

**Public Golf Course at Kau Sai Chau Island, Sai Kung**  
**Operation Phase**  
**Environmental Monitoring & Audit (EM&A) Report**  
**for November 2009**

**(Report No. 382812/0201/021)**

Report Authorized For  
Issue By:



For and on Behalf of  
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## Table of Content

### Executive Summary

1. Introduction
  - 1.1 *Background of the Project*
  - 1.2 *Purpose of the Report*
  - 1.3 *Structure of the Report*
2. Project Information
  - 2.1 *Background*
  - 2.2 *Site Description*
  - 2.3 *Summary of EM&A Requirements*
3. Environmental Monitoring Requirements
  - 3.1 *Water Quality*
  - 3.2 *Marine Ecology*
  - 3.3 *Landscape and Visual*
  - 3.4 *Soil Nutrient*
4. Monitoring Results
  - 4.1 *Water Quality*
  - 4.2 *Marine Ecology*
  - 4.3 *Landscape & Visual*
  - 4.4 *Soil Nutrient*
5. Conclusions

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**List of Figure**

- 1.1 Master Layout Plan of the Proposed Third Golf Course
- 3.1 Proposed Water Quality Monitoring Locations (Operation phase)
- 3.2 Locations of Coral and Seagrass Monitoring (Sites D2, D3 and C)

**List of Table**

- Table 1.1 Structure of the Report
- Table 2.1 Summary of Impact EM&A Requirements during Operation Phase
- Table 3.1 Derived Summaries of Action and Limit Levels for Freshwater Water Quality
- Table 3.2 Action and Limit Levels for Water Quality Monitoring
- Table 3.3 Derived Summaries of Action and Limit Levels for Marine Water Quality
- Table 3.4 Water Quality Monitoring Parameter, Frequency and Locations
- Table 3.5 Water Quality Monitoring Locations during Operation Phase
- Table 3.9 Analytical Methods to be applied to Water Quality Samples
- Table 4.2-1 Conditions of tagged corals at Site C
- Table 4.2-2 Conditions of tagged corals at Site D2
- Table 4.2-3 Conditions of tagged corals at Control Site

**List of Annex**

- Annex A Monitoring Programme for the reporting month
- Annex B Event Action Plan
- Annex C Monitoring results
- Annex D Calibration Certificates
- Annex E Fertilizer and pesticides applications

Public Golf Course at Kau Sai Chau Island, Sai Kung  
 Operation Phase - Monthly EM&A Report

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## **Executive Summary**

This is the twenty-one Operation Phase Monthly Environmental Monitoring and Audit (EM&A) Report prepared by Black & Veatch for the Project “Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung”. This report presents the results of the EM&A works conducted in the month of November 2009 (25<sup>th</sup> October to 24<sup>th</sup> November 2009).

### ***Water Quality***

2 sets of water quality monitoring were carried out on 30<sup>th</sup> October and 11<sup>th</sup> November 2009 at 9 marine and 6 freshwater monitoring locations. For F\_Filter (fresh water station), no filter effluent was discharging during sampling, thus no water sample was taken. No rainstorm event was recorded during this reporting month.

No exceedance was found for both marine and freshwater monitoring stations during the reporting month.

According to the approved revised pesticides monitoring plan at East Course, the monitoring will reduce to bi-monthly during dry season (i.e. December and February only). Monthly monitoring for pesticides is required during wet season (i.e. April to October). No pesticide monitoring is required for the present monitoring month. The bi-monthly monitoring will commence in December 2009.

### ***Marine Ecology***

The coral monitoring would change to semi-annually. The coral monitoring was carried out in October 2009 (wet season) which is the fifth operation phase coral monitoring and the second semi-annual monitoring. The upcoming coral monitoring will be carried out in February 2010 (dry season). The conditions, mortality, sedimentation and bleaching of the tagged corals at Control, Site C (south-eastern coast of Kau Sai Chau Island had high coral coverage) and Site D (near desalination plant) were monitored during the report month. No mortality, bleaching or sedimentation was found on most of the tagged corals except bleaching was observed on D-17 (about 50%). Given that no other bleaching was observed on other tagged corals at Site D, the bleaching on D-17 is not considered to be caused by the Project.

### ***Landscaping & Visual***

The present auditing inspection was the sixth and final inspection and was conducted in November 2009. It should be noted that the Contractor (if trees management are within the maintenance period)/Client shall carry out sufficient landscape maintenance operations and regular inspection, in particular, at those planting locations are vulnerable to strong wind. It is recommended that the Contractor shall consider replacing the missing or dead trees with shrubs in areas which are more exposed or windy. Native shrubs planted in various locations at East Course have been in good conditions since planting and fruiting was observed in the present monitoring. Fruits/berries on shrubs are a kind of food source for birds and can also enhance the ecological resources of the East Course.

### ***Soil Nutrient***

The soil sampling was carried out in November 2009 and results will be available in December 2009.

## 1. Introduction

### 1.1 Background of the Project

1.1.1 Black & Veatch (hereinafter called the “ET”) was appointed by The Jockey Club Kau Sai Chau Public Golf Course Limited (hereinafter called the "Project Proponent") to undertake Operation Phase of Environmental Monitoring and Audit (EM&A) for “Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung” (hereinafter called the “Project”). Under the requirements of Section 4 of Environmental Permit EP-224/2005/A, EM&A programme as set out in the EM&A Manual is required to be implemented. In accordance with the EM&A Manual, environmental monitoring on water quality, marine ecology, landscape and visual and land contamination during operation phase are required for the Project.

1.1.2 This report summarises the environmental monitoring and audit works for the Project in **November 2009**.

### 1.2 Purpose of the Report

1.2.1 This is the **twenty-one** EM&A report which summarizes the impact monitoring results and audit findings for the EM&A programme during the reporting period from **25<sup>th</sup> October to 24<sup>th</sup> November 2009**.

### 1.3 Structure of the Report

1.3.1 The structure of the report is shown in Table 1.1.

**Table 1.1 Structure of the Report**

<b>Section</b>		<b>Description</b>
<b>1</b>	Introduction	Details the scope and structure of the report
<b>2</b>	Project Information	Summarizes background and scope of the project and site description
<b>3</b>	Environmental Monitoring Requirement	Summarizes the monitoring parameters, programmes, methodology, frequency, location, action and limit levels, event action plans, environmental mitigation measures as recommended in the EIA report and relevant environmental requirements.
<b>4</b>	Monitoring Results	Summarizes the monitoring results obtained in the reporting period.
<b>5</b>	Environmental Non-conformance	Summarizes any monitoring exceedance, environmental complaints and environmental summons within the reporting period.
<b>6</b>	Conclusions	Provides an overall conclusion of the results and findings of the EM&A programme for the reporting period.

## **2. Project Information**

### **2.1 Background**

2.1.1 The Project comprises the following major components:

- Construction of the third 18-hole public golf course on the east side of the island, south of the existing golfing area;
- A new irrigation lake to collect surface runoff from the new 18-hole golf course. Water stored at the new irrigation lake can also be diverted to existing reservoir for tertiary treatment and recycling;
- A new desalination plant adjacent to the existing pier to serve as an additional irrigation water supply for the new golf course during dry season; and
- Expansion of existing administration and maintenance buildings.

2.1.2 The potential environmental impacts of the Project have been studied in the Environmental Impact Assessment (EIA) report (EIAO Register No. AEIAR- 091/2005). The EIA was approved on 14 November 2005 under the EIAO. An Environmental Permit (EP-224/2005) was granted on 28 November 2005. Application for Variation of an Environmental Permit by the Project Proponent was submitted on 2 August 2006 (Application No. VEP-222/2006) and the EP was superseded by EP-224/2005/A.

### **2.2 Site Description**

2.2.1 A layout plan of the Project is provided in **Figure 1.1**.

### **2.3 Summary of EM&A Requirements**

2.3.1 The EM&A programme requires environmental monitoring for water quality, marine ecology, landscape and visual and land contamination during operation phase. The EM&A requirements for each parameter are described in subsequent sections, including:

- All monitoring parameters;
- Action and Limit Levels for all environmental parameters;
- Event and Action Plans; and
- Environmental mitigation measures, as recommended in the project EIA final report.

2.3.2 A summary of impact EM&A requirements is presented in Table 2.1.

**Table 2.1 Summary of Impact EM&A Requirements during Operation Phase**

<b>Impacts</b>	<b>Parameters/descriptions</b>	<b>Locations</b>	<b>Frequencies</b>
<b>Water Quality</b>	Dissolved Oxygen, Temperature, Turbidity, pH, Salinity, SS, NO3-N, NO2-N, NH3-N, TP, Chl-a and selected pesticides.	9 marine and 6 freshwater locations	2-year of monitoring period for the operation phase. Monitoring should be carried out on bi-weekly basis for the first 12 months, after when the frequency will be reviewed by EPD. Additional monitoring parameters at Lake 1D are required (TKN, Ortho-P and Conductivity)
	Dissolved Oxygen, Temperature, Turbidity, pH, Salinity, SS, NO3-N, NO2-N, NH3-N, TP, Chl-a and selected pesticides.	8 marine locations	Additional water quality monitoring shall be carried out after heavy rain storm or when there is an overflow event from the reservoir, irrigation buffer lake or detention ponds/tanks.
<b>Marine Ecology</b>	Natural corals	Site C, Site D2 and the Control Site.	First three months would be monthly conducted during the first two years of the operation phase. If no exceedance was recorded, the monitoring schedule would be changed to semi-annually, i.e. once in dry season and once in wet season.
<b>Landscape and Visual</b>	Audits to ensure effective implementation of mitigation measures	Golf course area and at visual sensitive receivers	Auditing inspections and reporting shall be undertaken once every two months for the first year of the operation phase.
<b>Soil Nutrient</b>	Nutrient Status of the Soil	Golf course	Twice annually



### 3. Environmental Monitoring Requirements

#### 3.1 Water Quality

##### Monitoring Requirement

3.1.1 Water quality monitoring was conducted in accordance with the EM&A Manual. Tables 3.1 to 3.3 show the established Action/Limit Levels for the water environmental monitoring parameters.

**Table 3.1 Derived Summaries of Action and Limit Levels for Freshwater Water Quality**

Parameters	Location	Action	Location	Limit
DO (mid-depth)		6.3 mg/L	All	4 mg/L ξ
pH (mid-depth)		N/A	All	6.0 - 9.0
SS (mid-depth) ☆	All	3.8 mg/L or 120% of upstream control station's SS at the same tide of the same day	All	8 mg/L or 130% of upstream control station's SS at the same tide of the same day
Turbidity (Tby) (mid-depth) ☆	All	3.1 NTU or 120% of upstream control station's Tby at the same tide of the same day	All	4 NTU or 130% of upstream control station's Tby at the same tide of the same day
Ammonia Nitrogen (mid-depth)		N/A	All	0.01 mg/L
Nitrate Nitrogen (mid-depth)	All	0.10 mg/L	All	0.11 mg/L
Nitrite Nitrogen (mid-depth)		N/A	All	0.01 mg/L
TIN (mid-depth)	All	0.12 mg/L	All	0.13 mg/L
Total Phosphorus (mid-depth)		N/A	All	0.02 mg/L
Chlorophyll a (mid-depth)	All	0.5 µg/L	All	0.6 µg/L

Remarks:

☆ : Action and limit levels are subjected to review especially for wet season.

Freshwater monitoring locations: F\_UA, F\_DA, F\_UB, F\_DB, F\_UC, F\_DC and F\_Inland Marsh

As most of the freshwater samples were reported of NH<sub>3</sub>-N, NO<sub>2</sub>-N levels below the detection limit of 0.01 mg/L, limit level is set at 0.01 mg/L. Similarly for TP, a limit level of 0.02 mg/L (the detection limit of TP) is imposed.

ξ : Water Quality Objectives of the Port Shelter

**Table 3.2 Action and Limit Levels for Water Quality Monitoring  
(applicable to irrigation lake 1D and existing reservoir)**

Parameter (mg/L unless stated)	Action and Limit Levels
pH	6.0 - 9.0 <sup>(1)</sup>
Turbidity (NTU)	-
Dissolved Oxygen	>4 <sup>(1)</sup>
Chlorophyll a (mg/m <sup>3</sup> )	<5 <sup>(1)</sup>
Nitrate N	0.20 <sup>(1)</sup>
Nitrite N	0.20 <sup>(1)</sup>
Ammoniacal N	0.50 <sup>(1)</sup>
Total Kjeldahl N	1.2 <sup>(2)</sup>
Total Phosphate	0.1 <sup>(1)</sup>
Ortho Phosphate	0.05 <sup>(1)</sup>
Conductivity (µS/cm)	<1000 <sup>(1)</sup>

Note: (1) These values are based on professional judgment and knowledge

(2) Based on 90<sup>th</sup> percentile of operational phase monitoring data (1996 to June 1998)

**Table 3.3 Derived Summaries of Action and Limit Levels for Marine Water Quality**

Parameters	Location	Action	Location	Limit
<b>DO (Surface &amp; Middle)</b>	FCZ	6.0 mg/L	FCZ	5.3 mg/L
	All except FCZ	4.9 mg/L	All except FCZ	4.6 mg/L
<b>DO (Bottom)</b>	All	3.7 mg/L	All	3.4 mg/L
<b>pH (depth-averaged)</b>		N/A	All	6.5 - 8.5
<b>SS (Depth-averaged)☆</b>	FCZ	4.5 mg/L	FCZ	5.6 mg/L
	All except FCZ	6.1 mg/L	All except FCZ	10.6 mg/L
<b>SS (Depth-averaged) Dredging for submarine pipelines⊕</b>	M_RO1	6.1 mg/L	M_RO1	10.6 mg/L
<b>Turbidity (Tby) (depth-averaged) ☆</b>	FCZ	2.9 NTU☼	FCZ	3.9 NTU☼
	All except FCZ	3.3 NTU☼	All except FCZ	6.2 NTU☼
<b>Ammonia Nitrogen (depth-averaged)</b>	FCZ	0.02 mg/L	FCZ	0.03 mg/L
	All except FCZ	0.05 mg/L Δ	All except FCZ	0.05 mg/L Δ
<b>Nitrate Nitrogen (depth-averaged)</b>	FCZ	0.08 mg/L	FCZ	0.09 mg/L
	All except FCZ	0.09mg/L Δ	All except FCZ	0.09 mg/L Δ
<b>Nitrite Nitrogen (depth-averaged)</b>	FCZ	0.02 mg/L θ	FCZ	0.02 mg/L θ
	All except FCZ	0.02 mg/L	All except FCZ	0.04 mg/L
<b>TIN (depth-averaged)</b>	FCZ	0.12 mg/L	FCZ	0.14 mg/L
	All except FCZ	0.16 mg/L	All except FCZ	0.18 mg/L
<b>Total Phosphorus (depth-averaged)</b>	All	0.09 mg/L Δ	All	0.09 mg/L Δ
<b>Chlorophyll a (depth-averaged)</b>	FCZ	1.8 µg/L	FCZ	2.2 µg/L
	All except FCZ	3.8 µg/L	All except FCZ	6.8 µg/L

Remarks:

☆ : Action and limit levels are subjected to review especially for wet season throughout the construction phase of the project.

⊕ : Action and limit levels are subjected to review before the dredging works.

☼ : All are based on EM&A baseline monitoring data due to marked difference between EPD turbidity data and those from the baseline survey.

Δ : For nutrient monitoring (except NO<sub>2</sub>-N) at non-FCZ stations, the trigger level has made reference to the existing golf course guideline values. The guideline value of NO<sub>2</sub>-N is below the current detection limit of 0.01mg/L and thus not used.

θ : The same action and limit level of 0.02 mg/L is determined from the EM&A baseline data as 78% of the NO<sub>2</sub>-N data are ≤ 0.01 mg/L and all remaining 22% equal to 0.02 mg/L.

**FCZ** including fish culture zones of Kai Lung Wan, Tai Tau Chau and Kau Sai

**All except FCZ** including remaining impact monitoring station of M\_RO1, M\_Marsh, M\_BP and M\_Coral.

Control monitoring locations: M\_A & M\_B

Monitoring Parameters, Frequency and Programme

- 3.1.2 For marine water quality, measurements shall be taken at both mid-flood and mid-ebb tides and at three water depths (1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth is less than 6 m, in which case the mid-depth station may be omitted). Should the water depth be less than 3 m, only the mid-depth station will be monitored.
- 3.1.3 For the stream course, measurements shall be taken at mid-water depth.
- 3.1.4 The water quality parameters which need to be monitored are as follows:
- Marine water quality - dissolved oxygen (DO), temperature, turbidity, suspended solids (SS), pH and salinity
  - Freshwater water quality - dissolved oxygen (DO), temperature, turbidity, suspended solids (SS), pH, salinity and conductivity (Lake 1D only).
- 3.1.5 Additional marine and freshwater water quality monitoring parameters for the impact monitoring during construction include nitrate nitrogen (NO<sub>3</sub>-N), nitrite nitrogen (NO<sub>2</sub>-N), ammonia nitrogen (NH<sub>3</sub>-N), total phosphate (TP) and selected pesticides. For Lake 1D, Total Kjeldahl Nitrogen (TKN) and Orthophosphate (Ortho P) are required.
- 3.1.6 Additional water quality monitoring at Tai Tau Chau FCZ (TTC), Kai Lung Wan FCZ (KLW), Kau Sai FCZ (KS), downstream of the existing marsh (M\_Marsh), marine water of Port Shelter (M\_Coral), existing reservoir (F\_Inland M) and Control stations (M\_A and M\_B) shall be carried out after heavy rain storm or when there is an overflow event from the reservoir, irrigation buffer lake or detention ponds/tanks. The heavy rain storm shall be defined when there is an amber/red/black rainstorm warning signal issued by the Hong Kong Observatory. The water sample shall be taken within 24 hours after the black/red/amber rainstorm warning signal is cancelled. Please refer to revised EM&A manual for the sampling condition requirement after a heavy rain storm event occurs. The monitoring parameters shall include dissolved oxygen, temperature, turbidity, suspended solids, pH and salinity. Additional parameters shall be the same as stated in paragraphs 3.1.5.

*Monitoring Frequency*

3.1.7 After reviewing the water quality monitoring results during construction phase and early operation phase, EPD<sup>1</sup> agreed to revise monitoring parameters and frequency are summarized in Table 3.4. The monitoring programme for the reporting period is shown in **Annex A**.

**Table 3.4 Water Quality Monitoring Parameter, Frequency and Locations**

Parameters	Location	Frequency	Sampling Depth
Dissolved Oxygen (mg/L)	<p><b>Marine Water</b> Fish culture zone stations: TTC, KLW, KS</p> <p>Control stations: M_A, M_B</p> <p>Impact stations: M_RO1, M_RO2, M_Marsh, M_Coral</p> <p><b>Freshwater Water</b> Stream A (F_DA) Stream B (F_DB) Stream C (F_DC) Inland Marsh (F_Inland_M) Filter System (F_Filter) Irrigation Lake 1D (F_lake 1D)</p>	<p><b>Bi-weekly</b></p> <p><u>Marine water</u> : 2 times per day – 1 for mid-flood and 1 for mid-ebb</p> <p><u>Freshwater</u> : Mid-depth per trip</p>	<p>3 individual water depth samples (surface, middle &amp; bottom)</p>
Temperature (°C)			
Turbidity (NTU)			
pH			
Salinity (ppt)			
Suspended Solids (mg/L)			
Nutrients <sup>2</sup>			
Chemicals <sup>3</sup>	<p><b>Monthly (wet season) and Bi-Monthly (dry season)</b></p> <p><u>Marine water</u> : 2 times per day – 1 for mid-flood and 1 for mid-ebb</p> <p><u>Freshwater</u> : Mid-depth per trip</p>	<p>1 composite sample (combine surface, middle and bottom) with replicate</p>	

Wet season: Apr to October; Dry season: November to March

<sup>1</sup> EPD letter dated 14 July 2008 (Ref. no.: (6) in EP2/N8/O/47 Ax(7) Pt X) regarding the approval on the revised water quality monitoring proposal.

<sup>2</sup> Ammonia Nitrogen, Nitrate Nitrogen, Nitrite Nitrogen, Total Inorganic Nitrogen, Total Phosphorus and Chlorophyll a. For Lake 1D, addition nutrient parameters are Total Kjeldahl Nitrogen, Ortho Phosphate and Conductivity (µS/cm).

<sup>3</sup> Pesticides (approved lists are Imazaquin, Glyphosate, Oxadiazon, 2,4-D/Mecoprop, Chlorothalonil, Mancozeb, Iprodione, Fosetyl Aluminum, Chlorpyrifos, Fipronil and Imidachloprid).

Monitoring Locations

3.1.8 The water quality monitoring locations for marine and freshwater (**Figure 3.1**) are summarized in Table 3.5.

**Table 3.5 Water Quality Monitoring Locations during Operation Phase**

Identification Number	Location	Approx. Water Depth	No. of Depth
<i>Marine Water (9 stations)</i>			
TTC	Tai Tau Chau Fish Culture Zone	9.5 m	3
KLW	Kai Lung Wan Fish Culture Zone	13 m	3
KS	Kau Sai Fish Culture Zone	11 m	3
M_BP	Temporary barging point	9.6 m	3
M_RO1	Desalination plant south of the existing pier	5 m	2
M_RO2	Desalination plant south of the existing pier	13 m	3
M_Marsh	Discharge point at the existing marsh	7.7 m	3
M_Coral	Marine water of Port Shelter	10.2m	3
M_A	Water Control Station of Port Shelter	7.5 m	3
M_B	Water Control Station of Port Shelter	16.5 m	3
<i>Fresh Water (7 stations)</i>			
F_DA	downstream of stream A	Mid-depth	1
F_DB	downstream of stream B	Mid-depth	1
F_DC	downstream of stream C	Mid-depth	1
F_Inland M	Downstream of the existing marsh (Inland)	Mid-depth	1
F_lake 1D	Irrigation Lake 1D	Mid-depth	1
F_Filter	Filter effluent point at Holes 5 / 6	Mid-depth	1

Monitoring Equipment

*Dissolved Oxygen and Temperature Measuring Equipment*

3.1.9 The instrument shall be a portable and weatherproof DO measuring instrument complete with cable and sensor, and use a DC power source. The equipment shall be capable of measuring:

- dissolved oxygen levels in the range of 0 - 20 mg L<sup>-1</sup> and 0 - 200% saturation; and
- a temperature of 0 - 45 degrees Celsius.

3.1.10 It shall have a membrane electrode with automatic temperature compensation complete with a cable. Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary. (For example, YSI model 59 meter, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).

- 3.1.11 Should salinity compensation not be built-in in the DO equipment, in-situ salinity shall be measured to calibrate the DO equipment prior to each DO measurement.

*Turbidity Measurement Instrument*

- 3.1.12 Turbidity shall be measured in situ by the nephelometric method. The instrument shall be portable and weatherproof turbidity measuring instrument using a DC power source complete with cable, sensor and comprehensive operation manuals. It shall have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU (for example, Hach model 2100P or an approved similar instrument). The cable shall not be less than 25m in length. The meter shall be calibrated in order to establish the relationship between NTU units and the levels of suspended solids.

*Suspended Solids*

- 3.1.13 A water sample at least 2.5L in capacity with messenger and using a 10m line should be collected. Samples should be submitted to HOKLAS accredited laboratory as soon as possible for gravimetric analysis for suspended.

*Sampler*

- 3.1.14 A water sampler is required. It shall comprise a transparent PVC cylinder, with a capacity of not less than 2 litres, which can be effectively sealed with latex cups at both ends. The sampler shall have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth (for example, Kahlsico Water Sampler or an approved similar instrument).

*Water Depth Detector*

- 3.1.15 A portable, battery-operated echo sounder shall be used for the determination of water depth at each designated monitoring station. This unit can either be hand held or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

*Salinity*

- 3.1.16 A portable salinometer capable of measuring salinity in the range of 0 - 40 parts per thousand (ppt) shall be provided for measuring salinity of the water at each monitoring location.

*pH*

- 3.1.17 The instrument shall consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. It shall be readable to 0.1pH in a range of 0 to 14. Standard buffer solutions of at least pH 7 and pH 10 shall be used for calibration of the instrument before and after use. Details of the method shall comply with APHA, 19th ed. 4500-HTB.

*Flow Rate Meter*

- 3.1.18 A portable, battery-operated flow meter should be used for the determination of water depth at each designated monitoring location and record in m<sup>3</sup>/s. A hand held or meter fixed to the underside of the survey boat may be used.

#### *Sample Containers and Storage*

- 3.1.19 Water samples for laboratory analysis shall be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4°C without being frozen) and delivered to the laboratory and analysed as soon as possible after collection. Sufficient volume of samples shall be collected to achieve the required detection limit.

#### *Monitoring Position Equipment*

- 3.1.20 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication or other equipment instrument of similar accuracy, shall be provided and used during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

#### Monitoring Methodology and Calibration Details

- 3.1.21 Dissolved oxygen (DO), temperature, turbidity, pH and salinity were measured in situ at the designated water quality monitoring stations. General observation, weather conditions, with the sampling time, date and location were marked on the field record sheet.
- 3.1.22 Water samples were taken from each monitoring station for laboratory analysis. The sample identification number, sampling location, date, time, project name and analyses were required.
- 3.1.23 The samples were placed in a cooler with ice (to 4°C without being frozen) and kept away from sunlight. Samples were submitted to a Hong Kong Laboratory Accreditation Scheme (HOKLAS) or other international accredited laboratory for analysis within 24 hours of sampling.

#### *Calibration of In-Situ Instruments*

- 3.1.24 All in situ monitoring instruments were checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use and subsequently re-calibrated at three monthly intervals throughout all stages of the water quality monitoring programme. Responses of sensors and electrodes were checked with certified standard solutions before each use. Wet bulb calibration for a DO meter were carried out before measurement at each monitoring location.

#### *Laboratory Analysis*

- 3.1.25 All laboratory work were carried out by ALS Technichem Pty Ltd (HOKLAS accredited laboratory). Water samples were collected at the monitoring and control stations for carrying out the laboratory determinations. The determination work will start within 24 hours after collection of the water samples. The analysis shall follow the standard methods according to APHA Standard Methods for the Examination of Water and Wastewater, 19th Edition, or an equivalent method approved by EPD.

**Table 3.9 Analytical Methods to be applied to Water Quality Samples**

<b>Determinant</b>	<b>Standard Method</b>	<b>Reporting Limit</b>
Suspended Solids	APHA 2540 D	2 mg/L
Nitrate Nitrogen	APHA 4500-NO <sub>3</sub> <sup>-</sup>	0.01 mg/L
Nitrite Nitrogen	APHA 4500-NO <sub>2</sub> <sup>-</sup>	0.01 mg/L
Ammonia Nitrogen	APHA 4500-NH <sub>3</sub> (D)	0.01 mg/L
Total phosphorus	ASTM D515-88B	0.02 mg/L*

Determinant	Standard Method	Reporting Limit
Chlorophyll a	APHA 10200 H2 &3	0.5 µg/L

Remarks: \*After review baseline data, the detection limit report will be revised to 0.02 mg/L.

### *QA/QC Procedure*

- 3.1.26 ALS Technichem Pty Ltd. has comprehensive quality assurance and quality control programmes. For QA/QC procedures of parameters, one duplicate sample was analysed for every batch of 20 samples as required by HOKLAS.

### Event and Action Plans

- 3.1.27 The Event and Action Plan (EAP) for water quality monitoring is presented in **Annex B**.

## **3.2 Marine Ecology**

### Introduction

- 3.2.1 The marine ecological monitoring surveys are conducted in accordance with the EM&A manual.
- 3.2.2 As stipulated in the EM&A Manual, the ecological monitoring surveys for marine ecology included coral monitoring at both the eastern (Site C) and western (Site D2) coasts of Kau Sai Chau Island and Control Site. The purpose of the monitoring survey was to check the conditions of the tagged corals and the sites.

