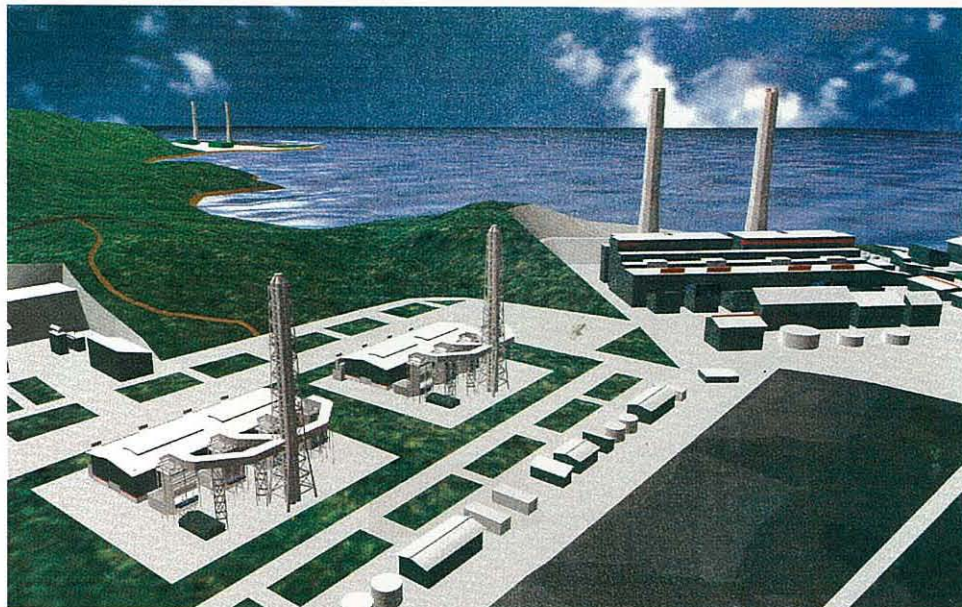


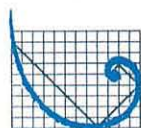
Castle Peak Power Company Limited



EIA of the Proposed 6000MW
Thermal Power Station at Black
Point: *Environmental Monitoring
and Audit*

September 1993

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Reference

For and on behalf of ERM Hong Kong

Approved by: *A.M. Lawton*

Position: *PROJECT MANAGER*

Date: *10th September 1993*

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1.1

BACKGROUND TO THE STUDY

Castle Peak Power Company Ltd (CAPCO), a joint venture of Exxon Energy Limited and China Light and Power Company (CLP), proposes to develop a Large Thermal Power Station (LTPS) at Black Point. CLP will act on behalf of CAPCO as the Project Manager for the construction and operation of the LTPS. The development of the LTPS has been programmed to be completed in two main phases. Phase 1 development comprises 4 x 600MW gas-fired units with industrial diesel oil as backup. Phase 2 development will be based upon gas or coal-fired main generating units and will be subject to separate approval of the Government in the future.

This report outlines all the necessary monitoring and auditing requirements and mitigation measures associated with the construction and operation of the LTPS based on the findings of the Initial Assessment Report and the Key Issue Reports.

ERM Hong Kong has been involved with the environmental assessment throughout the studies and therefore was commissioned by CLP to prepare this EM&A report.

1.2

OBJECTIVES OF ENVIRONMENTAL MONITORING

The objectives of the environmental monitoring and audit for the construction and operation of the Black Point Large Thermal Power Plant include :

- to provide a data base against which to determine any short or long term environmental impacts of the LTPS;
- to provide an early indication that any of the environmental control measures or practices are failing to achieve the acceptable standards;
- to provide data to enable an environmental audit of the construction and operation of the LTPS;
- to monitor the performance of the project and the effectiveness of mitigation measures during its construction and operation;
- to verify the environmental impacts predicted in the EIA study;
- to determine project compliance with regulatory requirements, standards and governmental policies; and
- to take remedial action if unexpected problems or unacceptable impacts arise.

Dredging/reclamation, site formation and associated construction works are scheduled to commence in March 1993. The monitoring and audit requirements are discussed in this section. CLP will employ an independent approved laboratory to carry out the environmental monitoring work while environmental auditing work will be undertaken by ERM Hong Kong during the early stage of construction and CLP's environmental team may possibly take up the auditing role at a later stage.

The IAR study has highlighted the various mitigation measures which need to be considered during construction to ensure that the proposed developments during construction will be able to comply with all environmental regulatory requirements, policies and standards. These mitigation measures were subsequently agreed with the EPD in the form of a Technical Schedule.

2.1 WATER QUALITY MONITORING REQUIREMENTS

Water quality monitoring is required to ensure that mitigation measures which have been designed for are implemented and operating effectively.

Baseline monitoring is required to be carried out prior to commencement of construction to establish the surrounding background water quality. Water quality monitoring is required during dredging as a check on the compliance with the Deep Bay Water Quality Objectives and the recommended Trigger, Action and Target levels. Parameters to be measured should include turbidity, suspended solids and dissolved oxygen concentration. *Table 2.1a* defines the various levels for determination of the level of action required by the relevant parties. In the event of an exceedance of a specific level, the appropriate action by the parties involved are clearly defined in *Table 2.1b*. Details of water quality monitoring are given in *Annex A1.1* and recommended mitigation measures are outlined in *Annex B1.1*.

2.2 NOISE MONITORING REQUIREMENTS

The predicted noise level at the Noise Sensitive Receivers (NSRs) as estimated during the IAR stage versus the contractor work schedule are presented in *Annex C*. This demonstrates that the estimated construction noise level is not envisaged to exceed the Acceptable Noise Level (ANL) for the daytime at the NSRs.

Although noise level is not envisaged to exceed the ANL for the daytime, weekly measurements and measurements for work during restricted hours is recommended as a compliance check. Monitoring requirements on the frequency, duration and location of a measurement are given in *Table 2.2a*. In the event of complaints, appropriate actions to be taken by the various parties involved are outlined in *Table 2.2b*. Details of noise monitoring

requirements are given in *Annex A1.2* and recommended mitigation measures are outlined in *Annex B1.2*.

2.3

AIR MONITORING REQUIREMENTS

Dust monitoring is recommended to provide information regarding the effectiveness of dust suppression measures; the actual dust exposure of the sensitive receptors; and to determine the requirements of further dust suppression measures.

Extensive Total Suspended Particulates (TSP) monitoring works have been carried out by CLP at Lung Kwu Tan (in between Pak Long and Nam Long). The TSP monitoring at Lung Kwun Tan should be representative of the general baseline level in the Black Point area. Taking account of the fact that no other construction work is currently carried out in the area. Data collected at Lung Kwu Tan can therefore be used to establish for the baseline TSP levels for the LTPS site. No additional baseline hourly monitoring is considered necessary. However, checking of the baseline TSP at the monitoring location is recommended. These should include daily ambient TSP measurement per day, and at least three times per day of hourly sampling every 6 months when all mitigation measures are implemented and when construction activities are not taking place.

Regular daily monitoring of dust should be carried out at least once every six days, and the day chosen should be fairly representative of normal construction activities. One-hour dust monitoring should be carried out three times for every 6 days during construction when significant dust emission is anticipated. Wind speed and direction should also be recorded during dust samplings.

Monitoring Requirements on frequency, duration and locations of a measurement are given in *Table 2.3a*. In the event of complaints, appropriate action by the various parties involved are outlined in *Table 2.3b*. Details of dust monitoring requirements are given in *Annex A1.3* and recommended mitigation measures are outlined in *Annex B1.3*.

2.4

CONTINGENCY PLAN

The following measures shall be undertaken to avoid any unnecessary delay in action or monitoring:

- i) Deputy to be appointed in the event of prolonged non-availability of key personnel;
- ii) Provision to be made for delay which may affect the monitoring schedule;
- iii) Spares to be available in the event of failure or theft of equipment;
- iv) Monitoring to be withheld in the event of adverse weather conditions until the latter has passed;

- v) Monitoring to be rescheduled in the event of failure to carry out the necessary monitoring exercise as scheduled due to unplanned events;
- vi) Allowance to be made to provide additional space for monitoring, additional monitoring equipment.

