



Quarterly EM&A Compliance Report

# SkyCity Nine Eagles Golf Course

May 2013 to July 2013



Project/Deliverable No.:	7076024   D01/13
Project Name:	SkyCity Nine Eagles Golf Course
Report Name:	Quarterly EM&A Compliance Report – May 2013 to July 2013
Report Date:	August 2013
Report for:	Sky City Nine Eagles Golf Course

#### PREPARATION, REVIEW AND AUTHORISATION

Revision #	Date	Prepared by	Reviewed by	Approved for Issue by
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#### ISSUE REGISTER

Distribution List	Date Issued	Number of Copies
Sky City Nine Eagles Golf Course – Eddie YUNG	August 2013	1 electronic
EPD (EIAO Office) – Kenny LEUNG	August 2013	2 hardcopies + 1 CD-ROM
EPD (Regional Office) – Wilson TAM	August 2013	1 hardcopy
SkyCity Nine Eagles – Vincent LEUNG	August 2013	1 electronic
Asia Turf Solutions – Rick HAMILTON	August 2013	1 electronic
Airport Authority – Sophia LAU	August 2013	1 electronic
SMEC Project File:	August 2013	1 electronic

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## EXECUTIVE SUMMARY

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The project is to construct and operate a 9-hole Golf Course at the east side of the North Commercial District (NCD) on the Airport Island as an interim arrangement prior to the area's future development as a business park. The golf facility, known as "SkyCity Nine Eagles Golf Course" is intended to serve airport passengers, overseas visitors and airport workers.

According to the approved EM&A Manual, monthly compliance monitoring of lake water quality at four locations (W1 and W2 in Lake A and W3 and W4 in Lake B) is required during the second phase of the Operation Period, with reporting on a quarterly basis. Parameters monitored comprise Suspended Solids (SS), Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD<sub>5</sub>), nitrogen, phosphorous, temperature and salinity.

This is the twenty-fifth Quarterly Compliance report covering May 2013 to July 2013 and complies with the reporting requirements stated in the approved EM&A Manual.

In May 2013, there was no exceedance of any parameter at any location, especially concentrations of SS all below the Action Level. It may be the results of the heavy rainfall during this month. The rainfall increased the lake volume and diluted the algae concentration which is considered as the primary contributor for the SS in both of lakes.

In June 2013, there were exceedances of Limit Level for SS at W1 and W2 in Lake A and exceedances of Action Level for SS at W3 and W4 in Lake B. Compared to the previous month, the level of SS are much higher in both Lake A and B. It may be due to the continuous hot weather and the increasing of growth of algae in the lakes. However, there were no exceedances of any other parameters. Total nitrogen and total phosphorous concentrations remained below Action Levels, which indicate that organic nutrients were NOT the cause of the exceedances.

In July 2013, there were likewise exceedances of Limit Level for SS at W1 and W2 in Lake A and exceedances of Action Level for SS at W3 and W4 in Lake B. Compared to the previous month, the concentration of SS in Lake B has almost no change and the concentration of SS in Lake A is higher. It may be due to the continuous hot weather and less rainfall, which subsequently increased the presence of algae. There were no exceedances of any other parameters. Total nitrogen and total phosphorous concentrations remained below Action Levels, which indicate that organic nutrients were NOT the cause of the exceedances.

Compared to previous quarter, except of the month of May, the water quality is lower in terms of the increasing of SS concentration. It may be the results of hot weather and increasing of the growth of algae in the lakes. Bio-Trol continues to be applied each month in an attempt to control the algae growth.

As soon as monthly results were available, EPD and the Golf Course Supervisor were notified of any exceedances, as required by the Event/Action Plan. Furthermore, the Golf Course Supervisor was also advised that lake water was or was not of an acceptable quality for discharge and that the control valve could not be opened.

There were no complaints, notifications of summons received during the reporting quarter. There were also no openings of the control valve, emergency or otherwise. As such, there was no off-site release of lake water and therefore no impact to the marine environment.

# 1. PROJECT DESCRIPTION

## 1.1 Overview

The purpose of this Project is to construct and operate a 9-hole Golf Course at the east side of the North Commercial District (NCD) on the Airport Island as an interim arrangement prior to the area's future development as a business park (see *Figure 1-1*). The golf facility, known as "SkyCity Nine Eagles Golf Course" is intended to serve airport passengers, overseas visitors and airport workers.

The Project is managed by SkyCity Nine Eagles Golf Course, who has engaged Asia Turf Solutions Ltd. to establish and maintain the turfgrass of the Golf Course. SMEC Asia Ltd have been employed as the Environmental Team (ET) for the Operation Period since May 2010 and have engaged ALS Technichem Pty Ltd as the HOKLAS accredited testing laboratory to carry out lake water analysis. Construction of the golf course was completed on 31 December 2006, the first phase of the Operation Period was completed on 30 April 2007, and the second (and current) phase commenced on 1 May 2007.

## 1.2 Operation

The Golf Course has been designed to contain water within two artificial lakes, which are linked together by two underwater pipes. The lakes provide a source of freshwater for irrigation. All rainwater and surplus irrigation water collected within the Golf Course will drain back into the lakes for reuse, through a sub-soil drainage system.

The lakes are maintained at a capacity of 15,000m<sup>3</sup>. This is not "full" but is the level that provides the required visual appearance. During the winter (dry) months, however, the lake water may fall below this level. The maximum capacity of the lakes is 20,000m<sup>3</sup>.

If the capacity of the lakes exceeds 20,000m<sup>3</sup>, then the Golf Course may flood. To avoid this, the Golf Course Supervisor can authorise the opening of a control valve to allow the water to overflow from the lakes into storm drains that discharge off-site via Outfall No. 8. However, the valve can only be opened if the lake water monitoring results indicate that water is of an acceptable quality. Under normal circumstances, the control valve remains closed and discharge off-site is not possible. All opening/closing of the control valve is logged on site.

If the latest lake water monitoring results indicate that water is not of an acceptable quality, then the valve cannot be opened, the lake water cannot overflow and the Golf Course may begin to flood. This is part of the mitigation design to prevent off-site discharge of water that does not meet the required standard.

The bund that surrounds the site is at least 1.5m high and up to 90,000m<sup>3</sup> of floodwater can be retained within the Golf Course in addition to the 20,000m<sup>3</sup> lake capacity. In this situation, water samples from the flooded Golf Course will be taken more frequently. Only when water has returned to an acceptable quality will the control valve be opened to allow water to overflow from the lake and into off-site storm drains that discharge via Outfall No. 8, thereby allowing the flood to recede.

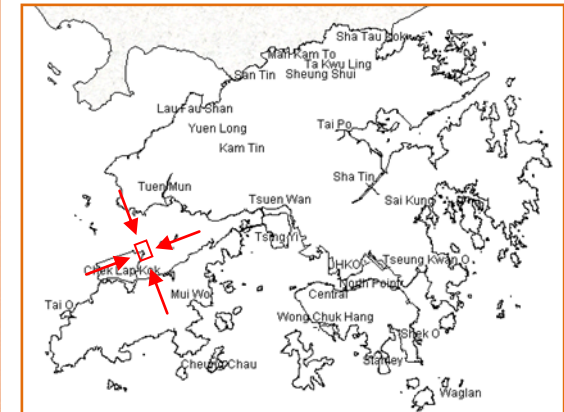
The system by which this water control is achieved is shown in *Figure 1-2*.



