

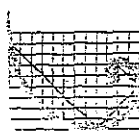
Castle Peak Power Company Limited



Environmental Monitoring and  
Audit Manual:  
*Erection and Commissioning Phase*

January 1995

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CONSULTING SERVICES BY ENVIRONMENTAL RESOURCES MANAGEMENT

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## INTRODUCTION

### 1.1

#### *PROJECT DESCRIPTION*

The Castle Peak Power Company Ltd (CAPCO), a joint venture of Exxon Energy Limited and China Light and Power Company (CLP), is developing a large thermal power station, the Black Point Power Station (BPPS) at Black Point. Civil construction work for the BPPS commenced in March 1993. Most of the civil works is expected to be completed by early 1996, erection and commissioning activities will subsequently follow.

An Environmental Monitoring and Audit (EM&A) Manual was developed for the civil construction phase to outline the environmental monitoring and audit requirements and associated mitigation measures specific to civil construction works. With civil works almost near completion, the EM&A requirements outlined in the EM&A Manual will no longer be applicable to the upcoming erection and commissioning activities. An updated EM&A Manual is therefore required for the developments in the Erection and Commissioning Phase.

ERM Hong Kong were the consultants appointed by CLP for the environmental assessment of the BPPS project as well as the development of the EM&A Manual for the civil construction phase and are currently the consultants for the preparation of this document, the updated EM&A manual for the erection and commissioning phase.

This manual provides recommendations on site activities with environmental implications during the erection and commissioning phase of the plant.

### 1.2

#### *CLP'S ENVIRONMENTAL POLICY*

CLP's position on environmental matters has been explicitly expressed in a policy document drafted early in 1994. Whilst the form of the text is in the process of finalisation, the message that is delivered is clear in the level of commitment required across the company. Environmental matters within CLP will be treated as a priority issue and individuals will be expected to administer and implement environmental management measures both to current standards and as an ongoing process of continual improvement. It is on the guidelines of this policy that this document is based.

The purpose of this EM&A manual are as follows:

- to provide specific guidance on overall hazardous waste management;
- to provide specific guidance on overall waste management;
- to provide specific guidance on an appropriate wastewater disposal strategy;
- to outline an environmental monitoring programme to monitor the environmental performance and the effectiveness of the mitigation measures;
- to provide specific guidance to determine environmental compliance with regulatory requirements, standards and CLP policies;
- to provide recommendations on remedial action in the event of unexpected problems or environmental incidents; and
- to enable environmental data to be gathered and environmental audits to be undertaken.

## 1.4

*UNDERSTANDING OF THE ERECTION AND COMMISSIONING ACTIVITIES*

In preparation of the EM&A Manual, the consultants carried out a series of interviews and discussions with relevant contractors and CLP personnel involved in the various aspects of the commissioning activities for the BPPS between 21 October and 6 December 1994. This exercise not only served to gather information but also to promote environmental awareness amongst the CLP staff and contractors.

ERM would like to thank the following interviewees for their cooperation through this period.

*GPD*

G T Boardman	Site Manager
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*Mechanical Branch*

Daniel Ng	Engineer
Caroline Belley	Site Environmental Officer

*Erection Branch*

Roy Smith	Acting Erection Superintendent.
S Y Au	Site Mechanical Engineer, Boiler.
K H Tsang	Asst. Site Mechanical Engineer, Boiler.
Edmund Chu	Site Electrical Engineer, Elect
Harold Wong	Site C&I Engineer, C&I
S H Lee	Engineer., C&I
H T Leung	Engineer., C&I
Henry Tsui	Engineer., C&I
Edward Leung	Snr. Supervisor, Material Control

*Commissioning Branch*

Paul Beards	Commissioning Superintendent
C W Ho	Comm. Team Leader, Balance of Plant Team
David Crighton	Asst. Comm. Team Leader
Albert Lam	Asst. Comm. Team Leader, Electrical Team
Richard Lancaster	Asst. Comm. Team Leader, Electrical Team
Albert Leung	Asst. Comm. Team Leader, C&I Team.

*Safety & Site Services*

Gordon Lamb	Safety & Site Support Superintendent
Steve Howarth	Safety Coordinator
Rocky Tse	Safety Engineer

*Black Point Construction*

Nick Lee	Civil Construction Manager
Ken Pullen	Senior Resident Engineer
Charles Lam	Drawing Office Engineer

*Civil Project*

Mark Burton	Civil Project Engineer
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*Project Management Services Branch*

Annette Hobhouse	Planning Engineer, Planning
K W Law	Engineer, Planning & System
Johnny Wong	Business System Analyst

*Technology & Environment Department*

Ken McGrath	Senior Chemist
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*Leighton*

Greg Heylen	Project Manager
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*MCJV*

Peter Chan	Senior Safety Supervisor
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*GEC Alstom*

Jean-Marc Jaillet	Technical Manager
Martin Hanks	Material Controller

In particular, we would like to thank Mr Neil Cave, the Mechanical Project Engineer, and Ms Anne Poon, the Site Environmental Officer, who coordinated the numerous information requests made and arrangement of the meetings and interviews.

1.5

*HOW TO USE THE MANUAL*

This EM&A Manual is designed to provide information, guidance and instruction to site staff charged with environmental responsibilities and who are undertaking the environmental monitoring and auditing work.

This manual will cover the following aspects with potential environmental

implications:

- Hazardous Material Management
- Waste Management
- Water Quality
- Air Quality
- Noise

A simple check list has been prepared in the *Annex A* to accompany this manual for quick and easy reference.

## 2 PROJECT DETAILS

### 2.1 COMMISSIONING PROGRAMME

The BPPS Phase 1 power plant is designed to deliver 2500MW of electricity when fully operational. Eight combined cycle gas-turbine units will be commissioned at various stages. The first firing on distillate for the first unit is scheduled to start by end of June 1995; subsequent units will be commissioned in stages. The first two units are expected to be operational by end of January 1996 on natural gas. The commissioning activities commenced in November 1994. (See Commissioning Programme in *Annex B*).

### 2.2 PROJECT ORGANISATION

The proposed environmental management organisation for the erection and commissioning phase and the various interfaces for the environmental monitoring and audit of the project are illustrated in *Figure 2.1a*. The charts show the relationship between the various responsible parties and their overall responsibilities with respect to environmental compliance.

### 2.3 ROLES AND RESPONSIBILITIES OF KEY STAFF

The effective EM&A programme depends upon the clear identification of responsibilities within the existing project organisation. Detailed roles and responsibilities of the relevant parties relating to environmental issues are discussed below.

#### *Project Manager*

The Project Manager will have the overall responsibilities to monitor performance of the activities by site staff and contractor(s) in meeting the necessary environmental requirements. The Project Manager shall:

- appoint responsible person(s), such as an Environmental Support Team, Material Controller, and Hazardous Material Coordinator, to assist with various aspects of the on-site EM&A programme;
- establish a "Positive Response" relationship with local press and neighbourhood groups, in conjunction with CLP Public Relations staff; and
- ensure that environmental matters are a standing agenda item for site progress meetings.



### *Site Manager*

The Site Manager will be responsible for compliance of environmental regulatory requirements for CLP staff and contractors on site. The Site Manager shall:

- have responsibility for the compliance of all site activities with local laws and the CLP Policy and Objectives;
- formulate, with the assistance of the Environmental Support Team, an EM&A plan and budget in order to comply with current environmental legislation and in some cases to go beyond regulatory requirements to meet CLP environmental objectives;
- facilitate a programme of regular environmental audits of the site by the Environmental Support Team with support from Technology and Environment Department (TED);
- be aware of and monitor the environmental performance of suppliers; and

### *Environmental Support Team*

The Environmental Support Team shall be directly responsible for implementing the CLP GPD's environmental policy and management system throughout the organisation and following up the day-to-day environmental monitoring and audit activities. The Environmental Support Team will play a key role in the dissemination of environmental information and will provide a specific point of reference for trouble shooting and specific environmental queries from all levels of management, especially for Branch Heads. The Environmental Support Team shall:

- keep an inventory of all environmental regulations and trends relevant to site activities;
- maintain and update the EM&A Manual;
- review and verify information available in records developed through the monitoring and audit programme;
- identify specific issues of non-compliance and develop recommendations to address non-compliance;
- check effectiveness of mitigatory measures;
- review the need for further mitigatory measures;
- be responsible for developing plans to prevent and mitigate accidents including action plans in the event of an emergency.
- develop and implement OIMS Primary System for Environmental Management within GPD; (See *Draft Primary System in Annex C*)

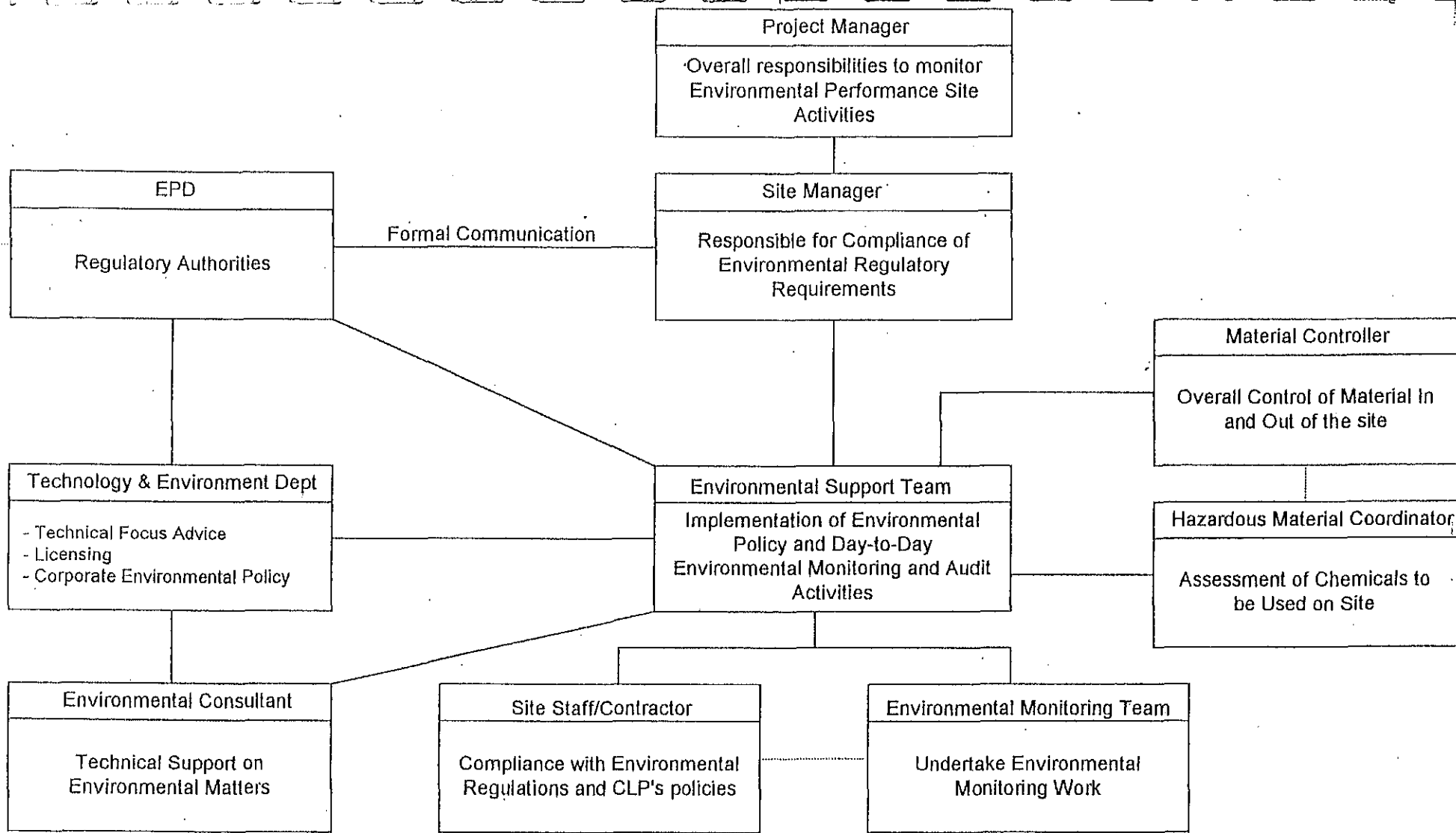


Figure 2.1a Organisation Chart for EM&A Erection & Commissioning Phase

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 Tsimshatsui, Kowloon  
 Hong Kong



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- organise regular audits to verify the successful implementation of recommendations outlined in the Manual;
- report on the overall site environmental performance to the Site Manager; and
- liaison with EPD on environmental control & renewal of licences.

#### *Material Controller*

The Material Controller will have the overall responsibility of controlling material arriving to and leaving the site. His responsibilities will be to:

- keep an inventory of all waste disposal records; and
- arrange for proper disposal of waste and, where practicable, the recycling/reuse of materials.

#### *Hazardous Material Coordinator*

The Hazardous Material Coordinator will have the overall responsibilities of assessing the environmental acceptability of the chemicals that can be used on site. His duties will be to:

- keep an inventory of all chemicals and hazardous materials brought onto the site;
- assess environmental acceptability of chemicals that are currently being used;
- assess environmental acceptability of chemicals for new purchase;
- source, where feasible, environmental acceptable alternatives;
- keep an inventory of all the Material Safety Data Sheet (MSDS)<sup>1</sup> provided by the contractors for the chemicals used; and
- ensure proper storage, handling and disposal of chemicals.

#### *Site Staff/Contractor*

The site staff and contractor will have overall responsibilities to comply with the environmental regulations and CLP policies. Their responsibilities will be to:

- ensure that erection and commissioning works are carried out in such a manner as to minimise adverse impacts to the environment;

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<sup>1</sup> Material Safety Data Sheets provide information on the hazardous nature of the chemicals and provide guidelines on the first-aid actions.

- take any practicable means that may be necessary to abate pollution caused by their actions;
- implement mitigation measures as required and as instructed by CLP; and
- report to the Environmental Support Team on all remedial action taken.

#### *Monitoring Team*

The Monitoring Team will be responsible for environmental monitoring work. Their duties will be to:

- carry out environmental monitoring as outlined in this manual;
- prepare monitoring reports; and
- notify the Environmental Support Team of any exceedances.

#### *Technology and Environment Department (TED)*

TED will assist the Site Environmental Support Team on environmental matters arising from Black Point Site on the following areas:-

- advise on corporate environmental policy;
- develop and implement Corporate Environmental Management System;
- technical support; and
- liaison with EPD for new licensing requirement.

#### *Environmental Consultant*

The Environmental Consultant will act as the environmental advisor on environmental matters throughout the commissioning phase of the plant. His duties will be to:

- undertake regular site visits and audits to identify specific issues of non-compliance and develop recommendations to address the latter;
- provide technical support on environmental matters; and
- assist with day-to-day liaison between CLP, and the EPD.

## 2.4 REPORTING

### 2.4.1 External

Progress Reports are prepared and submit to EPD on a monthly basis. The reports presents the environmental monitoring results; review and audit the monitoring results; and report actions taken to address any exceedances or complaints. See *Annex D* for the summary of the Progress Report and its Table of Contents for November.

### 2.4.2 Internal

At present, environmental incidents (e.g. exceedance, warnings from EPD etc.) are reported to the Project Manager, Site Manager, TED and related Branch(s) through Environmental Incident Reports (See sample in *Annex E*). The reports specify the problems and actions taken/to be taken in order to rectify the non-compliance.

GPD will modify the reporting system in conjunction with TED incorporating the following features:-

- Categories environmental incidents;
- Specify the persons to be informed and appropriate actions in each category; and
- Develop a feedback mechanism to verify if appropriate actions were taken.

## 2.5 CONTACT PERSON

The following lists the contact details of the various responsible persons who can be contacted regarding environmental issues.

### China Light and Power Company Limited

<i>Name</i>	<i>Title</i>	<i>Telephone No</i>	<i>Fax No</i>
Mr. Peter Shum	Project Manager	2452 7010	2441 1020
Mr. G.T. Boardman	Site Manager	2457 0628	2451 0178
Mr. N. Cave	Environmental Support Team	2452 7018	2441 1020
Ms. A. Poon		2452 7039	2441 1020
Ms. C. Belly		2450 1072	2451 7448
	Material Controller		
	Hazardous Material Coordinator		

## Environmental Protection Department

<i>Name</i>	<i>Section</i>	<i>Title</i>	<i>Telephone No</i>	<i>Fax No</i>
	Air			
Mr. S.K. Ip	Water	EPO	2411 9608	2611 9149/ 2413 3358
Mr. Sean S.H. Law	Noise	EPO	2594 6504	2827 8200
Mr. S.K. Ip	Waste	EPO	2411 9608	2611 9149/ 2413 3358

## Contractors

<i>Contractor</i>	<i>Contact Person</i>	<i>Title</i>	<i>Telephone No</i>	<i>Fax No</i>
Leighton	Mr. Heylen	Project Manager	2452 3762	2452 3872
MCJV	Mr. Takeda	Project Manager	2440 0010	2440 0316
Shui On	Mr. K.L. Cheng	Project Manager	2398 4772	-
GEC Alsthom	Mr. Jack Wilson	Deputy Project Manager	2404 8133	2441 2668
Costain	Mr. C.W. Ho	CLP Comm. Team Leader (Balance of Plant)	2457 0703	2451 7448

## Environmental Monitoring Team

<i>Monitoring Laboratory</i>	<i>Contact Person</i>	<i>Title</i>	<i>Telephone No</i>	<i>Fax No</i>
SGS Hong Kong	Ms. T.C. Wong	Laboratory Technical Development Manager	2774 7124	2334 9085
TBV Stanger Asia Ltd.	Mr. P.C.K. Chan	Environmental Supervisor	2682 1203	2682 0048

## Technology and Environment Department

<i>Contact Person</i>	<i>Title</i>	<i>Telephone No</i>	<i>Fax No</i>
Dr. Richard Jack	Technology & Environment Manager	2432 8472	2433 4515
Mr. Shaun Knight	Environment Manager	2432 8482	2433 4515

## Environmental Consultant - ERM Hong Kong

<i>Contact Person</i>	<i>Title</i>	<i>Telephone No</i>	<i>Fax No</i>
Mr. Steve Laister	Director	2722 9700	27235660
Mr. Freeman Cheung	Technical Director	2722 9700	27235660

## LEGISLATIVE REQUIREMENT

A Summary of Legislations relevant to CLP erection and commissioning activities are summarised in *Table 3.1a* and detailed requirements of the legislations are discussed in the relevant sections of this manual.

