Agreement No. CE 56/2008(CE)

Site Formation for Kai Tak Cruise Terminal Development -Design and Construction

Baseline Post-translocation Coral Monitoring Report

Deliverable ID: D22

July 2009

Issue	Description	Prepared by	Checked by	Approved by	Date		
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Letter Ref: 08290/325808 Date of Issue: 13 July 2009							



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LIST OF ABBREVIATIONS

AFCD	Agriculture, Fisheries and Conservation Department
ArchSD	Architectural Services Department
CEDD	Civil Engineering and Development Department
DEP	Director of Environmental Protection
EIA	Environmental Impact Assessment
EM&A	Environmental Monitoring and Audit
EP	Environmental Permit



1 INTRODUCTION

1.1 General

1.1.1 The main purpose of this Baseline Post-translocation Coral Monitoring Report is to document the field activities, results and findings of the Baseline Post-translocation Coral Monitoring Survey conducted on 19th June, 2009. The baseline monitoring was completed successfully in accordance with the Final Detailed Coral Translocation Plan ⁽¹⁾ and the detailed mitigation measures documented in the approved EIA Report, Environmental Monitoring and Audit (EM&A) Manual (*EIA 138/2007*) and Environmental Permit and variation (*EP-328/2009* and *VEP-289/2009*).

1.2 Description of the Project

- 1.2.1 Civil Engineering and Development Department (CEDD) have commissioned Scott Wilson Ltd under Agreement No. *CE 56/2008(CE)* to undertake design and construction supervision for the site formation works for Kai Tak Cruise Terminal Development at the former Kai Tak Airport in the south-eastern region of Kowloon Peninsula (the Project). After closure in 1998, the disused airport site has been occupied by various temporary uses, including a golf driving range and has been subjected to a number of proposals to redevelop the site with change usage.
- 1.2.2 The Project comprises the following key components.
 - (a) Site Formation Works
 - demolition of the existing seawall;
 - construction of Edge Structures and Transition Edge Structures;
 - formation and construction of an Apron Area, including the provision of trough & pit systems for installation of Apron Facilities by others;
 - formation of the Designated Areas including provision of piled quay deck structures and upgrading of existing seawalls;
 - installation of fender and mooring facilities, navigation aids and apron drainage; and,
 - dredging of seabed and fairways.
 - (b) Environmental monitoring and implementation of mitigation measures in association with the above.
- 1.2.3 In the original Project Brief, Temporary Infrastructure will be required to facilitate the operation of the Phase I Berth in mid 2013. However, based on the current programme and development, Architectural Services Department (ArchSD) will bring forward the construction programme for the Cruise Terminal Building such that the required facilities for the operation of the Phase I Berth will be provided by the newly constructed Cruise Terminal Building. As a result of this, the provision of the Temporary Infrastructure will not be

^{(&}lt;sup>1</sup>) Scott Wilson Ltd and ERM (2009). Detailed Coral Translocation Plan for Site Formation for Kai Tak Cruise Terminal Development – Design and Construction.



required and the design of the site formation works including the edge structures and seawalls will be carried out on this basis.

- 1.2.4 The development layout plans are presented in *Figure 1.1*.
- 1.2.5 A number of environmental studies have been carried out at the site as part of the masterplanning and Environmental Impact Assessments required under the Environmental Impact Assessment Ordinance (EIAO). These include:
 - The Environmental Appraisal Report for the Cruise Terminal;
 - EIA report (*EIA-139/2007*) for the decommissioning of the Former Kai Tak Airport Other than the North Apron approved on 19 December 2007;
 - EIA report (*EIA-138/2007*) for Dredging Works for the Proposed Cruise Terminal at Kai Tak approved on 19 December 2007; and,
 - EIA Report (*EIA-157/2008*) for the Kai Tak Development approved without conditions on 4 March, 2009.
- 1.2.6 An Environmental Permit (EP) has been obtained by CEDD for Dredging Works for the Proposed Cruise Terminal (*EP-328/2009*), which links directly to the EM&A measures set out and agreed in the approved *EIA-138/2007*.
- 1.2.7 The marine ecological impacts associated with the Project identify the potential for direct loss of habitat and associated marine life due to the dredging activities and demolition of the existing seawall required for the formation of the new cruise terminal. With respect to the mitigation of potential impacts, a specific requirement of the approved *EIA-138/2007* is the need to undertake coral translocation from the impacted area to an identified site in Tseung Kwan O. The requirements for coral translocation have also been set down in the Environmental Permit for Dredging Works and variation (*EP-328/2009* and *VEP-289/2009*).
- 1.2.8 As required under Agreement No. *CE 56/2008(CE)* and Environmental Permit No. *EP-328/2009*, the coral translocation works comprises three phases of works:
 - i. Preparation of a detailed Coral Translocation Plan, including the results of a pretranslocation surveys for the Kai Tak (donor site) and proposed coral recipient site (Tseung Kwan O);
 - ii. Execution and documentation of the coral translocation exercise; and
 - iii. The implementation and documentation of a post-translocation coral monitoring programme over a period of 12 months.

