



**CONTRACT NO. DE/2005/04**

**SUPPLY AND INSTALLATION OF ELECTRICAL AND MECHANICAL EQUIPMENT FOR  
UPGRADING OF TING KOK ROAD PUMPING STATION NO. 5**

***ENVIRONMENTAL MONITORING AND AUDIT***

**MONTHLY EM&A REPORT NO. 8**

**JANUARY 2008**

*for*

**Biwater Man Lee Limited**

*Submitted by*

**Kingsford Environmental (H.K.) Ltd.**

**CONTROLLED DOCUMENT**

Revision: C

Revision Date: 15/2/08

Approved by: SL

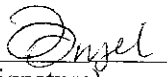
Distribution Date: 15/2/08

CUSTOMER: **Biwater Man Lee Limited**

PROJECT NAME: **Supply and Installation of Electrical and Mechanical Equipment for Upgrading of Ting Kok Road Pumping Station No. 5**

PROJECT NO.: 81901

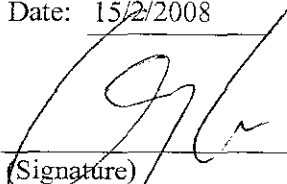
Author:

  
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(Name)

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Mr. S. Lau  
(Name)

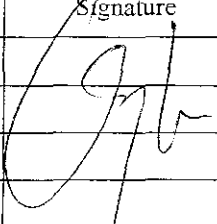
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### CONTROLLED DOCUMENT DISTRIBUTION

Document Title : Monthly EM&A Report No. 8      Controlled Copy No.: \_\_\_\_\_

Document No. : RPT:MRPTNo.8/RevC/81901

Distributed to : Biwater Man Lee Limited      Date : 15/2/2008

REVISION RECORD				
Rev. No.	Revision Notification	Date	Approved By	Signature
A	Report issued to Client	31/1/2008	S. Lau	
B	Report issued to Client	13/2/2008	S. Lau	
C	Report issued to Client	15/2/2008	S. Lau	

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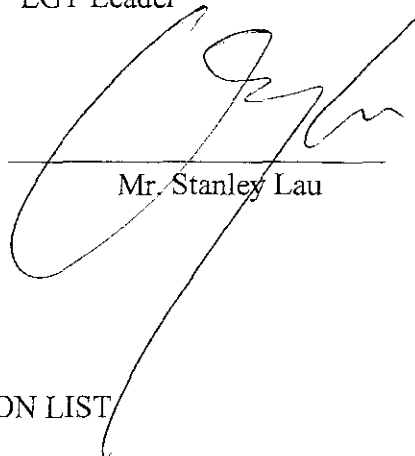
### APPROVAL & DISTRIBUTION SHEET

DOCUMENT DATE: 15 February 2008

#### APPROVAL

Certified by : LGT Leader

Signature:



Mr. Stanley Lau

Date: 15 February 2008

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Engineer's Representative (Drainage Services Department)	Mr. C. W. Tse	7
E&M Contractor (Biwater Man Lee Limited)	Mr. Thomas Jim	1
Independent Checker (Landfill Gas) (CH2M HILL Hong Kong Limited)	Mr. K. S. Lee	1

## EXECUTIVE SUMMARY

This is the eighth monthly Environmental Monitoring and Audit (EM&A) Report for the Drainage Services Department Contract No. DE/2005/04 entitled "Supply and Installation of Electrical and Mechanical Equipment for Upgrading of Ting Kok Road Pumping Station No. 5". This report contains the results of the landfill gas monitoring and environmental auditing for verification of mitigation implementation conducted by the Landfill Gas Team (LGT) of the E&M Contractor, Biwater Man Lee Limited, as required in the contract.

For the landfill gas monitoring activities, Action and Limit (A/L) Levels are defined levels of impact recorded which represent levels at which a prescribed response is required. Action Limit Level is provided by the baseline monitoring results documented in the baseline monitoring report (Report No. EA01284R002) for the Project. The A/L Level for the methane are 0.5%/1.0%, the A/L Level for the carbon dioxide are 0.5%/1.5% and the A/L Level for the oxygen are 19.0%/18.0%.

The works activity for January 2008 included the defect and functional test of E&M equipment at Pumping Station. In addition, operation and maintenance of E&M equipment at Pumping Station was conducted.

This report recorded the results and findings of the required EM&A works undertaken during January 2008. Note that no excavation work and construction work are carried out by Biwater Man Lee Limited from 12 January 2008 to 31 January 2008, which would not have any significant landfill gas impacts on site to the E&M contractor, Biwater Man Lee Limited.

For the landfill gas monitoring, a total 18 numbers of readings were monitored at Pumping Station by LGT technician in this month. In addition, weekly site inspections by Landfill Gas Team were carried out on 4 and 8 January 2008.

No exceedance of monitoring parameters was found and no deficiency was found during the site inspections in January 2008. Thus, the work activities and mitigation measures were in compliance with the environmental protection regulations, contract requirement and the requirement of the environmental permit.

The monthly EM&A meeting was held on 10 January 2008 with all of the parties (DSD, Civil and E&M contractors, LGTs, and the IC(LG)) involved.

There was no complaint received in January 2008.

There was no reporting change during the reporting month.

The planned activities for February 2008 as regards E&M equipment are mainly operation and maintenance at Pumping Station.

## 1 Introduction

This is the eighth monthly Environmental Monitoring and Audit (EM&A) Report for the Drainage Services Department Contract No. DE/2005/04 entitled "Supply and Installation of Electrical and Mechanical Equipment for Upgrading of Ting Kok Road Pumping Station No. 5". The report was prepared by the Landfill Gas Team, Kingsford Environmental (H.K.) Limited, of the E&M Contractor, Biwater Man Lee Limited. This report is submitted to the Client, the Drainage Services Department, and Independent Checker (Landfill Gas), CH2M HILL Hong Kong Limited, for the project. In addition, this report is to be submitted to the EPD in accordance with the requirement of the environmental permit (EP-212/2005) and Report on Landfill Gas Hazard Assessment as per section 8 (EM&A).

This report only presents the results of the landfill gas monitoring and environmental auditing of the project activities regarding to the E&M equipment site work conducted in the month of January 2008. The various landfill gas parameters at the beginning of each half working day for E&M installation work (i.e. morning and afternoon) was monitored and auditing works include mainly regular site inspections for verification of the mitigation measures implementation as recommended in the Report on Landfill Gas Hazard Assessment was conducted by LGT.

The EM&A contact information for the key personnel are shown in Appendix 1.

The action and limited levels, event/action plan and complaint procedure are shown in Appendix 2.

## 2 Work Activities during the Month

The works activity for January 2008 included the defect and functional test of E&M equipment at Pumping Station. In addition, operation and maintenance of E&M equipment at Pumping Station was conducted.

The activities and dates of occurrence of each activity are summarized below in Table 1. The Construction Programme is shown in Appendix 3.