Table 3.1a *Environmental Legislations Relevant to Erection & Commissioning Activities*

Ordinance	Regulation	Related Erection and Commissioning Activities	Maximum Penalties
Air Pollution Control Ordinance		Construction dust.	\$500,00 fine, 12 months imprisonment for non-compliance with air abatement notice
Crown Land Ordinance		Disposal of wastes.	\$10,000 fine, 6 months imprisonment
Dangerous Goods Ordinance	Dangerous Goods (Application and Exemption) Regulations	Classification of DG.	-
	Dangerous Goods (General) Regulations	Licensing conditions, usage, packing and storage of DG.	Refer to Regulations
Factories & Industrial Undertakings Ordinance	Factories & Industrial Undertakings (Dangerous Substances) Regulations	- Labelling of dangerous substances.	\$30,000 fine
		- Use protective clothing and equipment.	\$20,000 fine
	Factories & Industrial Undertakings (Noise at Work) Regulations	Occupational Noise.	\$30,000 fine
Noise Control Ordinance		Construction Noise.	First Conviction - \$50,000 fine
Ozone Layer Protection Ordinance		Use of halogenated solvents.	-
Public Health and Municipal Services Ordinance	Public Cleansing and Prevention of Nuisances By-laws	Disposal of waste.	\$200,000 fine - 6 months imprisonment
Radiation Ordinance		Possession and use radioactive isotopes.	\$50,000 fine and 2 years imprisonment
Waste Disposal Ordinance		Transportation and disposal of municipal waste.	First Offence - \$50,000 fine
	Waste Disposal (Chemical Waste)(General) Regulations	Generation, storage, collection, transportation and disposal of chemical wastes.	\$200,000 fine, 6 months imprisonment
Water Pollution Control Ordinance		Discharge of effluent to coastal water.	First Offence - \$100,000 fine



## 4.1 CLP POLICY

Hazardous materials are defined as materials that have a detrimental effect on human health or the environment. Such materials can also be classified under the *Dangerous Goods Ordinance (DGO)* within the different categories of dangerous substances, or they could even be chemicals commonly used by CLP that, if used or disposed of inappropriately, could constitute a concern to the environment. In the storage, use, handling and disposal of such materials, it is CLP's policy that all necessary measures be undertaken to comply with the relevant regulations and to ensure that neither the safeguarding of the environment nor the health and safety of staff and contractors is compromised.

In the construction and commissioning of the BPPS, this policy will be observed and implemented accordingly to the fullest extent as feasibly practicable.

## 4.2 BACKGROUND TO ISSUES

4.2.1 *Dangerous Goods*

The *Dangerous Goods Ordinance (Cap. 59)* applies to all explosive, compressed gases; petroleum and other substances giving off flammable vapours, substances giving off poisonous gas or vapour; corrosive substances; substances which become dangerous by interaction with water or air; substances liable to spontaneous combustion or of a readily combustible nature; and other substances specified by the Authority<sup>2</sup>. The manufacture, storage, conveyance or use of any dangerous goods required to be licensed under this Ordinance. The Ordinance also prohibits the possession, custody or control of dangerous goods. Licensing is further required for supplying labour, vessels or equipment for loading, discharging or moving dangerous goods on vessels. Dangerous goods should be clearly marked with the description and dangerous nature of the substances.

The *Dangerous Goods (Classification) Regulations (Cap. 59)* list the substances that are classified as dangerous goods and which are subject to control by the Ordinance. Dangerous goods are classified into ten categories and each category is divided into classes, with each class being further sub-divided into divisions. The *Dangerous Goods (General) Regulations (Cap. 59)* set out

2

Cat. 1	Commissioner of Mines.
Cat. 2 - Cat. 10	Director of Fire Services.
D.G. in Freight Containers	Director of Marine.

detailed requirements for dealing with each category of dangerous goods including licensing conditions, usage, packing and storage etc. The classification of dangerous goods are presented in *Table 4.2a* as follows:-

*Table 4.2a Classification of Dangerous Goods*

Category	Class	Division
1 Explosives	1. Gunpowder	Two divisions Two divisions Two divisions Three divisions Two divisions
	2. Nitrate mixture	
	3. Nitro-compound	
	4. Chlorate mixture	
	5. Fulminate	
	6. Ammunition	
	7. Fireworks	
2 Compressed Gases	1. Permanent gas	
	2. Liquefied gas	
	3. Dissolved gas	
3 Corrosive Substances		
4 Poisonous Substances	1. Substances giving off poisonous gas or vapour	
	2. Certain other poisonous substances	
5 Substances giving off Flammable Vapour	1. Flash point < 23°C	1. Substances immiscible with water 2. Substances miscible with water
	2. 23°C < Flash Point < 66°C	
	3. Flash Point > 66°C	
6 Substances Which Become Dangerous By Interaction With Water		
7 Strong Supporters of Combustion		
8 Readily Combustible Substances		
9 Substances Liable to Spontaneous Combustion		
9A Combustible Goods Exempted from Section 6 to 11 of the Ordinance		
10 Other Dangerous Substances		

#### 4.2.2

#### *Dangerous Substances*

##### *Labelling*

The Factories & Industrial Undertaking (*Dangerous Substances*) Regulations (Cap. 59) standardize risk symbols and labelling systems for dangerous substances and impose duties on proprietors and workers to take all reasonable safety measures in specified industrial undertakings.

Every container holding a dangerous substance should be labelled in English and Chinese with a prescribed form and the size of any symbol required to be shown on the label should not be less than one-tenth of the area of the label and in no case should it be less than 100mm<sup>2</sup>. Where it is impossible for a container to be labelled, a notice in respect of that substance should be displayed.

Dangerous substances are classified into seven categories by its chemical nature in this Ordinance which are oxidising, irritant, corrosive, flammable, toxic, harmful or explosive. Anticipated hazardous materials likely to be encountered on Black Point site are (Detailed Chemical Inventory at Black Point Site in *Annex F*):

- Chemicals and oils used in machines and industrial processes.
- Acid and Alkaline used for acid cleaning.
- Lead batteries acid containing sulphuric acid and nickel/cadmium batteries containing alkaline electrolyte.
- Cleaning agents such as bleaches.
- Glues, paints and thinners with volatile solvents, which can cause respiratory problems and irritation to mucous membranes.
- Any containers for the above materials.
- Smoke detectors and radiotracers, which contain small amounts of radioactive material. While these are not a health issue, such equipment should not be maintained or dismantled by untrained personnel.
- Asbestos used for specialised purposes such as brake linings. Inhalation of dislodged asbestos fibres can lead to asbestosis.

#### *Protective Clothing and Equipment*

The Factories & Industrial Undertakings (Dangerous Substances) Regulations (Cap. 59) require the proprietor to ensure that every employee who is or may be exposed to a dangerous substance is trained and instructed in the purpose, proper use and limitation of safety equipment provided and is advised of the health hazards associated with the exposure to that substance. The proprietor is expected to ensure that protective clothing and equipment are fully and properly used by every employee who works with or is likely to come into contact with a dangerous substance and that the clothing and equipment are properly maintained, cleansed and stored after used.

Employees are required by the Regulations to follow the instructions and observe the safety precautions stated on the label of the containers. Employees are also expected to make use of the protective clothing and equipment provided and to properly maintain and store these items after use.

The Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354) controls the generation, storage, collection, transportation and disposal of chemical waste through a "cradle to grave" approach. Under this regulation, any person or company that produces chemical waste or causes it to be produced must register with the EPD. Failure to register is an offence, and the offender is liable on conviction to a fine of up to HK\$200,000 and six months imprisonment.

Chemical waste producers must provide suitable packaging of chemical waste soon after it is produced, labelled, and stored prior to collection. Specifications and standards are contained in "*Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*".

Chemical waste producers should arrange for the chemical waste to be treated on site (following issue of the appropriate waste disposal licence) or to be sent to a licensed waste disposal facility. In Hong Kong, most of the chemical wastes can be sent to the Chemical Waste Treatment Centre (CWTC) for treatment. At present, the operator of the CWTC offers chemical waste collection, transportation and treatment services.

Upon collection of chemical waste by an EPD licensed collector, triplicate forms (trip tickets) must be filled out by the waste producer, collector, and reception point and retained for at least 12 months.

The Regulation also governs the import and export of chemical waste. Amendments to the WDO will be added in the near future to create additional controls in the form of special licensing for major landfills, public dumps, incinerators, waste transfer stations, waste treatment plants and waste recycling/recovery plants.

Existing regulations state that a company is only allowed to export chemical waste if suitable treatment facilities are not available in Hong Kong. Given that the CWTC is now in operation, in reality, this means that very little should be exported.

Prior to disposal of certain dangerous waste (eg asbestos, polychlorinated biphenyls, etc) the EPD must be notified and EPD's specific disposal instructions in each case must be complied with.

*Ozone Depleting Substances*

The *Ozone Layer Protection Ordinance (Cap. 403)* prohibits the manufacturing of chemicals that deplete the ozone layer (as defined in the 1987 Montreal Protocol) and imposes licensing controls on their import and export. Anyone who wishes to obtain a licence must be registered under section 5 of the Ordinance. Registration should be done through Trade Department with specified forms. EPD also operates a quota system for ozone depleting substances (ODS). There are two subsidiary forms of legislation prohibiting the import of products containing chlorofluorocarbons (CFC) and halons

from countries which are not signatories to the Montreal Protocol. These legislations also prohibit venting of these chemicals from motor vehicle air conditioners or from large chiller plants containing more than 50 kg of CFC refrigerant charge. The phasing out of CFCs and halons in Hong Kong should be completed by the year 2000. The control schedule in Hong Kong under the Montreal Protocol is shown in *Annex G*. Contravention of any condition of a licence is an offence punishable by a fine of \$1,000,000 and imprisonment for 2 years.

#### 4.2.5

##### *Storage Requirements*

Hazardous materials should be stored in accordance with suppliers data sheets and with regard to the following general principles:

- Explosive and radioactive substances should be stored separate from each other and not be stored with any other type of hazardous substance. A radioactive isotopes store has been built on site and the application for the licence is in progress. Before the licence is issued, the radioactive isotopes will be stored in Castle Peak Power Station Radioactive Isotopes Stores.
- Any type of flammable substance must not be stored with any other groups of hazardous substances.
- Oxidising materials should not be stored with any other types of hazardous substance.
- Toxic substances are excluded from storage with any other substance.
- Irritant and harmful substances can be stored with other chemicals, within the constraints of the above requirements.

#### 4.2.6

##### *Handling Requirements*

The requirement to provide proper handling procedures of hazardous materials and develop safety precautions is fundamental to some national legislation regarding hazardous materials, for example, the UK *Control of Substances Hazardous to Health (COSHH)* Regulations. Steps should be taken to minimise worker exposure to hazardous materials, through either use of correct in procedures or installation of protective measures.

In the event of handling hazardous materials, there are precautions that should be taken:

- Ensure that the user is informed of the hazardous characteristics of the material through the use of an up to date Material Safety Data Sheet (MSDS) and clear labelling of the containers. This information should include data on toxicological, irritant and other sensory effects.
- Wear protective clothing as appropriate, eg boots, safety glasses, gloves, overalls etc.

- Follow handling procedures as laid down in guidelines, eg use of specialised containers, provision of water hoses, and local eyewash facility when corrosives are handled.
- In the event of spillage or leaks, adequate measures should be in place to contain and eventually repair the situation.

#### 4.2.7 *Disposal Requirements*

Any waste containing other hazardous materials in concentration is likely to cause environmental pollution if released. A full definition and a list of substances is given under *Waste Disposal (Chemical Waste) (General) Regulation* in the *Waste Disposal Ordinance (Cap. 354)*.

If the facility uses any hazardous materials, as discussed above, then these materials may constitute chemical waste once they have been used. In addition, the containers used for dangerous substances may require handling and disposal as chemical wastes. Depending on the waste and the quantity, proper disposal may range from transport to a hazardous waste landfill, the Government Chemical Waste Treatment Centre at Tsing Yi, or no special treatment (ie disposal to the municipal waste stream). Arrangements for the disposal of chemical wastes should be made with contractors who are registered with the Environmental Protection Department.

#### 4.3 *IMPLICATIONS FOR CLP*

A number of chemicals, solvents and oils will be used during the commissioning activities of the BPPS. *Annex F* list the types and quantities of chemicals that will be used on site and type of chemical wastes that will be generated during commissioning. As a legal obligation, CLP will require licensing under the following Ordinances:

- Dangerous Goods Ordinance
- Radioactive Substances Ordinance
- Waste Disposal (Chemical Waste) Ordinance

CLP has applied for or has been granted the following licences:-

- LPG Licence (obtained in January 1995).
- DG Licence (apply in February 1995).
- Registered as Chemical Waste Producers.
- Radioactive Licence (obtained for Castle Peak Power Station).

#### 4.3.1 *Guidelines for Black Point Staff*

The storage, handling, transportation, use and eventual disposal of all hazardous materials on site should be carried out in accordance with the standards as laid down by CLP policies and regulatory requirements. In the event of spillage or leakages of these materials, the proper measures for containment and remediation should be carried out with reference to the

relevant MSDS and labelled instructions. During the handling of such materials, staff will take full safety precautions including protective wear and breathing apparatus, if necessary.

The following procedures should be observed:

- An inventory of all hazardous materials held on site should be compiled and updated on a monthly basis. The list will be the responsibility of the Hazardous Materials Coordinator, who will copy the list to the Environmental Support Team. All chemicals brought on site will be received by the Materials Controller before site use.
- Each substance on the inventory will be accorded a number and grade of classification according to the hazardous nature of its properties. As part of this inventory, MSDS should be supplied by the Contractor when the chemicals are delivered, where site specific, the Hazardous Material Controller will supplement information for the MSDS. The MSDS should advise the user of the following:
  - Handling and protective precautions
  - Particular hazards of the substance (include toxicological, irritant and other sensory effects)
  - Spillage and clean up procedures
- All new hazardous substances or chemicals to be brought onto site is recommended to be assessed beforehand by the Environmental Support Team, with assistance provided by TED, who will notify the Materials Controller. Once on-site, the substances will be entered into the Hazardous Materials inventory by the Materials Controller.
- All chemicals classified as DGs and to be stored in quantities in excess of the DG exemption volume are to be kept in the construction DG Store which will be operational by May 1995. The layout of the construction DG store is shown in *Annex H*. Prior to the completion of the construction DG store, all DGs chemicals have to be kept off site in public DG store and can be only brought onto site as required.
- An appointed officer from Materials Handling will be responsible for the setting up and maintenance of the DG Stores and chemical waste storage areas, and who will report to the Materials Controller and the Site Environmental Support Team on a monthly basis on any changes.
- A system of ownership of bulk storage items such as oils and chemicals will be defined such that process operators will undertake responsibility for providing handling and filling arrangements, and adequate provision for containment in the event of spillage. The responsible system owner will report to the Environmental Support Team on a monthly basis.
- All DGs and chemicals (including chemical waste) should be clearly labelled and notices posted advising staff on what immediate actions to take and whom to contact in the event of spillage and incidents. All significant incidents should be reported immediately to the

Environmental Support Team and the appropriate Branch or Section Head. The Environmental Support Team will be responsible for operating and maintaining an environmental incident reporting system which will include incident record sheets (See example in *Annex E*) and follow-up action plans.

- While it is preferable to store chemicals indoors, outdoor storage areas are acceptable provided that they are furnished with proper spill control and containment measures. It is highly desirable that such areas have at least a roof to prevent the accumulation of storm water. If a roof is not practical, procedures should be established to manage storm water accumulation and runoff.
- A sufficient quantity of suitable spill control equipment shall be kept in or near storage areas.
- In negotiating licences with the regulatory authorities, the respective system owner will undertake responsibility for the establishment and renewal of DG and waste licences and will consult with the Environmental Support Team on all issues related to this matter.
- Through the monthly reports, the Environmental Support Team will monitor the DG stores and all bulk storage facilities and every three months will conduct a review with the Materials Controller to ensure that all the site practices related to these areas comply with both regulatory and company policy requirements. This will form part of the quarterly site environmental audit.

#### 4.4 *SPECIFIC ISSUES*

##### 4.4.1 *Oil Storage*

###### *Background*

During the commissioning phase of Black Point Power station, large quantities of lubrication oil and transformer oil (mineral oil) in 200L drums will be brought on-site to fill the respective equipment. Temporary storage of large quantities of drums is required.

###### *Environmental Concerns*

- Leakage on unsealed ground which will lead to ground contamination.

###### *Preventive Measures*

- Absorbent materials (e.g. 3M Oil Absorbent Mats) should be kept near storage area. Any contaminated absorbent materials should be packed and disposed of by licensed contractors.