1.3 Objectives for the Baseline Post-translocation Coral Monitoring Survey

- 1.3.1 The objective of the Baseline Post-translocation Coral Monitoring Survey was to assess the health condition of the coral colonies soon after translocation from the Kai Tak Project site to the coral recipient site at Tseung Kwan O. Data from this first post-translocation monitoring survey were collected for two purposes:
 - To assess translocated coral condition after the moving process so as to confirm the success of the translocation works; and,



• Provide for a robust baseline dataset that will be used as part of a temporal monitoring programme (of 12 months duration) to track the status of the translocated corals in terms of health dynamics and the growth rates of *Oulastrea crispata*.

1.4 Structure of the Report

- 1.4.1 Following this introductory section (*Section 1*), the remainder of this Baseline Post-translocation Coral Monitoring Report is structured as follows:
 - Section 2: Detailed description of the coral monitoring approach and methodology.
 - Section 3: Presentation of the findings for the baseline post-translocation monitoring survey.
 - Section 4: A summary of the key results of the Baseline Post-translocation Coral Monitoring Survey with details of the temporal monitoring programme implementation over the following 12 months.



2 POST-TRANSLOCATION CORAL MONITORING METHODOLOGY

2.1 General

- 2.1.1 The post-translocation coral monitoring main objective was to track the health and condition of the translocated corals at the Tseung Kwan O recipient site over a period of 12 months⁽¹⁾ A baseline survey following the translocation works was carried out on 19 June 2009.
- 2.1.2 The corals removed from the seawall of the Former Kai Tak Runway and transferred to Tseung Kwan O were placed within the established recipient site located as shown in *Figure* 2.1 (please refer to the Coral Transplantation Report for details on the preparation of the recipient site ⁽²⁾ which was issued on 2 July 2009). As documented in the Detailed Coral Translocation Plan and the Coral Translocation Report, each of the 72 boulders/rocks containing a total of 157 colonies of *Oulastrea crispata* and removed from Kai Tak were placed in one of the marked 1 m² grid cells. The location of each boulder/rock with corals within the recipient site was mapped and is presented in *Figure* 2.2. Due to the small size of some rocks with corals removed from the Project site, several were placed within one grid cell. For example, three rocks are located in grid cell E9 (refer to *Figure* 2.2).
- 2.1.3 The condition of each translocated coral was assessed on the day after completion of the translocation works using standard coral health parameters and as stated in the Final Detailed Coral Translocation Plan. Representative photographs were also made and used to record the size of each hard coral colony, post-survey. Full details of the field methodology are detailed in the following section.

2.2 Monitoring of Coral Health Status

- 2.2.1 The depth and location of each translocated boulder/rock within the recipient site (as referenced by the underwater grid) were noted.
- 2.2.2 The following standard coral health parameters were recorded *in-situ* for each translocated coral colony (as detailed in the EM&A (*EIA-138/2007*) and the Final Detailed Coral Translocation Plan:
 - The number and size of all hard coral colonies of each translocated boulder/rock.
 - The existing surface area (percentage cover) exhibiting partial mortality.
 - The existing surface area exhibiting coral bleaching of which two categories were recorded: a. Blanched (i.e. pale) and b. bleached (i.e. whitened) and recorded as percentage cover of the total coral colony area.
 - Each coral colony was also assessed for sediment cover including the percentage cover of the colony affected and the colouration, texture and approximate thickness of sediment on the coral colony and adjacent substrate. Any contiguous patches of sediment cover >10 % were recorded.
- 2.2.3 Each coral colony of each tagged boulder/rock was photographed for documentation of their status at the time of the baseline post-translocation monitoring survey. In addition, a

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^{(&}lt;sup>1</sup>) Scott Wilson 2009. Final Detailed Coral Translocation Plan. Prepared by ERM for CE 56/2008 (CE) Site Formation for Kai Tak Cruise Terminal Development - Design and Construction.

^{(&}lt;sup>2</sup>) Scott Wilson 2009. Coral Transplantation Report. Prepared by ERM for CE 56/2008 (CE) Site Formation for Kai Tak Cruise Terminal Development - Design and Construction.



photograph of each coral from a standardised height above the coral was recorded so that with repeated monitoring the size and growth dynamics of each coral colony can be tracked. Details are provided in next sub-section.

