea conditions
0	Flat Calm; Glass
1	Ripples without crests
2	Small wavelets; crests do not break
3	Large wavelets; crests begin to break; scattered whitecaps
4	Small waves with breaking crests; fairly frequent whitecaps
5	Moderate waves; many whitecaps, small spray

***Visibility descriptions:

Visibility	Condition
Excellent	Clear, no obstruction to horizon
Good	Little to no haze and/or rain; Relatively clear horizon line
Fair	Some haze and/or rain; Horizon still visible
Poor	No visible horizon due to fog and/or rain

****In the event of marine mammal observed, mark down the Sighting Group No. in this box and fill the separate Marine Mammal Sighting Record Sheet

Examples for notes on construction activity:

DCM Injection / Silt Curtain Deployment / Sand Laying / Reclamation / Material Transfer / Dredging / Gravel Refill / Diver Checking / Maintenance / Suspending

Response for Marine mammal Notification during MMEZ monitoring

Prior to the commencement of DCM works, if a marine mammal is found within the MMEZ during the initial 30 minutes of scanning, the marine mammal observer(s) shall immediately inform construction superintendents and site agent and other marine mammal observers of each barge within the MMEZ cluster by mobile phone. The construction superintendents and site agent shall then inform the frontline staffs. The commencement of the DCM works are to be delayed on all barges until the marine mammal is not visible on the sea surface and the MMEZ is continuously clear of marine mammal for a period of 30 minutes. Also, all the on-effort marine mammal observers within the MMEZ cluster should monitor the marine mammal's appearance and activity until the marine mammal is not visible on the sea surface.

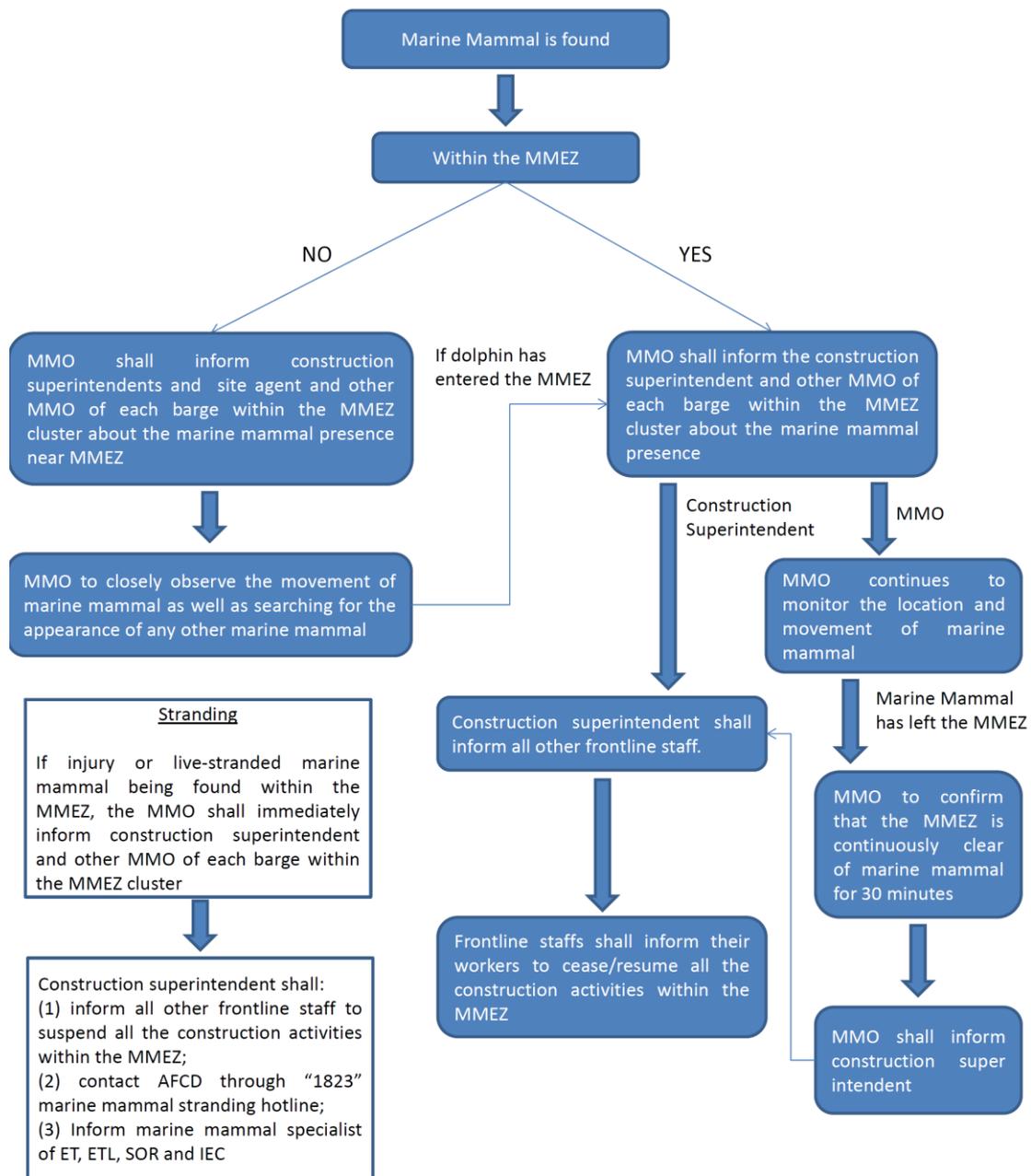
If a marine mammal is found within the MMEZ during the DCM works, the marine mammal observer(s) shall immediately inform construction superintendents and site agent and other marine mammal observers of each barge within the MMEZ cluster by mobile phone. The construction superintendents and site agent shall then inform all frontline staffs to cease all the construction activities within the MMEZ. All the on-effort marine mammal observers will continue to monitor the marine mammal's activity until it has left the MMEZ and that the MMEZ is continuously clear of marine mammal for a period of 30 minutes. The marine mammal observer(s) will contact other marine mammal observers of each barge within the MMEZ cluster to confirm the MMEZ is clear of marine mammal for a period of 30 minutes. Once cleared, the marine mammal observer(s) shall inform monitoring team coordinator. The construction superintendents and site agent shall then inform all frontline staffs to resume the DCM works.

If a marine mammal is found in close proximity to the MMEZ, the marine mammal observer(s) shall also inform construction superintendents and site agent and other marine mammal observers of each barge within the MMEZ cluster by mobile phone. The construction superintendents and site agent shall then inform all frontline staffs regarding the marine mammal's presence. All the on-effort marine mammal observers within the MMEZ cluster will continue to monitor the marine mammal's activity and the waters surrounding and within the MMEZ.

When the marine mammal is observed within or in close proximity to the MMEZ, the construction superintendents and site agent within the MMEZ cluster shall inform the vessel captains involved in the construction activities around the MMEZ to pay special attention to the marine mammal's presence in order to avoid the chance of collision with the marine mammal.

In case of any injured or live-stranded marine mammal(s) are found within the MMEZ, the marine mammal observer(s) shall immediately inform construction superintendents and site agent and other marine mammal observers of each barge within the MMEZ cluster by mobile phone. The construction superintendents and site agent shall then inform all frontline staffs to cease all the construction activities within the MMEZ and contact Agriculture, Fisheries and Conservation Department (AFCD) through "1823" marine mammal stranding hotline and marine mammal specialist of the ET.

Response Plan for Marine Mammal Notification





Contract No. EP/SP/66/12
Integrated Waste Management Facilities, Phase 1

Appendix B

Implementation Schedule for Mitigation Measures

Table B1 Implementation Schedule for Environmental Mitigation Measures to minimise disturbance on Finless Porpoise of IWMF

EIA Ref.	Current Plan Ref.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*			
					Des	C	O	Dec
7b.8.3.17 - 7b.8.3.24	5.2 - 5.6	<p><i>Avoidance of peak season for finless porpoise occurrence</i></p> <ul style="list-style-type: none"> To minimise potential acoustic disturbance from construction activities on Finless Porpoise, construction works that may produce underwater acoustic disturbance, if any, should be scheduled outside the months with peak Finless Porpoise occurrence (December to May) Such works should be restricted within June to November. This approach would not only avoid the peak season for Finless Porpoise occurrence, the magnitude of impacts arise from acoustic disturbance would also be minimised. <p><i>Opt for quieter construction methods and plants</i></p> <ul style="list-style-type: none"> Considering the sensitivity of marine mammals to underwater acoustic disturbance, instead of the previously proposed conventional breakwater and reclamation peripheral structure, which requires noisy piling works, the current precast concrete structure is proposed as an alternative option in addition to the steel cellular cofferdam method for the construction of seawalls and breakwaters, and DCM ground treatment will be adopted to provide stabilised and strengthened foundations to the seawalls and breakwaters of the Artificial Island. It is anticipated that the ground treatment of DCM and the installation of precast concrete seawall and breakwater would not induce any underwater acoustic disturbance to finless porpoise. Also, the precast concrete seawall and breakwater does not rely on embedment depth for structural strength and stability, therefore vibratory driving of the precast concrete seawall and breakwater into seabed is not required. In other words, unlike that of steel cellular cofferdam, the installation of precast concrete seawall and breakwater for the Artificial Island involves no 	IWMF site, work site	Contractor, Environmental Team		✓		

EIA Ref.	Current Plan Ref.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*			
					Des	C	O	Dec
		<p>use of vibratory hammer or hydraulic hammer and hence cause no underwater acoustic disturbance to finless porpoises.</p> <ul style="list-style-type: none"> • Since the DCM ground treatment and the installation of precast seawalls and breakwaters should generate no underwater acoustic disturbance to Finless Porpoise, no specific mitigation measures are required. • Non-percussive bore piling method for the installation of tubular piles for the berth construction has also been avoided with the newly adopted installation of precast concrete structures. <p><i>Monitored exclusion zones</i></p> <ul style="list-style-type: none"> • A monitored exclusion zone of 250 m radius from silt curtain or from the boundary of a work area should be implemented under the following situations (where applicable, Marine Mammal Watching Plan shall be conducted at the meantime): <ol style="list-style-type: none"> 1. 30 minutes before commencement of and during silt curtain installation/re-installation/relocation, deep cement mixing injection works or noisy construction works (as stipulated in FEP Clause 2.25 and 2.27); or 2. During implementation of MMEZ cluster plan with multiple construction vessels requiring MMO's duty operating simultaneously in close proximity. • The marine mammal exclusion zone (MMEZ) will be carried out in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains or works area and minimize underwater acoustic disturbance, so as for precautionary purpose for DCM works. If a marine mammal is noted within the exclusion zone, all marine works should stop immediately and remain idle for 30 minutes, or until the exclusion zone is free from marine mammals. The experienced marine mammal observer should be well trained to detect marine mammals. Binoculars should be used to search the exclusion zone from an elevated platform with unobstructed visibility. The marine mammal observer(s) shall be independent of the construction contractor and shall form part of the Environmental Team and have the power to call-off construction activities. 						

