

FUGRO TECHNICAL SERVICES LIMITED

MaterialLab Division,
Fugro Development Centre,
5 Lok Yi Street, 17 M.S. Castle Peak Road,
Tai Lam, Tuen Mun, N.T., Hong Kong.

Tel : +852-2450 8233
Fax : +852-2450 6138
E-mail : matlab@fugro.com.hk
Website : www.fugro.com

MaterialLab




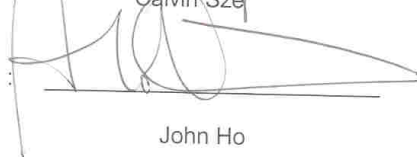
**Drainage Services Department, Contract No. DC/2006/01
Drainage Improvement Works in Sai Kung**

**Quarterly Environmental Monitoring and Audit Report
for
November 2007 to January 2008**

Client : Sum Kee Construction Limited

MaterialLab Ref. No. : 075117EN80066

Prepared by : 
Calvin Sze

Checked by : 
John Ho

CONTENTS

1. [Executive Summary](#)
2. [Introduction](#)
3. [General Review](#)
4. [Construction Phase Environmental Monitoring and Audit](#)
5. [Summary of Complaints, Summons and Successful Prosecutions](#)
6. [Comments and Conclusions for November 2007 to January 2008](#)

APPENDICES

- Appendix 1: [Environmental Mitigation Measures](#)
Appendix 2: [Waste Management Guideline](#)
Appendix 3: [Environmental Mitigation Implementation Schedule](#)
Appendix 4: [Graphical Presentation of Noise Level and Water Quality Monitoring Data](#)
Appendix 5: [Event Action Plan for Air Quality, Noise Level and Water Quality Monitoring](#)
Appendix 6: [Figures](#)
Appendix 7: [Work Program](#)

TABLES

- Table 3.1 [Summary of Monitored Parameters](#)
Table 3.2 [Action and Limit Level for Air Quality](#)
Table 3.3 [Action and Limit Level for Construction Noise](#)
Table 3.4 [Action and Limit Level for Water Quality](#)
Table 4.1 [Summary of Environmental Monitoring from November 2007 to January 2008](#)
Table 4.2 [Construction activity undertaken during November 2007 to January 2008](#)
Table 4.3 [Summary of Monitoring Non-Compliances](#)
Table 5.1 [Monthly Summary of Complaints Received](#)

FIGURES

- Figure 1.1 Location of Project Site
Figure 3.2 [Project Organisation Structure](#)
Figure 3.3 [Organisation Chart of Site Environmental Team](#)
Figure (2.2, 3.2 & 4.1-4.3) Location of Environmental Air, Noise and Water Monitoring Stations

1. Executive Summary

The requisite construction works for the Drainage Services Department Contract No. DC/2006/01 Drainage Improvement Works in Sai Kung has commenced constructional activity. The requisite impact environmental monitoring comprising of water and noise assessment was conducted throughout this review quarter period.

Air Quality

Ad hoc air quality monitoring at the project site will only be conducted by ET when instructed by the ER/IC(E) or on receipt of complaint. Nonetheless, the Contractor was advised to maintain the deployment of dust mitigation measures to minimise potential impacts from constructional works to a minimum.

Noise Level

In this review period, no documented complaint about noise nuisance was received and the monitoring results indicated that the recorded noise levels were well below the Limit Level of 70 or 75dB(A) during daytime on normal weekdays. Construction sourced activity was not considered influencing any nuisance impact to the sensitive receivers. The noise emanating from vehicular road traffic was found to be the major influential factor dominating the noise environment.

Water Quality

Non-compliance events regarding suspended solids and turbidity were recorded intermittently in the past three months. The scenario was deemed to be attributed to the prevailing water quality in which soil deposited along the riverbed bough up into the existing water body under the influence of tidal effect and surface runoff after heavy rain. The Contractor is advised to implement necessary mitigation measures so as to keep the disturbance on the water quality to minimal levels.

Complaints

As far as the complaint on the construction work in respect of environmental protection and pollution control was concerned, there was four documented complaints received during this review quarter period. The first complaint was recorded on 15/11/2007 regarding muddy water was found in Ho Chung River and Tai Chung River. In response to the complaint, the Contractor had enforced mitigation measures (i.e. increase the number of silt curtains or enclose the active working areas with silt curtains) to minimize water pollution impact. The second complaint was registered on 22/11/2007. The scenario was concerning construction dust observed near Ho Chung River. To address this complaint, the Contractor had increased the frequency of water spraying in order to keep reasonably wetted of main access road. Corresponding site investigations were performed on 21 and 24 November 2007 respectively.

The resting two complaints were received on 19/01/2008 and 22/01/2008 concerning noise and dust nuisance respectively at Sha Ha and Ho Chung. Site Investigation is scheduled on 15/02/2008. Compliant log and the follow up actions will be provided in the coming EM&A Report.

2. Introduction

This quarterly report reviews the progress of the environmental monitoring and audit work associated with Contract No. DC/2006/01 Drainage Improvement Works in Sai Kung for the second quarter of constructional activity from November 2007 to January 2008.

The graphical plots of the monitoring data are presented in Appendix 4. Comments and conclusions for this review quarter are included.

3. General Review

3.1 Background

The Drainage Services Department (DSD) of the Hong Kong Special Administrative Region Government has commissioned the drainage improvement works in Sai Kung under Contract No. DC/2006/01.

The location of the project site is shown in Figure 1.1 of Appendix 8.

The project commenced in July 2007 with the duration of the contract for the civil works approximately 24 months and scheduled for completion in July 2009.

The Contract for the construction works under Contract No. DC/2006/01 was awarded to Sum Kee Construction Limited.

MaterialLab Division of Fugro Technical Services Limited, was requested by Sum Kee Construction Limited to carry out the environmental monitoring and audit (EM&A) in connection with the project works.

The major works items under this contract comprise the following:

(A) Sai Kung River and Sha Ha Culvert :

- (i) Construction of approximately 150m long of trapezoidal using gabion lining with planting pits and natural substrates and rip-rap bedding; and
- (ii) Construction of approximately 280m long three cells 3m x 3m culvert to connect Sai Kung River to the downstream box culvert.

(B) Ho Chung Channel :

- (i) Construction of approximately 300m long of trapezoidal using gabion lining with planting pits and natural substrates and rip-rap bedding; and
- (ii) Construction of approximately 350m long of rectangular channel by bored pile with natural substrates and rip-rap bedding; and
- (iii) Re-provision of three pedestrian crossing;
- (iv) Reconstruction of existing vehicular crossing and weir arrangement adjacent to WSD to Ho Chung Lowland Pumping Station.

(C) Pak Kong River :

- (i) Re-provision of one pedestrian and one vehicular crossing to 3-cell box culvert.
- (ii) Construction of approximately 100m long retaining walls to stabilize an existing river slope adjacent to the Hiram's Highway.

The project organisation with respect to environmental protection works is shown in Figure 3.2, which indicates responsibilities and lines of communication of the various parties concerned. The organisation chart of the Environmental Team is shown in Figure 3.3.

Figure 3.2 Project Organisation Structure

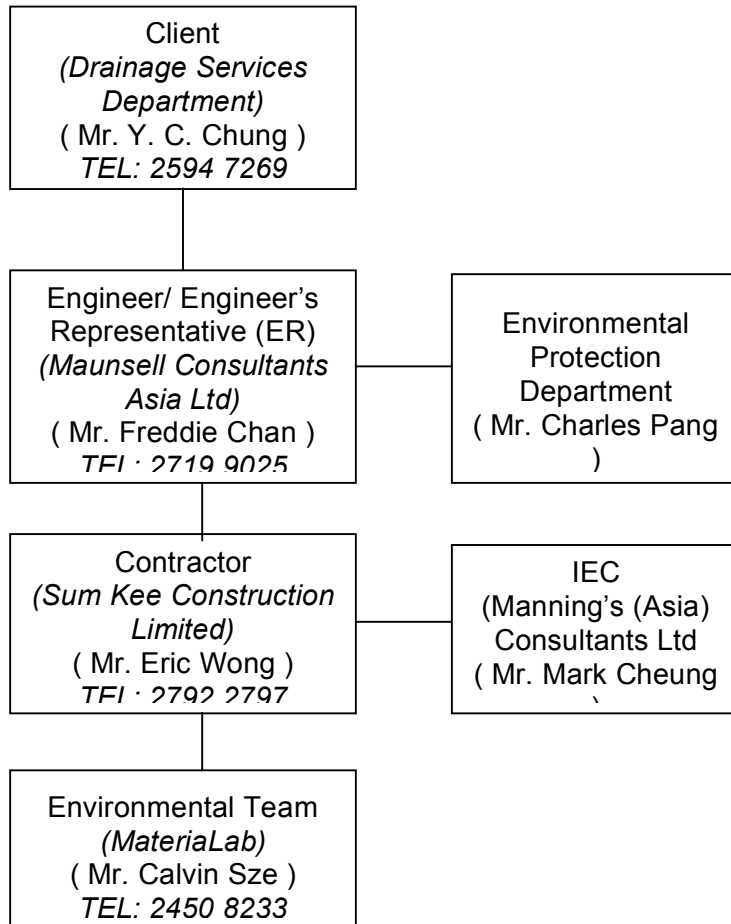
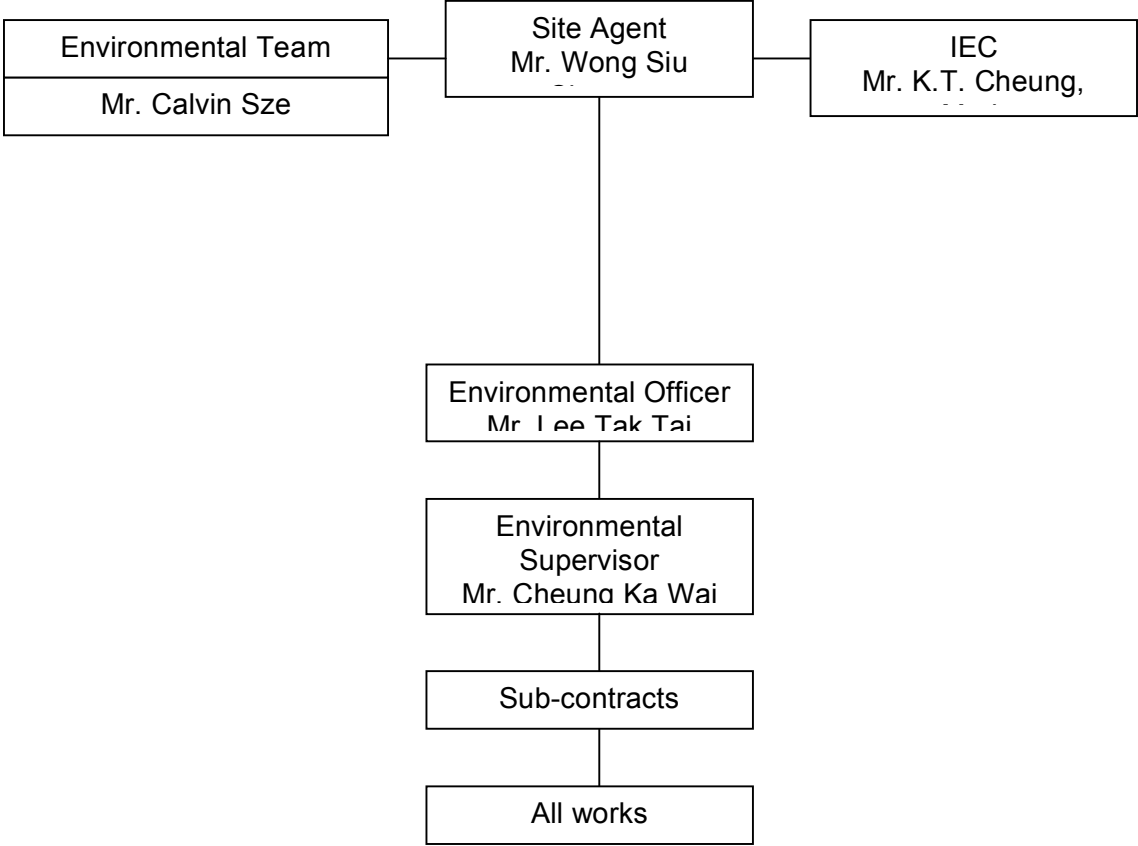


Figure 3.3 Organization Chart of Site Environmental Team



3.2 Summary of Environmental Monitoring and Audit (EM&A) Requirements

The EM&A programme requires the monitoring of air quality, noise level and water quality at the pre-agreed monitoring stations prior to the commencement of construction activities at the project site. During the course of construction, impact monitoring of air quality and noise levels will be undertaken at the designated monitoring stations in accordance to the active site works area(s) in operation. The requisite monitored parameters are summarised in Table 3.1.