**Figure 1-1** Location of SkyCity Golf Course on the Airport Island



**Location Map**



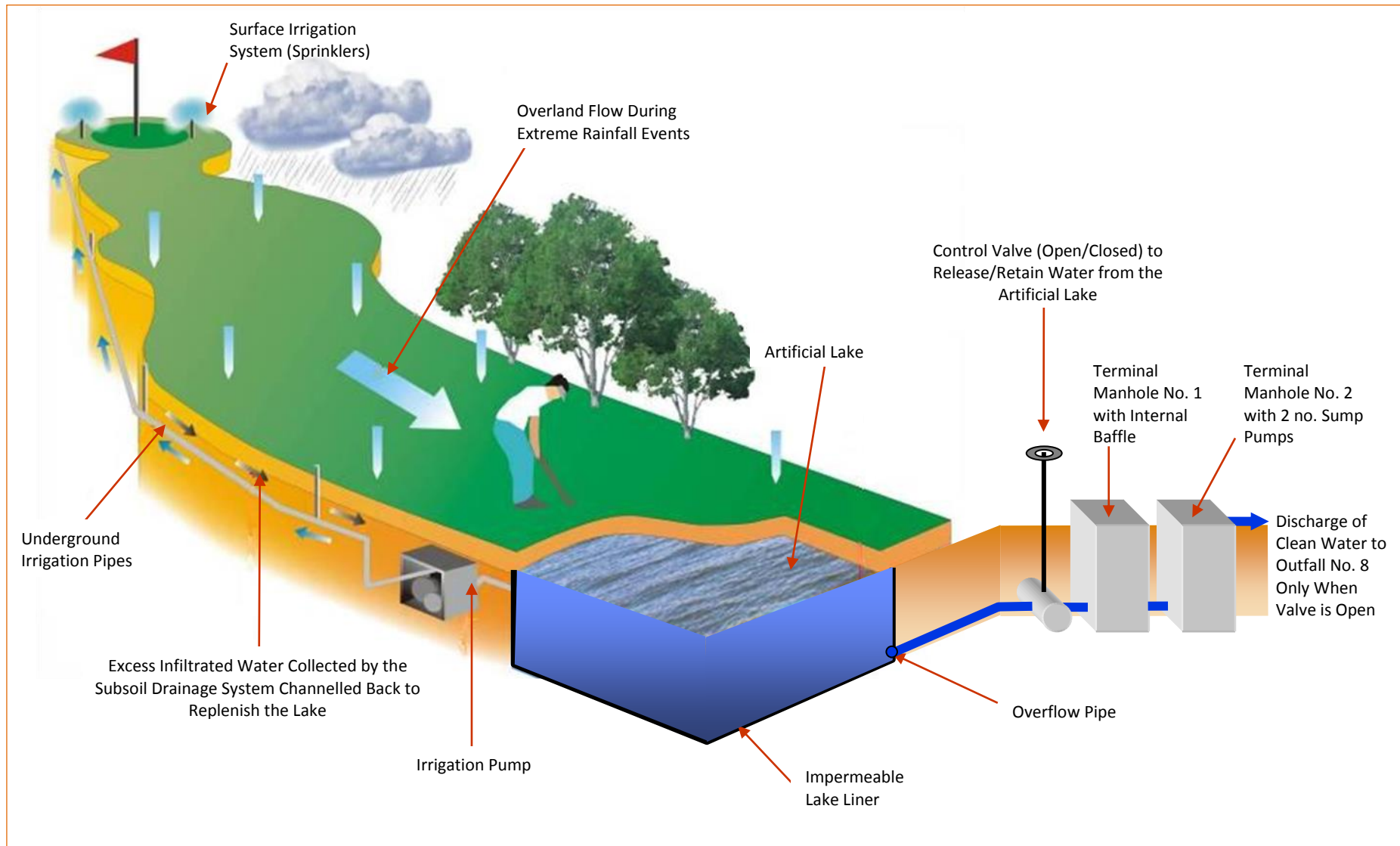
**Key**

- ① Terminal 2 & SkyPlaza  
 (Retail, F&B & Entertainment)  
 二號客運大樓及翔天廊 (零售、食肆及娛樂區)
- ② HKIA Tower  
 機場行政大樓
- ③ AsiaWorld - Expo  
 亞洲國際博覽館
- ④ 2nd on-airport hotel  
 第二間機場酒店
- ⑤ SkyPier  
 海天客運碼頭
- ⑥ SkyCity Nine Eagles Golf Course  
 航天城高爾夫球場
- ⑦ Airport World Trade Centre  
 暫名：機場世界貿易中心

Source: Image courtesy of Airport Authority



Figure 1-2 Schematic of Lake Water Control System



## 2. LAKE WATER QUALITY EM&A

### 2.1 EM&A Programme

Monitoring of Dissolved Oxygen (DO) in mg/ℓ, Suspended Solids (SS) in mg/ℓ, Biochemical Oxygen Demand (BOD<sub>5</sub>) in mg/ℓ, Total Nitrogen in mg/ℓ, Total Phosphorous in mg/ℓ, Salinity in g/ℓ, and temperature in °C was carried out by the ET to ensure that any deterioration in lake water quality could be readily detected and timely action could be taken to rectify the situation if this was due to site operations.

DO, temperature and salinity were measured in-situ whilst other parameters were determined in a HOKLAS-accredited laboratory.

#### 2.1.1 Monitoring This Quarter

The actual lake water monitoring schedule for this quarter (May to July 2013) is given in **Table 2-1**, below.

**Table 2-1 Monitoring Schedule for This Quarter**

Sampling Date	Sampling Locations
24 May 2013	W1 to W4
14 June 2013	W1 to W4
12 July 2013	W1 to W4

#### 2.1.2 Monitoring Next Quarter

The planned lake water monitoring schedule for the next quarter (August to October 2013) is given in **Table 2-2**, below.

**Table 2-2 Monitoring Schedule for the Next Quarter**

Sampling Date	Sampling Locations
9 August 2013	W1 to W4
13 September 2013	W1 to W4
11 October 2013	W1 to W4

## 2.2 Equipment and Methodology

Because of the relatively shallow water, in-situ measurements and water sampling were conducted at 0.5m from the surface (the mid-point of the 1m deep lake). Water samples for all monitoring parameters were collected, stored, preserved and analysed according to *APHA Standard Methods for the Examination of Water and Wastewater, 19th Ed, #17*.

In-situ monitoring was carried out using a DO concentration and DO saturation were carried out using a YSI Model 85 CE-C-M-Y multi-parameter meter and the range, resolution and accuracy of the equipment is provided in **Table 2-3**.

**Table 2-3 In-situ Monitoring Equipment Details**

In-situ Parameters	Measuring Devices	Measurement Precision
Dissolved Oxygen	YSI Professional Plus	0.1mg/ℓ and 0.1%
Salinity		0.1ppt (or g/ℓ)
Temperature		0.1°C

A Kahlisco water sampler was used to obtain water samples for subsequent SS analysis in the laboratory. A sufficient volume of the sample is collected in clean, high density polythene bottles, packed in ice (cooled to 4°C without being frozen), and delivered to the ALS laboratory immediately after monitoring. The analysis of the collected samples starts by the next working day following APHA *Standard Methods* #2540D.

## 2.3 Maintenance and Calibration

All in-situ monitoring instruments are calibrated and certified by ALS at monthly intervals throughout all stages of the lake water quality monitoring programme.

The YSI Multi-purpose Meter is calibrated once per monitoring day by the wet bulb method. Calibration at the ALS laboratory is carried out once every month in a water sample of known dissolved oxygen concentration. The sensor is immersed in the water and after thermal equilibration, the known mg/ℓ value is keyed in and the calibration is carried out automatically. Calibration details are provided in [Appendix 1](#).

## 2.4 Parameters Monitored

The following parameters are monitored and compared to Action/Limit (A/L) Levels:

- Dissolved Oxygen
- Suspended Solids
- BOD<sub>5</sub>
- Total Nitrogen
- Total Phosphorous

There are no A/L Levels for temperature or salinity – these parameters are recorded for information only.

## 2.5 Monitoring Locations

Monitoring locations together with grid references are shown in [Figure 2-1](#). Monitoring Stations are designated as W1, W2, W3 and W4.

## 2.6 Monitoring Date, Time, Frequency and Duration

In accordance with the EM&A Manual, the monitoring frequency of lake water quality is shown as [Table 2-4](#).

**Table 2-4 Monitoring Frequency**

	Operation Phase	
	Below A/L Level	A/L Level Exceedance
Monitoring Frequency	Monthly	Weekly

## 2.7 Action / Limit Levels

According to the approved EM&A manual, the A/L Levels for the compliance monitoring (for monitoring locations W1 to W4) are shown in **Table 2-5**, below.

