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TEST REPORT

DRAINAGE SERVICES DEPARTMENT

**CONTRACT NO. DC/2009/01 BUILDING AND
CIVIL MAINTENANCE AND MINOR WORKS OF
DSD PLANTS AND FACILITIES (2009-2012)**

**GROUNDWATER MONITORING AT
NGONG PING STW AND EFFLUENT EXPORT
PIPE**

MONTHLY EM&A REPORT

(OCTOBER 2009)

Prepared by:

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Senior Environmental Officer

Checked and
Approved by:

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Issued Date: 09 November 2009

Report No.: ENA90859

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Acousticians & Environmental Engineers

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沛然環境評估
工程顧問有限公司

Our Ref: 840/10-0003

10 February 2010

By POST and FAX (2827 8526)

Drainage Services Department
42nd Floor
Revenue Tower
5 Gloucester Road
Wan Chai
Hong Kong

Attn: Mr. Ringo Mok

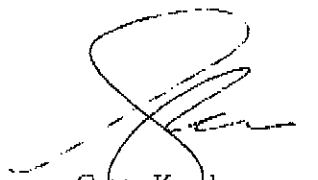
Dear Sir,

Re: Ngong Ping Sewerage Project
Groundwater Monitoring at Ngong Ping STW and Effluent Export Pipe
EM&A Reports (October and November 2009) and Final EM&A Report

We refer to the captioned reports submitted by the environmental team, messrs ETS-Testconsult Limited, via on 19 January 2010 and the revised reports on 4 February 2010 via emails. Please note that we have no adverse comment on the captioned reports and hereby verify Condition 5 of the Environmental Permit (EP-157/2003/A)

Should you have any queries, please do not hesitate to contact the undersigned at 2815 7028 for any queries

Yours sincerely,
For and on behalf of
Allied Environmental Consultants Ltd


Grace Kwok
Independent Environmental Checker

GK/wm

Cc. OAP Ms Ada Pang (By Email)
ETS-Testconsult – Ms Linda Law (By Email and Fax. 2695 3944)



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EXECUTIVE SUMMARY

This monthly EM&A report (No.23) has been prepared by the Environmental Team (ET) of ETS-Testconsult Ltd for groundwater monitoring under "Contract No. DC/2006/15 Building and Civil Maintenance and Minor Works to DSD Plants and Facilities (2007-2009) – Groundwater Monitoring at Ngong Ping STW and Effluent Export Pipeline" (the Project) during the operation period from 01 to 31 October 2009.

Under the requirements of Section 5 of "the Environmental Permit (No. EP-157/2003/A)" (the EP), EM&A programme as set out in the EM&A Manual and the EIA Report (Register No.: AEIAR-065/2002) is required to be implemented. In accordance with the EM&A manual and the EIA Report, groundwater monitoring is required for the Project during operation phase

Environmental Monitoring Progress

The summary of the monitoring activities in this monitoring month is listed below:

- *Groundwater Monitoring: 1 Occasion at 3 designated boreholes.*

Groundwater Monitoring

Groundwater monitoring was carried out on 29 October 2009 at WM10, WM11 and WM12.

Test results of the groundwater during this monitoring show no contamination of ground water by any treated effluent. In other words, it is evident that there was no leakage of treated effluent from the Ngong Ping Sewage Treatment Works or its effluent export pipeline into the water gathering ground.

Environmental Complaints

No complaints were received in this reporting month.

Notification of summons and successful prosecutions

There were no notification of summons and prosecutions with respect to environmental issues in this month.

Future Key Issues

Future Key issues to be considered for the prevention of contamination of the water gathering ground are as follows:

- *The provision of leakage containment system for the section of pipeline in the close proximity of the reservoir;*
- *Removing waste in a timely manner and disposing of outside the water gathering ground;*
- *Locating the chemical storage area at a safe environment with adequate space; and*
- *Reminding the workers not to discharge any sewage or wastewater into the nearby environment.*



1.0 INTRODUCTION

The construction works of Ngong Ping Sewage Treatment Works (NPSTW) was certificated completed on 09 March 2006 and the NPSTW was handed over to "Drainage Sewage Department" (DSD) for operation and maintenance from 10 March 2006. "ETS-Testconsult Limited" (ETL) has been commissioned as Environmental Team (ET) to carry out groundwater monitoring at Ngong Ping according to the EM&A Manual.

This monthly EM&A report presents the results of groundwater monitoring during the reporting period from 01 to 31 October 2009.

2.0 PROJECT INFORMATION

2.1 Background

Master Plan (OI SMP) Study in December 1994 and drew up a SMP for Lantau Island, Cheung Chau, Lamma Island, Peng Chau and other smaller and less populated islands. The SMP comprises provisions for upgrading and expanding the sewerage systems to cover unsewered areas.

This sewerage project is the Stage 1 works under the OI SMP and can be divided into 3 packages as follows:

Package 1 – Ngong Ping STW with tertiary treatment

Package 2 – Ngong Ping main trunk sewer and effluent export pipeline

Package 3 – Ngong Ping village sewerage system

This Project only covers the operation phase of Package 1 and Package 2. The general layout plan of the project is shown in Appendix D (Drawing No. 23400/EN/098).

The existing treatment facilities at Ngong Ping include grease traps and septic tanks, with discharge locally to soakaways. Following the opening of the Statue of Buddha in December 1993, the number of visitors to Ngong Ping increased significantly. Besides, the Cable Car system linking Tung Chung and Ngong Ping was being planned for commissioning in June 2006. It will certainly further increase the number of visitors in Ngong Ping. The existing treatment and disposal facilities were found to be inadequate, with significant quantities of sewage being directly discharged into the local stream. It was under this setting that the recommendation to provide a local sewerage system and a centralised treatment system for Ngong Ping was put forward in the OI SMP in 1994.

The Project was planned, designed, operated and maintained by the DSD. During the operation phase of NPSTW, DSD will follow the environmental monitoring recommendation stated at the M&A Manual that was prepared with reference to the EIA Report (Register No.: AEIAR-065/2002) to avoid the contamination of the water gathering ground.

