Stanger Asia

BASELINE WATER QUALITY MONITORING REPORT

FOR

CONTRACT No. CV/2002/13

FILL BANK AT TUEN MUN AREA 38

(Revision No.1)

Report No.: ET11750

Certified by: _____ Date: 23/07/2003

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EXECUTIVE SUMMARY.

Stanger Asia Ltd. has been appointed by Penta-Ocean Construction Co. Ltd. to provide an Environmental Team (ET) to monitor air and water quality and to audit landscape works for Contract No. CV/2002/13, Fill Bank at Tuen Mun Area 38.

The Environmental Monitoring & Audit (EM&A) manual prepared for this project, and the Environmental Permit issued subsequently, allows for the use of water quality monitoring data from the current works contract at this site, "Contract No. CV/2000/01 – Tuen Mun Area 38 Reclamation, Stage 2" to be used as baseline data for Contract No. CV/2002/13.

Statistical analysis of the data for the monitoring of dissolved oxygen, turbidity and suspended solids from the monthly Environmental Monitoring & Audit reports for the months of May and June 2003 produced for Contract CV/2000/01 was carried out in accordance to those procedures recommended in Section 4.7 of the "*Agreement No. PW 01/2003, Project Profile for Fill Bank at Tuen Mun Area 38 – Environmental Monitoring & audit Manual*" to derive the relevant Action levels for future impact air quality monitoring works. The Action and Limit levels thus derived are tabulated below.

Parameter	Action level	Limit level
Dissolved Oxygen in mg/L. Surface & Middle Bottom.	 <4.78mg/L <4.16mg/L	 <4mg/L <2mg/L
Suspended Solids (SS) in mg/L (depth-averaged)	>120% of upstream control station's SS at the same time of the same day.	>130% of upstream control station's SS at the same tide of the same day .
Turbidity (Tby) in NTU	>120% of upstream control station's Tby at the same tide of the same day.	>130% of upstream control station's Tby at the same tide of the same day.

All figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered necessary.

1. INTRODUCTION.

1.1 Purpose of Document.

This report outlines the water quality data to be employed as Baseline monitoring data for Contract No. CV/2002/13. The report aims to provide data in terms of dissolved oxygen, turbidity and suspended solids for water quality prior to the commencement of any construction activities under Contract No. CV/2002/13.

The Baseline monitoring data is then used for the determination of the appropriate Action Levels with the Limit levels being set in accordance with those as stipulated in the EM&A Manual produced for this project.

The manual prepared for this project, and the Environmental Permit issued subsequently, allows for the use of water quality monitoring data from the current works contract at this site, "Contract No. CV/2000/01 – Tuen Mun Area 38 Reclamation, Stage 2" to be used as baseline data for Contract No. CV/2002/13.

This report has been produced with reference to the "*Agreement No. PW 01/2002, Project Profile for Fill Bank at Tuen Mun Area 38 – Environmental Monitoring and Audit Manual"* dated November 2002 and prepared by CH2M HILL (China) Limited.

1.2 The Project Background Information.

The works for this contract mainly comprise the operation – inclusive of receiving of materials and transferal to barge, maintenance and landscaping works of the Fill Bank at Tuen Mun Area 38 in the North West New Territories.

The project proponent of the project is the Civil Engineering Department, Port Works Division, of Hong Kong.

The operation, maintenance and landscaping works is to be carried out by Penta-Ocean Construction Co. Ltd. of Hong Kong, the main contractor.

The Project Engineer to oversee the contract will be the Civil Engineering Department, Port Works Division.

1.3 Scope of Baseline Water Quality Monitoring Programme.

The scope of the water quality monitoring programme is to establish baseline quality levels for specified parameters.

1.4 Structure of Water Quality Monitoring Baseline Report.

Section 1- Gives an introduction and background information to the content and purpose of this report.
Section 2 - Gives the organisation and structure for the management of the air quality baseline, monitoring programme, and gives the responsibilities of key individuals;
Section 3 - Gives the water quality baseline monitoring requirements including baseline monitoring schedule, lists monitoring equipment, methodology and monitoring locations.
Section 4 - Gives the details for water quality monitoring results and observations.
Section 5 - Gives the derivation of the Action and Limit Levels.
Section 6 - Gives the proposed Event and Action Plan for exceedances to the derived Action and Limit levels.
Section 7 - Conclusion

2. PROJECT ORGANISATION.

2.1 General.

The contract specifications for the Project requires that the Contractor appoints an Environmental Team (ET) and an ET Leader (ETL) to conduct air quality monitoring and auditing works during the construction phase of the Project.

The appointment of the ET is subject to approval from the Environmental Protection Department (EPD).

The ETL shall have previous relevant experience in carrying out similar EM&A programmes, both in the monitoring and auditing of environmental parameters.

2.2 Project Organisation.

The Engineer appointed to oversee the construction works for the project will be form the Civil Engineering Department, Port Works Division. The appointed Resident Engineer is Mr. Chan Lun-ming, (Tel: 2762 5602) (Fax: 22714 0113).

The main Contractor for this project is Penta-Ocean Construction Co. Ltd. The Construction Manager is Mr. Stephen Choi, (Tel: 2491 1584) (Fax: 2496 9433).

The Independent Checker Environmental (IEC) for this project is
Mr. Joseph Poon, Environmental Consultant, MateriaLab Consultants Ltd.,
(Tel: 24509 8238) (Fax: 2450 6138).

The Environmental Team Leader (ETL) proposed for this project is Mr. Chris Shenfield, Senior Environmental Scientist, Stanger Asia Ltd., (Tel: 2682 1203) (Fax: 2682 0046).

3. MONITORING PROGRAMME.

3.1 Monitoring Locations.

The Environmental Monitoring & Audit (EM&A) Manual produced for this project specifies two monitoring locations FM1 & FM2 and two control stations FC1 & FC2 for the carrying out of water quality monitoring. Control station FC1 will act as upstream control stations on the mid-ebb tide with control station FC2 acting as upstream control stations for the mid-flood tide.

The impact water quality monitoring works for Contract CV/2000/01 was conducted at four impact monitoring stations MS1, MS2, MS3 & MS4 and four control monitoring stations CS1, CS2, CS3 & CS4. Control stations CS1 & CS2 act as the upstream control station for the mid-ebb tide with control stations CS3 & CS4 acting the control stations for the mid-flood tide. The monitoring locations are shown in Figure 3.1

The approximate coordinates for monitoring locations FM1, FM2 FC1 and FC2 for Contract CV/2002/13 are given in Table 3.1.

