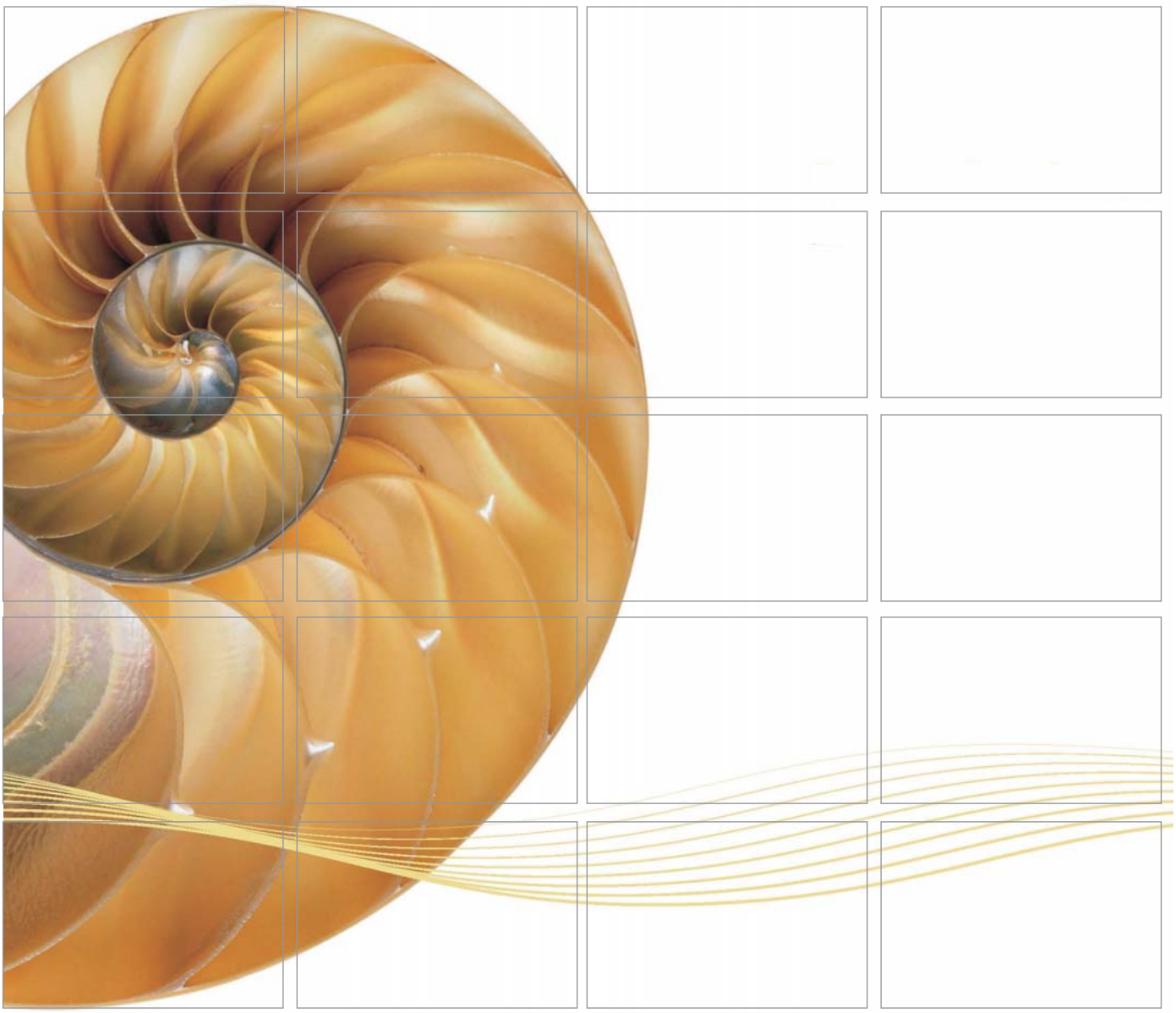
REPORT



Installation of Submarine Gas Pipelines and Associated Facilities from To Kwa Wan to North Point for Former Kai Tak Airport Development

Baseline Coral Monitoring Report

19 June 2012

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Baseline Coral Monitoring Report

Revision 1

Document Code: 0158059_Baseline Coral Monitoring Report_v1.doc

Client: MKJV	Project No: 0158059
Summary: This document presents the Baseline Coral Monitoring Report for the Installation of Submarine Gas Pipelines and Associated Facilities from To Kwa Wan to North Point for Former Kai Tak Airport Development.	Date: 19 June 2012 Approved by:  *Mr Craig Reid* *Partner*

Revision	Description	By	Checked	Approved	Date
V1	Baseline Coral Monitoring Report	CL	JT/WK	CAR	19/06/12

Distribution

☒ Internal

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Installation of Submarine Gas Pipelines and Associated Facilities from To Kwa Wan to North Point for Former Kai Tak Airport Development

Environmental Certification Sheet

Environmental Permit No. EP-401/2010

Reference Document/Plan

Document/~~Plan~~ to be ~~Certified~~/ Verified:	Baseline Coral Monitoring Report
Date of Report: 19/06/2012	
Date prepared by ET: 19/06/2012	
Date received by IEC: 19/06/2012	

Reference EM&A Manual/ EP Requirement

EM&A Manual Requirement: Sections 4.5

Content: *Baseline Coral Monitoring Report*

4.5 "The Baseline Survey Report should be submitted to the EPD and the AFCD prior to the commencement of the works."

ET Certification

I hereby certify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-401/2010.

Ms Winnie Ko,
Environmental Team Leader: Date: 19/06/2012

IEC Verification

I hereby verify that the above referenced document/~~plan~~ complies with the above referenced condition of EP-401/2010.

Dr Anne Kerr,
Independent Environmental Checker: Date: 19 June 2012

CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

The Project proposed by the Hong Kong and China Gas Company Limited comprises the construction of a new gas pipeline network from To Kwa Wan to North Point so as to replace the existing one affected by the proposed Cruise Terminal dredging works adjacent to the former Kai Tak runway and the proposed Central Kowloon Route crossing the Kowloon Bay at To Kwa Wan. The location of the Project is shown in *Figure 1.1*.

The Project involves the following key elements associated with the construction of the submarine gas pipeline, landing and pigging stations:

- Dredging of approximately 8.99 ha of seabed to form a trench for laying the twin submarine gas pipelines;
- Construction of two land gas pipelines at To Kwa Wan and North Point, respectively; and
- Construction of two pigging stations for pigging operation at To Kwa Wan and North Point, respectively.

The Environmental Impact Assessment (EIA) report (*Register No.: AEIAR-153/2010*) for the Project was approved by the Director of Environmental Protection (DEP) on 2 August 2010 under the *Environmental Impact Assessment Ordinance* (*EIAO*). Subsequent to the approval of the EIA, an Environmental Permit (*EP-401/2010*) for the Project was granted by the DEP on 6 October 2010.

