

Agreement No. CE 78/94
Wan Chai East and North Point Sewerage
Environmental Impact Assessment
Final EM&A Manual
September 1996

CEA-018.2/
/8C

EIA/015.2/96

Agreement No. CE 78/94
Wan Chai East and North Point Sewerage
Environmental Impact Assessment
Final EM&A Manual

September 1996

Report Authorized For
Issue By:



For and on Behalf of
Binnie Consultants Limited

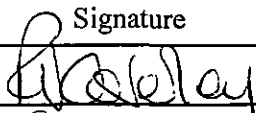
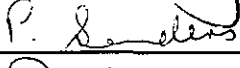
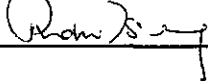
Binnie Consultants Limited
11/F, New Town Tower
Pak Hok Ting Street
Sha Tin
New Territories
Hong Kong

For
Drainage Services Department
Consultants Management Division
42/F, Revenue Tower
5 Gloucester Road
Wan Chai
Hong Kong

ENVIRONMENTAL MONITORING AND AUDIT MANUAL

CONTENTS

Section	Page
1 INTRODUCTION	1
1.1 Purpose of the Manual	1
1.2 Background	2
1.3 Environmental Monitoring and Audit Requirements	2
1.4 Project Organisation	2
1.5 Construction Programme	3
2 ENVIRONMENTAL MONITORING AND AUDIT	4
2.1 Construction Noise	4
2.2 Noise Monitoring Methodology	4
2.3 Noise Parameters	5
2.4 Monitoring Equipment	5
2.5 Monitoring Locations	5
2.6 Baseline Monitoring	6
2.7 Impact Monitoring	7
2.8 Event and Action Plan for Noise	7
2.9 Noise Mitigation Measures	9
3 SITE ENVIRONMENTAL AUDIT	10
3.1 Site Inspections	10
3.2 Compliance with Legal and Contractual Requirements	11
3.3 Environmental Complaints	12

	Name	Signature	Date
Prepared	R.V. Coverley		17-9-96
Checked	P. Sanders		19-9-96
Reviewed	K. Ho		09 Sept 96

4	REPORTING	14
4.1	General	14
4.2	Monthly EM&A Reports	14
4.2.1	First Monthly EM&A Report	14
4.2.2	Subsequent EM&A Reports	16
4.2.3	Quarterly EM&A Summary Reports	17
4.3	Data Keeping	18
4.4	Interim Notification of Environmental Quality Limit Exceedances	18
5	RECOMMENDED POLLUTION CONTROL CLAUSES	19
5.1	Avoidance of Nuisance	19
5.2	Noise Pollution Control	19
5.3	Dust Suppression Measures	24
5.4	Removal of Waste Material	24
5.5	Discharge to Sewers and Drains	25
	END OF TEXT	25

Figures

1.1	Study Area
1.2	Worst Affected Sensitive Receivers: Wan Chai East
1.3	Worst Affected Sensitive Receivers: North Point
1.4	Lines of Authority for the EM&A Programme
1.5	Proposed Construction Programme
2.1	Noise Monitoring Data Record Sheet - Sample
3.1	Complaints Procedure Action Flow Chart
4.1	Interim Notification of Environmental Quality Limits Exceedances Sheet - Sample

Tables

2.1	Action and Limit Levels for Construction Noise
2.2	Event/Action Plan for Construction Noise

1 INTRODUCTION

1.1 Purpose of the Manual

The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme to be undertaken for the construction of Wan Chai East & North Point Sewerage Project. It aims to provide systematic procedures for monitoring, auditing and minimising of the environmental impacts associated with the construction works.

Hong Kong environmental regulations for air and water quality, noise and waste, the Hong Kong Planning Standards and Guidelines, and recommendations in the EIA study final report on Wan Chai East & North Point Sewerage Project have served as environmental standards and guidelines in the preparation of this Manual.

This Manual contains the following :

- (i) duties of the *Environmental Manager (EM)* and the *Monitoring Team (MT)* with respect to the environmental monitoring and audit requirements during construction;
- (ii) information on project organisation and programming of construction activities for the project;
- (iii) requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- (iv) definition of Action and Limit levels;
- (v) establishment of event and action plans;
- (vi) requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria;
- (vii) requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures.

For the purpose of this manual, the "Engineer" shall refer to the Engineer as defined in the Contract and the Engineer's Representative (ER), in cases where the Engineer's powers have been delegated to the ER, in accordance with the Contract. The EM, who shall be responsible for and in charge of the MT, shall refer to the person delegated the role of executing the environmental monitoring and audit requirements.

1.2 Background

The Wan Chai East and North Point area covers 12 square kilometres on the northern part of Hong Kong Island.

The aim of the Wan Chai East & North Point Sewerage Project is to systematically improve the existing wastewater collection and disposal systems in the area.

Works proposed under the Project include re-laying the sewers in the lower reaches of both the Wan Chai East and North Point sewerage basins, using a combination of open cut and trenchless techniques. In addition, new pumping facilities will be provided at the North Point Screening Plant.

The Study Area is shown in Figure 1.1. Figures 1.2 and 1.3 show the location of the proposed works and the potentially worst affected sensitive receivers.

1.3 Environmental Monitoring and Audit Requirements

The Wan Chai East & North Point Sewerage Project EIA report recommends that construction noise is monitored throughout the construction period.

Details of the noise monitoring programme are presented in Section 2.

1.4 Project Organisation

The project organisation and lines of communication with respect to environmental protection works is shown in Figure 1.4.

The Engineer will appoint an Environmental Manager (EM) from within the resident site staff. The EM shall not be in any way an associated body of the Contractor. The EM shall have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the ER and the Environmental Protection Department (EPD).

Appropriate staff shall be included in the MT, under the supervision of the EM, to fulfil the EM&A duties of the EM specified in this manual. Basically, the duties comprise the following:

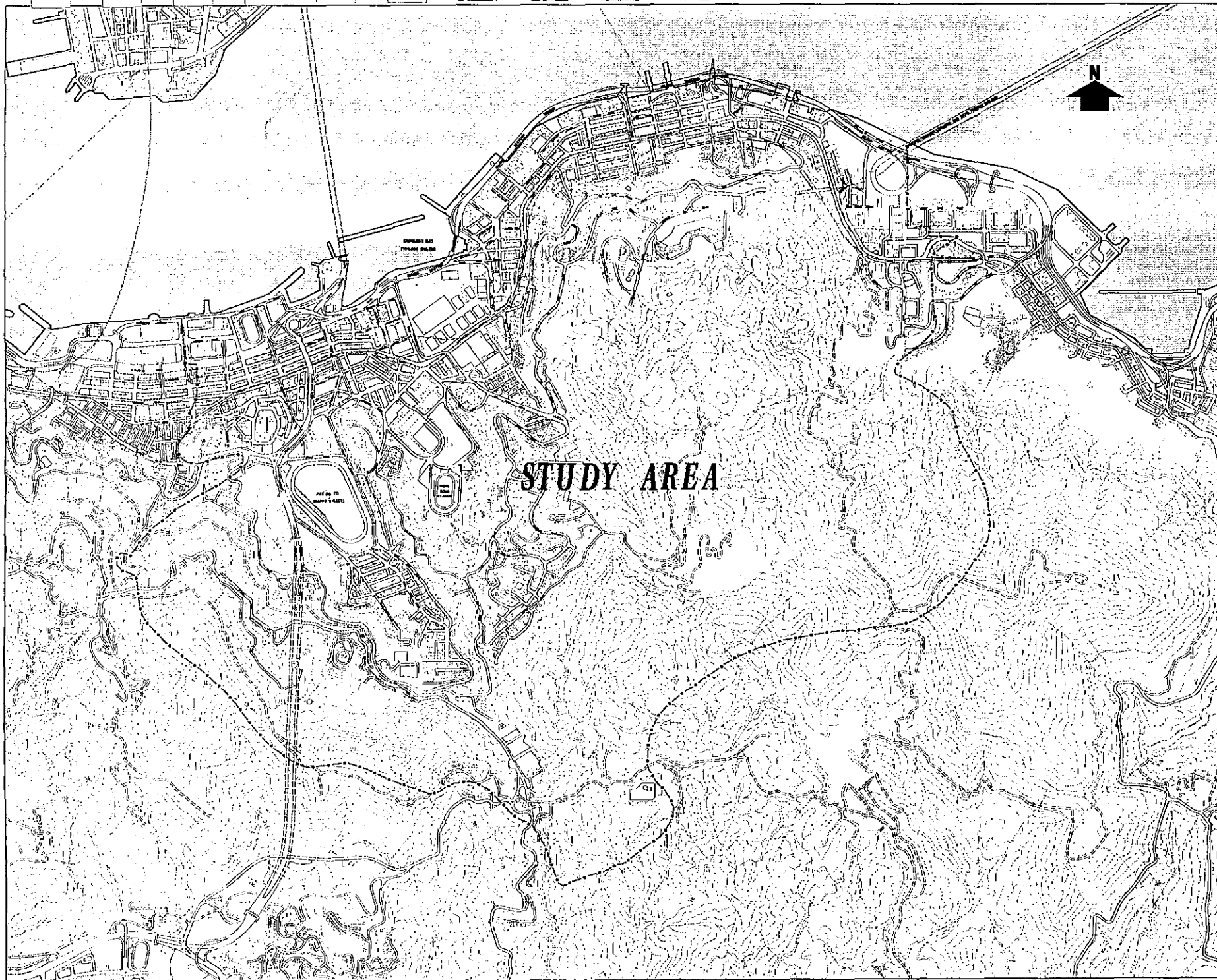
- (i) To monitor the various environmental parameters as required in EIA study final report.
- (ii) To investigate and audit the Contractors' equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive action before problems arise.
- (iii) To audit and prepare audit reports on the environmental monitoring data and the site environmental conditions;
- (iv) To report on the environmental monitoring and audit results to the Contractor, the ER, and the EPD or its delegate.

Appropriate resources shall also be allocated under the Contractor and the ER to fulfil their duties specified in this manual.

1.5 Construction Programme

Figure 1.5 is the tentative works programme for the project. The construction period is expected to last from mid-1997 to mid-2001.

This programme is for information of the EM to get an initial idea of the projection of the works. The EM shall make reference to the actual works progress and programme during the construction stage to schedule the EM&A works, and the Contractor shall provide the respective information to the EM for formulating the EM&A schedule.



LEGEND :

----- Study Boundary

PROVISIONAL
NOT FOR CONSTRUCTION

revision	date	description	initial
initial	designed	checked	drawn
initial	S&C	DPL	LIC
date	27/4/96	27/4/96	27/4/96
approved			

REB

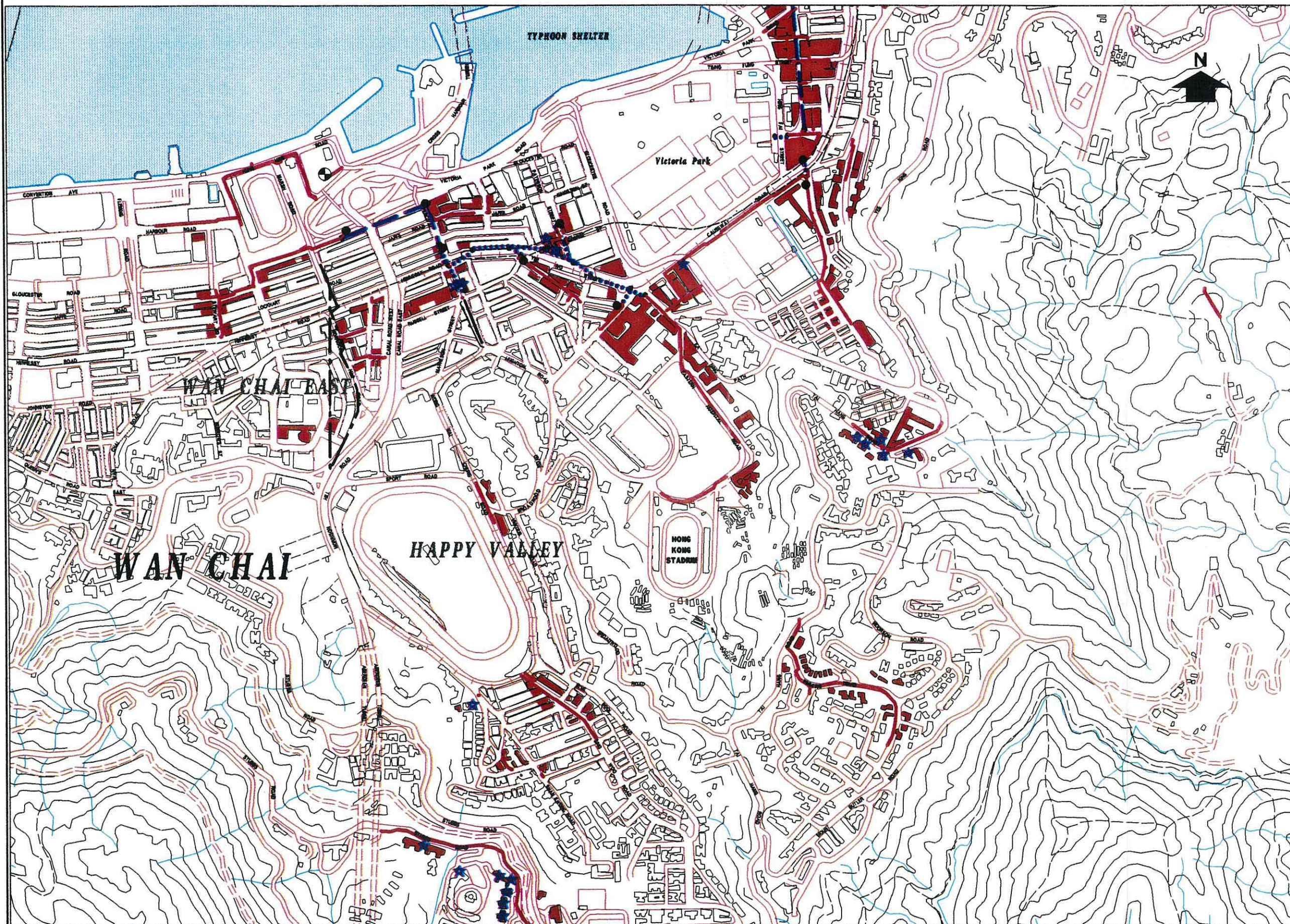
project
**WAN CHAI EAST &
NORTH POINT
SEWERAGE**

figure title
Study Area

figure no. **1.1** scale **NTS**

client
**DRAINAGE
SERVICES
DEPARTMENT**

consultant
HOOPER CONSULTANTS LIMITED 寶尼
寶尼工程顧問有限公司



Legend :

- Deep Tunnel & Shaft
- Open Cut
- - - Shallow Tunnel & Shaft
- - - Dry Weather Flow Channel
- Existing Screening Plant
- Worst Affected Sensitive Receiver
- ★ Affected by Night Time Works

revision	date	designation		initial
		designed	checked	
approved				

project
**WAN CHAI EAST &
NORTH POINT
SEWERAGE**


drawing title
**Worst Affected
Sensitive Receivers
Wan Chai East**

figure no. **1.2** scale **1 : 10 000**

client
**DRAINAGE
SERVICES
DEPARTMENT**

consultant
BEYONCE CONSULTANTS LIMITED 寶尼工程顧問有限公司

Client	
Contact person: _____ Organisation: _____ Phone no: _____ Fax no: _____	
↓	
Engineer	
Contact person: _____ Organisation: _____ Phone no: _____ Fax no: _____	
↓	
Engineer's Representative	
Contact person: _____ Organisation: _____ Phone no: _____ Fax no: _____	
↓	↓
Environmental Management Team	Contractor
Contact person: _____ Organisation: _____ Phone no: _____ Fax no: _____	Contact person: _____ Organisation: _____ Phone no: _____ Fax no: _____
↓	
Monitoring Team	
Contact person: _____ Organisation: _____ Phone no: _____ Fax no: _____	

