

Maeda Corporation



# Upgrading of Ting Kok Road Pumping Station No. 5

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Monthly EM&A Report No. 4  
for April 2006

May 2006

Report no: 01284R0142

**Hyder Consulting Ltd**

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Maeda Corporation



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Monthly EM&A Report No. 4 for April 2006

**Author:** Alexi Bhanja

**Checker:** Sharifah Or

**Approver:** Guiyi Li

**Report no:** EA01284R0142

**Date:**

May 2006

This report has been prepared for in accordance with the terms and conditions of Maeda Corporation appointment for the Upgrading of Ting Kok Road Pumping Station No. 5 in October 2005. Hyder Consulting Ltd (Incorporated in Hong Kong with limited liability—COI Number 126012) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.



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**Certified by Landfill Gas Team Leader  
Alexi Bhanja**

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# 1 Executive Summary

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Drainage Services Department (DSD) awarded the contract for the Upgrading of Ting Kok Road Pumping Station No. 5 to Maeda Corporation in September 2005. Maeda appointed Hyder Consulting Limited as the Contractor's Landfill Gas (LFG) Team during the construction period. The construction contract commenced in September 2005 and the total construction period is approximately 28 months.

This report recorded the results and findings of the required EM&A works undertaken during April 2006. All relevant mitigation measures and requirements were implemented. There have been no exceedances in A/L Levels at either fixed or variable monitoring locations except for a carbon dioxide level of 1% at location M1. This exceedance has also occurred in previous months. This level is within expected norms and is not of concern. As this is a fixed location, not part of the excavation works, there are no safety-related issues. Location M1 is not affected by any ongoing Works and so this exceedance is not considered to be due to the construction activities, nor it is considered to be a non-compliance in terms of the EM&A programme and implementation of the Action/Event Plan.

Environmental Protection Department (EPD) conducted one visit on 13 April 2006. They checked the wastewater discharge and chemical storage areas. According to the Contractor, they have not given any adverse comment regarding the site.

## Event and Action Levels

The baseline monitoring results documented in the baseline monitoring report for the Project (our report ref.: EA01284R0022) provided the Action and Limit (A/L) Levels for LFG impact monitoring and also the Action Plan. For methane, A/L Levels are 0.5%/1.0%; for carbon dioxide, A/L Levels are 0.5%/1.5%; and for oxygen, A/L Levels are 19.0%/18.0%.

## Complaint Log

There were no non-compliances during the reporting period and no complaints regarding LFG were received.

## Reporting Changes

There have been no reporting changes during the reporting period.

## Future Key Issues

Based on anticipated construction activities for next month, on the construction programme and on the review of relevant Contractor's method statements by the LGT, no significant future key issues in terms of LFG have been identified at this time.

## 2 Introduction

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### 2.1 Basic Project Information

Upgrading of Ting Kok Road Pumping Station No. 5 (TKRPS) under North District and Tolo Harbour Sewerage, Sewage Treatment and Disposal – High Priority Works is implemented based on the findings of the Study *Review of North District and Tolo Harbour Sewerage Master Plan*.

The purpose of the Project is to upgrade the existing TKRPS to cope with the sewerage needs of both existing and future developments along Ting Kok Road up to Tai Mei Tuk. The design pumping capacity of TKRPS has to be increased from 2,888m<sup>3</sup>/day to 11,520m<sup>3</sup>/day in order to serve the increasing sewage flow along Ting Kok Road. The Project is of high priority and needs to commence as soon as possible because full commissioning of the upstream sewerage facilities along Ting Kok Road is dependent on the completion of this Project.

The proposed scope of works includes construction of a new pumping station, laying of about 350m long twin 450mm diameter rising mains and 250m long 600mm diameter gravity sewer, and demolition of the existing pump pit. The main pumping station, transformer room, gravity sewers, manholes and boundary wall (except the twin rising mains) will be located outside the existing passive vent trench of Shuen Wan Landfill and the three existing Landfill Gas (LFG) monitoring probes within the Project site will not be affected by the works.

Six village houses are located about 60m away from the boundary of the proposed pumping station. The proposed pumping station upgrading works therefore constitute a Designated Project under type F.3(b)(i) in Schedule 2 of the Environmental Impact Assessment Ordinance. A Project Profile (PP) for direct application of the Environmental Permit (EP) (Application No.DIR-115/2005) was approved by the Environmental Protection Department (EPD) in March 2005 and an EP (EP-212/2005) was granted in April 2005, prior to the commencement of the upgrading works.

Drainage Services Department (DSD) awarded the contract for the upgrading of TKRPS to Maeda Corporation in September 2005. Maeda appointed Hyder Consulting Limited as the Contractor's Landfill Gas Team (LGT) during the construction period. CH2M HILL Hong Kong Limited is the Independent Checker (Landfill Gas) (IC(LG)) of the project. The construction contract commenced in September 2005 and the total construction period is approximately 28 months.

Close proximity of the Project to Shuen Wan Landfill (within the 250m Consultation Zone of Shuen Wan Landfill) may also suggest the possibility of landfill gas being released during excavation works for substructure of pumping station, transformer room and associated rising mains and gravity sewers. As such, a *Report on Landfill Gas Hazard Assessment* has been prepared previously (as Appendix E to the PP) in accordance with EPD's *Landfill Gas Hazard Assessment Guidance Note* and the *Practice Note for Professional Persons – Landfill Gas Hazard Assessment for Development Adjacent to Landfills*.