Pursuant to *Condition 3.1* of the EP, an environmental monitoring and audit (EM&A) programme as set out in the *EM&A Manual* is required to be implemented. In accordance with the *EM&A Manual*, a Coral Monitoring Programme should be undertaken when dredging works is being carried out within 250 m from the To Kwa Wan breakwaters.

1.2 OBJECTIVES OF THE CORAL MONITORING PROGRAMME

The overall purpose of the Coral Monitoring Programme is to verify the EIA prediction that only minor impact to corals at the To Kwa Wan breakwaters will occur as a result of the dredging operations of the Project, provided that suitable mitigation measures including the placement of a second silt curtain for protecting the coral communities are implemented when dredging works is being carried out within 250 m from the breakwaters. In the event that significant adverse impacts are identified as a consequence of the works, monitoring would also allow for implementation of appropriate remedial actions to reduce such impacts.

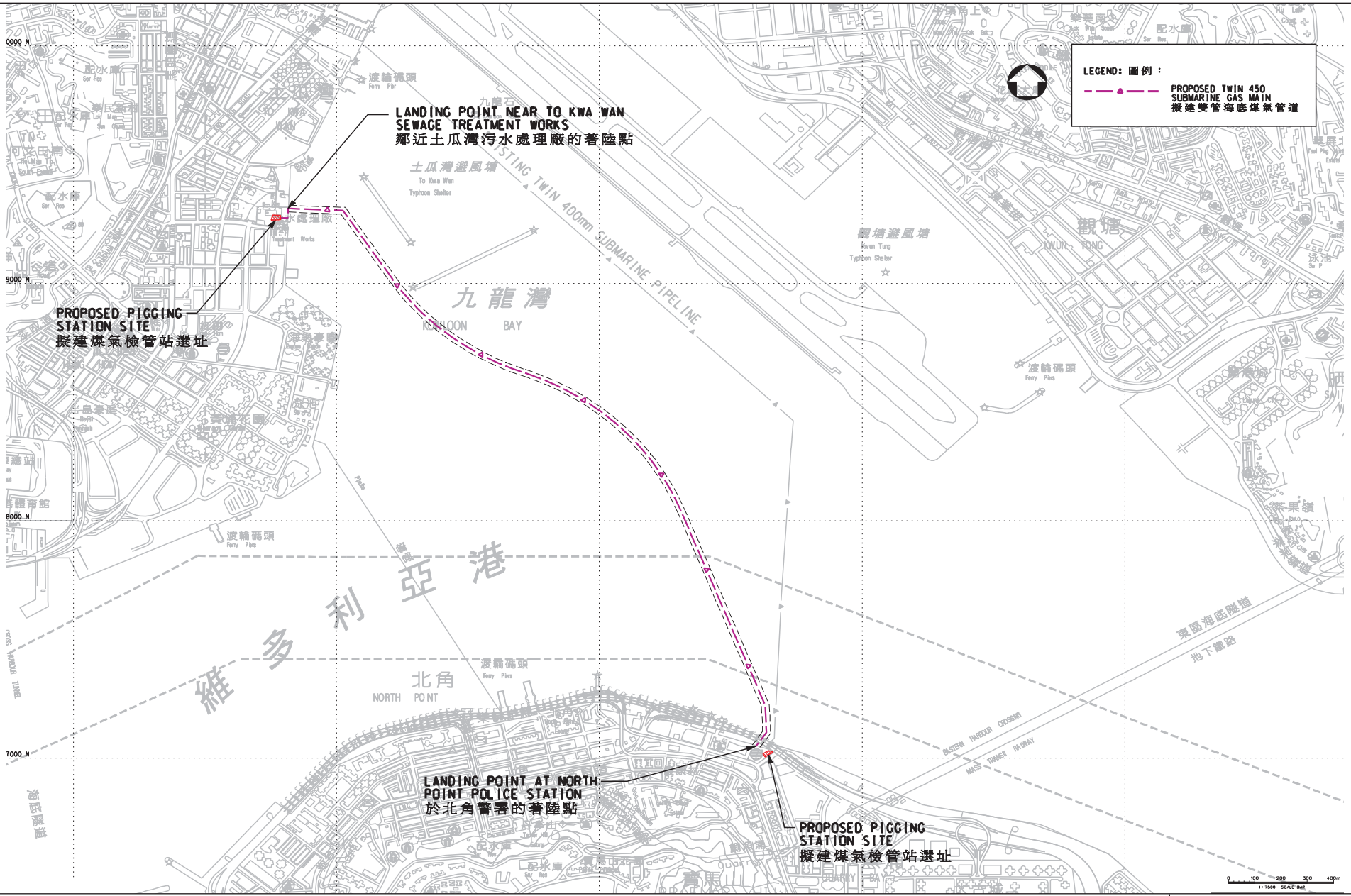

Figure 1.1

General Layout

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1.3 PURPOSE OF THIS REPORT

The purpose of this *Baseline Coral Monitoring Report* is to determine the baseline conditions of corals at the designated monitoring locations around the Project works area prior to the commencement of dredging works within 250 m from the To Kwa Wan breakwaters. Such baseline conditions will be used as the basis for comparing with the Impact Coral Monitoring data in order to identify any impacts on the health and condition of corals during the concerned dredging works near To Kwa Wan breakwaters.

1.4 STRUCTURE OF THE REPORT

The remainder of the report is structured as follows:

Section 2: Coral Monitoring - Details the coral monitoring locations and frequency, monitoring methodology and baseline coral monitoring results, and establishes the Action and Limit Levels in accordance with the *EM&A Manual*.

Section 3: Conclusion - Concludes the representativeness of the baseline coral monitoring results for the Project.

2 CORAL MONITORING

2.1 MONITORING LOCATIONS

Baseline Coral Monitoring has been conducted at three Impact Sites near the pipeline (Areas 1, 2 and 3) and one Control Site (Area 4) at the far end of the seawall which is perpendicular to the pipeline run as shown in *Figure 2.1*. The Baseline Coral Monitoring Survey was undertaken on 23 May 2012 prior to commencement of dredging operations of the Project. The start and end coordinates of each monitoring site was recorded using a portable GPS unit. Shoreline features for the start and end points of each monitoring sites were also noted to aid the re-location of the points for subsequent coral monitoring surveys (ie Impact Coral Monitoring Survey during dredging). The coordinates of the start and end points for each monitoring site are presented in *Table 2.1*.

Table 2.1 GPS Coordinates of Coral Monitoring Sites

		GPS				Depth
		Starting Point		Finishing Point		(-mCD)
Impact Sites	Area 1	22°18'50.87"	114°11'40.48"	22°18'49.86"	114°11'41.06"	2.5
	Area 2	22°18'40.90"	114°11'47.35"	22°18'41.73"	114°11'46.73"	1.8
	Area 3	22°18'35.18"	114°11'47.18"	22°18'35.71"	114°11'48.02"	3.0
Control Site	Area 4	22°18'43.57"	114°12'03.87"	22°18'43.05"	114°12'02.84"	3.5

2.2 MONITORING METHODOLOGY

The Baseline Coral Monitoring Survey which included a coral tagging exercise was carried out at Areas 1 to 4. A total of 10 colonies were tagged at each site, allowing 30 impact coral colonies and 10 control colonies. Beside the tagged coral colony, a white cable tie was tied around a rock. The tag which was laminated underwater paper of approximately 3 x 6 cm in size was attached to the cable tie. Tags and the target coral colonies were numbered 1-10 at each site (ie Area 1-4). Each of the tagged coral colonies was identified to species levels and photographed (*Annex A*).