2.3 Monitoring of Growth and Change in Cover of *Oulastrea crispata*

- 2.3.1 The baseline survey also established the collection of data to follow growth and change in coral cover of individual *Oulastrea crispata* colonies over the 12 month period of post-translocation monitoring. This was carried out using a quantitative and repeatable photographic survey approach whereby a photographic record was taken of each coral colony on all translocated boulders/rocks at a fixed vertical distance of 25 cm.
- 2.3.2 A wide angle, high resolution compact camera in a dedicated housing (Sea & Sea DX-1G) was used to take all photographic records. A reference bar attached to the bottom of the housing allowed for the standardised camera height above the substrate/coral colonies. All photographs were thus recorded at a fixed height (25 cm) above the coral colony. The images were then digitally analysed post-survey using Coral Point Count (CPCe) software (http://www.nova.edu/ocean/cpce/). The size (maximum diameter and area) of each coral colony was recorded from the coral images after scale calibration for all images had been carried out.
- 2.3.3 The baseline size of individual coral colonies following the translocation works will be used to track any changes in size through repeating the standardised photographic records for each post-monitoring survey. It is anticipated that an estimation of the growth rate of *Oulastrea crispata* will be possible by tracking changes in individual colony size using the photographic sequence to be recorded over the next 12 months of post-translocation monitoring.

2.4 Reference Corals

- 2.4.1 Health status and the general condition of translocated corals may change over time and in order to differentiate changes due to natural fluctuations and/or perturbations in environmental parameters versus stress induced by the translocation works a suite of reference corals were also monitored. Records of health and coral photographs were made of a number of coral colonies of the same species (*Oulastrea crispata*) occurring naturally within the recipient site and in the adjacent area. Existing *O. crispata* colonies recorded within and in the vicinity of the coral recipient site were included in the baseline translocation monitoring survey and will be referred to as "reference corals" through the post-monitoring programme. The "reference corals" were monitored using the same methods for the translocated colonies to assess their health status and size.
- 2.4.2 The aim for the post-survey monitoring was to assess the condition and take photographic records for a minimum of 10 randomly selected colonies of *Oulastrea. crispata* existing naturally within the recipient site. In addition, a reference transect of 15 m length was set up in the vicinity of the coral recipient site with the aim to also monitor a minimum of 20 randomly selected *O. crispata* colonies (*Figure 2.3*). The health status (partial mortality, bleaching and sediment cover) and size of these reference corals were assessed.
- 2.4.3 Coral health data obtained from the reference colonies will be collected on each postmonitoring survey occasion and used to compare with the coral condition of the translocated coral colonies. It is expected that the general health condition of the translocated and reference hard coral colonies will be similar.



3 RESULTS AND FINDINGS

3.1 Introduction

- 3.1.1 The Baseline Post-translocation Coral Monitoring Survey was conducted on 19th June, 2009. In the morning, the prevailing weather was overcast with periods of heavy rain and thunderstorms. The weather improved with a sunny and hot afternoon recorded.
- 3.1.2 Sea conditions were generally good throughout the survey day with calm seas and an infrequent slight swell. Underwater visibility reached 1.5 2 m which allowed for the relocation of translocated boulders/rocks without the guidance of the underwater grid system.

3.2 Results

General

3.2.1 All 157 translocated coral colonies were individually assessed as part of the monitoring survey. A reference transect was set up in close vicinity to the recipient site (*Figure 2.3*). A total of 33 reference *Oulastrea. crispata* colonies were randomly selected and monitored, 11 of which where located within the recipient site and the remainder along the reference transect. Representative photographs of the baseline post-translocation monitoring survey are presented in *Figure 2.4*. The underwater photographs show one of the ERM marine scientists' conducting the survey, examples of the tagged boulders/rocks with corals and macro-images of the individual *Oulastrea crispata* colonies post-translocation which show these corals did not exhibit any visual signs of stress one day after translocation.

Number and Size of Oulastrea crispata Colonies

- 3.2.2 *Table 1* presents the number of *Oulastrea crispata* colonies recorded on each translocated boulder/rock during the pre-translocation and baseline post-translocation surveys. Out of the 157 *O. crispata* colonies recorded, a total of 39 individuals were new records, ie, coral colonies not noted on the marked boulder/rock at the time of the pre-translocation survey. These colonies were generally small in size with a mean diameter of 2.3 cm. It is hypothesised that some of these small colonies may possibly be new coral recruits recently settled on the boulders/rocks (ie in 2009). It is also possible that some of these colonies were just not observed during the pre-translocation survey due to a cryptic location on the boulder/rock, low underwater visibility when making the assessment and/or possibly sediment cover obscuring the colonies. A total of two *O. crispata* colonies on rocks identified by Tag number 1 and 37 recorded during the pre-translocation survey.
- 3.2.3 The estimated size of individual translocated coral colonies (as extracted from the photographs) are presented in *Table 2*. The mean diameter of *Oulastrea crispata* ranged in size from 0.5 to 13.6 cm and the estimated total area of individual coral colonies ranged from 0.2 to 75.5 cm², representing a size spectrum from possible recent recruits to adult colonies. The average size (area estimate) of the translocated coral colonies was 13.0 cm². The size of individual colonies will be recorded in all future monitoring surveys to track and calculate growth rates and changes in live coral cover of the *O. crispata* colonies.
- 3.2.4 The size of the reference *Oulastrea crispata* coral colonies are presented in *Table 3*. The average size (estimated area) of the reference colonies within the recipient site and along the reference transect ranged from 0.5 to 12.8 cm^2 .