Environmental auditing on the monitoring data is to be undertaken via the establishment of a set of quality performance limits known as Action/Limit (AL) levels for the environmental parameters in concern to check against any exceedances.

The AL levels are summarised in Table 3.2, Table 3.3 and Table 3.4 and their derivations are detailed in the Baseline Environmental Monitoring Report.

Should the monitoring results indicate any non-compliance of the concerned Action/Limit (AL) levels, actions according to the event action plan for air, noise and water in Appendix 6 should be followed and appropriate environmental mitigation measures as shown in Appendix 1 are to be implemented to rectify the situation.

Advice in regard to the implementation status of the environmental protection and pollution control mitigation measures are shown in Appendix 3.

Table 3.1 Summary of Monitored Parameters

Parameter	Monitoring Items	Number of Stations	Frequency	Requirements
Ad hoc Impact Monitoring for Air	Total suspended particulates (TSP)	3	When required by the ER or IC(E) during the course of the works	1 x 24-hour sampling and 3 x 1-hour sampling
Noise	Daytime noise level of $L_{Aeq}(30min)$	6	Once per week	1 x L_{eq} (30 min.) between 0700 and 1900 on normal weekdays.
Water	DO, DOS, PH, Turbidity Temp, SS	4	Twice per week in the first three months, then once per week if no exceedances occur	A set of measurements on normal weekdays.

3.3 Action and Limit Levels

Air Quality

The Action and Limit levels for 1-hour and 24-hour total suspended particulate (TSP) are formulated from the baseline monitoring data. The quality performance levels are shown in Table 3.2.

Table 3.2 Action and Limit Level for Air Quality

Location	1-hour TSP ($\mu\text{g}/\text{m}^3$)		24-hour TSP ($\mu\text{g}/\text{m}^3$)	
	Action Level	Limit Level	Action Level	Limit Level
HCAM	346	500	195	260
PKAM	293	500	160	260
SKAM	291	500	149	260

Noise Level

The 'Action' and 'Limit' levels for noise is based on the number of complaints received during construction and the specified noise limits. The 'Action' and 'Limit' levels are shown in Table 3.3

Table 3.3 Action and Limit Level for Construction Noise

Time Period	Action Level	Limit Level, dB (A)
0700-1900 hrs on normal weekdays	When one documented complaint is received	75*

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

Water Quality

The Action and Limit levels for the respective water quality parameters are formulated as follows:

Table 3.4 Calculated Action and Limit Levels

Parameter	Station	Action	Limit
DO in mg/L (mid-depth)	W2	5	4
	W3	5	
	W5	6	
	W7	5	
SS in mg/l (mid-depth)	W2	27	39
	W3	27	39
	W5	12	21
	W7	7	9
Turbidity in NTU (mid-depth)	W2	50	63
	W3	50	63
	W5	9	14
	W7	11	18

Remark:

1. For DO, Non-compliance occurs when monitoring result is lower than the limits.
2. For SS and turbidity, non-compliance occurs when monitoring result is higher than the limits.

4. Construction Phase Environmental Monitoring and Audit

4.1. Review of the construction phase environmental monitoring

Noise level and water quality impact monitoring was undertaken from November 2007 to January 2008 and summarised in Table 4.1.

Impact water quality monitoring was performed at four locations. Noise level monitoring was carried out at six locations. The locations of the monitoring station selected as the nearest air water and noise sensitive receivers are shown in Figure 2.2, 3.2, 4.1, 4.2 and 4.3 of Appendix 6.

Table 4.1 Summary of Environmental Monitoring from November 2007 to January 2008

Monitored Parameter		November 2007	December 2007	January 2008
Air	3 x 1-hour TSP	0	0	0
	1 x 24-hour TSP	0	0	0
Noise	1 x Leq 30 min.	9	7	10
Water	DO, DOS, pH, SS, Temp and Turbidity	9	8	9

4.2 Synopsis of work undertaken during this quarter

During this quarter in review, constructional activity undertaken by the contractor is listed in Table 4.2.

Table 4.2 Construction activity undertaken during November 2007 to January 2008

Month	Construction task item
November 2007 to January 2008	Piling works Construction of retaining wall , Gabion wall and box culvert

4.3 Audit summary of non-compliances of the environmental quality performance limits from November 2007 to January 2008

Non-compliance regarding the monitored parameters was achieved in this review period. The summary of non-compliance is shown in Table 4.3.

Table 4.3 Summary of Monitoring Non-Compliance

Monitored Parameter	November 2007		December 2007		January 2008	
	Action	Limit	Action	Limit	Action	Limit
Air	3 x 1-hour TSP	0	0	0	0	0
	1 x 24-hour TSP	0	0	0	0	0
Noise	1 x Leq 30 min.	0	0	0	0	0
Water	Turbidity	2	0	0	1	0
	Suspended Solid	1	1	0	1	0
	DO	0	0	0	0	0

Remark: The number of non-compliances is shown

4.4 Review of the events of non-compliance

Water Quality

Exceedance events of turbidity and suspended solids were recorded occasionally at various monitoring stations. The scenario was deemed to be attributed to the prevailing water quality in which soil deposited along the riverbed brought up into the existing water body under the influence of tidal effect and surface runoff after heavy rain.

4.5 Action taken in the event of non-compliance

Noise level

The range and variation of the daytime noise level measurements were comparable to the attained baseline data. Construction sourced activity was not considered influencing any nuisance impact to the sensitive receivers. The noise emanating from vehicular road traffic was found to be the major influential factor dominating the noise environment.

Water Quality

In this reporting quarter, there were some reported exceedances based on the pre-established levels. The Contractor was urged to conduct effective mitigation measures (e.g. provide covering for open stockpiles/exposed areas, installation of silt curtains or deploy sandbag barrier at site boundary areas) to avoid potential surface run-off discharged into watercourses.

5. Summary of Complaints, Summons and Successful Prosecutions

No documented correspondence regarding summons and successful prosecutions in association with the construction activities was received in this three month period under review. However, four documented complaints concerning noise, muddy water and air were received in this reporting quarter. The monthly summary of complaints, summons and prosecutions received in this review quarter is presented in Table 5.1.

Table 5.1 Monthly Summary of Complaints Received

Parameter	November 2007	December 2007	January 2008
Air	1	0	1
Noise	0	0	1
Water	1	0	0

The first complaint was recorded on 15/11/2007 regarding muddy water was found in Ho Chung River and Tai Chung River. In response to the complaint, the Contractor had enforced mitigation measures (i.e. increase the number of silt curtains or enclose the active working areas with silt curtains) to minimize water pollution impact. The second complaint was registered on 22/11/2007. The scenario was concerning construction dust observed near Ho Chung River. To address this complaint, the Contractor had increased the frequency of water spraying in order to keep reasonably wetted of main access road. Corresponding site investigations were performed on 21 and 24 November 2007 respectively.

The resting two complaints were received on 19/01/2008 and 22/01/2008 concerning noise and dust nuisance respectively at Sha Ha and Ho Chung. Site Investigation is scheduled on 15/02/2008. Compliant log and the follow up actions will be provided in the coming EM&A Report.

6. Comments and Conclusions for November 2007 to January 2008

Air Quality

Ad hoc air quality monitoring at the project site will only be conducted by ET when instructed by the ER/IC(E) or on receipt of complaint. However, the Contractor should deploy dust mitigation measures to reduce potential impacts from constructional works to a minimum, which include frequent water spraying at dust generation areas.

Noise Level

In the past three months the noise levels attained have shown mainly full compliance to quality performance limits.

Overall, the noise level around the project was comparable to the baseline data with insignificant impact on the local environment.

Construction sourced noise have not engendered any contributory impact on the environment whereby the noise emanating from vehicular road traffic was found to be the major influential factor dominating the noise environment.

Water Quality

So far, water monitoring revealed that the water quality was not significantly affected by the construction works but subject to the effect of seasonal variations of water quality or tidal effect at sampling points. In addition, weather conditions are another crucial factor to affect water quality of the three rivers. The Contractor is advised to implement and maintain necessary mitigation measures so as to keep the disturbance on the water quality to minimal levels.

Appendix 1

Environmental Mitigation Measures

Air Quality Mitigation Measures

The Contractor shall be responsible for the design and implementation of these measures.

Below is a list of dust mitigation measures specified in the Contract specifications:

Work Area	Recommended Mitigation Measures
Sai Kung River	Twice daily watering of the work site with active operations (material handling and haul roads) when the weather and the work site are dry.
Pak Kong River	Twice daily watering of the work site with active operations (material handling and haul roads) when the weather and the work site are dry.
	Extensive watering of the haul roads (at least every two hours daily) to keep the haul roads in wet condition.
Ho Chung Channel	Twice daily watering of the work site with active operations (material handling) when the weather and the work site are dry.
	Extensive watering of the haul roads (at least every two hours daily) to keep the haul roads in wet condition.

- The dust control measures stipulated in the Air Pollution Control (Construction Dust) Regulation shall be incorporated in the contract specifications. These shall be implemented during construction in order to reduce dust impact to within the acceptable criteria of 500mgm^{-3} . Typical control measures are:
 - skip hoist for material transport should be totally enclosed by impervious sheeting;
 - every vehicle should be washed to remove any dusty materials from its body and wheels before leaving the construction site;
 - the area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;
 - where a site boundary adjoins a road, streets or other accesses to the public, hoarding of not less than 2.4 m high from ground level should be provided along the entire length except for a site entrance or exit;
 - all dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet;
 - all stockpiles of aggregate or spoil should be covered and water applied;
 - the height from which excavated materials are dropped should be controlled to a minimum practical height to limit fugitive dust generation from unloading; and
 - the load of dusty materials carried by vehicle leaving a construction site should be covered entirely by clean impervious sheeting to ensure dust materials do not leak from the vehicle.

In addition, the speed of haul road traffic should be limited to 10 km per hour.