The following baseline data were recorded for each tagged coral colonies during the Baseline Coral Monitoring Survey:

- Species
- Size (cm^2)
- Growth form
- Partial mortality (%)

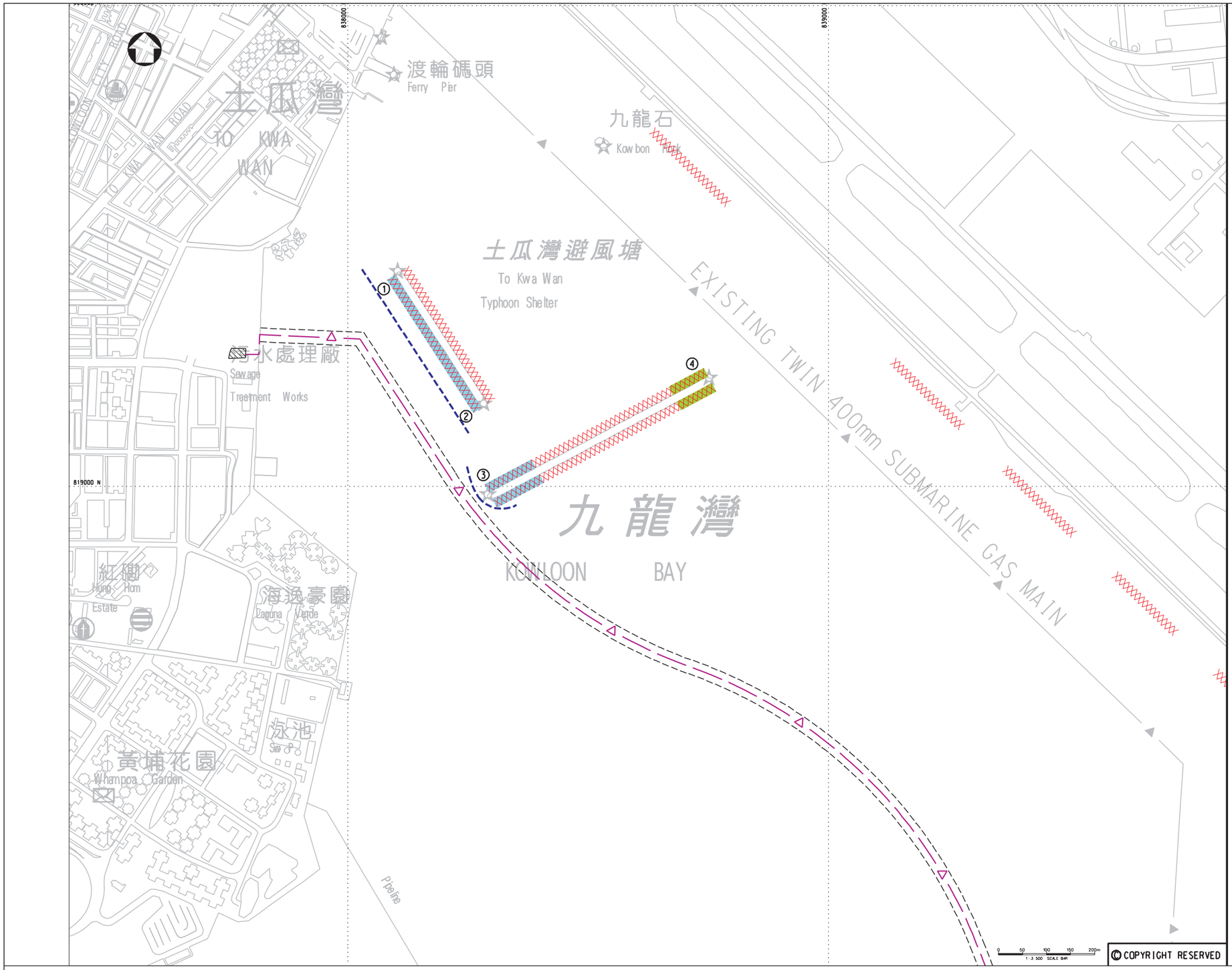

Figure 2.1

Locations of Coral Monitoring Sites at To Kwa Wan Breakwaters

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- Sediment (thickness, type and colour)
- The general health of the coral colony using the Asian Coral Watch Chart (1)

Photographic records of each coral colony tagged in this Baseline Survey were collected from an angle that best represents the entire colony (*Annex A*), and photographs maintaining the same aspect and orientation will be taken in subsequent Impact Monitoring Surveys. The same monitoring methodology will be adopted for the Impact Coral Monitoring Survey which will be undertaken weekly when dredging operations were being conducted within 250 m from the To Kwa Wan breakwaters. Data on species, size, growth form, partial mortality, sediment cover and general health of the tagged coral colonies at the four monitoring sites will be collected during the Impact Monitoring. The adoption of the same monitoring method would allow for direct comparison of baseline data with the impact monitoring data in order to determine any changes in conditions of corals after commencement of the concerned dredging works. Should impacts caused by the dredging operations to corals are identified, appropriate remedial action can be implemented to reduce such impacts.

2.3 BASELINE MONITORING RESULTS

The Baseline Coral Monitoring Survey was carried out on 23 May 2012 during which the weather conditions were fine. A total of 40 hard coral colonies were tagged during the Baseline Monitoring Survey. The species, size, growth form, partial mortality, sediment cover (thickness, type and colour) and general health of the tagged corals were summarized in *Tables 2.2 to 2.5*. These baseline data will be used to compare with Impact Coral Monitoring Data collected during the concerned dredging works in order to identify any impacts to the corals.

(1) Coral Watch is a rapid assessment on the health of coral colonies by using coral health color charts to monitor bleaching stages of corals. Coral color, or more specifically brightness and saturation, correlate with chlorophyll content and density of symbiotic algae (zooxanthellae) in coral tissue, providing a measure of coral health. Coral bleaching results from a loss of symbiosis or pigmentation from stressed, unhealthy coral.

