

The Hongkong Electric Co Ltd
香港電燈有限公司



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**LAMMA POWER STATION EXTENSION
ENVIRONMENTAL MONITORING & AUDIT PROGRAMME
AT CONSTRUCTION PHASE**



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Date	11 th June 2003
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EXECUTIVE SUMMARY

This is the twenty-sixth monthly Environmental Monitoring and Audit (EM&A) report for the Project “Construction of Lamma Power Station Extension” prepared by the Environmental Team (ET). This report presents the results of impact monitoring on air quality and noise for the said project in May 2003.

After successful completion of post-project monitoring in September 2002, no further marine water quality monitoring for the reclamation works would be required. Besides, as there were no activities for the laying of the gas pipeline in the reporting month, no water quality impact monitoring at the relevant stations was carried out.

Air and noise monitoring were performed. The results were checked against the established Action/Limit (AL) levels. An on-site audit was conducted once per week. The implementation status of the environmental mitigation measures, Event/Action Plan and environmental complaint handling procedures were also checked.

Construction Activities Undertaken

Construction activities for Lamma Extension during the reporting month are tabulated as follows:

Item	Construction Activities
Site Formation	Rockfilling, seawall construction, piling of foundation for link bridges, C.W. intake & outfall construction and slurry ash piping and filling.
Unit L9	Trial pipe construction for piling foundation.
Transmission System	No construction activities.

Environmental Monitoring Works

All monitoring work at designated stations was performed as scheduled satisfactorily.

Air Quality

No exceedance of Action and Limit levels for air quality was recorded in the month.

Noise

The hoarding works for the construction of transmission system were completed on 11 May 2002. The civil works would tentatively commence in early 2004. As there was no construction work in this reporting month, manual noise measurements for the construction of transmission system was suspended.

Construction work for Lamma Extension was carried out during the restricted hours including evening-time, holidays and night-time under valid Construction Noise Permits. No

exceedance of Action and Limit levels for noise arising from the construction of Lamma Extension was recorded in the month.

Site Environmental Audit

Site audits were carried out on a weekly basis to monitor environmental issues on the construction site. The site conditions were generally satisfactory. All required mitigation measures were implemented.

As the commencement of construction works of Transmission System had been deferred to early 2004, the weekly inspection for the site was suspended in the reporting month.

Environmental Licensing and Permitting

Description	Permit No.	Valid Period		Issued To	Date of Issuance
		From	To		
Varied Environmental Permit	EP-071/2000/B	13/07/01	-	HEC	13/07/01
Construction Noise Permit	PP-UW0030-02	15/11/02	14/05/03	Contractor	09/10/02
Construction Noise Permit	GW-UW0374-02	01/12/02	31/05/03	Contractor	28/11/02
Construction Noise Permit	GW-UW0409-02	15/01/03	14/07/03	Contractor	06/01/03
Construction Noise Permit	GW-UW0067-03	10/03/03	09/09/03	Contractor	10/03/03
Construction Noise Permit	PP-UW0008-03	15/05/03	14/11/03	Contractor	30/04/03
Registration of Chemical Waste Producer	WPN5213-912-G1050-01	01/06/02	-	Contractor	03/06/02
Dumping Permit	EP/MD/03-107	12/12/02	15/05/03	Contractor	22/11/02

Implementation Status of Environmental Mitigation Measures

Environmental mitigation measures for the construction activities as recommended in the EM&A manual were implemented in the reporting month.

Environmental Complaints

No complaint against the construction activities was received in the reporting month.

Future Key Issues

The future key issues to be considered in the coming month are as follows:

Site Formation

- to continue monitoring the noise level during construction and to ensure compliance with the CNP's already obtained;
- to continue the preventive measures for noise exceedance and keep monitoring/reviewing the performance;

- to monitor and review the sufficiency of the dust suppression measures provided and increase the resources accordingly if necessary;

Transmission System

- to closely monitor the construction activities, if any, in order to avoid disturbance to the rare plants;
- to provide temporary fire fighting equipment for prevention of fire within the work sites;

Unit L9 Piling Foundation

- to continue monitoring the noise level during construction and to ensure compliance with the CNPs already obtained;
- to continue the preventive measures for noise exceedance and keep monitoring/reviewing the performance;
- to spray water on the ground and road surface to prevent dust emission;
- to continue monitoring and reviewing the emission of smoke from construction machines;
- to minimize water consumption;
- to implement the Waste Management Plan.

Concluding Remarks

The environmental performance of the project was generally satisfactory.

1. INTRODUCTION

1.1 Background

The Environmental Team (hereinafter called the “ET”) was formed within the Hongkong Electric Co. Ltd (HEC) to undertake Environmental Monitoring and Audit for “Construction of Lamma Power Station Extension” (hereinafter called the “Project”). Under the requirements of Section 6 of Environmental Permit EP-071/2000/B, an EM&A programme for impact environmental monitoring set out in the EM&A Manual (Construction Phase) is required to be implemented. In accordance with the EM&A Manual, environmental monitoring of air quality, noise and water quality and regular environmental audits are required for the Project. As the post-project marine water monitoring was successfully completed in September 2002, no further water quality monitoring for the reclamation works would be required.

The Project involves the construction of a gas-fired power station employing combined cycled gas turbine technology, forming an extension to the existing Lamma Power Station. The key elements of the Project including the construction activities associated with the transmission system and submarine gas pipeline are outlined as follows.