2.2 Site Description

The general layout plan of the project is shown in Appendix D. The groundwater monitoring locations are also shown in the Drawing No. 23400/R/VS/406.

2.3 Project Organization and Management Structure

The line of communication of project organization with respect to the on-site environmental management and monitoring program are shown in Appendix A.



2.4 Contact Details of Key Personnel

The key personnel contact names and telephone numbers, and construction programme are shown in table 2.1.

Table 2.1 Contact Details of Key Personnel

Organization	Project Role	Name of Key Staff	Tel. No.	Fax No.
DSD	Contractor	Mr. P C Wu	2594 7199	2827 6657
ETL	Contractor's Environmental Team	Mr. C L Lau (ET Leader)	2946 7791	2695 3944

3.0 GROUNDWATER QUALITY MONITORING

3.1 Monitoring Locations

Groundwater quality monitoring was undertaken at three designated sampling points shown in Table 3.1.

Table 3.1 Locations of Groundwater Quality Monitoring

Sampling Point	Location
WM10	Ngong Ping Village
WM11	Ngong Ping Village
WM12	Ngong Ping Village

3.2 Monitoring Parameters

Monitoring of the groundwater monitoring parameters are listed below:

- Biochemical Oxygen Demand (BOD₅), mg/L;
- Ammonia Nitrogen (NH₄⁺-N), mg/L;
- Nitrate + Nitrite Nitrogen (NO₂⁻+NO₃⁻), mg/L;
- pH value;
- Turbidity, NTU;
- Oil & Grease (O&G), mg/L;
- Total Phosphates (TP), mg/L;
- Synthetic detergents, mg/L;
- E-coli, cfu/100ml.



3.3 Monitoring Frequency

The monitoring frequency of the groundwater monitoring is summarized in Table 3.3.

Table 3.3 The frequency of the Groundwater Monitoring

Parameter	Frequency	No. of Boreholes
Biochemical Oxygen Demand	Once per month	3
Ammonia Nitrogen		
Nitrate + Nitrite		
pH value		
Turbidity		
Oil & Grease		
Total Phosphates		
Synthetic detergents		
E-coli		

3.4 Monitoring Methodology and Equipment Used

A water sampler comprising a transparent PVC cylinder, with a capacity of not less than 2 liters, was lowered into the water body at the predetermined depth. The opening ends of the sampler were then closed accordingly and water samples were collected.

The sample container, made by high-density polythene / glass, was rinsed with a portion of the water sample. The groundwater sample was then transferred to the container, labeled with a unique sample ID and sealed with a screw cap. The water samples were stored in a cool box maintained at 4°C. The groundwater samples were then delivered to a local HOKLAS-accredited laboratory (Environmental Laboratory, ETS-Testconsult Ltd, HOKLAS Registration No. 022) on the same day for analysis.

In accordance with the requirement of HOKLAS, the laboratory testing of the monitoring parameters were carried out with QA/QC results shown in Appendix E. The summary of testing methods of testing parameters as recommended by EIA or required by EPD were shown in Table 3.4.

Table 3.4 Summary of testing procedures

Laboratory Analysis	Testing Procedure	Detection Limit
Biochemical Oxygen Demand	In house method TPE/001/W or BS 6068 : Section 2.14 : 1990	2.0 mg/L
Ammoniacal Nitrogen	In house method TPE/016/W, refer to APHA 19ed 4500-NH ₃ F & G	0.13 mg/L
Nitrate + Nitrite	In house method TPE/023/W, refer to APHA 19ed 4500-NO ₃ B	0.004 mg/L
pH (at 25°C)	In house method TPE/003/W, refer to APHA 19ed APHA 4500-H ⁺ B	Detection range: 4.0-10.0
Turbidity	In house method TPE/005/W, refer to APHA 19ed 2130B	0.5 NTU
Oil & Grease	APHA 19ed 5520 B	5.0 mL
Total Phosphate	In house method base on ASTM D 515-88	0.05 mg/L
Synthetic detergents	In house method based on APHA 19ed 5540 C & D	0.1 mg/L
E-coli	DoE Section 7.8 & 7.9 plus in-site urease test	<1 cfu/100ml



3.5 Groundwater Monitoring Results

In this reporting month, groundwater monitoring was carried out on 29 October 2009 at WM10, WM11 and WM12. The groundwater quality measurement results are detailed in Appendix B. Graphical presentation of the monitoring parameters for this reporting month is shown in Appendix C.

Test results of the groundwater during this monitoring show no contamination of ground water by any treated effluent. In other words, it is evident that there was no leakage of treated effluent from the Ngong Ping Sewage Treatment Works or its effluent export pipeline into the water gathering ground.

4.0 ENVIRONMENTAL NON-CONFORMANCE

4.1 Summary of Groundwater Quality Monitoring

According to the results of all testing parameters, they show no contamination of ground water by any treated effluent. In other words, it is evident that there was no leakage of treated effluent from the Ngong Ping Sewage Treatment Works or its effluent export pipeline into the water gathering ground.

4.2 Summary of Environmental Complaints

No complaints were received in this reporting month.

4.3 Summary of Notification of Summons and Prosecution

There was no notification of summons respect to environmental issues registered in this month.

5.0 IMPLEMENTATION STATUS

5.1 Implementation Status of Environmental Mitigation Measures

DSD has been implementing the required environmental mitigation measures indicating in Clause 4.5.20 of the EM&A manual.

5.2 Implementation Status of Environmental Complaint Handling

No complaints were received in this reporting month. The details of the complaint-log are presented in Table 5.1.



Table 5.1 Statistical Summary of Environmental Complaints

Reporting Month	Complaint Statistics			
	Frequency	Cumulative	Aspect	Investigation Results and Follow up Actions
November 07	0	0	---	---
December 07	0	0	---	---
January 08	0	0	---	---
February 08	0	0	---	---
March 08	0	0	---	---
April 08	0	0	---	---
May 08	0	0	---	---
June 08	0	0	---	---
July 08	0	0	---	---
August 08	0	0	---	---
September 08	0	0	---	---
October 08	0	0	---	---
November 08	0	0	---	---
December 08	0	0	---	---
January 09	0	0	---	---
February 09	0	0	---	---
March 09	0	0	---	---
April 09	0	0	---	---
May 09	0	0	---	---
June 09	0	0	---	---
July 09	0	0	---	---
August 09	0	0	---	---
October 09	0	0	---	---

5.3 Implementation Status of Notification of Summons and Prosecution

There were no notifications of summons respect to environmental issues registered in this reporting month.

