Ocean Park Master Redevelopment Project

EP-249/2006/B – Condition 3.4

Monthly EM&A Report – July 2012

Certified by _____ **on 19-October-12**

Winnie Ko (ETL)

Verified by Independent Environmental Checker on 22-October-12

IEC Certificate attached in the submission? Yes

Ocean Park Master Redevelopment Project

Environmental Permit No. EP-249/2006/B - Condition 3.4

Monthly EM&A Report – July 2012

Submitted by Ocean Park Corporation on 17-10-2012

This is to verify that

Monthly EM&A Report – July 2012

Submitted by Ocean Park Corporation

On 17-10-2012

Has been verified by the undersigned.

Signed p.p. Florence Yuen

Dr Anne F Kerr
Independent Environmental Checker (IEC)
Retained by Ocean Park Corporation
pursuant to Environmental Permit No. EP-249/2006/B

Date 22 October 2012

Ocean Park Master Redevelopment Project

Monthly Environmental Monitoring & Audit Report – July 2012

Table of Content

Part 1 Project Overview

Executive Summary

This is the combined monthly EM&A Report for Ocean Park Master Redevelopment Project, which includes CS03 "Thrill Mountain and Polar Adventure" under Part 2. This report presents the results of EM&A works conducted in the reporting month of July 2012 (from 26 June 2012 to 25 July 2012) for construction works.

The request to EPD for termination of the Air Quality (RSP) and Noise monitoring programmes for the operation of the Lagoon night shows has been approved by EPD on 13 February 2012, and no noise monitoring or air quality monitoring has been conducted during this period.

Construction works at the Entry Plaza, Aqua City and Grand Aquarium under CI07 have been completed in January 2011 and, as advised to EPD on 1 April (PD/PW/GOV/151/006107), no further construction monitoring will be undertaken.

Construction works at the Summit, CS02 for the Rainforest have been completed in April 2011 and CS03 for the Thrill Mountain and Polar Adventure have been completed in July 2012.

No complaint, non-compliance from IEC, summons or prosecution related to environmental issues was made against the Ocean Park Master Redevelopment Project in the reporting period of July 2012.

The major construction works of CS-03 were also completed in July 2012 and the post-project monitoring of coral was conducted in July 2012. The coral monitoring survey showed no significant increase in sedimentation, bleaching or mortality in all the 5 Monitoring Sites (1 to 5) and the Control Site C. And all the tags in 5 Monitoring Sites (1 to 5) and the Control Site C had been removed after the post-project coral monitoring survey.

1. Introduction

The "Master Redevelopment Project of Ocean Park" (hereinafter known as the "Project") is implemented by the Ocean Park Corporation at its existing site of Ocean Park and Nam Long Shan, Aberdeen. The Project involves both reconstruction/modification of existing facilities and expansion of the Park under Environmental Permit, EP-249/2006/B.

The construction works of the project consists of various contracts. Details of the contracts, which are required to perform the EM&A programme, are shown below.

Contract No.	Contract Title	Contractor	Construction Commencement
CI-05	Site Formation, Funicular Tunnel and Miscellaneous Works	Dragages-Bouygues JV	12 March 2007 and Construction phase has ceased in early June 2009
CS-01	Back of House for Marine Mammal Veterinary Hospital	Kaden – ATAL JV	26 March 2007 and Construction phase has ceased in mid-October 2008
CW-02	Astounding Asia	W. Hing Construction Co. Ltd.	1 August 2007 and Construction phase has ceased in mid-February 2010
CI-07	Entry Plaza, Aqua City and Grand Aquarium	Leighton Contractors (Asia) Ltd.	15 August 2008 and Construction Phase has ceased in January 2011
CS-02	Rainforest	W. Hing Construction Co. Ltd.	11 May 2009 and construction has ceased in April 2011
CS-03	Thrill Mountain and Polar Adventure	Kaden – ATAL JV	2 November 2009

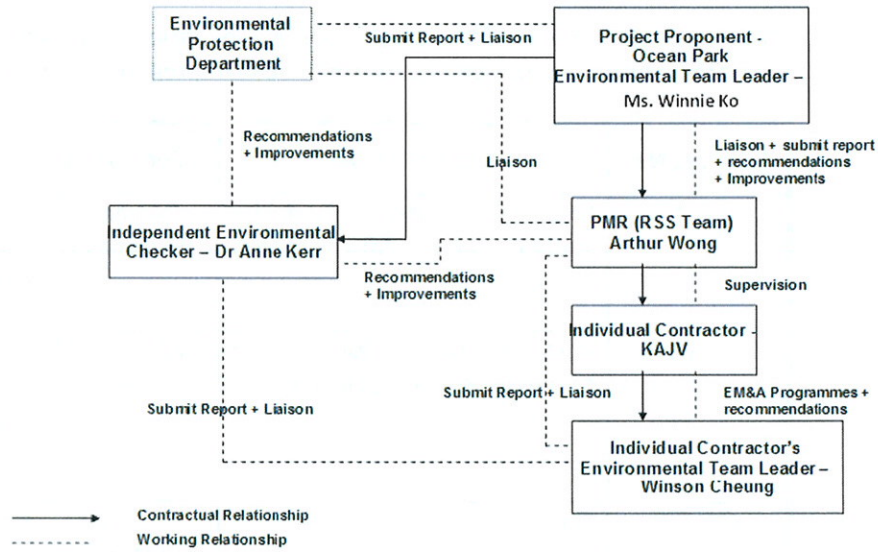
The Contractors conduct environmental audits during the construction stage and produce contract specific monthly EM&A reports. This is the combined monthly EM&A Report including the IEC audit findings and CS03 Monthly EM&A Report.

This report presents the results of EM&A works conducted in the reporting month of July 2012 (from 26 June 2012 to 25 July 2012) for construction works.

2. Project Organisation

The structure of the environmental management team is shown in below figure.

Figure 1.1 – Management Organisation



3. Construction Works Undertaken during the Reporting Month

In the reporting month, the construction activities are summarised as follows.

CI-05

- Construction phase has ceased in early June 2009.

CS-01

- Construction phase has ceased in mid-October 2008.

CW-02

- Construction phase has ceased in mid-February 2010.

CI-07

- Construction phase has ceased in January 2011.

CS-02

- Construction phase has ceased in April 2011.

CS-03

- Defects works;
- Landscape works; and
- Disposal Existing stockpile

4. Permits and License Status

4.1 Environmental Permit

The Environmental Impact Assessment (EIA) Report of the Project has been approved by the Environmental Protection Department (EPD) (Register No.: AEIAR-101/2006) on 12 July 2006. Subsequently, EPD issued Environmental Permit (EP) for the construction and operation of the project. Table below is a full list of the EPs.

EP No.	Issue Date	Key Variation
EP-249/2006	28 July 2006	First EP
EP-249/2006/A	25 September 2006	• Enhance the roosting habitat for freshwater birds by enlarging Pond 35 and its surrounds with a total area of no less than 120 squares meters and no construction works and discharge from construction sites shall be allowed within Pond 35 after enhancement. • Filling of Pond 37 at the Lowland Area. • Submission of the as-built drawings showing the enhancement works of Pond 35.
EP-249/2006B	3 November 2010	• Total sound power level of all loudspeaker clusters shall not exceed 109 db(A) and the sound pressure level at 9m away from each loudspeaker cluster shall not exceed 75 db(A). • Submit noise review study. • Submit detail design of night time functional and thematic lighting. • Trial pyrotechnical special effects materials display and submit air quality sampling plan.

4. 2 Other Permits & Licenses

Tables below show lists of other permits & license for individual contracts.

CS-03

Permit/Ref/No	Valid Period		Section	Status
Notification of Construction Work under APCO				
311433	N/A	N/A	Thrill Mountain and Polar Adventure	Valid
Water Discharge License				
WT00005926-2010	12-Feb-10	28-Feb-15	Thrill Mountain and Polar Adventure	Valid
Registration as Chemical Waste Producer				
WPN5213-176-K2880-02	25-Nov-09	N/A	Thrill Mountain and Polar Adventure	Registered
Construction Waste Disposal Billing Account with EPD				
7009695	N/A	N/A	Thrill Mountain and Polar Adventure	Issued

5. EP Submissions Status

Environmental submissions to EPD since the commencement of construction works at Ocean Park, i.e. from 12 March 2007 to 25 July 2012 are as below.

Contract	Submissions
CI-05	• Notification of Commencement Date • Management Organisation Chart • Construction Programme • Drainage Proposal • Silt Curtain Proposal • Waste Management Plan • Baseline Air Quality and Noise Monitoring Report • Transplantation Proposal for Uncommon Species • Baseline Coral Survey Report • As-built Drawings of Pond 35 • Detailed Compensatory Planting As-built Drawing
CS03	• Monthly EM&A Report (May 2012)
City Bus Limited	• Written Notice on Completion of TPH Contaminated Soil Disposal • Written Notice on Completion of Solidification Treatment of Heavy Metals Contaminated • As-built Remediation Plan
Hong Kong School of Motoring Ltd.	• Confirmation Letter to confirm that Land Contamination remediation Works within HKSM has been completed
Environmental Permit Conditions	• Noise Review Study Report • Glare impact Assessment report • Air Quality Sampling Plan • Trial PSEM Displays - Air Quality Monitoring Report • Use of PSEM for Two Shows - Air Quality Sampling Plan • Trial PSEM Displays - Preliminary Air Quality Monitoring Results • Trial Two PSEM displays, Air Quality Monitoring Report (7 Feb 2012) • Shrubland Compensatory Proposal (28 Feb 2012) • Air Quality Sampling Plan for 2012 PSEM (17 May 2012) • Shrubland Compensatory Proposal (25 May 2012) • Trial Three PSEM Displays Air Quality Monitoring Results (5 June 2012) • Trial Three PSEM Displays Air Quality Monitoring Report (29 June 2012)

6. Materials Management

Section 6.17 in the EIA report specified the disposal of materials to the public fill reception facilities should be considered as last resorts with the preferred approach to reuse the material within the project and/or other projects.

The amounts of different types of materials generated by the activities of the Project in the month are shown in following table. The total materials quantities of the project showed that the reuse of materials was maximized and the disposal to the public filling facilities was minimized. Mitigation measures under the Waste Management Plan (WMP) revision D have been implemented during the reporting period.

Materials Type	Disposal Locations	CS-03	Total
C&D Waste	SENT	99.6 Tonnes	99.69 Tonnes
	TKOSF	--	-
	TMSF	--	-
C&D Material	CWPFBP	8 Tonnes	8 Tonnes
	TKOFB	--	-
Chemical Waste	Collected by licensed collector	0 Litres	0 litres
General Waste	Collected by licensed collector	--	-

7. Environmental Monitoring and Results

7.1 Monitoring Requirements

Under EP-249/2006/B condition 3.2, impact environmental monitoring including sampling, measurements and necessary remedial action should be conducted in accordance with the requirements of the EM&A Manual, which has been updated to include operational monitoring of the Ocean Park Symbio Show.

7.1.1 Construction Monitoring

Construction works at the Entry Plaza, Aqua City and Grand Aquarium under CI07 have been completed in January 2011 and, as advised to EPD on 1 April 2011 (PD/PW/GOV/151/006107), no further construction monitoring will be undertaken.

The contract at the Summit, CS03 for the Thrill Mountain and Polar Adventure has been completed in July 2012. There is no construction monitoring will be undertaken for these works, only auditing works. The audits will continue to be carried out by the Contractors ET, certified by the OPC's ET and verified by the IEC.

Terrestrial Ecology

Monitoring of the health and condition of the transplanted plant species of conservation interest should be conducted at least once a month during the first 12 month after transplantation. Proposed monitoring location would be next to the Contract CI-05 site office.

Coral

The locations of the coral monitoring stations are presented in the table below.

Coral Impact Monitoring Stations	Identity/Description
Site 1	Seaside near the Lowland
Site 2 to Site 5	Around Headland
Control Station	Between Near Round Island and Chung Hom Kok

Ocean Park Symbio Show

Operational Stage Monitoring for Ocean Park Symbio Show for Environmental Monitoring for the Symbio Show commenced on the 27 January 2011. Following the completion of one year's monitoring, approval has been obtained to terminate the operational stage monitoring.