- Bulk storage of oils in above ground tanks and drums should be carried out in bunded areas and on sealed ground. And where appropriate, the storage area should be fenced to reduce the risk of accidental impact by other mobile machineries.
- All tanks containing flammable liquids should have fire protection systems installed. A regular monitoring programme should be carried out to test the integrity of the tanks.
- Off-site storage is available for rental in the event that large quantities of drum storage are required. (See *List of Contractors in Annex I*)
- Drums containing oil should be stored in a designated area on made ground with adequate secondary containment. Temporary/Portable containment are available for purchase/rental or similar facilities could be fabricated on site. (See *Annex J*). The drums should be racked in a tidy manner and the contents should be labelled clearly.
- During liquid transfer, drip trays should be used and any spillage should be cleaned immediately. An inventory of drums will be held by the Materials Controller.

#### 4.4.2

#### *Acid and Alkali Storage*

##### *Background*

Large volumes of acid and alkali would be used for commissioning of the water treatment plant, effluent treatment plan and for the HRSG cleaning. These include hydrochloric acid, sulphuric acid, hydrofluoric acid, sodium hydroxide and citric acid.

##### *Environmental Concern*

- leakage and spillage may pose potential safety hazards to site staff.
- leakage and spillage may cause potential ground contamination.

##### *Preventive Measures*

- Acid and alkalis should be stored in compatible containers eg plastic containers. Because of the varying nature of the chemicals, it is recommended that the chemicals be stored in accordance with the storage requirements specified in the MSDS.
- Acid and alkalis should be well segregated to prevent potential dangerous consequences in the event of contact between the two chemicals.
- The chemicals should be stored in bunded areas capable of retaining potential leakage based on the capacity of the largest drums. Temporary/Portable containment are available for purchase/rental or similar facilities could be fabricated on site. (See *Annex J*)

- The chemicals drums should be marked in English and Chinese to indicate the corrosive nature of their content.
- Only volumes below the DG exemption limits (See *Chemical Inventory in Annex F*) can be stored at the work sites. Large volumes of acids and alkalis in excess of the DG exemption limits shall be kept in the DG stores.
- Hydrofluoric acid should not be stored with sulphuric acid in the same compartment or banded space in any store.

During filling and unloading of the acid and alkali tanks, the following standing instructions should be observed:

1. The Security is to notify the Commissioning Chemist of the arrival of chemicals on-site.
2. A designated CLP person will inspect the road tanker and reject the delivery when visual leakage is observed.
3. An appropriate container is to be placed under the tanker discharge valve to catch any chemical remaining in the unloading connection.
4. A designated CLP person must ensure that shower, eye washer and general service water supply are functional before allowing pipeline to be connected to the chemical filling point.
5. A designated CLP person must ensure that the road tanker operator is wearing suitable protective equipment as specified in the unloading checklist and has isolated the unloading area and placed clear warning notes before allowing the operator to start the pumping.
6. A designated CLP person must ensure that the pipeline connection is firm and tight before giving instruction to the tanker operator to start unloading.
7. A designated CLP person must lock the filling valve unloading is completed and before disconnecting the pumping pipework from the filling valve.
8. A designated CLP person must ensure that the road tanker operator has drained the chemicals in in the filling line, cleaned up the unloading bay with water before allowing the tanker to leave for weighing.
9. A designated CLP person must inform the Commissioning Chemist of that satisfactory unloading is completed.

A Chemical Unloading Checklist is enclosed in *Annex K*.

## *Chemical Wastes Storage*

### *Background*

Chemical wastes generated during the erection and commissioning are stored before taken off-site for treatment or disposal. Although there are no licensing requirements for chemical waste storage, the *Code of Practice on the Packaging, Labelling and Storage of Chemical Waste* published by EPD should be followed regarding the storage of Chemical Waste. The Dangerous Goods Ordinance would still apply for chemical waste classified as DGs. The following guidelines should be followed to reduce the risks of spillage and ground contamination:

### *Environmental Concerns*

- Spillage of chemical waste which will lead to ground contamination.

### *Preventive Measures*

CLP is a registered chemical waste producer with EPD. The storage requirement as specified in the *Code of Practice on the Packaging, Labelling and Storage of Chemical Waste* should be followed. The requirements are summarised as follows:-

### *Packaging*

The containers should meet the following requirements:

- All parts of the container must be compatible with the chemical waste that is to be stored such that no reaction with the contents can weaken the container or produce any dangerous product. Plastics and steel are commonly used for drums. A suitable internal lining, protective coating or additional treatment may be required.
- Containers used should be in good condition and free from corrosion, contamination, damage or any defect which may affect the integrity of the container. Visual inspection of the inside and outside should be carried out prior to use of the container.
- Separate containers should be used for storing different types of waste from various processes. This prevents the mixing of incompatible waste which can be dangerous and simplifies the subsequent waste treatment processes.
- Sufficient air space should be maintained to allow for liquid expansion caused by changes in temperature. As a guide, 100 mm air space is recommended between the top of the container and the liquid level.
- Container should be securely closed or sealed such that spillage is prevented. The surface of the container should be kept clean at all times.

All containers should be appropriately labelled and should contain information such as chemical name/common name; waste type and code, particular risks; safety precautions; name, address and contact telephone number of the waste producers and the appropriate hazard symbol(s). The container should be labelled "Chemical Waste" in English and in Chinese.

### Storage

The waste producer should provide temporary storage of the chemical waste prior to collection. To minimise waste handling, storage areas are preferably located near the source of generation. However, outdoor storage can be used provided that the following requirements are met:

- dedicated chemical waste storage areas should be provided;
- enclosed on at least three sides by a wall, partition or fence which is rigidly erected and fixed to the area with a height of not less than two metres or the total height of the containers in stack;
- adequate ventilation should be provided;
- no connection to any surface water drains or foul sewer is allowed;
- adequate manoeuvring area for workers or lifting devices such as forklift trucks;
- outdoor storage area for chemical waste should be covered and protected from rain and from direct sunlight; for areas that are prone to flooding a raised platform should be provided;
- the storage area should be kept clean and dry;
- an impermeable protective coating should be applied to prevent infiltration of chemical waste into the ground;
- bunding of the area is required to contain any chemical spills. The bund should be designed to contain the largest container or 20% of the total quantity of chemical waste stored in the area, however, for convenient manual or mechanical handling of container, the bund height can be specified to not exceed 200 mm;
- incompatible materials should not be stored together. *Annex L* is a guide to the compatibility of hazardous waste. Compartments may be separated by impermeable partitions or walls; and
- stacking of containers is allowed provided that the partitions are constructed of impermeable material and that secure stacking can be achieved. Containers must be kept in an upright position and be readily removable when full. Maximum storage height should be limited to 2.5m.

## Compressed Gas

### Background

Compressed gases used for weldings (oxygen and acetylene) are currently stored in pairs in lockable sheds around various locations within the site. Centralised storage of compressed gas will be in operations when the Construction Dangerous Goods Stores are completed in May 1995. LPG is used for cooking at the site canteen and a designated LPG has been constructed (See location in *Annex M*) and the licence is obtained in January 1995.

### Environmental Concerns

- Storage of compressed gases.

### Preventive Measures

For the current storage arrangements, one bottle of oxygen and one bottle of acetylene in each lockable shed should be adequate as an interim measure before the completion of the construction DG stores. However, the following precautions should be taken:

- An inventory of all cylinders and their exact locations should be kept by the Materials Controller and a copy held by the Environmental Support Team.
- The cylinder should be stored in an upright position and chained to a supporting structure to prevent the cylinder from falling.
- Gas valves should be securely fastened and tested for integrity.
- All connecting pipelines should be fixed and not left in an untidy manner such that it would constitute a hazard to staff working in or occupying the premises.

## Solvents

### Background

Halogenated solvents (1,1,1-Trichloroethane) will be used to clean oil filters (See Section 5.4.8 and 5.4.9) and the grease from machine components before assembly. Other solvents (e.g. turpentine) will be used to remove varnish and finishes. Large quantity of paint thinners will also be used due to the substantial level of painting which will be carried out during erection and commissioning. CLP has conducted trials on alternatives to Ozone Depleting Substances and is prepared to use non ozone depleting solvents provided that the cleaning performance is similar to 1,1,1 Trichloroethane.

## Environmental Concerns

- Storage of solvents.
- Vapours given off by solvents.
- Use of Genklene (1,1,1 Trichloroethane) which is an Ozone Depleting Substance (ODS). The control schedule in Hong Kong under the Montreal Protocol indicates that the import of 1,1,1-Trichloroethane should be phased out by 1996.

## Preventive Measures

- Solvents, if in bulk quantities, should be held in secured premises or cabinets as described under the Dangerous Goods Ordinance. An inventory, including the relevant MSDS, of all solvents held on-site should be held by the Materials Controller and copied to the Environmental Support Team.
- The use of 1,1,1-Trichloroethane within CLP should be eliminated. Alternative solvents should be sought to replace the use of 1,1,1-Trichloroethane. The control schedule to phase out 1,1,1-Trichloroethane should be strictly followed.
- Trials of Lotoxane (alternative to 1,1,1-Trichloroethane) has been carried out but the main drawback is its slower clearing time and residual film on the cleaned surface. An "improved" Lotoxane product (Lotoxane Fast) claimed to be faster and does not leave residuals, although flammable, has become available since the trial by CLP. Depending on various factors (working environment, speed of cleaning required etc), other alternatives should be tested in order to replace 1,1,1-Trichloroethane. A list of possible alternatives (including water soluble degreasers) and relevant information are included in Annex N for reference.
- One of the uses of 1,1,1-Trichloroethane is to remove protective coatings from equipment. In future contracts when purchasing equipment, it is suggested to negotiate with suppliers that such protective coatings should only be applied if absolutely necessary. Alternative protective coatings, which can be removed by less hazardous solvents, should be used.
- Forced ventilation should be provided when solvents are used in enclosed/ semi-enclosed areas.
- Where individual supplies of solvents are held by staff and contractors, they will notify the Materials Controller of quantities and location. The designated storage areas for these solvents will be subject to assessment by the Environmental Support Team.
- Waste halogenated solvents should not be mixed with non-halogenated solvents.
- Spent solvent is classified as chemical waste and should be disposed of to the CWTC in Tsing Yi.

#### 4.4.6

### *Batteries*

#### *Background*

Disposal of lead-acid batteries is required as result of maintenance practices for site vehicles and machinery.

#### *Environmental Concerns*

- Storage of batteries
- Disposal of battery acid
- Disposal of battery casing

#### *Preventive Measures*

- Wet cell batteries held on site shall be stored in contained areas with appropriate measures for electrolyte filling. Drip trays should be used during transfer of liquids.
- Used batteries shall be stored in secure areas until as such a time when they can be disposed of by licensed contractors.
- Licensed contractors are available to empty the lead acid batteries for disposal at Chemical Waste Treatment Centre and disposal of the batteries casing. (See *Lists of Contractors in Annex I*)

#### 4.4.7

### *Empty Drums and Cans*

#### *Background*

Large quantities of lubricating oil and transformer oil are used to fill the respective equipment during erection and commissioning and hence large quantities of empty oil drums will be generated on-site.

#### *Environmental Concerns*

- Disposal of metal oil drums.

#### *Preventive Measures*

- Empty drums and cans should be stored in a designated area under the responsibility of Materials Handling Officer.
- Licensed contractors are available to collect and pack empty (and/or full of used oil) oil drums for disposal at landfill. (See *Lists of Contractors in Annex I*).

*CLP POLICY*

It is CLP's policy that the company will comply with all Hong Kong waste disposal regulations and further aim to minimise all wastes arising from the company's premises and operations. This will be achieved through the implementation of recycling, reuse and reduction measures at source of waste materials, wherever practicable and economically feasible.

In the erection and commissioning of the BPPS, management of wastes arising from the site activities will be implemented according to the above principles.

*BACKGROUND TO ISSUES*

In 1993, a daily average of 20,000 tonnes of solid waste was disposed of at three landfill sites and the Kwai Chung incinerator. Such waste is generated by the activities of 1.6 million domestic households, 280,000 commercial and manufacturing businesses and some 440 construction sites in the territory. During the commissioning phase of the BPPS, it is anticipated that a substantial volume of waste will be generated. This include hardwood from packaging cases, empty cable drums, formboard, etc. An estimated usage of 10000m<sup>2</sup> of 9mm thick wood will have been used for construction purpose by Leighton alone. Leighton also reused 80% of the wood. MCJV reused about 30% of their wood.

The generation of such quantities of solid waste in Hong Kong is clearly of significant concern to the Government. In a situation where land space is at a premium, a severe burden is being placed on the existing landfill sites in the territory and there is a critical need to reduce or recover the waste that would otherwise have to be disposed of. Waste can be reduced through implementation of the "three R's": Reduce, Reuse and Recycle.

**Reduction of waste:** This requires a commitment by senior management and the support of employees at all levels. Waste minimisation should include good housekeeping and inventory management, process modification, segregation, recycling or reuse.

**Reuse:** Many items and packaging materials are used only once before being discarded. By reusing such items, or switching over to durable alternatives, solid waste can be reduced.

**Recycling:** Four major waste materials are collected and recycled in Hong Kong; these being paper, plastics, metals and glass. By separating such items on site and contracting with a recycling company, these materials can



be kept out of the waste stream. Recycling or reuse contractors exist for all these categories of materials, and others, (eg. empty laser printer cartridges) can be refilled.

### 5.2.1

#### *Legislation*

The following legislation covers or has some relevance the handling, treatment and disposal of wastes in Hong Kong:

- Waste Disposal Ordinance (Cap 354);
- Waste Disposal (Chemical Waste) (General) Regulation (Cap 354);
- Crown Land Ordinance; and
- Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws (Cap 132).

Disposal of chemical waste is addressed in the hazardous waste management section.

#### *Waste Disposal Ordinance*

The *Waste Disposal Ordinance (Cap. 354)* (WDO) and its supplemental Regulations, establishes controls for the orderly transportation and disposal of municipal and chemical waste, and the disposal of other wastes within the territory. It also ensures that the disposal facilities achieve satisfactory environmental standards. *The Waste Disposal Plan* for Hong Kong provides for municipal waste to be taken to three strategic landfills sites which are currently being constructed in the New Territories (WENT, NENT and SENT) through a network of refuse transfer stations located around the territory.

According to the WDO, municipal waste collector must be properly licensed by the collection authority (USD or RSD). Waste can only be disposed of at locations approved by the EPD.

Government has not implemented a charging policy for the disposal of waste to landfill although this is currently under consideration and may be implemented for all wastes, including construction wastes, in early 1995.

#### *Crown Land Ordinance*

Construction wastes which are wholly inert may be taken to public dumps. Public dumps usually form part of land reclamation schemes and are operated by the Civil Engineering Department. The Crown Land Ordinance requires that dumping licences are obtained by individuals or companies who deliver suitable construction wastes to public dumps. The licences are issued by the Civil Engineering Department.

Individual licences and windscreen stickers are issued for each vehicle involved. Under the licence conditions public dumps will accept only inert building debris, soil, rock and broken concrete. There is no size limitation on the rock and broken concrete, and a small amount of timber mixed with other suitable material is permissible. The material should, however, be free from marine mud, household refuse, plastic metal, industrial and chemical waste, animal and vegetable matter and other material considered unsuitable by the dump supervisor.

#### *Public Cleansing and Prevention of Nuisances*

These Regulations provide a further control on the illegal tipping of wastes on unauthorised (unlicensed) sites. The illegal dumping of wastes can lead to fines of up to HK\$ 200,000 and imprisonment for up to 6 months.

5.3

#### *IMPLICATIONS FOR CLP*

Various types of waste arise and will arise from the construction, commissioning and operation of the BPPS. By far the highest volume will be construction waste in the form of building rubble, wood waste, scrap metals and packaging. Other site activities will generate waste including food waste, office waste, used batteries, old personal computers and empty containers.

The disposal of waste is regulated under the *Waste Disposal Ordinance*. The Ordinance establishes controls for the transportation and disposal of municipal, chemical and other wastes within the territory.

5.3.1

#### *Guidelines for CLP Staff*

The storage, handling and eventual disposal of site waste should be carried out in accordance with CLP policies and regulatory requirements including the appointment of registered waste contractors.

Where feasible, staff will adopt initiatives to minimise waste generation through reuse, recovery and recycling practices. This will reduce the requirement to import additional materials. Recycling would also reduce the collection, transportation and disposal of construction waste and any associated charges by the waste collectors. The following procedures should be observed:

The Site Manager should:

- Allocate dedicated area for centralised collection and segregation of waste.

The Materials Controller will be responsible for the following:

- Management of dedicated area for centralized collection of waste for different waste;
- Coordination of on-site waste collection;
- Management of waste storage areas;
- Appointment of waste contractors;
- Arrangement for regular collection of waste in coordination with Safety and Site Services Department; and
- Maintenance of waste records.

The waste storage areas will be managed by the Materials Controller in consultation with the Environmental Support Team for the necessary storage arrangements. The areas will be monitored regularly the Monitoring Team.

The Environmental Support Team will be responsible for identifying and establishing waste minimisation initiatives.

In negotiating the site waste licence with the regulatory authorities, the Environmental Support Team will undertake responsibility for the establishment and renewal of the licence in consultation with EPD.

Waste management systems on the site will be jointly reviewed by the Environmental Support Team and the Materials Controller every six months to ensure that all the site practices related to these areas comply with both regulatory and company policy requirements. This will form part of the quarterly site environmental audit.

The Materials Controller should ensure that reputable waste hauliers be used to collect and transport the wastes to the appropriate disposal points. The necessary measures to minimise adverse impacts including windblown litter and dust from the transportation of these wastes should also be instigated.