### Monitoring Frequency and Schedule

- 3.2.3 At each of the Site C and a Control Site near the AFCDD's Coral Buoy at Sharp Island (**Figure 3.2**), 20 natural coral colonies are already selected and tagged during construction phase. If the tagged coral is found die or not suitable for sequent operation phase monitoring during the first month survey, new coral will be selected, tagged and replaced for the damage one. The species of corals had been tagged included the following 15 species: *Cyphastrea serailia*, *Favia speciosa*, *Favites abdita*, *Favites pentagona*, *Goniastrea aspera*, *Goniopora columna*, *Hydnophora exesa*, *Leptastrea pruinosa*, *Lithophyllon undulatum*, *Pavona decussata*, *Platygyra acuta*, *Platygyra carnosus*, *Plesiastrea versipora*, *Psammocora superficialis*, and *Turbinaria peltata*. As the construction of the desalination plant intake and outfall at the existing pier was terminated, no dredging work had been carried out during the construction phase. According to the EM&A manual, no coral monitoring was required at Site D2 during the construction phase. As the original baseline coral monitoring at Site D2 was conducted 3.5 years ago (December 2005), most of the tags at the previous tagged corals were lost. Twenty (20) new corals were selected in Site D2 for operation phase monitoring purposes. The species of corals selected in Site D2 included the following 10 species: *Acropora tumida*, *Cyphastrea serailia*, *Favia speciosa*, *Favites chinensis*, *Goniastrea aspera*, *Goniopora columna*, *Gonipora stutchburyi*, *Pavona decussata*, *Porties lobata*, and *Turbinaria peltata*. The operation phase coral monitoring covering Site D2, Site C and the Control Site.
- 3.2.4 The coral monitoring will be conducted monthly for the first three months of the operation phase, and if no exceedance was recorded, the monitoring schedule will be changed to semi-annually (i.e. one dry season and one in wet season) during the rest of the operation phase. Monitoring survey will consist of checking tagged corals at both impact sites and control site. Percentages of survival, sedimentation and bleaching for each tagged corals will be recorded. The monitoring programme for the reporting period is shown in **Annex A**.



#### Event and Action Plans

- 3.2.5 The Event and Action Plan (EAP) for ecology monitoring is presented in **Annex B**.

### **3.3 Landscape and Visual**

- 3.3.1 The EIA concluded that the landscape and visual impacts associated with the construction of the third golf course are anticipated to be acceptable with mitigation. In order to ensure that the effective management and implementation of landscape mitigation measures developed and defined in the EIA, regular site inspections on trees health will be conducted.
- 3.3.2 Landscape and Visual Audit conducted during the Operational Phase of the project to follow up the compensatory planting under the requirements of the EIA for Proposed Extension of Public Golf Course at Kau Sai Chau , Sai Kung.
- 3.3.3 Under the Environmental Impact Assessment for the above, the proposed mitigation measures included both the compensatory planting works and treatment to structures. As stated in paragraphs 8.3 of the EM&A Manual, the contractor shall maintain all soft landscape works for a period of 12 months after implementation. This period shall be the establishment period and will be year one of the operation phase. Auditing inspections and reporting shall be undertaken once every two months of the operation phase.

#### Scope of Audit

- 3.3.4 The broad scope of the audit on mitigation measures during operation phase of East Course is to monitor the maintenance operations of tree planting to ensure all compensatory plants are well developed and grow during the Establishment Period. The monitoring programme for the reporting period is shown in **Annex A**.

### **3.4 Soil Nutrient**

- 3.4.1 Routine soil testing for nutrients at East Course will be conducted semi-annually to ensure that nutrient applications to the golf course are having the desired effect. Adjustments, if necessary, are made to the applications program approved by Golf Course Superintendent to amend any soil imbalances or deficiencies in nutrients. The details of the fertilizers and pesticides application will also be recorded.

#### **4. Monitoring Results**

4.1.1 Monitoring data are provided in **Annex C**.

#### **4.1 Water Quality**

4.1.2 Marine and freshwater water quality monitoring were conducted at the 9 and 6 designated monitoring stations respectively. The desalination plant commenced operation in December 2008.

4.1.3 Monitoring of marine and freshwater locations was conducted on 2 occasions in October and November (30<sup>th</sup> October and 11<sup>th</sup> November 2009). The QA/QC results for laboratory testing in the reporting month are acceptable and summarised in **Annex D**. No rainstorm signal was recorded during the reporting month.

4.1.4 As there is no water discharge from the Holes 5 / 6 through the drainage system during sampling, no water sample for F\_Filter was collected during the reporting month. Summary of fertilizer and pesticides applications are summarized in **Annex E**.

4.1.5 Chemical application according to the approved turfgrass management plan was applied during the reporting month.

##### Marine water

4.1.6 No exceedance was recorded during the reporting month.

##### Fresh water

4.1.7 No exceedance was recorded during the reporting month. As the pesticide monitoring was changed to bi-monthly, no monitoring was carried out during the reporting month.

#### **4.2 Marine Ecology**

4.2.1 Due to the removal of the temporary barging point, the operation phase coral monitoring was postponed and commenced in July 2008. The July 08 monitoring covering Site D2, Site C and the Control Site served as the baseline for the operation phase.

4.2.2 The present Marine Ecological Monitoring Survey was the fifth operation phase coral monitoring and the second semi-annual monitoring, and conducted on 17 October 2009. The weather conditions were good, and the underwater visibility was also good (approximately 3m). At Site D2, the 20 colonies of natural corals selected during the July 08 Baseline Survey were recovered and checked for conditions, while at, Site C and the Control Site, the same coral colonies adopted for construction phase monitoring were continuously used for monitoring purposes in operation phase.

4.2.3 Some corals in Site C and the Control Site were found missing during the July 08 baseline monitoring, probably due to the wave actions. Replacement coral colonies were selected in August 2008 (two in Site C and one in Control site) to maintain the number of tagged corals in each site to be 20.

4.2.4 It was found in the third monthly monitoring in October 2008, the Control Site and the coral communities inside were impacted by physical damages, possibly caused by severe adverse weather conditions in late September 2008. Three tagged corals in Control Site were missing

(i.e. X-16, X-18 & X-19) and physical damages on other tagged corals in Control Site were also observed, including X-02 (obvious damage at the tip), X-06 (buried by other damaged corals), X-10 (60% of the colonies were lost), and X-17 (60% of the colonies were lost). Though the physical damages, no sedimentation or bleaching was found on any of the tagged corals. Given the distance from the golf course and the observations on site, the damages on the tagged corals in the Control Site would not be caused by the Project. 5 Replacement corals (of the same species and similar sizes of the original tagged corals) were identified in the March 2009 monitoring to replace the missing ones and those subject to serious damage (i.e. X-06, X-16, X-17, X-18 and X-19).

- 4.2.5 Site C was on the south-eastern coast of Kau Sai Chau Island and had a high coral coverage among the sites investigated during the EIA Study. The sizes of coral colonies at Site C were also larger than those at other sites. Site C was away from the boundary of the new golf course and would not be subject to direct impacts during construction. The site and its vicinity still remained similar conditions as during the Baseline Survey. Among the 20 tagged corals in Site C, C-04 and C-20 were found missing during the July 08 baseline survey. Replacement coral colonies were selected in August 2008. For all tagged corals, no mortality, bleaching or sedimentation was found. (see **Table 4.2-1** and **Annex C - Photo Plates 4.2-1 to 4.2-2**).
- 4.2.6 Site D2 is close to the desalination plant. The monitoring site was not within area to be directly impacted by the project, but was located about 80m to the south of the existing ferry pier, where an area of hard substrates (bedrock and boulders) was present. The seabed was covered by bedrock. The bedrock cover continued to over 100m south from the pier. It was estimated that less than 5% coverage of corals was on the bedrock area, but the sizes of those colonies were fairly large (some reach 30cm). 20 natural corals were selected during the baseline survey in December 2005 (with codes ranging from D-01 to D-20). The distribution of these selected corals ran along the contour of the bedrock, rather than parallel with the coastline as most natural corals occurred along the bed rock edge. Due to no commencement of dredging work for the desalination plant during the construction phase, monitor at Site D2 were not required during the construction phase. As the original baseline monitoring for the corals in Site D2 were conducted over 3.5 years before in December 2005, the previously tagged corals at Site D2 have mostly lost the tags. 20 new corals were selected during the July 08 baseline monitoring in Site D2 for operation phase monitoring purposes. The species of corals selected in Site D2 included the following 10 species: *Acropora tumida*, *Cyphastrea serailia*, *Favia speciosa*, *Favites chinensis*, *Goniastrea aspera*, *Goniopora columna*, *Gonipora stutchburyi*, *Pavona decussata*, *Porties lobata*, and *Turbinaria peltata*. The conditions, mortality, sedimentation and bleaching of these 20 corals were shown in **Table 4.2-2** and **Annex C - Photo Plates 4.2-3 to 4.2-4**). No mortality, bleaching or sedimentation was found on most of the tagged corals. Except that bleaching was observed on D-17 (about 50%). Given that no other bleaching was observed on other tagged corals at Site D, the bleaching on D-17 is not considered to be caused by the Project.
- 4.2.7 The occurrence of seagrasses at Site D2 and Site D3 were checked. No seagrasses were found at Site D2, and the seagrass colonies previously observed at Site D3 was not found.
- 4.2.8 The Control Site is the buoy of coral marker established by AFCD in Sharp Island. Similar with Site C, both the coral coverage percentage and the sizes of coral colonies were high at this site. This site would not be impacted by the Project, and its vicinity still remained similar conditions as during the Construction Phase Monitoring. Coral X-05 was lost in previous construction phase monitoring in June 2006. Replacement coral for X-05 was selected in the August 2008. 5 tagged corals were found lost or subject to serious physical damages in October 2008, possibly caused by previous severe adverse weather conditions. In the March 2009 monitoring, 5 Replacement corals (of the same species and similar sizes of the original tagged corals) were identified to replace the missing ones and those subject to serious damage. The conditions of

the newly tagged replacement corals and the conditions, mortality, sedimentation and bleaching of the original tagged corals were show in **Table 4.2-3** and **Annex C - Photo Plates 4.2-5 to 4.2-6**. In the present monitoring, no mortality, sedimentation or bleaching was found on any of the tagged corals (see **Table 4.2-3**).

4.2.9 **Photo Plates 4.2-1 to 4.2-6** showed the photos of each tagged corals. The assigned numbers, species, mortality percentage, sedimentation coverage percentage and bleaching percentage of the baseline conditions of tagged corals and their present conditions were presented in **Tables 4.2-1 to 4.2-3** below.

**Table 4.2-1 Conditions of tagged corals at Site C**

Code of tagged corals	Species	Baseline Survey (July 2008)			Monitoring Survey (October 2009)		
		Mortality (%)	Sedimentation (%)	Bleaching (%)	Mortality (%)	Sedimentation (%)	Bleaching (%)
C-01	<i>Platygyra carnosus</i>	0	0	0	0	0	0
C-02	<i>Platygyra carnosus</i>	0	0	0	0	0	0
C-03	<i>Favia speciosa</i>	0	0	0	0	0	0
C-04*	<i>Favia speciosa</i>	0	0	0	0	0	0
C-05	<i>Turbinaria peltata</i>	0	0	0	0	0	0
C-06	<i>Favia speciosa</i>	0	0	0	0	0	0
C-07	<i>Platygyra acuta</i>	0	0	0	0	0	0
C-08	<i>Platygyra acuta</i>	0	0	0	0	0	0
C-09	<i>Favia speciosa</i>	0	0	0	0	0	0
C-10	<i>Platygyra acuta</i>	0	0	0	0	0	0
C-11	<i>Favia speciosa</i>	0	0	0	0	0	0
C-12	<i>Platygyra acuta</i>	0	0	0	0	0	0
C-13	<i>Platygyra carnosus</i>	0	0	0	0	0	0
C-14	<i>Favia speciosa</i>	0	0	0	0	0	0
C-15	<i>Goniopora columna</i>	0	0	0	0	0	0
C-16	<i>Platygyra carnosus</i>	0	0	0	0	0	0
C-17	<i>Goniopora columna</i>	0	0	0	0	0	0
C-18	<i>Platygyra carnosus</i>	0	0	0	0	0	0
C-19	<i>Favites pentagona</i>	0	0	0	0	0	0
C-20**	<i>Goniopora columna</i>	0	0	0	0	0	0

\*The original C-04 has been missing during the construction phase monitoring and a replacement colony of *Favia speciosa* was selected.

\*\*The original C-20 has been missing during the construction phase monitoring and a replacement colony of *Goniopora columna* was selected.

**Table 4.2-2 Conditions of tagged corals at Site D2**

Code of tagged corals	Species	Baseline Survey (July 2008)			Monitoring Survey (October 2009)		
		Mortality (%)	Sedimentation (%)	Bleaching (%)	Mortality (%)	Sedimentation (%)	Bleaching (%)
D-01	<i>Goniopora columna</i>	0	0	0	0	0	0
D-02	<i>Goniastrea aspera</i>	0	0	0	0	0	0
D-03	<i>Favia speciosa</i>	0	0	0	0	0	0
D-04	<i>Favia speciosa</i>	0	0	0	0	0	0
D-05	<i>Goniastrea aspera</i>	0	0	0	0	0	0
D-06	<i>Goniastrea aspera</i>	0	0	0	0	0	0
D-07	<i>Goniopora stutchburyi</i>	0	0	0	0	0	0
D-08	<i>Turbinaria peltata</i>	0	0	0	0	0	0
D-09	<i>Goniastrea aspera</i>	0	0	0	0	0	0
D-10	<i>Goniastrea aspera</i>	0	0	0	0	0	0
D-11	<i>Favia speciosa</i>	0	0	0	0	0	0
D-12	<i>Turbinaria peltata</i>	0	0	0	0	0	0
D-13	<i>Turbinaria peltata</i>	0	0	0	0	0	0
D-14	<i>Favites chinensis</i>	0	0	0	0	0	0
D-15	<i>Porites lobata</i>	0	0	0	0	0	0
D-16	<i>Turbinaria peltata</i>	0	0	0	0	0	0
D-17	<i>Acropora tumida</i>	0	0	0	0	0	50
D-18	<i>Cyphastrea serailia</i>	0	0	0	0	0	0
D-19	<i>Cyphastrea serailia</i>	0	0	0	0	0	0
D-20	<i>Pavonna descussata</i>	0	0	0	0	0	0

**Table 4.2-3 Conditions of tagged corals at Control Site**

Code of tagged corals	Species	Baseline Survey (July 2008)			Monitoring Survey (October 2009)		
		Mortality (%)	Sedimentation (%)	Bleaching (%)	Mortality (%)	Sedimentation (%)	Bleaching (%)
X-01	<i>Platygyra carnosus</i>	0	0	0	0	0	0
X-02	<i>Platygyra carnosus</i>	0	0	0	0	0	0
X-03	<i>Platygyra carnosus</i>	0	0	0	0	0	0
X-04	<i>Pavona decussata</i>	0	0	0	0	0	0
X-05*	<i>Platygyra carnosus</i>	0	0	0	0	0	0
X-06**	<i>Platygyra carnosus</i>	0	0	0	0	0	0
X-07	<i>Platygyra carnosus</i>	0	0	0	0	0	0
X-08	<i>Favites abdita</i>	0	0	0	0	0	0
X-09	<i>Cyphastrea serailia</i>	0	0	0	0	0	0
X-10	<i>Cyphastrea serailia</i>	0	0	0	0	0	0
X-11	<i>Platygyra carnosus</i>	0	0	0	0	0	0
X-12	<i>Platygyra acuta</i>	0	0	0	0	0	0
X-13	<i>Platygyra acuta</i>	0	0	0	0	0	0
X-14	<i>Platygyra acuta</i>	0	0	0	0	0	0
X-15	<i>Platygyra acuta</i>	0	0	0	0	0	0
X-16**	<i>Platygyra acuta</i>	0	0	0	0	0	0

Code of tagged corals	Species	Baseline Survey (July 2008)			Monitoring Survey (October 2009)		
		Mortality (%)	Sedimentation (%)	Bleaching (%)	Mortality (%)	Sedimentation (%)	Bleaching (%)
X-17**	<i>Favia speciosa</i>	0	0	0	0	0	0
X-18**	<i>Platygyra acuta</i>	0	0	0	0	0	0
X-19**	<i>Goniastrea aspera</i>	0	0	0	0	0	0
X-20	<i>Cyphastrea serailia</i>	0	0	0	0	0	0

\* The original X-05 has been missing during the construction phase monitoring and a replacement colony of *Platygyra carnosus* was selected.

\*\* The original X-06, X-16, X-17, X-18 and X-19 were found lost or seriously damaged by weather in October 2008. Replacement corals were identified in March 2009.

4.2.10 The upcoming semi-annual monitoring is scheduled in February 2010 (dry season).

### 4.3 Landscape & Visual

4.3.1 General observations for planting works and maintenance operations during the present site audit are shown below:

- In the previous monitoring, according to the 980 trees shown in as-built planting plan, 175 individuals of trees were found missing, dead, or fallen on ground, and would thus need remedial actions (replanting or erecting). The majority of these trees were still part of the 582 dead trees previously reported in January 2009 inspection. The Contractor was required either to replace these dead trees or to remove them as maintenance works.
- During the present audit, however, replanting works were observed in many planting locations. 305 individuals of trees were found missing, dead, or fallen on ground, and would thus need remedial actions (replanting or erecting or replacement).
- Major landscape maintenance operations and replanting works were carried out by the Contractor recently as recently replanted trees were observed in different locations; and
- A detailed summary of the inspection was shown on the drawings enclosed under **Annex C**.

4.3.2 Recommendations are shown below:

- The Contractor was recommended to perform landscape maintenance operations, including providing replacement plants, and removing all dead trees; erecting the fallen trees; providing stakes for leaning trees; re-staking all trees with broken/leaning tree stakes; pruning of die back tree branches; fertilizing of plants; and cutting of overgrown grass and removal of weeds on slopes, to ensure a healthy establishment of the compensatory planting;
- It is suggested that the Contractor should consider the replace the missing or dead trees with shrubs in areas which are more exposed or windy. As observed from previous monitoring, the exposed and windy areas with higher ratios of missing/fallen trees and higher frequency of tree replacement. On the other hand, the native shrubs planted in various locations of the site have been in good conditions since their planting, and were observed fruiting in the present monitoring. Fruits/berries on shrubs are a food source for birds and can enhance the ecological resources in the area;

- The Contractor was reminded to erect the fallen trees and to provide tree stakes to those trees for supporting; and
- The Contractor was reminded to carry out regular inspection of all tree stakes, especially trees on locations where it could be easily blown over in strong wind conditions, and rectify all defects as soon as possible.

4.3.3 The present audit is the final audit of the one year monitoring programme (once in every two months) starting from January 2009.

#### **4.4 Soil Nutrient**

4.4.1 The soil sampling was carried out in November 2009 and results will be available in December 2009.

## **5. Conclusions**

- 5.1.1 The Environmental Monitoring and Audit (EM&A) Report presents the operational EM&A works undertaken during the period from 25<sup>th</sup> October to 24<sup>th</sup> November 2009 in accordance with EM&A Manual and the requirement under EP-224-2005/A.
- 5.1.2 No exceedance on marine stations and fresh water stations are recorded.
- 5.1.3 Coral monitoring was carried out in October 2009. No mortality, bleaching or sedimentation was found on most of the tagged corals except bleaching was observed on D-17 (about 50%).
- 5.1.4 The soil sampling was taken in November 2009 and the analysis result is expected to be available in December 2009.
- 5.1.5 The final landscape and visual site audit was completed during the reporting month. The Contractor was reminded to replace the carry out landscape maintenance works and remove/replace the damage / dead trees with shrubs, in particular at those areas are vulnerable to strong wind.
- 5.1.6 No environmental complaint / summon was received during the reporting month.



# **Annex A**

## **Monitoring Programme for the reporting month**

<b>October 2009</b>						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
18	19	20	21	22	23	24
25 ME	26	27	28	29	30 WQ	31

<b>November 2009</b>						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11 WQ	12	13	14
15	16	17	18	19	20	21
22	23	24	25 LV	26	27	28
29	30					

WQ: Water Quality Monitoring (WQ); Rainstorm Water Sampling (RWQ)  
 ME: Marine Ecology  
 LV: Landscape and Visual

# **Annex B**

## **Event Action Plan**

### **Event and Action Plan for Water Quality**

Should monitoring results of the water quality parameters at any designated monitoring station exceed the water quality criteria related to turf management, action the proposed actions to be taken shall be as follows:

- inform Golf Course Manager immediately and stop chemical application;
- notify EPD and AFCD;
- review the application and re-evaluate suitability and availability of alternatives to chemical controls, etc.;
- agree remedial measures with Golf Course Manager and inform EPD and AFCD;
- implement the agreed remedial measures immediately; and
- increase monitoring frequency and/or locations to demonstrate effectiveness of the remedial measures.

**Action and Limit level and Event Action Plan for natural corals monitoring**

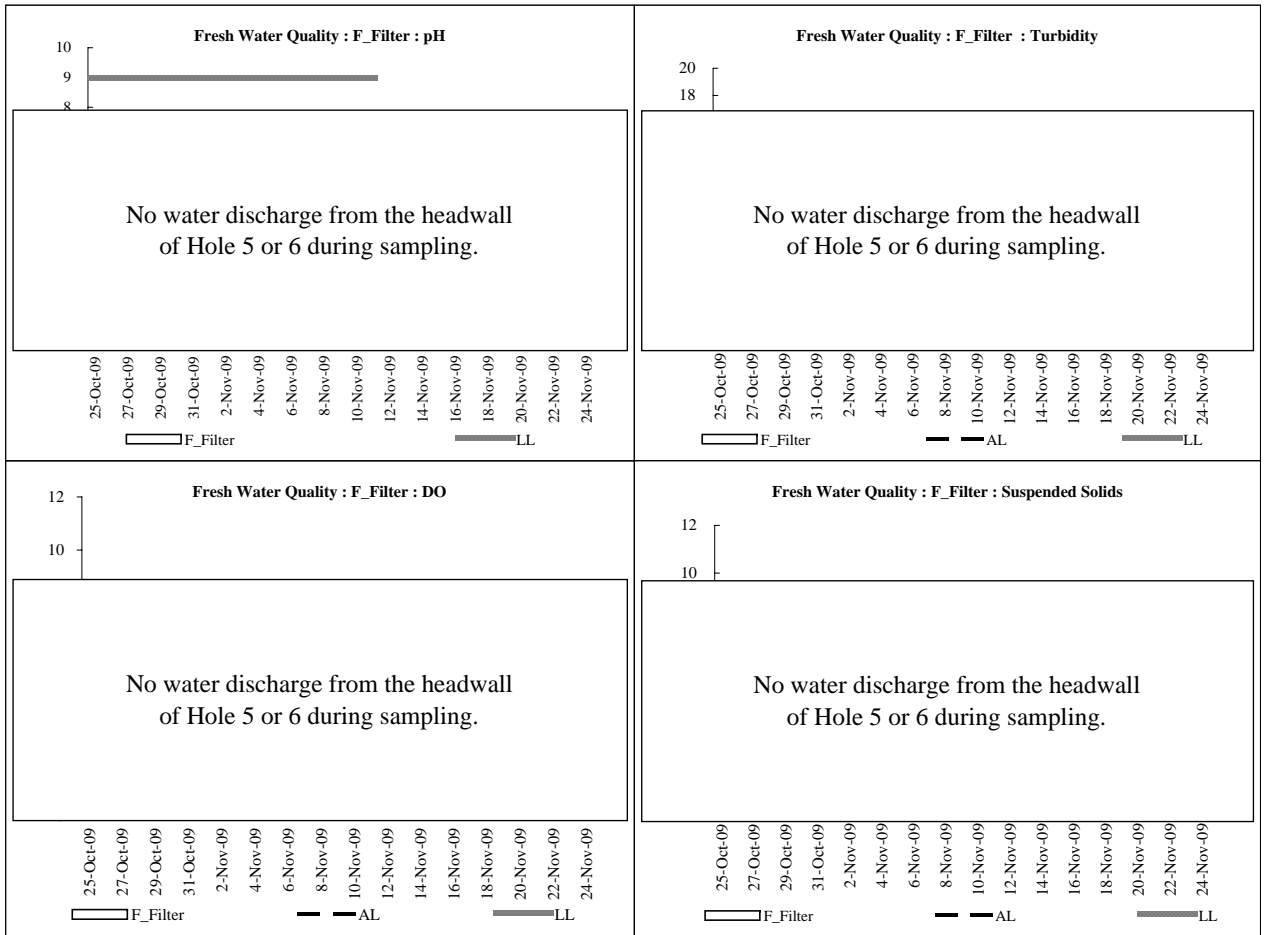
<b>Parameters</b>	<b>Action Level</b>	<b>Limit Level</b>
Sedimentation	a 15% increase in the percentage of sedimentation on the hard corals occurs at more than 20% of the tagged coral colonies at one or more monitoring sites	a 25% increase in the percentage of sedimentation on the hard corals occurs at more than 20% of the tagged coral colonies at one or more monitoring sites
Bleaching	a 15% increase in the percentage of bleaching of hard corals occurs at more than 20% of the tagged coral colonies at one or more monitoring sites	a 25% increase in the percentage of bleaching of hard corals occurs at more than 20% of the tagged coral colonies at one or more monitoring sites
Mortality	a 15% increase in the percentage of partial mortality of corals occurs at more than 20% of the tagged coral colonies at one or more monitoring sites	a 25% increase in the percentage of partial mortality of corals occurs at more than 20% of the tagged coral colonies at one or more monitoring sites

<b>Action</b>	<b>Action Level</b>	<b>Limit Level</b>
Operation phase	If the Action Level is exceeded the ET Leader should inform Golf Course Operator, EPD, and AFCD. The data from the water quality monitoring should also be reviewed. If the water quality monitoring shows no attributable effects of the installation works, then the Action Level is not triggered. If the water quality data indicate exceedances (salinity and/or pesticides) the ET Leader should discuss with the Golf Course Operator the most appropriate method of reducing salinity (e.g. reduce the daily operation time of the desalination plant), and/or control chemicals from runoff (e.g. reduce the frequency and quantity of chemical applied, check the intactness and effectiveness of the closed drainage system and stream buffer zone). This mitigated method should then be enacted on the next working day.	If the Limit Level is exceeded the ET Leader should inform all parties Golf Course Operator, EPD, and AFCD immediately. Should the Limit Level be exceeded, the Golf Course Operator should stop the operation of the desalination plant and/or the application of chemicals immediately and work out the solution according to the requirements of EPD and AFCD. The operation of the desalination plant and/or the application of chemicals would be suspended until an effective solution is identified.