- dredging and reclamation to form approximately 22 hectares of usable area;
- construction of six 300MW class gas-fired combined cycle units;
- construction of a gas receiving station;
- construction of a new transmission system linking the Lamma Extension to load centres on Hong Kong Island;
- laying of a gas pipeline for the supply of natural gas to the new power station

This report summarizes the environmental monitoring and audit work for the Project for the month of May 2003.

1.2 Project Organisation

An Environmental Management Committee (EMC) has been set up in HEC to oversee the Project. The management structure includes the following:

- Environmental Protection Department (The Authority);
- Environmental Manager (The Chairman of the Environmental Management Committee);
- Engineer;
- Independent Environmental Checker (IEC);
- Environmental Team (ET);
- Contractor.

The project organisation chart for the construction EM&A programme is shown in Appendix A.

1.3 Construction Works undertaken during the Reporting Month

Construction activities undertaken during the reporting month for site formation were rockfilling, construction of seawall, piling foundation for link bridge, C.W. intake & outfall construction and slurry ash piping and filling. Construction activity for Unit L9 was the construction of trial pile for piling foundation. There was no construction activity for Unit L9's associated transmission system. Layout plans for site formation and transmission system are shown in Figure 1.1 and Figure 1.2 respectively. Uncontaminated dredged/excavated materials arising from the piling foundation work of Unit L9 were dumped at the assigned location within the South Cheung Chau Spoil Disposal Area. Figure 1.3 shows the dumping location in May 2003.

The main construction activities carried out during the reporting month and the corresponding environmental mitigation measures are summarized in Table 1.1. The implementation of major mitigation measures in the month is provided in Appendix I.

Table 1.1 Construction Activities and Their Corresponding Environmental Mitigation Measures

Item	Construction Activities	Environmental Mitigation Measures
Site Formation		
1	Rockfilling & Seawall Construction	<p>Noise</p> <ul style="list-style-type: none"> – General noise mitigation measures employed at all work sites throughout the construction phase. <p>Waste Management</p> <ul style="list-style-type: none"> – Waste Management Plan submitted and implemented. <p>Marine Ecology</p> <ul style="list-style-type: none"> – All construction related vessels approached the site from the designated route/channel to avoid possible disturbance to the finless porpoise.
2	Piling Foundation for Link Bridge	<p>Noise</p> <ul style="list-style-type: none"> – General noise mitigation measures implemented and silent type equipment deployed. <p>Air</p> <ul style="list-style-type: none"> – Dust suppression measures implemented.

Item	Construction Activities	Environmental Mitigation Measures
3	C.W. Intake & Outfall	Noise – General noise mitigation measures implemented and silent type equipment deployed.
4	Slurry ash piping and filling	Noise – General noise mitigation measures implemented and silent type equipment deployed.
Construction of Transmission System		
4	No construction activities	Terrestrial Ecology – Special care and close monitoring to avoid disturbances to the rare plant species. – Temporary fire fighting equipment provided within the work area during construction.
Construction of Unit L9 Piling Foundation		
5	Trial Pile Construction	Water Quality – Water usage kept to a minimum. Noise – General noise mitigation measures implemented and silent type equipment deployed. Air – Dust suppression measures implemented. Waste Management – Chemical waste is stored and collected.

1.4 Summary of EM&A Requirements

The EM&A program requires environmental monitoring for air, noise and water quality. As the post-project marine water monitoring was successfully completed in September 2002, no further water quality monitoring for the reclamation works would be required. The detailed EM&A monitoring work for air quality and noise are described in Sections 2 and 3 respectively. Regular environmental site audits for air quality, noise, water quality and waste management were carried out.

The following environmental audits are summarized in Section 4 of this report:

- Environmental monitoring results;
- Waste Management Records;
- Weekly site audit results;
- The status of environmental licensing and permits for the Project;
- The implementation status of environmental protection and pollution control/mitigation measures.

Future key issues will be reported in Section 5 of this report.