Agreement no. CE 78/94 WAN CHAI EAST AND NORTH POINT SEWERAGE EIA - LINES OF AUTHORITY FOR EM & A PROGRAMME	 BINNIE CONSULTANTS LIMITED 賓尼工程顧問有限公司 CONSULTING ENGINEERS	Date	Scale
		NOV. 95	Figure No.
		Initial	1.4

Wan Chai East and North Point Sewerage Contract 1 - Advanced Works

Row #	Task Name	Duration	Start	End	1996												1997												1998												1999			
					06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03						
1	DESIGN PHASE	417.50 d	03/06/96	25/07/97																																								
2	DESIGN/ DOCUMENTATION	225.00 d	03/06/96	13/01/97																																								
3	TENDER PROCESS	192.00 d	14/01/97	25/07/97																																								
4	CONSTRUCTION PHASE	578.00 d	25/07/97	22/02/99																																								
5	MOBILISATION	28.00 d	25/07/97	21/08/97																																								
6	MAIN SITE OFFICE ESTABLISHMENT	46.00 d	22/08/97	06/10/97																																								
7	WAN CHAI EAST WORKS	504.00 d	07/10/97	22/02/99																																								
8	WC101, Russel Street (OC)	140.00 d	20/01/98	08/06/98																																								
9	WC103, Percival Street (RF)	105.00 d	07/10/97	19/01/98																																								
10	WC1041, Wong Nai Chung Road (OC)	267.00 d	21/04/98	12/01/99																																								
11	WC1042, Wong Nai Chung Road (RF)	196.00 d	07/10/97	20/04/98																																								
12	WC105, Sing Woo Road, East Line (OC)	77.00 d	07/10/97	22/12/97																																								
13	WC106, Sing Woo Road, West Line (OC)	262.00 d	23/12/97	10/09/98																																								
14	WC107, Wang Tak Street (OC)	78.00 d	25/11/97	10/02/98																																								
15	WC108, Shan Kwong Road (OC)	56.00 d	11/02/98	07/04/98																																								
16	WC109, Bowrington Street (OC)	56.00 d	03/03/98	27/04/98																																								
17	WC110, Morrison Hill Road new manhole (OC)	35.00 d	07/10/97	10/11/97																																								
18	WC112, Morrison Hill Road (RF)	259.00 d	07/10/97	22/06/98																																								
19	WC113, Sharp Street West (OC)	217.00 d	03/03/98	05/10/98																																								
20	WC114, Wan Chai Road (OC)	147.00 d	07/10/97	02/03/98																																								
21	WC115, Stubbs Road (OC)	504.00 d	07/10/97	22/02/99																																								
22	WC116, Perkins Road (OC)	330.00 d	07/10/97	01/09/98																																								
23	WC117, Tai Hang Road (OC)	504.00 d	07/10/97	22/02/99																																								
24	WC118, Canal Road West new manholes (OC)	56.00 d	07/10/97	01/12/97																																								
25	WC119, Village Road (OC)	49.00 d	07/10/97	24/11/97																																								
26	WC120, Wan Chai Road DWF Interceptor (OC)	91.00 d	06/10/98	04/01/99																																								
27	WC121, Tang Lung Market interceptor	105.00 d	07/10/97	19/01/98																																								
28	WC122, Wan Chai Market Interceptor (OC)	56.00 d	07/10/97	01/12/97																																								
29	WC123, Wan Chai Road Market Interceptor (OC)	56.00 d	02/12/97	26/01/98																																								
30	NORTH POINT WORKS	210.00 d	07/10/97	04/05/98																																								
31	NP106, Dragon Road (OC)	168.00 d	07/10/97	23/03/98																																								
32	NP101, Alleys along Electric Road (OC)	210.00 d	07/10/97	04/05/98																																								
33	NP104, Alley near Tong Shui Road (OC)	168.00 d	07/10/97	23/03/98																																								
34	NP105, King's Road (OC)	105.00 d	07/10/97	19/01/98																																								
35	NP107, North Point Market Interceptor (OC)	56.00 d	07/10/97	01/12/97																																								
36	EXPEDIENT CONNECTION REMEDIAL WORKS	350.00 d	01/01/98	16/12/98																																								

Wan Chai East and North Point Sewerage Contract 2 - Wan Chai East

Ro #	Task Name	Duration	Start	End	1996				1997				1998				1999				2000				2001				2002				2003				2004			
					Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
1	DESIGN PHASE	481.00 d	03/06/96	26/09/97																																				
2	DESIGN/ DOCUMENTATION	347.00 d	03/06/96	15/05/97																																				
3	PREQUALIFICATION OF CONTRACTOR	126.00 d	06/11/96	11/03/97																																				
4	TENDER PROCESS	134.00 d	16/05/97	26/09/97																																				
5	CONSTRUCTION PHASE	1,540.00 d	27/09/97	14/12/01																																				
6	MOBILISATION	63.00 d	27/09/97	28/11/97																																				
7	MAIN SITE OFFICE ESTABLISHMENT	49.00 d	29/11/97	16/01/98																																				
8	Percival Street Footbridge Completion	0.00 d	26/03/98	26/03/98																																				
9	Completion of Shaft W1 (entrusted to CW3)	0.00 d	31/10/98	31/10/98																																				
10	Completion of CW3 Shaft W19	0.00 d	31/01/00	31/01/00																																				
11	DEEP TUNNEL CONSTRUCTION	552.00 d	27/09/97	01/04/99																																				
12	Supply Tunnelling Equipment	175.00 d	27/09/97	20/03/98																																				
13	Diversion and Improvement Works at Shaft W17	140.00 d	29/11/97	17/04/98																																				
14	Construct Shaft W17	84.00 d	18/04/98	10/07/98																																				
15	Drive Tunnel from W17 to W2	118.00 d	11/07/98	05/11/98																																				
16	Diversion and Improvement Works at Shaft W2	140.00 d	27/03/98	13/08/98																																				
17	Construct Shaft W2	84.00 d	14/08/98	05/11/98																																				
18	Drive Tunnel from W2 to W1	98.00 d	06/11/98	11/02/99																																				
19	Complete Tunnel	0.00 d	11/02/99	11/02/99																																				
20	Line Tunnel and Finish Shafts	49.00 d	12/02/99	01/04/99																																				
21	Commission Deep Tunnel	0.00 d	01/04/99	01/04/99																																				
22	SHALLOW TUNNELS	903.00 d	29/11/97	19/05/00																																				
23	SHALLOW TUNNELS GROUP 1	903.00 d	29/11/97	19/05/00																																				
24	WC2031, Percival Street shallow tunnel 1	231.00 d	29/11/97	17/07/98																																				
25	WC2021, Percival Street shallow tunnel 2	266.00 d	28/08/99	19/05/00																																				
26	WC2032, Hennessy Road shallow tunnel 1	273.00 d	18/07/98	16/04/99																																				
27	WC2033, Hennessy Road shallow tunnel 2	133.00 d	17/04/99	27/08/99																																				
28	SHALLOW TUNNELS GROUP 2	882.00 d	29/11/97	28/04/00																																				
29	WC2034, Yee Woo Street shallow tunnel 1	231.00 d	29/11/97	17/07/98																																				
30	WC2041, Jardine Bazaar shallow tunnel	224.00 d	18/07/98	26/02/99																																				
31	WC2054, Yee Woo Street shallow tunnel 2	217.00 d	18/07/98	19/02/99																																				
32	WC2051, Yee Woo Street shallow tunnel 3	210.00 d	20/02/99	17/09/99																																				
33	WC2056, Yee Woo Street shallow tunnel 4	217.00 d	20/02/99	24/09/99																																				
34	WC2053, Tung Lo Wan Road shallow tunnel	217.00 d	25/09/99	28/04/00																																				
35	WC2057, Leighton Road shallow tunnel	210.00 d	25/09/99	21/04/00																																				
36	WC2061, Paterson Street shallow tunnel 1	210.00 d	20/02/99	17/09/99																																				
37	WC2076, Paterson Street shallow tunnel 2	203.00 d	18/09/99	07/04/00																																				
38	OPEN CUT SEWERS	1,140.00 d	01/11/98	14/12/01																																				
39	WC211, Deep sewer along Gloucester Road	343.00 d	01/11/98	09/10/99																																				
40	WC213, Tonnochy Road	175.00 d	10/10/99	01/04/00																																				
41	WC214, Jaffe Road and Stewart Road	168.00 d	02/04/00	16/09/00																																				
42	WC215, Wan Chai North	469.00 d	01/02/00	14/05/01																																				
43	WC217, Percival Street (RF)	60.00 d	20/05/00	18/07/00																																				
44	WC219, Matheson Street (RF)	30.00 d	19/07/00	17/08/00																																				
45	WC2042, Jardine Bazaar	84.00 d	27/02/99	21/05/99																																				
46	WC207, Great George Street and Paterson Street	301.00 d	08/04/00	02/02/01																																				
47	WC2081, Tung Lo Wan Road	154.00 d	29/04/00	29/09/00																</																				

