DRAINAGE SERVICES DEPARTMENT

TAI PO SEWAGE TREATMENT WORKS - STAGE V PHASE 1

Baseline Environmental Monitoring Report

Version 2.0

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Certified By

(Environmental Team Leader)

REMARKS:

The information supplied and contained within this report is, to the best of our knowledge, correct at the time of printing.

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EXECUTIVE SUMMARY

1. This Baseline Environmental Monitoring Report is prepared by Cinotech Consultants Ltd. for the Project of "Tai Po Sewage Treatment Works – Stage V Phase I". This report presents the baseline air quality and noise monitoring works performed between 13 and 27 July 2005.

Air Quality

2. The baseline 1-hour and 24-hour TSP (Total Suspended Particulates) monitoring was conducted at three designated locations in the baseline monitoring period. During the monitoring, there was no major dust generating activities undertaken in the vicinity of the monitoring stations. Data collected was reviewed and analyzed to determine the Action and Limit Levels for air quality during impact monitoring throughout the construction of the Project. Details of the methodology, locations and results are presented in the report.

Noise

3. Baseline noise monitoring was conducted at one designated monitoring stations. Noise levels at the designated monitoring station were measured continuously for 24 hours for a period of 14 days. The baseline noise monitoring data was processed according to the following periods:
   - Daytime: 0700-1900 hours on normal weekdays
   - Evening-time: 1900-2300 hours on non-holidays
   - Holiday-time: 0700-2300 hours on general holidays including Sundays
   - Night-time: 2300-0700 hours of next day

1 INTRODUCTION

Background

1.1 Tai Po Sewage Treatment Works (TPSTW) is located within the Tai Po Industrial Estate. It currently comprises four Stages: I, II, IVA and IVB works. The TPSTW - Stage V aims to upgrade the existing STW to provide additional sewage treatment capacity from the present design flow of 88,000 m^3/day to 130,000 m^3/day to meet the demands of both the existing and future developments, and to meet the revised discharge license requirements.

1.2 The TPSTW Stage V is a Designated Project under the Environmental Impact Assessment Ordinance (Cap. 449). A study of environmental impact assessment (EIA) was undertaken to evaluate various environmental impacts associated with the works. An EIA Report as well as an Environmental Monitoring and Audit (EM&A) Manual were approved by the Environmental Protection Department (EPD) on 28 October 2004.

1.3 The Stage V works will be implemented in 2 phases. The design capacities of Phase 1 and Phase 2 works are 100,000 m^3/d and 130,000 m^3/d respectively. An Environmental Permit (EP) No. EP-202/2004 was issued on 29 November 2004 for the TPSTW Stage V Phase I to the Drainage Services Department (DSD) as the Permit Holder. A master construction programme of the Project is provided in Appendix E.

1.4 Cinotech Consultants Ltd. was designated as the Environmental Team (ET) to undertake the EM&A works for the Project. This Baseline Environmental Monitoring Report (the Report) is prepared by Cinotech for the Project prior to the commencement of construction activity in accordance with the EM&A Manual.

Purpose of the Report

1.5 The purpose of the Report is to set out baseline levels for the air quality and noise in accordance with the EM&A Manual. These baseline levels will be used as the basis for compliance check during the impact monitoring in construction stage of the Project. This Report presents the locations, equipment, period, methodology, results and observations for the air and noise monitoring during the baseline period.

Structure of the Baseline Monitoring Report

1.6 The structure of the Report is summarized as follows:

Section 1: Introduction, purpose, background and the structure of the report.
Section 2: Air Quality, which describes the baseline air quality monitoring.
Section 3: Noise, which describes the baseline noise monitoring.
Section 4: Revisions for inclusion in the EM&A Manual
Section 5: Conclusions

2 AIR QUALITY

Monitoring Requirements

2.1 In accordance with the EM&A Manual, baseline air quality monitoring should be conducted for a period of fourteen days, in terms of 1-hour and 24-hour Total Suspended Particulates (TSP). Monitoring of 1-hour TSP was carried out three times per day while that of 24-hour TSP was conducted once everyday for 14 consecutive days.