7.2 Monitoring Results

7.2.1 Construction Monitoring Results

Terrestrial Ecology

According to the requirement in the EM&A Manual, the monitoring of transplanted plants at the receptor has been completed in August 2008.

Coral

The construction for CS03 for the Thrill Mountain and Polar Adventure has been completed on 12 July 2012. The 10th coral monitoring survey after the Coral Re-tagging exercise in November 2009, which is also the post-project coral monitoring survey after the completion of construction, was conducted on 15 July 2012. All the tags in 5 Monitoring Sites (1 to 5) and the Control Site C had been removed after the post-project coral monitoring survey.

The monitoring survey, provided in part 3 of this Report, showed that the change in level of sedimentation on the tagged colonies was small (≤ 10%) when using the baseline data in November 2009 and previous survey in February 2012 as reference. The level of sedimentation in all sites was low and within the range of that in the Control Site C (0-10%). This small difference in sedimentation was likely a natural fluctuation as a result of stream runoffs during the wet season, and also daily tidal current and wave exposure, etc. No increase in level of blenching or partial mortality suggested the all tagged corals were in good condition and healthy.

The data from this monitoring survey showed no significant enhancement in sedimentation, bleaching or mortality in all the 5 Monitoring Sites 1 to 5 and the Control Site C. Hence, no adverse impact by the construction activity on the coral community was observed.

8. Site Audit

8.1 IEC Site Audit

IEC conducted monthly site audit on CS-03 on 30 July 2012. Audit checklists are attached in Appendix A of Part 1.

CS-03 Observations:

- All construction works for CS-03 had been completed in mid-July 2012. Only minor rectification works were observed being carried out during the site inspection.

8.2 Non - Compliance

No non-compliances were recorded in July 2012.

9. Implementation status of Environmental Mitigation Measures

Please see Part 2, of this Report for the individual contractual report for the details of the implementation of environmental mitigation measures.

10. Summary of Complaint, Summon or Prosecution

No complaint, summon or prosecution was recorded in the reporting month.

11. Future Issues

Key Issues to be considered in the coming month include:

CI-05
- Construction phase had ceased in early-June 2009.

CW-02
- Construction phase had ceased in mid-February 2010.

CS-02
- Construction phase had ceased in April 2011.

CS-01
- Construction phase had ceased in mid-October 2008.

CI-07
- Construction phase had ceased in January 2011.

CS-03
- Construction phase had ceased in the end of July 2012.

12. Conclusion

No non-compliance from IEC, complaint, summons or prosecution related to environmental issues was made against the Ocean Park Master Redevelopment Project in the reporting period of July 2012 for construction works.

Termination of noise and air quality monitoring has been approved by EPD on 13 February 2012 and hence no operational stage monitoring was conducted during this reporting period.

All the construction works had been completed, the construction phase had ceased in July 2012.

Appendix A

Part 1 Independent Environmental Checker's Site Inspection Records

Ocean Park Master Redevelopment Project
Contract P007
Independent Environmental Checker

MONTHLY SITE INSPECTION CHECKLIST

Inspection Date	30/07/2012	Time	9:00	Inspected By	EM: Toby Li IEC: Florence Yuen Contractor: CS03: N/A
Site Location	CS03				

Weather

Condition		Sunny	✓	Fine		Overcast		Drizzle		Rain		Storm		Hazy
Temperature	33°C				Humidity		High		Moderate		Low		
Wind	✓	Calm		Light		Breeze		Strong		Direction			

		Close-out on last comments Y/N	N/A or not obs	Yes	No	Photo/Remarks
	Construction Noise					
S2.18	Is a valid Construction Noise Permit (CNP) obtained for works during restricted hours?		✓			
S2.26	Good Site Practices: • Are the operating plants well-maintained and serviced regularly?			✓		
	• Are silencers or mufflers utilized on construction equipment? Are they properly maintained?			✓		
	• Is the mobile plant sited far enough from NSRs?			✓		
	• Are intermittently used machines and plants shut down between work periods?			✓		
	• Is the plant known to emit noise strongly in one direction, if any, oriented to direct noise away from the NSRs?		✓			
	• Is the stockpile or other structures utilized effectively, wherever practicable, in screening noise from the works?		✓			
S2.27	Are suitable quiet plants adopted?			✓		
S2.28	Are movable barriers used for both movable PME and stationary PME?		✓			
S2.29	Do the screening materials used achieve the predicted noise reduction?		✓			
S2.30	Are the noisy works avoided during examination period of the nearby school?		✓			
	Blasting Noise					
S2.32	• Are the NSRs informed of the blasting work in advance?		✓			
	• Is sufficient time allowed for alerting all the potential NSRs prior to every blasting work?		✓			

• Are proper procedures put in place to alert and minimise any startling effect on the staff working in Ocean Park?		✓			
• Is the optimal amount of charge used evaluated for noise reduction?		✓			

Landscape and Visual

S3.10	Consideration on existing surrounding vegetation:				
	• Are temporary tree nurseries set up?		✓		
	• Is "no-intrusion zones" implemented?		✓		
	• Is the existing vegetation protected from damage?			✓	
	• Are hill fire prevention measures taken?			✓	
	• Is dust and erosion controlled for exposed soil?			✓	
	• Are the irrigation networks set up throughout the Establishment Period?		✓		
	• Is Quarterly Report on existing trees to be retained or transplanted prepared by the Contractor?		✓		
S3.11	Consideration on appearance and view:				
	• Is the appearance of hoardings suitable?			✓	
	• Is the appearance of construction workers, plants/machines suitable?			✓	
	• Are the screening and alignment of the temporary barging point and conveyor system suitable?		✓		
	• Are the selected security floodlights suitable		✓		

Ecology

S4.5	Transplantation:				
	• Is the transplantation work supervised by a qualified botanist/horticulturalist in the ET?			✓	
	• Are the transplanted plant species of conservation interest monitored during the first 12 months after transplantation?			✓	
S4.7	Construction:				
	• Is the runoff entering watercourses avoided by control measure, especially during heavy rain?		✓		
	• Is the site runoff directed to regularly cleaned and maintained silt traps (or oil separators)?		✓		
	• Are sediment traps included in drainage to collect and control construction run-off?		✓		
	• Is suitable size silt traps or oil interceptor used?		✓		
	• Is vegetation survey carried out to determine the feasibility and suitability of individual plants for transplantation?			✓	
	• Are the trees located within the works area preserved suitably?			✓	
	• Are individual plants of conservation interest transplanted prior to the construction phase?			✓	
	• Are the equipments and stockpiles placed in designated works areas and access routes selected on existing disturbed land to minimise disturbance to natural habitats?			✓	

• Are construction activities restricted to the work areas demarcated?			✓		
• Are waste skips provided to collect general refuse and construction wastes?			✓		
• Are the wastes disposed of timely and properly off-site?			✓		
• Is open burning on works sites prohibited?			✓		
• Are native plant species made use of as far as possible on newly formed land?			✓		

Construction Waste

S5.4	Good Site Practices				
	• Are arrangements made for collection and effective disposal of all wastes generated?			✓	
	• Are the waste management and chemical handling procedures followed?			✓	
	• Are sufficient waste disposal points provided?			✓	
	• Are the wastes disposed of regularly?			✓	
	• Are appropriate measures taken to minimise windblown litter and dust during transportation of waste by either covering trucks or transporting wastes in enclosed containers?		✓		
	• Are the drainage systems, sumps and oil interceptors regularly cleaned and maintained?		✓		
S5.5	Waste Reduction Measures:				
	• Is the C&D waste from demolition and decommissioning of existing facilities sorted to recover recyclable materials?		✓		
	• Are different types of wastes segregated and stored in different containers, skips or stockpiles to enhance reuse or recycling and the proper disposal?		✓		
	• Are aluminium cans segregated in labelled bins and collected by individual collectors for recycling?			✓	
	• Are proper storage and site practices maintained to minimise the potential for damage or contamination of construction material?		✓		
	• Are the construction materials planned and stocked carefully to avoid unnecessary generation of waste?			✓	
S5.7	General Refuse				
	• Is the general refuse stored in enclosed bins or compaction units separate from C&D material?			✓	
	• Is the general refuse removed regularly by a waste collector?			✓	
S5.8	C&D Material				
	• Are the excavated materials from site formation of the expansion areas and tunnel construction for the funicular system reused on-site as backfilling material and for landscape works?		✓		
	• Are the surplus rock and other inert C&D material disposed of at the public fill sites?		✓		
	• Is a waste management plan prepared?			✓	
	• Is a recording system present for the record of amount of wastes generated, recycled and disposed?			✓	

	• Is the trip-ticket system required in ETWB TCW No.31/2004 followed on site?			✓		
	Chemical Wastes					
S5.9	Is chemical wastes generated from the works? And if yes,				✓	
	• Is the Contractor registered as a Chemical Waste Producer?		✓			
	• Are good quality containers used for separating and storing chemical wastes?		✓			
	• Are appropriate labels securely attached on each chemical waste container to indicate their corresponding chemical characteristics?		✓			
	• Is the Contractor licensed to transport and dispose of the chemical wastes?		✓			
	Land Contamination					
S6.11	• Is the contact of construction workers with contaminated materials minimised by using bulk earth-moving excavator equipment?		✓			
	• Are appropriate cloth, personal protective equipment, hygiene and washing facilities provided to minimise exposure to any contaminated material?		✓			
	• Is stockpiling of contaminated excavated materials avoided?		✓			
	• Is the use of contaminated soil for landscaping without proper treatment prohibited?		✓			
	• Are vehicles containing excavated materials covered properly to limit potential dust emissions or contaminated wastewater runoff?		✓			
	• Is the speed of the trucks carrying contaminated materials controlled?		✓			
	• Are the necessary waste disposal permits obtained from appropriate authorities in according with Waste Disposal (Chemical Waste) (General) Regulation?		✓			
	• Are silt removal facilities provided with retention time for silt/sand traps of 5 minutes under maximum flow conditions?		✓			
	• Are the records maintained for quantity of wastes generated and disposal of?		✓			
	Remediation Process					
S6.12	• Is biopile covered by tarpaulin or low permeable sheet to avoid dust emission?		✓			
	• Is vented air from biopile treated by blower and carbon adsorption system before released to the atmosphere?		✓			
	• Are the materials which may generate airborne dust emissions adequately wetted prior to and during the loading, unloading and handling operations?		✓			
	• Are silencers installed at biopile blower to minimise noise impact?		✓			
	• Are quiet plants such as generator and blower used for biopile?		✓			
	• Are the mixing process and other associated material handling activities properly scheduled to minimise potential noise impact?		✓			
	• Are impermeable liners placed at the bottom of biopile?		✓			

• Is leachate collection sump construction along the perimeter of biopile?		✓			
• Is the lachate recycled back to the biopile or truck away to Chemical Waste Treatment Centre for disposal?		✓			
• Is the mixing of contaminated soils and cement/water/other additive(s) undertaken at a solidification plant to minimise the potential for leaching?		✓			
• Is a concrete bund construction along the perimeter of the solidification/stabilisation area to prevent runoff?		✓			
• Are the loading, unloading, handling, transfer and storage of cement carried out in an enclose system?		✓			
• Are the contaminated soils transported by roll-off trucks (containerisation)?		✓			
• Is temporary hoarding provided around the treatment area to minimise the visual impact?		✓			

Air Quality

S7.23 Good Site Practices

• Is watering carried out regularly with complete coverage to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather?		✓		
• Is watering frequently carried out for particularly dusty construction areas, temporary stockpiles and areas close to ASRs?		✓		
• Are the aggregate or dusty material storage piles covered with their side enclosed to reduce emissions? Or if this is not practicable, is watering applied to aggregate fines?			✓	
• Is open stockpiles avoided or covered and placed far enough from the ASRs?			✓	
• Is the dropping height of material restricted to minimise the fugitive dust from unloading/loading?		✓		
• Is tarpaulin used to cover all dusty vehicle loads transported to, from and within the site?			✓	
• Are vehicle wheel and body washing facilities available at the exit points of the site?			✓	
• Are wind shield and dust extraction units or similar dust mitigation measures provided at the loading points? If dust generation is likely during the process, particularly in dry seasons, is water sprinklers provided at the loading site?		✓		
• Do the vehicles comply with the recommended speed limit of 10 km/h on unpaved roads?			✓	
• Are dusty activities rescheduled during high-wind conditions?		✓		
• Are the routing of vehicles and positioning of construction plants at maximum possible distance from the ASRs?			✓	
• Is suitable buffer zone provided and work areas fenced off with hoarding (not less than 2.4m from ground level)?			✓	