**Table 1: Work Activities for January 2008**

<i>Pumping Station</i>	
Defect and functional test of E&M equipment	1 Jan '08 – 11 Jan '08
Operation and Maintenance	28 Nov '07 – 11 Jan '08

### **3 Status of Environmental Protection**

#### Noise, air quality, water quality and waste/chemicals Management

The job nature of the E&M contractor, Biwater Man Lee Limited, is mainly for installation of E&M equipment inside the Pumping Station, all hand-held's breakers, bulldozer, concrete lorry mixer, dump truck and hand-held's poker, vibratory would not be used so that the impact from noise and dust would be low. For water quality, appropriate mitigation measure e.g. regular removal of stagnant water and/or spraying larvicide will be implemented in place, if necessary.

The minor construction waste materials are preferred to be removed promptly from the site. No inert C&D materials will be generated from installation of E&M equipment whereas the minor non-inert C&D waste will be disposed to Tseung Kwan O landfill. Note that the C&D materials should be reduced, reused and recycled if possible, before disposal. Any substance identified as chemical waste would be disposed of properly by a licensed collector. A trip ticket system for the disposal of C&D waste should be conducted as required by the Particular Specification. Rubbish bins are provided on-site for collecting general refuses as necessary. The general refuse would be removed regularly and disposed to landfills by a licensed collector. A proper record of each waste disposal, including the new bar-coded disposal delivery form, would be kept to verify proper handling and disposal.

#### Landfill Gas Hazard

The installation of E&M equipment is carried out inside the Pumping Station and no excavation work will be carried out by Biwater Man Lee Limited.

Appropriate mitigation measure will be implemented in place e.g. smoking and naked flames are not allowed within the working area and worker is not allowed to work alone at any time in the confined area. In addition, Safety Officer, trained to familiar with gas detection equipment and landfill gas-related hazards, is appointed on site. Also, safe portable instruments, appropriately calibrated and capable of measuring the methane (0-100% LEL and 0-100% by volume), carbon dioxide (0-100%) and oxygen (0-21%) is provided.

For the confined space, welding, flame-cutting or other hot works are only allowed to be carried out in accordance with the requirement of the Report on Landfill Gas Hazard Assessment as per section 6 and mitigation measures for the construction phase extracted from Appendix G of the Project Profile ("Implementation Schedule for Landfill Gas Hazard Mitigation Measures").

The temporary site offices or buildings that have enclosed spaces with the capacity to accumulate landfill gas, then they are located on an area which has been proven to be free of landfill gas and monitoring manually by the Safety Officer or an approved and appropriately qualified person to ensure that hazardous concentration of landfill gas does not occur; or be raised clear of the ground. Also, adequate fire extinguishing equipment, fire-resistant clothing and breathing apparatus (BA) sets will be made available on site. Lastly, periodic environmental monitoring report with LFG control measures evaluation during construction phase should be provided by contractor.

The status of permits and licenses is attached in Appendix 4. The implementation status of mitigation measures for the construction phase extracted from Appendix G of the Project Profile (“Implementation Schedule for Landfill Gas Hazard Mitigation Measures”) is attached in Appendix 5.

#### **4 Landfill Gas Monitoring Results**

The landfill gas monitoring by Landfill Gas Team was carried out in January 2008 to monitor the landfill gas parameters comprising methane, carbon dioxide and oxygen. Note that temperature is also recorded. The gas analyzer equipment (Manufacture: Gas Data Model GFM410 Landfill, Serial No. 10239) was used for landfill gas monitoring and the calibration records for the equipments used for landfill gas monitoring are attached in Appendix 6.

The site works of the E&M contractor, Biwater Man Lee Limited, is mainly for installation of E&M equipment inside the Pumping Station and no excavation work is carried out by Biwater Man Lee Limited. Therefore, monitoring locations were selected at Pumping Station.

M3 (existing manholes) monitored by civil contractor (Maeda) was dismantled in December 2007. A manhole MH3 (approximately 4m depth and 3m next to M3) of the new system was constructed and monitored by civil contractor to serve the same purpose of M3. A manhole MH3 was recorded monthly for the analysis of potential risk of hazardous gases and hence; identify any adverse impacts arising from the boreholes in order to protect the workers from potential hazards. Note that M1 (new deep borehole) monitored by civil contractor was dismantled in September 2007, which would not have any significant impacts on site to the E&M contractor, Biwater Man Lee Limited. For the site work of Biwater Man Lee Limited, no excavation work is carried out. In addition, before carrying out any E&M installations, landfill gas monitoring would be performed at the designated working area each day; i.e. morning and afternoon, to ensure the safety at work.

The results are summarized below in Table 2 and the layout plan and the monitoring location code is shown in Appendix 7.



**Table 2: Monitoring results by civil contractor (Maeda) at fixed location for January 2008**

Fixed Monitoring Station	Date of measurement	Flammable gas Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temp. (°C)	Remarks
MH3	29-Jan -2008	0.0	0.0	20.9	10	1m depth
MH3	29-Jan-2008	0.0	0.0	20.9	10	3m depth

The landfill gas monitoring was carried out according to the working area of E&M installation / operation (inside Pumping Station) at the beginning of each half working day for the E&M installation / operation works (i.e. morning and afternoon).

For this month, the landfill gas was monitored at Pumping Station by LGT technician. A total 18 numbers of readings were monitored at Pumping Station.

No exceedances for Action or Limit Level at any locations were recorded during the reporting period. Refer to field measurement recording sheet and monitoring location in Appendix 7.

## 5 Site Inspection

For this month, site inspections by an LGT technician were carried out on 4 and 8 January 2008.

The site locations inspected were marked on a site layout plan and the location code was recorded on the checklist. The site layout plan is shown in Appendix 8.

The works activity for January 2008 included the defect and functional test of E&M equipment at Pumping Station. In addition, operation and maintenance of E&M equipment at Pumping Station was conducted. Note that no excavation work and construction work are carried out by Biwater Man Lee Limited from 12 January 2008 to 31 January 2008,

No deficiency was found during this month. Inspection checklists are annexed in Appendix 8. Whereas all of the environmental aspects were inspected in the work areas, the most applicable descriptions are addressed below.

### Odour

In this month, a deodourizer with a forced ventilation system was installed to remove odour during operation and maintenance of E&M equipment at Pumping Station. The exhaust of the deodourizer was located in a direction away from the sensitive receivers. The effect of odour is to be insignificant with the implementation of proper mitigation measures.

### Landfill Gas Hazard

Daily field measurement recording sheet was checked and no exceedances for Action or Limit Level at any locations were recorded during the reporting period. In addition, no hot work was carried out in this month. Adequate fire extinguishing equipments were made available on site.

### Waste Management

Refuse bins and waste storage/sorting area were provided for the collection of general refuse and sorting the C&D materials.

Packaging wastes and construction wastes mainly from Pumping Station was disposed to Tseung Kwan O landfill by the licensed waste collector this month.