**Table 2-5 Action and Limit Levels for Lake Water Quality**

Parameter	Acceptable Standard (mg/ℓ)	
	Action Level	Limit Level
Suspended Solids	20	30
BOD <sub>5</sub>	13.5	20
Dissolved Oxygen	4	3
Total Nitrogen	20	30
Total Phosphorous	3.5	5

In case of exceedance of A/L Levels caused by the operation of the Golf Course, the ET shall immediately implement the Event/ Action Plan (E/AP), shown in **Table 2-6**, below, in order to resolve lake water quality problems:

**Table 2-6 Event/Action P for Lake Water Quality Monitoring**

Event	Action
Exceedance of Action Level	<ul style="list-style-type: none"> <li>Notify the Golf Course Supervisor of the exceedance, providing full details (time, location, parameter, level, etc.)</li> <li>Increase the frequency of monitoring of the particular parameter(s) to “Action/Limit Level Exceedance” as shown in <b>Table 2-4</b></li> <li>If water quality continues to worsen, it may be prudent to review the Turfgrass Management Plan (TMP) in terms of application of nutrients and agree any revisions with the Golf Facility Supervisor</li> <li>Notify the Golf Facility Supervisor when water quality falls below “Action Level” and reduce monitoring frequency to “Below Action/Limit Level” as shown in <b>Table 2-4</b></li> </ul>
Exceedance of Limit Level	<ul style="list-style-type: none"> <li>Notify EPD and Golf Course Supervisor of the exceedance, providing full details (time, location, parameter, level, etc.)</li> <li>Suspend any ongoing application of organic nutrients</li> <li>Determine the likely cause of the exceedance(s) Review the TMP in terms of application of nutrients and agree any revisions with the Golf Facility Supervisor Continue to irrigate the Golf Course using lake water</li> <li>Increase the frequency of monitoring of the particular parameter(s) to “Action/Limit Level Exceedance” as shown in <b>Table 2-4</b> (if not already at this frequency) to demonstrate the effectiveness of remedial measures and to confirm that water quality has returned to acceptable levels</li> <li>Notify EPD and Golf Course Supervisor when water quality falls below “Action Level” (not “Limit Level”) and reduce monitoring frequency to “Below Action/Limit Level” as shown in <b>Table 2-4</b></li> </ul>



**Figure 2-1**      **Locations for Lake Water Quality Monitoring**





## 3. MONITORING RESULTS

### 3.1 Summary of Results

A summary of scheduled lake water monitoring results for the reporting quarter is provided in **Error! Reference source not found.**, below. Detailed results are provided in **Appendix 2** and graphical plots since commencement of the second phase of Operation are given in **Appendix 3**.

**Table 3-1 Summary of Compliance Monitoring Data during Reporting Quarter**

Monitoring Location		Salinity (g/ℓ)	Temperature (°C)	SS (mg/ℓ)	BOD <sub>5</sub> (mg/ℓ)	DO Saturation (%age)	DO Concentration (mg/ℓ)	Total Nitrogen (mg/ℓ)	Total Phosphorous (mg/ℓ)
W1	Mean	0.1	27.0	<b>30</b>	4.0	89	6.8	2	0.1
	Minimum	0.1	25.7	15	3.0	75	6.1	1	0.1
	Maximum	0.1	27.7	<b>43</b>	5.0	106	7.9	2	0.2
W2	Mean	0.1	27.0	<b>30</b>	4.0	92	6.9	2	0.1
	Minimum	0.1	25.6	14	2.0	78	6.1	1	0.1
	Maximum	0.1	27.7	<b>44</b>	6.0	110	8.2	2	0.2
W3	Mean	0.1	27.4	<b>24</b>	7.0	78	6.2	2	0.1
	Minimum	0.1	26.1	15	5.0	66	5.7	2	0.1
	Maximum	0.2	28.2	<b>30</b>	11.0	88	6.7	3	0.2
W4	Mean	0.1	27.5	<b>24</b>	7.7	81	6.2	2	0.1
	Minimum	0.1	26.2	15	5.0	70	5.7	2	0.1
	Maximum	0.2	28.4	<b>29</b>	12.0	92	6.8	3	0.2

**Note:** **Bold** indicates Action Level exceedance; **Bold** indicates **Limit Level** exceedance.

### 3.2 Discussion

#### 3.2.1 May 2013

In May 2013, there was no exceedance of any parameter at any location of W1 to W4; especially SS concentrations are all below the Action Level. It may be the results of the heavy rainfall and the increasing of the lakes volume, which dilute the concentration of algae as primary contributor to SS in both of lakes.

Although the lake water is considered to be of an acceptable quality for discharge into the surrounding marine waters, in accordance with the EM&A Manual, the opening of the control valve shall be authorized if need and the activity (date and time) shall be recorded in a log book kept on-site. The Golf Facility Supervisor shall authorise the closing of the control valve when, in his opinion, circumstances have returned to normal. This activity shall also be recorded in the log book, which shall be made

available for inspection as required. Bio-Trol continues to be applied in an attempt to control algal growth.

Since there were no exceedances recorded, the Event/Action Plan specified in the EM&A Manual did not need to be implemented for this month.

### 3.2.2 June 2013

In June 2013, there were exceedances of Limit Level for SS at W1 and W2 in Lake A and exceedances of Action Level for SS at W3 and W4 in Lake B. Therefore, in accordance with the EM&A Manual, the Golf Facility Supervisor was advised that **the control valve shall remain closed and there shall be no discharge off-site into the surrounding marine waters** until such time as lake water has returned to an acceptable quality. There were no exceedances of any other parameters – total nitrogen and total phosphorous concentrations remained below Action Levels, which indicate that organic nutrients were NOT the cause of the exceedances. The exceedances may be due to the hot weather and the increasing of the presence of algae in both lakes.

As the reason for the exceedance is understood, it is not considered necessary to increase frequency of monitoring at this time. Since the application of organic nutrients is not the cause of the exceedance, there is no need to suspend application of organic nutrients, to review the TMP, or remedial measures in terms of turfgrass management.

While the water quality in the lakes remains below acceptable levels for discharge it should be noted that there has been no discharge off-site and so there have been no adverse environmental impacts to the surrounding marine environment.

### 3.2.3 July 2013

Similarly to the previous month, there were exceedances of Limit Level for SS at W1 and W2 in Lake A and exceedances of Action Level for SS at W3 and W4 in Lake B in July 2013. Therefore, in accordance with the EM&A Manual, the Golf Facility Supervisor was advised that **the control valve shall remain closed and there shall be no discharge off-site into the surrounding marine waters** until such time as lake water has returned to an acceptable quality. There were no exceedances of any other parameters – total nitrogen and total phosphorous concentrations remained below Action Levels, which indicate that organic nutrients were NOT the cause of the exceedances. The exceedances may be due to the continuous hot weather and increasing of the growth of algae in both lakes.

As the reason for the exceedance is understood, it is not considered necessary to increase frequency of monitoring at this time. Since the application of organic nutrients is not the cause of the exceedance, there is no need to suspend application of organic nutrients, to review the TMP, or remedial measures in terms of turfgrass management.

While the water quality in the lakes remains below acceptable levels for discharge it should be noted that there has been no discharge off-site and so there have been no adverse environmental impacts to the surrounding marine environment.

### 3.3 Operational Practice

**Table 3-2**, below, shows the operational practice during the reporting quarter, i.e., the activities relating to the management of water in the lakes. The lake water quality in May was well below the Action/Limit Level and considered to be acceptable for discharge. But the lake water quality in June and July decreased and were not considered to be of an acceptable for discharge. Therefore, the control valve remained closed and no water was discharged off site in June and July.

**Table 3-2 Operational Results**

Month	Month-end Lake Water Depth (m)	Can Control Valve Be Opened?	Was Control Valve Opened?	Quantity of Water Discharged (m <sup>3</sup> )
May 2013	1.2	Yes	No	0
June 2013	1.5	No	No	0
July 2013	1.2	No	No	0

### 3.4 Complaints and Notifications of Summons

During the reporting quarter, there were no complaint received and no notifications of summons. There were also no openings of the control valve, emergency or otherwise.

## 4. COMMENTS, RECOMMENDATIONS AND CONCLUSIONS

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Reporting during the second phase of the Operation Period is required on a quarterly basis. This is the twenty-fifth Quarterly Compliance report covering May 2013 to July 2013 and complies with the reporting requirements stated in the approved EM&A Manual.

Compliance monitoring of lake water quality is required on a monthly basis, with an increase in frequency to weekly if there are Action or Limit Levels exceedances caused by the operation of the Golf Course. Parameters tested include SS, DO, BOD<sub>5</sub>, nitrogen, phosphorous, temperature and salinity.

In May 2013, there was no exceedance of any parameter at any location, especially the level of SS are all below the Action Level. It may be the results of the drop-down of the concentration of algae by heavy rainfall and increasing of lake volume.

