

Contract No. HY/2012/07
Tuen Mun – Chek Lap Kok Link –
Southern Connection Viaduct Section

Detailed Coral Translocation Methodology

9 October 2013

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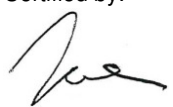


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Detailed Coral Translocation Methodology

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Client: DBJV		Project No: 0215660			
Summary: This document presents the Detailed Coral Translocation Methodology for Tuen Mun – Chek Lap Kok Link Southern Connection Viaduct Section.		Date: 9 October 2013			
		Approved by:  Mr Craig Reid Partner			
		Certified by:  Mr Jovy Tam ET Leader			
V2	Detailed Coral Translocation Methodology	CL	JT	CAR	09/10/13
V1	Detailed Coral Translocation Methodology	CL	JT	CAR	17/09/13
V0	Detailed Coral Translocation Methodology (Draft)	CL	JT	CAR	27/08/13
Revision	Description	By	Checked	Approved	Date
<p>This report has been prepared by Environmental Resources Management the trading name of '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.</p> <p>We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.</p> <p>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.</p>		<p>Distribution</p> <p><input checked="" type="checkbox"/> Internal</p> <p><input type="checkbox"/> Public</p> <p><input checked="" type="checkbox"/> Confidential</p> <div style="text-align: right;">   </div>			

Ref.: HYDHZMBEEM00_0_1301L.13

15 October 2013

AECOM
Supervising Officer Representative's Office
6 Hoi Kok Street,
Tsuen Wan, N.T.

By Fax (2492 2057) and By Post

Attention: Mr. Daniel Ip

Dear Sir,

**Re: Agreement No. CE 48/2011 (EP)
Environmental Project Office for the
HZMB Hong Kong Link Road, HZMB Hong Kong Boundary Crossing Facilities,
and Tuen Mun-Chek Lap Kok Link – Investigation**

**Contract No. HY/2012/07
Tuen Mun – Chek Lap Kok Link
Southern Connection Viaduct Section
Detailed Coral Translocation Methodology v2 (EP Condition 2.6)**

Reference is made to the submission of a Detailed Coral Translocation Methodology certified by the ET Leader (ERM ref: 0215660_Coral Translocation_Southern_v2.doc on 9 October 2013) and also by the Design Auditor (Atkins' reference: 7705231/10.00/OC012/DS/KP/fl, dated on 15 October 2013) provided to us via email on 10 and 15 October 2013, respectively.

We are pleased to inform you that we have no adverse comments on the captioned Detailed Coral Translocation Methodology. We write to verify the captioned submission in accordance with Condition 2.6 of EP-354/2009/A

Thank you for your kind attention. Please do not hesitate to contact the undersigned or the ENPO Leader Mr. Y H Hui should you have any queries.

Yours sincerely,



Tony Cheng
Independent Environmental Checker
Tuen Mun – Chek Lap Kok Link

c.c. HyD – Mr. Stephen Chan (By Fax: 3188 6614)
HyD – Mr. Matthew Fung (By Fax: 3188 6614)
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ERM – Mr. Jovy Tam (By Fax: 2723 5660)
Gammon – Mr. Roy Leung (By Fax: 2750 0922)

Internal: DY, YH, SC, ENPO Site

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1.1

BACKGROUND

According to the findings of the Northwest New Territories (NWNT) Traffic and Infrastructure Review conducted by the Transport Department, Tuen Mun Road, Ting Kau Bridge, Lantau Link and North Lantau Highway would be operating beyond capacity after 2016. This forecast has been based on the estimated increase in cross boundary traffic, developments in the Northwest New Territories (NWNT), and possible developments in North Lantau, including the Airport developments, the Lantau Logistics Park (LLP) and the Hong Kong – Zhuhai – Macao Bridge (HZMB). In order to cope with the anticipated traffic demand, two new road sections between NWNT and North Lantau – Tuen Mun – Chek Lap Kok Link (TM-CLKL) and Tuen Mun Western Bypass (TMWB) are proposed.

An Environmental Impact Assessment (EIA) of TM-CLKL was prepared in accordance with the EIA Study Brief (No. ESB-175/2007) and the *Technical Memorandum of the Environmental Impact Assessment Process (EIAO-TM)*. The EIA Report was submitted under the Environmental Impact Assessment Ordinance (EIAO) in August 2009. Subsequent to the approval of the EIA Report (EIAO Register Number AEIAR-145/2009), an Environmental Permit (EP-354/2009) for TM-CLKL was granted by the Director of Environmental Protection (DEP) on 4 November 2009, and EP variation (EP-354/2009A) was issued on 8 December 2010.

Under *Contract No. HY/2012/07*, Gammon Construction Limited is commissioned by the Highways Department (HyD) to undertake the design and construction of the Southern Connection Viaduct Section of TM-CLKL (“the Contract”). ERM-Hong Kong, Limited (ERM) has been appointed as the Environmental Team (ET) for the Contract.

1.2

CORAL TRANSLOCATION FOR SOUTHERN VIADUCT

According to the approved EIA Report of the TM-CLKL, due to the fact that no corals were recorded in the southern reclamation location and that the existing coral populations on the seawall in the southern landing area at Tai Ho Wan are far away (>10m) from the proposed reclamation area and from either side of the viaduct piers, no direct impacts on corals were anticipated in the location of the southern viaduct landing area. However, during the design and construction stage of the Southern Connection Viaduct Section, it became apparent that the water depth in the vicinity of bridge structures south of the Tung Chung Navigation Channel is too shallow. This constraint will prohibit transportation of piling rigs and related plant by flat barges being towed by tug boats to the piling locations. Therefore, temporary staging platforms with associated extension from the existing navigation channel/land would be required.

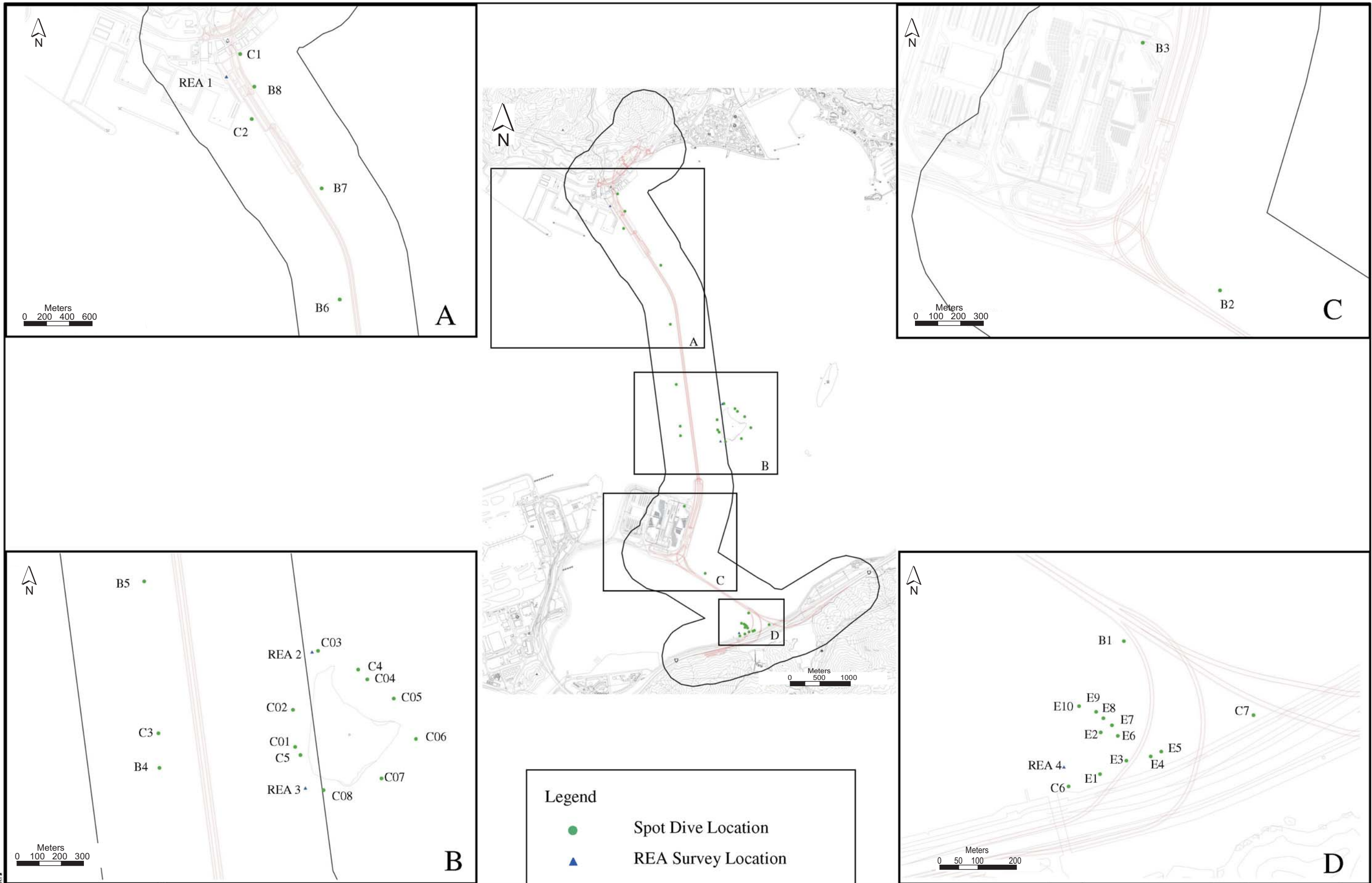
The construction of temporary staging would involve the removal of about 25 m rock armour at each landing position (total 3 landing positions). According to the coral survey in the approved EIA, coral communities are identified at certain locations (for example, survey station C7 as shown in *Figure 1.1*) along the seawall of the North Lantau Highway section at Tai Ho Wan. Potential direct impact to the coral communities at the affected seawall may thus arise. Coral translocation was therefore recommended for the coral colonies at Tai Ho Wan prior to construction of the temporary staging platforms in order to reduce the potential marine ecological impacts.

1.3

ENVIRONMENTAL REQUIREMENTS

According to *Condition 2.6* of the EP-354/2009A, the Permit Holder shall submit to the Director of Environmental Protection (DEP) for approval, at least one month before the commencement of construction of the Project, three hard copies and one electronic copy of a detailed coral translocation methodology, including pre-translocation survey, identification of receptor site and post-translocation monitoring.

