

6b. ECOLOGICAL IMPACT (BOTH TERRESTRIAL AND AQUATIC) (ARTIFICIAL ISLAND NEAR SKC)

6b.1 Introduction

6b.1.1.1 The EIA report has identified the proposed Project Site as an important habitat for Finless Porpoise. The shoreline within the study area was also identified to be supporting 15 coral species (8 hard corals and 7 octocorals). An active nest of White-bellied Sea Eagle had been previously recorded at the southwest of Shek Kwu Chau within hillside shrubland. Adverse impacts on the habitats of Finless Porpoise, coral communities, and the nest of White-bellied Sea Eagle have been predicted due to the proposed Project.

6b.1.1.2 Specific mitigation measures have been recommended for Finless Porpoise, corals, and White-bellied Sea Eagle in the EIA report, with the aim to minimize potential direct and indirect impacts. With the implementation of the recommended measures, adverse impacts from the construction and operation of the proposed Project on the concerned fauna groups should be minimised.

6b.1.1.3 This section describes the specific mitigation measures and the requirements for monitoring and auditing recommended for Finless Porpoise, corals, and White-bellied Sea Eagle.

6b.2 Ecological Mitigation Measures

6b.2.1 *Specific Measures to Minimise Disturbance on Finless Porpoise*

Minimisation of habitat loss for Finless Porpoise

6b.2.1.1 In order to minimise the potential loss of important habitat for Finless Porpoise, substantial revision has been made on the layout plan of the breakwater. The revised layout of the breakwater has greatly reduced the size of the embayment area. Moreover, the newly proposed breakwater form (circular cells) has also reduced the size of the footprint. As a result, the total habitat loss (including reclamation and embayment) for Finless Porpoise has reduced from ~50 ha, down to ~31 ha.

Avoidance of peak season for Finless Porpoise occurrence

6b.2.1.2 In order to minimise potential acoustic disturbance from construction activities on Finless Porpoise, construction works that may produce underwater acoustic disturbance should be scheduled outside the months with peak Finless Porpoise occurrence (December to May), including:

- sheet piling works for construction of cofferdam surrounding the reclamation area (Phase 1);
- sheet piling works for construction of the shorter section of breakwater (Phase 1);
- sheet piling works for construction of the remaining section of breakwater (Phase 3);
- bored piling works for berth area (Phase 3); and
- submarine cable installation works between Shek Kwu Chau and Cheung Sha.

6b.2.1.3 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.

Opt for quieter construction methods and plants

6b.2.1.4 In order to minimise underwater acoustic disturbance on Finless Porpoise, quieter construction methods and plants should be adopted:

- 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 circular cells structure for breakwater and reclamation peripheral structure is proposed. A quieter sheet piling method using vibratory hammer or hydraulic impact hammer, would be adopted for the installation of circular cells for cellular cofferdam and northern breakwater during Phase 1, and southern breakwater Phase 3;
- Non-percussive bore piling method would be adopted for the installation of tubular piles for the berth construction during Phase 3.

Monitored exclusion zones

6b.2.1.5 During the installation/re-installation/relocation process of floating type silt curtains, in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains, a monitored exclusion zone of 250 m radius from silt curtain should be implemented. The exclusion zone should be closely monitored by an experienced marine mammal observer at least 30 minutes before the start of installation/re-installation/relocation process. 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.

6b.2.1.6 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 observer should also be independent from the project proponent and has the power to call-off construction activities.

6b.2.1.7 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.

Marine mammal watching plan

6b.2.1.8 Upon the completion of floating type silt curtain installation/re-installation/relocation, all marine works would be conducted within a fully enclosed environment within the silt curtain (as shown in **Appendix 5.5** of the EIA Report), hence exclusion zone monitoring would no longer be required. Subsequently, a marine mammal watching plan would be implemented. The plan would include regular inspection of silt curtains, and visual inspection of the waters surrounded by the curtains. 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 50 m opening. An action plan should be devised to cope with any unpredicted incidents such as the case when marine mammals are found within the waters surrounded by the silt curtains.

Small openings at silt curtains

6b.2.1.9 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 as small as possible to minimise the risk of accidental entrance.

Adoption of regular travel route

- 6b.2.1.10 In order to minimize the disruption on marine mammal's behavioural pattern during construction and operation phases, captains of all vessels should adopt regular travel route, in order to minimize the chance of vessel collision with marine mammals, which may otherwise result in damage to health or mortality.
- 6b.2.1.11 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, 2010a). 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.

