

ENVIRONMENTAL MONITORING AND AUDIT REPORT

FOR

CONTRACT No. DC/2000/13

POK WAI DRAINAGE CHANNEL

OCTOBER 2003

Report No.: ET 11898

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EXECUTIVE SUMMARY.

This is the 21st monthly Environmental Monitoring and Audit (EM&A) report for Contract No. DC/2000/13 – Pok Wai Drainage Channel and it covers the monitoring works conducted during October 2003.

Construction Activities for the Reported Period.

- Construction of channel wall stems DC51A, inlet No. 2 and DC39A.
- Construction of toe wall B, C and D, concrete pipe between M2A – M13.
- Construction of catchpits and u-channels.
- Backfilling embankment type 2 and type 3.
- Extracting sheetpiles along DC47A – DC81A.
- Installing shoring along stilling chamber to channel DC4A.
- Laying watermain along the access road.

Air Quality Monitoring.

Monitoring of 24-hour Total Suspended Particulates (TSP) was carried out on five occasions at Wing Kei Tsuen (ASR-1). There were no exceedances to the set Trigger, Action or Target (TAT) levels for this parameter during the reported period. Monitoring of 1-Hour TSP was carried out on sixteen occasions at ASR-1. There were no exceedances to the set TAT levels for this parameter during the reported period.

Noise Monitoring.

Monitoring of construction noise was carried out on eight occasions at Wing Kei Tsuen (NSR-1) for daytime working hours. There were no exceedances to the Target level for noise during the reported period. No works were carried out in evening times or on General holidays for this reported period.

Water Quality Monitoring.

Water quality in terms of suspended solids, temperature and zinc, were monitored on thirteen occasions at WMS1 (Upstream station) and WMS3 (Downstream station). There was no exceedance to the set Trigger, Action Level or Target Level for suspended solids and zinc.

Waste Management.

There was no disposal of excavated materials in this month. All of them were reused onsite for backfilling.

Complaints and Notifications of Summon and Successful Prosecutions.

No complaints or notification of summonses were received in this reported period.

Site Inspections.

Five Site Inspections were conducted by the Environmental Team (ET) in this reported period. The major observation by the ET, actions by the Contractor and outcome are summarized in the following table.

Observations by ET	Actions by the Contractor	Outcome
Excavated materials were stockpiled without cover.	Cleared the stockpiles.	The stockpiles were cleared.
Fugitive dust generation was observed from site traffic on dry haul roads.	Watering on site haul roads was conducted by water truck.	The situation improved.

Future Key Issues.

The tentative works activities, predicted impacts and areas of environmental concern for the following month are summarized in the following table.

Works Activities	Predicted Impacts	Proposed Mitigation Measures
Construction of Channel wall stems of inlet No. 1, manholes, concrete pipe and u-channels. Excavation and construction of toe wall A.	Noise impact Dust impact	·Allocate the plants away form the NSRs as far as practicable. ·Better housekeeping shall be achieved. -Apply water spray during excavation if excavated materials were dry.
Backfilling for ramp B, embankment Type 2 and Type 3.	Dust impact Noise impact	·Conduct the backfilling with water spray if necessary. ·Reduce the number of plant.
Excavation and rockfilling from Stilling Chamber to Channel DC4A.	Water impact Waste generation Noise impact	·Isolate the excavation area and dry the area before excavation. ·Wet the haul road more frequently as number of trucks used it for transporting the excavated soil. ·The truck shall be covered by impervious sheet during transportation.
Extracting sheetpiles along DC47A to DC81A.	Noise and vibration impacts.	·Reduce the concurrent noisy operations and number of plants. -Complete the noisy works as soon as possible.
Installing shoring along stilling chamber to Channel DC4A.	Noise impact	·Reduce the number of plants and allocate the plants away from NSRs as far as practicable.

1. INTRODUCTION.

1.1 Background.

Stanger Asia Ltd. has been commissioned by the Hsin Chong Construction Co., Ltd. to provide an Environmental Team (ET) to monitor air, noise, water quality and waste management. The team is to take a pro-active role in all issues, which may be of environmental concern during the construction of the Pok Wai Drainage Channel.

The Independent Environmental Checker (IEC) appointed for this project is the CH2M-IDC Hong Kong Ltd.

In this report, the air, noise, water quality and waste management monitoring works conducted for October 2003 will be detailed and reviewed. All monitoring works were conducted in accordance to the Main Drainage Channels for Ngai Tam Mei, Yuen Long and Kam Tin: Environmental Schedules (MDCES).

1.2 Report Structure.

The purpose of this report is to detail and review the air, noise and water quality monitoring works undertaken for October 2003. The impact forecast for the next reporting month and the schedules of monitoring works for the following three months are also given.

The report follows the format given below:

- Section 1: Introduction and background information to the content of this report.
- Section 2: This section gives the information of the project.
- Section 3: This section summarizes all the environmental permits and licenses.
- Section 4: Summary of the EM&A requirements is presented.
- Section 5: This section details the implemented mitigation measures.
- Section 6: Details monitoring results.
- Section 7: Audit the monitoring results.
- Section 8: The status for solid and liquid waste management for the site is overviewed.
- Section 9: Complaints, notifications of summons and successful prosecutions are summarized.
- Section 10: This section gives the predicted impacts of the construction activities.
- Section 11: This section gives a conclusion in relation to all monitoring activities.

2. PROJECT INFORMATION.

2.1 Site Description.

The construction of Pok Wai Drainage Channel is undertaken as part of the drainage improvements works entitled “Main Drainage Channels for Ngau Tam Mei, Yuen Long and Kam Tin. The major construction works for the project includes the removal and disposal of contaminated material, construction of reinforced concrete channel, footpaths and road works and landscape works from the Pok Wai Village to some 0.5 km downstream.

The site layout plan is shown in Figure 2.1.

2.2 Project Organization.

Mr. M.T. Chow (Tel: 25747400, Fax: 28278700) is the Engineer and Mr. C.L. Leung (Tel: 24712826, Fax: 24719117) is the Engineers’ Representative for Drainage Services Department, Government of the HKSAR.

The Independent Environmental Checker (IEC) for this project is Mr. David B.K. Yeung of CH2M-IDC Hong Kong Ltd. (Tel: 25072203, Fax: 25072293).

Mr. Frankie Lam is the Project Manager for Hsin Chong Construction Co., Ltd. (Tel: 60212602, Fax: 2482 7075).

The Environmental Team (ET) for the project is Stanger Asia Ltd. The team is headed by Mr. Chris Shenfield – Senior Environmental Scientist. (Tel: 26821203, Fax: 26820046).

The Organization Chart with the key personnel contacts names and telephone numbers is given in Appendix I.

2.3 Construction Programme.

The details of the construction works of the construction activities are summarized in the following table.

Table 2.1 – Summary of Construction Activities

Area	Construction Activities
- Channel DC47A-DC81A.	- Construction of toe wall and wall stems.
- DC 39A, DC54A- DC73A.	- Backfilling.
- Stilling chamber - DC4A.	- Extraction of sheetpiles.
- Channel wall DC51A.	- Construction of concrete pipe.
- Inlet No. 2.	- Construction of catchpits and u-channels.
- Toe wall B, C and D.	- Installing shoring.
- M2A – M13.	- Laying watermain.

3. ENVIRONMENTAL PERMITS AND LICENSES.

The summary of the status of all environmental permits, licenses and notification for this project as at October 2003 is summarized in the following table.

Table 3.1 – Summary of the Environmental Permits and Licenses

Description	Licence/Permit No.	Issued Date	Expiry Date	Status
Further Environmental Permit	FEP-01/089/2002	7-Jan-02	--	Issued
Registration of Chemical Waste Producer	5113-541-H2913-20	17-Jan-02	--	Issued
Notification of Works Under APCO	--	--	--	Notified
Effluent Discharge Licence	IS36/1	30-May-02	31-May-07	Issued
Effluent Discharge Licence	IS35N/1	30-May-02	--	Issued
Dumping permit	EP/MD/03-086	10-Oct-02	11-Apr-03	Expired

4. SUMMARY OF EM&A REQUIREMENTS.

4.1 Air Quality.

Monitoring Location

The project has one Air Sensitive Receiver (ASR), Wing Kei Tsuen. This monitoring location was coded as ASR1. The coordinates of it are listed in the following table. The air monitoring location is shown in Figure 4.1.

Table 4.1 – Coordinates of ASR1

Station	HK Metric Grid – Easting	HK Metric Grid – Northing
ASR1	823627	835852

Methodology

The measurement of 24-hour and 1-hour TSP levels were carried out in accordance to high volume sampling method set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50) Appendix B. When positioning the high volume samplers, the following points have been considered:

- a horizontal platform with appropriate support to secure the high volume sampler against gusty wind, should be provided;
- horizontal distance between the high volume samplers and an obstacle, such as buildings, must be at least twice the height of the obstacle protruding above the high volume samplers;
- a minimum separation of 2 m should be provided from walls, parapets, and penthouses for rooftop high volume samplers;
- a minimum separation of 2 m should be provided from any supporting structure measured horizontally;
- there should not be any furnace or incinerator flues nearby;
- there should be unrestricted airflow around the high volume samplers;
- a minimum separation of 20 m should be provided from the dripline;
- any wire fence and gate employed to protect the high volume samplers should not cause any obstruction during monitoring.

All relevant data including elapsed time, meter reading for the start and finish of the sampler, identification and weight of the filter paper, and other special phenomena were recorded.

Monitoring Equipment and Calibration Details

Andersen GMW Model GS2310 high volume samplers were used to carry out the monitoring of 24-hour and 1-hour TSP. The high volume samplers are in compliance with the specifications listed in the Environmental Schedules as follows:

- 0.6 – 1.7 m³/min (20-60 SCFM) adjustable flow range;
- equipped with a timing / control device with 5 minutes accuracy over 24 hours operations;
- installed with elapsed-time meter with 2 minutes accuracy over 24 hours operations;
- capable of providing a minimum exposed area of 406 cm² (63 in²);
- flow control accuracy: 2.5% deviation over 24-hr sampling period;
- equipped with shelter to protect the filter and sampler;
- incorporated with an electronic mass flow rate controller or other equivalent devices;
- equipped with a flow recorder for continuous monitoring;
- provided with peaked roof inlet, incorporated with manometer;
- able to hold and seal the filter paper to the sampler housing at horizontal position;
- easy to change filter; and
- capable of operating continuously for 24-hr period.

The high volume samplers were calibrated at bi-monthly intervals. The calibration kit (Andersen Model G2535) comprising pressure plates and a transfer standard is traceable to the internationally recognized standard, and is calibrated annually. Calibration records for the above equipment are given in Appendix II of this report.

Monitoring Parameters Frequency

Table 4.2 – Air Quality Monitoring Frequency

Monitoring Location	Parameter	Frequency
ASR1	24-hr TSP	Once in every six days
	1-hr TSP	Three times in every six days

Trigger, Action and Target Levels

The TAT levels for air quality monitoring were established from the baseline monitoring data prior to the commencement of the construction of the project and summarized in the following table.

Table 4.3 - Trigger, Action and Target Levels for the project

Parameter Monitored	Trigger Level $\mu\text{g}/\text{m}^3$	Action Level $\mu\text{g}/\text{m}^3$	Target Level $\mu\text{g}/\text{m}^3$
1-hour TSP	256	378	500
24-hour TSP	129	194	260

4.2 Noise.

Monitoring Location

The project has one Noise Sensitive Receiver (NSR), Wing Kei Tsuen. This monitoring location was coded as NSR1 and the coordinates of it are listed in the following table. The noise monitoring location is shown in Figure 4.2.

Table 4.4 – Coordinates of NSR1

Station	HK Metric Grid - Easting	HK Metric Grid - Northing
NSR1	823607	835724

Methodology

Monitoring was carried out in accordance to procedures recommended in the Environmental Schedule for the monitoring of construction noise as follows:

- measurements shall be recorded to the nearest 0.1dB.
- Weather conditions, including a measurement of wind speed, should be recorded for the measurement. Where the steady wind speed exceeds 5 m/s, or gusts are above 10 m/s, or in the presence of fog or rain, measurements should be treated as invalid, and repeated in more appropriate conditions.