Coral Health Condition

- 3.2.5 The health condition of the translocated coral colonies was assessed (% partial mortality, bleaching and sediment cover) and data are presented in *Table 2*. The majority of the translocated corals (97 %) were in good condition after their placement within the recipient site and exhibited no recent partial mortality. A few *Oulastrea crispata* colonies (~3 % of total number), however, did exhibit small areas of partial mortality as observed as exposed skeleton (<5 % of the colony area). Furthermore, a number of colonies (4.5 %) [DMC1]possessed areas of old partial mortality (as indicated by the algal overgrowth on the exposed skeleton) ranging from 5 to 40 % cover. Both types of partial mortality were attributed to the removal of sediment obscuring these dead skeletal areas and sediment was most likely removed during the translocation works. The field observations made did not indicate any partial mortality occurrence as a result of the translocation process.
- 3.2.6 No records of coral bleaching were made for any of the *Oulastrea crispata* colonies moved to the recipient site at Tseung Kwan O.
- 3.2.7 Sediment cover on each coral colony was assessed. The number of coral colony affected by sedimentation dropped from 21 %, as recorded in pre-translocation survey to 16.6 % in the baseline post-translocation survey. The sediment cover on each coral colony also decreased from between 5-20 % to between 3-5 % of individual coral colony area and was attributed to sediment removal that had occurred during the coral translocation works. In addition, for the majority of coral colonies recorded with sediment cover the sediment was associated with areas of the colony that had macro-borers such as barnacles while areas of live coral cover did not exhibit any sediment cover. Sediment was composed of fine silt, brown in colour and was of a uniform appearance and composition for all coral colonies. The removal of sediment from the rocks during the coral translocation works was viewed as potentially beneficial as this removed a possible source of stress to the attached coral colonies.
- The health condition of the translocated corals was compared to the reference corals 3.2.8 recorded within the recipient site and along the reference transect. The majority of the reference corals were in good condition exhibiting no partial mortality, bleaching or sediment cover. A total of three (13 %) of Oulastrea crispata colonies exhibited partial mortality and were represented by small areas (5 %) of freshly exposed coral skeleton (Figure 2.5). It was noted that the nature of this partial mortality was similar to that observed for a small number of translocated corals (as observed on the second day of translocation and recorded during the baseline post-translocation monitoring survey, subsection 3.2.5). Figure 2.5 presents photographs of the reference and translocated corals with the small areas of exposed skeleton. The absence of sediment cover on the living coral for both the translocated and reference corals indicates active sediment removal by coral polyps. The similar observations of small areas of partial mortality (freshly exposed skeleton) observed for both translocated and reference corals is attributed to the removal of sediment exposing dead coral areas that had not yet been overgrown with algae and does not represent recent tissue die-off and does not indicate that translocated corals exhibited stress that manifested in this type of partial mortality.
- 3.2.9 Photographs recorded included those of a standardized height from each coral colony and a number of macro-images per coral colony. The photographs at the standardized height are presented in *Annex A*.



4 SUMMARY

- 4.1.1 All 157 translocated *Oulastrea crispata* coral colonies were assessed and data collected during the Baseline Post-translocation Coral Monitoring Survey on 19th June, 2009. The majority of *O. crispata* colonies were in good condition exhibiting no stress or damage attributed to the translocation works. The occurrence and percentage cover of partial mortality per coral colony was generally low for both the moved and reference corals.
- 4.1.2 A slight reduction in sediment cover on translocated coral colonies was observed between pre- and post-translocation surveys indicating that the translocation process most likely removed sediment from the corals and the boulder/rocks in general.
- 4.1.3 A small number of translocated coral colonies exhibited small areas of partial mortality (as freshly exposed skeleton), however, after comparing with reference colonies, it was found this type of partial mortality was exhibited in the *Oulastrea crispata* colonies occurring naturally within and adjacent to the recipient site at Tseung Kwan O. It is noted that the partial mortality observed for the translocated corals during the baseline post-translocation survey already existed but had not been noted in the pre-translocation survey due to sediment cover on these dead portions of the colonies.
- 4.1.4 The absence of visual observations of stress (coral mucous production, bleaching and partial mortality) during or after the translocation works support the finding that the translocation programme for the Kai Tak project site (CE 56/2008) was successfully completed.
- 4.1.5 The baseline data collected will serve as the first of the temporal monitoring datasets to be collected during the 12 month post-translocation monitoring programme. The condition of the translocated corals will be further assessed in future surveys which will be conducted every three months (ie quarterly and for the months of September and December, 2009 and March and June, 2010).
- 4.1.6 All tags identifying the corals and associated boulder/rocks moved from Kai Tak in June 2009 will be removed in June 2010 after completion of the last post-translocation monitoring survey.



Tables



Table 1:Summary Table of the Number of Oulastrea crispata Colonies recorded on
Translocated Boulders/Rocks during the Pre-translocation Survey and Coral
Translocation Works.

