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## **EXECUTIVE SUMMARY**

This is the sixth monthly Environmental Monitoring and Audit (EM&A) report prepared by Maunsell Environmental Management Consultants Limited (MEMCL), the designated Environmental Team (ET), for the Project "Fill Bank at Tuen Mun Area 38 – Stage 2". This report presents the results of EM&A works conducted in the month of December 2005.

In the reporting month, the following work activities took place during the reporting period:

### *Work Activities:*

- Public fill operation
- Operation of tipping hall
- Hydroseeding to slope surface

Monitoring of 1-hour Total Suspended Particulates (TSP) and 24-hour TSP at two designated monitoring stations and water quality at four designated monitoring stations were performed. The monitoring results were checked and reviewed. Site inspections were conducted on weekly basis. The implementation of the environmental mitigation measures, Event and Action Plans and environmental complaint handling procedures were also implemented.

## **Environmental Monitoring Works**

### **Air Quality**

All measured 1-hour TSP concentrations in the reporting month were below the Action and Limit (AL) Levels.

Two Action and two Limit Level exceedances were recorded for 24-hour TSP concentration. The exceedances were concluded due to poor regional air quality and the dry weather. No exceedance was recorded at subsequent monitoring events.

### **Water Quality**

For water quality monitoring, twelve exceedances (eight Action and four Limit Level) were recorded during the reporting month. All exceedances were concluded not due to the Project-works.

## **Implementation Status of Environmental Mitigation Measures**

The following key observations were made during site inspection with regards to the implementation status of environmental mitigation measures:

- The Contractor was reminded to collect and clear general refuse regularly.
- The Contractor was reminded to repair the tarpaulin at the tipping hall.

## **Environmental Complaints and Prosecution**

No complaint, summons or prosecution related to environmental issues was made against the Project in the reporting period.

## **Future Key Issues**

Key issues to be considered in the coming month include:

- Dust generation from activities on-site, such as vehicular movements along unpaved area.
- Noise impact from operating equipment and machinery on-site.
- Uncontrolled wastewater and surface runoff from the construction site discharge into nearby water body.
- Storage and using of chemicals/fuel and chemical waste/waste oil on site.

## 1. INTRODUCTION

### Background

- 1.1 Maunsell Environmental Management Consultants Limited (MEMCL) (hereinafter called the “ET”) was appointed by Concentric – Penta-Ocean Joint Venture (hereinafter called the “Contractor”) to undertake Environmental Monitoring and Audit for “Fill Bank at Tuen Mun Area 38 – Stage 2” (hereinafter called the “Project”). Under the requirements of Section 4 of Environmental Permit EP-210/2005, EM&A programme as set out in the Project Profile is required to be implemented.

### Project Organisation

- 1.2 The structure of the environmental management team is shown in Figure 1.1. Contacts of key environmental staff of the Project are shown in Appendix K.

### Construction Works undertaken during the Reporting Month

- 1.3 The work activities undertaken in December 2005 were:

*Work Activities:*

- Public fill operation
- Operation of tipping hall
- Hydroseeding to slope surface

- 1.4 A layout plan of the Project is provided in Figure 1.2.

### Summary of EM&A Requirements

- 1.5 The EM&A programme requires environmental monitoring for air quality, water quality and waste management. The EM&A requirements for each parameter are described in subsequent sections, including:
- All monitoring parameters;
  - Action and Limit Levels for all environmental parameters;
  - Event and Action Plans;
  - Environmental mitigation measures, as recommended in the project EIA final report;
  - Environmental requirements in contract documents.
- 1.6 The environmental licensing and permits are described in Section 6.
- 1.7 The advice on the implementation status of environmental protection and pollution control/mitigation measures is summarized in Section 6 of the Report.

## 2. AIR QUALITY MONITORING

### Monitoring Requirements

- 2.1 1-hour TSP and 24-hour TSP monitoring was conducted to monitor the air quality. Appendix A shows the established Action and Limit Levels for the environmental monitoring works.

### Monitoring Equipment

- 2.2 A High Volume Sampler (HVS – Model GMWS-2310 Accu-Vol) complete with the appropriate sampling inlets was installed for the 24-hour TSP sampling. The HVS met all the requirements of the approved EM&A Manual. Portable dust meter was used to carry out the 1-hour TSP monitoring. Table 2.1 summarises the equipment that was used in the dust monitoring programme.