Table 3.1 – Approximate Coordinates of Water Quality Monitoring Locations – CV/2002/13

Station	HK Metric Grid – Northing	HK Metric Grid - Easting
FC1	“825564.69”	“808914.19”
FM1	“824723.77”	“810522.70”
FM2	“824440.99”	“810899.46”
FC2	“823821.18”	“812624.57”

Key: “” – indicates estimated form Ordinance Survey Map, to be confirmed by on-site measurement prior to commencement of impact monitoring works.

The exact coordinates for monitoring locations MS1, MS2, MS3, MS4, CS1, CS2, CS3 & CS4 for Contract CV/2000/01 are given in Table 3.2 below. The monitoring locations are shown in Figure 3.2

Table 3.2 – Exact Coordinates of Water Quality Monitoring Locations – CV/2000/01

Station	HK Metric Grid – Northing	HK Metric Grid – Easting
MS1	825032.73	810350.00
MS2	824723.77	810522.70
MS3	824440.99	810899.46
MS4	824299.60	811283.69
CS1	825564.69	808914.19
CS2	825000.00	808348.90
CS3	823821.18	812624.57
CS4	823128.24	812231.20

The ET shall review the location of the monitoring stations regularly in regards to its suitability to serve nearby air sensitive receivers, in order to take into account the changes in the surrounding environment and the nature of construction works in progress, if necessary.

3.2 Monitoring Methodology.

Measurements are taken at three water depths, namely 1m below water surface, mid-water and 1m above seabed at both mid-flood and mid-ebb tides, except where the water depth less than 6m, when the mid-depth station may be omitted. Should the water depth have been less than 3m, only the mid-depth was monitored.

Two measurements of turbidity, dissolved oxygen (mg/L), dissolved oxygen (% saturation) and temperature at each depth of each stations are taken. The probes are removed from the water after the first measurement and then redeployed for the second measurement. If the difference between in value between the first and second reading of each set is more than 25% of the value of the first reading, the readings are discarded and further readings taken. One sample of suspended solids measurements are taken at each depth and at each water quality control station. The samples are kept in a chilled condition during delivery to the laboratory ad before commencement of analysis. For the purpose of evaluating the water quality, all values for suspended solids and turbidity shall be dept-averaged.

3.3 Monitoring Equipment.

The following equipment was employed for routine water quality monitoring.

3.3.1 Dissolved Oxygen Meter.

YSI model 58 with stirrer.

3.3.2 Turbidity Meter.

Hach 2100P.

3.3.3 Echo Sounder.

Eagle magna.

3.3.4 Water Sampler.

Kahlisco 3 litre with messenger.

3.3.5 GPS Receiver.

Magellan 5000.

3.3.6 Thermometer.

Standard calibrated tmermomter.

3.4 Monitoring Equipment Calibration Details.

All on-site monitoring equipment was calibrated three-monthly at MateriaLab's HOKALS accredited laboratory. An on-site calibration check was carried out prior to the taking of measurements in accordance standard water quality monitoring procedures.

The thermometer for measuring water temperature was calibrated every six months.

3.5 Laboratory Measurement.

The laboratory measurements of suspended solids were carried out at MateriaLab Ltd., a HOKLAS accredited laboratory in accordance with Method No. 2540D 17th Edition of APHA.

MateriaLab operates a comprehensive quality assurance and quality control programmes for QA/AC procedures in accordance with the requirements of HOLAS accreditation, all filters were equilibrated and weighted repeatedly until the difference of two consecutive results is less than 0.5 mg.

3.6 Monitoring Schedule.

Monitoring for water quality was carried out on three days per week, at mid-flood and mid-ebb tides at the designated monitoring locations.

Table 3.3- Monitoring Schedule

Monitoring Locations	Monitoring Parameters	Frequency	Requirements
4 monitoring stations (MS1-MS4) and 4 control stations (CS1-CS4).	Dissolved oxygen Turbidity Suspended Solids.	Three days per week.	At three depths during mid-ebb and mid-flood tides.

4 MONITORING RESULTS AND OBSERVATIONS.

4.1 Monitoring Results.

The detailed records for water quality monitoring were not available to the ET. However, from a recent inspection there was little or no major construction activities expected to affect water quality.

Results for water quality monitoring data for the last two weeks of May 2003 and for the first two weeks of June 2003 in terms of dissolved oxygen, turbidity and suspended solids are presented graphically in Figures 4.1, 4.2 and 4.3 respectively. The statistical summary of these parameters are tabulated below.

Table 4.1 - Statistical Summary of Water Quality Parameters.

Sample Location	Surface & Middle Averaged Dissolved Oxygen (Range), mg/L	Bottom Averaged Dissolved Oxygen (Range), mg/L	Depth Averaged Turbidity (Range), NTU	Depth Averaged Suspended Solids (Range), mg/L
CS1 (FC1)	5.75 (4.81-7.29)	4.73 (4.01-5.73)	7.01 (3.46-10.32)	7.17 (4.33-10.67)
MS2 (FM1)	5.59 (4.58-7.14)	4.77 (4.05-6.65)	6.86 (3.60-9.86)	6.49 (4.33-8.67)
MS3 (FM2)	5.51 (4.66-7.11)	4.77 (4.16-6.91)	6.98 (3.21-10.26)	6.65 (4.00-9.33)
CS3 (FC2)	5.52 (4.66-7.05)	4.69 (4.14-5.47)	6.72 (3.57-10.02)	6.50 (4.00-9.67)

Key – ( ) indicates the corresponding monitoring station for Contract CV/2002/13.

4.2 Influencing Factors, Weather Conditions and Major Activities.

Only details on weather were stated in the available EM&A report for May 2003, the influencing factors, weather conditions and major activities the month of June 2003 were derived from the sampling record sheets for that period.

These are summarized in Table 4.2 below.

Table 4.2 - Summary of the Weather and Influencing Factors

Date	Day	Weather Condition	Influencing Factors & Major Activities
19/05/2003	Mon	Cloudy	n/s
21/05/2003	Wed	Sunny	
23/05/2003	Fri	Sunny	
26/05/2003	Mon	Sunny	n/s
28/05/2003	Wed	Cloudy	
30/05/2003	Fri	Sunny	
02/06/2003	Mon	Sunny	n/s
04/06/2003	Wed	Sunny	
06/06/2003	Fri	Showery	
09/06/2003	Mon	Cloudy	n/s
11/06/2003	Wed	Sunny	
13/06/2003	Fri	Sunny	

Key: n/s – not stated.

5. DETERMINATION OF ACTION AND LIMIT LEVELS.

5.1 Methodology for setting up the Action and Limit Levels.

Based on the statistical analysis of the results of the water quality monitoring data obtained for the last two weeks of May 2003 and the first two weeks of June 2003 and utilising the criteria laid out in Section 6.8 of the EM&A Manual for the project, as given in Table 5.1 below, the Action levels for this Project have been calculated.

Table 5.1 – Criteria for Calculation of Action and Limit Levels.