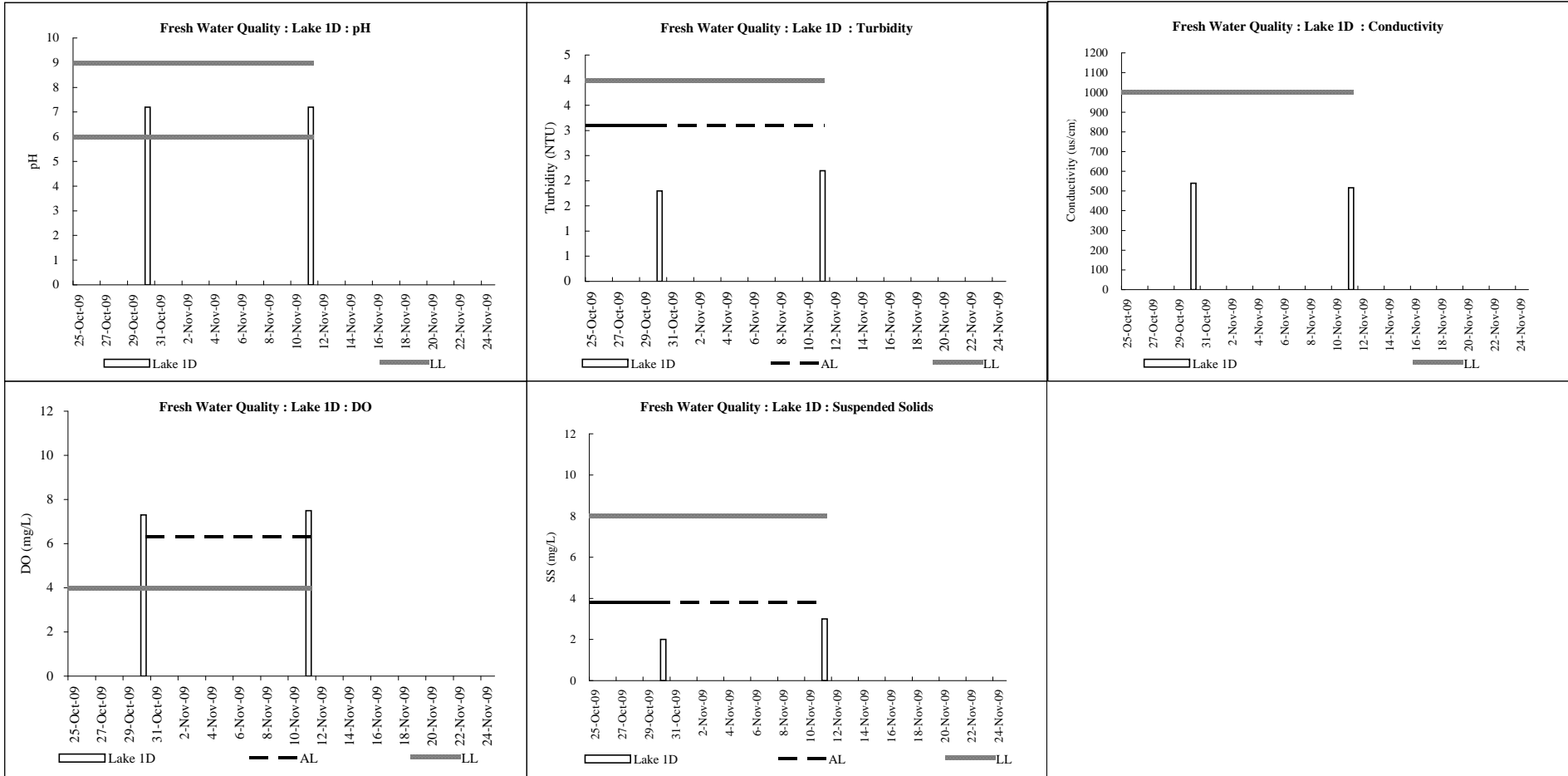
# **Annex C**

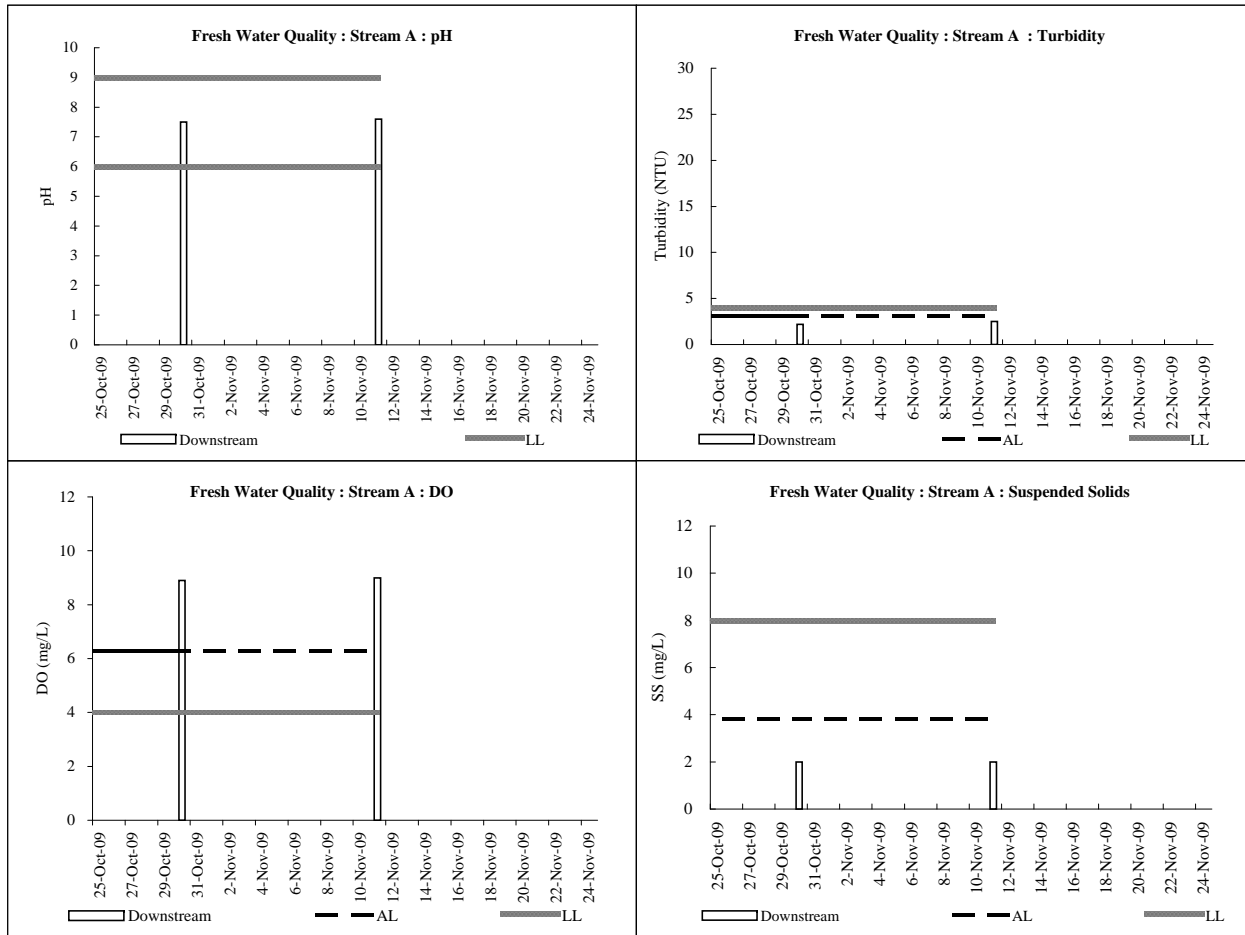
## **Monitoring results**

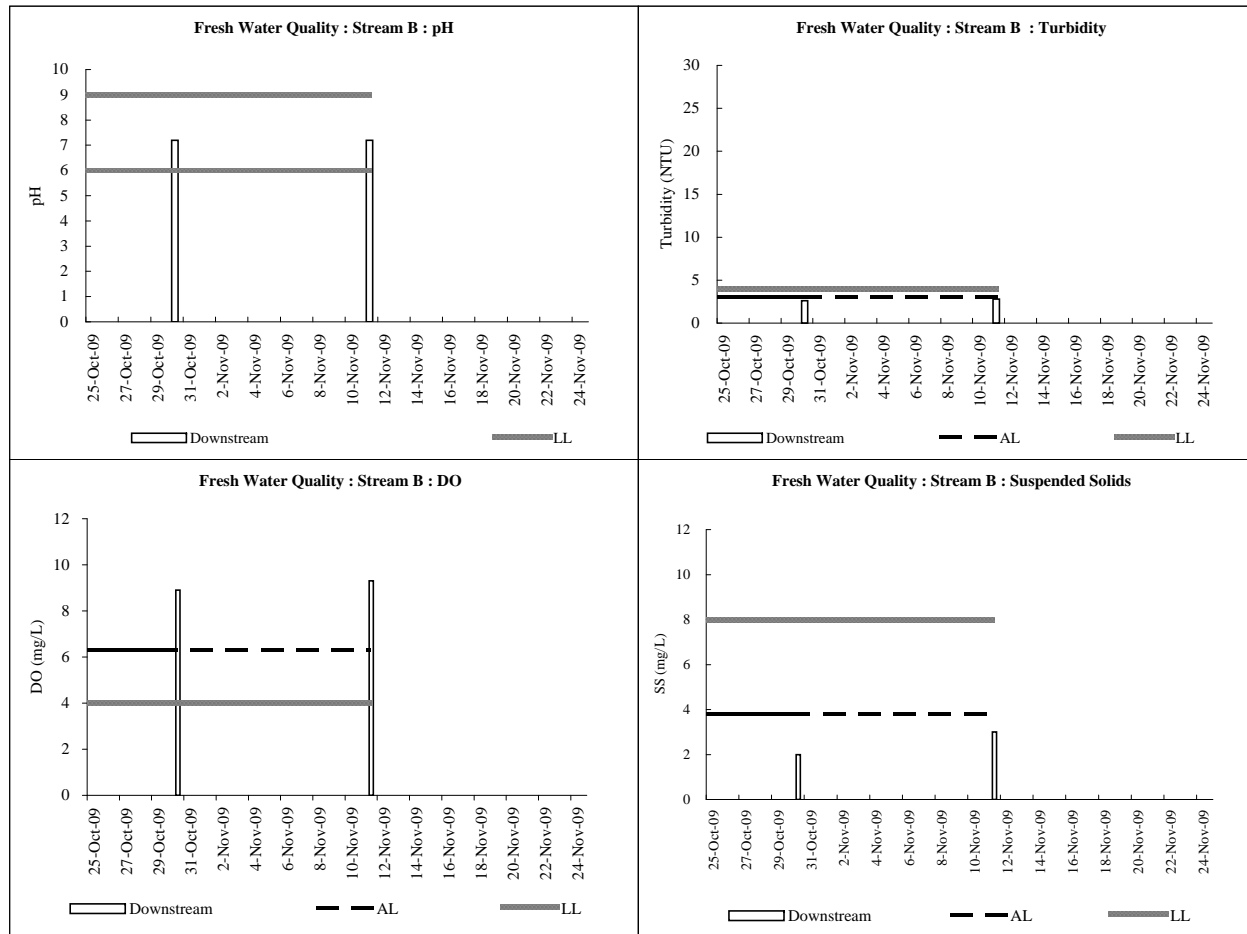
# Water Quality

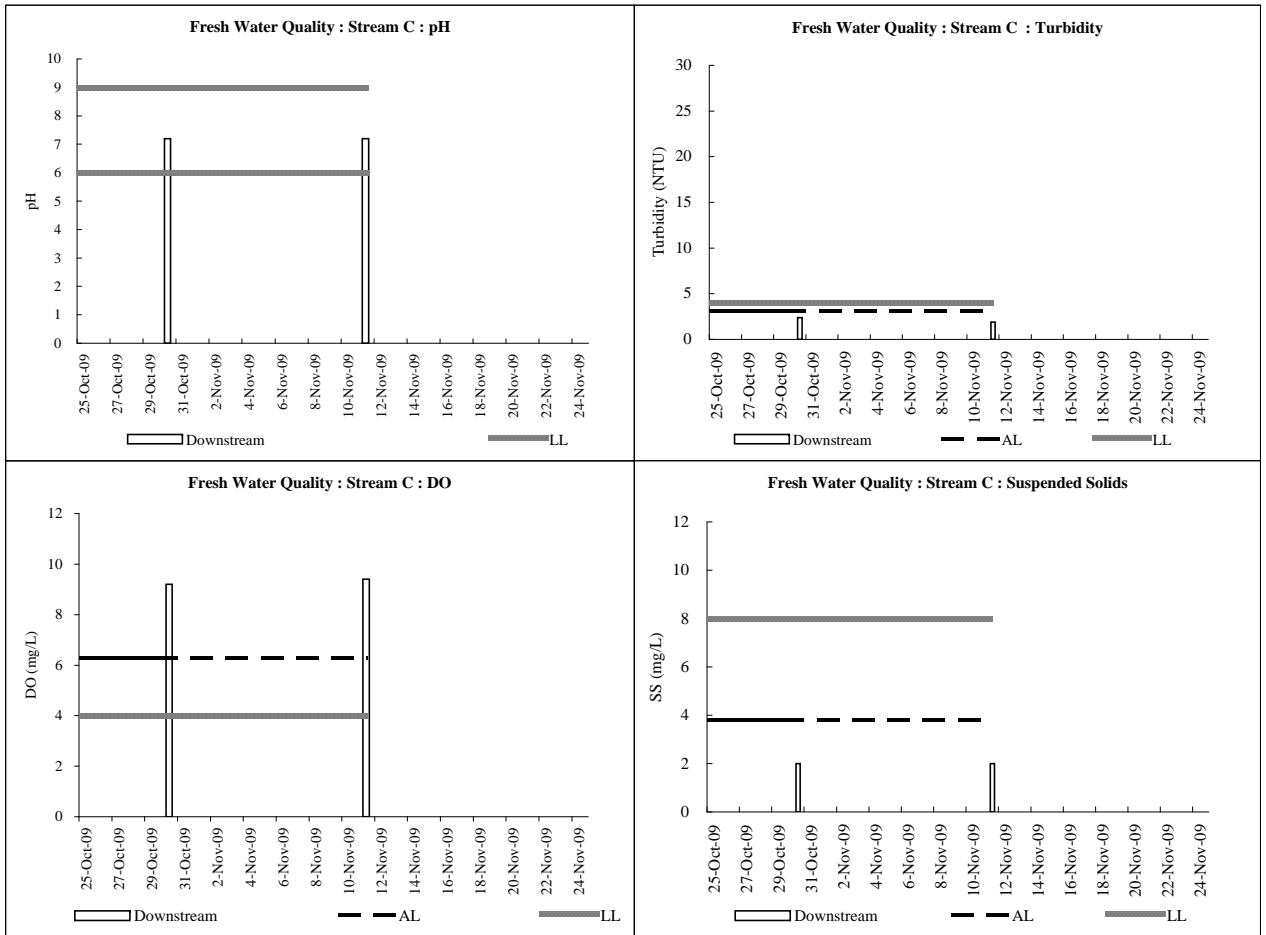


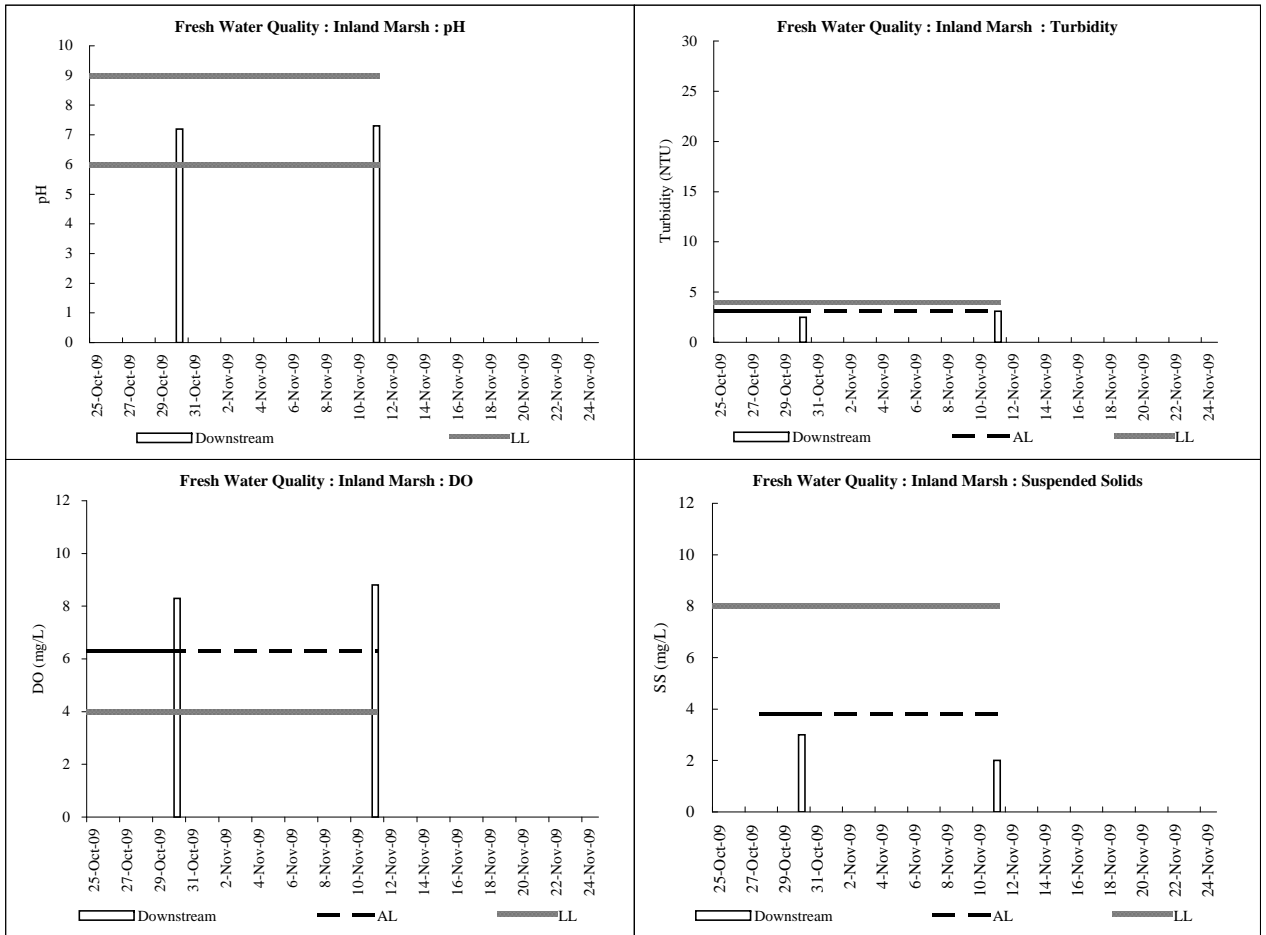


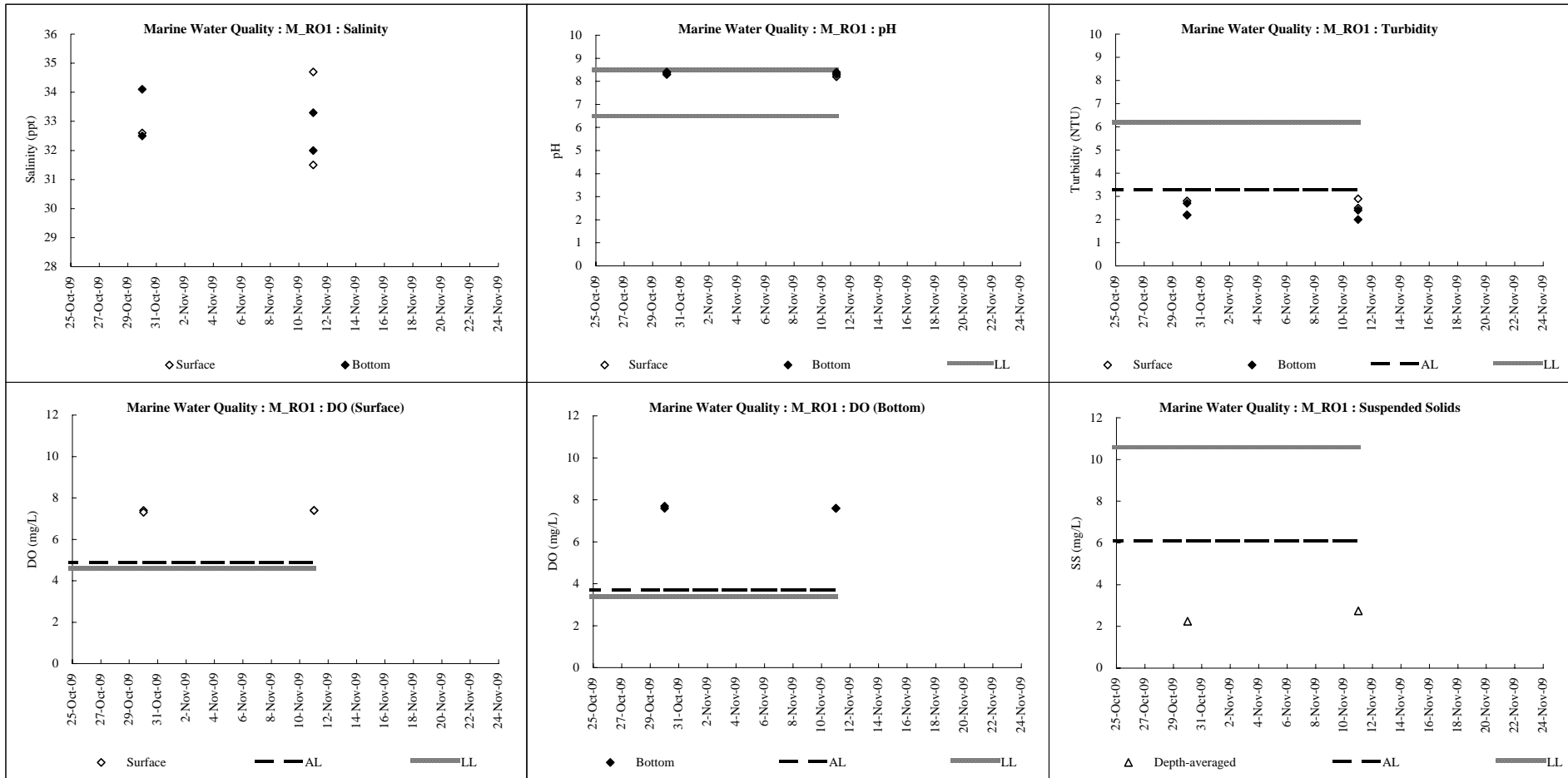


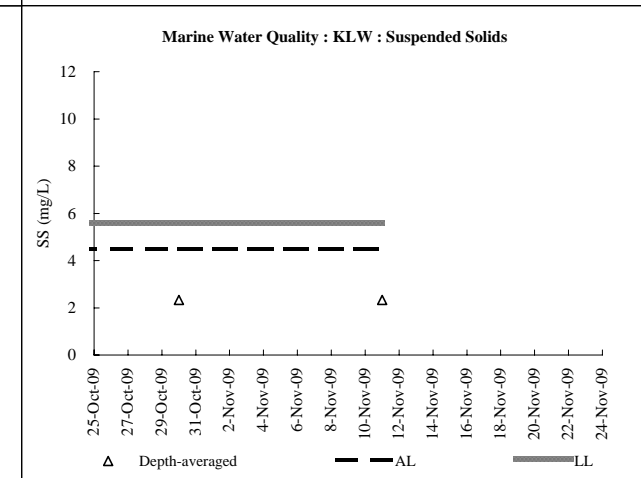
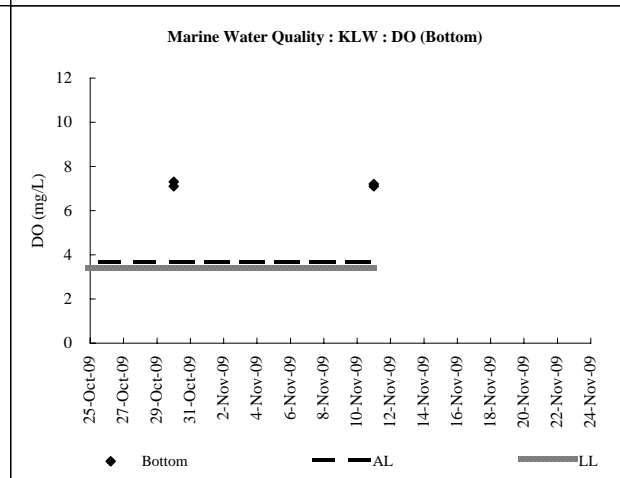
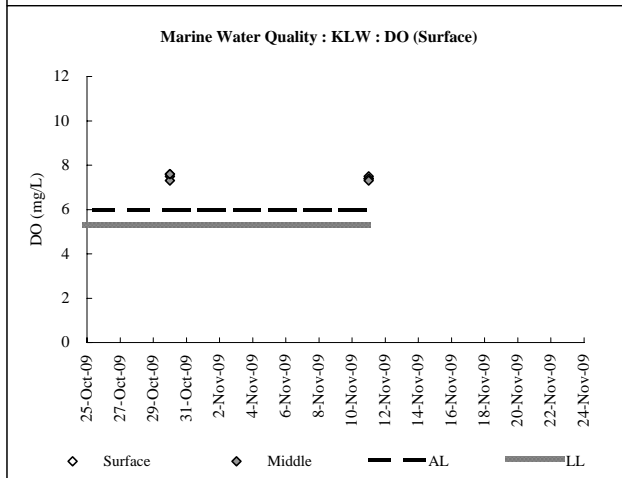
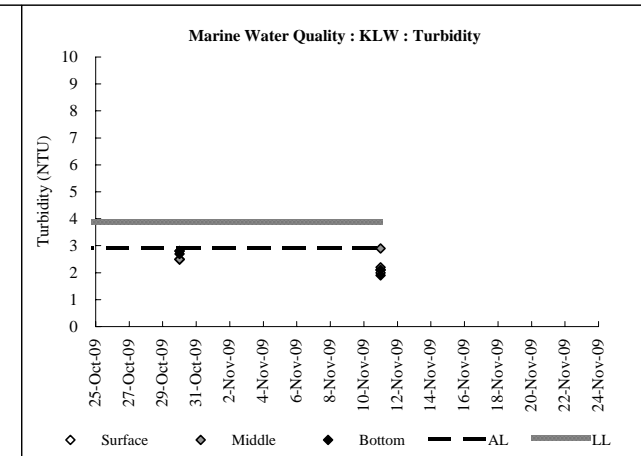
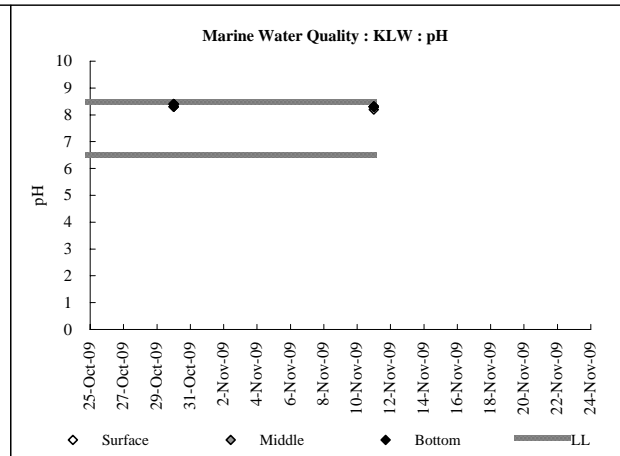
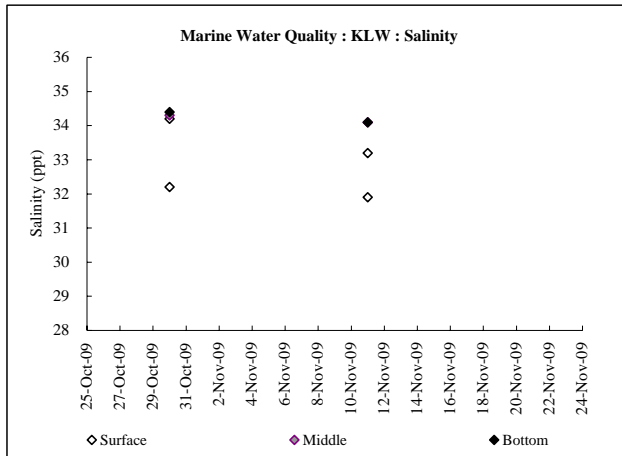


