

THE OCEANWAY CORPORATION LTD

# REPORT

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FIELD DIVING SURVEYS OF CORALS ON  
SOFT-BOTTOM SUBSTRATES AROUND  
CHEK LAP KOK  
PROPOSED THIRD RUNWAY

**FINAL**



January 2014

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## EXECUTIVE SUMMARY

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- In May 2013, a coral survey on soft bottom substrate was carried out within areas which may be directly impacted by the project. These areas include the reclamation footprint within HKIAAA in Area 3 along the northern coast of existing airport island, at the potential pipeline diversion landing point within Sha Chau and Lung Kwu Chau Marine Park (SCLKCMP).
- A total of 19 coral survey sites were investigated for soft bottom coral communities (Nine within Project footprint, four along proposed submarine pipelines and cables diversion alignments and in adjacent areas, two within the SCLKCMP with four other sites to the west and east of the airport island as reference sites). This report is the result of the fast response diver survey carried out in September 2012. The map of the surveyed sites is attached in Appendix 1. These sites are labeled C1~C19.
- A further three coral survey sites were added after data from the Sub-marine Archeological Side-scan Sonar Survey was received. These locations were reasonably large (>10 m<sup>2</sup>) areas of submerged rock that were recorded in that survey. Certain species of coral have been recorded on this type of substratum in areas around Hong Kong in the past. These sites are labeled SC2, SC10 & SC12.
- The depths of all the surveyed sites range between 3.7 m and 13.9 m. Visibility values are low, range between 0.3 m to 1 m as the bottom substratum are mainly soft mud with occasion small area of rocks.
- Occurrence of benthos on the muddy seabed surface is very low. These include crabs and sea urchins.
- Occurrence of attached marine benthos on rock surface include green mussel, various species of soft corals and one species of hard coral.
- Since the sea bottom of the study sites are composed of loose substrate and have low visibility, such sites are not suitable habitat for reef-building corals. Only low abundance of soft corals occurs.
- Some photographs of the site are attached in Appendix 5.
- There is no coral community in the study sites and thus it is not necessary to carry out Rapid Ecological Assessment Survey (REA).
- Recommendations are:
  - To mitigate any impact to the soft coral communities by constructing the seawalls along the third runway structure using a coral friendly design with suitable materials.
  - The low density, small size and relatively high partial mortality precludes any reasonable chance of relocating these corals to another location.

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## INTRODUCTION

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In May 2013, coral survey on soft bottom substrate was carried out within areas which may be directly impacted by the project. These areas include the reclamation footprint within the HKIAAA in Area 3 along the northern coast of existing airport island, at the potential pipeline diversion landing point within Sha Chau and Lung Kwu Chau Marine Park (SCLKCMP).

The natural shorelines between Tai O (Sites C1 and C2) to Yan O (Sites C18 and C19) were selected as reference sites for the proposed pipeline landing point at Sha Chau, to gather baseline information for future impact assessment process.

A total of 19 coral survey points for soft bottom coral (Nine within Project footprint, four along proposed submarine pipelines and cables diversion alignments and in adjacent areas, two within the SCLKCMP with four other sites to the west and east of the airport island as reference sites) were covered (Table 1). These are labeled C1 to C19.

A further three coral survey sites were added after data from the Sub-marine Archeological Side-scan Sonar Survey was received. These locations were reasonably large (>10 m<sup>2</sup>) areas of submerged rock that were recorded in that survey. Certain species of coral have been recorded on this type of substratum in areas around Hong Kong in the past. These sites are labeled SC2, SC10 & SC12.

The survey locations are based on the existing available information on seabed feature and subject to confirmation and refinement based on the latest geophysical survey to be conducted in December 2012 for the planning of soft bottom coral survey points. It should be noted that there was no coral survey point on the eastern coast of HKIA due to the safety consideration of diving activities in area with heavy marine traffic induced by the marine work of the Hong Kong-Zhuhai-Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities (HKBCF) and the existing high-speed vessels travelling routes to and from the Mainland and SkyPier.

**Table 1.** Coordinates for the start locations of each area surveyed

<b>Site Name</b>	<b>Easting</b>	<b>Northing</b>
<b>C1</b>	113.51.087	22.15.820
<b>C2</b>	113.51.528	22.16.018
<b>C3</b>	113.52.845	22.18.195
<b>C4</b>	113.54.214	22.19.093
<b>C5</b>	113.54.909	22.19.292
<b>C6</b>	113.55.607	22.19.532
<b>C7</b>	113.54.220	22.19.363
<b>C8</b>	113.54.996	22.19.614
<b>C9</b>	113.52.943	22.19.239
<b>C10</b>	113.53.603	22.19.453
<b>C11</b>	113.54.248	22.19.668
<b>C12</b>	113.54.971	22.19.899
<b>C13</b>	113.52.907	22.19.616
<b>C14</b>	113.53.549	22.19.907
<b>C15</b>	113.54.342	22.20.204
<b>C16</b>	113.53.766	22.20.538
<b>C17</b>	113.53.582	22.20.987
<b>C18</b>	113.59.085	22.18.887
<b>C19</b>	113.59.487	22.19.091
<b>SC2</b>	113.53.429	22.20.401
<b>SC10</b>	113.53.372	22.20.454
<b>SC12</b>	113.55.309	22.20.323

This report documents the coral survey results conducted within these twenty-two areas.

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## MATERIALS AND METHODS

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The survey techniques used was a tiered methodology used to assess sub-littoral benthic communities, in particular, soft and hard corals within the identified coral areas. It is carried out by simple Diver Surveys.

### DIVER SURVEYS

These surveys provide general information and give a general indication of a coral area. Suitably trained SCUBA divers dived within each coral area to look for specific indicators or situations within that area. The dives covered each area at a density that was sufficient to satisfactorily cover the majority of the area concerned. The search pattern adopted for C1~C19 was the expanding square method. This was necessary given the poor visibility (<1.0 m), ever-present current flow, and high level of boat traffic in the area. The areas of hard stratum, SC2, SC10 and SC12 were either single rocks or piles of boulders. These were thoroughly searched for soft corals. For each dive the following information was recorded:

- Depth range.
- Visibility.
- Seabed composition.
- Estimated % of octocoral (soft corals and sea pens) cover and estimated % of hard coral cover.
- Estimate % of partial mortality.
- Other invertebrates present.

Data were recorded on waterproof paper attached to a suitable slate. This data should be transferred to the report as general comments and observations.

All data was input to Excel spreadsheets for initial storage and preliminary analyses.

## RESULTS

### DIVER SURVEYS

A total of 22 Diver Survey dives covering ~2,003 m were carried out in the twenty-two areas (Appendix 1 and Table 2). These were carried out over five days in May 2013. The range of depth and distance surveyed for each site are as follows. There is no coral community in the study sites and thus it is not necessary to carry out Rapid Ecological Assessment Survey (REA).