The following odour control measures are recommended in the EIA Report:

- any odorous dredged material should be placed remote from air sensitive receivers;
- any odorous permitted stockpiled material should be removed within two days of work to reduce the amount of time available for decomposition; and

- any odorous permitted stockpiled material should be covered with plastic tarpaulin sheets.
- If the above measures are not sufficient to restore the air quality to acceptable levels upon the advice of ET Leader, the Contractor shall liaise with the ET Leader on some other mitigation measures, propose to ER for approval, and implement the mitigation measures.

Noise Mitigation Measures

The Contractor shall be responsible for the design and implementation of these measures:

- Use of quiet Powered Mechanical Equipment (PME)
- Use of movable noise barriers
- Use of temporary noise barriers

If the above measures are not sufficient to restore the construction noise quality to acceptable levels upon the advice of ET Leader, the Contractor shall liaise with the ET Leader on some other mitigation measures, propose to ER and IC(E) for approval, and carry out the mitigation measures

Water Quality Mitigation Measures

The Contractor shall be responsible for the design and the implementation of these measures.

Below is a list of water mitigation measures specified in the Contract specifications :

Construction Phase

Channel Excavation Works

- Regarding to the impacts on water quality, it is very important to properly schedule the construction activities. The excavation works for the earth channel construction would be carried out along the three streams. Wet excavation should be reduced as much as possible. Due to the characteristics of narrow width and small water flow of the original channel, the excavation can be carried out in dry condition (even in wet season) by diverting the stream flow from upstream by a temporary drainage channel or narrowing the river/stream with a temporary earth bund or barrier. Containment measures such as bunds and barriers should be used within the river/stream to prevent water from entering the excavation area. The temporary drainage channel would be backfilled when the construction works are completed or the temporary diversion is no longer required. Although flooding of the proposed contaminant section seldom occurs during the dry season, the excavation would consider to temporarily stop when flood water enter the containment causing leakage of runoffs to stream water.
- To further minimise the leakage and loss of sediments during excavation, tightly sealed closed grab excavators should be employed in river sections where material to be handled is wet. Where material is dry and in non-river sections, conventional excavations can be used.

Construction Run-off and Drainage

The site practices outlined in *ProPECC PN 1/94 "Construction Site Drainage"* should be followed as far as practicable in order to minimise surface runoff and the chance of erosion, and also to retain and reduce any suspended solids prior to discharge. These practices include the following items:

- Before commencing any site formation work, all sewer and drainage connections should be sealed to prevent debris, soil, sand etc. from entering public sewers/drains.
- Temporary ditches should be provided to facilitate run-off discharge into appropriate watercourses, via a silt retention pond.
- Boundaries of earthworks should be marked and surrounded by dykes or embankments for flood protection, as necessary.
- Sand/silt removal facilities such as sand traps, silt traps and sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standard under the Water Pollution Control Ordinance. The design of silt removal facilities should be based on the guidelines provided in ProPECC PN 1/94. All drainage facilities and erosion and sediment control structures should be inspected monthly and maintained to ensure proper and efficient operation at all times and particularly during rainstorms.

- Water pumped out from foundation excavations should be discharged into silt removal facilities.
- Careful programming of the works to minimise surface excavations for the drainage improvement works during the wet season. If excavation of soil cannot be avoided during the wet season, exposed slope surfaces should be covered by a tarpaulin or other means. Other measures that need to be implemented before, during, and after rainstorms are summariseised in ProPECC PN 1/94.
- Exposed soil areas should be minimizeised to reduce potential for increased siltation and contamination of runoff.
- Earthwork final surfaces should be well compacted and subsequent permanent work should be immediately performed.
- Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms.

General Construction Activities

- Debris and refuse generated on-site should be collected, handled and disposed of properly to avoid entering the adjacent watercourses. Stockpiles of cement and other construction materials should be kept covered when not being used.
- Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents to the river/streams, all fuel tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event.

Sewage from Construction Workforce

- Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site where necessary to handle sewage from the workforce. A licensed contractor would be responsible for appropriate disposal and maintenance of these facilities.

Operation Phase

- Desilting of the three river channels should be carried out during periods of low flow (i.e. dry season, from November to March).

Accidental Spillage of Chemicals on Site

- In case of the occurrence of accidental spillage of chemicals, it is required to take immediate actions to control the release of chemicals into the nearby water bodies. It is recommended that the contractor of the project should develop an emergency plan to deal with accidental spillage of chemicals in the construction site.
- Good site practices would avoid the accidents to occur. Areas for chemical storage should be securely locked and kept as far from the drainage systems or stream courses as possible. The storage area should have an impermeable floor and bunding of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest, to minimise the impacts from any potential accidents.
- Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance. The Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published under the Waste Disposal Ordinance details the requirements to deal with chemical wastes. General requirements are given as follows:
 - Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport;
 - Chemical waste containers should be suitably labelled to notify and warn the personnel who are handling the wastes to avoid accidents; and

Storage area should be selected at a safe location on site and adequate space should be allocated to the storage area

Appendix 2

Waste Management Guideline

Waste Management

Below is a list of waste material mitigation measures specified in the Contract specifications:

Good Site Practices and Waste Reduction Measures

- Appropriate waste handling, transportation and disposal methods for all waste arisings generated during the construction works shall be implemented to ensure that construction wastes do not enter the river and stream channels.
- It is expected that adverse impacts from waste management would not arise, provided that good site practices are strictly followed. Recommendations for good site practices during construction to be carried out by the Contractor include:
 - nomination of approved personnel, such as a site manager, to be responsible for good site practices, and making arrangements for collection of all wastes generated at the site and effective disposal to an appropriate facility;
 - training of site personnel in proper waste management and chemical waste handling procedures;
 - provision of sufficient waste disposal points and regular collection for disposal;
 - appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;
 - separation of chemical wastes for special handling and appropriate treatment at the Chemical Waste Treatment Facility;
 - regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
 - a recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be proposed; and
 - a Waste Management Plan shall be prepared by the Contractor and submitted to ER for approval. One may make reference to ETWB TCW No. 15/2003 for details.
- In order to monitor the disposal of C&D material at landfills and public filling areas, as appropriate, and to control fly tipping, a trip-ticket system shall be included as one of the contractual requirements to be implemented by the Contractor and audited by the ET. One may make reference to ETWB TCW No. 31/2004 for details.
- Good management and control can prevent the generation of significant amounts of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction to be carried out by the Contractor include:
 - segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
 - to encourage collection of aluminium cans by individual collectors, separate labelled bins shall be provided to segregate this waste from other general refuse generated by the work force;

- any unused chemicals or those with remaining functional capacity shall be recycled;
 - maximising the use of reusable steel formwork to reduce the amount of C&D material;
 - prior to disposal of C&D waste, it is recommended that wood, steel and other metals shall be separated for re-use and / or recycling to minimise the quantity of waste to be disposed of to landfill;
 - proper storage and site practices to minimise the potential for damage or contamination of construction materials; and
 - plan and stock construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste.
- In addition to the above good site practices and waste reduction measures, specific mitigation measures are recommended below for the identified waste arisings to minimise environmental impacts during handling, transportation and disposal of these wastes.

Construction and Demolition Material

- The C&D material generated from the river improvement works would comprise public fill, being excavated soil and small rocks. To minimise off-site disposal of public fill, the excavated material with suitable characteristics/size should be reused on-site as fill material as far as practicable, such as for backfilling of temporary drainage channels or construction of embankments, and small cobbles and rocks should be used in the construction of the recreated channel bed.
- When disposing C&D material at a public filling area, it shall be noted that the material shall only consist of soil, rock, concrete, brick, cement plaster/mortar, inert building debris, aggregates and asphalt. The material shall be free from marine mud, household refuse, plastic, metals, industrial and chemical waste, animal and vegetable matter, and other material considered to be unsuitable by the Filling Supervisor.
- The C&D material generated from demolition of existing structures should be sorted on-site into inert C&D material (that is, public fill) and C&D waste. The proposed disposal sites for the public fill and C&D waste are the Fill Bank at Tseung Kwan O Area 137 and SENT Landfill, respectively. Suitable areas should be designated within the works site boundaries for temporary stockpiling of C&D material. Within stockpile areas, the following measures should be taken to control potential environmental impacts or nuisance:
 - covering material during heavy rainfall;
 - locating stockpiles to minimise potential visual impacts; and
 - minimising land intake of stockpile areas as far as possible.

Excavated Riverbed Material

- It is anticipated that the excavated riverbed material may need to be temporarily stockpiled on-site prior to disposal off-site. Details of environmental control measures to be taken at the stockpiling area to prevent water pollution are discussed in *Section 4*. Use of water-tight trucks would be required for the transportation of excavated riverbed material to the designated barging point for disposal at the designated public filling area, or transported directly to the public filling area. The proposed disposal site for the excavated material is the Fill Bank at Tseung Kwan O Area 137.

Chemical Wastes

- If chemical wastes are produced at the construction site, the Contractor shall be required to register with the EPD as a Chemical Waste Producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosives, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport and dispose of the chemical wastes generated at the Chemical Waste Treatment Centre at Tsing Yi, or other licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

General Refuse

- General refuse should be stored in enclosed bins or compaction units separate from C&D material. A reputable waste collector shall be employed by the Contractor to remove general refuse from the site, separately from C&D material. An enclosed and covered area is preferred to reduce the occurrence of 'wind blown' light material. Waste Management

Appendix 3

Environmental Mitigation Measures Implementation Schedule

Environmental Mitigation Measures Implementation Schedule

Air Quality

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
S3.8.4	<p><u>Sai Kung River</u></p> <ul style="list-style-type: none"> Twice daily watering of the work site with active operations (material handling and haul roads) when the weather and the work site are dry. <p><u>Ho Chung Channel and Pak Kong River</u></p> <ul style="list-style-type: none"> Twice daily watering of the work site with active operations (material handling) when the weather and the work site are dry. Extensive watering of the haul roads (at least every two hours daily) to keep the haul roads in wet condition 	Work site / During construction period	Contractor		✓		Air Pollution Control (Construction Dust) Regulation
S3.8.6	Dust mitigation measures stipulated in the <i>Air Pollution Control (Construction Dust) Regulation</i> shall be incorporated to control dust emission. Notice shall be given to the authority prior to commencement of works.	Work site / During construction period	Contractor		✓		Air Pollution Control (Construction Dust) Regulation
S3.8.7	The speed of haul road traffic should be limited to 10 kph..	Work site / During construction period	Contractor		✓		Air Pollution Control (Construction Dust) Regulation
S3.8.8	To minimise odour nuisance at nearby ASRs, the following odour control measures are recommended: <ul style="list-style-type: none"> any odorous dredged material should be placed remote from air sensitive receivers; any odorous permitted stockpiled material should be removed within two days of work to reduce the amount of time available for decomposition; and any odorous permitted stockpiled material should be covered with plastic tarpaulin sheets.. 	Work site / During construction period	Contractor		✓		Air Pollution Control (Construction Dust) Regulation

All recommendations and requirements resulted during the course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project.