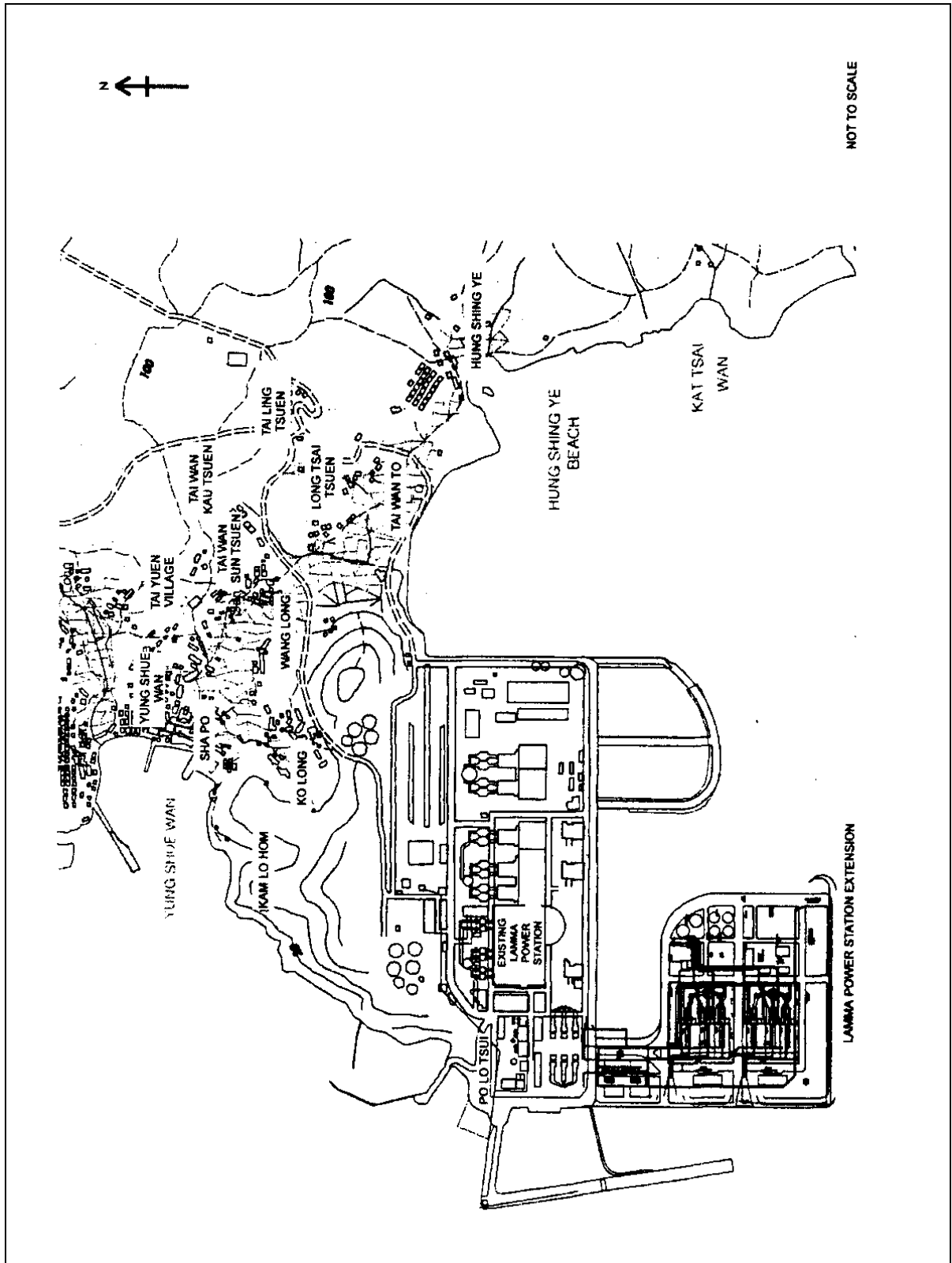


Figure 1.1 Layout of Work Site

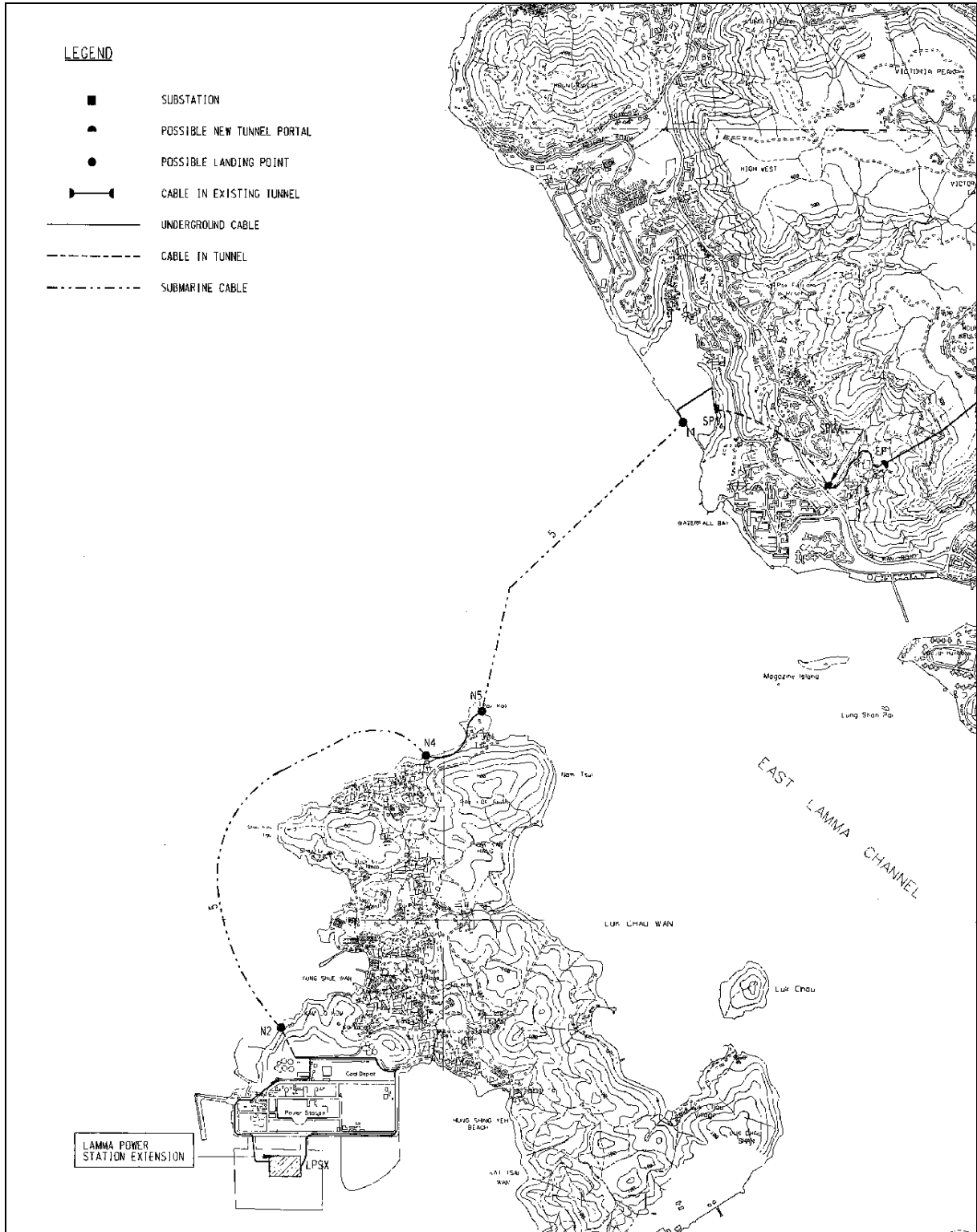


Figure 1.2 Cable Route of Transmission System

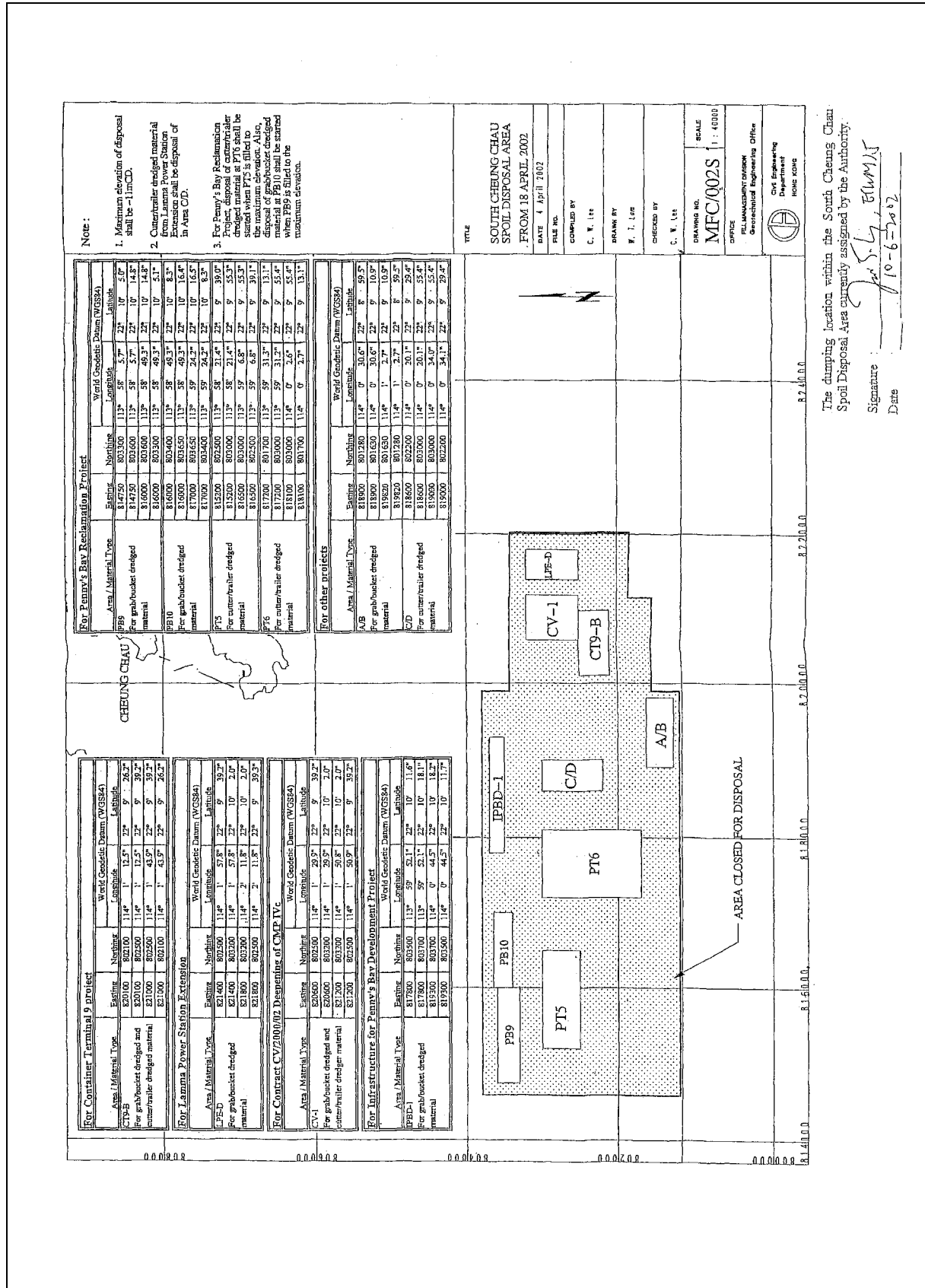


Figure 1.3 Location of Dumping Area (from 12th June 2002)

2. AIR QUALITY

2.1 Monitoring Requirements

1-hour and 24-hour TSP monitoring at agreed frequencies were conducted to monitor air quality. The impact monitoring data were checked against the Action/Limit Levels as determined in the Baseline Monitoring Report (Construction Phase). Appendix B shows the established Action/Limit Levels for Air Quality.

2.2 Monitoring Locations

Three dust monitoring locations were selected for 1-hour TSP sampling (AM1, AM2 & AM3) while four monitoring locations were selected for 24-hour TSP sampling (AM1, AM2, AM3 and AM4). Table 2.1 tabulates the monitoring stations. The locations of the monitoring stations are shown in Figure 2.1.

Table 2.1 Air Quality Monitoring Locations

Location I.D.	Description
AM1	Reservoir
AM2	East Gate
AM3	Ash Lagoon
AM4	Tai Yuen Village

2.3 Monitoring Equipment

Continuous 24-hour TSP air quality monitoring was performed using the GS2310 High Volume Air Samplers (HVAS), Partisol Model 2000 Sampler and the MINIVOL Portable Sampler at AM1&2, AM3 and AM4 respectively. TEOM Model 1400a continuous dust monitors were used to carry out 1-hour TSP monitoring at AM1, AM2 and AM3. Table 2.2 summarises the equipment used in dust monitoring.