Table 2.1a *Water Quality Monitoring Requirements*

Frequency	Baseline	4 sampling days ¹ per week for 4 consecutive weeks prior to commencement of dredging, at mid-flood and mid-ebb.
	Work Phase	3 days per week at mid-flood and mid-ebb at 3 depths at each station. On a working day with intervals between each series of samplings not less than 36 hours.
Monitoring Locations	Designated monitoring and control stations as indicated in Appendix A – Figure A1.1a	
Trigger Levels	Station result greater than 30% above the baseline Level for suspended solids; and/or more than 100 mg/l of SS at a radius of 100 m from the dredger and/or less than 30% below the mean value of the Baseline Monitoring measurements for dissolved oxygen.	
Action Levels	Station result greater than 30% above the mean value of recorded reading in the same day at the controls station recording for suspended solids; and/or more than 100 mg/l of SS at a radius of 100 m from the dredger; and/or less than 4 mg/litre dissolved oxygen at the surface layer; and/or less than 2mg/litre dissolved oxygen at 2 meters above bottom ²	
Target Levels	Station result greater than 30% above maximum recorded reading in same day at the controls station recording for suspended solids; and/or persistently (3 times) more than 100 mg/l of SS at a radius of 100 m from the dredger; and/or persistently (3 times) less than 4 mg/litre dissolved oxygen at the surface layer; and/or less than 2mg/litre dissolved oxygen at 2 meters above bottom ²	

Note

- 1 Dredging activities has already started. Baseline monitoring was carried out for 4 days which may be supplemented by the summer silt measurements conducted by CLP in 1991. The baseline level for DO and SS have been agreed with EPD.
- 2 5 mg/litre DO in the surface layer applicable for the Mariculture zone.

Table 2.1b Water Quality - Action Plan

Event	Action	
	Project Proponent/Engineer	Contractor
Exceedance of Trigger level	<p>Notify EPD</p> <p>Evaluate the effectiveness of the contractor's proposed mitigation measures</p> <p>Require contractor to implement the necessary mitigation measures to prevent breaching another level</p>	<p>Repeat measurements as soon as possible to check compliance of water quality parameters with reference to the compliance standards.</p> <p>Notify Project Proponent/Engineer.</p> <p>Review their own plants, equipment and working procedures.</p> <p>Identify source and impose necessary mitigation measures.</p> <p>Recommended mitigation measures include but are not limited to the following:</p> <ul style="list-style-type: none"> · Modifications to dredging practice - silt curtain, water tight grabs. · Rescheduling of dredging activities. · Improved operational and maintenance techniques.
Exceedance in Action level	<p>Notify EPD immediately.</p> <p>Require Contractor to make additional proposals on mitigation measures</p>	<p>Repeat measurements as soon as possible to check compliance of water quality parameters with reference to the compliance standards.</p> <p>Identify source.</p> <p>Review plant and equipment and working procedures.</p> <p>Submit proposals for mitigation measures to Project Proponent/Engineer.</p> <p>Implement remedial action immediately.</p> <p>Notify Project Proponent/Engineer of the action taken.</p>
Exceedance of Target level	<p>Notify EPD immediately.</p> <p>Require Contractor to make additional proposals and to take immediate steps to mitigate situation</p> <p>Provide investigation report which should be sent to EPD as soon as possible.</p>	<p>Repeat measurements as soon as possible to check compliance of water quality parameters with reference to the compliance standards.</p> <p>Daily monitoring is to be imposed.</p> <p>Notify Project Proponent/Engineer.</p> <p>Identify source.</p> <p>Review plant and equipment and working procedures.</p> <p>Submit proposals for mitigation measures to Project Proponent/Engineer.</p> <p>Implement remedial action immediately.</p> <p>Notify Project Proponent/Engineer of the action taken.</p> <p>Provide investigation report which should include the findings and suggestions to prevent such exceedance happening again.</p> <p>If target limits are breached for 3 consecutive measurements, dredging to be suspended until the Authority is convinced that the problem is well under control and that the continuation of dredging operations will be in compliance with DBWQO.</p>

Table 2.2a Noise Monitoring Requirements

Frequency	Ambient	Twice a year for each locations when no construction activities are taking place
	Construction	Weekly and when work in restricted hours is required.
Measurement Method	Ambient	24 hour continuous measurement of Leq and L90
	Construction	L _{eq (30 mins)} for 0700–1900hrs. L _{eq (5 mins)} for 1900–0700 hrs.
Monitoring Locations	Nearest identified sensitive receivers, namely, Tsang Tsui and Tai Shui Hang	
Trigger Level	A single complaint	
Action Level	More than one complaint	
Target Level	L _{eq(30min)} 75 dB(A) exceeded between 0700–1900 hrs on Monday to Saturday	
	L _{eq(5min)} 60 dB(A) exceeded between 0700–2300 hrs on holidays and 1900–2300 hrs on all other days	
	L _{eq(5min)} 45 dB(A) exceeded between 2300–0700 hrs of next day	

Table 2.2b Action Plan for Noise

Event	Action	
	Engineer	Contractor
Exceedances of Trigger Level	<ul style="list-style-type: none"> • Notify Contractor • Conduct measurement • Investigate noisy operations 	
Exceedances of Action Level	<ul style="list-style-type: none"> • Notify Contractor • Analyse investigation • Require Contractor to propose measures for the analysed noise problem • Increase monitoring frequency to check mitigation effectiveness 	<ul style="list-style-type: none"> • Submit noise mitigation proposals to Engineer • Implement noise mitigation proposals
Exceedance of Target Level	<ul style="list-style-type: none"> • Notify Contractor • Require Contractor to implement mitigation measures • Increase monitoring frequency to check mitigation effectiveness 	<ul style="list-style-type: none"> • Implement mitigation measures • Prove to Engineer effectiveness of measures applied

Table 2.3a *Dust Monitoring Requirements*

Frequency	<p><i>Baseline Checking</i></p> <ul style="list-style-type: none"> 24 hour ambient TSP measurement and at least three times per day of hourly sampling every 6 months when construction activities are not taking place and when all mitigation measures are implemented. <p><i>Impact Monitoring</i></p> <ul style="list-style-type: none"> Collection of three 1-hour measurements for every 6 days are the minimum. The measurements should coincide with the construction activities with significant dust emissions. Collection of 24 hour sample once every six days.
Measurement Method	High Volume Method for TSP as described by USEPA in 40CFR part 50 or Direct reading dust meter capable of achieving results comparable to a HVS for 1 hour sampling.
Monitoring Locations	At site boundary on the southeastern side in the direction of Lung Kwu Tang and Lung Kwu Sheung Tan, if necessary, sampling may be required at other locations during the course of the work.
Trigger Level	30% above the baseline monitoring data.
Action Level	Average value of the trigger and target levels.
Target Level	AQO for TSP: 260ug/m ³ averaged over 24 hours.

Table 2.3b Dust – Action Plan

Event	Action	
	Project Proponent/Engineer	Contractor
Exceedance of Trigger level		Repeat measurement as soon as possible. Notify Project Proponent/Engineer Identify source and impose necessary mitigation measures.
Exceedance of Action level	Notify EPD Require Contractor to make additional proposals for dust suppression.	Daily monitoring is to be imposed. Identify source. Review plant and equipment and working procedures. Submit proposals for reducing dust to Project Proponent/Engineer. Implement remedial action to dust emission immediately. Notify Project Proponent/Engineer of the action taken.
Exceedance of Target level	Notify EPD immediately. Require Contractor to make additional proposals for dust suppression. Provide investigation report which should be sent to EPD as soon as possible.	Notify Project Proponent/Engineer immediately. Daily monitoring is to be imposed. Identify source. Review plant and equipment and working procedures. Submit proposals for reducing dust to Project Proponent/Engineer. Implement remedial action to dust emission immediately. Notify Project Proponent/Engineer of the action taken. Provide investigation report which should include the findings and suggestions to prevent such exceedance happening again. Stop the relevant portion of work as necessary as determined by the Project Proponent/Engineer.

CLP propose to proceed with 4 x 600MW gas-fired combined-cycle gas turbine (CCGT) units fired primarily on gas with industrial diesel oil as backup for Phase 1 of the LTPS development. While the first two units will be installed at Black Point, the location of the third and the fourth units will be subject to confirmation. This section outlines the monitoring requirements associated with the operation of the gas-fired power plants. Proposed mitigation measures for the operational phase are being considered by EPD.

Environmental monitoring for the operational phase will be undertaken by the CLP's environmental team. Regular auditing work by an independent organisation is recommended.

3.1 AIR MONITORING REQUIREMENTS

Two different sources of air pollutants were identified during the Key Issue Report, namely, stack emissions and fugitive emissions from ground level sources. However, as the power plant will be gas-fired, fugitive emissions from handling of coal and pulverised fuel ash (PFA) or FGD reagent/product will not arise.

Ambient Air Monitoring

The stack emissions will depend on the fuel used and mitigation measures employed. With gas fired CCGT units, only the NO₂ emission will cause concern. Light diesel oil will be used for firing the CCGT in case the supply of gas is interrupted. Ambient SO₂ monitoring will also be conducted. This monitoring program will provide the necessary background air quality data for the Phase 2 development of the LTPS.