S7.24 Drilling & Blasting

• Is watering carried out on the exposed area after blasting?		✓		
• Is vacuum extraction drilling method used?		✓		
• Is the blasting process carefully sequenced?		✓		

	• Is the firing of explosive carried out in the morning prior to opening of the Park?		✓			
S7.25	Crushing Plant					
	• Is water sprayed on the crusher?		✓			
	• Are fabric filters installed for the crushing plant?		✓			
	• Is chute or dust curtain used for controlling dust when transferring materials from crusher to the conveyors?		✓			
S7.26	Barging Point & Conveyor Belt System					
	• Are the conveyors placed within enclosed structures?		✓			
	• Is profiled steel cladding provided at two sides of loading point?		✓			
	• Are dust suppression sprays installed and operated at the feeding inlet and outlet?		✓			
	• Is the barging point placed within an enclosed structure incorporating an enclosed chute for material transfer to the barge?		✓			
	• Is a flexible curtain hanged on the enclosed chute to prevent dust emission when excavated materials/rocks transported into the barge?		✓			
	Water Quality					
S8.3	Site Run-off and Drainage					
	• Are all sewer and drainage connections sealed to prevent debris, soil, sand etc. from entering public sewer before commencing any site formation work?		✓			
	• Are temporary ditches provided to facilitate runoff discharge into appropriate watercourses, via appropriate sized silt retention pond?		✓			
	• Are cut-off ditches provided for all major site clearance/excavation works where soils would be exposed to control runoff from the areas?		✓			
	• Are channels, earth/concrete bunds and sand bags deployed to direct surface runoff?		✓			
	• Are catchpits and perimeter channels constructed in advance of relevant site formation works?			✓		
	• Are the boundaries of earthworks marked and surrounded by dykes or embankments for flood protection?		✓			
	• Are sand/silt traps and sediment basins provided to remove sand/silt particles from runoff?		✓			
	• Are silt removal facilities, channels and manholes maintained and deposited silt/grit removed regularly to ensure that these facilities are functioning properly at all times?		✓			
	• Are exposed soil surfaces covered?		✓			
	• Is the water pumped out from foundation excavations discharged into silt removal facilities?		✓			
	• Are exposed soil areas minimised to reduce potential for increased siltation and contamination of runoff?		✓			
	• Are earthwork final surfaces well compacted and is subsequent permanent work or surface protection performed immediately?			✓		

	• Is the rainwater pumped out from trenches or excavation directed to silt removal facilities before discharge?		✓			
	• Are open stockpiles of construction materials or construction wastes of more than $50m^3$ covered with tarpaulin during rainstorm?		✓			
	In case of an excavation in rainy seasons: • Is temporary, exposed slope/soil surfaces covered by tarpaulin as far as practicable?		✓			
	• Are intercepting channels provided to prevent storm runoff from washing across exposed soil surfaces?		✓			
	• Are surface protection measures and arrangements implemented to prepare for arrival of a rainstorm?		✓			
	Coral Sites					
S8.4	• Are enhanced (with the use of flocculants added) sand/silt removal facilities employed for treatment of runoff from the major excavation at the Summit?		✓			
	• Is a silt curtain system used to enclose the construction phase discharge point at Tai Shue Wan?			✓		
	• Are debris and refuse collected, handled and disposed of properly to avoid entering any nearby water bodies and public drainage system?			✓		
	• Are stockpiles of cement and other construction materials kept covered when not being used?			✓		
	• Are oils and fuels used and stored in designated areas which have pollution prevention facilities (Fuel tanks and storage areas provided with locks and sited on sealed areas, within bunds of a capacity equality to 110% of the storage capacity of the largest tank)?		✓			
	• Are temporary sanitary facilities, such as portable chemical toilets, employed on-site where necessary to hand sewage from the workforce? Is a licensed contractor employed for disposal of waste matter and maintenance of these facilities?			✓		
	• Is a reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimize odour, pest and litter impacts. Burning of refuse on construction sites is prohibited by law?			✓		
	• Are aluminium cans recovered from the waste stream and collected separate labelled bins?			✓		
	• Are office wastes reduced through the recycling of paper?			✓		
	• Are training provided to workers on site cleanliness & waste management procedure?			✓		
	Cultural Heritage					
S10.6	If there is any work planned within one metre of the grave, is a one metre buffer zone provided around the grave and is the grave demarcated by temporary fence?		✓			
	Hazard to Life					
S11.3	Good Site Practices: • Is the area around the magazine free of vegetation?		✓			
	• Is the control of (small) fires planned and provided through the following?					

- Weekly checking of fire fighting equipment and the on-site fire water tank level. | | ✓ | | |
- Daily checking of all critical safety equipment on vehicle, including the fire extinguishers. | | ✓ | | |
- Maintaining back-up means of fighting fire on the explosive vehicles. | | ✓ | | |
- Providing safety training for drivers and other personnel present during explosive delivery with regard to operating fire hydrants and fighting of explosive fires. | | ✓ | | |

- Is the magazine secured against unauthorised entry and theft of explosive through the following?

- Maintaining a list of persons authorised to enter the magazine and ensuring the list is available to the magazine security guard. | | ✓ | | |
- Activating an alarm system that limits times at which explosive can be removed from the magazine and connecting the system to central security station. | | ✓ | | |
- Incorporating "Duress code" function in the alarm system. | | ✓ | | |
- Maintaining alarm system in good condition. | | ✓ | | |

- Is the magazine security guard located separately from the magazine complex? | | ✓ | | |

- Is the communication maintained in emergency with the following measures?

- Providing non-hazardous electronic equipment for persons working within 60 m of detonators. | | ✓ | | |
- Ensuring availability of phone numbers for all key personnel. | | ✓ | | |

- If there is a typhoon signal no. 3 or above, or black rainstorm signal, are all operations at magazine and transport ceased? | | ✓ | | |

- Is the risk of detonators explosion on vehicle reduced during transit through the following?

- Ensuring that magazine within vehicle is lined. | | ✓ | | |
- Limiting off-site transport to 5 to 6 a.m. each day. | | ✓ | | |
- Escorting vehicles with separate security vehicle when using the public road. | | ✓ | | |
- Ensuring that UN 1.4B packaging of detonators remains intact until handed over at blasting site. | | ✓ | | |

- Is the fuel isolation switch available on vehicle to prevent fire spreading in case a fire breaks out? | | ✓ | | |

- Is an experienced driver with accident-free record employed for explosive vehicle and security escort? | | ✓ | | |

- Are the drivers checked for health before employing? | | ✓ | | |

- Are the vehicles regularly checked to maintain in good condition to reduce chance of accident due to breaking down? | | ✓ | | |

- Is the truck fuel fire escalating to cause explosion avoided through the following means?

- Ensuring that the Contractor is aware of the potential hazards to site. | | ✓ | | |
- Maintaining appropriate fire fighting equipment. | | ✓ | | |

- Requiring the Contractor to plan and make emergency arrangements. | | ✓ | | | |

- Is spare/redundant fire fighting equipment provided? | | ✓ | | | |
- Can communications be maintained between two vehicles (drivers and security) during the trip to prevent collision of two explosive vehicles in case of an accident? | | ✓ | | | |
- Are the processes of checking of condition of drivers to suspend any driver of concern carried out? | | ✓ | | | |

Project specific measures:

- Is the speed of vehicle limited along the Ocean Park portion of Nam Long Shan Road within 100 m of the explosives magazine to 25 km/hr? | | ✓ | | | |
- Is other contractors' use of the Ocean Park Internal service road restricted during delivery of explosives, i.e. 6 to 7 a.m? | | ✓ | | | |
- Is the Ocean Park guard required to call to the magazine guard on an hourly basis when explosives are stored in magazines? | | ✓ | | | |
- Is the evacuation of part or all of Ocean Park Headland Area arranged in case of the explosive magazine being engulfed in fire? | | ✓ | | | |
- Is the risk to the public from accidental initation during charging and blasting limited by the following means?

  - Closing the Ocean Park from commencement of charging holes until completion of blasting each day. | | ✓ | | | |
  - Arranging for relevant authorities to post notices to mariners – warning them of blasting operations and advising them to stay away from a strip 100m wide immediately to the east of Headland from commencement of charge holes until completion of blasting each day (i.e. 9 a.m). | | ✓ | | | |
  - Not operating amusement rides in the event of accidental explosion until confirmed free of critical damage. | | ✓ | | | |
- If unexploded explosives are found in blasthole(s), is the opening of Ocean Park delayed or is part of the Ocean Park delayed when there are unspent explosives? | | ✓ | | | |
- Is the opportunity for arson/deliberate initiation of explosive reduced with the following means?

  - Paying attention to the security alert status from the Government. | | ✓ | | | |
  - Developing a security plan to address high alert level. | | ✓ | | | |
- Is an emergency plan developed to address uncontrolled fire in magazine area? | | ✓ | | | |
- Is the transfer of explosives between 5 to 6 a.m agreed by Mines Division? | | ✓ | | | |
- Is the road surface along the explosive transportation route maintained? | | ✓ | | | |
- Are the contractor's driver and security escort tested in respect of safety plan? Is the route driven before the driver undertakes the first delivery of explosives? | | ✓ | | | |
- Is adequate space provided for the explosive vehicle to manoeuvre without reversing close to the magazine to limit the likelihood of vehicle accident? | | ✓ | | | |
- Is lighting for explosive vehicles provided on temporary | | ✓ | | | |

	road(s)?					
S11.4	• Is ammonium nitrate emulsion (ANE) delivered outside of Park opening times?		✓			

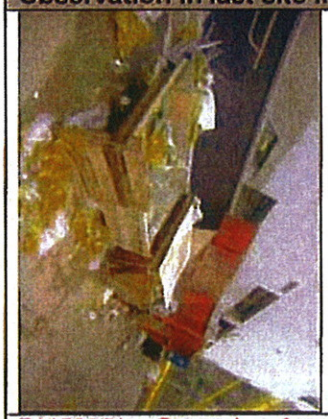
Observations for this month

(1) All construction works for CS03 had been completed in mid-July 2012. Only minor rectification works were observed being carried out during the site inspection.

IEC Representative	Environmental Manager	Contractor's Representative CS03
Florence Yuen		
(Florence Yuen)	(Toby Li)	(N/A)

Ocean Park Master Redevelopment Project
Contract P007
Independent Environmental Checker

MONTHLY SITE INSPECTION PHOTOS

Contract CS03 Thrill Mountain and Polar Adventure	
Follow up observations in June 2012	
Observation in last site inspection	**Observation in this site inspection**
	
P1150971: General refuse and construction waste were scattered around the site. The Contractor was reminded to clear and dispose them more frequently.	Closed P1160324 – General refuse and construction waste around the site had been cleared. Construction Phase for CS03 had been ceased in mid-July 2012.
Observations in July 2012	
Construction Phase for CS03 had been completed in mid-July 2012.	

Part 2 CS-03 EM&A REPORT (July 2012)

KADEN - ATAL JOINT VENTURE

Contract No. CS03

Ocean Park Redevelopment Project - Thrill Mountain & Polar Adventure

Monthly EM&A Report

July 2012

Prepared By	Alex Enagnon Gbaguidi
Certified By	
	(Keith Kwan)
	(Acting Project Manager)

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EXECUTIVE SUMMARY

Introduction

This is the 33rd monthly Environmental Monitoring and Audit (EM&A) Report prepared by Kaden – ATAL JV for the Contract No. CS03 "Ocean Park Redevelopment Project – Thrill Mountain & Polar Adventure" (hereinafter called "the Project"). The Project was commenced on 2nd November 2009. This document reports the findings of the environmental auditing works conducted in July 2012.

The major site activities undertaken in the reporting month included:

- Defects Works;
- Landscape Works;
- Disposal Existing Stockpile.