Table 2.2 Air Quality Monitoring Equipment

Equipment	Model and Make
<i>24-hour sampling:</i> HVAS Sampler	Model GS2310 Anderson Instruments Inc.
Partisol Air Sampler	Partisol Model 2000 Rupprecht & Patashnick
MINIVOL Portable Sampler	AIRMETRICS
<i>1-hour sampling:</i> Continuous TSP Dust Meter	TEOM Model 1400a Rupprecht & Patashnick

2.4 Monitoring Parameters, Frequency and Duration

Table 2.3 summarises the monitoring parameters, duration and frequency of air quality monitoring. The monitoring schedule for the reporting month is shown in Appendix C.

Table 2.3 Air Quality Monitoring Parameter, Duration and Frequency

Monitoring Stations	Parameter	Duration	Frequency
AM1	1-hour TSP	1	3 hourly samples every 6 days
	24-hour TSP	24	Once every 6 days
AM2	1-hour TSP	1	3 hourly samples every 6 days
	24-hour TSP	24	Once every 6 days
AM3	1-hour TSP	1	3 hourly samples every 6 days
	24-hour TSP	24	Once every 6 days
AM4	24-hour TSP	24	Once every 6 days

2.5 Monitoring Procedures and Calibration Details

24- hour TSP Monitor:

Preparation of Filter Papers

- Visual inspection of filter papers was carried out to ensure that there were no pinholes, tears and creases;
- The filter papers were then labelled before sampling.

- The filter papers were equilibrated at room temperature and relative humidity < 50% for at least 24 hours before weighing.

Field Monitoring

- During collection of the sampled filter paper, the information on the elapse timer was logged. Site observations around the monitoring stations, which might have affected the monitoring results, were also recorded. Major pollution sources, if any, would be identified and reported. The flow record chart for the previous sampling was checked to see if there was any abnormality.
- The post-sampling filter papers were removed carefully from the filter holder and folded to avoid loss of fibres or dust particles from the filter papers;
- The filter holder and its surrounding were cleaned;
- A pre-weighed blank filter paper for the next sampling was put in place and aligned carefully. The filter holder was then tightened firmly to avoid leakage;
- A new flow record chart was loaded into the flow recorder;
- The programmable timer was set for the next 24 hrs sampling period, $\pm 1/2$ hr;
- The post-sampling filter papers were equilibrated at room temperature and relative humidity < 50% for at least 24 hours before weighing.

1- hour TSP Monitor:

- The following parameters of the TEOM model dust meters are regularly checked to ensure proper functionality:
 - Mass concentration;
 - Total mass;
 - Frequency of the tapered element;
 - Electrical noise;
 - Main flow;
 - Auxiliary flow.

Maintenance & Calibration

- The monitoring equipment and their accessories are maintained in good working conditions.
- Monitoring equipment is calibrated at monthly intervals. Calibration details are shown in Appendix F.

2.6 Results and Observations

Dust monitoring was conducted as scheduled in the reporting month. All monitoring data and graphical presentation of the monitoring results are provided in Appendix D. Key findings and observations are provided below:

1-hour TSP

No exceedance of 1-hour TSP Action/Limit Level was recorded in the month.

24-hour TSP

No exceedance of 24-hour TSP Action/Limit Level was recorded in the month.