* Des - Design, C - Construction, and O – Operation, and Dec - Decommissioning

Noise Level

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
S 4.8.1-S4.8.3	Use of quiet PME	Work site / During the construction period	Contractor		✓		ProPECC PN2/93 and Noise Control Ordinance
S 4.8.4-S4.8.10	Use of movable noise barriers and temporary noise barrier	Work site / During the construction period	Contractor		✓		ProPECC PN2/93 and Noise Control Ordinance
S 4.8.11	<p><i>Good Site Practice</i></p> <ul style="list-style-type: none"> ▪ Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction program; ▪ Silencers or mufflers on construction equipment should be utilised and should be properly maintained during the construction program; ▪ Mobile plant, if any, should be sited as far from NSRs as possible; ▪ Machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum; ▪ Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the nearby NSRs; and ▪ Material stockpiles and other structures should be effectively utilised, wherever practicable, in screening noise from on-site construction activities. 	Work site / During the construction period	Contractor		✓		ProPECC PN2/93 and Noise Control Ordinance
S4.10.1	Environmental Monitoring and Audit (EM&A) programme is recommended to be implemented during the construction stage.	Work site / During the construction period	Contractor		✓		-

All recommendations and requirements resulted during the course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project.

* Des - Design, C - Construction, and O – Operation, and Dec - Decommissioning

Water Quality

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
S5.8.2 – S5.8.3	<p>Channel Excavation Works</p> <ul style="list-style-type: none"> Excavation to can be carried out in dry condition (even in wet season) by diverting the stream flow from upstream by a temporary drainage channel or narrowing the river/stream with a temporary earth bund or barrier. Containment measures such as bunds and barriers should be used within the river/stream to prevent water from entering the excavation area. Tightly sealed closed grab excavators should be employed in river sections where material to be handled is wet. Where material is dry and in non-river sections, conventional excavations can be used. 	Work site / During the construction period	Contractor		✓		-
S5.8.5	<p>Construction Runoff and Drainage</p> <ul style="list-style-type: none"> Before commencing any site formation work, all sewer and drainage connections should be sealed to prevent debris, soil, sand etc. from entering public sewers/drains. Temporary ditches should be provided to facilitate run-off discharge into appropriate watercourses, via a silt retention pond. Boundaries of earthworks should be marked and surrounded by dykes or embankments for flood protection, as necessary. Sand/silt removal facilities such as sand traps, silt traps and sediment basins should be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standard under the WPCO. The design of silt removal facilities should be based on the guidelines provided in ProPECC PN 1/94. All drainage facilities and erosion and sediment control structures should be inspected monthly and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. Water pumped out from foundation excavations should be discharged into silt removal facilities. Careful programming of the works to minimise surface excavations for the drainage improvement works during the wet season. If excavation of soil cannot be avoided during the wet season, exposed slope surfaces should be covered by a tarpaulin or other means. Other measures that need to be implemented before, during, and after rainstorms are summarised in ProPECC PN 1/94. Exposed soil areas should be minimised to reduce potential for increased siltation and contamination of runoff. Earthwork final surfaces should be well compacted and subsequent permanent work should be immediately performed. Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms. 	Work site / During the construction period	Contractor		✓		ProPECC PN 1/94; WPCO

Water Quality (continued)

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages	Relevant Legislation and Guidelines
-----------	---	-------------------	----------------------	-----------------------	-------------------------------------

S5.8.6-S5.8.7	<p>General Construction Activities</p> <ul style="list-style-type: none"> ▪ Debris and refuse generated on-site should be collected, handled and disposed of properly to avoid entering the adjacent watercourses. Stockpiles of cement and other construction materials should be kept covered when not being used. ▪ Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents to the river/streams, all fuel tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event. 	Work site / During the construction period	Contractor		✓	ProPECC PN 1/94; WPCO
S5.8.8	<p>Sewage from Construction Workforce</p> <ul style="list-style-type: none"> ▪ Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site where necessary to handle sewage from the workforce. A licensed contractor would be responsible for appropriate disposal and maintenance of these facilities. 	Work site / During the construction period	Contractor		✓	WPCO

Water Quality (continued)

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines	
S5.8.10- S5.8.12	<p>Accidental Spillage of Chemicals on Site</p> <ul style="list-style-type: none"> ▪ In case of the occurrence of accidental spillage of chemicals, it is required to take immediate actions to control the release of chemicals into the nearby water bodies. It is recommended that the contractor of the project should develop an emergency plan to deal with accidental spillage of chemicals in the construction site. ▪ Good site practices would avoid the accidents to occur. Areas for chemical storage should be securely locked and kept as far from the drainage systems or stream courses as possible. The storage area should have an impermeable floor and bunding of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest, to minimise the impacts from any potential accidents. ▪ Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance. The Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published under the Waste Disposal Ordinance details the requirements to deal with chemical wastes. General requirements are given as follows: <ul style="list-style-type: none"> ➤ Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport; ➤ Chemical waster containers should be suitably labelled to notify and warn the personnel who are handling the wastes to avoid accidents; ➤ Storage area should be selected at a safe location on site and adequate space should be allocated to the storage area. 	Work site / During the construction period			✓		WPCO	
S5.10.1	<ul style="list-style-type: none"> ▪ Water quality monitoring requirements and regular audit during construction phase should be carried out. 	Drainage channel / During the operation period	Contractor			✓		-

All recommendations and requirements resulted during the course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project.

* Des - Design, C - Construction, and O – Operation, and Dec - Decommissioning

Waste Management

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
S6.5.2 – S6.5.3	<p>Good Site Practices and Waste Reduction Measures</p> <p>Good site practices during the construction activities include:</p> <ul style="list-style-type: none"> ➤ Nomination of approved personnel, such as a site manager, to be responsible for good site practices and making arrangements for collection of all wastes generated at the site and effective disposal to an appropriate facility. ➤ Training of site personnel in proper waste management and chemical waste handling procedures. ➤ Provision of sufficient waste disposal points and regular collection for disposal. ➤ Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers. ➤ Separation of chemical wastes for special handling and appropriate treatment at the Chemical Waste Treatment Facility. ➤ Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors. ➤ A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) shall be proposed. ➤ A Waste Management Plan shall be prepared and submitted to the Engineer for approval. One may make reference to ETWB TCW No. 15/2003 for details. ➤ In order to monitor the disposal of C&D materials at landfills and public filling areas, and to control fly tipping, a trip-ticket system shall be included as one of the contractual requirements. One may make reference to ETWB TCW No. 321/20042 for details. 	Work site / During the construction period	Contractor		✓		Waste Disposal Ordinance (Cap.54), WBTC No.21/2002, ETWB TCW No. 15/2003, ETWB TCW No. 31/2004
S6.5.9	<p>Excavated Riverbed Material</p> <p>Use of water-tight trucks for the transportation of excavated riverbed material to the designated barging point for disposal at the designated public filling area, or transported directly to the public filling area. General Refuse</p>	Work site / During the construction period	Contractor		✓		WDO

Waste Management (continued)

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
S6.5.11	<p>General Refuse</p> <p>General refuse shall be stored in enclosed bins or compaction units separate from C&D material. A reputable waste collector shall be employed by the contractor to remove general refuse from the site, separately from C&D material. An enclosed and covered area is preferred to reduce the occurrence of 'wind blown' light material.</p>	Work site / During the construction period	Contractor		✓		Public Health and Municipal Services Ordinance (Cap. 132)
S6.5.10	<p>Chemical Waste</p> <p>If chemical wastes are produced at the construction site, the Contractor shall register with the EPD as a Chemical Waste Producer and follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes shall be used, and incompatible chemicals shall be stored separately. Appropriate labels shall be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosives, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport and dispose of the chemical wastes generated at the Chemical Waste Treatment Centre at Tsing Yi, or other licencedlicensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.</p>	Work site / During the construction period	Contractor		✓		Waste Disposal (Chemical Waste) (General) Regulation

All recommendations and requirements resulted during the course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project.

* Des - Design, C - Construction, and O – Operation, and Dec - Decommissioning

Land Contamination

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
S.7.7.2 – S.7.7.3	<p>Land Contamination Assessment</p> <p>A full site inspection is required by the future Environmental Team immediately after the site was resumed should be undertaken to review the validity of the preliminary CAP and define the exact sampling locations and sampling parameters for further site investigation.</p> <p>An updated CAP shall then be prepared after the site inspection in accordance with EPD's "Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshops" and submitted to EPD for approval endorsed by EPD prior to commencement of the site investigation.</p> <p>Upon receipt of EPD's approval on the updated CAP, the actual site investigation for land contamination impact assessment shall be conducted according to the approved CAPly before any construction work started at the identified contaminated sites.</p> <p>A Contamination Assessment Report (CAR) shall be compiled to document the findings and shall include interpretation of laboratory testing results in accordance with the <i>ProPECC Note No. 3/94</i> and comparison of the findings with relevant standards, such as the Dutch guidelines or other international practices as appropriate.</p> <p>If land contamination is confirmed, a Remediation Action Plan (RAP) shall be drawn up to formulate necessary remedial measures and potential water quality impact to the river shall be also addressed if necessary in the remediation measures. The subsequent CAR and RAP shall be endorsed by EPD before implementation of any remedial technology.</p> <p>The contaminated sites should be remediated before commencement of any construction work at the concerned sites which may disturb the ground. The duration of remediation should be taken into account by the Project Proponent or the Contractor as part of the construction programme.</p>	Identified areas which require specific contamination investigation /After land resumption and during construction period	Contractor		✓		ProPECC PN3/94 and Guidance Notes for Investigation and Remediation of Contaminated Sites of: Petrol Filling Stations, Boatyards, and Car Repair / Dismantling Workshops

Land Contamination (continued)

EIA Ref#	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
S.7.9.1	<p>Mitigation Measures</p> <p>Mitigation measures for handling of the the identified areas contaminated materials are recommended to minimise the potentially adverse effects on the health and safety of construction workers and the impacts arising from the disposal of potentially contaminated materials. These measures include:</p> <ul style="list-style-type: none"> ➤ Construction workers' potential contact with contaminated materials should be minimised by using bulk earth-moving excavator equipment; ➤ Exposure to any contaminated materials should be minimised by wearing appropriate clothing and personal protective equipment such as gloves and masks (when interacting directly with suspected contaminated material), providing adequate hygiene and washing facilities and preventing smoking and eating during such activities; ➤ Stockpiling of contaminated excavated materials on site should be avoided as far as possible; ➤ The use of contaminated soil for landscaping should be prohibited unless there is proper treatment of soil; ➤ Vehicles containing any excavated materials should be suitably covered to limit potential dust emissions or contaminated wastewater run-off, and truck bodies and tailgates should be sealed to prevent any discharge during transport or during wet conditions; ➤ Only licensed waste haulers should be used to collect and transport any contaminated material to an appropriate disposal site and procedures should be developed to ensure that illegal disposal of waste does not occur; ➤ The necessary waste disposal permits should be obtained, as required, from the appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap 354), Waste Disposal (Chemical Waste) (General) Regulation (Cap 35), as required; ➤ Records of the quantities of wastes generated and disposed of should be maintained; and ➤ In accordance with good construction practice, silt traps should be used to reduce the impact to drainage caused by suspended solids arising from disturbed ground, or any construction materials such as cement and gravel. Wastewater, surface runoff or extracted groundwater should be disposed of in accordance with the WPCO. 	Contaminated sites identified in the CAR / During construction period	Contractor		✓		Waste Disposal Ordinance, Waste Disposal (Chemical Waste) (General) Regulation.

All recommendations and requirements resulted during the course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project.