Vessel speed limit

- 6b.2.1.12 In order to minimise potential injury and mortality of marine mammals due to collision with vessels during construction (working vessels) and operation phases (4 round trips/day for MSW vessel, and 12 round trips/day for visitor/staff shuttle ferry), a speed limit of ten knots should be strictly enforced within areas with high density of Finless Porpoise, as identified in the latest *Monitoring of Marine Mammals in Hong Kong Waters* (AFCD, 2010a). The recommend area where speed limit should be adopted include the grids Q30, Q31, and R31 (**Figure 6b.2**).
- 6b.2.1.13 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 minimised to acceptable level.
- 6b.2.1.14 Passive acoustic monitoring and land-based theodolite monitoring surveys should be adopted to verify the predicted impacts and effectiveness of the proposed mitigation measures.

Training of staff

- 6b.2.1.15 In order to ensure that all staff, including captains of vessels, are aware of the guidelines for safe vessel operations in the presence of cetaceans during construction and operation phases, adequate trainings should be provided.

Designation of Marine Park

- 6b.2.1.16 Loss of 31 ha of marine habitat would be permanently resulted from the reclamation and breakwater construction at the southwestern waters of Shek Kwu Chau. The proposed works area is of high ecological value, as it is identified as an important habitat for Finless Porpoise; hence high level of adverse impact is predicted. As minimisation measures are exhausted, compensatory measure is therefore required.
- 6b.2.1.17 According to the Finless Porpoise data recorded between 2004 and 2009 (AFCD, 2010a), the waters between Shek Kwu Chau and Soko Islands is the nearest area to the proposed Project that has high sighting concentration of Finless Porpoise than the rest of the nearby waters. In addition, the extent of Finless Porpoise habitat is the most continuous and connected to other nearby important habitats of marine mammals, i.e. Soko Islands, which has records of both Finless Porpoise and Chinese White Dolphin.
- 6b.2.1.18 The Project Proponent has made a firm commitment to seek to designate an approximate area of 700 ha in the waters between Soko Islands and Shek Kwu Chau as a marine park,

in accordance with the statutory process stipulated in the Marine Parks Ordinance, as a compensation measure for the habitat loss arising from the construction of the IWMF at an artificial island near SKC.

- 6b.2.1.19 The firm commitment to seek to designate the marine park, where incompatible activities would be regulated and proper management regime imposed in accordance with the Marine Park Ordinance, would significantly help conserve Finless Porpoise, and hence serve as an effective compensation measure for the permanent loss of Finless Porpoise habitat arising from the project. The Project Proponent shall seek to complete the designation by 2018 to tie in with the operation of the IWMF at an artificial island near SKC.
- 6b.2.1.20 A further study should be carried out to review relevant previous studies and collate available information on the ecological characters of the proposed area for marine park designation; and review available survey data for Finless Porpoise, water quality, fisheries, marine traffic and planned development projects in the vicinity. Based on the findings, ecological profiles of the proposed area for marine park designation should be established, and the extent and location of the proposed marine park be determined. The adequacy of enhancement measures should also be reviewed.
- 6b.2.1.21 In addition, a management plan for the proposed marine park should be proposed, covering information on the responsible departments for operation and management (O&M) of the marine park, as well as the O&M duties of each of the departments involved. Consultation with relevant government departments and stakeholders should be conducted under the study. The study should be submitted to Director of Environmental Protection (DEP) for approval before the commencement of construction works.
- 6b.2.1.22 The Project Proponent should provide assistance to AFCD during the process of the marine park designation.

6b.2.2 Specific Measures to Minimise Impact on Corals

Coral translocation

- 6b.2.2.1 According to the results of the existing REA surveys, all 198 coral colonies to be directly affected by the proposed Project were attached to movable rocks, which are less than 50 cm in diameter. Translocation of the potentially affected corals is technically feasible to avoid direct loss. With the implementation of coral translocation prior to the construction works, no loss of coral colonies would be expected. Coral translocation should be carried out during the winter season (November to March) in order to avoid the spawning season of corals (July to October) (Lam, 2000; Storlazzi, 2004). The health status of translocated corals should be regularly monitored after the translocation works.
- 6b.2.2.2 Prior to coral translocation, a more detailed baseline survey, including a coral mapping survey, is recommended to further confirm the exact number and location of coral colonies within the potentially affected area. A more detailed coral translocation plan, including selection of suitable recipient site, plan for coral translocation, and event / action plan for coral monitoring should be submitted upon approval of this Project, prior to commencement of construction works. Advice from relevant governmental departments (e.g. AFCD) and professionals would be sought after, in order to identify a desirable location for the relocation of coral communities. Post-translocation monitoring on the translocated corals should also be considered.