The following requirements should form part of the contract document for the waste collector:

- (a) wastes should be handled and stored in a manner which ensures that they are held securely without loss or leakage thereby minimising the potential for pollution;
- (b) appropriate measures should be employed to minimise windblown litter and dust during transportation by either covering trucks or transporting wastes in enclosed containers;
- (c) the necessary waste disposal permits should be obtained from the appropriate authorities, if they are required, in accordance with the Waste Disposal Ordinance (Cap 354), Waste Disposal (Chemical Waste) (General) Regulation (Cap 354) and the Crown Land Ordinance;

- (d) collection of general refuse should be carried out frequently, preferably daily;
- (e) waste should only be disposed of at licensed sites and the Environmental Support Team should ensure that illegal disposal of wastes does not occur;

- The Materials Controller should ensure that the waste storage areas are well maintained and cleaned regularly; and
- The Materials Controller should maintain records of the quantities of wastes generated, recycled and disposed, determined by either weighing each load or other methods. Copies should be sent to the Site Environmental Support Team.

## 5.4 *SPECIFIC ISSUES*

### 5.4.1 *Construction Waste*

#### *Environmental Concern*

The issue of construction waste is a key environmental concern. Indiscriminate disposal of construction waste will take up vast volume of the landfill space. In accordance with the New Disposal Arrangements for Construction Waste, disposal of construction waste can either be at a specified landfill, or at a public dumping ground, depending on the nature of waste. The reuse of this waste (eg soil, wood, bricks, concrete etc) is encouraged. Surplus waste not suitable for reuse on-site will be collected by waste collector and will be disposed of to landfill or public dump. At the present time, Government has not implemented a charging policy for the disposal of waste to landfill although this is currently under consideration and may be implemented for all wastes, including construction wastes, in early 1995.

#### *Preventive Measures*

The following procedures should be followed:

- Specially designated areas should be prepared by the Materials Controller for the segregation and storage of construction waste.
- Staff and contractors should bring construction waste to the designated areas and segregate into the corresponding categories:
  - Wood
  - Rubble and concrete
  - Soil and rock
  - Scrap metals
  - Copper from cable ends from electrical installations

- The Materials Controller should appoint reputable waste hauliers to remove inert waste for reclamation purposes. Construction waste that cannot be reused shall be sent to the landfill or public dump. The contractor should obtain the necessary disposal permit for the public dump.

#### *Monitoring and Auditing*

- The Environmental Support Team should undertake regular audits of waste disposal records.
- The Environmental Support Team should undertake regular inspection of the waste disposal permit of the waste collector.

### 5.4.2

#### *Wood Waste*

##### *Environmental Concern*

The disposal of wood from construction practices has long been recognised as one of the main problems concerning the disposal of waste in the Territory. This wood waste also includes discarded wood from packaging and scrap pallets. Much of this wood originates from tropical hardwood forests. Whilst the majority of wood sourced by Hong Kong comes from forests that are responsibly managed, there are reported instances of indiscriminate logging which is contributory to the wider issues of loss of biodiversity, soil erosion and displacement of native tribes.

In principle, softwood is a perfectly acceptable alternative for all applications. For temporary works, the use of softwood is technically feasible in most applications. Softwood, if treated correctly, is more economical than hardwood, due to its high reusability (due to the fact that it is easier to remove nails and other temporary fixing materials after use). There is currently little experience in the use of softwood for falsework and formwork in Hong Kong. Softwood formwork may however require adjustment to the formwork design and (possibly) to the design of buildings, due to the different load factors.

Non-tropical alternatives can be used for interior fittings, particularly veneered chipboard and particleboard which are comparable in price and quality to hardwood. The use of softwoods for interior fittings has been highly successful, and acceptance by end users is high.

While there is some uncertainty about the degree to which softwood can replace hardwood, the substitution potential of metal is also recognised. Most of this potential is in the area of temporary works including formwork, falsework, hoardings, proppings, shorings and temporary site offices. Metal casting (on-site or through pre-cast units) is gradually becoming the standard for many civil engineering projects. Steel (and aluminium) formwork is economical when multiple reuses are possible and is structurally reliable therefore offering advantages in being safer than timber framework, and preferable on a cost basis.

Contractors are also gaining experience, with some measure of success, with other composite, non-hardwood or non-metal/non-timber materials including the following:

- *Fibreglass* hoardings are preferable to metal hoardings. They are cheaper (but still more expensive than timber), easier to handle, very durable and long-lasting. They can also be used for formwork.
- *MDF (medium density fibreboard)*, a fine grade chipboard with an extremely smooth surface, predominantly for interior applications, often used with hardwood veneer. There are 10-15 small suppliers of MDF in Hong Kong.
- *OSB (oriented strand board)*, an exterior-use board made from large non-rainforest chips with 95% the strength of plywood but trading at a significant discount to plywood; it can be used for concrete shuttering.
- *Phenolic film paper overly plywood*, which can be reused 15-20 times, as opposed to 5-10 times for untreated plywood.
- Some positive results, with respect to increased strength and reusability, have been achieved with *composite metal/wood products* such as steel-faced plywood.
- *Polyurethane* formwork, which is stronger than timber formwork.

As of March 1993, the Hong Kong Government Works Branch have instituted a policy for the purpose of eliminating the use of tropical hardwoods for temporary structures, such as wood for site hoarding, falsework and formwork for construction of public sector projects. *Table 5.4a* presents an extract of the *Works Branch Technical Circular No. 32/92 on The Use of Tropical Hardwood on Construction Sites*.

*Table 5.4a* Works Branch Technical Circular No. 32/92 - Policy

- 
1. *As a first step towards elimination of hardwood for temporary works, hardwood for site hoardings, falsework and the shoring of trenches and pits shall be specified as not to be used on all contracts for which the first call for tenderers is gazetted (or equivalent) as of 1 March 1993.*
  2. *Contractors must propose alternatives to hardwoods in their tenders or be directed to use specified acceptable alternatives.*
  3. *The various uses of hardwoods on construction sites are listed in Technical Circular together with some suggestions for alternatives.*
  4. *This policy will be kept under review to consider broadening restrictions in the use of hardwoods generally.*
-

In summary, the Technical Circular proposes alternatives for site hoardings, fittings and formwork as follows:

Site hoardings	Metal frames and metal sheet coverings, softwood framing and softwood veneered plywood as well as composite boards.
Fittings	Hardwoods are usually specified for most of the interior wood works such as doors, door frames and sills, skirting boards, floors etc. The use of hardwoods should only be considered for exposed items and any unseen wood works should be of alternative materials such as softwood.
Formwork	Steel, precast concrete and softwood based plywood/MDF are suitable alternative materials to the use of tropical hardwoods in formwork.

Key actions that will need to be taken in all public sector projects include the following:

- substitution for other wood forms;
- alternative materials such as metals and other synthetic materials; and
- increased efficiency in usage.

Alternatives for interior fittings are softwood materials of corresponding quality. Alternatives for temporary works such as hoardings, formwork, falsework and proppings are the following timbers:

- sustainable hardwoods;
- (sustainable) softwoods; and
- special wood products.

CLP, as an environmentally responsible company, acknowledges the need to address this issue both as a waste concern and more broadly as the irreversible loss of a natural resource. Hence, whilst recognising the need for construction wood to meet the needs of the project, environmental criteria will be applied in both sourcing the wood and in identifying ways in which to reduce usage or encourage re-use.

#### *Preventive Measures*

The following procedures should be observed:

- The Contracts and Purchasing Department, together with the Environmental Support Team, will produce guidelines for the sourcing of wood for construction purposes which will be part of the contractors terms of contract. These will include the sourcing of wood from environmentally managed forests.

- All users of construction wood will look at ways of re-using the material or avoiding the use altogether wherever practicably possible (eg for shuttering uses). The design could maximise the use of standard wooden panels in formwork so that the maximum reuse of panels can be achieved. The need to cut panels could also be minimised. Alternatives such as the use of steel formwork or plastic facing could be considered to increase the potential for reuse. It is important that wood wastes are stored separately from other general construction wastes to minimise any contamination which would render the wastes unsuitable for disposal at public dumps.
- This will also include identifying substitutes which can replace the use of wood such as heavy duty fibreglass. If a substitute is to be used, the Environmental Support Team is to be consulted on the environmental implications of replacement such as disposal of the substitute after use.
- As part of the quarterly environmental audit, the Environmental Support Team, with support from TED and Environmental Consultant, will assess the site consumption trends of wood and determine if further reductions can be made. The Environmental Support Team will also be responsible for addressing any queries from site staff regarding the suitability of substitutes.
- Alternatives on the use of tropical hardwood include, but are not limited to, the following:
  - site hoarding
    - use of metal frames and metal sheet coverings, softwood framing and veneered plywood and composite boards
  - formwork
    - plain or profiled steel sheeting as formwork to support in-situ concrete, precast concrete, structural actions, softwood based plywood/medium density fibreboard
  - falsework and trench support
    - softwood, metal props, propriety steel systems

#### 5.4.3

#### *Packaging Waste*

##### *Environmental Concern*

Packaging for equipment and construction materials forms a substantial part of site waste. Packaging wastes are usually bulky and can take up considerable landfill space. In general, these wastes are usually clean and can be segregated for re-use.



### *Preventive Measures*

The procedures for disposal are as follows:

- All Staff and Contractors should ensure that all packaging waste is segregated and held in a designated storage area eg. cable drums, wooden pallets, cardboard and plastics (eg. poly foam).
- Staff and contractors should keep the waste clean and separated.
- Where feasible, all forms of packaging should be re-used. The Environmental Support Team will contact respective suppliers to see if programmes for taking back packaging are feasible. Non-returnable cardboard can be recycled on site or can be collected for subsequent recycling. (See *List of Contractors in Annex I*)

#### 5.4.4

### *General Refuse*

#### *Environmental Concern*

The storage of general refuse has the potential to give rise to adverse environmental impacts such as odour if the waste is not collected frequently; presence of pests and vermin if the waste storage area is not well maintained; windblown litter, and visual impact. General refuse may include food wastes and office wastes.

#### *Preventive Measures*

The procedures for disposal are as follows:

- All staff and contractors should ensure that general refuse generated on-site are stored and collected separately from other construction and chemical wastes.
- The Materials Controller should arrange for the collection and disposal of the refuse by a reputable waste haulier.
- The removal of waste from the site should be arranged on a daily or at least on every alternate day by the contractor to avoid potential odour impacts, minimise the presence of pests, vermin and other scavengers and prevent unsightly accumulation of waste.
- The Materials Controller should provide enclosed bins or compaction units for storage of general refuse.

#### *Food Waste*

Food waste from the site will be disposed of through the normal municipal routes. The use of styrofoam lunch boxes should be discouraged. The following measures can be adopted:

- encourage staff and contractors to bring their own reusable containers to minimise the level of waste styrofoam lunch boxes;
- food sold within the site boundary should be served in paper boxes rather than in styrofoam lunch box;
- restrict the use of styrofoam lunchbox by food vendor within the site.

A new construction canteen which will cater for all staff and workers on site will come into service in February 1995 which should centralised and control food waste. Polystyrene box should not be used if takeaway food are provided at the canteen.

In addition, the use of returnable-bottled drinks should be encourage and if this is not possible, CLP should arrange for the aluminum canned drinks to be recycled. (See Recyclers in *List of Contractors in Annex I*)

#### *Office Waste*

Typical office wastes comprise paper, plastics, printer cartridges and other miscellaneous items. 805,000 sheets of A4 paper (approx. 4070kg) were consumed by GPD between January and May 1994 for photocopying and laser printing. At present, only computer paper from accounts department and old files from GPD are recycled under a confidential paper collection system established in June 1993. A small amount of paper from Black Point site is recycled with the scheme at Castle Peak Power Station. It will be more feasible and practical to implement recycling scheme within GPD when GPD is moved to Black Point Site. The recycling scheme should included all types of recyclable papers instead of the limited types as at the present scheme.

Measures that can minimise office waste include, but are not limited to, the following:

- In accordance with the waste paper recycling policy in CLP, all waste paper from the site should be sent for recycling where practicable and economic;
- Used toner cartridges may be collected and returned to the supplier for recycling (See *Annex I*);
- "Environmentally friendly" products (e.g. recycled paper, ozone friendly correction fluid, double-sided laser printers etc.) should be purchased; and
- "Recycling" of old personal computers (PC) should be investigated. (See *Annex I*) One of the possible ways is to donate workable PC to charitable organizations.

*POLICY STATEMENT*

It is CLP's policy that no effluent discharge from BPPS shall exceed the standards for effluent discharged into the coastal waters of Deep Bay Water Control Zone as specified in the *Technical Memorandum - Standards for Effluent Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM)* under the *Water Pollution Control Ordinance*. This will be achieved through implementing measures to prevent unintentional discharge; and regular sampling of effluent to ensure compliance with discharge standards.

In the construction and commissioning of the Black Point Power Station, this policy will be observed and implemented accordingly to the fullest extent as feasibly practicable.

*REVIEW OF EM&A - CONSTRUCTION PHASE*

Water quality monitoring was 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 measured included turbidity, suspended solids and dissolved oxygen concentration. After reviewing the monitoring requirements of the construction phase and the construction programme for Black Point Site, *Table 6.2a* defines the various levels for determination of the level of action required by the relevant parties during the commissioning phase. In the event of an exceedance of a specific level, the appropriate action by the parties involved are clearly defined in *Table 6.2b*.

Table 6.2a Water Quality Monitoring Requirements

Frequency	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.
Duration	Until six weeks after completion of dredging (June 1995).
Monitoring Locations	As indicated in Figure 6.2a.
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 <sup>1</sup>
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 <sup>1</sup>

Note

1 5 mg/litre DO in the surface layer applicable for the Mariculture zone.

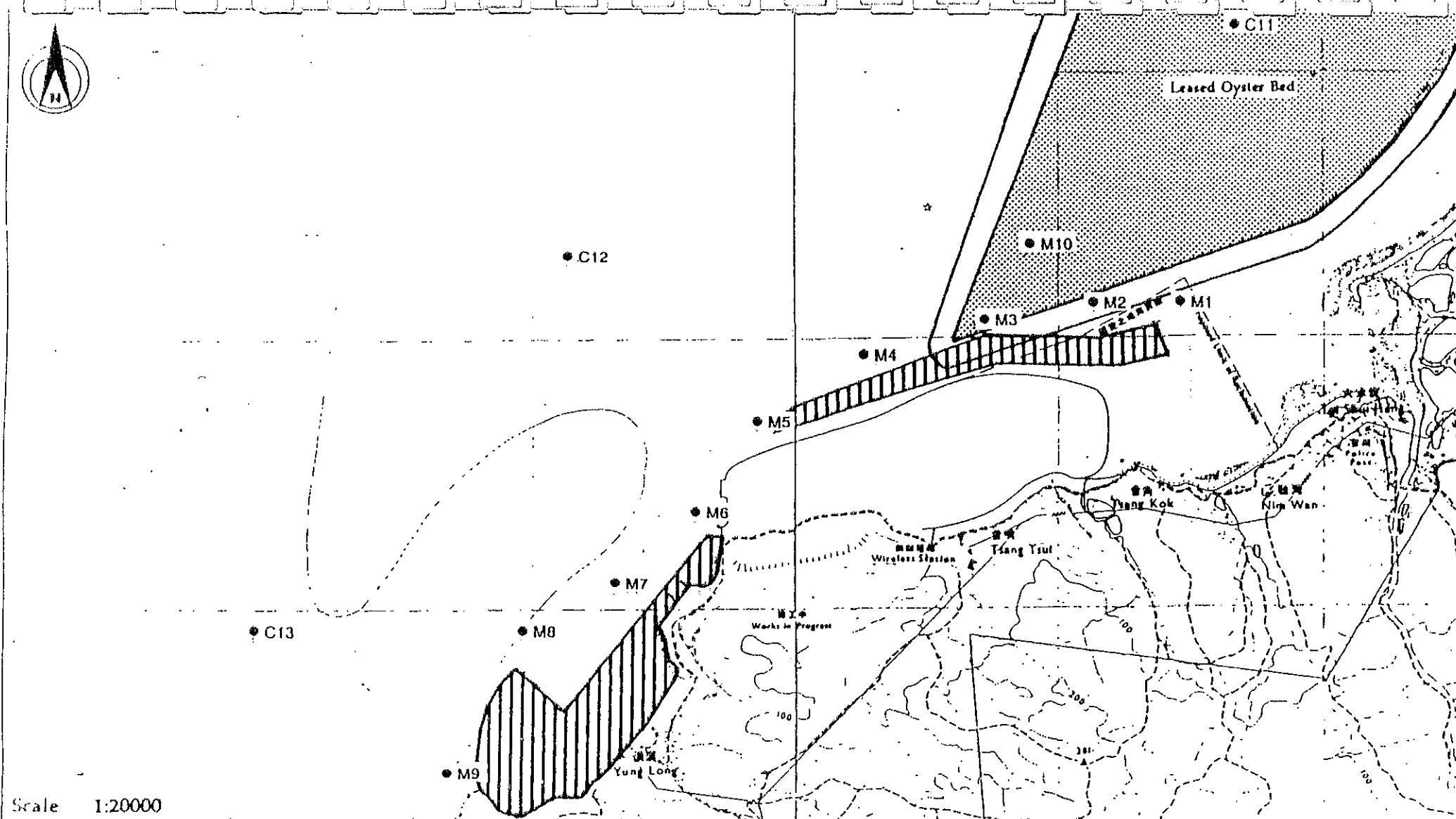


Figure 6.2a Locations of Marine Water Monitoring Stations

ERM Hong Kong

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



Table 6.2b Water Quality - Action Plan

Event	Action	
	Site Manager	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 Site Manager.</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"> <li>· Modifications to dredging practice - silt curtain, water tight grabs.</li> <li>· Rescheduling of dredging activities.</li> <li>· Improved operational and maintenance techniques.</li> </ul>
Exceedance in Action level	<p>Notify EPD.</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 Site Manager.</p> <p>Implement remedial action immediately.</p> <p>Notify Site Manager of the action taken.</p>
Exceedance of Target level	<p>Notify EPD.</p> <p>Require Contractor to make additional proposals and to take immediate steps to mitigate situation</p> <p>Report to EPD in Monthly Progress Report of the incident and remedial action taken.</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 Site Manager.</p> <p>Identify source.</p> <p>Review plant and equipment and working procedures.</p> <p>Submit proposals for mitigation measures to Site Manager.</p> <p>Implement remedial action immediately.</p> <p>Notify Site Manager 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>

6.3

BACKGROUND TO ISSUES

The Water Pollution Control Ordinance (Cap. 358) (WPCO) and its supplemental Regulations and Technical Memorandum control the quantity and quality of effluent waste discharged in the territory. Under this ordinance the EPD has arranged Hong Kong's water into 10 water control zones, which must meet strict water quality objectives. Effluent discharged from BPPS enters the Deep Bay Water Control Zone. It is an offence to discharge waste into an area designated as a water control zone without first obtaining a licence from EPD.

