

NTT Com Asia Ltd

**Asia Submarine-cable Express
(ASE) – Tseung Kwan O**
亞洲快線海底光纜系統 – 將軍澳

Updated EM&A Manual

December 2013
2013年12月

Environmental Resources Management
16/F DCH Commercial Centre
25 Westlands Road
Quarry Bay, Hong Kong

Telephone 852 2271 3000
Facsimile 852 2723 5660

NTT Com Asia Ltd

Asia Submarine-cable Express (ASE) –
Tseung Kwan O
亞洲快線海底光纜系統 - 將軍澳

December 2013

2013年11月

Reference 0223932

檔案0223932

For and on behalf of
ERM-Hong Kong, Limited
香港環境資源管理顧問有限公司

Approved by 批核: Terence Fong



Signed by 簽署: Terence Fong

Position 職位: Partner

Date 日期: December 2013

This report has been prepared by ERM-Hong Kong, Limited with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by //agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.

本報告由香港環境資源管理顧問有限公司，根據與顧客訂定之合約條款（其中包含本公司之通用合約條款），投入與顧客事先協定的資源，以適當的技巧細心謹慎撰寫。

本公司不會就任何上述範圍以外之事向顧客負任何責任。

本報告內容為顧客的機密資料。第三者若以任何形式得悉本報告全部或部分內容，將與本公司無關。任何引用本報告的第三者須自負全責。

Asia Submarine-cable Express (ASE) - Tseung Kwan O
Environmental Certification Sheet
EP-433/2011

Reference Document/Plan

Document/ Plan -to be Certified/ Verified:	Updated EM&A Manual
Date of Report:	
Date prepared by ET:	ERM-Hong Kong Ltd
Date received by IEC:	Ecosystem Ltd

Reference EM&A Manual/ EP Requirement

EM&A Manual Requirement:	Section 1
Content:	<i>EM&A Review</i>
1.3.2	"Review EM&A report submitted by the ET leader and feedback review results to ET by signing off relevant EM&A proformas."
1.4	"The EM&A Manual is an evolving document that should be updated to maintain its relevance as the Project progresses...The primary focus for these reviews are to ensure the impacts predicted and the recommended mitigation measures remain consistent and appropriate to the manner in which the works are to be carried out."
EP Condition:	Condition No. 2.2
Content:	<i>Independent Environmental Checker (IEC)</i>
	During the construction period, the Permit Holder shall employ an Independent Environmental Checker (IEC) to audit the implementation of all mitigation measures recommended in the Project Profile (Register No. PP-452/2011) and the approved Environmental Monitoring and Audit (EM&A) Manual in the Register.

ET Certification

I hereby certify that the above referenced document/ plan complies with the above referenced condition of EP-433/2011.	
Terence Fong, Environmental Team Leader:	Date: Dec 2013

IEC Verification

I hereby verify that the above referenced document/ plan complies with the above referenced condition of EP-433/2011.	
Vincent Lai, Independent Environmental Checker:	Date: December 2013

CONTENTS

1	INTRODUCTION	1
1.1	BACKGROUND	1
1.2	PURPOSE OF THE MANUAL	2
1.3	ORGANIZATION AND STRUCTURE OF THE EM&A	3
1.4	STRUCTURE OF THE EM&A MANUAL	6
2	CABLE INSTALLATION WATER QUALITY MONITORING	7
2.1	SAMPLING AND TESTING METHODOLOGY	7
2.2	MONITORING LOCATIONS	9
2.3	SAMPLING PROCEDURES	12
2.4	COMPLIANCE/ ACTION EVENT PLAN	13
2.5	REPORTING	15
3	MARINE MAMMAL OBSERVATION	17
4	CORAL MONITORING	19
4.1	OBJECTIVES AND APPROACH	19
4.2	MONITORING LOCATIONS	20
4.3	MONITORING METHODOLOGY	21
4.4	REPORTING	26
5	COMPLIANCE AUDIT PROCEDURES OF MITIGATION MEASURES	27
5.1	SITE INSPECTIONS	27
6	ENVIRONMENTAL COMPLAINTS	28
ANNEX A	SITE INSPECTION LOG	
ANNEX B	CABLE RE-INSTALLATION PROCEDURE	

1.1

BACKGROUND

NTT Com Asia (NTTCA) proposed to install a telecommunication cable (Asia Submarine-cable Express (ASE) cable) of approximately 7,200 km in length, connecting Japan and Singapore with branches to the Philippines, Hong Kong SAR (HKSAR) and Malaysia. NTTCA was responsible for securing the approval to land the ASE cable in Tseung Kwan O, Hong Kong SAR (HKSAR) and the proposed landing site is a new Beach Manhole (BMH) which ultimately connects with a Data Centre in Tseung Kwan O (TKO) Industrial Estate which was completed in 2012. It should be noted that Tseung Kwan O is currently the landing site for a number of submarine cables. From Tseung Kwan O, the cable extends westward approaching the Tathong Channel. Near to Cape Collinson, the cable is approximately parallel to the Tathong Channel until north of Waglan Island where the cable travels eastward to the boundary of HKSAR waters where it enters the South China Sea. The total length of cable in Hong Kong SAR waters is approximately 33.5 km. A map of the cable route is presented in *Figure 1.1*.

The Project Profile (PP-452/2011) which includes an assessment of the potential environmental impacts associated with the installation of the submarine telecommunications cable system was prepared and submitted to the Environmental Protection Department (EPD) under section 5.(1)(b) and 5.(11) of the Environmental Impact Assessment Ordinance (EIAO) for the application for Permission to apply directly for Environmental Permit (EP). The Environmental Protection Department, subsequently issued an approval letter on Application for Permission to Apply Directly for Environmental Permit on 14th November 2011 (Ref: (18) in EP2/G/C/161). The assessment was based on information compiled by the Project Proponent describing the expected Project installation activities and an Environmental Permit (EP-433/2011) was granted on 20 December 2011.

The ASE cable was installed and first began operation in early 2013 and post-Project monitoring was initially conducted revealing no adverse effect due to the cable installation. Later in 2013 however, a section of the sub-marine cable in HK waters was damaged in such a way that the cable totally ceased to be operational for telecommunications traffic to/from Hong Kong. It is therefore necessary to re-install any damaged cable to ensure the cable becomes fully functional once again.

The procedure for the re-installation is outlined in *Annex A* and the cable laying methodology for re-installation works will follow the same methodology as for the initial installation as described in the Project Profile (PP-452/2011) and follow all conditions of EP-433/2011. The cable re-installation is therefore considered to cause the same potential environmental impacts as assessed in the Project Profile (PP-452/2011).

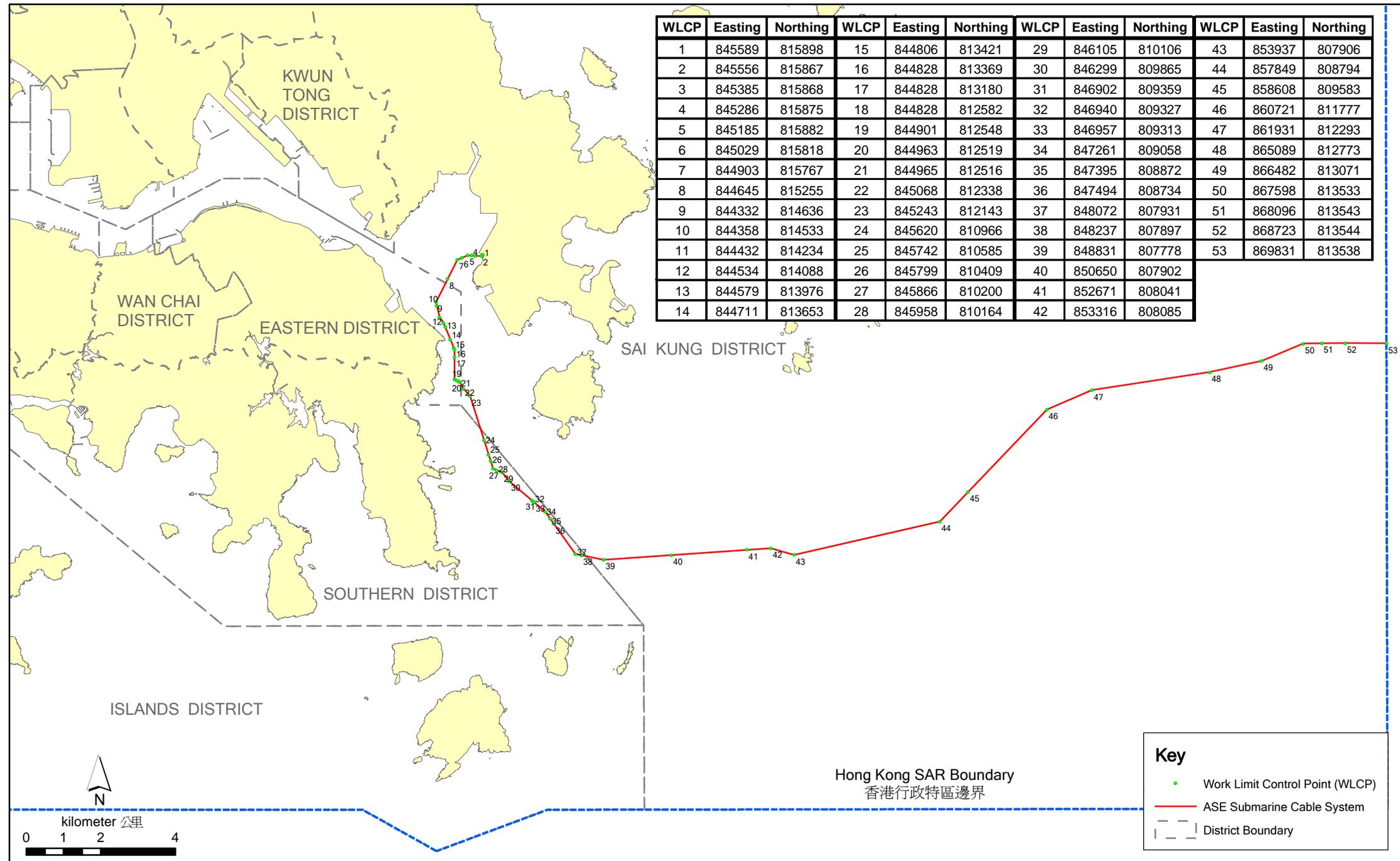


Figure 1.1 Proposed ASE Submarine Cable System (Layout Plan)

File: 0122859_Landing_Overview_20110815.mxd
Date: 18/08/2011

Key

- Work Limit Control Point (WLCP)
- ASE Submarine Cable System
- District Boundary

Environmental Resources Management



Once operational the cable will not result in impacts to the environment.

During all cable installation works it has been recommended that predicted environmental impacts are monitored and checked as part of an Environmental Monitoring and Audit (EM&A) programme. This EM&A programme is relevant both to the initial installation works as well as the re-installation works, according to the area of HK waters where works will be conducted.