In June 2013, there were exceedances of Limit Level for SS at W1 and W2 in Lake A and of Action Level for SS at W3 and W4 in Lake B, but there were no exceedances of any other parameters. Total nitrogen and total phosphorous concentrations remained below Action Levels, which indicate that organic nutrients were NOT the cause of the exceedances. The exceedance of SS concentration may be due to the hot weather and the increasing of the presence of algae.

In July 2013, there were also exceedances of Limit Level for SS at W1 and W2 in Lake A and of Action Level for SS at W3 and W4 in Lake B. Compared to the previous month, the concentration of SS in Lake A was higher and the concentration of SS in Lake B was almost no change. There were no exceedances of any other parameters. Total nitrogen and total phosphorous concentrations remained below Action Levels, which indicate that organic nutrients were NOT the cause of the exceedances. The exceedance of the concentration of SS may be due to the continuous hot weather and the increasing of the growth of algae.

Based on observation, the heavy rainfall in May increased the lakes volume and diluted the concentration of algae in both lakes. It significantly reduced the SS levels at all monitoring locations. In June and July, the less rainfall and continuous hot weather surged the growth of the algae and increased the concentration of algae, which primarily contributes to the concentration of SS in both lakes. Therefore, it occurred the concentration of SS exceeded the Limit Level at W1 and W2 at Lake A and the Action Level at W3 and W4 at Lake B. During the reporting quarter, Bio-Trol was being applied each month in an attempt to control the algal growth.

As the reason for the exceedances over the reporting quarter is understood, it was not considered necessary to increase frequency of monitoring. Since the application of organic nutrients is not the cause of the exceedances, there is no need to suspend application of organic nutrients, to review the TMP, or remedial measures in terms of turfgrass management.

During the reporting quarter there were no complaints and no notifications of summons. There were also no openings of the control valve, emergency or otherwise.

As such, there was no off-site release of lake water and therefore no impact to the marine environment.



---

## APPENDIX 1

### Equipment Calibration Details



**ALS Technichem (HK) Pty Ltd**

## REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

**CONTACT:** MR ALEXI BHANJA  
**CLIENT:** SMEC ASIA LIMITED  
**ADDRESS:** 27/F, FORD GLORY PLAZA,  
37-39 WING HONG STREET,  
CHEUNG SHA WAN,  
KOWLOON, HONG KONG.  
**PROJECT:** SKY CITY GOLF COURSE

**WORK ORDER:** HK1313983  
**SUB-BATCH:** 1  
**LABORATORY:** HONG KONG  
**DATE RECEIVED:** --  
**DATE OF ISSUE:** 07/06/2013

### COMMENTS

It is certified that the item under calibration/checking has been calibrated/checked by corresponding calibrated equipment in the laboratory.  
Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of ALS will be followed.

Scope of Test: Dissolved Oxygen and Temperature  
Description: YSI PROPLUS  
Brand Name: YSI  
Model No.: PROPLUS  
Serial No.: 09K100735  
Equipment No.: --  
Date of Calibration: 24 May, 2013

### 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

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1-3 Wing Yip Street  
Kwai Chung  
HONG KONG

**Phone:** 852-2610 1044  
**Fax:** 852-2610 2021  
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Mr. Fung Lim Chee, Richard  
General Manager -  
Greater China & Hong Kong

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# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

**Work Order:** HK1313983  
**SUB-BATCH:** 1  
**Date of Issue:** 07/06/2013  
**Client:** SMEC ASIA LIMITED



**Description:** YSI PROPLUS  
**Brand Name:** YSI  
**Model No.:** PROPLUS  
**Serial No.:** 09K100735  
**Equipment No.:** --  
**Date of Calibration:** 24 May, 2013

**Date of next Calibration:** 24 August, 2013

**Parameters:**

**Dissolved Oxygen** **Method Ref: APHA (21st edition), 4500O: G**

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
4.19	4.08	-0.11
6.15	6.10	-0.05
8.15	8.01	-0.14
Tolerance Limit ( $\pm$ mg/L)		0.20

**Temperature**

**Method Ref: Section 6 of International Accreditation New Zealand Technical  
 Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.**

Expected Reading ( $^{\circ}$ C )	Displayed Reading ( $^{\circ}$ C )	Tolerance ( $^{\circ}$ C )
10.5	10.3	-0.2
22.0	22.5	0.5
37.5	38.2	0.7
Tolerance Limit ( $\pm$ $^{\circ}$ C)		2.0

  
 Mr. Fung Lim Chee, Richard  
 General Manager -  
 Greater China & Hong Kong

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## APPENDIX 2

### Lake Water Quality Monitoring Data

Date	Time	Station	Salinity (g/ℓ)	Temperature (°C)	SS (mg/ℓ)	BOD5 (mg/ℓ)	DO Sat (%Saturation)	DO Conc (mg/ℓ)	Total Nitrogen (mg/ℓ)	Total Phosphorous (mg/ℓ)
24-May-13	6:45	W1	0.1	25.7	15	3	75.2	6.1	1.2	0.1
	6:40	W2	0.1	25.6	14	2	78.3	6.1	1.2	0.1
	6:35	W3	0.1	26.1	15	5	66.3	5.7	1.8	0.1
	6:30	W4	0.1	26.2	15	5	70.3	5.7	1.8	0.1
14-June-13	7:00	W1	0.1	27.7	<b>32</b>	5	85.1	6.5	2.3	0.2
	6:55	W2	0.1	27.7	<b>32</b>	6	87.4	6.5	2.3	0.2
	6:50	W3	0.1	28.2	<b>30</b>	11	78.3	6.1	2.9	0.2
	6:45	W4	0.1	28.4	<b>29</b>	12	80.5	6.1	3.0	0.2
12-July-13	6:45	W1	0.1	27.6	<b>43</b>	4	106.0	7.9	1.6	0.1
	6:40	W2	0.1	27.7	<b>44</b>	4	110.0	8.2	1.6	0.1
	6:35	W3	0.2	28.0	<b>28</b>	5	87.9	6.7	2.6	0.1
	6:30	W4	0.2	28.0	<b>29</b>	6	91.7	6.8	2.6	0.1
<b>Mean</b>			0.1	27.2	27	6	84.8	6.5	2.1	0.1
<b>Minimum</b>			0.1	25.6	14	2	66.3	5.7	1.2	0.1
<b>Maximum</b>			0.2	28.4	<b>44</b>	12	110.0	8.2	3.0	0.2