Tag Number	Subsea Marker Number	Grid no.	Depth at Recipient Site (m)	No. of Coral(s) Recorded in Pre- Translocation Survey	No. of Coral(s) Recorded during Coral Translocation
1	8	D17	4.5	2	1
2	7	D16	4	1	1
3	6	D15	3.8	1	3
4	5	D13	3.6	1	1
5	28	E9	2.8	1	2
6	15	E9	2.5	1	2
7	35	E2	3.2	1	1
8	14	D3	3.3	2	2
9	22	D4	2.9	2	2
10	24	E1	3.4	1	1
11	11	D1	3.5	1	5
12	1	A20	3.6	1	1
13	25	B20	4.2	1	1
14	18	C18	3.9	2	3
15	2	A18	3.9	3	3
16	23	B19	4.3	1	1
17	27	C20	4.2	3	3
18	17	A19	4	1	1
19	19	A18	3.8	1	1
20	20	B16	3.9	1	1
21	12	A17	3.6	1	1
22	21	B17	3.9	2	2
23	13	A16	3.5	2	4
24	38	B11	3.1	2	3
25	42	B16	3.5	2	2
26	43	B18	4	2	2
27	33	C16	3.4	1	4
28	3	B14	3	1	1
29	44	C19	4.1	1	1
30	46	A12	2.1	1	3
31	45	C18	4	3	5
32	37	A15	3.1	2	1
33	34	D17	4.5	1	1
34	41	E18	5.2	1	1
35	10	E18	5.2	1	1
36	60	A4	2.3	2	2
37	52	B2	2.5	2	2



Tag Number	Subsea Marker Number	Grid no.	Depth at Recipient Site (m)	No. of Coral(s) Recorded in Pre- Translocation Survey	No. of Coral(s) Recorded during Coral Translocation
38	57	A2	2.3	1	3
39	59	B11	2.1	1	1
40	56	B7	1.9	3	3
41	39	C8	2.2	2	2
42	29	C10	2.1	2	2
43	9	C9	2.1	2	2
44	36	C4	2.6	2	2
45	49	C5	2.6	4	4
46	58	C15	2.9	2	2
47	40	B9	2.1	1	1
48	54	A10	2.3	3	3
49	51	A14	2.6	1	1
50	48	C13	2.2	1	1
51	66	A1	2.6	1	1
52	47	A15	3.5	2	5
53	31	F10	3.5	1	2
54	62	E12	3.1	4	7
55	80	D11	3.1	1	1
56	50	E13	3.5	2	2
57	30	D4	2.9	1	1
58	55	C/D5	2.7	1	2
59	61	D1	3.5	2	2
60	63	F1	3.7	1	1
61	64	E4	3	2	2
62	67	E15	3.6	2	2
63	65	E14	3.6	2	3
64	78	F13	3.5	2	2
65	73	F6	2.9	1	1
66	77	E7	2.9	4	5
67	76	E9	2.8	5	5
68	75	E11	3.2	1	1
69	74	D19	5.2	2	2
70	71	E19	5.2	3	3
23B	Additional	D2	3.3		4
40B	Additional	D7	2.7		4
			Total	120	157



Table 2:Summary Table of the *Oulastrea crispata* Colony Details on each Marked
Boulder/Rock. The newly recorded coral colonies are shaded in grey.

	Running	Coral Diameter	Coral Diameter	Coral Area measured at Post- Translocation (cm ²)	Health Status	
Tag no.	Count Number of <i>Oulastrea</i> Colonies	measured at Pre- Translocation (cm)	measured at Post- Translocation (cm)		Partial Mortality (% Affected)	Sediment Cover (% Affected)
1	1	7.5	5.7	18.4	-	-
2	2	1	1.3	1.3	-	-
3	3	2.5	3.3	7.3	-	-
3	4	-	1.2	0.9	-	-
3	5	-	2.2	2.7	-	-
4	6	4	5.3	17.2	-	-
5	7	5.5	6.2	24.3	-	5
5	8	-	5.4	21.6	-	-
6	9	-	2.2	3.2	-	-
6	10	2.5	4.1	9.2	-	-
7	11	6.5	8.6	30.8	-	5
8	12	2.5	7.8	38.2	-	-
8	13	1.5	2.1	2.5	-	-
9	14	7	9.4	42.9	-	-
9	15	4.5	4.1	21.4	-	-
10	16	2.5	4.6	12.5	-	-
11	17	-	1.4	1.6	-	-
11	18	3	3.0	3.1	-	-
11	19	-	0.6	0.3	-	-
11	20	-	0.5	0.2	-	-
11	21	-	0.8	0.9	-	-
12	22	4	5.5	17.1	-	5
13	23	4.5	6.1	21.2	<5 (sediment removal)	-
14	24	3.5	4.8	14.7	-	-
14	25	-	5.5	16.7	-	-
14	26	4	4.8	13.8	-	_
15	27	3.5	4.6	14.2	-	-
15	28	1.5	2.6	4.7	-	-
15	29	3	4.2	10.4	-	-
16	30	5	6.6	28.2	-	-