Environmental Monitoring and Audit Works

Environmental monitoring and audit works for the Project was performed as stipulated in the updated EM&A Manual. Site audits were conducted once per week. Environmental site audits were conducted on 6th July 2012 and No non-compliance was observed during the site audits.

The implementation of the environmental mitigation measures was checked and the environmental management plan was submitted.

No notification of exceedance was received from the Assistance Project Environmental Team Leader (ETL) in the reporting month.

Environmental Licenses and Permits

Licenses/Permits granted to the Project include the Environmental Permit (EP) for the Redevelopment Project, Construction Noise Permit (CNP), Billing Account for Disposal of Construction Waste and Water Discharge License

Registration of Waste Producer (Chemical Waste), and notification pursuant to Section 3(1) of the Air Pollution Control (Construction Dust) Regulation was acknowledged by EPD.

Complaints and Prosecutions

No environmental complaint and prosecution was received in the reporting month.

Future Key Issues

Key issues to be considered in the coming month include:

- Defects works;
- Landscape works; and
- Disposal Existing Stockpile.

1. INTRODUCTION

Background

1.1 Kaden-ATAL JV (the Contractor) was commissioned by the Employer to undertake the construction of the Contract No. CS03 "Ocean Park Redevelopment Project – Thrill Mountain & Polar Adventure" (the Project) and the project was commenced on 2nd November 2009. The site layout plan is illustrated in Figure 1.1.

1.2 These report summaries the environmental monitoring and audit works for the Project in the month of July 2012.

1.3 The scope of works for the Project includes:

(a) Construction of summit reservoir and associated pump room.
(b) Construction of vehicular bridge.
(c) Construction of the Polar Adventure Building.
(d) Construction of back of house facilities in the Polar Adventure Building.
(e) Construction of other one to three storey buildings in Polar Adventure.
(f) Construction of foundation and installation of Bobsled Ride.
(g) Installation of Life Support Systems.
(h) Construction of one to three storey buildings in Thrill Mountain.
(i) Construction of foundation and installation of the Floorless Coaster.
(j) Installation of the Ultramax, Aviator, Musik Express and Bumper Car.
(k) New roadwork, paving, footpaths and infrastructure support.
(l) Installation of building services.
(m) Soft and hard landscape works.
(n) Construction of underground utilities and services.
(o) Construction of earth retaining structures.
(p) Construction of all interior fitting out works.
(q) Supply and installation of all elevator(s) and escalator(s).
(r) Coral survey and maintenance of existing suit curtain.

Project Organizations

1.4 Different parties with different levels of involvement in the project organization include:

- The Engineer and Project Environmental Team Leader (ETL) – AECOM Consultant Ltd.
- Contractor – Kaden-ATAL JV.
- Independent Environmental Checker (IEC) – Mott MacDonald HK Ltd.

1.5 The responsibilities of respective parties are provided in Section the Contractor's EM&A Manual of the Project.

1.6 The key contacts of the Project are shown in **Table 1.1**.

Table 1.1 Key Project Contacts

Party	Name	Role	Phone No.	Fax No.
Project ET	Mr. Tommy Lau	RSS Representative (Safety & Environmental)	2552 1546	2552 1406
Contractor	Mr. Keith Kwan	Acting Project Manager	3582 6099	3582 4877
	Mr. Lai Tung Yee	Construction Manager	3582 6005	
Contractor's ET	Mr. Alex Enagnon Gbaguidi	Contractor's Assistance Environmental Team Leader	3582 4880	3582 4877
IEC	Miss Florence Yuen	Independent Environmental Checker (IEC) Representative	2828 5757	28271823

Construction Programme

1.7 The site activities undertaken in the reporting month were:

- Defect Works;
- Landscape works and
- Disposal Existing Stockpile.

Summary of EM&A Requirements

1.8 The EM&A programme requires construction phase environmental site audit. The duties and responsibilities comprise the following:

- monitor various environmental parameters, if necessary, as specified in the Contractor's EM&A Manual;
- analyze the environmental monitoring and audit data;
- review the EM&A programme to confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify and adverse environmental impacts arising;
- carry out site inspection to investigate and audit the Contractor's site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and effect proactive action to pre-empt problems;
- audit and prepare EM&A reports on the site environmental conditions;
- report the environmental audit results to the Contractor;
- recommend appropriate mitigation measures to the Contractor in case of exceedance of Action and Limit Levels in accordance with the Event and Action Plans; and
- adhere to the procedures for carrying out complaint investigation in accordance with the Contractor's EM&A Manual.

1.9 This report presents the environmental monitoring and audit works for the Project in July 2012.

2. ENVIRONMENTAL AUDIT

Environmental Site Audits

2.1 Environmental site audits were carried out on weekly basis to monitor the timely implementation of proper environmental management practices and mitigation measures in the Project site.

2.2 Site audits for the Project in the reporting month was conducted on Environmental site audits were conducted on 6th July 2012 and No non-compliance was observed during the site audits. The summaries of site audits are attached in **Appendix A**.

2.3 During site inspections in the reporting month, no non-conformance was identified. The observations and recommendations are summarized in **Table 2.1**.

Table 2.1 Observations and Recommendations of Site Audits

Parameters	Date	Observations / Recommendations	Remediation/ Follow up
Waste/ Chemical Management	6/7/12	General refuse was scattered around the site. The contractor was reminded to clear them away more frequently.	General refuse and construction waste were stored in debris skip and remove offsite regularly.
Dust Control	6/7/12	Nil.	
Water Pollution	6/7/12	Nil	
Air Pollution	6/7/12	Nil	

Status of Environmental Licensing and Permitting

2.4 All valid permits/licenses obtained for the Project are summarized in **Table 2.2.**

Table 2.2 Summary of Environmental Licensing and Permit Status

Permit No.	Valid Period		Details	Status
	From	To		
Environmental Permit				
EP-249/2006/A	23/10/2006	N/A	Expansion of the existing Ocean Park and reconstruction / modification of its existing facilities.	Valid
Registration of Chemical Waste Producer				
WPN5213-176-K2880-02	25/11/2009	N/A	Waste Disposal (Chemical Waste) (General) Regulation - Registration of Waste Producer	Valid
Construction Noise Permit				
GW-RS0596-12	06/06/2012	30/11/2012	Construction Noise Permit for Top of Nam Long Shan Rd., Ocean Park, 180 Wong Chuk Hang, Hong Kong	Valid
Water Discharge License				
WT00005926-2010	05/11/2009	28/02/2015	Discharge of industrial trade effluent arising from the Sedimentation tank at the construction site (CS03 Ocean Park Redevelopment Project) to communal storm water drain.	Valid
Others				
311433	N/A	N/A	Notification Pursuant to Section 3(1) of the Air Pollution Control (Construction Dust) Regulation	Valid
7009695	N/A	N/A	Construction Waste Disposal Billing Account with EPD	Valid

Status of Waste Management

2.5 The amount of waste generated by the construction activities of the Project in the reporting month is attached in **Table 2.3.**

Table 2.3 Actual Quantity of Waste Generated in July 2011

Waste Type	Examples	Actual quantity disposed (Tonnes / Liter)	Disposal Locations
C&D Waste	Construction waste (Plastic, wood and bamboo)	99.6 (T)	SENT Landfill
	Mixed rock & soil	8 (T)	CW barging point
Chemical waste	Used oil, spent solvent	0 L	Collected by licensed collector

Implementation Status of Environmental Mitigation Measures

2.6 During site inspections in the month, the following observations and recommendations were made.

Water Quality Mitigation Measures

- The wastewater was recycled for wheel washing and dust control and Septic Tank should be maintained well functioning.

Air Quality Mitigation Measures

- The Contractor to ensure cement materials was well covered.

Noise

- No violation was observed nor recorded.

Ecology

- No violation was observed nor recorded.

Waste / Chemical Management

- Stagnant water was accumulated in drip tray. Contractor to ensure all contaminated water was well collected and stored in chemical waste storage area without spillage.
- Collection of waste oil by registered waste collector.

Others

- No other violation was observed nor recorded.

Summary of Exceedances

2.7 No Action/Limit Level exceedance was reported in the reporting month.

Implementation Status of Event Action Plans

2.8 No complaint, summons or prosecution related to environmental issues was received or made against the Project in the reporting month.

Summary of Complaints and Prosecutions

2.9 No environmental complaint and prosecution related to the Project works was received

during the reporting month.

3. FUTURE KEY ISSUES

Key Issues for the Coming Month

3.1 Key issues to be considered in the coming month include:

- Defect Works;
- Landscape works; and
- Disposal Existing Stockpile.

4. CONSTRUCTION OF DRAINAGE, SEWERAGE AND WATER MAIN SYSTEM.CONCLUSIONS AND RECOMMENDATIONS

Conclusions

4.1 One environmental site audit was performed in July 2012. No non-compliance was observed during the site audits.

4.2 No exceedance of environmental monitoring was reported in the reporting month.

4.3 No environmental complaint and prosecution related to the project was received in the reporting month.

Recommendations

4.4 According to the environmental audits performed in the reporting month, the following recommendations are suggested:

Water Quality Impact

- Should ensure that the contaminated water to be treated before discharging off site.

Dust Impact

- To cover the existing stockpile general fill material when they were not in use.

Waste / Chemical Waste Impact

- To ensure all domestic waste was fully cover in rubbish bin and cleaning up frequently.

- To ensure general refuse were store in the enclosed container or compaction units and separate from C& D materials.

Air Pollution Impact

- To ensure all plants and equipments are well maintained in good condition and replace air filter frequently.

Site Layout Plan

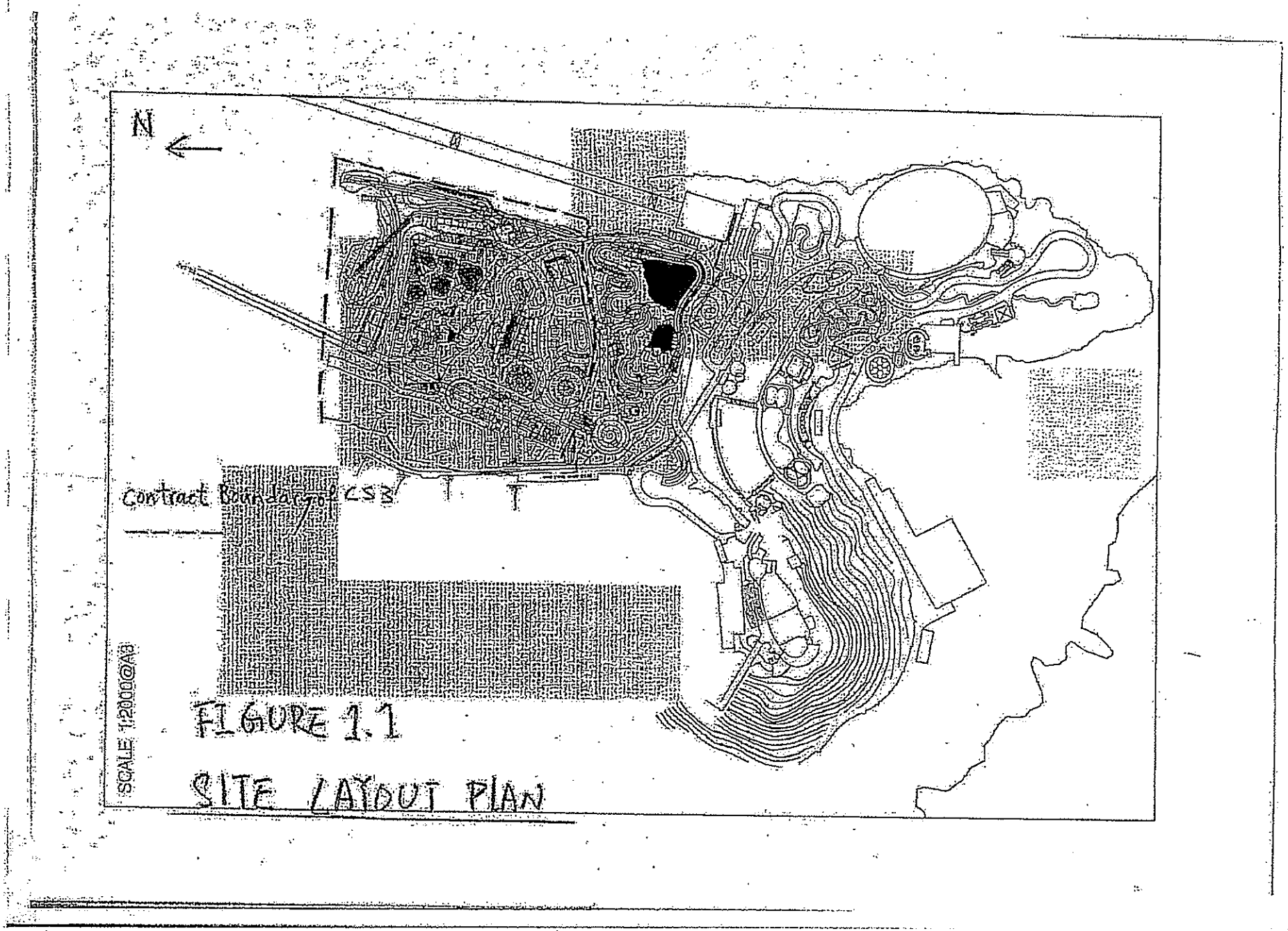

FIGURE 1.1

SITE LAYOUT PLAN

APPENDIX A
Site Audit Summary
(Refer to Appendix A of EM & A Report)