Table 2.2 ***Species, Size, Growth Form, Partial Mortality, Sediment Cover and General Health of Tagged Coral Colonies at Area 1 (Impact Site)***

Coral No.	Species	Size (cm^2)	Growth Form	Partial Mortality (%)	Sediment Thickness (mm)	Sediment Type (Mud/Sand)	Sediment Color	General Health of Tagged Coral (1)
1	*Oulastrea crispata*	12	Encrusting	0	0	N/A	N/A	4.5
2	*Oulastrea crispata*	9.2	Encrusting	0	0	N/A	N/A	4.5
3	*Oulastrea crispata*	12.2	Encrusting	0	0	N/A	N/A	4.5
4	*Oulastrea crispata*	4.8	Encrusting	0	0	N/A	N/A	5
5	*Oulastrea crispata*	6.2	Encrusting	0	0	N/A	N/A	4.5
6	*Oulastrea crispata*	4.4	Encrusting	0	0	N/A	N/A	5
7	*Oulastrea crispata*	12.1	Encrusting	0	0	N/A	N/A	4.5
8	*Oulastrea crispata*	3.6	Encrusting	0	0	N/A	N/A	5.5
9	*Oulastrea crispate*	34.6	Encrusting	<1	0	N/A	N/A	5
10	*Oulastrea crispata*	3.2	Encrusting	0	0	N/A	N/A	4.5

(1) The general health of the coral is assessed by using the Asian Coral Watch Chart. The brightness of colour range from 1 (pale or bleached corals) to 6 (dark corals with high quantities of algae and chlorophyll in their tissues), representing different stages of bleaching and recovery which correspond to varying concentrations of symbiotic algae and chlorophyll within coral tissues. Generally, the coral health is considered to be better with higher value on the Coral Watch Chart.

Table 2.3 ***Species, Size, Growth Form, Partial Mortality, Sediment Cover and General Health of Tagged Coral Colonies at Area 2 (Impact Site)***

Coral No.	Species	Size (cm^2)	Growth Form	Partial Mortality (%)	Sediment Thickness (mm)	Sediment Type (Mud/Sand)	Sediment Color	General Health of Tagged Coral (1)
1	*Oulastrea crispata*	6.8	Encrusting	0	0	N/A	N/A	4.5
2	*Oulastrea crispata*	1.7	Encrusting	0	0	N/A	N/A	4
3	*Oulastrea crispata*	1.3	Encrusting	0	0	N/A	N/A	5
4	*Oulastrea crispata*	2.6	Encrusting	0	0	N/A	N/A	5
5	*Oulastrea crispata*	14.6	Encrusting	0	0	N/A	N/A	4.5
6	*Oulastrea crispata*	4.6	Encrusting	0	0	N/A	N/A	4.5
7	*Oulastrea crispata*	8.1	Encrusting	0	0	N/A	N/A	5
8	*Oulastrea crispata*	13.1	Encrusting	0	0	N/A	N/A	4.5
9	*Oulastrea crispata*	5.7	Encrusting	0	0	N/A	N/A	5
10	*Oulastrea crispata*	6.9	Encrusting	0	0	N/A	N/A	5

(1) The general health of the coral is assessed by using the Asian Coral Watch Chart. The brightness of colour range from 1 (pale or bleached corals) to 6 (dark corals with high quantities of algae and chlorophyll in their tissues), representing different stages of bleaching and recovery which correspond to varying concentrations of symbiotic algae and chlorophyll within coral tissues. Generally, the coral health is considered to be better with higher value on the Coral Watch Chart.

Table 2.4 ***Species, Size, Growth Form, Partial Mortality, Sediment Cover and General Health of Tagged Coral Colonies at Area 3 (Impact Site)***

Coral No.	Species	Size (cm^2)	Growth Form	Partial Mortality (%)	Sediment Thickness (mm)	Sediment Type (Mud/Sand)	Sediment Color	General Health of Tagged Coral (1)
1	*Oulastrea crispata*	7.2	Encrusting	0	0	N/A	N/A	4.5
2	*Oulastrea crispata*	0.9	Encrusting	0	0	N/A	N/A	4
3	*Oulastrea crispata*	3.4	Encrusting	0	0	N/A	N/A	4
4	*Oulastrea crispata*	106.8	Encrusting	0	1	Mud	Light brown	4.5
5	*Oulastrea crispata*	7.3	Encrusting	0	1	Mud	Light brown	4.5
6	*Oulastrea crispata*	32.4	Encrusting	0	0	N/A	N/A	5
7	*Oulastrea crispata*	23.6	Encrusting	0	0	N/A	N/A	5
8	*Oulastrea crispata*	5.3	Encrusting	0	1	Mud	Light brown	4.5
9	*Oulastrea crispata*	20.5	Encrusting	0	0	N/A	N/A	4
10	*Oulastrea crispata*	11.6	Encrusting	0	0	N/A	N/A	5

(1) The general health of the coral is assessed by using the Asian Coral Watch Chart. The brightness of colour range from 1 (pale or bleached corals) to 6 (dark corals with high quantities of algae and chlorophyll in their tissues), representing different stages of bleaching and recovery which correspond to varying concentrations of symbiotic algae and chlorophyll within coral tissues. Generally, the coral health is considered to be better with higher value on the Coral Watch Chart.

Table 2.5 ***Species, Size, Growth Form, Partial Mortality, Sediment Cover and General Health of Tagged Coral Colonies at Area 4 (Control Site)***

Coral No.	Species	Size (cm^2)	Growth Form	Partial Mortality	Sediment Thickness	Sediment Type	Sediment Color	General Health of Tagged Coral (1)
1	*Oulastrea crispata*	7.8	Encrusting	0	0	N/A	N/A	5
2	*Oulastrea crispata*	3.9	Encrusting	0	0	N/A	N/A	5
3	*Oulastrea crispata*	15.2	Encrusting	0	0	N/A	N/A	5
4	*Oulastrea crispata*	6.2	Encrusting	0	0	N/A	N/A	5
5	*Oulastrea crispata*	8.2	Encrusting	0	0	N/A	N/A	4.5
6	*Oulastrea crispata*	7.3	Encrusting	0	0	N/A	N/A	4.5
7	*Oulastrea crispata*	12.2	Encrusting	0	0	N/A	N/A	5
8	*Oulastrea crispata*	14.4	Encrusting	0	0	N/A	N/A	5
9	*Oulastrea crispata*	5.2	Encrusting	0	0	N/A	N/A	4
10	*Oulastrea crispata*	13.5	Encrusting	0	0	N/A	N/A	5

(1) The general health of the coral is assessed by using the Asian Coral Watch Chart. The brightness of colour range from 1 (pale or bleached corals) to 6 (dark corals with high quantities of algae and chlorophyll in their tissues), representing different stages of bleaching and recovery which correspond to varying concentrations of symbiotic algae and chlorophyll within coral tissues. Generally, the coral health is considered to be better with higher value on the Coral Watch Chart.

The Action and Limit Levels for Partial Mortality of tagged coral colonies were determined in accordance with the criteria stated in the *EM&A Manual* (1) which are summarized in *Table 2.6*. If the defined Action Level or Limit Levels for coral monitoring are exceeded which would indicate potential adverse impacts to corals, a set of stepwise procedures shown in *Table 2.7* will be implemented in order to rectify such impacts.