As part of the licence conditions when setting effluent standards within a control zone, EPD uses the TM issued by the Secretary for Planning, Environment and Lands as a guide. The licence will limit the nature and volume of waste. Sewage treatment plants and septic tanks receiving domestic sewage are subject to control, as are industrial manufacturing, commercial and construction effluent discharges.

The *Technical Memorandum for Standards of Effluents Discharged into Drainage and Sewage Systems, Inland and Coastal Waters 1991* (TM) sets the acceptable limits for effluents into foul sewers, storm drains, inland and coastal waters. The limits are based on the physical, chemical and microbial quality of effluents. Dilution is not allowed as a means of meeting effluent standards.

The penalty for discharging polluted matter without a valid licence in a water control zone ranges from fines up to \$100,000 for the first offence, \$200,000 for a subsequent offence and additional daily fines thereafter. Clean-up costs are borne by the offenders. A licence, for effluent discharge, is valid for two years only and must be renewed 60 days before expiry.

## 6.4

### *IMPLICATION TO CLP*

During the commissioning phase of Black Point Power Station, demineralised water, towns water or sea water is used to flush various aqueous systems to remove construction debris. Hydraulic tests are also performed to demonstrate the mechanical integrity of components and equipment prior to them being used for working fluids e.g. Oil or chemicals. Chemical cleaning agents are required to prepare the internal surfaces of various plant equipment for operations. Furthermore, acid or antifoulant is used to prevent metallic oxide deposits and surfactant is used to remove oil and grease within pipework system. Production of domestic sewage will increase as the personal on site will reach its peak during the commissioning phase.

A list of the expected effluent generated from the commissioning activities has been prepared by the Commissioning Branch and is included in *Annex O*. The discharge of effluent that arises from these activities must comply with discharge standards as specified in the TM. (See *Table 6.3a*)

### 6.4.1

#### *Licensing*

The effluent discharges arise from the following erection and commissioning activities should be licensed under the Water Pollution Control Ordinance prior to any discharge:-

- Acid cleaning;
- Pipe chemical cleaning;
- Hydraulic test of water tank;
- Non-seawater cooling water pipework chemical clean;
- Cleaning of reusable filters; and
- Temporary sewage treatment plant.

Table 6.3a

Standards for effluents discharged into the coastal waters of Deep Bay Water Control Zone (All units in mg/L unless otherwise stated; all figures are upper limits unless otherwise indicated)

Flow rate (m <sup>3</sup> /day)	≤10	>10 and ≤200	>200 and ≤400	>400 and ≤600	>600 and ≤800	800 and ≤1000	>1000 and ≤1500	>1500 and ≤2000	>2000 and ≤3000	>3000 and ≤4000	>4000 and ≤5000	>5000 and ≤6000
Determinand												
pH (pH units)	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9
Temperature (°C)	45	45	45	45	45	45	45	45	45	45	45	45
Colour (Lovibond units) (25mm cell length)	1	1	1	1	1	1	1	1	1	1	1	1
Suspended solids	50	50	50	50	50	50	25	25	25	25	25	25
BOD	20	20	20	20	20	20	10	10	10	10	10	10
COD	80	80	80	80	80	80	50	50	50	50	50	50
Oil & Grease	20	20	20	20	20	20	10	10	10	10	10	10
Iron	10	10	10	7	5	4	3	2	1	1	1	1
Boron	5	4	3	2.5	2	1.6	1.1	0.8	0.5	0.4	0.3	0.2
Barium	5	4	3	2.5	2	1.6	1.1	0.8	0.5	0.4	0.3	0.2
Mercury	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Other toxic metals individually	1	0.5	0.5	0.5	0.4	0.4	0.25	0.25	0.15	0.1	0.1	0.1
Total toxic metals	2	1	1	1	0.8	0.8	0.5	0.5	0.3	0.2	0.14	0.1
Cyanide	0.1	0.1	0.1	0.1	0.1	0.08	0.06	0.06	0.03	0.02	0.01	0.01
Phenols	0.5	0.5	0.4	0.3	0.25	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Sulphide	5	5	5	5	5	5	2.5	2.5	1.5	1	1	0.5
Total residual chlorine	1	1	1	1	1	1	1	1	1	1	1	1
Total nitrogen	100	100	100	100	100	100	80	80	50	50	50	50
Total phosphorus	10	10	10	10	10	10	8	8	5	5	5	5
Surfactants (total)	15	15	15	15	15	15	10	10	10	10	10	7
E. coli (count/100ml)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Source : Technical memorandum - standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters. Water Pollution Control (Amendment) Ordinance 1990.



In order to ensure compliance of effluent discharge standards during the commissioning phase, the following guidelines should be followed by Black Point Staff as far as possible:-

- The Environmental Support Team should identify and keep a record of all effluent producing streams and their discharge points.
- The Environmental Support Team should be notified when there will be discharge of effluent from these streams prior to discharge. Appropriate samplings should be arranged.
- No process effluent should be discharged unless it is confirmed to comply with the relevant discharge criteria.
- Relevant discharge licences under the *Water Pollution Control Ordinance* must be obtained prior to any discharge.
- To ensure that the risk of significant water pollution from accidental events is minimised. Where appropriate, all storage containers holding contaminated wastewater should be in bunded areas of adequate capacity.
- To ensure that the disposal methods of licensed contractors are environmentally acceptable.
- If reasonably practicable, the treatment of wastewater should be performed close to the source of generation of the wastewater in order to reduce the chance of leaks or spills of wastewater.

## 6.5

### *SPECIFIC ISSUES*

#### 6.5.1

#### *Heat Recovery Steam Generator (HRSG) Acid Cleaning*

##### *Process*

The objective is to chemically clean the internal surfaces of the HRSG to remove insoluble debris. The principle chemical cleaning agent of concern is Hydrofluoric Acid. A working party consisting of engineering, commissioning, safety, chemistry and environmental staff within CLP has been set up since July 1994 to review the proposed acid cleaning method for HRSG. Alternative methods employing less hazardous chemicals are being investigated by the working party.

The chemical cleaning programme will be carried out in eight stages as described below:-

#### Stage 1 - Initial Water Flush

After completion of the hydraulic test, the system will be water flushed until the effluent turbidity is of an agreed level above the influent value.

#### Stage 2 - Surfactant Wash

The temperature of the system will be raised to 60-70°C and a biodegradable surfactant will be injected. The system will be drained after recirculation.

#### Stage 3 - Water Flushing

The system will be water flushed until the effluent turbidity meets an agreed level above the influent value.

#### Stage 4 - Acid Clean

The temperature of the system will be raised to 75°C. Chemicals will be injected to give the following concentrations:-

- 1.00% w/w Hydrofluoric Acid
- 0.10% w/w Dodigen 95

Half of the system will be circulated while the other half is allowed to reside. The systems will alternate at predetermined intervals. The system will be drained to the effluent holding pit for treatment when the levels of the dissolved iron in solution remains constant.

#### Stage 5 - Citric Acid Rinse

The system will be filled with water and circulated with a chemical concentration of 0.1% w/w Citric Acid.

#### Stage 6 - Water Flushing

The system will be water flushed until the effluent turbidity is of an agreed level above the influent value.

#### Stage 7 - Passivation

The system will be filled with water and circulated at 55-60°C, with a chemical concentration of 0.5% w/w Citric Acid at pH 3.5 with Ammonia, to pick up any "after rusting" resulting from Stage 6. The pH is adjusted to 9.0 - 9.5 before adding 0.30% w/w Hydrogen Peroxide. The effluent is then drained to the effluent pit after circulation.

## Stage 8 - Ammonia Solution Rinse

The system will be filled with water heated to 40-45°C and dosed with 50-100 ppm Ammonia. Circulation will continue until clear ammoniated water at pH 10-10.5 is obtained. The system will be drained and allowed to dry by natural ventilation.

### *Effluent and Solid Waste Disposal*

A lined effluent holding pit with total volume of about 3000m<sup>3</sup> divided into two compartments will be constructed to hold the effluent discharged from acid cleaning of two HRSG units only. The effluent in the pits will be neutralised using calcium hydroxide (commonly known as lime hydrate) and very fine calcium fluoride and gelatinous iron hydroxide will be precipitated. The effluent, when confirmed to the TM discharge limits, will be discharged to sea. The disposal method of the sludge (calcium fluoride and iron hydroxide) is under review and is likely to be disposed at Chemical Waste Treatment Centre (CWTC) at Tsing Yi if treatment facilities are available or disposed at co-disposal landfill with the permission of EPD.

The method of cleaning the HRSG is currently under review by both CLP and specialist chemical cleaning contractors. One of the main aims of the review is to minimise the environmental impact of the cleaning operation.

### *Environmental Concerns*

- Discharge of acid or alkaline to sea.
- Discharge of metals in suspended solids or in dissolved form to sea.
- Disposal of sludge.
- Handling and storage of hazardous materials.

### *Preventive Measures*

- During the acid wash for the first HRSG unit, samples should be taken from each stage of the wash to indicate the composition and volume of the each effluent. The purpose is to segregate the effluent at different stages (e.g. water flushes) into batches that will comply with the TM limits for discharge from the effluent that does not (e.g. Acid clean). This information can be used during the second and subsequent HRSG acid clean to reduce the volume of effluent that requires treatment.
- The effluent should be allowed to settle and coagulants should be used, if necessary, to assist settlement.
- pH and metal contents must be confirmed by chemical analysis that the standards for discharge are met prior to discharge of the effluent.
- Laboratory tests should be performed to estimate the quality and quantity of the sludge produced from the acid wash. Preacceptance sample should be sent to CWTC to determine if it is a chemical waste. The results should indicate the hazardous nature of the sludge and

should form the basis of discussion between representatives from CWTC, EPD and CLP. CWTC should be able to indicate if the sludge is acceptable for treatment.

- The acid cleaning will be carried out by Costain, a specialised chemical cleaning contractor.
- When disposal at CWTC is not feasible, licensed contractors should be appointed to collect and pack the sludge for disposal at landfill.
- Alternative acid cleaning methods using less hazardous chemicals should be sought. The handling and storage of hazardous chemicals should follow guidelines as discussed in *Section 2 Hazardous Materials Management* in the Manual.
- The effluent holding pit should be fenced off and warning notices should be erected to inform staff and contractors of the hazardous nature of the effluent. This also prevents the effluent holding pit from acting as a chemical dump.
- The temporary piping and manifolds for the acid cleaning should be securely fitted and must be resistant to Hydrofluoric Acid to prevent ruptures and leakages.

#### *Monitoring*

The following monitoring parameters are recommended for, subject to EPD's discharge licence requirements, the effluent discharge from each stage as well as the final effluent from the effluent holding pit for the Acid Cleaning. The monitoring parameters should be reviewed and revised after the first unit is commissioned to append or delete parameters for subsequent units:-

- pH
- COD
- Suspended Solids
- Temperature
- Oil & Grease
- Iron
- Phenols
- Total Nitrogen
- Surfactants (total)

The list should be updated when the methods and procedures of the acid cleaning is finalised.

*Process*

The Fire Resistance Fluid (FRF) System is chemically cleaned before final flushing using the system fluid. The purpose of pipe chemical clean is to remove the oil, grease and any loose deposits and debris from the pipework. Sulphuric acid has been employed in Castle Peak Power Station to achieve this task. The manufacturer has proposed using "non-hazardous" cleaning agents for the pipe chemical clean for the Black Point Power Station which includes a combination of 'MICRO', a mixture of surfactants which has the ability to remove oil and grease, and 'Newsolve DR', a sequestering/dispersing agent to dislodge the loose deposits/debris and prevent redeposition.

The proposed cleaning method for Hydraulic Fluid System will require the whole pipework system to be fully primed with water at 50°C and circulated with Newsolve DR and MICRO chemicals at a concentration by volume of 5% and 1% respectively. The system is drained and rinsed with demineralised water. The rinsing is repeated for three times where the temperature of the last rinse is raised to 85-95°C. The proposed cleaning solution are biodegradable and will be drained off by surface drainage system. The system will be dried by air. Alternatives are likely to be proposed for the FRF system and Commissioning/TED will assess suitability of alternative processes.

*Environmental Concerns*

- Discharge of rust (iron oxide) and other metal oxides removed from the pipework with the effluent to the sea.
- Colour of effluent due to iron oxide.
- Although the proposed sequestering/dispersing agent Newsolve DR is claimed to be biodegradable, the chemical composition of the proposed Newsolve DR is not known and hence the expected quality of effluent discharged is also unknown.
- Discharge of excessive surfactants (also claimed to be biodegradable) to the sea.
- Temperature of the last rinse exceeding the permitted value of 40°C for discharge into Deep Bay Water Control Zone.

*Preventive Measures*

- A settling tank should be provided to allow the effluent to be settled and only the overflow from the settling tank should be discharged.
- Chemical tests are required when visual inspection cannot confirm whether the limit of 1 lovibond unit is exceeded.
- The chemical composition of the sequestering/dispersing agent should be sought from the chemical manufacturer and the expected quality of effluent should be deduced to determine whether treatment is required.

- One of the feasible methods to treat biodegradable sequestering/dispersing agent and surfactants is biological treatment. The effluent can be diverted to the construction sewage treatment plant which employs an extended aeration treatment process, provided that the permissible discharge flow rate of 300m<sup>3</sup>/day is not exceeded. It should be noted that the temporary sewage treatment plant is licensed to treat domestic sewage and variation to the influent should be approved by EPD prior to operation. The effluent from the temporary sewage treatment plant should be monitored when effluent from pipe chemical clean is diverted to the plant.
- The settling tank can also act as a buffer storage where the last rinse can be quenched by effluent from previous rinses in the tank and hence the temperature can be reduced.
- Skid-mounted "Greensand filters" for iron removals can be employed to remove the iron content and hence colour from effluent (See *List of Contractors in Annex I*) at relatively low cost. This option should be explored when iron content or the colour of the effluent exceeds the discharge limit. (See *Annex P* the working principles of Iron Removal Filters)

#### *Monitoring*

The following monitoring parameters are recommended, subject to EPD's discharge licence requirements, for the effluent discharge from Pipe Chemical Clean. The monitoring parameters should be revised after the first unit is commissioned to append or delete parameters for subsequent units:-

- pH
- COD
- Suspended Solids
- Temperature
- Colour<sup>1</sup>
- Oil & Grease
- Iron
- Total phosphorus
- Surfactants (total)

\* When visual inspection cannot confirm whether the limit of 1 lovibond unit is exceeded.

The list should be updated when the chemical composition of Nowsolve DR is determined.

*Background*

Hydraulic testing using demineralised water is carried out to test the integrity of the water tanks. In order to minimise the quantity of water used during hydrostatic testing of water tanks, only one tank will be tested at any one time and the water will be transferred from tank to tank. Most of these tanks are lined. A strainer is provided at inlet to the water transfer pump to collect any construction debris. The effluent will be discharged via the station surface water drainage system.

*Environmental Concerns*

- Colour of effluent due to metal oxide.
- Disposal of solid waste collected in the strainers.

*Preventive Measures*

- The method of reusing the water for testing (e.g. Station Demineralised Water Tanks) is considered to be good practice and should be strictly adhered to.
- Chemical tests are required when visual inspection of the water inside the last tank cannot confirm whether the limit of 1 lovibond unit is exceeded.
- Most of the solid waste collected by the strainer is anticipated to be construction debris and should be disposal of in general waste skips provided on site.
- Skid-mounted "Greensand filters" for iron removals can be employed to remove the colour from effluent (See *List of Contractors in Annex D*) at relatively low cost. This option should be explored when iron contents of the effluent and hence the colour exceeds the discharge limit.

*Monitoring*

The following monitoring parameters are recommended, but not limited to, for the effluent discharge from Hydraulic test of water tank.

- Colour
- Visual inspection the discharge point.
- \* When visual inspection cannot confirm whether the limit of 1 lovibond unit is exceeded.

*Process*

Metal oxide deposits, oil and grease inside the pipework of non-seawater cooling water system (e.g. Gas Turbine cooling water system) must be eliminated prior to operation. The manufacturer has proposed to use antifoulant, corrosion inhibitor and microbiocide from Drew Chemical Corporation. These chemicals will be dosed in the pipework to the desired concentration where the water will be recirculated. The proposed Drew Chemicals have been test by *United States Department of Agriculture (USDA)* and are listed for use with cooling system (See extract of *List of Proprietary Substances and Nonfood Compounds* of USDA in *Annex Q*). The effluent discharge point is under review.

*Environmental Concerns*

- The quality of the effluent depends very much on the dosage of the chemicals and often the dosage is not determined until the actual cleaning.
- Discharge of oil and grease to sea.
- Colour of effluent due to metal oxide.