Parameters	Action level	Limit level
D.O. in mg/L (Surface, Middle & Bottom)	<u>Surface & Middle</u> 5% - ile of baseline data for surface and middle layer. <u>Bottom</u> 5% - ile of baseline data for bottom layer.	<u>Surface & Middle</u> 4mg/L except for 5mg/L for Fish Culture Zone (FCZ) or 1% – ile of baseline data for surface and middle layer. <u>Bottom</u> 2mg/L or 1% - ile of baseline data for bottom layer.
Suspended Solids (SS) in mg/L (Depth-averaged)	95% - ile of baseline data or 120% of upstream control station's SS at the same tide of the same day.	99% - ile of baseline, 130% of upstream control station's SS at the same tide of the same day and specific sensitive receiver water quality requirements.
Turbidity (Tby) in NTU (depth-averaged)	95% - ile of baseline data or 120% of upstream control station's Tby at the same tide of the same day.	99% – ile of baseline data or 130% of upstream control station's Tby at the same tide of the same day.

5.2 Derived Action and Limit Levels.

According to the Table 5.1 and the results obtained in Section 4.1, the Action and Limit levels for the project are thus calculated and summarized in the following table.

As the 1% - ile levels (4.66mg/L and 4.01mg/L for surface & middle depth samples and bottom depth samples respectively) for calculating the Limit levels for dissolved oxygen were close to the derived Action levels, then the values of 4mg/L for surface & middle depth samples and 2mg/L for bottom depth samples as proposed in Table 6.1 of the EM&A Manual have been adopted.

To allow for possible daily and seasonal variations to water quality, turbidity and suspended solids Action and Limit levels shall be based upon 120% and 130%, respectively, of the values obtained for these parameters for the upstream control station at the same tide of the same day.

Table 5.2 – Derived Action and Limit Levels.

Parameter	Action level	Limit level
Dissolved Oxygen in mg/L. Surface & Middle Bottom.	 <4.78mg/L <4.16mg/L	 <4mg/L <2mg/L
Suspended Solids (SS) in mg/L (depth-averaged)	>120% of upstream control station's SS at the same time of the same day.	>130% of upstream control station's SS at the same tide of the same day .
Turbidity (Tby) in NTU	>120% of upstream control station's Tby at the same tide of the same day.	>130% of upstream control station's Tby at the same tide of the same day.

The Action and Limit levels stated above are based upon statistical treatment of the data sets indicated.

All the figures given in the table are used for reference only and the EPD may amend the figures whenever necessary.

6. PROPOSED EVENT AND ACTION PLAN FOR EXCEEDANCES TO ACTION AND LIMIT LEVELS.

Should the non-compliance of the Action and Limit Levels for this project occur, actions in accordance with the Action Plan in the following in Table 6.1, shall be carried out.

Table 6.1 – Proposed Event and Action Plan for Water Quality.

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action level				
Action level being exceeded by one sampling day.	1. Repeat in-situ measurements to confirm findings; 2. Identify source(s) of impacts; 3. Inform IEC and Contractor; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC and Contractor; 6. Repeat measurements on next day of exceedance.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise ER accordingly; 3. Assess the effectiveness of implemented mitigation measures.	1. Discuss with IEC on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented.	1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET and IEC and propose mitigation measures to IEC and ER; 6. Implement the agreed mitigation measures.
Action level being exceeded by more than one consecutive sampling day.	1. Repeat in-situ measurements to confirm findings; 2. Identify source(s) of impact; 3. Inform contractor and IEC; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Prepare to increase the monitoring frequency to daily; 8. Repeat measurements on next day of exceedance.	1. Discuss with ET and Contractor on the proposed mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor advise ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures.	1. Discuss with IEC on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented; 3. Assess the effectiveness of the implemented mitigation measures.	1. Inform the Engineer and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with the ET and IEC and propose mitigation measures to IEC and ER within 3 working days; 6. Implement the agreed mitigation measures.

Table 6.1(Cont'd) – Proposed Event and Action Plan for Water Quality.

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Limit level				
Limit level being exceeded by one sampling day.	1. Repeat in-situ measurements to confirm findings; 2. Identify source(s) of impact; 3. Inform contractor and IEC; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Prepare to increase the monitoring frequency to daily until no exceedance of Limit level.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by the Contractor and advise the ER accordingly; 3. Assess the effectiveness of implemented mitigation measures.	1. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 3. Assess the effectiveness of the implemented mitigation measures.	1. Inform the Engineer and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with the ET and IEC and propose mitigation measures to IEC and ER within 3 working days; 6. Implement the agreed mitigation measures.
Limit level being exceeded by more than one sampling day.	1. Repeat in-situ measurements to confirm findings; 2. Identify source(s) of impact; 3. Inform contractor and IEC; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by the Contractor and advise ER accordingly; 3. Assess the effectiveness of implemented mitigation measures.	1. Discuss with IEC on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Assess the effectiveness of the implemented mitigation measures. 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of works identified as the cause of exceedance until no exceedance of Limit level.	1. Inform the Engineer and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with the ET and IEC and propose mitigation measures to IEC and ER within 3 working days; 6. Implement the agreed mitigation measures; 7. As directed by the Engineer, slow down or stop all or part of theworks identified as the cause of exceedance or construction activities.

7. CONCLUSION.

Statistical analysis of the water quality monitoring data generated from Contract No. CV/2000/01 for the periods of the last two weeks in May and the first two weeks in June 2003, was carried out in accordance with Section 6.8 of the EM&A Manual prepared for Contract No. CV/2002/13 to derive the Action and Limit levels for the identified water quality monitoring parameters.

Parameter	Action level	Limit level
Dissolved Oxygen in mg/L. Surface & Middle Bottom.	 <4.78mg/L <4.16mg/L	 <4mg/L <2mg/L
Suspended Solids (SS) in mg/L (depth-averaged)	>120% of upstream control station's SS at the same time of the same day.	>130% of upstream control station's SS at the same tide of the same day .
Turbidity (Tby) in NTU	>120% of upstream control station's Tby at the same tide of the same day.	>130% of upstream control station's Tby at the same tide of the same day.

All figures given the table are used for reference only and the EPD may amend the figures whenever it is considered necessary.