In addition, according to *Section 6.4.3.1* of the EM&A Manual, a pre-construction survey of corals at Tai Ho Wan and potential receptor site(s) should be conducted prior to the translocation works. The suitability of the potential receptor site(s) should be reviewed and verified, and alternative receptor site(s) be proposed if necessary. A Coral Translocation Proposal, which includes findings of the pre-construction surveys, should be submitted for AFCD's agreement. Coral translocation should then be undertaken prior to any major relevant construction works in accordance with the Detailed Coral Translocation Methodology prepared under *Condition 2.6* of the EP-354/2009A.



Legend

Spot Dive Location

REA Survey Location

Plotting By: JADATES
 PLOT SCALE: 1:25000

<div><div>MAUNSELL</div><div>AECOM</div></div> <div>Maunsell Consultants Asia Ltd</div>	AGREEMENT NO. CE 52 / 2007 (HY) TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION		SCALE	--	DATE	JUN. 2009	
	Survey Stations for Coral (Spot Dive and REA) Survey under TM-CLKL Study (2008-2009)		CHECK	--	DRAWN	--	
			JOB No.	08111511	DRAWING No.	8.5b	REV

This Detailed Coral Translocation Methodology is prepared for the coral translocation exercise of the Southern Connection Viaduct Section of TM-CLKL. In accordance with *Condition 2.6* of the *EP-354/2009A*, the following information is presented in this document:

- Findings of the pre-construction surveys which were undertaken at the donor site at Tai Ho Wan and at the proposed coral receptor site at Tai Mo To in December 2012 and January 2013;
- Identification of receptor site(s) for the translocated corals from Tai Ho Wan;
- Details of the proposed procedures for the pre-translocation survey;
- Coral translocation method; and
- Post-translocation monitoring method.

This Detailed Coral Translocation Methodology will be submitted to the DEP for approval at least one month before the commencement of construction of the Southern Connection Viaduct Section of the TM-CLKL.

2.1 PRE-CONSTRUCTION SURVEY AT THE DONOR SITE

Spot-check dives and Rapid Ecological Assessment (REA) surveys were conducted at the donor site at Tai Ho Wan. The seabed of the survey site was mainly composed of natural bedrocks, boulders, artificial sloping boulders, and artificial vertical seawall. Two coral species (one hard coral and one gorgonian species) were recorded during the surveys. The survey results at Tai Ho Wan are presented in the following sections.

Tai Ho Wan

2.1.1 Spot Check Dive

A total of 12 spot-check dives were carried out on 17th – 19th December 2012 (Figure 2.1). The seabed of the survey sites (THW01 to THW12) were composed of artificial sloping boulders and sandy / muddy substrates, with water depth ranging from 1 to 7.5 m. The survey sites supported limited marine life. One hard coral species and one gorgonian species were found on boulder surfaces at spot-check dive sites THW01 to THW04. They were ahermatypic cup coral *Balanophyllia* sp. and gorgonian *Guaiagorgia* sp. The coral species recorded are common in local Hong Kong waters. The percentage cover of the corals found was low (<1%) (Table 2.1).

Table 2.1 *Species, Coverage and Size of Corals Found at Spot-Check Dive Sites at Tai Ho Wan*

Site	Coral Species	Coverage (%)	Size in Height/ Diameter (cm)
THW01	<i>Balanophyllia</i> sp.	<1%	<1
	<i>Guaiagorgia</i> sp.	<1%	10-15
THW02	<i>Balanophyllia</i> sp.	<1%	<1
	<i>Guaiagorgia</i> sp.	<1%	10-15
THW03	<i>Balanophyllia</i> sp.	<1%	<1
	<i>Guaiagorgia</i> sp.	<1%	10-15
THW04	<i>Balanophyllia</i> sp.	<1%	<1
	<i>Guaiagorgia</i> sp.	<1%	10-15

2.1.2 REA

Two 100 m REA transects were surveyed on 11th January 2013 following the spot-check dives (Figure 2.2). Tables 2.2-3 summarize the ecological and substratum attributes, and the ranks of taxon abundance along the two REA transects.

Setting Out Point for Transect					
Point	Easting	Northing	Point	Easting	Northing
C1	814778.2430	818276.7233	C18	815093.1725	818357.7636
C2	814973.2643	818356.5572	C19	815008.3556	818326.5015
C3	814812.6523	818202.1347	C20	815224.7779	818331.0124
C4	814841.6066	818128.1756	C21	815245.1437	818268.1515
C5	815027.7108	818209.2946	C22	815067.1009	818185.9498
C6	814869.0921	818055.5278	C23	815282.6338	818194.9486
C7	815058.8681	818141.3413	C24	815095.6903	818115.2196
C8	814896.1580	817983.1422	C25	815115.5439	818079.1842
C9	815091.2580	818069.7164	C26	815292.1803	818160.4868
C10	815095.2707	818033.9695	C27	815289.4314	818237.4912
C11	814909.7958	817951.4604	C28	815401.0742	818296.0613
C12	814880.4220	817942.9105	C29	815319.0626	818177.7964
C13	814693.1637	817897.9056	C30	815446.1570	818244.8841
C14	814878.4288	817973.3335	C31	815111.5312	818040.1589
C15	814781.0755	817938.8192	C32	815289.9773	818128.9099
C16	814766.0738	817973.3335	C33	815310.5128	818136.9353
C17	814862.4830	818008.5821	C34	815495.5680	818242.7860

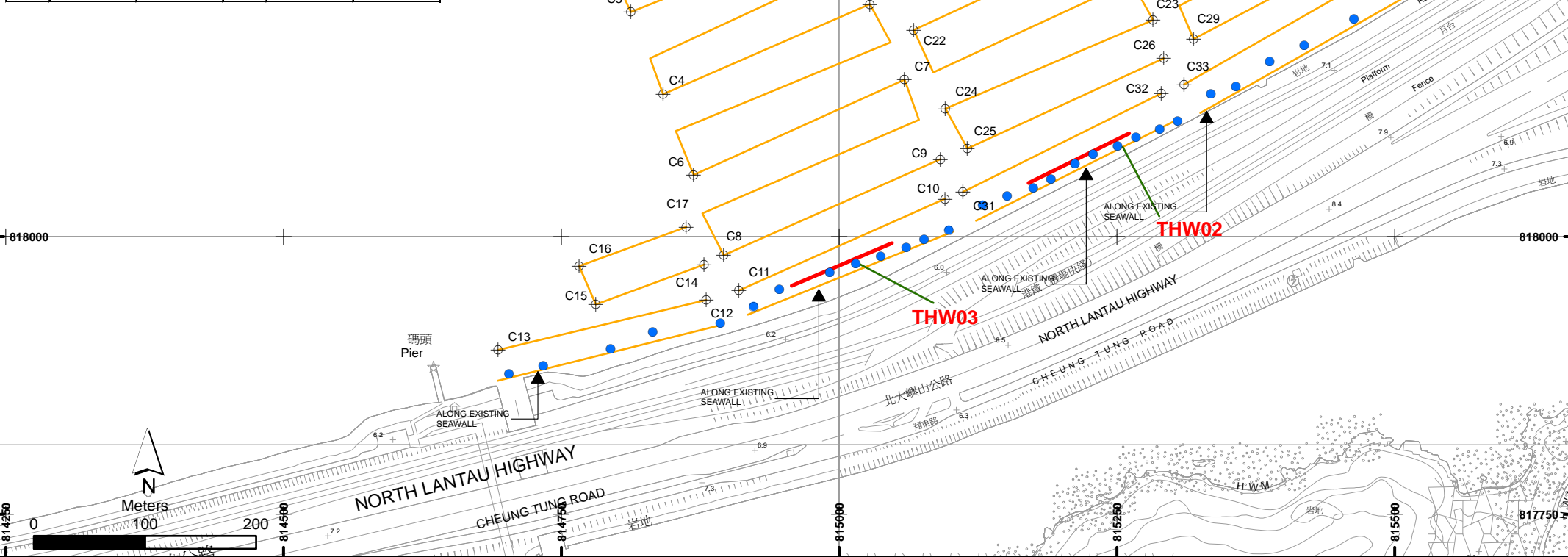


Figure 2.1

Spot-Check Dive Site at Tai Ho Wan

Setting Out Point for Transect					
Point	Easting	Northing	Point	Easting	Northing
C1	814778.2430	818276.7233	C18	815093.1725	818357.7636
C2	814973.2643	818356.5572	C19	815008.3556	818326.5015
C3	814812.6523	818202.1347	C20	815224.7779	818331.0124
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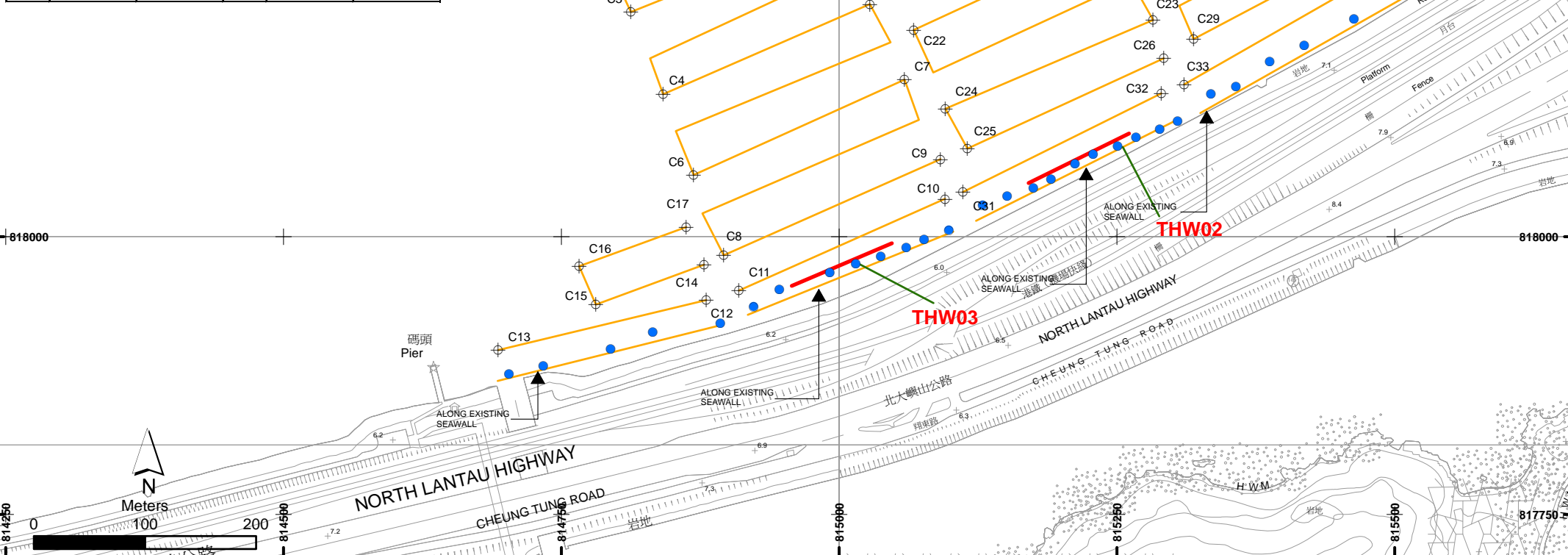