*Preventive Measures*

- Chemical analysis on laboratory samples should be performed to determine the expected quality of the effluent and hence the treatment method, if required.
- The effluent from the chemical clean should be stored in buffer storage and analysed before discharge.
- The effluent should be directed to the station oil separator if the chemical analysis indicates that the oil & grease content exceeds the discharge limit. Skid-mounted Oil-Water Separation System is a possible option if the station oil separator is not available for the pipework chemical clean. (See *List of Contractors* in *Annex I* and the working principles in *Annex P*)
- Chemical tests are required when visual inspection cannot confirm whether the limit of 1 lovibond unit is exceeded.
- Skid-mounted "Greensand filters" for iron removals can be employed to remove the colour from effluent (See *List of Contractors* in *Annex I*) at relatively low cost. This option should be explored when iron contents of the effluent and hence the colour exceeds the discharge limit.

*Monitoring*

The following monitoring parameters are recommended, but not limited to, for the effluent discharge from non-seawater cooling water pipework chemical clean. The monitoring parameters should be revised after the first



unit is commissioned to append or delete parameters for subsequent units:-

- pH
- COD
- Suspended Solids
- Colour<sup>1</sup>
- Oil & Grease
- Iron
- Surfactants (total)<sup>2</sup>

<sup>1</sup> When visual inspection cannot confirm whether the limit of 1 lovibond unit is exceeded.

<sup>2</sup> Determination of this parameter takes over one week.

#### 6.5.5

#### *System Water Flush by Sea Water*

##### *Process*

Pipework will be flushed with sea water to remove any construction debris. Sea water will be obtained in a clean filtered and chlorinated form from any point after the main cooling water drum screens. Systems will be flushed until there is no visible signs of construction debris. The flushing water will be directed to the station surface water drainage via a strainer arrangement. Solid wastes will be collected and disposed of accordingly.

##### *Environmental Concerns*

- Disposal of solid waste collected from the strainer.
- Discharge of excessive chlorine (<1ppm residual chlorine).

##### *Preventive Measures*

- The strainer should be checked by visual inspection and emptied regularly to prevent overflowing of construction debris when the strainer is full.
- Most of the solid waste collected by the strainer is anticipated to be construction debris and should be disposed of in general waste skips provided on site.
- Ensure that the chlorine dosing at the cooling water intakes does not result in excess residual chlorine.

##### *Monitoring*

The following monitoring parameter is recommended for the effluent discharge from System Water Flush by Sea Water:-

- Chlorine dosing at Cooling Water Intake.

## 6.5.6

### *System Water Flush by Demineralised Water*

#### *Process*

Similar to system water flushes by sea water, pipework will be flushed with towns water to remove any construction debris. Towns water will be obtained from either the station system or directly from the towns water main supply line. Systems will be flushed until there is no visible signs of construction debris. The flushing water will be directed to the station surface water drainage via a strainer arrangement. Solid wastes will be collected and disposed of accordingly.

#### *Environmental Concerns*

- Disposal of solid waste collected from the strainer.

#### *Preventive Measures*

- Investigate the feasibility to reuse the flushing water.
- The strainer should be checked by visual inspection and emptied regularly to prevent overflowing of construction debris when the strainer is full.
- Most of the solid waste collected by the strainer is anticipated to be construction debris and should be disposal of in general waste skips provided on site.

## 6.5.7

### *Fuel Oil Flushing*

#### *Process*

All fuel oil system pipework will be flushed by recirculating the fuel oil between the pipework and the fuel oil tank. Recirculated oil will be filtered to remove solid particulates. Systems will be flushed at a velocity above the normal working velocity until the correct oil cleanliness is achieved. Oil cleanliness will be confirmed by visual inspection and sampling at the return strainer basket. Spent filter elements, construction debris and contaminated oil will be removed from the system and stored in drums prior to off site disposal.

#### *Environmental Concerns*

- Disposal of oil contaminated debris collected from strainers and filters.
- Disposal of spent filter elements and contaminated oil.
- Leakage of fuel oil from pipework during testing.

### *Preventive Measures*

- Absorbent materials (e.g. 3M Oil Absorbent Mat) should be located near the pipework system in case of spillage/leakage.
- Oil contaminated debris, spent filters elements and contaminated oil be stored in the drum and properly labelled as chemical waste. The labelling and storage of these drums should comply with *Waste Disposal (Chemical Waste)(General) Regulation*.
- The oil contaminated solid waste should be properly packed and disposed off by licensed contractors to co-disposal landfill.

### *Monitoring*

- Records of trip tickets for the disposal of waste should be kept Material Controller to ensure proper disposal of the waste by the contractors. Copies should be sent to the Site Environmental Support Team.

## 6.5.8

### *Lubricating Oil Flushing*

#### *Process*

Clean Lubricating oil will be used for flushing, being transferred from the clean oil drum using fine filter to collect dirt in the process. The lube oil system pipework will be divided into several paths for flushing so that the velocity of oil will be brought to above the normal working velocity until the correct oil quality is achieved. Replaceable filter cartridges will be installed at the pump discharge before going to the flushing circuit to ensure a clean oil for flushing. Fine wire mesh filter elements will be installed at the end of the flushing path to monitor the cleanliness of the flushing circuit. The oil quality will be confirmed by sampling and chemical testing.

At the end of the flushing, the dirty filter elements in the flushing circuit will be taken out in a controlled manner to be washed in a container using Genklene (1,1,1-Trichloroethane). Replaceable filter cartridges will be replaced by clean cartridges and the spent cartridges will be stored in oil drums prior to off-site disposal. Solid waste collected by the filters and contaminated oil during filter change and minor system leaks will also be stored in oil drums prior to off-site disposal.

#### *Environmental Concerns*

- Disposal of oil contaminated debris collected from strainers and filters.
- Disposal of spent filter elements and contaminated oil.
- Leakage of lubricating oil from pipework during testing.
- Use of Genklene (1,1,1 Trichloroethane) which is an Ozone Depleting Substance. The control schedule in Hong Kong under the Montreal Protocol indicated that the use of 1,1,1-Trichloroethane should be phased out by January 1996.

### *Preventive Measures*

- Drip Trays should be used during filter changes and any spillages should be cleaned by absorbent material.
- Absorbent materials (e.g. 3M Oil Absorbent Mat) should be located near the pipework system in case of spillage/leakage.
- Oil contaminated debris, spent filters elements and contaminated oil should be stored in the drums and properly labelled as chemical waste. The labelling and storage of these drums should comply with *Waste Disposal (Chemical Waste)(General) Regulation*.
- The drums should be properly packed and disposed off by licensed contractors to co-disposal landfill.
- Commissioning Branch is investigating in the feasibility of a better alternative cleaning filters/strainers with steam and detergent instead of using 1,1,1-Trichloroethane. The effluent will be directed to the station oil/water separator. These would be the preferred method for clearing of oil contaminated filters and strainers. (See *Annex N for Alternative Solvents*).

### *Monitoring*

- Records of trip tickets for the disposal of waste should be kept to ensure proper disposal of the waste by the contractors.

## 6.5.9

### *Cleaning of Strainers/Filters*

#### *Process*

Strainers and filters are employed to ensure the cleanliness of various fluid used during the commissioning phase. These can be classified into two types:-

Type I      Disposable  
Type II      Reusable

In addition, each type can be categorised into the following:-

A. Air and Gas Systems      C. Chemical Systems  
B. Water Systems              D. Oil Systems

Type IA & IB filters will be treated as solid waste and Type IC & ID filters will be treated as chemical waste. Type II filters will be cleaned and the effluent will be treated/discharged accordingly.

### *Environmental Concerns*

- Disposal of Type IA & IB filters.
- Disposal of chemical and/or oil contaminated filters.
- Discharge of effluent for cleaning Type II filters.
- Halogenated solvents (Genklene) used for cleaning oil filters.

### *Preventive Measures*

- Type IA & IB filters and the collected debris should be discarded in skips for general waste and disposed of by licensed collector.
- Drip Trays should be used during filter changes and any spillages should be cleaned by absorbent material.
- Spent chemical and oil filters elements should be stored in the separate drums and properly labelled as chemical waste. The labelling and storage of these drums should comply with *Waste Disposal (Chemical Waste)(General) Regulation*.
- The drums should be disposed of by licensed contractors.
- Effluent from cleaning Type IIC (chemical) filters should be discharged into the station chemical drainage system for treatment at the Station Effluent Treatment Plant.
- Commissioning Branch is investigating the feasibility of a better alternative in cleaning Type IID filters/strainers with steam and detergent instead of using 1,1,1 - Trichloroethane. The effluent will be directed to the station oil/water separator. It would be the preferred method for the cleaning of reusable oil contaminated filters and strainers. (See *Annex N* for Alternative Solvents).
- Alternative solvents should be sought, if steam cleaning is not feasible, to replace the use of 1,1,1-Trichloroethane as discussed in *Section 1.4.7*.

### 6.5.10 *C&I Acid Cleaning of Instrument Pipeline*

#### *Process*

Several litres of 5% concentration Citric acid will be used to clean the instrument pipelines for each unit during the installation of control and instrumentation equipment.

#### *Environmental Concern*

- Disposal of used Citric acid.

### *Preventive measures*

- Spent Citric acid should be stored in compatible containers (See Section 4.4.3).
- Separate compartment should be provided for the storage of the spent acid in C&I workshop and clearly labelled as "Chemical Waste" in English and Chinese. (See also Section 4.4.3)
- The Material Controller should be informed when the containers are nearly full to arrange for disposal to CWTC at Tsing Yi.

### 6.5.11

#### *Domestic Sewage*

##### *Process*

Domestic sewage is treated by three systems (tertiary biological system, septic tanks system, and chemical toilets) on Black Point Site. The majority of the sewage will be treated by the construction sewage treatment plant which employs an extended aeration process. The organic matters are decomposed by bacteria in the activated sludge and the final effluent is sand filtered and chlorinated before discharge. A licence under the Water Pollution Control Ordinance has been granted for the discharge from the construction sewage treatment plant and is valid until 30 September 1996. The licence limits the discharge from the construction sewage treatment plant to 300 m<sup>3</sup>/day and requires the following parameters of the effluent to be monitored on a monthly basis:-

- BOD
- Suspended Solids
- Total Residual Chlorine
- *E. Coli*

Septic tanks are installed in the contractors' respective areas and CLP's compounds and chemical toilets are provided at remote locations. A licence under the Water Pollution Control Ordinance has been granted for the discharge from septic tanks and is valid until 1 October 1996. The licence limits the maximum discharge flowrate to 540 m<sup>3</sup>/day.

The location of sewage treatment facilities are shown in *Figure 5.4a*. The figure indicates that the all the toilet compounds are located on the western side of the site whereas the majority of work will be carried out on the eastern side of the site at the boiler/turbine halls.

##### *Environmental Concerns*

- Discharge from septic tanks.
- Disposal of waste from chemical toilets.
- Discharge from construction sewage treatment plant.
- Workers not utilising the toilet facilities as they are located too far away from workplace.

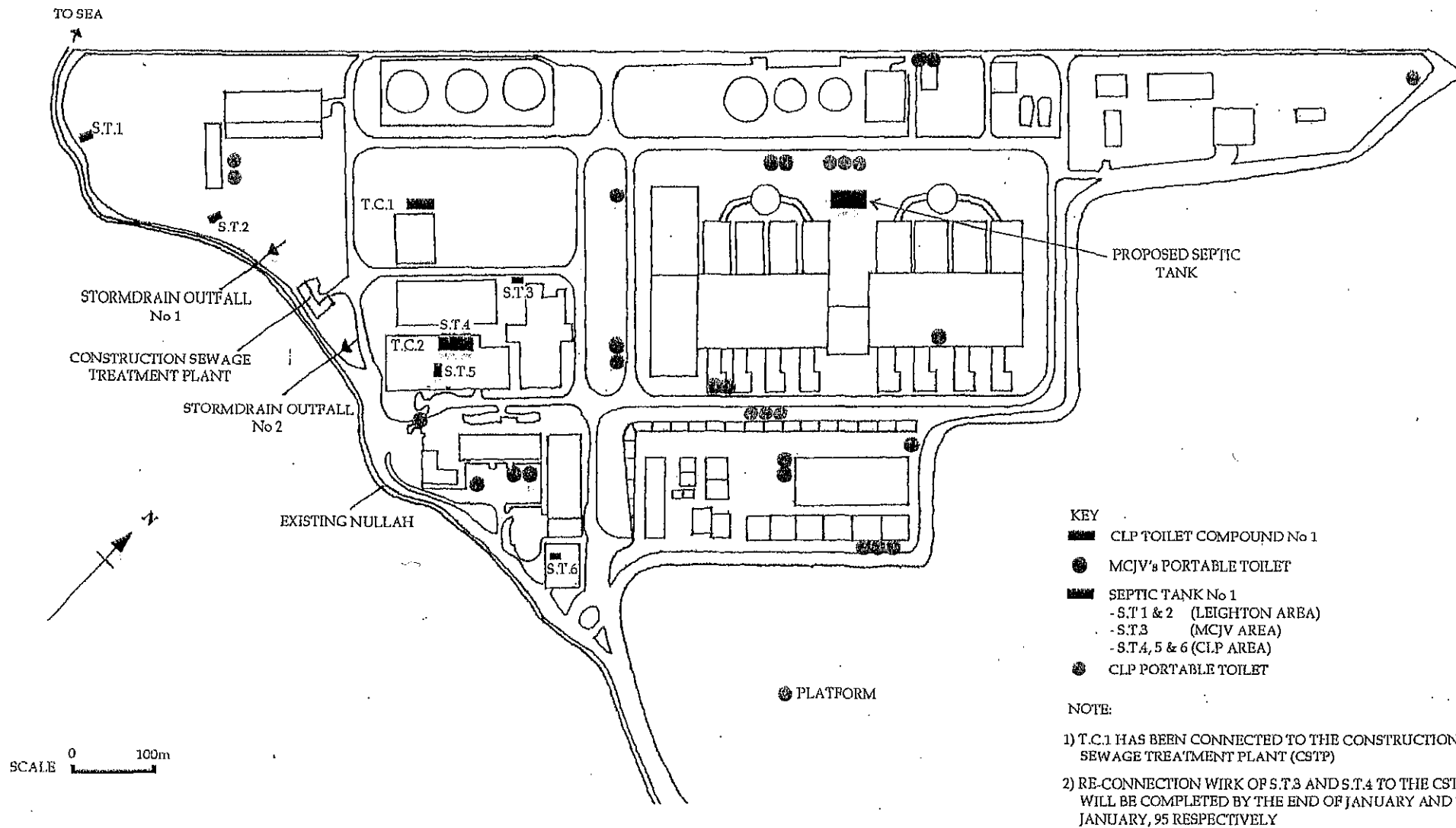
Storage of Sodium Hypochlorite solution at the sewage treatment plant.

#### *Preventive Measures*

- The septic tanks/soakaway pits should be inspected and the sludge removed regularly by licensed contractors to prevent overflowing.
- The discharge from the septic tanks/soakaway pits, where practical, should be directed to the construction sewage treatment plant for further treatment.
- Disposal of waste from chemical toilets must be carried out by licensed collectors.
- During various information gathering sessions with CLP staff, it was concluded that the chemical toilets are not used by site personnel possibly due to odour problems and lack of washing facilities. It was raised in the sessions that a septic tank and washing facilities should be provided near the chimney area to encourage the site staff to use the toilet facilities. (See *Figure 5.4a*)
- A contract for monitoring of the effluent discharged from the temporary sewage treatment plant has been awarded and commenced. The monitoring programme exceeds the minimum requirements as stated in the WPCO discharge licence. The monitoring programme (as summarised below) is considered adequate to indicate deteriorating conditions so that corrective measures can be implemented.
- The Environmental Support Team should examine the monitoring results once available so that corrective actions can be taken.
- Storage of sodium hypochlorite solution above 250L will require a Dangerous Goods Licence. The operator of the plant should ensure that this quantity must not be exceeded. The storage containers should be properly labelled according to the *Dangerous Goods (General) Regulations* and the reference booklet published by the Labour Department on *Classification and labelling of Dangerous Substances Commonly used in Industry*.

#### *Monitoring*

The following listed the monitoring parameters as specified in the contract for effluent discharged from construction sewage treatment plant:-



- KEY**
- CLP TOILET COMPOUND No 1
  - MCJV's PORTABLE TOILET
  - SEPTIC TANK No 1
    - S.T.1 & 2 (LEIGHTON AREA)
    - S.T.3 (MCJV AREA)
    - S.T.4, 5 & 6 (CLP AREA)
  - ⊗ CLP PORTABLE TOILET

- NOTE:**
- 1) T.C.1 HAS BEEN CONNECTED TO THE CONSTRUCTION SEWAGE TREATMENT PLANT (CSTP)
  - 2) RE-CONNECTION WIRK OF S.T.3 AND S.T.4 TO THE CSTP WILL BE COMPLETED BY THE END OF JANUARY AND 10th JANUARY, 95 RESPECTIVELY

FIGURE 5.4a - LOCATION OF SEWAGE FACILITIES AS OF JANUARY 1995 AT BLACK POINT SITE

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



Table 6.5a *Monitoring Programme for Construction Sewage Treatment Plant*

<i>Monitoring Parameters</i>	<i>Frequency</i>
Biochemical Oxygen Demand (BOD)	Weekly
Suspended Solids	Weekly
Total Residual Chlorine	Weekly
E. Coli	Weekly
Total Phosphorus	Weekly
Total Nitrogen	Weekly
Flow rate	Weekly
pH	Weekly
Temperature	Weekly
Colour	Monthly
Chemical Oxygen Demand	Monthly
Oil & Grease	Monthly
Iron	Monthly
Boron	Monthly
Barium	Monthly
Mercury	Monthly
Cadmium	Monthly
Cyanide	Monthly
Phenols	Monthly
Sulphide	Monthly
Surfactants (total)	Monthly

The monitoring under the first contract is very comprehensive and the frequency and parameters of monitoring should be reviewed after the commissioning phase.