**Table 2. Summary Table of the Dive Survey Results**

Location number	Maximum Depth (m)	Minimum Depth (m)	Distance surveyed (m <sup>2</sup> )	Field survey date
C1	13.8	13.2	100	10-May-13
C2	13.9	12.7	100	14-May-13
C3	8.1	8	100	14-May-13
C4	9.2	8.4	100	09-May-13
C5	5.4	5.2	100	09-May-13
C6	6.9	6.5	100	24-May-13
C7	6.6	6.5	100	24-May-13
C8	5.2	4.9	100	10-May-13
C9	7.3	7.2	100	10-May-13
C10	7.1	7	100	10-May-13
C11	5.2	5	100	24-May-13
C12	7.2	6.8	100	10-May-13
C13	7.6	7.2	100	14-May-13
C14	5.4	5.2	100	14-May-13
C15	7.3	7.2	100	21-May-13
C16	10.2	9.9	100	21-May-13
C17	8.2	8.1	100	09-May-13
C18	6.1	6	100	09-May-13
C19	10.1	10	100	21-May-13
SC2	10.8	5.2	55	21-May-13
SC10	6.8	3.7	32	14-May-13
SC12	10.1	8.1	16	10-May-13

### Summary Results

#### Location C1

This site, together with C2, were surveyed as the reference sites at Tai O near-shore soft bottom areas. The depth of Site 1 is between 13.2 and 13.8 m, which is slightly deeper than the survey sites which are generally between 5 - 8 m. The substrate is composed of fine silt and mud with no obvious benthos occurred on the seabed.

Parameter	Results	Remarks
Depth range (m)	13.2 - 13.8	
Visibility (m)	0.5	
Salinity (at water surface) (‰)	20	
Water temperature (at 1 m depth) (°C)	22	
Seabed substratum composition	fine silt and mud	slight current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	

Estimated % coral partial mortality	0%	
Other invertebrates	none	

### *Location C2*

This site share similar characteristics with the C1. The depth of Site 1 is between 12.7 and 13.9 m. The substrate is composed of fine silt and mud with no obvious benthos occurred on the seabed surface.

<b>Parameter</b>	<b>Results</b>	<b>Remarks</b>
Depth range (m)	12.7-13.9	
Visibility (m)	0.7	
Salinity (at water surface) (‰)	22	
Water temperature (at 1 m depth) (°C)	22	
Seabed substratum composition	fine silt, mud and, some shells.	slight current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	none	

### *Location C3*

Site C3 to C6 will be undergone reclamation as part of the expansion of a present runway. These areas are located at proximity of the present shoreline of the airport. Depth range of location three is 8 - 8.1 m. The sea bottom is composed of mud and gravel with no obvious seabed surface benthos.

<b>Parameter</b>	<b>Results</b>	<b>Remarks</b>
Depth range (m)	8 – 8.1	
Visibility (m)	0.3	
Salinity (at water surface) (‰)	18	
Water temperature (at 1 m depth) (°C)	22	
Seabed substratum composition	mud and gravel	slight current
Estimated % of octocoral (soft corals )	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	none	



**Location C4**

This site share similar characteristics with the C3 but with greater water depth of 8.4 – 9.2 m. Similarly, the sea bottom is composed of mud with no obvious seabed surface benthos.

Parameter	Results	Remarks
Depth range (m)	8.4 - 9.2	
Visibility (m)	1	
Salinity (at water surface) (‰)	18	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	soft mud some broken shells	slight current
Estimated % of octocoral (soft corals )	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	none	

**Location C5**

This site share similar characteristics with the C3 and C4 but with lower water depth of 5.2 – 5.4 m. Similarly, the sea bottom is composed of mud with no obvious seabed benthos.

Parameter	Results	Remarks
Depth range (m)	5.2 – 5.4	
Visibility (m)	1	
Salinity (at water surface) (‰)	23	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	soft mud, patches of broken shells	slight current
Estimated % of octocoral (soft corals )	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	Unidentified crabs	

**Location C6**

This site share similar characteristics with the C3, C4 and C5. Water Depth of this site is 6.5 – 6.9 m. Similar to C3 – C5, the sea bottom is composed of mud with no obvious benthos on seabed surface.

Parameter	Results	Remarks
Depth range (m)	6.5 – 6.9	
Visibility (m)	0.5	
Salinity (at water surface) (‰)	24	
Water temperature (at 1 m depth) (°C)	22	
Seabed substratum composition	soft mud, broken shells	slight current
Estimated % of octocoral (soft corals )	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	none	

**Location C7**

The sites of C7 and C8 are further north and offshore from sites C3 – C6. The depth of site C7 is between 6.5 - 6.6 m. There was no obvious surface benthos on the soft bottom but green mussel occurred on a 14 m<sup>2</sup> of rock surface.

Parameter	Results	Remarks
Depth range (m)	6.5 – 6.6	
Visibility (m)	0.5	
Salinity (at water surface) (‰)	10	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	soft mud, broken shells	slight current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	Green mussel <i>Perna viridis</i>	~14m <sup>2</sup> of rock surface with <i>Perna viridis</i> .

**Location C8**

This site is a relatively shallow area, with depth of 4.9 – 5.2 m. The sea bottom is composed of soft mud and broken shells. A sea pen occurred at this site. No other obvious surface benthos occurred.

Parameter	Results	Remarks
Depth range (m)	4.9 – 5.2	
Visibility (m)	0.5	
Salinity (at water surface) (‰)	11	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	soft mud, broken shells	slight current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	<1%	0.00001818% cover over survey
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	none	

**Location C9**

This sites of C9 to C12 will be reclaimed as land and as part of the third runway. The site of C9 is of depth of 7.2 – 7.3 m and is composed of mud and small rocks. Only several crabs of unidentified species occurred.

Parameter	Results	Remarks
Depth range (m)	7.2 – 7.3	
Visibility (m)	0.5	
Salinity (at water surface) (‰)	15	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	mud and small rocks	slight current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	Unidentified crabs	

**Location C10**

The site of C10 is of depth of 7.2 – 7.3 m and is composed of soft mud and broken shells. No obvious seabed benthos occurred.

Parameter	Results	Remarks
Depth range (m)	7 -7.1	
Visibility (m)	0.5	
Salinity (at water surface) (‰)	20	
Water temperature (at 1 m depth) (°C)	22	
Seabed substratum composition	soft mud, broken shells	moderate current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	none	

**Location C11**

The site of C11 is of depth of 5 – 5.2 m and is composed of soft mud. No obvious seabed benthos occurred.