Figure 2.2
Indicative Locations of Coral Area and REA Transect at Tai Ho Wan

Table 2.2 *Ecological and Ecological Attributes of the REA Transects at Tai Ho Wan*

Ecological Attributes	REA 1 ⁽¹⁾	REA 2 ⁽¹⁾
Hard Coral	1	1
Dead Coral	0	0
Octocoral (Soft Corals and Gorgonians)	1	1
Anemone Beds	0	0
Dead Standing Corals	0	0
Other Benthos (sponges, zoanthids, ascidians and bryozoans)	1	1
Macroalgae	0	0
Substratum Attributes	REA 1 ⁽¹⁾	REA 2 ⁽¹⁾
Bedrock/ Continuous Pavement	0	0
Boulders Blocks (diam. >50cm)	5	5
Boulders Blocks (diam. <50cm)	3	3
Rubble	0	0
Other	0	0
Sand	2	2
Mud/Silt	0	0
Mud	0	0

Note: (1) Rank of percentage cover: 0 = None recorded; 1 = 1-5%; 2 = 6-10%; 3 = 11-30%; 4 = 31-50%; 5 = 51-75%; 6 = 76-100%

Table 2.3 *Ranks of Taxon Abundance of the REA Transects at Tai Ho Wan*

Benthic Taxon	REA 1 ⁽¹⁾	REA 2 ⁽¹⁾
<i>Balanophyllia</i> sp.	2	2
<i>Guaiagorgia</i> sp.	2	2
Sponges	3	3
Bryozoans	3	3
<i>Saccostrea cucullata</i>	3	3
<i>Perna viridis</i>	2	2

Note:

(1) Ordinal Ranks of Taxon Abundance: 0 = Absent; 1 = Sparse; 2 = Uncommon; 3 = Common; 4 = Abundant; 5 = Dominant

Sparse and patchy coverage (<1%) of hard coral (*Balanophyllia* sp.) and gorgonian (*Guaiaorgia* sp.) were recorded during the REA surveys. A total of 67 colonies of *Guaiaorgia* sp. (10 – 15 cm in height) were recorded on boulder surfaces along the REA transects at an average depth of 4 m. In addition, patches of *Balanophyllia* sp. were also found on the boulder surfaces along the shoreline with very low coverage (<1%). The recorded corals were in fair health condition.

Nine (9) out of the 67 recorded coral colonies were attached to movable boulders (<50 cm in diameter). It is considered technically feasible to translocate these movable boulders to reduce the direct loss of corals. Prior to coral translocation, a more detailed pre-translocation survey is recommended to find out the exact number of coral colonies (both movable and non-movable) within the affected area.

Overall, all the corals (*Balanophyllia* sp. and *Guaiaorgia* sp.) recorded during the REA survey are widespread and common across Hong Kong waters especially in the western waters with very low visibility. Owing to their commonness, sparse cover (< 5%), small size (most of the corals) and low species diversity and richness, the coral habitat of the surveyed area is considered as of low ecological value.

Detailed results of the dive surveys are provided in *Appendix A*. Representative photographs of the habitats and species recorded are shown in *Appendix B*.

2.2 *PRE-CONSTRUCTION SURVEY AT THE RECEPTOR SITE (TAI MO TO)*

Spot-check dives and REA surveys were conducted at the receptor site (Tai Mo To) proposed in the approved EIA Report in December 2012 and January 2013. The seabed of the survey site was mainly composed of natural bedrocks and boulders. Two coral species (one hard coral and one gorgonian species) were recorded during the surveys.

2.2.1 *Spot-Check Dive*

A total of six spot-check dives were carried out on 13th December 2012 (*Figure 2.3*). The seabed of the survey sites (TMT01 to THW06) were composed of bedrocks, boulders and sandy / muddy substrates, with water depth ranging from 1.5 to 7.5 m. The survey sites supported limited marine life. One hard coral species and one gorgonian species were found on boulder surfaces at spot-check dive sites TMT01 and TMT02. They were ahermatypic cup coral *Balanophyllia* sp. and gorgonian *Guaiaorgia* sp. The coral species recorded are common in local Hong Kong waters. The percentage cover of the corals found were low (<1%) (*Table 2.4*).

Setting Out Point for Transect		
Point	Easting	Northing
B1	814413.4266	821539.7767
B2	814391.1889	821353.5676
B3	814388.3110	821329.2910
B4	814381.4727	821242.3050
B5	814409.7437	821159.9106
B6	814437.6878	821170.8252
B7	814411.5193	821246.4307
B8	814423.0721	821367.5518
B9	814444.0857	821543.5115

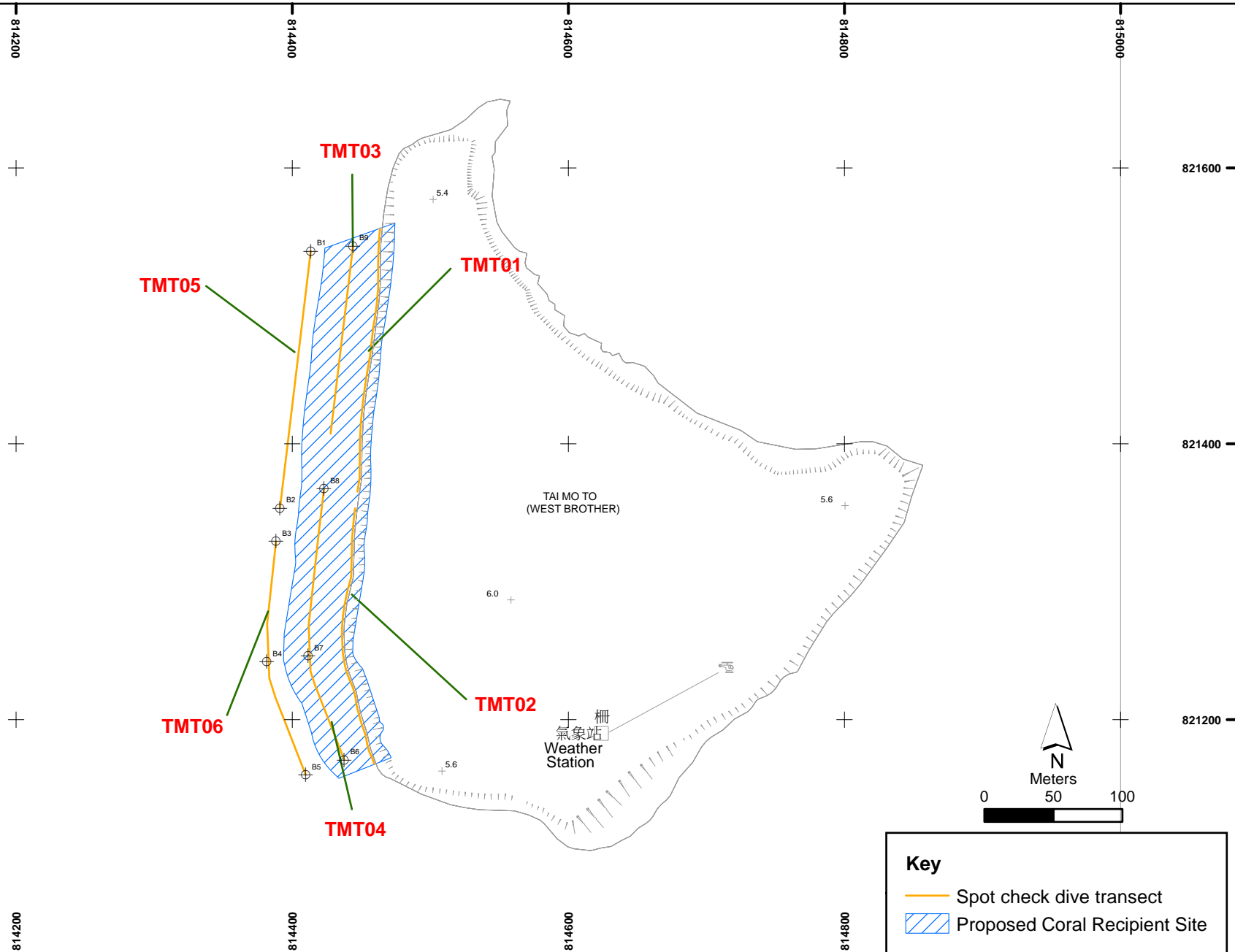


Figure 2.3

Spot-Check Dive Sites at Tai Mo To

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Date: 10/9/2013

Environmental
Resources
Management



Table 2.4 *Species, Coverage and Size of Corals found at Spot-Check Dive Sites at Tai Mo To*

Site	Coral Species	Coverage (%)	Size in Height/ Diameter (cm)
TMT01	<i>Balanophyllia</i> sp.	<1%	<1
	<i>Guaiaigorgia</i> sp.	<1%	10-25
TMT02	<i>Balanophyllia</i> sp.	<1%	<1
	<i>Guaiaigorgia</i> sp.	<1%	10-25

2.2.2 REA

A 100 m REA transect was surveyed on 10th January 2013 following the spot-check dives (Figure 2.4). Tables 2.5-6 summarize the ecological and substratum attributes, and the ranks of taxon abundance along the REA transect.