Monitoring Equipment

2.2 Both 1-hour TSP monitoring and continuous 24-hour TSP air quality monitoring was performed using High Volume Sampler (HVS) associated with equipment and shelter complied with the specifications stipulated in the EM&A Manual. Table 2.1 summarizes the equipment used in the baseline air quality monitoring programme. Copies of the calibration certificates for the equipment are presented in Appendix A1.

Table 2.1 Air Quality Monitoring Equipment

Equipment	Model and Make	Qty.
HVS	Graseby GMW 2310 HVS, Model GS-2310105-1	5
	Tisch Environmental, Inc.; Model no. TE-5170	1
Calibrator	Anderson Instruments, Inc.; Model no.: G25A	1

Monitoring Locations

2.3 Baseline air quality monitoring was conducted at the 3 monitoring stations, as shown in Figure 1.2. Table 2.2 describes the locations of the air quality monitoring stations.

Table 2.2 Air Quality Monitoring Locations

Monitoring Stations	Description	Location of Measurement
CAM1	Government Staff Quarters	On flat roof
CAM2	Hung Hing Printing Centre	On ground within TPSTW and just next to the Printing Centre
CAM3	Talcon Industrial Ltd.	On ground within TPSTW and just next to Talcon Industrial Ltd.

2.4 For Stations CAM2 and CAM3, the staff of the two factories did not allow installation of the monitoring equipment within the factories. Therefore, the monitoring equipment (HVS) was installed within the TPSTW and located just next to the 2 sensitive receivers. It should be noted that the monitoring stations were separated by non-solid fence from the receivers. Therefore, it was considered that the selected monitoring locations could represent the monitoring station as defined in the EM&A Manual.

Monitoring Parameters, Frequency and Duration

2.5 Table 2.3 summarizes the monitoring parameters, monitoring period and frequencies of baseline air quality monitoring.

Table 2.3 Frequency and Parameters of Baseline Air Quality Monitoring

Monitoring Stations	Parameter	Period	Frequency
CAM1, CAM2 and CAM3	24-hour TSP	24 hours	Daily
	1-hour TSP	0700-1900	3 times/day

Monitoring Methodology and QA/QC Procedure

2.6 Weather data was recorded during the baseline period and is shown in Appendix C. The air temperature, wind speed, wind direction, precipitation and the relative humidity data was obtained from the Hong Kong Observatory Webpage. The general weather conditions (i.e. sunny, cloudy or rainy) were recorded by the field staff's observation on the monitoring day.

Instrumentation

2.7 High volume Samplers (HVS) completed with appropriate sampling inlets were employed for air quality monitoring. Each sampler was composed of a motor, a filter holder, a flow controller and a sampling inlet and its performance specification complies with that required by USEPA Standard Title 40, Code of Federation Regulations Chapter 1 (Part 50).

HVS Installation

2.8 The following guidelines were adopted during the installation of HVS:

- Sufficient support was provided to secure the samplers against gusty wind.
- No two samplers were placed less than 2 meters apart.
- The distance between the sampler and an obstacle, such as buildings, was at least twice the height that the obstacle protrudes above the sampler.
- A minimum of 2 meters of separation from walls, parapets and penthouses was required for rooftop samples.
- A minimum of 2 meters separation from any supporting structure, measured horizontally was required.
- No furnaces or incineration flues were nearby.
- Airflow around the sampler was unrestricted.
- The samplers were more than 20 meters from the drip line.
- Any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring.

Filters Preparation

2.9 Fiberglass filters (G810) were used [Note: these filters have a collection efficiency of larger than 99% for particles of 0.3 mm diameter]. A HOKLAS accredited laboratory, Wellab Ltd., was responsible for the preparation of 24-hr conditioned and pre-weighed filter papers for Cinotech's monitoring team.

2.10 All filters, which were prepared by Wellab Ltd., 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 ±3 °C; the relative humidity (RH) was < 50% and not variable by more than ±5%. A convenient working RH was 40%.