Wan Chai East and North Point Sewerage Contract 3 - North Point

Ro #	Task Name	Duration	Start	End	1996			1997			1998				1999				2000				2001		
					Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	DESIGN PHASE	541.00 d	03/06/96	25/11/97																					
2	DESIGN/ DOCUMENTATION	346.00 d	03/06/96	14/05/97																					
3	PREQUALIFICATION OF CONTRACTOR	126.00 d	06/11/96	11/03/97																					
4	TENDER PROCESS	195.00 d	15/05/97	25/11/97																					
5	CONSTRUCTION PHASE	1,421.00 d	26/11/97	16/10/01																					
6	MOBILISATION	63.00 d	26/11/97	27/01/98																					
7	MAIN SITE OFFICE ESTABLISHMENT	49.00 d	28/01/98	17/03/98																					
8	NORTH POINT PUMPING STATION	756.00 d	28/01/98	22/02/00																					
9	ADMINISTRATION BUILDING REPROVISIONING	336.00 d	23/02/00	23/01/01																					
10	DEEP TUNNELS	623.00 d	28/01/98	12/10/99																					
11	Supply Tunnelling Equipment	175.00 d	28/01/98	21/07/98																					
12	Diversion and Improvement Works at Shafts	140.00 d	28/01/98	16/06/98																					
13	Construct Shafts	350.00 d	17/06/98	01/06/99																					
14	Drive Tunnels	350.00 d	09/09/98	24/08/99																					
15	Line Tunnels	49.00 d	25/08/99	12/10/99																					
16	Finish Shafts	49.00 d	25/08/99	12/10/99																					
17	Commission Deep Tunnels	0.00 d	12/10/99	12/10/99																					
18	SHALLOW TUNNELS	583.00 d	28/01/98	02/09/99																					
19	NP3041, Lau Sin Street Shallow Tunnel	203.00 d	28/01/98	18/08/98																					
20	NP3031, Tung Lo Wan Road Shallow Tunnel	210.00 d	28/01/98	25/08/98																					
21	NP3151, Tin Chiu Street Shallow Tunnel	210.00 d	28/01/98	25/08/98																					
22	NP3181, Hoi Yu Street Shallow Tunnel	245.00 d	01/01/99	02/09/99																					
23	OPEN CUT SEWERS	1,358.00 d	28/01/98	16/10/01																					
24	NP3032, King's Road (off Park's Tower)	266.00 d	13/10/99	04/07/00																					
25	NP3042, Lau Sin Street	84.00 d	05/07/00	26/09/00																					
26	NP308, Causeway Road and Shelter Street	588.00 d	25/11/98	04/07/00																					
27	NP306, Tung Lo Wan Road	210.00 d	05/07/00	30/01/01																					
28	NP307, Wun Sha Street	259.00 d	31/01/01	16/10/01																					
29	NP 309, Electric Road and Java Road (DD)	210.00 d	13/10/99	09/05/00																					
30	NP310, Jupiter Street and Watson Road	231.00 d	13/10/99	30/05/00																					
31	NP329, Comfort Terrace	168.00 d	31/05/00	14/11/00																					
32	NP311, Fuk Yuen Street	98.00 d	13/10/99	18/01/00																					
33	NP312, North Point Road	210.00 d	13/10/99	09/05/00																					
34	NP313, Shu Kuk Street	336.00 d	01/05/00	01/04/01																					
35	NP314, Kam Hong Street	287.00 d	28/01/98	10/11/98																					
36	NP315, Tin Chiu Street	154.00 d	13/10/99	14/03/00																					
37	NP328, NP Screening Plant and Man Hong Street	140.00 d	13/10/99	29/02/00																					
38	NP324, NP Screening Plant bypass sewer	210.00 d	28/01/98	25/08/98																					
39	NP326, North Point Vehicular Ferry Concourse	126.00 d	13/10/99	15/02/00																					
40	NP317, Healthy Street E	182.00 d	13/10/99	11/04/00																					
41	NP318, Hoi Yu Street	42.00 d	03/09/99	14/10/99																					
42	NP321, Java Road	259.00 d	13/10/99	27/06/00																					
43	NP319, Hoi Chak Street	252.00 d	03/09/99	11/05/00																					
44	NP320, Hoi Kwong Street/Hoi Chak Street	294.00 d	13/11/98	02/09/99																					
45	NP322, King's Road	448.00 d	13/10/99	02/01/01																					
46	NP325, Java Road (near NP Screening Plant)	105.00 d	13/10/99	25/01/00																					
47	NP327, Electric Road and Java Road (RF)	350.00 d	13/10/99	26/09/00																					

Wan Chai East and North Point Sewerage Contract 3 - North Point

Ro #	Task Name	Duration	Start	End	1996			1997			1998			1999			2000			2001		
					Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
1	DESIGN PHASE	541.00 d	03/06/96	25/11/97																		
2	DESIGN/ DOCUMENTATION	346.00 d	03/06/96	14/05/97																		
3	PREQUALIFICATION OF CONTRACTOR	126.00 d	06/11/96	11/03/97																		
4	TENDER PROCESS	195.00 d	15/05/97	25/11/97																		
5	CONSTRUCTION PHASE	1,421.00 d	26/11/97	16/10/01																		
6	MOBILISATION	63.00 d	26/11/97	27/01/98																		
7	MAIN SITE OFFICE ESTABLISHMENT	49.00 d	28/01/98	17/03/98																		
8	NORTH POINT PUMPING STATION	756.00 d	28/01/98	22/02/00																		
9	CIVIL WORKS	756.00 d	28/01/98	22/02/00																		
10	Provide Temporary Administration Building	56.00 d	28/01/98	24/03/98																		
11	Demolish Temporary Administration Building	42.00 d	25/03/98	05/05/98																		
12	Install Diaphragm Wall	126.00 d	06/05/98	08/09/98																		
13	Excavation	35.00 d	09/09/98	13/10/98																		
14	Construct Substructure	126.00 d	14/10/98	16/02/99																		
15	Connect Tunnel	35.00 d	17/02/99	23/03/99																		
16	Construct Superstructure	126.00 d	12/05/99	14/09/99																		
17	Install Building Services Works	98.00 d	15/09/99	21/12/99																		
18	Finishing Works	63.00 d	22/12/99	22/02/00																		
19	Commissioning of Pumping Station	0.00 d	22/02/00	22/02/00																		
20	E & M WORKS	679.00 d	28/01/98	07/12/99																		
21	Approval of Drawings	168.00 d	28/01/98	14/07/98																		
22	Manufacture/ Test	196.00 d	15/07/98	26/01/99																		
23	Deliver	105.00 d	27/01/99	11/05/99																		
24	Install	126.00 d	12/05/99	14/09/99																		
25	Test	49.00 d	15/09/99	02/11/99																		
26	Commission	35.00 d	03/11/99	07/12/99																		
27	POWER SUPPLIES	301.00 d	15/07/98	11/05/99																		
28	Agree Terms for Supply	98.00 d	15/07/98	20/10/98																		
29	Design Wayleave, Lay Cable and Construct Sub	140.00 d	21/10/98	09/03/99																		
30	Install	63.00 d	10/03/99	11/05/99																		
31	ADMINISTRATION BUILDING REPROVISIONING	336.00 d	23/02/00	23/01/01																		
32	Decommission & Demolish Existing Screw Pump	98.00 d	23/02/00	30/05/00																		
33	Reinstate Site	28.00 d	31/05/00	27/06/00																		
34	Construct New Administration Building	210.00 d	28/06/00	23/01/01																		
35	DEEP TUNNELS	623.00 d	28/01/98	12/10/99																		
36	SHALLOW TUNNELS	583.00 d	28/01/98	02/09/99																		
37	OPEN CUT SEWERS	1,358.00 d	28/01/98	16/10/01																		