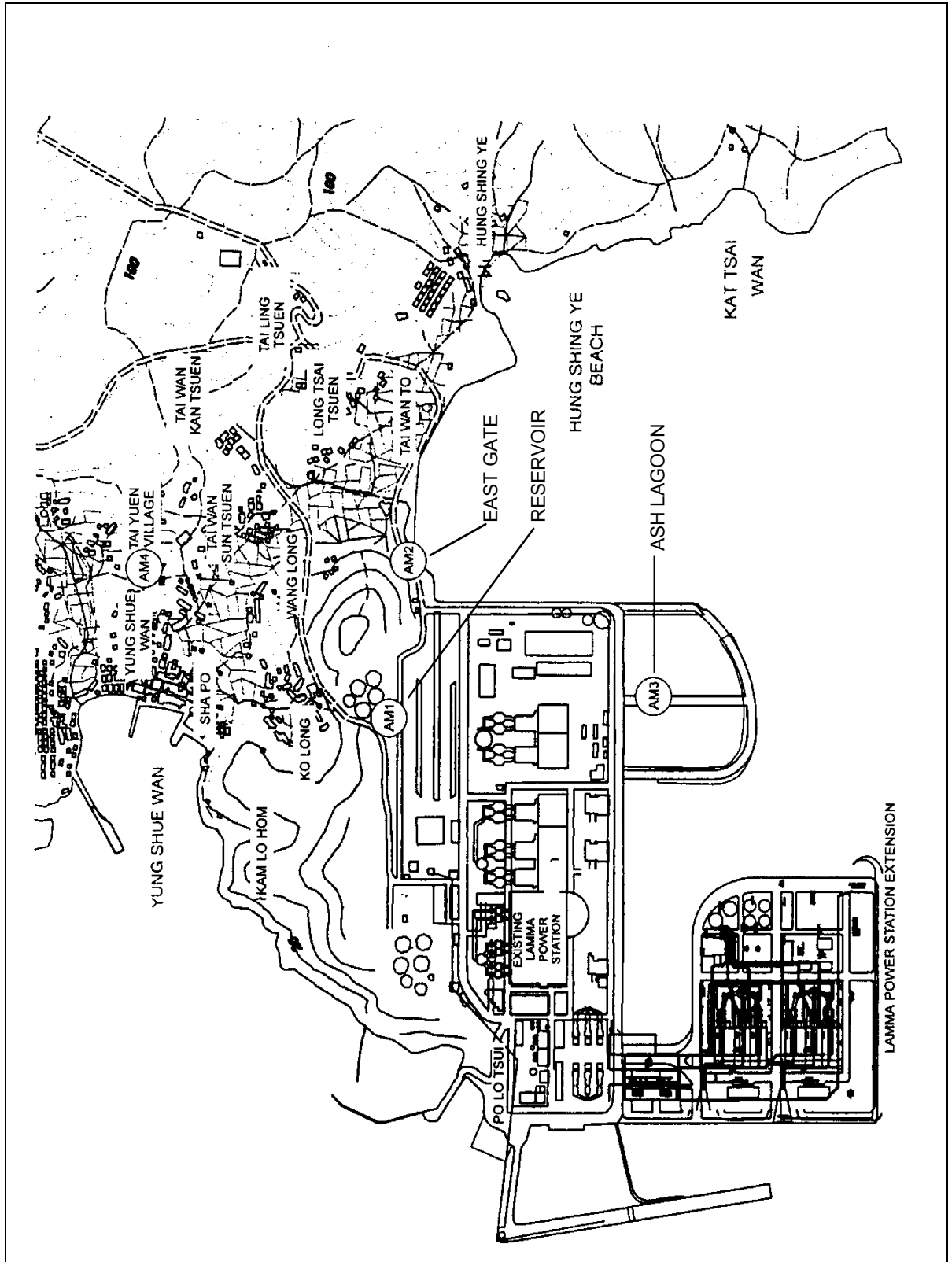


Figure 2.1 Location of Air Quality Monitoring Stations

3. NOISE

3.1 Monitoring Requirements

Continuous noise alarm monitoring at Ash Lagoon/Ching Lam were carried out to calculate the noise contributed by the construction activities at the two critical NSR's, viz. Long Tsai Tsuen/Hung Shing Ye and the school within the village of Tai Wan San Tsuen. The impact monitoring data for construction noise were checked against the limit levels specified in the EM&A Manual. With the availability of the construction noise permits, impact monitoring for the construction work during the restricted hours was also carried out. Section 4 presents the details of the construction noise permits. The impact noise monitoring data were checked against the limit levels specified in the EM&A Manual. Appendix B shows the established Action/Limit Levels for noise.

The hoarding works for the construction of transmission system were completed on 11 May 2002. The civil works would tentatively commence in early 2004. As there was no construction work in May 2003, manual noise measurements at Pak Kok Tsui residences was suspended in this reporting month.

3.2 Monitoring Locations

In accordance with the EM&A manual, the identified noise monitoring locations are listed in Table 3.1 and shown in Figure 3.1.

Table 3.1 Noise Monitoring Locations

Purpose of noise monitoring	Monitoring Location
Lamma Extension	Ash Lagoon
Lamma Extension	Ching Lam

3.3 Monitoring Equipment

The sound level meters used for noise monitoring complied with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1). The noise monitoring equipment used is shown in Table 3.2.

Table 3.2 Noise Monitoring Equipment

Equipment	Model
Sound level meter	Rion NA-27/B&K 2238F
Sound level calibrator	Rion NC-74

3.4 Monitoring Parameters, Frequency and Duration

Continuous alarm monitoring of A-weighted Leq levels was carried out at Ash Lagoon and Ching Lam. The measurement duration and parameter of noise monitoring were presented in Table 3.3 as follows:

Table 3.3 Noise Monitoring Duration and Parameter

Location	Time Period	Frequency	Parameter
Ash Lagoon	Daytime: 0700-1900 hrs on normal weekdays	Daytime: 30 minutes	30-min L_{Aeq}
Ching Lam	Evening-time & holidays: 0700-2300 hrs on holidays; and 1900-2300 hrs on all other days	Evening-time & holidays: 5 minutes	5-min L_{Aeq}
	Night-time: 2300-0700 hrs of next day	Night-time: 5 minutes	5-min L_{Aeq}

3.5 Monitoring Procedures and Calibration Details

Monitoring Procedures

Continuous Noise Monitoring for Lamma Extension Construction

The measured noise levels (MNL's) were collected at the noise alarm monitoring stations at Ash Lagoon and Ching Lam. The notional background noise levels (viz. baseline noise data at Ash Lagoon and Ching Lam) were applied to correct the corresponding MNL's in 30-min/5-min L_{Aeq} .

A wind speed sensor was installed at Station Building Rooftop. The wind speed signal was used to determine whether the data from Ash Lagoon and Ching Lam noise alarm monitoring stations were affected. The instantaneous data was discarded in case the instantaneous wind speed exceeded 10 m/s. The 30-min/5-min L_{Aeq} was considered valid only if the amount of valid data was equal to or above 70%.

When calibrating the noise measuring equipment, all observations around the monitoring stations, which might have affected the monitoring results, were recorded.

Equipment Calibration

The sound level meters and calibrators have been verified by the manufacturer or accredited laboratory. Equipment for continuous noise monitoring was calibrated at site on a monthly basis. Calibration details are shown in Appendix F

3.6 Results and Observations

Continuous noise monitoring was conducted at the two monitoring stations at Ash Lagoon and Ching Lam. All monitoring results and their graphical presentations are provided in Appendix E

No exceedance of noise Action/Limit Level was recorded in the month.