The key aspects of the EM&A programme include Water Quality, Marine Mammal (Finless Porpoise) and Coral Monitoring (conducted according to the location of works) and are summarized as follows ⁽¹⁾:

- The forward speed of cable laying barge will be limited to a maximum of 1 km hr⁻¹ so that the amount of seabed sediment disturbed and dispersed during the cable laying process can be kept to a minimum;
- Good house-keeping practices for onshore activities at the cable landing will serve to avoid impacts to water quality;
- Silt curtain will be employed around the seawall area to reduce the dispersion of sediments from the landing site;
- A water quality monitoring programme will be conducted at Junk Bay, Tung Lung Chau, Tai Long Pai to verify that adverse impacts do not occur to water quality, marine ecology and fisheries due to the installation of the cable;
- A marine mammal exclusion zone within a radius of 250 m from the cable installation barge will be implemented during the cable installation works to verify that the area is clear of marine mammals prior to the commencement of works and to reduce any disturbance to them; and
- A coral monitoring programme will be conducted at Cape Collinson and Tai Long Pai as well as the control site Tung Lung Chau prior to, and after, the cable installation works to verify that no adverse impacts occur to the corals that are in the vicinity of the cable alignment zone.

1.2

PURPOSE OF THE MANUAL

ERM-Hong Kong, Limited (ERM) has been appointed by NTTCA to undertake the environmental permitting and prepare the Environmental Monitoring and Audit (EM&A) Manual ("the Manual") for this Project. This Manual is a supplementary document of the project entitled *Asia Submarine-cable Express (ASE) – Tseung Kwan O* (Application No.: DIR-217/2011) and is required to be submitted to the Director of Environmental Protection for approval prior to the application for an environmental permit as listed under the *Conditions*

⁽¹⁾ Installation is taken to signify both initial cable installation and cable re-installation of damaged cable.

Imposed under Section 5(12) of the EIA Ordinance for Permission to Apply Directly for Environmental Permit.

The EM&A Manual has been prepared to:

- Monitor the effectiveness of the control measures employed during the cable installation (actual laying works as well as testing and finalisation works as circumstances dictate) ;
- Verify that the project works are not resulting in any impacts to water quality at seawater intakes at Junk's Bay and Siu Sai Wan, coral communities and Fish Culture Zone at Tung Lung Chau, and coral communities at Tai Long Pai, Fat Tong Chau, Sung Kong and Waglan Island;
- To ensure that any adverse impacts are detected during the cable laying process and that appropriate action is undertaken in the event that impacts are identified to sensitive receivers and are found to be associated with the cable installation works;
- Verify the project works are not carried out if marine mammals (ie Finless Porpoise) are within a radius of 250 m from the cable alignment site, so to ensure they will not be disturbed by the cable laying works; and
- Carry out coral monitoring works at Impact stations (Cape Collinson and Tai Long Pai) which are in the vicinity of the alignment of cable and at Control station (Tung Lung Chau) to ensure corals (ie hard corals, octocorals and black corals) are not affected by the cable laying works.

1.3 ORGANIZATION AND STRUCTURE OF THE EM&A

1.3.1 General

NTT Com Asia Limited (NTTCA) will appoint an Environmental Team (ET) to conduct the monitoring and auditing works and to provide specialist advice on the undertaking and implementation of environmental responsibilities. The ET shall have previous experience with managing similarly sized EM&A programmes and the Environmental Team Leader (ET Leader) shall be a recognized environmental professional, preferably with a minimum of 7 years relevant experience in impact assessment and impact monitoring programmes.

To maintain strict control of the EM&A process, NTTCA shall appoint an independent environmental consultant to act as an "Independent Environmental Checker" (IC(E)) to verify and validate the environmental performance of the Contractor and his Environmental Team.

1.3.2 *Project Organisation*

The roles and responsibilities of the various parties involved in the EM&A process are further expanded in the following sections. The ET Leader will be responsible for, and in charge of, the Environmental Team; and shall be the person responsible for executing the EM&A requirements.

Contractor

Reporting to NTTCA, the Contractor shall:

- Work within the scope of the Project installation contract and other tender conditions;
- Provide assistance to the ET in conducting the required environmental monitoring;
- Participate in the site inspections undertaken by the ET, as required, and undertake any corrective actions instructed by NTTCA;
- Implement measures to reduce impact where Action and Limit levels are exceeded; and
- Take responsibility and strictly adhere to the guidelines of the EM&A programme and complementary protocols developed by their project staff.

NTTCA

NTTCA will:

- Employ an ET to undertake monitoring, laboratory analysis and reporting of the EM&A requirements outlined in this Manual;
- Employ an IC(E) to verify and validate the environmental performance of the Contractor and his Environmental Team
- Monitor the Contractor's compliance with contract specifications, including the effective implementation and operation of environmental mitigation measures and other aspects of the EM&A programme;
- Comply with the agreed Event and Action Plan in the event of any exceedance; and
- Instruct the Contractor to follow the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

Environmental Team

The duties of the Environmental Team (ET) and Environmental Team Leader (ET Leader) are to:

- Monitor the various environmental parameters as required by this or subsequent revisions to the EM&A Manual;
- Assess the EM&A data and review the success of the EM&A programme determining the adequacy of the mitigation measures implemented and the validity of the Project Profile predictions as well as identify any adverse environmental impacts before they arise;
- Conduct regular site inspections and to investigate and inspect the Contractor's equipment and work methodologies with respect to pollution control and environmental mitigation, monitor compliance with the environmental issues that may require mitigation before the problem arises;
- Audit environmental monitoring data and report the status of the general site environmental conditions and the implementation of mitigation measures resulting from site inspections;
- Review Contractor's working programme and methodology, and comment as necessary;
- Investigate and evaluate complaints, and identify corrective measures;
- Advice to the Contractor on environmental improvement, awareness, enhancement matters, etc., on site;
- Report on the environmental monitoring and audit results and the wider environmental issues and conditions to the IC(E), Contractor, NTTCA and the EPD; and
- Adhere to the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

The ET shall be led and managed by the ET leader. The ET leader shall have relevant education, training, knowledge, experience and professional qualifications. Suitably qualified staff shall be included in the ET, and ET should not be in any way an associated body of the Contractor.

Independent Environmental Checker

An Independent Environmental Checker [IC(E)], independent from the management of Project installation works, shall be appointed to audit and verify the overall environmental performance of the works and to assess the effectiveness of the ET in their duties. The main objectives will be to:

- Review and monitor the implementation of the EM&A programme and the overall level of environmental performance being achieved;
- Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers, especially the distance between locations of the major

coral communities at Tai Long Pai and Cape Collinson and the alignment of cable;

- Check complaint cases and the effectiveness of corrective measures; and
- Review EM&A report submitted by the ET leader and feedback review results to ET by signing off relevant EM&A proformas.

The IC(E) should not be in any way an associated body of the Contractor or ET.

1.4 ***STRUCTURE OF THE EM&A MANUAL***

The remainder of the Manual is set out as follows:

- *Section 2* details the requirements for water quality baseline, impact and Post Project monitoring, and lists relevant monitoring equipment, compliance and Event and Action Plans (EAPs);
- *Section 3* describes the requirements for marine mammals (ie Finless Porpoise) monitoring and lists the relevant actions needed to be taken;
- *Section 4* details the requirements for Baseline and Post Project surveys of coral monitoring, and lists relevant monitoring equipment, compliance and EAPs; and
- *Section 5* describes the scope and frequency of site auditing; and
- *Section 6* describes the handling of environmental complaints.

The EM&A Manual is an evolving document that should be updated to maintain its relevance as the Project progresses. Revisions to the original EM&A Manual have taken place:

- a) once the monitoring locations were agreed with NTTCA, Independent Environmental Checker [IC(E)] and EPD; and
- b) when the proposed work processes and activities had been determined following any supplementary environmental reviews which were required.

The primary focus for reviews are to ensure the impacts predicted and the recommended mitigation measures remain consistent and appropriate to the manner in which the works are to be carried out.

Potential impacts on water quality associated with the Project works have been identified in the Project Profile.

As recommended in the Project Profile, mitigation measures will include limiting the speed of the cable installation barge, employment of silt curtain and a water quality monitoring programme.

The following Section provides details of the water quality monitoring during the installation (including actual laying, testing and finalisation) of the submarine cable.

2.1 SAMPLING AND TESTING METHODOLOGY

2.1.1 Parameters Measured

The parameters to be measured *in situ* are:

- dissolved oxygen (DO) (% saturation and mgL⁻¹)
- temperature (°C)
- turbidity (NTU)
- salinity (‰ or ppt)

The only parameter to be measured in the laboratory is:

- suspended solids (SS) (mgL⁻¹)

In addition to the water quality parameters, other relevant data shall also be measured and recorded in field logs, including the location of the sampling stations and cable burial machine at the time of sampling, water depth, time, weather conditions, sea conditions, tidal state, current direction and speed, special phenomena and work activities undertaken around the monitoring and works area that may influence the monitoring results.

2.1.2 Equipment

For water quality monitoring, the following equipment shall be supplied and used by the environmental contractor.

- ***Dissolved Oxygen and Temperature Measuring Equipment*** - The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and shall be operable from a DC power source. It shall be capable of measuring: dissolved oxygen levels in the range of 0 - 20 mgL⁻¹ and 0-200% saturation; and a temperature of 0-45 degrees Celsius.

It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 35 m in length. Sufficient stocks of spare electrodes and cable shall be available for replacement where necessary (for example, YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).

- ***Turbidity Measurement Equipment*** - Turbidity should be measured from a split water sample from the SS sample. A suitable turbidity test kit should be used to measure the turbidity level.
- ***Salinity Measurement Instrument*** - A portable salinometer capable of measuring salinity in the range of 0-40 ppt shall be provided for measuring salinity of the water at each monitoring location.
- ***Water Depth Gauge*** - No specific equipment is recommended for measuring the water depth. However, water depth gauge affixed to bottom of the water quality monitoring vessel is preferred. The environmental contractor shall seek approval of their proposed equipment with the client prior to deployment.
- ***Current Velocity and Direction*** - No specific equipment is recommended for measuring the current velocity and direction. However, the environmental contractor shall seek approval of their proposed equipment with the client prior to deployment.
- ***Positioning Device*** - A Global Positioning System (GPS) shall be used during monitoring to ensure the accurate recording of the position of the monitoring vessel before taking measurements. The use of DGPS is preferred for positioning device, which should be well calibrated at appropriate checkpoint (e.g. Quarry Bay Survey Nail).
- ***Water Sampling Equipment*** - A water sampler, consisting of a transparent PVC or glass cylinder of not less than two litres, which can be effectively sealed with cups at both ends, shall be used (Kahlsico Water Sampler 13SWB203 or an approved similar instrument). The water sampler shall have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth.

2.1.3 ***Sampling/Testing Protocols***

All *in situ* monitoring instruments shall be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use, and subsequently re-calibrated at-monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes shall be checked with certified standard solutions before each use.

For the on-site calibration of field equipment, the BS 1427: 1993, Guide to Field and On-Site Test Methods for the Analysis of Waters shall be observed.

Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when equipment is under maintenance, calibration etc.

Water samples for SS measurements shall be collected in high density polythene bottles, packed in ice (cooled to 4° C without being frozen), and delivered to a HOKLAS laboratory as soon as possible after collection.