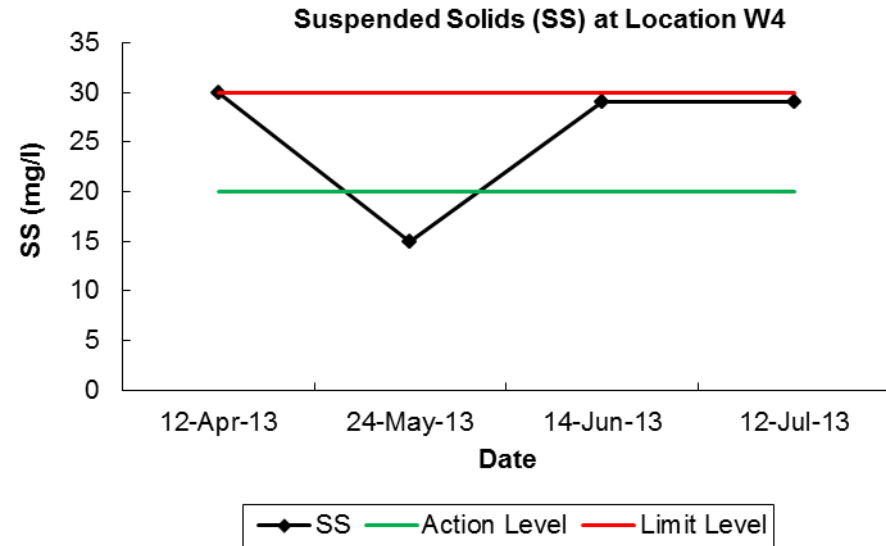
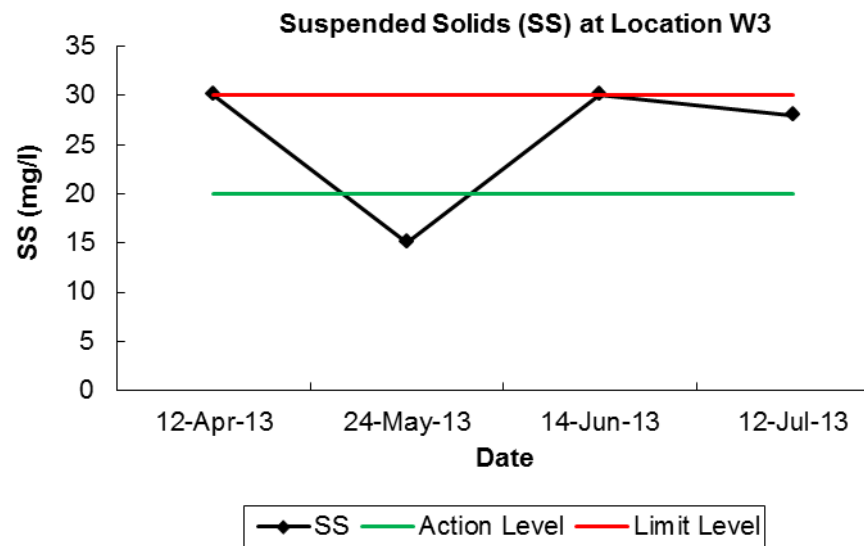
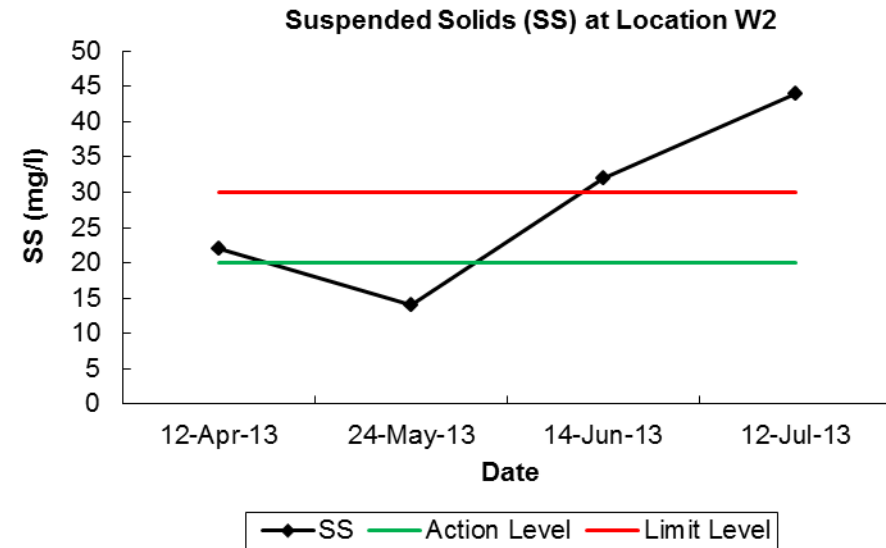
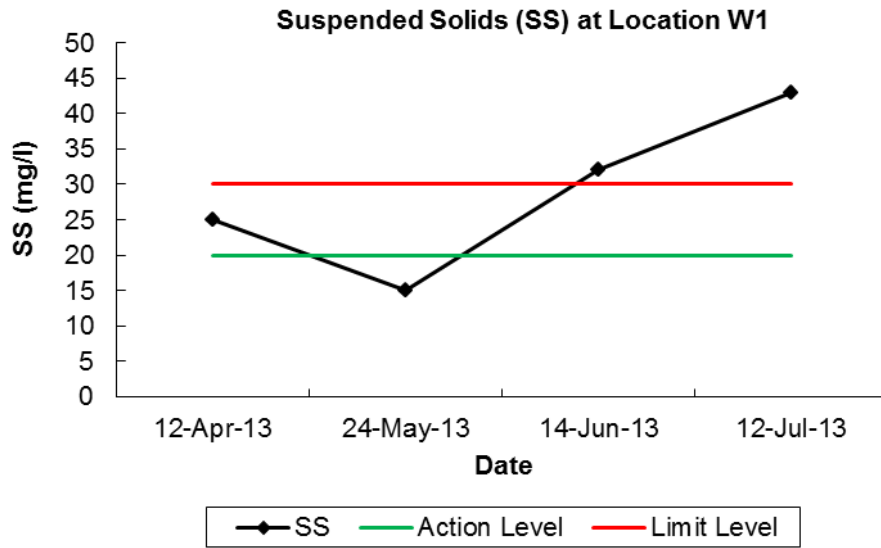
**Note:** **Bold** indicates Action Level exceedance; **Bold** indicates **Limit Level** exceedance

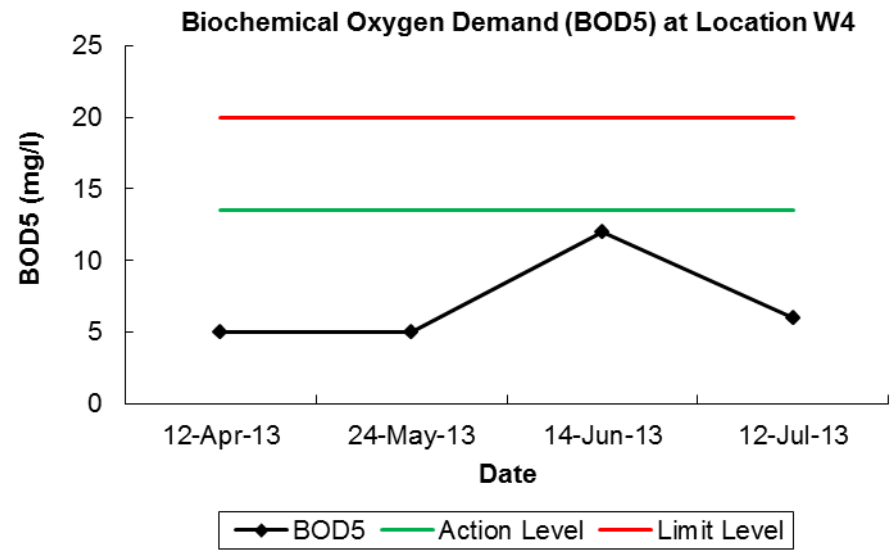
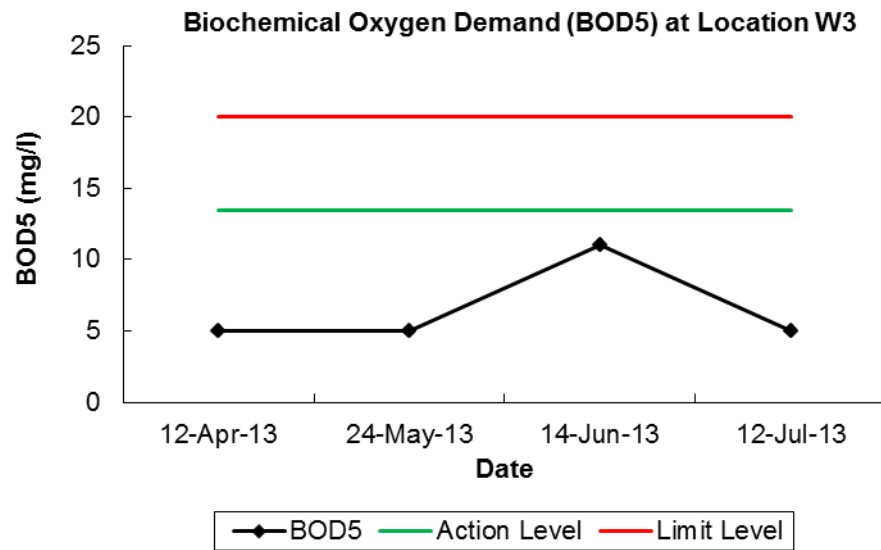
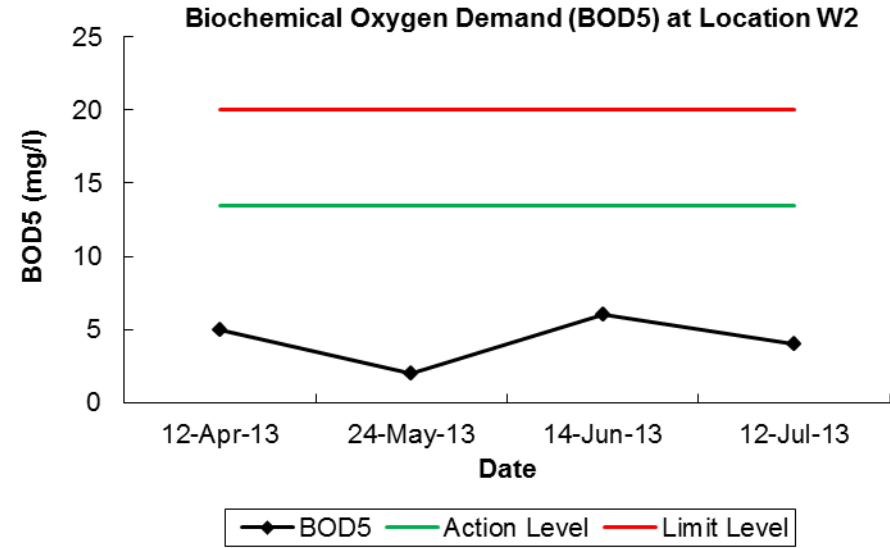
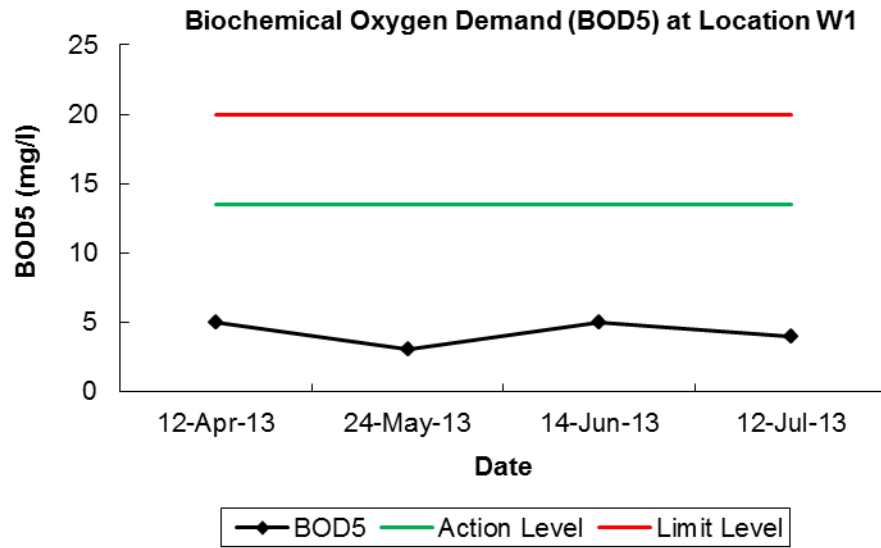