This noise meter was programmed to measure A-weighted equivalent continuous sound pressure level at six 5-minute intervals. Acoustic information measured by the noise meter over the 30 minutes period was recorded and stored with a record number assigned to each measurement. Additional supplementary acoustical data in terms of L_{10} and L_{90} were also recorded for reference and auditing.

Due to the fact that dBs are logarithmic values, they cannot just be simply added together and then averaged. Therefore, the individual dB values are converted to linear values. After calculation, the values are converted back to dB by taking logarithm and the product by ten. The equation is expressed as follows:

$$\text{Average Noise Level, } L_{eq(30 \text{ min})} \text{ dB(A)}$$

$$= 10 \log_{10} \left[\frac{10^{(L_{eq(5 \text{ min})}/10)} + 10^{(L_{eq(5 \text{ min})}/10)} + \dots}{n} \right]$$

while n is the number of the data.

i is the ith data.

Monitoring Equipment and Calibration Details

The noise level at NSR1 was determined using a Brüel & Kjaer Modular precision sound level meter type 2231. The meter complies with the International Electrotechnical Commission Publication (IEC) 651:1979 (Type 1) and 804:1985 (Type 1) specifications. As referred to in the Technical Memorandum issued under the Noise Control Ordinance (NCO). A Brüel & Kjaer Sound level calibrator type 4231 was used for the on-site calibration of the meter. This calibrator complies with the IEC Publication 942 (1988) Class 1 and ANSI S1.40 – 1984. Noise measurements were only accepted to be valid if the calibration levels from before and after the measurement agree to within 1.0dB. The sound level meter and calibrator are calibrated annually by the manufacturer.

Wind speeds were measured by a portable anemometer, TSI model 8330 VelociCheck, with direction being determined with a compass.

The calibration certificate of the anemometer, sound level meter and sound level calibrator are given in Appendix II.

Monitoring Parameters and Frequency

Table 4.5 - Noise Monitoring Frequency

Monitoring location	Parameter	Frequency
NSR1	$L_{Aeq(30 \text{ min})}$, L_{90} & L_{10}	Two times a week.

Trigger, Action and Target Levels

Table 4.6 - Trigger, Action and Target levels for Construction Noise

Time Period	Trigger Level	Action Level	Target Level
Daytime (0700-1900 hrs) on normal weekdays, e.g. Monday through Saturday excluding Public Holidays.	When one documented complaint is received.	When more than one complaint is received within 2 weeks on the same location.	$L_{Aeq(30min)}$ 75dB(A)
Daytime on holidays: and 1900 to 2300 hours on all other days.			$L_{Aeq(5min)}$ 60dB(A)
All night time periods (2300 to 0700 hours)			$L_{Aeq(5min)}$ 45dB(A)

4.3 Water Quality.

Monitoring Locations

The EM&A manual details one upstream and one downstream monitoring location to be monitored during the impact monitoring period, these were have been coded as WMS1 and WMS3 respectively. The sampling point of WMS3 shall be located after the treatment facilities. Therefore, the exact location may be changed occasionally depends on the location of the treatment facilities. In view of this, no coordinate of the sampling point was provided. Designated monitoring stations are shown in Figure 4.3.

Methodology

Surface water quality shall be monitored for the following parameters: temperature (°C), suspended solids (mg/L) and zinc (mg/L). As the designated monitoring locations are not tidal and their depth is less than 1.5m, only one sample was taken from the middle of the water column.

Suspended solids and zinc shall be determined in the laboratory. Samples were collected in 3 L volumes, duplicate sample to be taken during impact monitoring works.

During monitoring works, the following shall also be recorded:

- monitoring location;
- depth of water;
- time;
- weather conditions including ambient temperature;
- water temperature;
- any special phenomena or activities at the construction site.

Monitoring Equipment and Calibration Details

Suspended Solids and Zinc

As the depth of water being sampled was generally less than 50cm, the “grab sampling” technique was employed for the taking of water samples for the determination of suspended solids and total zinc at all designated monitoring locations.

Samples were kept in high-density polythene bottles, packed in ice and cooled to 4°C without being frozen for delivery to the laboratory as soon as possible after collection.

Thermometer

A standard certified laboratory mercury thermometer with an accuracy of at least 0.5°C was employed, calibrated against a certified thermometer of 0.1°C scale. This thermometer was employed for measuring both ambient and water temperatures. The calibration certificate for the thermometer is attached in Appendix II.

Depth Detector

As the depth of water being sampled was generally less than 50cm, a clearly marked depth gauge was employed to determine water depth at all designated monitoring locations.

Laboratory Analysis

Samples were returned to a HOKLAS accredited laboratory for the determination of suspended solids and total zinc. Suspended solids content was determined employing Method 2540D (APHA 20th Edition) and zinc determined by Method No. 303E for sample digestion, and Method No. 3111 (APHA 18th Edition) for the analysis of zinc by flame atomic absorption spectrometry. The value of lowest of reporting (LOR) for zinc analysis is 0.05 mg/L. Methods are referenced from the “Standard Methods for the Examination of Water and Wastewater” (APHA, AWWA, WEF). The laboratory operates a QA/QC scheme for these analysis inclusive of duplicate and spike recovery analysis.

Monitoring Parameters and Frequency

Table 4.7 – Water Quality Monitoring Frequency

Monitoring Locations	Parameter	Frequency
WMS1, WMS3	Total Suspended Solids, Total Zinc and Water Temperature	Three times a week

Trigger, Action and Target Levels

Table 4.8 – Derived Trigger/Action/Target Level

Parameter	Trigger Level	Action Level	Target Level
Suspended Solids (mg/L)	>18 mg/L AND >120% of upstream control station of same day	>18 mg/L AND >130% of upstream control station of same day	>18 mg/L AND >130% of upstream control station of same day for three consecutive times
Zinc (mg/L)	>120% of upstream control station of same day	>130% of upstream control station of same day	>130% of upstream control station of same day for three consecutive times

4.4 Event and Action Plans.

The Event and Action Plans for air, noise and water are attached in Appendix III of this report.

5. IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES.

The contractor implemented various environmental mitigation measures as recommended in the EIA report and Environmental Permit. The implementation status is attached in Appendix IV and summarized as follows:

- Minimum number of plants were used as far as practicable.
- Plants were turned off when idling.
- Quiet plants were used.
- Water spray and water bowser was employed to alleviate dust generation.
- Chemical waste was collected in chemical waste bin and stored at a designated area.
- Pump out the stagnant water.
- The waste was removed in a regular basis.

6. MONITORING RESULTS.

6.1 Completed Monitoring Works.

Table 6.1 gives the completed monitoring works for the reported period.

Table 6.1 – Completed Monitoring Works for October 2003

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			October 1	2	3	4
				Site Inspection Water 1-hr TSP	Water Noise 1-hr TSP 24-hr TSP	
5	6	7	8	9	10	11
	1-hr TSP	1-hr TSP Water Noise		Site Inspection Water		Water
12	13	14	15	16	17	18
		1-hr TSP Water Noise	Noise 1-hr TSP 24-hr TSP	1-hr TSP Site Inspection Water	1-hr TSP	24-hr TSP 1-hr TSP Water Noise
19	20	21	22	23	24	25
	1-hr TSP	24-hr TSP Water Noise 1-hr TSP		Site Inspection Water 1-hr TSP		Noise Water 1-hr TSP
26	27	28	29	30	31	
	1-hr TSP 24-hr TSP	Water Noise 1-hr TSP		Site Inspection Water 1-hr TSP		

Notes: 1. Noise: daytime noise monitoring (twice a week) conducted at Wing Kei Tsuen. (6 x 5 minutes)
 2. Water: water quality monitoring (three times per week) at stations WMS1 (upstream) and WMS3 (downstream).
 3. 24-hr TSP (once in every 6 days) conducted at Wing Kei Tsuen.
 4. 1-hr TSP (three times in every 6 days) conducted at Wing Kei Tsuen.
 5. Site inspection: once a week

6.2 Air Quality Monitoring.

Impact monitoring of 24-Hour TSP was conducted on five occasions, with the monitoring of 1-Hour TSP being conducted on sixteen occasions at monitoring location ASR-1. Monitoring on 9.10.03 and 11.10.03 was re-scheduled due to failure of electricity.

The monitoring records for 24-hour and 1-hour TSP are given in the following table. All detailed monitoring results are given in Appendix VII. The results are presented graphically in Figures 6.1 and 6.2.

Table 6.2 - Results of 24-hour TSP Monitoring Data

Date	ASR1, $\mu\text{g}/\text{m}^3$	Exceedance (Y/N)
03-Oct-03	104	N
15-Oct-03	79	N
18-Oct-03	115	N
21-Oct-03	94	N
27-Oct-03	110	N
Trigger Level	129 $\mu\text{g}/\text{m}^3$	
Action Level	194 $\mu\text{g}/\text{m}^3$	
Target Level	260 $\mu\text{g}/\text{m}^3$	

Table 6.3 – Results of 1-hour TSP Monitoring Data

Date	ASR1, $\mu\text{g}/\text{m}^3$	Exceedance (Y/N)
02-Oct-03	204	N
03-Oct-03	183	N
06-Oct-03	177	N
07-Oct-03	215	N
14-Oct-03	168	N
15-Oct-03	182	N
16-Oct-03	171	N
17-Oct-03	204	N
18-Oct-03	249	N
20-Oct-03	223	N
21-Oct-03	234	N
23-Oct-03	217	N
25-Oct-03	225	N
27-Oct-03	224	N
28-Oct-03	207	N
30-Oct-03	223	N
Trigger Level	256 $\mu\text{g}/\text{m}^3$	
Action Level	378 $\mu\text{g}/\text{m}^3$	
Target Level	500 $\mu\text{g}/\text{m}^3$	

6.3 Noise Monitoring.

Monitoring of daytime construction noise, 0700-1900 hrs on normal weekdays, was carried out on a total of eight occasions, at designated station (NSR1). The result was attached in Appendix V. There were no works conducted during the evening or on General holidays.

The noise levels for the designated monitoring station and periods are summarized in the table below. All detailed monitoring results are given in Appendix V. The results are also presented graphically in Figure 6.3.

Table 6.4 - Day Time Noise Levels for NSR1

Date	Measurement Time	NSR1, dB(A)	Exceedance (Y/N)
03-Oct-03	09:00	59.0	N
07-Oct-03	13:35	65.2	N
14-Oct-03	10:30	60.5	N
15-Oct-03	09:00	60.2	N
18-Oct-03	09:20	64.0	N
21-Oct-03	09:00	61.7	N
25-Oct-03	10:20	61.9	N
28-Oct-03	13:05	64.8	N
Target Level		75 dB(A)	

6.4 Water Quality Monitoring.

Water quality in terms of suspended solids, temperature and zinc, was carried out on thirteen occasions at WMS1 (upstream station) and WMS3 (downstream station). The summary of results for water quality monitoring is summarized in the following tables. Detailed monitoring results are presented in Appendix VI. Graphical presentation of the suspended solids is shown in Figure 6.4.

Table 6.5 – Summary of Water Quality Monitoring Data (SS)

Date	WMS1 SS, (mg/L)	Baseline Trigger, Action & Target Level (mg/L)	Daily Trigger Level (mg/L)	Daily Action Level (mg/L)	WMS3 SS, (mg/L)	Exceedance (Y/N)
02-Oct-03	24	18	29	31	20	N
03-Oct-03	25	18	30	33	18	N
07-Oct-03	22	18	26	29	24	N
09-Oct-03	22	18	26	28	25	N
11-Oct-03	35	18	41	45	34	N
14-Oct-03	29	18	34	37	26	N
16-Oct-03	25	18	30	33	22	N
18-Oct-03	26	18	31	33	25	N
21-Oct-03	20	18	24	26	22	N
23-Oct-03	20	18	23	25	19	N
25-Oct-03	21	18	25	27	22	N
28-Oct-03	21	18	25	27	20	N
30-Oct-03	20	18	24	26	20	N

Table 6.6 – Summary of Water Quality Monitoring Data (Zn)

Date	WMS1 Zn, (mg/L)	Trigger Level	Action Level	Target Level	WMS3 Zn, (mg/L)	Exceedance (Y/N)
02-Oct-03	<0.05	-	-	-	<0.05	N
03-Oct-03	<0.05	-	-	-	<0.05	N
07-Oct-03	<0.05	-	-	-	<0.05	N
09-Oct-03	<0.05	-	-	-	<0.05	N
11-Oct-03	<0.05	-	-	-	<0.05	N
14-Oct-03	<0.05	-	-	-	<0.05	N
16-Oct-03	<0.05	-	-	-	<0.05	N
18-Oct-03	<0.05	-	-	-	<0.05	N
21-Oct-03	<0.05	-	-	-	<0.05	N
23-Oct-03	<0.05	-	-	-	<0.05	N
25-Oct-03	<0.05	-	-	-	<0.05	N
28-Oct-03	<0.05	-	-	-	<0.05	N
30-Oct-03	<0.05	-	-	-	<0.05	N

Note: The levels of Suspended Solids (SS) and Zinc (Zn) are the averaged of duplicate samples.