<b>Parameter</b>	<b>Results</b>	<b>Remarks</b>
Depth range (m)	5 – 5.2	
Visibility (m)	0.5	
Salinity (at water surface) (‰)	17	
Water temperature (at 1 m depth) (°C)	22	
Seabed substratum composition	soft mud	moderate current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates		

**Location C12**

The site of C12 is of depth of 6.8 – 7.2 m and is composed of soft mud and broken shells. Three sea anemones occurred.

<b>Parameter</b>	<b>Results</b>	<b>Remarks</b>
Depth range (m)	6.8 – 7.2	
Visibility (m)	0.5	
Salinity (at water surface) (‰)	8	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	soft mud, broken shells	strong current at surface
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	3 sea anemones	

**Location C13**

Sites C13 to C15 will be at proximity of the third runway land-reclamation area. Site C13 is ~7.2 – 7.6 m deep, composed of soft mud with no obvious seabed benthos occurred.

Parameter	Results	Remarks
Depth range (m)	7.2 -7.6	
Visibility (m)	0.3	
Salinity (at water surface) (‰)	20	
Water temperature (at 1 m depth) (°C)	22	
Seabed substratum composition	soft mud	strong current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	none	

**Location C14**

Site 14 is ~5.2 – 5.4 m deep, composed of soft mud with no obvious seabed benthos occurred.

Parameter	Results	Remarks
Depth range (m)	5.2 – 5.4	
Visibility (m)	1	
Salinity (at water surface) (‰)	10	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	soft mud	slight current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	none	

**Location C15**

Site 14 is ~5.2 – 5.4 m deep. It share similar characteristics with C13 and C14, that is, composed of soft mud with no obvious seabed benthos occurred.

Parameter	Results	Remarks
Depth range (m)	5.2 – 5.4	
Visibility (m)	1	
Salinity (at water surface) (‰)	10	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	soft mud	slight current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	Sea urchins	

**Location C16**

Site 16 is further north from the third runway with depth of 7.2 – 7.3 m. The seabed is composed of soft mud and broken shells. One colony of *Echinomuricea* sp. occurred. Several sea urchins occurred in this site.

Parameter	Results	Remarks
Depth range (m)	7.2 – 7.3	
Visibility (m)	0.3	
Salinity (at water surface) (‰)	5	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	soft mud, occasional broken shells	slight current
Estimated % of octocoral (soft corals)	< 1% <i>Echinomuricea</i> sp. (Family Plexauridae)	1 soft coral colony with 7 cm height. 0.0000045% cover over survey.
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	sea urchins	

**Location C17**

Site C17 is ~8.1 – 8.2 m deep, composed of soft mud with a few unidentified crabs and gastropods as seabed benthos occurred.

Parameter	Results	Remarks
Depth range (m)	8.1 – 8.2	
Visibility (m)	1	
Salinity (at water surface) (‰)	12	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	soft mud, broken shells	slight current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	Unidentified crabs, gastropods	

**Location C18**

Both Site C18 and C19 are reference sites located on the eastern site of the airport island. Site C18 is ~6 – 6.1 m deep, composed of soft mud and broken shells with no obvious seabed benthos occurred.

Parameter	Results	Remarks
Depth range (m)	6 – 6.1	
Visibility (m)	1	
Salinity (at water surface) (‰)	22	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	soft mud, broken shells	moderate current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	none	

**Location C19**

Site C18 is ~10 - 10.1 m deep, composed of soft mud and broken shells with low abundance of sea anaemone and sea urchins as seabed benthos occurred.

Parameter	Results	Remarks
Depth range (m)	10 – 10.1	
Visibility (m)	0.5	
Salinity (at water surface) (‰)	22	
Water temperature (at 1 m depth) (°C)	22	
Seabed substratum composition	soft mud, some small rocks	moderate current
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	Sea anaemone and sea urchins	

**Location SC2**

The sites of SC2 and SC10 are of proximity (~100 m apart) and are located on the southern shore of the island of Sha Chau. Seabed of Site SC2 is composed of rock and thus provided stable substratum of a small coral community of ~5% coral cover.

Parameter	Results	Remarks
Depth range (m)	5.2 – 10.8	
Visibility (m)	1	
Salinity (at water surface) (‰)	14	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	Rock	Moderate current
Estimated % of octocoral (soft corals)	< 5% by gorgonian <i>Guaiaorgia</i> sp., (Family Gorgoniidae)	3 small colonies of <i>Guaiaorgia</i> sp. 0.000018% cover over survey.
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	

Estimated % of hard coral cover	< 5% by ahermatypic (non-reef building) cup corals ~1% <i>Paracyathus rotundatus</i> and ~4% <i>Balanophyllia</i> sp (Family Dendrophylliidae).	<i>Paracyathus rotundatus</i> 0.00000682% cover over survey. <i>Balanophyllia</i> sp. 0.0000136% cover over survey.
Estimated % coral partial mortality	20%	On the <i>Guaiagorgia</i> sp.
Other invertebrates	Green mussel <i>Perna viridis</i> , sea urchins, and oysters	

**Location SC10**

Seabed of Site SC10 is composed of rock and thus provided stable substratum of a small coral community of ~5% coral cover.

Parameter	Results	Remarks
Depth range (m)	3.7 – 6.8	
Visibility (m)	1	
Salinity (at water surface) (‰)	12	
Water temperature (at 1 m depth) (°C)	23	
Seabed substratum composition	Rock	
Estimated % of octocoral (soft corals)	< 5% by <i>Guaiagorgia</i> sp.,	7 colonies of <i>Guaiagorgia</i> sp. 3 small colonies of <i>Guaiagorgia</i> sp. 0.000018% cover over survey.
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	< 5% by ahermatypic (non-reef building) cup corals. ~1% <i>Paracyathus rotundatus</i> and ~4% <i>Balanophyllia</i> sp.	<i>Paracyathus rotundatus</i> 0.00000682% cover over survey. <i>Balanophyllia</i> sp. 0.0000136% cover over survey.
Estimated % coral partial mortality	15%	On the <i>Guaiagorgia</i> sp.
Other invertebrates	None	

**Location SC12**

This site is located on the north-eastern side of the airport island. The seabed substratum is composed of quarry rock. Only few crabs and gastropods occurred.