Part 3 10th Coral Monitoring Survey
(Post-project Monitoring Survey)

OCEAN PARK CORPORATION MASTER REDEVELOPMENT PROJECT

CONTRACT NO. CS-03

THRILL MOUNTAIN AND POLAR ADVENTURE

POST-CONSTRUCTION CORAL MONITORING

JULY 2012

CLIENT:

Kaden Construction Limited

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65 Wong Chuk Hang Road,
Wong Chuk Hang
Hong Kong

PREPARED BY:

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E-mail: info@lamenviro.com
Website: http://www.lamenviro.com

APPROVED BY:

Raymond Dai
Principal Environmental Consultant /
Project Manager

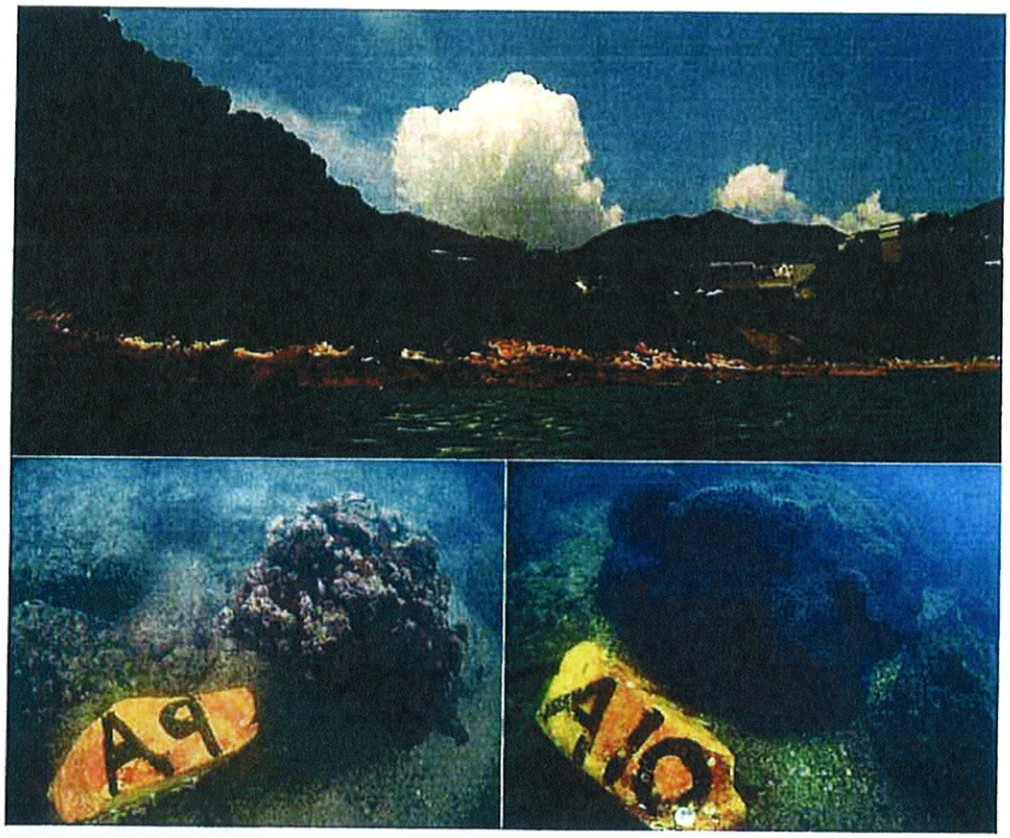
DATE:

28 July 2012

Ocean Park Corporation Master Redevelopment Project

Contract No. CS-03

Thrill Mountain and Polar Adventure



Report for

Coral Monitoring Survey

July 2012

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1 INTRODUCTION

1.1 Project Background

1.1.1 Ocean Park planned to upgrade and expand the existing area to meet the anticipated visitor demands and to position Ocean Park as a premium tourist attraction and a regional leader in the themed recreational and educational park experience.

1.1.2 Lam Environmental Services Limited (LAM) has been appointed to formulate a Coral Survey Team to conduct the Marine Ecology Survey for Ocean Park Corporation Master Redevelopment Project Contract No. C105 – Site Formation, Funicular Tunnel and Miscellaneous Works and Contract No. CS-03 – Thrill Mountain and Polar Adventure.

1.1.3 miniprojects Company Limited (miniprojects co. Ltd.) has been commissioned by LAM to undertake Coral Monitoring Survey on the tagged hard coral colonies at five Monitoring Sites around the Construction Site and one Control Site for captioned project.

1.1.4 In the impact monitoring surveys conducted on 16 August 2009, six out of the 60 tagged coral colonies were found to detach completely from their substrate and 46 tagging stones or marks were loss or worn out in all five Monitoring Sites and one Control Site. Such physical damage on the coral colonies and tags was believed to be caused by several strong tropical cyclones attacked Hong Kong prior to the August 2009 surveys.

1.1.5 miniprojects co. Ltd. has been commissioned by LAM to undertake the Coral Re-tagging Exercise and Baseline Data Re-collection on the re-tagged hard coral colonies in November 2009 at all five Monitoring Sites around the Construction Site and one Control Site and subsequent quarterly monitoring surveys since November 2009 for captioned project.

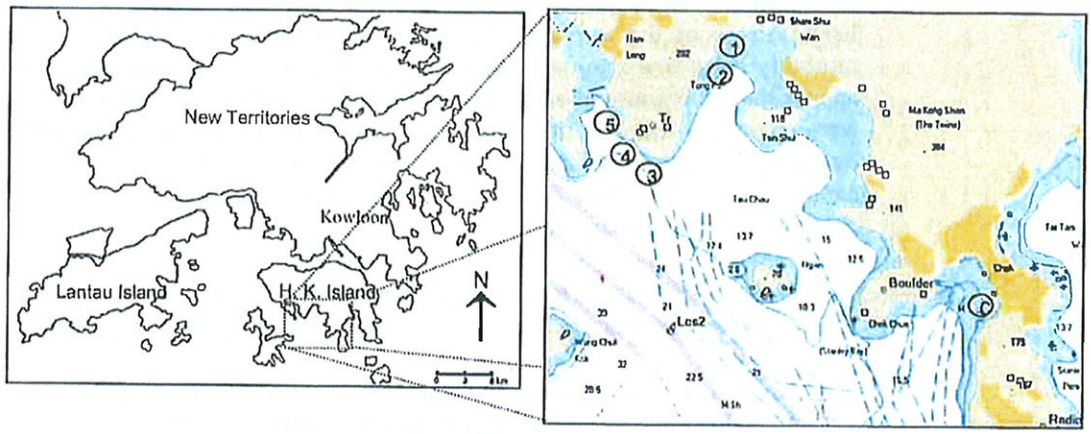
1.1.6 This report presents the results of the 10th Coral Monitoring Survey after Coral Re-tagging Exercise in November 2009 and was a post-construction coral monitoring survey conducted on 15 July 2012 after the completion of construction.

2 METHODOLOGY

2.1 Monitoring Surveys – Locations

2.1.1 Five locations close to the potential impact areas were identified and designated as Impact Monitoring Sites (Sites 1 to 5; Fig. 2.1). In order to identify background environmental perturbations that are not associated with the construction, St. Stephen Beach, which is away from the impact areas, was designated as the Control Site (Control Site C; Fig. 2.1). Locations (GPS coordinates) of the five Impact Monitoring Sites and one Control Site C are summarized in Table 3.1.

Fig. 2.1 Map Showing the Locations of the Five Impact Monitoring Sites (1 to 5) and One Control Site (C).



2.2 Monitoring Requirements

2.2.1 The construction phase coral monitoring programme comprises an Initial Survey, Coral Tagging Exercise and Impact Monitoring Surveys. Initial Survey and Coral Tagging Exercise were completed on 07-12 April 2007.

2.2.2 Impact monitoring aims to determine whether impacts are occurring on tagged corals during the period of construction works commenced in June 2007. A particular focus of the Impact Monitoring is the effects of sedimentation, bleaching and mortality on corals.

2.2.3 As required in the EM&A manual, coral monitoring at Site 5 and Control Site C should be conducted twice a month at first 3 months of the construction (i.e. June, July and August 2007). The monitoring frequency would be changed to monthly for month 4 to month 6 (i.e. September, October and November 2007) if no adverse effects were recorded (Table 2.1). After that, the monitoring will be changed to quarterly from month 7 (i.e. December 2007) until the end of construction works.

2.2.4 Monitoring Survey for Sites 1 to 4 should be conducted monthly during the first 2 months (i.e. June and July 2007) of the construction works. If there is no exceedance recorded (Table 2.1), the monitoring frequency would be adjusted to quarterly from month 3 (i.e. August 2007) till the end of the construction period.

2.2.5 Several tropical cyclones, attacked Hong Kong between May and August 2009, led to serious physical damage on tagged and un-tagged coral colonies and the loss of the tagging stones and marks in all five Monitoring Sites and one Control Site. Coral re-tagging exercise and baseline data re-collection were undertaken in November 2009 (month 30) at all five Monitoring Sites around the Construction Site and one Control Site. The results will be as reference and reviewed during further Coral Monitoring surveys.

2.2.6 At each of the Impact Monitoring and Control Sites, 10 hard coral colonies were re-tagged for continuous monitoring over the course of construction phase. The health status of the re-tagged corals including area of bleaching and partial mortality, and level of sedimentation as percentage of sediment cover and approximate thickness of sediment on the colony and on adjacent hard substrate were recorded. The condition of each re-tagged coral colony was also recorded by taking photographs that best represents the entire colony. General physical parameters were recorded for each survey site, including visibility, weather, tidal conditions and water current.

2.2.7 The results of the Coral Re-tagging Exercise and Baseline Data Re-collection will be as reference and reviewed with further the Coral Monitoring Surveys.

2.2.8 This report presented the results of the 10th Coral Monitoring Survey in month 62 (July 2012) after Coral Re-tagging Exercise and Baseline Data Re-collection, required at Sites 1 to 5 and Control Site C. The schedule was summarized as follow,

Table 2.1 Schedule of Coral Monitoring

	Coral Monitoring Survey Date
	15 July 2012
Site 1	✓
Site 2	✓
Site 3	✓
Site 4	✓
Site 5	✓
Control Site C	✓

2.3 Compliance / Event Action Plan

2.3.1 Coral monitoring results were evaluated against Action and Limit Levels. Evaluation were based on recorded changes in,

- Percentage of partial mortality
- Percentage of sediment cover
- Percentage of bleaching

2.3.2 Action and Limit Levels are defined in Table 2.1

2.3.3 If the defined Action Level or Limit Levels for coral monitoring were exceeded, the stepwise procedures should be implemented in accordance to the EM&A manual to reverse the unfavourable impact on the coral communities.