The type and quantity of waste for final disposal during January 2008 is shown in Table 3. Note that a record of each disposal is being kept.

**Table 3: Type and Quantity of Waste Disposed of in January 2008**

<b>Types of Waste</b>	<b>Quantity</b>
Inert C&D Material	Nil
Non-inert C&D Waste	3.05 tonnes (~ 40 m <sup>3</sup> )
Chemical Waste	Nil

## **6 Summary of Deficiencies and Remedial Actions**

There was no deficiency noted from the site inspections in January 2008.

## **7 Summary of Complaints and Remedial Actions**

No complaints were received in January 2008. In the event of complaints, the procedure for handling of the complaints is detailed in the Report on Landfill Gas Hazard Assessment.

## **8 Monthly Landfill Gas Monitoring and Auditing for the Coming Months**

The landfill gas monitoring for the coming month (February 2008) will be continued. In addition, the planned activities for the coming month (February 2008) as regards E&M equipment consists of operation and maintenance, as listed below:-

- Pumping Station

The anticipated landfill gas issues for February 2008 will be as follows:-

- Pumping Station
  - No significant landfill gas issue.

## **9 Conclusions and Comments**

There have been no exceedances in A/L level at any monitoring locations. In addition, the required weekly site inspections have been conducted. No deficiencies, i.e. non-compliances, were noted.

## **Appendix 1**

### **EM&A Contact Information for Key Personnel**

### EM&A Contact Information for Key Personnel

Name	Title	Telephone	Fax
Mr. Thomas Jim (BML)	Site Agent	26712350 / 90804998	26712351
Mr. Tommy Lo (BML)	Deputy Site Agent	24162828	24136278
Mr. Thomas Jim (BML)	Site Waste Manager / Co-ordinator	26712350 / 90804998	26712351
Mr. K. C. Lau (BML)	Site Supervisor	97569316	24136278
Mr. Stanley Lau (KEL)	LGT Leader	2612-2817	2614-7012
Ms. Angela Lau (KEL)	LGT Assistance	2612-2817	2614-7012
Mr. C. W. Tse (DSD)	Engineer's Representative	25947309	28278532
Mr. K. S. Lee (CH2M)	The Independent Checker (Landfill Gas)	2507-2203	2507-2293

## **Appendix 2**

### **Action and Limited Levels, Event/Action Plan and Complaint Procedure**

## Event and Action Plan (EAP) for Landfill Gas

The Event and Action Plan for landfill gas detected in utilities and any on-site areas following construction are shown in the table below.

### Event and Action Plan for Landfill Gas

Parameter	Level	Action
Oxygen	<19%	- Ventilate to restore oxygen to >19%
	<18%	- Stop works - Evacuate personnel/prohibit entry - Increase ventilation to restore oxygen to >19%
Methane	>10% LEL (i.e. >0.5% by volume)	- Post "No Smoking" signs - Prohibit hot works - Ventilate to restore methane to <10% LEL
	>20% LEL (i.e. >1% by volume)	- Stop works - Evacuate personnel/prohibit entry - Increase ventilation to restore oxygen to <10% LEL
Carbon Dioxide	>0.5%	- Ventilate to restore carbon dioxide to <0.5%
	>1.5%	- Post "No Smoking" signs - Prohibit hot works - Increase ventilate to restore carbon dioxide to <0.5%

## **Landfill Gas Complaint**

Landfill gas complaint should be referred to the LGT Leader for action. The LGT Leader should undertake the following procedures upon receipt of any complaint:

- log complaint and date of receipt onto the complaint database and inform the IC(LG) and the ER immediately;
- investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities;
- identify mitigation measures in consultation with the IC(LG) if a complaint is valid and due to works;
- advise the Contractor if mitigation measures are required;
- review the Contractor's response to identified mitigation measures, and the updated situation;
- if the complaint is transferred from the EPD, submit interim report to the EPD on status of the complaint investigation and follow-up action within the time frame assigned by the EPD;
- undertake additional monitoring and audit to verify the situation if necessary, and review that circumstances leading to the complaint do not recur;
- report investigation results and subsequent actions to complainant (if the source of complaint is EPD, the results should be reported within the timeframe assigned by the EPD); and
- record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.



## **Appendix 3**

### **Construction Programme**

Contract DE/2005/04  
 Supply and Installation of Electrical and Mechanical Equipment for Upgrading of Ting Kok Road Pumping Station No. 5  
 WORKS PROGRAMME