The ambient monitoring stations should be equipped with continuous monitors for NO₂, SO₂, wind speed and direction. This setup is essentially similar to CLP's existing air quality monitoring stations. It is recommended that the monitoring stations, namely, Lung Kwu Tan, Mai Po Natural Reserve, Tung Chung identified in the KIA be operated three months before the commissioning of the first unit to collect air quality data to establish a realistic background concentration. These monitoring stations will be used for ambient monitoring during the first two years of operation. Future monitoring requirements will be considered in the light of the Specified License Process requirements. These sites were selected based on the representative nature of the site and the extent of air quality from LTPS and CPPS. The background data can then be used to compare with data from the operational period to assess the impacts resulting from the new units at Black Point. The exact location of the station will have to be agreed with EPD. Details on monitoring requirements are given in Table 3.1a.

It is anticipated that the existing monitoring sites at Tuen Mun (San Hui) and in the North West New Territories – Hung Shui Kiu and Au Tau, and the planned Butterfly Estate Station will also serve the LTPS. The overall monitoring programme for air quality impacts will need to be reviewed after the addition of these 3 monitoring stations.

The provision of monitoring stations will have to be reviewed on a regular basis to ensure that any changes in the ambient air quality in the vicinity of the sensitive receptors being affected are adequately recorded. Any proposed changes or amendments should be discussed and agreed with EPD.

Stack Gas Monitoring

Apart from the off-site ambient monitoring, monitoring of stack gas emissions should also be carried out to confirm the efficiency of the pollution control equipment. Under the Best Practical Means (BPM) for gas-fired gas turbines, the following are required:

i) Continuous stack gas monitoring:

- Continuous in-stack monitoring of NO_x, O₂, CO and stack temperature;
- Continuous process monitoring include generation output, water-to-fuel injection ratio and other essential operating parameters which may significantly affect the emission of air pollutants.

ii) Stack sampling:

- NO_x in accordance with USEPA Reference Method 7 or the equivalent.

On-line telemetry should be considered to allow EPD real time access to the monitoring data. This will ensure compliance with emissions control regulations and the design and operational criteria laid down in the Specified Process Licence.

3.2

WATER QUALITY REQUIREMENTS

Effluent discharges from the planned LTPS into the Deep Bay Water Control Zone, will be subjected to control standards stipulated in the TM¹, and hence the monitoring and licensing requirements for the Water Pollution Control Ordinance (WPCO) licence have to be agreed by EPD. With the adoption of the gas-fired units, some of the effluents previously identified during the KIA will not arise from the operation such as the effluent from ash pit and FGD and runoff from the coal stockyard.

¹ Technical Memorandum, standards for effluents discharged into drainage and sewerage systems inland and coastal waters.

Effluent Monitoring

Liquid effluents from a number of sources will be mixed with the cooling water and discharged via the outfall. It should be noted that every individual effluent stream will have to comply with the TM standards before mixing up with the cooling water discharges. Since there is a large variation in effluent characteristics, quality and quantity, monitoring of individual effluent streams at source is proposed. A list of proposed sources, monitoring parameters and frequency is shown in *Table 3.2*.

Marine Water Quality Monitoring

To keep track of trends in water quality and to check compliance with the Water Quality Objectives (WQOs) in the vicinity of the discharge, monthly monitoring is recommended during the initial years of operation till the full capacity of the plant. As a guide, far field monitoring sites should be selected at about 1500m and 2000m from the Cooling Water discharge outfall or located round the periphery of the 2°C contour to provide compliance checking with the water temperature WQO for Deep Bay.

When at full capacity, the requirements for monitoring may be reviewed on a regular basis if monitoring confirms that the cooling water is not causing the ambient water temperature to rise by 2°C .

3.3

NOISE MONITORING REQUIREMENTS

The proposed noise monitoring programme as presented in *Table 4.2a* is based on the findings in the noise assessment study, and the noise prediction should be validated by direct noise measurement. A suitable location near the LTPS site boundary, experiencing the minimum of ambient noise variations or other likely influencing factors, should be selected for noise prediction validation. It is recommended that the western boundary of the existing Tsang Tsui Ash Lagoon (site D in baseline noise survey) be selected as the noise reference site. (Noise prediction using the initial source model and calculation algorithms is performed and recorded for the Ash Lagoon noise reference site.)

Environmental noise monitoring is considered necessary to check compliance with the statutory noise criteria and should be performed at least once, after the commissioning of each generating unit at the nominal operation load and thereafter at quarterly intervals.

The commissioning and operational phase of the proposed LTPS will extend over a long period. As a result of the other planned developments in the vicinity, namely the WENT Landfill and the proposed Tuen Mun Port Development, the area will be subjected to an external change in the background noise environment. To allow for the adjustment of this type of external change in the background noise level, a monitoring programme for the background noise environment is recommended in the following section.

It will be CLP's responsibility to conduct operational noise monitoring and submit the results to Government.

Compliance Monitoring

Noise measurements for a period of 24 hours should be carried out at the three of the Noise Sensitive Receivers (NSRs) identified in IAR, namely, Lung Kwu Sheung Tan, Tsang Tsui Village and Lung Kwu Tan.

The noise measurements should be corrected and adjusted for the background noise level, in accordance with TM procedures, for compliance checking with statutory noise criteria and the predicted noise level.

Background Monitoring

Background noise monitoring should be carried out annually during the operational phase to adjust for changes to the baseline noise conditions that will result from other developments in the area. Monitoring is recommended at Lung Kwu Sheung Tan, Lung Kwu Tan, Tsang Tsui Village, and Tsang Tsui Ash Lagoon Boundary

Extra noise measurements may be carried out on those occasions when commencement of external development is expected to maintain a specific record such that the causes and effects on the noise baseline can be followed.

All measurements in the Environmental Noise Monitoring Programme should be performed as follows:

- a) All sound level readings should be measured and recorded by suitably experienced staff.
- b) Noise measurements should be carried out using approved equipment, which shall be tested at regular intervals in a manner and in a laboratory approved by EPD.
- c) The sound level meters used shall comply with the International Electrotechnical Commission Publications 651: 1979 (type 1) and 804: 1985 (type 1), specification, as referred to in the Technical Memorandum to the Noise Control Ordinance.
- d) The location of the noise monitoring is to be notified to EPD and recorded for use in subsequent monitoring.
- e) Environmental noise levels for criteria checking should be recorded as the average of consecutive $L_{eq(30\text{ min})}$ measurements. L_{90} and $L_{10(30\text{ min})}$ measurements should also be taken for reference, at agreed locations, to the agreed schedule.

- f) Calibration and measurement procedures for the noise criteria checking measurements should follow the Annex of the TM.

Table 3.1a Air Monitoring Requirements

	Compliance Monitoring			Background Ambient Monitoring
	Ambient Monitoring	Stack Monitoring	Stack Sampling	
Parameters	NO ₂ , SO ₂	NO _x , O ₂ , CO and stack temperature	NO _x	NO ₂ , SO ₂
Frequency	24 hr continuous	24 hr continuous	at least once per year	24hr continuous for at least three months prior to operation of the LTPS
Measurement Method	Same as existing CPPS ¹ monitoring programme	Same as existing CPPS in stack monitoring programme	USEPA method 7 or any EPD approved equivalent method	Same as existing CPPS in ambient monitoring programme
Locations	Lung Kwu Tan, Tung Chung and Mai Po Natural Reserve ²	In-stack	In-stack	Lung Kwu Tan, Tung Chung and Mai Po Natural Reserve
Other Info	Wind speeds and direction logging	Loading (MW), water to fuel ratio, logging of operating condition ⁴	Loading (MW), Water-to-fuel ratio, logging of operating condition ⁴	Wind speeds and direction logging
Compliance Limits	Hong Kong Air Quality Objectives	NO _x : 75 ppm	NO _x : 75 ppm	N/A ³

* 1 CPPS – Castle Peak Power Station

* 2 Exact location to be agreed with EPD

* 3 N/A – Not applicable

* 4 When detail of the plant is available, a complete list of operating conditions to be logged should be agreed with EPD.

Table 3.3a Noise Monitoring Requirements

	Compliance Monitoring	Background Monitoring
Frequency	Quarterly ⁽¹⁾ and after commissioning of new LTPS units	Annually and after introduction of other major works
Measurement Method	24 hours continuous measurement	24 hours continuous measurement
Parameters	Criteria : $L_{eq(30\ min)}$ Reference : $L_{10(30\ min)}$ $L_{90(30\ min)}$ $\frac{1}{3}$ octave spectrum	$L_{90(30\ min)}$ $L_{10(30\ min)}$ $L_{eq(30\ min)}$ $\frac{1}{3}$ octave spectrums
Locations	Criteria : Lung Kwu Sheung Tan Lung Kwu Tan Tsang Tsui Village Reference : Boundary of Tsang Tsui Ash Lagoon	Lung Kwu Sheung Tan Lung Kwu Tan Tsang Tsui Village Boundary of Tsang Tsui Ash Lagoon
Limits ⁽²⁾	55 dB(A) $L_{eq(30\ min)}$ for day and evening, 45 dB(A) $L_{eq(30\ min)}$ for night time	N/A

(1) If exceedance of noise criteria occurs, additional monitoring and frequency may be required as agreed with EPD .