* Des - Design, C - Construction, and O – Operation, and Dec - Decommissioning

Ecological Requirements

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
S8.7.2 & S8.7.5	<ul style="list-style-type: none"> ▪ For the Sai Kung River, the base of the improved channel should be lined with natural substrates (e.g., gravel, cobbles and boulders). Substrates found in the existing river section should be used to line the new channel. Substrates lining the improved channel should be arranged to re-create the existing riffle-pool sequence found in the river. Pits would be provided in the gabion to allow planting of herbaceous riparian vegetation. ▪ For the Ho Chung River, newly widened sections of riverbed should be lined with natural substrates (e.g., cobbles and boulders), with the size and arrangement of these substrates selected to complement adjacent areas of the existing riverbed. The substrates should be sourced as far as practicable from materials excavated during the river widening. Pits should be provided in the gabion to allow planting of herbaceous riparian vegetation. 	Work site / During planning & design stage, construction stage	Contractor	✓	✓		-
S8.7.10 & S8.8.5	<ul style="list-style-type: none"> ▪ At the Sai Kung and Ho Chung Rivers the following measures would be implemented: ▪ Drainage improvement works would be limited to downstream sections of the existing rivers. ▪ Within the proposed works areas, drainage improvement works would be conducted in sections (approximately 250m in length) along only one bank of the river at a time. Excavation works would be restricted to an enclosed dry section of the river, with containment measures such as bunds and barriers used within the river to minimise the impacts upon the downstream water body. Using this approach to construction works, only localised areas of the river would be subject to disturbance at any one time, and flow would be maintained within the rivers. ▪ The excavation works for channels should be carried out in the dry condition, with construction carried out by land-based plant. Excavation works should be restricted to an enclosed dry section of the river, with containment measures such as bunds and barriers used within the river to minimise the impacts upon the downstream water body. Site runoff should be directed towards regularly cleaned and maintained silt traps and oil/grease separators to minimise the risk of sedimentation and pollution of river water. The silt and oil/grease separators should be appropriately designed for the local drainage and ground conditions. To minimise leakage and loss of sediments during excavation in narrow channels, tightly sealed closed grab excavators should be deployed where material to be handled is wet 	Work site/during construction phase	Contractor		✓		-

Ecological Requirements (continued)

EIA Ref#	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
S8.8.6	Noise mitigation measures including the use of quiet construction plant and temporary noise barriers (Section 4 of the EIA report refers) should be implemented to minimise disturbance to habitats adjacent to the works areas. In particular, measures such as noise barriers should be used to minimise disturbance to the bat roost identified close to the Pak Kong works area.	Pak Kong/during construction phase	Contractor		✓		-
S8.8.7	Two small trees and six seedlings of the rare tree species Ehretia acuminata recorded on the southern bank of the existing Ho Chung River to be transplanted to another area within the Ho Chung site boundary before the commencement of construction phase activities. The exact location for transplantation would be confirmed during the design stage. Fencing would be erected around the transplanted trees/seedlings to minimise potential construction phase disturbance.	Ho Chung works site/before construction phase	Contractor		✓		-
S8.8.9	Seeds from the existing Ehretia acuminata trees should be collected and propagated. The seeds should be collected from mature fruits (the fruiting period of E. acuminata is from May to September) prior to transplantation, and germinated in containers under suitable conditions. Following germination and growth, the seedlings should be planted at suitable locations within the Ho Chung Works Area (to be determined during the detailed design stage). The survival of newly planted seedlings should be monitored. Seed collection, propagation, planting and monitoring of E. acuminata should be undertaken by a suitably qualified botanist/horticulturalist appointed by the Project Proponent. A detailed methodology for these works should be formulated during the detailed design stage of the Project, in consultation with AFCD.	Ho Chung works site/before construction phase	Contractor		✓		-
S8.8.14	The improved Ho Chung River is expected to provide a suitable habitat for fish communities previously recorded from the river. To further increase the value of the River for fish communities, it is recommended that small fish ladders are to be constructed over the weirs along the river channel. Existing weirs within the river currently impede the movement of fish between upstream and downstream sections of the river. The fish ladders would facilitate movement past these obstacles, extending the range of fish communities in both upstream and downstream areas. The detailed design of the ladders would be submitted to AFCD for comment and approval before finalisation.	Work site / During planning & design stage, and construction stage	Contractor	✓	✓		-

Ecological Requirements (continued)

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
S8.8.15- S8.8.16	<ul style="list-style-type: none"> ▪ Extensive planting of trees and other vegetation along the banks of the newly created channels would be implemented ▪ Compensatory planting should make use of native plant species with flowers/fruits attractive to wildlife. 	Works site/during construction phase	Contractor		✓		-
S8.10.1	The proper implementation of ecological mitigation measures should be audited. Details are provided in the EM&A Manual.	Works site/during construction phase	Contractor/ET	✓	✓		-
S8.10.2- S8.10.3	<ul style="list-style-type: none"> ▪ A specific monitoring programme of channels constructed to replace Sai Kung and Ho Chung Rivers is recommended. Details are provided in the EM&A Manual. ▪ Contingency plan should be implemented if the post-construction phase monitoring demonstrates that re-colonisation is unsuccessful. Details are provided in the EM&A Manual. 	Works site/before and during construction phase, operation phase	Contractor /Ecologist appointed by Project Proponent (DSD)	✓	✓	✓	-
S8.10.4	Regular monitoring of the trees and seedlings covering the 12-month period following transplantation and planting should be conducted by a suitably qualified botanist/horticulturalist appointed by the Project Proponent. Details are provided in the EM&A Manual.	Ho Chung works site/before and during construction phase	botanist/ horticulturalist appointed by the Project Proponent (DSD)	✓	✓		-

All recommendations and requirements resulted during the course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project.

* Des - Design, C - Construction, and O – Operation, and Dec - Decommissioning

Landscape and Visual

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
Fig A9.12A	<p><i>LMM 1 - Gabions with Pits to Plant Riparian Vegetation</i></p> <ul style="list-style-type: none"> During detailed design, there should be co-ordination between the designers to ensure that pits are allowed in gabions with sufficient soil for the planting of riparian vegetation. 	Works site/during construction phase	12 months establishment period: Contractor Operation: DSD		✓	✓	DSD Particular Specification WBTC 2/2004
Fig A9.12A	<p><i>LMM 2 - Rip Rap and Riffles Treatment to Channel Base</i></p> <ul style="list-style-type: none"> The channel base should be covered in rip-rap which is considered to be more aesthetically appropriate than fair-faced concrete. Riffles with different water depths should be created incorporating aquatic plants. 	Works site/during construction phase	12 months establishment period: Contractor Operation: DSD		✓	✓	DSD Particular Specification
Fig A9.12A	<p><i>LMM 3 – Surface Treatment of Flood Walls and Retaining Walls</i></p> <ul style="list-style-type: none"> At the design stage, there should be comprehensive planning by the designers to ensure that the appearance of flood walls incorporate aesthetic treatments which is considered to be aesthetically appropriate than fair-faced concrete. 	Works site/before and during construction phase	12 months establishment period: Contractor Operation: DSD		✓	✓	DSD Particular Specification
Fig A9.12B	<p><i>LMM 4 – Compensatory Planting along Drainage Channel</i></p> <ul style="list-style-type: none"> At the detailed design stage, tree and shrub planting should be included by the designer using amenity species along footpath areas or woodland seedling tree and shrub on slopes. 	Works site/during construction phase	12 months establishment period: Contractor Operation: DSD		✓	✓	WBTC 14/2002 WBTC 2/2004
Fig A9.12B	<p><i>LMM 5 – New Roadside Tree Planting along Access Roads</i></p> <ul style="list-style-type: none"> Allowance should be made for planting of heavy standard size trees in the ratio of one tree planted every tree felled 	Works site/during construction phase	12 months establishment period: Contractor Operation: DSD		✓	✓	WBTC 14/2002 WBTC 2/2004
Fig A9.12B	<p><i>LMM 6 - Grass Concrete Slabs</i></p> <ul style="list-style-type: none"> Grass concrete slabs should be used in maintenance access over covered culverts and access ramps to produce a more pronounced greening effect. 	Works site/during construction phase	12 months establishment period: Contractor Operation: DSD		✓	✓	DSD Particular Specification

All recommendations and requirements resulted during the course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project.

* Des - Design, C - Construction, and O – Operation, and Dec - Decommissioning

Cultural Heritage

EIA Ref #	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
S10.10.1	The Contractor should report to the Engineer, DSD and the AMO immediately for any discovery of the Antiquities or supposed antiquities during the course of the construction works.	Work site /during construction phase	Contractor		✓		Antiquities and Monuments Ordinance
S10.10.2	<p>Mitigation Measures during Construction Stage</p> <ul style="list-style-type: none"> ▪ <i>Higher earth god shrine:</i> Protective measures should be provided for the shrine if works are taken place in close proximity. The protective measures should consist of the following: (1) High visibility fencing at a distance of one meter around the shrine; and (2) Heavy duty plastic sheeting to be placed over the exterior surfaces of the shrine for duration of ongoing works. ▪ A pedestrian access path to the shrine should be maintained throughout the construction period. As the shrine is located within the works area, for purposes of public safety, the path should be marked with a temporary fence and the access route clearly marked by signage. ▪ <i>The Che Kung Temple, Ho Chung:</i> Vehicle parking is currently available in an open lot directly to the northwest of the temple. If the works area infringes on the parking area, alternative parking facilities should be made available. Clear signage for directions to the temple should be provided from Hiram's Highway. ▪ <i>Mature Trees along the banks of all three rivers:</i> The felling of mature trees should be avoided. If it is unavoidable, any trees that are removed from the area should be replaced by trees of the same species. 	Specified Resources / during construction phase	Contractor		✓		-

All recommendations and requirements resulted during the course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project.

* Des - Design, C - Construction, and O – Operation, and Dec - Decommissioning

Other EIA Requirements

EIA Ref#	Environmental Mitigation Measures / Mitigation Measures	Location / Timing	Implementation Agent	Implementation Stages			Relevant Legislation and Guidelines
				Des	C	O	
-	<p>Environmental Monitoring and Audit (EM&A)</p> <ul style="list-style-type: none"> ▪ Site inspection shall be carried out regularly by the Environmental Team (ET) to inspect construction activities to ensure that the recommended environmental protection and pollution control mitigation measures are properly implemented. Details of the requirements and procedures in conducting site inspections are given in the EM&A Manual. ▪ On the receipt of any complaints, the Environmental Team Leader (including co-operation s required from other parties) shall promptly undertake investigation work and the necessary actions carried out as based on the results of the investigation. Details of the recommended complaints handling procedures and actions are given in the EM&A Manual. 	Work site /during construction phase	Contractor and ET		✓		-