Coral monitoring programme

- 6b.2.2.3 A coral monitoring programme is recommended to assess any adverse and unacceptable impacts to the coral communities at the coasts of Shek Kwu Chau during construction of the Project.

6b.2.3 Specific Measures to Minimise Disturbance on Breeding White-bellied Sea Eagle

Avoidance of noisy works during the breeding season of White-bellied Sea Eagle

6b.2.3.1 In order to minimise potential construction noise disturbance on WBSE to acceptable level, noisy construction works should be scheduled outside their breeding season (December to May) to minimise potential degradation in breeding ground quality and breeding activities. Works that are recommended to adopt such measure include:

- sheet piling works for construction of cofferdam surrounding the reclamation area (Phase 1);
- sheet piling works for construction of the shorter section of breakwater (Phase 1);
- sheet piling works for construction of the remaining section of breakwater (Phase 3); and
- bored piling works for berth area (Phase 3).

Opt for quieter construction methods and plants

6b.2.3.2 In order to minimise potential construction noise disturbance on WBSE, quieter construction methods and plants should be adopted. The recommended noise mitigation measures in should be implemented to minimise potential noise disturbance to acceptable levels.

Restriction on vessel access near the nest of White-bellied Sea Eagle

6b.2.3.3 During construction and operation, in order to minimise disturbance on the existing WBSE nest, a pre-defined practical route to restrict vessel access near the nest should be adopted to keep vessels and boats as far away from the nest as possible.

White-bellied Sea Eagle monitoring programme

6b.2.3.4 A WBSE monitoring programme is recommended to assess any adverse and unacceptable impacts to the breeding activities of WBSE during construction and operation of the Project. Monitoring surveys for WBSE would include pre-construction phase, construction phase, and operation phase.

Education of staff

6b.2.3.5 Staff, including captains of all vessels during construction and operation phases, should be aware of the ecological importance of WBSE. Awareness should be raised among staff to minimise any intentional or unintentional disturbance to the nest.

Minimisation of Glare Disturbance

6b.2.3.6 To minimise glare disturbance on WBSE, which may cause disorientation of birds by interfering with their magnetic compass, and disruption in behavioural patterns such as reproduction, fat storage and foraging pattern, any un-necessary outdoor lighting should be avoided, and in-ward and down-ward pointing of lights should be adopted.

6b.3 Marine Mammal Monitoring

6b.3.1 Introduction

6b.3.1.1 The marine mammal monitoring programme would focus on Finless Porpoise, as the study area has been identified as a hotspot for this species. The monitoring would verify the predicted impacts, 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.

6b.3.2 Vessel-based Line-transect Survey

6b.3.2.1 The survey methodology should remain the same as that adopted during the EIA study to allow fair comparison of marine mammal monitoring results (**Figure 6b.1**), as well as the proposed marine park for the compensation of loss of important habitat for Finless Porpoise. The marine mammal monitoring programme should cover pre-construction phase, construction phase, and operation phase.

6b.3.2.2 To determine the baseline condition of Finless Porpoise occurrence in the study area, pre-construction phase monitoring of Finless Porpoise should be conducted twice a month for the duration of three months (any three months within the peak season for Finless Porpoise occurrence – December to May) before the commencement of works. Throughout the construction phase involving marine construction works, monitoring of Finless Porpoise should be conducted twice per month during the peak season for Finless Porpoise, and once per month during the off-peak season. For operation phase, monitoring of Finless Porpoise should last for 1 year, following the survey frequency adopted during construction phase.

6b.3.2.3 For construction and operation phase monitoring, surveys for all 4 seasons should be covered, 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). After analysis of the data, the results would allow the detection of any changes of their usage of habitat, in response to the proposed construction works.

6b.3.2.4 The line-transect monitoring survey should be led by suitably qualified persons with recognisable experience in marine mammal monitoring survey. The methodology for marine mammal monitoring should be consulted with the Agriculture, Fisheries and Conservation Department (AFCD) before the commencement of the monitoring programme.