**Table 2.1 TSP Monitoring Equipment**

Equipment	Model
HVS (for 24-hr TSP measurement)	GMWS 2310 Accu-Vol system
Calibration Kit (for HVS)	GMW 25
Dust Meter (for 1-hr TSP measurement)	Laser Dust Monitor – Model LD-3

### Monitoring Parameters, Frequency and Duration

- 2.3 The monitoring parameters and frequency are summarised in Table 2.2. The monitoring schedule for the reporting month is shown in Appendix B.

**Table 2.2 Air Quality Monitoring Parameters and Frequency**

Location	Parameter	Duration	Frequency
A1, A2	1-hour TSP	1 hour	3 times every 6 days
	24-hour TSP	24 hours	Once every six days

### Monitoring Locations

- 2.4 In accordance with the EM&A Manual, two air quality monitoring stations, namely A1 and A2, were selected for the 1-hour TSP and 24-hour TSP sampling. The monitoring stations are shown in Figure 2.1.

### Monitoring Methodology

#### 24-hour TSP Monitoring

##### *Installation*

- 2.5 The HVS was installed in the vicinity of the air sensitive receivers. The following criteria were considered in the installation of the HVS.
- A horizontal platform with appropriate support to secure the sampler against gusty wind was provided.
  - The distance between the HVS and any obstacles, such as buildings, was at least twice the height that the obstacle protrudes above the HVS.

- A minimum of 2 meters separation from walls, parapets and penthouses was required for rooftop sampler.
- No furnace or incinerator flues were nearby.
- Airflow around the sampler was unrestricted.
- Permission was obtained to set up the samplers and to obtain access to the monitoring station.
- A secure supply of electricity was obtained to operate the sampler.

*Preparation of Filter Papers by ALS Technichem (HK) Pty Ltd.*

- Glass fibre filters, G810 were labeled and sufficient filters that were clean and without pinholes were selected.
- All filters were equilibrated in the conditioning environment for 24 hours before weighing. The conditioning environment temperature was around 25 °C and not variable by more than  $\pm 3$  °C; the relative humidity (RH) was < 50% and not variable by more than  $\pm 5$ %. A convenient working RH was 40%.
- *ALS Technichem (HK) Pty Ltd.* has comprehensive quality assurance and quality control programmes.

*Field Monitoring*

- The power supply was checked to ensure the HVS works properly.
- The filter holder and the area surrounding the filter were cleaned.
- The filter holder was removed by loosening the four bolts and a new filter, with stamped number upward, on a supporting screen was aligned carefully.
- The filter was properly aligned on the screen so that the gasket formed an airtight seal on the outer edges of the filter.
- The swing bolts were fastened to hold the filter holder down to the frame. The pressure applied should be sufficient to avoid air leakage at the edges.
- Then the shelter lid was closed and was secured with the aluminum strip.
- The HVS was warmed-up for about 5 minutes to establish run-temperature conditions.
- A new flowrate record sheet was set into the flow recorder.
- The flow rate of the HVS was checked and adjusted at around 1.2 m<sup>3</sup>/min. The range specified in the EM&A Manual was between 0.6-1.7 m<sup>3</sup>/min.
- The programmable timer was set for a sampling period of 24 hrs  $\pm$  1 hr, and the starting time, weather condition and the filter number were recorded.
- The initial elapsed time was recorded.
- At the end of sampling, the sampled filter was removed carefully and folded in half length so that only surfaces with collected particulate matter were in contact.
- It was then placed in a clean plastic envelope and sealed.
- All monitoring information was recorded on a standard data sheet.
- Filters were sent to *ALS Technichem (HK) Pty Ltd.* for analysis.

*Maintenance & Calibration*

- The HVS and its accessories are maintained in good working condition, such as replacing motor brushes routinely and checking electrical wiring to ensure a continuous power supply.
- HVS is calibrated at bi-monthly intervals using GMW-25 Calibration Kit throughout all stages of the air quality monitoring.

**1-hour TSP Monitoring**

*Monitoring Procedures*

2.6 The measuring procedures of the 1-hour TSP by a dust meter are in accordance with the Manufacturer's Instruction Manual as follows:

- Set POWER to "ON", push BATTERY button, make sure that the meter's indicator is in the range with a red line and allow the instrument to stand for about 3 minutes (Then, the air sampling inlet has been capped).

- Push the knob at MEASURE position.
- Push “O-ADJ” button. (Then meter’s indication is 0).
- Push the knob at SENSI ADJ position and set the meter’s indication to S value described on the Test Report using the trimmer for SENSI ADJ.
- Pull out the knob and return it to MEASURE position.
- Push “START” button.