(2) The noise measurements should be corrected and adjusted for the background noise level.

Table 3.2a Water Monitoring Requirements

	Compliance Monitoring					Background Ambient Monitoring
Effluent Source	Cooling Water	Water Treatment Plant	Boiler Blowdown	Oil Water Separation	Domestic Sewage	
Frequency ¹	Daily (except for temperature – continuous measurement)	Every Batch	Every Batch	Every Batch	Weekly	Monthly for a year prior to operation of the LTPS
Measurement Method	Analytical method as listed under the Technical Memorandum – Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters					
Parameters	Residual Chlorine, pH, Oil, TSS, pH, Temperature		Suspended solids, pH	Oil, pH	Suspended Solids, residual chlorine, E Coli, BOD	Temperature, Dissolved Oxygen
Locations	Point of discharge as agreed with EPD					
Compliance Limits	Standards as stipulated in the Technical Memorandum – Standards for Discharged into the Coastal Waters of Deep Bay or as agreed with EPD					N/A

Note¹: The frequency of measurement to be confirmed and agreed with EPD when detailed design becomes available.

Environmental auditing is required as recommended to test the adequacy of the environmental management systems and the effectiveness of the environmental monitoring programme. Environmental auditing should be carried out by an independent body to review and verify information available in records developed through the monitoring programme, and to thereby identify specific issues of non-compliance and recommendations to meet them. It is recommended that an audit be carried out on a regular basis to check effectiveness of mitigatory measures and review the need for other mitigatory measures.

An Environmental Monitoring and Audit (EM&A) Manual for both the construction and operational phase of the LTPS will be prepared by the Project Proponent/Engineer to provide information, guidance and instruction to environmental site staff undertaking the EM&A work. The manual should also include the management mechanism for environmental issues for effective control on site and reporting procedures. It is recommended that a member of on-site staff be appointed to monitor performance by contractor(s) in complying to the environmental requirements. The individual should preferably be a member of the engineering team who has the authority to give immediate instruction to the Contractor if non-compliance is observed during daily inspection.

The EM&A Manual for the construction phase should be submitted to EPD for consideration. The EM&A Manual for the operational phase should be submitted prior to commencement of baseline monitoring and operation of the LTPS. Guidelines on the EM&A Manual is given in *Annex D1*.

Monitoring data on air, noise and water should be recorded and stored for ease of reference. An EM&A progress report should be prepared by the Project Proponent/Engineer and submitted to EPD on a monthly basis. The reports should include monitoring data for air, noise and water, audit/review of the environmental monitoring data to identify compliance with regulatory requirements, policies and standards and any remedial works taken/required to mitigate the adverse impacts. Format and guidelines of the EM&A Progress Report are given in *Annex D2*.

ANNEXES

Annex A

Environmental Monitoring Construction Phase

A1 INTRODUCTION

The following section includes proposals for procedures designed to safeguard the environment on aspects of water, noise, air and waste during the construction phase of the proposed LTPS.

A1.1 WATER QUALITY MONITORING

A1.1.1 General Requirements

- a) The construction works should be carried out in such a manner as to minimise adverse impacts on water quality, in accordance with the Deep Bay Guidelines on Dredging, Reclamation and Drainage works, and to ensure that the Water Quality Objectives (WQO) for Deep Bay as specified in the Statement of Water Quality Objectives (Deep Bay Water Control Zone) under the Water Pollution Control Ordinance (Cap. 358) are maintained.
- b) The following standards on the Deep Bay Water Control Zone WQO shall be complied with:
 - (i) Dissolved Oxygen – a minimum of 5mg/l in the surface layer and 2mg/l in the bottom layer at all stations.
 - (ii) Turbidity – a maximum increase of 30% above ambient at all Designated Monitoring Stations in Deep Bay.
 - (iii) Suspended Solids – a maximum of 100 mg/l at a radius of 100m from the dredger, and a maximum of 30% above ambient levels at Designated Monitoring Stations in Deep Bay.

A1.1.2 Objectives

The objective of the monitoring programme is to minimise adverse impacts on the water quality during the various stages of the dredging operations such as dredging, loading, transport, and dumping. In order to achieve this the contractor shall design and implement methods of working that:

- (i) minimise disturbance to the seabed while dredging;
- (ii) minimise leakage of dredged material during lifting;
- (iii) minimise loss of material during transport of fill or dredged material;
- (iv) prevent discharge of dredged material except at approved locations;
and
- (v) prevent the unacceptable reduction, due to the Works, of the dissolved oxygen content of the water adjacent to the Works.

The Contractor shall provide within one week of the date of the Purchaser's Instruction to Commence the Works, the following equipment:

(a) Dissolved oxygen and temperature measuring equipment.

The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and be operable from a DC power source. It shall be capable of measuring:

- (i) dissolved oxygen level in the range of 0-20 mg/l and 0-200% saturation.
- (ii) temperature in a range of 0-45 degree Celsius.

It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 25m in length. Sufficient stocks of spare electrodes and cable shall be maintained for replacement where necessary. (*SI model 58 metre, YSI 573(probe, YSI 5795A submersible stirrer with reel and cable or similar approved).*)

(b) Turbidity Measurement Instrument

Turbidity within the water shall be measured in-situ by the nephelometric method. The instrument shall be a portable weatherproof turbidity-measuring instrument complete with cable sensor and comprehensive operation manuals. The equipment shall be operable from a DC power source, it shall have a photoelectric sensor capable of measuring turbidity between 0-100 NTU and be complete with cable not less than 25m in length. (*Partech Turbidimeter Model 7000 3RP Mark 2 or similar approved.*)

(c) Suspended Solids

A 12 volt DC powered peristaltic pump equipped with a Tygon tubing of a minimum of 25m in length shall be used for sampling water. Samples shall be collected in high density polythene bottles, packed in ice (cooled to 5°C without being frozen), and delivered to the laboratory as soon as possible after collection. Upon arrival to the laboratory, samples shall be well-mixed and then immediately filtered (with a vacuum of less than 381mm of Hg) through pre-weighed Millepore matched pair filters (for <5 mg.L0 or preweighted Whatman GF/C filters (for >5mg.L). Particulate collected on the filter papers shall be stored at 5°C and be dried within 48 hours in a drying oven at 103°C until constant weight is reached on two consecutive weightings. Filter papers taken from the drying oven shall be cooled to room temperature in a desiccator prior to being weighed. An accurate electronic balance shall be used to give a precision level of 0.01mg.

(d) Thermometer

A laboratory standard certified mercury thermometer with an accuracy of at least 0.5 degree Celsius. Temperature sensors should be calibrated against a mercury thermometer of 0.1°C scale.

(e) Water Depth Detector

A portable, battery-operated Echo Sounder shall be used for the determination of water depth within the Site and at each Designated Monitoring Station. This unit can either be handheld or affixed to the bottom of the work boat if the same vessel is to be used throughout the monitoring programme.

All monitoring instruments shall be checked, calibrated and certified by an approved accredited laboratory before use on the Works and subsequently re-calibrated at 3-month intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes shall be checked with certified standard solutions before each use. The turbidity meter shall be calibrated to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in mg/l).

A1.1.4

Water Quality Monitoring

Monitoring should be carried out in accordance with the following:

- a) Baseline conditions for the various water quality parameters should be established prior to the commencement of the marine works. The baseline conditions should be determined by measurement of turbidity, suspended solids (mg/l), dissolved oxygen concentration (D.O. in mg/l) and dissolved oxygen saturation at the locations specified in A1.1.5 below on 4 sampling days per week for 4 consecutive weeks at mid-flood and mid-ebb prior to Commencement of the Works. All measurements of temperature, dissolved oxygen concentration, dissolved oxygen saturation and turbidity shall be taken in situ at 3 water depths namely 1m below water surface, mid-water depth, and 1m above sea bed. Water samples for suspended solids analysis shall be taken at the same three depths. In the event of shallow waters less than 3m, samples shall be taken at mid-depth but additional samples (3 samples) shall be taken.

Note : Due to constraints in the overall programme, dredging has already started, baseline monitoring was carried out on 4 consecutive days. This information may be supplemented by CLP's summer silt measurements in 1991.

- b) During the course of the Works, monitoring shall be undertaken three days a week at mid-flood and mid-ebb. Monitoring at each Designated Control and Monitoring Station shall be undertaken on a working day. The interval between each series (mid-ebb and mid-flood) of samplings shall not be less than 36 hours. The values of turbidity, DO, suspended solids shall be determined at the designated locations. Two measurements at each depth of each station shall be taken. The probes must be removed from the water after the first measurement and then

redeployed for the second measurement. Where the difference in value between the first and second ratings of each set is more than 25% of the value of the first reading, the readings shall be discarded and further readings shall be taken. For the purpose of evaluating the water quality, all values shall be depth average.