Parameter	Results	Remarks
Depth range (m)	8.1 – 10.1	
Visibility (m)	0.5	
Salinity (at water surface) (‰)	17	
Water temperature (at 1 m depth) (°C)	21	
Seabed substratum composition	quarry rock	Probably illegally dumped
Estimated % of octocoral (soft corals)	0%	
Estimated % of <i>Pennatulacea</i> (sea pens)	0%	
Estimated % of hard coral cover	0%	
Estimated % coral partial mortality	0%	
Other invertebrates	crabs, gastropods, hydroids	



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## SUMMARY AND CONCLUSIONS

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- In May 2013, coral survey for soft bottom substrate was carried out within areas which may be directly impacted by the project. These areas include the reclamation footprint within HKIAAA in Area 3 along the northern coast of existing airport island, at the potential pipeline diversion landing point within SCLKCMP.
- A total of 19 coral survey sites for soft bottom coral (Nine within Project footprint, four along proposed submarine pipelines and cables diversion alignments and in adjacent areas, two within the SCLKCMP with four other sites to the west and east of the airport island as reference sites) were covered. This report is the result of the fast response diver survey carried out in September 2012. The map of the surveyed sites is attached in Appendix 1. These sites are labeled C1~C19.
- A further three coral survey sites were added after data from the Sub-marine Archeological Side-scan Sonar Survey was received. These locations were reasonably large (>10 m<sup>2</sup>) areas of submerged rock that were recorded in that survey. Certain species of coral have been recorded on this type of substratum in areas around Hong Kong in the past. These sites are labeled SC2, SC10 & SC12.
- The depths of all the surveyed sites range between 3.7 m and 13.9 m. Visibility values are low, range between 0.3 m to 1 m as the bottom substratum are mainly soft mud with occasion small area of rocks.
- Occurrence of mobile benthos on the muddy seabed surface is very low. These include crabs and sea urchins.
- Occurrence of attached marine benthos on rock surface include green mussel, *Perna viridis*, and various species of gorgonians *Echinomuricea* sp. and *Guaiagorgia* sp. along with two ahermatypic hard cup corals *Balanophyllia* sp. and *Paracyathus rotundatus*. Hydroids occurred on one of the reference site SC12.
- The distribution of these coral species, as indicated by the Hong Kong Agriculture, Fisheries and Conservation Department (AFCD) is given in the table below:

Species	Status	Distribution
<i>Guaiagorgia</i> sp.	Localised	North Lantau Area.
<i>Echinomuricea</i> sp.	Common	Wide spread in Hong Kong.
<i>Balanophyllia</i> sp.	Common	Western waters in Hong Kong
<i>Paracyathus rotundatus</i>	Common	Western waters in Hong Kong

- Stony corals (Order Scleratinia) of which the ahermatypic cup corals (*Balanophyllia* sp. and *Paracyathus rotundatus*) belong to are listed in Schedule 1 and 2 of the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). Import, export and possession of those corals, no matter dead or living, are restricted. ([http://www.afcd.gov.hk/english/conservation/con\\_mar/con\\_mar\\_cor/con\\_mar\\_cor\\_con/con\\_mar\\_cor\\_con4.html](http://www.afcd.gov.hk/english/conservation/con_mar/con_mar_cor/con_mar_cor_con/con_mar_cor_con4.html)).

- All the above coral species are not listed in the CITES-listed endangered species database of Hong Kong.

([http://www.afcd.gov.hk/english/conservation/con\\_end/con\\_end\\_pub/con\\_end\\_pub\\_data/con\\_end\\_pub\\_data.html](http://www.afcd.gov.hk/english/conservation/con_end/con_end_pub/con_end_pub_data/con_end_pub_data.html);

<http://www.cites.org/eng/resources/species.html>).

- The coral cover values of these area are low at <1% for most areas and <5% in areas with suitable hard substratum.
- Since the sea bottom of the study sites are composed of loose substrate and have low visibility and salinity, such sites are not suitable habitat for reef-building corals. Only low abundance of soft corals, hence, occurs.
- Soft coral colony at the study sites also suffer from partial mortality of up to 20%, most probably as a result of the high sediment load in the water column.
- There is no coral community in the study sites and thus it is not necessary to carry out Rapid Ecological Assessment Survey (REA).

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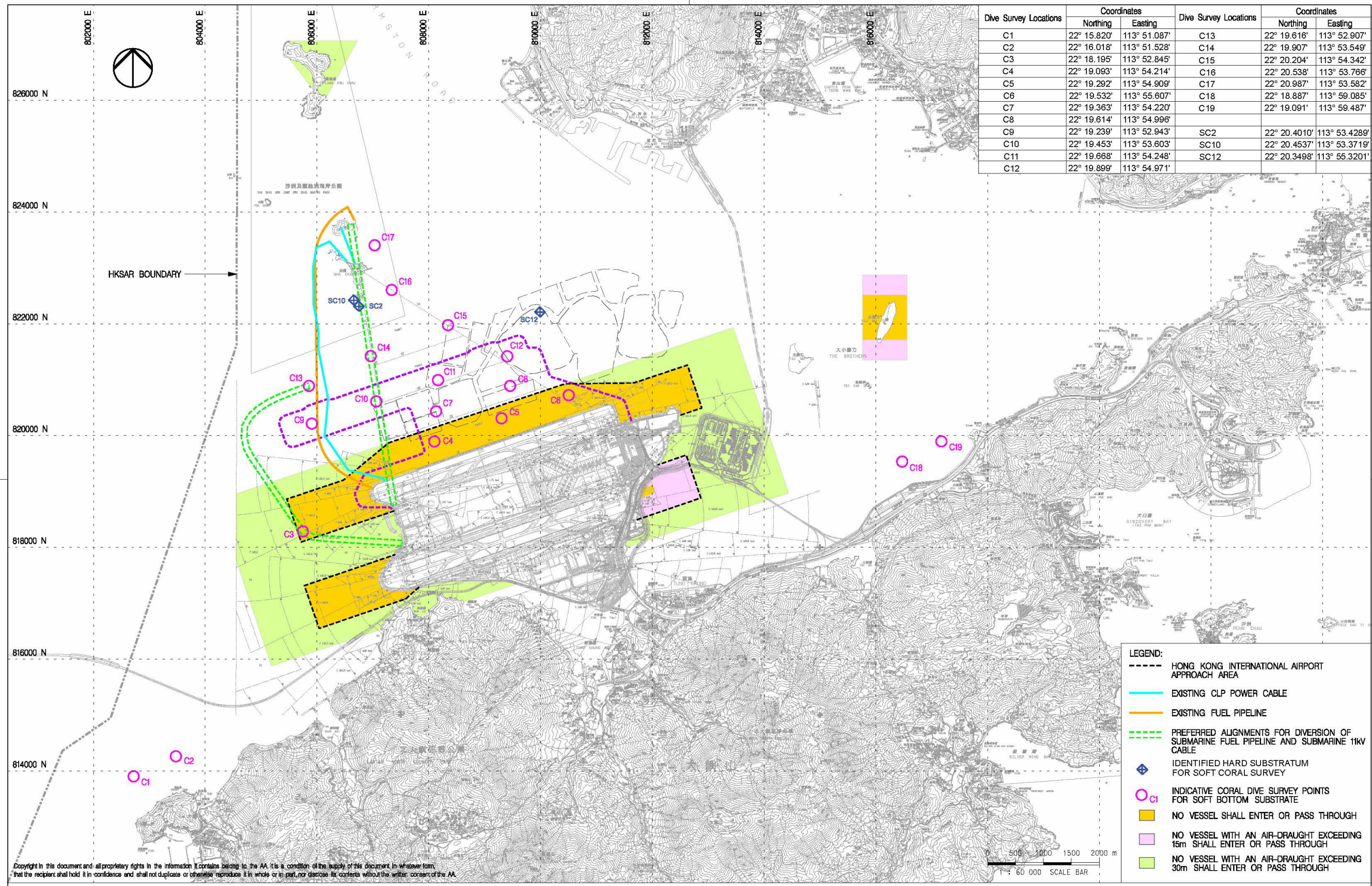
## RECOMMENDATIONS