2.11 Wellab Ltd. has a comprehensive quality assurance and quality control programmes.

Operating/Analytical Procedures

2.12 Operating/analytical procedures for the air quality monitoring were highlighted as follows:

- Prior to the commencement of the dust sampling, the flow rate of the HVS was properly set (between 1.1 m3/min. and 1.4 m3/min.) in accordance with the manufacturer's instruction to within the range recommended in USEPA Standard Title 40, CFR Part 50.
- The power supply was checked to ensure the sampler worked properly.
- On sampling, the sampler was operated for 5 minutes to establish thermal equilibrium before placing any filter media at the designated air quality monitoring station.
- The filter holding frame was then removed by loosening the four nuts and carefully a weighted and conditioned filter was centered with the stamped number upwards, on a supporting screen.
- The filter was aligned on the screen so that the gasket formed an airtight seal on the outer edges of the filter. Then the filter holding frame was tightened to the filter holder with swing bolts. The applied pressure should be sufficient to avoid air leakage at the edges.
- The shelter lid was closed and secured with the aluminum strip.
- The timer was then programmed. Information was recorded on the record sheet, which included the starting time, the weather condition and the filter number (the initial weight of the filter paper can be found out by using the filter number).
- After sampling, the filter was removed and sent to the Wellab Ltd. for weighing. The elapsed time was also recorded.
- Before weighing, all filters were equilibrated in a conditioning environment for 24 hours. The conditioning environment temperature should be between 25°C and 30°C and not vary by more than ±3°C; the relative humidity (RH) should be < 50% and not vary by more than ±5%. A convenient working RH is 40%. Weighing results were returned to Cinotech for further analysis of TSP concentrations collected by each filter.

Maintenance/Calibration

2.13 The following maintenance/calibration was required for the HVS:

- The high volume motors and their accessories were properly maintained. Appropriate maintenance such as routine motor brushes replacement and electrical wiring checking were made to ensure that the equipment and necessary power supply are in good working condition.
- All HVS were calibrated (five point calibration) using Calibration Kit prior to the commencement of the baseline monitoring.

Results and Observations

Results

2.14 Baseline air quality monitoring was conducted at 3 monitoring stations, namely CAM1, CAM2 and CAM3, in the period between 13 and 26 July 2005. The detailed monitoring schedule is shown in Appendix D.

2.15 The monitoring data are summarized in Tables 2.4 and 2.5. All monitoring data of 1-hour and 24-hour TSP are presented in Appendices A2 and A4 respectively. Graphical presentations of the 1-hour TSP and 24-hour TSP results are shown in Appendices A3 and A5 respectively. Detailed weather conditions during the baseline monitoring period are shown in Appendix C.

Table 2.4 Summary of Baseline 1-hour TSP Monitoring Results

Monitoring Station	Average TSP Concentration, μg/m^3 (Range)
CAM1	91 (14 – 301)
CAM2	82 (15 – 361)
CAM3	93 (12 – 388)

Table 2.5 Summary of Baseline 24-hour TSP Monitoring Results

Monitoring Station	Average TSP Concentration, μg/m^3 (Range)
CAM1	57 (17 – 161)
CAM2	48 (15 – 143)
CAM3	61 (17 – 189)

Observations

2.16 The weather was generally sunny or fine during the baseline monitoring period. Nevertheless, thunderstorms and rains were also encountered on few days.

2.17 During the baseline monitoring, no major dust generating activity was identified in the vicinity of the monitoring stations.

2.18 It should be highlighted that a sudden rise of 1-hour and 24-hour TSP was recorded during the period of 18 to 20 July 2005. This rise in TSP results were considered justifiable and could represent the ambient air quality based on the following considerations:

1. The rise occurred consistently for both 1-hour and 24-hour TSP monitoring at all three monitoring stations during the concerned period.

2. According to EPD's Air Pollution Index (API) in Tai Po area, a similar trend with increased API during the concerned period was noted. The relevant API data and the graphical presentation are provided in Appendix A6.

2.19 Based on the above considerations, the rise in TSP concentrations in the period of 18 to 20 July 2005 were considered related to the poor ambient air quality in Tai Po area.

2.20 Apart from the meteorological conditions, no other influencing factor that may affect the monitoring results could be identified. Therefore, the baseline air quality monitoring results are considered representative to the ambient air quality conditions of the respective sensitive receivers.