Figures

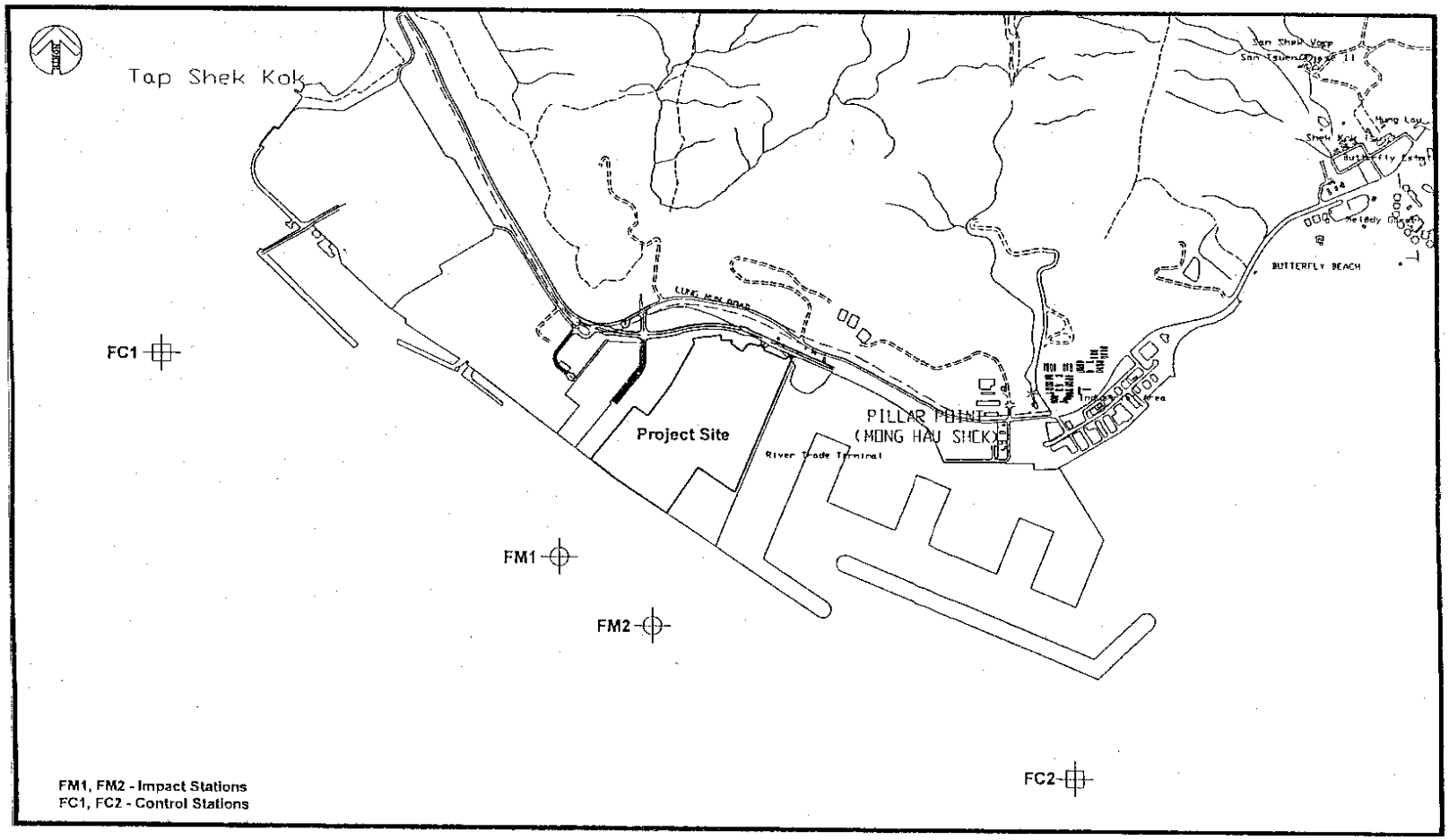

Figure 3.1 – Location of Water Quality Monitoring Stations for Contract CV/2002/13.

FM1, FM2 – Impact Stations	FC1, FC2 – Control Stations

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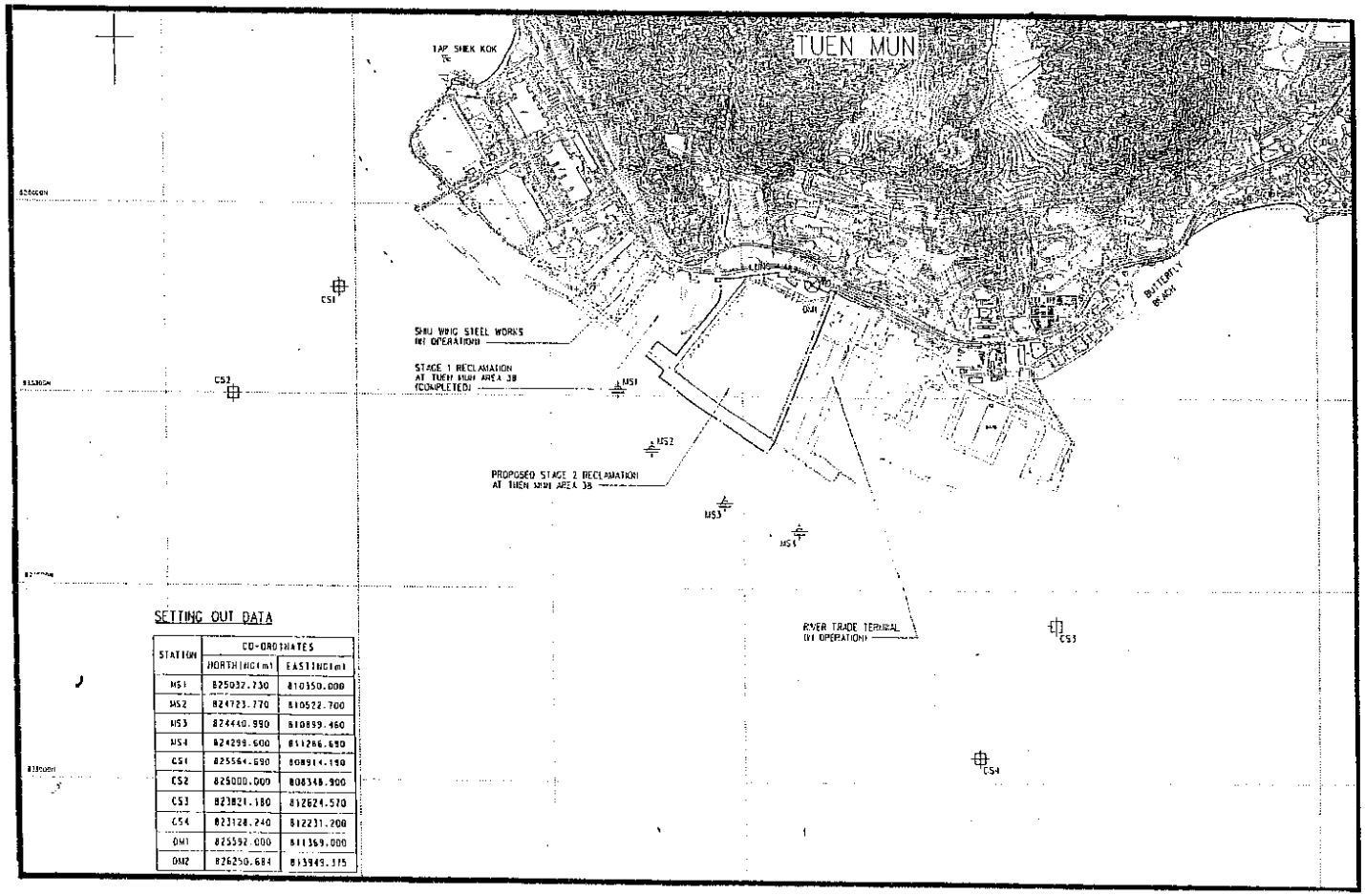