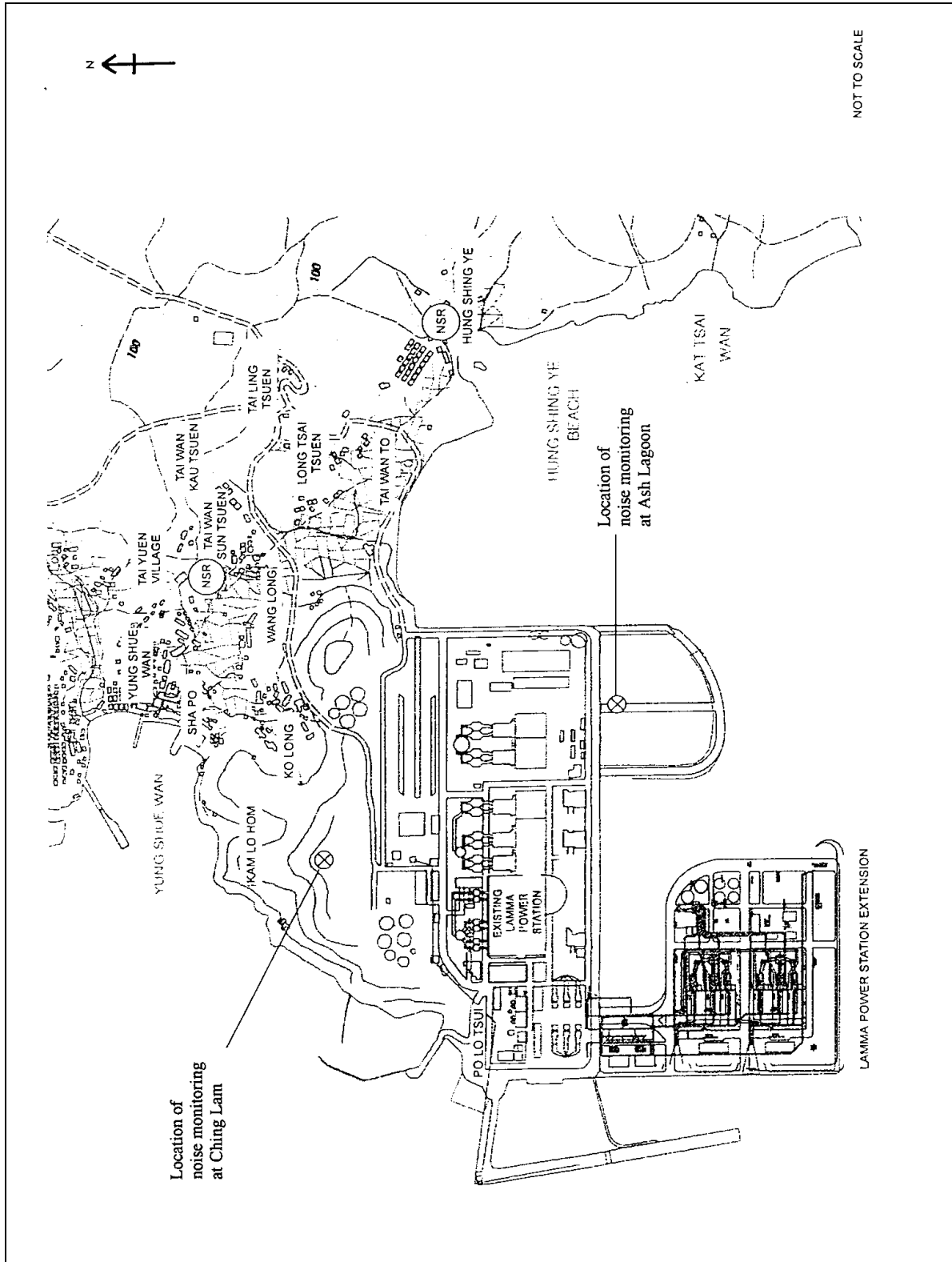


Figure 3.1 Location of Noise Monitoring Stations

4. ENVIRONMENTAL AUDIT

4.1 Review of Environmental Monitoring Procedures

The environmental monitoring procedures were regularly reviewed by the Environmental Team. No modification to the existing monitoring procedures was recommended.

4.2 Assessment of Environmental Monitoring Results

Monitoring results for Air Quality and Noise

The environmental monitoring results for Air Quality and Noise in the reporting month presented in sections 2, 3 and 4 respectively are summarized in Table 4.1.

Table 4.1 Summary of AL Level Exceedances on Monitoring Parameters

Item	Parameter Monitored	Monitoring Period	No. of Exceedances In		Event/Action Plan Implementation Status and Results
			Action Level	Limit Level	
Air					
1	Ambient TSP (24-hour)	01/05/03-31/05/03	0	0	
2	Ambient TSP (1-hour)	01/05/03-31/05/03	0	0	
Noise					
1	Noise level at the critical NSR's predicted by the noise alarm monitoring system	01/05/03-31/05/03	0	0	
2	Manual noise monitoring at the Pak Kok Tsui residences	01/05/03-31/05/03	N/A	N/A	Hoarding works at Pak Kok Tsui were completed on 11/5/2002. Civil works would tentatively commence in early 2004. Manual noise monitoring was suspended during the period from 12/5/2002 to 31/5/2003.

Waste Management Records

The estimated amounts of different types of waste generated in May 2003 are shown in Table 4.2.

Table 4.2 Estimated Amounts of Waste Generated in May 2003

Waste Type	Examples	Estimated Amount
General Refuse	Domestic wastes collected on site	6.02 Ton

4.3 Site Environmental Audit

Site audits were carried out by ET on a weekly basis to monitor environmental issues at the construction sites to ensure that all mitigation measures were implemented timely and properly. The site conditions were generally satisfactory. All required mitigation measures were implemented. The weekly site inspection results are attached in Appendix H.