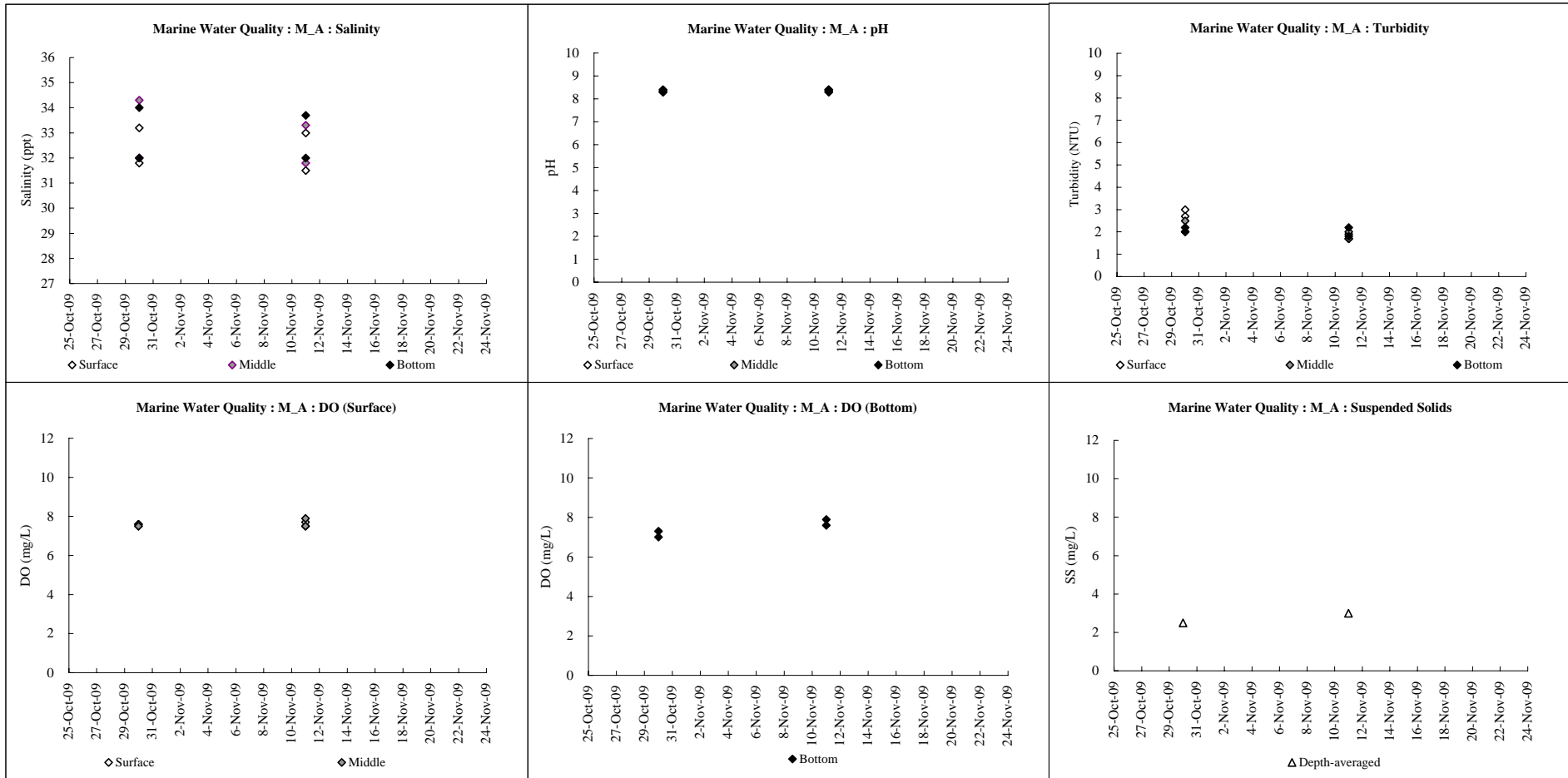




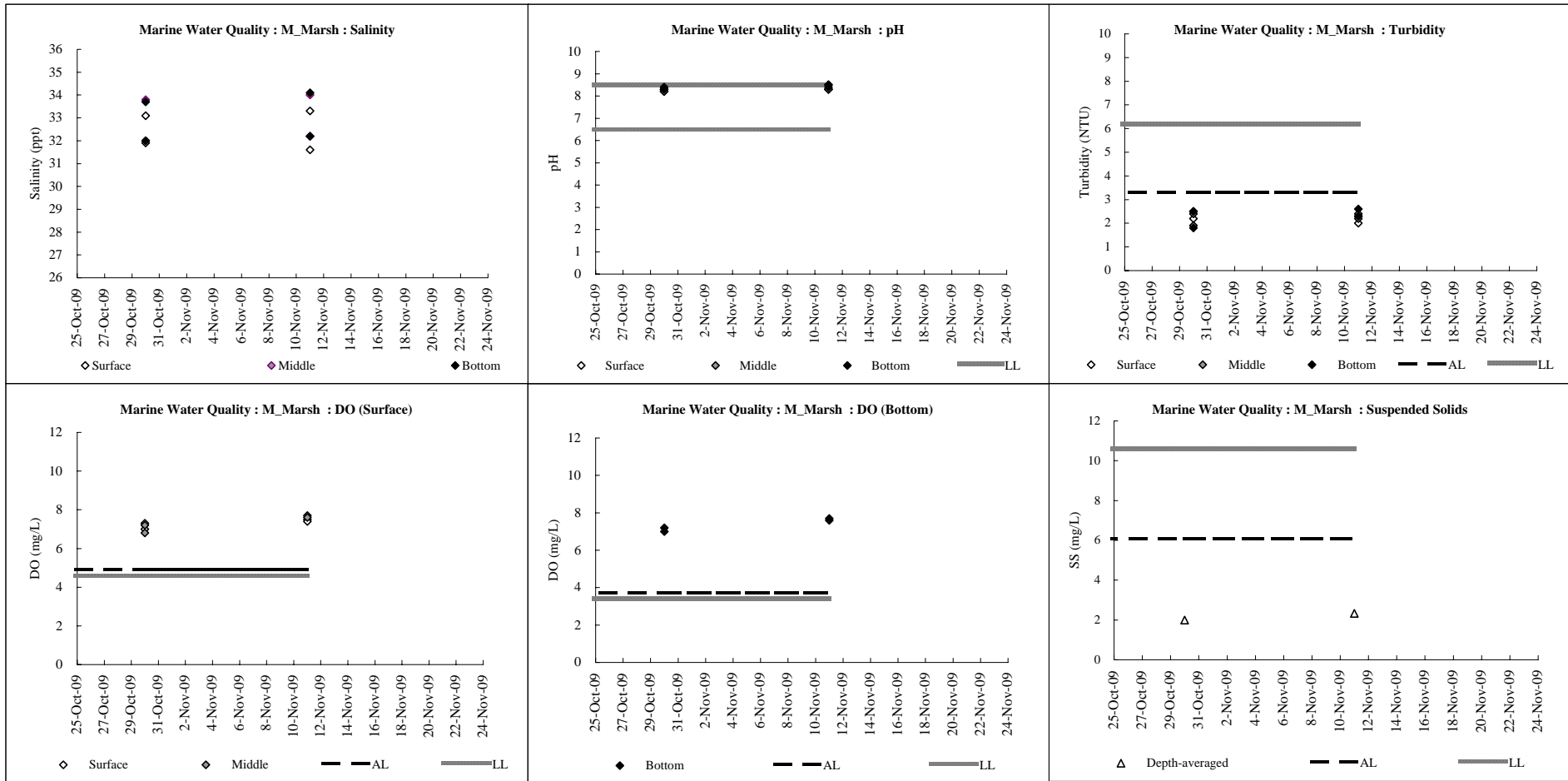


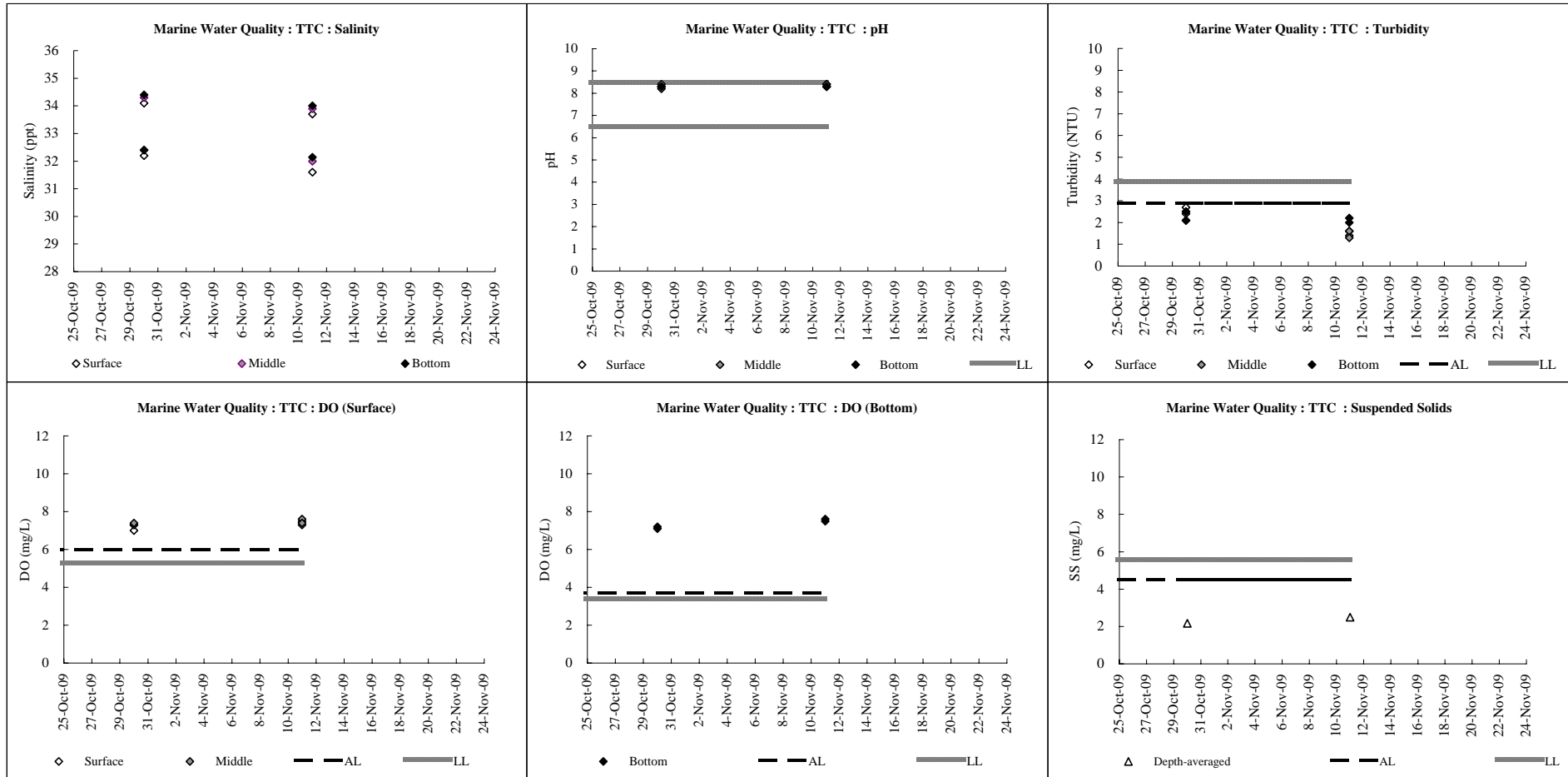


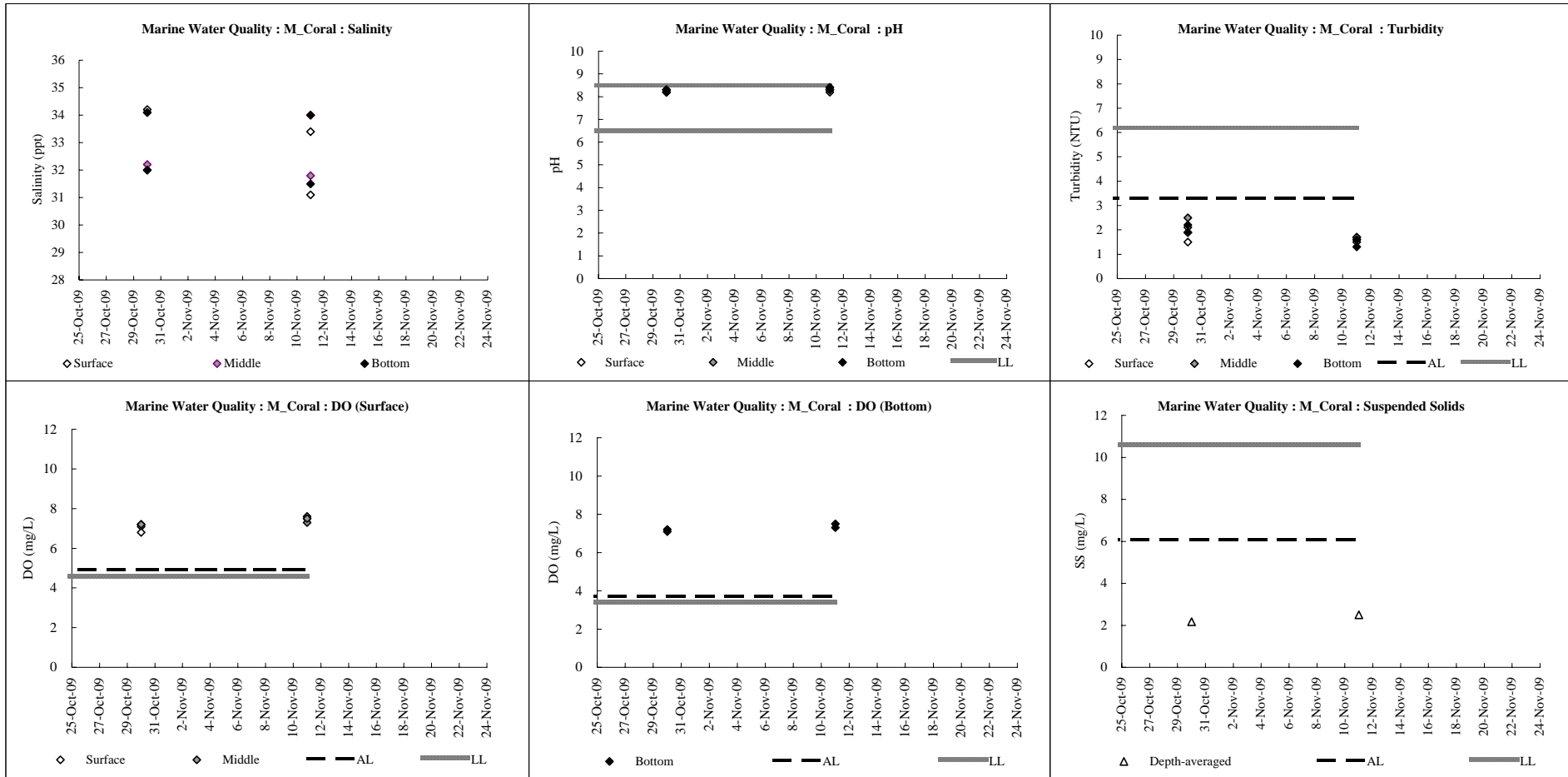


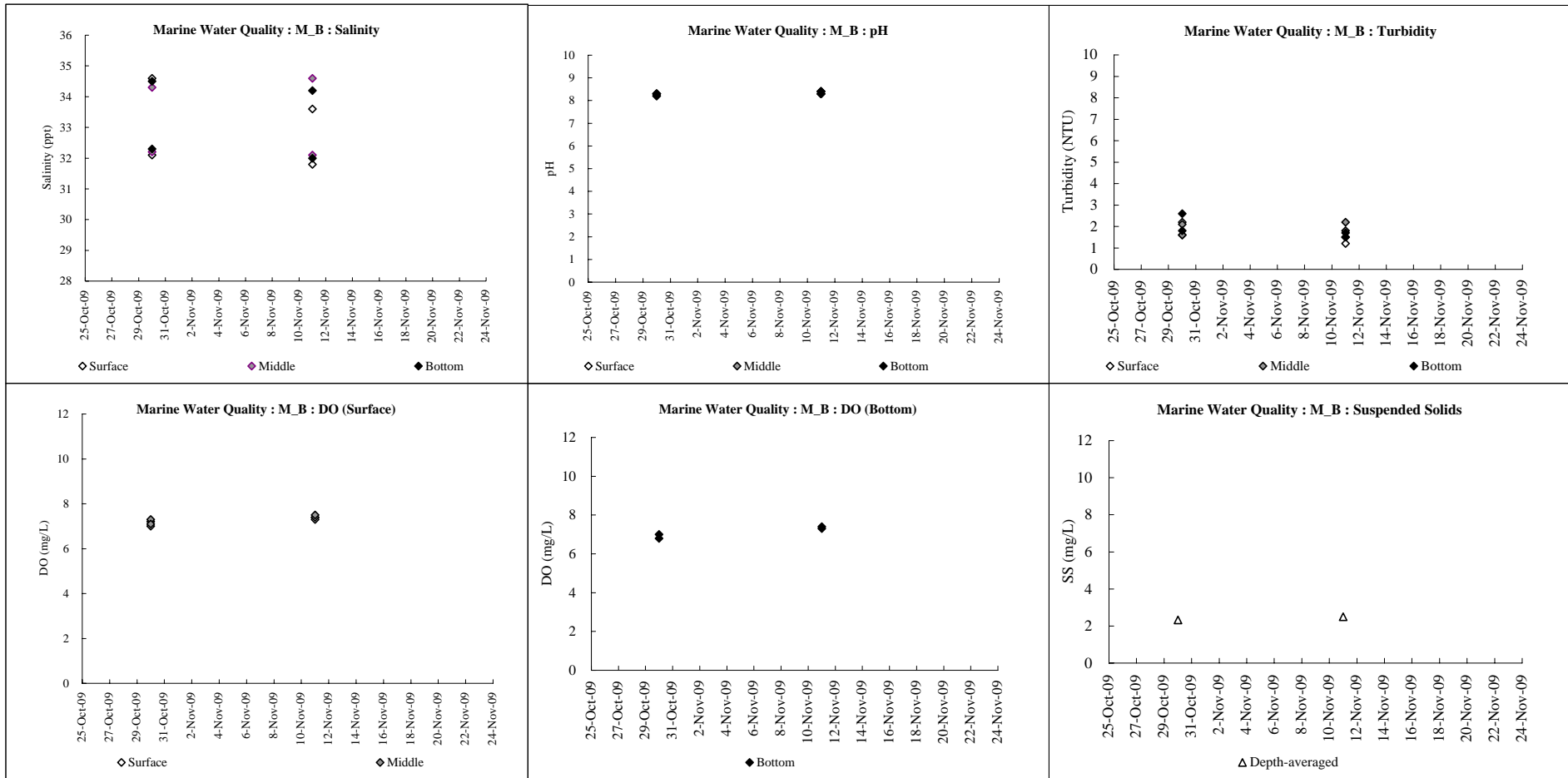


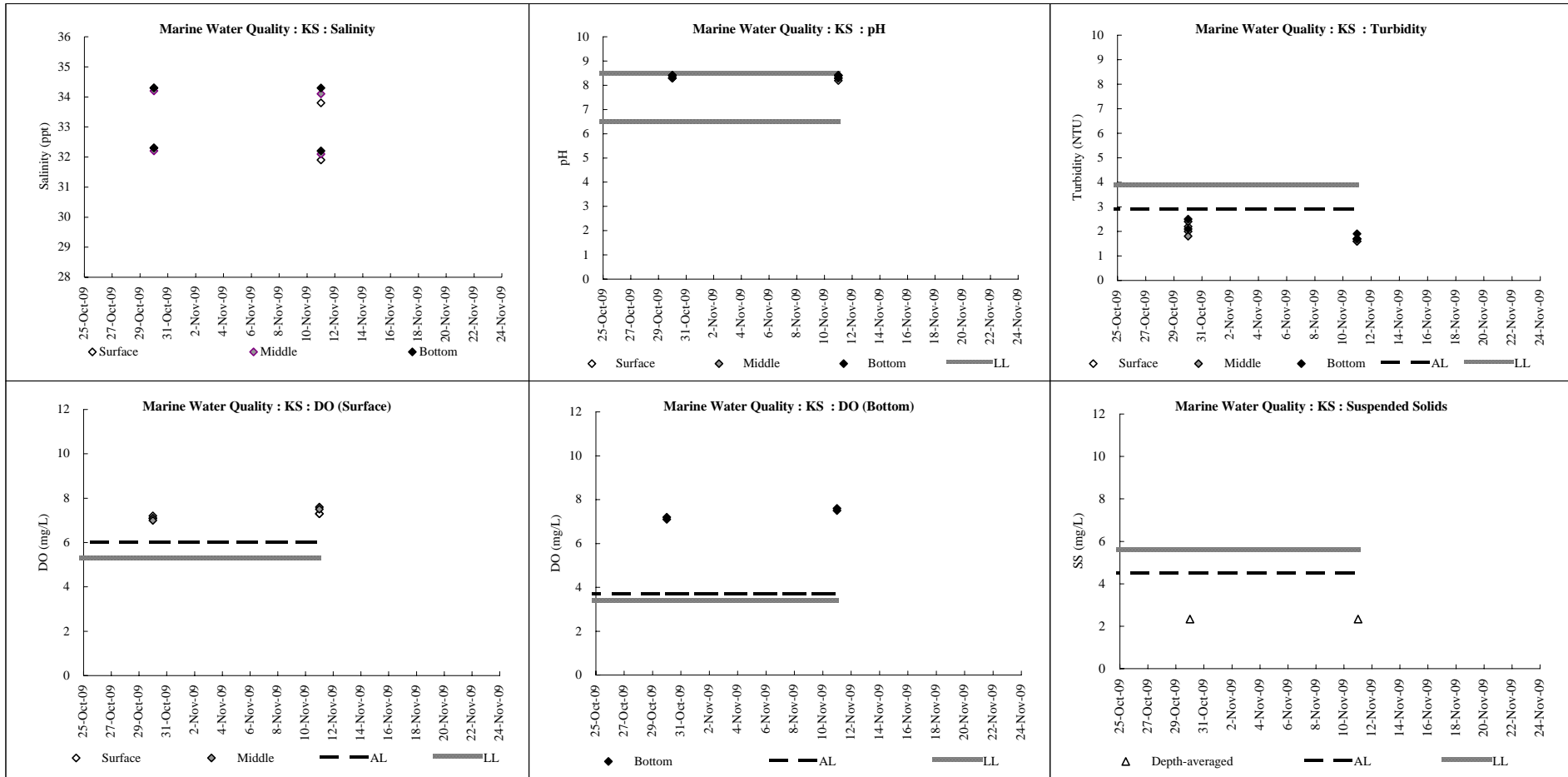


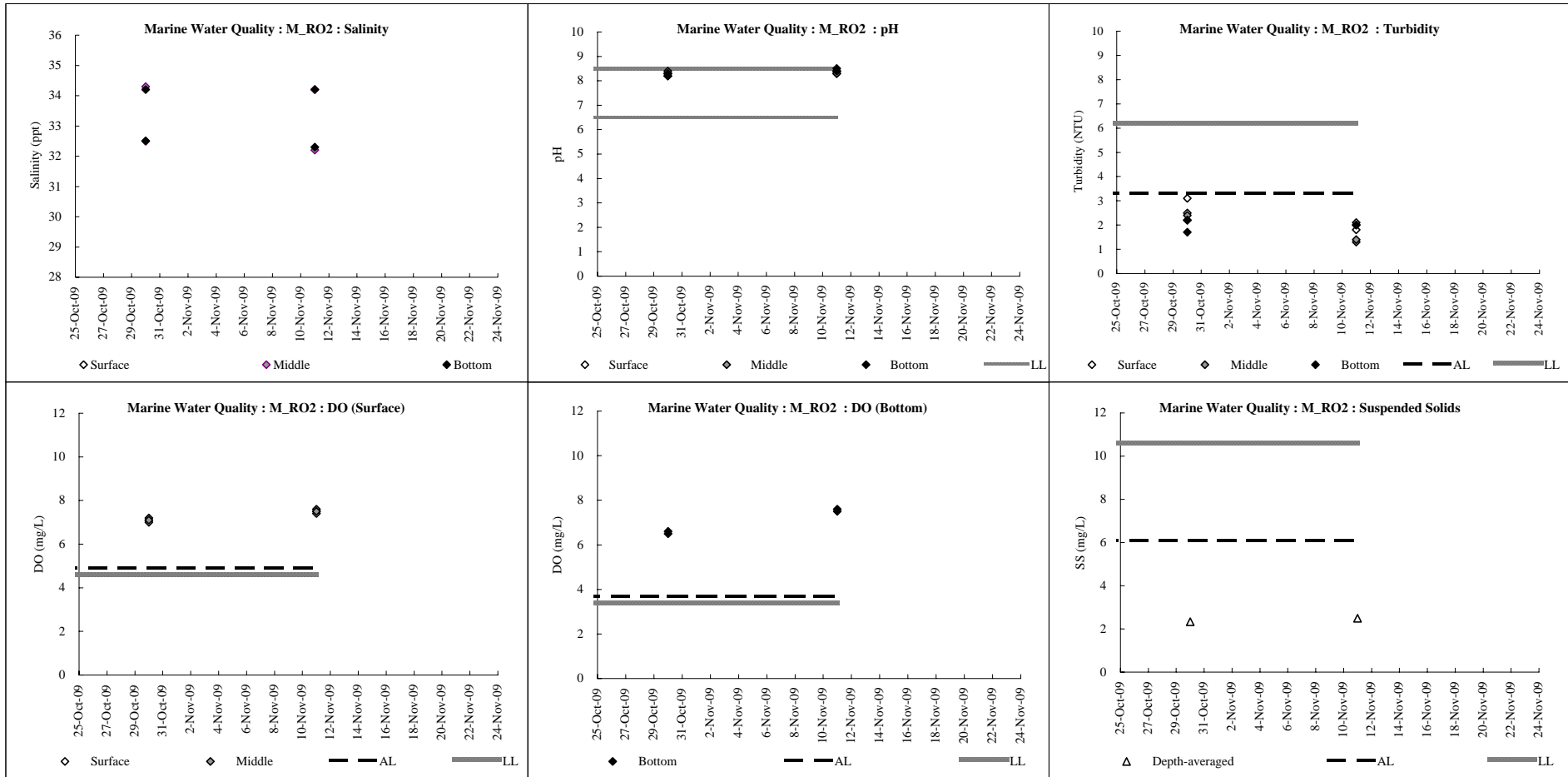


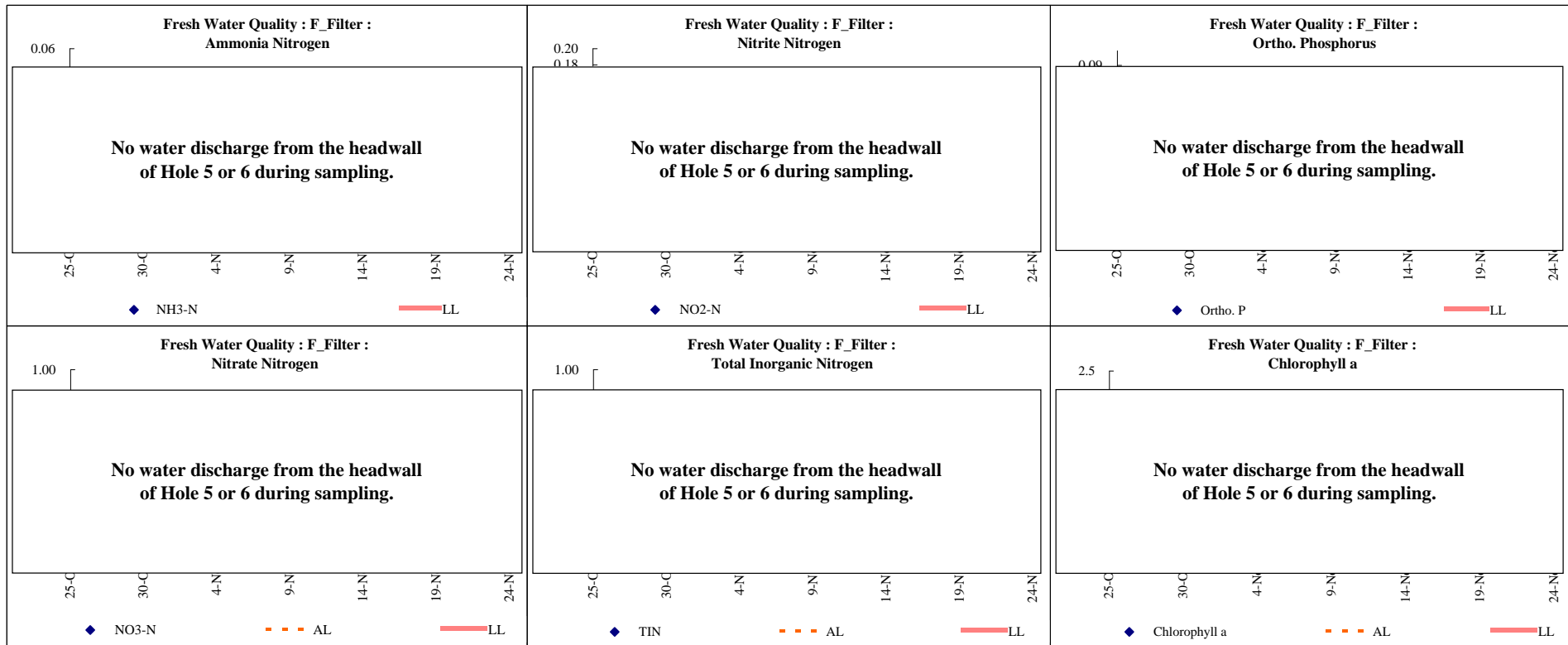


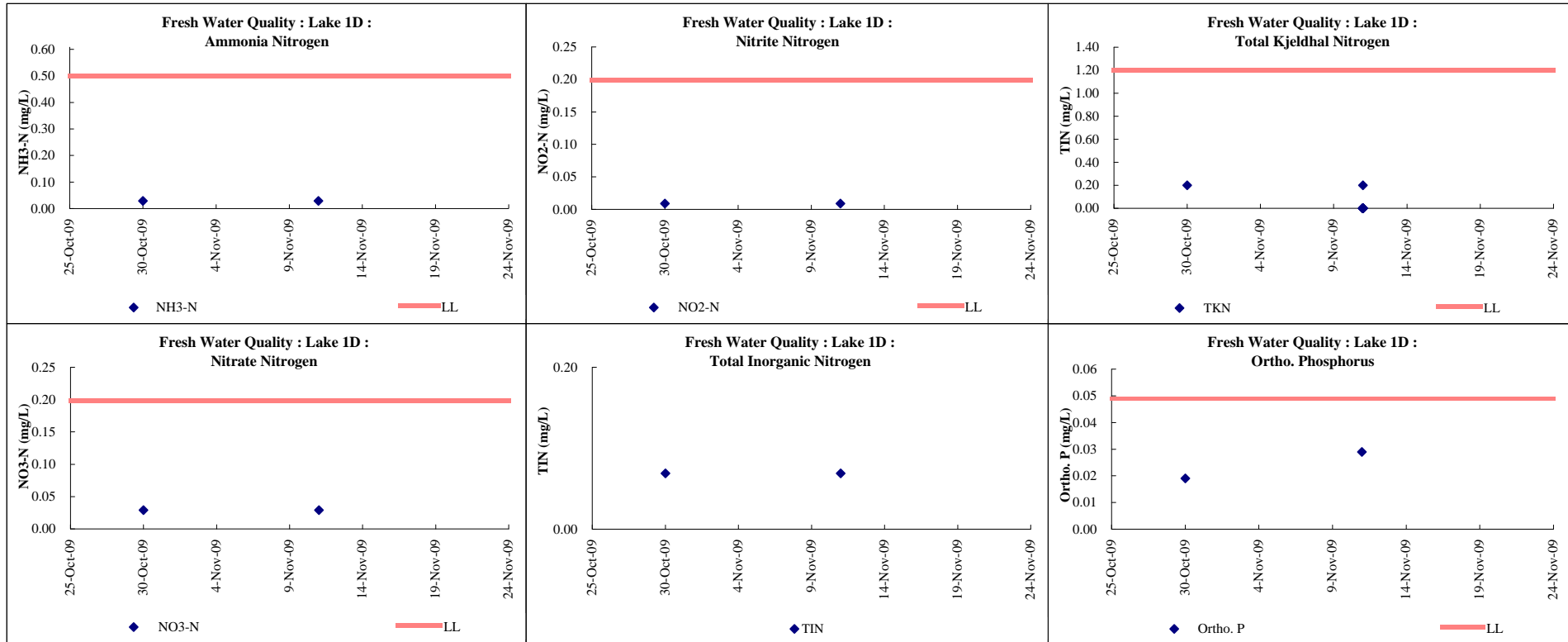




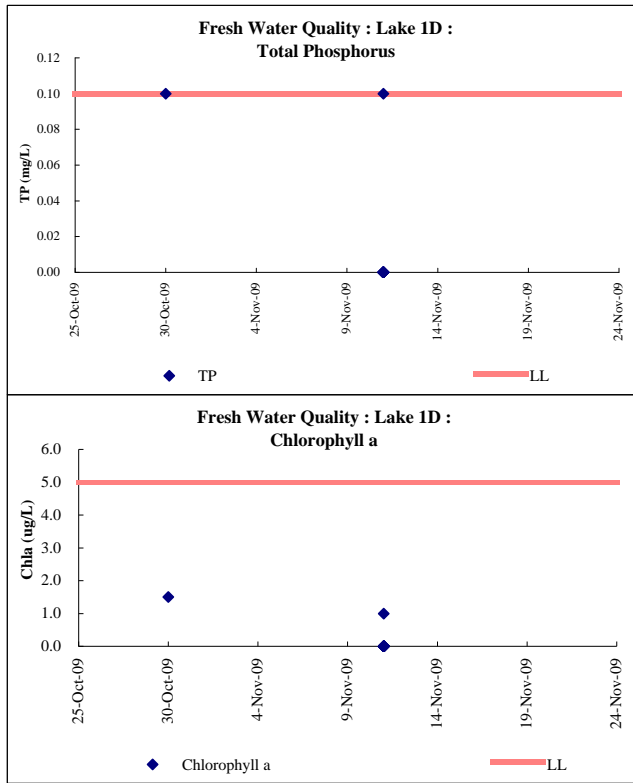


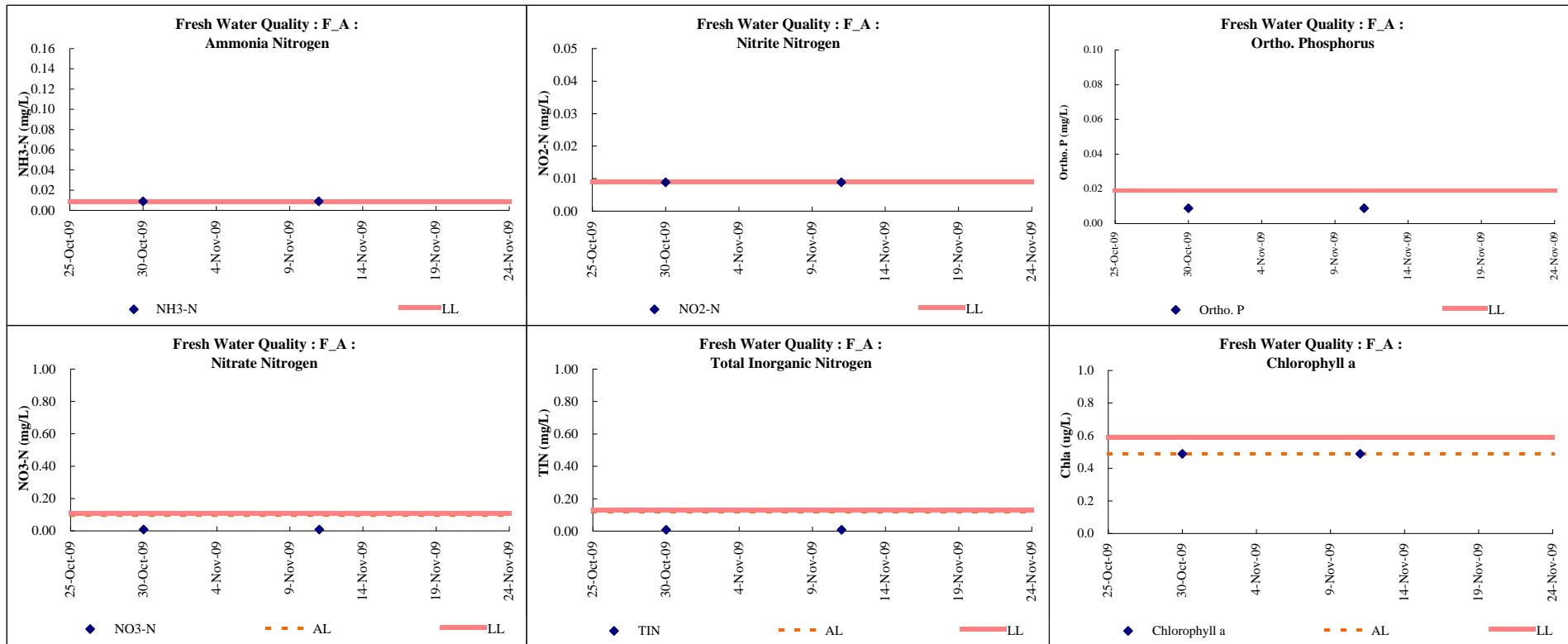


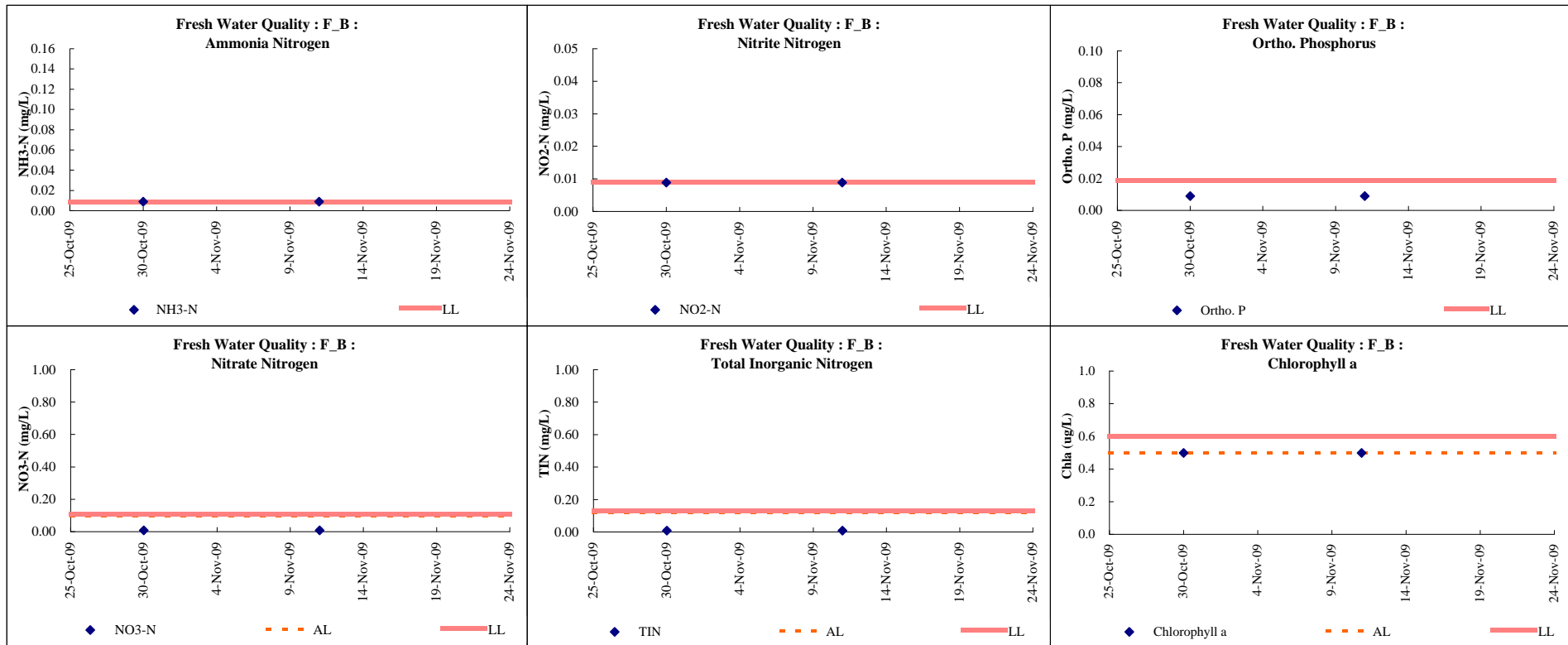


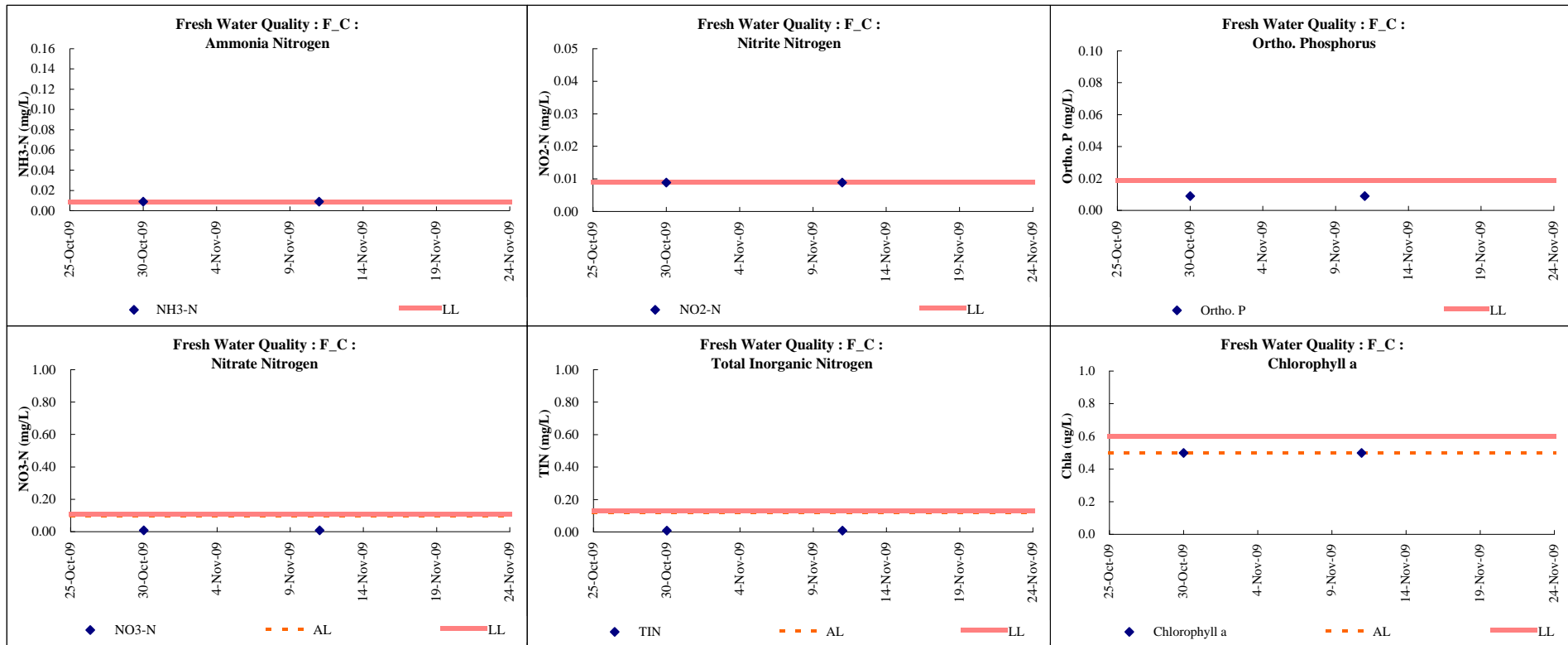


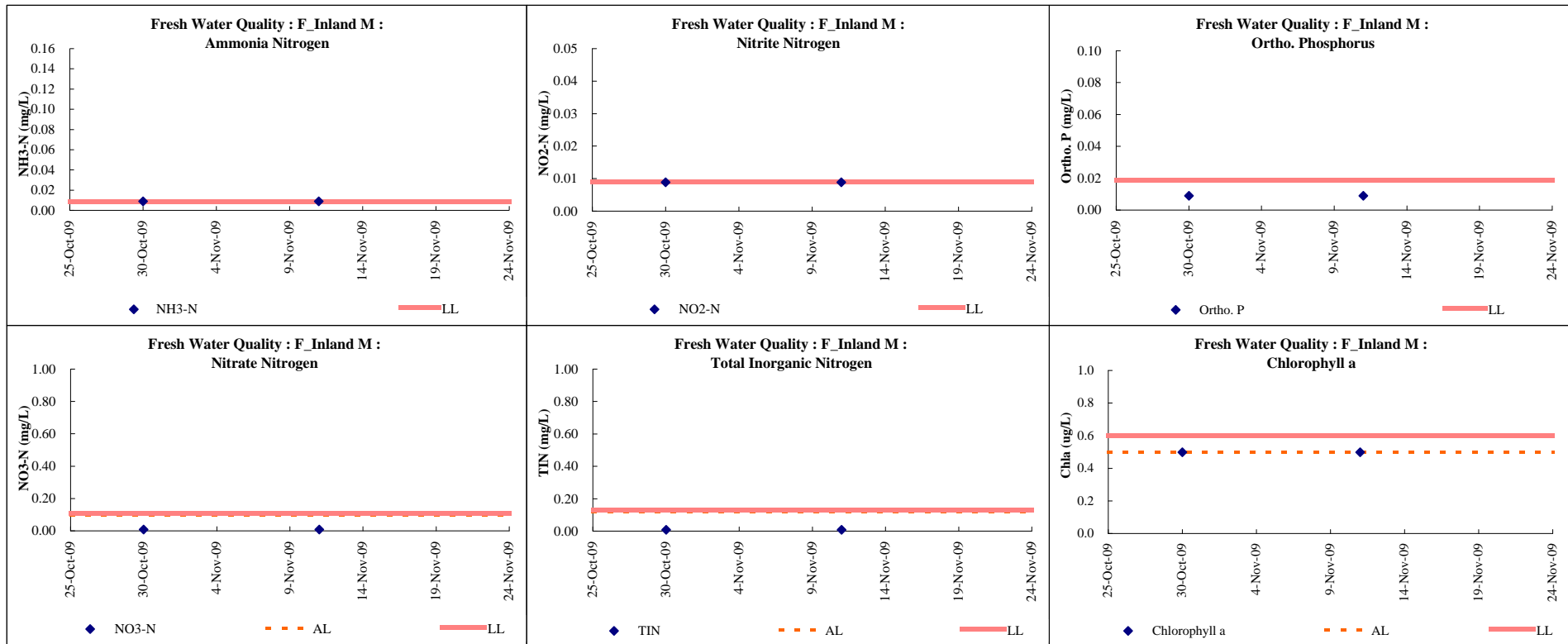


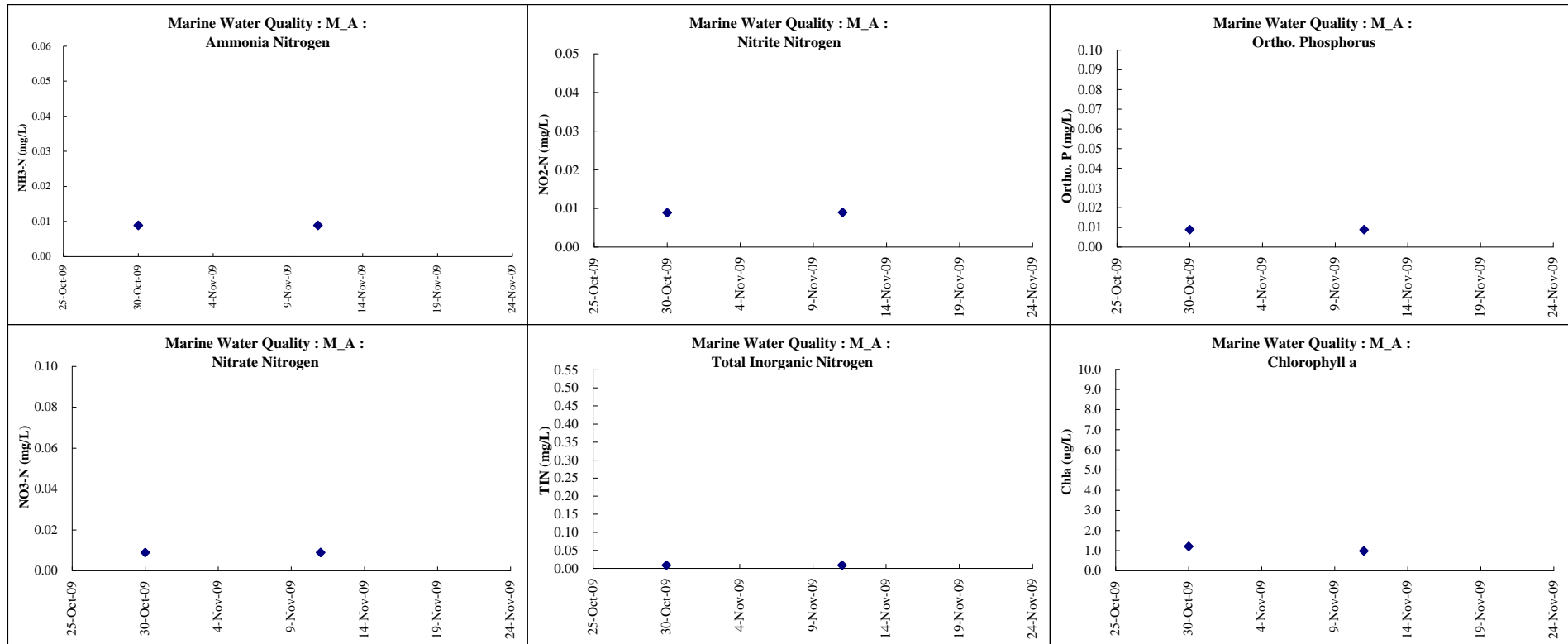


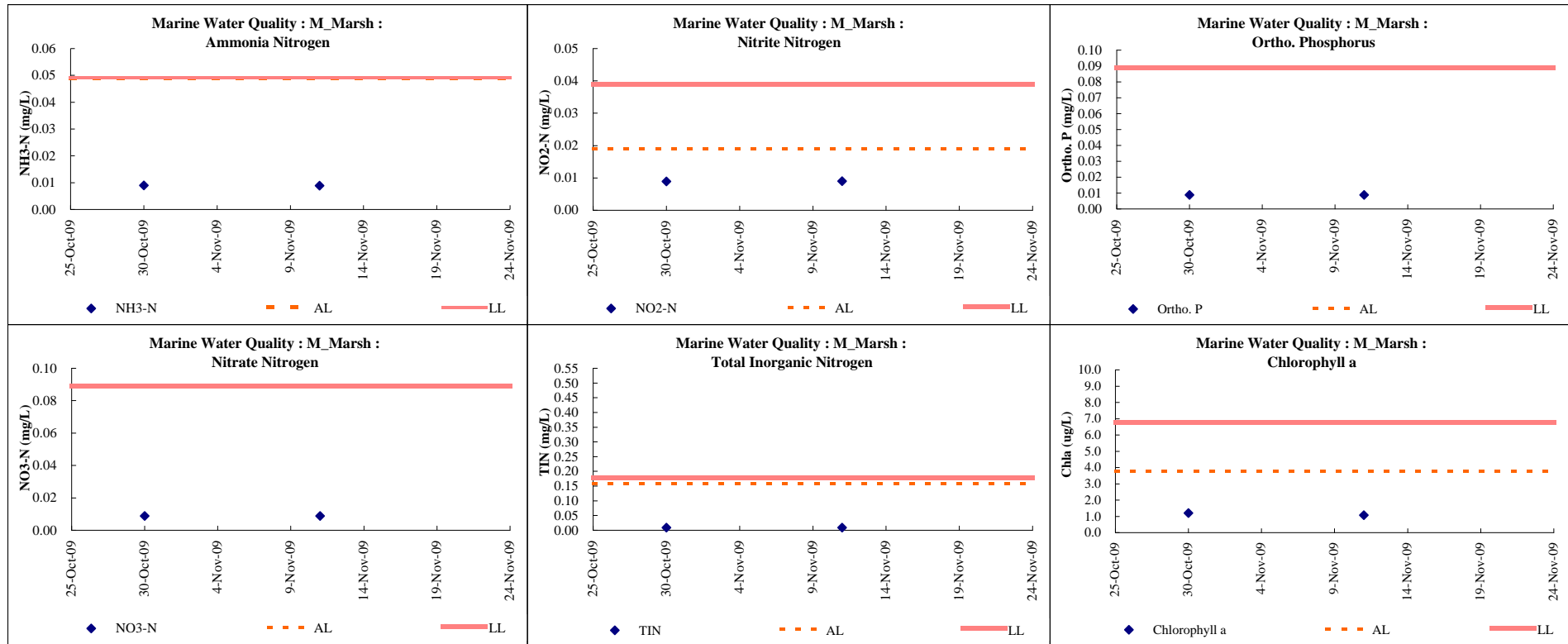


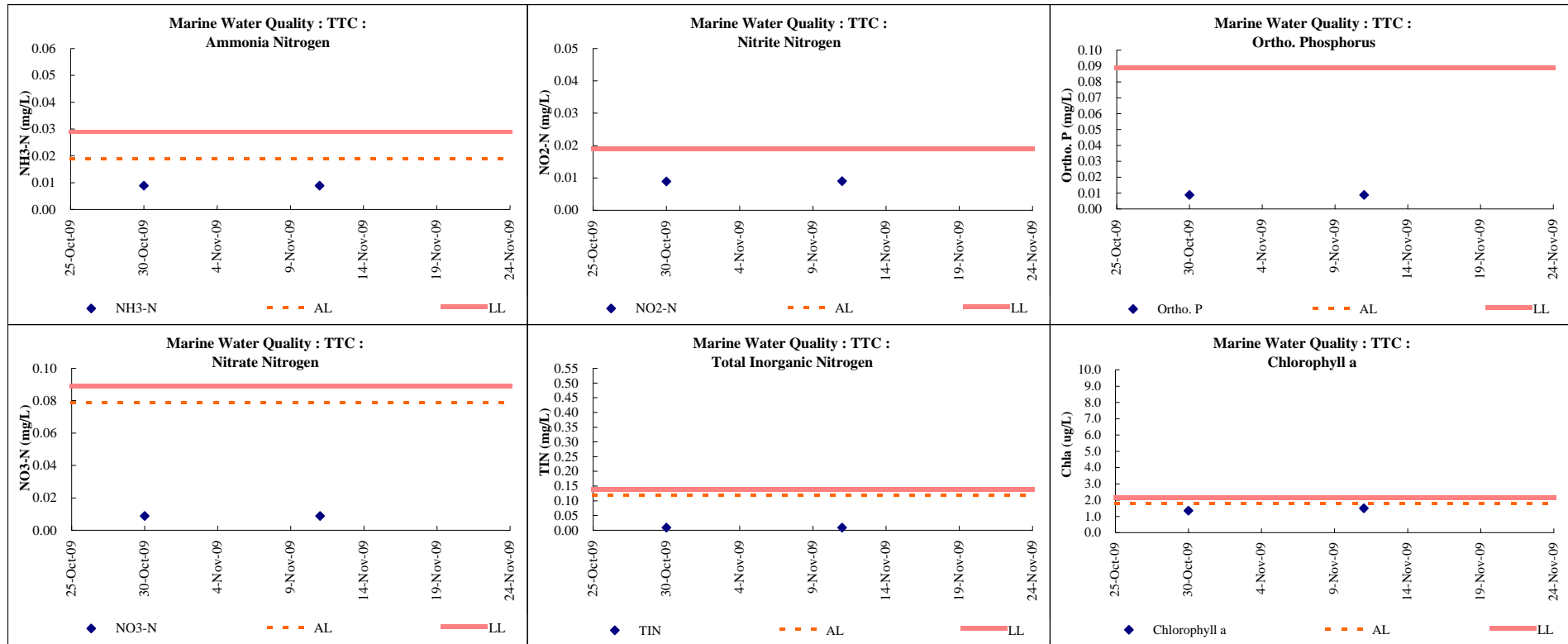




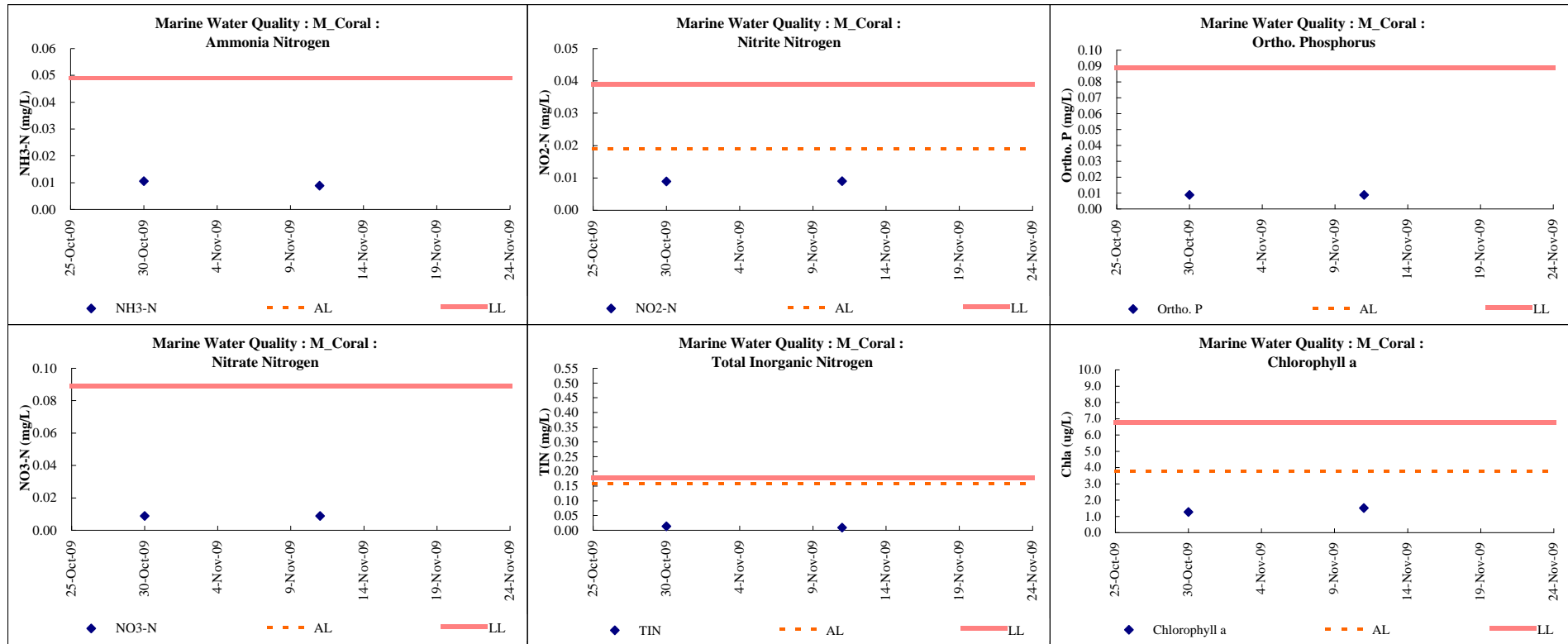


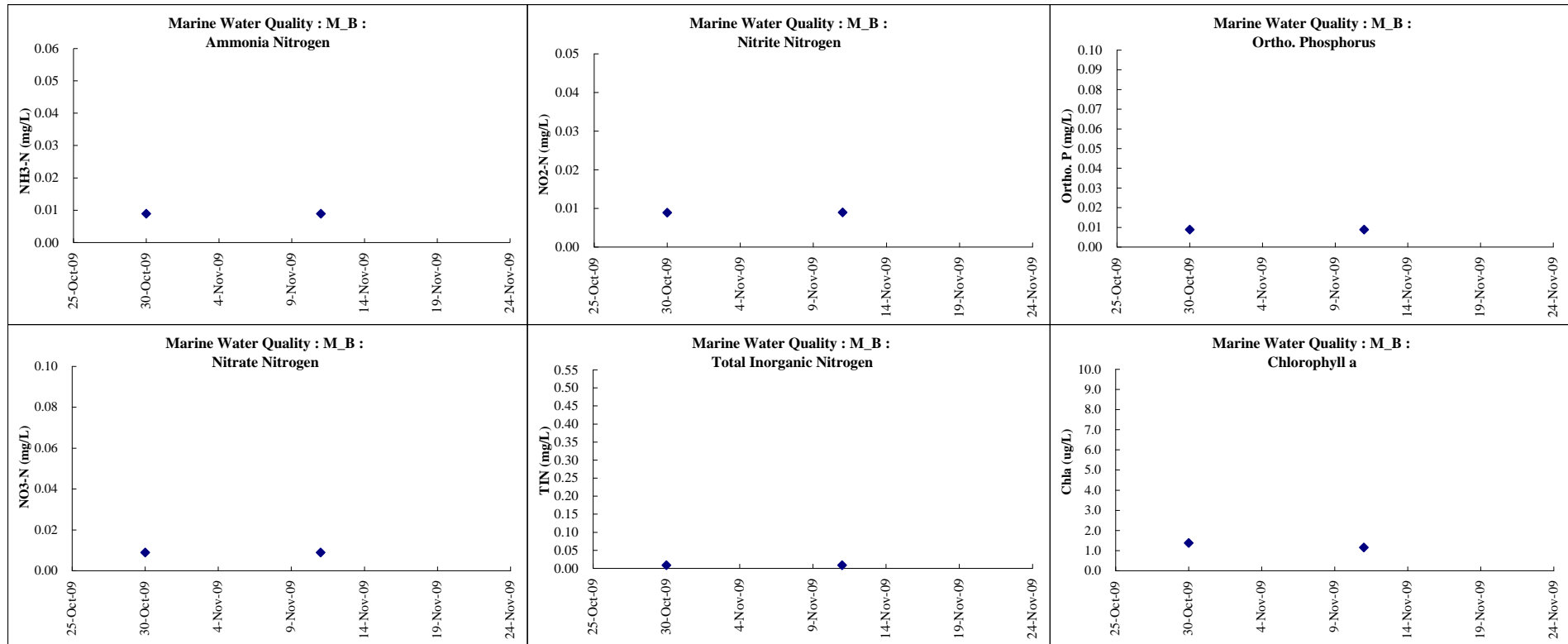


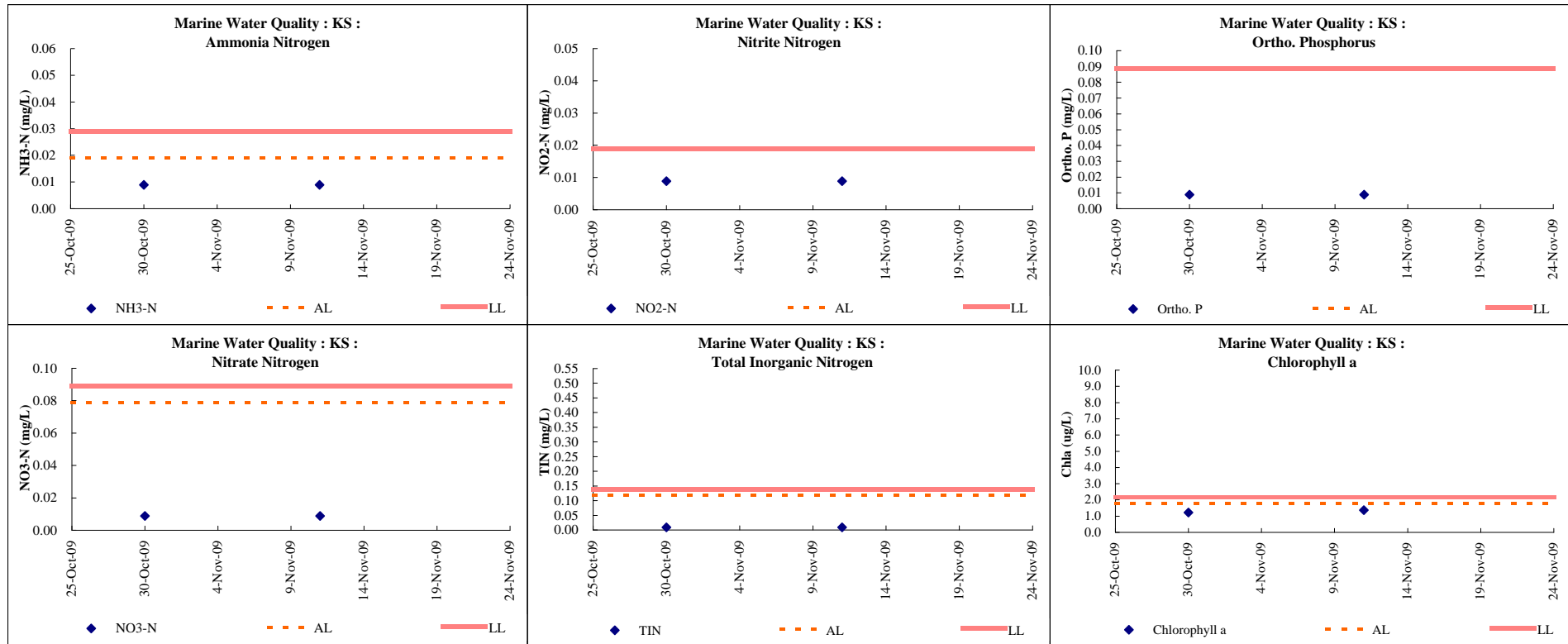












# Marine Ecology

Operation Phase  
Baseline in Jul 08

5th monitoring Oct09

X-01



X-02



X-03



X-04



X-05\*  
tagged in  
Aug08 to  
replace  
missing



Operation Phase  
Baseline in Jul 08

5th monitoring Oct09

X-06



X-07



X-08



X-09



X-10



Operation Phase  
Baseline in Jul 08

5th monitoring Oct09

X-11



X-12



X-13



X-14



X-15



Operation Phase  
Baseline in Jul 08

5th monitoring Oct09

X-16

Missing in  
Oct08, and  
replacement  
coral tagged



X-17

Damaged in  
Oct08, and  
replacement  
coral tagged



X-18

Missing in  
Oct08, and  
replacement  
coral tagged



X-19

Missing in  
Oct08, and  
replacement  
coral tagged



X-20



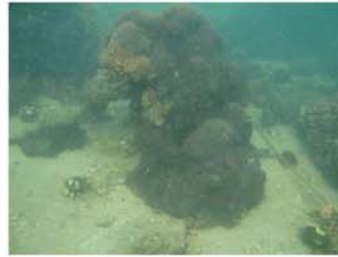
Operation Phase  