At least 2 replicate samples should be collected from each of the monitoring events for *in situ* measurement and lab analysis.

2.1.4 *Laboratory Analysis*

All laboratory work shall be carried out in a HOKLAS accredited laboratory. Water samples of about 1,000 mL shall be collected at the monitoring and control stations for carrying out the laboratory determinations. The determination work shall start within the next working day after collection of the water samples. The SS laboratory measurements shall be provided to the client within 2 days of the sampling event (48 hours). The analyses shall follow the standard methods as described in APHA Standard Methods for the Examination of Water and Wastewater, 19th Edition, unless otherwise specified (APHA 2540D for SS).

The submitted information should include pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per-batch etc), detection limits and accuracy. The QA/QC details shall be in accordance with requirements of HOKLAS or other internationally accredited scheme (e.g. NATA of Australia and CNAS of China which are under mutual recognition agreements with HOKLAS).

2.2 *MONITORING LOCATIONS*

The monitoring station locations have been established to identify potential impacts to water and ecological sensitive receivers.

Prior to, during, and after Project marine installation works, water quality sampling will be undertaken at stations situated around the cable laying works at Junk Bay and near to Tung Lung Chau and Tai Long Pai. The monitoring at these stations is to ensure the Project marine installation works of the Project do not affect the sensitive area nearby (shown in *Figures 2.1-2.3*).

- B1 is an Impact Station to monitor the impacts of cable installation works on the Big Wave Bay Beach;
- B2 is an Impact Station to monitor the impacts of cable installation works on the Rocky Bay Beach;

- B3 is an Impact Station to monitor the impacts of cable installation works on the Shek O Beach;
- E1 is an Impact Station to monitor impacts of cable installation works on Cape d'Aguilar Marine Reserve;
- E2 is an Impact Station to monitor the impacts of cable installation works on the coral communities at Tung Lung Chau;
- E4 is the Impact Station to monitor the impacts of cable installation works on the coral communities at the coast of Sung Kong;
- E5 is the Impact Station to monitor the impacts of cable installation works on the coral communities at the coast of Waglan Island;
- E6 is an Impact Station to monitor the impacts of cable installation works on the coral communities at Tai Long Pai (the Gradient Station is not set due to the short distance of this Impact Station to nearby proposed cable works which may affect the cable laying works);
- E7 is the Impact Station located at Fat Tong Chau to monitor the impacts of cable installation works on the coral communities in the proximity;
- E8 is an Impact Station to monitor the impacts of cable installation works on the coral communities along Junk Bay – South West;
- E9 is an Impact Station to monitor the impacts of cable installation works on the coral communities at Cape Collison (the Gradient Station is not set due to the short distance of this Impact Station to nearby proposed cable works which may affect the cable laying works);
- F1 is an Impact Station to monitor the impacts of cable installation works on the Tung Lung Chau Fish Culture Zone;
- S1 is an Impact Station situated at the WSD Seawater Intake Point in Junk Bay. It is located within 500 m north of the cable alignment at Junk Bay and set up to monitor the effect of cable laying works in the area;
- S2 is an Impact Station to monitor the impacts of cable installation works on the WSD Seawater Intake at Siu Sai Wan;
- S3 is an Impact Station to monitor the impacts of cable installation works on the Pamela Youde Nethersole Eastern Hospital Cooling Water Intake at Heng Fa Chuen;
- G1 is a Gradient Station between S1 and the cable alignment;
- G2 is a Gradient Station between S2 and the cable alignment;
- G3 is a Gradient Station between F1 and the cable alignment;
- G4 is a Gradient Station between E2 and the cable alignment;

- G5 is the Gradient Station between E4 and the alignment;
- G6 is the Gradient Station between E5 and the alignment;
- G7 is a Gradient Station between E1 and the cable alignment;
- C1 is a Control Station (approximately 3 km from the proposed cable alignment) for Zone A. It is not supposed to be influenced by the cable laying works due to its remoteness to the construction works;
- C2 is a Control Station (approximately 3.4 km from the proposed cable alignment) for Zone B. It is not supposed to be influenced by the cable laying works due to its remoteness to the construction works; AND
- C3 is a Control Station (approximately 3 km from the proposed cable alignment) for Zone C. It is not supposed to be influenced by the cable laying works due to its remoteness to the construction works.

The monitoring works will be carried out at C1, S1, G1, E7, E8, S2, S3, G2, E9, F1 and G3 when the vessel is operating inside Zone A (*Figure 2.1*). Similarly, the monitoring works will be carried out at C2, F1, G3, B1, B2, B3, E2, G4, E6, G7, E1 and E9 when the vessel is operating inside Zone B (*Figure 2.2*). Monitoring works will start at C3, G5, G6, E4 and E5 when the vessel is operating inside Zone C (*Figure 2.3*).

The suggested co-ordinates of these monitoring stations are listed in *Table 2.1* and the exact co-ordinates should be confirmed before commencement of Baseline Monitoring.

The above monitoring stations shall be sampled during Baseline Monitoring (prior to Project marine installation works in the relevant zone(s)), Impact Monitoring (during Project marine installation works in the relevant zone(s)) and Post Project Monitoring (after completion of Project marine installation works in the relevant zone(s)).

Table 2.1 *Co-ordinates of Sampling Stations (HK Grid)*

Station	Nature	Easting	Northing
B1	Impact Station (Beach)	843557	811853
B2	Impact Station (Beach)	844062	810369
B3	Impact Station (Beach)	843988	809902
E1	Impact Station (Marine Reserve)	845474	810605
E2	Impact Station (Coral Communities)	845203	815205
E4	Impact Station (Coral Communities)	843210	816322
E5	Impact Station (Coral Communities)	844627	813609
E6	Impact Station (Coral Communities)	845321	816718
E7	Impact Station (Coral Communities)	843779	814520
E8	Impact Station (Coral Communities)	843111	815126
E9	Impact Station (Coral Communities)	843557	811853
F1	Impact Station (Fish Culture Zone)	847196	811056

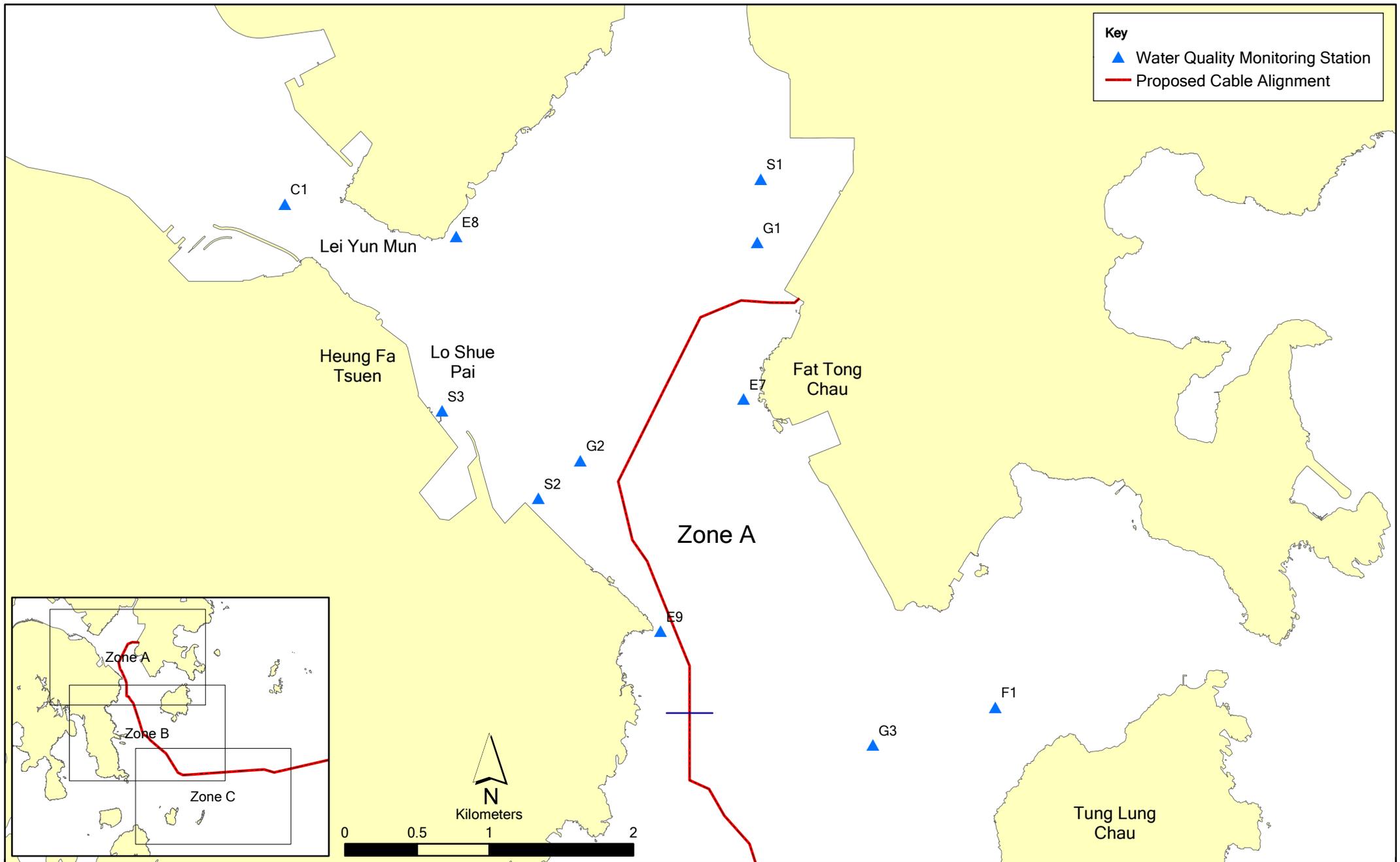


Figure 2.1

Proposed Water Quality Monitoring Station (Zone A)