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From these survey results it is possible to make some recommendations. These are included below in point form:

- To mitigate any impact to the soft coral communities by constructing the seawalls along the third runway structure using a coral friendly design with suitable materials. The existing seawall design and makeup is quite suitable for this purpose. If it is intended to construct the seawall from solid concrete, then provision should be made to add specially sculptured surfaces that will promote the growth of gorgonians and ahermatypic cup corals.
- The low density, (<1% over the survey) and small size of the majority of the population of gorgonians and relatively high partial mortality precludes any reasonable chance of relocating these corals to another location. Most colonies were recorded outside the footprint of the 3<sup>rd</sup> Runway reclamation. It is therefore prudent to protect these colonies from increased sediment during the works period. Suitably placed sediment curtains are recommended.

APPENDIX 1: LOCATION OF THE DIVES CARRIED OUT.



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## APPENDIX 2: SIDE SCAN SONAR IMAGES

Image showing SC2 (SC002).

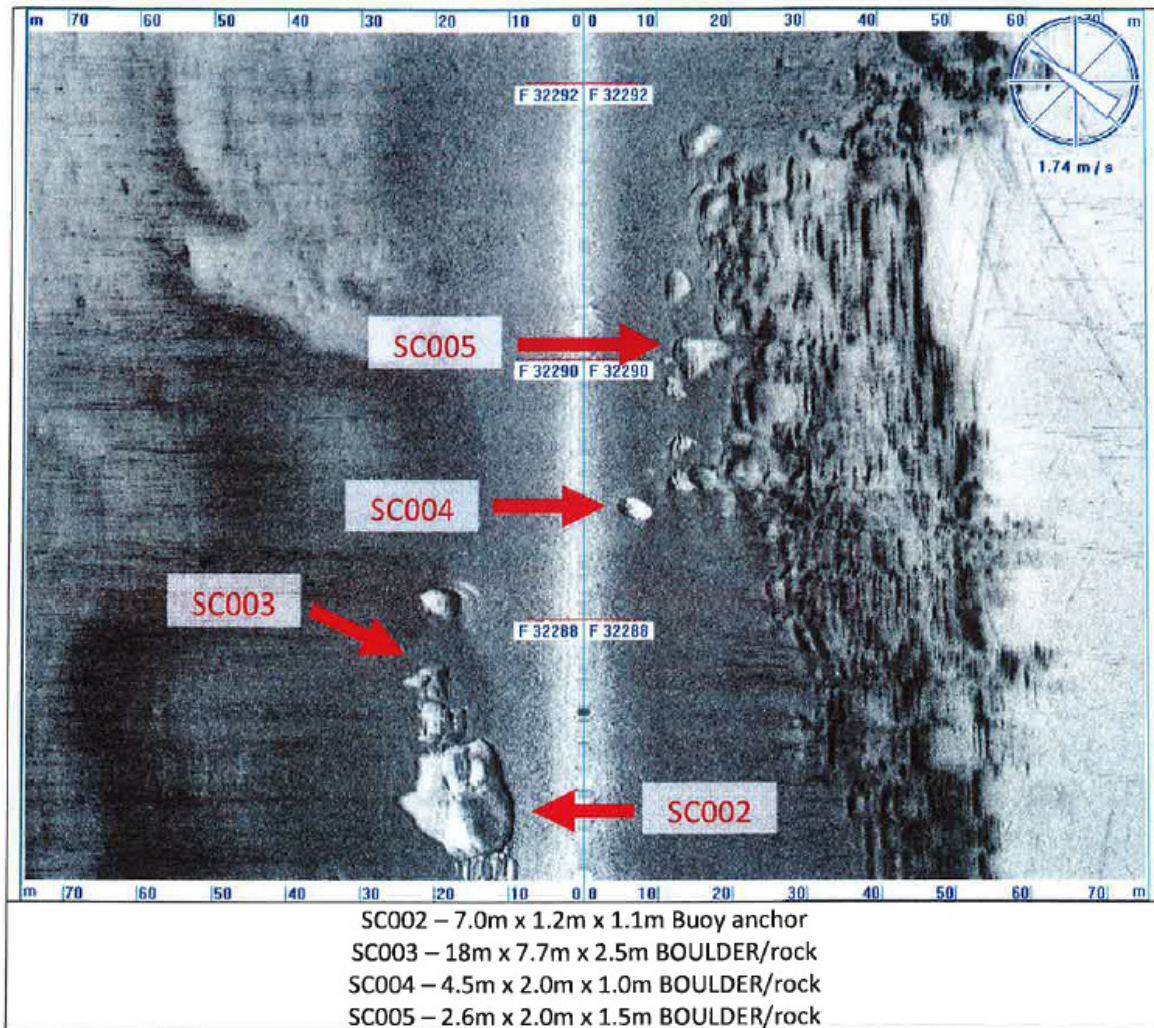


Image showing SC10 (SC010)