## 2.2 Management Structure and Project Organisation

The Engineer (DSD) is responsible for overseeing the construction works and ensuring that they are undertaken by the Contractor (Maeda) in accordance with the specification and contractual requirements. The Contractor shall report to the Engineer. The LGT is employed by the Contractor and responsible for conducting the EM&A programme. The IC(LG) shall advise the Engineer on LFG issues related to the Project.

The key personnel contact names and telephone number are summarised in Table 2-1. The project organisation is shown in Appendix 1.

Party	Position	Name:	Tel. No.:
Project Proponent and Engineer – DSD	Project Manager	Raymond LEE	2594 7457
	Engineer's Representative	Tim TSOI	2594 7460
Contractor – Maeda	Site Agent	George CHEUNG	9268 1918
LGT – Hyder Consulting	LGT Leader	Alexi BHANJA	2911 2916
IC(LG) – CH2M HILL	IC(LG)	Aldex LEE	2507 2203

Table 2-1 Contact Details for Key Project Personnel

## 2.3 Construction Programme

Construction programme of the Project is attached in Appendix 2. As can be seen, all works carried out during the reporting period have been carried out with the required LFG control measures in place (e.g. LFG monitoring for “hot works”).

## 2.4 Works Undertaken during the Month

Works undertaken during the reporting period included:

- The construction of permanent piles;
- Post-drilling; and
- Loading test.

## 3 Environmental Status

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### 3.1 Works Undertaken during the Month with Illustrations

Works undertaken during the reporting period are identified in Section 2.4. Illustrations of these works, such as location of works, are provided in Appendix 3.

## 3.2 Project Area and Monitoring Locations

The site is located at Ting Kok Road in Tai Po, and the major items to be constructed are located outside the existing passive vent trench of the adjacent Shuen Wan Landfill.

The impact monitoring locations specified in the *Report on Landfill Gas Hazard Assessment* comprise “utilities’ manholes and chambers” (i.e. fixed locations for purposes of environmental protection) and at excavations of 1m depth or more (i.e. variable locations for purposes of worker safety), which vary from month to month.

In terms of fixed monitoring locations, the Baseline Report identified two existing manholes. A third location – a deep borehole – was installed by the Contractor to provide further coverage.

The fixed monitoring locations are summarised in Table 3-2:

Monitoring Station ID	Description
M1	New Deep Borehole (11m deep)
M2	Existing Manhole (2m deep)
M3	Existing Manhole (2m deep)

**Table 3-2 Monitoring Locations for LFG EM&A**

Project area is shown in Appendix 3 and the fixed monitoring locations are shown in Appendix 4.

## 4 Brief Summary of EM&A Requirements

### 4.1 Monitoring Parameters

During the construction phase, impact monitoring of LFG is to be carried out in accordance with the *Report on Landfill Gas Hazard Assessment* at the selected locations. LFG parameters to be monitored comprise oxygen, methane and carbon dioxide. Temperature is also recorded but this is not a LFG parameter.

### 4.2 Monitoring Equipment

Table 4-3 shows the equipment list for LFG monitoring.

Equipment	Manufacturer / Serial Nos.
Gas Analyser GA 2000	Geotechnical Instruments / GA 08277

**Table 4-3 Equipment List for LFG Monitoring**



### 4.3 Event and Action Levels/Plans

The baseline monitoring results documented in the baseline monitoring report for the Project (our report ref.: EA01284R0022) provided the Action and Limit (A/L) Levels for LFG impact monitoring and also the Action Plan. As per the *Report on Landfill Gas Hazard Assessment*, and in keeping with the standard presentation of LFG EM&A in other projects, both the A/L Levels and Action Plan are shown in the same table.

Table 4-4 shows the combined A/L Level and Action Plan for the Project, to be triggered if the LFG criteria are exceeded:

Parameter	A/L Level	Action Plan
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)	– 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 methane to < 10% LEL
Carbon Dioxide	>0.5%	– Ventilate to restore carbon dioxide to <0.5%
	>1.5%	– Stop works – Evacuate personnel/prohibit entry – Increase ventilation to restore carbon dioxide to >0.5%

**Table 4-4 Action and Limit Levels and Action Plan for Landfill Gas**

### 4.4 Mitigation Measures and Requirements in Contract Documents

Measures for mitigating LFG hazards during the construction works have been stated clearly in the *Report on Landfill Gas Hazard Assessment*, which forms part of the contract documents Specification. Relevant excerpts could be referred to the Project Profile for Upgrading of Ting Kok Road Pumping Station No. 5.

Section 5 and Appendix 5 summarise the mitigation measures and requirements as well as the implementation status.

## 5 Implementation Status of Landfill Gas Hazard Control Measures

The status of the mitigation measures implemented by the Contractor is listed in Appendix 5. All LFG hazard control measures have been implemented as stipulated in the contract documents and in the *Report on Landfill Gas Hazard Assessment*.

## 6 Monitoring Results

Calibration records for the equipment used for LFG monitoring are provided in Appendix 6. *Original Field Measurement Recording Sheets* for both fixed locations and variable locations are provided in Appendix 7.