File: 0122859_Proposed_WQMS_ZoneA.mxd
Date: 05/12/2011

**Environmental
Resources
Management**



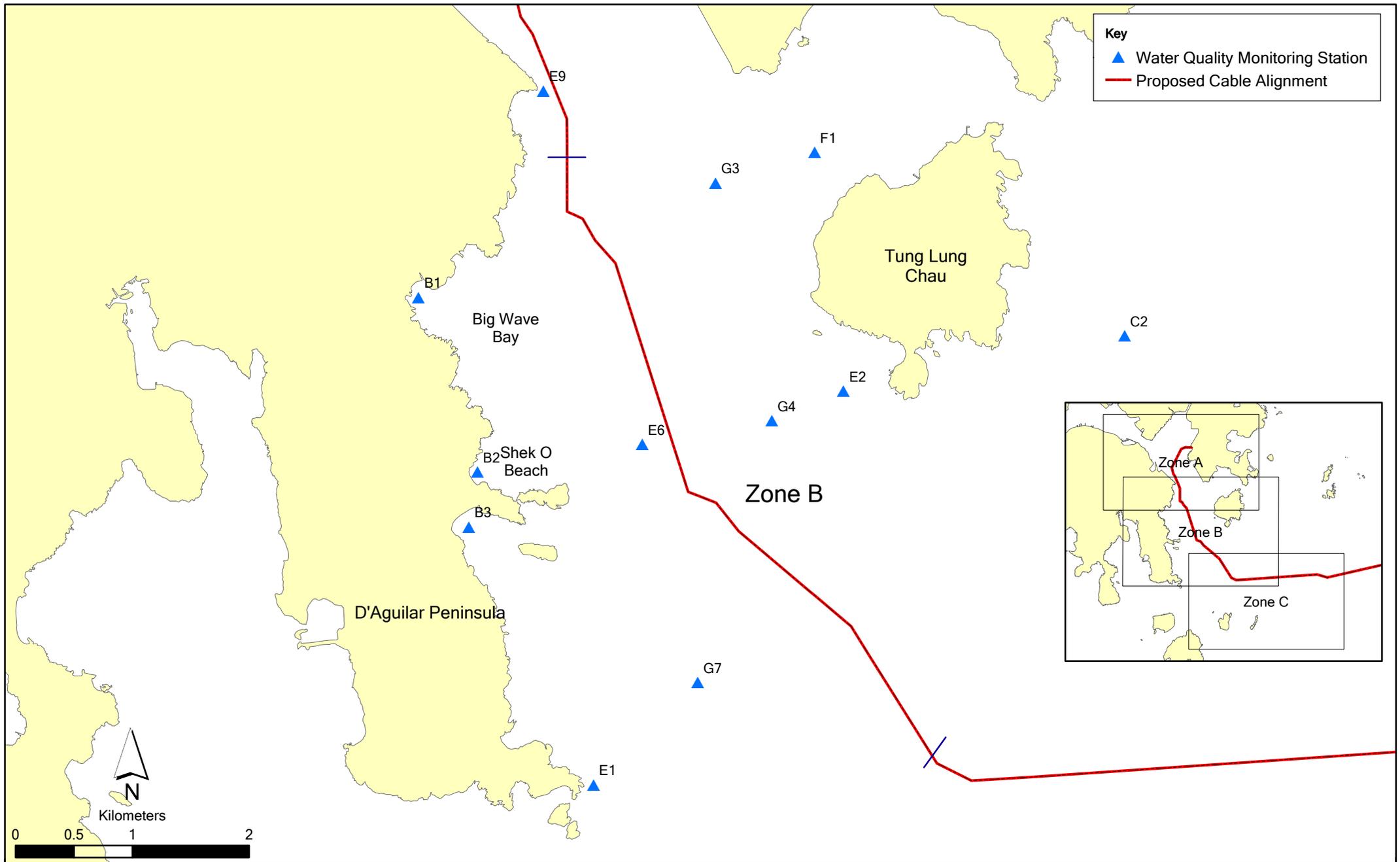


Figure 2.2

Proposed Water Quality Monitoring Station (Zone B)

File: 0122859_Proposed_WQMS_ZoneB.mxd
Date: 09/12/2011

**Environmental
Resources
Management**



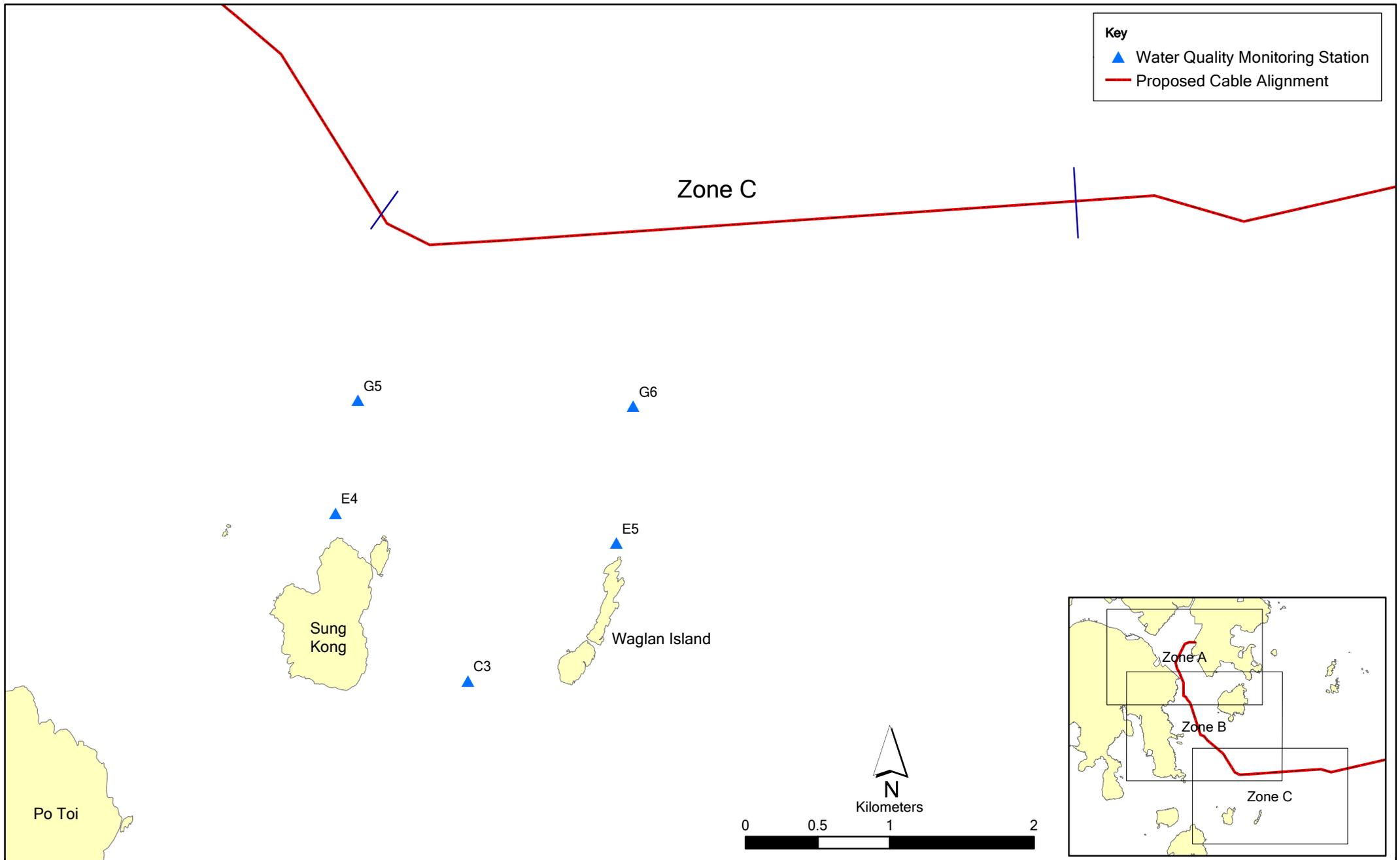


Figure 2.3

Proposed Water Quality Monitoring Station (Zone C)

File: 0122859_Proposed_WQMS_ZoneC.mxd
Date: 09/12/2011

**Environmental
Resources
Management**



Station	Nature	Easting	Northing
S1	Impact Station (Seawater Intakes)	847639	805900
S2	Impact Station (Seawater Intakes)	849587	805696
S3	Impact Station (Seawater Intakes)	845474	810605
G1	Gradient Station	845297	816282
G2	Gradient Station	844071	814784
G3	Gradient Station	846099	812826
G4	Gradient Station	846583	810809
G5	Gradient Station	847795	806678
G6	Gradient Station	849703	806636
G7	Gradient Station	845946	808583
C1	Control Station	842022	816547
C2	Control Station	849603	811528
C3	Control Station	848556	804750

Note: The actual co-ordinates may be fine-tuned on site subject to the water depth, site condition and the safety distance required by the cable installation barge during cable laying.

E3 represented coral communities along the coast of Ninepins (as presented in the Project Profile) was not monitored due to the long distance (~4.7 km from the proposed cable alignment) and unlikely to be affected by the works.

2.3 SAMPLING PROCEDURES

2.3.1 Monitoring Frequency

Baseline Monitoring

Baseline Monitoring will comprise sampling on three occasions (days) prior to, but no more than six weeks before, the start of Project marine installation work in relevant zone(s). The interval between two sets of monitoring shall not be less than 36 hours. The monitoring will be undertaken at monitoring stations, as shown in *Figures 2.1 to 2.3* and in *Table 2.1* according to where Project marine installation works will be carried out (Zone A, B and/ or C). Samples will be taken during mid-flood and mid ebb tidal state on each sampling occasion.

Impact Monitoring

Impact Monitoring at S1, S2, S3, G1, G2, E7, E8, E9, C1, F1 and G3 will commence when the Project marine installation works are within Zone A. The sampling works will cease once the cable barge is outside Zone A or no cable laying works are being undertaken.

Similarly, Impact Monitoring at B1, B2, B3, E1, E2, E6, F1, G3, G4, G7, C2 and E9 will commence when cable installation barge works move to within Zone B. The monitoring works will start at E4, E5, G5, G6 and C3 when the vessel goes into Zone C. The sampling works will cease once the cable laying works are outside Zones B and C or no cable laying works are involved.

In-situ data and SS data will be collected at monitoring stations (actual time interval subject to the sampling vessel travelling time among stations) during the cable installation works for each zone.

Post Project Monitoring

Post Project Monitoring will comprise sampling on three occasions (days) within three weeks after completion of the Project marine installation works at the same stations as where Baseline Monitoring was conducted for the works, during mid-flood and mid-ebb tides. The interval between two sets of monitoring shall not be less than 36 hours.

2.3.2 *Timing*

For Baseline and Post Project Monitoring, water quality sampling will be undertaken within a 4 hour window of 2 hour before and 2 hour after mid-flood and mid-ebb tides.

For Impact Monitoring, *In-situ* data and SS data of each station will be collected at least 4 times (estimated 4-hour sampling intervals to be required for each zone, actual time interval subject to the sampling vessel travelling time among stations) ⁽¹⁾ during the cable installation works for each zone within a day. Impact Monitoring will be conducted as soon as marine works commence and will be undertaken throughout the Project works, including for route clearance operations.

The environmental contractor will be responsible for liaison with the engineering contractor to ensure installation works are being undertaken during the water quality sampling. Tidal range for flood and ebb tides should not be less than 0.5 m for capturing representative tides.

2.3.3 *Depths*

Each station will be sampled and measurements will be taken at three depths, 1 m below the sea surface, mid-depth and 1 m above the seabed. For stations that are less than 3 m in depth, only the mid depth sample shall be taken. For stations that are less than 6 m in depth, only the surface and seabed sample shall be taken.

2.4 *COMPLIANCE/ACTION EVENT PLAN*

Water quality monitoring results will be evaluated against Action and Limit levels shown in *Table 2.2*.

⁽¹⁾ Following Impact Monitoring conducted for the cable installation works in 2012/3, a 2-hour sampling interval for each zone was found to be inadequate to sample at each of the necessary sampling stations (SS) given the vessel travel time between each. This has therefore been updated to a 4-hour sampling interval with minimum of 4 different data samples collected daily from each.