6.0 CONCLUSION

In this reporting month, groundwater monitoring was carried out on 29 October 2009 at WM10, WM11 and WM12.

Test results of the groundwater during this monitoring show no contamination of ground water by any treated effluent. In other words, it is evident that there was no leakage of treated effluent from the Ngong Ping Sewage Treatment Works or its effluent export pipeline into the water gathering ground.

7.0 FUTURE KEY ISSUES

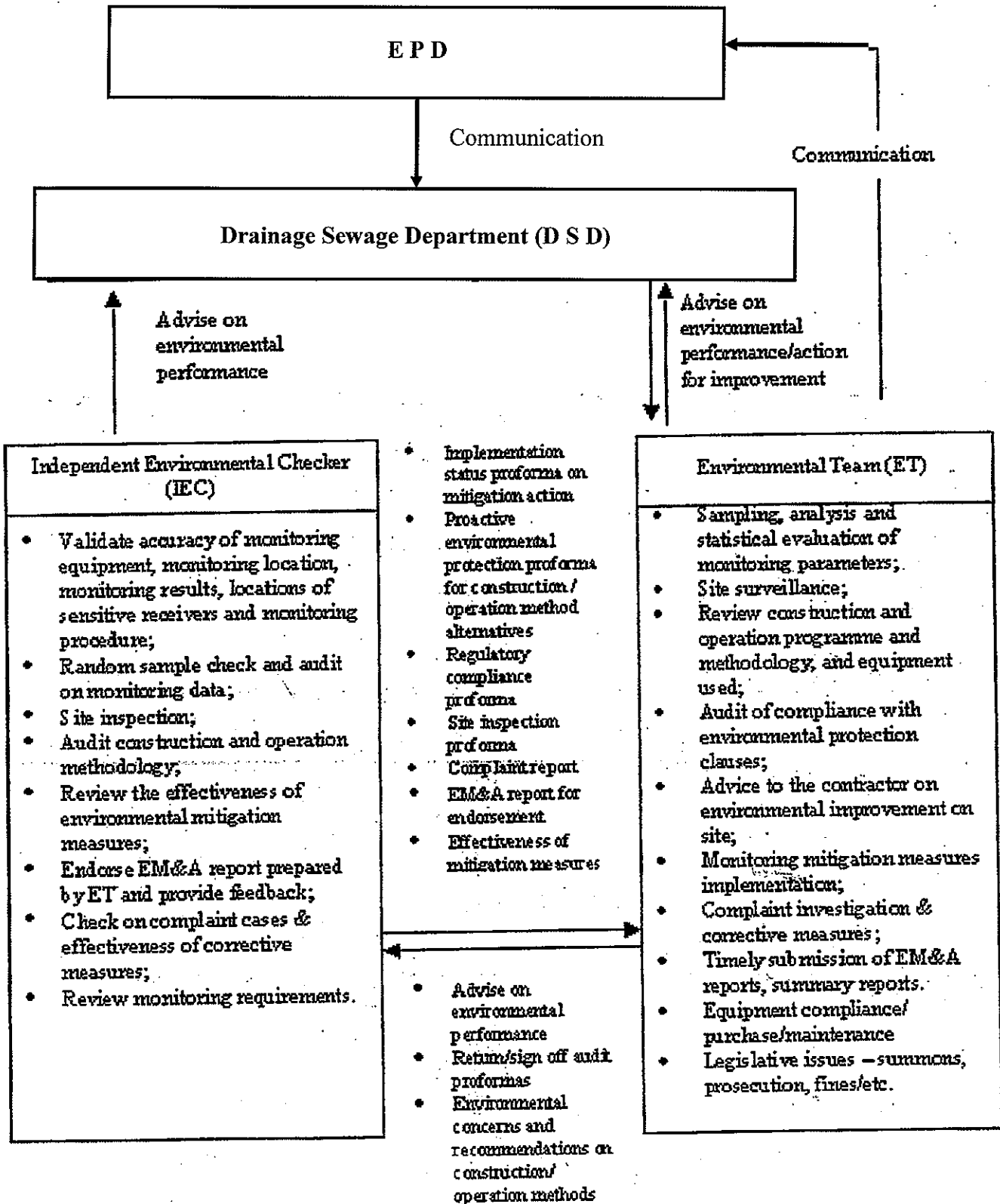
DSD will continue to carry out operation and maintenance works of NPSTW in the coming month. Future Key issues to be considered for the prevention of contamination of the water gathering ground are as follows:

- The provision of leakage containment system for the section of pipeline in the close proximity of the reservoir;
- Removing waste in a timely manner and disposing of outside the water gathering ground;
- Locating the chemical storage area at a safe environment with adequate space; and
- Reminding the workers not to discharge any sewage or wastewater into the nearby environment.



Appendix A

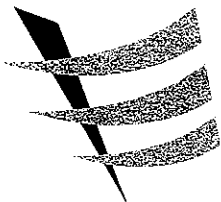
Lines of Communication





Appendix B

Groundwater Monitoring Results and Photos of Groundwater Monitoring at Boleholes



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TEST REPORT

Form : E/EN/R/01/Issue 4 (1/1) [08/02]

Environmental Testing of Water & Wastewater

Report No. : ENA90858
Date of issue : 06 November 2009
Page No. : 1 of 3

Information provided by Customer

Customer name : Sun Fook Kong (Civil) Ltd
Customer address : Rm 3207-10 32/F, Great Eagle Centre, 23 Harbour Road, Wan Chai, Hong Kong
Sample Source : Contract No. DC/2009/01 - Building and Civil Maintenance and Minor Works to DSD Plants and Facilities (2009-2012) - Groundwater Monitoring at Ngong Ping STW and Effluent Export Pipe
Sample Type : Groundwater
Date of sampling : 29 October 2009
Sample Description : The sample was collected in 100ml glass bottle (for Total Phosphates only), 500ml glass bottle (for Oil & Grease only), 100ml sterilized glass bottle (for E-coli only), 500ml and 1L plastic bottles (for other testing parameters). Sample for Ammonia and Nitrate + Nitrite Nitrogen was preserved by adding conc. H₂SO₄ to pH<2. Sample for Oil & Grease was preserved by adding conc. HCl to pH<2. All samples were chilled immediately after collection.