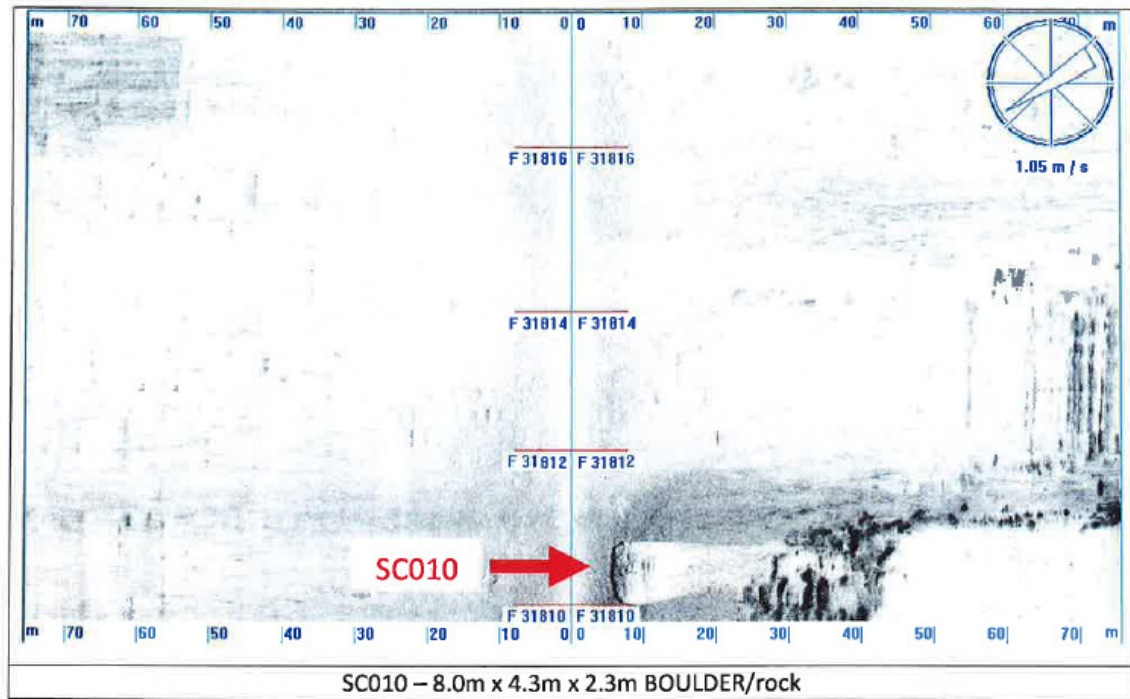
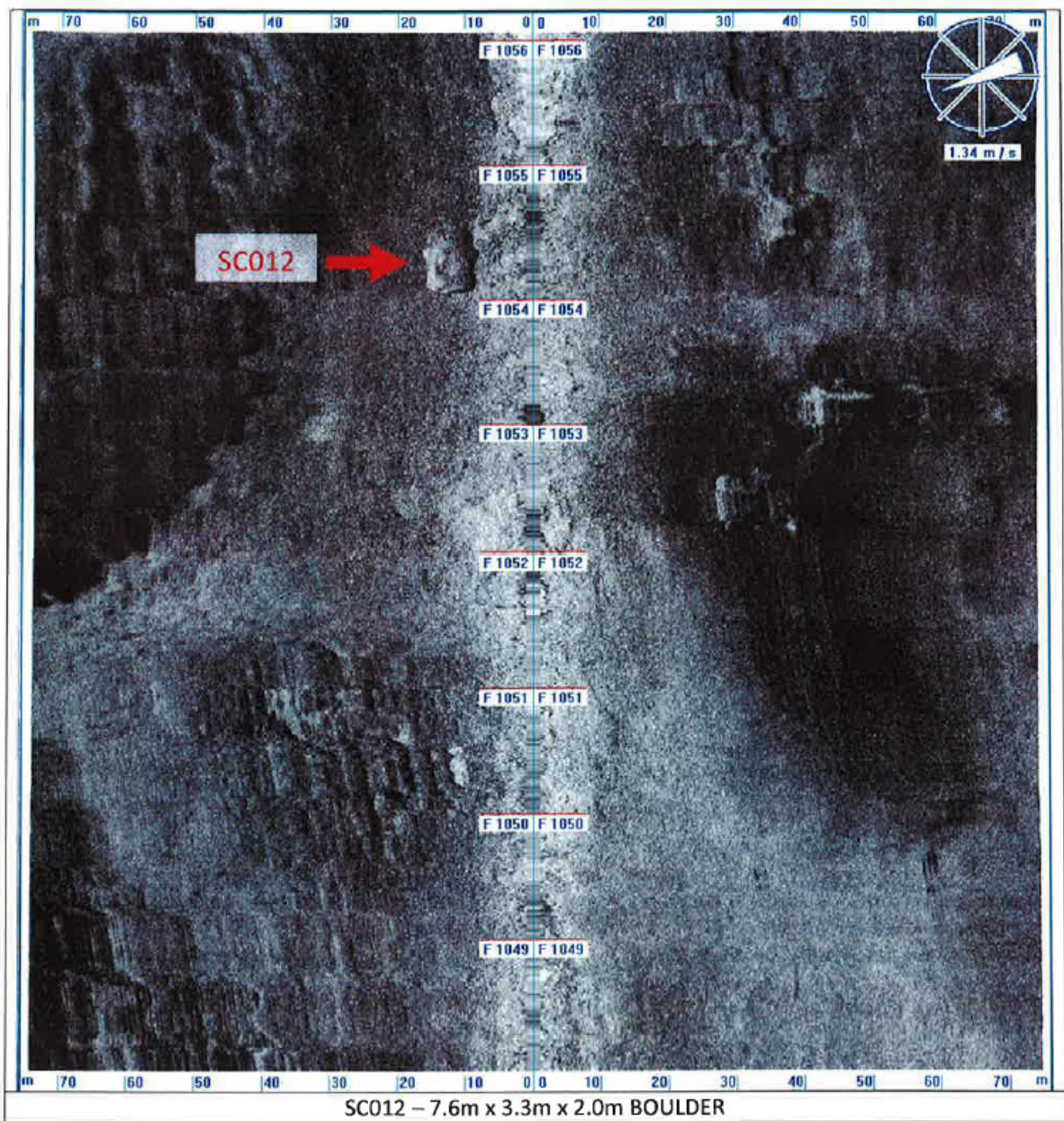


Image showing SC12 (SC012)



**APPENDIX 3: DIVER SURVEY RAW DATA**

Location	C1	C2	C3	C4	C5
Depth min (m)	13.2	12.7	8	8.4	5.2
Depth max (m)	13.8	13.9	8.1	9.2	5.4
Distance covered (m)	100	100	100	100	100
Direction of Transect (Deg)	180	180	180	270	90
Visibility (m)	0.5	0.7	0.3	1.0	1.0
Current	Mild	none	none	Slight	mild
Salinity (‰)	20	22	18	18	23
Temperature - 1m (°C)	22	22	22	23	23
Substratum type	Fine silt mud	fine silt mud some shells	mud gravel	soft mud broken shells	soft mud patchy broken shells
Corals species	none	none	none	none	none
coral partial mortality (%)	0	0	0	0	0
Other invertebrates	none	none	none	none	Unidentified crabs
Remarks					



Location	C6	C7	C8	C9	C10
Depth min (m)	6.5	6.5	4.9	7.2	7
Depth max (m)	6.9	6.6	5.2	7.3	7.1
Distance covered (m)	100	100	100	100	100
Direction of Transect (Deg)	90	60	0	60	60
Visibility (m)	0.5	0.5	0.5	0.5	0.5
Current	none	none	none	mild	mild
Salinity (‰)	24	10	11	15	20
Temperature - 1m (oC)	22	23	23	23	22
Substratum type	soft mud broken shells	soft mud broken shells	soft mud broken shells	mud small rocks	soft mud broken shells
Corals species	none	none	1 sea pen	none	none
coral partial mortality (%)	0	0	0	0	0
Other invertebrates	none	<i>Perna viridis</i>	none	Unidentified crabs	none
Remarks		<i>Perna sp. on 4m2 rock</i>			