Table 2.5 *Ecological and Substratum Attributes of the REA Transects at Tai Mo To*

Ecological Attributes	REA 1 ⁽¹⁾
Hard Coral	1
Dead Coral	0
Octocoral (Soft Corals and Gorgonians)	1
Anemone Beds	0
Dead Standing Corals	0
Other Benthos (sponges, zoanthids, ascidians and bryozoans)	1
Macroalgae	0
Substratum Attributes	REA 1 ⁽¹⁾
Bedrock/ Continuous Pavement	2
Boulders Blocks (diam. >50cm)	4
Boulders Blocks (diam. <50cm)	3
Rubble	0
Other	0
Sand	2
Mud/Silt	0
Mud	0

Note: (1) Rank of percentage cover: 0 = None recorded; 1= 1-5%; 2 = 6-10%; 3 = 11-30%; 4 = 31-50%; 5 = 51-75%; 6 = 76-100%

Table 2.6 *Ranks of Taxon Abundance of the REA Transects at Tai Mo To*

Benthic Taxon	REA 1 ⁽¹⁾
<i>Balanophyllia</i> sp.	2
<i>Guaiaigorgia</i> sp.	2
Sponges	3
Bryozoans	3
<i>Saccostrea cucullata</i>	3
<i>Perna viridis</i>	2
<i>Sabellastarte japonica</i>	2

Note:

(1) Ordinal Ranks of Taxon Abundance: 0 = Absent; 1 = Sparse; 2 = Uncommon; 3 = Common; 4 = Abundant; 5 = Dominant

Setting Out Point for Transect		
Point	Easting	Northing
B1	814413.4266	821539.7767
B2	814391.1889	821353.5676
B3	814388.3110	821329.2910
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B5	814409.7437	821159.9106
B6	814437.6878	821170.8252
B7	814411.5193	821246.4307
B8	814423.0721	821367.5518
B9	814444.0857	821543.5115

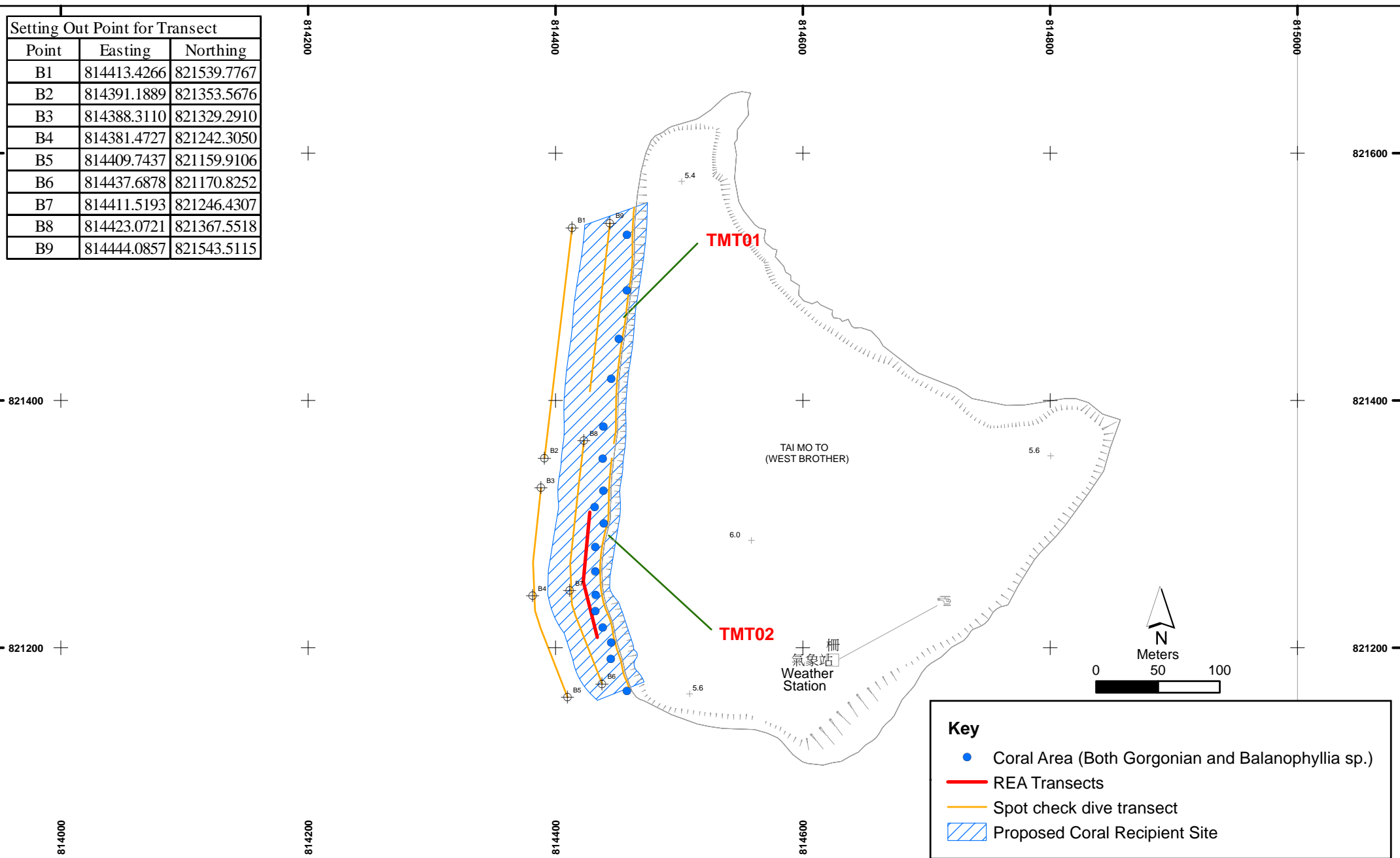


Figure 2.4

Indicative Locations of Coral Area and REA Transect at Tai Mo To

Sparse and patchy coverage (<1%) of hard coral (*Balanophyllia* sp.) and gorgonian (*Guaiaigorgia* sp.) were recorded during the REA survey. A total of 57 colonies of *Guaiaigorgia* sp. (10 – 25 cm in height) were recorded on bedrock or boulder surfaces along the REA transect at an average depth of 3.5 m. In addition, patches of *Balanophyllia* sp. were also found on the boulder surfaces along the shoreline with very low coverage (<1%). All recorded corals were in fair health condition.

Detailed results of the dive surveys are provided in *Appendix A*. Representative photographs of the habitats and species recorded are shown in *Appendix B*.

2.3

ALTERNATIVE CORAL RECEPTOR SITE

The EIA of the Project recommended that an area around Tai Mo To could be a suitable location for the receptor site. However, when compared with the donor site at Tai Ho Wan, the underwater visibility at the suggested coral receptor site at Tai Mo To was very low during the spot-check dives and REA surveys and the site is very exposed. Since post-translocation monitoring is required after coral translocation, the very low underwater visibility and rough sea conditions at Tai Mo To would make it difficult to find the translocated corals at the site. In addition, the translocated corals may be displaced easily if the wave is too strong. Therefore, it is recommended to find a more suitable receptor site which is less exposed and with similar coral assemblages to the donor site (ie with presence of *Guaiaigorgia* sp. and *Balanophyllia* sp.). Recent coral surveys undertaken under *Contract No. HY/2011/03 Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road-Section between Scenic Hill and Hong Kong Boundary Facilities* showed that *Guaiaigorgia* sp. and *Balanophyllia* sp. were found at Yam Tsai Wan of North Lantau which is a relatively less exposed site (*Figure 2.5*). It should also be noted that Yam Tsai Wan was selected as the receptor site for the coral translocation exercise of *Contract No. HY/2011/03* under which corals had been translocated successfully to this receptor site in October 2012. Considering the above, it is recommended to select Yam Tsai Wan as the coral receptor site for the present translocation exercise of the Southern Connection Viaduct Section.