As the commencement of construction works of Transmission System had been deferred to early 2004, the weekly inspection for the site was suspended in the reporting month.

4.4 Status of Environmental Licensing and Permitting

All permits/licenses obtained for the project are summarised in Table 4.3.

Table 4.3 Summary of Environmental Licensing and Permit Status

Description	Permit No.	Valid Period		Highlights	Status
		From	To		
Varied Environmental Permit	EP-071/2000/B	13/07/01	-	The whole construction work site.	Valid
Construction Noise Permit	PP-UW0030-02	15/11/02	14/05/03	Percussive piling for Unit L9 piling foundation	Superseded
Construction Noise Permit	GW-UW0374-02	01/12/02	31/05/03	Operation of specified PME's allowed during the restricted hour (23:00-07:00 on next day). 2 groups of PME's are assigned and only one group can be used.	Valid

Description	Permit No.	Valid Period		Highlights	Status
		From	To		
Construction Noise Permit	GW-UW0409-02	15/01/03	14/07/03	Operation of PME's allowed during the restricted hours (07:00-23:00 on holidays and 19:00-23:00 on all other days)	Valid
Construction Noise Permit	GW-UW0067-03	10/03/03	09/09/03	8 groups (1-8) of PME's are assigned. Only one group can be used. Group 7 and Group 8 are not used between 11:00pm and 7:00am on next day.	Valid
Construction Noise Permit	PP-UW0008-03	15/05/03	14/11/03	Percussive piling for Unit L9 piling foundation	Issued on 30/4/2003
Registration of Chemical Waste Producer	WPN5213-912-G1050-01	01/06/02	-	Unit L9 piling foundation work.	Valid
Dumping Permit	EP/MD/03-107	12/12/02	15/05/03	Dumping at South Cheung Chau Disposal Area; Unit L9 piling foundation work.	Expired on 16/5/2003

4.5 Implementation Status of Environmental Mitigation Measures

Mitigation measures detailed in the permits and the EM&A Manual (Construction Phase) are required to be implemented. An updated summary of the Environmental Mitigation Implementation Schedule (EMIS) is presented in Appendix I.

4.6 Implementation Status of Event/Action Plans

The Event/Action Plans extracted from the EM&A Manual (Construction Phase) are presented in Appendix G.

4.7 Implementation Status of Environmental Complaint Handling Procedures

In May 2003, no complaint against the construction activities was received.

Table 4.4 Environmental Complaints / Enquiries Received in May 2003

Case Reference / Date, Time Received / Date, Time Concerned	Descriptions /Actions Taken	Conclusion / Status
Nil	N/A	N/A

Table 4.5 Outstanding Environmental Complaints / Enquiries Received Before

Case Reference / Date, Time Received / Date, Time Concerned	Descriptions /Actions Taken	Conclusion / Status
Nil	N/A	N/A

5. FUTURE KEY ISSUES

5.1 Status of Natural Gas supply

Based on current project schedule, HEC anticipates there is no delay in the supply of natural gas.

5.2 Key Issues for the Coming Month

Key issues to be considered in the coming month include:

Site Formation

Noise Impact

- To continue monitoring the noise level during construction and to ensure compliance with the CNP's already obtained.
- To continue the preventive measures for noise exceedance and keep monitoring/reviewing the performance.

Air Impact

- To monitor and review the sufficiency of the dust suppression measures provided and increase the resources accordingly if necessary.

Transmission System

Terrestrial Ecology Impact

- To closely monitor the construction activities, if any, in order to avoid disturbance to the rare plants;
- To provide temporary fire fighting equipment for prevention of fire within the work sites.

Unit L9 Piling Foundation

Noise Impact

- To continue monitoring the noise level during construction and to ensure compliance with the CNPs already obtained.
- To continue the preventive measures for noise exceedance and keep monitoring/reviewing the performance.

Air Impact

- To spray water on the ground and road surface to prevent dust emission.

- To continue monitoring and reviewing the emission of smoke from construction machines.

Water Impact

- To minimize water consumption.

Waste Management

- To implement the Waste Management Plan.

5.3 Monitoring Schedules for the Next 3 Months

The hoarding works for the construction of transmission system at Pak Kok Tsui were completed on 11/5/2002. The civil works would tentatively commence in early 2004. As there was no construction work during the period from 12/5/2002 to end May 2003, the manual noise monitoring at Pak Kok Tsui was suspended in May 2003.

With the completion of post-project monitoring, no further marine water quality monitoring for the reclamation works is required.

The initial post-construction marine ecological survey is scheduled to be carried out in July 2003 tentatively. The initial survey will be conducted in order to assess the immediate impacts of the construction works on the corals and other organisms of interest identified in the EIA and re-examined in the Baseline survey.

The tentative environmental monitoring schedules for the next 3 months are shown in Appendix C.

5.4 Construction Program for the Next 3 Months

The tentative construction program for the next 3 months is shown in Appendix J.

6. CONCLUSION

The environmental monitoring works and site inspection were performed as scheduled in the reporting month. All monitoring results were checked and reviewed.

No Action/Limit level exceedance on 1-hour and 24-hour TSP level was recorded in the reporting month.

No Action/Limit level exceedance on noise was recorded in the reporting month.

Environmental mitigation measures recommended in the EM&A manual for the construction activities were implemented in the reporting month. No complaint against the construction activities was received in the reporting month. No prosecution was received for this Project in the reporting period.

The environmental performance of the Project was generally satisfactory.