Table 2.2 Action and Limit Level for Water Quality (based on the result of the Baseline Report)

Parameter	Action Level (d)	Limit Level (e) (d)
SS in mgL ⁻¹ (Depth-averaged) (a) (c)	95%-ile of baseline data, or 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data, and 30% exceedance of value at any impact station compared with corresponding data from control station
DO in mgL ⁻¹ (b)	<u>Surface and Middle</u> 5%-ile of baseline data for surface and middle layer <u>Bottom</u> 5%-ile of baseline data for bottom layers	<u>Surface and Middle</u> 5mg/L or 1%-ile of baseline for surface and middle layer <u>Bottom</u> 2mg/L or 1%-ile of baseline data for bottom layer
Turbidity in NTU (Depth-averaged) (c)	95%-ile of baseline data, or 20% exceedance of value at any impact station compared with corresponding data from control station	99%-ile of baseline data, and 30% exceedance of value at any impact station compared with corresponding data from control station

Notes:

- a. "Depth-averaged" is calculated by taking the arithmetic means of reading of all sampled depths.
- b. For DO, non-compliance of the water quality limits occurs when the monitoring result is lower than the limits.
- c. For SS and turbidity, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
- d. Limit level for DO was derived from the Water Quality Objectives (WQO) for Junk Bay, Eastern Buffer, and Mirs Bay Water Control Zones under the Water Pollution Control Ordinance (WPCO) Chapters 358L, 358Y, and 358I respectively.

The measures that will be undertaken in the event that the Action or Limit Levels are exceeded are shown in *Table 2.3*.

Table 2.3 Event Action Plan for Water Quality

Event	Contractor
Action Level Exceedance	<p>Step 1 - repeat sampling event.</p> <p>Step 2 - Inform EPD and AFCD and confirm notification of the non-compliance in writing;</p> <p>Step 3 - discuss with cable installation contractor the most appropriate method of reducing suspended solids during cable installation (e.g. reduce cable laying speed/volume of water used during installation.</p> <p>Step 4 - repeat measurements after implementation of mitigation for confirmation of compliance.</p> <p>Step 5 - if non-compliance continues, increase measures in Step 3 and repeat measurements in Step 3. If non-compliance occurs a third time, suspend cable laying operations.</p>
Limit Level Exceedance	Undertake Steps 1-4 immediately, if further non-compliance continues at the Limit Level, suspend cable laying operations until an effective solution is identified.

Schedule for baseline and impact monitoring should be submitted to the Environmental Protection Department (EPD) before the commencement of the respective monitoring works, for agreement.

The reports to be provided shall include:

- Baseline Monitoring Report;
- Weekly Impact Monitoring Reports; and
- Post Project Monitoring Report.

A Baseline Monitoring Report shall be provided no later than two weeks before the start of Project marine installation work and should be submitted to EPD for agreement on the Action/Limit Levels. An Impact Monitoring Report will be provided weekly within three days after the relevant monitoring data are collected or become available during Project marine installation work. A Post Project Monitoring Report to review the environmental status after Project marine installation and compare with the results as presented in the relevant Baseline Monitoring Report shall be provided within one month after completion of the Project marine installation works.

A Baseline Monitoring Report shall include the following details:

- brief project background information;
- drawings showing locations of the baseline monitoring stations;
- an updated Project marine installation works programme with milestones of environmental protection/mitigation activities annotated;
- monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations (and depth), monitoring date, time, frequency and duration;
- details on influencing factors, including major activities, if any, being carried out on the Site during the period, weather conditions during the period and other factors which might affect the results;
- determination of the Action and Limit Levels (AL levels) for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored; and
- comments and conclusions.

A Weekly Impact Monitoring shall include, but not limited to, the following details:

- Basic Project Information – Project marine installation works programme with fine tuning of activities showing the inter-relationship with environmental protection/mitigation measures for the week and works undertaken during the week;
- Operating practices of any Project marine installation works machinery (e.g. cable burial machine) during sampling (including: position, speed, cable burial depth) and an interpretation of monitoring results; and
- The monitoring data should be provided graphically to show the relationship between the Control and the Impact monitoring stations and compliance or non-compliance with respect to the Action/Limit Levels.

A Post Project Monitoring Report shall include the following details:

- brief project background information;
- drawings showing locations of the baseline monitoring stations;
- full Project marine installation works programme with milestones of environmental protection/mitigation activities annotated;
- monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations (and depth), monitoring date, time, frequency and duration. The monitoring results should show the relationship between the Control and the Impact monitoring stations and compliance or non-compliance with respect to the Action/Limit Levels
- review the environmental status after Project marine installation works and compare with results presented in the relevant Baseline Monitoring Report;
- comments and conclusions.

Project marine installation works may result in a minor and short term increase in underwater sound from marine vessels. Given that Finless Porpoises use high frequency ultrasonic clicks for foraging and communication, the low frequency underwater sound associated with vessels, jetting and cable laying would not be expected to interfere significantly with Finless Porpoises. No unacceptable adverse impacts to Finless Porpoises from underwater sounds are expected to occur. The actual cable installation works will be short-term and temporary, and be carried by one cable installation barge within about 15 working days in Hong Kong waters, with limited additional days required for testing and finalisation works as circumstances dictate. The Finless Porpoises are hence not expected to be disturbed by the cable laying vessel.

However, additional precautionary measure will be instituted for marine mammals during the Project marine installation works (including actual laying, testing and finalisation) depending on the Zone in which the works are conducted (Refer to Figures 2.1-2.3 for delineation of Zones A to C respectively). This is elaborated upon below.

A marine mammal exclusion zone within a radius of 250 m from the cable installation barge will be implemented during the cable installation works taking place in daylight hours along the section outside Zones A to B (ie Zone C and from C to the boundary of HKSAR waters). The marine mammal exclusion zone will be monitored by qualified observer(s) ⁽¹⁾ with an unobstructed, elevated view of the area. The view will be undertaken from the cable installation barge. The viewpoint will be agreed with the Independent Environmental Checker.

Qualified observer(s) will stand on the open upper decks of the barge, allowing for observer eye heights of 4 to 5 m above water level and relatively unobstructed forward visibility between 270° and 90°. Vessel-based observation by the observer(s) shall be conducted by searching the 180° swath in front of the barge (270° to 90°) with appropriate marine binoculars, scanning the same area with the naked eyes and occasional binocular check.

Qualified observer(s) will scan the 250 m exclusion zone for at least 30 minutes prior to the start of cable installation. If cetaceans are observed in the exclusion zone, cable installation works will be delayed until they have left the area. This measure will confirm that the area in the vicinity of the cable installation work is clear of marine mammals prior to the commencement of works and will serve to reduce any disturbance to marine mammals. As per previous practice in Hong Kong, should cetaceans move into the works area

(1) The qualification and experience of the qualified observer(s) shall be to the satisfaction of the Director of Agriculture, Fisheries and Conservation (DAFC). The qualified observer(s) for the marine mammal monitoring must be suitably trained to conduct the visual monitoring works. CVs of the qualified observer(s) will be provided to the DAFC prior to commencement of monitoring surveys.

during cable installation, it is considered that cetaceans will have acclimatised themselves to the works therefore cessation of cable installation is not required (1).

The marine mammal exclusion zone monitoring will be required during periods when there are cable installation works. Daily monitoring will be conducted till the completion of cable installation works.

(1) This precautionary measure is consistent with conditions for grab dredging works inside the Sha Chau and Lung Kwu Chau Marine Park included in the issued Environmental Permit for the Permanent Aviation Fuel Facility for Hong Kong International Airport project

Coral communities at Cape Collinson and Tai Long Pai which are in the vicinity of the cable alignment may have the potential to be indirectly impacted through seabed disturbance resulting in increases in suspended solids in the water column and sedimentation rate during cable-laying works. However, no unacceptable adverse indirect impacts on coral communities are expected to occur due to the following reasons.

- Firstly, the Project marine installation works will be of small-scale, short-term and temporary (approximately 15 working days (only several workings hours for the sections near Cape Collinson and Tai Long Pai) for the actual cable installation, with limited additional days required for testing and finalisation works as circumstances dictate.
- Secondly, the sediment plume calculation indicated that the maximum distance of transport for the suspended sediments would be approximately 180 m, however the disturbed sediments would have settled onto the seabed in less than 4 minutes, i.e. before they can travel to the coral communities at Cape Collinson and Tai Long Pai.

Nevertheless, coral monitoring is recommended to verify that the Project marine installation works are not resulting in any adverse impacts to the coral communities at Cape Collinson and Tai Long Pai.

Pursuant to the environmental monitoring and audit (EM&A) programme required for this Project, baseline data were collected prior to the start of cable installation works in 2012 (refer to the *Baseline Coral Monitoring Survey Report* of September 2012⁽¹⁾) and monitoring and audit were conducted throughout the cable installation and after its completion in early 2013 (refer to the *Post Project Coral Monitoring Survey Report* of February 2013⁽²⁾). Overall, there did not appear to be any unacceptable impacts to corals as a result of the AES cable installation works, as detailed in these reports.

Given re-installation works are now required for the ASE cable due to damage to the cable (see *Section 1.1 Introduction Background*), the EM&A programme will resume. The following Section provides details of the coral monitoring programme for the installation and re-installation of the ASE submarine cable.

4.1

OBJECTIVES AND APPROACH

The objective of the coral monitoring programme is to verify whether any adverse impacts to coral communities at Cape Collinson and Tai Long Pai occur as a result of the Project marine installation works.

⁽¹⁾ Available at <http://www.ase-tseungkwano-ema.com.hk/>

⁽²⁾ Available at <http://www.ase-tseungkwano-ema.com.hk/>

The coral monitoring programme comprises the following two surveys:

1. Baseline Surveys will be conducted within one month before any jetting works for the Project marine installation works start. The objective of Baseline Surveys is to identify suitable coral monitoring locations and to collect baseline monitoring data of corals at those locations for comparison with data collected during Post Project Surveys.
2. Post Project Surveys will be conducted within one month after completion of the Project marine installation works. During Post Project Surveys, data will be collected at the same locations and using the same methodology as Baseline Surveys. Data from Post Project Surveys will be used to compare with relevant baseline data in order to determine any detectable changes in coral conditions after Project marine installation works.

Coral monitoring will not be undertaken during jetting works as the works near Cape Collinson and Tai Long Pai will only last for several hours which will not allow adequate time for completion of the coral monitoring surveys at the monitoring locations.

Coral monitoring data will be reviewed in conjunction with the water quality monitoring data which will measure the levels of suspended solids generated during jetting works.

4.2

MONITORING LOCATIONS

Coral monitoring will be undertaken at Cape Collinson and Tai Long Pai (Monitoring Station), and a Control Station at Tung Lung Chau which is located more than 2 km from the cable alignment and thus unlikely to be impacted by the works. The monitoring locations are shown in *Figure 4.1* and detailed below:

Monitoring Stations:

- Zone A: Cape Collinson; and
- Zone B: Tai Long Pai.

Control Station:

- Zone C: Tung Lung Chau.

At each monitoring station, coral monitoring will be undertaken in two depth zones (ie shallow water: -2 to -5 mCD and deep water: -5 to -15 mCD). The depth ranges may be revised based on observations of coral distribution during Baseline Surveys.