SETTING OUT DATA

STATION	CO-ORDINATES	
	NORTHING(m)	EASTING(m)
MS1	825032.730	810350.000
MS2	824723.770	810522.700
MS3	824440.990	810899.460
MS4	824299.600	811266.690
CS1	825564.690	808914.190
CS2	825000.000	808348.900
CS3	823821.180	812624.570
CS4	823128.240	812231.200
DM1	825592.000	811369.000
DM2	826250.684	813949.315

Figure 3.2 – Locations of Water Quality Monitoring Stations for Contract CV/2000/01

MS1, MS2, MS3 & MS4 – Impact Stations CS1, CS2, CS3 & CS4 – Control Stations

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Figure 4.1 - Graphical Plot of Surface & Middle Depth Dissolved Oxygen

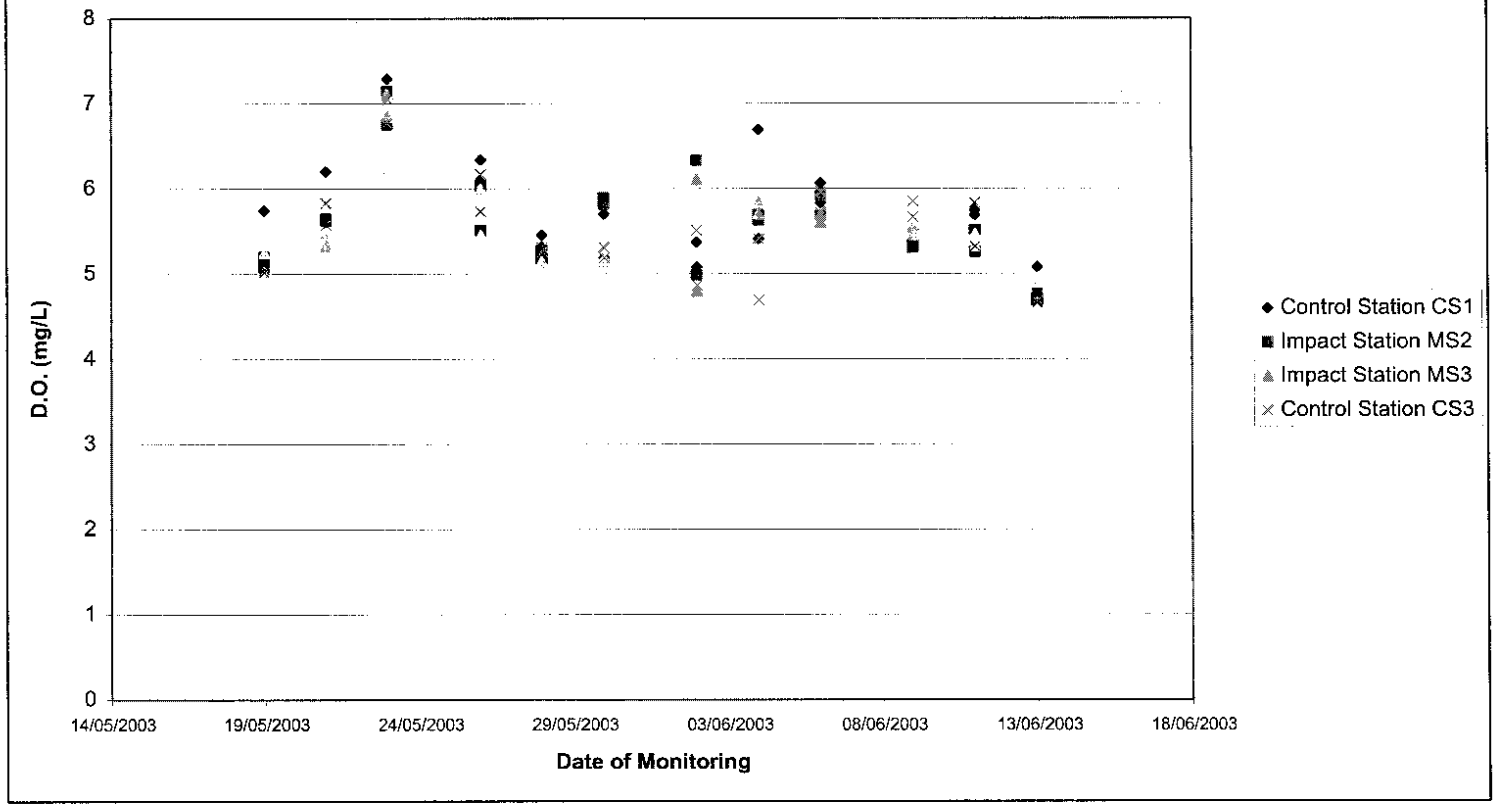

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Figure 4.2 - Graphical Plot of Bottom Depth Dissolved Oxygen