EIA Ref.	Current Plan Ref.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*			
					Des	C	O	Dec
		<ul style="list-style-type: none"> In addition, as marine mammals cannot be effectively monitored within the proposed monitored exclusion zone at night, or during adverse weather conditions (i.e. Beaufort 5 or above, visibility of 300 meters or below), marine works should be avoided under weather conditions with low visibility as much as possible. Marine Mammal Exclusion Zone (MMEZ) Plan shall be properly implemented. <p><i>Marine mammal watching plan</i></p> <ol style="list-style-type: none"> <ul style="list-style-type: none"> Upon the completion of silt curtain installation/re-installation/relocation, the marine works would be conducted within an enclosed environment within the silt curtain. Subsequently, Visual Inspection of the Waters Surrounded by Silt Curtains (Section 2.1, MMWP) and Regular Inspection of Deployed Silt Curtain (Section 2.2, MMWP) inspection under Marine Mammal Watching Plan (MMWP) would be implemented (where applicable, Marine Mammal Exclusion Zone shall be conducted at the meantime). <ul style="list-style-type: none"> All measures recommended in the Marine Mammal Watching Plan shall be fully and properly implemented for the Project. Special attention should be paid to Phase 2 (reclamation) where the floating type still curtain would be opened occasionally for vessel access, leaving a temporary 50 m opening. Action plan devised in the Marine Mammal Watching Plan shall be properly implemented to cope with any unpredicted incidents such as the case when marine mammals are found within the waters surrounded by the silt curtains. <p><i>Small openings at silt curtains</i></p> <ul style="list-style-type: none"> In order to avoid the entrance of marine mammals into the works area through the opening at silt curtains for vessel access, and the subsequent potential 						

EIA Ref.	Current Plan Ref.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*			
					Des	C	O	Dec
		impacts including increase in stress level in marine mammals due to underwater noise and chance of collision with working vessels, the openings for vessel access at the silt curtains should be restricted to be from 50m-100m to minimize the risk of accidental entrance by marine mammal.						
7b.8.3.25 - 7b.8.3.30	5.7 - 5.9	<p><i>Adoption of regular travel route</i></p> <ul style="list-style-type: none"> In order to minimize the disruption on marine mammal's behavioural pattern during construction and operational phases, and minimize the chance of vessel collision with marine mammals, which may otherwise result in damage to health or mortality, captains of all vessels should adopt regular travel route. Route and design in Vessel Travel Details shall be properly implemented. The regular travel route should avoid areas with high sighting density of Finless Porpoise as much as possible, as indicated in the latest Monitoring of Marine Mammals in Hong Kong Waters (AFCD, 2017). With the adoption of regular travel route, potential alteration in behavioural pattern of marine mammals due to increase in marine traffic is considered to be acceptable. <p><i>Vessel speed limit</i></p> <ul style="list-style-type: none"> In order to minimise potential injury and mortality of marine mammals due to collision with vessels during construction (working vessels) and operational phases (4 round trips per day for MSW vessel, and 12 round trips per day for visitor/staff shuttle ferry), a speed limit of ten knots should be strictly enforced within areas with high density of Finless Porpoise. Instructions and guidelines in Vessel Travel Details for the vessels driver shall be properly followed. Passive acoustic monitoring and land-based theodolite monitoring surveys should be adopted to verify the predicted impacts and effectiveness of the proposed mitigation measures. 	IWMF site, work site, marine traffic route	Contractor, Environmental Team		✓	✓	

EIA Ref.	Current Plan Ref.	Environmental Protection Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages*			
					Des	C	O	Dec
		<p><i>Training of Staff</i></p> <ul style="list-style-type: none"> For the implementation of Marine Mammal Watching Plan and Marine Mammal Exclusion Zone Plan, training sessions shall be conducted for MMO by marine mammal specialist, Dr. Samuel Hung, Dr. Lindsay, Ms. Julia Chan or someone with equivalent qualifications, with briefing materials provided as guidelines, instructing adequate knowledge of all requirements for observing marine mammal and appropriate actions to be taken according to this plan. Competence checking by ET shall be provided at least once every 6 months to the trained MMO involved in implementation of this plan. As frontline staff of the main contractor or its sub-contractors, i.e. foremen, site agent, superintendents and engineers would involve in the implementation of this plan, briefings for these personnel will be provided by the trained MMO during induction trainings to get familiar with the plans for assisting on marine mammal observations within waters surrounded by silt curtains and taking necessary action according to the plans when there is marine mammal trapped by the silt curtain or appearance of marine mammal within the MMEZ. Refresh briefings will be provided to all frontline staff once every 6 months. The briefing and training records will be provided to ETL, IEC and SO for audit and record. The contractor shall provide training to vessel captains to ensure vessel operation poses minimal risks to Chinese White Dolphin and Finless Porpoise. The training shall include briefings on predefined routes, general education on local cetaceans and white-bellied sea eagles, the required environmental practices / measures while operating construction and associated vessels under the Project, guideline for operating vessel safely in the presence of Chinese White Dolphin and Finless Porpoise. The contractor shall also schedule the training with individual marine contractors and shall ensure all marine vessel captains working on the Project are adequately briefed and trained prior to marine construction or prior to operating vessels within the construction site area. The same arrangement shall be adopted for vessel captains during operation stage. The training record shall be kept on site / office for both construction stage and operation stage. Participant shall sign his name and title on the training record. 						



Contract No. EP/SP/66/12
Integrated Waste Management Facilities, Phase 1

Implementation Schedule for Mitigation Measures

*Des – Design, C-Construction, O-Operation, and Dec - Decommissioning



Contract No. EP/SP/66/12

Integrated Waste Management Facilities, Phase 1

Appendix C

Curriculum Vitae (CV) of ET's Environmental Experts

Project Director (CV 1)

Name: Ir Dr LAM, Chun Kong Gabriel

Nationality: Chinese

Capability: Environmental Assessment and Management, Pollution Control and Prevention, Environmental Monitoring, Audit and Training, Energy and Power Engineering

Country Experience: Hong Kong S.A.R., Macao S.A.R. China, United Kingdom, Australia, Indonesia, Thailand, Malaysia, Singapore

Language: Chinese (Cantonese): Mother Tongue; Chinese (Putonghua): Fluent; English: Fluent

KEY EXPERIENCES

Dr Lam has over thirty years of experiences in environmental and energy engineering work, with direct hands-on experiences in the managing of environmental issues for a large power utility company in Hong Kong.

He has specific expertise in environmental monitoring & audit and environmental impact assessment (EIA) of large-scale engineering and construction work including ecological impact assessment from inception, technical assessment through liaison with government officials and consultations with public groups and government consultative bodies to final approval. His past achievements also include the development of the first continuous air quality monitoring network in Hong Kong, the first territorial wide saturation monitoring for fine suspended particulate in Hong Kong, the Lamma Power noise alarm System which was likely to be the first of its kind in the world, the selection and commissioning of the first utility boiler flue gas desulphurization system and its associated continuous emission monitoring system in Hong Kong, successful environmental audits and indoor air quality assessments of various facilities local, China and abroad. He has successfully completed his mission as Team Leader of an international team of experts commissioned by the Asian Development Bank for environmental evaluation of the Mae Moh Power Plant and Mine in Thailand. He has also served as Environmental Team Leader and Independent Environmental Checker for a number of prestigious projects for BEAM and EIA Ordinance compliances.

He has also extensive experiences in the operation, efficiency monitoring, mechanical design & research of power plant equipment and undertaken researches and projects in renewable energy, energy recovery from waste, energy and carbon audits, environmental protection and thermo-fluids. He is the originator of the well-known low Reynolds number two-equation turbulence model in computational fluid dynamics analysis.

His work on cold meat thawing was granted a utility model patent (no. 820431) issued by the State Intellectual Property Office of The Peoples' Republic of China in 2006, and his work on seawater scrubbing was granted Hong Kong short-term patent (no. HK1170108).

He is an ex-Council Member of The Hong Kong Institution of Engineers and ex-Chairman of Environmental Engineering Discipline of the Institution.

EDUCATIONAL & PROFESSIONAL QUALIFICATIONS

PhD Degree in the subject of turbulence modelling, University of Queensland, Australia.

MSc Degree in the subject of thermodynamics & fluid mechanics, University of Manchester, Institute of Science & Technology, U.K

Fellow, The Hong Kong Institution of Engineers, Hong Kong

Fellow, Hong Kong Institute of Acoustics, Hong Kong

Registered Professional Engineer (Environmental & Mechanical), Hong Kong

Qualified Service Provider for Energy-cum-carbon Audit Projects under the Buildings Energy Efficiency Funding Schemes, Hong Kong

Registered Energy Assessor under the Buildings Energy Efficiency (Registered Energy Assessors) Regulation (Cap. 610B)

Corporate Member, Institution of Mechanical Engineers, U.K.

Certificate of Competency for operation of steam boilers and steam receivers, Labour Department, Hong Kong.

PROFESSIONAL SERVICES

Institution	Nature	Period
Institute of Acoustics, U.K. (Hong Kong Branch) & Hong Kong Institute of Acoustics	Various study groups & sub-committees including Product Noise Regulation Study Group and Noise At Work Regulation, Noise Descriptors & Harmonization	April - December 1992, February 2001
Hong Kong Institution of Engineers	Visit Secretary/Assistant Secretary/Committee Member of the Environmental Division	May 1993 – June 1999
	Council Member	July 2005 – June 2007
	Various positions from member to Chairman of the Environmental Engineering Discipline Advisory Panel	June 1995 – June 2009
Engineers Registration Board	Board Member for registration of professional engineers in Hong Kong	September 2006 – September 2010

EMPLOYMENT HISTORY

Employer	Title	Period
The Hongkong Electric Co., Ltd.	Assistant Engineer (Operations)	Aug. 1972 - Oct. 1974
C.A. Parsons & Co., Ltd, U.K.	Research Engineer	Dec. 1975 - June 1977
The Hongkong Electric Co., Ltd.	Power Plant Services Engineer	July 1980 - Dec. 1982
The Hongkong Electric Co., Ltd.	Environmental Engineer / Senior Environmental Engineer	Jan. 1983 - Aug. 1995
Ashdown Environmental (Asia)	Technical Director	Sep. 1995 - Feb. 1996
Linfair Holdings Ltd. (Stock Code: 462)	Independent Non-Executive Director	August 2004 – March 2008
Nature Technologies / Nature & Technologies (HK) Ltd	Director	March 1996 till date
The Hong Kong University of Science & Technology	Lecturer (part-time) in the subject of Energy Management in Buildings for MSc Degree	2005 and 2007
The Hong Kong Polytechnic University	Visiting Lecturer (part-time) in the Department of Civil and Structural Engineering	September – December 2006
Cheong Ming Holdings Ltd. / Cheong Ming Investments Limited (Stock Code: 1196)	Independent Non-Executive Director	December 1996 – July 2014
Global Opto Technology Development Ltd.	Independent Energy Consultant	May 2010 – March 2014
The University of Hong Kong	Adjunct Associate Professor (part-time), Lecturer (part-time), part-time researcher on energy and carbon management, and air pollution control	1994 – 1996, 2004, 2006, 2008 till date

WORKING EXPERIENCES

1. Environmental work experience
 - 1.1 Environmental impact assessment & planning
 - Coal-firing and gas turbine electricity generating units with a capacity of over 3200 MW
 - Navigation channel & jetty modification to allow the berthing of Cape size vessels
 - Electrical substations with capacity up to 800 MVA & 275 KV
 - Transmission cable project totalling to 30 km of roads and tunnels
 - Independent technical review of the Environmental Impact Assessment for Route 10 – North Lantau to Yuen Long Highway, Hong Kong Special Administrative Region
 - Environmental assessment and review of traffic air and noise impacts to property and road development
 - Environmental evaluation of Mae Moh Power Plant and Lignite Coal Mines in Thailand, serving as Team Leader of a team of international experts
 - Independent review of air pollution control for diesel electricity generating units of Macau Power Station
 - Air quality and odour modelling for Lamma Power Station, To Kwa Wam Gas Production Plant, various crematoria and stone crushing plants.
 - Environmental assessment for effluent reuse in food factory development
 - 1.2 Environmental Consents & Permitting
 - Specified Processes licensing and small furnace installation approval under Air Pollution Control Ordinance of Hong Kong
 - Effluent Discharge Consents and licensing under Water Pollution Control Ordinance of Hong Kong
 - Chemical Waste Registration and disposal licensing under Waste Disposal Ordinance of Hong Kong
 - Permit application for construction works and construction equipment under Noise Control Ordinance of Hong Kong
 - Environmental Permit application under the Environmental Impact Assessment Ordinance
 - 1.3 Air Quality & Pollution Source Sampling Services
 - Ambient continuous air quality monitoring network, mobile air quality monitoring station and source emission monitoring system design, development, maintenance and operation for power stations for Hong Kong and Macau
 - Territorial wide survey of respirable and fine suspended particulate and nitrogen dioxide for Hong Kong by saturation monitoring and diffusion tubes
 - Air quality dispersion numerical and wind tunnel modelling studies for power plants, gas production plants, crematoria, ammonia plants, construction sites

Analysis of power station operation air quality impact from source and ambient environmental monitoring data

Flue gas sampling to U.S.E.P.A. and JIS Reference Methods for boilers, gas turbines, gas production and chemical plants

Indoor air quality survey and certification for bank, cinema and museum offices, restaurants and academic institutions.