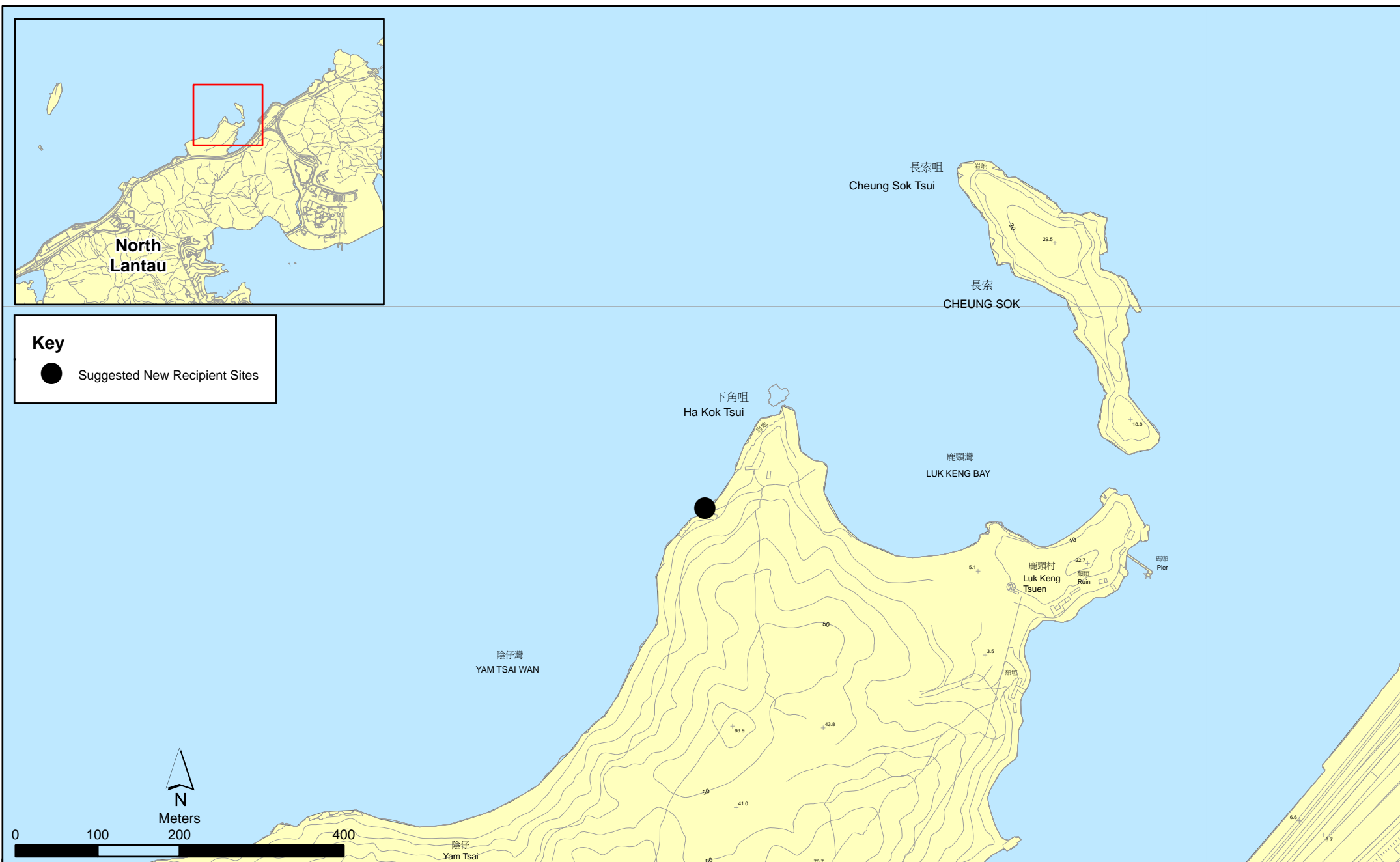


Figure 2.5

Suggested Alternative Coral Receptor Site at Yam Tsai Wan, North Lantau

3.1 PRE-TRANSLOCATION AND TRANSLOCATION SURVEYS AT THE DONOR SITE

A coral mapping survey will be conducted at the donor site at Tai Ho Wan as part of the pre-translocation coral survey. The location of the donor site is shown in *Figure 2.2*.

The location of any hard corals and gorgonians will be mapped. The size and health condition (including percentage cover of bleaching, mortality, degree of sedimentation) of the corals will be recorded. The feasibility of translocation of corals including but not limited to those of conservation importance will be assessed.

Coral colonies (i.e. those attached to movable boulders with diameter <50 cm, in good health condition, and feasible for translocation) proposed to be translocated will be identified, mapped and tagged during the survey. Each coral colony will be tagged using laminated, waterproof labels (approximately 20 cm x 10 cm), which will be tied onto boulders just adjacent to the coral colonies. Photograph(s) of each coral colony will be taken and additional information for each of the coral colonies will also be collected (e.g. depth, orientation, size of the attached boulders, general conditions immediately surrounding the coral colonies).

Substratum removal method is not suggested for translocating the two coral species (*Balanophyllia* sp. and *Guaiaigorgia* sp.) found at Tai Ho Wan. This is because the hard coral species *Balanophyllia* sp. is in encrusting growth form on the attached substrate. In addition, *Balanophyllia* sp. is a solitary coral species with single, small size polyp (ie mostly not larger than 5 mm in diameter for each individual) attached to the substrate. Substratum removal method would not be feasible as that would likely to damage the coral colonies and lead to a very low chance of survival during the translocation process. For the azooxanthellate gorgonian *Guaiaigorgia* sp., it depends on filter feeding with the tentacles capturing plankton and particulate matter from the water column. At the receptor site, it would be necessary to attach (or glue) them using epoxy or underwater cement to the seabed of an area with relatively stronger current to facilitate their filter feeding process. High mortality of gorgonian is expected at the receptor site due to the following reasons:

- According to overseas experience of gorgonian translocation, growing edge of the holdfast will recede or die back when the detached gorgonian is being glued to the substrate of the receptor site by epoxy or underwater cement ⁽¹⁾;

(1) Akins North America, Inc. (2011) Amendment No 1 to the Professional Services between the City of Miami Beach, Florida and Akins North America, Inc.

- Under relatively strong current, it is unlikely to be able to attach the gorgonian firmly to the substrate and high mortality is thus expected for the translocated gorgonian; and
- The colony of *Guaiagorgia* sp. does not exhibit an obvious central spine (please refer to *Appendix B* for photos of *Guaiagorgia* sp.) and it would be difficult to glue the detached gorgonian to the substrate, leading to easy detachment by current and consequently high mortality.

Considering the above and the lack of local experiences in adopting substratum removal method for gorgonian translocation, the substratum removal method is not recommended for the target translocated coral species at Tai Ho Wan.

Since underwater visibility at the donor site is very low (<0.5m), relocating all tagged coral colonies after coral mapping is almost impossible. Therefore, coral translocation will be undertaken immediately after locating the movable coral colonies. Further details on the coral translocation procedure are presented in *Section 4*.

3.2

PRE-TRANSLOCATION SURVEY AT THE RECEPTOR SITE

It is preferable to select a receptor site with the following characteristics:

- In the vicinity of the original coral colony;
- Not impacted by the Project or other construction/ activities;
- Presence of healthy coral community of the same species and similar hydrographical conditions as donor site; and
- With sufficient space to receive the newly translocated coral colonies.

As mentioned in the previous section, Tai Mo To is not a suitable receptor site due to the exposed and rough sea conditions. Recent coral surveys for another project (*Contract No. HY/2011/03: Hong Kong-Zhuhai-Macao Bridge - Hong Kong Link Road*) showed that the coastline of Yam Tsai Wan is an optional coral receptor site for translocation as it shares similar habitat to the existing corals to be translocated (*Figure 2.5*).

A pre-translocation survey will be conducted at the proposed receptor site at Yam Tsai Wan to ensure its suitability before the translocation of corals commenced at the donor site of Tai Ho Wan. A spot-check dive will be conducted at the proposed receptor site and its vicinity to check for the presence of healthy coral colonies such as hard coral *Balanophyllia* sp. and gorgonian *Guaiagorgia* sp. which had been observed in previous surveys.

Following the spot-check dive, the substrate type and taxonomic composition of the receptor site will be assessed using REA method. The REA survey will be performed along a 100 m transect parallel to the coastline (based on the preliminary results from the spot-check dives). The substrate type along the

length of the transects will be recorded at 1 m intervals. The benthic cover, taxon abundance, and ecological attributes along the transects will also be recorded in a swathe of 2 m wide, 1 m either side of the transect.

The locations of the REA transects will be recorded on-site using a handheld GPS unit. The number of colonies, sizes and types of corals, their coverage, abundance, depth, health status of coral species will also be recorded. Photographs of representative taxa along the transects will also be taken during the surveys.

Health status of coral will be assessed by the following criteria:

- Gorgonian coral: Percentage of branches exhibiting partial mortality and secretion of mucus.
- Hard coral: Percentage of surface area exhibiting partial mortality and blanched/ bleached area using specially designed Coral Health Monitoring Chart (*Appendix C*).

The benthic cover (Tier I) and taxon abundance (Tier II) of the transect will be assessed in a swathe 2 m wide, 1 m either side of the transect. Two assessment categories (Tiers) will be used in the surveys, as follows:

Tier I – Categorization of Benthic Cover

Upon the completion of each transect, ecological and substratum attributes (*Table 3.1*) will be assigned to standard ranked ordinal categories (*Table 3.2*).

Table 3.1 *Tier I Benthic Attribute Categories*

Ecological Attributes	Substratum Attributes
Hard Coral	<u>Hard Substrata</u>
Dead Coral	Bedrock/ Continuous Pavement
Octocoral (Soft Corals and Gorgonians)	Boulder blocks (diam. >50cm)
Anemone Beds	Boulder blocks (diam. <50cm)
Dead Standing Corals	Rubble
Other Benthos (sponges, zoanthids, ascidians and bryozoans)	Other
Macroalgae	<u>Soft Substrata</u>
	Sand
	Mud/Silt
	Mud

Table 3.2 *Tier I Ordinal Ranks of Percentage Cover of Benthic Attributes*

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

For substratum attributes, it is preferable to record actual estimates of cover. The percentage of hard substrata vs. soft substrata can be provided (e.g. 80% and 20% respectively). The percentage cover of the types of hard or soft substrata could also then be presented (e.g. bedrock pavement 60%, rubble 20%, sand 15%, mud / silt 5%). Similarly, recording and presenting actual estimates of, for instance, hard and soft coral cover may be more informative (e.g. <1%).

Tier II – Taxonomic Inventories to Define Types of Benthic Communities

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

- Hard corals to species, where possible;
- Soft corals, anemones and conspicuous macroalgae to genus level, where possible;
- Other benthos (including sponges, zoanthids, ascidians and bryozoans) to genus level, where possible.

For each transect, each taxon in the inventory will be ranked in terms of abundance in the community (*Table 3.3*). The taxon categories will be ranked in terms of relative abundance of individuals, rather than the contribution to benthic cover along each transect. The ranks are visual assessments of abundance, rather than quantitative counts of each taxon. Representative photos of organisms will be taken.

Table 3.3 ***Ordinal Ranks of Taxon Abundance***

Rank	Relative Abundance
0	Absent
1	Sparse
2	Uncommon
3	Common
4	Abundant
5	Dominant

In order to distinguish the natural variation in health status of corals and the health variation due to coral translocation, a certain number of natural coral colonies (eg 10 colonies) of the same species as those translocated from the donor site within and adjacent to the receptor site will be randomly selected and tagged. Baseline information will be collected for these tagged coral colonies before translocation and the type of information collected will be the same as those collected for the coral colony during the baseline survey at the donor site. The baseline information collected will be used for the purpose of post-translocation monitoring.

Upon completion of the pre-translocation surveys, the requirement for translocation and the required dimensions of the receptor site will be identified. If necessary, fine tuning / adjustment to the location of the preferred receptor site for successful translocation should be considered.

Once the exact location of the receptor site is marked, GPS coordinates will be recorded.

The pre-translocation survey should be carried out by a qualified marine biologist(s) with specialist knowledge of corals and sound experience at identifying sessile benthic taxa in the field. The qualification of the specialists proposed for the dive survey will be provided to and approved by AFCD prior to the pre-translocation survey.

Results of the baseline surveys at the donar and receptor sites will be presented in the Detailed Translocation Report to be submitted after completion of the coral translocation exercise (see *Section 6* below).

4.1 CORAL TRANSLOCATION PROCEDURES

The following procedures will be performed during coral translocation to minimize stress and prevent damage to corals, as far as possible.