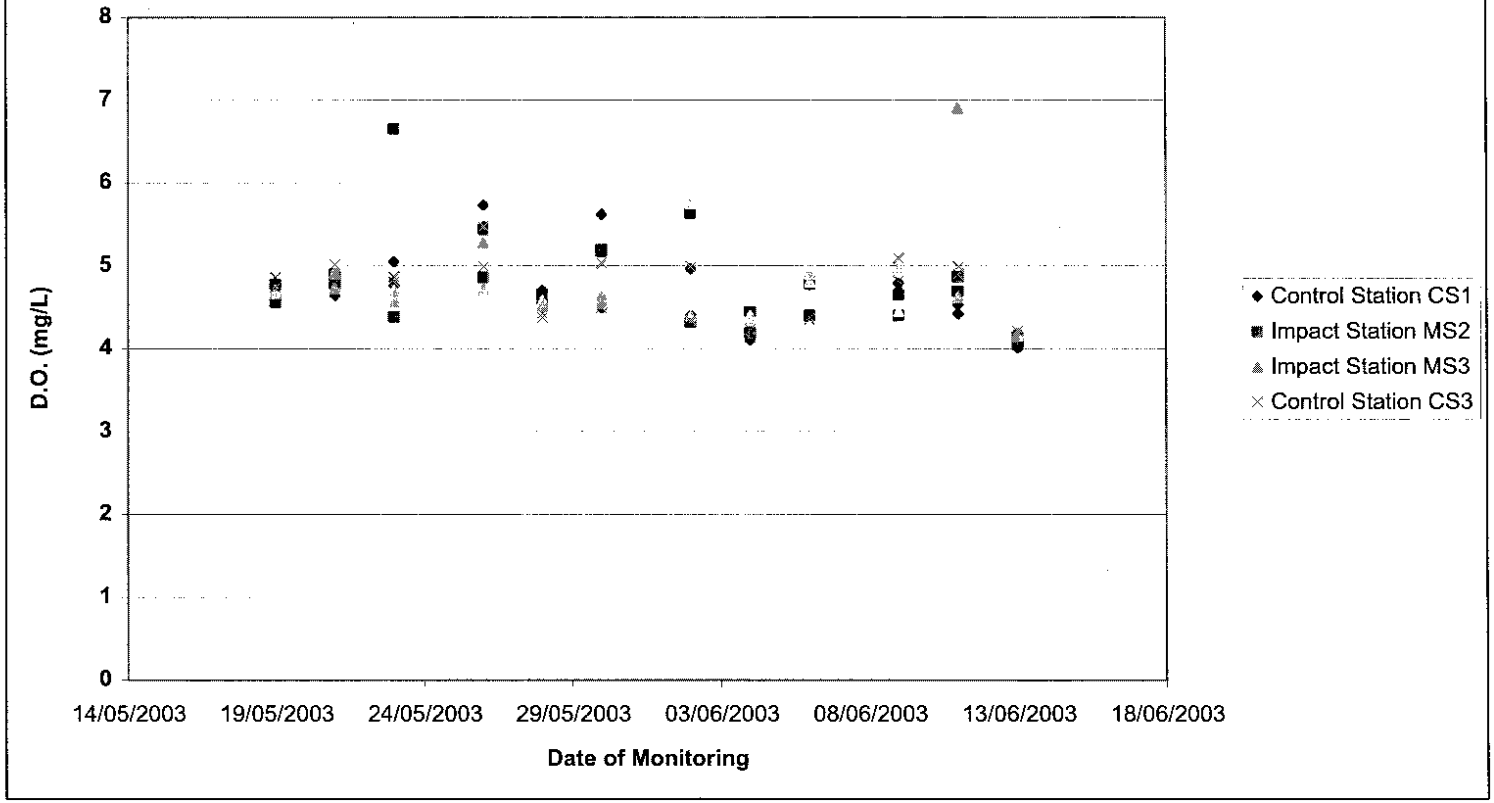

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Figure 4.3 - Graphical Plot of Depth Averaged Turbidity