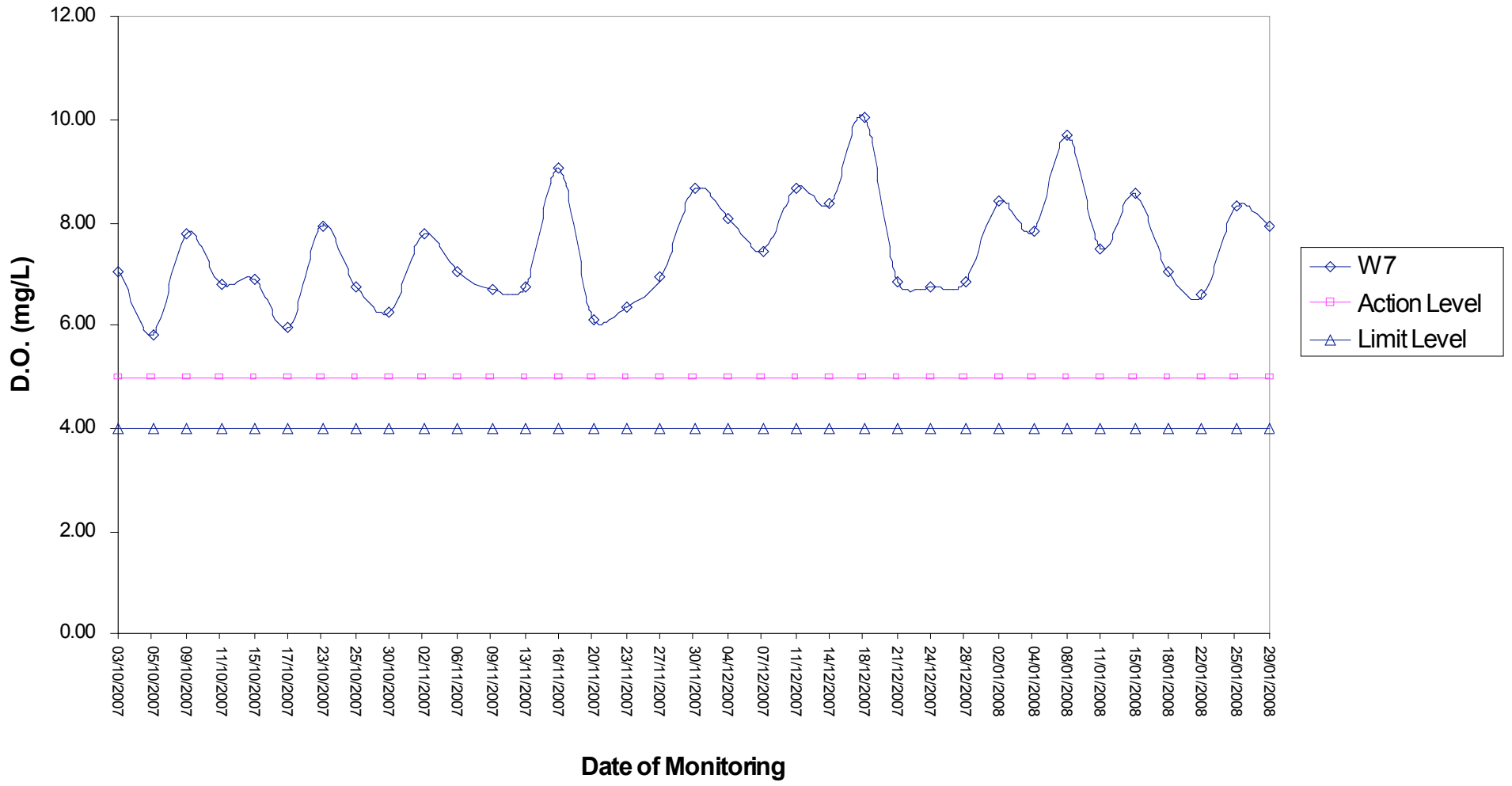
All recommendations and requirements resulted during the course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project.