1.4 Noise Control & Planning

Continuous noise monitoring network and mobile noise monitoring station design, development and operation

Noise propagation mathematical modeling for power station and property development

Acoustic design, specification and testing of electrical substations, chiller plants, motors, fans, pumps, and power plant equipment, roadside noise barriers

Materials acoustic performance laboratory testing

Power Station noise alarm system development, maintenance and operation

Noise surveys and noise impact assessment of power station in-plant equipment and electricity transmission and distribution substations

Improvement work for Golden Lady (a local cafe) to meet requirements of Noise Abatement Notice No. N798015 from Government

Territorial-wide survey of background noise levels and traffic noise in Hong Kong

Review of train noise prediction models

Noise monitoring and control of Catholic Mass proceeding at the Hong Kong Stadium for the Diocesan Office for Laity Formation

1.5 Waste Handling Studies

Ash management strategy study for 30 years of coal-fired power generation

Gypsum management strategy study for flue gas desulphurization facilities for coal-fired steam boilers with a total heat input of 3000 MW

Ash audit submission to Government and routine monitoring of waste quantities movement

Waste reuse and disposal arrangement for mineral oil, asbestos, transformers, generation and transmission facilities

Analysis of prospects of energy recovery of scrap tyre in Hong Kong

Preparation of waste management plans for construction sites

1.6 Effluent Management

Feasibility study of upgrading effluent management system for existing 1800 MW coal-fired generating units to meet stringent Hong Kong Effluent Technical Memorandum

Design of a zero discharge effluent management scheme and environmental review of an alternative effluent management scheme for ash handling facilities and flue gas desulphurization plants waste water for coal-fired generating units amounting to a total capacity of over 1000 MW

Development of effluent management scheme for construction works of area up to 60,000 m²

Development of effluent monitoring programme for trade effluent and sewage discharges from power station, electrical substation, construction works and commercial premises of quantity up to 9 million m³/day flow quantity

Design study, commissioning effluent testing and operation manual preparation for Hung Shing Ye Beach building sewage treatment plant

Current and temperature surveys of marine waters covering an area of up to 40km²

Marine monitoring and bioaccumulation experiments for ash lagoon operation

1.7 Pollution control equipment/process selection, design and testing

Selection, specifications and acceptance performance testing of flue gas desulphurization process for large coal-firing electricity generating units

Specifications and testing of low NO_x burners for large coal-fired utility boilers and NO_x reduction water injection system for large gas turbine electricity generating units

Electrostatic precipitator performance enhancement options comparison

Fugitive dust emission control design for open storage coal stockpile of up to 0.5 million tons capacity

Selection of bottom ash handling system with ash handling water recycling facilities for 2 x 350 MW coal-fired generating unit

Method selection, conceptual design & testing for coastal power station cooling water discharge foam suppression system

Food factory waste water treatment plant and treated water reuse equipment specification, tendering and final acceptance testing

1.8 Energy/Carbon/Environmental Management Studies

Study on the potential applications of new and renewable energy for Hong Kong for Government Electrical & Mechanical Services Department

Power generation and interconnection feasibility study for the proposed Waste-to-Energy Incineration Facility by Hong Kong Government

Research on hydrogen generation, storage and energy conversion

Carbon and energy audits for catering facilities, food production factory and Hong Kong Institute of Education, various building properties, e.g. Dawning Views, Grand Promenade, Metrocity, Granville Garden, La Cite Noble, Citiplaza, Wheelock House, Whampoa Garden, etc.

Application for registration under The Hong Kong Energy Efficiency Registration Scheme for buildings for compliance with the Building Energy Codes and conduct of Energy-carbon-cum projects under the HKSAR Building Energy Efficiency Funding Schemes for St Jude's Church and various residential estates and commercial properties, e.g. Gateway, Grand Waterfront, King's Park Hill, Dawning Views, Grand Promenade, Metrocity, Granville Garden, La Cite Noble, Citiplaza, Wheelock House, Whampoa Garden, etc.

Design and built of a solar-powered wind monitoring system for engine testing facility at Chek Lap Kok

Design and built of a solar and wind power system for street lights, Display Board and fountain pump for a school in Cheung Chau

Energy options evaluation for a new food factory at Tai Po Industrial Estate

Selection of optimum electricity tariff for a number of catering facilities

Evaluation of energy savings at the Laundry and Dry Cleaning factory of Maxim's Caterer's Ltd. at Chai Wan

Preparation of environmental management plan for electrical and mechanical contractor, construction contractor and catering facility.

1.9 EHS Audits, Environmental Team Leader, Independent Checker and Expert Witness

Environmental Team Leader (ETL) or Independent Environmental Checker (IEC) for the environmental monitoring & audit meeting environmental permit requirements of the Environmental Impact Assessment Ordinance for various clients:

- Construction of 132 KV Overhead Pole line and underground cable from Po Lam to Tui Min Hoi S/S - Circuit No.2 for CLP Power Hong Kong Ltd (Permit No. EP-050/2000)
- Excavation, piling and foundation work for the development of the Former Marine Police Headquarters in 2004 for Konwall Construction & Eng Co., Ltd (Permit No. EP-184/2004)
- Superstructure furnishing and Infrastructure furnishing for the development of the Former Marine Police Headquarters for Hien Lee Engineering Co Ltd (Permit No. EP-184/2004)
- Dredging work for navigation channel improvement at Lamma Power Station by The Hongkong Electric Co., Ltd. (Permit No. EP-165/2003 and subsequent variation)
- Operation of the Lamma Power Station GT57 combined cycle electricity generating unit by The Hongkong Electric Co., Ltd. (Permit No. EP-083/2000 and subsequent variations)
- Operation of the Lamma Power Station Extension gas-fired electricity generating units by The Hongkong Electric Co., Ltd. (EP-071/2000 and its variations)
- Decommissioning and Decontamination Works For the South Apron of the Former Kai Tak Airport for Maunsell Consultants Asia Ltd (Permit No. EP-285/2008)
- Decommissioning of the Remaining Parts (Ex-GFS Building and Radar Station) of the Former Kai Tak Airport for AECOM Asia Co. Ltd. (Permit No. EP-339/2009/A)
- Comprehensive Development at Yau Tong Bay in 2009 – 2015 by Main Wealth Development Limited (Permit No. EP-152/2003)
- Extension of the Convention and Exhibition Centre in 2006 – 2007 by Trade Development Council (Permit

No. EP-239/2006 and its variation)

- In-situ reprovisioning of Sha Tin Water Treatment Works (South Works) Advance Works for Water Supplies Department (Permit No. 494-2015)

Environmental team leader and specialist for over 50 property developments for HK BEAM and BEAM PLUS compliance.

IEC for government projects meeting requirements of Preliminary Environmental Reviews for construction of Cycle Parking Area at Yung Shue Wan (2015 – 2016) and for reconstruction of the Sharp Island Pier (2017 to date) by Civil Engineering and Development Department.

Verifier for independent verification of emission data for Lamma Power Station

Preparation of environmental audit manual and actual site environmental audits for Lamma Power Station coal-fired generating units and ash lagoon construction/operations.

Environmental management system review and gap analysis to ISO 14000 for Lamma Power Station 2 x 350MW coal-fired generating units.

Specialist support to ISO14001 certification audit for CLP Power System Business Group and Companhia de Electricidade de Macau-CEM (Macau Electric Co.)

Environmental review for the design office and construction works supervision for Binnie Black & Veatch HK Ltd., West Rail and a garment factory in Macau.

Support for independent verification of Environmental Report of Government Electrical & Mechanical Maintenance Service

Environmental audit for landfill site operation at Fanling

Technical advices to environmental audit for power plants in Hefei, Jiaozhou and Wuhu.

Environmental audit for Meizhou Wan Power Station in Putien of Fuzhou.

Independent review of air emission control for Coloane Power Station of Macau SAR.

EHS audit of printed circuit board and disk drive assembly facilities in Indonesia and Malaysia for Seagate Technology International.

EHS audit of manufacturing facilities for products of household cleaning, personal care and insect control for Shanghai Johnson Ltd. in Shanghai

Noise abatement design independent checker for Sheung Shui Slaughter House project.

Independent assessment of noise control design by equipment manufacturers for gas-fired combined cycle plants

Expert witness in defending successfully against a high court noise complaint case (H.C. Action No. A5214 of 1997) on water pump noise

Expert witness in Magistrate's Court in defending against an air pollution abatement notice on objectionable odour from a catering facility

Contract No. EP/SP/66/12
Integrated Waste Management Facilities, Phase 1

1.10 Environmental and Energy Management Training

Training for general industrial representatives, a one-day training carried out twice for the Hong Kong Management Association on industrial pollution in July 1986 and August 1991.

Environmental Awareness Continuing Professional Training for young engineers, a half-day training carried out twice for The Hong Kong Institution of Engineers in April & June, 1995.

Continuing Professional Development Course in Environmental Engineering for Scheme "A" graduate trainees of The Hong Kong Institution of Engineers, a three days training carried out for The Hongkong Electric Co., Ltd. in May 1995.

Environmental Training for power plant operation engineers, a four half-day training for each operation shift in July 1995 on how to protect the environment in power plant operation.

Continuing Professional Development Course to meet training requirements of The Hong Kong Institution of Engineers in Environmental & Related Technological Matters, a one-day training on ISO14001 and Environmental Impact Assessment organized jointly with The University of Hong Kong School of Professional And Continuing Education in February and June 1997.

Environmental Management Training for the Construction Sector, held twice with PE Handley-Walker in July and October 1999, and May 2000.

Environmental Training for 600 staffs Maxim's Caterers Ltd. in October 1999,

Environmental management system implementation training course for Housing Authority in 2001.

Environmental life cycle assessment ISO14040 1-day course organized jointly with The University of Hong Kong School of Professional And Continuing Education in February 2003.

ISO14064 audit on job training for CMA Testing and Certification Laboratories, March – August 2014.

1.11 Asbestos & Site Decontamination Work

Independent Environmental Auditor for Yau Tong Bay – Decommissioning of Shipyard Sites

Independent quality assurance checking of sample analysis results for Cheoy Lee Shipyard Phase II site decontamination/remediation work at Penny's Bay

Independent environmental checker for the decommissioning and decontamination works at south apron of the former Kai Tak Airport

Successful coordination of removal/remediation work for 995 MW oil-fired electricity generating units suitable for subsequent residential development of the South Horizons

Asbestos investigation report, management & operation plan and abatement for asbestos containing materials in electrical substations and residential electrical riser mains

Specialist adviser to company strategy on air pollution and waste handling of asbestos containing materials

1.12 Radiation Work

Technical support for handling of public concerns on possible radiation from coal and ash handling in modern coal-fired power station

Study on the radiation aspects in the use of pulverized fuel ash in building materials

Study of indoor radon in private dwelling

Study on office workers safety due electromagnetic radiation from transmission antenna in Tai Po

2. Other engineering work experiences include
 - 2.1 Mechanical performance monitoring and routine efficiency testing of oil-fired power generating units and its auxiliary equipment.
 - 2.2 Power plant equipment mechanical specification, design options evaluation and flow system reviews
 - 2.3 Shop inspection of power plant equipment at manufacturers' works for new coal-fired power station
 - 2.4 Efficient and reliable operation of electricity generating units and their auxiliary equipment
 - 2.5 Design optimization of radial fan design to increase ventilation flow through turbogenerator windings
 - 2.6 Model and full scale test on axial and centrifugal fan performances
 - 2.7 Feasibility analysis of power generation from possible waste-to-energy incineration plant at four potential sites for HKSAR
 - 2.8 Specification and tender evaluation for fuel supply, fuel pumping and storage system for Tai Po food factory
 - 2.9 Model scale test and computational fluid simulation for improvement of turbogenerator winding temperature and flow distribution.
 - 2.10 Air ventilation studies/computational fluid dynamics analysis for carpark and casino ventilations, condenser cooling water system and ash slurry flow surges, two phase flow in kitchen wastewater grease trap discharge

PUBLICATIONS

C.K.G. Lam "Development of a Centrifugal Compressor One-Dimensional Optimization Program." *MSc Dissertation*, University of Manchester Institute of Science & Technology, October 1974.