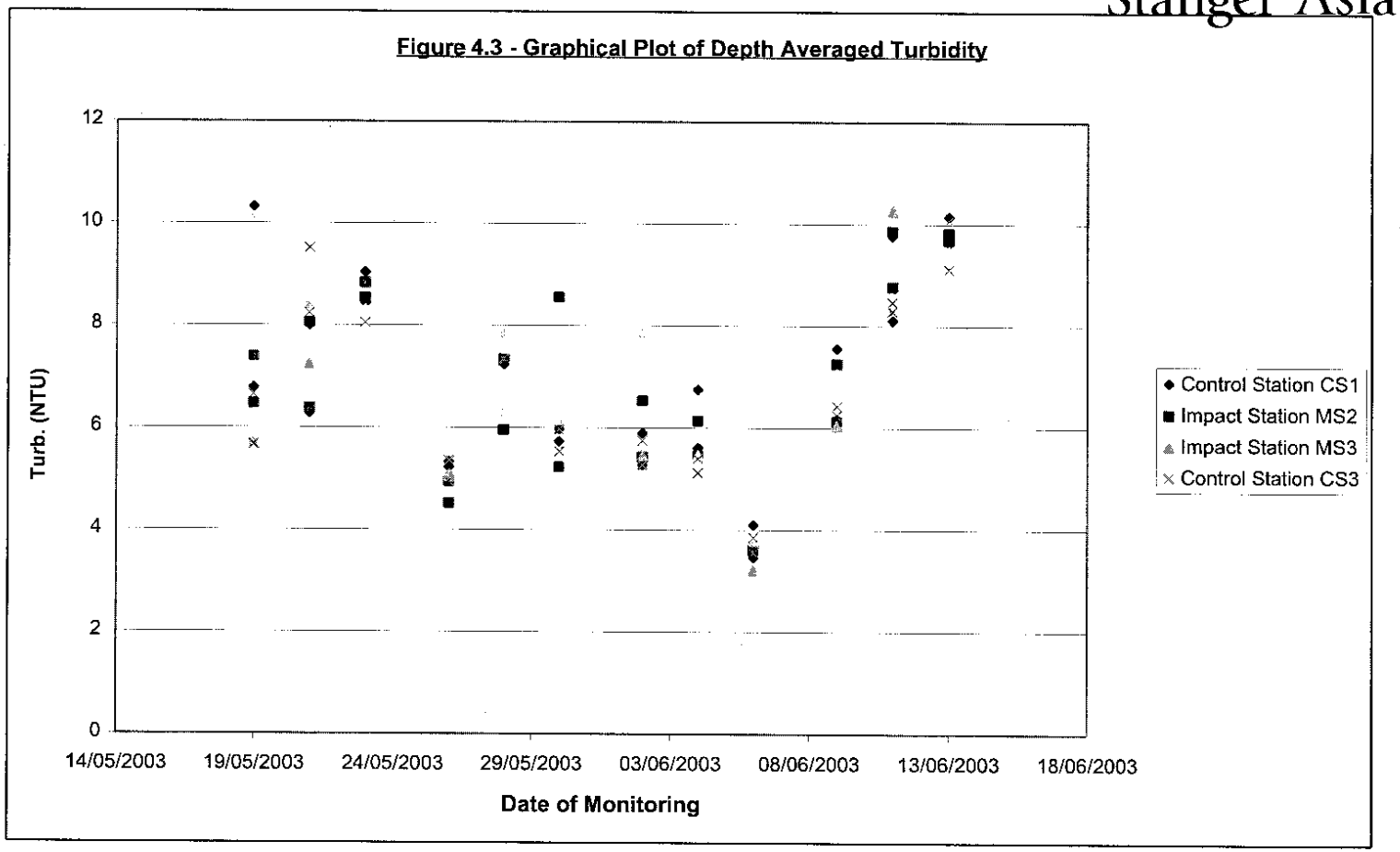

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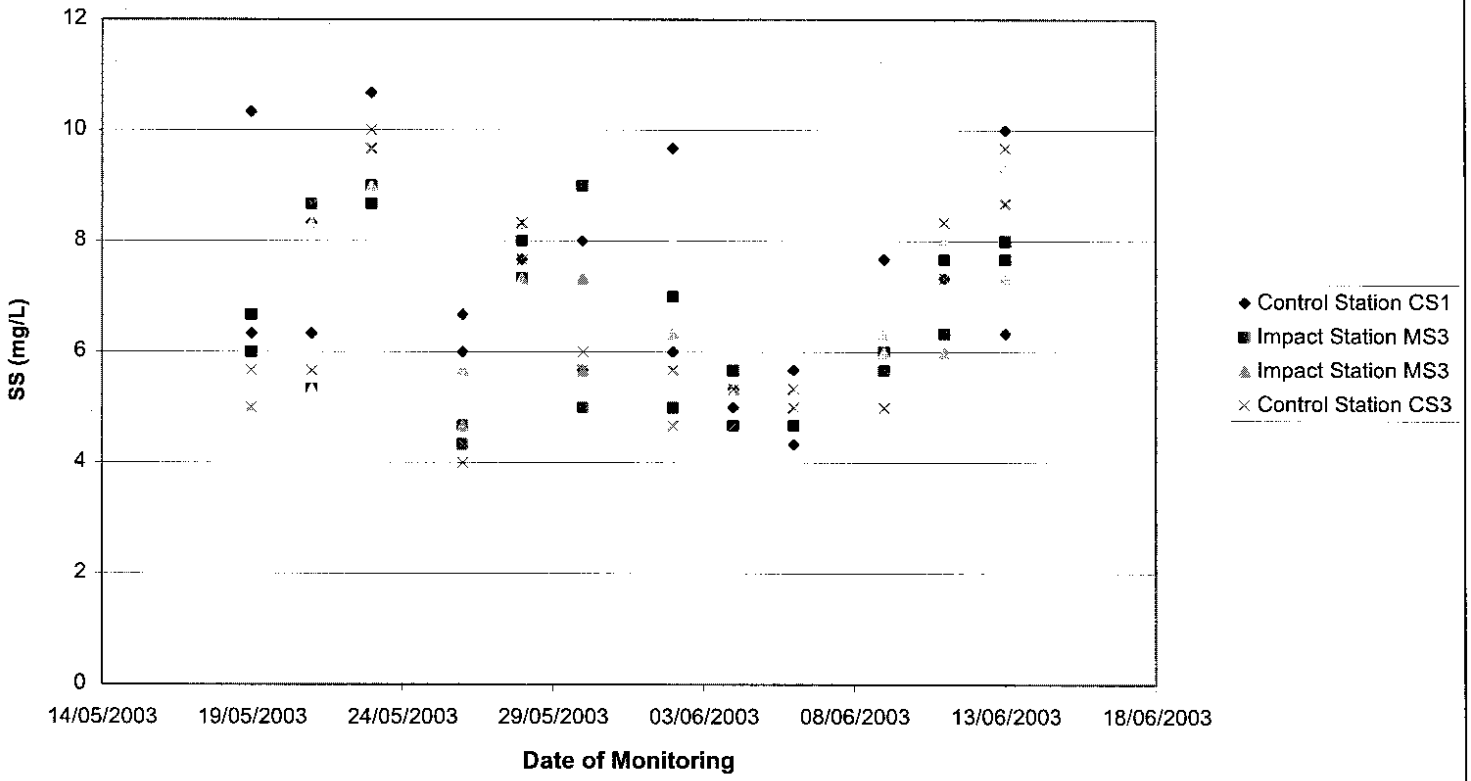
Figure 4.4 - Graphicla Plot of Depth Avergaed Suspended Solids



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Appendix I

Calibration Records of Monitoring Equipment

Calibration records for the monitoring equipment were not available from the reports supplied.

Appendix II

Tabulation of Water Quality Monitoring Data from Monthly EM&A Reports

Summary of Water Qulaity Monitoring Data

Contract CV/2001/01

Monitoring stations: CS1, MS2, MS3 & CS3.

Parameter	Mean Value	Lowest Value	Highest Value	1% - ile	5% - ile	95% - ile	99% - ile
D.O. (mg/L) Surface & middle depth	5.59	4.58	7.29	4.66	4.78	N/A	N/A
D.O. (mg/L) Bottom depth	4.74	4.01	6.91	4.01	4.16	N/A	N/A
Turbidity (NTU) Depth averaged	6.89	3.21	10.32	N/A	N/A	10.03	10.26
SS (mg/L) Depth avearged	6.7	4	10.67	N/A	N/A	9.4	10.34

N/A - not applicable to this parameter.

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Summary of Water Qulaity Monitoring Data

Contract CV/2001/01

Station CS1

Date	Tide	DO (mg/L) (S&M)	DO (mg/L) (B)	Turb (NTU) (D/A)	SS (mg/L) (D/A)
19/05/2003	mid-flood	5.14	4.73	6.78	6.33
19/05/2003	mid-ebb	5.74	4.8	10.32	10.33
21/05/2003	mid-flood	5.61	4.64	6.28	6.33
21/05/2003	mid-ebb	6.2	4.85	8	8.33
23/05/2003	mid-flood	7.29	5.05	8.44	10.67
23/05/2003	mid-ebb	7.12	4.76	9.04	8.67
26/05/2003	mid-flood	6.34	5.73	5.22	6
26/05/2003	mid-ebb	6.11	5.47	5.33	6.67
28/05/2003	mid-flood	5.31	4.7	7.31	7.67
28/05/2003	mid-ebb	5.45	4.6	7.24	7.67
30/05/2003	mid-flood	5.7	5.62	5.73	5.67
30/05/2003	mid-ebb	5.19	4.49	5.97	8
02/06/2003	mid-flood	5.08	4.96	5.27	6
02/06/2003	mid-ebb	5.37	4.4	5.9	9.67
04/06/2003	mid-flood	5.41	4.1	6.75	5
04/06/2003	mid-ebb	6.69	4.23	5.61	5.33
06/06/2003	mid-flood	5.83	4.86	3.46	4.33
06/06/2003	mid-ebb	6.06	4.77	4.1	5.67
09/06/2003	mid-flood	5.51	4.7	6.17	6
09/06/2003	mid-ebb	5.51	4.79	7.56	7.67
11/06/2003	mod-flood	5.69	4.53	9.77	6.33
11/06/2003	mid-ebb	5.74	4.42	8.11	7.33
13/06/2003	mid-flood	5.08	4.19	9.63	10
13/06/2003	mid-ebb	4.81	4.01	10.15	6.33
Mean value		5.75	4.73	7.01	7.17
Lowest value		4.81	4.01	3.46	4.33
Highest value		7.29	5.73	10.32	10.67

S&M = surface and middle depth sample.
B = bottom depth sample.
D/A = depth averaged sample.