Laboratory information

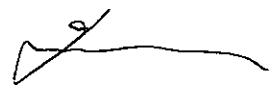
Date Received : 29 October 2009

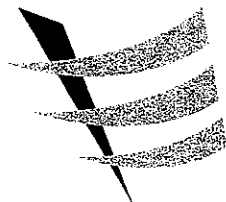
Result

Customer Sample ID	Lab Ref No	Test	Method Used	Result	Date Tested
WM10	W24918 (01)	pH Value	In house method TPE/003/W	5.3 (at 25°C)	29 October 2009
		Turbidity	In house method TPE/005/W	18 NTU	29 October 2009
		Biochemical Oxygen Demand (5-day)	In house method TPE/001/W	<2 mg/L	29 October 2009 (17:00) to 03 November 2009 (17:00)
	W24918 (04)	Nitrate & Nitrite Nitrogen	In house method TPE/023/W	0.23 mg/L	03 November 2009
		Ammonia	In house method TPE/016/W	<0.25 mg/L	30 October 2009
	W24918 (07)	Synthetic Detergents	In house method refer to APHA 19th ed 5540 C & D	<0.1 mg/L	30 October 2009
	W24918 (10)	Total Phosphates	In house method TPE/019/W	0.10 mg/L	30 October 2009
	W24918 (13)	Oil & Grease	APHA 19ed 5520B	<5.0 mg/L	02 November 2009
W24918 (16)	E-coli *	DoE (1983), section 7.8 & 7.9 plus in-situ urease test	10 cfu/100ml	29 to 31 October 2009	

Remark (if any) : The tests marked with "*" indicated the tests were sub-contract to ALS Technichem (HK) Pty Ltd and HOKLAS accredited. Ground water monitoring was carried out at WM10, WM11 and WM12. The reporting limit of Total Phosphates and Ammonia were <0.10mg/L and <0.25mg/L instead of <0.010mg/L and <0.025mg/L correspondingly since the samples were diluted 10-fold before analysis due to matrix effect.

Checked by : 
LAW, Sau Yee
Senior Chemist

Approved by : 
LAU, Chi Leung
Chief Chemist



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Page No. : 2 of 3

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Sample Source : Contract No. DC/2009/01 - Building and Civil Maintenance and Minor Works to DSD Plants and Facilities (2009-2012) - Groundwater Monitoring at Ngong Ping STW and Effluent Export Pipe
Sample Type : Groundwater
Date of sampling : 29 October 2009
Sample Description : The sample was collected in 100ml glass bottle (for Total Phosphates only), 500ml glass bottle (for Oil & Grease only), 100ml sterilized glass bottle (for E-coli only), 500ml and 1L plastic bottles (for other testing parameters). Sample for Ammonia and Nitrate + Nitrite Nitrogen was preserved by adding conc. H₂SO₄ to pH<2. Sample for Oil & Grease was preserved by adding conc. HCl to pH<2. All samples were chilled immediately after collection.

Laboratory information

Date Received : 29 October 2009

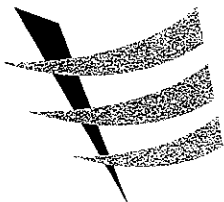
Result

Customer Sample ID	Lab Ref No	Test	Method Used	Result	Date Tested
WM11	W24918 (02)	pH Value	In house method TPE/003/W	5.4 (at 25°C)	29 October 2009
		Turbidity	In house method TPE/005/W	92 NTU	29 October 2009
		Biochemical Oxygen Demand (5-day)	In house method TPE/001/W	<2 mg/L	29 October 2009 (17:00) to 03 November 2009 (17:00)
	W24918 (05)	Nitrate & Nitrite Nitrogen	In house method TPE/023/W	0.68 mg/L	03 November 2009
		Ammonia	In house method TPE/016/W	<0.25 mg/L	30 October 2009
	W24918 (08)	Synthetic Detergents	In house method refer to APHA 19th ed 5540 C & D	<0.1 mg/L	30 October 2009
	W24918 (11)	Total Phosphates	In house method TPE/019/W	<0.10 mg/L	30 October 2009
	W24918 (14)	Oil & Grease	APHA 19ed 5520B	<5.0 mg/L	02 November 2009
W24918 (17)	E-coli *	DoE (1983), section 7.8 & 7.9 plus in-situ urease test	0 cfu/100ml	29 to 31 October 2009	

Remark (if any) : The tests marked with "*" indicated the tests were sub-contract to ALS Technichem (HK) Pty Ltd and HOKLAS accredited. Ground water monitoring was carried out at WM10, WM11 and WM12. The reporting limit of Total Phosphates and Ammonia were <0.10mg/L and <0.25mg/L instead of <0.010mg/L and <0.025mg/L correspondingly since the samples were diluted 10-fold before analysis due to matrix effect.

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Environmental Testing of Water & Wastewater

Report No. : ENA90858
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Page No. : 3 of 3

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Sample Type : Groundwater
Date of sampling : 29 October 2009
Sample Description : The sample was collected in 100ml glass bottle (for Total Phosphates only), 500ml glass bottle (for Oil & Grease only), 100ml sterilized glass bottle (for E-coli only), 500ml and 1L plastic bottles (for other testing parameters). Sample for Ammonia and Nitrate + Nitrite Nitrogen was preserved by adding conc. H₂SO₄ to pH<2. Sample for Oil & Grease was preserved by adding conc. HCl to pH<2. All samples were chilled immediately after collection.