- c) Should the monitoring programme record levels of suspended solids in excess of 30% above the ambient range, or levels of dissolved oxygen below 4mg/l (5mg/l for mariculture zone), closer monitoring is required. The Project Manager may direct that monitoring shall be undertaken daily at each Designated Control and Monitoring Station until the recorded depth averaged values of these parameters indicate to the satisfaction of the Project Manager an improving and acceptable level of water quality.
- d) At completion of all dredging and filling works, the project proponent/Engineer shall continue the monitoring of water quality for a period of six consecutive weeks. At the end of this period, the project proponent/Engineer shall submit a post-project audit report to EPD in printed and magnetic media form, and in an agreed format giving the dates and times of each series of measurements. The actual measurements of each recording, together with comments on any discarded measurements shall also be provided. For each location and series of measurements, the project proponent/Engineer shall compare these measurements with the established baseline water quality parameters and shall implement appropriate remedial measures if deterioration of water quality attributable to the works, is discovered.

A1.1.5

Positions of Designated Control and Monitoring Stations

Water quality monitoring should be carried out at the Designated Control and Monitoring Stations as shown in Figure A1.1a to provide an indication of the water quality in the surrounding waters. Five monitoring stations are recommended for each site. In addition, two monitoring stations will be located within the boundary of the oyster bed. *Figure A1.1* shows the location of the proposed monitoring and control stations.

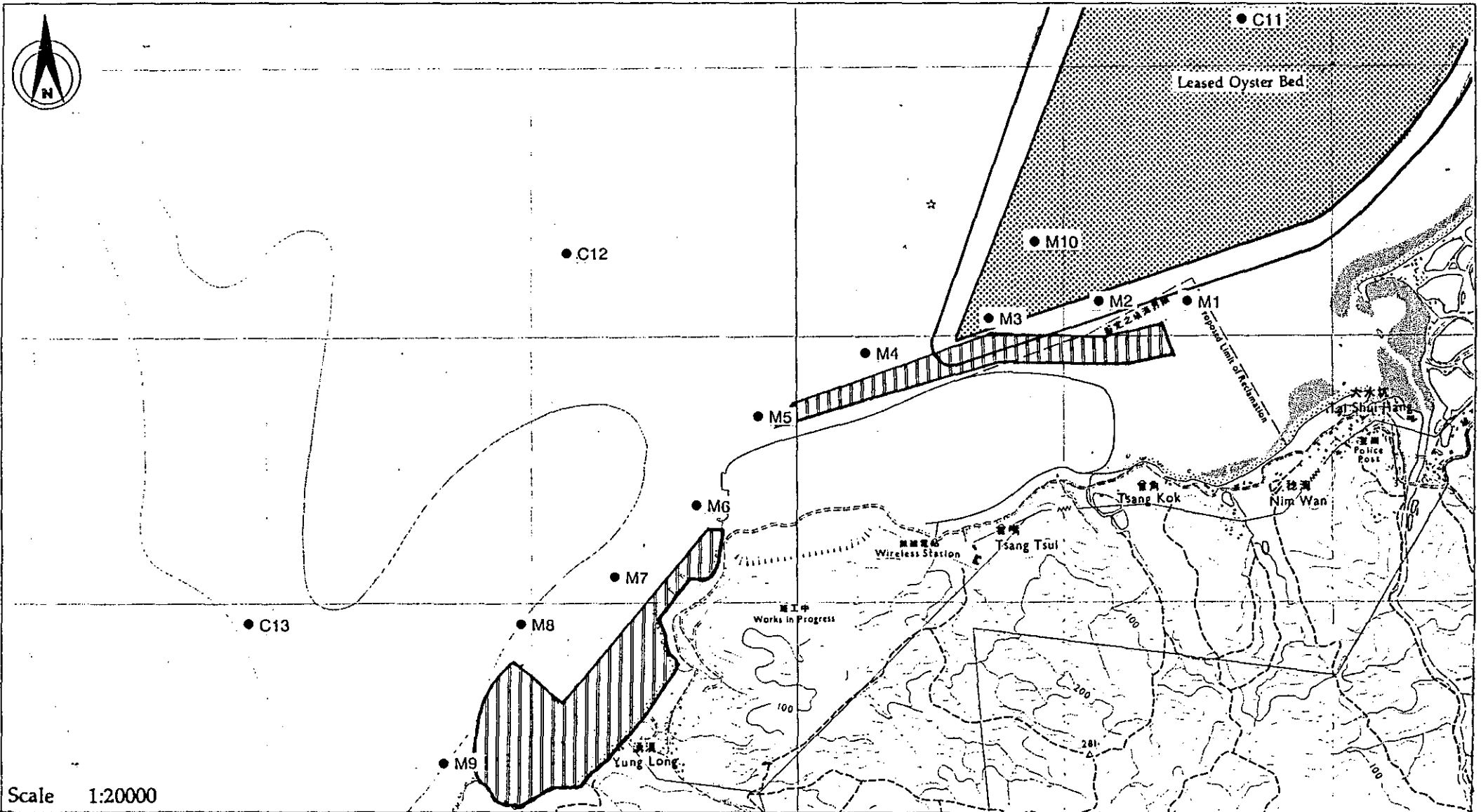


Figure A1.1a Locations of Control and Monitoring Stations

ERM Hong Kong

10-11th Floor
 Hecny Tower
 9 Chatham Road
 Tsimshatsui, Kowloon
 Hong Kong



Table A1.1a Recommended Locations of Monitoring Stations for Dredging at Black Point

	E	N
Control Station		
C12	808605	832110
C13	807380	830735
Monitoring Station		
M3	810160	831845
M6	809075	831135
M7	808770	830875
M8	808410	830695
M9	808120	830165
M10	810340	832125

Note : M3 and M10 are located within the boundary of the oyster bed

A1.1.6 Recording of Monitoring Data

The results of all Water Quality Monitoring shall be provided by the Contractor to the Project Manager, in an agreed format, no later than 24 hours after the sampling, except for the results for the suspended solids which shall be reported no later than 48 hours after sampling. Sample monitoring data record sheets are given in *Table A1.1b* and *Table A1.1c*.

At monthly intervals or at times to be agreed with the Project Manger, the Contractor shall provide to the Project Manager a summary report, in both printed and magnetic media form, to an agreed format, details of wear quality data obtained in that month. This will include a summary report of any repeat monitoring or remedial measures taken to maintain the wear quality. The Project proponent/Engineer should provide an audit report.

The results of all Water Quality Monitoring should be retained and made available for inspection by EPD. In the event of any exceedance of WQOs recorded during the course of the works, a record of mitigation measures, adopted in order to restore water quality to a level compliant with the WQOs, will be retained and made available for inspection by EPD.

Table A1.1b Water Quality Monitoring Record Sheet - Dissolved Oxygen Level

Monitoring Station		Water Depth ⁵		
		S	M	B
M3 ^{*1}				
M6				
M7				
M8				
M9				
M10 ^{*1}				
Control Station				
C12				
C13				
Trigger level (mg/l)		5.3	5.3	5.3
Exceedances ^{*2}				
Action Level	Mariculture Zone	5	5	5
	Other than Mariculture Zone	4	4	2
Exceedances ^{*3}				
Target Level	Mariculture Zone	5	5	5
	Other than Mariculture Zone	4	4	2
Exceedances ^{*4}				
<p>Note:</p> <p>S = 1 meter below surface</p> <p>M = middepth</p> <p>B = 1 m above seabed</p> <p>*1 - Monitoring Stations within Oyster Bed</p> <p>*2 - Trigger Level - Compare with readings of the monitoring stations</p> <p>*3 - Action Level - Compare with readings of the monitoring stations</p> <p>*4 - Target Level - Target level is exceeded if action level is persistently exceeded for 3 times</p> <p>*5 - Two reading at each water depth</p>				

	Name & Designation	Signature	Date
Field Operator :	_____	_____	_____
Lab Staff :	_____	_____	_____
Checked by :	_____	_____	_____

Table A1.1C Water Quality Monitoring Record Sheet – Suspended Solids Level

Monitoring Station	Water Depth ⁵		
	S	M	B
M3 ¹			
M6			
M7			
M8			
M9			
M10 ¹			
Mean			
Maximum			
Control Station			
C12			
C13			
Mean			
Maximum			
Trigger level (mg/l)	42	45	89
Exceedances ²			
Action Level (30% above mean at control Station or 100mg/l at 100m from the dredger)			
Exceedances ³			
Target Level (30% above maximum at Control station or persistently (3 times) 100mg/l at 100m from the dredger)			
Exceedances ⁴			
Note : S = 1 meter below surface M = middepth B = 1 m above seabed *1 = Monitoring stations within Oyster Bed *2 = Trigger Level - Compare with readings of the monitoring stations *3 = Action Level - Compare with daily mean of the monitoring stations *4 = Target Level - Compare with the daily maximum of the monitoring stations *5 = Two reading at each water depth			