(1) Mott MacDonald 2010. Installation of Submarine Gas Pipelines and Associated Facilities from To Kwa Wan to North Point for Former Kai Tak Airport Development: Environmental Monitoring and Audit Manual.

Table 2.6 Determination of Action and Limit Level for Partial Mortality of the Tagged Coral Colonies

Parameter	Action Level
Partial Mortality	If during Impact Monitoring, a 15% increase in the percentage of partial mortality of corals occurs at more than 20% of the tagged coral colonies at either of the Impact Monitoring Stations (ie Areas 1, 2 and 3) that is not recorded at the Control Station (ie Area 4).
	Limit Level
	If during Impact Monitoring, a 25% increase in the percentage of partial mortality at more than 20% of any tagged coral colonies occurs that is not recorded at the Control Station (ie Area 4).

Table 2.7 Stepwise Procedures for Action and Limit Levels Exceedances

Event	The Marine Biologist
Action Level Exceedance	**Step 1** – Inform the Contractor, the Project Designer and AFCD and discuss the most appropriate method of reducing sediment in the discharge. **Step 2** – Implement mitigation measures on site. **Step 3** – If non-compliance continues, check and confirm the effectiveness of mitigation measures and repeat monitoring survey measurements.
Limit Level Exceedance	Undertake Steps 1 – 3. If further exceedance of Limit Level, suspend construction works until an effective solution is identified. Once the solutions have been identified and agreed with all parties, construction works may commence

Baseline Coral Monitoring Survey has been carried out on 23 May 2012 at four designated monitoring sites (including 3 Impact Sites and 1 Control Site) in accordance with the *EM&A Manual*. During the monitoring, 10 coral colonies were tagged at each site. The conditions of the tagged coral colonies are considered to be representative of the baseline conditions as the monitoring was undertaken prior to the commencement of the concerned dredging operations within 250 m of the To Kwa Wan breakwaters.

The Action and Limit Levels for partial mortality of tagged corals were established based on the baseline coral data (*Table 3.1*). These levels will be adopted for the Impact Coral Monitoring which will be conducted weekly when dredging works is being carried out within 250 m from the To Kwa Wan breakwaters.

Table 3.1 Determination of Action and Limit Level for Partial Mortality of the Tagged Coral Colonies

Parameter	Action Level
Partial Mortality	If during Impact Monitoring, a 15% increase in the percentage of partial mortality of corals occurs at more than 20% of the tagged coral colonies at either of the Impact Monitoring Stations (ie Areas 1, 2 and 3) that is not recorded at the Control Station (ie Area 4).
	Limit Level
	If during Impact Monitoring, a 25% increase in the percentage of partial mortality at more than 20% of any tagged coral colonies occurs that is not recorded at the Control Station (ie Area 4).

Should exceedance of the Action or Limit Level is identified which would indicate potential impacts to corals as a result of the concerned dredging operations, a set of stepwise procedures shown in *Table 3.2* will be implemented in order to rectify such impacts.

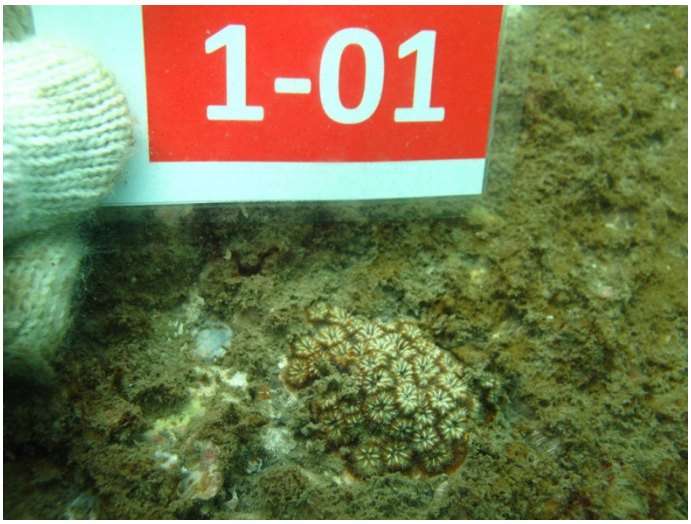
Table 3.2 Stepwise procedures for Action and Limit Levels Exceedances

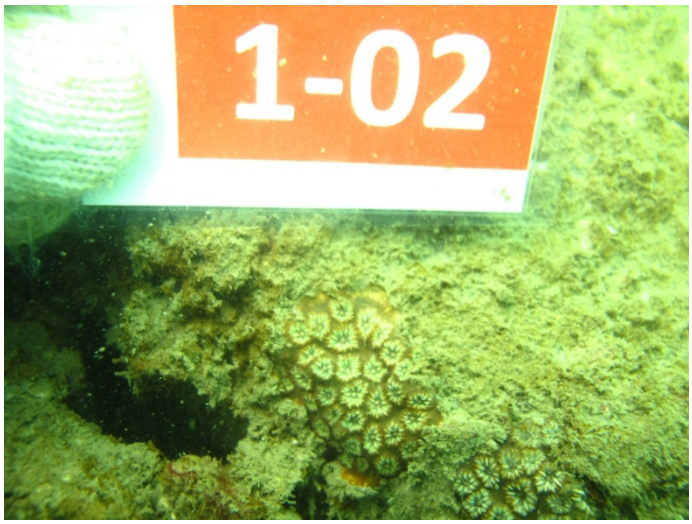
Event	The Marine Biologist
Action Level Exceedance	**Step 1** – Inform the Contractor, the Project Designer and AFCD and discuss the most appropriate method of reducing sediment in the discharge. **Step 2** – Implement mitigation measures on site. **Step 3** – If non-compliance continues, check and confirm the effectiveness of mitigation measures and repeat monitoring survey measurements.
Limit Level Exceedance	Undertake Steps 1 – 3. If further exceedance of Limit Level, suspend construction works until an effective solution is identified. Once the solutions have been identified and agreed with all parties, construction works may commence