C.K.G. Lam "Models for Isothermal and Non-Isothermal Wall Turbulence and Their Application to Fully Developed Pipe Flow in The Presence of a Ring Type Turbulence Promoter." *PhD Thesis*, University of Queensland, June 1980.

C.K.G. Lam & K Bremhorst "Prediction of Turbulent Heat Fluxes and Temperature Fluctuations." *Letters in Heat and Mass Transfer Journal*, Vol. 6, 1979.

C.K.G. Lam & K. Bremhorst "A Modified Form of The k- ϵ Model for Predicting Wall Turbulence." *Journal of Fluids Engineering*, Vol. 103, 1981.

Gabriel C.K. Lam "The Hong Kong Electric Experience - Productivity Integrated with Careful Consideration to Ensure Life Quality Improvement." *Green Productivity* September 1988. Hong Kong Productivity Council.

Andrew H.P. Lau & Gabriel C.K. Lam "Inequality Relationship for Validation of Data Collected by Automatic Continuous Sound Level Analyzers." *The Journal of Applied Acoustics*, vol. 28, 1989.

Gabriel C.K. Lam "Unsteady Tall Stack Dispersion of Chimney Emissions and Its Application to Varying Wind Directions." *Journal of Air & Waste Management Association*, Vol. 42, 1992.

Gabriel C.K. Lam "Noise Abatement of Existing Electrical Zone Substations in Stringent Hong Kong Environment." *Proceeding of the 9th Conference on the Electric Power Supply Industry 5*, November 1992.

Gabriel C.K. Lam "The Nature's Laws on Environmental Protection and Their Implications on Sustainability." *Green Productivity*, Hong Kong Productivity Council, No. 2, 1992.

Gabriel C.K. Lam & Dennis Y.C. Leung "The dependence of NO_x emissions on coal & operating parameters in large coal-fired boilers", *Conference on Environmental & Related Materials Technology, Asian Industrial Technology Congress '93*, Hong Kong, 21st - 22nd May 1993.

Dennis Y.C. Leung & Gabriel C.K. Lam "Development of a Coal Stockpile Dust Suppression System", *The International Journal of Bulk Solids Handling*, Vol. 13, No.3, September 1993.

Dennis Y.C. Leung, Gabriel C.K. Lam & Gary C.K. Chang "Flue Gas Desulphurization Process Selection for Lamma Power Station L7/L8", *Hong Kong Engineer*, The Journal of The Hong Kong Institution of Engineers, Vol. 21, No. 9, September 1993.

Gabriel C.K. Lam & Raymond Fong "New Trends in Energy Management - Report on APO Study Meeting in Japan with Emphasis on Non-conventional power generation technology", *Green Productivity*, Hong Kong Productivity Council, No. 4, 1994.

Gabriel C.K. Lam "Advanced Continuous Noise Surveillance for a Modern Coal-fired Power Station", *Conference Proceedings, Polmet '94 Pollution in the Metropolitan and Urban Environment, Beijing*, November 1994.

Dennis Y.C. Leung & Gabriel C.K. Lam "Prospects for energy recovery from scrap tyres in Hong Kong", *Proceedings of the 3rd Asian-Pacific International Symposium on Combustion and Energy Utilization*, Hong Kong, December 1995.

G.C.K. Lam, D.Y.C. Leung, M. Niewiadomski, S.W. Pang, A.W.F. Lee and P.K.K. Louie, "Street-level concentrations of nitrogen dioxide and suspended particulate matter in Hong Kong", *Atmospheric Environment*, Vol. 33, No.1, 1999.

Gabriel C K Lam and Chris Yau, "EIA or ISO 14001? How About Both?", *Asia Engineer*, The Journal of The Hong Kong Institution of Engineers, June 2000.

To, W M., Ip, C.W.R., Lam, G.C.K. and Yau, T.H.C., "A Multiple Regression Model for Urban Traffic Noise in Hong Kong", *Journal of the Acoustical Society of America.*, August 2002.

Gabriel C.K. Lam, H F Chan, N. Preston and James Tam, "Use of chlorine based disinfectant in building sewerage systems", *Conference Proceedings, Polmet 2003 Pollution in the Metropolitan and Urban Environment, Hong Kong*, November 2003.

Wat, SF, Lam, Benjamin Y B & Gabriel C.K. Lam "Treating wastewater from Hong Kong's Catering Industry", *Hong Kong Engineer*, The Journal of The Hong Kong Institution of Engineers, Vol. 33, No. 1, January 2005.

Leung, M K H, Leung, D Y C, Ching, M W H, & Lam, G C K "Environmental-Friendly Cold water Thawing Practice", *ISBN: 962-85138-1-8*, December 2004.

Leung, M K H, Ching, W H, Leung, D Y C & Lam G C K "Theoretical study of heat transfer with moving phase-change interface in thawing of frozen food", *J. Phys. D: Appl. Phys.*, Vol. 38, 2005 pp.477-482.

Leung, M, Ching, W H, Leung, D Y C & Lam G C K "Fluid dynamics and heat transfer in cold water thawing", *Journal of Food Engineering*, Vol. 78, 2007 pp.1221-1227 .

Gabriel C K Lam "Wind energy conversion efficiency limit", *Wind Engineering*, Vol. 30, No. 5, December 2006.

Leung, M K H, Leung, D Y C, Chan, A H S, Cheng, D M, Shek, T, Lam G C K , Cheng, S W K, Koo, B C P, Deng Yun, "Carbon Audit Toolkit for Small and Medium Enterprises in Hong Kong", *The University of Hong Kong.*, ISBN: 978-962-85138-7-1, February 2010.

Gabriel C K Lam, "公教信仰與科學下的環保及先知態度", 神思 Spirit, A Review for Theology and Spirituality, Xavier Publishing Association Co., Ltd., Issue No.94, August 2012, in Chinese

Leung, D.Y.C. & Lam, G.C.K., "An efficient water scrubbing device with NOx reduction for marine applications", In *Environment, Energy and Applied Technology*, CRC Press Inc., ISBN 9781138026919 - CAT# K24369, January 2015, pp. 493-497

Project Manager (CV 2)

Name: Mr. LI, W. M. Kevin
Nationality: Chinese
Experience: 15+ years
Country: Hong Kong S.A.R., Macao S.A.R., China
Language: Chinese (Cantonese): Mother Tongue; Chinese (Putonghua): Fluent; English: Fluent

MY EXPERIENCES

Mr. Li has been actively involved in various projects of environmental consultancy and monitoring, environmental management and assessment, environmental monitoring and audit (EM&A), Independent Environmental Checker, land contamination and sediment quality assessment, indoor environmental quality assessment e.g. Indoor Air, acoustics and asbestos investigation, management and supervision for more than 10 years. Mr. Li has been environmental team leader or independent environmental checker of the EM&A projects for various Main Contacts for Airport Authority (AA) and Governmental Departments in Hong Kong. He is also a qualified Marine Mammal observer to carry out monitoring of Chinese White Dolphins during construction under AA Work Contracts and audit the implementation of land based ecological mitigation measures works for various EM&A projects. He has undergone extensive training and gained the practical experience in environmental management and engineering through the exposures to various aspects of the environmental monitoring and audit works, environment impact assessment, land contamination assessment and process infrastructure engineering.

EDUCATIONAL & PROFESSIONAL QUALIFICATIONS

- Master of Philosophy, the Hong Kong Polytechnic University, Hong Kong
- Bachelor of Engineering (Honour) in Environmental Engineering, the Hong Kong Polytechnic University, Hong Kong.
- BEAM Professional under the Accreditation of Hong Kong Green Building Council (HKGBC) (BEAM Pro No.: BP2011-0586).
- Registered Asbestos Consultant under the register of Environmental Protection Department (EPD).
- Energy Institute Hong Kong Certificate on Energy Audit for Building Energy Efficiency.
- Certificate of the Hong Kong Productivity Council on ISO 50001 Energy Management System.
- Certificates of the Hong Kong Institute of Acoustics on Noise Control and Road Traffic Noise Measurement
- Certificate of Attainment on Occupational Safety and Health in Industrial Undertakings issued by the Hong Kong Polytechnic University.
- Occupational Safety & Health Council Certificate for Safety and Health Supervisor (Construction).
- Occupational Safety & Health Council Certificate in Asbestos Management.

PROFESSIONAL EXPERIENCES

Environmental Impact Assessment & Management

- Project Manager for Environmental Assessment for Application of a Direct Environmental Permit for Agreement No. CE53/2014 (GE) Landslip Prevention and Mitigation Programme 2014, Package J Landslip Prevention and Mitigation Works and Provision of Emergency Works Services for Natural Terrain Landslides Occurring in Hong Kong Island East – Investigation, Design and Construction
- Project Manager for Preparation of a Project Profile for Application of a Direct Environmental Permit for Landslip Prevention and Mitigation Works at Study Area 11NE-B/SA3 at Razor Hill, Sai Kung
- Project Manager for Environmental Assessment for Application of a Direct Environmental Permit for Agreement No. CE26/2011 (GE) Landslip Prevention and Mitigation Programme 2011, Package H, Natural Terrain Hazard Mitigation Works - Investigation, Design and Construction.

- Project Manager for Environmental Assessment for Section 16 Application for Proposed Residential Development in D.D. 92, Yin Kong Village, Kwu Tung North, N.T.
- Project Manager for Environmental Assessment for Proposed Residential Development at Various Lots in D.D.181, Pak Tin Village, Shatin, N.T.
- Project Manager for Traffic Noise Impact Assessment and Independent Environmental Monitoring and Audit Works for the Proposed Residential Development at No. 9 Shouson Hill Road.

Environmental Monitoring and Audit Team Leader or Independent Environmental Checker (IEC)

- Environmental, Marine Water and Mammal Monitoring for AA Contract 3203 Deep Cement Mixing Works for Three Runway System Project of Airport Authority;
- Environmental, Marine Water and Mammal Monitoring for AA Contract 3204 Deep Cement Mixing Works for Three Runway System Project of Airport Authority;
- Environmental, Marine Water and Mammal Monitoring for AA Contract 3206 Main Reclamation for Three Runway System Project of Airport Authority;
- Environmental, Marine Water and Mammal Monitoring for AA Contract P550 - Water Quality Monitoring for Marine Site Investigation Works in Contaminated Mud Pits in Sha Chau
- Contract No. EP/SP/58/08 Environmental Team for Environmental Monitoring and Auditing for Construction of Sludge Treatment Facilities in Nim Wan, Tuen Mun;
- Contract No. KLN/2016/05 – Independent Environmental Checker for Contract No. KL/2015/02 – Kai Tak Development – Stage 5A Infrastructure at Former North Apron Area;
- Contract No. KLN/2015/07 – Environmental Monitoring Works for Contract No. KL/2014/03 – Kai Tak; Development – Stage 3 Infrastructure Works for Developments at the Southern Part of the Former Runway: Deputy;
- Agreement No. CE21/2014(EP) - Environmental Monitoring and Audit (EM&A) for Operation of Tai Po Sewage Treatment Works Stage 5 Phase 2B – Investigation;
- Contract No. DC/2014/01- Environmental Monitoring and Audit (EM&A) Services for Castle Peak Road Trunk Sewer and Tuen Mun Village Sewerage;
- Contract No.SSC504 - Provision of Environmental Measures Design and Construction of New Territories West Regional Office and Water Resources Education Centre of Water Supplies Department;
- Agreement No. CE 22/2006 (HY) Cycle Tracks Connecting North West New Territories with North East New Territories – Investigation, Design and Construction Contract No. YL/2013/01 (Cycle Tracks from Tuen Mun to Sheung Shui – Stage 1);
- Contract No. CV/2013/04 Dredging Works in Kwai Tsing Container Basin and its Approach Channel;
- Independent Environmental Checker for Agreement No. CE 19/2009 - Dredging Works for Proposed Cruise Terminal in Kai Tak: Deputy IEC for the Construction Monitoring Works of Kai Tak Cruise Terminal Project for the Contract No. CE 19/2009;
- Independent Environmental Checker for Contract No. PW3/2016 Signature Project Scheme Sai Kung District Reconstruction of the Sharp Island Pier for CEDD;

Marine Mammal Specialist (CV3)

Name: Dr. Hung Ka Yiu, Samuel

ACADEMIC HISTORY

Doctor of Philosophy in Division of Ecology & Biodiversity, School of Biological Sciences (2001-2008),

University of Hong Kong, Hong Kong

Thesis Title: Habitat use of Indo-Pacific humpback dolphins (*Sousa chinensis*) in Hong Kong (Supervisors: Prof. D. Dudgeon & Dr. T.A. Jefferson; External Examiner: Prof. B. Würsig)

Master of Science in Marine Science (1997-2000), University of San Diego, California, U.S.A.