2 NOISE

2.1 Construction Noise

A system of noise monitoring and auditing of the implementation of Wan Chai East & North Point Sewerage Project shall be established to ensure that construction takes place with a minimum of adverse impact on nearby NSRs and in compliance with the *Noise Control Ordinance* (NCO) and its associated Technical Memoranda (TM).

Noise monitoring shall be undertaken before the Commencement of the Works until the Completion of the Works:

- (i) to determine essential background and control data;
- (ii) to collect sufficient data to ensure that predicted impacts and environmental standards are not exceeded;
- (iii) to evaluate and report on the noise levels measured and their significance;
- (iv) to identify any measures necessary to mitigate unacceptable effects;
- (v) to provide data to determine the effectiveness of any mitigation measures which may be sought by means such as changes in working practice, plant and equipment, location of plant and equipment, acoustic screens and barriers;
- (vi) to provide an early indication if any of the environmental control measures or environmental design assumptions might fail to achieve their objectives during construction; and
- (vii) to protect the nearby NSRs from unacceptable noise impact.

2.2 Noise Monitoring Methodology

Noise monitoring shall be undertaken in accordance with:

- (i) the *Noise Control Ordinance*; and
- (ii) as directed by the Engineer.

2.3 Noise Parameters

The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (Leq). Leq(30 min) shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays. For all other time periods, Leq(5 min) shall be employed for comparison with the NCO criteria.

As supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference. A sample data record sheet is shown in Figure 2.1 for reference.

2.4 Monitoring Equipment

As referred to in the TM issued under the NCO, sound level meters in compliance with the *International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1)* specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement, the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0dB.

Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5ms^{-1} or wind with gusts exceeding 10ms^{-1} . The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

The Contractor is responsible for the provision of the monitoring equipment. The EM shall ensure that sufficient noise measuring equipment and associated instrumentation are available to the MT for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

2.5 Monitoring Locations

Construction will be carried out in sections. Baseline monitoring will be carried out prior to construction at the nearest sensitive receivers to the new section of work and any other locations considered necessary, in agreement with the ER and the EPD. The potentially worst affected sensitive receivers are indicated in Figure 1.2 (Wan Chai East) and Figure 1.3 (North Point).

The monitoring locations should be chosen based on the following criteria:

- (i) at locations close to the major site activities which are likely to have noise impacts;
- (ii) close to the noise sensitive receivers (N.B. For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre should be considered as noise sensitive receiver); and
- (iii) for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

The monitoring station shall normally be at a point 1m from the exterior of the sensitive receivers building facade and be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free field measurements.

The EM shall agree with the ER on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

2.6 Baseline Monitoring

Under the direction of the EM, the MT shall carry out baseline noise monitoring prior to the commencement of the construction works. The baseline monitoring shall be carried out daily for a period of at least two weeks. A schedule on the baseline monitoring shall be submitted to the ER for approval before the monitoring starts.

There shall not be any construction activities in the vicinity of the stations during the baseline monitoring.

In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the EM shall liaise with EPD to agree on an appropriate set of data to be used as a baseline reference and submit to the ER for approval.

2.7 Impact Monitoring

Monitoring will be undertaken at the nearest NSRs to active sites on a frequent, random basis at the direction of the EM. Monitoring will also be carried out at the relevant sensitive receiver(s) on receipt of complaints.

When noise generating construction activities are underway, noise measurements will be taken:

- (i) between 0700-1900 hours on normal weekdays;
- (ii) between 1900-2300 hours;
- (iii) between 2300-0700 hours of next day; and
- (iv) between 0700-1900 hours on holidays.

For the measurements (ii), (iii) and (iv) above, one set of measurements shall at least include 3 consecutive $L_{eq}(5 \text{ min})$ results.

If a school exists near the construction activity, noise monitoring shall be carried out at the monitoring stations for the schools during the school examination periods. The EM shall liaise with the school's personnel and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract.

In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan in Section 2.8 shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

2.8 Event and Action Plan for Noise

The Action and Limit levels for construction noise are defined in Table 2.1. Should non-compliance of the criteria occurs, action in accordance with the Action Plan in Table 2.2, shall be carried out.

Table 2.1 Action and Limit Levels for Construction Noise

Time Period	Action	Limit
0700-1900 hrs on normal weekdays	When one documented complaint is received	75* dB(A)
0700-2300 hrs on holidays; and 1900-2300 hrs on all other days		60/65/70** dB(A)
2300-0700 hrs of next day		45/50/55** dB(A)

* reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods.

** to be selected based on Area Sensitivity Rating.

Table 2.2 Event/Action Plan for Construction Noise

EVENT	ACTION	
	EM or ER	Contractor
Action Level	<ol style="list-style-type: none"> 1. Notify Contractor 2. Analyse investigation 3. Require Contractor to propose measures for the analysed noise problem 4. Increase monitoring frequency to check mitigation effectiveness 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals to Environmental Manager/Engineer's Representative 2. Implement noise mitigation proposals
Limit Level	<ol style="list-style-type: none"> 1. Notify Contractor 2. Notify EPD 3. Require Contractor to implement mitigation measures 4. Increase monitoring frequency to check mitigation effectiveness 	<ol style="list-style-type: none"> 1. Implement mitigation measures 2. Prove to Environmental Manager /ER effectiveness of measures applied

2.9 Noise Mitigation Measures

Throughout the development of the Wan Chai East & North Point Sewerage Project, the Contractor shall consider construction noise to be a serious constraint. All equipment shall be chosen so as to reduce the intensity or duration of noise. Without careful choice of equipment and acoustic mitigation the Contractor is warned that the necessary licences needed under the *Noise Control Ordinance* may be difficult to obtain. This will have a serious effect on the planning and programming of the works.

The EIA study report has recommended construction noise control and mitigation measures. These measures are presented as recommended Contract clauses in Section 5. The Contractor shall be responsible for the design and implementation of these measures.

If the recommended measures are not sufficient to restore the construction noise quality to an acceptable levels upon the advice of EM, the Contractor shall liaise with the EM on some other mitigation measures, propose to ER for approval, and carry out the mitigation measures.