	Running	Coral Diameter	Coral Diameter	Coral Area	Health Status	
Tag no.	Count Number of <i>Oulastrea</i> Colonies	measured at Pre- Translocation (cm)	measured at Post- Translocation (cm)	measured at Post- Translocation (cm ²)	Partial Mortality (% Affected)	Sediment Cover (% Affected)
17	31	4	5.8	17.2	5 (old)	-
17	32	2	3.6	8.0	-	-
17	33	1	2.3	3.4	-	-
18	34	2.5	4.7	9.8	-	-
19	35	2.5	4.5	12.3	-	-
20	36	2	3.8	10.1	-	-
21	37	3	4.2	10.2	-	-
22	38	2	4.2	10.2	-	-
22	39	1	3.4	6.5	-	-
23	40	1.5	2.6	3.5	-	-
23	41	-	2.4	3.8	-	-
23	42	-	1.2	1.1	-	-
23	43	2.5	4.0	9.8	-	-
24	44	4.5	6.7	21.7	-	-
24	45	1.5	2.4	4.0	-	-
24	46	-	1.3	1.1	-	-
25	47	6	6.5	21.7	-	-
25	48	2	3.0	4.9	-	-
26	49	4	8.8	29.3	-	-
26	50	1.5	3.1	6.2	-	-
27	51	5.5	4.9	11.2	-	-
27	52	-	4.8	10.4	-	-
27	53	-	2.6	4.1	-	-
27	54	-	3.2	6.0	-	-
28	55	7	10.8	41.0	-	5
29	56	2.5	3.9	8.6	-	-
30	57	9.5	10.2	42.2	-	-
30	58	-	0.7	0.4	-	-
30	59	-	0.9	0.5	-	-
31	60	6	7.8	31.8	-	-
31	61	5	7.2	29.7	-	-
31	62	3.5	5.0	11.7	-	-
31	63	-	1.5	1.2	-	-



	Running	Coral Diameter	Coral Diameter	Coral Area	Health Status	
Tag no.	Count Number of <i>Oulastrea</i> Colonies	measured at Pre- Translocation (cm)	measured at Post- Translocation (cm)	measured at Post- Translocation (cm ²)	Partial Mortality (% Affected)	Sediment Cover (% Affected)
31	64	-	1.0	0.6	-	-
32	65	2.5	2.1	3.5	-	-
33	66	3	5.2	12.6	-	-
34	67	5	6.6	21.6	-	5
35	68	3	5.0	12.8	-	-
36	69	2.5	2.9	4.3	-	-
36	70	1	2.6	3.3	-	-
37	71	1.5	0.6	0.2	-	-
37	72	3	4.6	10.6	-	-
38	73	2.5	3.4	6.3	-	-
38	74	-	0.9	0.6	-	-
38	75	-	0.7	0.4	-	-
39	76	3	5.3	14.7	-	-
40	77	1.5	4.2	17.6	-	-
40	78	4	4.7	9.6	-	-
40	79	1	1.7	1.5	-	-
41	80	4	5.9	15.4	5 (sediment removal)	-
41	81	1.5	2.5	4.4	-	-
42	82	2.5	3.8	6.5	-	-
42	83	5.5	7.5	19.5	40 (old)	-
43	84	3	4.6	8.6	20 (old)	-
43	85	2	2.9	4.8	-	-
44	86	6	7.7	40.0	-	5 %
44	87	7.5	7.8	18.7	-	-
45	88	2	3.2	5.4	-	-
45	89	1	2.3	3.1	-	-
45	90	3.5	5.5	15.9	-	-
45	91	3.5	4.4	11.4	-	-
46	92	5	6.6	24.3	30 (old)	-
46	93	3	4.7	8.8	-	-
47	94	10	13.4	75.5	-	-
48	95	4	6.1	18.0	-	3



Running		Coral Diameter	Coral Diameter	Coral Area	Health Status	
Tag no.	Count Number of <i>Oulastrea</i> Colonies	measured at Pre- Translocation (cm)	measured at Post- Translocation (cm)	Post- Translocation (cm ²)	Partial Mortality (% Affected)	Sediment Cover (% Affected)
48	96	1.5	2.5	3.6	-	-
48	97	2.5	3.6	7.6	-	-
49	98	4	6.0	19.9	-	-
50	99	4	4.3	10.1	20 (old)	-
51	100	3	4.1	10.3	-	-
52	101	13	13.4	75 1	_	5
52	102	3	4 7	87	_	-
52	103	_	17	2.1	_	_
52	104		29	2.9		
52	105	_	4.4	13.2	_	-
53	106	6	8.7	34.1	_	3
53	107	-	1.8	1.7		-
54	108	4	5.9	13.4	10 (old)	-
54	109	3	3.8	7.7	-	-
54	110	1.5	0.9	0.5	-	-
54	111	1.5	0.9	0.4	-	-
54	112	-	0.6	0.5	-	-
54	113	-	0.7	0.3		_
54	114	-	0.6	0.2	-	-
55	115	3.5	4.2	8.5	-	-
56	116	6.5	9.7	32.6	-	5%
56	117	6	8.3	29.3	-	-
57	118	3	3.5	6.5	5 (sediment removal)	-
58	119	12.5	13.6	52.4	-	-
58	120	-	0.7	0.3	-	-
59	121	5	6.0	19.9	-	-
59	122	3	4.7	11.2	-	-
60	123	2.5	3.9	6.6	-	-
61	124	5	6.9	21.4	5 (sediment removal)	-
61	125	3	4.5	12.3	-	-
62	126	7.5	9.6	37.7	-	5
62	127	5	5.8	18.4	-	-