Location	C11	C12	C13	C14	C15
Depth min (m)	5	6.8	7.2	5.2	7.2
Depth max (m)	5.2	7.2	7.6	5.4	7.3
Distance covered (m)	100	100	100	100	100
Direction of Transect (Deg)	100	180	90	90	40
Visibility (m)	0.5	0.5	0.3	1.0	0.3
Current	mild	strong at surface	strong at surface	slight	mild
Salinity (‰)	17	8	20	10	5
Temperature - 1m (oC)	22	23	22	23	23
Substratum type	soft mud	soft mud broken shells	soft mud	soft mud	soft mud some broken shells
Corals species	none	none	none	none	none
coral partial mortality (%)	0	0	0	0	0
Other invertebrates	none	3 sea aneomes	none	none	sea urchins
Remarks					

Location	C16	C17	C18	C19
Depth min (m)	9.9	8.1	6	10
Depth max (m)	10.2	8.2	6.1	10.1
Distance covered (m)	100	100	100	100
Direction of Transect (Deg)	180	180	180	50
Visibility (m)	0.5	1.0	1.0	0.5
Current	none	none	mild	mild
Salinity (‰)	8	12	22	22
Temperature - 1m ( °C)	23	23	23	22
Substratum type	soft mud	soft mud	soft mud	soft mud
	broken shells	broken shells	broken shells	
Corals species	<i>Echinomuricea</i> sp.	none	none	none
coral partial mortality (%)	0	0	0	0
Other invertebrates	Unidentified crabs	Unidentified crabs	none	anemone
	sea urchins	live gastropods		sea urchins
Remarks	less than 1% coral cover			
	<i>Echinomuricea</i> sp. [1 colony 7cm]			
	rubbish			

Location	SC2	SC10	SC12
Depth min (m)	5.2	3.7	8.1
Depth max (m)	10.8	6.8	10.1
Distance covered (m)	55	32	16
Direction of Transect (Deg)	none	none	none
Visibility (m)	1.0	1.0	0.5
Current	none	none	none
Salinity (‰)	14	12	17
Temperature - 1m ( oC)	23	23	21
Substratum type	rock	rock	quarry rock
Corals species	<i>Guaiaegorgia sp.</i>	<i>Guaiaegorgia sp.</i>	none
	<i>Paracyanthus rotundatus</i>	<i>Paracyanthus rotundatus</i>	
	<i>Balanophyllia sp.</i>	<i>Balanophyllia sp.</i>	
coral partial mortality (%)	20%	15%	0
Other invertebrates	<i>Perna viridis</i>	none	crabs
	sea urchins		gastropods
	oysters		
Remarks	less than 5% coral cover	less than 5% coral cover	possible illegally dumped quarry rock boulder pile [10x15x2]
	<i>Balanophyllia sp.</i> [20 per m2] & <i>Guaiaegoriga</i> [3 small colonies]	7 colonies of <i>Guaiaegoriga</i> on west side	
	1 large rock 8x8x5.6m	5x4x3.1 rock (irregular)	

## APPENDIX 4: SAMPLE DATA SHEETS

Data sheet used to record observations in the spot dives

<b>Dive Location</b>		Taxa observed:          Notes:
<b>Date</b>		
<b>Team</b>		
<b>Start Time</b>		
<b>Depth</b>	<b>Min</b>	
<b>Max</b>		
<b>Distance</b>		
<b>Substrate</b>		
<b>Coral cover</b>		
<b>Part. Mort.</b>		

<b>Dive Location</b>		Taxa observed:          Notes:
<b>Date</b>		
<b>Team</b>		
<b>Start Time</b>		
<b>Depth</b>	<b>Min</b>	
<b>Max</b>		
<b>Distance</b>		
<b>Substrate</b>		
<b>Coral cover</b>		
<b>Part. Mort.</b>		

<b>Dive Location</b>		Taxa observed:          Notes:
<b>Date</b>		
<b>Team</b>		
<b>Start Time</b>		
<b>Depth</b>	<b>Min</b>	
<b>Max</b>		
<b>Distance</b>		
<b>Substrate</b>		
<b>Coral cover</b>		
<b>Part. Mort.</b>		

<b>Dive Location</b>		Taxa observed:          Notes:
<b>Date</b>		
<b>Team</b>		
<b>Start Time</b>		
<b>Depth</b>	<b>Min</b>	
<b>Max</b>		
<b>Distance</b>		
<b>Substrate</b>		
<b>Coral cover</b>		
<b>Part. Mort.</b>		

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## APPENDIX 5: REFERENCES




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## APPENDIX 6: SELECTED PHOTOGRAPHS

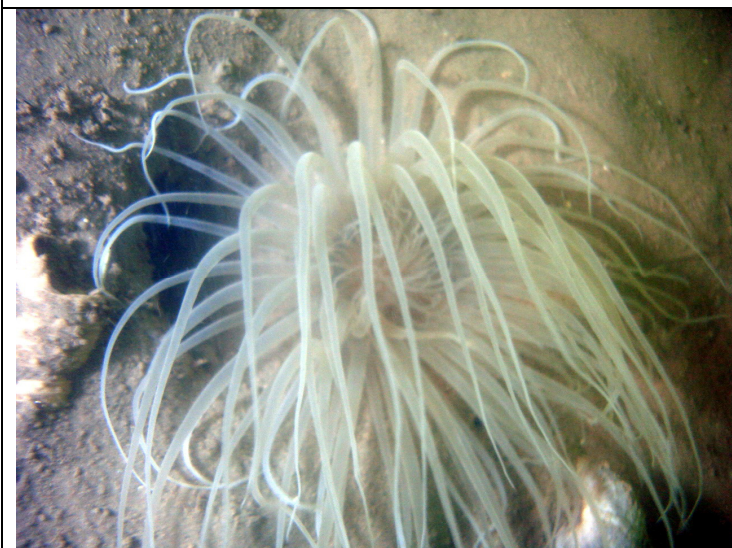
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	<p><b>Plate 1.</b> Sea surface at Location C1.</p> <p>Photo : May 2013</p>
	<p><b>Plate 2.</b> Soft mud sea bottom at Location C1.</p> <p>Photo: May 2013</p>
	<p><b>Plate 3.</b> Broken shells at C5.</p> <p>Photo: May 2013</p>



**Plate 4.** Broken shells at C10.

Photo: May 2013.



**Plate 5.** Sea anemone at C12.

Photo: May 2013.