Thesis Title: Ranging patterns of Indo-Pacific humpback dolphins (*Sousa chinensis*) in the Pearl River Estuary, People's Republic of China (Supervisors: Prof. H. Ellis, Dr. T. A. Jefferson and Dr. B. Stewart)

Bachelor of Arts in Biology (1992-1996), Point Loma Nazarene University, California, U.S.A.

PROFESSIONAL AFFILIATIONS & MEMBERSHIPS

Hong Kong Dolphin Conservation Society (Founder & Academic Advisor; Former Chairman (2003-2016))

FormosaCetus Research and Conservation Group (Research Associate)

Eastern Taiwan Strait *Sousa* Technical Advisory Working Group (Member)

Society of Hong Kong Nature Explorers (Executive Director & Founding Member)

SPECIALIZED SKILLS

- Experienced in shipboard and helicopter marine mammal survey techniques, photo-identification technique, marine mammal dissection, underwater acoustic recording, passive acoustic monitoring, and shore-based theodolite tracking of marine mammals.
- Experienced in using specialized computer programs including GIS (*ArcView*® 3.1 and Animal Movement Extension), *Distance* 6.1, *Pythagoras*, *CPOD.exe*, and *EndNote*® 3.1

MAJOR FUNDINGS ACQUIRED

- 2011-18** Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government “Monitoring of Marine Mammals in Hong Kong Waters”
- 2017-18** Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government
“Provision of Services for Passive Acoustic Monitoring of Chinese White Dolphins within The Sha Chau and Lung Kwu Chau Marine Park and The Brothers Marine Park”
- 2011-12** Highways Department of Hong Kong SAR Government
“Advanced and Baseline Chinese White Dolphin Monitoring for Hong Kong-Zhuhai-Macao Bridge Hong Kong Projects”
- 2007-11** Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government
“Monitoring of Marine Mammals in Hong Kong Waters – Data Collection”
- 2002-07** Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government
“Monitoring of Chinese White Dolphins (*Sousa chinensis*) in Hong Kong Waters – Data Collection”
- 2003-05** Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government
“Monitoring of Finless Porpoise (*Neophocaena phocaenoides*) in Hong Kong Waters”

WORK EXPERIENCE

Director (2002 – present); Research Supervisor (1998 – 2002); Research Intern (1997-1998)

Hong Kong Cetacean Research Project

Job Duties: Oversees a long-term monitoring research project on local humpback dolphins and finless porpoises in Hong Kong and adjacent waters; organizes and conducts line-transect boat surveys, helicopter surveys & land-based surveys; conducts photo-identification analysis & line-transect analysis; conducts necropsy on stranded cetaceans; performs specialized data analyses such as ranging pattern analysis & quantitative grid analysis on habitat use; trains researchers, consultants and university students to participate in cetacean research; delivers guest lectures at various universities; produces educational material and provides educational seminars

Marine Mammal Specialist (Sub-consultant)

China State Construction Engineering (Hong Kong) Limited (July 2017 – present)

Job Duties: Coordinates and participates in dolphin monitoring and training services for the EM&A study for the Hong Kong Link Road (reclamation works) construction

China State Construction Engineering (Hong Kong) Limited (July 2017 – present)

Job Duties: Serves as Dolphin Specialist and coordinates training services for the EM&A study for the Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion)

Leighton – Chun Wo Joint Venture (November 2016 – present)

Job Duties: Coordinates dolphin monitoring and training services for the EM&A study for the Hong Kong Boundary Crossing Facilities – Passenger Clearance Building

ERM Hong Kong Limited (June 2016 - present)

Job Duties: Coordinates and participates in marine mammal line-transect monitoring surveys and passive acoustic monitoring works in western waters of Hong Kong for the EIA study for the Hong Kong Offshore LNG Terminal *ERM Hong Kong Limited (November 2013 - present)*

Job Duties: Coordinates and participates in marine mammal monitoring services for the EM&A programme of the Tuen Mun-Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section

Gammon Construction Limited (September 2013 - present)

Job Duties: Coordinates and participates in dolphin monitoring services, including the implementation of bored piling monitoring programme (i.e. land-based theodolite tracking study, underwater noise study and dolphin acoustic behavioural study), line-transect monitoring surveys, implementation of dolphin exclusion zone monitoring, for the EM&A programme of Tuen Mun-Chek Lap Kok Link Southern Connection Viaduct Section *Dragages – China Harbour – VSL Joint Venture (November 2012 – present)*

Job Duties: Coordinates and participates in dolphin monitoring services, including the implementation of bored piling monitoring programme (i.e. land-based theodolite tracking study and dolphin acoustic behavioural study) and line-transect monitoring surveys, for the EM&A study of the Hong Kong Link Road (viaduct section) construction

Atkins China Limited (October 2012 – June 2017)

Job Duties: Coordinates and participates in dolphin monitoring and training services for the EM&A study for the Hong Kong Link Road (reclamation works) construction

Environ Ramboll Hong Kong Limited (March 2015 – May 2017)

Job Duties: Conducts regularly line-transect monitoring surveys of Chinese White Dolphins in Southwest Lantau for the Environmental Project Office for the HZMB HKLR, HKBCF and TMCLKL for HyD *Ove Arup & Partners Limited (September 2013 – December 2016)*

Job Duties: Conducts comprehensive data analysis for a detailed study of the marine park in the Brothers Islands for HyD

ERM Hong Kong Limited (October 2015 – March 2016)

Job Duties: Conducts comprehensive data analysis to delineate the boundaries of compensatory marine park for Integrated Waste Management Facilities at an Artificial Island near Shek Kwu Chau for EPD

ERM Hong Kong Limited (February 2015 – December 2015)

Job Duties: Conducts comprehensive data analysis to delineate the boundaries of Southwest Lantau Marine Park and Soko Islands Marine Park for AFCD

ERM Hong Kong Limited (April 2015 – November 2015)

Job Duties: Coordinates and participates in shore-based theodolite tracking at Black Point for an Environmental Study in Deep Bay

Ove Arup & Partners Limited (January 2012 – November 2015)

Job Duties: Provides technical review on dolphin related issues for the Planning and Engineering Study on the Remaining Development in Tung Chung – Feasibility Study for CEDD

Ove Arup & Partners Limited (August 2013 – January 2014)

Job Duties: Coordinates the site-specific field monitoring survey for Chinese White Dolphin under the feasibility study for Increasing Land Supply by Reclamation and Rock Cavern Development for CEDD *ERM Hong Kong Limited (February 2013 – January 2014)*

Job Duties: Coordinates and participates in marine mammal monitoring surveys around Lamma for the EIA study for GHK Submarine Gas Pipeline

Mott MacDonald Hong Kong Limited (October 2012 – November 2013)

Job Duties: Coordinates 14 months of line-transect vessel surveys and shore-based theodolite-tracking in North Lantau for an airport expansion project

ERM Hong Kong Limited (February 2011 – November 2013)

Job Duties: Coordinates and participates in dolphin monitoring surveys in Deep Bay for the EM&A study for the Black Point Gas Supply Project for CAPCO

ERM Hong Kong Limited (December 2010 – August 2012)

Job Duties: Coordinates and participates in line-transect surveys for an EIA study on a marina project on Lamma Island (The Baroque).

AECOM Asia Company Limited (January 2010 – December 2011)

Job Duties: Conducts comprehensive data analysis to delineate the potential boundary of a marine protected area for the Preliminary Study for Marine Park in the Brothers Islands for the HZMB Hong Kong Boundary Crossing Facilities for Highways Department (HyD)

Ove Arup & Partners Limited (April 2010 – November 2011)

Job Duties: Provides technical advice on dolphin related issues for the Boundary Crossing Facilities (Reclamation Works) – Design and Construction of the Hong Kong-Zhuhai-Macau Bridge for HyD

ERM Hong Kong Limited (October 2009 – December 2010)

Job Duties: Conducts desktop reviews on impact assessment on Chinese white dolphins for the Contaminated Mud Pits at South Brothers EIA study for Civil Engineering and Development Department (CEDD)

ERM Hong Kong Limited (July 2009 – December 2009)

Job Duties: Conducts desktop reviews on impact assessment on Chinese white dolphins for the Black Point Gas Supply Project EIA study for CAPCO.

Ove Arup & Partners Limited (February 2009 – June 2009)

Job Duties: Conducted desktop reviews on impact assessment on Chinese white dolphins for the Boundary Crossing Facility (BCF) Site Options for HyD.

ENSR Asia (HK) Limited (December 2008 – November 2009)

Job Duties: Coordinated and participated in line-transect surveys, conducted data analysis and impact assessment for an EIA study on Engineering Investigation and Environmental Studies for Integrated Waste Management Facilities Phase I for Environmental Protection Department.

ERM Hong Kong Limited (July 2008 – July 2009)

Job Duties: Coordinated and participated in line-transect surveys and conducted data analysis for an EIA study on site selection of an offshore windfarm in eastern and southern waters of Hong Kong for Hong Kong Electric *Maunsell Consultants Asia Limited (July 2008 – June 2009)*

Job Duties: Coordinated and participated in line-transect surveys and conducted data analysis for an EIA study on Tuen Mun-Chek Lap Kok Link for HyD

ERM Hong Kong Limited (July 2008 – July 2009)

Job Duties: Coordinated and participated in dolphin and porpoise monitoring surveys in East Lantau for Hong Kong Disneyland Theme Park

Ove Arup & Partners Limited (November 2007 – January 2008)

Job Duties: Conducted desktop review on impacts on Chinese white dolphins for a proposed contaminated mud disposal facility within the Airport East / East of Sha Chau area for CEDD

South China Sea Fisheries Research Institute, PRC (July 2007-July 2008)

Job Duties: Supervised and participated in 12-month large-scale line-transect surveys and photo-ID study on Chinese white dolphins & finless porpoises in western section of the Pearl River Estuary for PRC Government

Maunsell Environmental Management Limited (September 2000 – January 2008)

Job Duties: Coordinated and participated in dolphin and porpoise monitoring surveys for Penny's Bay Reclamation Stage I/II projects for CEDD; provides classroom and onboard training for boat surveys

ERM Hong Kong Limited (January 2006 – September 2007)

Job Duties: Coordinated and participated in line-transect surveys, photo-ID study and data analysis for 12-month comprehensive study of Chinese white dolphins in Pearl River Estuary and Hong Kong waters for an ecological, fisheries and water quality impact assessment study for the proposed port development at Northwest Lantau for Economic, Labour and Development Bureau (EDLB)

ERM Hong Kong Limited (July 2005 – February 2007)

Job Duties: Coordinated and participated in line-transect surveys, photo-ID study and data analysis for an EIA study on site selection of a liquefied natural gas (LNG) receiving terminal in Hong Kong for China Light and Power; and provided classroom and onboard training for boat surveys

South China Sea Fisheries Research Institute, PRC (January 2005 – March 2007)

Job Duties: Supervised and participated in 12-month large-scale line-transect surveys and photo-ID study on Chinese white dolphins in the Pearl River Estuary for preliminary impact assessment on Hong Kong-Zhuhai-Macau bridge for HZMB office

Chinese University of Hong Kong (October 2003 – April 2005)

Job Duties: Supervised land-based observations on the occurrence and habitat use of Chinese white dolphins within Sha Chau and Lung Kwu Chau Marine Park for AFCD; provided training course to field staff for land-based observations; analyzed land-based observation data. *Cinotech Consultants Limited (January – March 2004)*

Job Duties: Conducted field surveys and photo-ID work on humpback dolphins in the Pearl River Estuary for the Environmental Impact Assessment of Tonggu waterway channel

ERM Hong Kong Limited (September 2001 - January 2002; February 2004)

Job Duties: Conducted land-based observations on the occurrence and habitat use of Chinese white dolphins at Tai O Bay; conducted training course to field staff

Publisher & Editor-in-Chief (2000 – present)

- *Hong Kong Geographic Book Series: over 30 publications (2007-present)*
- *Hong Kong Countryside Explore Magazine (2006-09)*
- *Hong Kong Discovery Magazine (2000-05)*

Volunteer Research Assistant (1996-1998)

Center of Reproduction for Endangered Species, San Diego Zoo, California, U.S.A.