Laboratory information


Date Received : 29 October 2009

Result

Customer Sample ID	Lab Ref No	Test	Method Used	Result	Date Tested
WM12	W24918 (03)	pH Value	In house method TPE/003/W	5.5 (at 25°C)	29 October 2009
		Turbidity	In house method TPE/005/W	29 NTU	29 October 2009
		Biochemical Oxygen Demand (5-day)	In house method TPE/001/W	7.3 mg/L	29 October 2009 (17:00) to 03 November 2009 (17:00)
	W24918 (06)	Nitrate & Nitrite Nitrogen	In house method TPE/023/W	1.4 mg/L	03 November 2009
		Ammonia	In house method TPE/016/W	<0.25 mg/L	30 October 2009
	W24918 (09)	Synthetic Detergents	In house method refer to APHA 19th ed 5540 C & D	<0.1 mg/L	30 October 2009
	W24918 (12)	Total Phosphates	In house method TPE/019/W	<0.10 mg/L	30 October 2009
	W24918 (15)	Oil & Grease	APHA 19ed 5520B	<5.0 mg/L	02 November 2009
	W24918 (18)	E-coli *	DoE (1983), section 7.8 & 7.9 plus in-situ urease test	27 cfu/100ml	29 to 31 October 2009

Remark (if any) : The tests marked with "*" indicated the tests were sub-contract to ALS Technichem (HK) Pty Ltd and HOKLAS accredited. Ground water monitoring was carried out at WM10, WM11 and WM12. The reporting limit of Total Phosphates and Ammonia were <0.10mg/L and <0.25mg/L instead of <0.010mg/L and <0.025mg/L correspondingly since the samples were diluted 10-fold before analysis due to matrix effect.

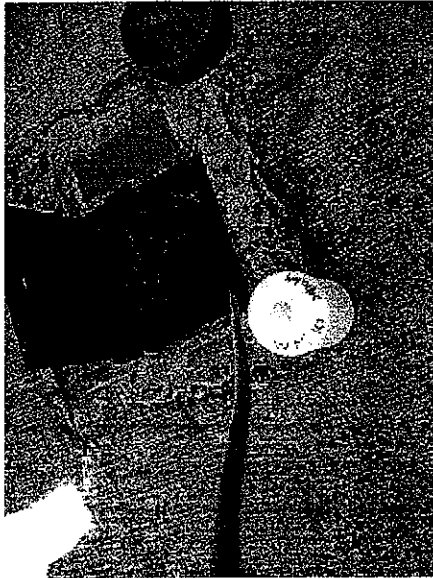
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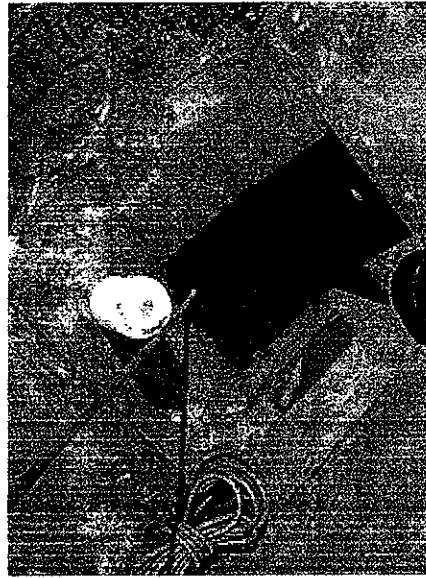


Project : DC/2006/15 - Building and Civil Maintenance and
Minor Works to DSD Plants and Facilities (2007-2009)
Date of sampling and photo taking : 29 October 2009
Report No. : ENA90858
Date of issue : 06 November 2009