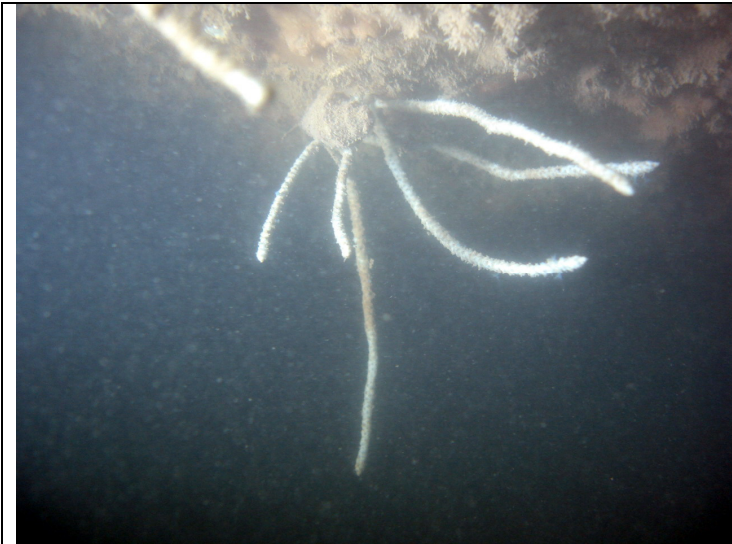


**Plate 6.** Sea urchin at C16.

Photo: May 2013.



	<p><b>Plate 7.</b> <i>Echinomuricea</i> sp. at Location C16.</p> <p>Photo : May 2013</p>
	<p><b>Plate 8.</b> Unidentified crab at Location C17.</p> <p>Photo: May 2013</p>
	<p><b>Plate 9.</b> Location SC10 at Sha Chau.</p> <p>Photo: May 2013</p>



**Plate 10.** *Guaiagorgia* sp. at Location SC2.

Photo: May 2013.



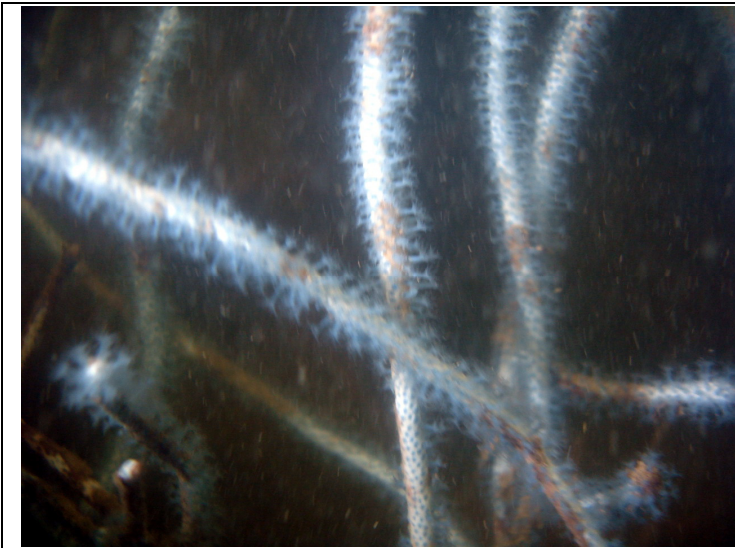
**Plate 11.** *Guaiagorgia* sp. at SC2.

Photo: May 2013.



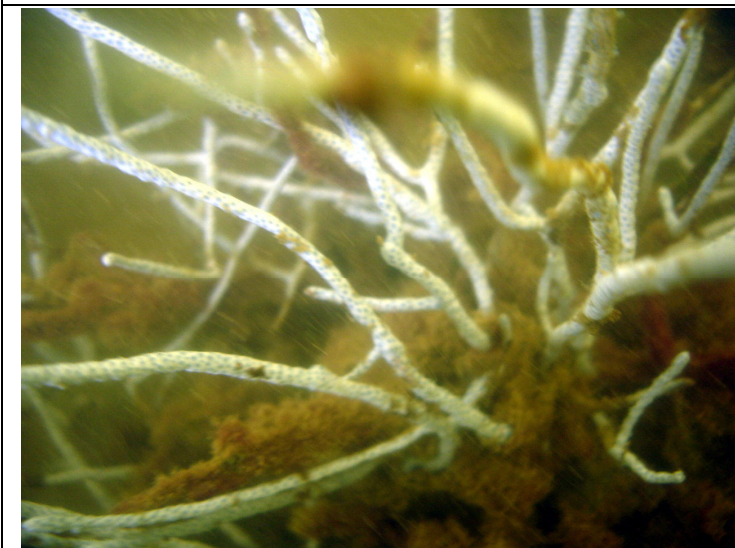
**Plate 12.** *Balanophyllia* sp. at SC2.

Photo: May 2013.



**Plate 13.** *Guaiagorgia* sp. at Location SC10.

Photo : May 2013






**Plate 14.** *Guaiagorgia* sp. at Location SC10.

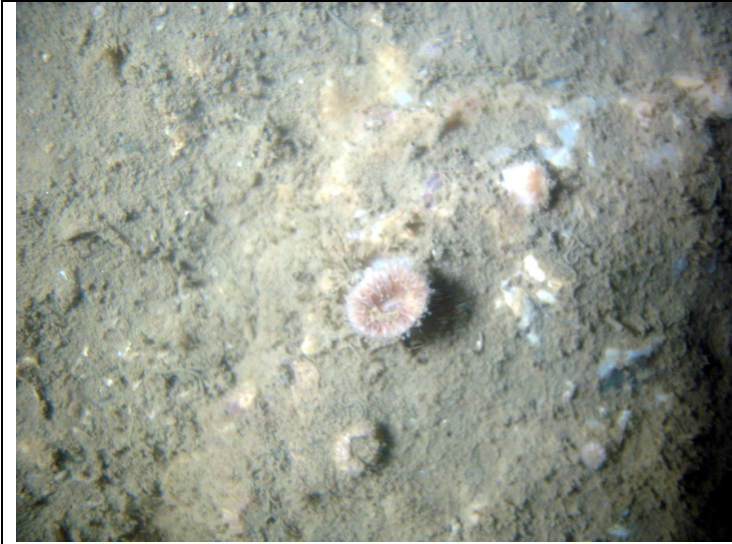
Photo: May 2013



**Plate 15.** *Guaiagorgia* sp. at SC10.

Photo: May 2013

	<p><b>Plate 16.</b> <i>Balanophyllia</i> sp. and <i>Echinomuricea</i> sp. at Location SC10.</p> <p>Photo: May 2013.</p>
	<p><b>Plate 17.</b> Juvenile colony of <i>Guaiaorgia</i> sp. at SC12.</p> <p>Photo: May 2013.</p>
	<p><b>Plate 18.</b> Hydroids at SC12.</p> <p>Photo: May 2013.</p>



**Plate 19.** *Paracyathus rotundatus.*

Photo: May 2013.