During the reporting period, LFG was monitored at the three fixed locations for purposes of environmental protection). These are shown in Table 6-5, below (**bold** indicates an exceedance of Action Level and **bold** indicates an exceedance of Limit Level):

Fixed Monitoring Station ID	Date	Gas Concentration (%)			Temperature (°C)	Remarks
		Methane	Carbon Dioxide	Oxygen		
M1	03-Apr-06	0.3	<b>1.0</b>	19.5	27.5	Nil
M2	03-Apr-06	0.1	0.1	20.3	27.5	
M3	03-Apr-06	0.2	0.3	19.9	27.5	

**Table 6-5 Monitoring Results at Fixed Locations**

Appendix 4 shows the position of each fixed monitoring station. The concentration of carbon dioxide exceeded the Action Level of 0.5% at M1 during the monitoring period. This exceedance has also occurred in previous months. The recorded level is within expected norms and is not of concern. As this is a fixed location, not part of the excavation works, there are no safety-related issues. Location M1 is not affected by any ongoing Works and so this exceedance is not considered to be due to the construction activities, nor it is considered to be a non-compliance in terms of the EM&A programme and implementation of the Action/Event Plan.

During the reporting period, LFG was monitored at variable locations (for purposes of worker safety). These locations were within Portion 4 as shown in Appendix 3.

A total of 70 readings, each including carbon dioxide, methane and oxygen, at variable locations were taken for safety-related reasons, including piling works, trench excavation, post-drilling work and the construction of temporary drainage system. There were no exceedances for Action or Limit Level at any variable locations during the reporting period.

The LFG monitoring results for variable locations are provided on the *Field Measurement Recording Sheets* in Appendix 7.

## 7 Report on Non-Compliance and Complaints

EPD has conducted one site inspection on 13 April 2006. The wastewater discharge and chemical storage areas were inspected. According to the Contractor, there was no adverse comment given by EPD.

There were no non-compliances during the reporting period and no complaints regarding LFG were received.

## 8 Others

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### 8.1 Future Key Issues

Construction activities for next month are anticipated to include:

- Sheet piling work and temporary work for trenchless method;
- Excavation;
- Working pit construction for rising mains;
- The installation of pile head steel plate; and
- The construction of sub-structure.

Based on the above, on the construction programme (shown in Appendix 2) and on the review of relevant Contractor's method statements by the LGT, no significant future key issues in terms of LFG have been identified at this time.

LFG monitoring will be continued and the tentative monitoring schedule at fixed locations for the next three months is shown below:

- 2 May 2006
- 1 June 2006
- 3 July 2006

### 8.2 Comments, Recommendations and Conclusions

The LFG mitigation measures adopted by the Contractor during the reporting period are considered to have been implemented in a satisfactory manner and there have been no exceedances in A/L Levels at variable monitoring locations.

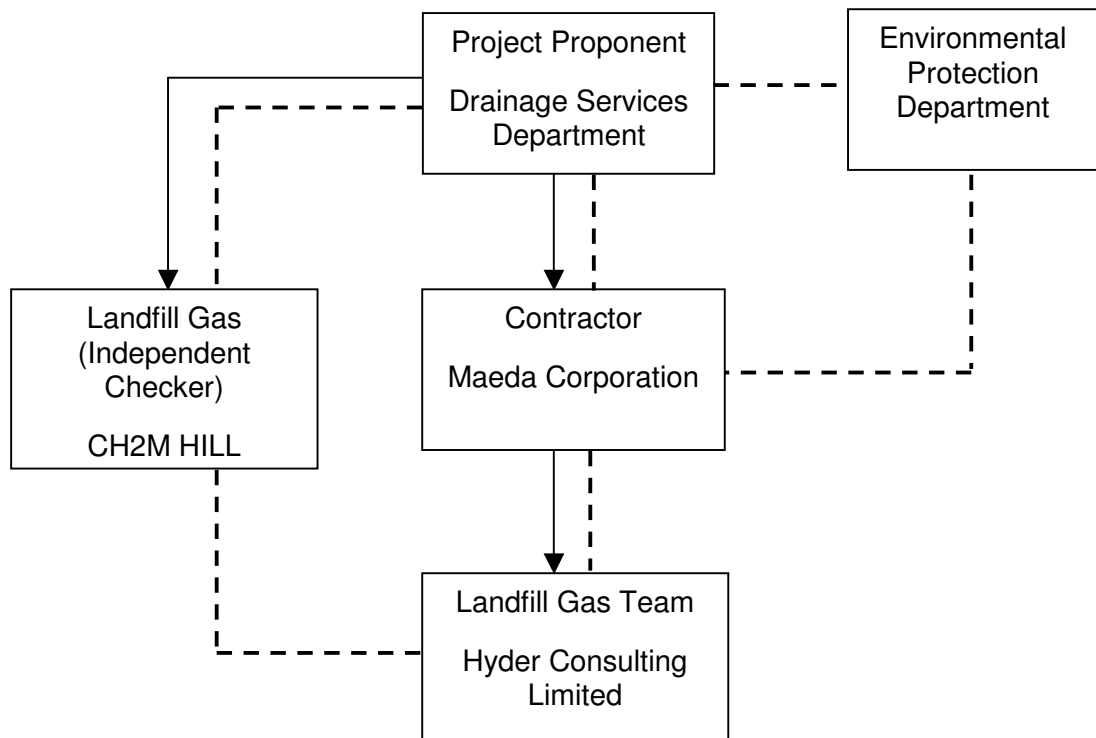
The EM&A programme is considered to be performed acceptably and there are no recommendations for improvements or modifications at this time.