- Since the underwater visibility at the donor site is very low (<0.5m), relocating all tagged coral colonies after coral mapping is almost impossible. Therefore, coral translocation will be undertaken immediately after locating the movable coral colonies.
- All tagged movable boulder (with diameter <50 cm) supporting coral colony which is selected for translocation will be moved entirely as a whole object, lifted from the sea bottom and loaded to ship/boat with lifting bag.
- The coral colonies transferred onto the vessel will be fully submerged in seawater tanks of suitable size with continuous aeration onboard. Each seawater tank will hold no more than four boulders to avoid overcrowding.
- Ambient water quality parameters such as sea surface water temperature and dissolved oxygen will be measured once (with at least three replicates) at the coral donor site on the day of coral translocation. The seawater quality in the tanks will be checked every 10 minutes to ensure no fluctuation above 10% of ambient occurs to the seawater in which the coral colonies are submerged.
- Corals will be transported to the receptor site as soon as possible on the same day following the removal. The vessel will progress in a slow and steady speed (<5 knots) when approaching close to the receptor site.
- When arriving at the coral receptor site, SCUBA divers, under the supervision of marine biologist with relevant experience, will carefully place the boulders with coral colonies one by one to the seabed in order to minimize disturbance to the seabed and/or sediment. The coral colonies will be positioned to similar depths and orientations as their previous locations at the donor site as far as possible.
- Divers will tag translocated colonies at the receptor site with small plastic labels (e.g. with colony number) anchored or attached on nearby hard substratum using epoxy without touching the corals. All tags will be anchored in vicinity of the coral colonies at distances not so close to interfere with the potential growth. This would allow the revisit of the coral colonies during the post-translocation monitoring.
- Divers will record the size, location, health conditions (percentage of mortality and bleaching), percentage cover of sediment of each

translocated coral colony after the completion of translocation works using the same methodologies adopted in the pre-translocation coral survey. Photographs of each translocated coral upon completion of translocation will be taken and used as a baseline for future monitoring.

4.2

PRECAUTIONARY MEASURES OF CORAL TRANSLOCATION

The following precautionary measures will be adopted during the coral translocation process:

- In the case where any tagged boulder with corals recorded during the pre-translocation survey no longer accommodates live coral growth, the boulder will not be moved. If additional boulders with coral that can be moved are discovered, these boulders will also be incorporated into the translocation works.
- Effort will be made to minimize the amount of contact by the diver and the length of time the boulders/rocks are handled. All the coral colonies attached on the boulders will be kept submerged at all times with a brief unavoidable exposure when transferred onto the vessel.
- The placement of boulders in tanks will ensure that the coral colonies are fully covered by seawater. Coral exposure to air should be avoided as far as possible during the translocation process from the donor site to the receptor site. Shading will also be provided by placing the seawater tanks under roof of the vessel to avoid exposure to direct sunlight.
- Constant supervision of the boulders and the correct orientation of the boulders in the seawater holding tanks will be carried out to ensure coral colonies are not being stressed or damaged on the way to the receptor site.
- The coral translocation should be carried out by a qualified marine biologist(s) with specialist knowledge of corals and sound experience in coral identification and translocation works. The qualification of the specialists proposed for the dive survey shall be provided to and approved by AFCD prior to the coral translocation.

4.3

PRELIMINARY CORAL TRANSLOCATION SCHEDULE

According to the preliminary schedule of coral translocation, the coral translocation exercise, including pre-translocation survey and coral translocation, will commence in October 2013 for completion within five days (please refer to *Table 6.1* in *Section 6*).

5.1 MONITORING METHODOLOGY

After translocation is complete, an audit survey will be carried out to determine if all corals have been moved. The audit survey may be undertaken on the same day of completion of the coral translocations works or after that. Following the audit survey, the translocated coral colonies as well as the tagged natural coral colonies at the receptor site will be monitored once every three (3) months for a period of 12 months. The size, survival, health conditions (percentage of mortality / bleaching) and percentage cover of sediment of each translocated coral colony will be recorded during the monitoring, using the same methodology adopted during the pre-translocation survey. The general environmental conditions including weather, sea and tidal conditions of the coral receptor site will also be monitored. A sample of survey record form is provided in *Appendix D*.

Photographic records of the translocated and natural coral colonies will be taken as far as possible maintaining the same aspect and orientation as photographs taken for the pre-translocation surveys. All the tags for marking the translocated and natural coral colonies will be removed / retrieved once the monitoring programme is completed.

The results of the post-translocation monitoring should be reviewed with reference to findings of the pre-translocation survey and the data from original colonies at the receptor site.

If observations of any die-off / abnormal conditions of the translocated corals are made during the post-translocation monitoring, the ET should inform the Contractor, Independent Environmental Checker (IEC) / Environmental Project Office (ENPO), and AFCD, and liaise with AFCD to investigate any mitigation measures needed.

Post-translocation monitoring results will be evaluated against Action and Limit Levels. Evaluation will be based on recorded changes in percentage of partial mortality of the corals. Action and Limit Levels are defined in *Table 5.1*.

Table 5.1 *Action and Limit Levels for Post-Translocation Coral Monitoring*

Parameter	Action Level Definition	Limit Level Definition
Mortality	If during Impact Monitoring a 15% increase in the percentage of partial mortality on the corals occurs at more than 20% of the translocated coral colonies that is not recorded on the original corals at the receptor site, then the Action Level is exceeded.	If during Impact Monitoring a 25% increase in the percentage of partial mortality on the corals occurs at more than 20% of the translocated coral colonies that is not recorded on the original corals at the receptor site, then the Limit Level is exceeded.

If the defined Action Level or Limit Level for coral monitoring is exceeded, the actions as set out in *Table 5.2* will be implemented.

Table 5.2 Event and Action Plan for Post-Translocation Monitoring

Event	Action			
	ET Leader	IEC	SOR	Contractor
Action Level Exceedance	<ol style="list-style-type: none"> 1. Check monitoring data 2. Inform the IEC, SOR and Contractor of the findings; 3. Increase the monitoring to at least once a month to confirm findings; 4. Propose mitigation measures for consideration 	<ol style="list-style-type: none"> 1. Discuss monitoring with the ET and the Contractor; 2. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise the SOR accordingly. 	<ol style="list-style-type: none"> 1. Discuss with the IEC additional monitoring requirements and any other measures proposed by the ET; 2. Make agreement on the measures to be implemented. 	<ol style="list-style-type: none"> 1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR; 3. Implement the agreed measures.
Limit Level Exceedance	<ol style="list-style-type: none"> 1. Undertake Steps 1-4 as in the Action Level Exceedance. If further exceedance of Limit Level, propose enhancement measures for consideration. 	<ol style="list-style-type: none"> 1. Discuss monitoring with the ET and the Contractor; 2. Review proposals for additional monitoring and any other measures submitted by the Contractor and advise the SOR accordingly. 	<ol style="list-style-type: none"> 1. Discuss with the IEC additional monitoring requirements and any other measures proposed by the ET; 2. Make agreement on the measures to be implemented. 	<ol style="list-style-type: none"> 1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR; 3. Implement the agreed measures.

6.1 TENTATIVE SCHEDULE

Following approval of this Detailed Coral Translocation Methodology, the pre-translocation coral surveys will be undertaken at the receptor site of Yam Tsai Wan in October 2013. The receptor site survey will be followed by the pre-translocation survey and coral translocation at the donar site of Tai Ho Wan which will be undertaken at the same time. Following completion of the coral translocation, an audit survey will be undertaken on the same day of completion of coral translocation or after that. It is expected that the pre-translocation coral surveys, coral translocation and audit survey will be completed by October 2013 and a tentative schedule is presented in *Table 6.1* below.

Table 6.1 *Tentative Schedule of Pre-Translocation Coral Surveys, Coral Translocation Works and Audit Survey*

Day	Task
Day 1	Pre-translocation survey at the receptor site Yam Tsai Wan.
Day 2	Coral mapping at Tai Ho Wan; Coral translocation from Tai Ho Wan to Yam Tsai Wan.
Day 3	Coral mapping at Tai Ho Wan; Coral translocation from Tai Ho Wan to Yam Tsai Wan.
Day 4	Coral mapping at Tai Ho Wan; Coral translocation from Tai Ho Wan to Yam Tsai Wan.
Day 5	Audit survey to confirm that all target coral colonies for translocation have been removed from Tai Ho Wan

The tentative schedule of the quarterly post-translocation monitoring is provided in *Table 6.2* below.

Table 6.2 *Schedule of Quarterly Post-Translocation Monitoring*

Post-Translocation Monitoring Survey	Timing
1 st Quarterly Monitoring	3 months after the translocation works
2 nd Quarterly Monitoring	6 months after the translocation works
3 rd Quarterly Monitoring	9 months after the translocation works
4 th Quarterly Monitoring	12 months after the translocation works

6.2 **REPORTING**

A Detailed Translocation Report will be submitted to EPD and AFCD upon the completion of the translocation works. The locations, conditions and photographic records of the translocated corals and the conditions of the receptor site will be detailed in the report. This report will be submitted within two weeks from completion of the coral translocation works which is anticipated to be in late October 2013.

A Post-Translocation Monitoring Report will be submitted to EPD and AFCD two weeks after completion of each quarterly survey. The results of the post-translocation monitoring surveys should be reviewed with reference to the pre-translocation survey results and findings.

Highways Department, 2009. Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road - EIA Report. Prepared by Ove Arup & Partners Hong Kong Limited for Highways Department, The Government of Hong Kong Special Administrative Region.

Highways Department, 2009. Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road - EM&A Manual. Prepared by Ove Arup & Partners Hong Kong Limited for Highways Department, The Government of Hong Kong Special Administrative Region.