* Des - Design, C - Construction, and O – Operation, and Dec - Decommissioning

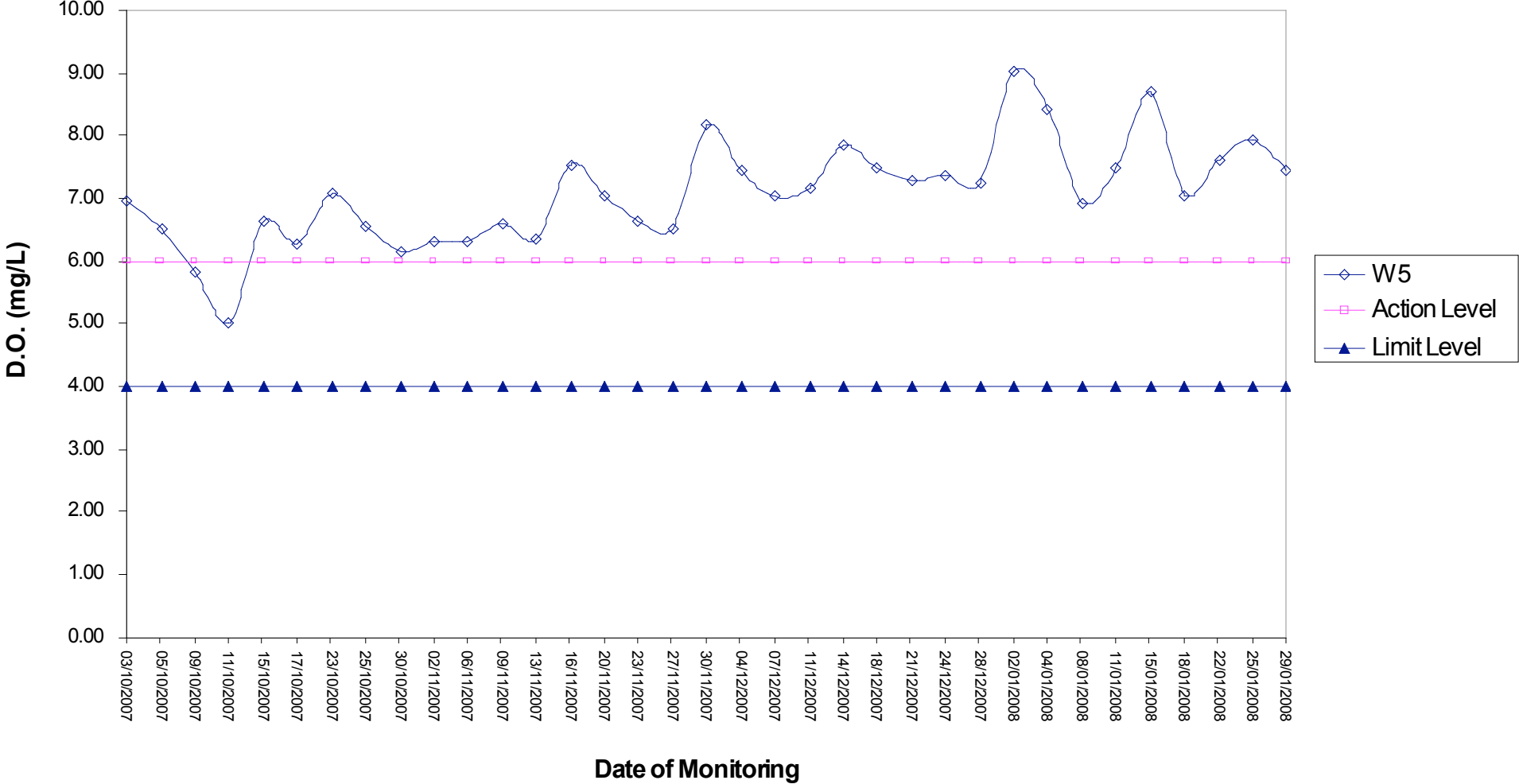
Appendix 4

Graphical Presentation of Noise Level and Water Quality Monitoring Data

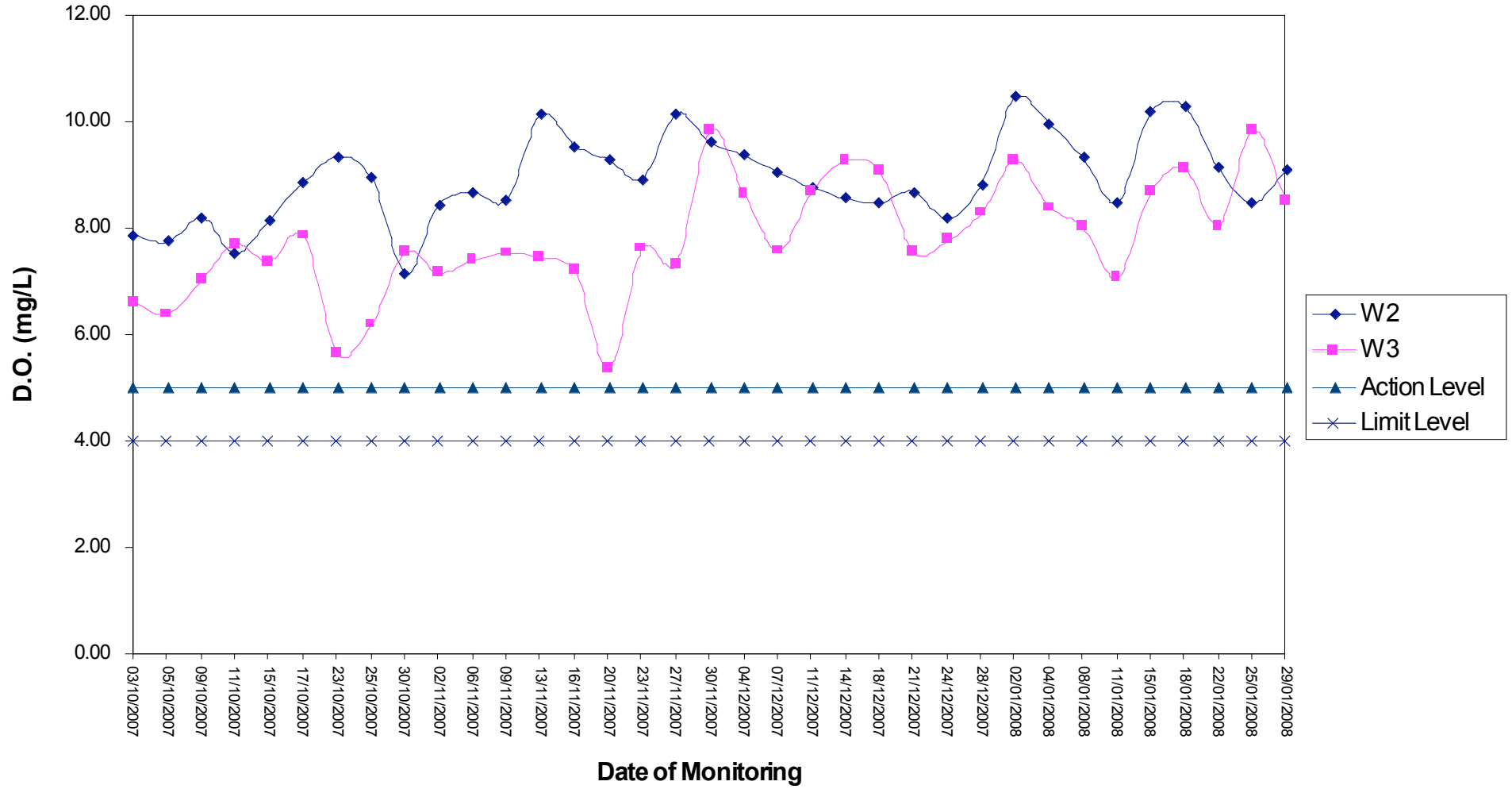
DO Level at Ho Chung River



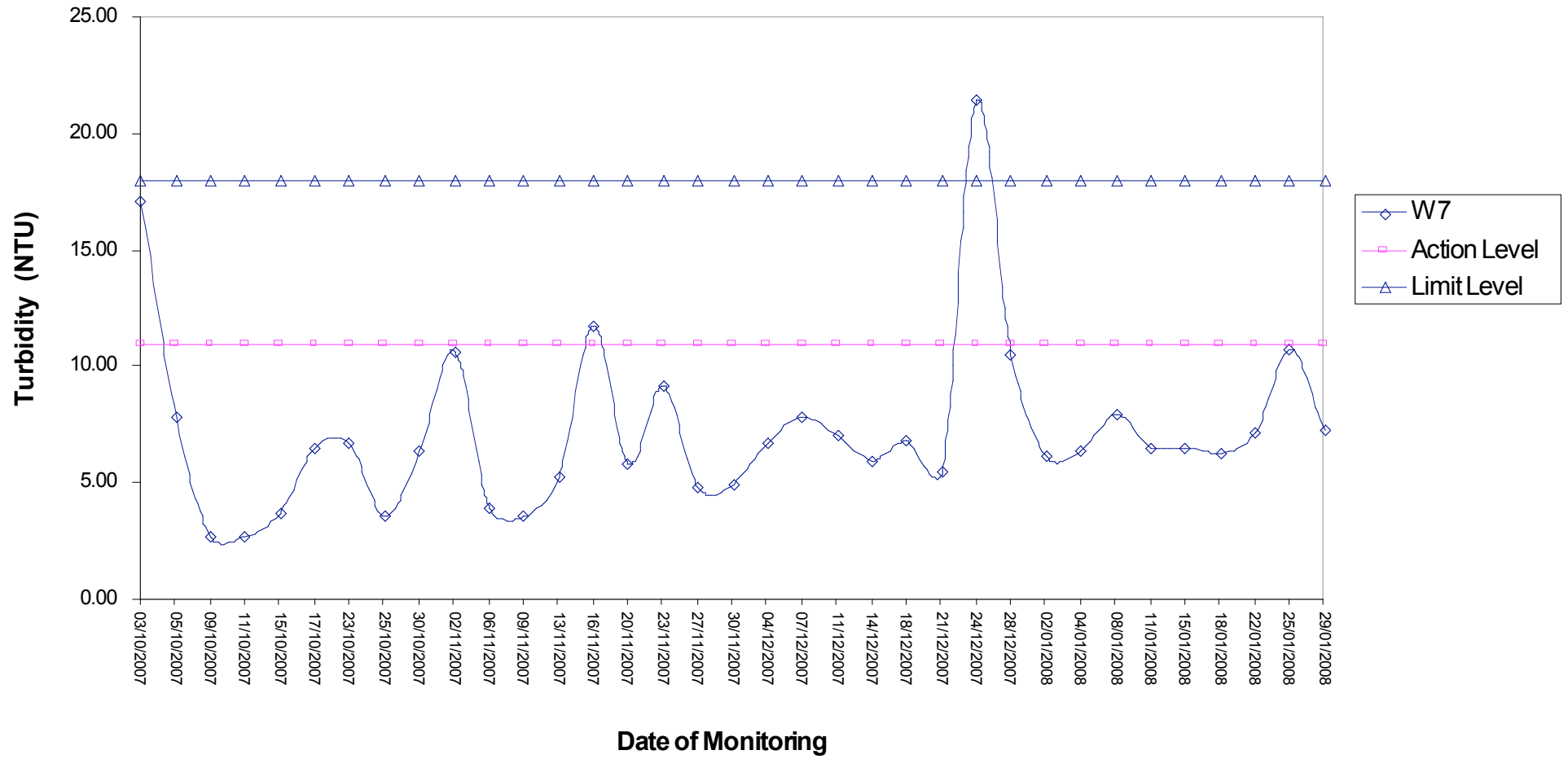
DO Level at Pak Kong River