Table 2.3 Action and Limit Level for Coral Monitoring

Parameter	Action Level Definition	Limit Level Definition
Sedimentation	If during Impact Monitoring a 15% increase in the percentage of sediment cover on hard corals occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Action Level is exceeded.	If during the Impact Monitoring a 25% increase in the percentage of sediment cover occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Limit Level is exceeded.
Bleaching	If during Impact Monitoring a 15% increase in the percentage of bleaching (bleached white) on hard corals occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Action Level is exceeded.	If during the Impact Monitoring a 25% increase in the percentage of bleaching (bleached white) occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Limit Level is exceeded.
Mortality	If during Impact Monitoring a 15% increase in the percentage of partial mortality on hard corals occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Action Level is exceeded.	If during the Impact Monitoring a 25% increase in the percentage of partial mortality occurs at more than 20% of the tagged coral at any one Impact Monitoring Site that is not recorded at the Control Site, then the Limit Level is exceeded.

3 RESULTS

3.1 Sites 1 to 5 and Control Site C – Coral Monitoring Survey Date: 15 July 2012

3.1.1 Coral monitoring survey at Sites 1 to 5 and Control Site C were conducted on 15 July 2012. The physical conditions of each site are summarized in Table 3.1.

Table 3.1 Sites 1 to 5 and Control Site C – Physical Conditions.

Site	Site 1	Site 2	Site 3	Site 4	Site 5	Control Site C
GPS Coordinates	N 22°14'34.1" E 114°10'43.6"	N 22°14'25.39" E 114°10'37.2"	N 22°13'49.3" E 114°10'14.2"	N 22°13'53.3" E 114°10'07.3"	N 22°14'01.9" E 114°09'59.3"	N 22°12'48.3" E 114°12'51.2"
Date	15 July 2012					
Sedimentation on Rock surfaces (mm)	1-2	1-2	1-2	1-2	1-2	1-2
Visibility (m)	0.5 - 1					
Weather	South-east wind; sun patches					
Tide	Neap tide; ebb tide during survey					
Current (Knot)	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0

3.1.2 Percentages of sedimentation, bleaching and mortality of each re-tagged colony were presented in Tables 3.2 and 3.3. Photographs of each re-tagged coral in Sites 1 to 5 and Control Site C were illustrated in Appendices Ia to If, respectively.

Site 1

3.1.3 When compared with baseline data collected in November 2009, increased sedimentation was recorded on two colonies (A4 and A9R), by 2 to 6%. No bleaching was recorded. All tagged corals were in good condition with low percentages of sedimentation (1 – 10%) and no bleaching (0%). Small percentage of partial mortality (2 - 5%) in three colonies A2, A7 and A10R, recorded in the baseline surveys, remained unchanged (Table 3.2). (Table 3.2).

Site 2

3.1.4 When compared with the baseline data in November 2009, sedimentation increased in four colonies (B2, B3, B4 and B9) by 1 to 5%. All tagged corals were in good condition, no bleaching was recorded. Partial mortality found in four colonies (B3, B4, B5 and B9) in baseline survey remained unchanged (Table 3.2).

Site 3

3.1.5 When compared with baseline data in November 2009, sedimentation increased in five colonies (C1, C2, C5, C6 and C8) by 2 to 4%. All tagged corals were in good condition, no bleaching was recorded. Partial mortality found in four colonies (C1, C2, C3, and C5) in baseline survey remained unchanged (Table 3.2).

Site 4

3.1.6 When compared with baseline data in November 2009, sedimentation increased in four colonies (E2, E3, E5 and E7) by 1 to 5%. All tagged corals were in good condition, no bleaching was recorded. Partial mortality found in five colonies (E3, E5, E6, E8 and E10) in baseline survey remained unchanged (Table 3.2).

Site 5

3.1.7 When compared with baseline data in November 2009, sedimentation increased in four colonies (D5, D7, D8 and D9) by 1 to 5%. All tagged corals were in good condition, no bleaching was recorded. Partial mortality found in five colonies (D1, D6, D7, D9 and D10) in baseline survey remained unchanged (Table 3.2).

Control Site C

3.1.8 When compared with baseline data in November 2009, four colonies (F3, F4, F5 and F9) showed increase in sedimentation by 3 to 10 %. All tagged corals were in good condition, no bleaching was recorded. Partial mortality found in 3 colonies (F2, F3 and F6) in baseline survey remained unchanged (Table 3.2).

Table 3.2 Sites 1 to 5 and Control Site C – Percentage and thickness of Sedimentation, Bleaching and Mortality of the Re-tagged Coral Colonies in Coral Re-tagging Exercise and Baseline Data Collection (November 2009) and the Present Monitoring Survey (July 2012). "▲" and "▼" indicate increased and decreased in percentage, respectively, when compared with the coral re-tagging exercise and baseline data collected in November 2009.

Site 1

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)				Bleaching (%)				Mortality (%)			
			21 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012	21 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012	21 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012
A1	*Platygyra carnosus*	1200	0, 0	0, 0	0, 0	0, 0	0	0	0	0	0	0	0	0
A2	*Favites abdita*	400	5, 1	2, 1▼	3, 1▼	5, 1	0	0	0	0	2	2	2	2
A3	*Plesiastrea versipora*	600	0, 0	0, 0	0, 0	0, 0	0	0	0	0	0	0	0	0
A4	*Leptastrea purpurea*	6200	0, 0	5, 1▲	4, 1▲	6, 1▲	0	0	0	0	0	0	0	0
A5	*Platygyra carnosus*	3200	1, 1	0, 0▼	0, 0▼	1, 1	0	0	0	0	0	0	0	0
A6	*Platygyra carnosus*	2600	0, 0	0, 0	0, 0	0, 0	0	0	0	0	0	0	0	0
A7	*Favia speciosa*	500	2, 1	0, 0▼	2, 1	2, 1	0	0	0	0	0	0	0	0
A8	*Platygyra carnosus*	1500	2, 1	0, 0▼	2, 1	2, 1	0	0	0	0	5	5	5	5
*A9R	*Leptastrea purpurea*	1500	4, 1	8, 0	8, 0	10, 0▲	0	0	0	0	0	0	0	0
*A10R	*Platygyra carnosus*	2250	0, 0	5, 0	5, 0	5, 0	-	0	0	0	-	0	0	0
							-	0	0	0	-	2	2	2

*Notes: A9R and A10R are re-tagged coral colonies as A9 and A10 were damaged by anchoring or typhoon events, and not suitable for monitoring purpose.

Site 2

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)				Bleaching (%)				Mortality (%)			
			29 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012	29 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012	29 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012
B1	*Platygyra carnosus*	1300	2, 1	0, 0▼	0, 0▼	2, 0	0	0	0	0	0	0	0	0
B2	*Plesiastrea versipora*	650	4, 1	0, 0▼	0, 0▼	5, 0▲	0	0	0	0	0	0	0	0
B3	*Psammocora superficialis*	4400	5, 1	5, 1	5, 1	10, 1▲	0	0	0	0	3	3	3	3
B4	*Favia speciosa*	800	0, 0	0, 0	0, 0	5, 1▲	0	0	0	0	2	2	2	2
B5	*Plesiastrea versipora*	1000	2, 1	2, 1	2, 1	2, 1	0	0	0	0	2	2	2	2
B6	*Platygyra carnosus*	1500	0, 0	0, 0	0, 0	0, 0	0	0	0	0	0	0	0	0
B7	*Hydnophora exesa*	1600	1, 1	0, 0▼	0, 0▼	1, 1	0	0	0	0	0	0	0	0
B8	*Plesiastrea versipora*	1300	0, 0	0, 0	0, 0	0, 0	0	0	0	0	0	0	0	0
B9	*Favia speciosa*	450	1, 1	1, 1	1, 1	5, 1▲	0	0	0	0	2	2	2	2
B10	*Psammocora superficialis*	400	0, 0	0, 0	0, 0	0, 0	0	0	0	0	0	0	0	0

Site 3

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)				Bleaching (%)				Mortality (%)			
			28 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012	28 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012	28 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012
C1	*Porites sp*	100	2, 1	5, 1▲	2, 1	5, 1▲	0	0	0	0	3	3	3	3
C2	*Porites sp*	210	3, 1	3, 1	3, 1	5, 1▲	0	0	0	0	5	5	5	5
C3	*Goniopora stutchburyi*	410	5, 1	0, 0▼	0, 0▼	5, 1	0	0	0	0	7	7	7	7
C4	*Pavona decussata*	240	4, 1	2, 1▼	2, 1▼	4, 1	0	0	0	0	0	0	0	0
C5	*Pavona decussata*	210	3, 1	0, 0▼	0, 0▼	5, 1▲	0	0	0	0	1	1	1	1
C6	*Pavona decussata*	200	3, 1	0, 0▼	0, 0▼	5, 1▲	0	0	0	0	0	0	0	0
C7	*Montipora cf. turgescens*	960	3, 1	3, 1	3, 1	3, 1	0	0	0	0	0	0	0	0
C8	*Goniopora stutchburyi*	140	1, 1	1, 1	1, 1	5, 1▲	0	0	0	0	0	0	0	0
C9	*Porites sp*	300	3, 1	3, 1	3, 1	3, 1	0	0	0	0	0	0	0	0
C10	*Cyphastrea serailia*	600	4, 1	2, 1▼	4, 1	4, 1	0	0	0	0	0	0	0	0

Site 4

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)				Bleaching (%)				Mortality (%)			
			28 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012	28 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012	28 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012
E1	*Goniopora stutchburyi*	290	5, 1	0, 0▼	5, 1	5, 1	0	0	0	0	0	0	0	0
E2	*Coscinaraea sp.*	620	0, 0	0, 0	0, 0	5, 1▲	0	0	0	0	0	0	0	0
E3	*Goniopora stutchbury*	300	4, 1	0, 0▼	4, 1	5, 1▲	0	0	0	0	3	3	3	3
E4	*Goniopora stutchbury*	130	3, 1	0, 0▼	0, 0▼	3, 1	0	0	0	0	0	0	0	0
E5	*Goniopora stutchbury*	460	6, 1	3, 1▼	3, 1▼	10, 1▲	0	0	0	0	4	4	4	4
E6	*Goniopora stutchbury*	380	10, 1	5, 1▼	5, 1▼	10, 1	0	0	0	0	8	8	8	8
E7	*Goniopora stutchbury*	120	3, 1	0, 0▼	3, 1	5, 1▲	0	0	0	0	0	0	0	0
E8	*Goniopora stutchbury*	230	4, 1	4, 1	4, 1	4, 1	0	0	0	0	2	2	2	2
E9	*Goniopora stutchbury*	170	3, 1	3, 1	3, 1	3, 1	0	0	0	0	0	0	0	0
E10	*Goniopora stutchbury*	540	7, 1	5, 1▼	5, 1▼	7, 1	0	0	0	0	3	3	3	3

Site 5

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)				Bleaching (%)				Mortality (%)			
			29 Nov 09 (baseline)	Nov 2011	Feb 2011	July 2012	29 Nov 09 (baseline)	Nov 2011	Feb 2011	July 2012	29 Nov 09 (baseline)	Nov 2011	Feb 2011	July 2012
D1	*Psammocora* sp.	800	6, 1	0, 0▼	5, 1▼	6, 1	0	0	0	0	3	3	3	3
D2	*Montipora peltiformis*	600	4, 1	1, 1▼	4, 1	5, 1	0	0	0	0	0	0	0	0
D3	*Goniopora stutchburyi*	450	2, 1	0, 0▼	2, 1	2, 2	0	0	0	0	0	0	0	0
D4	*Cyphastera serailia*	100	3, 1	3, 1	3, 1	3, 1	0	0	0	0	0	0	0	0
D5	*Montipora cf. turgescens*	320	4, 1	4, 1	4, 1	5, 1▲	0	0	0	0	0	0	0	0
D6	*Montipora peltiformis*	480	10, 1	5, 1▼	5, 1▼	10, 1	0	0	0	0	20	20	20	20
D7	*Montipora peltiformis*	500	8, 1	8, 1	8, 1	10, 1▲	0	0	0	0	2	2	2	2
D8	*Montipora peltiformis*	410	6, 1	6, 1	6, 1	10, 1▲	0	0	0	0	0	0	0	0
D9	*Montipora peltiformis*	200	5, 1	5, 1	5, 1	10, 1▲	0	0	0	0	5	5	5	5
D10	*Goniopora stutchburyi*	510	7, 1	5, 1▼	5, 1▼	7, 1	0	0	0	0	5	5	5	5