7. AUDIT REPORT.

7.1 Air Quality Monitoring.

No exceedance to set TAT levels for either 24 or 1-Hour TSP monitoring was recorded in this month.

No significant trend was observed for this month's monitoring data.

7.2 Noise Monitoring.

No exceedance to Limit Level was recorded in this month.

7.3 Water Quality Monitoring.

There was no exceedance to Trigger, Action Level or Target Level for both suspended solids and zinc in this reported period.

7.4 Site Inspections.

Five inspections were carried out by the ET this reported period. Observations by the ET, actions by the Contractor and outcome are summarised below. Site inspection reports are given in Appendix VII.

Table 7.1 – Summary of findings, actions and outcomes of site inspection

Observations by ET	Actions by the Contractor	Outcome
Excavated materials were stockpiled without cover.	Cleared the stockpiles.	The stockpiles were cleared.
Fugitive dust generation was observed from site traffic on dry haul roads.	Watering on site haul roads was conducted by water truck.	The situation improved.

8. WASTE MANAGEMENT.

There was no disposal of excavated materials in this reported month. All of them were reused for backfilling onsite.

9. COMPLAINTS, NOTIFICATIONS OF SUMMONS AND SUCCESSFUL PROSECUTIONS.

No complaints received this month. Complaint Log is attached in Appendix IX. Cumulative statistics on complaints, notifications of summons and successful prosecutions are attached in Appendix X.

10. FUTURE KEY ISSUES.

The following are the scheduled construction activities for the next reported period. Scheduled monitoring activities for the following three months are given in Appendix XI.

Table 10.1 - Works programme for November 2003

Works Activities	Predicted Impacts	Proposed Mitigation Measures
Construction of Channel wall stems of inlet No. 1, manholes, concrete pipe and u-channels. Excavation and construction of toe wall A.	Noise impact Dust impact	·Allocate the plants away from the NSRs as far as practicable. ·Better housekeeping shall be achieved. -Apply water spray during excavation if excavated materials were dry.
Backfilling for ramp B, embankment Type 2 and Type 3.	Dust impact Noise impact	·Conduct the backfilling with water spray if necessary. ·Reduce the number of plant.
Excavation and rockfilling from Stilling Chamber to Channel DC4A.	Water impact Waste generation Noise impact	·Isolate the excavation area and dry the area before excavation. ·Wet the haul road more frequently as number of trucks used it for transporting the excavated soil. ·The truck shall be covered by impervious sheet during transportation.
Extracting sheetpiles along DC47A to DC81A.	Noise and vibration impacts.	·Reduce the concurrent noisy operations and number of plants. -Complete the noisy works as soon as possible.
Installing shoring along stilling chamber to Channel DC4A.	Noise impact	·Reduce the number of plants and allocate the plants away from NSRs as far as practicable.

11. CONCLUSION.

All results for the air quality monitoring conducted this month were acceptable with no exceedance to the set Action or Limit level for either 24 or 1-Hour TSP level at ASR1. No untoward results or trends in results were noted. All impact noise monitoring gave results that complied with the proposed Limit exceedance levels NSR1. Water quality was acceptable this month.

Prepared by

Arthur Cheng
Environmental Scientist

Figures



Figure 2.1 - The Site Layout Plan

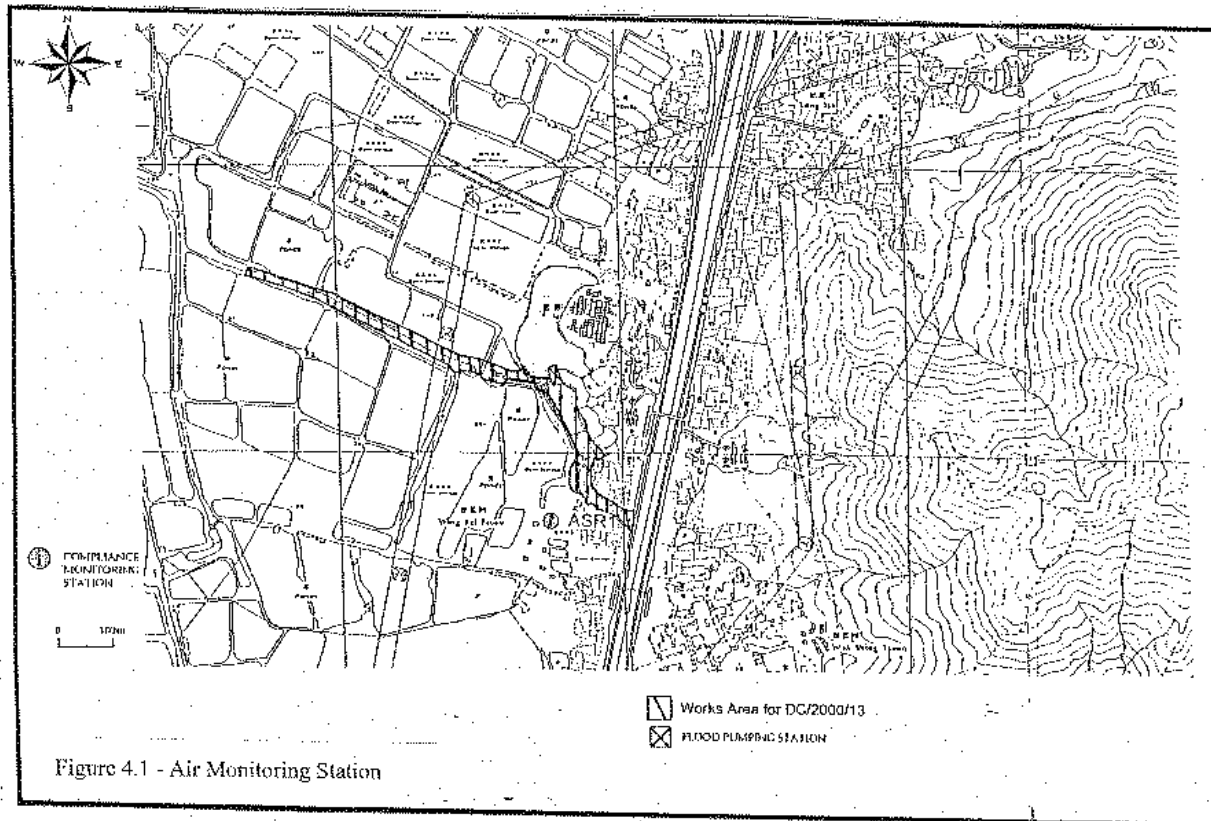
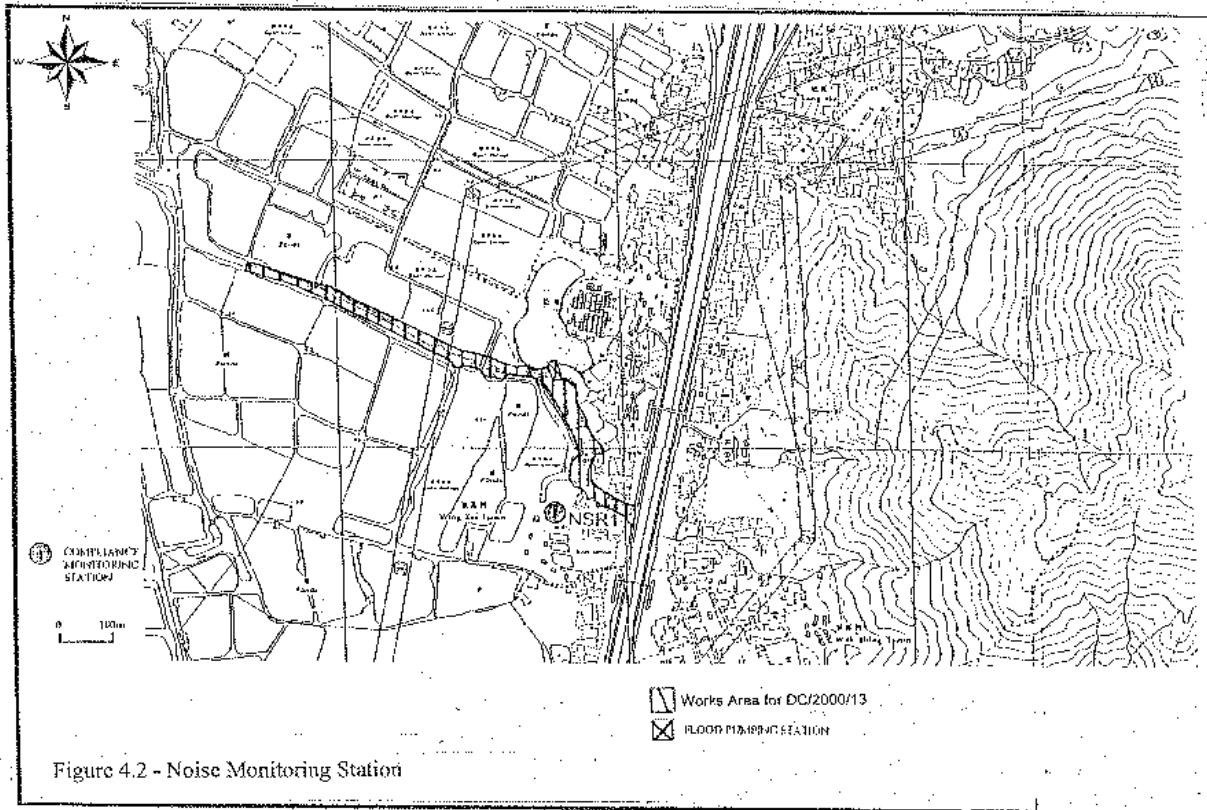