	Running	Coral Diameter	Coral Diameter	Coral Area	Health Status	
Tag no.	Count Number of <i>Oulastrea</i> Colonies	measured at Pre- Translocation (cm)	measured at Post- Translocation (cm)	measured at Post- Translocation (cm ²)	Partial Mortality (% Affected)	Sediment Cover (% Affected)
63	128	6	8.1	32.2	5 (old)	-
63	129	-	0.6	0.2	-	-
63	130	2	3.5	6.2	-	-
64	131	3	4.0	11.0	-	-
64	132	2.5	1.6	2.5	-	-
65	133	6.5	9.2	40.8	-	5
66	134	4.5	8.3	27.9	5 (sediment removal)	-
66	135	1.5	2.0	2.3	-	-
66	136	1	1.8	2.1	-	-
66	137	-	1.4	1.0	-	-
66	138	2	2.4	3.5	-	-
67	139	3.5	5.3	13.2	-	3
67	140	1	2.0	2.9	-	-
67	141	1	0.9	0.6	-	-
67	142	3.5	2.9	6.5	-	-
67	143	4	6.1	18.8	-	-
68	144	8	11.7	73.4	-	-
69	145	2	3.3	6.1	-	-
69	146	3.5	4.9	16.3	-	-
70	147	4	6.1	21.0	-	-
70	148	2	2.9	5.6	-	-
70	149	3	4.1	9.1	-	-
23B	150	-	5.9	15.0	-	-
23B	151	-	1.6	1.6	-	-
23B	152	-	1.8	2.4	-	-
23B	153	-	9.4	37.4	-	-
40B	154	-	4.1	10.2	-	-
40B	155	-	1.6	1.0	-	-
40B	156	-	3.2	6.3	-	-
40B	157	-	1.4	1.0	-	-



Table 3: Table of the Size of the Reference Oulastrea crispata Colonies

		Health Status		
Running Count Number of <i>Oulastrea</i> colonies	Coral Size (cm ²)	Partial Mortality (% Affected)	Sediment Cover (% Affected)	
Outside Recipient Si	ite			
1	12.6	-	5	
2	1.0	-	-	
3	2.5	-	-	
4	1.3	-	5	
5	2.0	-	-	
6	3.8	5	5	
7	1.7	-	-	
8	0.9	-	-	
9	2.7	-	-	
10	3.9	-	-	
11	1.6	5	-	
Reference Transect				
1	6.3	-	-	
2	5.8	-	-	
3	1.0	-	-	
4	2.9	-	-	
5	5.1	-	-	
6	3.1		-	
7	0.5	-	-	
8	0.6	-	-	
9	0.9	-	-	
10	7.7	-	-	
11	1.7	-	-	
12	8.2	-	-	
13	2.7	-	-	
14	1.1	-	-	
15	6.2	-	-	
16	2.7	-	-	
17	4.4	-	-	
18	11.8	-	-	
19	0.9	-	-	
20	1.6	-	-	
21	1.8	-	-	
22	2.7	-	-	



Figures





Figure 1.1 Cruise Terminal Development Layout Plan

Figure 2.1 Location of the Approved Recipient Site at Tseung Kwan O





Figure 2.2Location Plan of Translocated Boulders/Rocks in the Underwater Grid Cells (1m² dimension) of the established Tseung
Kwan O Coral Recipient Site. O - indicates boulder/rock with tag number (as in Tables 1 and 2)





Figure 2.3 Location of the Coral Recipient Site and Reference Transect at Tseung Kwan O





Figure 2.4Representative Photographs of Post-translocation Coral
Monitoring Survey at Tseung Kwan O Coral Recipient Site.





Figure 2.5Representative Photographs of the Oulastrea crispata Coral
Colonies Exhibiting small areas of Partial Mortality as
Recorded for the Translocated and Reference Corals





Annex A



A1 PHOTOGRAPHIC RECORDS OF CORAL COLONIES (TRANSLOCATED AND REFERENCE) RECORDED FOR THE BASELINE POST-TRANSLOCATION SURVEY.

Full details on the field methodology are provided in the main report. Please note that for each coral colony as well the photographs as presented in this *Annex* (taken from a standardised height of 25 cm) a series of macro images were also taken of each coral colony.