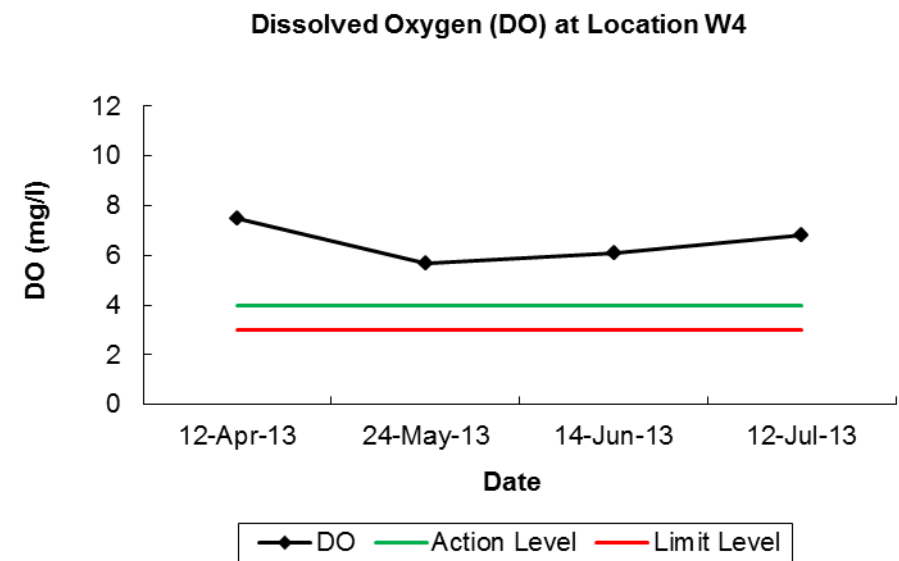
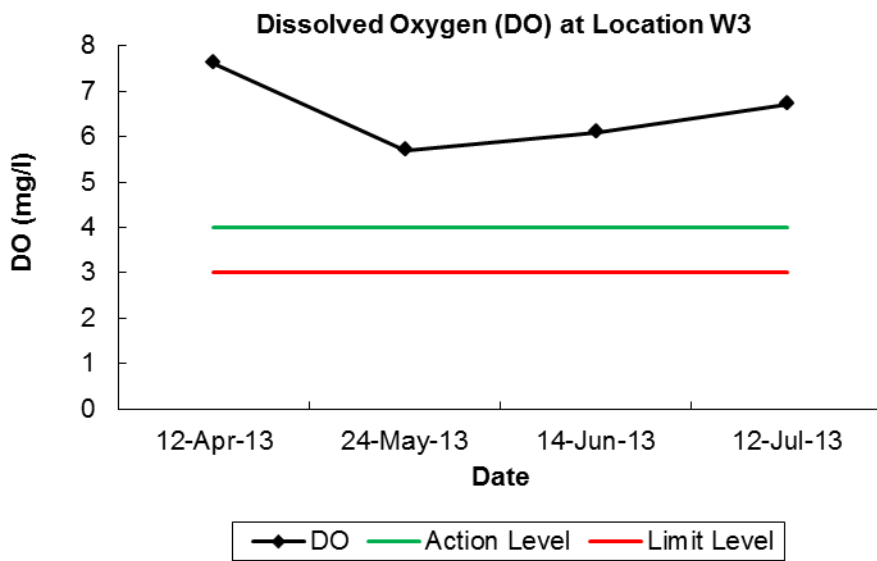
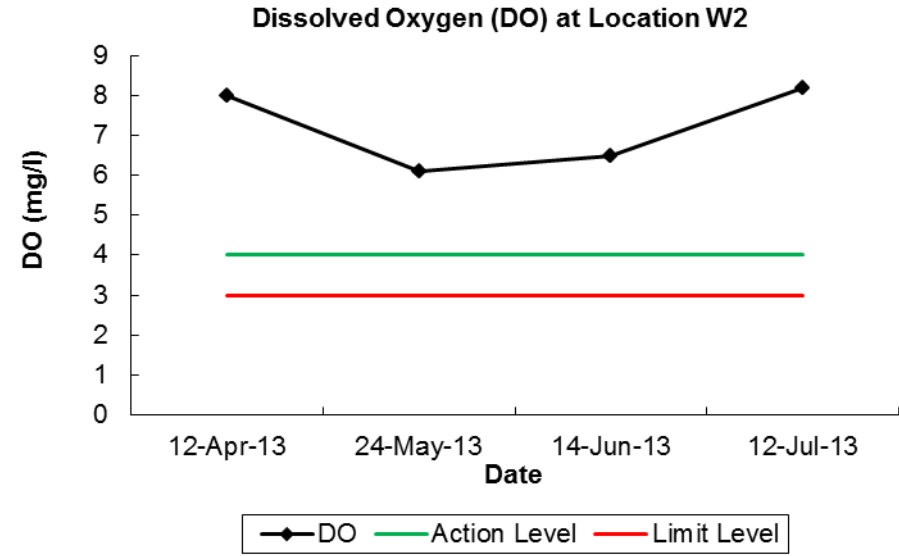
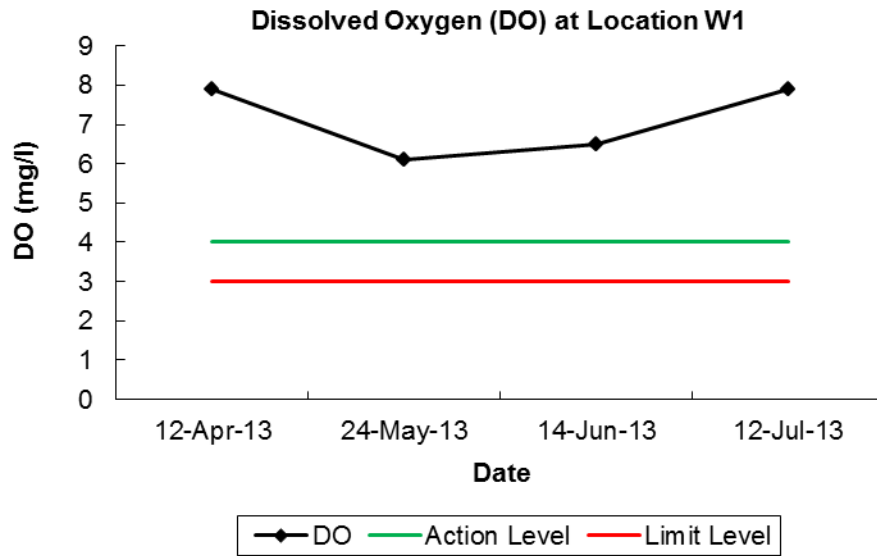
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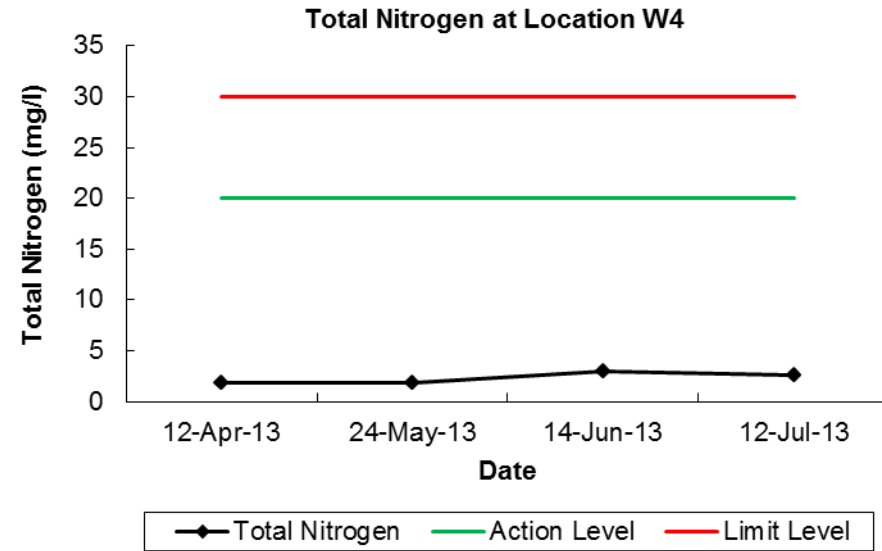
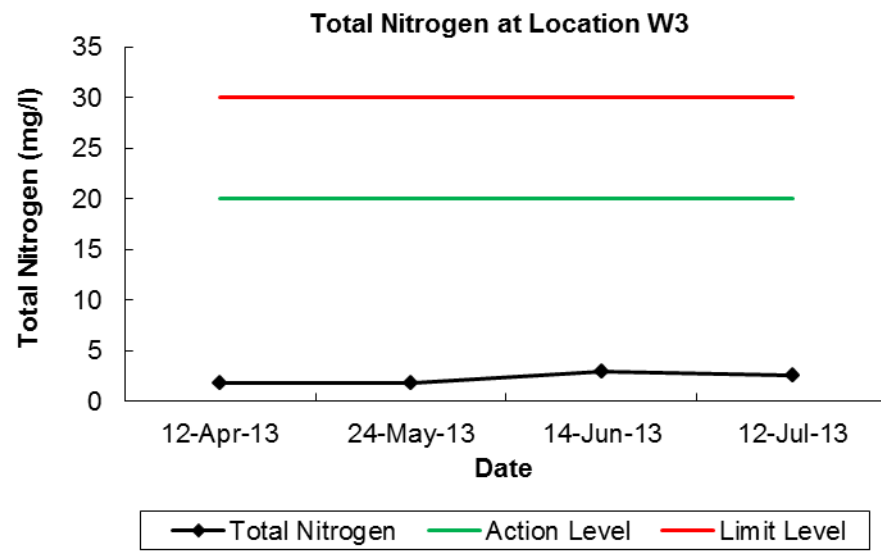
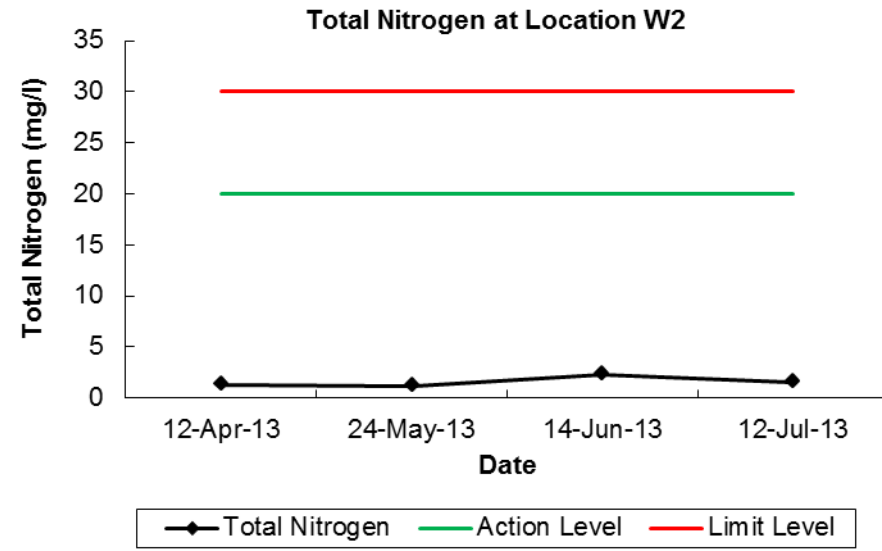
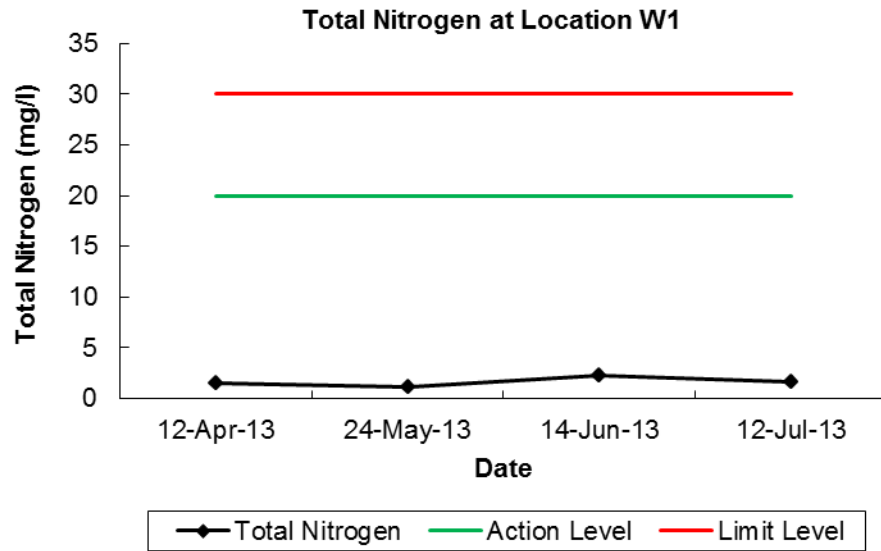
## APPENDIX 3