Baseline in Jul 08

5th monitoring Oct09

C-01



C-02



C-03



C-04\*



C-05



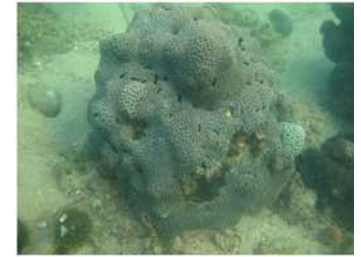
Operation Phase  
Baseline in Jul 08

5th monitoring Oct09

C-06



C-07



C-08



C-09



C-10



Operation Phase  
Baseline in Jul 07

5th moniotring Oct09

C-11



C-12



C-13



C-14



C-15



Operation Phase  
Baseline in Jul 07

5th moniotring Oct09

C-16



C-17



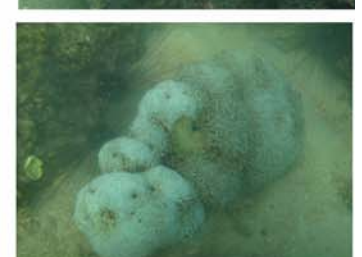
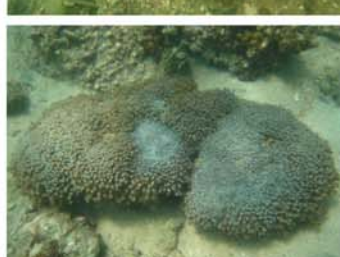
C-18



C-19



C-20\*  
Replacement  
coral tagged  
in Aug08





Operation Phase  
Baseline in Jul 08

5th monitoring Oct09

D-01



D-02



D-03



D-04



D-05



Operation Phase  
Baseline in Jul 08

5th monitoring Oct09

D-06



D-07



D-08



D-09



D-10



Operation Phase  
Baseline in Jul 08

5th Monitoring Oct09

D-11



D-12



D-13



D-14



D-15



Operation Phase  
Baseline in Jul 08

5th Monitoring Octr09

D-16



D-17



D-18



D-19



D-20



# **Landscape and Visual**

22 trees to be replanted

5

10 trees to be replanted

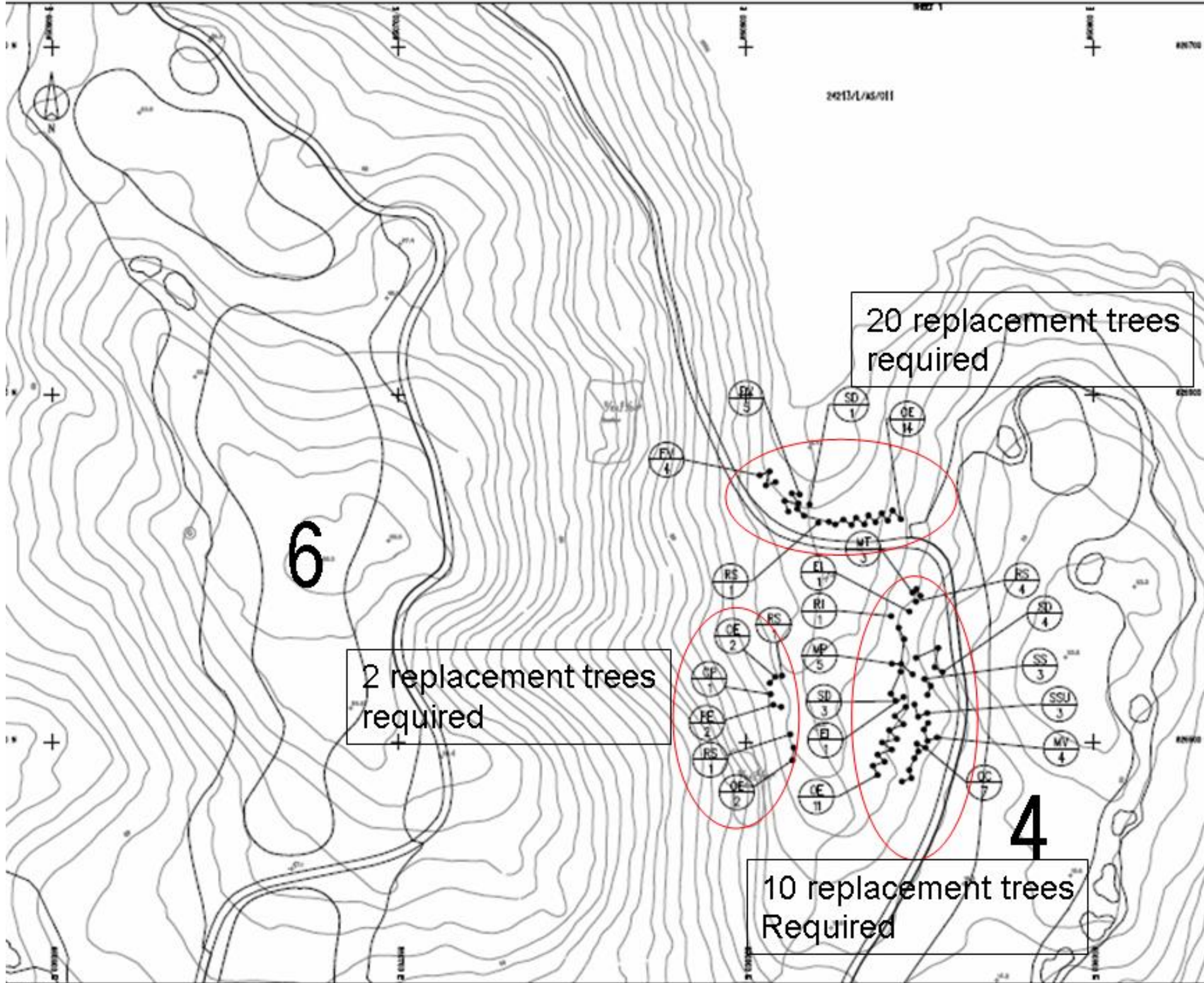
**ARUP**  
Incorporated in  
New Zealand  
Chartered Accountants  
Public Accountants  
Engineers and Architects  
Civil Engineers  
Quantity Surveyors



THE  
KAI  
PUBLIC  
TRUST  
KAI

PLANTING PLAN  
(TREE AND G

Scale: 1:1000  
Date: 11/09/14  
Sheet: AS-4  
Drawing No: 240137



20 replacement trees required

2 replacement trees required

10 replacement trees Required

6

4

2013/L/AS/011

NO.	REV.	DATE	DESCRIPTION



**ARUP** CONSULTANTS  
 25/F, ARUP CENTRE, 115 HONG KONG STREET, HONG KONG  
 ARUP CONSULTANTS (HONG KONG) LIMITED  