6b.3.2.5 Two experienced observers, a data recorder and a primary observer, should make up the on-effort survey team. The survey vessel should transit different transect lines at a constant speed of 13-15 km per hour. The data recorder should search for signs of marine mammals with unaided eye and fills out the datasheets; and the primary observer should search continuously through a pair of marine binoculars. Both observers should search the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°).

6b.3.2.6 During on-effort survey periods, the survey team should record effort data including time, position (latitude and longitude), weather conditions (Beaufort sea state and visibility) and distance travelled in each series (a continuous period of search effort), with the assistance of a professional GPS. Two additional experienced observers should 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.

6b.3.2.7 When marine mammals are sighted, the survey team should end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as sighting time and position. The research vessel should then

divert from its course to approach the animals for species identification, group size estimation, group composition assessment, behavioural observations, and collection of identification photos. The perpendicular distances (PSD) of the dolphin groups to the transect line should be calculated from the initial sighting distance and angle.

6b.3.3 Active Acoustic Monitoring

6b.3.3.1 Active acoustic monitoring aims to study the acoustic behaviour of Finless Porpoise in relation to the presence and absence of vessels, and their associated underwater acoustic disturbance. Hydrophones should be deployed from stationary boat to record noise data from vessels and Finless Porpoise.

6b.3.3.2 With the recorded data, analysis on whether 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.

6b.3.3.3 Approximately 30 days of field work should be carried out during the peak occurrence period of Finless Porpoise (December to May), with the main focus on operation phase where traffic of MSW vessels and visitor/staff shuttle ferry is regular. Details of the active acoustic monitoring methodology and frequency should be agreed with AFCD.

6b.3.4 Passive Acoustic Monitoring

6b.3.4.1 Passive acoustic monitoring aims to study the utilisation of an area by Finless Porpoise. An array of automated static porpoise detectors (e.g. C-POD) should be deployed at different locations within and outside the Project Area to detect the unique ultra-high frequency sounds produced by Finless Porpoise during pre-construction, construction and operation phases. Porpoise detectors would be left on-site over the monitoring period, the utilisation of the area by Finless Porpoise would be monitored 24-hours a day and under any weather conditions. The monitoring results should be used to verify the predicted impacts and the effectiveness of the proposed mitigation measures.

6b.3.4.2 Porpoise detectors should be deployed approximately 30 days before works commence (baseline), 30 days during construction, and 30 days during operation phase. The recorded data should provide an overview on utilisation of the area by marine mammals, as well as to identify any differences between work stages.

6b.3.4.3 The final number, position, and duration of the porpoise detector deployment should be agreed with AFCD.

6b.3.5 Land-based Theodolite Tracking

6b.3.5.1 The objective of the land-based theodolite tracking of Finless Porpoise is to study their movement and behavioural pattern in response to the presence of marine vessels and their associated underwater acoustic disturbance within and around the Project Area.

6b.3.5.2 With a well-positioned theodolite from un-obstructed vantage points at a height above the monitoring area, the movement and behavioural patterns of marine mammals could be monitored. Theodolite tracking records the geographic positions (Longitude and Latitude) of groups and individuals during the monitoring period, providing information on the target's distance from shore, depth of water, distance from anthropogenic activities, and relative speeds and orientations; as well as measurements of leg (one point to another) speeds, re-orientations, distance made-good over time, and other movement related parameters.

6b.3.5.3 The survey should cover pre-construction phase to obtain baseline movement and behavioural pattern of Finless Porpoise within and near the Project Area, and construction

and operation phases to verify the predicted marine traffic impacts on Finless Porpoise, as well as the effectiveness of the proposed mitigation measures.

- 6b.3.5.4 The frequency of monitoring is likely to comprise 30 days for each of the phases. Details of the land-based theodolite tracking methodology and frequency should be agreed with AFCD.

6b.3.6 Land-based Monitoring of Channel between the IWMF and Shek Kwu Chau

- 6b.3.6.1 Although the trapping of marine mammals within the channel was predicted to be unlikely in the EIA report; however in view of their conservation importance, precautionary land-based monitoring of channel for potential trapping of marine mammals by site staff during operation phase should be adopted to verify the impact predication. The monitoring frequency should be once per week for duration of one year during operation phase.

- 6b.3.6.2 Should any trapping occurs, the site staff must contact responsible parties immediately, i.e. AFCD or specialist, for rescue.