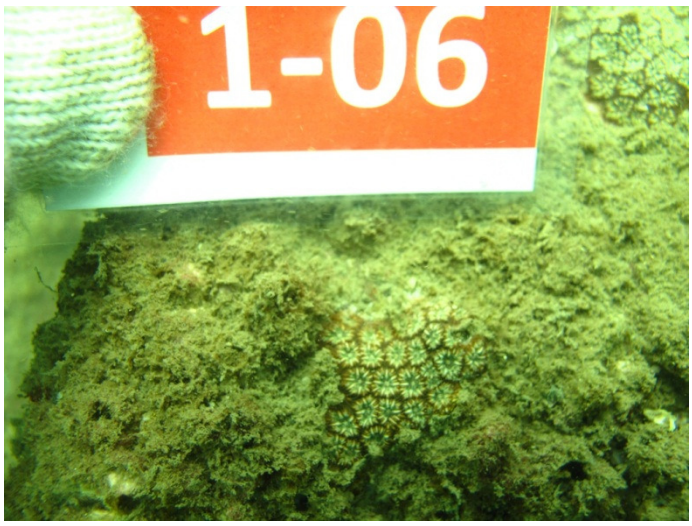
Annex A

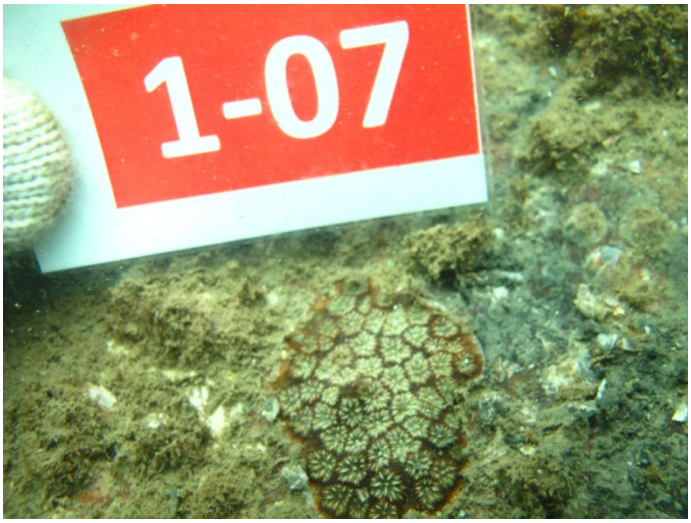
Photographic Records of Tagged Coral Colonies

Annex A1 Photographic Records of Tagged Coral Colonies at Impact Monitoring Site (Area 1) during Baseline Monitoring Survey





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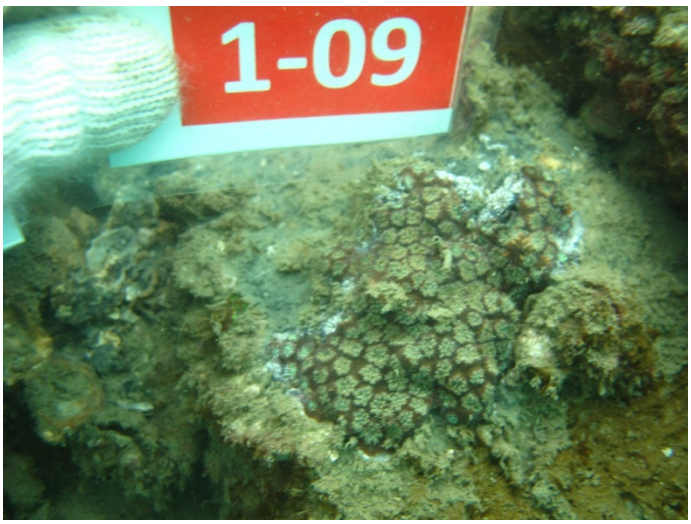
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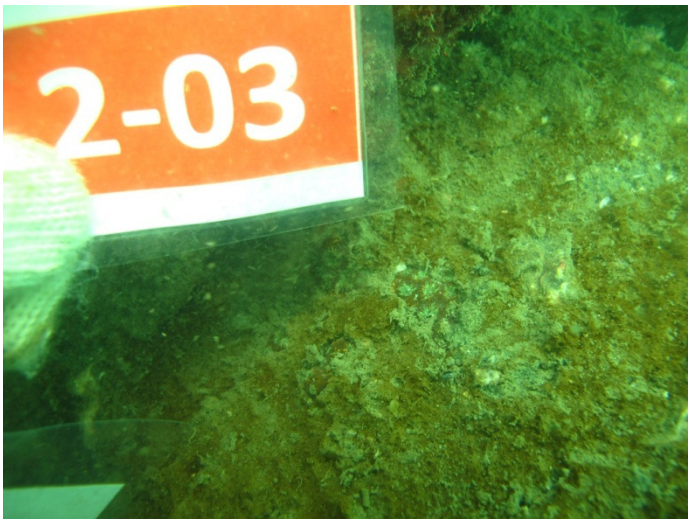
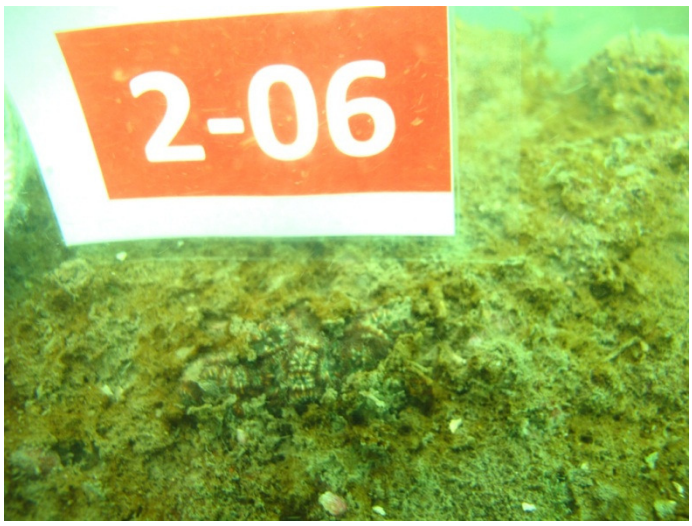
Annex A2 Photographic Records of Tagged Coral Colonies at Impact Monitoring Site (Area 2) during Baseline Monitoring Survey