 ARUP CONSULTANTS (HONG KONG) LIMITED  
 ARUP CONSULTANTS (HONG KONG) LIMITED



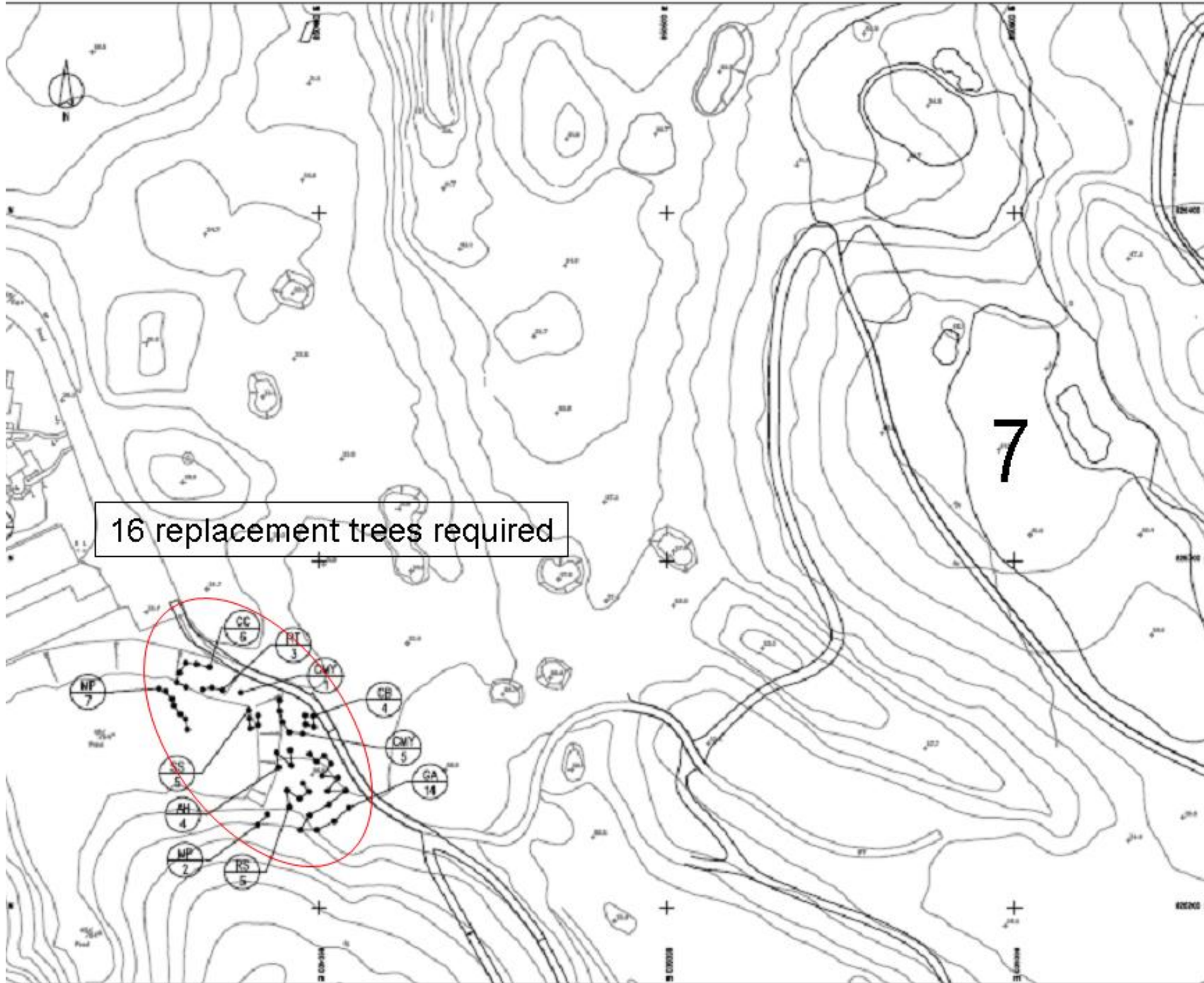
THE JOCKEY CLUB  
 KAU SAI CHAI  
 PUBLIC GOLF COURSE  
 THIRD GOLF COURSE  
 KAU SAI CHAI

PLANTING PLAN  
 (TREE AND GRASS COVER)

DATE	ISSUED	REVISED	SCALE

AS-CONSTRUCTED

2013/L/AS/011



16 replacement trees required

NO.	REV.	DESCRIPTION

**ARUP** GROUP OF COMPANIES  
 15/F, ARUP BUILDING, 15 DES VIGNES ROAD, SINGAPORE 049627  
 TEL: 65 6349 2222  
 FAX: 65 6733 3333  
 WWW.ARUP.COM

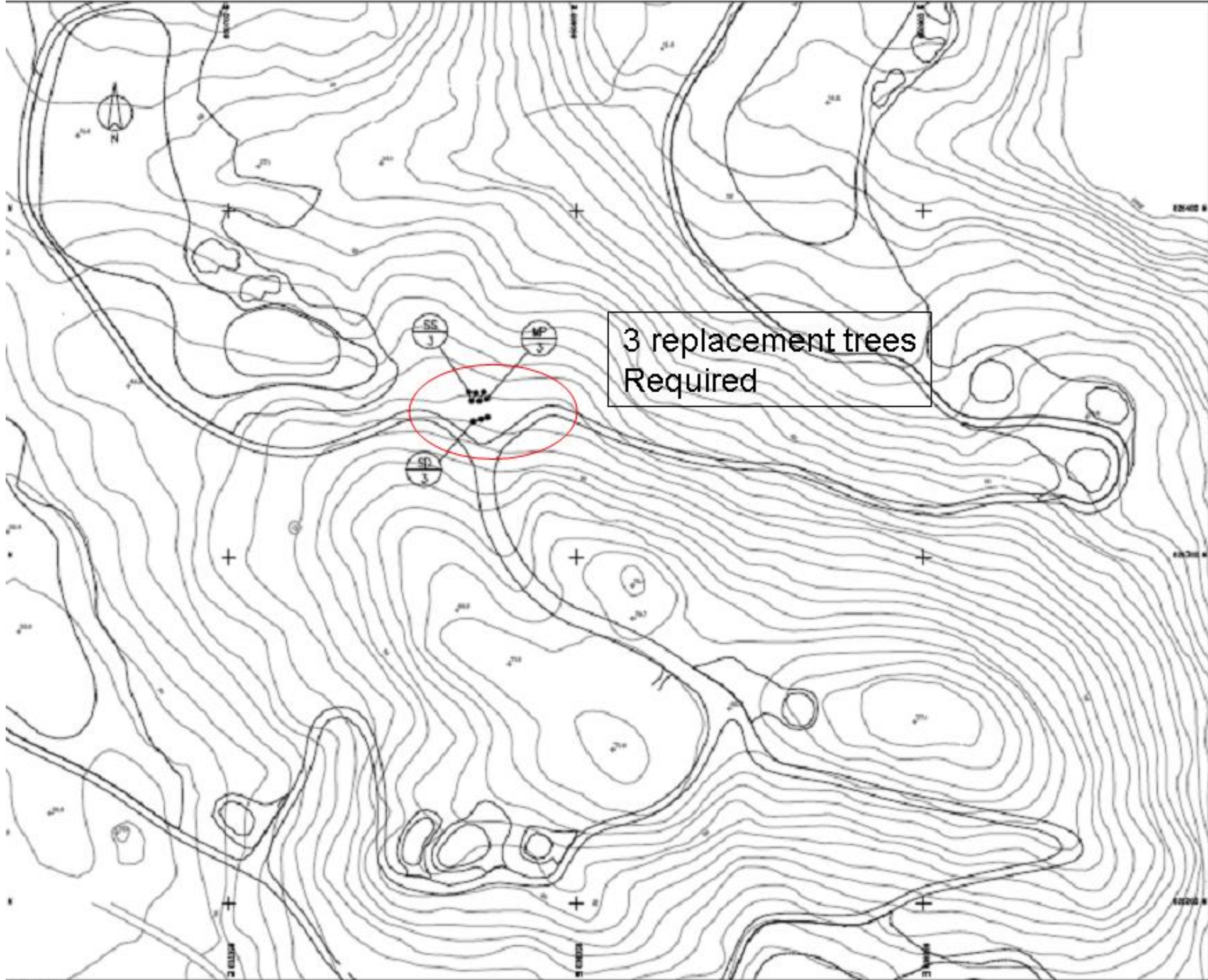
**HEG** HONG KONG ENGINEERING GROUP  
 HONG KONG ENGINEERING GROUP LIMITED

PROJECT: THE JOCKEY CLUB  
 KAU SAE CHAI  
 PUBLIC GOLF COURSE  
 THIRD GOLF COURSE  
 KAU SAE CHAI

DATE: 15/06/13

AS-COMPLETED

24/014/16/013



3 replacement trees  
Required

Scale	1:1000
North Arrow	True



**ARUP** CONSULTANTS  
 100, Market Street, Suite 2000  
 Singapore 050075  
 Tel: +65 6337 2200  
 Fax: +65 6337 2201  
 Email: arup@arup.com



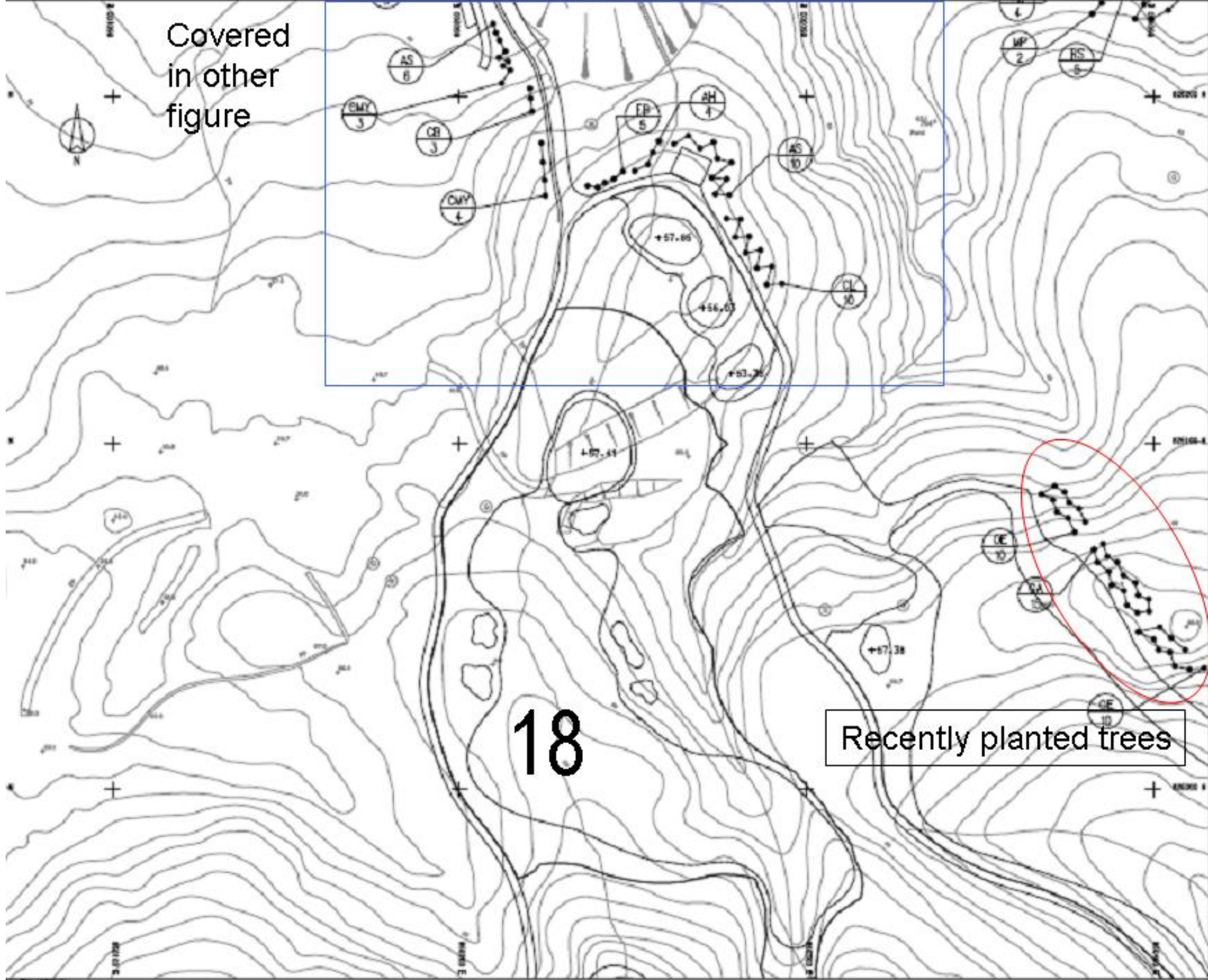
**THE JOCKEY CLUB  
 KAI SAI CHAI  
 PUBLIC GOLF COURSE  
 THIRD GOLF COURSE  
 KAI SAI CHAI**

**PLANTING PLAN  
 (TREE AND OPENING CIRCLE)**

Scale	1:1000	Date	18/05/2011
Author	AS-CONSTRUCTED	Drawn	AS-CONSTRUCTED

Project No: 34013A/AS/011

Covered  
in other  
figure

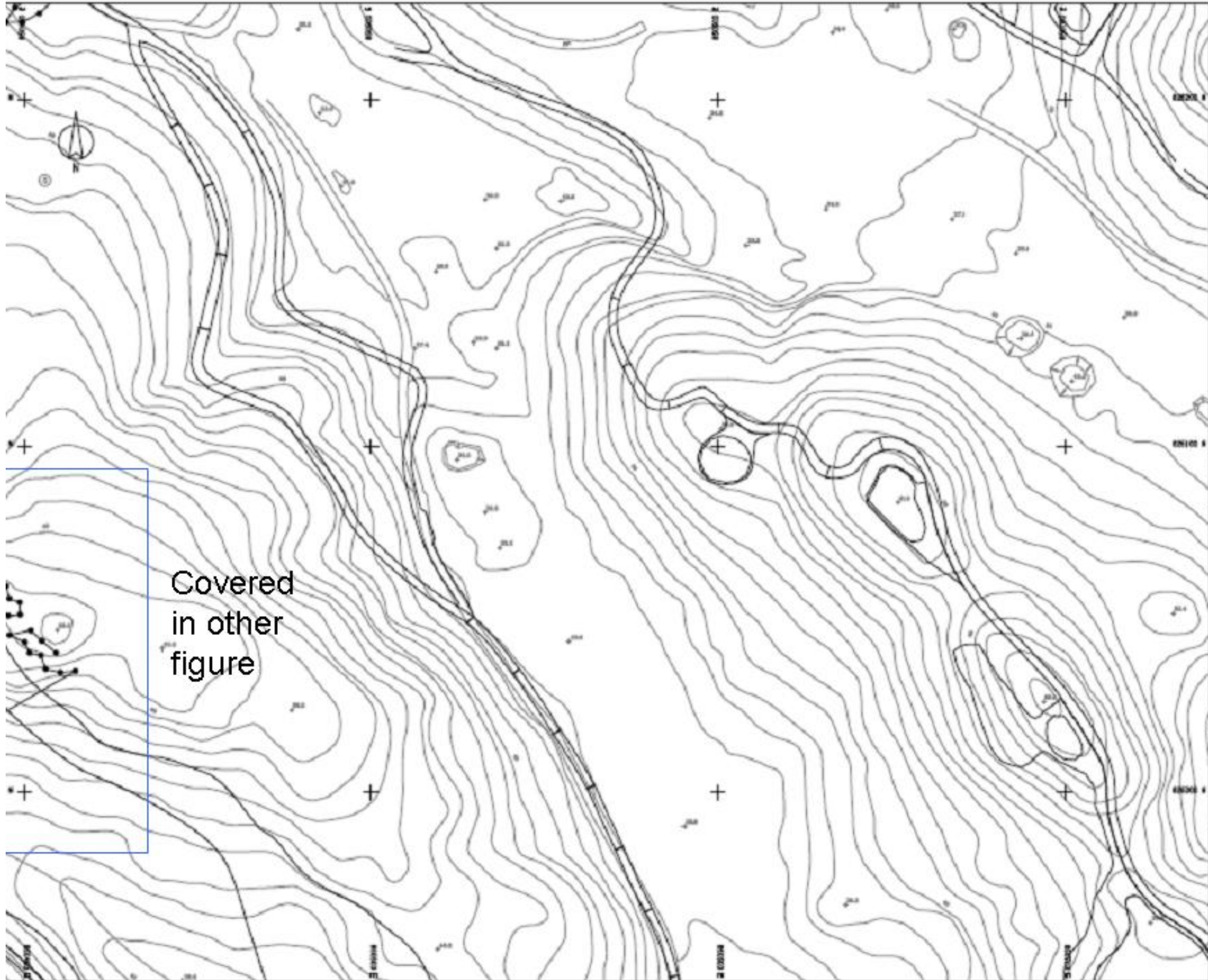


18

Recently planted trees

Scale	1:1000
North	As Shown
Author	ARUP
Client	THE JOCKEY CLUB KAI SAE CHAI PUBLIC GOLF COURSE THIRD GOLF COURSE KAI SAE CHAI
Project	PLANTING PLAN (TREE AND GRASS COVER)
Date	24/12/15
Drawn	AP
Checked	AP
Scale	AS-CONSTRUCTED
Project	24/12/15/019