Action and Limit Levels

2.21 The Action and Limit Levels have been set in accordance with the EM&A Manual, which are summarized in Table 2.6.

Table 2.6 Guidelines for Establishing Action and Limit Levels for Air Quality

Parameters	Action Level	Limit Level
1-hour TSP	• If BL ≤ 384 μg/m^3, AL = (BL × 1.3 + LL) ÷ 2 • If BL > 384 μg/m^3, AL = LL	500 μg/m^3
24-hour TSP	• If BL ≤ 200 μg/m^3, AL = (BL × 1.3 + LL) ÷ 2 • If BL > 200 μg/m^3, AL = LL	260 μg/m^3

Remarks:
BL – Baseline Level (Average); AL – Action Level; LL – Limit Level

2.22 Following the above guidelines, the Action and Limit Levels for air quality impact monitoring have been set, as presented in Tables 2.7 and 2.8.

Table 2.7 Action and Limit Levels for 1-hour TSP

Location	Action Level, μg/m^3	Limit Level, μg/m^3
CAM1	309	500
CAM2	303	
CAM3	311	

Table 2.8 Action and Limit Levels for 24-hour TSP

Location	Action Level, μg/m^3	Limit Level, μg/m^3
CAM1	167	260
CAM2	161	
CAM3	170	

3 NOISE

Monitoring Requirements

3.1 Baseline noise monitoring was conducted for 14 days at the designated monitoring station between 13 July 2005 (07:00am) and 27 July 2005 (07:00am). Logger function check and calibration was carried out according to manufacturer's recommendations. The equipment was checked and inspected not less than once every two days after the set up at each monitoring station.

Monitoring Locations

3.2 Table 3.1 gives the location of the monitoring station, which is also shown in Figure 1.2.

Table 3.1 Location of Noise Monitoring Station

Monitoring Station	Description	Location of Measurement
NM1	Government Staff Quarter	Outside the corridor of 1/F

Monitoring Equipment

3.3 Integrating Sound Level Meter was used for noise monitoring. The meter is a Type 1 sound level meter capable of giving a continuous readout of the noise level readings including equivalent continuous sound pressure level (L_{eq}) and percentile sound pressure level (L_x) and also complied with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1) specifications. Table 3.2 summarizes the noise monitoring equipment being used. Copies of the calibration certificates for the sound level meter and calibrator are attached in Appendix B1.

Table 3.2 Noise Monitoring Equipment

Equipment	Model and Make	Quantity
Integrating Sound Level Meter	B&K Model 2238	1
Calibrator	B&K 4231	1
Wind Speed Anemometer	Vane Anemometer, Model 451104	1

Monitoring Parameters, Frequency and Duration

3.4 In accordance with the EM&A Manual, baseline noise for the A-weighted levels L_{eq}, L_{10} and L_{90} was recorded. Data obtained from the baseline noise monitoring was processed and presented according to the following periods:

- Daytime: 0700-1900 hours on normal weekdays
- Evening-time: 1900-2300 hours on normal weekdays
- Holiday-time: 0700-2300 hours on general holidays including Sundays
- Night-time: 2300-0700 hours of next day

3.5 The frequency and parameters of noise measurement are presented in Table 3.3.

Table 3.3 Frequency and Parameters of Noise Monitoring

Time Period	Duration, min	Parameter
Daytime on normal weekdays (0700-1900 hrs)	5*	L_{eq}, L_{10} & L_{90}
Evening time on normal weekdays (1900-2300 hrs)	5	
Holidays including Sundays (0700-2300 hrs)		
All days during the night-time (2300-0700 hrs)		

Remarks: Leq (30-min) would be determined for daytime noise by calculating the logarithmic average of six Leq (5min) data. The averaging equation is provided in Appendix B2.

Monitoring Methodology and QA/QC Procedures

3.6 Weather data was recorded during the baseline period and is presented in Appendix C. Air temperature, wind speed, wind direction and relative humidity data was obtained from the Hong Kong Observatory Webpage. General weather conditions (i.e. sunny, cloudy or rainy), which are given in Appendices B2 to B5, were recorded by field observation during equipment check and estimated according to weather data from the Hong Kong Observatory.