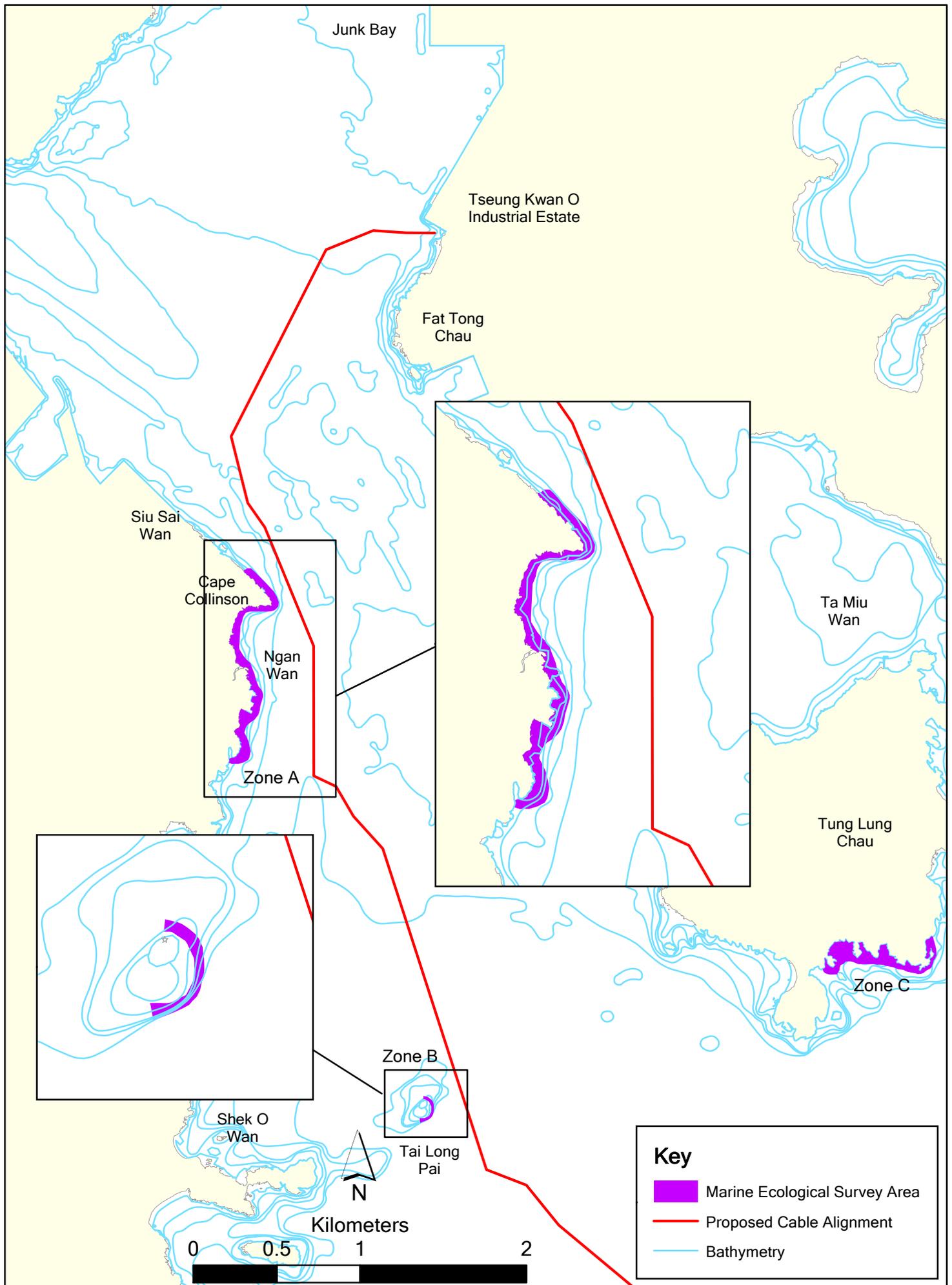


Figure 4.1

Locations of Marine Ecological Survey

File: 0122859_Marine_Ecological_Survey_Zone.mxd
Date: 22/11/2011

Environmental
Resources
Management



4.3 *MONITORING METHODOLOGY*

4.3.1 *Monitoring Personnel*

The coral monitoring works should be undertaken by a qualified coral specialist hired by the ET. The qualified coral specialist should be a degree holder in marine sciences with at least three years of post-graduate experience in the field of marine ecology and undertaking coral surveys. The same coral specialists should be used for each dive survey to maintain consistency in the documentation of the coral condition and should be approved by AFCD in advance of undertaking the monitoring work.

4.3.2 *Survey Methodology*

The Baseline Survey comprises the following three components:

- Qualitative spot dive survey;
- Semi-quantitative Rapid Ecological Assessment (REA) survey; and
- Coral Colony Monitoring.

Post Project Surveys comprises the same components as the Baseline Survey, except that the qualitative spot dive survey will not be undertaken. Survey methodology of the three components is described below.

Qualitative Spot Dive Survey

The qualitative spot dive survey will be undertaken as part of Baseline Surveys only to identify suitable coral monitoring locations at Cape Collinson, Tai Long Pai and Tung Lung Chau. During the survey, spot dive reconnaissance checks will be conducted within the designated Monitoring and Control Stations by SCUBA to collect qualitative information including coral composition, abundance and distribution. Based on the information collected, locations within which significant coral habitats will be found (defined as locations with relatively higher coral abundance and specie/ genus number for the purpose of this coral monitoring programme) and selected for the subsequent REA survey and coral colony monitoring during Baseline and Post Project Surveys. The depth range (shallow and deep) to be monitored will also be finalised based on observed coral distribution.

Rapid Ecological Assessment (REA) Survey Method

A standardised semi-quantitative Rapid Ecological Assessment (REA) survey technique will be used to investigate the general conditions of the coral communities (hard, soft and black corals) associated with subtidal hard bottom habitats at the Monitoring and Control Stations. The collection of REA data during Baseline and Post-Project Surveys would allow for a comparison of coral conditions before and after cable installation works in order to determine any changes in conditions due to the works.

The REA technique allows semi-quantitative information on the ecological attributes of the subtidal habitat to be obtained in a relatively simple way without compromising scientific rigour. This technique is the standard practices for EIA marine baseline surveys in Hong Kong and has been modified from the standardised REA survey technique established for the assessment of coral communities on the Great Barrier Reef ⁽¹⁾ for marine environment of Hong Kong ⁽²⁾.

A series of REA surveys will be conducted by qualified coral ecologists by SCUBA at the Monitoring stations (Cape Collinson and Tai Long Pai; *Figure 4.1*) and Control Station (Tung Lung Chau; *Figure 4.1*) with the aim to record the condition of substratum, estimate the diversity and relative abundance of coral assemblages (ie hard corals, octocorals and black corals) and with all hard coral colonies identified to species level while octocorals and black corals recorded to genus level. The survey will be undertaken on REA transects laid onto the seabed, each of which measure 100 m in length, at the following two depth zones of each station:

- Shallow depth region: -2 to -5 m CD (typically the depth range of hard coral colonies associated with subtidal hard bottom habitat); and
- Deep depth region: -5 to -15 m CD.

The location of the REA transects as well as the depth ranges of the monitored depth zones will be determined based on findings from the qualitative spot dive survey. A total of three (3) REA transects will be monitored at each depth region of Cape Collinson and Tung Lung Chau, while two (2) transects will be monitored at each depth region of Tai Long Pai due to limited survey area at this Monitoring Station.

Following the laying of the transect line, the coral specialist will swim along the transect slowly and conduct the REA survey. The REA methodology will encompass an assessment of the benthic cover (Tier I) and taxon abundance (Tier II) undertaken in a swathe ~ 4 m wide, 2 m either side of each transect. The belt transect width was dependent on underwater visibility and might be adjusted to a swathe ~ 2 m wide, 1 m either side of each transect in case of reduced visibility. An explanation of the two assessment categories (Tiers) used in the survey is presented below.

Tier I – Categorisation of Benthic Cover

Upon the completion of each survey transect, five ecological and seven substratum attributes will be assigned to one of seven standard ranked (ordinal) categories (Table 4.1 and 4.2).

(1) DeVantier, L.M., G.De' Ath, T.J. Done and E. Turak (1998). *Ecological assessment of a complex natural system: A case study from the Great Barrier Reef*. Ecological Applications 8: 480-496.

(2) Fabricius, K.E. and D. McCorry. (2006). *Changes in octocoral communities and benthic cover along a water quality gradient in reefs of Hong Kong*. Marine Pollution Bulletin 52: 22-23.

Table 4.1 *Categories used in the REA Surveys - Benthic Attributes*

Ecological	Substratum
Hard coral	Hard Substratum
Dead standing coral	Continuous pavement
Soft coral	Bedrock
Black coral	Rubble
Macroalgae	Sand
Turf Algae	Silt
	Large boulders (>50 cm)
	Small boulders (<50 cm)
	Rocks (<26 cm)

Table 4.2 *Categories used in the REA Surveys - Ordinal Ranks of Percentage Cover*

Rank	Percentage Cover (%)
0	None recorded
1	1-5
2	6-10
3	11-30
4	31-50
5	51-75
6	76-100

Tier II - Taxonomic Inventories to Define Types of Benthic Communities

An inventory of benthic taxa will be compiled for each transect. Taxa will be identified *in situ* to the following levels:

- Scleractinian (hard) corals to species wherever possible;
- Soft corals, gorgonians, black corals, anemones and conspicuous macroalgae recorded according to morphological features and to genus level where possible; and
- Other benthos (including sponges, zoanthids, ascidians and bryozoans) recorded to genus level wherever possible but more typically to phylum plus growth form.

Following the completion of each transect survey, each taxon in the inventory will be ranked in terms of abundance in the community (*Table 4.3*). These broad categories rank taxa in terms of relative abundance of individuals, rather than the contribution to benthic cover along each transect. The ranks are subjective assessments of abundance, rather than quantitative counts of each taxon.

Table 4.3 Ordinal Ranks of Taxon Abundance

Rank	Abundance
0	Absent
1	Rare ^(a)
2	Uncommon
3	Common
4	Abundant
5	Dominant

Note:

(a) The classification of “rare” abundance refers to low abundance (small quantity) on the transect, rather than in terms of distribution in Hong Kong waters.

A set of environmental site descriptors will be recorded for each REA transect as follows:

1. The degree of exposure to prevailing wave energy is ranked from 1 - 4, where:
 - 1 = sheltered (highly protected by topographic features from prevailing waves);
 - 2 = semi-sheltered (moderately protected);
 - 3 = semi-exposed (only partly protected); and
 - 4 = exposed (experiences the full force of prevailing wave energy).

2. Sediment deposition on the reef substratum (particle sizes ranging from very fine to moderately coarse) rated on a four point scale, from 0 -3, where:
 - 0 = no sediment;
 - 1 = minor (thin layer) sediment deposition;
 - 2 = moderate sediment deposition (thick layer), but substrate can be cleaned by fanning off the sediment; and
 - 3 = major sediment deposition (thick, deep layer), and substrate cannot be cleaned by fanning.