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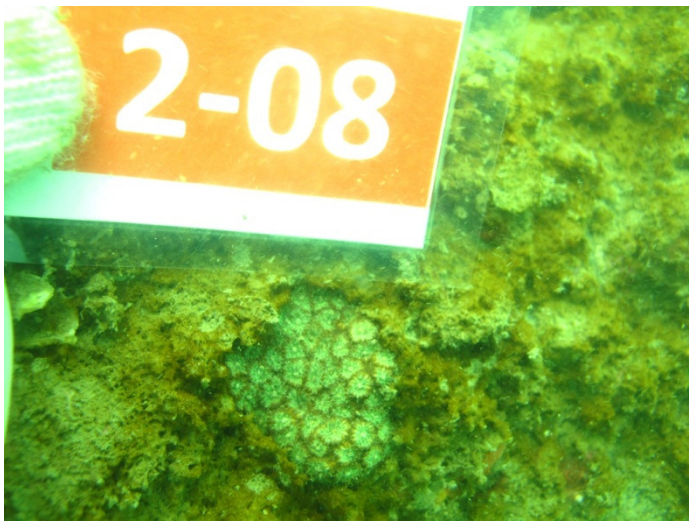
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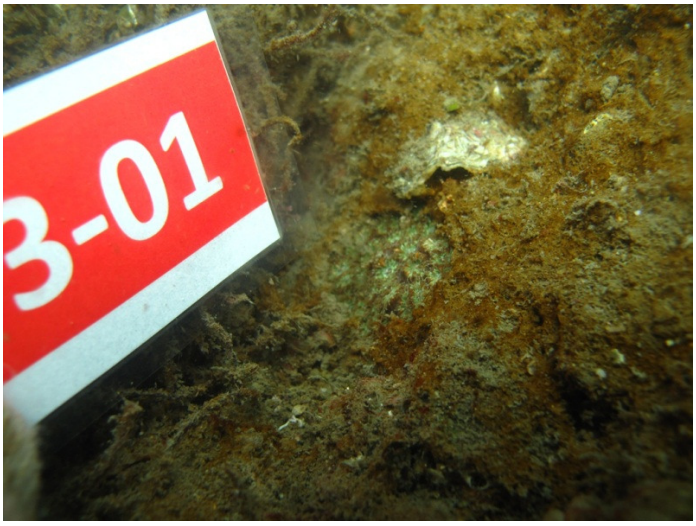
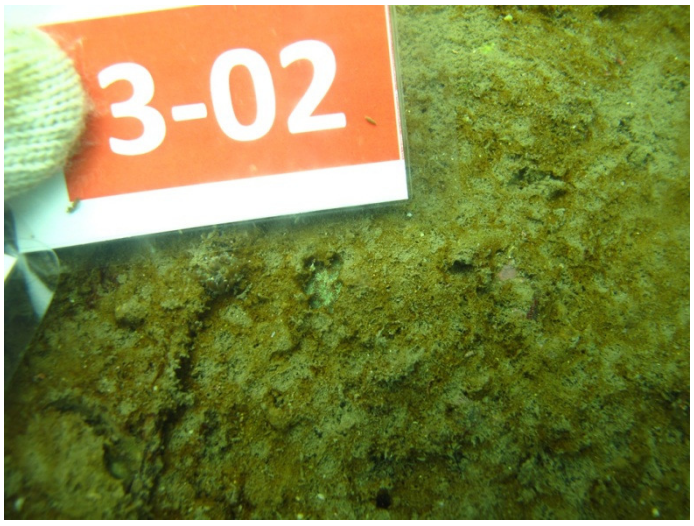
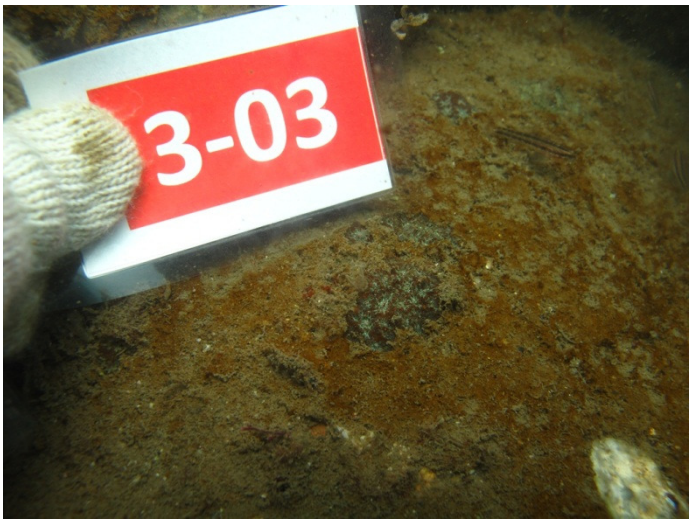
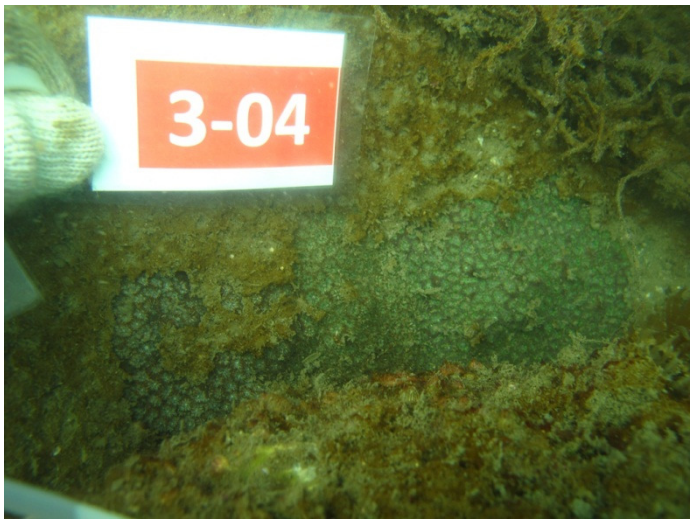
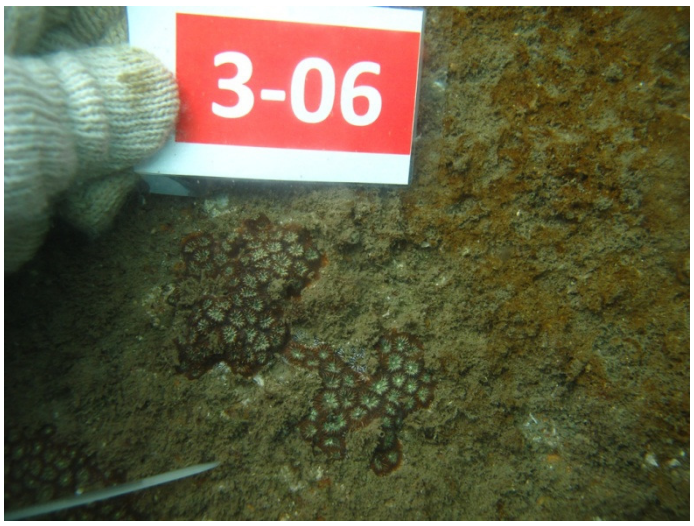
Annex A3 Photographic Records of Tagged Coral Colonies at Impact Monitoring Site (Area 3) during Baseline Monitoring Survey