In conclusion, there have been no significant issues relating to LFG hazard during the reporting period.

# Appendix 1

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## Project Organisation



- - - - - Line of communication

—> Line of Authority

# Appendix 2

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Construction Programme

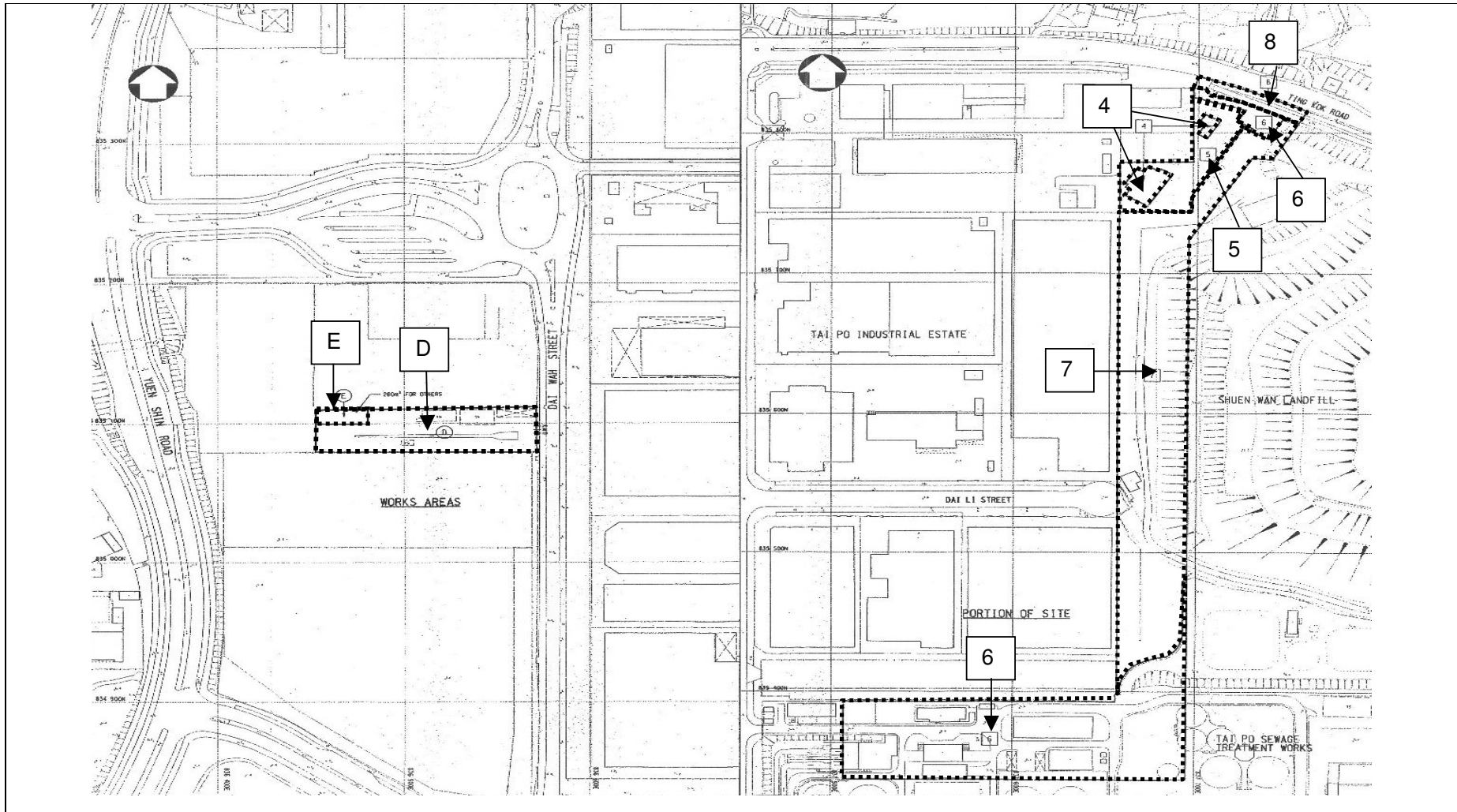


# Appendix 3

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Location of Works and Project Area





Title

Upgrading of Ting Kok Road Pumping Station No. 5 – Portion of Site and Works Area

Date

Dec 2005

Figure

N.A.