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Stanger Asia

Summary of Water Qulaity Monitoring Data

Contract CV/2001/01

Station MS2

Date	Tide	DO (mg/L) (S&M)	DO (mg/L) (B)	Turb (NTU) (D/A)	SS (mg/L) (D/A)
19/05/2003	mid-flood	5.2	4.77	6.47	6.67
19/05/2003	mid-ebb	5.08	4.56	7.39	6
21/05/2003	mid-flood	5.65	4.79	6.38	5.33
21/05/2003	mid-ebb	5.63	4.9	8.06	8.67
23/05/2003	mid-flood	7.14	6.65	8.83	8.67
23/05/2003	mid-ebb	6.75	4.38	8.54	9
26/05/2003	mid-flood	6.03	5.44	4.94	4.67
26/05/2003	mid-ebb	5.51	4.86	4.52	4.33
28/05/2003	mid-flood	5.27	4.58	5.96	7.33
28/05/2003	mid-ebb	5.17	4.65	7.34	8
30/05/2003	mid-flood	5.89	5.19	5.23	5
30/05/2003	mid-ebb	5.82	5.17	8.56	9
02/06/2003	mid-flood	6.33	5.63	5.43	5
02/06/2003	mid-ebb	4.99	4.32	6.53	7
04/06/2003	mid-flood	5.63	4.19	5.46	4.67
04/06/2003	mid-ebb	5.69	4.44	6.14	5.67
06/06/2003	mid-flood	5.92	4.4	3.6	4.67
06/06/2003	mid-ebb	5.68	4.78	3.61	4.67
09/06/2003	mid-flood	5.31	4.4	6.13	5.67
09/06/2003	mid-ebb	5.33	4.65	7.26	6
11/06/2003	mid-flood	5.51	4.87	9.86	6.33
11/06/2003	mid-ebb	5.26	4.69	8.77	7.67
13/06/2003	mid-flood	4.71	4.14	9.82	7.67
13/06/2003	mid-ebb	4.68	4.05	9.69	8
Mean value		5.59	4.77	6.86	6.49
Lowest value		4.68	4.05	3.6	4.33
Highest value		7.14	6.65	9.86	8.67

S&M = surface and middle depth sample.
B = bottom depth sample.
D/A = depth averaged sample.

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Summary of Water Qulaity Monitoring Data

Contract CV/2001/01

Station MS3

Date	Tide	DO (mg/L) (S&M)	DO (mg/L) (B)	Turb (NTU) (D/A)	SS (mg/L) (D/A)
19/05/2003	mid-flood	5.25	4.71	5.73	5
19/05/2003	mid-ebb	5.03	4.67	10.12	7.33
21/05/2003	mid-flood	5.48	4.73	7.25	5.33
21/05/2003	mid-ebb	5.33	4.91	8.42	8.33
23/05/2003	mid-flood	7.11	4.71	8.32	8.33
23/05/2003	mid-ebb	6.85	4.57	7.97	9
26/05/2003	mid-flood	6	5.28	5.05	5.67
26/05/2003	mid-ebb	5.46	4.72	5.1	4.67
28/05/2003	mid-flood	5.14	4.58	6.3	7.33
28/05/2003	mid-ebb	5.15	4.52	7.84	8.33
30/05/2003	mid-flood	5.13	4.64	6.16	5.67
30/05/2003	mid-ebb	5.2	4.55	6.82	7.33
02/06/2003	mid-flood	6.11	5.75	5.46	6.33
02/06/2003	mid-ebb	4.8	4.4	7.86	8
04/06/2003	mid-flood	5.71	4.4	5.47	5.33
04/06/2003	mid-ebb	5.84	4.34	6.36	5.33
06/06/2003	mid-flood	5.61	4.9	3.21	4
06/06/2003	mid-ebb	5.69	4.81	3.79	5.33
09/06/2003	mid-flood	5.46	4.45	6.05	6
09/06/2003	mid-ebb	5.55	4.97	7.08	6.33
11/06/2003	mid-flood	5.33	6.91	10.26	6
11/06/2003	mid-ebb	5.47	4.62	8.34	8
13/06/2003	mid-flood	4.9	4.19	9.48	7.33
13/06/2003	mid-ebb	4.66	4.16	9.07	9.33
Mean value		5.51	4.77	6.98	6.65
Lowest value		4.66	4.16	3.21	4
Highest value		7.11	6.91	10.26	9.33

S&M = surface and middle depth sample.
B = bottom depth sample.
D/A = depth averaged sample.

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Stanger Asia

Summary of Water Qulaity Monitoring Data

Contract CV/2001/01

Station CS3

Date	Tide	DO (mg/L) (S&M)	DO (mg/L) (B)	Turb (NTU) (D/A)	SS (mg/L) (D/A)
19/05/2003	mid-flood	5.05	4.86	5.67	5
19/05/2003	mid-ebb	5.02	4.74	6.65	5.67
21/05/2003	mid-flood	5.57	4.9	9.52	5.67
21/05/2003	mid-ebb	5.83	5.01	8.24	8.67
23/05/2003	mid-flood	7.05	4.87	8.83	9.67
23/05/2003	mid-ebb	6.77	4.8	8.05	10
26/05/2003	mid-flood	6.17	5.47	5.36	4
26/05/2003	mid-ebb	5.73	4.99	4.94	4.33
28/05/2003	mid-flood	5.31	4.37	7.36	7.67
28/05/2003	mid-ebb	5.26	4.43	7.33	8.33
30/05/2003	mid-flood	5.31	5.03	5.54	5.67
30/05/2003	mid-ebb	5.19	4.49	5.97	6
02/06/2003	mid-flood	5.51	4.99	5.27	4.67
02/06/2003	mid-ebb	4.86	4.34	5.75	5.67
04/06/2003	mid-flood	4.69	4.14	5.4	5.33
04/06/2003	mid-ebb	5.41	4.23	5.12	4.67
06/06/2003	mid-flood	5.96	4.35	3.86	5.33
06/06/2003	mid-ebb	5.72	4.38	3.57	5
09/06/2003	mid-flood	5.67	4.82	6.43	5.67
09/06/2003	mid-ebb	5.85	5.09	6.25	5
11/06/2003	mid-flood	5.83	4.99	8.47	7.33
11/06/2003	mid-ebb	5.32	4.9	8.29	8.33
13/06/2003	mid-flood	4.68	4.22	10.07	9.67
13/06/2003	mid-ebb	4.66	4.21	9.12	8.67
Mean value		5.52	4.69	6.72	6.5
Lowest value		4.66	4.14	3.57	4
Highest value		7.05	5.47	10.07	9.67

S&M = surface and middle depth sample.
B = bottom depth sample.
D/A = depth averaged sample.

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