A suite of representative photographs will be taken for each REA transect. All field data will be checked upon completion of each REA transect and a dive survey proforma sheet will be completed at the end of the fieldwork day. Photographs will be compiled for each REA transect which will then be reviewed and REA data be verified.

Verified REA data will be presented in terms of:

- Site (transect) information (Tier I and II data), depth and environmental descriptors; and
- Species abundance data for each transect.

- Species lists, species richness and mean values for ecological and substratum types will be compiled. The rank abundance values will be converted to a mid-value percentage cover.

Coral Colony Monitoring

Coral colony monitoring will be undertaken during Baseline and Post Project Surveys to identify any evidence of sediment stress to corals before and after cable installation works. At each coral monitoring station, a total of fifteen (15) hard coral colonies and fifteen (15) octocoral/black coral colonies will be selected for monitoring. Priority will be given to selecting colonies of horizontal plate-like and massive growth forms which present large stable surfaces for the interception and retention of settling solids. Each of the selected corals will be identified to species or genus levels and photographed. The following data will be collected:

- Maximum diameter of the identified hard coral and soft coral colonies;
- Maximum height and width of the identified gorgonians and black corals;
- Percentage of sediment cover on the identified colonies and the colouration, texture and approximate thickness of sediment on the coral colonies and adjacent substrate. Any contiguous patches of sediment cover >10 % were recorded;
- Percentage of bleached area on the identified colonies of which two categories were recorded: a. blanched (ie pale) and b. bleached (ie whitened);
- Percentage of colony area showing partiality mortality; and
- Physical damage to colonies, tissue distension, mucous production and any other factors relevant will be noted in the field.

Other information such as the survey date, time, weather, sea and tidal conditions should also be recorded. The coral colony monitoring exercise will be undertaken to ensure colonies of similar growth forms and size will be selected for Baseline and Post Project Monitoring. Although coral tagging is a common practice for repeated monitoring of individual colony, this technique will not be employed in this monitoring programme due to difficulties in locating the tagged corals given the generally low visibility in the area and low light conditions in deep water.

Schedule for Baseline and Post Project Survey should be submitted to the Environmental Protection Department (EPD) prior to the commencement of the monitoring works for agreement.

The reports to be provided should include Baseline Monitoring and Post Project Monitoring Reports.

A Baseline Monitoring Survey Report should be submitted within two weeks after the completion of baseline monitoring and include the following details:

- Brief project background information;
- Monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations (and depth), monitoring date, time, frequency and duration; and
- Comments and conclusions.

Post Project Survey Report should be submitted within one month after completion of the Project marine installation works and should include, but not be limited to, the following details:

- Basic project information;
- Review of the coral conditions at the monitoring stations and the health status of the corals after the Project marine installation works and comparison with results as presented in relevant Baseline Monitoring Report; and
- Discussion of any detected adverse impacts to coral communities as a result of the cable installation works.

5.1 SITE INSPECTIONS

The site inspection will be undertaken at the landing point (ie new Beach Manhole (BMH) in Tseung Kwan O (TKO) Industrial Estate) to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with the Project Profile (PP-452/2011). In addition, the ET Leader will be responsible for defining the scope of the inspections (*Annex A*), detailing any deficiencies that are identified, and reporting any necessary action or additional mitigation measures that were implemented as a result of the inspection.

A weekly site inspection will be carried out at the proposed BMH in TKO Industrial Estate until the completion of construction works at the landing point. The areas of inspection will not be limited to the site area and should also include the environmental conditions outside the site which are likely to be affected, directly or indirectly, by the site activities. The ET will make reference to the following information while conducting the inspections:

- the Project Profile and EM&A recommendations on environmental protection and pollution control mitigation measures;
- ongoing results of the EM&A programme;
- works progress and programme;
- the relevant environmental protection and pollution control laws; and
- previous site inspection results and the results of Environmental Performance Reviews undertaken by the IC(E).

The Contractor(s) will update the ET with relevant information on the construction works prior to carrying out the site inspections. The site inspection results will be submitted to NTTCA and the Contractor(s) within 72 hours. Should actions be necessary, the ET will follow up with recommendations on improvements to the environmental protection and pollution control works and will submit these recommendations in a timely manner to NTTCA and the Contractor(s). They will also be presented, along with the remedial actions taken, in the EM&A report. The Contractor(s) will follow the procedures and time frame stipulated in the environmental site inspection for the implementation of mitigation proposal and the resolution of deficiencies. An action reporting system shall be formulated and implemented to report on any remedial measures implemented subsequent to the site inspections.

The ET will undertake the following procedures (*Figure 6.1*) upon receipt of a complaint:

- (i) log complaint and date of receipt into the complaint database;
- (ii) investigate the complaint and discuss with the Contractor(s) and NTTCA to determine its validity and to assess whether the source of the issue is due to works activities;
- (iii) if a complaint is considered valid due to the works, the ET will identify mitigation measures in consultation with the Contractor(s) and NTTCA;
- (iv) if mitigation measures are required, the ET will advise the Contractor(s) accordingly;
- (v) review the Contractor(s)'s response on the identified mitigation measures and the updated situation;
- (vi) if the complaint is transferred from EPD, an interim report will be submitted to EPD on the status of the complaint investigation and follow-up action within the time frame assigned by EPD;
- (vii) undertake additional monitoring and audit to verify the situation if necessary and ensure that any valid reason for complaint does not recur;
- (viii) report the investigation results and the subsequent actions on the source of the complaint for responding to complainant. If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD; and
- (ix) record the complaint, investigation, the subsequent actions and the results in the EM&A report.

During the complaint investigation work, the Contractor(s) and NTTCA will cooperate with the ET in providing the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor(s) will promptly carry out the mitigation measures. NTTCA will approve the proposed mitigation measures and the ET will check that the measures have been carried out by the Contractor(s).

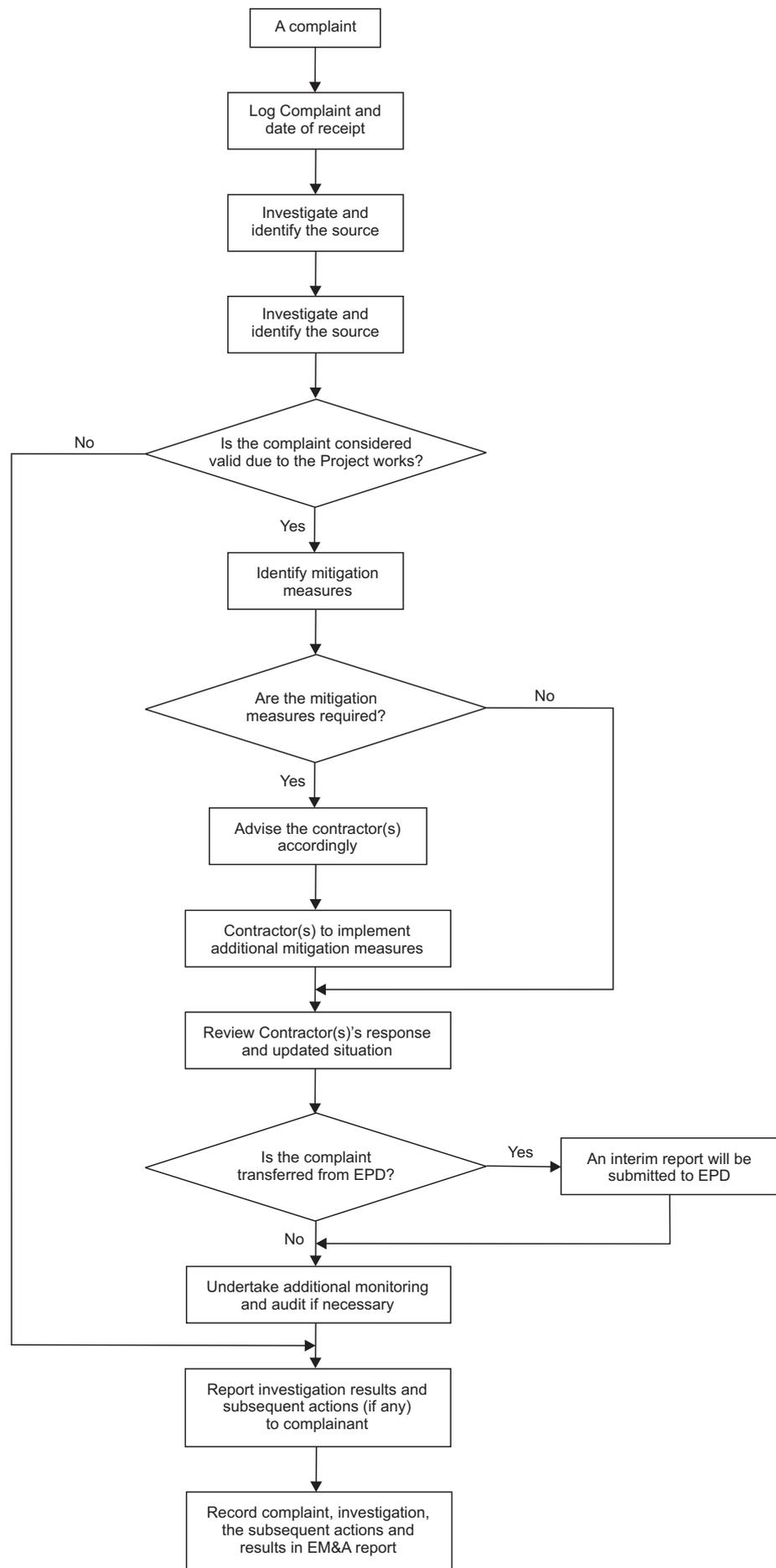


Figure 6.1

Flow Chart for Handling Environmental Complaints

Annex A

Site Inspection Log

Site:

Inspected By:

Inspection Date:

Time:

Weather

Condition Sunny Fine Overcast Drizzle Rain Storm Hazy

Temperature °C **Humidity** High Moderate Low

Wind Calm Light Breeze Strong

A Noise

	N/A or not observed	Yes	No	Photo/Remarks
A1 Are all plant and equipment well maintained and in good operating condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
A2 Is idle equipment turned off or throttled down?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
A3 Are powered mechanical equipment covered or shielded by acoustic materials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
A4 Are silenced equipment used where practicable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
A5 Do mobile plants be sited as far away from NSRs as possible?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
A6 Do plants known to emit noise strongly in one direction be oriented away from nearby NSRs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
A7 Major noise source(s) <input type="checkbox"/> Traffic <input type="checkbox"/> Construction activities outside of site	<input type="checkbox"/> Construction activities inside of site <input type="checkbox"/> Others			_____
A8 Any remedial action undertaken?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____

B Water Quality

	N/A or not observed	Yes	No	Photo/Remarks
B1 Is drainage system adequate? Are there temporary ditches for runoff discharge into appropriate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B2 Watercourse?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B3 With silt retention pond?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B4 Do permanent drainage channels have: sediment basin?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B5 traps and baffles?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B6 Are there sediment tanks for settling runoff prior to disposal?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B7 Are there oil interceptors in drainage system?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B8 Oil and grease removed regularly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B9 Bypass to prevent flushing during periods of heavy rain?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B10 Is drainage system well maintained?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B11 Is exposed earth stabilized after earthworks have been completed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B12 Are exposed slope surfaces covered (by tarpaulin or other means)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B13 Are open stockpiles of more than 20 m ³ covered during rainstorm?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B14 Are manholes covered and sealed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Rainy Season				
B15 Drainage system adequately designed for storm flow?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B16 Sediment control measures inspected and maintained after rain storms?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B17 Is debris and rubbish on site collected and disposed of properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B18 Is wastewater discharge license available for inspection?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B19 Measures to prevent the washing away of sand/silt to drains?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B20 Is there any sediment plume observed existing the marine works area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____

C Environmental Complaint

C1 Number of Environmental Complaint Received from _____ to _____. _____

D General / Housekeeping

	N/A or not observed	Yes	No	Photo/Remarks
D1 Are potential stagnant pools cleared and mosquito breeding prevented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____

Items for Inspection

Notes / Issues Recorded On Site

Corrective Actions

Signatures:
ET:

(Name: _____)

Annex B

Cable Re-installation Procedure

ANNEX B CABLE RE-INSTALLATION PROCEDURE

INTRODUCTION

With reference to *Environmental Impact Assessment Ordinance, Technical Memorandum (EIAO-TM)*, Section 6 (Material Change to a Designated Project or to an Environmental Impact), it is considered that the cable re-installation work will not constitute any material changes from the information provided in the approved ASE-TKO PP.