Covered  
in other  
figure

Scale	1:1000
North	As indicated
Author	ARUP
Client	THE JOCKEY CLUB KAI SAE CHAI PUBLIC GOLF COURSE THIRD GOLF COURSE KAI SAE CHAI
Contract No.	24211A/KS/016

**ARUP** GROUP LIMITED  
 11th Floor, 111, Queen's Road East, Hong Kong  
 ARUP ASSOCIATES (SINGAPORE) PTE. LTD.  
 15 Collyer Quay, Singapore  
 ARUP ASSOCIATES (AUSTRALIA) PTY. LTD.  
 150 Market Street, Sydney, Australia

**HEG** HONG KONG ENGINEERING CONSULTANTS LIMITED  
 11/F, 111, Queen's Road East, Hong Kong

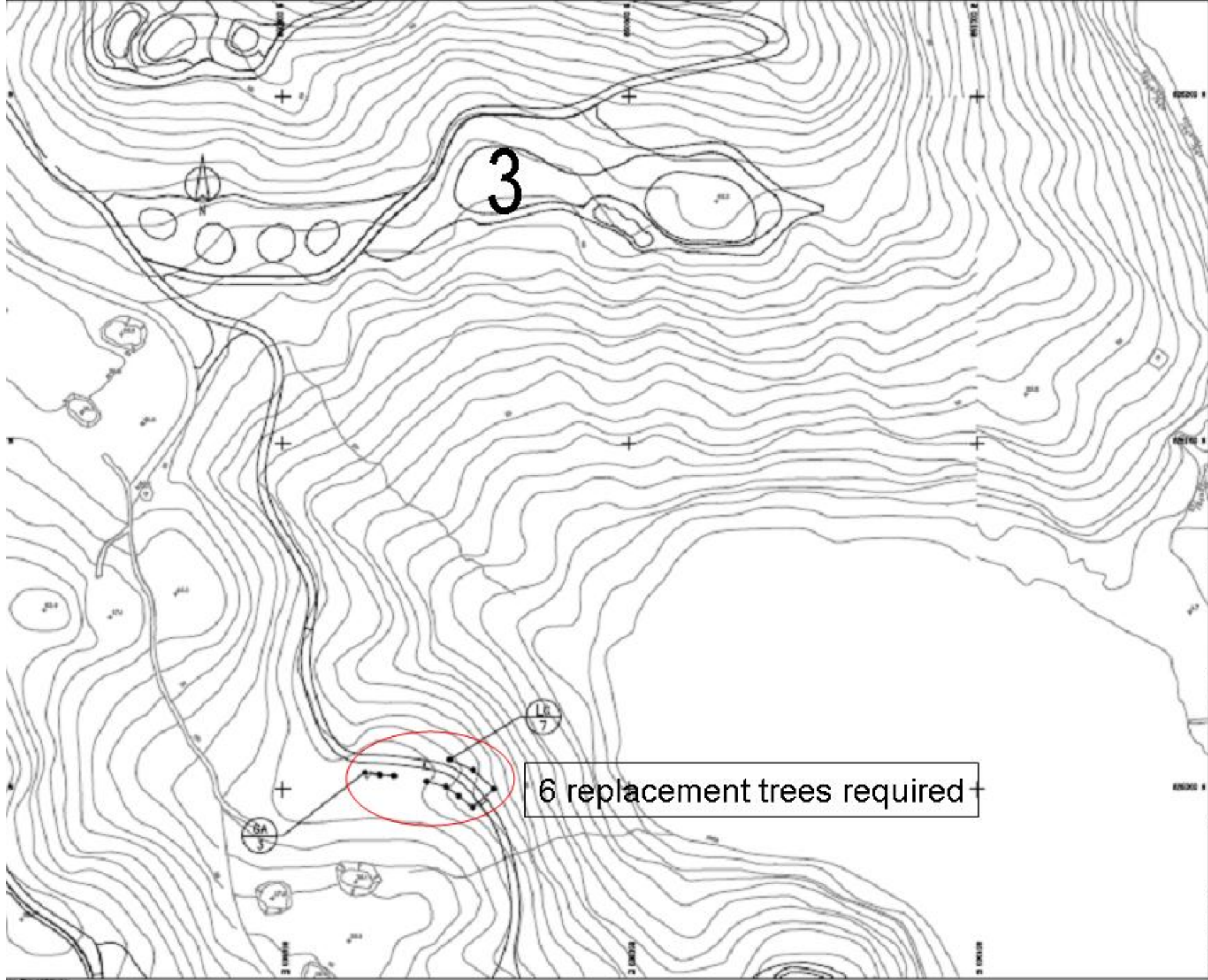
**THE JOCKEY CLUB  
 KAI SAE CHAI  
 PUBLIC GOLF COURSE  
 THIRD GOLF COURSE  
 KAI SAE CHAI**

**PLANTING PLAN  
 (TREE AND GRASS COVER)**

Scale	1:1000	As Indicated
Author	ARUP	HEG
Contract No.	24211A/KS/016	150

AS-CONSTRUCTED

24211A/KS/016



6 replacement trees required




**ARUP** CONSULTANTS  
 4/F, 100, Nathan Road, Kowloon, Hong Kong  
 Tel: (852) 2500 8688  
 Fax: (852) 2500 8689  
 Email: arup@arup.com



THE JOCKEY CLUB  
 KAU SAI CHAU  
 PUBLIC GOLF COURSE  
 THIRD GOLF COURSE  
 KAU SAI CHAU

**PLANTING PLAN**  
 (TREE AND GRASS COVER)

DATE	ISSUE	BY	CHKD
11/03/07	01	AP	AP
11/03/07	01	AP	AP

SCALE: AS-CONSTRUCTED  
 DATE: 24/03/07



1

8

10 replacement trees Required

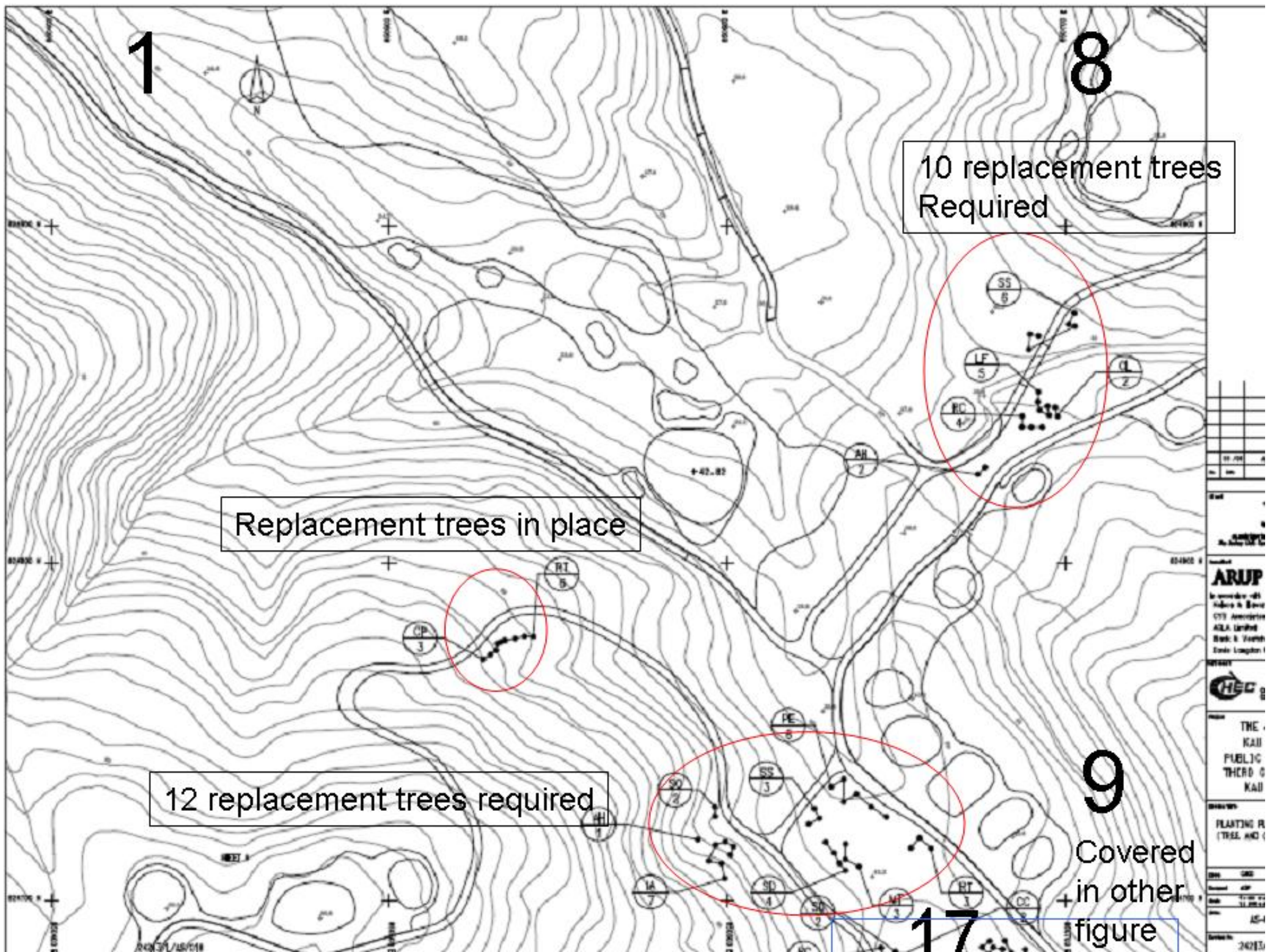
Replacement trees in place

12 replacement trees required

9

Covered in other figure

17



12 replacement trees  
Required

2



DATE	DESCRIPTION



Author  
**ARUP** For Asia & Further  
Far East Limited  
In association with  
Yehua & Szei (S.K.) Ltd.  
City Associates (Hong Kong) Ltd.  
AGL Limited  
Hoak & Veitch Hong Kong Limited  
EwingColeman & Seah

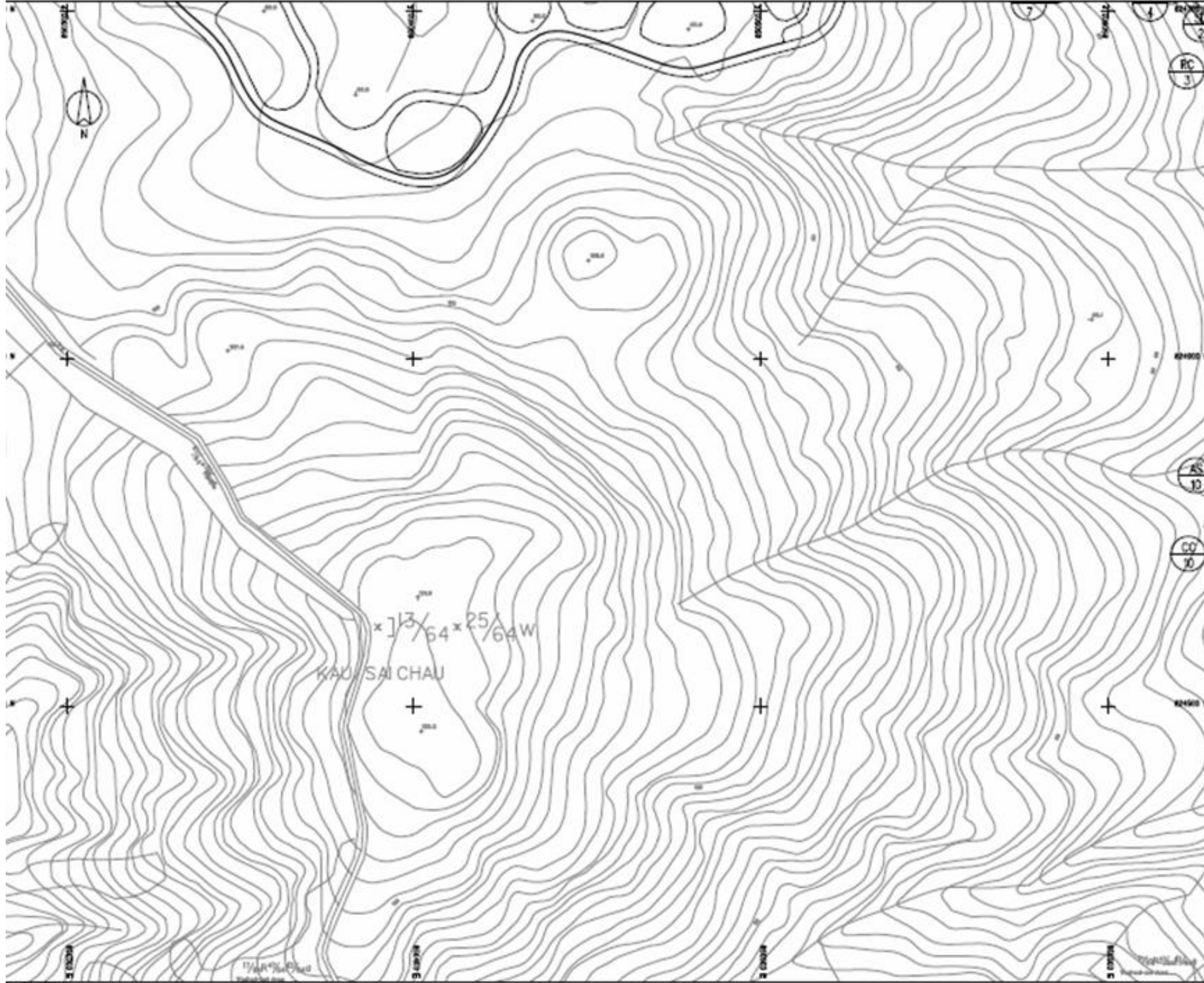


Client  
THE JOCKEY CLUB  
KAI SAI CHAI  
PUBLIC GOLF COURSE  
THIRD GOLF COURSE  
KAI SAI CHAI

Drawn by  
PLANTING PLAN  
(TREE AND OPENING COVER)

Date	1/24/14	Scale	1:100
Drawn	AS/100	Check	AS/100
Scale	1:100	Scale	1:100
Date	1/24/14	Date	1/24/14

Sheet No.  
AS-CONSTRUCTED  
24/14/AS/100





NO. OF SHEETS	40-SHEETS
TOTAL NO. SHEETS	40


  
**ARUP** Inc. and its Partner  
 Hong Kong Branch (HK) Ltd.  
 C/O Association (Hong Kong) Ltd.  
 42/A, Leung King Road  
 22/F, Leung King Building  
 22/F, Leung King Building


  
**HEC** HONG KONG ENGINEERING CONSULTANTS

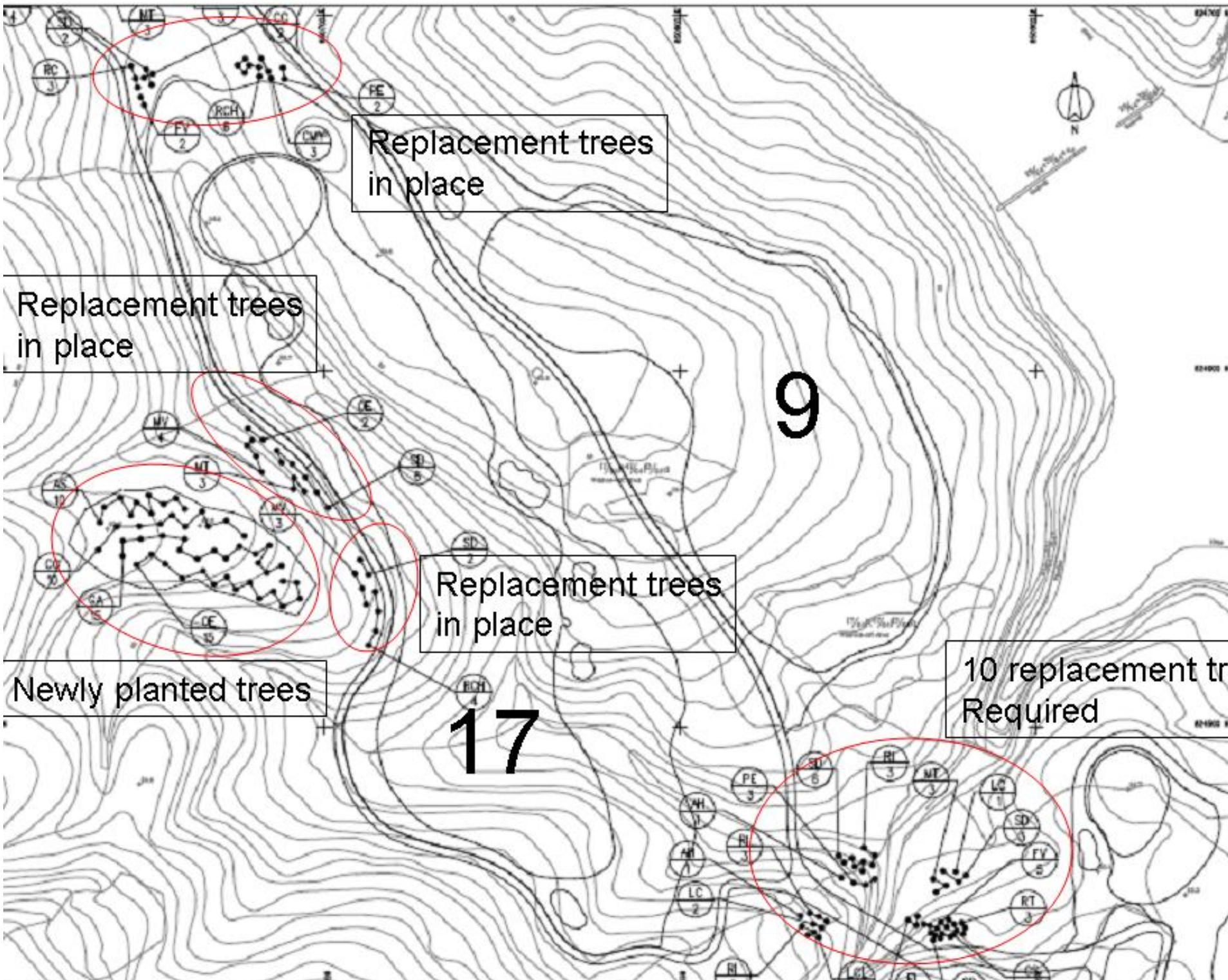
**THE JOCKEY CLUB  
 KAU SAI CHAU  
 PUBLIC GOLF COURSE  
 THIRD GOLF COURSE  
 KAU SAI CHAU**

**PLANTING PLAN  
 (TREE AND SHRUB COVER)**

Scale	1:500	Date	11/11/11
Drawn	AS	Checked	AS
Rev.	1:1000	Date	11/11/11

**AS-CONSTRUCTED**

Drawing No. 2411/L/AS/021



Replacement trees  
in place

Replacement trees  
in place

Replacement trees  
in place

Newly planted trees

10 replacement trees  
Required

9

17

NO.	REV.	DATE	DESCRIPTION

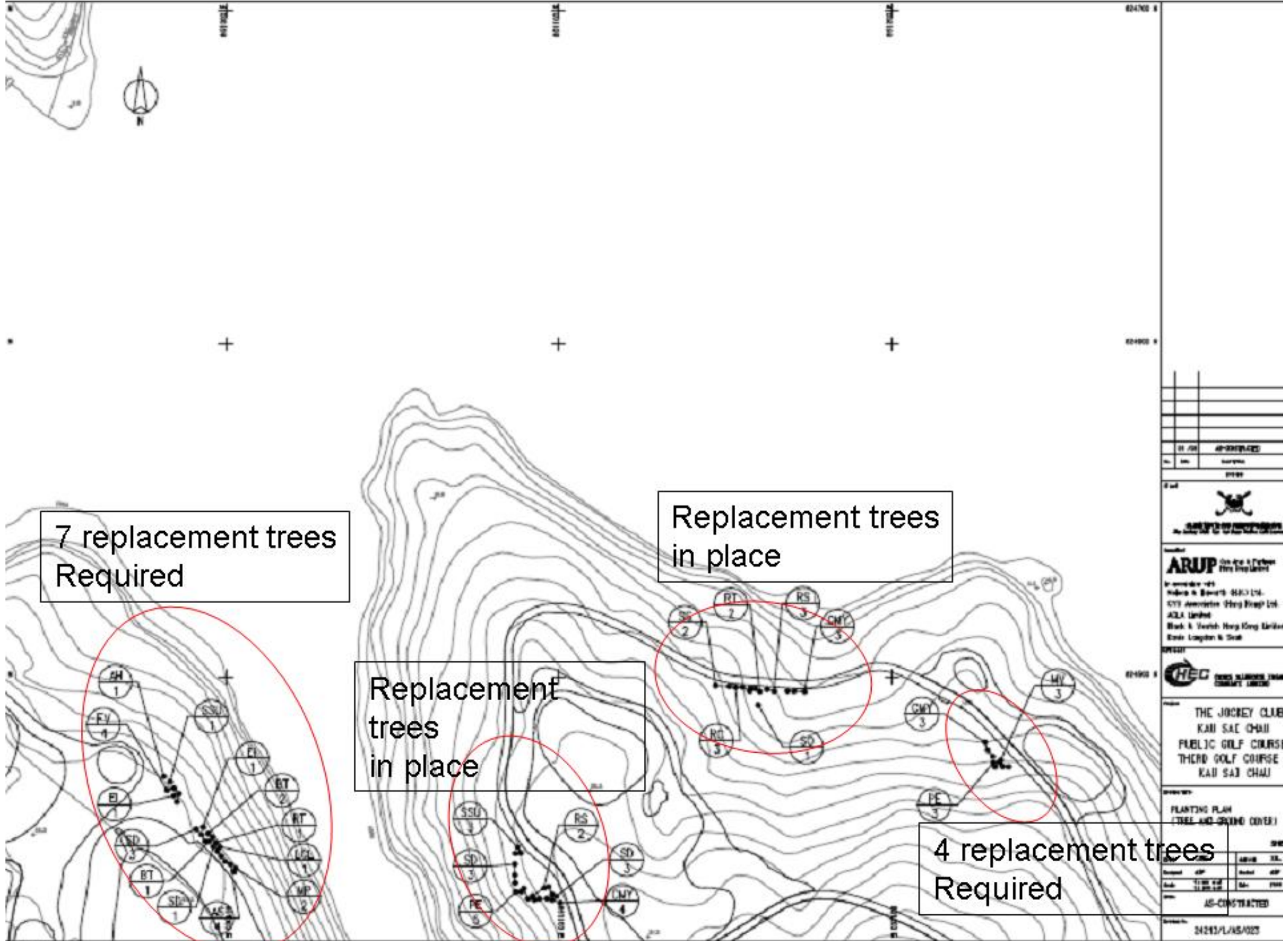
ARUP  
 110 Market Street, 11th Floor  
 Singapore 048946  
 Tel: +65 6339 2000  
 Fax: +65 6339 2001  
 www.arup.com

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 HONG KONG ENGINEERING CONSULTANTS

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 PUBLIC GOLF COURSE  
 THIRD GOLF COURSE /  
 KAU SAI CHAI

PLANTING PLAN  
 (TREE AND GRASS COVER)

Scale	AS SHOWN
Author	AS SHOWN
Date	11/05/08
Sheet No.	100
Project No.	AS CONTRACTED
Drawn by	AS CONTRACTED



7 replacement trees  
Required

Replacement trees  
in place

Replacement  
trees  
in place

4 replacement trees  
Required

NO.	DESCRIPTION
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	



**ARUP** Group Limited  
 11th Floor, One One One  
 City Square, Hong Kong  
 ARUP Group Limited  
 11th Floor, One One One  
 City Square, Hong Kong



THE JOCKEY CLUB  
 KAU SAE CHAI  
 PUBLIC GOLF COURSE  
 THIRD GOLF COURSE  
 KAU SAE CHAI

PLANTING PLAN  
 (TREE AND SHRUB COVER)

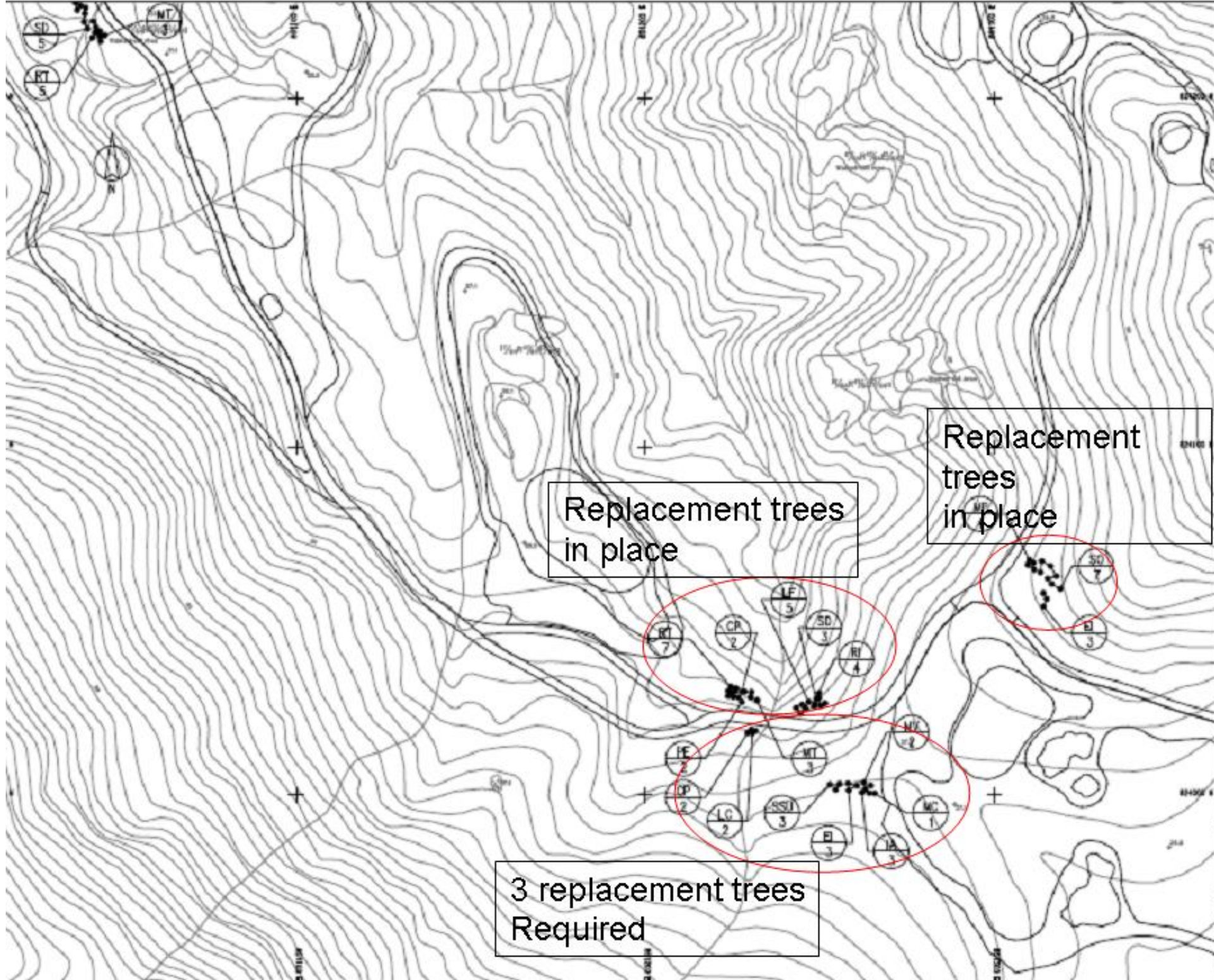
NO.	DATE	BY	CHKD
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			