Control Site C

Code	Coral Species	Area (cm^2)	Sedimentation (%, mm)				Bleaching (%)				Mortality (%)			
			21 Nov 09 (baseline)	Nov 2011	Feb 2012	July 2012	21 Nov 09 (baseline)	Nov 2011	Feb 2011	July 2012	21 Nov 09 (baseline)	Nov 2011	Feb 2011	July 2012
F1	*Goniastrea aspera*	450	2, 1	0, 0▼	0, 0▼	2, 1	0	0	0	0	0	0	0	0
F2	*Favites pentagona*	2100	2, 1	2, 1	2, 1	2, 1	0	0	0	0	2	2	2	2
F3	*Favites pentagona*	1000	0, 0	0, 0	0, 0	5, 1▲	0	0	0	0	5	5	5	5
F4	*Porites sp*	1300	2, 1	2, 1	2, 1	5, 1▲	0	0	0	0	0	0	0	0
F5	*Cyphastrea seraili*	2100	0, 0	10, 1▲	0, 0	10, 1▲	0	0	0	0	0	0	0	0
F6	*Porites sp*	2100	5, 1	5, 1	5, 1	5, 1	0	0	0	0	2	2	2	2
F7	*Plesiastrea versipora*	3000	2, 1	2, 1	2, 1	2, 1	0	0	0	0	0	0	0	0
F8	*Favites pentagona*	680	0, 0	0, 0	0, 0	0, 0	0	0	0	0	0	0	0	0
F9	*Favites pentagona*	2600	0, 0	4, 1▲	4, 1▲	5, 1▲	0	0	0	0	0	0	0	0
F10	*Favia rotumana*	600	0, 0	0, 0	0, 0	0, 0	0	0	0	0	0	0	0	0

4 SUMMARY AND CONCLUSION

4.1 Summary

4.1.1 In the post-construction monitoring surveys conducted on 15 July 2012, from all the 5 Monitoring Sites 1 to 5, the change in level of sedimentation on the tagged colonies was small (≤ 10%) when using the baseline data in November 2009 and previous survey in February 2012 as reference. The level of sedimentation in all sites was low and within the range of that in the Control Site C (0 to 10%). This small difference in sedimentation was likely a natural fluctuation as a result of stream runoffs during the wet season, and also daily tidal current and wave exposure, etc. No increase in level of bleaching or partial mortality suggested the all tagged corals were in good condition and healthy.

4.1.2 The data from this monitoring survey showed no significant enhancement in sedimentation, bleaching or mortality in all the 5 Monitoring Sites 1 to 5 and the Control Site C. Hence, no adverse impact by the construction activity on the coral community was observed.

4.2 Compliance / Event Action Plan

4.2.1 The monitoring results were evaluated against the Action and Limit Levels as defined in the EM&A manual and summarized in Table 4.1.

4.2.2 Overall, the healthy status of the tagged coral colonies was normal, with low levels of sedimentation. Neither action/limit level of sedimentation, bleaching or mortality was exceeded in the monitoring survey conducted in February 2012.

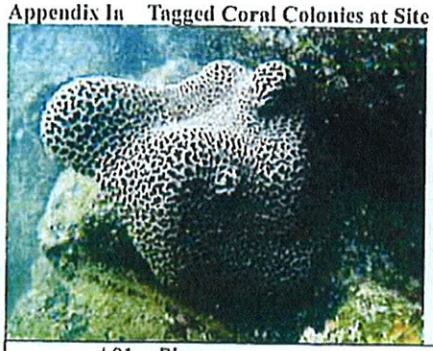
Table 4.1 Evaluation of Monitoring Results against Action and Limit Level for Coral Monitoring Survey. Note Definition of Action/Limit levels are listed in Table 2.1. "No" indicates NO exceedance.

Exceedance / Site	Sedimentation		Bleaching		Mortality	
	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level
Site 1	No	No	No	No	No	No
Site 2	No	No	No	No	No	No
Site 3	No	No	No	No	No	No
Site 4	No	No	No	No	No	No
Site 5	No	No	No	No	No	No
Control Site C	No	No	No	No	No	No

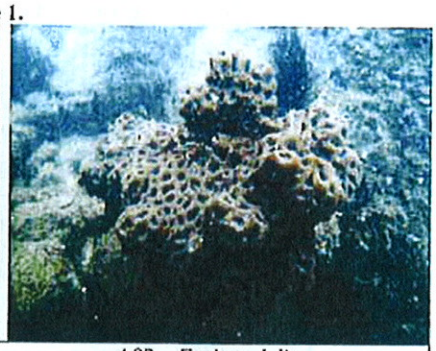
APPENDIX I

Photographs of the Tagged Corals at Sites 1 to 5 and Control Site C

Appendix Ia Tagged Coral Colonies at Site 1.



A01 *Platygyra carnosus*

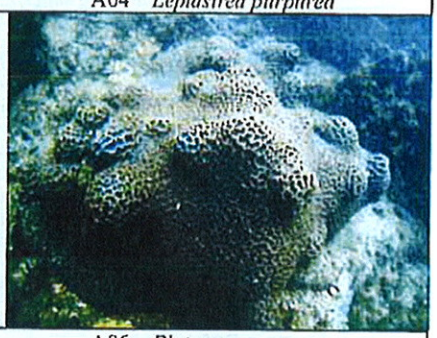


A02 *Favites abdita*

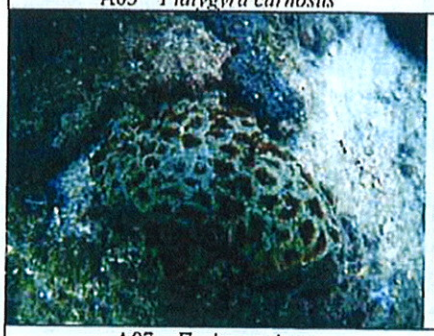
A03 *Plesiastrea versipora*

A04 *Leptastrea purpurea*

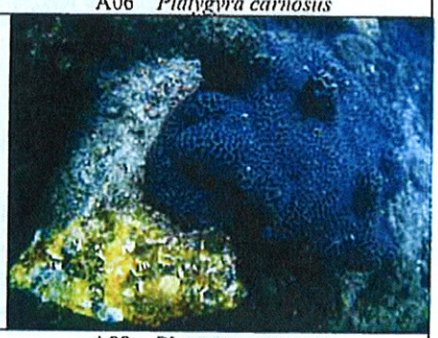
A05 *Platygyra carnosus*



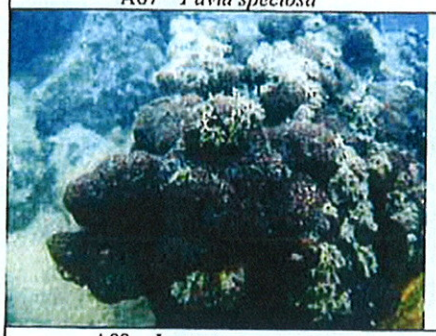
A06 *Platygyra carnosus*



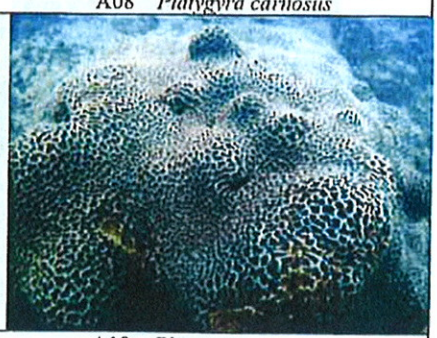
A07 *Favia speciosa*



A08 *Platygyra carnosus*

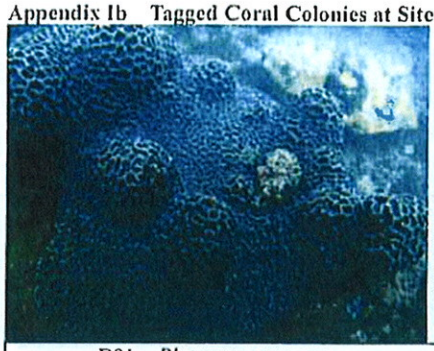


A09 *Leptastrea purpurea*

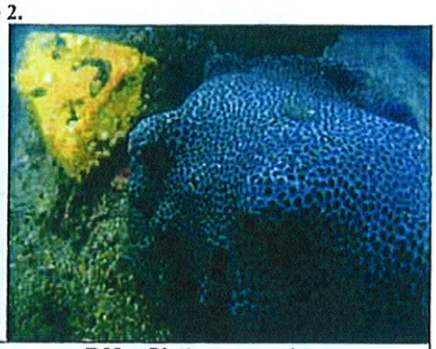


A10 *Platygyra carnosus*

Appendix Ib Tagged Coral Colonies at Site 2.



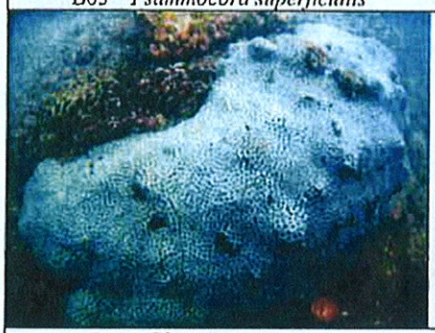
B01 *Platygyra carnosus*



B02 *Plesiastrea versipora*

B03 *Psammocora superficialis*

B04 *Favia speciosa*

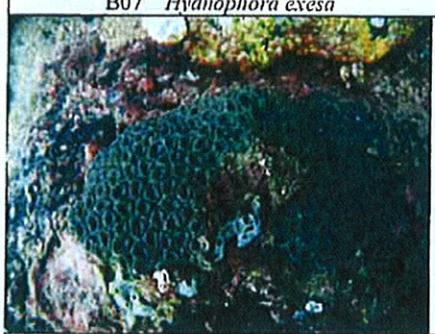


B05 *Plesiastrea versipora*

B06 *Platygyra carnosus*

B07 *Hydnophora exesa*

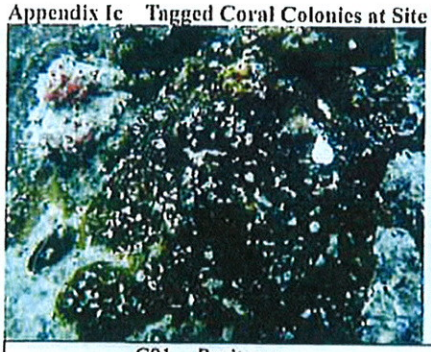
B08 *Plesiastrea versipora*



B09 *Favia speciosa*

B10 *Psammocora superficialis*

Appendix Ic Tagged Coral Colonies at Site 3.



C01 *Porites* sp.

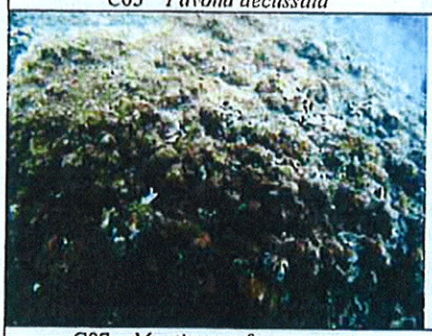
C02 *Porites* sp.