TEACHING EXPERIENCE

- Regular guest lecturer on Hong Kong's cetacean conservation issues, environmental impact assessment, ecotourism, and marine mammals in captivity at: University of Hong Kong, Chinese University of Hong Kong, Hong Kong University of Science and Technology, City University of Hong Kong, Hong Kong Baptist University, Hong Kong Institute of Education, Hong Kong Polytechnic University, Open University of Hong Kong, Hong Kong Institute of Vocational Education, College of International Education of HKBU, and Community College of City University
- Co-organizer and instructor of an interuniversity field course (*Dolphin and Whale Biology and Conservation in Tropical Asia*) in the Ontario Universities Program in Field Biology for senior undergraduate and graduate students and hosted by Trent University
- Organizer and instructor of university students training programmes at Chinese University of Hong Kong and City University of Hong Kong
- Trained over 20 research assistants and 30 research interns for various marine mammal survey techniques in Hong Kong and China
- Trained over 30 marine mammal observers for implementation of dolphin monitored exclusion zone and dolphin watching plan for various development project

PUBLICATIONS

38. **Hung, S. K.**, Araújo-Wang, C. C., Kallamaa, M. Q., Lui, G. and Wang, J. Y. In prep. Trends in abundance of Indo-Pacific humpback dolphins (2001-2014) in Hong Kong: implications for conservation and management.
37. Araújo, C. C., Wang, J. Y., **Hung, S. K.**, White, B. N., Currey, R. J. and Brito, D. In review. Coastal development and the viability of the Indo-Pacific humpback dolphin (*Sousa chinensis*) in the Pearl River Estuary, southern China. Submitted to *Aquatic Conservation*.
36. Hoffman, J. M., **Hung, S. K.**, Wang, J. Y. And White, B. N. 2017. Regional differences in the whistles of Australasian Humpback Dolphins (Genus *Sousa*). *Canadian Journal of Zoology* 95: 515-526 (DOI: 10.1139/cjz-2016-0204).
35. **Hung, S. K.** 2017. Final Report on Monitoring of Marine Mammals in Hong Kong Waters (2016-17). An unpublished report submitted to the Agriculture, Fisheries and Conservation Department of Hong Kong SAR Government, 162 pp.

34. Wright, K. A., Wang, J. Y., **Hung, S. K.**, Riehl, K. N., Yang, S. C. and White, B. N. 2017 (in press). Preliminary sex differentiation of Indo-Pacific humpback dolphins (*Sousa chinensis*) in the Pearl River estuary and eastern Taiwan Strait using scarring of dorsal fins. Accepted by *Marine Mammal Science*.
33. Hoffman, J. M., Ponnampalam, L. S., Araújo-Wang, C., Kuit, S. H., **Hung, S. K.** and Wang, J. Y. 2017. Description of whistles of Irrawaddy dolphin (*Orcaella brevirostris*) from the waters of Matang, Peninsular Malaysia. *Bioacoustics* 26: 15-24 (DOI: 10.1080/09524622.2016.1169558)
32. Munger, L., Lammers, M., Cifuentes, M., Würsig, B., Jefferson, T. A. and **Hung, S. K.** 2016. Spatial and temporal variation of Indo-Pacific humpback dolphins in Hong Kong waters from year-round passive acoustic monitoring. *Journal of the Acoustical Society of America* 140: 2754-2765 (DOI: 10.1121/1.4963874)
31. Hoffman, J. M., Ponnampalam, L. S., Araújo, C. C., Wang, J. Y., Kui, S. H. and **Hung, S. K.** 2015. Comparison of Indo-Pacific humpback dolphins (*Sousa chinensis*) whistles from two areas of western Peninsular Malaysia. *Journal of the Acoustical Society of America* 138: 2829-2835 (DOI: 10.1121/1.4934254)
30. Wang, J. Y., Yang, S. C. and **Hung, S. K.** 2015. Diagnosability and description of a new subspecies of Indo-Pacific humpback dolphin *Sousa chinensis* (Osbeck, 1765) from Chinese waters. *Zoological Studies* 54:36 (DOI: 10.1186/s40555-015-0115-x).
29. Marcotte, D., **Hung, S. K.** and Caquard, S. 2015. Mapping cumulative impacts on Hong Kong's pink dolphin population. *Ocean & Coastal Management* 109: 51-63.
28. Yeung, R. L. K., Li, A. H. F. and **Hung, S. K.** 2015. Monetising social and environmental costs in infrastructure evaluation: the case of Hong Kong's third international airport runway. *Asia Pacific Journal of Public Administration* 37(3): 207-215 (DOI: 10.1080/23276665.2015.1075530).
27. Yeung, R., Li, A., Chan, W., Lai, A., **Hung, S. K.**, Wong, V. T., Chau, M. And Lay, B. 2015. Study on Social Return on Investment (SROI) for Hong Kong Third Runway Project: Final Report, 110 pp.
26. Araújo, C. C., Wang, J. Y., **Hung, S. K.**, White, B. N. and Brito, D. 2014. Viability of the Critically Endangered Eastern Taiwan Strait population of Indo-Pacific humpback dolphin, *Sousa chinensis*. *Endangered Species Research* 24: 263-271.
25. Slooten, E. Wang, J. Y., Dungan, S. Z., Forney, K. A., **Hung, S. K.**, Jefferson, T. A., Riehl, K. N., Rojas-Bracho, L., Ross, P. S., Wee, A. N., Winkler, R., Yang, S. C. and Chen, A. 2013. Impacts of fisheries on the Critically Endangered humpback dolphin (*Sousa chinensis*) in the eastern Taiwan Strait. *Endangered Species Research* 22: 99-114.
24. Dungan, S. Z., **Hung, S. K.**, Wang, J. Y. and White, B. N. 2012. Two social communities in the Pearl River Estuary population of Indo-Pacific humpback dolphins (*Sousa chinensis*). *Canadian Journal of Zoology* 90: 1031-1043.
23. Jefferson, T. A., **Hung, S. K.**, Robertson, K. M. and Archer, F. I. 2012. Life history of the Indo-Pacific humpback dolphin (*Sousa chinensis*) in the Pearl River Estuary, southern China. *Marine Mammal Science* 28: 84-104 (DOI: 10.1111/j.1748-7692.2010.00462.x).
22. Piwetz, S., **Hung, S. K.**, Wang, J. Y., Lundquist, D. and Würsig, B. 2012. Influence of vessel traffic on movements of Indo-Pacific humpback dolphins (*Sousa chinensis*) off Lantau Islands, Hong Kong. *Aquatic Mammals* 38: 325-331.
21. Sims, P., **Hung, S. K.** and Würsig, B. 2012. High speed vessel sounds in West Hong Kong waters and their contributions relative to Indo-Pacific humpback dolphins (*Sousa chinensis*). *Journal of Marine Biology* Volume 2012: Article ID 169103, 11 pages (doi:10.1155/2012/169103).
20. Chen, T., Qiu, Y., Jia, X., **Hung, S. K.** and Liu W. 2011. Distribution and group dynamics of Indo-Pacific humpback dolphins in the western Pearl River Estuary, China. *Mammalian Biology* 76: 93-96.
19. Sims, P., Vaughn, R., **Hung, S. K.** and Würsig, B. 2011. Sounds of Indo-Pacific humpback dolphins (*Sousa chinensis*) in west Hong Kong: a preliminary description. *Journal of the Acoustical Society of America* 131: EL48-EL53 (doi: 10.1121/1.3663281).

18. Ross, P. S., Dungan, S., **Hung, S. K.**, Jefferson, T. A., MacFarquhar, C., Perrin, W., Riel, K. N., Slooten, E., Wang, J., White, B., Würsig, B., Yang, S. and Reeves, R. 2010. Averting the Baiji syndrome: characterizing habitat for critically endangered dolphins in Eastern Taiwan Strait. *Aquatic Conservation: Marine and Freshwater Ecosystems* 20: 685-694.
17. Chen, T., **Hung, S. K.**, Qiu, Y., Jia, X. and Jefferson, T. A. 2010. Distribution, abundance and individual movements of Indo-Pacific humpback dolphins (*Sousa chinensis*) in the Pearl River Estuary, China. *Mammalia* 74: 117-125.
16. Jefferson, T. A., **Hung, S. K.** and Würsig, B. 2009. Protecting small cetaceans from coastal development: Impact assessment and mitigation experience in Hong Kong. *Marine Policy* 33: 305-311.
15. **Hung, S. K.** 2008. Habitat use of Indo-Pacific humpback dolphins (*Sousa chinensis*) in Hong Kong. Ph.D. dissertation. University of Hong Kong, Hong Kong, 266 p.
14. Jefferson, T. A. and **Hung, S. K.** 2008. Effects of biopsy sampling on Indo-Pacific humpback dolphins (*Sousa chinensis*) in a polluted coastal environment. *Aquatic Mammals* 34: 310-316.
13. Wang, J. Y., **Hung, S. K.**, Yang, S. C., Jefferson, T. A. and Secchi, E. R. 2008. Population differences in the pigmentation of Indo-Pacific humpback dolphin, *Sousa chinensis*, in Chinese waters. *Mammalia* 72: 302-308.
12. Wang, J. Y., Yang, S. C., **Hung, S. K.** and Jefferson T. A. 2007. Distribution, abundance and conservation status of the Eastern Taiwan Strait population of Indo-Pacific humpback dolphins, *Sousa chinensis*. *Mammalia* 71: 157-165.
11. Jefferson, T. A. and **Hung, S. K.** 2007. An updated, annotated checklist of the marine mammals of Hong Kong. *Mammalia* 71: 105-114.
10. Hung, C. L. H., Lau, R. K. F., Lam, J. C. W., Jefferson, T. A., **Hung, S. K.**, Lam, M. H. W. and Lam, P. K. 2007. Risk assessment of trace elements in the stomach contents of Indo-Pacific humpback dolphins and finless porpoises in Hong Kong waters. *Chemosphere* 66: 1175-1182.
9. Jefferson, T. A., **Hung, S. K.** and Lam, P. K. S. 2006. Strandings, mortality, and morbidity of Indo-Pacific humpback dolphins in Hong Kong, with emphasis on the role of organochlorine contaminants. *Journal of Cetacean Research and Management* 8: 181-193.
8. Hung, C. L. H., Xu, Y., Lam, J. C. W., Jefferson, T. A., **Hung, S. K.**, Yeung, L. W. Y., Lam, M. H. W., O'Toole, D. K. and Lam, P. K. S. 2006. An assessment of the risks associated with polychlorinated biphenyls found in the stomach contents of stranded Indo-Pacific humpback dolphins (*Sousa chinensis*) and finless porpoises (*Neophocaena phocaenoides*) from Hong Kong waters. *Chemosphere* 63: 845-852.
7. Leung, C. C. M., Jefferson, T. A., **Hung, S. K.**, Zheng, G. J., Yeung, L. W. Y., Richardson, B. J. and Lam, P. K. S. 2005. Petroleum hydrocarbons, polycyclic aromatic hydrocarbons, organochlorine pesticides and polychlorinated biphenyls in tissues of Indo-Pacific humpback dolphins from south China waters. *Marine Pollution Bulletin* 50: 1713-1744.
6. **Hung, S. K.** and Jefferson, T. A. 2004. Ranging patterns of Indo-Pacific humpback dolphins (*Sousa chinensis*) in the Pearl River Estuary, People's Republic of China. *Aquatic Mammals* 30: 157-172.
5. Jefferson, T. A. and **Hung, S. K.** 2004. A review of the status of the Indo-Pacific humpback dolphin in Chinese waters. *Aquatic Mammals* 30: 147-156.
4. Wang, J. Y., **Hung, S. K.** and Yang, S. C. 2004. Records of Indo-Pacific humpback dolphins, *Sousa chinensis* (Osbeck, 1765), from the waters of western Taiwan. *Aquatic Mammals* 30: 187-194.
3. Jefferson, T. A. and **Hung, S. K.** 2004. *Neophocaena phocaenoides*. *Mammalian Species* 746: 1-12.
2. Jefferson, T. A., **Hung, S. K.**, Law, L., Torey, M. and Tregenza, T. 2002. Distribution and abundance of finless porpoises in waters of Hong Kong and adjacent areas of China. *Raffles Bulletin of Zoology (Supplement)* 10:43-55.
1. **Hung, S. K.** 2000. Ranging patterns of Indo-Pacific humpback dolphins (*Sousa chinensis*) in the Pearl River Estuary, People's Republic of China. M.Sc. thesis. University of San Diego, USA, 187 p.