Scale	1:500
North	True

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Incorporated in Hong Kong  
 015 American Street, Suite 101  
 ARLA Limited  
 Mark 6, Tenth Floor, King's Park  
 Kowloon, Hong Kong

**HEC** HONG KONG ENGINEERING CONSULTANTS

**THE JOCKEY CLUB  
 KAU SAE CHAU  
 PUBLIC GOLF COURSE  
 THIRD GOLF COURSE  
 KAU SAE CHAU**

**PLANTING PLAN  
 (TREE AND GRASS COVER)**

Date	08/01/07	Scale	1:500
Drawn	CP	Checked	CP
Issue	11/01/07	Rev	001
Proj	11/01/07	Rev	001

AS-CONSTRUCTED

Date: 24/11/07

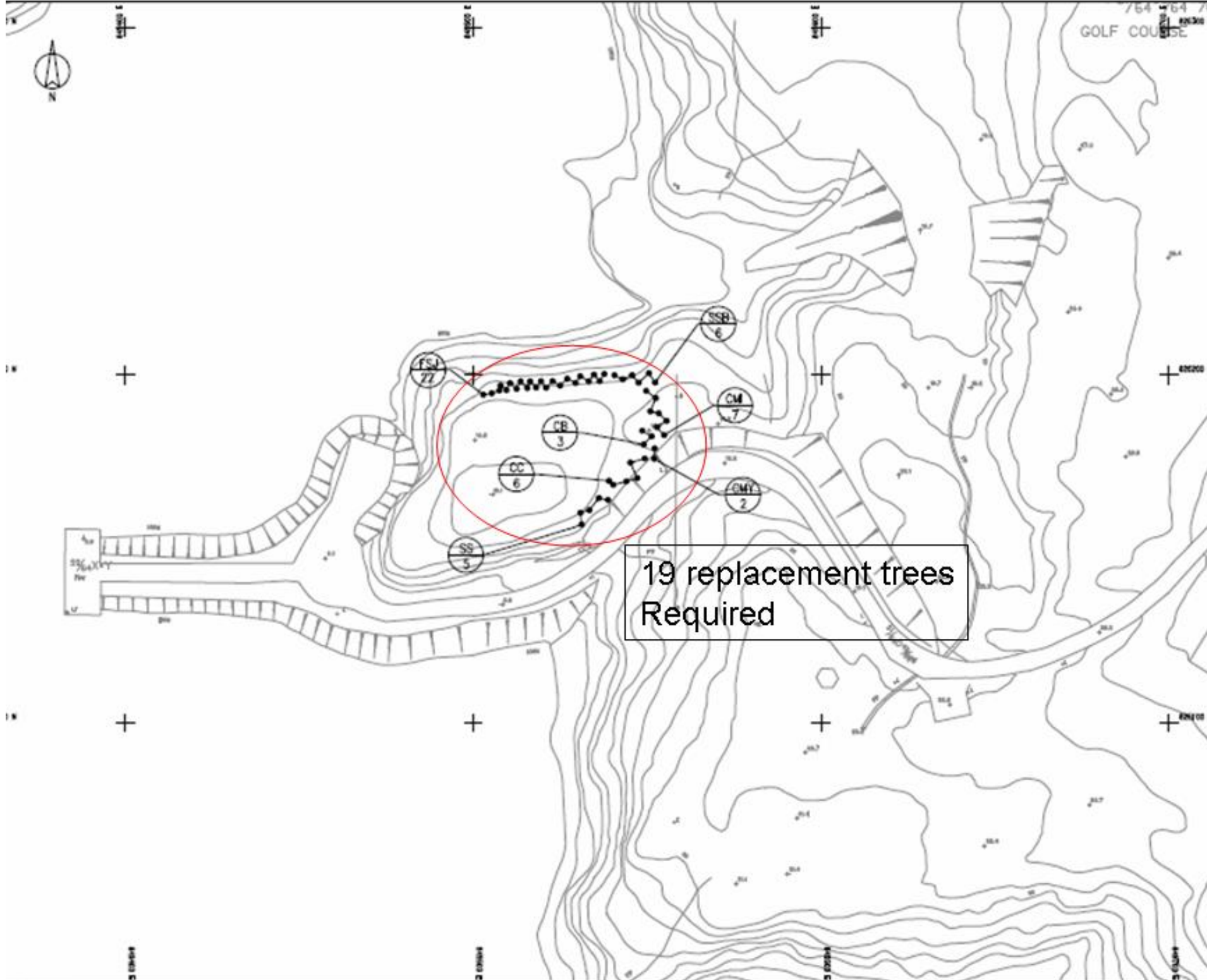












19 replacement trees  
Required

NO.	DATE	BY	REVISION



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 ARUP (HONG KONG) LIMITED  
 ARUP (HONG KONG) LIMITED  
 ARUP (HONG KONG) LIMITED



**THE JOCKEY CLUB**  
**KOWLOON GOLF COURSE**  
**PUBLIC GOLF COURSE**  
**THIRD GOLF COURSE**  
**KOWLOON**

**PLANTING PLAN**  
**(TREE AND GRASS COVER)**

DATE	BY	SCALE	1:1

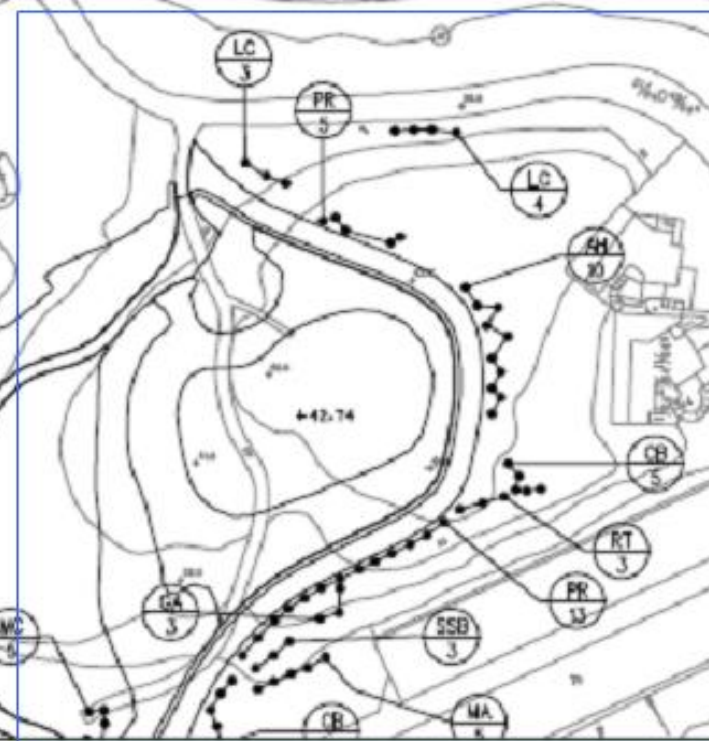
AS-CONSTRUCTED

24211/L/AS/032

3 replacement trees  
Required

Covered  
in other  
figure

21/64 53/64 49/64 37/64 39/64  
GOLF COURSE



1:1	1:1	1:1
1:1	1:1	1:1
1:1	1:1	1:1
1:1	1:1	1:1



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ARUP Limited  
Bank of China Hong Kong Limited  
Chartered Accountants & Surveyors



THE JOCKEY CLUB  
KAI SAE CHAI  
PUBLIC GOLF COURSE  
THIRD GOLF COURSE  
KAI SAI CHAI

PLANTING PLAN  
(TREE AND SHRUB COVER)

DATE	2011/11/15	SCALE	1:1
DRAWN BY	MA	CHECKED BY	MA
DATE	2011/11/15	DATE	2011/11/15

AS-COMPLETED  
2011/11/15/033

# **Annex D**

## **Calibration Certificates**



Environmental Division

**CERTIFICATE OF ANALYSIS**

**CONTACT:** MR WONG SIU HO  
**CLIENT:** ENOVATIVE ENV TECHNOLOGY CO  
**ADDRESS:** RM 3704 SIK MAN HOUSE  
HOMANTIN ESTATE  
KOWLOON  
**ORDER No.:**  
**PROJECT:**

**Batch:** HK162220  
**Sub Batch:** 0  
**LABORATORY:** HONG KONG  
**DATE RECEIVED:** 25/10/2009  
**DATE OF ISSUE:** 30/10/2009  
**SAMPLE TYPE:** EQUIPMENT  
**No. of SAMPLES:** 1

**COMMENTS**

The calibration procedure used for the analysis has been applied for the calibration of the above instrument.

**NOTES**

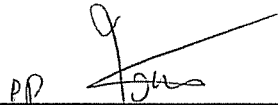
This is the Final Report and supersedes any preliminary report with this batch number.  
Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

**ISSUING LABORATORY: HONG KONG**

**Address**

ALS Technichem (HK) Pty Ltd  
11/F  
Chung Shun Knitting Centre  
1-3 Wing Yip Street  
Kwai Chung  
HONG KONG

**Phone:** 852-2610 1044  
**Fax:** 852-2610 2021  
**Email:** hongkong@alsenviro.com

  
\_\_\_\_\_  
Ms Wong Wai Man, Alice  
Laboratory Manager - Hong Kong

**Other ALS Environmental Laboratories**

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Brisbane                      Hong Kong                      Vancouver  
Melbourne                      Singapore                      Santiago  
Sydney                      Kuala Lumpur                      Amtofagasta  
Newcastle                      Bogor                      Lima

**ALS Technichem (HK) Pty Ltd**  
Part of the **ALS Laboratory Group**

11/F, Chung Shun Knitting Centre, 1-3 Wing Yip Street, Kwai Chung, N.T., H.K.  
Phone: 852-2610 1044 Fax: 852-2610 2021 www.alsenviro.com  
A Campbell Brothers Limited Company

# CERTIFICATE OF ANALYSIS




Batch: HK162220  
Sub Batch : 0  
Date of Issue: 30/10/2009  
Client: ENOVATIVE ENV TECHNOLOGY CO  
Client Reference:

## Calibration of Tubidimeter

Item : YSI SONDE Environmental Monitoring System  
Model No. : 6920  
Serial No. : 000109DF  
Calibration Method : This meter was calibrated in accordance with standard method APHA (19th Ed.) 2130B  
Date of Calibration : 25 October, 2009  
Testing Results :

Expected Reading	Recording Reading
0.00 NTU	0.0 NTU
4.00 NTU	4.02 NTU
16.0 NTU	16.2 NTU
80.0 NTU	80.1 NTU
160 NTU	160 NTU
Allowing Deviation	±10%

  
Ms Wong Wai Man, Alice  
Laboratory Manager - Hong Kong

# CERTIFICATE OF ANALYSIS

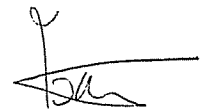


Batch: HK162220  
Sub Batch : 0  
Date of Issue: 30/10/2009  
Client: ENOVATIVE ENV TECHNOLOGY CO  
Client Reference:

## Calibration of Conductivity System

Item : YSI SONDE Environmental Monitoring System  
Model No. : 6920  
Serial No. : 000109DF  
Calibration Method : This meter was calibrated in accordance with standard method APHA (19th Ed.) 2510B  
Date of Calibration : 25 October, 2009  
Testing Results :

Expected Reading	Recording Reading
1412 uS/cm	1433 uS/cm
6667 uS/cm	6681 uS/cm
58670 uS/cm	58470 uS/cm
Allowing Deviation	±10%

  
Ms Wong Wai Man, Alice  
Laboratory Manager - Hong Kong

# CERTIFICATE OF ANALYSIS




Batch: HK162220  
Sub Batch : 0  
Date of Issue: 30/10/2009  
Client: ENOVATIVE ENV TECHNOLOGY CO  
Client Reference:

## Calibration of Salinity System

Item : YSI SONDE Environmental Monitoring System  
Model No. : 6920  
Serial No. : 000109DF  
Calibration Method : This meter was calibrated in accordance with standard method APHA (19th Ed.) 2520 A and B  
Date of Calibration : 25 October, 2009

### Testing Results :

Expected Reading	Recording Reading
10.0 g/L	10.1 g/L
20.0 g/L	20.0 g/L
30.0 g/L	30.0 g/L
Allowing Deviation	±10%

  
Ms Wong Wai Man, Alice  
Laboratory Manager - Hong Kong

# CERTIFICATE OF ANALYSIS




**Batch:** HK162220  
**Sub Batch :** 0  
**Date of Issue:** 30/10/2009  
**Client:** ENOVATIVE E.N.V TECHNOLOGY CO  
**Client Reference:**

**Calibration of Thermometer**

**Item :** YSI SONDE Environmental Monitoring System  
**Model No. :** 6920  
**Serial No. :** 000109DF  
**Calibration Method :** In-house Method  
**Date of Calibration :** 25 October, 2009

**Testing Results :**

Reference Temperature (°C)	Recorded Temperature (°C)
3.5 °C 20.1 °C	3.5 °C 20.1 °C
Allowing Deviation	±2.0°C

  
 Ms Wong Wai Man, Alice  
 Laboratory Manager - Hong Kong



# CERTIFICATE OF ANALYSIS



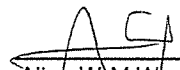
Batch: HK162220  
Sub Batch : 0  
Date of Issue: 30/10/2009  
Client: ENOVATIVE ENV TECHNOLOGY CO  
Client Reference:

## Calibration of DO System

Item : YSI SONDE Environmental Monitoring System  
Model No. : 6920  
Serial No. : 000109DF  
Calibration Method : This meter was calibrated in accordance with standard method APHA (18th Ed.) 4500-OC & G  
Date of Calibration : 25 October, 2009

### Testing Results :

Expected Reading	Recording Reading
0.00 mg/L	0.10 mg/L
2.47 mg/L	2.50 mg/L
4.31 mg/L	4.38 mg/L
7.94 mg/L	7.90 mg/L
Allowing Deviation	±0.2 mg/L

  
\_\_\_\_\_  
Alice W M Wong  
Laboratory Manager - Hong Kong

# CERTIFICATE OF ANALYSIS



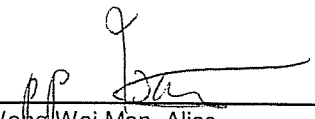
Batch: HK162220  
Sub Batch : 0  
Date of Issue: 30/10/2009  
Client: ENOVATIVE ENV TECHNOLOGY CO  
Client Reference:

## Calibration of pH System

Item : YSI SONDE Environmental Monitoring System  
Model No. : 6920  
Serial No. : 000109DF  
Calibration Method : This meter was calibrated in accordance with standard method APHA (19th Ed.) 4500 H:B  
Date of Calibration : 25 October, 2009

### Testing Results :















Expected Reading	Recording Reading
4.00	4.00
7.00	7.00
10.0	9.99
Allowing Deviation	±0.2 unit































  
Ms Wong Wai Man, Alice  
Laboratory Manager - Hong Kong



# **Annex E**

## **Fertilizer and Pesticides Application**

October 2009						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
18 	19 	20 	21 	22  F (1-18)	23 	24 
25 	26 	27 	28 	29 	30  WQ	31 

November 2009						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 	2 	3  F (1-18, PG2)	4  F (1-18, PG2)	5 	6 	7 
8 	9 	10  C (1-18, PG2)	11  F (1-18, PG2) WQ	12 	13 	14 
15  F (1-18)	16  F (1-18)	17  F (1-18, PG2)	18 	19 	20 	21 
22 	23 	24  F (1-18, PG2)	25  C (1-18, PG2)	26 	27 	28 
29 	30 					

Remarks:

1. Dosage Application by JCKSC

F (follow with numbers) – fertilizers were applied at those holes of East Golf Course.

C (follow with numbers) – non-biological chemicals (eg. pesticides, fungicides, etc.) were applied at those holes of East Golf Course.

2. Weather Information (from Hong Kong Observatory)



daily duration of sunshine > 4 hours and without raining



daily rainfall > 0.5 mm at Kau Sai Chau Island



daily duration of sunshine < 4 hours and without raining



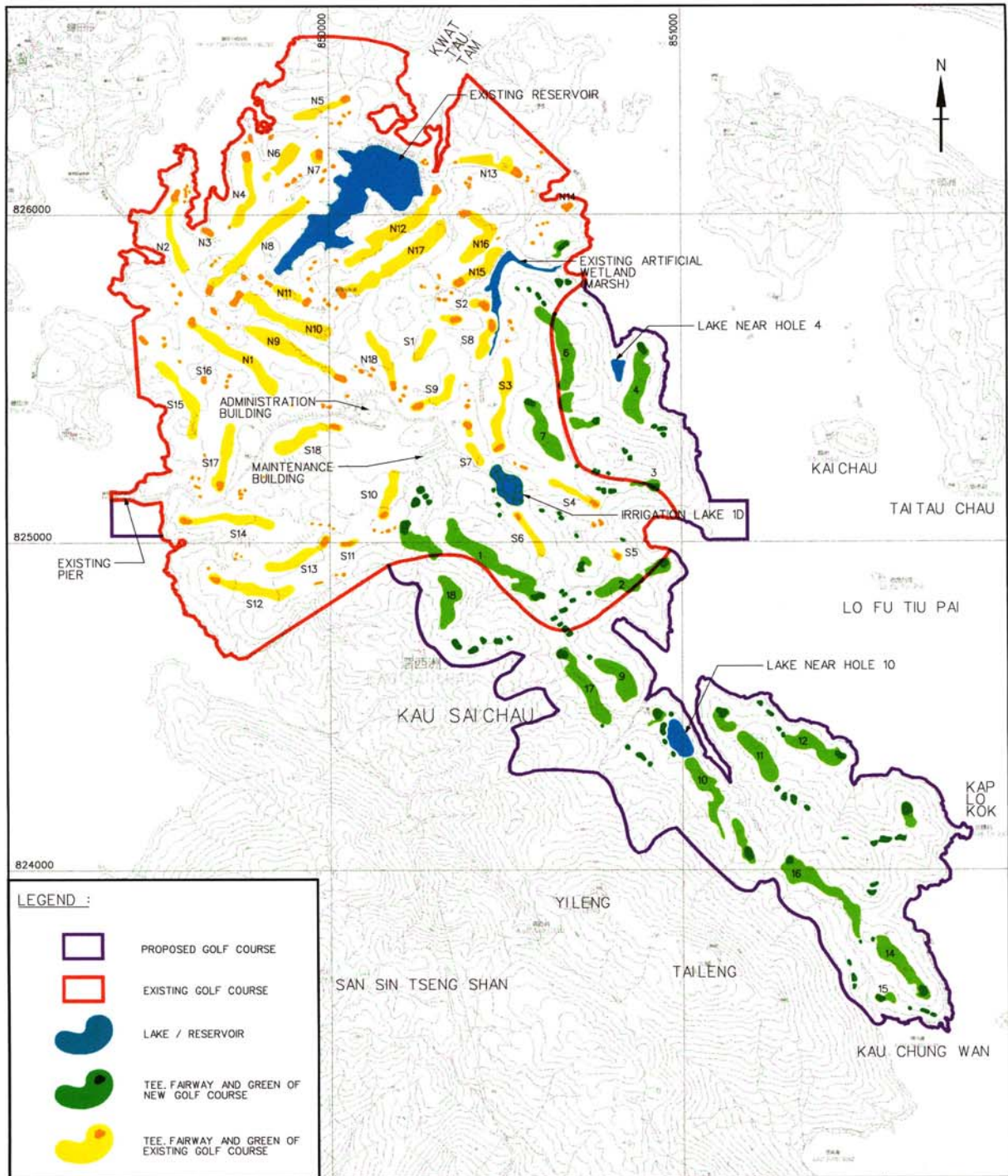
daily rainfall > 30 mm at Kau Sai Chau Island

{R} Rainstorm signal was hoisted; “A” stands for Amber, “R” stands for Red and “B” stands for Black rainstorm signals were hoisted.






3. Environmental Monitoring

WQ – fresh and marine water quality monitoring were implemented.

# FIGURES



LEGEND :

	PROPOSED GOLF COURSE
	EXISTING GOLF COURSE
	LAKE / RESERVOIR
	TEE, FAIRWAY AND GREEN OF NEW GOLF COURSE
	TEE, FAIRWAY AND GREEN OF EXISTING GOLF COURSE

 The Hong Kong Jockey Club

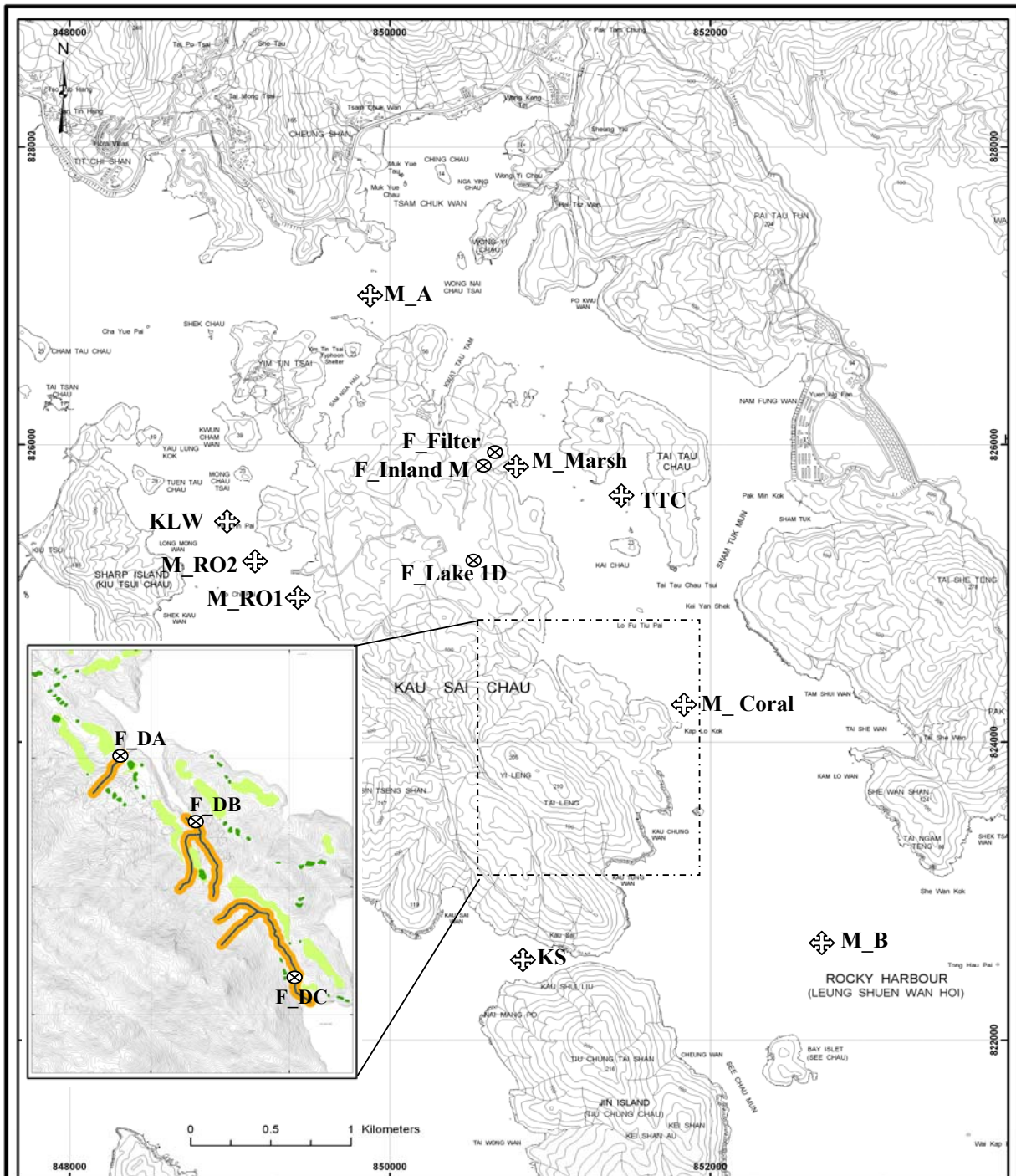
 **BLACK & VEATCH HONG KONG LIMITED**  
博威工程顧問有限公司

PROPOSED EXTENSION OF PUBLIC GOLF  
Public Golf Course at Kau Sai Chau Island,  
Sai Kung

Master Layer Plan

<b>Fig 1.1</b>	Revision
Reference	File Name
Prepared	Checked
Date	Scale
ET	PKL
Apr 08	1 : 15000 (A4)





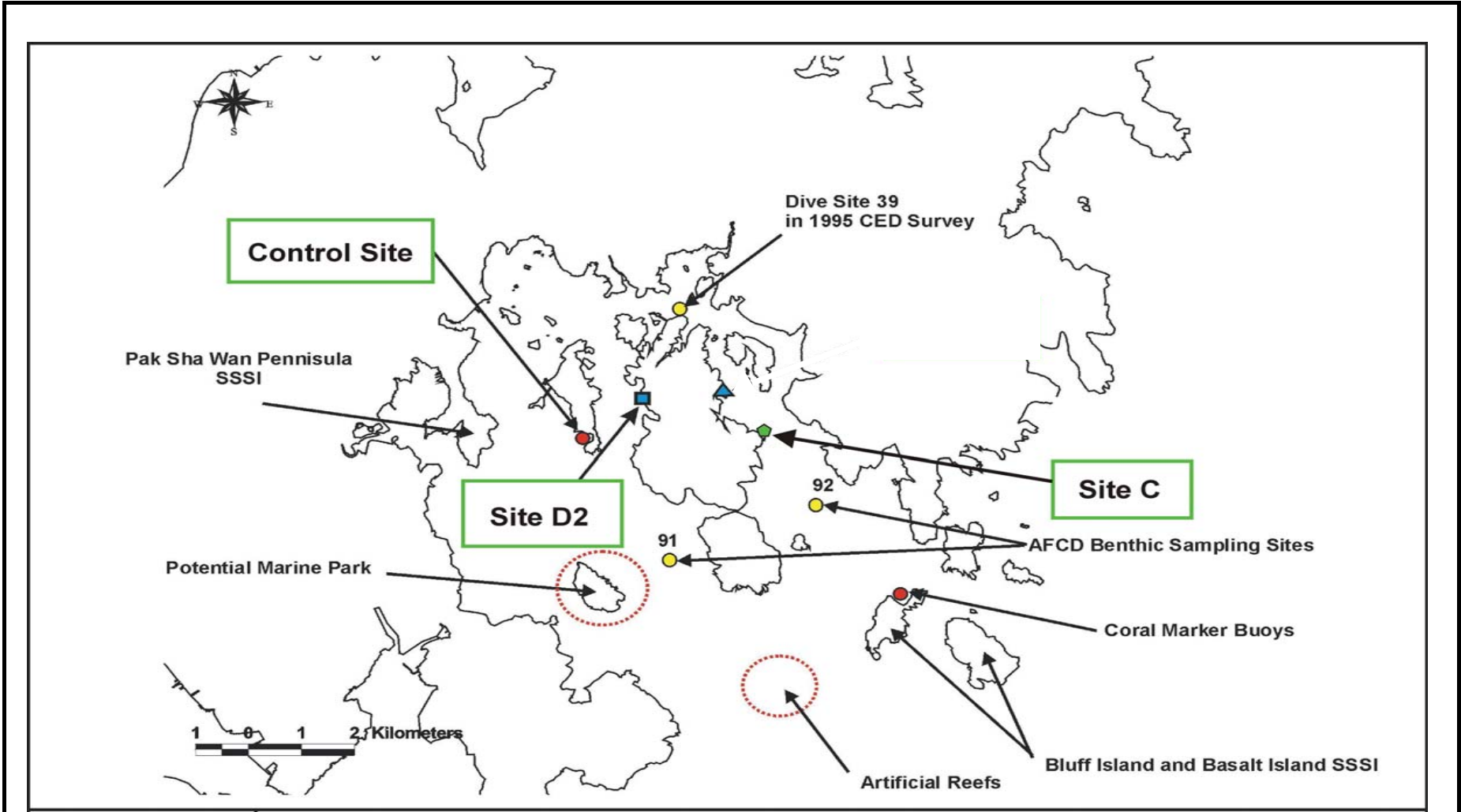

 香港賽馬會  
 The Hong Kong Jockey Club


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 博威工程顧問有限公司

Public Golf Course at Kau Sai Chau Island, Sai Kung  
 Water Quality Monitoring Locations -  
 Operation Phase

Fig 3.1	
ET	PKL
Apr 08	

MKD No CP555 D:\Project\032219\_022\location.mxd  
 Plot No CP555 D:\Project\032219\_022\location.pdf



香港賽馬會  
The Hong Kong Jockey Club



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博威工程顧問有限公司

Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung

Coral Survey Monitoring Location

Fig 3.2

Prepared	Checked
ET	PKL
Date	Apr-08