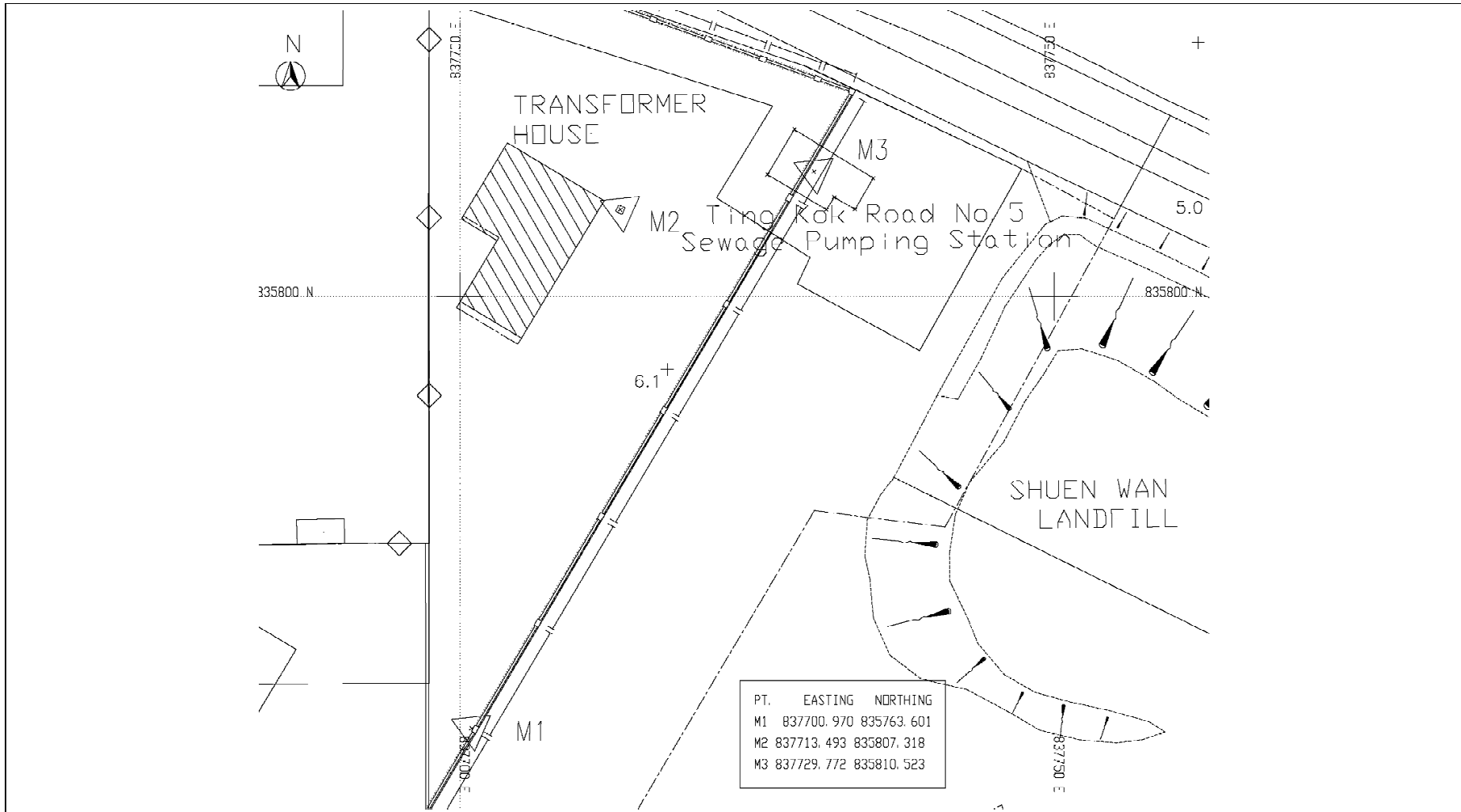
Scale

NTS

# Appendix 4

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## Fixed Monitoring Locations



Title

Upgrading of Ting Kok Road Pumping Station No. 5 – LFG Monitoring Station

Date

Dec 2005

Figure

N.A.

Scale

NTS

# Appendix 5

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Updated Implementation Schedule

Section	Environmental Protection Measure	Status	Location	Implementation Agent	Implementation Stage	Relevant Legislation & Guidelines
6.1	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: methane            0-100% LEL and 0-100% by volume; carbon dioxide    0-100%;and oxygen              0-21%	Y	Within the work site	Contractor	Construction	Code of practice on Safety and Health at Work in Confined Space.  Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)
6.2	No smoking and naked flames should be allowed.	Y				Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)
6.2	No worker should work alone at any time in the confined area or any excavation trenches.	N/A				
6.2	Construction equipment should be equipped with a vertical exhaust at least 0.6m above ground level and/or with spark arrestors	Y				
6.2	Electrical motors and electrical extension cords should be explosion-proof or intrinsically safe.	N/A				
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.	Y				
6.2	Forced ventilation should be required for workers, if in a trench deeper than 1m.	N/A				

Section	Environmental Protection Measure	Status	Location	Implementation Agent	Implementation Stage	Relevant Legislation & Guidelines
6.2	During piping assembly or conducting 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.	Y	Within the work site	Contractor	Construction	Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)
6.2	The Safety Officer should set down the monitoring frequency and areas prior to commencement of construction works.	Y				
6.2	Daily and routine monitoring should be carried out in all excavations.	Y				
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.	Y				
6.2	For excavations deeper than 1m, measurement 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 works are in the excavation.</li> </ul>	N/A				

Section	Environmental Protection Measure	Status	Location	Implementation Agent	Implementation Stage	Relevant Legislation & Guidelines
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>	Y				
6.2	The landfill gas precautionary measures involved with excavation and piping works should be included in the Safety Plan.	Y	Within the work site	Contractor	Construction	Landfill Gas Hazard Assessment Guidance Note (EPD/TR8/97)
6.3	The cracks on the ground level at the working area should be monitored during ground-works construction	N/A				
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 proved 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>	Y				
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.	Y				
6.6	Adequate fire extinguishing equipment, fire-resistant clothing and breathing apparatus (BA) sets should be made available on site.	Y				