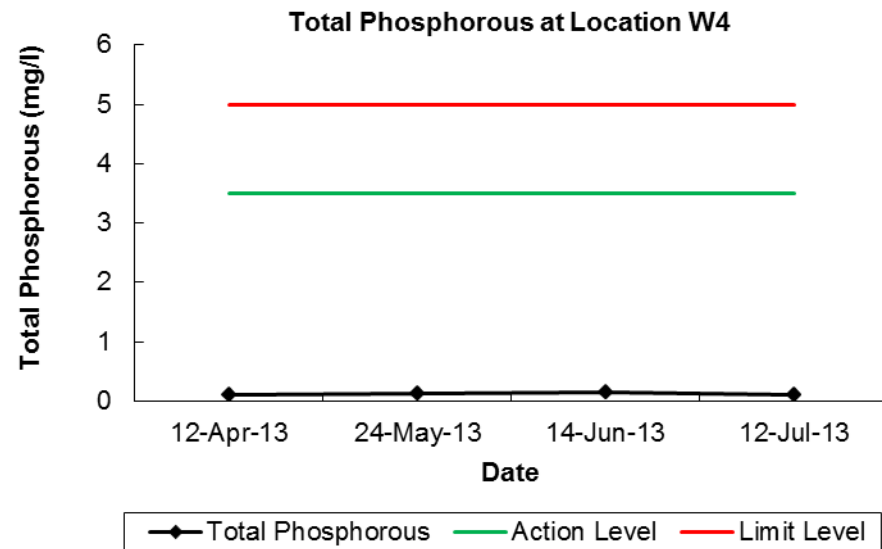
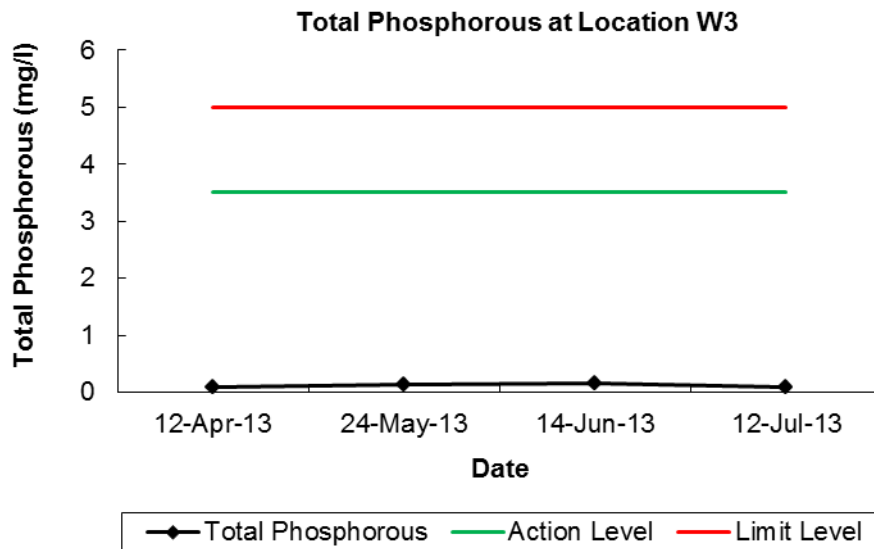
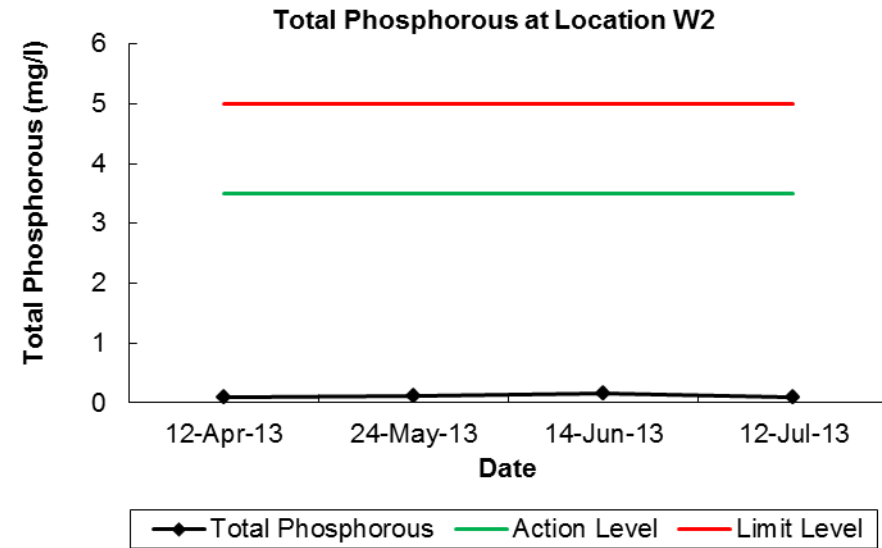
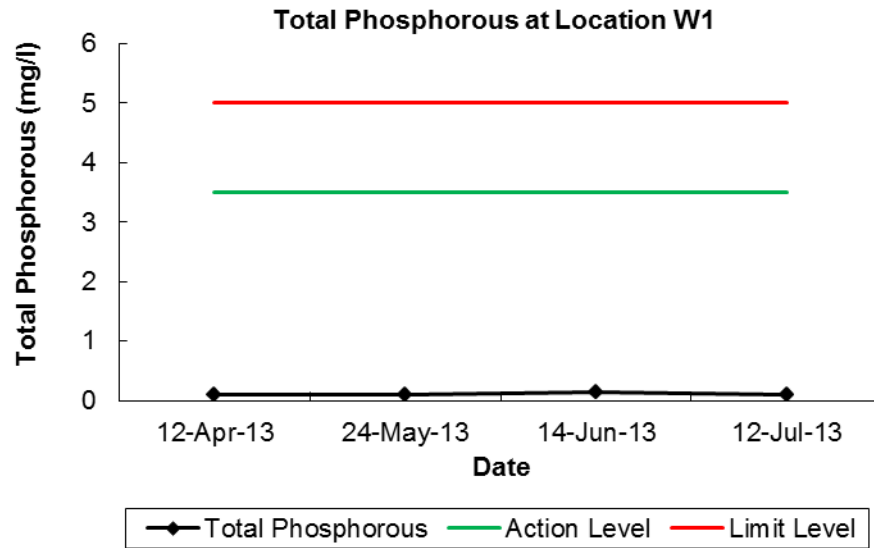
### Graphical Plots of Monitoring Data for the Past Four Months