	Name & Designation	Signature	Date
Field Operator	: _____	_____	_____
Lab Staff	: _____	_____	_____
Checked by	: _____	_____	_____

A1.2 CONSTRUCTION NOISE MONITORING

To demonstrate compliance with appropriate noise limits to minimise the disturbance to the general public caused by construction noise, the following construction noise monitoring procedures are recommended:

- (a) all sound level measurements should be carried out and recorded by suitably experienced personnel.
- (b) a schedule of proposed sound measurement times and locations should be produced and submitted to EPD for approval. The measurement times should be at appropriate intervals and chosen to represent normal construction activities.
- (c) construction noise monitoring should be carried out using appropriate equipment which is kept in a good state of repair in accordance with the manufacturers instructions.
- (d) the sound level meters used should comply with the International Electrotechnical Commission Publication 651:1979 (type 1) and 804:1985 (type 1), specification as referred to in the Technical Memorandum to the Noise Control Ordinance.
- (e) the construction noise level monitoring should be carried out at a distance of 1 metre from the external facade of the nearest identified sensitive receivers, namely at Tsang Tsui, and Tai Shui Hang or on the boundary of the construction site.
- (f) construction site noise levels should be recorded as the average of three consecutive $L_{eq(30\text{ min})}$ measurements for 0700–1900hrs and $L_{eq(5\text{ min})}$ measurements for 1900–0700h. Where a permit is given to work during restricted hours, additional measurements should be taken during the restricted hours.
- (g) baseline monitoring to determine and agree pre-existing ambient sound levels should be carried out prior to the commencement of the construction works. Where the noise climate may be affected by other developments, further baseline measurements should be made.
- (h) checking of ambient noise levels should be carried out on two occasions per year separated by not less than one monthly intervals, for each location. The checking should be carried out when construction activities are not taking place.
- (i) Monitoring requirements and definition of Trigger/ Action/Target levels are given in *Table 2.2a*.
- (j) An action plan which outlines details of appropriate responsibilities by relevant parties in the event of exceedance of the recommended level is given in *Table 2.2b*.
- (k) Noise monitoring data should be recorded in a format as given in *Table A1.2a*.

Table A1.2a Data Sheet for Noise Monitoring

Monitoring Location and reference

Date and day

Personnel reference

Weather conditions (general)

Wind Speed – average/peak (m/s)

Calibration before measurement

Calibration after measurement

Start and finish time of measurement

Duration of measurement

L₉₀ level

L₁₀ level

L_{eq} level

Principle Noise Sources

Other comments

	Name & Designation	Signature	Date
Field Operation :	_____	_____	_____
Lab. Staff :	_____	_____	_____
Checked by :	_____	_____	_____

A1.3 DUST (TSP) LEVELS

A1.3.1 General Requirements

The criteria against which the dust (measured as total suspended particulates (TSP)) monitoring should be assessed are:

- Hong Kong Air Quality Objectives (HKAQO) for TSP : daily and annual TSP levels of $260 \mu\text{g m}^{-3}$ and $80 \mu\text{g m}^{-3}$ respectively;
- EPD recommended hourly TSP limit of $500 \mu\text{g m}^{-3}$.

The TSP monitoring should be carried out by suitably experience personnel.

A1.3.2 Objectives

The objectives of TSP monitoring are to demonstrate the extent of construction dust impacts on sensitive receivers; effectiveness of mitigation measures to control dust from construction activities; and the requirements of further mitigation measures if found to be necessary.

A1.3.3 Monitoring Equipments

The TSP levels should be measured by High Volume Method for TSP as described by USEPA in 40CFR part 50, and a direct reading dust meter capable of achieving results comparable to a high volume air sampler (HVAS) for 1 hour sampling in the range of $0.1\text{--}100 \text{ mg m}^{-3}$.

The samplers shall be properly maintained and frequently calibrated. Prior to dust monitoring commencing, appropriate checks should be made to ensure that all equipment and necessary power supply are in good working condition. The samplers, equipments and shelters should be constructed so as to be transferable between monitoring stations.

A1.3.4 Monitoring Location

The TSP monitoring should be carried out at a site close to or at the site boundary on the southeastern side in the direction of Lung Kwu Tan and Lung Kwu Sheung Tan. The location of the dust (TSP) monitoring should be notified the EPD. The agreed locations should not be located near major roads and should be free from local obstructions or sheltering.

A1.3.5 Baseline Monitoring

Baseline monitoring should be carried out to determine the ambient TSP levels at the monitoring location prior to the commencement of the construction works. This baseline TSP level should be agreed by EPD.

Usually, baseline monitoring should be carried out for a continuous period of at least two weeks with daily ambient measurements to be taken day at the monitoring location, and at least three times per day hourly sampling when the highest dust impacts are expected.

Checking of ambient dust levels should be carried out every six months at the monitoring location. The checking should be carried out when all mitigation measures are implemented and when construction activities are not taking place.

An alternative to determine the baseline TSP levels is to use other long term TSP monitoring results carried out in the vicinity.

A1.3.6 Impact Monitoring

The quarterly schedule of the monitoring programme should be drawn up by the Contractor, one month prior to the commencement of the scheduled construction period. TSP monitoring should include the following:

- collection of 24 hour samples once every six days;
- collection of three 1-hour measurements for every 6 days. The measurements should coincide with the construction activities with significant dust emissions; and
- recording of general meteorological conditions, eg wind direction and wind speed.

Air quality monitoring data should be presented in the report format as given in *Table A1.3a*. Definition of Trigger/ Action/Target levels are given in *Table 2.1e*. An action plan which outlines details of appropriate responsibilities by relevant parties in the event of exceedance of the recommended trigger/action/target levels is given in *Table 2.1b*.

A1.3.7 Reporting of TSP monitoring

The Contractor should submit the monthly dust monitoring report to EPD in both printed and magnetic form on an agreed format. This should include a brief account of construction activity during the month; an interpretation of the significance of the monitoring results by verifying compliance and highlighting any failure to comply with the target levels; and an account of the remedial measure recommended and taken by the Contractor as a result.

Exceedance of the target levels should be reported immediately to the EPD as well as the progress of the findings and remedial action taken. These events should also be included in the monthly report.

The Contractor should also organise all monitoring data/records to establish the record of air quality change associated with construction.

Table A1.3a Data Sheet for TSP Monitoring

Monitoring Location	
Details of Location	
Sampler Identification	
Date & Time of Sampling	
Elapsed-time	Start (min.)
Meter Reading	Stop (min.)
Total Sampling Time (min.)	
Weather Conditions	
Site Conditions	
Initial Flow	Pi (mmHg) Ti (°C)
Rate	Hi (in.)
Qsi	Qsi (std. m ³)
Final Flow	Pf (mmHg) Tf (°C)
Rate	Hf (in.)
Qsf	Qsf (std. m ³)
Average Flow Rate	(std. m ³)
Total Volume	(std. m ³)
Filter Identification No.	
Initial Wt. of Filter	(g)
Final Wt. of Filter	(g)
Measured TSP level	(ug/m ³)

	Name & Designation	Signature	Date
Field Operation :	_____	_____	_____
Lab. Staff :	_____	_____	_____
Checked by :	_____	_____	_____

Annex B

Mitigation Measures for the Construction Phase

Water Quality Aspects

- a) The Contractor shall employ plant and arrange his method of working such that the water quality parameters specified in Table B1a are complied with, in order to achieve the Deep Bay WQO.

Table B1a Compliance Standards for Water Quality Parameters in Deep Bay Area

Parameter	Water Quality Objectives
SS	30% increase above the ambient level; maximum of 100mg/l at a radius of 100m from the dredger.
DO	minimum of 4 mg/l in surface layer and minimum of 2 mg/l in bottom layer minimum of 5 mg/l in surface layer for Mariculture Zone
Turbidity	30% increase above the ambient level.

- b) Where monitoring shows a deteriorating water quality, the Contractor shall take all necessary steps to ensure that the works being carried out by the Contractor are not contributing to the deterioration.

These steps should include the following:

- checking of all marine plant and equipment;
- maintenance or replacement of any marine plant or equipment contributing to the deterioration;
- review of all working methods;
- if the situation warrants, suspend the works until there are sufficient reasons for the Authority to believe that the problem is well under control and that the continuation of the dredging operations will be in full compliance with DBWQO.

The Project Manager shall also review the overall due-diligence management practices by the dredging contractor. A record of actions taken should be kept and made available for inspection by EPD.

The Contractor shall inform the Engineer of all remedial action taken.

The contractors should also take any practicable means that may be necessary to abate pollution caused by his action to the aquatic environment.