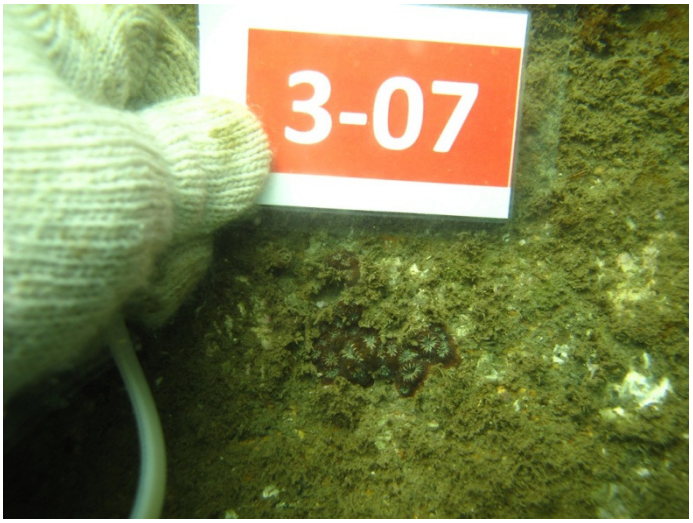








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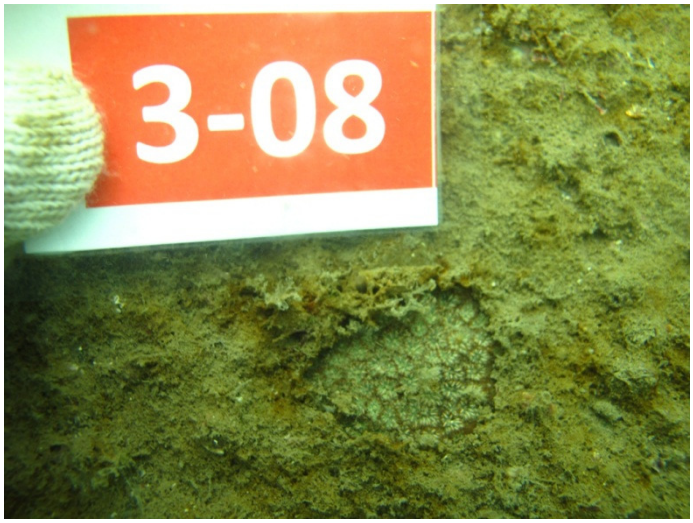
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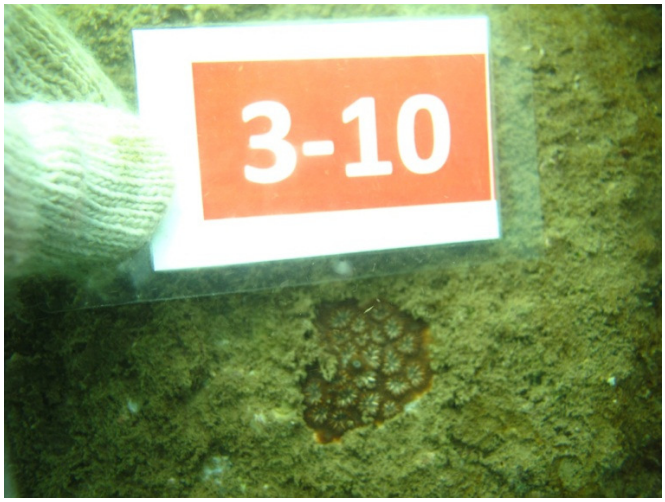
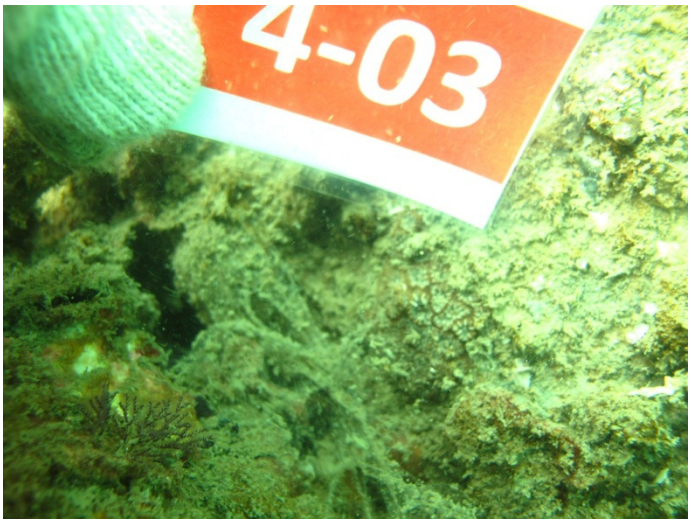
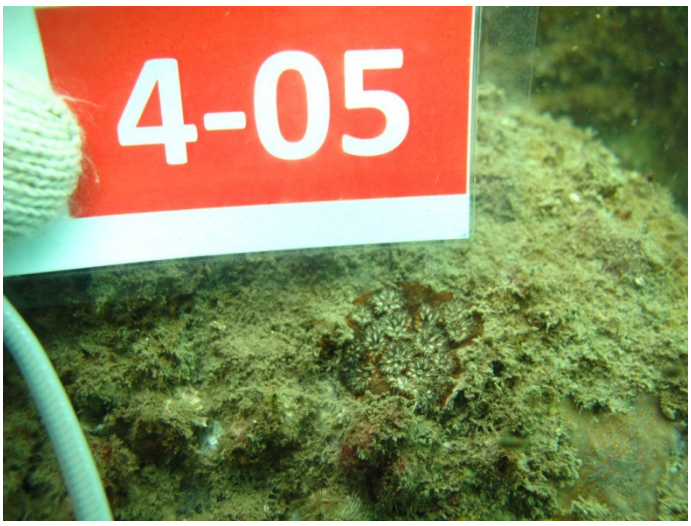
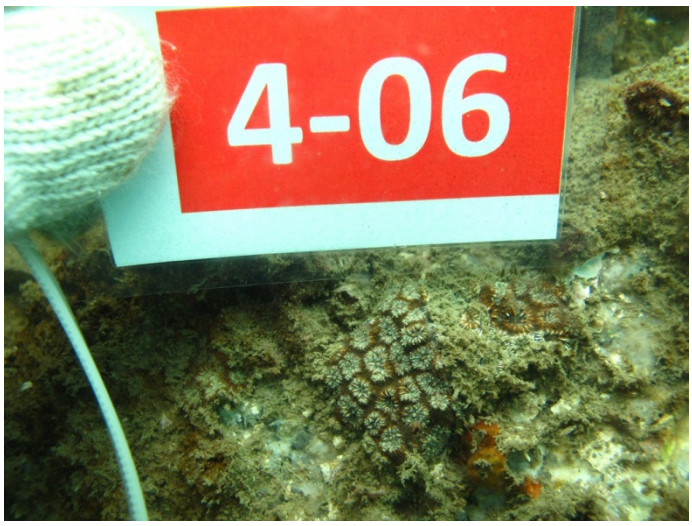
3-09


3-10

Annex A4 Photographic Records of Tagged Coral Colonies at Control Site (Area 4) during Baseline Monitoring Survey



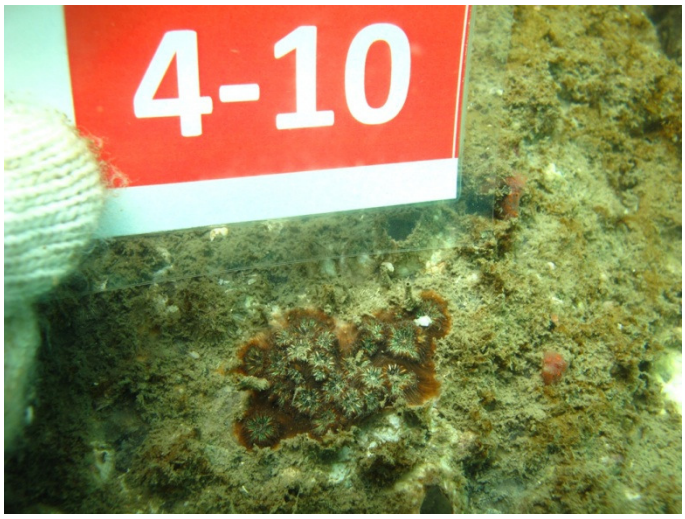





4-07


4-08


4-09


4-10