## 7.1

## CLP POLICY

It is CLP's policy to safeguard the health of employees and workers and to minimise air emissions from all its processes and activities. Therefore offsite air pollutant levels should comply with the *Air Pollution Control Ordinance* (APCO) and the *Hong Kong Air Quality Objectives* (HKAQOs) and other guidelines levels from the Environmental Protection Department (EPD) should not be exceeded. In addition, air pollutant levels within site offices and indoor work area should follow the guideline levels given in the *Reference Note on Occupational Exposure Limits for Chemical Substances in the Work Environment* issued by the Labour Department. This will be achieved through proper control measures, ventilation and air quality monitoring to ensure compliance of the above standards.

In the erection and commissioning of the BPPS, this policy will be observed and implemented accordingly to the fullest extent as feasibly practicable.

## 7.2

## REVIEW OF EM&amp;A - CONSTRUCTION PHASE

Dust monitoring was 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.

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

After reviewing the monitoring requirements on frequency, duration and locations for construction, the measurement given in *Table 7.2a* are recommended for the erection and commissioning phase. In the event of complaints, appropriate action by the various parties involved are outlined in *Table 7.2b*. (See Monitoring Schedule for November in *Annex R*)

Table 7.2a Dust Monitoring Requirements

Frequency	<p><i>Impact Monitoring</i></p> <ul style="list-style-type: none"> <li>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.</li> <li>Collection of 24 hour sample once every six days.</li> </ul>
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 and Tsang Tsui.
Trigger Level	30% above the baseline monitoring data.
Action Level	Average value of the trigger and target levels.
Target Level	<p>AQO for TSP: 260ug/m<sup>3</sup> averaged over 24 hours.                      EPD guideline                      1 hr TSP: 500 ug/m<sup>3</sup></p>

Table 7.2b Dust - Action Plan

Event	Action	
	Site Manager	Contractor
Exceedance of Trigger level		Repeat measurement as soon as possible. Notify Site Manager 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 Site Manager. Implement remedial action to dust emission immediately. Notify Site Manager of the action taken.
Exceedance of Target level	Notify EPD. Require Contractor to make additional proposals for dust suppression. Provide investigation report which should be sent to EPD as soon as possible.	Notify Site Manager immediately. Daily monitoring is to be imposed. Identify source. Review plant and equipment and working procedures. Submit proposals for reducing dust to Site Manager. Implement remedial action to dust emission immediately. Notify Site Manager 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 Site Manager.

7.3

*BACKGROUND TO ISSUES*

Building erection and installation of machinery will be the major activities during the commissioning phase. Outdoor and indoor air pollutants may be generated by these activities. These air pollutants may include dust attributed to heavy construction, concrete batching plant as well as haul road traffic; hazardous fumes and organic solvent vapours attributed to various construction, cleaning and finishing activities, such as acid cleaning, welding and paint spraying. These hazardous materials may affect the health of the workers and other staff in the site office, canteen and other work areas within the BPPS site.

The *Air Pollution Control Ordinance (Cap. 311)* (APCO) and its supplemental regulations, Technical Memorandum and Codes of Practices control the emission from stationary sources of various gas and particulate pollutants into Hong Kong's atmosphere. For the commissioning phase of the Black Point Power Station, the total suspended particulate (TSP) concentration in the air within the site will have to meet the following requirements:

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

For occupational exposure, in particular during building finishing, painting, and cleaning operations involving the use of volatile chemical, the *Reference Note on Occupational Exposure Limits for Chemical Substances in the Work Environment* published by the Labour Department should be used to serve as a practical guidelines for evaluating workers exposure to hazardous vapour. The guideline values given in this reference are in the form of Occupational Exposure Limits (OELs) which represent time-weighted airborne concentration of individual chemical substance. The OELs are only recommended exposure limits and exposure to chemicals by the workers should be kept as low as possible. The OELs are not relative indices of toxicity and should not be used in the evaluation of non-occupational exposures and may not be applicable directly to indoor air pollution problems.

The OELs are expressed in three categories as follows:-

- (1) OEL - Time-Weighted Average (OEL-TWA) is the time-weighted average of the airborne concentration of a chemical substances over an eight-hour working day, for a 5-day working week unless otherwise stated.
- (2) OEL - Short-Term Exposure Limit (OEL-STEL) is the 15-minute time-weighted average of the airborne concentration of a chemical substances. Workers should not be exposed to the concentration above this limit for more than 15 minutes and no more than 4 times per 8-hour working day even the OEL-TWA is not exceeded.
- (3) OEL - Ceiling (OEL-C) is the limit that should not be exceeded during any part of the working day even the OEL-TWA is not exceeded for that chemical substance.

The airborne concentration of hazardous vapour in critical work areas, especially within confined spaces, should be investigated based on this guideline during the commissioning phase of the Black Point Power Station project.

Potential air quality problems during the commissioning period of the Black Point Power Station may include dust emissions from unpaved haul road, heavy construction and concrete batching activities. In addition, fumes and organic solvent vapours attributed to building finishing, equipment cleaning and other activities, such as acid cleaning, welding and paint spraying may also be a potential hazard to the health of site workers. In particular, large quantities of strong acids such as hydrofluoric acid will be used in boiler cleaning.

#### 7.4.1

##### *Guidelines to Black Point Staff*

In order to ensure compliance of the Air Quality Objectives and the reference occupational exposure limits for chemical substances in the work environment, the following measures for controlling exposure should be followed by Black Point Staff as far as possible.

- The Environmental Support Team should identify and keep a record of substances or processes potentially generating hazardous fumes or vapours. The record should include the potential emission points and the type of control measures used.
- Substances potentially generating hazardous fumes or vapour should be avoided, eliminated or substituted by non-hazardous alternatives. If this is unavoidable, sufficient ventilation should be provided.
- The number of workers should be kept to a minimum in areas using substances hazardous to health, and these substances (e.g. waste paint or solvent) should be stored and disposed of following the chemical waste requirements.
- Adequate personal protective equipment (PPE), such as respirators, should be provided to workers handling this type of substances, especially in cases where local exhaust ventilation (LEV) and other control measures are not possible.
- All engineering control measures, such as LEV, should receive regular inspection and tests should be carried out to assess their effectiveness. Similarly, respiratory protective equipment should be examined at regular basis.
- Dust emission sources, such as unpaved haul road, should be watered frequently to minimise particulate generation and to avoid the impact on the air quality of site offices and other indoor work areas.
- Contaminated outdoor air can be treated prior to entry to the indoor area. In particular, dust and particulates can be reduced by appropriate air-cleaning system such as filter.

- The indoor pollutants can also be diluted by outdoor air with a good ventilation system. For example, good ventilation is essential if the source is originated within the office, e.g. ozone from photocopier.

## 7.5 SPECIFIC ISSUES

### 7.5.1 Construction Dust Monitoring

As the majority of heavy construction activities will be reduced during the commissioning phase, dust problem is expected to be reduced. However, to ensure other commissioning stage activities, such as erection of buildings, concrete batching etc. will not cause significant air quality impacts to the surrounding environment and that the air quality objectives are not exceeded, air quality monitoring at the locations previously used in the Construction Phase EM&A Manual should be continued.

### 7.5.2 Indoor Air Quality (IAQ) Survey

To ensure that air quality of the site offices and canteen block is acceptable and not affected by dust or other air pollutants during the erection and commissioning stage, indoor air quality survey in offices and other confined working environment should be conducted regularly. The following provide general guidelines for such survey:

- Any IAQ survey should be conducted as frequent as possible (e.g. monthly).
- The IAQ survey will involve walkthrough evaluation of the building to identify potential problem area. The recommended parameters to assess the adequacy of the indoor air quality condition of office and canteen should include the following:
  - temperature
  - humidity
  - air distribution
  - cleanliness
  - odour
  - source of contaminants
- The ventilation and air conditioning systems (HVAC) should be inspected to review if air pollutants generated inside the room or from external sources are vented adequately. In addition, an analysis of the adequacy and effectiveness of the ventilation system covering the following should be undertaken:
  - (a) Assessment of the location of building outdoor intakes to ensure an acceptable quality of outdoor air.

- (b) Assessment of the location of building exhausts and pollutant sources to prevent re-entrainment of exhausted or polluted air back into the building.
- (c) Evaluation of the design of the building exhaust system to ensure complete external exhaust of pollutants and odours created in building support areas, canteen, printing areas and other special purpose facilities. The evaluation determine if treatment to eliminate particles and toxic pollutants from the air is required before exhaust.
- (d) Inspection of the HVAC system in order to ensure an adequate ventilation rate of outdoor air to the ultimate expected building population and adequate make-up air is provided.

Office and site workers should be interviewed during the IAQ survey to check if there is any obvious indoor air quality problems. Parameters to be reviewed may include odour, dust, temperature, etc.

If required, air sampling will have to be carried out to quantify the scale of the problem. The procedures may involve:

- development of an air sampling plan for the problem areas, detailing the parameters to be measured, time of measurement and number of samples to be taken;
- evaluation of the HVAC system's ability to provide enough ventilation (e.g. by carrying out air flow measurement); and
- recommendation of alternatives and engineering controls to improve the situation.

A typical air sampling plan is shown below for the assessment of indoor air quality. However, for any detailed survey, specialist services should be sought.

#### *Indoor Air Sampling Plan*

##### *Criteria*

As there is no indoor air quality standard for parameters like dust and particulates, the ambient Air Quality Objectives (HKAQOs) should be taken as the criteria of indoor air quality. In case that the HKAQOs are not applicable, the guideline values for indoor air listed in *Table 7.5a* should be employed (Note: For details of these guidelines values, reference should be made to the *ASHRAE Standard - Ventilation for Acceptable Indoor Air Quality* published by the American Society of Heating, Refrigerating and Air-conditioning Engineers Inc. *Table 7.5b* gives some examples of industrial air pollutants that may be relevant during the commissioning phase of the Black Point Power Station and their occupational exposures level (OEL). A full guidance can be found



in the *Reference Note on Occupational Exposure Limits for Chemical Substances in the Work Environment* published by the Labour Department.

Table 7.5a *Common Indoor Air Quality Parameters and Guideline Values (For Site Offices)*

Parameter	Guideline Value ( $\mu\text{g}/\text{m}^3$ )	Exposure Time
Formaldehyde	0.4 ppm	Continuous
Carbon Dioxide	1.8 $\text{g}/\text{m}^3$ <sup>1</sup>	Continuous
Ozone	100	Continuous
Radon gas	4 pCi/L	Annual Average
Volatile Organic Compound (VOC)	500	/

Notes: 1 This level is not considered a health risk but is a surrogate for human comfort (odour).

Table 7.5b *Common Industrial Air Pollutants and Their Occupational Exposure Limits (For Workplace)*

Substance	Long-term exposure limit (8-hour avg) ( $\text{mg}/\text{m}^3$ )	Short-term exposure limit (10-minute avg) ( $\text{mg}/\text{m}^3$ )
Nuisance Dust		
- Total	10	-
- Respirable	5	-
Nitrogen Dioxide	5	9
Sulphur Dioxide	5	13
Welding fumes	5	-
Mineral Fibre	5	-
Silica		
- Total	6	-
- Respirable	3	-
Ammonia	17	24
Carbon Dioxide	9,000	54,000
Carbon Monoxide	55	330
Hydrogen fluoride	14	21

### *Survey Methodology*

Indoor air should be monitored at the breathing level of workers/employees. Ventilation rate, temperature and relative humidity should also be recorded in the survey. Concentrations of pollutants of the outdoor air should be measured as far as possible as the control. All samplers and pumps should be calibrated prior to measurement. Measurements should be made at a regular interval (e.g. quarterly) or when receiving complaints from the workers.

### Equipment

Two types of monitoring devices are commonly used for IAQ survey, they are:

- (1) passive air sampler, which absorb chemicals by diffusion through membrane or fibre tubes; and
- (2) active air sampler, which use air pump to force air through an absorbent media (solid or solution) or as a grab sample into a bag.

Typical sampling equipment used for indoor air monitoring is listed in *Table 7.5c*.

*Table 7.5c Typical Sampling or Measurement Equipment for Indoor Air Survey*

<i>Pollutant</i>	<i>Methodology</i>
TSP	Filtration-gravimetric
RSP	Optical scatter
Total VOCs	Photoionization Detector
Ammonia	Bubbler-phenate
Carbon Dioxide	Electrochem/pump
Carbon Monoxide	Electrochem/pump
Nitrogen Dioxide	Electrochem/pump
Radon	Track-etch badge
Formaldehyde	Dry filter/pump

### Action Plan

In the event of exceedance of the relevant standards/guideline values, the relevant parties should be informed. An indoor air action plan is shown in *Table 7.5d* for reference.

Table 7.5d Indoor Air – Action Plan

Event	Recommended Actions
Compliant of odour nuisance received from workers or identified during the IAQ walkthrough survey.	<ul style="list-style-type: none"> <li>• Notify Department Head.</li> <li>• Inform the Environmental Officer and the Building Services Department.</li> <li>• Identify source of odour.</li> <li>• Consider measures to eliminate odour source, relocate air exhaust or improve ventilation.</li> <li>• Environmental Officer/Building Service Department submit report to Department Head on recommended corrective actions.</li> <li>• Implement corrective actions.</li> </ul>
Compliant of insufficient ventilation received from workers or identified during the IAQ walkthrough survey.	<ul style="list-style-type: none"> <li>• Notify Department Head.</li> <li>• Inform the Environmental Officer and the Building Services Department.</li> <li>• Review the HVAC system and identify source of problem.</li> <li>• Building Services Department consider measures to improve the HVAC system.</li> <li>• Building Service Department submit report to Department Head on recommended corrective actions.</li> <li>• Implement corrective actions.</li> </ul>
Exceedance of Occupational Exposure Criteria	<ul style="list-style-type: none"> <li>• Notify Department Head.</li> <li>• Require the concerned party to make additional measures for pollutants suppression (e.g. provision of local exhaust ventilation devices).</li> </ul>

## 8.1

*CLP POLICY*

Noise concern during the erection and commissioning phase of the BPPS can be classified into environmental noise (i.e. construction noise) and occupational noise (indoor machine noise). Whilst environmental noise will cause nuisance to the Noise Sensitive Receivers (NSRs) near the source, prolonged exposure to elevated noise level in the workplace may cause Noise Induced Hearing Loss (NIHL) of the workers. As such, the government has set up regulations to control both of types of noise through the *Noise Control Ordinance (NCO)* and the *Factories and Industrial Undertakings (Noise at Work) Regulations*. It is CLP's policy that all necessary measures will be taken to comply with these regulations and to ensure that neither the safeguard of the environment nor the health and safety of staff and contractors is compromised.

In the erection and commissioning of the BPPS, this policy will be observed and implemented accordingly to the fullest extent as feasibly practicable.