Field Monitoring

3.7 The monitoring procedures are as follows:

- The microphone head of the head level meter was positioned 1m exterior of the noise sensitive facade and lowered sufficiently so that the building's external wall acts as a reflecting surface.
- The battery condition was checked to ensure good functioning of the meter.
- Parameters such as frequency weighting, the time weighting and the measurement time were set as follows:

  - frequency weighting : A
  - time weighting : Fast
  - measurement time : 5 minutes (Leq (30-min) would be determined for daytime noise by calculating the logarithmic average of six Leq (5min) data.)

- Prior to and after noise measurement, the meter was calibrated using the calibrator for 94.0 dB at 1000 Hz. If the difference in the calibration level before and after measurement is more than 1.0 dB, the measurement was considered invalid and repeat of noise measurement was required after re-calibration or repair of the equipment.
- The wind speed at the monitoring station was checked with the portable wind meter.
- Noise monitoring was carried out continuously for 24 hours during the 14 days baseline monitoring period. Monitoring data was recorded and stored automatically within the sound level meter system. At the end of the monitoring period, noise

levels in term of L_{eq}, L_{90} and L_{10} were recorded. In addition, site conditions and noise sources were recorded when the equipment were checked and inspected every two days.

- All the monitoring data within the sound level meter system was downloaded through the computer software, and all these data was checked and reviewed within the computer.

Maintenance and Calibration

3.8 Maintenance and Calibration procedures were as follows:

- The microphone head of the sound level meter and calibrator were cleaned with a soft cloth at quarterly intervals.
- The sound level meter and calibrator were checked and calibrated at yearly intervals.

Results and Observations

Results

3.9 Baseline noise monitoring was conducted at the designated station in the period between 13 July 2005 (07:00am) and 27 July 2005 (07:00am). The monitoring schedule is shown in Appendix D.

3.10 The baseline noise monitoring results (L_{eq}) are summarized in Table 3.4. Supplementary information (L_{10} and L_{90}) obtained during the baseline monitoring are provided in Table 3.5. All baseline noise monitoring results are given in Appendices B2 to B5. Graphical presentations of the data are provided in Appendix B6. Weather conditions recorded during the baseline monitoring period are shown in Appendix C.

Table 3.4 Summary of Baseline Noise Levels

Period (Measurement Duration)	Baseline Noise Levels (L_{eq})		
	Mean	Max	Min
Daytime 0700-1900 hrs on normal weekdays (30 min)	61.9	67.7	58.6
Evening-time 1900-2300 hrs on normal weekdays (5 min)	59.7	60.5	58.2
Holidays 0700-2300 hrs (5 min)	59.9	66.2	57.0
Night-time 2300-0700 hrs of the next day (5 min)	58.1	63.5	55.3

1. The abnormal data described in Section 3.14 was discarded during the data manipulation for the above summary table.

Table 3.5 Summary of Supplementary Information (L_{10} & L_{90}) Obtained during Baseline Noise Monitoring

Period (Measurement Duration)	Supplementary Information					
	L_{10}			L_{90}		
	Mean	Max	Min	Mean	Max	Min
Daytime 0700-1900 hrs on normal weekdays (5 min)	63.4	70.5	58.5	58.5	66.0	56.5
Evening-time 1900-2300 hrs on normal weekdays (5 min)	64.2	65.5	60.5	56.7	57.0	56.0
Holidays 0700-2300 hrs (5 min)	60.8	65.5	57.5	57.8	64.5	56.0
Night-time 2300-0700 hrs of the next day (5 min)	58.3	66.5	56.0	56.6	61.5	54.0

1. The abnormal data described in Section 3.14 was discarded during the data manipulation for the above summary table.

Observations

3.11 The weather was mainly sunny or fine during the baseline monitoring period. Nevertheless, thunderstorms and rains, which might influence the noise measurement results, were encountered on 19 to 22 July 2005.

3.12 During the baseline monitoring period, no construction activity was undertaken in the vicinity of the monitoring station.