SELECTED PRESENTATIONS

- 2016** Threats and Conservation Issues on Chinese White Dolphins in Hong Kong. Oral presentation at the Chinese White Dolphin Population Viability Analysis Workshop, Hong Kong, 30 March - 1 April 2016.
- 2015** Impacts of coastal development on the Indo-Pacific humpback dolphins (*Sousa chinensis*) in Hong Kong. Oral presentation at the International Conference on Biodiversity, Ecology and Conservation of Marine Ecosystems, Hong Kong, 1-3 June 2015.
- 2014** Conservation issues of Pearl River Estuary population of *Sousa chinensis* with special reference on fisheries interaction. Oral presentation at the Symposium on Sustainable Fisheries and Conservation of the Eastern Taiwan *Sousa* Population, Tainan, 28-29 April 2014.
- 2013** Impacts of high-speed ferry traffic on Indo-Pacific humpback dolphins (*Sousa chinensis*) in Hong Kong. Oral presentation at the Twentieth Biennial Conference on the Biology of Marine Mammals, Dunedin, New Zealand, 9-13 December 2013.
- 2012** Biology and conservation status of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*). Oral presentation at the International Conference for the Release of Captive Dolphins, Seoul, South Korea, 9 May 2012.
- 2011** Temporal trends in abundance of Indo-Pacific humpback dolphins (*Sousa chinensis*) in Hong Kong waters (2001-2010). Oral presentation at the Nineteenth Biennial Conference on the Biology of Marine Mammals, Tampa, Florida, 27 November-2 December 2011.
- 2010** Long-term monitoring of Hong Kong Cetaceans – Implications for conservation and management. Oral presentation at the Workshop on Diversity of Marine Mammals Along the Asian Coasts, Tokyo, Japan, 26-28 August 2010.
- 2008** Habitat use of Indo-Pacific humpback dolphins (*Sousa chinensis*) in Hong Kong. Paper presented at the Symposium on Cetacean Research and Conservation across Taiwan Strait, Wuhan, China, 31-27 October 2008.
- 2005** Quantitative analysis of habitat use of Indo-Pacific humpback dolphins (*Sousa chinensis*) in Hong Kong waters. Poster presented at the 16th Biennial Conference on the Biology of Marine Mammals, San Diego, California, 12-16 December 2005.
- 2005** A review of the status of finless porpoises (*Neophocaena phocaenoides*) in Hong Kong waters. Paper presented at the Small Cetacean Subcommittee of the International Whaling Commission, Ulsan, South Korea, 31 May – 7 June 2005.
- 2004** Research Studies and Conservation Effort to protect Indo-Pacific Humpback Dolphins in HK and PRC. Papers presented at the 1st Symposium & Workshop on the Conservation and Research of *Sousa chinensis* in Taiwan, NMMBA, Taiwan, 23-27 February 2004.
- 2002** A review of cetacean research in Hong Kong and adjacent waters. Paper presented at the Second International Conference on the Marine Mammals of Southeast, Dumaguete City, Philippine, 22-26 April 2002.
- 2001** Records of Bryde's Whales (*Balaenoptera c.f. edeni*) along the coast of China. Poster presented at the Fourteenth Biennial Conference on the Biology of Marine Mammals, Vancouver, 28 November-3 December 2001.
- 2001** A review on biology and conservation of Chinese white dolphins (*Sousa chinensis*) and finless porpoise (*Neophocaena phocaenoides*) in Hong Kong waters. Paper presented at the Symposium on Conservation of Cetaceans in PRC, Shanghai, 11-15 March 2001.
- 1999** Home range characteristics of Indo-Pacific hump-backed dolphins in the Pearl River Estuary, PRC. Poster presented at the Thirteenth Biennial Conference on the Biology of Marine Mammals, Maui, 29 November-3 December 1999.

Marine Mammal Specialist (CV4)

Name: Dr. Lindsay Porter

ACADEMIC HISTORY

The University of Hong Kong, Hong Kong S.A.R.,

Ph.D. 1993-1999

*The Taxonomy, Ecology and Conservation of *Sousa chinensis* (Osbeck, 1765) (Cetacea: Delphinidae) in Hong Kong waters.*

The University of Glasgow, Scotland

B.Sc. (HONS) 1988-1992 Aquatic Bioscience

PROFESSIONAL AFFILIATIONS & MEMBERSHIPS

IUCN SSC-Cetacean Specialist Group

International Whaling Commission (IWC) Scientific Committee: Small Cetaceans Sub-Committee (Chair)

United Kingdom Government National Science Team (small cetaceans)

Marine Mammal Society: Awards and Scholarships Committee (Chair)

South East Asian Marine Mammal association (SEAMMAMS): Senior Advisor

Asian Marine Mammal Stranding Network: Collaborative Research Committee (Co-Chair)

Centre for Research on Indian Ocean Marine Mammals (CRIOMM):

International Advisory Panel (Member)

Society of Conservation Biology (SCB): Marine Liaison Officer Asia Section

Association for Tropical Biological and Conservation (ATBC): Treasurer

World Wide Fund for Nature (WWF): Advisor to the Board (Marine Policy)

WORK EXPERIENCE

Senior Research Scientist (2010 – present)

SMRU Hong Kong (The University of St. Andrews)

Job Duties: In the last twenty years, Lindsay has worked primarily within eastern hemisphere waters, leading projects in Hong Kong, China, Australia, Maldives, Sri Lanka, Vietnam, Cambodia, Malaysia, Indonesia, East Timor and South Africa. In Hong Kong, Lindsay has conducted primary research on both Chinese white dolphin (*Sousa chinensis*) and finless porpoise (*Neophocaena phocaenoides*) and is a specialist in these species. She has extensive experience consulting on major infrastructure projects and is fully versed in Hong Kong Environmental Permit requirements and the provision of professional environmental monitoring and mitigation practises. Lindsay has extensive experience using a variety of marine mammal research tools and techniques and has led surveys which have incorporated;

- photo-identification,
- visual and acoustic line transects,
- static passive acoustic monitoring,
- theodolite tracking,
- video surveillance,
- aerial transects (drones, helicopters and fixed wing)
- biopsy collection
- tag attachment.

Since 2001, Dr. Porter has delivered workshops on marine mammal surveys techniques with colleagues from the University of St Andrews, which is home to the Sea Mammal Research Unit, an internationally renowned marine mammal research institute. These workshops have included line transect and DISTANCE software courses; photo-ID procedures and databasing; passive acoustic monitoring systems and their deployment; and biopsy and sample collection. Lindsay is also a qualified marine mammal observer (MMO) and passive acoustic monitoring (PAM) operator trainer and holds MMO/PAM qualifications specific to Europe/the America's, Asia and Australia/New Zealand. Currently, Lindsay is focusing on three areas; the impact of several major construction projects in Hong Kong; the status of coastal marine mammal and turtle populations of Malaysia and, the impact of offshore windfarm development in Taiwan on Eastern Taiwan White dolphin (*S. chinensis taiwanensis*). These projects incorporate baseline status of important marine mammal species, assessment of impact from proposed construction works and development and implementation of monitoring and mitigation strategies for construction activities.

Dolphin Conservation Officer (2001-2009)

The World Wide Fund for Nature Hong Kong: Dolphin Conservation Officer.

Job Duties: Lindsay held a variety of positions within WWF; volunteer, consultant and member of staff. She generated most of the funding required to support her various research and community capacity projects. Her role was both to continue research on Chinese populations of marine mammals and to facilitate the dissemination of conservation information to the scientific community and the general public. In 2003, her role expanded to collaborate with regional WWF offices and authorities, including Indonesia, Timor-Leste, Australia, the Maldives and Sri Lanka. In this time, Lindsay conducted extensive offshore research surveys in the shared aquatic regions of Indonesia, Timor Leste and northern Australia.

PUBLICATIONS

Journal articles, book chapters and other published papers

- Parsons, E.C.M., Felley, M and Porter, L. 1995. An annotated checklist of cetaceans recorded from Hong Kong's territorial waters. *Asian Marine Biology* 12: 79-100.
- Ross, G.J.B., Heinsohn, G.E., Cockcroft, V.G., Parsons, E.C.M., Porter, L.J. and Preen, A. 1996. Review of the taxonomic status of the humpbacked dolphins, genus *Sousa*. Working paper UNEP/SEA95/WP19. 25pp. In Report of the Workshop on the Biology and Conservation of Small Cetaceans and Dugongs of Southeast Asia, Dumaguete, June 1995. (Ed. W.F. Perrin, M.L. Dolar, and M.N.R. Alava). UNEP (W)/EAS WG.1/2. Bangkok: United Nations Environment Programme.
- Corkeron, P.J., Morissette, N.M., Porter, L.J. and Marsh, H. 1997. Distribution and Status of Hump-backed dolphins, *Sousa chinensis*, in Australian waters. *Asian Marine Biology* 14: 49-60.
- Corpe, H.M., Thompson, P.M. and Porter, L.J. 1998. A Rapid Non-invasive Technique for Determining the Age of Young Harbour seals (*Phoca vitulina*). *Marine Mammal Science* 14:12-23.
- Porter, L. 2002. A re-description of *Sousa chinensis* (Osbeck, 1765) (Mammalia: Delphinidae) and designation of a neotype. *Bulletin of the Natural History Museum of London (Zool.)* 68(1): 27-37.
- Porter, L. and Morton, B. 2003. A Description of the First Intact Dwarf Sperm Whale from the South China Sea and a Review of Documented Specimens of the Kogiidae (Cetacea) from Hong Kong. *Systematics and Biodiversity* 1:43-52
- Porter, L. 2008. The Indo-Pacific humpback Dolphin. In *Australian Mammals* ed. S. van Dyck. Sydney: New Holland 836-7.
- Porter, L. 2008. The Pantropical Spotted Dolphin. In *Australian Mammals* ed. S. van Dyck. Sydney: New Holland 840-1.
- Porter, L. 2008. The Spinner Dolphin. In *Australian Mammals* ed. S. van Dyck. Sydney: New Holland 843- 4.
- Frere, C.; Hale, P.; Porter, L.; Cockcroft, V. and Dalebout, M. 2008. Phylogenetic analysis of mtDNA sequences suggests revision of humpback dolphin (*Sousa* spp.) taxonomy is needed. *Marine and Freshwater Research* 59(3):259-268.