## 8.2

*REVIEW OF EM&A - CONSTRUCTION PHASE*

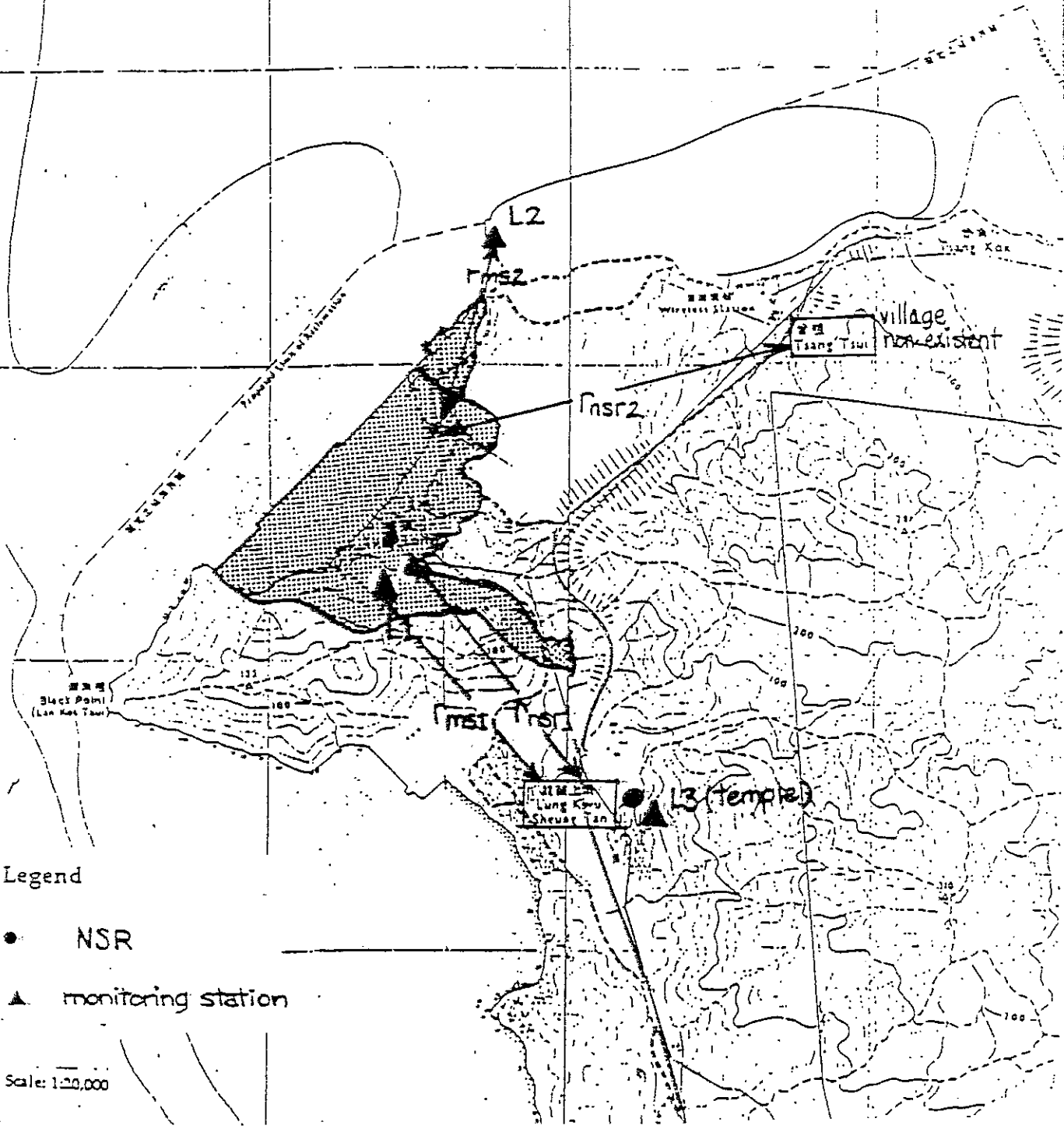
Although noise level is not envisaged to exceed the ANL for the daytime, weekly measurements and measurements for work during restricted hours is recommended as a compliance check. After reviewing the monitoring requirements on the frequency, duration and location of measurement during construction phase, the revised monitoring requirements are given in *Table 8.2a*. An extra monitoring location L3 at Lung Kwu Sheung Tan is incorporated as work on Gas Transmission System has commenced. In the event of complaints, appropriate actions to be taken by the various parties involved are outlined in *Table 8.2b*. (See Monitoring Schedule for November in *Annex R*)

Table 8.2a 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 <sub>eq(30 mins)</sub> for 0700-1900hrs. L <sub>eq(5 mins)</sub> for 1900-0700 hrs.
Monitoring Locations	Nearest identified sensitive receivers, namely, Tsang Tsui, Tai Shui Hang and Lung Kwu Sheung Tan as shown in Figure 8.2a.	
Trigger Level	A single complaint	
Action Level	More than one complaint	
Target Level	L <sub>eq(3min)</sub> 75 dB(A) exceeded between 0700-1900 hrs on Monday to Saturday	
	L <sub>eq(5min)</sub> 60 dB(A) exceeded between 0700-2300 hrs on holidays and 1900-2300 hrs on all other days	
	L <sub>eq(5min)</sub> 45 dB(A) exceeded between 2300-0700 hrs of next day	

Table 8.2b Action Plan for Noise

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



Legend

- NSR
- ▲ monitoring station

Scale: 1:20,000

Figure 8.2a - Location of dust and noise monitoring stations

ERM Hong Kong

8th Floor,  
Hecny Tower  
9 Chatham Road  
Tsimshatsui, Kowloon  
Hong Kong



## 8.3 BACKGROUND TO ISSUES

### 8.3.1 Occupational Noise

During the commissioning phase, many installation works will be carried out inside the buildings of the power station. As this will directly affect the health of the workers concern, this problem should be closely monitored.

The *Factory and Industrial Undertakings (Noise at Work) Regulations*, which protect the hearing of employees who are exposed or likely to be exposed to high noise level while at work in any industrial undertaking, is hence relevant to the commissioning of the BPPS.

There are three action levels defined in this Regulation:

First Action Level - a daily personal noise exposure ( $L_{EP,d}$ ) of 85 dB(A).

Second Action Level - a daily personal noise exposure ( $L_{EP,d}$ ) of 90 dB(A).

Third Action Level - a peak sound pressure level of 140 dB or peak sound pressure of 200 Pa.

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 8.3a*.

Table 8.3a Action Plan for Noise

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

CLP will take certain basic steps (e.g. assessment of noise exposure, noise reduction, provision of information to employees, provision of ear protectors and maintenance and use of noise control equipment etc) where its staff or contractor is likely to be exposed to noise at or above the First Action Level during the commissioning phase. These together with additional action, must also be taken where an employee is likely to be exposed to noise at or above the Second or Peak Action Level.

#### 8.4 IMPLICATION TO CLP

As a legal obligation, CLP will require compliance with the above Regulations, namely:

- Noise Control Ordinance
- Factory and Industrial Undertaking (Noise at Work) Regulations

##### 8.4.1 Guidelines to Black Point Staff

In order to ensure the compliance with CLP policy and the regulations mentioned above, the following guidelines should be followed by the Black Point staff as far as possible.



- The effects on noise emissions of all current and proposed equipment during the commissioning phase should be reviewed and verified with the previous studies.
- Best industrial practice should be applied to the control of noise at all times and initiate reductions in noise emissions where practicable. The *Practical Guide for the Reduction of Industrial Noise* published by EPD could be referred.
- Major noise sources should be identified and included in a noise emission inventory kept by the Environmental Support Team. The identification of these major noise sources for inclusion in the inventory can be put in effect using a number of methods, for example:
  - sound power level or the expected sound pressure level generated by the equipment concerned should be included in the inventory;
  - a noise survey of the area of concern will enable the major sources of noise to be verified and their noise emissions quantified.
- Some of the methods for preventing noise generation which may be appropriate when setting up noisy machinery are listed below:
  - avoid impacts or arrangements to cushion them.
  - increased damping to reduce the tendency of machine parts to ring.
  - silencers to reduce noise generated by turbulence at air jets.
  - low noise air nozzles, pneumatic ejectors and cleaning guns constructed on good aerodynamic principles, or substitution of an alternative method of doing the job.
  - matching of air supply pressure to the actual needs of air powered equipment, by using pressure reducing valves to adjust the supplies for a good compromise between reliable operation and noise.
  - arrangements for noisy devices to be switched on only when needed.
  - use of flexible elements to reduce structure borne sound through a machine frame.
  - dynamic balancing of rotating parts.
- If noise problem still exists after all possible precaution and prevention measures are employed, ear protection equipment should be provided to the employees and ear protection zone should be designated as stipulated in the *Factories and Industrial Undertaking (Noise at Work) Regulation*.
- Ear protection zones should be marked with signs showing areas where ear protection is necessary, and people who go into these zones should wear ear protection.

### 8.5.1 Machinery and Plant Noise Survey

Since a number of plants and equipment will be erected and installed during the commissioning period, the noise performance of these machinery should be tested and assessed upon the completion of installation. The purpose is to determine whether the machine or plants meet their design specifications, and to ensure that noise problem will not be created due to improper installation, wrong layout and other reasons.

The performance test can be carried out according to standard methods, such as *ISO 3746 Acoustics - Determination of Sound Power Levels of Noise Sources - Survey Method* (if sound power level is given in the technical specification for a particular plant/equipment). The following outline the basic steps for such noise assessment:

- Review noise information provided in the technical specification to find out the specified sound power level (SWL) or sound pressure level (SPL) measured at a distance of the machine.
- Upon completion of the installation, measure the sound pressure level at a distance away from the machine as stated in the technical specification (e.g. 1m). Alternatively, the sound power level should be measured in accordance with the method given in ISO 3746 or its equivalent.
- Depending on the type of machine, the location of the machine, and the nature of the noise concern, the following standard methods may be referred to.
  - ISO 266, Preferred frequencies for acoustical measurements.
  - ISO/R 354, Measurement of absorption coefficients in a reverberation room.
  - ISO 2204, Acoustics - Guide to the measurement of airborne acoustical noise and evaluation of its effects on man.
  - ISO 3740, Acoustics - Determination of sound power level on noise sources - Guidelines for the use of basic International Standards and for the preparation of noise test codes.
  - ISO 3741, Acoustics - Determination of sound power levels of noise sources - Precision methods for broad-band sources in reverberation rooms.
  - ISO 3742, Acoustics - Determination of sound power levels of noise sources - Precision methods for discrete-frequency and narrow-band sources in reverberation rooms.
  - ISO 3743, Acoustics - Determination of sound power levels of noise sources - Engineering methods for free-field conditions over a reflecting plane.

- If the measured sound pressure levels or sound power levels do not meet the given value in the technical specification, the installation of the machine should be reviewed, or the equipment supplier or the service contractor should be called in to review the problem.

## 8.5.2

### *Occupational Noise Assessment*

A proper occupational noise exposure assessment should be carried out when the noise level in any area of the BPPS site is such that one has to shout to be heard or have difficulty being understood in a short distance (about 2m).

An adequate assessment can usually be made without making a detailed measurement of each workers exposure, for example:

- where groups of workers are employed in the same area an assessment may be based on the noise levels measured in the working area and the length of time they are likely to spend there.
- where groups of workers perform similar tasks, measurements are available about the noise the machine produces during operation.

Where measurement of noise is required to fulfill the *Factories and Industrial Undertaking (Noise at Work) Regulation*, this must be carried out by a competent person (Note: the Occupational Safety and Health Council provides 5-day Certificate of Competence In Workplace Noise Assessment Course for technicians who are employed for this purpose). The following are some general principles for workplace noise assessment:

- obtain an instrument appropriate for the measurement of the workplace noise level. (e.g. Sound level meters comply with International Electrotechnical Commission Publications 651:1979 (Type I) and 804:1985 (Type I))
- calibrate the instrument on the dB(A) setting.
- set the noise level meter to fast response and measure the noise at the required point.
- record and identify the exact location at which the readings were taken.
- record should briefly describe the area of measurement, location of the machinery, plant activity and the task during the measurement is made.
- parameters including  $L_{Aeq,T}$ ,  $L_{peak}$ , daily exposure period, no of employees exposed, the calculated  $L_{EP,d}$  level etc should also be recorded in a format as shown overleaf.

Appropriate actions, such as noise reduction, provision of information to site staff, provision of ear protection etc, as shown in *Table 8.5a* should be taken if the assessment values are higher than the Action Levels as stipulated in *Factories and Industrial Undertaking (Noise at Work) Regulations*.

## Noise Assessment Report

### Factories and Industrial Undertakings (Noise at Work) Regulation

Name of Industrial Undertaking: \_\_\_\_\_

Address: \_\_\_\_\_

Date of survey: \_\_\_\_\_ Ref. No.: \_\_\_\_\_

Survey made by: \_\_\_\_\_ Occupation: \_\_\_\_\_ Training/experience: \_\_\_\_\_

Item No.	Brief description of area/location machinery/plant activity/task	Noise Level		Daily exposure period [hr]	LEP, d [dB(A)]	No. of employees exposed	Description of ear protector (if provided)	Description of demarcated ear protection zone (comment if not demarcated)
		LAeq, T [dB(A)]	Lpeak [dB] (where appropriate)					

General comments: \_\_\_\_\_

Instruments used: \_\_\_\_\_

Signature: \_\_\_\_\_

Date of last calibration: \_\_\_\_\_

Date: \_\_\_\_\_

Note: This report must be sent to Commissioner for Labour within 28 days of completing the assessment.



Action required where  $L_{EP,d}$  is likely to be or above:  
(see note 1 below)

First Action Level  
85 dB(A)

Second Action Level  
90 dB(A)  
(see note 2 below)

CLP's Action:

- | Action required where $L_{EP,d}$ is likely to be or above:<br>(see note 1 below)   | First Action Level<br>85 dB(A) | Second Action Level<br>90 dB(A)<br>(see note 2 below) |
|--|--------------------------------|---|
| CLP's Action:  |                                |   |
| 1. Assessment of noise exposure  |                                |   |
| - Get a competent person to assess   | ✓                              | ✓   |
| - Review assessment when necessary   | ✓                              | ✓   |
| - Send assessment report to Labour Department within 28 days   | ✓                              | ✓   |
| - Make assessment report available for inspection by inspector   | ✓                              | ✓   |
| 2. Noise reduction   |                                |   |
| - Reduce noise exposure as far as is practicable by means other than ear protectors  | ✓                              | ✓   |
| 3. Provision of information to employees   |                                |   |
| - Provide adequate information, instruction and training about risks to hearing, what employees should do to minimize risk, and their obligations under the Regulation | ✓                              | ✓   |
| - Mark ear protection zones with notices, so far as is practicable   |                                | ✓   |
| - Specify the distance for noisy machine within which suitable approved ear protectors have to be worn   |                                | ✓   |
| 4. Ear protectors  |                                |   |
| - Ensure as far as is practicable that suitable approved ear protectors are:   |                                |   |
| - provided to employees who ask for them   | ✓                              | ✓   |
| - provided to all exposed  |                                | ✓   |
| - properly maintained  | ✓                              | ✓   |
| - used by all exposed  |                                | ✓   |
| - ensure all operatives within the specified distance wear suitable approved ear protectors  |                                | ✓   |
| - Ensure as far as is practicable that all go into an ear protection zone wear suitable approved ear protectors  |                                | ✓   |
| 5. Maintenance and use of noise control equipment  |                                |   |
| - Ensure as far as is practicable that:  |                                |   |
| - all equipment provided under the Regulation is properly used   | ✓                              | ✓   |
| - ensure all equipment is properly maintained  | ✓                              | ✓   |

Staff and Contractor's Duties:

Use of equipment

- |   |   |   |
|---|---|---|
| - use suitable approved ear protectors as far as is practicable |   | ✓ |
| - report any defects to the proprietor                          | ✓ | ✓ |

Notes: (1) The dB(A) action levels are values of daily personal exposure to noise ( $L_{EP,d}$ ).

(2) All the actions indicated at 90 dB(A) are also required where the peak sound pressure level is at or above 140 dB.

*CLP POLICY*

It is CLP's policy that the company is committed to continuous efforts to improve environmental performance and will conduct periodic and independently verified environmental audits to monitor its progress.

*BACKGROUND*

The environmental audit is a management tool used to identify the key environmental issues and to prioritise these issues accordingly. The audit is commonly conducted against a set of established baselines such as:

- environmental regulations; or
- environmental policies or guidelines.

In comparing the environmental performance against these criteria, it is possible to develop a succession of audits of the same issue such that the audit then becomes equally useful as a means of measuring the level of improvement over a defined timeframe.

*IMPLICATIONS FOR CLP*

In the preceding sections, appropriate practices and monitoring requirement to achieve good environmental performance have been given for the following section:-

- Water quality
- Air emissions
- Hazardous materials
- Waste management
- Noise

*Guidelines for CLP Staff*

In order to ensure these practices are carried out and the monitoring results are acceptable to the required standards, environmental audits have to be conducted regularly. General guidelines for these audits are provided below.

In addition to the monthly progress report, a requirement as stated in the EM&A manual of the erection and construction phase, it is the responsibility

of the Environmental Support Team to carry out detail environmental audits of the Black Point site quarterly to ensure that environmental impacts are managed and controlled in accordance with the stated objectives.

The following procedures should be undertaken:

- The Environmental Support Team will appoint a team of internal or external auditors for the purposes of this audit.
- Branch and Section Heads will nominate a representative to assemble data on request from the audit team, and to generally provide assistance to the team.
- The auditors, through interviews, documentation review and site inspections, assess the existing on-site environmental management systems.
- Any environmental monitoring records or reports will have to be carefully reviewed and compared to the relevant regulatory or corporate standards.
- If non-compliance of environmental procedures or standards occurs, the Environmental Support Team, in association with respective Branch or Section Head, will have to develop corrective measures to achieve compliance.
- The Environmental Support Team will be responsible for preparing the quarterly audit reports and action plans for the issue. Copies of the report will be forwarded to the respective Branch or Section Head, as well as to the Site Manager.
- The effectiveness of any mitigating measures recommended will have to be reviewed and if necessary, further mitigating actions should be undertaken.

### *Background*

As part of environmental training for Black Point staff, environmental seminars are designed to deliver awareness training and focused messages to CLP staff and contractors for Black Point project to enable them to take necessary steps for proactive environmental management.

### *Objectives*

- To promote the level of environmental awareness amongst site personnel, in particular with reference to the need to comply with environmental legislation.
- To introduce and explain the use of the site environmental management manual as a management tool to assist staff in environmental matters during the discharge of their normal duties.
- To train CLP staff members to conduct their own environmental training sessions for future projects and events.

### *Seminar to Site Managers (Branch Managers and First Engineers)*

#### *Opening Seminar*

The opening seminar is to explain the need for environmental compliance during the commissioning and operation of the Black Point site. Examples will be drawn from other areas of CLP activities based on the Consultant's experience to highlight this need, including a description of the current environmental initiatives taking place throughout the company. The roles of the different managers will also be explained with reference to the newly developed site environmental management manual and managers will be encouraged to establish their own individual environmental objectives.

#### *Additional Seminars*

The theme of further seminars is two-fold. From the environmental targets developed for site managers in the initial seminar, the subsequent seminars should be a forum to report progress and discuss existing and likely problems in implementation of the respective environmental programmes. Secondly, the emphasis on achieving a balance of presenting and participation will allow CLP staff an opportunity to take a larger role in training and explaining ideas.

The suggested timing of these seminars is every three months or at suitable periods to coordinate with the timing of key phases in the erection and commissioning of the site plant.



### *Seminars to Site Staff and Contractors*

A series seminars are proposed for CLP staff and contractors working at the Black Point site. The seminars can be conducted in either Chinese or English as appropriate. The seminars would be of a shorter duration focusing on a particular topic of environmental significance to the Black Point project. Typical topics could include:

- Air pollution
- Noise
- Water pollution
- Waste management
- Storage of chemicals
- Use of wood
- Recycling and waste minimisation
- Energy management
- EMF

Particular examples could be drawn from normal site activities and the timing of these topics could be coordinated with the site commissioning programme to make the message more pertinent.