#### *Maintenance and Calibration*

- The 1-hour TSP Dust Meter would be verified at 1-year intervals throughout all stages of the construction phase monitoring.
- The calibration status of the HVS and direct dust meters is summarised in Appendix G.

#### **Results and Observations**

- 2.7 Dust monitoring was conducted as scheduled in the reporting month. All monitoring data are provided in Appendix C.
- 2.8 Wind speed and wind direction data were obtained from a Hong Kong Observatory meteorological station situated in Tuen Mun. The meteorological data is presented in Appendix D.
- 2.9 Monitoring of 1-hour and 24-hour TSP was conducted on 15 and 6 occasions respectively in December 2005. The monitoring schedule for the reporting month is presented in Appendix B.
- 2.10 24-hour TSP monitoring at A2 was cancelled on 1 and 7 December 2005 due to power failure of the electric supply. The electric supply was restored on 11 December 2005 and 24-hour TSP monitoring at A2 was carried out as scheduled.
- 2.11 All measured 1-hour TSP concentrations were below the AL Levels. No exceedance was recorded in the reporting month.
- 2.12 Two Action and two Limit Level exceedances were recorded for 24-hour TSP concentration. The exceedances were concluded due to poor regional air quality and dry weather. No exceedance was recorded at subsequent monitoring events.

### 3. WATER QUALITY MONITORING

#### Monitoring Requirements

- 3.1 Water quality monitoring was conducted at four monitoring stations. Appendix A shows the established Action and Limit Levels for water quality.

#### Monitoring Equipment

- 3.2 Water samples were collected at surface at selected sampling locations by water sampler. The parameters of Dissolved Oxygen (DO) and Turbidity were measured *in-situ* and the Suspended Solids (SS) were analysed in a Hong Kong Laboratory Accreditation Scheme (HOKLAS) accredited laboratory. The water quality monitoring equipment deployed are described in Table 3.1

**Table 3.1 Water Quality Monitoring Equipment**

Equipment	Model and Make
DO and Temperature Meter, Salinity Meter and Turbidimeter	YSI Model 6820 CE-C-M-Y
Positioning Equipment	Magellan 5000
Water Depth Detector	Eagle cuda 168
Water Sampler	Kahlsico Water Sampler 2 L with messenger

#### Monitoring Parameters, Frequency and Duration

- 3.3 Table 3.2 summarises the monitoring parameters and frequency of impact water quality monitoring. The monitoring schedule for the reporting month is provided in Appendix B.

**Table 3.2 Water Quality Monitoring Parameters and Frequency**

Monitoring Stations	Parameter, unit	Frequency	No. of Depths
<i>Control Stations:</i> FC1 & FC2	Depth, m Temperature, °C Salinity, ppt	Three times per week	Three (Surface, Mid-Depth and Bottom)
<i>Impact Stations:</i> FM1 – FM2	DO, mg/L DO Saturation, % Turbidity, NTU SS, mg/L		

#### Monitoring Locations

- 3.4 As stipulated in the EM&A requirement, impact monitoring at four designated stations was undertaken during the construction phase. The monitoring locations are shown in Figure 3.1. The two impact stations, namely FM1 and FM2, were chosen on their proximity to the site boundary, which would be under the greatest potential for water quality impacts. Two control stations, namely FC1 and FC2, were also set up for ebb and flood tide respectively for reference of the ambient water quality in the region.

### Monitoring Methodology

3.5 The following procedures were adopted for DO, temperature, salinity, turbidity and suspended solids measurement:

#### *Instrumentation*

3.6 The *in-situ* water quality parameters, viz. dissolved oxygen, temperature, salinity and turbidity were measured by a multi-parameter meter (*Model: YSI6820 CE-C-M-Y*).

#### *Operating/Analytical Procedures*

3.7 Given that all water monitoring stations had water depths over 6 m, all *in-situ* measurements and samplings were conducted at 3 water depths, namely 1 m below water surface, mid-depth and 1 m from seabed.

3.8 At each sampling depth, duplicate readings of dissolved oxygen content and turbidity were taken. The probes were retrieved out of the water after the first measurement and then re-deployed for the second measurement. Where the difference between the first and second readings of each set was more than 25% of the value of the first reading, a third measurement would be conducted to ensure data precision.