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## APPENDIX 4

### Aqua Bio-Trol Liquid – Product Datasheet

# Aqua Bio-Trol Liquid

## Liquid Microbial Pond Clarifier

PRODUCT DATA BULLETIN

### Features

- Eliminates pond scum and green, soupy conditions
- Improves water clarity
- Reduces foul odors and organic sediment
- Contains facultative bacteria capable of withstanding low oxygen levels
- Reduces levels of harmful nitrates & ammonia
- Effective under a wide range of climactic conditions
- Enhances conditions for all aquatic life
- Reduces biological oxygen demand
- Non-toxic, safe for fish, plants & applicator
- Microencapsulated, microbial stimulants

**Aqua Bio-Trol Liquid** is the safe, natural way to establish and maintain cleaner pond and lake water without chemicals. *Aqua Bio-Trol Liquid* eliminates pond scum and green, soupy conditions, while eliminating foul odors. *Aqua Bio-Trol Liquid* improves water clarity and digests excess organic matter in ponds, lakes and fountains.

**Aqua Bio-Trol Liquid** helps to create and maintain a healthier pond, lake and fountain water ecosystem through non-chemical treatment. *Aqua Bio-Trol Liquid* is an all natural, microbial based product effective for improving poor water conditions, and especially for maintenance of healthy water conditions once they are established. *Aqua Bio-Trol Liquid* is a concentration of naturally occurring microbes, which act to bring pond and lake water into proper ecological balance.

**Aqua Bio-Trol Liquid** is completely biodegradable and non-toxic to humans, animals and water life. The result of treatment is reduced organic sediment and particulate, reduced sludge, clear water, and enhanced conditions for all aquatic life.

**Aqua Bio-Trol Liquid** microbes preemptively consume organic matter which feeds algae and which leads to anaerobic conditions, including bad odors. The active microbes in *Aqua Bio-Trol Liquid* feed on excess nutrients in the entire water column, from sludge at the bottom to suspended particulate, to green organic matter on the surface. Routine application helps keep water in it's best condition without the use of potentially harmful chemicals.



### DIRECTIONS FOR USE

**Aqua Bio-Trol Liquid** is most effective when water temperatures range from 50° to 100° F. For best results, provide adequate surface or subsurface aeration. Subsurface aeration is preferred. For maximum efficiency, assure a minimum of 5-6 % dissolved oxygen.

Apply by distributing liquid as much as possible around pond and lake edges. Avoid dumping liquid in one location.

Pond Volume	Initial Treatment	Monthly Maintenance
Acre Foot 325,900 gallons	4 gallons	2 gallons

### Formulas to help in your calculations

- Length x Width x Depth (feet) x 7.48 = Number of Gallons
- One acre-foot of water = 325,900 gallons
- One acre-foot of water = 1,233 CuMt

### Active Ingredients

A proprietary blend of 58 strains of aerobic and facultative beneficial bacteria at a minimum concentration of 6.6 x 10<sup>7</sup> CFU per ml (including *Bacillus subtilis*)

**Warranty:** Seller warrants that the product conforms to its chemical description and is reasonably fit for the purpose stated on the label when used in accordance with directions under normal conditions of use; but neither this warranty nor any other warranty of merchantability or fitness of a particular product expressed or implied, extends to the use of this product contrary to label conditions, or under conditions not reasonably foreseeable to the seller; and buyer assumes the risk of any such use.



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