Appendix 6  
 Revision: 11  
 Date: 17 Nov 2007

ID	Task Name	Duration	Start	Finish	2006												2007												2008	
					Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1	<b>Contract Period</b>	<b>720 days</b>	<b>Mon 16/1/06</b>	<b>Sat 5/1/08</b>	[Gantt bar spanning from Dec 2006 to Dec 2008]																									
2	Contract Commencement Day	0 days	Mon 16/1/06	Mon 16/1/06	◆ 16/1																									
3	<b>Works of Section 1</b>	<b>120 days</b>	<b>Mon 16/1/06</b>	<b>Mon 15/5/06</b>	[Gantt bar from Dec 2006 to May 2007]																									
4	Section 1 Commencement	0 days	Mon 16/1/06	Mon 16/1/06	◆ 16/1																									
5	<b>Submission &amp; Approval</b>	<b>95 days</b>	<b>Fri 10/2/06</b>	<b>Mon 15/5/06</b>	[Gantt bar from Feb 2007 to May 2007]																									
27	Completion of Section 1	0 days	Mon 15/5/06	Mon 15/5/06	◆ 15/5																									
28	<b>Works of Section 2</b>	<b>622 days</b>	<b>Mon 24/4/06</b>	<b>Sat 5/1/08</b>	[Gantt bar from May 2007 to Dec 2008]																									
29	Section 2 Commencement	0 days	Tue 16/5/06	Tue 16/5/06	◆ 16/5																									
30	Remaining Submission	601 days	Mon 24/4/06	Sat 15/12/07	[Gantt bar from May 2007 to Dec 2007]																									
31	Minor Equipment	601 days	Mon 24/4/06	Sat 15/12/07	[Gantt bar from May 2007 to Dec 2007]																									
42	Equipment Manufacture & Delivery	415 days	Wed 13/9/06	Thu 1/11/07	[Gantt bar from Sep 2006 to Nov 2007]																									
43	Manufacturing	320 days	Wed 13/9/06	Sun 29/7/07	[Gantt bar from Sep 2006 to Jul 2007]																									
57	Delivery	247 days	Wed 28/2/07	Thu 1/11/07	[Gantt bar from Feb 2007 to Nov 2007]																									
71	<b>Site Installation</b>	<b>191 days</b>	<b>Wed 9/5/07</b>	<b>Thu 15/11/07</b>	[Gantt bar from May 2007 to Nov 2007]																									
72	Availability of Work Area "E"	0 days	Wed 9/5/07	Wed 9/5/07	◆ 9/5																									
73	Possession of storage area and Provide DSD container Office (assume handover to be agreed)	191 days	Wed 9/5/07	Thu 15/11/07	[Gantt bar from May 2007 to Nov 2007]																									
74	Site Handover for P/S & Transformer Rm.	0 days	Tue 15/5/07	Tue 15/5/07	◆ 15/5																									
75	<b>Site installation Period</b>	<b>236 days</b>	<b>Tue 15/5/07</b>	<b>Sat 5/1/08</b>	[Gantt bar from May 2007 to Dec 2008]																									
76	Landfill Gas Monitoring	185 days	Tue 15/5/07	Thu 15/11/07	[Gantt bar from May 2007 to Nov 2007]																									
77	<b>Installation for Equipment</b>	<b>191 days</b>	<b>Thu 21/6/07</b>	<b>Fri 28/12/07</b>	[Gantt bar from Jun 2007 to Dec 2007]																									
78	Penstock & Actuator	94 days	Sat 21/7/07	Mon 22/10/07	[Gantt bar from Jul 2007 to Oct 2007]																									
79	Inlet Screens	42 days	Sat 1/9/07	Fri 12/10/07	[Gantt bar from Sep 2007 to Oct 2007]																									
80	Inlet Screens	21 days	Sat 1/9/07	Fri 21/9/07	[Gantt bar from Sep 2007 to Sep 2007]																									
81	S&I Screening Enclosure	21 days	Sat 22/9/07	Fri 12/10/07	[Gantt bar from Sep 2007 to Oct 2007]																									
82	Submersible Pumps	70 days	Sat 18/8/07	Fri 26/10/07	[Gantt bar from Aug 2007 to Oct 2007]																									
83	DI Pipework & Fittings	60 days	Wed 29/8/07	Sat 27/10/07	[Gantt bar from Sep 2007 to Oct 2007]																									
84	Valves c/w Actuators	21 days	Sun 23/9/07	Sat 13/10/07	[Gantt bar from Sep 2007 to Oct 2007]																									
85	Building Service Equipment	124 days	Thu 21/6/07	Mon 22/10/07	[Gantt bar from Jun 2007 to Oct 2007]																									
86	Fire Service Equipment	37 days	Fri 21/9/07	Sat 27/10/07	[Gantt bar from Sep 2007 to Oct 2007]																									
87	Lifting Appliances	19 days	Wed 4/7/07	Sun 22/7/07	[Gantt bar from Jul 2007 to Jul 2007]																									
88	<b>Deodorization Plant</b>	<b>57 days</b>	<b>Fri 2/11/07</b>	<b>Fri 28/12/07</b>	[Gantt bar from Nov 2007 to Dec 2007]																									
89	Air Blowers, Carbon Vessel & accessories	21 days	Fri 2/11/07	Thu 22/11/07	[Gantt bar from Nov 2007 to Nov 2007]																									
90	S&I for Air Ductwork	21 days	Sat 8/12/07	Fri 28/12/07	[Gantt bar from Dec 2007 to Dec 2007]																									
91	MACS Equipment	21 days	Mon 15/10/07	Sun 4/11/07	[Gantt bar from Oct 2007 to Nov 2007]																									

Biwater Man Lee Limited
Task Milestone Rolled Up Task Rolled Up Progress External Tasks Group By Summary
  
Progress Summary Rolled Up Milestone Split Project Summary



## **Appendix 4**

### **Permits**

**Same as in June 2007 Report**

## **Appendix 5**

### **Environmental Requirements and Implementation Status**

*Appendix G  
Implementation Schedule for LFG Hazard Mitigation Measures*

Section	Environmental Protection Measures	Location	Implementation Agent	Implementation Stage	Relevant Legislation & Guidelines
6.1	<p>Safety Officer, trained in the use of gas detection equipment and landfill gas-related hazards, should be appointed on site throughout the ground works phase. The Safety Officer should be provided with intrinsically safe portable instruments, appropriately calibrated and capable of measuring the following gases in the ranges indicated:</p> <p style="margin-left: 40px;">methane                    0-100% LEL and 0-100% by volume;  carbon dioxide        0-100%; and  oxygen                      0-21%</p>	Within the work site	Contractor	Construction	<p><i>Code of Practice on Safety and Health at Work in Confined Space,</i></p> <p><i>Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)</i></p>
6.2	No smoking and naked flames should be allowed.				
6.2	No worker should work alone at any time in the confined area or any excavation trenches.				
6.2	Construction equipment should be equipped with a vertical exhaust at least 0.6m above ground level and/or with spark arrestors.				
6.2	Electrical motors and electrical extension cords should be explosion-proof or intrinsically safe.				
6.2	Welding, flame-cutting or other hot works should only be carried out in trenches or confined spaces when controlled by a 'permit to work' procedure, properly authorized by the Safety Officer.				
6.2	Forced ventilation should be required for workers, if in a trench deeper than 1m.				
					<p><i>Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)</i></p>

*Appendix G  
Implementation Schedule for LFG Hazard Mitigation Measures*

Section	Environmental Protection Measures	Location	Implementation Agent	Implementation Stage	Relevant Legislation & Guidelines
6.2	During piping assembly or conduiting construction, all valves/seals should be closed as installed to prevent the migration of gases through the pipeline/conduit. Forced ventilation and gas monitoring should be performed before staff entering and working in large diameter pipe.	Within the work site	Contractor	Construction	<i>Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)</i>
6.2	The Safety Officer should set down the monitoring frequency and areas prior to commencement of construction works.				
6.2	Daily and routine monitoring should be carried out in all excavations.				
6.2	All measurements in excavations should be made with the extended monitoring tube located not more than 10mm from the exposed ground surface. Monitoring should be performed properly to make sure that the area is free of landfill gas before any man enters the area.				
6.2	For excavations deeper than 1m, measurements should be carried out: <ul style="list-style-type: none"> <li>• at the ground surface before excavation commences;</li> <li>• immediately before any worker enters the excavation;</li> <li>• at the beginning of each half working day (i.e. morning and afternoon) for the entire period the excavation remains open; and</li> <li>• periodically through the working day whilst workers are in the excavation.</li> </ul>				
6.2	For excavations between 300mm and 1m deep, measurements should be carried out: <ul style="list-style-type: none"> <li>• directly after the excavation has been completed; and</li> <li>• periodically whilst the excavation remains open.</li> </ul>				

*Appendix G*  
*Implementation Schedule for LFG Hazard Mitigation Measures*

Section	Environmental Protection Measures	Location	Implementation Agent	Implementation Stage	Relevant Legislation & Guidelines
6.2	The landfill gas precautionary measures involved with excavation and piping works should be included in the Safety Plan.	Within the work site	Contractor	Construction	<i>Landfill Gas Hazard Assessment Guidance Note (EPD/TRS/97)</i>
6.3	The cracks on the ground level at the working area should be monitored during ground-works construction				
6.4	Where there are any temporary site offices, or any other buildings that have enclosed spaces with the capacity to accumulate landfill gas, then they should either: <ul style="list-style-type: none"> <li>• Be located on an area which has been proven to be free of landfill gas and monitored manually by the Safety Officer or an approved and appropriately qualified person to ensure that hazardous concentration of landfill gas does not occur; or</li> <li>• Be raised clear of the ground. If buildings are raised clear of the ground, a minimum, clear separation distance should be 500mm.</li> </ul>				
6.5	Such offices or buildings should be provided with some kinds of control of gas by mechanical means e.g. forced ventilation using fans or blowers.				
6.6	Adequate fire extinguishing equipment, fire-resistant clothing and breathing apparatus (BA) sets should be made available on site.				
6.7	Periodic environmental monitoring report with LFG control measures evaluation during construction phase should be provided by contractor and submitted to SP/DSD and EPD.				