Figure 4.1 - Air Monitoring Station



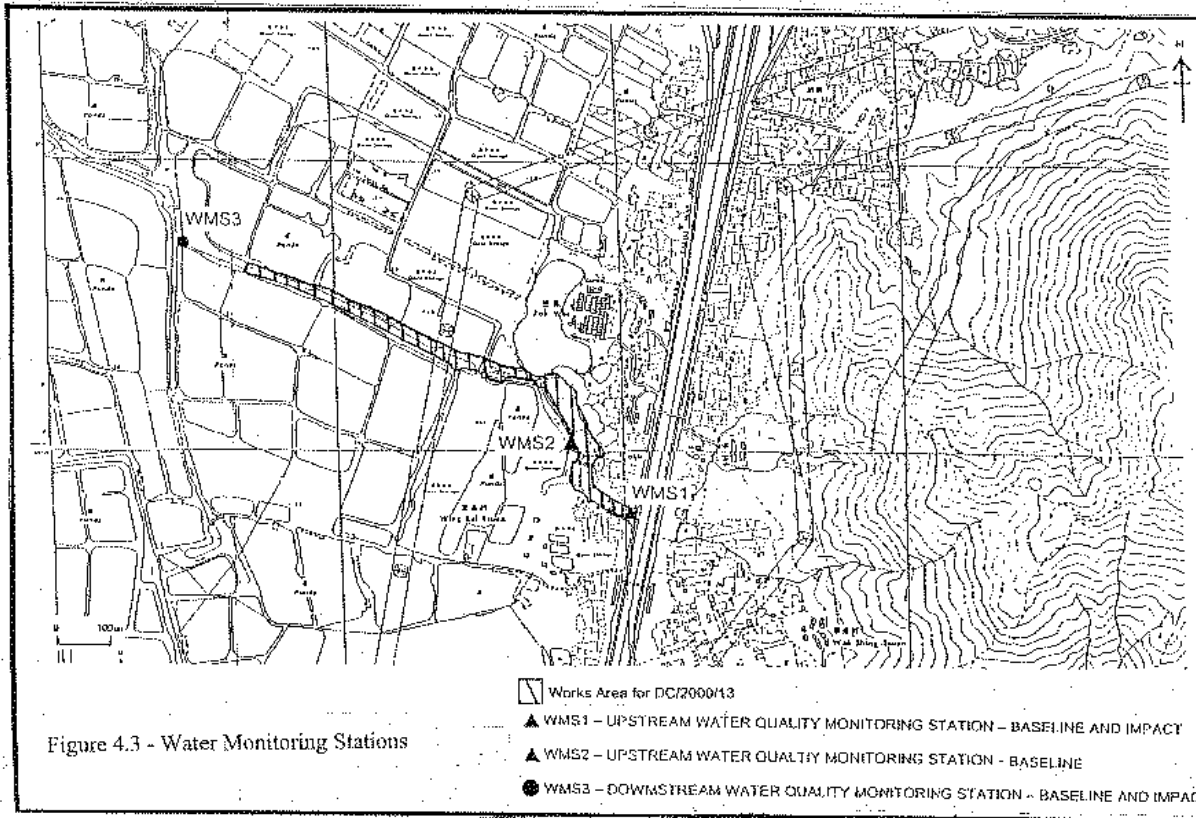


Figure 6.1 - Graphical Plot of 24-hour TSP Levels

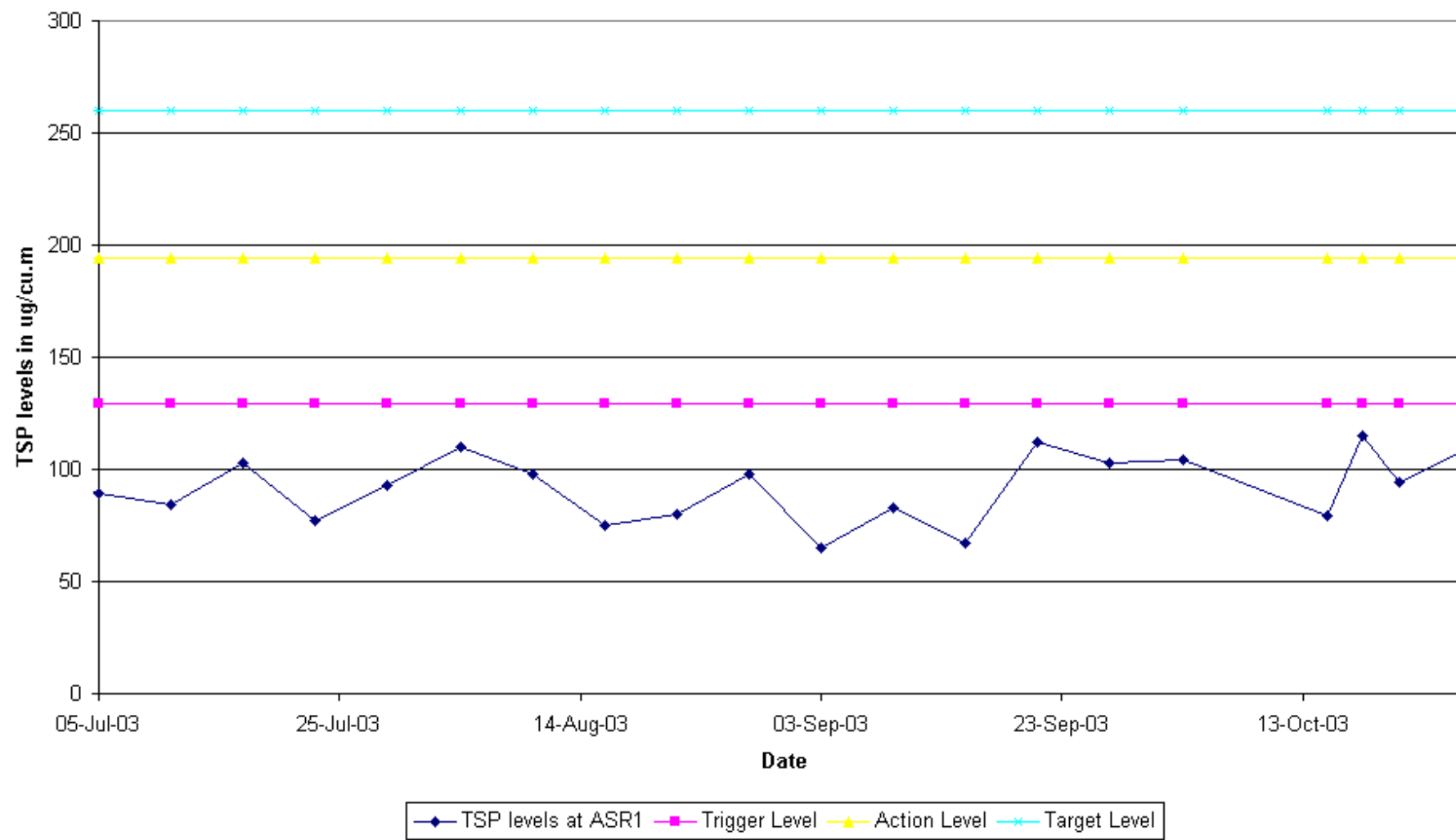


Figure 6.2 - Graphical Plot of 1-hour TSP Levels

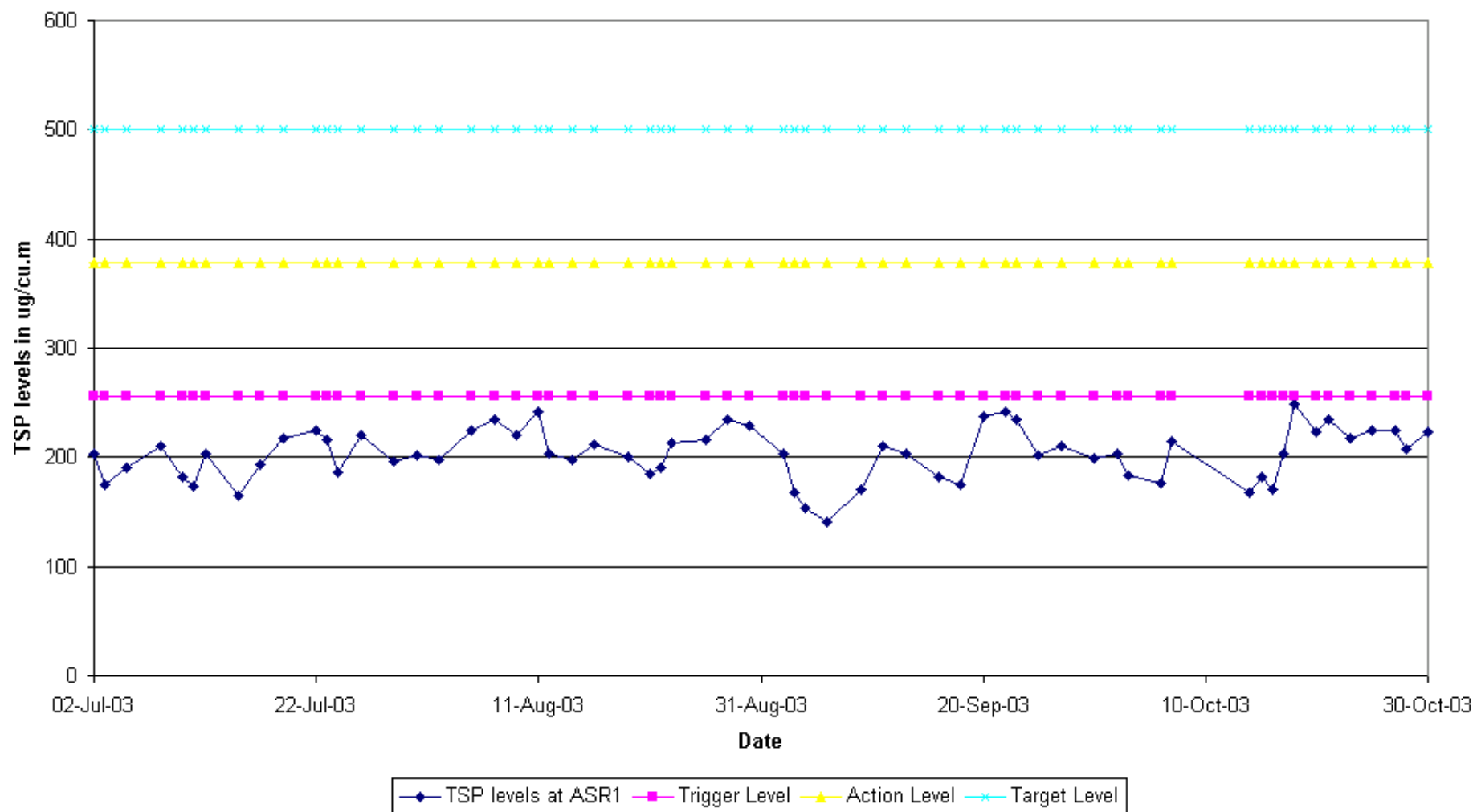


Figure 6.3 - Graphical Plot of Noise Levels

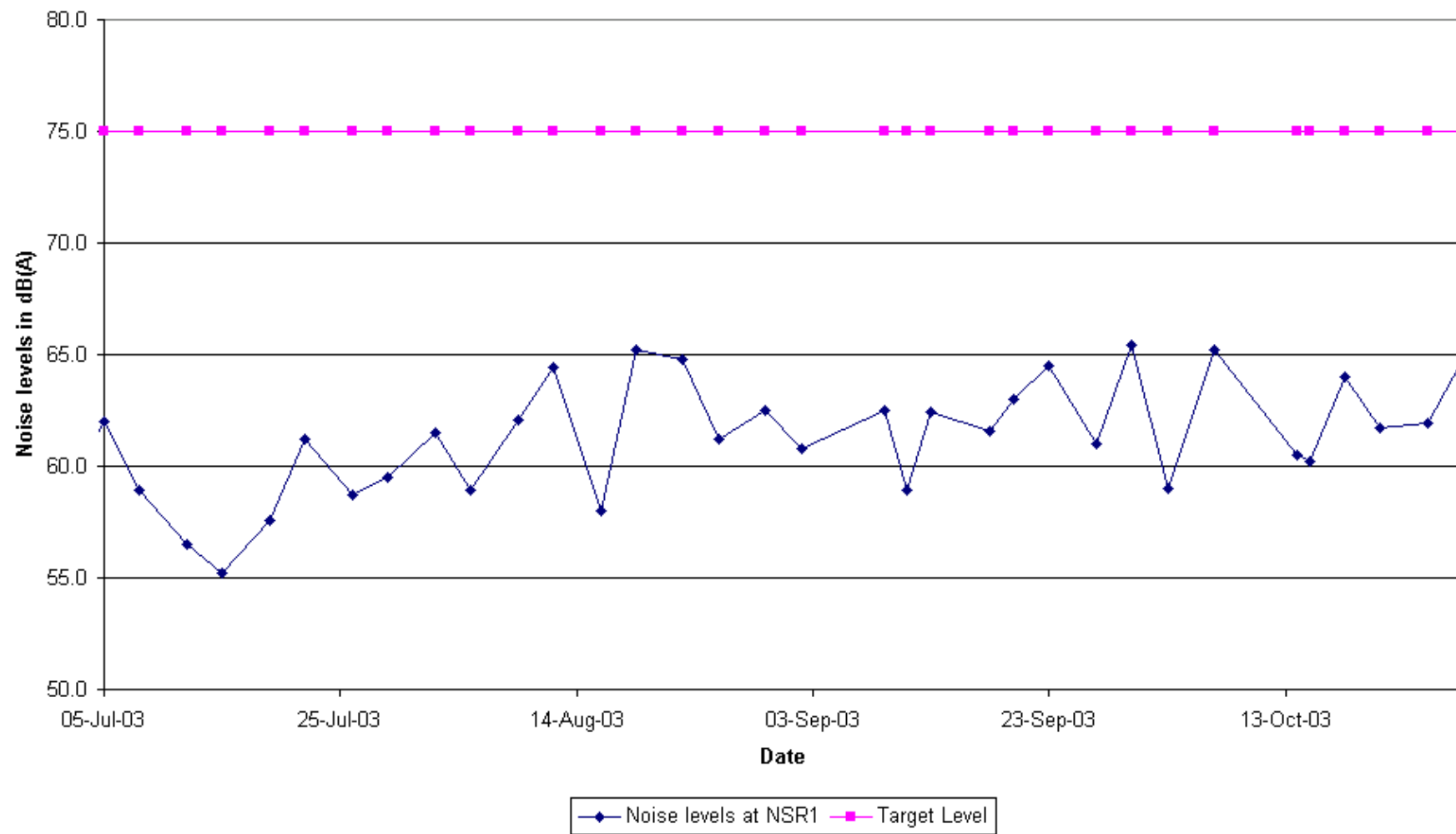
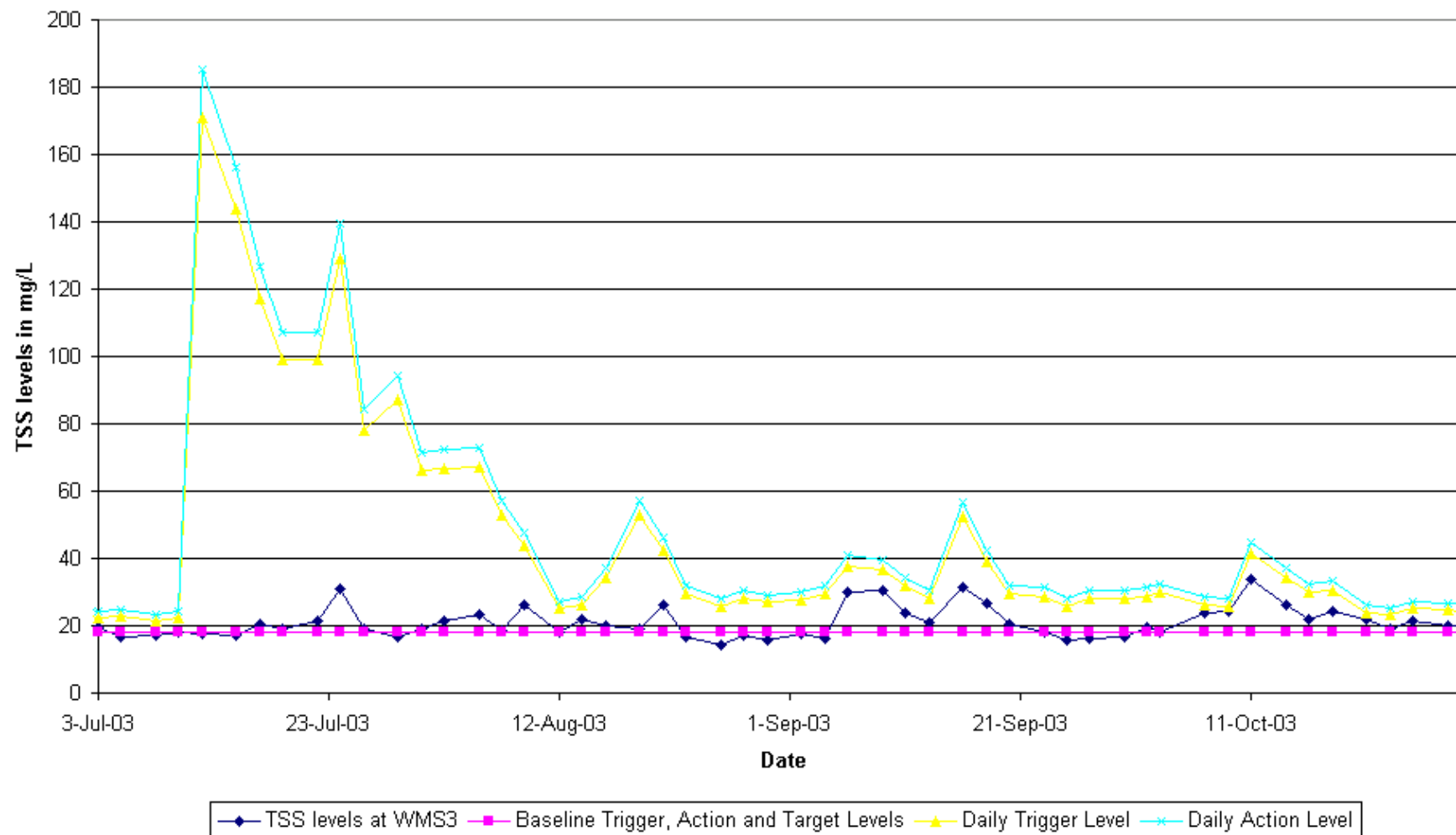
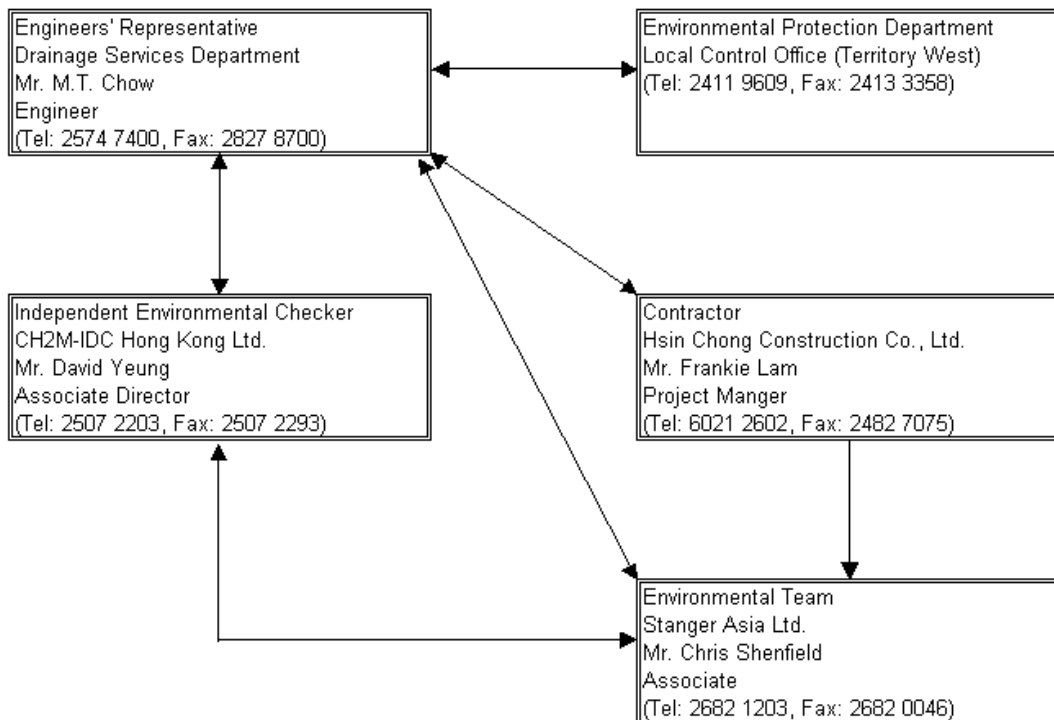


Figure 6.4 - Graphical Plot of Suspended Solids Levels



Appendix I
Organization Chart

Project Organization (Environmental)
Construction of Pok Wai Drainage Channel
Contract No. DC/2000/13



Appendix II

Calibration Certificates of the Monitoring Equipment

Appendix III
Event and Actions Plans

Event and Action Plan for Air Quality

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Trigger Level				
Exceedance for one sample	<ol style="list-style-type: none"> 1. Identify sources 2. Inform ER and IEC 3. Repeat measurements to confirm findings 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET 2. Check Contractor's working methods 	<ol style="list-style-type: none"> 1. Notify Contractor 2. Check monitoring data and Contractor's working methods 	<ol style="list-style-type: none"> 1. Rectify any unacceptable practices
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Identify source. 2. Inform ER and IEC. 3. Repeat measurements to confirm findings 4. Increase monitoring frequency to daily 5. Discuss with ER, IEC and Contractor for remedial actions required 6. If remedies required, contact ER and Contractor to make arrangements 7. If problem is short term, continue monitoring 8. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET. 2. Check Contractor's working method 3. Discuss with ET and Contractor on possible remedial measures 4. Advise ER on the effectiveness of the proposed remedial measures 5. Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Notify Contractor 2. Check monitoring data and Contractor's working methods 3. Discuss with Contractor for remedial works, if necessary 	<ol style="list-style-type: none"> 1. Rectify any unacceptable practice 2. Consider changes to working method

Event and Action Plan for Air Quality

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action Level				
Exceedance for one sample	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER and IEC 3. Repeat measurements to confirm findings 4. Increase monitoring frequency to daily 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET 2. Check Contractor's working method 	<ol style="list-style-type: none"> 1. Notify Contractor 2. Check monitoring data and Contractor's working methods 	<ol style="list-style-type: none"> 1. Rectify any unacceptable practice 2. Amend working methods if appropriate
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER and IEC 3. Repeat measurements to confirm findings 4. Increase monitoring frequency to daily 5. Discuss with ER, IEC and Contractor for remedial actions required 6. If exceedance continues, arrange meeting with IEC and ER 7. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET 2. Check Contractor's working methods 3. Discuss with ET and Contractor on possible remedial measures 4. Advise ER on the effectiveness of the proposed remedial measures 5. Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Check monitoring data and Contractor's working methods 4. Discuss with IEC and Contractor on potential remedial actions 5. Ensure remedial actions properly implemented 	<ol style="list-style-type: none"> 1. Submit proposals for remedial actions to ER/IEC within 3 working days of notification 2. Implement the agreed proposals 3. Amend proposal if appropriate

Event and Action Plan for Air Quality

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Target Level				
Exceedance for one sample	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER, IEC and EPD verbally 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET 2. Check Contractor's working method 3. Discuss with ET and Contractor on possible remedial measures 4. Advise ER on the effectiveness of the proposed remedial measures 5. Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Check monitoring data and Contractor's working methods 4. Discuss with ET, IEC and Contractor potential remedial actions 5. Ensure remedial actions are properly implemented 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedances 2. Submit proposals for remedial actions to ER within 3 working days of notification 4. Implement the agreed proposals 5. Amend proposal if appropriate
Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Identify source 2. Inform ER, IEC and EPD the cause and actions taken for the exceedances 3. Repeat measurement to confirm findings 4. Increase monitoring frequency to daily 5. Investigate the causes of exceedance 6. Carry out analysis of Contractor's working procedure to determine possible mitigation to be implemented 7. Arrange meeting with EPD, IEC and ER to discuss the remedial actions to be taken 8. Assess effectiveness of Contractor's remedial actions and keep EPD, IEC and ER informed of the results 9. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Discuss amongst ER, ET and Contractor on the potential remedial actions 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly 3. Supervise the implementation of remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Discuss amongst Et, IEC and Contractor potential remedial actions 5. Review Contractor's remedial actions whenever necessary to assure their effectiveness 6. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to ET, IEC and ER within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

Event and Action Plan for Construction Noise

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Trigger Level				
When a complaint is received	<ol style="list-style-type: none"> 1. Notify Contractor and IEC 2. Conduct measurement 3. Investigate noisy operations 	<ol style="list-style-type: none"> 1. Review the analysed results submitted by the ET 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly 	<ol style="list-style-type: none"> 1. Notify Contractor 2. Investigate noisy operations 	<ol style="list-style-type: none"> 1. Propose remedial measures to IEC
Action Level				
When more than one complaint are received within 2 weeks on the same event or at the same location	<ol style="list-style-type: none"> 1. Notify Contractor and IEC 2. Carry out investigation 3. Report the results of investigation to the IEC and Contractor 4. Require Contractor to propose measures for the analysed noise problem 5. Increase monitoring frequency to check mitigation effectiveness 	<ol style="list-style-type: none"> 1. Review the analysed results submitted by the ET 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly 3. Supervise the implementation of remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Require Contractor to propose remedial measures for the analysed problem 4. Ensure remedial measures are properly implemented 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals to IEC 2. Implement noise mitigation proposals

Event and Action Plan for Construction Noise

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Target Level				
Non-statutory – 75*dB(A) exceeded between 0700-1900 hrs on normal weekdays; Statutory – 60/65/70** dB(A) exceeded between 0700-2300 hrs on holidays and 1900-2300 hrs on all other days; Statutory – 45/50/55** dB(A) exceeded between 2300-0700 hrs of next day	<ol style="list-style-type: none"> 1. Notify Contractor, IEC, EPD and ER 2. Identify source 3. Repeat measurements to confirm findings 4. Require Contractor to implement mitigation measures 5. Increase monitoring frequency to check mitigation effectiveness 6. Inform IEC, ER and EPD of the causes & actions taken for the exceedances 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed results 8. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Discuss amongst ER, ET and Contractor on the potential remedial actions 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly 3. Supervise the implementation of remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Require Contractor to propose remedial measures for the analysed problem 4. Ensure remedial measures are properly implemented 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated

* reduce to 70dB(A) for schools and 65dB(A) during school examination periods. ** to be selected based on Area Sensitivity Rating

Event and Action Plan for Water Quality.