One photograph for each coral colony is presented and identified by the tag number of the boulder/rock and the subsea marker number used for the pre-translocation survey at the project site of Kai Tak. Please note that several of the coral colonies are extremely small and hard to see in the photographs. All photographs with tags represented corals transplanted from Kai Tak to Tseung Kwan O (photo plates 1-12).





Tag No.1 (Subsea Marker No.8)



Tag No.3-1 (Subsea Marker No.6)



Tag No.2 (Subsea Marker No.7)



Tag No.3-2 (Subsea Marker No.6)



Tag No.4 (Subsea Marker No.5)



Tag No.6-1 (Subsea Marker No.15)



Tag No.5 (Subsea Marker No.28)



Tag No.6-2 (Subsea Marker No.15)





Tag No.7 (Subsea Marker No.35)



Tag No.8-2 (Subsea Marker No.14)



Tag No.8-1 (Subsea Marker No.14)



Tag No.9 (Subsea Marker No.22)



Tag No.10 (Subsea Marker No.24)



Tag No.11-2 (Subsea Marker No.11)



Tag No.11-1 (Subsea Marker No.11)



Tag No.11-3 (Subsea Marker No.11)







Tag No.17 (Subsea Marker No.27)

Tag No.18 (Subsea Marker No.17)





Tag No.19 (Subsea Marker No.19)



Tag No.21 (Subsea Marker No.12)



Tag No.20 (Subsea Marker No.20)



Tag No.22 (Subsea Marker No.21)



Tag No.23 (Subsea Marker No.13)



Tag No.23B-2 (Additional)



Tag No.23B-1 (Additional)



Tag No.24 (Subsea Marker No.38)





Tag No.25 (Subsea Marker No.42)



Tag No.27 (Subsea Marker No.33)



Tag No.26 (Subsea Marker No.43)



Tag No.27-1 (Subsea Marker No.33)



Tag No.27-2 (Subsea Marker No.33)



Tag No.29 (Subsea Marker No.44)



Tag No.28 (Subsea Marker No.03)



Tag No.30-1 (Subsea Marker No.46)





Tag No.30-2 (Subsea Marker No.46)



Tag No.32 (Subsea Marker No.37)



Tag No.31 (Subsea Marker No.45)



Tag No.33 (Subsea Marker No.34)



Tag No.34 (Subsea Marker No.41)



Tag No.36-1 (Subsea Marker No.60)



Tag No.35 (Subsea Marker No.10)



Tag No.36 (Subsea Marker No.60)





Tag No.37-1 (Subsea Marker No.52)



Tag No.38 (Subsea Marker No.57)



Tag No.37-2 (Subsea Marker No.52)



Tag No.39 (Subsea Marker No.59)



Tag No.40 (Subsea Marker No.56)



Tag No.40B-2 (Additional)



Tag No.40B-1 (Additional)



Tag No.40B-3 (Additional)





Tag No.41 (Subsea Marker No.39)



Tag No.43 (Subsea Marker No.9)



Tag No.42 (Subsea Marker No.29)



Tag No.44 (Subsea Marker No.36)



Tag No.45-1 (Subsea Marker No.49)



Tag No.45-3 (Subsea Marker No.49)



Tag No.45-2 (Subsea Marker No.49)



Tag No.46 (Subsea Marker No.58)





Tag No.47 (Subsea Marker No.40)



Tag No.49 (Subsea Marker No.51)



Tag No.48 (Subsea Marker No.54)



Tag No.50 (Subsea Marker No.48)



Tag No.51 (Subsea Marker No.66)



Tag No.52-2 (Subsea Marker No.47)



Tag No.52-1 (Subsea Marker No.47)



Tag No.53 (Subsea Marker No.31)





Tag No.54-1 (Subsea Marker No.62)



Tag No.54-3 (Subsea Marker No.62)



Tag No.54-2 (Subsea Marker No.62)



Tag No.54-4 (Subsea Marker No.62)



Tag No.54-5 (Subsea Marker No.62)



Tag No.56 (Subsea Marker No.50)



Tag No.55 (Subsea Marker No.80)



Tag No.57 (Subsea Marker No.30)





Tag No.58 (Subsea Marker No.55)



Tag No.59-2 (Subsea Marker No.61)



Tag No.59-1 (Subsea Marker No.61)



Tag No.60 (Subsea Marker No.63)



Tag No.61 (Subsea Marker No.64)



Tag No.63-1 (Subsea Marker No.65)



Tag No.62 (Subsea Marker No.67)



Tag No.63-2 (Subsea Marker No.65)





Tag No.64 (Subsea Marker No.78)



Tag No.66 (Subsea Marker No.77)



Tag No.65 (Subsea Marker No.73)



Tag No.67 (Subsea Marker No.76)



Tag No.68 (Subsea Marker No.75)



Tag No.69 (Subsea Marker No.74)



Tag No.70 (Subsea Marker No.71)



The following colour plates show underwater photographs of the reference corals assessed: 1. Inside the recipient site of Tseung Kwan O and 2.. Along the reference transect established adjacent to the recipient site.





Inside Recipient Site





Reference Transect





Reference Transect