*Appendix G  
Implementation Schedule for LFG Hazard Mitigation Measures*

Section	Environmental Protection Measures	Location	Implementation Agent	Implementation Stage	Relevant Legislation & Guidelines
7.1	When service voids, manholes or inspection chambers within the proposed site are entered for maintenance, monitoring and a checklist system of safety requirements should be performed before entry	Manhole/ chamber	DSD	Operation	<i>Code of Practice on Safety and Health at Work in Confined Spaces</i>
7.2	A procedure should be developed as part of the station operation to respond to gas detector alarms. The detection system should be maintained and calibrated regularly in accordance with the manufacturer's recommendations. In the event of a power failure, the detectors should have an 8-hour battery back-up system, and the procedures should indicate for manual monitoring in the station in the event of prolonged power failure (of longer than 8 hours).	Pumping station			
7.3	Forced ventilation should be used if methane of more than 0.5 % (by volume) in the internal atmosphere (e.g. in service voids, manholes, inspection chambers or rooms as mentioned above) is detected.				
7.4	No person should enter or remain in any confined spaces or trenches where the carbon dioxide concentration exceeds 1.5 % (by volume).	Manhole/ chamber/			
7.5	Oxygen concentration should be monitored and no person should enter or remain in any confined spaces or trenches where the oxygen content of air has fallen below 18 % by volume.	Pumping station			
7.6	All the access to these confined spaces would be restricted only to authorize personnel who should be aware of the LFG hazard. No member of general public should be permitted or allowed to access these confined spaces, manholes or inspection chambers.				

## **Appendix 6**

### **Calibration Records**

TEST DATE AND CONDITIONS	
Date	27/07/2007
Atmospheric Pressure	996 mB
Ambient Temp	19 °C
Envionics Serial No.	3268

**GAS DATA LTD**

Pegasus House  
Seven Stars Estate  
Wheler Rd  
Coventry  
CV3 4LB



Tel 02476303311 Fax 02476307711

**GFM410 FINAL INSPECTION & CALIBRATION CERTIFICATE**

INSTRUMENT DETAILS	
Serial No	Customer
10239	science international corporation

INSTRUMENT CHECKS			
Keyboard	✓	Pump Flow	400 cc/min
Display Contrast	✓	Pump Flow @ -200mB	300 cc/min
Clock Set / Running	✓	S/W Version	G410.0022/0004
Labels Fitted	✓	Recalibration Date	27/7/2008

GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+0.1
CH4	5 %	5.1	+/-0.3	0.0	0.0	0.0	+0.1
	60%	59.2	+/-3.0	0.0	0.0	0.0	+0.1
CO2	5%	0.0	0.0	4.9	+/-0.3	0.0	+0.1
	40%	0.0	0.0	39.4	+/-3.0	0.0	+0.1
AIR (20.9% O2, 400ppm CO2)	100%	0.0	0.0	0.0	+0.1	20.9	+/-0.5

PRESSURE CHECKS							
Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric [Ap] ( mB )	tol. ( mB )	Static [Sp] ( mB )	tol. ( mB )		
All ports	current atmospheric	996	+/-2.0	0	0.0		
Ap port (internal)	+800mB(a)	800	+/-5.0	0	0.0		
	+1200mB(a)	1200	+/-5.0	0	0.0		
Gas IN port	+400mB(g)	996	n/a	400	+/-2.0		
	-400mB(g)	996	n/a	-399	+/-2.0		

TEST DATE AND CONDITIONS	
Date	27/07/2007
Atmospheric Pressure	996 mB
Ambient Temp	19°C
Enviroics Serial No.	3268

**GAS DATA LTD**

Pegasus House  
 Seven Stars Estate  
 Wheler Rd  
 Coventry  
 CV3 4LB  
 Tel 02476303311 Fax 02476307711



**GFM410 FINAL INSPECTION & CALIBRATION CERTIFICATE**

**FLOW CHECKS**

OPTIONAL GAS CHECKS								
Calibration Gas		Instrument Gas Channels Read						
Gas Type	Applied Conc.	Label Range						tol. (% vol.)
N2	100%							0.0
								+/- 5.0
								+/- 5.0
								+/- 5.0
								+/- 5.0
								+/- 5.0

**OPTIONAL TEMPERATURE CHECK**

PACKING							
Instrument	✓	AC Powered Battery Charger		<u>UK</u>	EUR	US	
Gas Sample Pipe	✓	Manual	✓	Carry Case			✓
Spares Pot	✓	Allen Key	✓				
USB Lead		PC Software					
Vane Anemometer		Extra Items					