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Appendix A

Raw Data Recorded during the Dive Surveys at Tai Ho Wan and Tai Mo To

Table 1 *Weather Condition during the Spot-Check Dives at Tai Ho Wan*

Date	Weather Condition	Average Underwater Visibility
December 2012	North force 4 to 5 Sunny	0.5m
December 2012	Northeast force 4 to 5 Sunny	0.5m
December 2012	Northeast force 4 to 5 Sunny	0.5m

Table 2 *GPS Location, Route Distance, Minimum Depth, Maximum Depth, Bottom Substrate and Underwater Visibility at Spot-Check Dive Sites at Tai Ho Wan*

Site	Location (GPS) (Starting Point)	Route Distance (m)	Min. Depth (m)	Max. Depth (m)	Bottom Substrate	Visibility (m)
THW01	818210.722N 815507.438E	170	1	5	Artificial Sloping Boulders	0.5
THW02	818122.389 N 815345.028 E	180	1.5	5.5	Artificial Sloping Boulders	0.5
THW03	818020.809N 815143.956E	170	1.5	5	Artificial Sloping Boulders	0.5
THW04	818018.057N 814906.666E	170	1.5	6	Artificial Sloping Boulders	0.5
THW05	818242.7860N 815495.5680E	180	5.5	7	Sand/ Mud	0.5
THW06	818128.9099N 815289.9773E	180	6	7	Sand/Mud	0.5
THW07	818033.9695N 815059.2707E	180	6	7.5	Sand/Mud	0.5
THW08	817942.9105N 814880.4220E	180	6.5	7	Sand/ Mud	0.5
THW09	818244.8841N 815446.1570E	400	6	7	Sand/Mud	0.5
THW10	818160.4868N 815292.1803E	400	6	7	Sand/Mud	0.5
THW11	818069.7164N 815091.2580E	1700	6	7.5	Sand/Mud	0.5
THW12	817973.3335N 814878.4288E	210	6	7	Sand/ Mud	0.5

Table 3 *Species, Coverage and Size of Corals found at Spot-Check Dive Sites at Tai Ho Wan*

Site	Coral Species	Coverage	Size in Height/ Diameter (cm)
THW01	<i>Balanophyllia</i> sp.	<1%	<0.1
	<i>Guaiaorgia</i> sp.	<1%	10-15
THW02	<i>Balanophyllia</i> sp.	<1%	<0.1
	<i>Guaiaorgia</i> sp.	<1%	10-15
THW03	<i>Balanophyllia</i> sp.	<1%	<0.1

Site	Coral Species	Coverage	Size in Height/ Diameter (cm)
THW04	<i>Guaiagorgia</i> sp.	<1%	10-15
	<i>Balanophyllia</i> sp.	<1%	<0.1
	<i>Guaiagorgia</i> sp.	<1%	10-15

Table 4 *Weather Condition during the REA Survey at Tai Ho Wan*

Date	Weather Condition	Average Underwater Visibility
January 2013	East force 4 to 5 Sunny	0.5m

Table 5 *GPS of Transect Starting Point and End Point, Maximum Depth, Bottom Substrate and Underwater Visibility of REA Transects at Tai Ho Wan*

Transect	Location (GPS) (Starting Point)	Location (GPS) (End Point)	Max. Depth (m)	Bottom Substrate	Visibility (m)
REA 1	818132.175N	818048.122N	4	Artificial Sloping	0.5
	815359.925E	815190.649E		Boulders	
REA 2	817986.747N	817929.737N	4	Artificial Sloping	0.5
	815084.087E	814935.168E		Boulders	

Table 6 *Size and Health Condition of Coral Colonies found at Transect REA 1 at Tai Ho Wan*

Coral Number	Coral Species	Size in Height/ Diameter (cm)	Distance on Transect (m)	Health Condition	Translocation Feasibility ⁽¹⁾
1	<i>Guaiagorgia</i> sp.	10	9.5	Fair	No
2	<i>Guaiagorgia</i> sp.	15	9.5	Fair	No
3	<i>Guaiagorgia</i> sp.	11	12	Fair	No
4	<i>Guaiagorgia</i> sp.	12	15	Fair	No
5	<i>Guaiagorgia</i> sp.	10	15.2	Fair	No
6	<i>Guaiagorgia</i> sp.	11	25	Fair	No
7	<i>Guaiagorgia</i> sp.	12	26.2	Fair	No
8	<i>Guaiagorgia</i> sp.	13	29	Fair	No
9	<i>Guaiagorgia</i> sp.	15	29.5	Fair	No
10	<i>Guaiagorgia</i> sp.	10	42	Fair	No
11	<i>Guaiagorgia</i> sp.	10	42.1	Fair	Yes
12	<i>Guaiagorgia</i> sp.	12	50.2	Fair	No
13	<i>Guaiagorgia</i> sp.	14	50.3	Fair	No
14	<i>Guaiagorgia</i> sp.	10	50.4	Fair	No
15	<i>Guaiagorgia</i> sp.	10	62	Fair	No
16	<i>Guaiagorgia</i> sp.	10	62.3	Fair	No
17	<i>Guaiagorgia</i> sp.	15	70	Fair	No
18	<i>Guaiagorgia</i> sp.	14	72.5	Fair	Yes
19	<i>Guaiagorgia</i> sp.	13	75.6	Fair	No

(1) The translocation feasibility was determined based on the size of boulders measured at the time of the pre-construction survey. Corals that were attached to movable boulders of <50 cm in diameter were considered feasible to be translocated. Further evaluation of the translocation feasibility will be undertaken during the pre-translocation survey according to requirements stated in the current Detailed Coral Translocation Methodology.

Coral Number	Coral Species	Size in Height/ Diameter (cm)	Distance on Transect (m)	Health Condition	Translocation Feasibility ⁽¹⁾
20	<i>Guaiagorgia</i> sp.	13	76.4	Fair	No
21	<i>Guaiagorgia</i> sp.	10	77.2	Fair	No
22	<i>Guaiagorgia</i> sp.	12	76	Fair	No
23	<i>Guaiagorgia</i> sp.	13	78.2	Fair	No
24	<i>Guaiagorgia</i> sp.	10	78.3	Fair	No
25	<i>Guaiagorgia</i> sp.	15	78.4	Fair	No
26	<i>Guaiagorgia</i> sp.	15	79	Fair	No
27	<i>Guaiagorgia</i> sp.	10	79.1	Fair	Yes
28	<i>Guaiagorgia</i> sp.	10	79.2	Fair	No
29	<i>Guaiagorgia</i> sp.	12	82	Fair	No
30	<i>Guaiagorgia</i> sp.	11	82.2	Fair	Yes
31	<i>Guaiagorgia</i> sp.	13	90.5	Fair	No
32	<i>Guaiagorgia</i> sp.	15	92.1	Fair	No
33	<i>Guaiagorgia</i> sp.	15	95.2	Fair	No
34	<i>Guaiagorgia</i> sp.	15	95.2	Fair	No
35	<i>Guaiagorgia</i> sp.	10	96	Fair	Yes
36	<i>Guaiagorgia</i> sp.	15	96.1	Fair	No

Table 7 ***Size and Health Condition of Coral Colonies found at Transect REA 2 at Tai Ho Wan***

Coral Number	Coral Species	Size in Height/ Diameter (cm)	Distance on Transect (m)	Health Condition	Translocation Feasibility
1	<i>Guaiagorgia</i> sp.	10	4.2	Fair	No
2	<i>Guaiagorgia</i> sp.	10	10.1	Fair	No
3	<i>Guaiagorgia</i> sp.	11	10.2	Fair	No
4	<i>Guaiagorgia</i> sp.	12	11.5	Fair	No
5	<i>Guaiagorgia</i> sp.	14	16	Fair	No
6	<i>Guaiagorgia</i> sp.	10	19	Fair	No
7	<i>Guaiagorgia</i> sp.	12	25	Fair	No
8	<i>Guaiagorgia</i> sp.	10	32.2	Fair	No
9	<i>Guaiagorgia</i> sp.	15	33	Fair	Yes
10	<i>Guaiagorgia</i> sp.	15	34	Fair	No
11	<i>Guaiagorgia</i> sp.	10	34.1	Fair	No
12	<i>Guaiagorgia</i> sp.	10	46	Fair	No
13	<i>Guaiagorgia</i> sp.	11	46.1	Fair	No
14	<i>Guaiagorgia</i> sp.	12	55	Fair	Yes
15	<i>Guaiagorgia</i> sp.	15	55.2	Fair	No
16	<i>Guaiagorgia</i> sp.	12	56	Fair	No
17	<i>Guaiagorgia</i> sp.	10	67	Fair	No
18	<i>Guaiagorgia</i> sp.	14	67.2	Fair	No
19	<i>Guaiagorgia</i> sp.	10	74	Fair	Yes
20	<i>Guaiagorgia</i> sp.	10	75.5	Fair	No
21	<i>Guaiagorgia</i> sp.	11	77.7	Fair	No
22	<i>Guaiagorgia</i> sp.	10	78	Fair	No
23	<i>Guaiagorgia</i> sp.	11	78.2	Fair	No
24	<i>Guaiagorgia</i> sp.	12	78.3	Fair	No
25	<i>Guaiagorgia</i> sp.	15	79.5	Fair	No
26	<i>Guaiagorgia</i> sp.	15	79.5	Fair	No
27	<i>Guaiagorgia</i> sp.	10	82	Fair	No
28	<i>Guaiagorgia</i> sp.	10	83	Fair	No
29	<i>Guaiagorgia</i> sp.	15	83.4	Fair	Yes
30	<i>Guaiagorgia</i> sp.	15	87	Fair	No
31	<i>Guaiagorgia</i> sp.	14	89	Fair	No

Table 8 *Weather Condition during the Spot-Check Dives at Tai Mo To*

Date	Weather Condition	Average Underwater Visibility
December 2012	Northeast force 4 to 5 Sunny	0.5m

Table 9 *GPS Location, Route Distance, Minimum Depth, Maximum Depth, Bottom Substrate and Underwater Visibility of Spot-Check Dive Sites at Tai Mo To*

Site	Location (GPS) (Starting Point)	Route Distance (m)	Min. Depth (m)	Max. Depth (m)	Bottom Substrate	Visibility (m)
TMT01	821548.983N 814460.231E	200	1.5	5.5	Bedrock/ Boulders	0.5
TMT02	821383.835N 814414.147E	190	1.5	2	Bedrock/ Boulders	0.5
TMT03	821543.5115N 814444.0857E	170	2.5	3.5	Sand/ Mud	0.5
TMT04	821367.5518N 814423.0721E	220	3	6	Sand/ Mud	0.5
TMT05	821539.7767N 814413.4266E	230	5	7.5	Sand/ Mud	0.5
TMT06	821329.291N 814388.311E	200	5	7	Sand/ Mud	0.5

Table 10 *Species, Coverage and Size of Corals found at Spot-Check Dive Sites at Tai Mo To*

Site	Coral Species	Coverage	Size in Height/ Diameter (cm)
TMT01	<i>Balanophyllia</i> sp.	<1%	<0.1
	<i>Guaiaogorgia</i> sp.	<1%	10-25
TMT02	<i>Balanophyllia</i> sp.	<1%	<0.1
	<i>Guaiaogorgia</i> sp.	<1%	10-25