WM10



WM11



WM12



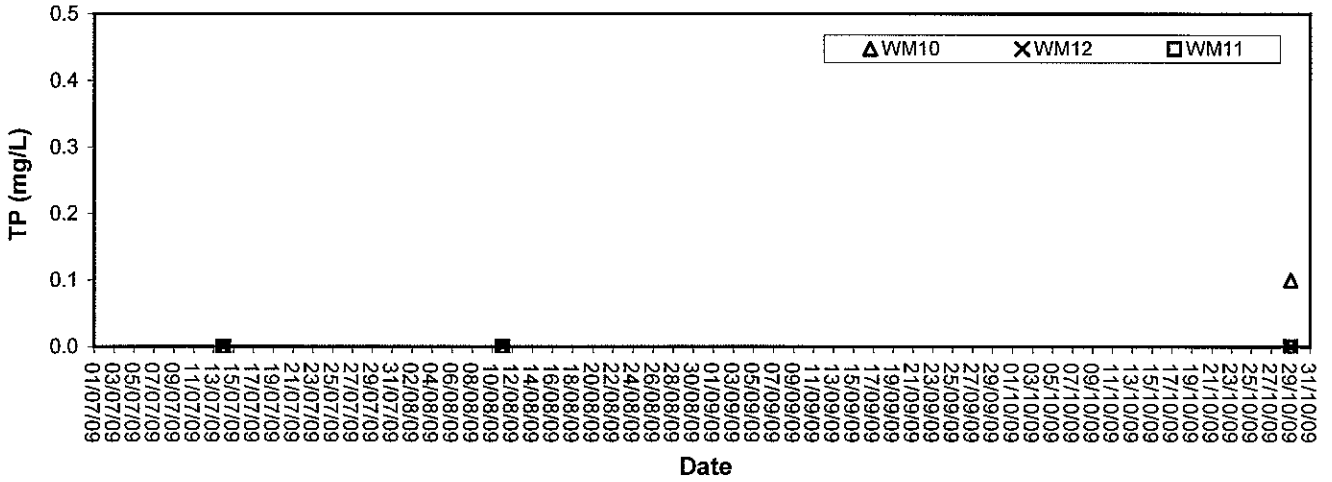


Appendix C

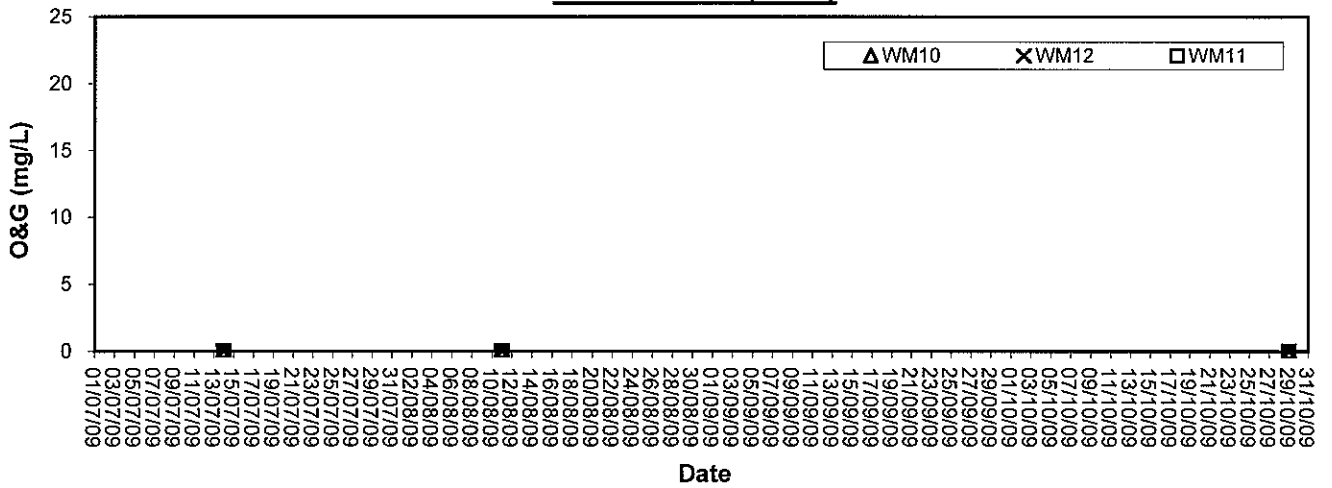
Graphical Plots of Groundwater Monitoring Data



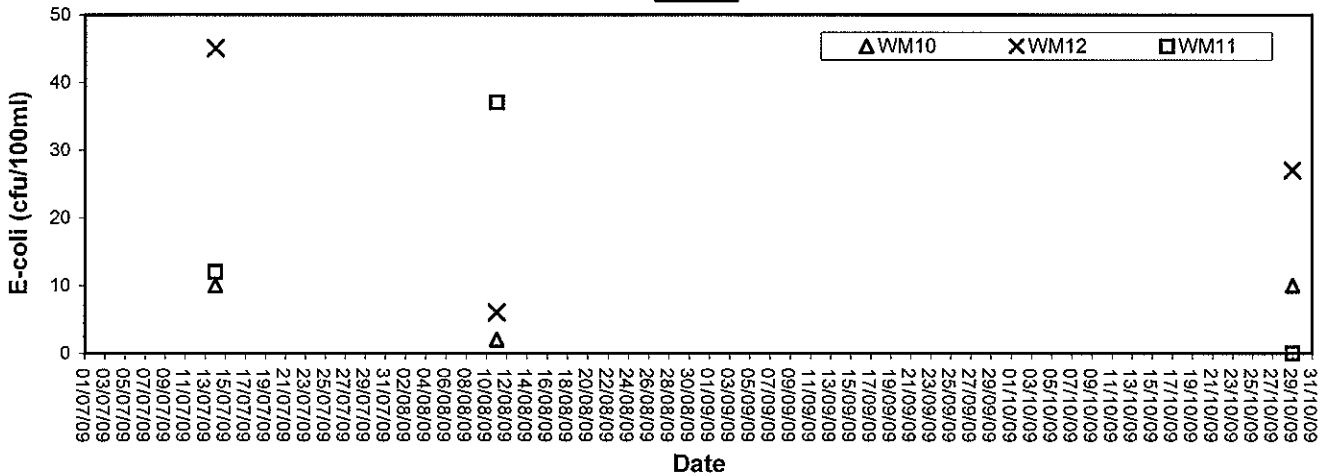
Total Phosphates (TP)



Oil & Grease (O&G)