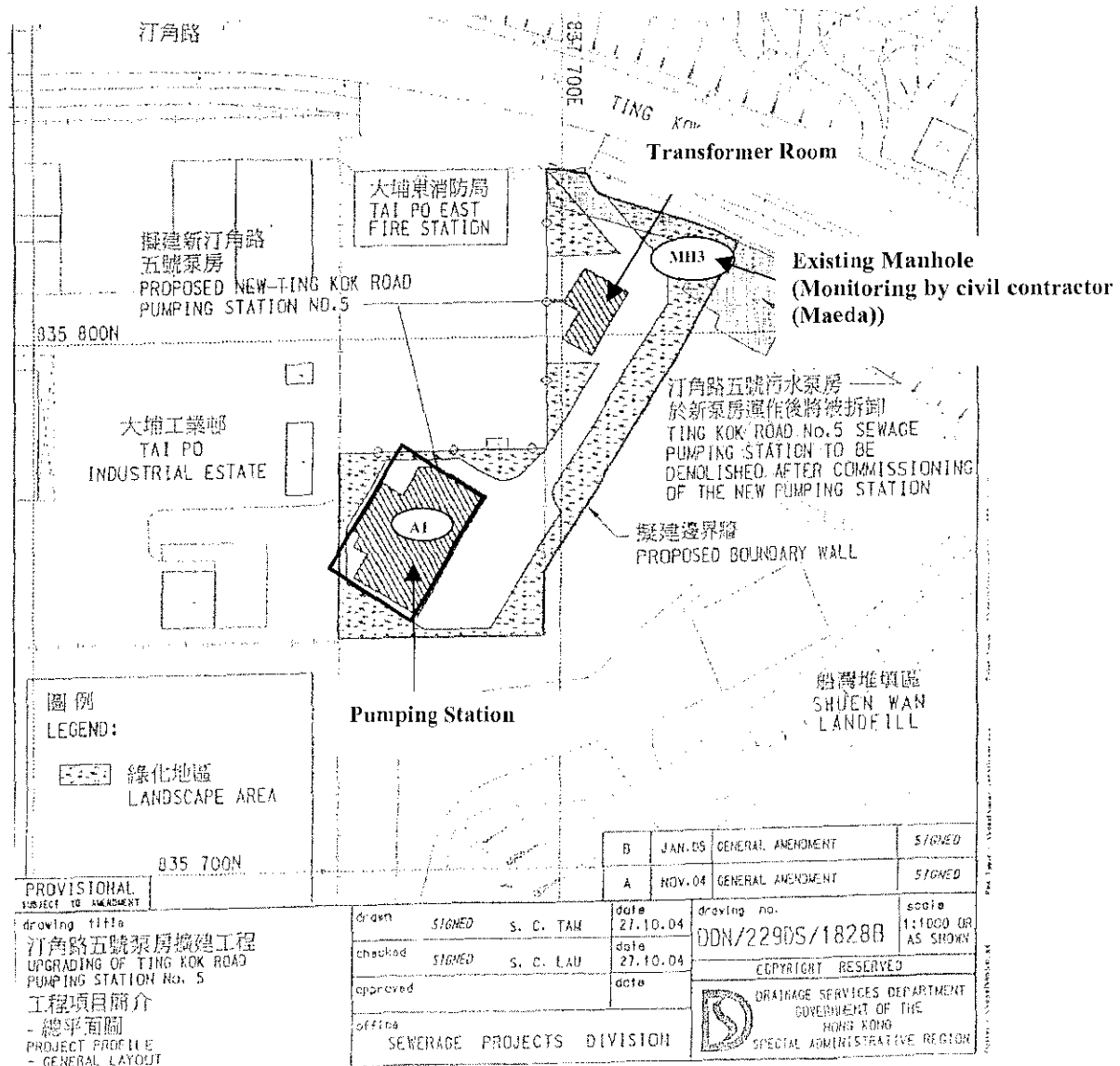
TESTED *ps sarkaria* .....

APPROVED *[Signature]* .....

## **Appendix 7**

### **Landfill Gas Monitoring Results**

# Upgrading Ting Kok Road Pumping Station No. 5 – E&M Works Landfill Gas Monitoring – January 2008 Site Layout




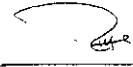
# Landfill Gas Monitoring – Field Measurement Recording Sheet

Name of Site: DE/2005/04- Ting Kok Road Pumping Station No. 5  
 Date of measurement: 2 January 2008

Sampling equipment used:	Dates calibrated
Gas Data	27 / 07 / 2007
Model GFM410 Landfill	
Serial No. 10239	

Sample location	Date of measurement	Sampling time	Perimeter on-site and/or off-site monitoring holes						Remark
			Weather condition	Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	
A1	2 Jan 2008	8:59	Sunny	79.1	0.0	0.0	20.8	14	
A1	2 Jan 2008	12:67	Sunny	79.1	0.0	0.0	20.8	16	

Field Technician:   
 (Site Agent)

Checked by:   
 (RSO)

## Landfill Gas Monitoring – Field Measurement Recording Sheet

Name of Site: DE/2005/04- Ting Kok Road Pumping Station No. 5  
 Date of measurement: 3 January 2008

Sampling equipment used:	Dates calibrated
Gas Data	27 / 07 / 2007
Model GFM410 Landfill	
Serial No. 10239	

Sample location	Date of measurement	Sampling time	Perimeter on-site and/or off-site monitoring holes						
			Weather condition	Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	Remark
A1	3 Jan 2008	8:59	Sunny	79.1	0.0	0.0	20.8	14	
A1	3 Jan 2008	12:59	Sunny	79.1	0.0	0.0	20.8	16	

Field Technician:                 g                  
 (Site Agent)

Checked by:                 z                  
 (RSO)






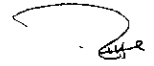
# Landfill Gas Monitoring – Field Measurement Recording Sheet

Name of Site: DE/2005/04- Ting Kok Road Pumping Station No. 5  
 Date of measurement: 5 January 2008

Sampling equipment used:	Dates calibrated
Gas Data	27 / 07 / 2007
Model GFM410 Landfill	
Serial No. 10239	

Sample location	Date of measurement	Sampling time	Perimeter on-site and/or off-site monitoring holes						
			Weather condition	Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	Remark
A1	5 Jan 2008	8:59	Sunny	79.1	0.0	0.0	20.8	14	
A1	5 Jan 2008	12:54	Sunny	79.1	0.0	0.0	20.8	15	

Field Technician:   
 (Site Agent)


Checked by:   
 (RSO)


# Landfill Gas Monitoring – Field Measurement Recording Sheet

Name of Site: DE/2005/04- Ting Kok Road Pumping Station No. 5  
 Date of measurement: 7 January 08

Sampling equipment used:	Dates calibrated
Gas Data	27 / 07 / 2007
Model GFM410 Landfill	
Serial No. 10239	

Sample location	Date of measurement	Sampling time	Perimeter on-site and/or off-site monitoring holes						
			Weather condition	Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	Remark
A1	7 Jan 2008	8:59	Sunny	79.1	0.0	0.0	20.8	15	
A1	7 Jan 2008	12:58	Sunny	79.1	0.0	0.0	20.8	17	

Field Technician:   
 (Site Agent)

Checked by:   
 (RSO)





# Landfill Gas Monitoring – Field Measurement Recording Sheet

Name of Site: DE/2005/04- Ting Kok Road Pumping Station No. 5  
 Date of measurement: 9 January 2008

Sampling equipment used:	Dates calibrated
Gas Data	27 / 07 / 2007
Model GFM410 Landfill	
Serial No. 10239	

Sample location	Date of measurement	Sampling time	Perimeter on-site and/or off-site monitoring holes						Remark
			Weather condition	Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	
A1	9 Jan 2008	8:57	Sunny	79.1	0.0	0.0	20.8	17	
A1	9 Jan 2008	12:59	Sunny	79.1	0.0	0.0	20.8	19	

Field Technician:   
 (Site Agent)


Checked by:   
 (RSO)

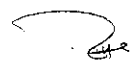
# Landfill Gas Monitoring – Field Measurement Recording Sheet

Name of Site: DE/2005/04- Ting Kok Road Pumping Station No. 5  
 Date of measurement: 10 January 2008

Sampling equipment used:	Dates calibrated
Gas Data	27 / 07 / 2007
Model GFM410 Landfill	
Serial No. 10239	