Section	Environmental Protection Measure	Status	Location	Implementation Agent	Implementation Stage	Relevant Legislation & Guidelines
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.	Y				
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.	N/A	Manhole/ chamber	DSD	Operation	Code of Practice on Safety and health at Work in Confined Spaces
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 (or longer than 8 hours).	N/A	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.	N/A	Manhole/ chamber/ pumping station			
7.4	No person should enter or remain in a confined spaces or trenches where the carbon dioxide concentration exceed 1.5% (by volume).	N/A				
7.5	Oxygen concentration should be monitored and no person should enter or remain in any confined spaced or trenches where the oxygen content of air has fallen below 18% by volume.	N/A				



Section	Environmental Protection Measure	Status	Location	Implementation Agent	Implementation Stage	Relevant Legislation & Guidelines
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.	N/A				

Note:

Y – Implemented

N – Not Implemented

N/A – Not Applicable

# Appendix 6

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## Calibration Records

# Verification Checklist

Product Type: Gas Analyser

GA 2000

Serial Number: GA 08277

Checks and processes to be carried out		(✓) or (n/a)	
Documents	All paperwork has been completed and signed	✓	
	Solenoid by-pass - signed as reconnected (GEM-500 only)	N/A	
Functions, options & settings	Anemometer set (refer Precal Sheet)	✓	
	H2 warning level set (compensated CO only, refer Project 1 or Precal Sheet)	N/A	
	Baud rate set to 19200+HS (2K ONLY)	✓	
	Barometer set (± 5mbar of actual)	✓	
	Internal Gas sensors fitted	Cell 1	N/A
		Cell 2	N/A
		Cell 3	N/A
		Oxy cell	✓
	Current software version correct (write current version)	✓ 2.35	
	Current time correct	✓	
	Date format correct	(UK) USA	
	Company logo correct	✓	
	Instrument type correct (refer to opening title screen)	✓	
	Lifetime guarantee	on / off	
Service due date set (current date + 6 months)	✓		
Last gas check date set (refer outward gas check)	✓		
Sample flow	Vacuum tested at inlet port	✓	
	Flow correct	✓	
	Flow fail operates correctly	✓	
Ancillary readings	Temperature probe registers correct temperature	✓	
	Analyser recognises gas pod correctly	✓	
	Analyser recognises flow pod correctly	✓	
Pressure transducer	Check 5psi relative pressure transducer set using DPI	✓	
	Check 1psi differential pressure transducer set using DPI (GEM ONLY)	N/A	
Labels	All relevant product labels are fitted correctly	✓	
	'Ex' screen printing/label is clear/correct for product	✓	
	Battery cover sealing tape fitted (Hyperbaric units only)	N/A	
Accessories	All relevant accessories included correct	✓	
Memory & battery	Update EPROM database (2K only)	✓	
	Update GA Production database	✓	
	Memory clear (unless client requests otherwise)	✓	
	New batteries fitted as standard (NMRI Hyperbaric units only)	N/A	
	Battery life tested by logging (If new 2k battery fitted only)	14 Hrs	
Comments			

Verified By: L. Gibbs (ref. FI0002) Date: 08.11.05.

Signed

Printed

# CERTIFICATE OF CALIBRATION

Certificate number: GA08277L0041105

Date of Calibration: 04/11/05

Product: GA 2000

Serial number: GA08277

## CALIBRATION CHECK RESULTS

### Primary Gas Channels

Methane		Carbon Dioxide	
Certified Gas %	Reading %	Certified Gas %	Reading %
0.0	0.0	0.0	0.0
0.5	0.4	0.5	0.4
5.0	5.0	5.0	4.5
14.8	14.7	14.8	14.2
59.5	59.9	40.5	37.8
50.1	50.9	49.9	47.5
100.0	99.0	0.0	0.0

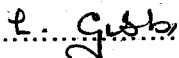
### Oxygen Channel

Certified Gas	0% O <sub>2</sub>	4.95 % O <sub>2</sub>	Air (20.9% nominal)
Reading	0.0 %	4.8 %	20.9 %

Approved by:

L. Gibbs

(Name)



(Signature)

All gases are certified to traceable National Standards.

This unit must be serviced at regular 6 monthly intervals by a Geotechnical Instruments Ltd approved service facility.

# Appendix 7

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Field Measurement Recording Sheets

DCI2005/01

Particular Specification

PS/A/P 1.18-15

# ANNEX A Landfill Gas Monitoring - Field Measurement Recording Sheet (Sample)

Name of site: Trys Kok Road Pumping Station  
Date of measurement: 3 April 06.