Specifically the re-installed cable will follow the same alignment as the existing approved ASE cable alignment (Refer to EIAO-TM, 6.1a), there will be no increase in the extent of dredging works (Refer to EIAO-TM, 6.1b) and given the works will follow the same methodology as the approved ASE-TKO PP no physical works are likely to affect any rare, endangered or protected species, or any important ecological habitat, or any site of cultural heritage since (Refer to EIAO-TM, 6.1e). Equally the environmental performance requirements as set out in the approved ASE-TKO PP are not expected to be exceeded or violated (Refer to EIAO-TM, 6.2).

The proposed cable re-installation will also adhere to the conditions of EP-433/2011, particularly the Specific Conditions set out in 2.1-2.5, regarding:

- keeping to the set alignment, burial depth, installation methods (more details below);
- employing an Independent Environmental Checker (as outlined in *Sections 1.3.1 and 1.3.2* of this EM&A Manual);
- protection of coral communities (as elaborated on further in *Section 4* of this EM&A Manual;
- monitoring the environmental impacts and timely implementation of recommended mitigation measures (as set out in this EM&A Manual); and
- set up and maintenance of a dedicated website informing the public about the EM&A works and results. (the Project EM&A website is active and can be found at: <http://www.ase-tseungkwano-ema.com.hk/>)

Further details of the procedure and methodology to be used for the cable re-installation works are provided below.

RE-INSTALLATION WORKS PROCEDURE AND METHODOLOGY

The methodology follows that used for the ASE cable installation works described in the previous Project Profile (PP-452/2011) and permitted under EP-433/2011. There are four main steps in the process as detailed below.

1. *Sub-marine Cable Cut and Pick Up at Surface Lay Area*

To reinstall new cable for damaged cable, firstly the cable will be cut at one of the surface lay areas where it is protected by URADUCT (rather than buried at 5 m), to cause minimal disturbance to the seabed during de-burial. There are two proposed locations:

- A) On either side of the DSD sewerage outfall pipeline crossing* (See *Figure B-1*), approximately 400 m from the BMH, OR
- B) Near Cape Collinson (See *Figure 1.1*), approximately 2 km from the BMH.

The cable at the proposed location (Scenario A or B) will be actually located using jetting technique involving Injector Burial Tool or diver using localised hand jetting. The cable will then be cut by the diver underwater and one cable end carefully lifted with diver's assistance (tie up the cable end by rope and lift up gently) up to the cable installation barge so as to cause minimal disturbance. Once on the barge, electrical and optical testing will be conducted and if necessary the second cable end lifted up to the barge for testing separately if necessary.

**Note. The potential location A) and method of procedure for crossing DSD submarine outfall have been agreed with the Director of Drainage Services Department (D of DS) following a meeting on 5 November 2013 and further correspondence with D of DS confirming the method of procedure is the same as that detailed in the previous Project Profile (PP-452/2011).*

2. *Route Clearance*

NTTCA recently conducted a side scan survey and diver inspection to try and help identify the nature of the fault. This has shown that the damaged cable has been moved (it is not known how) from the original as-laid route. Following the same procedure as stated in the previous Project Profile, Route Clearance Operation (RC) will be carried out prior to the cable re-installment operations. This is done by clearing away sea bed debris that could inhibit the burial operation and any residual/damaged cable that was not moved by the cause of damage, will also be cleared (*in situ*) from the ASE cable alignment by the Injector Burial Tool either cutting through it or it being moved immediately aside. Minimal water quality impact is anticipated during RC in this way and this operation will allow the same burial depth to be achieved for the re-installation cable.

3. *Sub-Marine Cable Re-Installation From Pick Up Point to Shore-End*

Assuming the section of cable offshore from the pick-up point is fully functional upon testing, a new sub-marine cable will be installed from the pick-up point to the shore after the route clearance. The offshore cable section will be connected to a new cable section on board the cable installation barge and then re-installed along the original ASE route.

The target burial depth is approximately 5 m below the seabed where possible except at the sections of hard bottom and crossing existing Drainage Services

Department (DSD) sewerage outfall pipeline and approximately 20 m out from the exit of the conduit under the seawall at Tseung Kwan O. No existing telecommunication cables are expected to be crossed at the moment.

The cable re-installation will be conducted by a purposely built cable installation barge and cable burial machine and will be conducted using the jetting technique. This method uses an "Injector Burial Tool" which is designed to simultaneously lay and bury the cable (See Project Profile PP-452/2011, *Figure 2.4*). It should be noted that the seabed can be expected to naturally reinstate to before-work level and condition shortly after completion of the works.

Photographic records of a typical Cable Installation Barge, Injection Burial Tool and Grapnel Anchor are presented in See Project Profile PP-452/2011, *Figure 2.5*.

If the re-installed cable crosses the DSD sewage pipe it will be surface laid with shallow burial for a distance of 50 m centred on the crossing point respectively (See Project Profile PP-452/2011, *Figure 2.2*). The surface laid cable will be protected by URADUCT (See Project Profile PP-452/2011, *Figure 2.3*) which will not affect the existing seabed level or the utility that is crossed.

4. Shore End Installation/ Cable Protection

The shore end installation and cable protection (at the shallow burial section as mentioned above) works will primarily involving divers. Approximately 20 m out from the exit of the conduit under the seawall at TKO, the target burial depth of the cable is approximately 2 m below the seabed. Cable burial for this shore end segment will be undertaken by divers using jet probes to sink the cable (with articulated pipe protection) into the sediment (See Project Profile PP-452/2011, *Figure 2.1*).

After completion of the cable re-installation, cable protection along the shallow burial and shore end segment will be carried out by installing articulated pipe (which is the protection for the cable) under sea (See Project Profile PP-452/2011, *Figure 2.1*).

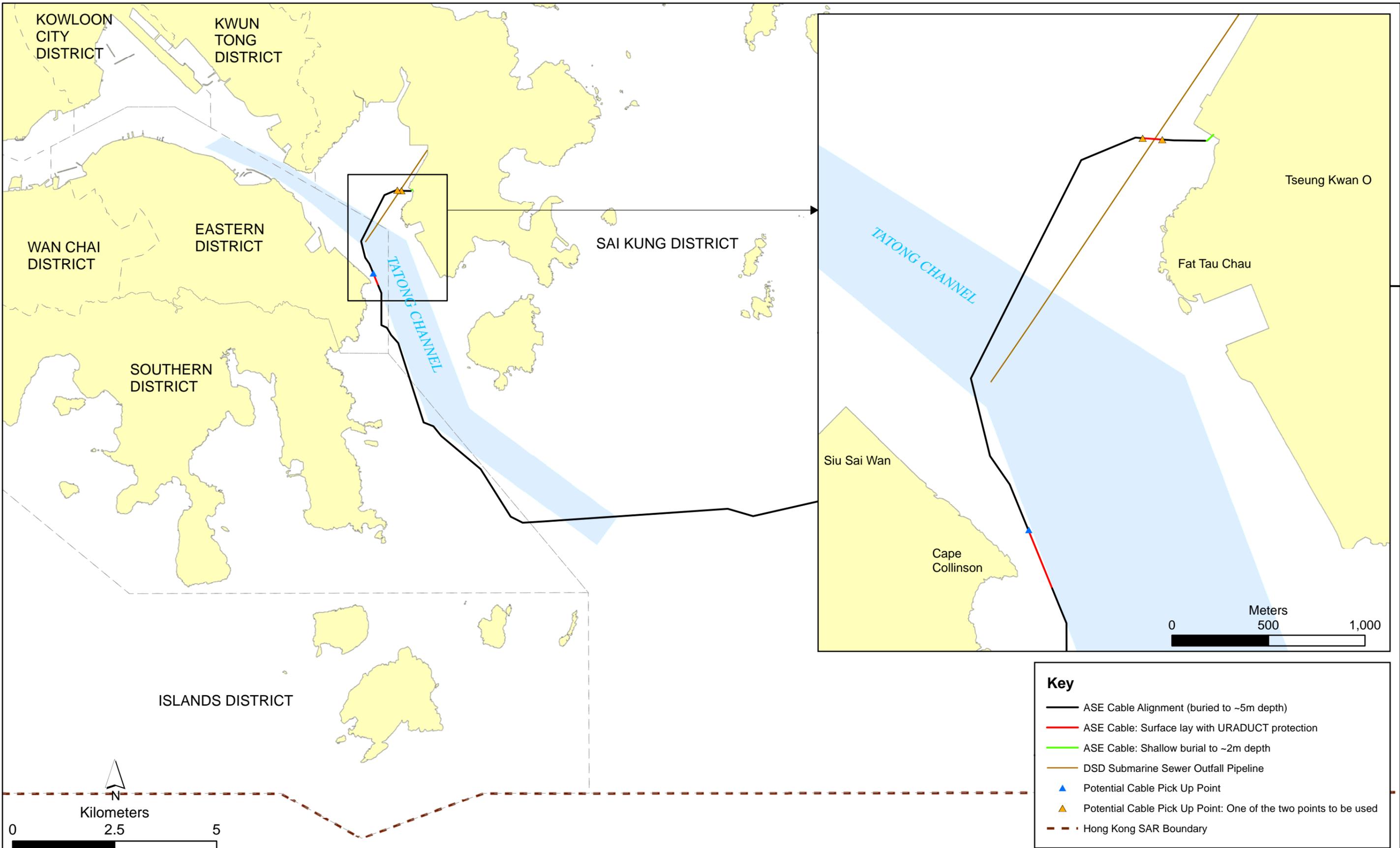


Figure B1

ASE Submarine Cable System (Layout Plan)