Sample location	Date of measurement	Sampling time	Perimeter on-site and/or off-site monitoring holes						
			Weather condition	Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	Remark
A1	10 Jan 2008	8:58	Sunny	79.1	0.0	0.0	20.8	18	
A1	10 Jan 2008	13:00	Sunny	79.1	0.0	0.0	20.8	20	

Field Technician:   
 (Site Agent)

Checked by:   
 (RSO)

### Landfill Gas Monitoring – Field Measurement Recording Sheet

Name of Site: DE/2005/04- Ting Kok Road Pumping Station No. 5  
 Date of measurement: 11 January 2008

Sampling equipment used:	Dates calibrated
Gas Data	27 / 07 / 2007
Model GFM410 Landfill	
Serial No. 10239	

Sample location	Date of measurement	Sampling time	Perimeter on-site and/or off-site monitoring holes						Remark
			Weather condition	Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	
A1	11 Jan 2008	8:58	Sunny	79.1	0.0	0.0	20.8	19	
A1	11 Jan 2008	12:59	Sunny	79.1	0.0	0.0	20.8	21	

Field Technician:  \_\_\_\_\_  
 (Site Agent)

Checked by:  \_\_\_\_\_  
 (RSO)

## **Appendix 8**

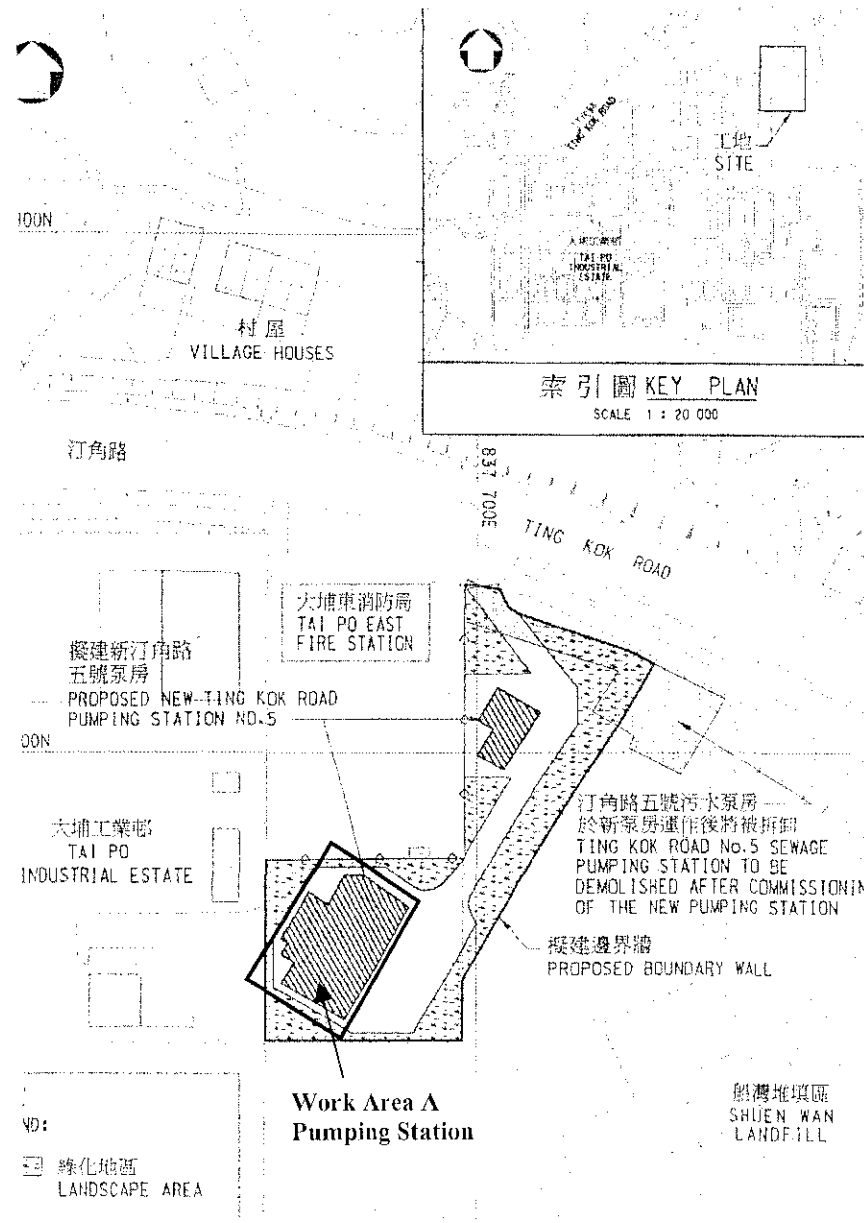
### **Site Inspection Checklists**



# Upgrading Ting Kok Road Pumping Station No. 5 – E&M Works

## EM&A Site Inspection – January 2008

### Site Layout



UPGRADING TING KOK ROAD PUMPING STATION NO. 5 – CONTRACT NO. DE/2005/04  
 ENVIRONMENTAL MONITORING AND AUDIT

ENVIRONMENTAL SITE INSPECTION CHECKLIST

Inspection Date: January 4, 2008 Time: 17:00 - 18:00

Inspected By:

DSD Representative: /

E&M Contractor Representative: Thomas Jim

Landfill Gas Team Inspector: Angela Lau

**Weather**

Condition  Sunny  Fine  Overcast  Drizzle  Rain  Storm  Hazy

Temperature  °C Humidity  %

Wind  Calm  Light  Breeze  Strong Direction

Ref. No. <sup>(1)</sup>	Brief Description of Mitigation	Site Location <sup>(2)</sup>	Activity Compliance				Action Required/Responsible Party <sup>(3)</sup>
			Yes	No	N/A	Unk	
<b>Water Quality</b>							
1	Rainwater silt removal	A	✓				
2	Groundwater silt removal	↓			✓		
3	Large object				✓		
4	Sewage discharged				✓		
5	Fuel/chemical storage				✓		
6	Storage area condition				✓		
7	Clean-up actions				✓		
<b>Waste Disposal</b>							
8	Construction wastes	A	✓				
9	Licensed waste collector	↓			✓		
10	Removal of construction wastes			✓			
11	Waste storage areas			✓			
12	Windblown litter/dust				✓		
13	Waste disposal permits				✓		
14	Licensed waste disposal facilities			✓			

**UPGRADING TING KOK ROAD PUMPING STATION NO. 5 – CONTRACT NO. DE/2005/04  
ENVIRONMENTAL MONITORING AND AUDIT**

Ref. No. <sup>(1)</sup>	Brief Description of Mitigation	Site Location <sup>(2)</sup>	Activity Compliance				Action Required/ Responsible Party <sup>(3)</sup>
			Yes	No	N/A	Unk	
15	Careful design, planning & good site management	A			✓		
16	Chemical wastes handling				✓		
17	Chemical waste storage				✓		
18	Condition of chemical waste storage area				✓		
19	Disposal of chemical wastes				✓		
20	General refuse		✓				
21	Chemical waste separation				✓		
22	Strictly prohibited of refuse burning		✓				
23	Environmental Permit and other documents on-site		✓				
24	Environmental Permit and license displayed		✓				
25	Waste records	↓	✓				
<b>Landfill Gas Hazard</b>							
26	S.O., trained in the use of gas detection equipment and landfill gas-related hazards.	A	✓				
27	No smoking and naked flames		✓				
28	No worker work alone at confined area or excavation trenches.		✓				
29	Welding, flame-cutting or other hot works in trench or confined spaces controlled by a 'permit to work'		✓				
30	Forced ventilation for trench deeper than 1m				✓		
31	Enclosed spaces of temporary site offices, or any other building				✓		
32	Provided control of gas by mechanical means				✓		
33	Adequate fire extinguishing equipment, fire-resistant clothing and breathing apparatus	↓	✓				