3.9 Water samples were collected by water samplers and stored in polyethylene bottles. Sampling bottles were pre-rinsed with the same water samples. The sample bottles were then packed into a cool-box kept at 4°C, and delivered to a HOKLAS accredited laboratory, *ALS Technichem (HK) Pty Ltd.* for the analysis of suspended solids. For QA/QC, one duplicate sample from each batch of 20 samples was analysed as required by the HOKLAS. The QC results are summarized in Appendix F.

#### *Maintenance and Calibration*

3.10 Before each round of monitoring, the dissolved oxygen probe of YSI 6820 was calibrated by the wet bulb method.

3.11 The monitoring instruments were checked, calibrated and certified by a laboratory accredited under HOKLAS before use and subsequently re-calibrated at 3-monthly intervals throughout all stages of the water quality monitoring. Calibration records are shown in Appendix G.

### Laboratory Analysis

3.12 All laboratory work was carried out by *ALS Technichem Pty. Ltd.* Water samples of about 1,000 ml were collected at the monitoring stations for carrying out the laboratory determinations. The determination works started within 24 hours after collection of the water samples. The analysis followed the standard methods according to Table 3.3 and as described in APHA Standard Methods for the Examination of Water and Wastewater.

**Table 3.3 Analytical Methods to be applied to Water Quality Samples**

Determinant, unit	Standard Method
Total Suspended Solids, mg/L	APHA 20 <sup>th</sup> ed 2540D

### QA/QC Procedure

3.13 *ALS Technichem Pty. Ltd.* Has comprehensive quality assurance and quality control programmes. For QA/QC procedures, at least one duplicate sample was analysed for every batch of 20 samples as

required by HOKLAS. The QA/QC results are summarised in Appendix F.

### Results and Observations

- 3.14 Water quality monitoring was conducted at the 4 designated monitoring stations. All monitoring data are provided in Appendix E.
- 3.15 Monitoring of water quality was conducted on 12 occasions in December 2005.
- 3.16 The QA/QC results for laboratory testing in the reporting month were acceptable. The QA/QC results are summarised in Appendix F.
- 3.17 The exceedances are summarised in Table 3.4.

**Table 3.4 Water Quality Exceedance Summary**

Tide	Monitoring Stations	Exceedance Level	Parameters				
			Dissolved Oxygen		Turbidity	Suspended Solids	TOTAL
			Surface and Middle	Bottom			
Mid -Ebb	FM1	Action	1	0	1	1	3
		Limit	0	0	0	2	2
	FM2	Action	1	0	0	1	2
		Limit	0	0	0	1	1
Mid -Flood	FM1	Action	0	0	0	1	1
		Limit	0	0	0	0	0
	FM2	Action	1	0	0	1	2
		Limit	0	0	0	1	1
<b>Total</b>		<b>Action</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>4</b>	<b>8</b>
		<b>Limit</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>

#### *Turbidity and Suspended Solids*

- 3.18 A total of twelve exceedances (eight Action and four Limit Level) were recorded. Field observation confirmed that no sediment plume observed from the Fill Bank. The recorded levels were within the respective baseline data range. The exceedances were due to natural variation and not Project-related.

#### 4. LANDSCAPE AND VISUAL

##### Landscape and Visual Audit

- 4.1 Landscape and visual site audit was carried out on a monthly basis to monitor environmental issues on the construction sites to ensure that all mitigation measures were implemented timely and properly. The findings in December 2005 were.
- The maximum stockpiling height at the Fill Bank was limited to a maximum of +40 mPD;
  - The Contractor hydroseeded the outer slopes of the Fill Bank as far as practicable;
  - The Contractor removed the stockpile of public fill in a sequence to allow the outer hydroseeded to be removed later than other portions as far as practicable;
  - *Casuarina equisetifolia* were planted as buffer tree along the northern perimeter of the Site. The height of *Casuarina equisetifolia* was maintained at least 3000mm above soil level; and
  - Lighting was set to minimise nighttime glare.

#### 5. WASTE MANAGEMENT

##### Waste Generation Schedule

- 5.1 The actual amounts of different types of waste generated by the activities of the Project in the month are shown in Table 5.1.

**Table 5.1 Actual Amounts of Waste Generated in December 2005**

Waste Type	Actual Amount	Disposal Locations
Public fill collected	188,710 m <sup>3</sup>	-
C&D waste	120 tonne	WENT Landfill
Chemical waste	0 Litre	Chemical Waste Treatment Centre

## 6. ENVIRONMENTAL AUDIT

### Site Environmental Audit

- 6.1 Site audit was carried out on a weekly basis to monitor environmental issues on the construction sites to ensure that all mitigation measures were implemented timely and properly. A summary of the site audits in December 2005 is provided in Appendix H.