Figure 2.1: Noise Monitoring Field Record Sheet

Monitoring Location		
Description of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length (min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Measurement Results	L ₉₀ (dB(A))	
	L ₁₀ (dB(A))	
	Leq (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

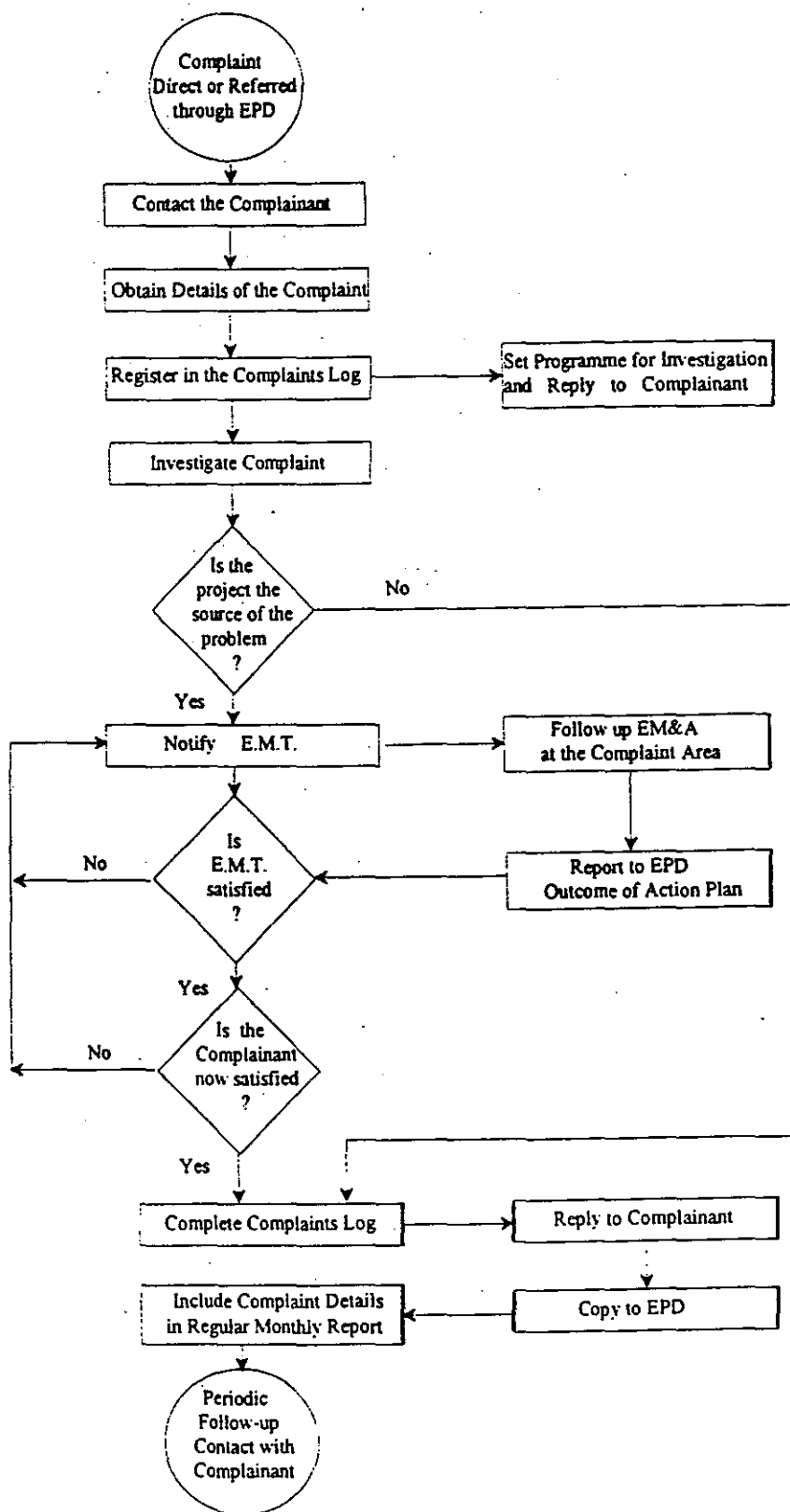
Name & Designation


Signature

Date

Recorded By :

Checked By :



Agreement no. CE 78/94 WAN CHAI EAST AND NORTH POINT SEWERAGE EIA - COMPLAINTS PROCEDURE ACTION FLOW CHART FOR EM & A PROGRAMME	 BINME CONSULTANTS LIMITED 賓尼工程顧問有限公司 CONSULTING ENGINEERS	Date NOV. 95	Scale
		Initial	Figure No. 3.1

3 SITE ENVIRONMENTAL AUDIT

3.1 Site Inspections

Site Inspections provide a direct means to trigger and enforce the specified environmental protection and pollution control measures. They shall be undertaken routinely to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. With well defined pollution control and mitigation specifications and a well established site inspection, deficiency and action reporting system, the site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.

The EM is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspection works. He shall submit a proposal on the site inspection, deficiency and action reporting procedures within 21 days of the construction contract commencement to the Contractor for agreement and to the ER for approval.

Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site; it should also review the environmental situation outside the site area which is likely to be affected, directly or indirectly, by the site activities. The EM shall make reference to the following information in conducting the inspection:

- (i) the EIA recommendations on environmental protection and pollution control mitigation measures;
- (ii) works progress and programme;
- (iii) individual works methodology proposals (which shall include proposal on associated pollution control measures);
- (iv) the contract specifications on environmental protection;
- (v) the relevant environmental protection and pollution control laws; and
- (vi) previous site inspection results.

The Contractor shall update the EM with all relevant information of the construction contract for him to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the ER and the Contractor within 24 hours, for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the EM to report on any remedial measures subsequent to the site inspections.

Ad hoc site inspections shall also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

3.2 Compliance with Legal and Contractual Requirements

There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong which the construction activities shall comply with.

In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the ER for approval shall be sent to the EM for vetting to see whether sufficient environmental protection and pollution control measures have been included.

The EM shall also review the progress and programme of the works to check that relevant environmental laws have not been violated, and that the any foreseeable potential for violating the laws can be prevented.

The Contractor shall regularly copy relevant documents to the EM so that the checking work can be carried out. The document shall at least include the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws, and all the valid licence/permit. The site diary shall also be available for the EM's inspection upon his request.

After reviewing the document, the EM shall advise the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions.

If the EM's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works may not cope with the works programme or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Contractor and the ER accordingly.

Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ER shall follow up to ensure that appropriate action has been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

3.3 Environmental Complaints

Complaints shall be referred to the EM for carrying out complaint investigation procedures. The EM shall undertake the following procedures upon receipt of the complaints:

- (i) log complaint and date of receipt onto the complaint database;
- (ii) investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
- (iii) if a complaint is valid and due to works, identify mitigation measures;
- (iv) if mitigation measures are required, advise the Contractor accordingly;
- (v) review the Contractor's response on the identified mitigation measures, and the updated situation;
- (vi) if the complaint is transferred from EPD, submit interim report to EPD on status of the complaint investigation and follow-up action within the time frame assigned by EPD;
- (vii) undertake additional monitoring and audit to verify the situation if necessary, and review that any valid reason for complaint does not recur;
- (viii) report the investigation results and the subsequent actions to the source of complaint for responding to complainant (If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD); and
- (ix) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

During the complaint investigation work, the Contractor and ER shall cooperate with the EM in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor shall promptly carry out the mitigation. The ER shall ensure that the measures have been carried out by the Contractor.

A flow chart of the complaints response procedures is shown in Figure 3.1.

4 REPORTING

4.1 General

The following reporting requirements based upon a paper documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the ER and EPD. This would enable a transition from a paper/historic and reactive approach to an electronic/real time proactive approach.

4.2 Monthly EM&A Reports

The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the EM. The EM&A report shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due in the month after construction commences. A maximum of 4 copies of each monthly EM&A report shall be submitted to each of the three parties: the Contractor, the ER and the EPD. Before submission of the first EM&A report, the EM shall liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium requirement.