Sampling equipment used:	Dates calibrated
<u>GA 2000</u>	<u>4/11/05</u>
<u>Serial no GA 08271</u>	<u>2/11/06</u>

To: Shoufal / Claudio  
 Total # pages: Annex A  
 From: Edith

# FAX

Sample location	Date of measurement	Sampling time	Weather condition	Perimeter on-site and/or off-site monitoring holes				Remark	
				Balance gas (%)	Plammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)		Temp (°C)
M1	3-4-06	9:45	Fm	79.0	0.7	1	19.5	27.5	
M2	3-4-06	9:46	Fm	79.3	0.1	0.1	20.3	27.5	
M3	3-4-06	9:48	Fm	79.5	0.2	0.3	19.9	27.5	

Hydr: Hydr Consulting Limited  
 Date: 27 APR 2006  
 Reg no: 2006-2296  
 DIVIDED: TRV  
 PROJECT: GA  
 and person: J  
 1082

Copy to:	Sign:	Date:
Reply date:		
File ref:		

Field Technician: [Signature] (TA)

Checked by: [Signature] (RSB)

Annex A

Annex A

**ANNEX A**  
**Landfill Gas Monitoring - Field Measurement Recording Sheet (Sample)**

Name of site: Top Kok Road Rampy Station A1.5  
 Date of measurement: See below

Sampling equipment used:	Dates calibrated
<u>GA 2000</u>	<u>2/11/05</u>
<u>Seal no. 08211</u>	

Sample location	Date of measurement	Sampling time	Weather condition	Petinometer on-site and/or off-site monitoring holes						
				Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	Remark	
Port 4	1/4/06	08:10	Cloudy	78.0	0	0	20.8	21.1	} P/Ly 2005	
		08:11		78.0	0	0	20.8	21.1		
Port 4	"	13:25	Fog	79.2	0	0	20.6	29.5	} P/Ly 2005	
		13:26		79.2	0	0	20.6	29.5		
Port 4	2/4/06	08:16	Fog	75.1	0	0	20.7	23.6	} P/Ly 2005	
		08:17		79.1	0	0	20.7	25.6		
Port 4	"	13:13	Fog	79.2	0	0	20.6	28.4	} P/Ly 2005	
		13:14		79.2	0	0	20.6	28.4		
Port 4	4/4/06	8:15	Fog	79.2	0	0	20.6	24.7	} P/Ly 2005	
		8:16		79.2	0	0	20.6	24.7		
Port 4	4/4/06	13:21	Fog	79.3	0	0	20.5	29.4	} P/Ly 2005	
		13:22		79.3	0	0	20.5	29.4		

Field Technician: Anna Sharma

Checked by: Anna Sharma (K50)

**ANNEX A  
Landfill Gas Monitoring - Field Measurement Recording Sheet (Sample)**

Name of site: Trig ket Road Pumping Station No. 5  
 Date of measurement: See below

Sampling equipment used:	Dates calibrated
<u>Qd 2000</u>	<u>6/11/05</u>
<u>Serial No. 08277</u>	

Sample location	Date of measurement	Sampling time	Weather condition	Perimeter on-site and/or off-site monitoring holes						
				Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	Remark	
Station 4	6 Apr 06	10:15	Fine	79.0	0.1	0.0	20.8	27.6	} Ring work	
"	"	"	"	79.0	0.1	0.0	20.8	27.6		
Perimeter 4	6 Apr, 06	13:15	Fine	79.0	0.1	0	20.6	29.3	} Ring work	
"	"	13:16	"	79.0	0.1	0	20.6	29.3		
Perimeter 4	<del>7</del> 7 April 06	8:30	Fine	79.0	0.1	0	20.8	21.1	} Ring work	
"	7 April 06	8:31	Fine	79.0	0.1	0	20.8	21.1		
Perimeter 4	7 April 06	13:15	Fine	79.1	0	0	20.7	23.3	} Ring work	
"	7 April 06	13:16	Fine	79.1	0	0	20.7	23.3		
Perimeter 4	8 April 06	8:19	Fine	79.0	0.1	0	20.8	22.0	} Ring work	
"	8 April 06	8:20	"	79.0	0.1	0	20.8	22.0		
Perimeter 4	8 Apr, 06	13:20	Fine	79.1	0.1	0	20.6	30.6	} Ring work	
"	8 Apr, 06	13:21	Fine	79.1	0.1	0	20.6	30.6		

Field Technician: John Linn

Checked by: John Linn



ANNEX A

ANNEX A  
 Landfill Gas Monitoring - Field Measurement Recording Sheet (Sample)

Name of site: Tiny Lk Road Pippy Station No. 5  
 Date of measurement: See below

Sampling equipment used:	<u>GA 2000</u>	Dates calibrated:	<u>4/15/05</u>
	<u>Serial No. 0817</u>		

Sample location	Date of measurement	Sampling time	Weather condition	Perimeter on-site and/or off-site monitoring holes						
				Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (C)	Remark	
Patch 4	10 Apr, 06	08:15	Fine	79.1	0	0	20.6	26.4	Ply work	
"	"	08:16	Fine	79.1	0	0	20.7	26.4		
Patch 4	10 Apr, 06	13:15	Fine	79.4	0	0	20.6	33.4	Ply work	
"	"	13:16	Fine	79.4	0	0	20.8	33.4		
Patch 4	11 Apr, 06	08:20	Fine	79.0	0	0	20.7	27.8	Ply work	
"	"	08:21	Fine	79.0	0	0	20.7	27.8		
Patch 4	11 Apr, 06	13:10	Fine	79.1	0	0	20.6	32.8	Ply work	
"	"	13:11	Fine	79.4	0	0	20.6	32.8		
Patch 4	12 Apr, 06	08:10	Fine	79.1	0	0	20.6	27.3	Ply work	
"	"	08:11	Fine	79.1	0	0	20.6	27.3		
Patch 4	12 Apr, 06	13:19	Fine	79.3	0	0	20.6	31.0	Ply work	
"	12 Apr, 06	13:19	Fine	79.3	0	0	20.6	32.0		