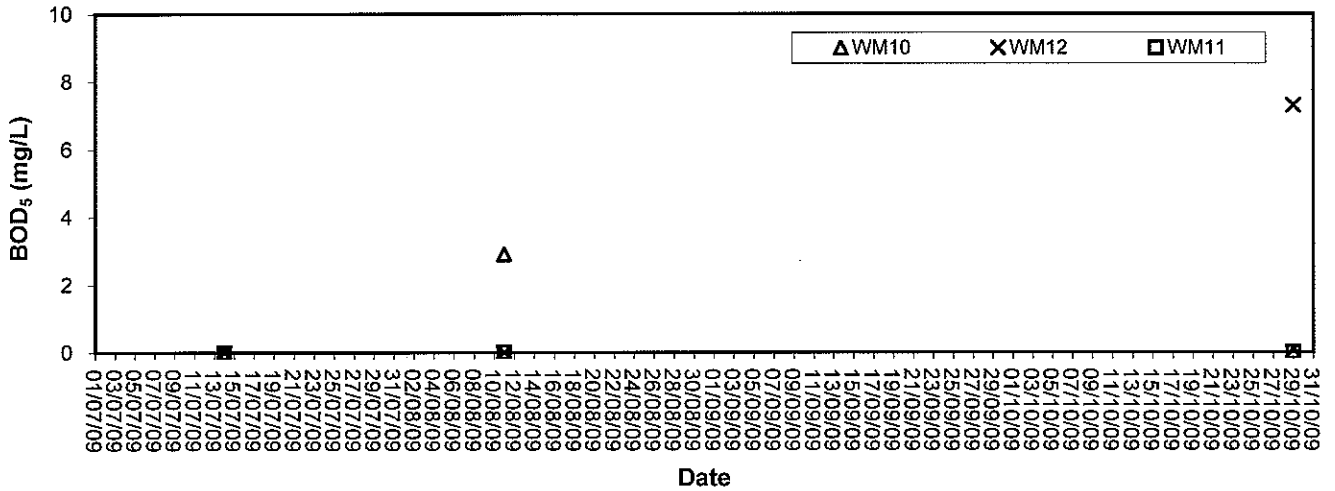


E-coli

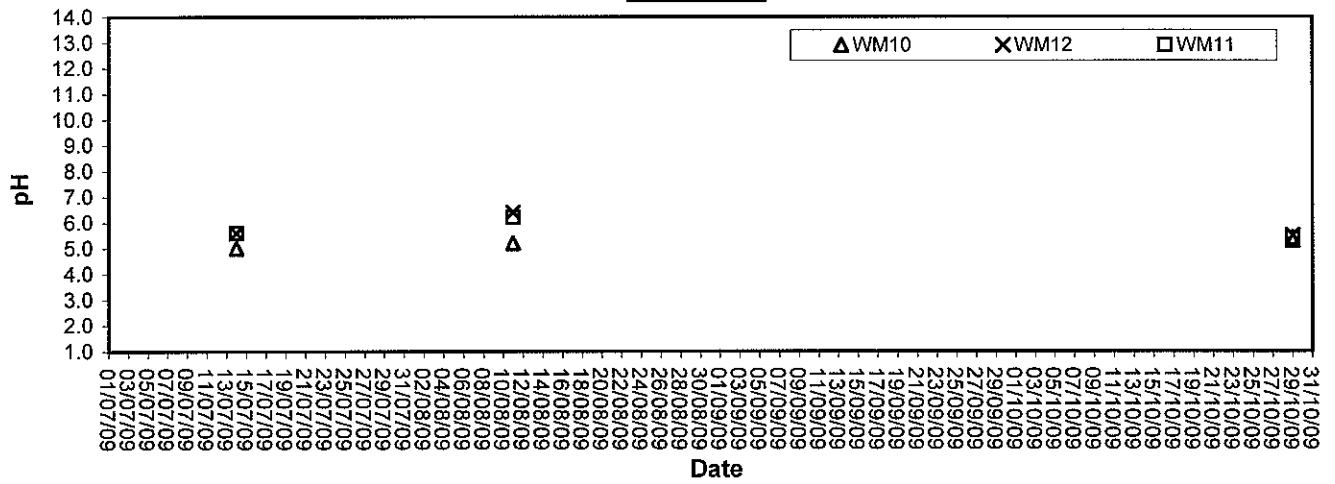




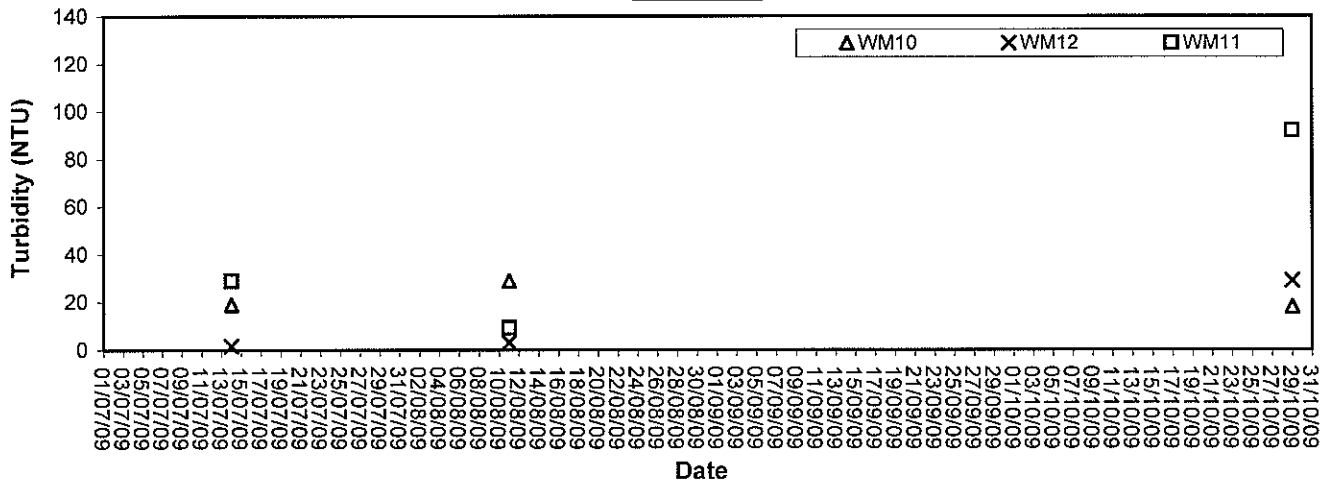
5-day Biochemical Oxygen Demand (BOD₅)