- (c) Measures to minimise pollution should include :
- (i) mechanical grabs if used should be designed and maintained to avoid spillage and should seal tightly while being lifted
 - (ii) cutterheads of suction dredgers should be suitable for the material being excavated and should be designed to minimise overbreak and sedimentation around the cutter
 - (iii) all vessels should be sized such that adequate clearance is maintained between vessels and the sea bed at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash
 - (iv) all pipe leakages should be repaired promptly and plant should not be operated with leaking pipes
 - (v) the Works should cause no visible foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the Site or dumping grounds
 - (vi) all barges and hopper dredgers should be equipped with tight fitting seals to their bottom openings to prevent leakages of material
 - (vii) excess material should be cleaned from the decks and exposed fittings of barges and hopper dredgers before the vessel is moved; and
 - (viii) loading of barges and hoppers should be controlled to prevent splashing of dredged material to the surrounding water and barges or hoppers should not be filled to a level which will cause overflowing of material or polluted water during loading or transportation.
- d) Trailing suction hopper dredger shall not be used for dredging without consultation with the relevant group of EPD.
- e) The contractor shall comply with requirements of the Marine Dumping Licence issued by the EPD.
- f) Suction dredgers or barges for the transportation and dumping of dredging material shall be equipped with automatic self monitoring device as specified by the EPD.

- g) The contractor shall employ an independent approved accredited laboratory to carry out a comprehensive water quality monitoring programme as outlined in *Annex A1.1*.
- h) Monitoring requirements and definition of Trigger/ Action/Target levels are given in *Table 2.1a*.
- i) An action plan which outlines details of appropriate responsibilities by relevant parties in the event of exceedance of the recommended level is given in *Table 2.1b*.

Mitigation Measures for general construction activities

- All wastewater/ effluent generated as a result of dust control measures, eg water spraying, wheel washing, should be treated in full compliance with the requirements of the EPD.
- Disposal of any solid materials, litter or wastes to marine wastes should not occur.
- All fuel tanks should be provided with locks and be sited on sealed areas within bunds of a capacity of 110% of the tank volume.
- All polluted water should be treated before discharge. Discharge should comply with the Technical Memorandum Standards for effluents discharged to coastal waters of the Deep Bay Water Control Zone.

B2

Noise Aspects

- a) The Contractor shall employ plant on-site schedules to the Engineer and make due allowance in scheduling the construction such that noise levels specified in *Table 2.1c* are not exceeded.
- b) All plant and equipment used by the Contractor on the Works shall have noise labels and shall be effectively "sound reduced" by means of silencers, mufflers, acoustic linings or shields or acoustic sheds or screens, or noise insulation.
- c) The Contractor shall apply for a Construction Noise Permit in accordance with the Technical Memorandum on Noise from Construction Work other than Percussive Piling.
- d) The Contractor shall employ a qualified person to be responsible for preparing his submissions on noise control.
- e) The Contractor shall keep good maintenance of plant and choice of appropriate plant for the dredging task.
- f) Where the relevant noise trigger levels are repeatedly exceeded during evening or night time periods in spite of the implementation of

mitigation measures, the Contractor shall schedule the dredging work so as to avoid evening or nighttime construction.

- g) An action plan which outlines details of appropriate responsibilities by relevant parties in the event of exceedance of the recommended level is given in *Table 2.1d*.
- h) Dredging and associated operations west and south of the Black Point promontory should be limited to the daytime period (0700–1900 hours).

B3 Air

- a) For construction activities at all construction sites, the following dust control measures are recommended during construction:
 - water spraying of batch loading and dumping from onsite, off-road haul trucks;
 - wheel and undercarriage washing facilities should be installed at site exits and used diligently;
 - drop heights should be kept to the minimum practicable when handling fill material;
 - regular compaction and water sprays are recommended for un-paved haul roads within the site;
 - site vehicles should be subject to speed restrictions and their movements should be confined to designated roadways when inside the site;
 - contractors should provide pollution control measures such as bag filters for cement silo and spray systems at aggregate transfer points, for concrete batching plants and crushers;
 - during site clearance, the areas of erodible material exposed at any one time should be kept to a minimum and, in the absence of rainfall, should be dampened using water bowsers with spray bars working in conjunction with the clearance plant. Large surface areas of friable soil must not be left exposed without dampening, and should be stabilised or sealed as soon as practicable.
- b) It should also be noted that stone crushing, grading and concrete batching processes are classified as specified processes under the category of 'Mineral Works', or 'Cement Works' and will require the Best Practicable Means (BPM) pertaining at the time of construction to be applied, which may include measures in addition to those identified above. A license should be obtained from the EPD prior to operation.
- c) Careful siting of the dust generating activities can further reduce the off-site impact.

- d) The contractor shall comply with the conditions specified in the Specified Processes License.
- e) The project proponent/engineer shall submit air quality monitoring and audit reports to EPD in an agreed format.

Annex C

Predicted Noise Levels at NSRs

Annex D

Environmental Monitoring
and Audit Manual and
Progress Report Format

ANNEX D1

ENVIRONMENTAL MONITORING AND AUDIT MANUAL
FORMAT GUIDELINES/CHECKLIST

Environmental Monitoring and Audit Manual

An Environmental Monitoring and Audit (EM&A) Manual is required to be submitted to the Director of Environmental Protection (DEP) at the commencement of the project.

The EM&A Manual should address but not necessarily be limited to the following requirements, which are not exhaustive:-

Purpose of the Manual:

- | | |
|--|--|
| Background: | Site Detail and Project Description; Period and Structure of Project EIA study undertaken; Key issues studied in the EIA; Main study findings; Land Lease and Engineering Conditions; Environmental Protection Requirements in Contract Documents; etc. |
| Project Organisation: | Management Structure & Organisation Chart; Liaison & communications flowchart (Internal and External liaison pathways); etc. |
| Project programme: | Sequence of Project construction; Location of works areas (On- and off-site); Phasing of works; Temporary works; Summary of Project data; etc. |
| Environmental Monitoring and Audit Requirements: | EM&A Implementation Plan; Noise and Water Quality Parameters; Monitoring Locations; Baseline Monitoring & Audit; Impact Monitoring & Audit; Trigger/Action/Target Levels; Event/Action Plans (including Emergency Plans); Recommended Mitigation Measures; Guidance on the reviews of pollution sources/working procedures in the event of non-compliance with environmental quality levels; Compliance and Post-Project Audit follow-up procedures; Monitoring Equipment required; Equipment Maintenance and Calibration Requirements; etc. |
| Environmental complaints Procedures: | Liaison and consultation procedures (Internal & External liaison pathways etc.); Complaints database; reporting procedures (telephone/written complaints); complaints action plan; complaints audit follow-up procedures; etc. |
| Report Procedures: | Format; frequency; special report procedures; etc. |
| Appendices: | Appropriate drawings/tables of monitoring locations, sensitive receiver locations, EM&A requirements, correspondence and contact lists; definitions of terms used; etc. |

ENVIRONMENTAL MONITORING AND AUDIT PROGRESS REPORTS FORMAT GUIDELINES/CHECKLIST

Environmental Monitoring and Audit (EM&A) Reports are required to be submitted to the Director of Environmental Protection (DEP) at agreed intervals, commencing one month after the commencement of the works.

The EM&A progress report to be submitted to DEP should address but not necessarily be limited to, the following requirements which are not exhaustive:-

Executive Summary

- | | |
|--|---|
| Project Data: | A synopsis of the Project organisation; Project programme; management/liaison structure; etc. |
| Environmental Monitoring and Audit Requirements: | Summary of Monitoring Parameters; Trigger/Action/Target Levels; Event/Action Plans; Environmental Protection Requirements in Contract Documents; Land Lease and Engineering Conditions; etc |
| Monitoring Methodology: | Monitoring equipment used; Locations; Duration/Period; etc |
| Monitoring Results: | Example of an appropriate monitoring data report format is attached (not exhaustive). |
| Audit of Results: | Review of pollution sources/working procedures in the event of non-compliance with environmental quality levels; actions taken in the event of non-compliance; follow-up procedures related to earlier non-compliance actions; etc. |
| Complaints: | Liaison and consultation undertaken; actions taken; database of telephone/written complaints; location of complaints; complaints action plan and follow-up procedures; etc. |
| Appendices: | Appropriate drawings/tables of monitoring locations, sensitive receiver locations, EM&A requirements, etc. |

**RESPONSE TO
GOVERNMENT COMMENTS**

Annex E

Response to EPD's Comments

*EIA of the Proposed 6000 MW Thermal Power Station
at Black Point – Draft EM & A Report
Response to Comments*

No.	Department	Section	Comments	Consultant's Response
1.	EAPG	General	Our comments on the Technical Schedule are relevant and should be taken into account in the preparation of this report.	Noted.
2.			The report should clearly identify the party responsible for the monitoring and audit work and highlight the management mechanism for effective control on site and reporting.	<p>CLP will employ independent approved laboratory to undertake environmental monitoring during the construction phase. Environmental monitoring during the operational phase will be undertaken by CLP's environmental team.</p> <p>The management mechanism for environmental issues will be outlined in the EM&A manuals for construction and operational phase.</p>
3.		Section 2	<p>The following are also objectives of EM&A:</p> <p>To monitor the performance of the project and the effectiveness of mitigation measures during its construction and operation.</p> <p>To verify the environmental impacts predicted in the EIA study.</p> <p>To determine project compliance with regulatory requirements, standards and government policies.</p> <p>To take remedial action if unexpected problems or unacceptable impacts arise.</p>	Agreed, recommendations to be listed under objectives in the revised EM&A report.