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Trigger Level				
Trigger level being exceeded by one sampling day	Inform Contractor and IEC	Discuss with ET and Contractor on the mitigation measures		Rectify unacceptable practice
Trigger level being exceeded by more than two consecutive sampling days	Repeat in-situ measurements to confirm findings Identify source(s) of impact Inform contractor and IEC Check monitoring data, all plant, equipment and Contractor's working methods Discuss mitigation measures with ER and Contractor	Discuss with ET and Contractor on the mitigation measures Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly Assess effectiveness of the implemented mitigation measures	Discuss with ET and Contractor on the proposed mitigation measures Make agreement on the mitigation measures to be implemented Assess the effectiveness of the implemented mitigation measures EPD shall be informed by a report, summarising monitoring data, implemented mitigation measures, and the proposed actions to avoid further occurrence	Inform Engineer Rectify unacceptable practice Check all plant and equipment Consider changes of working methods Propose mitigation measures to ER and discuss with ET and ER Implement mitigation measures

Event and Action Plan for Water Quality.

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action Limit				
Action level being exceeded by one sampling day	Repeat in-situ measurements to confirm findings Identify source(s) of impact Inform contractor and IEC Check monitoring data, all plant, equipment and Contractor's working methods Discuss mitigation measures with ER and Contractor. Repeat measurements on the next day of exceedance	Discuss with ET and Contractor on the mitigation measures Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly Assess the effectiveness of the implemented mitigation measures	Discuss with IEC on the proposed mitigation measures Reach agreement on the mitigation measures to be implemented Assess the effectiveness of the implemented mitigation measures	Inform ER and confirm notification of the non-compliance in writing Rectify unacceptable practice Check all plant and equipment Consider changes of working methods Propose mitigation measures to ER/IEC and discuss with ET and ER/IEC Implement the agreed mitigation measures
Action level being exceeded by more than one consecutive sampling days.	Repeat in-situ measurement to confirm findings Identify source(s) of impact Inform Contractor and IEC Check monitoring data, all plant, equipment and Contractor's working methods Discuss mitigation measures with ER/IEC and Contractor Ensure mitigation measures are implemented Prepare to increase the monitoring frequency to daily Repeat measurements on the next day of exceedance	Discuss with ET and Contractor on the mitigation measures Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly Assess the effectiveness of the implemented mitigation measures	Discuss with IEC on the proposed mitigation measures Reach agreement on the mitigation measures to be implemented Assess the effectiveness of the implemented mitigation measures EPD shall be informed by a report summarising monitoring data, implemented mitigation measures, and the proposed actions to avoid further occurrence	Inform the Engineer and ER and confirm notification of exceedance in writing Rectify unacceptable practice Check all plant and equipment Consider changes of working methods Propose mitigation measures to ER/IEC within 3 working days upon notification and discuss with ET and the ER/IEC Implement the agreed mitigation measures

Event and Action Plan for Water Quality.

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Target Limit				
Target level being exceeded	Repeat in-situ measurement to confirm findings Identify source(s) of impact Inform Contractor, IEC and EPD Check monitoring data, all plant, equipment and Contractor's working methods Discuss mitigation measures with the IEC, ER and Contractor Ensure mitigation measures are implemented Increase the monitoring frequency to daily until no exceedance of Target level for two consecutive days	Discuss with ET and Contractor on the mitigation measures Review proposals on mitigation measures submitted by Contractor and advise ER accordingly Assess the effectiveness of the implemented mitigation measures	Discuss with IEC, ET and the Contractor on the proposed mitigation measures Request Contractor to critically review the working methods Assess the effectiveness of the implemented mitigation measures Consider and instruct if necessary, the Contractor to slow down or to STOP those works identified as giving rise to the exceedance, until no exceedance of Target level EPD shall be informed by a report, summarising monitoring data, implemented mitigation measures, and the proposed Actions to avoid further occurrence	Inform the Engineer and ER and confirm notification of exceedance in writing Rectify unacceptable practice Check all plant and equipment Review critically the working methods Propose mitigation measures to ER/IEC within 3 working days upon the notification and discuss with ET, the ER/IEC Implement the agreed mitigation measures As directed by the Engineer, to slow down or STOP all or part of the works identified as the cause for the exceedances

Appendix IV

Implementation Status of Mitigation Measures

Item No.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Responsible by	Location of the measure	Implementation period	Implementation status	Action required
1	Discharge from construction site must be controlled to comply with the standards for effluents discharged into the inland waters under the TM of the WPCO.	Apply a discharge license from EPD and comply to its requirement	Site Agent	Existing stream	Throughout the construction period	The license issued.	Maintain the mitigation measures
2	Tightly sealant closed grab excavators be employed in river sections where material to be handled is wet.	To minimise the leakage and loss of sediments during excavation	Foreman	Existing stream	Throughout the construction period	Implemented	
3	Enclose the channel work with sheetpile or earth bunds.	Avoid disturbance to water bodies	Site Agent	Existing stream	Throughout the construction period	Implemented	
4	Excavation preferably carried out during period of low flow (dry season) whenever possible.	To minimise downstream impacts on sensitive water bodies	Site Agent	Existing stream	Throughout construction period	Implemented	
5	Boundaries of earthwork should be marked and surrounded by dykes or embankment.	To prevent flood	Foreman	Perimeter of site limit	Feb 02 – Dec 03	Implemented	
6	Use earth buns or sand bags to guide surface water from earth work area to silt retention pond firstly.	To prevent direct discharge into stream	Foreman	Around earth work area	Feb 02 – Dec 03	Implemented	
7	Clean sediment traps and channels regularly. Daily inspections are required.	To ensure the effectiveness of sediment traps	Foreman	Effluent exit point and channel	Throughout construction period	Implemented	
8	Construct temporary / permanent perimeter U-channels as soon as possible.	Intercept surface runoff from site	Foreman	Along toe of embankment	Mar 03 – Oct 03	Implemented	
9	All traps (temporary or permanent) should also incorporate oil and grease removal facilities.	To intercept oil and grease into stream and channel	Foreman	Works area of channel	Feb 02 – Dec 03	Implemented	
10	Manholes should be covered or temporarily sealed.	To reduce odour and for safety purpose	Foreman	Manhole	Feb 02 – Dec 03	Implemented	
11	Open material storage stockpiles should be covered with tarpaulin or similar facilities.	To prevent material from washing away	Foreman	Earthwork stockpile	Feb 02 – Dec 03	Implemented	
12	Exposed soil areas should be minimised.	To reduce the risk of increased siltation and contamination of runoff	Foreman	All works area	Feb 02 - Dec 03	Implemented	
13	Earth final surfaces should be well compacted and subsequent permanent work should be immediately performed.	To reduce dust generation	Foreman	Embankments	Feb 02 - Dec 03	Implemented	
14	As much construction as possible should be undertaken between September and April.	To minimize soil erosion during rainy season and incorporates into project works programme.	Site Agent	Earthworks	Feb 02 - Dec 03	Implemented	

Item No.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Responsible by	Location of the measure	Implementation period	Implementation status	Action required
15	Water used for water testing and boring drilling works should be recirculated / reused as far as practicable.	To reduce the amount of wastewater	Foreman/Sub-contractor	Pipeworks, S.I.	Feb 02 – Dec 03	Not applicable in this stage	
16	Washwater from wheel washing facility should have sand or silt removed before discharging into stormwater drains.	To prevent site runoff from entering stormwater drain	Foreman	Wheel washing bay	Feb 02 – Dec 03	Implemented	
17	Provide desilting facility for water leaving works area.	To remove sand or silt in discharged water	Foreman	Effluent exit point	Feb 02 – Dec 03	Implemented	
18	All fuel tank and storage area should be provided with locks and be sited on sealed area, within bunds of capacity equal to 110% of storage capacity of the largest tank.	To prevent spillage of fuel oils or other polluting fluids to coastal water	Foreman	Fuel Tanks	Feb 02 – Dec 03	Implemented	
19	Backfall should be formed at site exit	To prevent site runoff from entering public road	Foreman	Site exit	Feb 02 – Dec 03	Implemented	
20	Portable toilet will be provided for on-site construction workforce and treated effluent should comply with the TM	To ensure all polluted water can be treated before discharge	Foreman	All works area	Feb 02 – Dec 03	Implemented	
21	General refuse generated on-site will be stored and collected separately from other construction and chemical wastes	The contractor will be responsible for the removal of waste	Foreman	All works area	Feb 02 – Dec 03	Implemented	
22	Both contaminated and uncontaminated dredged material have to be transported by water tight trucks to marine barging points	To avoid leakage of dredged material during transportation.	Truck driver	Truck	Feb 02 – Dec 03	Not applicable in this stage	
23	All vessels should be sized such that adequate clearance is maintained between vessels and the seabed at all states of tide	To ensure undue turbidity is not generated by turbulence from vessel movement or propeller wash	Barge Captain	Barge	Feb 02 – Oct 03	Not applicable in this stage	
24	The works should cause no visible foam, oil, grease, scum, litter or objectionable water to be present on the water within the site and dumping ground	To avoid pollution to water	Barge Captain	Barge	Feb 02 – Oct 03	Implemented	
25	Drain wet excavated material before disposal	Avoid leakage of wastewater during transportation	Foreman	Near location of excavation	Feb 02 – Oct 03	Implemented	
26	Lay sand bags or earth bun around wetted material stockpile.	Prevent seepage of muddy water.	Foreman	Around wet material stockpile	Feb 02 – Oct 03	Not applicable	
27	Employ barges fitted with tight fitting seals to their bottom openings	To prevent leakage of material during transportation.	Site Agent	Barge	Feb 02 – Oct 03	Not applicable in this stage	
28	Barges should not be loaded to full.	Prevent overflow of material during transportation.	Foreman	Barge	Feb 02 – Oct 03	Not applicable in this stage	