pH Value



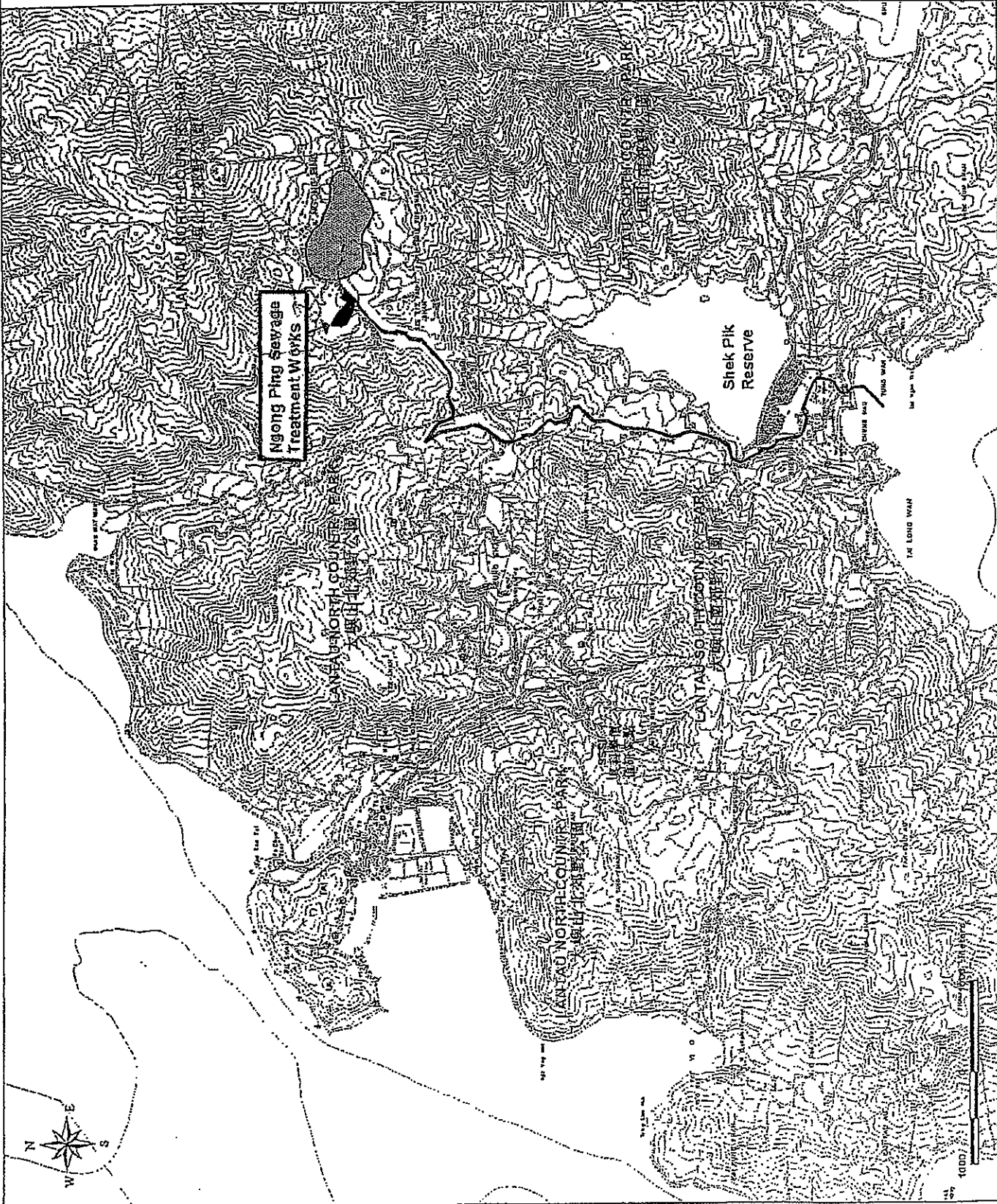
Turbidity








Appendix D

General Layout Plan



Legend:

-  Proposed Effluent Export Pipeline
-  Proposed Trunk Sewer of Ngong Ping Sewerage
-  Ngong Ping Sewerage Catchment Area

<p>ARUP 611 King's Highway, Hong Kong</p>	
<p>AGREEMENT NO. CE 23/01 OUTLINE ISLANDS STAGE 1 PHASE 1 NGONG PING SEWERAGE TREATMENT WORKS AND SEWERAGES</p>	
<p>Ngong Ping Sewerage Project Scheme - General Layout</p>	
<p>23/00/EN/039</p>	<p>AC AC</p>
<p>KC Feb 03</p>	<p>12/00/043</p>
<p>Preferential</p>	
<p>香港特別行政區政府 SAR GOVERNMENT OF THE HONG KONG SAR SPECIAL ADMINISTRATIVE REGION</p>	



Appendix E

QA/QC Results



QA/QC Results of Laboratory Analysis of Testing Parameters

Testing Parameter	QC Sample Analysis	Sample Duplicate		Sample Spike	
	% Recovery *	Sample ID	% Error #	Sample ID	% Recovery @
Turbidity	98.8	WM10	1.1	---	---
Nitrate + Nitrite	106.7	---	---	---	---
Oil & Grease	103.5	---	---	---	---
Ammoniacal Nitrogen	102.8	WM10	3.8	WM10	88.2
Synthetic detergents	---	---	--	---	---
Biochemical Oxygen Demand (5-day)	96.5	WM10	1.4	---	---
Total Phosphates	102.8	WM10	6.2	WM10	101.4
Testing Parameter	QC Sample Analysis	Sample Duplicate		Sample Spike	
	% Recovery *	Sample ID	Difference between Duplicates +	Sample ID	% Recovery @
pH Value(at 25°C)	---	WM10	0.01 unit	---	---

- Note:
- (*) % Recovery of QC sample should be between 80% to 120%.
 - (#) % Error of Sample Duplicate should be between -10% to 10%.
 - (@) % Recovery of Sample Spike should be between 80% to 120%.
 - (+) Difference between Duplicates should be less than 0.1 unit for pH value.



Figures

NOTE:
 1. EXACT LOCATIONS OF GROUND WATER MONITORING BOREHOLES ARE SUBJECT TO CORRECTION ON SITE.

LEGEND:
 — PROPOSED SENSOR AND WIRING
 ⊕ WATER MONITORING BOREHOLE

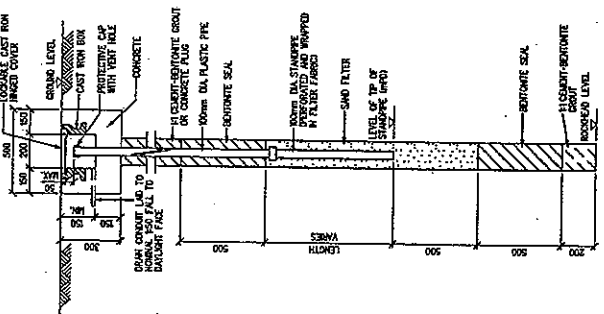
Rev	Description	By	Date
A	TRACER EDGE	THE	07/05

ARUP
 One Ping & Parkview Hong Kong Limited

CONTRACT NO. DC0200015
AGONG PING VILLAGE SEWERAGE

LOCATION & TYPICAL DETAILS OF GROUND WATER MONITORING BOREHOLE

Contract No.	23400RYS4466	Rev.	A
Drawn By	SALE	Checked By	THE
Date	2015	Drawn By	THE
Scale	1:500	Checked By	THE
Drawn By	THE	Checked By	THE
Scale	1:500	Checked By	THE



TYPICAL DETAILS OF GROUND WATER MONITORING BOREHOLE
 N.T.S.