No.	Department	Section	Comments	Consultant's Response
4.		Section 5 & Annex B	<p>The first sentence implies that the mitigation measures for the operation phase are also included in Annex B. This seems to be misleading because:</p> <ul style="list-style-type: none"> i) Mitigation measures for the operation phase are yet to be proposed in the respective key issue reports for our consideration. ii) It appears to us that only mitigation measures for the construction phase are listed in Annex B. 	Noted and Agreed. Text amended.
5.			Please also mention in the text that mitigation measures for the construction work were subsequently agreed with the EPD in the form of a Technical Schedule.	Noted.
6.	EM&A Section, EAPG	3.1	The text does not clearly indicate who is responsible for carrying the monitoring work. B.1g only states that the Contractor will employ an independent laboratory to carry out water quality monitoring. No information is provided for other monitoring work, eg. air and noise.	CLP will employ an independent laboratory to carry out monitoring work. This will be stated in the revised EM&A report.
7.		3.1.2 & Table 3.1c	Target levels are missing in Table 3.1c. There are targets levels specified in the action plan for noise we forwarded to you previously (vide our letter dated 11 June 1993). Please incorporate those levels into the table.	Noted, text amended accordingly.
8.		3.1.3	Air quality baseline monitoring requirements for construction phase should be addressed in the report.	Baseline monitoring issue addressed in ERM letter ref. C1096/L1127/RL dated 27 July 93 to EPD. Baseline checking is recommended in the revised EM&A report.

No.	Department	Section	Comments	Consultant's Response
9.		4.1	The consultants should recommend the suitable party to carry out monitoring work during the operation phase.	It is recommended that monitoring during the operation phase be undertaken by CLP and supplemented by regular audit by an independent organisation. CLP has the necessary equipment to carry out the monitoring work by their in-house environmental team which has a thorough understanding of the operation of the plant and therefore can be in a better position to identify any problem which may give rise to exceedances.
10.		Section 5	Environmental audit carried out by an independent body is supported. The meaning of independent is however unclear. It is preferably an independent consultant employed by the project proponent for both the construction and operation phases.	Noted and agreed.
11.		Section 6	a) The report does not address who will prepare the EM&A Manual. The Manual should be prepared by the project proponent/Engineer.	CLP will undertake the responsibility to prepare the EM&A Manual.
12.			b) The recommendations of appointing a site staff to monitor the implementation of mitigation measures and compliance with environmental requirements on site is supported. Preferably, this site staff is a member of the Engineer'team who is given the authority to give immediate instruction to the Contractor in case of non-compliance is observed during daily inspection.	The Civil Construction Manager for the Black Point Power Station will be appointed to monitor the implementation of mitigation measures and compliance with environmental requirements during construction phase and will have the authority to give immediate instruction to the Contractor in case of non-compliance is observed during daily inspection.

No.	Department	Section	Comments	Consultant's Response
13.			c) The text does not clearly indicate who will be responsible for the preparation of the EM&A Progress Report nor the reporting frequency. B.3g only mentions that the project proponent/Engineer shall submit the report for air quality only, but are silent on water and noise. The progress report should be prepared and submitted by the project proponent/Engineer and cover all the required environmental parameters.	CLP will take up the responsibilities of compiling the monthly progress report. The report will cover air, noise and water quality.
14.	NPG	3.1.2	A contractor's work schedule vs noise level at relevant NSRs should be appended in this report to demonstrate that the construction noise level limit will not be exceeded.	Estimated noise levels based on typical construction activities at relevant NSRs is included in the revised EM&A report.
15.		Table 3.1c	<p>Representative noise limits should be indicated in addition to the Trigger event(s) and Action proposed.</p> <p>The daytime construction noise level outside the restricted hours should be limited to below $Leq_{(5\ min)} 75\text{dBA}$ level.</p> <p>Construction work carried out within the restricted hours will require a Construction Noise Permit from the EPD.</p>	<p>The use of complaints to determine trigger and action level; and the requirement for noise monitoring for $L_{eq\ (30\ min)}$ outside the restricted hours were based on EPD's recommendation ref. EP2/G/39 dated 3rd March 1993.</p> <p>Noted and agreed</p>
16.		Table 3.1d	The Action should state clearly the responsible parties and noise control person for the project. The EPD are not a responsible party for any remedial action when the monitored noise level exceeds the Target Noise Levels.	CLP will undertake to mitigate the situation in the event that the monitored noise level exceeds the Target Noise Levels. The responsible parties and noise control person for the Action Plan will be clearly defined in the EM&A Manual.
17.		4.1.2	It will be more appropriate to specify the noise monitoring person/team in the CLP who will liaise with the EPD. The operational noise limits should be achieving the planned Target Noise Levels stated in the EIA reports. Table 4.1b is not referred to in the text.	Noted.

No.	Department	Section	Comments	Consultant's Response
18.		B2	If dredging work is to cause noise levels repeatedly exceeding the criteria stipulated, the CLP should provide adequate noise insulation modification to the equipment causing the exceedance.	Agreed.
19.		Others	Since the construction work has already begun, could the consultants include their noise data as in Appendix to this report to demonstrate that the EIA recommendations have been effectively carried out on site.	Noise monitoring data will be included in the monthly EM&A Progress Report.
20.	APG	4.4.1 & Table 4.1a	a) The report only recommends that monitoring stations at Lung Kwu Tan and Mai Po Reserve be operated three months before commissioning of first units. Please confirm these two stations are also used for long term monitoring.	Noted. The monitoring programme is expected to last for two years. Future monitoring requirements will be reviewed in the light of the Specified Process License requirements.
21.			b) In addition to the above stations, areas like Tung Chung have been identified in the EIA as areas of concerns for air impact from the LTPS and CPPS. Monitoring stations should also be set up at these areas.	Noted. Monitoring station will be setup at Tung Chung. Future monitoring requirements will be reviewed in the light of the monitoring results.
22.			c) In the review of the provision of monitoring stations, any proposed changes should have prior discussion and agreement with the EPD.	Noted.
23.			d) The report only proposed NO ₂ as the parameter for ambient monitoring. Since light diesel oil will be used for firing the OCGTs in case the supply of natural gas is interrupted, ambient SO ₂ monitoring is also needed at all monitoring stations. It can also provide background data for the Phase 2 development of the LTPS for which the type of plant has not been determined yet.	Noted and agreed.

No.	Department	Section	Comments	Consultant's Response
24.			<p>e) Under the Best Practical Means (BPM) for gas-fired gas turbines, the following are required:</p> <p>i) Continuous stack gas monitoring:</p> <ul style="list-style-type: none"> · continuous in-stack monitoring of NO_xO₂, CO and stack temperature; · continuous process monitoring include generation output, water-to-fuel injection ratio and other essential operating parameters which may significantly affect the emission of air pollutants. <i>When details of the plant are available, please liaise with the EPD on the agreed list of operating parameters to be monitored.</i> <p>ii) Stack sampling:</p> <ul style="list-style-type: none"> · The parameter to be measured shall be NO_x USEPA Reference Method 7 (not 6) or the equivalent shall be adopted. 	<p>Noted and text amended.</p> <p>Noted and text amended.</p>
25.			<p>f) In Table 4.1a, under the column Background Ambient Monitoring, for Measurement Method, the statement "same as existing CPPS <u>in stack</u> monitoring programme" appears incorrect.</p>	<p>Typing error. The statement should read "same as existing CPPS <u>ambient</u> monitoring programme"</p>
26.		A.1.3	<p>Please clarify what is "monitoring procedures should be carried for <u>wires</u> at the Yuen Long Area" in the first paragraph.</p>	<p>Typing error, the sentence should read as "monitoring procedures should be carried out for works in the Yung Long Area" Text amended.</p>
27.		B.3(b)	<p>Pleas note that for these processed, ie "Mineral Works" or "Cement Works", a license should be obtained from the EPD prior to operation.</p>	<p>Noted.</p>

No.	Department	Section	Comments	Consultant's Response
28.		C2	For air quality, please use attached report format (Annex A) for reporting dust levels.	Noted. Report format will be incorporated in the EM&A report and manual.
29.	WPG	Table 3.1a	The term "persistently (3 times)" under the heading Target Levels should be deleted. Otherwise, it might be confused with the action plan for Exceedance of Target Level in Table 3.1b.	Noted.
30.		4.1.3	The CLP are required to comply with the TM standards for every individual effluent stream before mixing up with the cooling water discharge. The consultants should address this point in details.	Noted and agreed.

EA