Item No.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Responsible by	Location of the measure	Implementation period	Implementation status	Action required
29	Contaminated material shall be transported to East Sha Chau for dumping.	To comply with EPDTC1-1-92, WBTC 22/92 and 6/92	Site Agent/ Foreman	East Sha Chau	Feb 02 – Oct 03	Not applicable in this stage	
30	Contaminated material be transported by split barge of capacity not less than 750 cu. M	To minimize environmental risk	Site Agent/ Foreman	Barge	Feb 02 – Oct 03	Not applicable in this stage	
31	Material should be placed in the pit by bottom dumping, at a location within the pit specified by FMC	To reduce loss of contaminated material	Barge Captain	Barge	Feb 02 – Oct 03	Not applicable in this stage	
32	Hoppers of barge should open and close rapidly.	Minimize wash away of material	Barge Captain	Barge	Feb 02 – Oct 03	Not applicable in this stage	
33	Keep barge stationary throughout the dumping operation and fixed to position to ± 10m	Minimize wash away of material	Barge Captain	Barge	Feb 02 – Oct 03	Not applicable in this stage	
34	Barge equipped with automatic self-monitoring devices	To ensure that loss of material does not take place during transportation.	Barge Captain	Barge	Feb 02 – Oct 03	Not applicable in this stage	
35	Solid C & D materials should be sorted by category (excavated material, construction waste for public dump, chemical waste and general refuse) for re-use, re-cycle and disposal.	To reduce volume of disposal to public fill.	Engineer/ Foreman	All works area	Feb 02 – Oct 03	Implemented	
36	Chemical wastes shall be collected in chemical waste collection bin and be disposed of in Tsing Yi Chemical Waste Treatment Centre by Enviropace.	To avoid land contamination	Foreman	On site at designated locations	Feb 02 – Dec 03	Implemented	
37	Approved licensed waste collectors are used	To reduce spreading of waste	Foreman	All works area	Feb 02 – Dec 03	Implemented	
38	Good site practice such as a) daily collection of general refuse or as often, b) regular maintenance and cleaning of waste storage area, c) storage of waste in suitable container/ receptable	To ensure on-site impacts are minimised	Foreman	All works area	Feb 02- Dec 03	Implemented.	
39	Whenever possible, use quiet plant.	To reduce level of construction noise.	Site Agent	All works area	Feb 02 – Dec 03	Implemented	
40	Reduction in the number of noisy plant operating simultaneously.	To reduce noise generation	Foreman	All works area	Feb 02 – Dec 03	Implemented	
41	Properly maintain construction plants.	To reduce noise generation.	Operator	All works area	Feb 02 – Dec 03	Implemented	
42	Place mobile plant as far away from NSRs as possible	To reduce noise to local residents	Foreman	All works area	Feb 02 – Dec 03	Implemented	

Item No.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Responsible by	Location of the measure	Implementation period	Implementation status	Action required
43	Plants should be turned off when idling.	Reduce noise generation.	Operator	All works area	Feb 02 – Dec 03	Implemented	
44	Materials should be stock around work area as far as possible.	To screen noise.	Site Agent/ Foreman	All works area	Feb 02 – Oct 03	Implemented	
45	3.5m high temporary noise barrier no further than 20m from plant should be erected between plants and Pok Wai	Reduce noise to local residents	Foreman	Within 20m of plant	Feb 02 – Oct 03	Not implemented	
46	No more than 2 plants be used within 50m of an NSR	Reduce noise level.	Foreman	Within 50m of NSRs	Feb 02 – Oct 03	Implemented	
47	No construction activities shall be undertaken within restricted hours under NCO unless a valid CNP is issued by the Authority.	To comply with EPD regulation	Site Agent	All works area	Feb 02 – Dec 03	No applicable	
48	Haul road should be located at a minimum distance of 60m from the nearest ASRs as far as possible.	To reduce quantity of loose particle on haul road and noise to ASRs	Site Agent /Foreman	Site haul road	Feb 02 – Dec 03	Implemented	
49	On site unpaved haul road that are frequently used should be regularly compacted and clear of loose material; water spraying to control dust.	To reduce and wet lose particles on haul road.	Foreman	Open unpaved area	Feb 02 – Dec 03	Implemented	
50	Limit vehicular speed to 11km/h max on site.	Minimize agitation of dust by traffic.	Foreman	Haul road	Feb 02 – Dec 03	Implemented	
51	11km/h speed limit sign be posted beside haul road.	To remind drivers of speed limit.	Foreman	Along side haul road	Feb 02 – Dec 03	Implemented	
52	All haul vehicles should receive a thorough wheel washing, 1 to 1.5 minutes, prior to exiting the site	To wash away dust particles adhered on vehicle	Foreman	Site exit	Feb 02 – Dec 03	Implemented	
53	Vehicles that have potential to create dust while transporting materials should have properly fitting side and tail boards. Materials transported by vehicles should be covered, with the cover properly secured and extended over the edges of the side and tail boards. The materials should also be dampened if necessary before transportation	Prevent dropping of material or dust generation during transportation	Foreman/ Driver	Trucks	Feb 02 – Dec 03	Implemented	
54	Stockpiled material should be removed off site as quickly as is practicable on a first-in, first-out (older material removed first).	To reduce dust generation	Foreman	All works area	Feb 02 – Dec 03	Implemented	

Item No.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concerns to address	Responsible by	Location of the measure	Implementation period	Implementation status	Action required
55	Water spray facilities should be provided and used both for damping during reception and storage of raw materials.	To reduce dust generation	Foreman	All works area	Feb 02 – Dec 03	Implemented	
56	Prompt re-vegetation of completed earthworks, surface compaction, regular wetting of the surface and the minimisation of the amount of soil exposed.	To reduce dust emission, amount of soil exposed and dust generation potential	Foreman	All works area	Feb 02 – Dec 03	Implemented	
57	Location of material stockpile should be as far as possible from ASRs including Pok Wai and Wing Kei Tsuen.	Minimize dust nuisance caused to ASRs.	Site Agent/ Foreman	All works area	Feb 02 – Dec 03	Implemented	
58	Sand and aggregates stockpile of more than 20 cu. m should be enclosed three sides with walls extending above the pile and 2m beyond the front of the pile.	Reduce exposed area and hence dust generation.	Foreman	All works area	Feb 02 – Dec 03	Implemented	
59	Odorous excavated material should be stockpiled as far as possible from ASRs.	Reduce concentration of odor.	Foreman	All works area	Feb 02 – Dec 03	Implemented	
60	Odorous excavated material should be removed as soon as possible.	Eliminate source of odor.	Foreman	All works area	Feb 02 – Dec 03	Implemented	
61	Any odorous permitted stockpiled material should be covered with plastic tarpaulin sheets if left for extended periods of time (in excess of 2 days).	To reduce odour nuisance at nearby ASRs	Foreman	All works area	Feb 02- Dec 03	Implemented	

Appendix V
Noise Monitoring Results

Summary report on Noise Monitoring Results

Location: NSR1 (Wing Kei Tsuen)

Date	Start Time	Wind Speed, m/s	Calibration before measurement, dB(A)	Calibration after measurement, dB(A)	Weather	Noise Sources	Noise Level, dB(A) (30 min)		
							L ₉₀	L ₁₀	L _{eq}
03-Oct-03	09:00	<5	93.8	93.8	Sunny	Noise generated from the containers pot.	56.5	62.5	59.0
07-Oct-03	13:35	<5	93.8	93.8	Sunny	Dogs barked	62.0	67.3	65.2
14-Oct-03	10:30	<5	93.8	93.8	Cloudy	Noise generated from the containers pot.	58.4	64.0	60.5
15-Oct-03	09:00	<5	93.8	93.8	Sunny	Vehicles noise	57.6	63.3	60.2
18-Oct-03	09:20	<5	93.8	93.8	Haze	Dogs barked	59.5	67.9	64.0
21-Oct-03	09:00	<5	93.8	93.8	Sunny	Noise generated from the containers pot.	57.1	64.0	61.7
25-Oct-03	10:20	<5	93.8	93.8	Sunny	Vehicles noise	59.2	64.9	61.9
28-Oct-03	13:05	<5	93.8	93.8	Sunny	Dogs barked	60.1	68.4	64.8

Appendix VI

Water Quality Monitoring Data

Summary report on water quality monitoring

Location: WMS1 (upstream station)

Date	Weather	Time	Temperature, °C	Total Suspended Solids, mg/L			Total Zinc, mg/L	
				Trial 1	Trial 2	Average	Trial 1	Trial 2
02-Oct-03	Sunny	10:40	29.0	24	24	24	<0.05	<0.05
03-Oct-03	Sunny	09:35	29.0	26	24	25	<0.05	<0.05
07-Oct-03	Sunny	14:15	28.5	23	21	22	<0.05	<0.05
09-Oct-03	Sunny	16:20	30.0	20	23	22	<0.05	<0.05
11-Oct-03	Rainy	10:00	28.0	34	35	35	<0.05	<0.05
14-Oct-03	Cloudy	09:30	27.0	28	29	29	<0.05	<0.05
16-Oct-03	Sunny	09:45	26.0	25	25	25	<0.05	<0.05
18-Oct-03	Haze	10:05	26.0	26	25	26	<0.05	<0.05
21-Oct-03	Sunny	09:35	25.5	19	21	20	<0.05	<0.05
23-Oct-03	Sunny	09:55	25.5	20	19	20	<0.05	<0.05
25-Oct-03	Sunny	09:25	25.5	22	20	21	<0.05	<0.05
28-Oct-03	Sunny	13:45	25.0	20	21	21	<0.05	<0.05
30-Oct-03	Sunny	09:45	25.5	19	21	20	<0.05	<0.05

Summary report on water quality monitoring

Location: WMS3 (downstream station)

Date	Weather	Time	Temperature, °C	Total Suspended Solids, mg/L			Total Zinc, mg/L	
				Trial 1	Trial 2	Average	Trial 1	Trial 2
02-Oct-03	Sunny	11:10	29.0	19	20	20	<0.05	<0.05
03-Oct-03	Sunny	10:05	29.5	18	18	18	<0.05	<0.05
07-Oct-03	Sunny	14:40	29.0	24	24	24	<0.05	<0.05
09-Oct-03	Sunny	16:55	30.0	25	24	25	<0.05	<0.05
11-Oct-03	Rainy	10:30	28.5	33	35	34	<0.05	<0.05
14-Oct-03	Cloudy	09:55	27.0	27	25	26	<0.05	<0.05
16-Oct-03	Sunny	10:15	26.5	22	22	22	<0.05	<0.05
18-Oct-03	Haze	10:30	26.0	24	25	25	<0.05	<0.05
21-Oct-03	Sunny	10:05	26.5	21	23	22	<0.05	<0.05
23-Oct-03	Sunny	10:25	25.5	20	18	19	<0.05	<0.05
25-Oct-03	Sunny	09:55	26.0	21	22	22	<0.05	<0.05
28-Oct-03	Sunny	14:15	25.5	19	21	20	<0.05	<0.05
30-Oct-03	Sunny	10:10	25.5	20	20	20	<0.05	<0.05

Appendix VII

Air Quality Monitoring Results

Summary report on 1-hour TSP monitoring

Location: ASR1 (Wing Kei Tsuen)

Date	Filter Weight, g		Elapse Time, hr		Sampling Time, hr	Weather Condition	Wind Direction	Flow rate (std. m ³ /min)	TSP Level, $\mu\text{g}/\text{m}^3$
	Initial	Final	Initial	Final					
02-Oct-03	2.8396	2.8567	4809.98	4810.98	1.00	Sunny	E	1.40	204
03-Oct-03	2.8324	2.8478	4810.98	4811.98	1.00	Sunny	E	1.40	183
06-Oct-03	2.8411	2.8560	4836.01	4837.01	1.00	Sunny	N	1.40	177
07-Oct-03	2.8463	2.8646	4837.01	4838.01	1.00	Sunny	N	1.42	215
14-Oct-03	2.8427	2.8570	4838.01	4839.01	1.00	Cloudy	N	1.42	168
15-Oct-03	2.8472	2.8627	4839.01	4840.01	1.00	Sunny	N	1.42	182
16-Oct-03	2.8352	2.8498	4864.12	4865.12	1.00	Sunny	N	1.42	171
17-Oct-03	2.8355	2.8526	4865.12	4866.12	1.00	Sunny	E	1.40	204
18-Oct-03	2.8326	2.8535	4866.12	4867.12	1.00	Haze	E	1.40	249
20-Oct-03	2.8463	2.8650	4891.27	4892.27	1.00	Sunny	NE	1.40	223
21-Oct-03	2.8422	2.8619	4892.27	4893.27	1.00	Sunny	E	1.40	234
23-Oct-03	2.8464	2.8644	4917.29	4918.29	1.00	Sunny	E	1.38	217
25-Oct-03	2.8401	2.8587	4918.29	4919.29	1.00	Sunny	E	1.38	225
27-Oct-03	2.8348	2.8533	4919.29	4920.29	1.00	Sunny	E	1.38	224
28-Oct-03	2.8490	2.8661	4944.29	4945.29	1.00	Sunny	E	1.38	207
30-Oct-03	2.8429	2.8616	4945.29	4946.29	1.00	Sunny	E	1.40	223

Summary report on 24-hour TSP monitoring

Location: ASR1 (Wing Kei Tsuen)

Date	Filter Weight, g		Elapse Time, hr		Sampling Time, hr	Weather Condition	Flow rate (std. m ³ /min)	TSP Level, $\mu\text{g}/\text{m}^3$
	Initial	Final	Initial	Final				
03-Oct-03	2.8356	3.0455	4811.98	4836.01	24.03	Sunny	1.40	104
15-Oct-03	2.8376	2.9999	4840.01	4864.12	24.11	Sunny	1.42	79
18-Oct-03	2.8313	3.0646	4867.12	4891.27	24.15	Haze	1.40	115
21-Oct-03	2.8449	3.0346	4893.27	4917.29	24.02	Sunny	1.40	94
27-Oct-03	2.8315	3.0501	4920.29	4944.29	24	Sunny	1.38	110

Appendix VIII
Site Inspection Reports

CONTRACT No.DC/2000/13 POK WAI DRAINAGE CHANNEL
WEEKLY ENVIRONMENTAL SITE INSPECTION REPORT – No. PW2003/40

Date of Inspection:	03/10/2003	Current Weather:	Sunny
Time of Inspection:	16:00	Weather Previous 24 Hrs.:	Sunny
1. Works in Progress:			
1.1 Formation of channel wall and base slab. 1.2 Installation of sheetpiles.			
2. Air Quality:			
2.1. Acceptable. Recommendations: - Maintain the watering activity.			
3. Noise:			
3.1 Works away from sensitive receivers - acceptable. Recommendations: - None at present.			
4. Waste Management:			
4.1 Refuses were found near the outlet. Recommendations: - Clear the refuses to avoid hygiene problem.			
5. Water Quality:			
5.1 Acceptable. Recommendations: - None at present.			
6. Status and Performance of Mitigation Measures:			
6.1 Wheel wash bay was operated at Wing Kei Tsuen. 6.2 Hoarding was erected. 6.3 Chemical waste storage area is available. 6.4 Water truck was in operation.			