### Review of Environmental Monitoring Procedures

- 6.2 The monitoring works conducted by the monitoring team were inspected internally on a regular basis. The following observations have been recorded for the monitoring works:

#### *Air Quality Monitoring*

- The monitoring team recorded all observations around the monitoring station within and outside of the construction site.
- The monitoring team recorded the temperature, air pressure and weather conditions on the monitoring day.

#### *Water Quality Monitoring*

- The monitoring team recorded all observations around the monitoring stations, which might affect the monitoring results.
- Major water pollution sources were identified and recorded.

### Status of Environmental Licensing and permitting

- 6.3 All permits/licences/notifications obtained as of the reporting period are summarised in Table 6.1

**Table 6.1 Summary of Environmental Notification, Licensing and Permit Status**

Description	Permit No.	Date of Issue	Date of Expiry	Status
Environmental Permit	EP-210/2005	25 February 2005	-	Issued
Registration of waste producer	5296-421-P280 0-21	13 July 2005	-	Registered

### Implementation Status of Environmental Mitigation Measures

- 6.4 Weekly site inspections were carried out on 1, 7, 14, 21, 31 December 2005. The following observations and recommendations were made:
- 6.5 The haul road adjacent to RTT was dry [7,14/12/05]

### Implementation Status of Event and Action Plans

- 6.6 The Event and Action Plans for air quality and water quality are presented in Appendix I.
- 6.7 No exceedance of Action and Limit Levels for 1-hour TSP concentrations was recorded.

- 6.8 Two Action and two Limit Level exceedance was recorded for 24-hour TSP concentration. The exceedances were concluded due to poor regional air quality. No exceedance was recorded at subsequent monitoring events.
- 6.9 For water quality monitoring, twelve exceedances (eight Action and four Limit Level) were recorded during the reporting month. All exceedances were concluded not due to the Project-works.

### **Implementation Status of Environmental Complaint Handling Procedures**

#### *Summary of the Complaints and Prosecutions*

- 6.10 Appendix J presents the environmental complaint flow diagram and the complaint log of the Project.
- 6.11 No complaint, summon or prosecution related to environmental issues was received or made against the Project in the reporting month.

## **7. FUTURE KEY ISSUES**

### **Key Issues for the Coming Month**

- 7.1 Key issues to be considered in the coming month include:
- Dust generation from activities on-site, such as vehicular movements along unpaved area.
  - Noise impact from operating equipment and machinery on-site.
  - Uncontrolled wastewater and surface runoff from the construction site discharge into nearby water body.
  - Storage and using of chemicals/fuel and chemical waste/waste oil on site.
- 7.2 To mitigate against the predicted impact arising from the scheduled works activities, the following mitigation measures are proposed:
- Regularly water of haul road, exposed area and stockpiles
  - Properly maintain all equipment at good working condition.
  - Avoid stockpiling fill materials near the seafront.
  - Store all chemical waste at designated chemical waste store.

### **Environmental Monitoring Program for the Next Three Months**

- 7.3 Tentative dust and water monitoring and site inspection schedule for the coming three months is shown in Appendix B.

## 8. CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

- 8.1 Environmental impact monitoring was performed in December 2005. All monitoring results in the reporting month were checked and reviewed.
- 8.2 All measured 1-hour TSP concentrations in the reporting month were below the AL Levels. Two Action and two Limit Level exceedances were recorded for 24-hour TSP concentration. The exceedances were concluded due to poor regional air quality. No exceedance was recorded at subsequent monitoring events.
- 8.3 For water quality monitoring, twelve exceedances (eight Action and four Limit Level) were recorded during the reporting month. All exceedances were concluded not due to the Project's works.
- 8.4 No complaint, summons or prosecution related to environmental issues was made against the Project in the reporting month.

### Recommendations

- 8.5 According to the environmental audits performed and the tentative construction programme in the reporting month, the following recommendations are made:

#### *Dust Impact*

- To prohibit any open burning on site.
- To water all haul roads, exposed area and stockpiles.

#### *Noise Impact*

- To regularly maintain the machinery and vehicles on site.

#### *Water Impact*

- To minimise water discharge and surface runoff into nearby water body.
- To minimise soil loss to nearby water body.

#### *Waste/Chemical Management*

- To check for any accumulation of waste materials or rubbish on site.
- To avoid any discharge of chemical waste or oil directly from the site.