6b.3.7 Exclusion Zone

- 6b.3.7.1 During the installation/re-installation/relocation process of floating type silt curtains, in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains, a monitored exclusion zone of 250 m radius from silt curtain should be implemented. The exclusion zone should be closely monitored by an experienced marine mammal observer at least 30 minutes before the start of installation/re-installation/relocation process. 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.

- 6b.3.7.2 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 observer should also be independent from the project proponent and has the power to call-off construction activities.

- 6b.3.7.3 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.

6b.3.8 Marine Mammal Watching Plan

- 6b.3.8.1 Upon the completion of floating type silt curtain installation/re-installation/relocation, all marine works would be conducted within a fully enclosed environment within the silt curtain (as shown in **Appendix 5.5** of the EIA Report), hence exclusion zone monitoring would no longer be required. Subsequently, a marine mammal watching plan would be implemented. The plan would include regular inspection of silt curtains, and visual inspection of the waters surrounded by the curtains. 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 50 m opening. An action plan should be devised to cope with any unpredicted incidents such as the case when marine mammals are found within the waters surrounded by the silt curtains.

6b.3.9 Assessment and Evaluation of Monitoring Results

- 6b.3.9.1 A final marine mammal monitoring report should be submitted to AFCD for comments upon completion of the monitoring survey. The report should contain a summary of the survey findings during the entire monitoring programme, and assessment on the effectiveness of the mitigation measures implemented.

- 6b.3.9.2 Evaluation of results should take natural fluctuations and accidental human-induced events (e.g. oil spill) into account. The monitoring results between the EIA study, AFCD's long term marine mammal monitoring programme, and the construction phase, should be compared. Any significant difference should be identified and evaluated.

6b.4 Coral Monitoring Programme

6b.4.1 Introduction

- 6b.4.1.1 A coral monitoring programme is recommended to verify the predicted impacts, and examine whether the mitigation measures recommended in the EIA report have been effectively implemented to protect the corals along the shore of Shek Kwu Chau from negative impacts from construction activities.

6b.4.2 Coral Monitoring Survey

- 6b.4.2.1 The coral monitoring programme should comprise 3 phases: pre-construction phase, construction phase, and operation phase (one year after the completion of construction works).
- 6b.4.2.2 To monitor the health condition of corals during different phases, corals located within areas likely to be affected by the Project, and corals located at control sites (areas unlikely to be affected by the Project) should be chosen, in order to identify any adverse indirect impact from the marine works. The size, percentage cover and health condition of corals at representative transects should be recorded during each monitoring.
- 6b.4.2.3 All monitoring should be led by suitably qualified persons with recognisable experience in coral monitoring survey. The survey methodology should remain the same during different phases, in order to allow direct comparison of coral monitoring results among different phases.
- 6b.4.2.4 The methodology for coral monitoring programme should be consulted with the Agriculture, Fisheries and Conservation Department (AFCD) before the commencement of the monitoring programme. A more detailed coral monitoring plan, including which coral species and colonies to be monitored, methodology, monitoring frequency, and Event and Action Plan for coral monitoring should be submitted upon approval of this Project, prior to commencement of construction works.

6b.4.3 Post-translocation Coral Monitoring Survey

- 6b.4.3.1 A post-translocation monitoring survey for the translocated corals should also be included in the coral monitoring programme. A more detailed post-translocation monitoring plan, including selection of recipient site, plan and time for coral translocation, and Event and Action Plan, should be submitted to AFCD for agreement before the commencement of the monitoring programme.

6b.4.4 Coral Monitoring Methodology

Pre-construction Phase Monitoring

- 6b.4.4.1 A pre-construction monitoring should be conducted before commencement of construction works, in order to confirm the locations of coral communities identified during the EIA study. Spot check dive surveys should be qualitatively conducted at the sites where corals were previously identified during the EIA study.
- 6b.4.4.2 If corals are identified, mitigation measures for adverse water quality impact should be proposed and their effectiveness evaluated. Other than adoption of silt curtains and

closed grab dredger, the possibility of coral translocation should also be considered to further minimise the adverse impacts on coral communities.

- 6b.4.4.3 A detailed coral translocation plan and a suitable translocation site should be proposed, and agreed by AFCD prior to the commencement of works.