The EM shall review the number and location of monitoring stations and parameters to monitor every 6 months or on as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

4.2.1 First Monthly EM&A Report

The first monthly EM&A report shall include at least the following :

- (i) 1-2 pages executive summary;
- (ii) basic project information including a synopsis of the project organisation, programme and management structure, and the work undertaken during the month;
- (iii) a brief summary of EM&A requirements including:
 - all monitoring parameters;
 - environmental quality performance limits (Action and Limit levels);
 - Event-Action Plans;

- environmental mitigation measures, as recommended in the project EIA study final report;
- environmental requirements in contract documents;
- (iv) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
- (v) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (vi) monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology
 - equipment used and calibration details
 - parameters monitored
 - monitoring locations (and depth)
 - monitoring date, time, frequency, and duration;
- (vii) graphical plots of trends of monitored parameters over the past four reporting periods for representative monitoring stations annotated against the following:
 - major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
- (viii) advice on the solid and liquid waste management status;
- (ix) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (x) a review of the reasons for and the implications of noncompliance including review of pollution sources and working procedures;
- (xi) a description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures related to earlier noncompliance;
- (xii) a summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints; and

- (xiii) An account of the future key issues as reviewed from the works programme and work method statements.

4.2.2 Subsequent EM&A Reports

The subsequent monthly EM&A reports shall include the following :

- (i) Title Page
- (ii) Executive Summary (1-2 pages)
 - Breaches of Action and Limit Levels
 - Complaint Log
 - Reporting Changes
 - Future key issues
- (iii) Contents Page
- (iv) Environmental Status
 - Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations
 - Summary of non-compliance with the environmental quality performance limits
 - Summary of complaints
- (v) Environmental Issues and Actions
 - Review issues carried forward and any follow-up procedures related to earlier non-compliance (complaints and deficiencies)
 - Description of the actions taken in the event of noncompliance and deficiency reporting
 - Recommendations (should be specific and target the appropriate party for action)
 - Implementation status of the mitigatory measures and the corresponding effectiveness of the measures
- (vi) Future Key Issues
- (vii) Appendix
 - Action and Limit Levels
 - Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - (a) major activities being carried out on site during the period;
 - (b) weather conditions during the period; and

(c) any other factors which might affect the monitoring results

- Monitoring schedule for the present and next reporting period
- Cumulative complaints statistics
- Details of complaints, outstanding issues and deficiencies

4.2.3 Quarterly EM&A Summary Reports

The quarterly EM&A summary report which should generally be around 5 pages (including about 3 of text and tables and 2 of figures) should contain at least the following information:

- (i) up to half a page executive summary;
- (ii) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;
- (iii) a brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (Action and Limit levels); and
 - environmental mitigation measures, as recommended in the project EIA study final report;
- (iv) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;
- (v) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (vi) graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against;
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
- (vii) advice on the solid and liquid waste management status;

- (viii) a summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (ix) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- (x) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- (xi) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- (xii) comments (eg. effectiveness and efficiency of the mitigation measures), recommendations (eg. any improvement in the EM&A programme) and conclusions for the quarter; and
- (xiii) proponents' contacts and any hotline telephone number for the public to make enquiries.

4.3 Data Keeping

The site document such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, the document shall be well kept by the EM and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. The monitoring data shall also be recorded in magnetic media form, and the software copy can be available upon request. The water quality data software format shall be agreed with EPD. All the documents and data shall be kept for at least one year after completion of the construction contract.

4.4 Interim Notification of Environmental Quality Limit Exceedances

With reference to Event/Action Plans in Table 2.2, when the environmental quality limits are exceeded, the EM shall immediately notify the ER & EPD, as appropriate. The notification shall be followed up with advice to EPD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in Figure 4.1.

**Figure 4.1 Interim Notification of Environmental Quality Limits
Exceedances Sheet - Sample**

Incident Report on Action Level or Limit Level Non-compliance

Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measured Level	
Possible reason for Action or Limit Level Non-compliance	
Actions taken/to be taken	
Remarks	

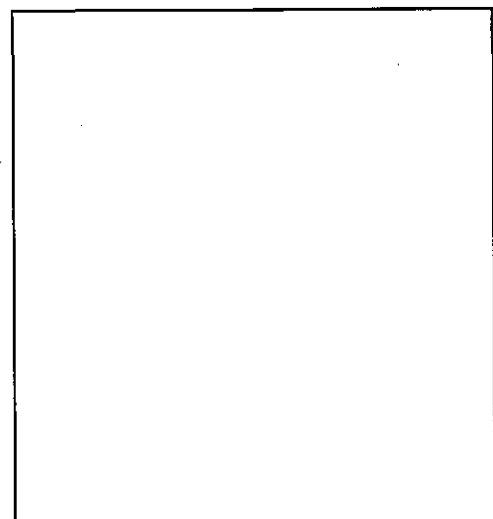
Location Plan

Prepared by : _____

Designation : _____

Signature : _____

Date : _____



5 RECOMMENDED POLLUTION CONTROL CLAUSES

5.1 Avoidance of Nuisance

- (i) All construction works are to be carried out in such a manner as to cause as little inconvenience as possible to nearby residents, property and to the public in general, and the Contractor shall be held responsible for any claims which may arise from such inconvenience.
- (ii) The Contractor shall be responsible for the adequate maintenance and clearance of channels, gullies etc.
- (iii) Water shall be used to prevent dust rising and the Contractor shall take every precaution to prevent excavated materials from entering into the public drainage system.
- (iv) The Contractor shall carry out the Works in such a manner as to minimize adverse impacts on the environment.
- (v) The Contractor shall ensure that no vehicle or mobile plant leaves the Site with waste or debris on it that may drop or be deposited on public roads or private rights of way.
- (vi) The Contractor shall provide a fully mechanised road washer/sweeper or other appropriate equipment and personnel for washing and cleaning of the streets within the vicinity of all active work sites.
- (vii) The Contractor shall sweep and keep clean at all times the streets and pavements adjacent to the Site and remove all spillages of mud, waste, litter and debris from whatever source.

5.2 Noise Pollution Control

Throughout the development of the project, the Contractor shall consider construction noise to be a serious constraint. All equipment shall be chosen so as to reduce the intensity or duration of noise. Without careful choice of equipment and acoustic mitigation the Contractor is warned that the necessary licences needed under the *Noise Control Ordinance* may be difficult to obtain. This will have a serious effect on the planning and programming of the works.

To comply with Noise Control Ordinance

- (i) The Contractor shall comply with and observe the *Noise Control Ordinance* and its subsidiary regulations in force in Hong Kong.

The Acceptable Noise Levels (ANLs) for various construction equipment and processes at different time of the day and the requirement for applying Construction Noise Permit (CNP) for works outside 07:00 to 19:00 hours on week days and all day on a general holiday are documented in the following Technical Memoranda (TM):

- (a) *TM on Noise from Percussive Piling;*
- (b) *TM on Noise from Construction Works Other Than Percussive Piling;*
- (c) *TM on Noise from Construction Works in Designated Areas.*

Copies of these TM are available from the Environmental Protection Department (EPD).

Non-statutory Noise Control

- (ii) In addition to the requirements imposed by the *Noise Control Ordinance*, to control noise generated from equipment and activities for the purpose of carrying out construction work other than percussive piling during the time period from 07:00 to 19:00 hours or any day not being a general holiday (including Sundays), the following requirements shall all be complied with:
- (a) The noise level measured at 1 m from the most affected external facade of the nearby noise sensitive receivers from the construction work alone during any 30 minute period shall not exceed an equivalent sound level (Leq) of 75 dB(A).
 - (b) The noise level measured at 1 m from the most affected external facade of the nearby schools from the construction work alone during any 30 minute period shall not exceed an equivalent sound level (Leq) of 70 dB(A) [65 dB(A) during school examination periods].

The Contractor shall liaise with the schools and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract.

Provision of Construction Noise Monitoring Equipment and Noise Monitoring Team

- (iii) The Contractor shall be responsible for providing a noise specialist who can fulfil the environmental monitoring and audit requirements as stipulated in the Environmental Monitoring and Audit (EM&A) Manual, under the supervision of the Resident Site Engineer.