3.13 The major noise source at the monitoring station included the operation of the existing facilities of the TPSTW (such as the inlet pumping station) as well as the vehicles attending and leaving the TPSTW. Noise, from the road traffic on Dai Kwai Street and activities in nearby factories, might also have minor effect on the measured noise levels. These noise sources are expected to exist in near future and throughout the construction period of the Project.

3.14 As mentioned above, there were thunderstorms and rains on 19 to 22 July 2005. Data collected were reviewed carefully to identify any abnormal noise levels were recorded. Table 3.6 summarizes the abnormal data collected during the baseline monitoring.

3.15 The time periods mentioned in Table 3.6 only contribute less than 5 % of the total measurement duration of the whole baseline monitoring period. Excluding the data collected in these periods, the baseline monitoring results are considered representative to the ambient noise level of the sensitive receiver.

Table 3.6 Abnormal Data Collected during the Baseline Monitoring Period

Time Period	Possible Cause of Abnormality
00:00 (19/7) to 05:00 (19/7)	• Heavy rains (over 40mm rainfall on Tai Po area according to HK Observatory's Isohyet Chart) • Amber rainstorm warning was hoisted from 02:05 to 03:15. • Thunderstorm warning was issued by HK Observatory during this period.
22:00 (20/7) to 03:30 (21/7)	• Heavy rains (over 40mm rainfall on Tai Po area according to HK Observatory's Isohyet Chart) • Amber rainstorm warning was hoisted from 23:00 (20/7) to 01:35 (21/7). • Thunderstorm warning was issued by HK Observatory during this period.
06:00 (22/7) to 09:30 (22/7)	• Heavy rains (over 30mm rainfall on Tai Po area according to HK Observatory's Isohyet Chart) • Thunderstorm warning was issued by HK Observatory during this period.
10:20 (24/7) to 10:30 (24/7)	• Cause could not be identified. The weather was fine during that period.

Action and Limit Levels

3.16 The Action and Limit Levels were established in accordance with the EM&A Manual. The baseline noise level shall be referenced during the compliance check in the impact noise monitoring period. Table 3.7 presents the Action and Limit Levels for construction noise.

Table 3.7 Action Limit Levels for Noise during Construction Period

Time Period	Action Level	Limit Level
0700-1900 hrs on normal weekdays	When one documented complaint is received	75 dB(A)
0700-2300 hrs on holidays; and 1900-2300 hrs on all other days		70* dB(A)
2300-0700 hrs of next day		55* dB(A)

Notes:
* The Area Sensitivity Rating for Station NM1 is taken as C, due to the nearby industrial area, according to Table 1 of EPD's Technical Memorandum on Noise from Construction Work other than Percussive Piling.

4 REVISIONS FOR INCLUSION IN THE EM&A MANUAL

4.1 The baseline environmental monitoring was conducted according to the EM&A Manual for air quality and noise.

4.2 The monitoring methodology, parameters monitored, and monitoring locations are all in line with the EM&A Manual.

5 COMMENTS AND CONCLUSIONS

5.1 The baseline environmental monitoring was conducted between 13 and 27 July 2005. The monitoring results were used to establish the ambient air quality and noise levels at the sensitive receiver prior to the construction of the Project.

5.2 Both the baseline air quality and noise monitoring were carried out in accordance with the EM&A Manual, in respect of the methodology, equipment, location and monitoring parameters.

5.3 The baseline air quality (1-hour and 24-hour TSP levels) monitoring was conducted at the 3 designated locations. During the monitoring, no major construction work or dust generating activities were undertaken in the vicinity of the monitoring stations. The baseline air quality monitoring results are considered representative to the ambient air quality conditions of the respective sensitive receivers. The Action and Limit Levels for the air quality were established based on the baseline monitoring results.

5.4 Baseline noise monitoring was conducted at one designated location. The major noise sources identified at the monitoring station included the existing TPSTW's facilities and site vehicle attending and leaving the TPSTW. The noise measurement data was reviewed and processed. A small portion of data, which was probably influenced by adverse weather conditions, was identified and discarded during the data manipulation. Apart from this small set of data, the baseline noise monitoring results are considered representative to the ambient noise level of the sensitive receiver.