Field Technician: Jan Krivy

Checked by: Jan Krivy (RSO)

ANNEX A

ANNEX A  
Landfill Gas Monitoring - Field Measurement Recording Sheet (Sample)

Name of site: Trig Lok Road Pungay Station WS  
Date of measurement: See below

Sampling equipment used:	Dates calibrated
<u>GA 2000</u>	
<u>Serial No. 08511</u>	<u>4/11/05</u>

Sample location	Date of measurement	Sampling time	Weather condition	Perimeter on-site and/or off-site monitoring holes						
				Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	Remark	
Pothole 1	13 Apr 06	08:15	Fair	79.0	0.1	0	20.9	20.7	} Digging work	
"	"	08:16	"	79.1	0.1	0	20.8	20.9		
Pothole 4	13 Apr 06	13:10	Fair	79.2	0	0	20.1	24.9	} Digging work	
"	"	13:21	"	79.2	0	0	20.7	24.8		
Pothole 4	18 April 06	8:22	Fair	79.0	0.1	0	20.8	22.1	} Digging work	
"	"	8:23	"	79.0	0.1	0	20.8	22.0		
Pothole 4	18 April 06	13:16	Fair	79.1	0	0	20.7	25.3	} Digging work	
"	"	13:17	"	79.1	0	0	20.7	26.4		
Pothole 4	19 April 06	8:19	Fair	79.0	0	0	20.8	25.4	} Digging work	
"	"	8:20	"	79.0	0	0	20.8	25.3		
Pothole 4	19 April 06	13:20	Fair	79.1	0	0	20.7	31.8	} Digging work	
"	"	13:21	"	79.1	0	0	20.7	31.8		
Pothole 4	20 April 06	08:11	Fair	79.1	0	0	20.8	26.8	} Trench excavation	
"	"	13:19	"	79.1	0	0	20.8	28.3		

Field Technician: Jim King

Checked by: [Signature]

ANNEX A

**ANNEX A  
Landfill Gas Monitoring - Field Measurement Recording Sheet (Sample)**

Name of site:  
Date of measurement:

Sampling equipment used:	GA 200
Serial No.:	08277
Dates calibrated	04/11/05

Sample location	Date of measurement	Sampling time	Weather condition	Perimeter on-site and/or off-site monitoring holes						
				Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (C)	Remark	
Position 4	24 Apr. 06	08:00	Fine	79.2	0.1	0	20.6	25.6	Trench	
"	24 Apr. 06	08:01	Fine	79.2	0.1	0	20.6	25.6	Trench	
Position 4	24 Apr. 06	13:05	Fine	79.2	0.1	0	20.6	26.8	Trench	
"	24 Apr. 06	13:06	Fine	79.2	0.1	0	20.6	26.8	Trench	
Position 4	22 Apr. 06	08:22	Fine	79.0	0.0	0	20.7	26.2	No Excavation works today	
"	22 Apr. 06	08:10	Fine	79.2	0	0	20.6	26.7	"	
Position 4	22 Apr. 06	13:28	Fine	79.1	0	0	20.7	31.1	No Excavation works today	
"	22 Apr. 06	13:29	"	79.0	0	0	20.8	20.9	"	
Position 4	24 Apr. 06	08:13	Fine	79.3	0	0	20.5	23.9	"	
"	24 Apr. 06	08:14	"	79.2	0	0	20.6	24.6	"	
Position 4	24 Apr. 06	13:16	Fine	79.2	0	0	20.6	28.9	"	
"	24 Apr. 06	13:17	"	79.1	0	0	20.7	28.8	"	

Field Technician:

*Alan Lewis*

Checked by:

*John (RSO)*

ANNEX A

Annex A

To: ZLKH

ANNEX A  
Landfill Gas Monitoring - Field Measurement Recording Sheet (Sample)

Name of site: Toy Kak Road Dumping Site No.5  
Date of measurement: See below

Sampling equipment used:	
<u>GA 2000</u>	
<u>Serial No. 38277</u>	
Dates calibrated	<u>4/1/05</u>

Sample location	Date of measurement	Sampling time	Weather condition	Perimeter on-site and/or off-site monitoring holes						
				Balance gas (%)	Flammable gas (methane %)	Carbon dioxide (%)	Oxygen (%)	Temp (°C)	Remark	
Portion 4	25 Apr, 06	8:12	Fair	79.1	0.1	0	20.6	23.4		post drill
Portion 4	25 Apr, 06	8:13	"	79.1	0.1	0	20.6	23.5		and
Portion 4	25 Apr, 06	13:19	Fair	79.0	0	0	20.9	24.4		Temp
Portion 4	25 Apr, 06	13:22	"	79.0	0	0	20.9	24.3		Reaction
Portion 4	26 Apr, 06	08:12	Fine	79.1	0	0	20.6	23.1		Temp. Drilling
Portion 4	26 Apr, 06	08:14	"	79.1	0	0	20.6	23.1		after
Portion 4	26 Apr, 06	13:05	Fine	79.1	0	0	20.6	27.2		Temp. Drilling system
Portion 4	26 Apr, 06	13:06	"	79.1	0	0	20.6	27.2		

Field Technician: Cameron Ford

Checked by: [Signature] (RS0)

Annex A