- Wenzhi Lin, Ruilian Zhou, Lindsay Porter, Jialin Chen and Yuping Wua 2010. Evolution of *Sousa chinensis*: A scenario based on mitochondrial DNA study. *Molecular Phylogenetics and Evolution* doi:10.1016/j.ympev.2010.07.012
- Frère, C., Seddon, J., Palmer, C., Porter, L. and Parra, G.J. 2011. Multiple lines of evidence for an Australasian geographic boundary in the Indo-Pacific humpback dolphin (*Sousa chinensis*): population or species divergence? *Conservation Genetics* DOI 10.1007/s10592-011-0242-9
- Van Bresse M.F., Minton G., Sutaria D., Kelkar N., Peter, C., Zulkarnaen, M., Mansur, R.M., Porter, L., Rodriguez Vargas, L. and Rajamani, L. 2014. Cutaneous nodules in Irrawaddy dolphins: an emerging disease in vulnerable populations. *Dis Aquat Org* 107:181-189
- Priyadarshana, T., Randage, S.M., Alling, A., Calderan, S., Gordon, J., Leaper, R. and Porter, L., 2015. Distribution patterns of blue whale (*Balaenoptera musculus*) and shipping off southern Sri Lanka. *Regional Studies in Marine Science*.
- Karczmarski, L., Huang, S.L., Or, C.K., Gui, D., Chan, S.C., Lin, W., Porter, L., Wong, W.H., Zheng, R., Ho, Y.W. and Chui, S.Y., 2016. Chapter Two-Humpback Dolphins in Hong Kong and the Pearl River Delta: Status, Threats and Conservation Challenges. *Advances in Marine Biology*, 73, pp.27-64.
- Minton, G., Poh, A.N.Z., Peter, C., Porter, L. and Krebs, D., 2016. Chapter Six-Indo-Pacific Humpback Dolphins in Borneo: A Review of Current Knowledge with Emphasis on Sarawak. *Advances in Marine Biology*, 73, pp.141-156.
- Würsig, B., Parsons, E.C.M., Piwetz, S. and Porter, L., 2016. Chapter Three-The Behavioural Ecology of Indo-Pacific Humpback Dolphins in Hong Kong. *Advances in Marine Biology*, 73, pp.65-90.
- Pine, M.K., Wang Ding, Porter, L. & Wang, K. 2018. Investigating the spatio-temporal variation of fish choruses to help identify important foraging habitat for Indo-Pacific humpback dolphins, *Sousa chinensis*. *ICES Journal of Marine Science*

Conference and working papers

- Porter, L. 1995. Surveys of *Sousa chinensis* in the estuary of the Pearl River by boat and helicopter. In the proceedings of The Conference on Conservation of Marine Mammals in Fujian, Hong Kong and Taiwan. (Ed. Huang Zongguo, S. Leatherwood, J. Woo and Liu Wenhua). *Journal of Oceanography in the Taiwan Strait (Special Publication 4)*. 32-4 [In Chinese].
- Cockcroft, V.G., Leatherwood, S., Goodwin, J. and Porter, L. 1997. The phylogeny of humpback dolphins Genus *Sousa*: insights through mtDNA analyses. Presented at The 49th International Whaling Commission Meeting, Scientific Committee Annual Meeting, Bournemouth, United Kingdom, September-October 1997. SC/49/SM25
- Porter, L., Parsons, E.C.M. and Morton, B.S. 1997. The Status and Biology of the Chinese White Dolphin (Indo-Pacific Humpback dolphin: *Sousa chinensis*) in Hong Kong: Recommendations for its Conservation and Management. Hong Kong: Hong Kong University. 300pp.
- Porter, L. 1997. Dolphin research at The Swire Institute of Marine Science. In Proceedings of the Colloquium and Workshop for the Management of the Chinese White Dolphin, Hong Kong 1996, 19-26. Hong Kong: The Government of the Hong Kong Special Administrative Region.
- Porter, L. 1998. The Taxonomy, Ecology and Conservation of *Sousa chinensis* (Osbeck, 1765) (Cetacea: Delphinidae) in Hong Kong waters. PhD. thesis, The University of Hong Kong, Hong Kong.
- Porter, L., Chappel, O. and Gordon, J. 1998. A Preliminary acoustic survey for Finless Porpoise (*Neophocaena phocaenoides*) in Hong Kong SAR coastal waters. Hong Kong: the Worldwide Fund for Nature Hong Kong. 10pp
- Porter, L. 2002. Epimeletic Behaviour in *Sousa chinensis*: Implications for Management. Presented at The 54th International Whaling Commission Meeting, Scientific Committee Annual Meeting, Shimonoseki, Japan May – June 2004. SC/54/SM16.
- Porter, L. 2004. The Abundance and Distribution of Indo-Pacific Humpback dolphin (*Sousa chinensis*) within the Pearl River Estuary. Final Report prepared for the State Oceanic Administration of the Peoples Republic of China. [In Chinese and English].
- Porter, L. 2004. Co-operation under the auspices of Convention of Migratory Species; An example of multiple country collaboration in the Timor Sea Marine Mammal Research Initiative. In Conserving Whales and Dolphins in Australian Waters: National Research Partnerships Workshop, Ballina, Australia 2-4 May, 2004.

- Porter, L. and Azeez, A. 2004. The Importance of The Maldivian Atoll System for Marine Mammals. Presented at Biology in Asia Conference, National University of Singapore, December 7-10, 2004.
- Porter, L., Gordon, J. and Chappell, O. 2005. Use of an Automated Acoustic Detection System for Finless Porpoise (*Neophocaena phocaenoides*) in the South China Sea. Presented at The 57th International Whaling Commission Meeting, Scientific Committee Annual Meeting, Ulsan, Korea, May – June 2005. SC/57/SM14.
- Pan, W., Porter, L., Qin D., Long Y., Jin, T. Liang, Z., Wang D., Su Y., Pei, Z. and Van Waerebeek, K. 2006. The Importance of the Indo-Pacific Humpback Dolphin (*Sousa chinensis*) Population of Sanniang Bay, Guangxi Province, PR China: Recommendations for Habitat Protection. Presented at The 58th International Whaling Commission Meeting, Scientific Committee Annual Meeting, St. Kitts, Caribbean, May – June 2006. SC/58/SM18
- Porter, L. and Corkeron, P. 2006. The Conservation of Lesser Known Tropical Marine Delphinids. A workshop report at the Sixteenth Biennial Conference of the Biology of Marine Mammals, San Diego, 2005. 20pp.
- Wilson, B., Porter, L., Gordon, J., Hammond, J., Hodgins, N., Wei, L., Lin, J., Lusseau, D., Tsang, A., Van Waerebeek, K. and Wu Y.P. 2008. A Decade of Management Plans, Conservation Initiatives and Protective Legislation for Chinese White Dolphin (*Sousa chinensis*): An Assessment of Progress and Recommendations for Future Management Strategies in the Pearl River Estuary, China. Workshop Report, 7-11 April, 2008. Hong Kong: WWF Hong Kong 65pp
- Ling, S.N. and Porter, L.J. 2011. Dolphin Populations in the Kinabatangan: Questionnaire Survey of Fishermen. Report to LEAP 32pp
- Porter, L.J., Wood, J and Davies, R. 2015. The Indo-Pacific Humpback Dolphin and The Hong Kong-Zhuai- Macao Bridge: Building Bridges Between Science and Management. The Twenty First Biennial Conference of the Biology of Marine Mammals, San Francisco, 2015.
- Porter, L.J. and Ruxton, J. 2017. A Journey from Analogue to Digital: the Intertwining Paths of Scientific Investigation and Media Reporting Across a Twenty Years Study of Hong Kong's Iconic Dolphin. The Twenty Second Biennial Conference of the Biology of Marine Mammals, Halifax, 2017
- Porter, L.J., Lai, H.Y. Le Double, S. and Scheidat, M. 2017. The Habitat Use and Behavior of Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) in Hong Kong SAR waters. The Twenty Second Biennial Conference of the Biology of Marine Mammals, Halifax, 2017
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- Porter, L.J. 2018. Dams and Dolphins: Investigating Impacts and Making Management Decisions. The ATBC Asia Pacific Meeting, Kuching, Sarawak, Malaysia.
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- Porter, L.J. and Nian, L.S. 2018. People, Dolphins and Fishes of the Kinabatangan River, Sabah. The Society of Conservation Biology, The 5th International Marine Conservation Congress (IMCC5), Kuching, Sarawak, Malaysia.
- Porter, L.J., Lee, K.M. and Pine, M. 2018. Habitat use and behavior of Indo-Pacific humpback dolphins (*Sousa chinensis*) and Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) in Hong Kong SAR waters. The Society of Conservation Biology, The 5th International Marine Conservation Congress (IMCC5), Kuching, Sarawak, Malaysia.

Marine Mammal Specialist (CV5)

Name: Ms. Julia Chan

ACADEMIC HISTORY

*The University of Hong Kong, Hong Kong S.A.R.,
M.Sc. 2001-2003 Environmental Management.*

*The University of Hong Kong, Hong Kong S.A.R.,
B.Sc. (HONS) 1996-1999 Environmental Science*

PROFESSIONAL AFFILIATIONS & MEMBERSHIPS

*Environmental Management Association of Hong Kong (EMAHK): Member
Chartered Institute of Water and Environmental Management(CIWEM): Member
Hong Kong Institute of Qualified Environmental Professionals(HKIQEP): Member*

WORK EXPERIENCE

Associate Director - Environment (2009 – present)

Mott MacDonald Hong Kong Limited

Job duties: Specialised in nature and wetland conservation, ecological and fisheries monitoring, ecological and fisheries impact assessment, stream conservation and eco-enhancement channel design. Project management and coordination of environmental assessment and experience in stakeholders consultation.

Ecological Surveyor (2002-2005)

Agriculture, Fisheries and Conservation Department

Assistant Environmental Scientist (1999-2002)

Black & Veatch

Project Experience

Expansion of Hong Kong International Airport (HKIA) into a Three-Runway System (3RS)

Job duties: As Environmental Team Leader and Marine Ecology Specialist, assist in updating EM&A Manual and event action plan regarding Chinese White Dolphin monitoring. Provide training to Dolphin Observers in implementation of dolphin exclusion zone (DEZ) as part of the 3RS project mitigation measures. Support professional liaison group and green non-governmental organisations round table meeting consultation

Development at Siu Ho Wan and the Associated Transport Infrastructures (Feasibility Study)

Job duties: As Project Manager, co-ordinate the terrestrial ecological review and 12-month marine mammal monitoring by land-based theodolite tracking at Siu Ho Wan and Lung Kwu Tan areas.

Improvement Dredging for Lamma Power Station Navigation Channel Pre-construction Phase

Job duties: As Qualified Ecologist, provide ecological advice and review of the ecological (finless porpoise, green turtle, corals, inter-tidal communities and sub-tidal benthos) and fisheries baseline of the study area, for the fulfil of environmental permit conditions prior to the commencement of marine dredging works.

Engineering Feasibility and Environmental Assessment Study for Airport Master Plan 2030

Job duties: As Marine Ecology Team Leader, co-ordinate the marine ecological assessment for the project, conducting marine mammal land-based surveys trained by international dolphin experts and giving advices on the options selection

through the analysis of marine ecological baseline findings and recommends mitigation measures for any adverse marine ecological impacts identified. The project involves intensive study in selecting the most desirable option of the 3RS.

Expansion of Hong Kong International Airport into a Three-Runway System – Dolphin Exclusion Zone (DEZ) Monitoring for Site Investigation Works of HDD in Sha Chau

Job duties: As DEZ Monitoring Team Leader, lead the DEZ monitoring team to implement a 250m radius DEZ for 3 borehole locations within Sha Chau and Lung Kwu Chau Marine Park during the course of the SI works. Marine Ecology Team Leader responsible for preparing the specifications for dolphin monitoring for the implementation of DEZ for the site investigation works.

Expansion of HKIA into a Three-Runway System (3RS) EIA

Job duties: As Environmental Specialist, responsible for coordinating and design of methodology for marine ecological surveys and fisheries baseline surveys and carry out marine ecological and fisheries impact assessment. Provide recommendations on mitigation measures (including marine park establishment, marine traffic diversion, eco- shoreline enhancement), marine ecological and fisheries enhancement strategy, providing technical input and participating in technical briefing groups for dolphin and marine ecology, green groups consultation, public forum and other stakeholders' engagement activities.

Preliminary Environmental Review for Reconstruction of Pak Kok Pier on Lamma Island

Job duties: As Marine Ecology and Fisheries Specialist, conduct PER for the support of reconstruction of existing pier, recommendation of environmental monitoring and mitigation measures, supervise and oversee the marine ecological and fisheries impact assessment.

Project Formosa – Critical Habitat Assessment, Taiwan

Job duties: As Marine Mammals Specialist, conduct a critical habitat assessment for the project, which has identified the subpopulation of Indo-pacific humpback dolphin of Eastern Taiwan Strait that may trigger the categorization of critical habitat as defined in the International Finance Corporation (IFC).

Guidelines for Risk Assessment and Mitigation of Developing Offshore Wind Farms in Taiwan

Job duties: As Ecologist responsible for conducting research on risks relating to the development of offshore wind farms on endangered marine species (especially green sea turtle and white dolphin) and marine species of conservation concern in Taiwan. Provide guidelines for mitigating the potential high risk on marine ecology due to the construction and operation of the proposed development