C03 *Goniopora stutchburyi*

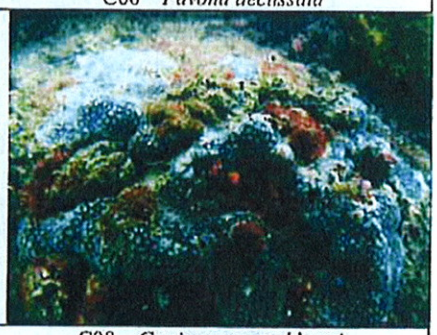
C04 *Pavona decussata*

C05 *Pavona decussata*

C06 *Pavona decussata*



C07 *Montipora cf. turgescens*

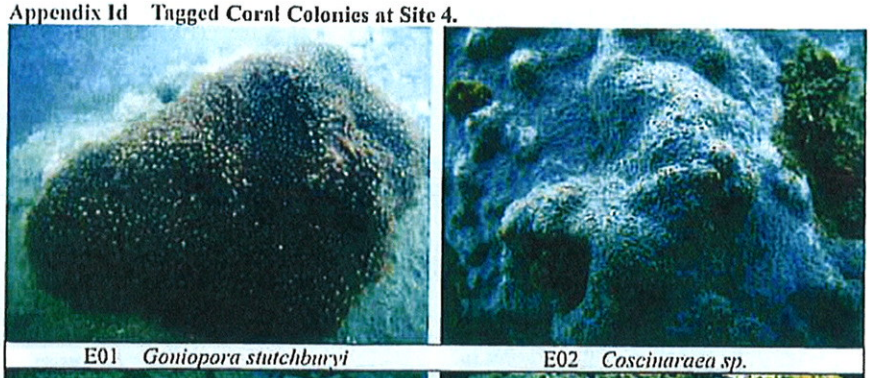


C08 *Goniopora stutchburyi*

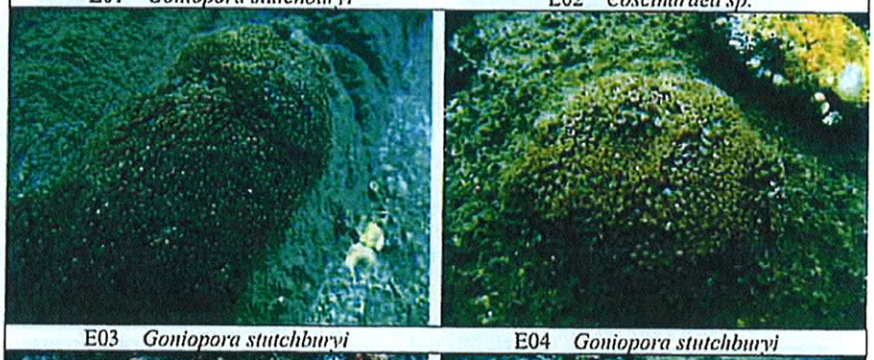
C09 *Porites* sp.

C10 *Cyphastrea serailia*

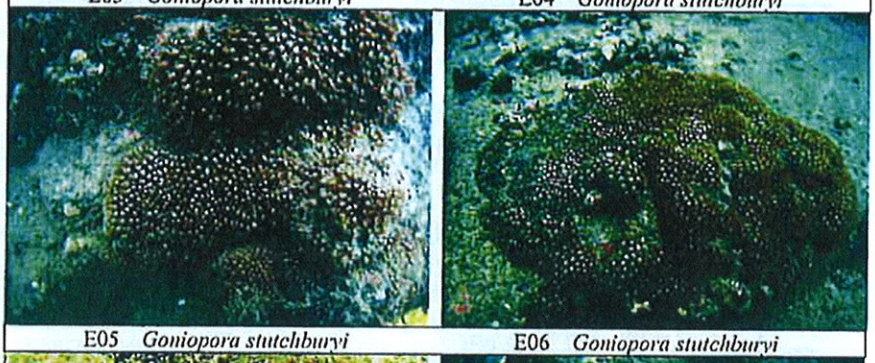
Appendix Id Tagged Coral Colonies at Site 4.



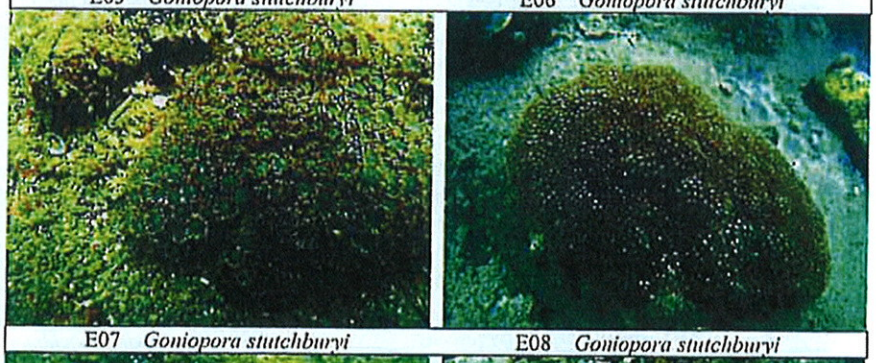
E01 *Goniopora stutchburyi* E02 *Coscinaraea sp.*



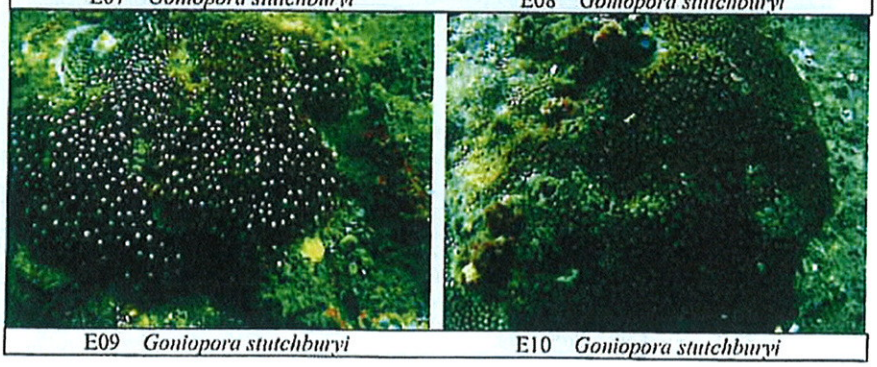
E03 *Goniopora stutchburyi* E04 *Goniopora stutchburyi*



E05 *Goniopora stutchburyi* E06 *Goniopora stutchburyi*

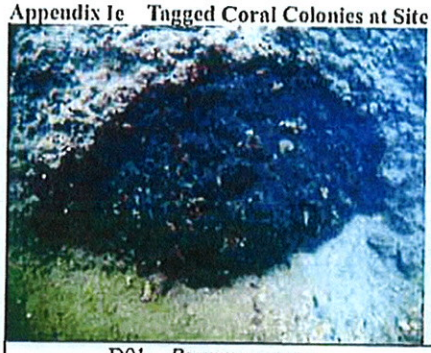


E07 *Goniopora stutchburyi* E08 *Goniopora stutchburyi*



E09 *Goniopora stutchburyi* E10 *Goniopora stutchburyi*

Appendix Ie Tagged Coral Colonies at Site 5.



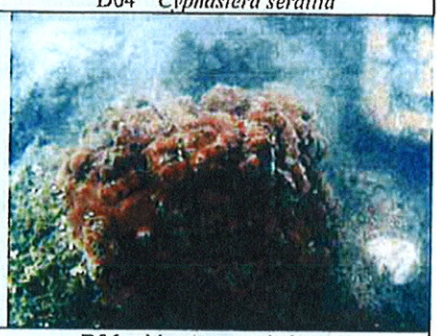
D01 *Psammocora* sp.

D02 *Montipora peltiformis*

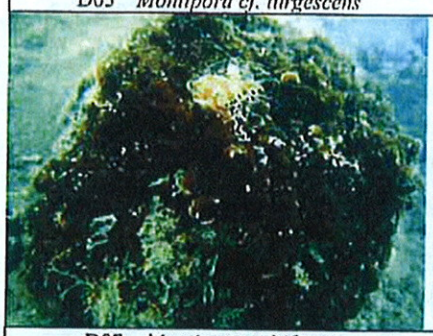
D03 *Goniopora stutchburyi*

D04 *Cyphastera serailia*

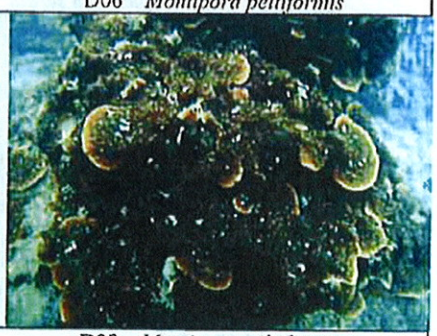
D05 *Montipora cf. turgescens*



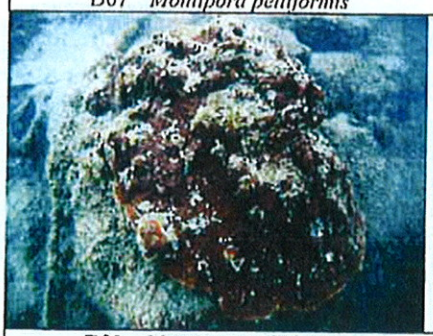
D06 *Montipora peltiformis*



D07 *Montipora peltiformis*



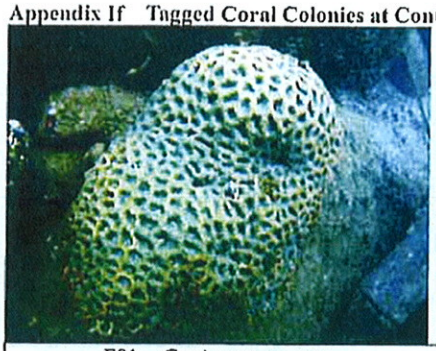
D08 *Montipora peltiformis*



D09 *Montipora peltiformis*

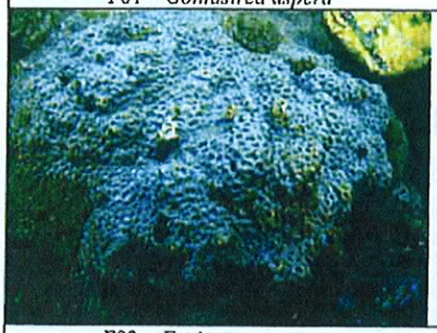
D10 *Goniopora stutchburyi*

Appendix If Tagged Coral Colonies at Control Site C.

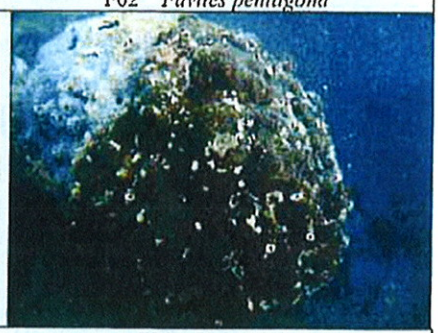


F01 *Goniastrea aspera*

F02 *Favites pentagona*

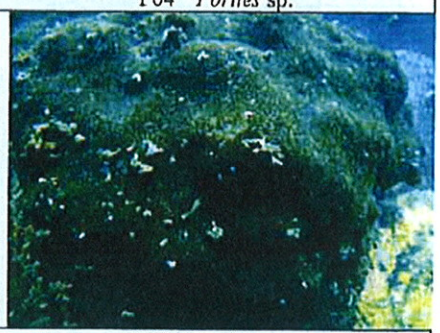


F03 *Favites pentagona*



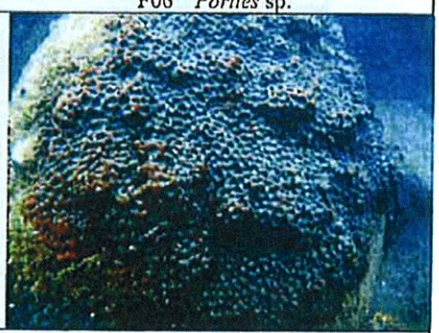
F04 *Porites* sp.

F05 *Cyphastrea seraili*

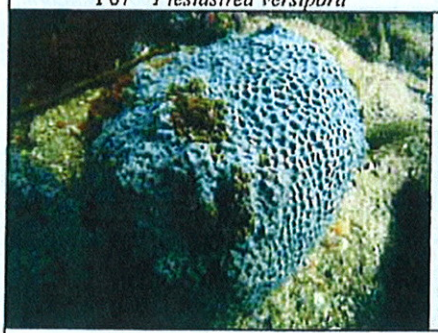


F06 *Porites* sp.

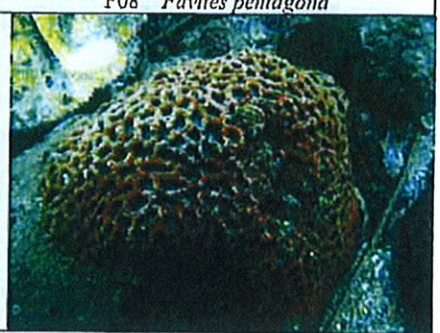
F07 *Plesiastrea versipora*



F08 *Favites pentagona*



F09 *Favites pentagona*



F10 *Favia rotumana*