Inspection carried out by: _____
Arthur Cheng
Environmental Scientist

Dated: 03/10/2003

**CONTRACT No.DC/2000/13 POK WAI DRAINAGE CHANNEL
WEEKLY ENVIRONMENTAL SITE INSPECTION REPORT – No. PW2003/41**

Date of Inspection:	08/10/2003	Current Weather:	Sunny
Time of Inspection:	14:30	Weather Previous 24 Hrs.:	Sunny
1. Works in Progress:			
1.3 Installation of sheetpiles. 1.4 Excavation and backfilling.			
2. Air Quality:			
2.1. Acceptable – site access was dampened.			
Recommendations: - None at present.			
3. Noise:			
3.1 Works away from sensitive receivers - acceptable.			
Recommendations: - None at present.			
4. Waste Management:			
4.1 Refuses were found in the channel.			
Recommendations: - Clear the refuses regularly.			
5. Water Quality:			
5.1 Acceptable.			
Recommendations: - None at present.			
6. Status and Performance of Mitigation Measures:			
6.1 Wheel wash bay was operated at Wing Kei Tsuen. 6.2 Hoarding was erected. 6.3 Chemical waste storage area is available. 6.4 Water truck was in operation.			

Inspection carried out by: _____
Arthur Cheng
Environmental Scientist

Dated: 08/10/2003

**CONTRACT No.DC/2000/13 POK WAI DRAINAGE CHANNEL
WEEKLY ENVIRONMENTAL SITE INSPECTION REPORT – No. PW2003/42**

Date of Inspection:	18/10/2003	Current Weather:	Sunny
Time of Inspection:	11:15	Weather Previous 24 Hrs.:	Sunny
1. Works in Progress:			
1.5 Installation of sheetpiles. 1.6 Excavation and backfilling. 1.7 Construction of retaining wall and drainage channel.			
2. Air Quality:			
2.1. Some portions of the haul road were dry with dust generation by site traffic. 2.2 Wheel washing bay was demolished.			
Recommendations: - Apply watering on all haul roads. - Make sure vehicles were clean before leaving the site.			
3. Noise:			
3.1 Noise was generated from sheetpiling works.			
Recommendations: - Complete the sheetpiling works as soon as possible to reduce nuisance.			
4. Waste Management:			
4.1 Stockpile of excavated materials was observed without cover.			
Recommendations: - Clear the excavated materials or cover it with impervious sheeting.			
5. Water Quality:			
5.1 Acceptable – discharge through sedimentation.			
Recommendations: - None at present.			
6. Status and Performance of Mitigation Measures:			
6.1 Hoarding was erected. 6.2 Chemical waste storage area is available. 6.3 Water truck was in operation. 6.4 Hose was provided for wheel washing.			

Inspection carried out by: _____
Arthur Cheng
Environmental Scientist

Dated: 18/10/2003

CONTRACT No.DC/2000/13 POK WAI DRAINAGE CHANNEL**WEEKLY ENVIRONMENTAL SITE INSPECTION REPORT – No. PW2003/43**

Date of Inspection:	25/10/2003	Current Weather:	Sunny
Time of Inspection:	14:45	Weather Previous 24 Hrs.:	Sunny
1. Works in Progress:	1.8 Extraction of sheetpiles. 1.9 Excavation and backfilling. 1.10 Construction of retaining wall and drainage channel.		
2. Air Quality:	2.1 Acceptable – no significant dust generation was observed. Recommendations: - Make sure vehicles were clean before leaving the site.		
3. Noise:	3.1 Noise was generated from sheetpiling works. Recommendations: - Complete the sheetpiling works as soon as possible to reduce nuisance.		
4. Waste Management:	4.1 Acceptable. Recommendations: - None at present.		
5. Water Quality:	5.1 Acceptable – discharge through sedimentation. Recommendations: - None at present.		
6. Status and Performance of Mitigation Measures:	6.1 Hoarding was erected. 6.2 Chemical waste storage area is available. 6.3 Water truck was in operation. 6.4 Hose was provided for wheel washing.		

Inspection carried out by: _____
Arthur Cheng
Environmental Scientist

Dated: 25/10/2003

CONTRACT No.DC/2000/13 POK WAI DRAINAGE CHANNEL
WEEKLY ENVIRONMENTAL SITE INSPECTION REPORT – No. PW2003/44

Date of Inspection:	29/10/2003	Current Weather:	Sunny
Time of Inspection:	09:45	Weather Previous 24 Hrs.:	Sunny
1. Works in Progress:			
1.11	Extraction of sheetpiles.		
1.12	Excavation and backfilling.		
1.13	Construction of retaining wall and drainage channel.		
2. Air Quality:			
2.1 Dust generation by site traffic on some haul roads was observed.			
Recommendations:			
- Make sure vehicles were clean before leaving the site.			
- All haul roads should be dampened regularly.			
- Loads on dump trucks should be covered before leaving the site.			
3. Noise:			
3.1 Noise was generated from sheetpiling works.			
Recommendations:			
- Complete the sheetpiling works as soon as possible to reduce nuisance.			
4. Waste Management:			
4.1 Acceptable – most stockpiles were removed.			
Recommendations:			
- None at present.			
5. Water Quality:			
5.1 Acceptable – small amount of discharge through sedimentation tanks.			
Recommendations:			
- None at present.			
6. Status and Performance of Mitigation Measures:			
6.1 Hoarding was erected.			
6.2 Chemical waste storage area is available.			
6.3 Water truck was in operation.			
6.4 Hose was provided for wheel washing.			

Inspection carried out by: _____
 Arthur Cheng
 Environmental Scientist

Dated: 29/10/2003

Appendix IX

Complaint Log

Complaint Log

CONTRACT No. DC/2000/13 CONSTRUCTION OF POK WAI DRAINAGE CHANNEL – ENVIRONMENTAL COMPLAINT LOG.					
Complaint Log No.	Date of Complaint Received	Description	Actions	Closing Date	Remarks

APPENDIX X

Cumulative Statistics on Complaints, Notifications of Summons and Successful Prosecutions

Cumulative Statistics on Complaints

Environmental Parameters	Cumulative No. Brought Forward	No. of Complaints This Month			Cumulative Number to Date
		Air	Noise	Water	
Air	0	---	---	---	
Noise	0	---	---	---	
Water	0	---	---	---	
Waste	0	---	---	---	
Total	0	---	---	---	

APPENDIX XI

Monitoring Schedule for the Following Three Months

Construction of Pok Wai Drainage Channel
Environmental Monitoring Schedule
November 2003

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						November 1
						Noise Water
2	3	4	5	6	7	8
24-hr TSP	1-hr TSP	1-hr TSP Water Noise		Site Inspection Water 1-hr TSP		24-hr TSP 1-hr TSP Noise Water
9	10	11	12	13	14	15
		1-hr TSP Water Noise		1-hr TSP Site Inspection Water	1-hr TSP 24-hr TSP	1-hr TSP Water Noise
16	17	18	19	20	21	22
		Water Noise 1-hr TSP		24-hr TSP Site Inspection Water 1-hr TSP		Noise Water 1-hr TSP
23	24	25	26	27	28	29
		Water Noise 1-hr TSP	1-hr TSP 24-hr TSP	Site Inspection Water 1-hr TSP		Noise Water 1-hr TSP
30						

- Notes:
1. Noise: daytime noise monitoring (twice a week) conducted at Wing Kei Tsuen. (6 x 5 minutes)
 2. Water: water quality monitoring (three times per week) at stations WMS1 (upstream) and WMS3 (downstream).
 3. 24-hr TSP (once in every 6 days) conducted at Wing Kei Tsuen.
 4. 1-hr TSP (three times in every 6 days) conducted at Wing Kei Tsuen.
 5. Site inspection: once a week

Construction of Pok Wai Drainage Channel
Environmental Monitoring Schedule
December 2003

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	December 1	2	3	4	5	6
		1-hr TSP Water Noise 24-hr TSP		Site Inspection Water 1-hr TSP		1-hr TSP Noise Water
7	8	9	10	11	12	13
	24-hr TSP	1-hr TSP Water Noise		Site Inspection Water 1-hr TSP		1-hr TSP Noise Water
14	15	16	17	18	19	20
24-hr TSP		1-hr TSP Water Noise	1-hr TSP	1-hr TSP Site Inspection Water		24-hr TSP 1-hr TSP Water Noise
21	22	23	24	25	26	27
	Water Noise 1-hr TSP		Site Inspection Water 1-hr TSP		24-hr TSP	Noise Water 1-hr TSP
28	29	30	31			
	1-hr TSP	Water Noise 1-hr TSP				

- Notes:
1. Noise: daytime noise monitoring (twice a week) conducted at Wing Kei Tsuen. (6 x 5 minutes)
 2. Water: water quality monitoring (three times per week) at stations WMS1 (upstream) and WMS3 (downstream).
 3. 24-hr TSP (once in every 6 days) conducted at Wing Kei Tsuen.
 4. 1-hr TSP (three times in every 6 days) conducted at Wing Kei Tsuen.
 5. Site inspection: once a week

Construction of Pok Wai Drainage Channel
Environmental Monitoring Schedule
January 2004

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				January 1	2	3
				24-hr TSP	Site Inspection Water 1-hr TSP	1-hr TSP Noise Water
4	5	6	7	8	9	10
		1-hr TSP Water Noise	1-hr TSP 24-hr TSP	Site Inspection Water 1-hr TSP		1-hr TSP Noise Water
11	12	13	14	15	16	17
		24-hr TSP 1-hr TSP Water Noise		1-hr TSP Site Inspection Water		1-hr TSP Water Noise
18	19	20	21	22	23	24
	24-hr TSP Water 1-hr TSP	Noise Water 1-hr TSP	Site Inspection Noise Water 1-hr TSP			
25	26	27	28	29	30	31
24-hr TSP	1-hr TSP	Water Noise 1-hr TSP		1-hr TSP Site Inspection Water		24-hr TSP 1-hr TSP Water Noise

- Notes:
1. Noise: daytime noise monitoring (twice a week) conducted at Wing Kei Tsuen. (6 x 5 minutes)
 2. Water: water quality monitoring (three times per week) at stations WMS1 (upstream) and WMS3 (downstream).
 3. 24-hr TSP (once in every 6 days) conducted at Wing Kei Tsuen.
 4. 1-hr TSP (three times in every 6 days) conducted at Wing Kei Tsuen.
 5. Site inspection: once a week