The noise specialist should have an acoustics, physics, mechanical engineering or environmentally related degree, or be able to demonstrate knowledge of three years experience in designing noise control measures. Experience in designing temporary noise enclosures for outdoor use would be especially valuable.

- (iv) The Contractor shall be responsible for providing suitable noise monitoring equipment for the fulfilment of the EM&A requirements including, but not limited to, the following:
- (a) An approved integrating sound level meter to IEC 651 : 1979 (Type 1) and 804 : 1985 (Type 1) and the manufacturer's recommended sound level calibrator for the exclusive use of the Engineer at all times. The Contractor shall maintain the equipment in proper working order and provide a substitute when the equipment is out of order or otherwise not available.
 - (b) The sound level meter, including the sound level calibrator, shall be verified by the manufacturer every two years to ensure it performs to the same level of accuracy as stated in the manufacturer's specifications. That is to say at the time of noise measurements, the equipment shall have been verified within the last two years.

Should the above sub-clauses (i), (ii) and (iv) be violated, construction shall stop and shall not recommence until appropriate measures acceptable to the Engineer that are necessary for compliance have been implemented.

Any stoppage or reduction in output resulting from compliance with this clause shall not entitle the Contractor to any extension of time for completion or to any additional costs whatsoever.

Noise Mitigation Measures

- (v) Before the commencement of any work, the Engineer may require the methods of working, equipment and sound-reducing measures intended to be used on the Site to be made available for inspection and approval to ensure that they are suitable for the project.
- (vi) The Contractor shall arrange methods of working and carry out the Works in such a manner so as to minimize noise impacts on the surrounding environment, and shall provide experienced personnel with suitable training to ensure that these methods are implemented.
- (vii) The Contractor shall ensure that all plant and equipment to be used on site are properly maintained in good operating condition with regular oiling and greasing, and that noisy construction activities shall be effectively sound-reduced by means of silencers, mufflers, acoustic linings or shields, acoustic sheds or screens or other means to avoid disturbance to any nearby noise sensitive receivers.
- (viii) Notwithstanding the requirements and limitations set out in clause (ii) above and subject to compliance with clauses (vi) and (vii) above, the Engineer may upon application in writing by the Contractor, allow the use of any equipment and the carrying out of any construction activities for any duration provided he is satisfied that the application is, in his opinion, of absolute necessity or of an emergency nature, and adequate noise insulation has been provided to any educational institutions to be affected, and not in contravention with the *Noise Control Ordinance* in any respect.
- (ix) The following noise control measures are recommended:
 - (a) Noisy equipment and activities should be sited by the Contractor as far from the close proximity of sensitive receivers as is practical. Prolonged operation of noisy equipment close to residences during night time or early morning should be avoided except in the cases of the tunnel shafts and working areas surrounding the shafts;
 - (b) Noisy plant or processes should be replaced by silenced alternatives where possible. Silenced diesel and gasoline generators and power units, as well as silenced and super-silenced electric air compressors, can be readily obtained;

- (c) All surface breaking, open cut works and use of haulage traffic should be scheduled for daytime or off traffic peak levels outside 23:00 - 07:00 hours whenever feasible;
- (d) If the use of excavator mounted breakers instead of hand held ones can reduce the duration of the road breaking process significantly, the greater noise may be acceptable for such a short period. Specially designed brackets with vibration damping properties are available from construction plant manufacturers for reduction of mounted breaker noise. The use of excavator mounted breakers should however be restricted to day time only.
- (e) Idle equipment should be turned off or throttled down. Noisy equipment should be properly maintained and used no more often than is necessary;
- (f) Construction plant and the associated silencing measures should be properly maintained and operated;
- (g) Plant known to emit noise strongly in one direction should, where possible, be orientated so that the noise is directed away from nearby sensitive receivers. An example is the exhaust noise from compressors and fans;
- (h) For areas requiring night time open cut works between 23:00 to 07:00, the Contractor should give prior notice to the nearby worst affected noise sensitive receivers so that good communication and relations are established.

If measures (a) - (h) do not achieve the required noise reduction, it is recommended that:

- (i) A gap free barrier with a surface mass density of at least 20 kg/m² should be constructed around the active part of the site, screening all major noise sources of operating equipment from the line of sight of any ground floor receivers; **and**
- (j) A double shelled ½" plywood enclosure with the larger outer shell separated from the inner shell by an air gap that is at least 100 mm wide. The inner surface of the enclosure should be lined with sound absorptive damping material such as leaded vinyl and polyurethane. The surface mass density requirements are the same as that for the barrier. The noise sources of the equipment should not be visible by the sensitive receivers from the top or any other sides after the enclosure is erected;

5.3 Dust Suppression Measures

- (i) The Contractor shall undertake at all times to prevent dust nuisance as a result of his activities.
- (ii) The Contractor shall at his own cost, and to the satisfaction of the Engineer, install effective dust suppression equipment and take such other measures as may be necessary to ensure that at the Site boundary and any nearby sensitive receiver the concentration of air-borne dust shall not exceed the *Hong Kong Air Quality Objectives*.
- (iii) In the process of material handling, any material which has the potential to create dust shall be treated with water or sprayed with wetting agent.
- (iv) Where dusty materials are being discharged to vehicle from a conveying system at a fixed transfer point, a three-sided roofed enclosure with a flexible curtain across the entry shall be provided. Exhaust should be provided for this enclosure and vented to a fabric filter system.
- (v) Any vehicle with an open load carrying area used for moving materials which have the potential to create dust shall have properly fitting side and tail boards. Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin. The tarpaulin shall be properly secured and shall extend at least 300 mm over the edges of the side and tail boards.
- (vi) Stockpiles of sand and aggregate greater than 20 m³ shall be enclosed on three sides, with walls extending above the pile and 2 metres beyond the front of the pile. In addition, water sprays shall be provided and used both to dampen stored materials and when receiving raw material.
- (vii) The Contractor shall frequently clean and water the site to minimize the fugitive dust emissions.

5.4 Removal of Waste Material

- (i) The Contractor shall be aware of, and comply with, the *Waste Disposal Ordinance*, the *Public Health Ordinance*, the *Municipal Services Ordinance* and the *Water Pollution Control Ordinance*.

- (ii) The Contractor shall not permit any sewage, wastewater or effluent containing sand, cement, silt or any other suspended or dissolved material to flow from the site onto any adjoining land or allow any wastewater or refuse to be deposited anywhere within the site or onto any adjoining land and shall have all such matter removed from the site.
- (iii) The Contractor shall be liable for any damages caused to adjoining land through his failure to comply with clause 5.4 (i).
- (iv) The Contractor shall segregate all inert construction waste material suitable for reclamation or land formation and shall dispose of such material at such public dumping area(s) as may be specified from time to time by the Director of Civil Engineering Services.
- (v) All non-inert construction waste material deemed unsuitable for reclamation or land formation and all other waste material shall be disposal of at a public landfill.
- (vi) The Contractor shall register as a Chemical Waste Producer.

5.5 Discharge to Sewers and Drains

- (i) The Contractor shall be aware of, and comply with, the *Buildings Ordinance*, *Water Pollution Control Ordinance*, and the *Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters*.
- (ii) If any office, site canteen or toilet facility is erected, foul water effluent shall be directed to a foul sewer or to a sewage treatment facility either directly or indirectly by means of pumping or other means approved by the Engineer.

END OF TEXT

Binnie Consultants Limited, Engineers and Scientists

Hong Kong Office

11th Floor, New Town Tower, Pak Hok Ting Street, Shatin, N.T., Hong Kong

Telephone (852) 2601 1000 Facsimile (local) 2601 3988 (overseas) (852) 2601 3331

Email Address : binnie@hk.super.net

Shenzhen Office

5th Floor, Hong Tao Building, 2 Baoan Road, Shenzhen, P.R.C

Telephone / Facsimile (86755) 558 2873