Construction Phase Monitoring

- 6b.4.4.4 Representative patches of coral communities within areas likely to be affected by the Project (impact site) should be monitored for their health condition and tolerance to the construction disturbance. Other than the impact site, corals located at areas unlikely to be affected by the Project (control site) should also be identified and included in the monitoring programme to allow fair evaluation of the health condition of corals.

- 6b.4.4.5 If coral translocation were adopted as a mitigation measure during the pre-construction phase monitoring, such corals should also be monitored for their health condition during construction phase.

Operation Phase Monitoring

- 6b.4.4.6 Upon completion of construction works, monitoring of the corals at impact site and control site should be conducted for a duration of one year after the completion of construction works.

- 6b.4.4.7 If coral translocation were adopted as a mitigation measure during the pre-construction phase monitoring, such corals should also be monitored for their health condition during operation phase.

- 6b.4.4.8 A final coral monitoring report with photos should be submitted to AFCD for comments upon completion of the post-project monitoring survey. The report should contain a summary of the activities, assessment of health conditions of the corals during the entire monitoring programme, and assessment on the effectiveness of the mitigation measures implemented.

6b.5 White-bellied Sea Eagle Monitoring Programme

- 6b.5.1.1 Noting the recordable breeding success of the WBSE nest at Shek Kwu Chau since 2006, and the current undisturbed nature of the location of the nest; with the implementation of the proposed mitigation measures during construction and operation phases, the possibility of WBSE nest abandonment still remains.

- 6b.5.1.2 A White-bellied Sea Eagle monitoring programme should be carried out to assess any adverse and unacceptable indirect impacts from the Project, especially for the nest of White-bellied Sea Eagle located about 60 m above ground within a hillside shrubland habitat, 130 m in-land from shore, and about 550 m away from the proposed reclaimed land, with no human access. The monitoring programme should comprise 3 phases: pre-construction phase, construction phase, and operation phase.

- 6b.5.1.3 Reference is made to the completed monitoring programme for White-bellied Sea Eagle under *EIA-041/2000 Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures - Environmental Impact Assessment* (CED, 2000).

Pre-construction Phase Monitoring

- 6b.5.1.4 For pre-construction phase, field surveys should be conducted twice per month for a duration of three months during their breeding season (between December and May) immediately before the commencement of works. The main objective of the pre-

construction monitoring should be to verify the presence of White-bellied Sea Eagle in the Shek Kwu Chau area, as well as to confirm their breeding status and how the area is utilised.

6b.5.1.5 Information to be collected should include feeding, perching/roosting, preening, soaring, flying, nesting and territorial guarding and the time spent on each activity. Other disturbances such as weather condition, or invasion by other fauna species should also be recorded.

Construction Phase Monitoring

6b.5.1.6 Throughout the construction phase, field surveys should be conducted twice per month during their core breeding season (from December to May), and once per month outside their core breeding season (June to November). The objective of the construction phase monitoring should be to verify the utilisation of the area by White-bellied Sea Eagle, their responses to construction disturbance, as well as the effectiveness of the proposed mitigation measures.

6b.5.1.7 Information to be collected should include feeding, perching/roosting, preening, soaring, flying, nesting and territorial guarding and the time spent on each activity. The responses and reactions to any disturbance to the WBSEs should also be recorded and examined in conjunction with the construction noise and/or other events in the vicinity. Other disturbances such as weather condition, or invasion by other fauna species should also be recorded.

6b.5.1.8 Should the White-bellied Sea Eagles be absent for a whole day during the monitoring, an Event and Action Plan is recommended in **Table 6b.1**. As the presence and breeding status of the recorded pair is to be verified during baseline monitoring, the proposed Event and Action is based on an assumption that the White-bellied Sea Eagle utilise the survey area on regular basis, and is rarely absent from their territory at Shek Kwu Chau. Nevertheless, if the assumption is proved to be different during baseline monitoring, the proposed Event and Action plan should be revised accordingly.