UPGRADING TING KOK ROAD PUMPING STATION NO. 5 – CONTRACT NO. DE/2005/04  
 ENVIRONMENTAL MONITORING AND AUDIT

Ref. No. <sup>(1)</sup>	Brief Description of Mitigation	Site Location <sup>(2)</sup>	Activity Compliance				Action Required/ Responsible Party <sup>(3)</sup>
			Yes	No	N/A	Unk	
34	Periodic environmental monitoring report with LFG control measures evaluation	A	✓				

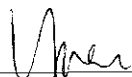
**Summary / Remarks<sup>(4)</sup>**

- Operation and maintenance of E&M equipments were observed at Pumping station.
- No particular observation during the site inspection.

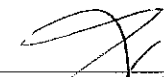
(Note: Refer to attached site layout)

**Signatures**

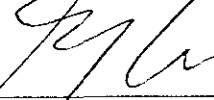
DSD Representative

  
 Name: M. H. YUEN

E&M Contractor Representative

  
 Name: Charles Fan

Landfill Gas Team Leader

  
 Name: Stanley Lau

- (1) Refer to Site Inspection Checklist Attachment for complete description (Summarized Project Profile and Environmental requirement) of referenced mitigation measure or requirement.
- (2) Indicate exact locations as indicated (by code) on the attached site layout.
- (3) Note actions/plans and responsible party regarding any non-compliance in this column.
- (4) To be filled out by the Landfill gas team.

UPGRADING TING KOK ROAD PUMPING STATION NO. 5 – CONTRACT NO. DE/2005/04  
 ENVIRONMENTAL MONITORING AND AUDIT

ENVIRONMENTAL SITE INSPECTION CHECKLIST

Inspection Date: January 8, 2008 Time: 17:15 - 18:00

Inspected By:

DSD Representative: /

E&M Contractor Representative: Thomas Jim

Landfill Gas Team Inspector: Angela Lau

**Weather**

Condition  Sunny  Fine  Overcast  Drizzle  Rain  Storm  Hazy

Temperature  °C Humidity  %

Wind  Calm  Light  Breeze  Strong Direction

Ref. No. <sup>(1)</sup>	Brief Description of Mitigation	Site Location <sup>(2)</sup>	Activity Compliance				Action Required/ Responsible Party <sup>(3)</sup>
			Yes	No	N/A	Unk	
<b>Water Quality</b>							
1	Rainwater silt removal	A	✓				
2	Groundwater silt removal	↓			✓		
3	Large object				✓		
4	Sewage discharged				✓		
5	Fuel/chemical storage				✓		
6	Storage area condition				✓		
7	Clean-up actions	↓			✓		
<b>Waste Disposal</b>							
8	Construction wastes	A	✓				
9	Licensed waste collector	↓			✓		
10	Removal of construction wastes		✓				
11	Waste storage areas		✓				
12	Windblown litter/dust				✓		
13	Waste disposal permits				✓		
14	Licensed waste disposal facilities	↓	✓				

**UPGRADING TING KOK ROAD PUMPING STATION NO. 5 – CONTRACT NO. DE/2005/04  
ENVIRONMENTAL MONITORING AND AUDIT**

Ref. No. <sup>(1)</sup>	Brief Description of Mitigation	Site Location <sup>(2)</sup>	Activity Compliance				Action Required/ Responsible Party <sup>(3)</sup>
			Yes	No	N/A	Unk	
15	Careful design, planning & good site management	A			✓		
16	Chemical wastes handling				✓		
17	Chemical waste storage				✓		
18	Condition of chemical waste storage area				✓		
19	Disposal of chemical wastes				✓		
20	General refuse		✓				
21	Chemical waste separation				✓		
22	Strictly prohibited of refuse burning		✓				
23	Environmental Permit and other documents on-site		✓				
24	Environmental Permit and license displayed		✓				
25	Waste records	✓	✓				
<b>Landfill Gas Hazard</b>							
26	S.O., trained in the use of gas detection equipment and landfill gas-related hazards.	A	✓				
27	No smoking and naked flames		✓				
28	No worker work alone at confined area or excavation trenches.		✓				
29	Welding, flame-cutting or other hot works in trench or confined spaces controlled by a 'permit to work'		✓				
30	Forced ventilation for trench deeper than 1m				✓		
31	Enclosed spaces of temporary site offices, or any other building				✓		
32	Provided control of gas by mechanical means				✓		
33	Adequate fire extinguishing equipment, fire-resistant clothing and breathing apparatus	✓	✓				

**UPGRADING TING KOK ROAD PUMPING STATION NO. 5 – CONTRACT NO. DE/2005/04  
ENVIRONMENTAL MONITORING AND AUDIT**

Ref. No. <sup>(1)</sup>	Brief Description of Mitigation	Site Location <sup>(2)</sup>	Activity Compliance				Action Required/ Responsible Party <sup>(3)</sup>
			Yes	No	N/A	Unk	
34	Periodic environmental monitoring report with LFG control measures evaluation	A	✓				

**Summary / Remarks<sup>(4)</sup>**

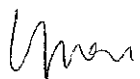
- Operation and maintenance of E&M equipments were observed at Pumping Station

- No particular observation during the site inspection.

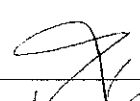
(Note: Refer to attached site layout)

**Signatures**

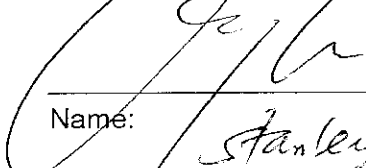
DSD Representative

  
Name: M. H. YUEN

E&M Contractor Representative

  
Name: Choral Jan

Landfill Gas Team Leader

  
Name: Stanley Loeu

- (1) Refer to Site Inspection Checklist Attachment for complete description (Summarized Project Profile and Environmental requirement) of referenced mitigation measure or requirement.
- (2) Indicate exact locations as indicated (by code) on the attached site layout.
- (3) Note actions/plans and responsible party regarding any non-compliance in this column.
- (4) To be filled out by the Landfill gas team.

**Appendix 9**

**Deficiency Investigation Reports**

**(Not Applicable)**



**Appendix 10**

**Complaint Reports**

**(Not Applicable)**