Table 11 *Weather Condition during the REA Survey at Tai Mo To*

Date	Weather Condition	Average Underwater Visibility
January 2013	East force 4 to 5 Sunny	0.5m

Table 12 *GPS of Transect Starting Point and Ending Point, Maximum Depth, Bottom Substrate and Underwater Visibility of REA Transects at Tai Mo To*

Transect	Location (GPS) (Starting Point)	Location (GPS) (End Point)	Max. Depth (m)	Bottom Substrate	Visibility (m)
REA 1	821337.727N 814414.147E	821212.501N 814437.723E	3.5	Bedrocks/ Boulders	0.5

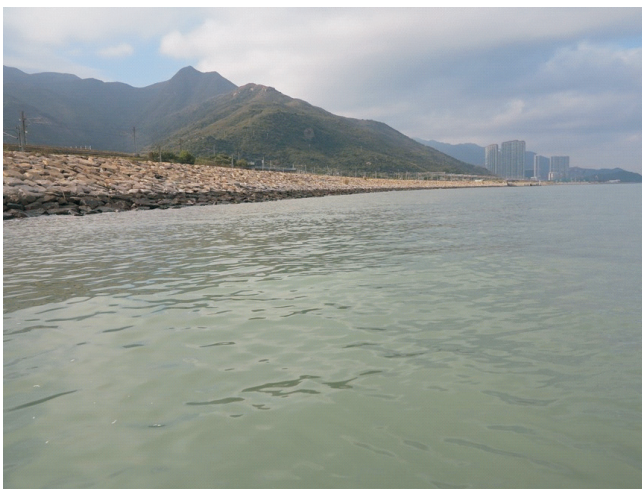
Table 13 **Size and Health Condition of Coral Colonies found at Transect REA 1 at Tai Mo To**

Coral Number	Coral Species	Size in Height/ Diameter (cm)	Distance on Transect (m)	Health Condition	Translocation Feasibility
1	<i>Guaiagorgia</i> sp.	10	4.2	Fair	No
2	<i>Guaiagorgia</i> sp.	11	5	Fair	No
3	<i>Guaiagorgia</i> sp.	15	7	Fair	No
4	<i>Guaiagorgia</i> sp.	12	7.5	Fair	No
5	<i>Guaiagorgia</i> sp.	20	12	Fair	No
6	<i>Guaiagorgia</i> sp.	20	12.2	Fair	No
7	<i>Guaiagorgia</i> sp.	15	16	Fair	No
8	<i>Guaiagorgia</i> sp.	25	16.3	Fair	No
9	<i>Guaiagorgia</i> sp.	17	24	Fair	No
10	<i>Guaiagorgia</i> sp.	18	28	Fair	No
11	<i>Guaiagorgia</i> sp.	14	28.5	Fair	No
12	<i>Guaiagorgia</i> sp.	16	32.4	Fair	No
13	<i>Guaiagorgia</i> sp.	10	32.8	Fair	Yes
14	<i>Guaiagorgia</i> sp.	21	33.9	Fair	No
15	<i>Guaiagorgia</i> sp.	14.	42	Fair	No
16	<i>Guaiagorgia</i> sp.	22	44.5	Fair	No
17	<i>Guaiagorgia</i> sp.	25	44.5	Fair	No
18	<i>Guaiagorgia</i> sp.	15	44.6	Fair	Yes
19	<i>Guaiagorgia</i> sp.	16	44.6	Fair	Yes
20	<i>Guaiagorgia</i> sp.	19	57	Fair	No
21	<i>Guaiagorgia</i> sp.	10	57.4	Fair	No
22	<i>Guaiagorgia</i> sp.	21	57.6	Fair	No
23	<i>Guaiagorgia</i> sp.	20	62	Fair	No
24	<i>Guaiagorgia</i> sp.	15	62.1	Fair	Yes
25	<i>Guaiagorgia</i> sp.	14	62.2	Fair	No
26	<i>Guaiagorgia</i> sp.	10	62.2	Fair	No
27	<i>Guaiagorgia</i> sp.	10	65	Fair	Yes
28	<i>Guaiagorgia</i> sp.	15	65.5	Fair	No
29	<i>Guaiagorgia</i> sp.	15	65.5	Fair	No
30	<i>Guaiagorgia</i> sp.	14	65.7	Fair	No
31	<i>Guaiagorgia</i> sp.	16	65.8	Fair	Yes
32	<i>Guaiagorgia</i> sp.	14	65.8	Fair	No
33	<i>Guaiagorgia</i> sp.	21	67	Fair	No
34	<i>Guaiagorgia</i> sp.	19	67	Fair	Yes
35	<i>Guaiagorgia</i> sp.	20	67.1	Fair	No
36	<i>Guaiagorgia</i> sp.	14	67.2	Fair	No
37	<i>Guaiagorgia</i> sp.	10	67.2	Fair	No
38	<i>Guaiagorgia</i> sp.	15	67.7	Fair	No
39	<i>Guaiagorgia</i> sp.	16	82	Fair	No
40	<i>Guaiagorgia</i> sp.	17	82	Fair	No
41	<i>Guaiagorgia</i> sp.	10	82.1	Fair	No
42	<i>Guaiagorgia</i> sp.	10	82.4	Fair	No
43	<i>Guaiagorgia</i> sp.	12	82.6	Fair	No
44	<i>Guaiagorgia</i> sp.	10	82.5	Fair	No
45	<i>Guaiagorgia</i> sp.	15	83.4	Fair	Yes
46	<i>Guaiagorgia</i> sp.	10	83.5	Fair	No
47	<i>Guaiagorgia</i> sp.	14	83.5	Fair	No
48	<i>Guaiagorgia</i> sp.	10	84	Fair	No
49	<i>Guaiagorgia</i> sp.	19	86.2	Fair	No
50	<i>Guaiagorgia</i> sp.	14	88.1	Fair	No
51	<i>Guaiagorgia</i> sp.	15	88.7	Fair	No
52	<i>Guaiagorgia</i> sp.	21	92	Fair	No
53	<i>Guaiagorgia</i> sp.	22	92.4	Fair	No
54	<i>Guaiagorgia</i> sp.	13	93	Fair	Yes

Coral Number	Coral Species	Size in Height/ Diameter (cm)	Distance on Transect (m)	Health Condition	Translocation Feasibility
55	<i>Guaiagorgia</i> sp.	25	94.5	Fair	No
56	<i>Guaiagorgia</i> sp.	12	94.6	Fair	No
57	<i>Guaiagorgia</i> sp.	10	95	Fair	No

Appendix B

Representative Photographs Taken during the Dive Surveys



Artificial Sloping Boulders



Natural Bedrocks and Boulders



Guaiaagorgia sp.



Guaiaagorgia sp.



Guaiaagorgia sp.



Guaiaagorgia sp.

Figure B1

Representative Photographs taken during the Dive Surveys
on 11th January 2013

FILE: P078118a1
DATE: 17/09/2013

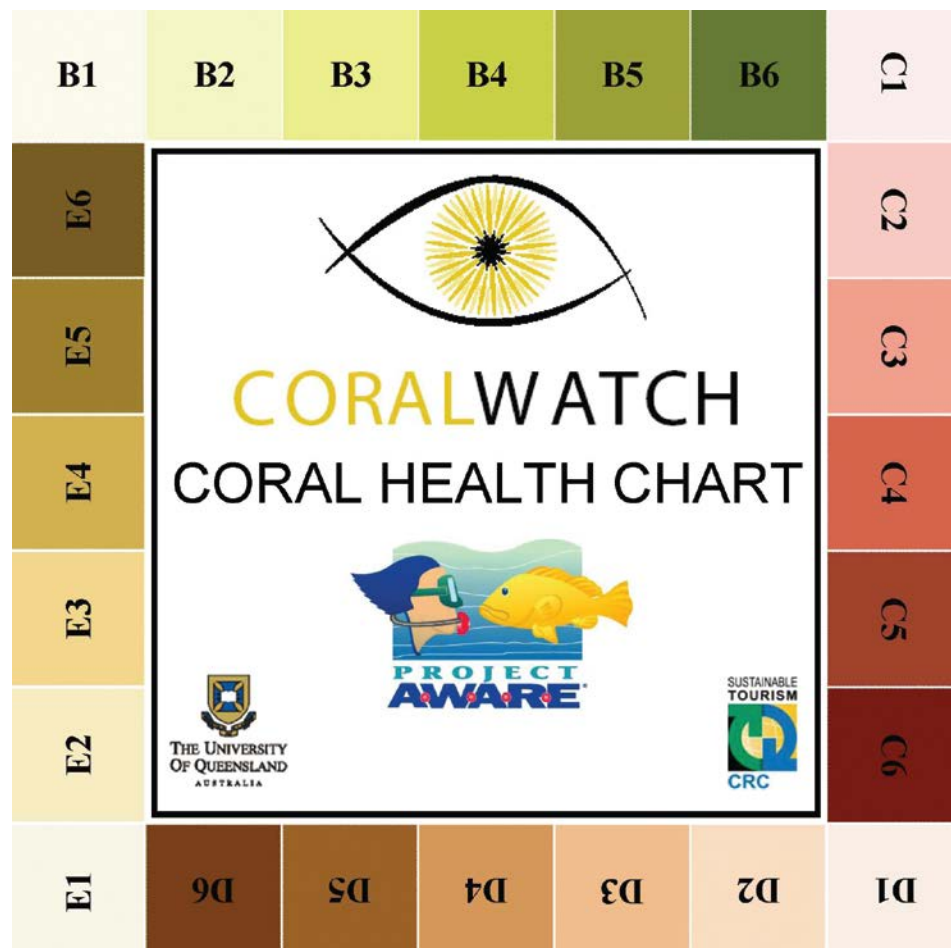
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Appendix C

Coral Health Monitoring Chart

The Coral Health Monitoring Chart has four sample colours and six degrees of darkness (Code 1 to 6) for each sample colour indicating different stages of coral health condition. Code 1 is the lightest (representing bleaching) and Code 6 has the dark colour (representing the healthiest). During the REA survey, the lightest and darkest areas of each coral will be selected, and the colour of areas will be matched to the categories on the chart.



Appendix D

Sample Survey Record
Form

Appendix D Sample Survey Record Form

[illegible]