Table 6b.1 Event and Action Plan during Construction Phase

Event	Action		
	Environmental Team	Audit Team	Contractor
Absence of White-bellied Sea Eagle during a whole day of monitoring	Inform audit team. Increase monitoring frequency to daily	Inform site engineer and contractor. If the absence remains: <ul style="list-style-type: none"> • Review construction activities and noise monitoring records of the associated period; • Identify potential causes of the absence; • Propose remedial measures, such as change of construction method and sequence; • Confirm the feasibility of the proposed remedial measures with site engineer and contractor; • Discuss with environmental team about the effectiveness of the proposed remedial measures. 	Implement the agreed remedial measures

Operation Phase Monitoring

- 6b.5.1.9 During operation phase, field surveys should be conducted twice per month during their core breeding season (from December to May), and once per month outside their core breeding season (June to November), for a duration of two years. The objective of the operation phase monitoring should be to verify the utilisation of the area by White-bellied Sea Eagle, their responses to operation disturbance, as well as the effectiveness of the proposed mitigation measures.
- 6b.5.1.10 Information to be collected should include behaviour (e.g. foraging, territory fending), breeding activity, and any observable response to disturbances. Any observable responses to disturbances should be assessed, taking into account of the human induced activities occurring at the time, as well as other disturbances such as weather condition, or invasion by other fauna species.
- 6b.5.1.11 Should the White-bellied Sea Eagles be absent for a whole day during the monitoring, an Event and Action Plan is recommended in **Table 6b.2**. As the presence and breeding status of the recorded pair is to be verified during baseline monitoring, the proposed Event and Action is based on an assumption that the White-bellied Sea Eagle often utilise the survey area, and is rarely absent from their territory at Shek Kwu Chau. Nevertheless, if the assumption is proved to be different during baseline monitoring, and that if any specific scenario occurs during construction phase (e.g. abandonment of Shek Kwu Chau nest), the proposed Event and Action plan should be revised accordingly.

Table 6b.2 Event and Action Plan during Operation Phase

Event	Action	
	Environmental Team	Project Proponent
Absence of White-bellied Sea Eagle during a whole day of monitoring	<p>Inform Project Proponent and the IWMF Operator</p> <p>Increase monitoring frequency to daily.</p> <p>If the absence remains:</p> <ul style="list-style-type: none"> Identify potential causes for the absence; Propose remedial measures, such as alteration in travel route of vessels; Confirm the feasibility of the proposed remedial measures with Project Proponent and the IWMF Operator; <p>Upon the implementation of the proposed remedial measures, report to Project Proponent and the IWMF Operator on sighting of White-bellied Sea Eagle.</p>	<p>Initiate increase of monitoring frequency by Environmental Team.</p> <p>If the absence remains:</p> <ul style="list-style-type: none"> Review the IWMF operation, attempt to identify sources and causes of disturbance; Discuss and confirm on the feasibility of the proposed remedial measures from Environmental Team; Implement the proposed remedial measures with the IWMF Operator; <p>Follow up on the effectiveness of the implemented remedial measures with Environmental Team.</p>

- 6b.5.1.12 A more detailed White-bellied Sea Eagle monitoring programme, including confirmation of location and status of breeding nest, commencement dates for monitoring, and detailed survey methodology in relation to the latest location of breeding nest etc., should be submitted upon approval of this Project, prior to commencement of construction works.

Advice from relevant governmental departments (i.e. AFCD) and professionals would be sought after, in order to identify an effective practice for monitoring of White-bellied Sea Eagle.

6b.6 Reference

AFCD (2010a). Monitoring of Marine Mammals in Hong Kong Waters – Data Collection (2009-2010), Final Report. Agriculture, Fisheries and Conservation Department, Hong Kong.

AFCD (2010b). Breeding Ecology of White-bellied Sea Eagle (*Haliaeetus leucogaster*) in Hong Kong – A review and Update. *Hong Kong Biodiversity – Agriculture, Fisheries and Conservation Department Newsletter*, Issue No. 18, February 2010. Agriculture, Fisheries and Conservation Department, Hong Kong.

CED (2000). Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures - Environmental Impact Assessment. Civil Engineering Department, Hong Kong.

HyD (2009). *EIA-172/2009 Hong Kong - Zhuhai - Macao Bridge Hong Kong Link Road*. Highways Department, Hong Kong.

Lam, K.K.Y. (2000). Sexual reproduction of a low-temperature tolerant coral *Oulastrea crispata* (Scleractinia, Faviidae) in Hong Kong, China. *Marine Ecology Progress Series* vol.205: 101-111.

Storlazzi, Curt D. Michael E. Field, Andrea S. Ogston, Joshua B. Logan, M. Kathy Presto and Dave G. Gonzales 2004. Coastal Circulation and Sediment Dynamics Along West Maui, Hawaii Part III: Flow and Particulate Dynamics During the 2003 Summer Coral Spawning Season.