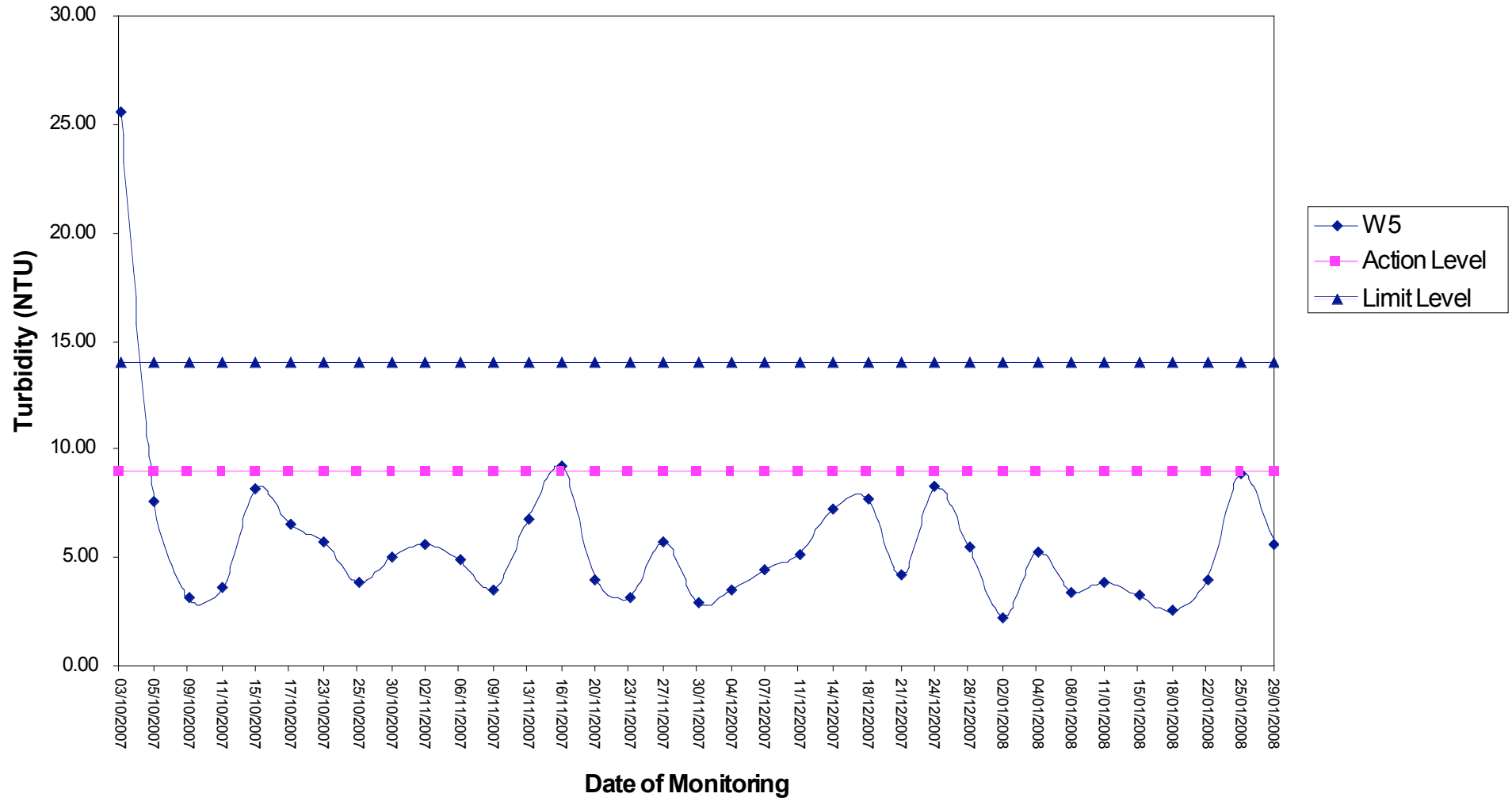
DO Level at Sai Kung River



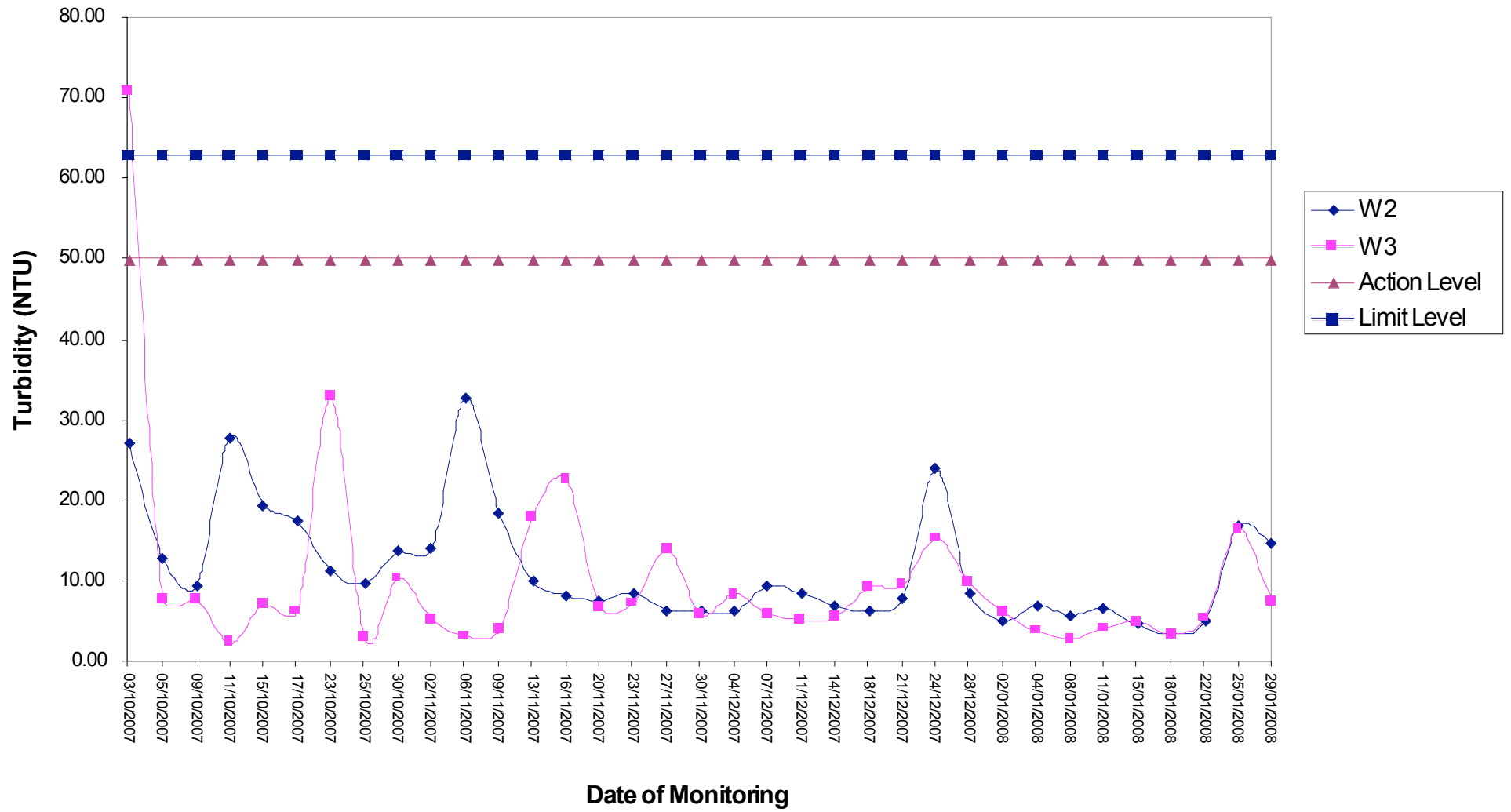
Turbidity Level at Ho Chung River



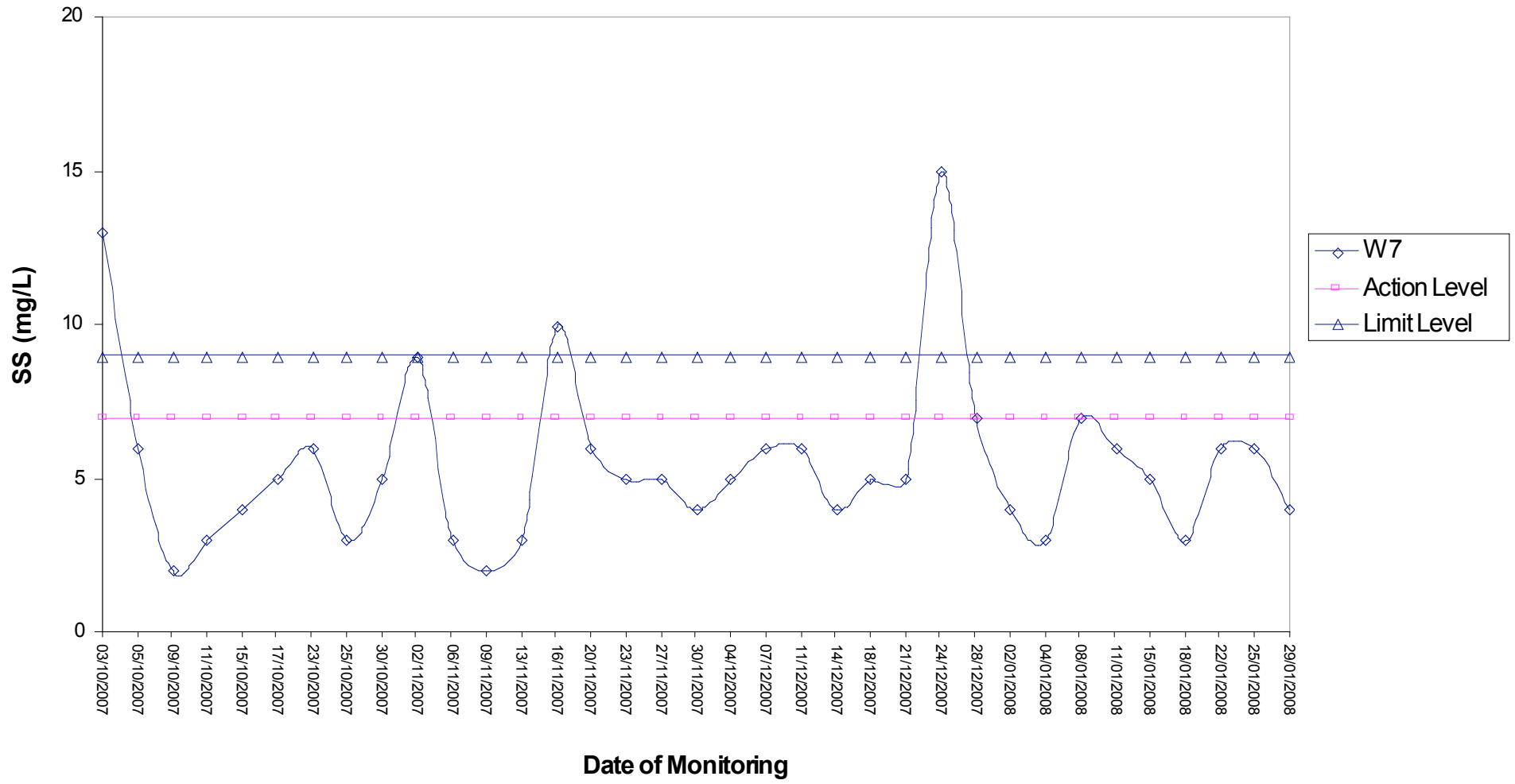
Turbidity Level at Pak Kong River



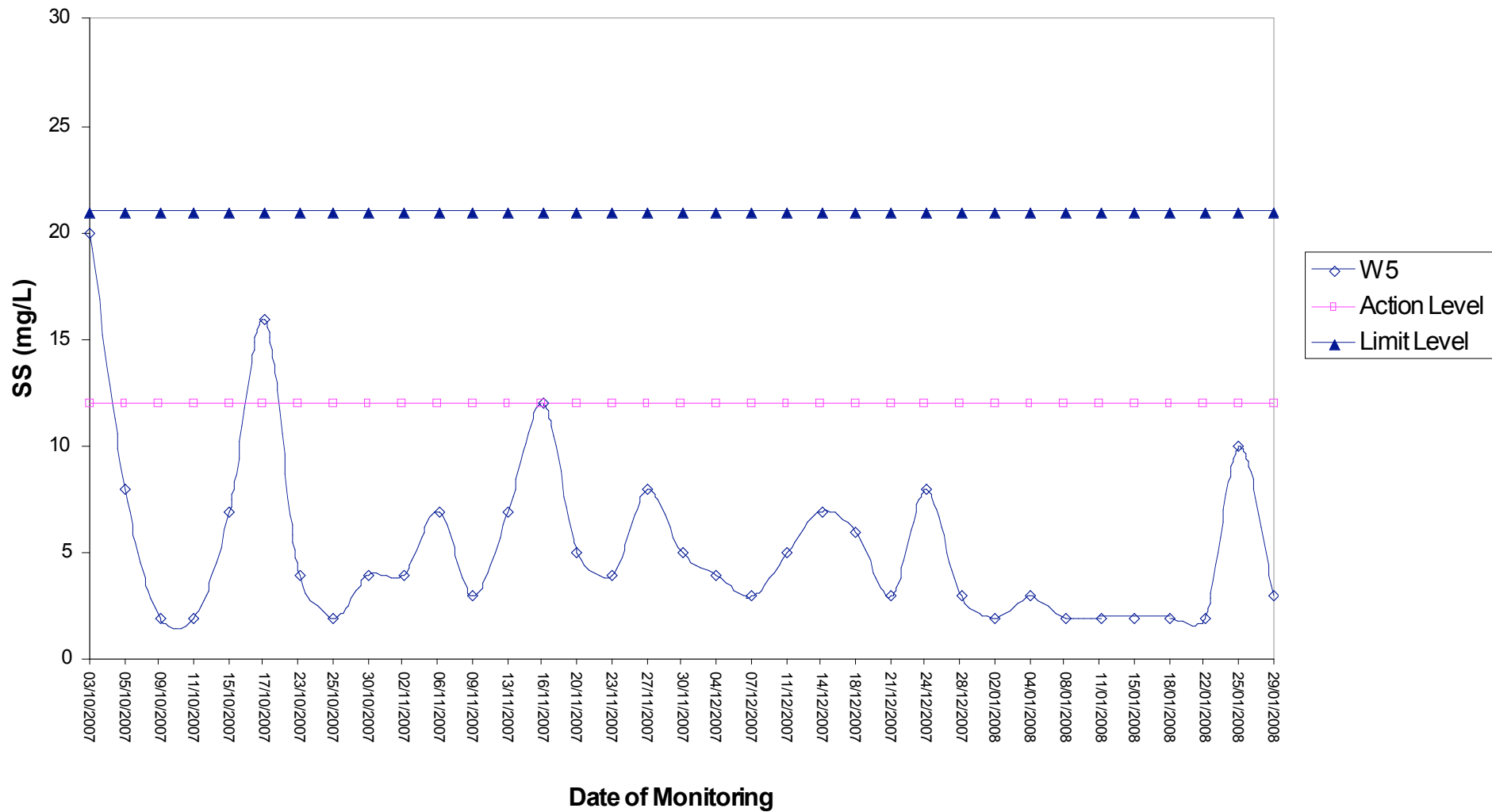
Turbidity Level at Sai Kung River



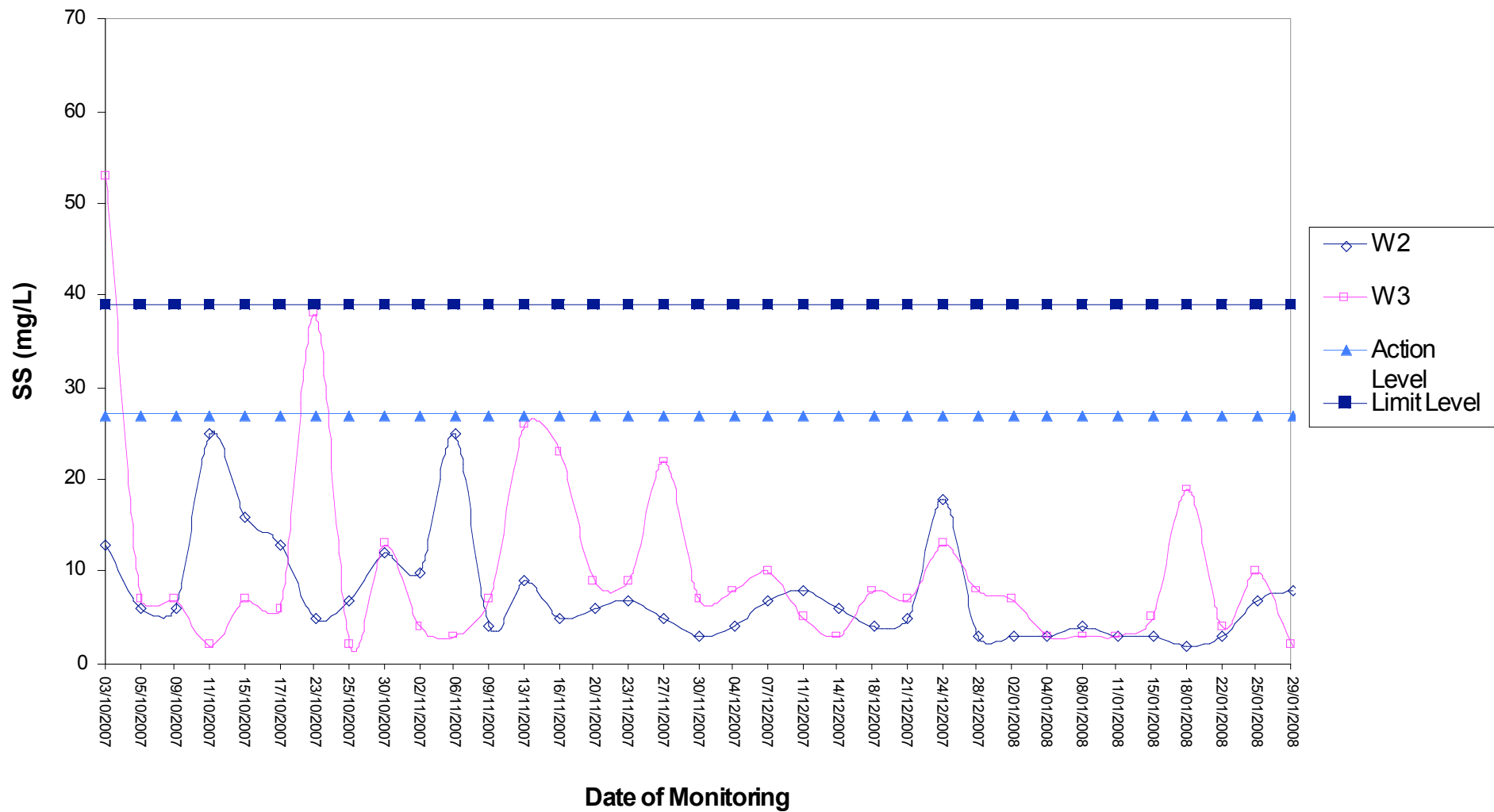
SS content at Ho Chung River



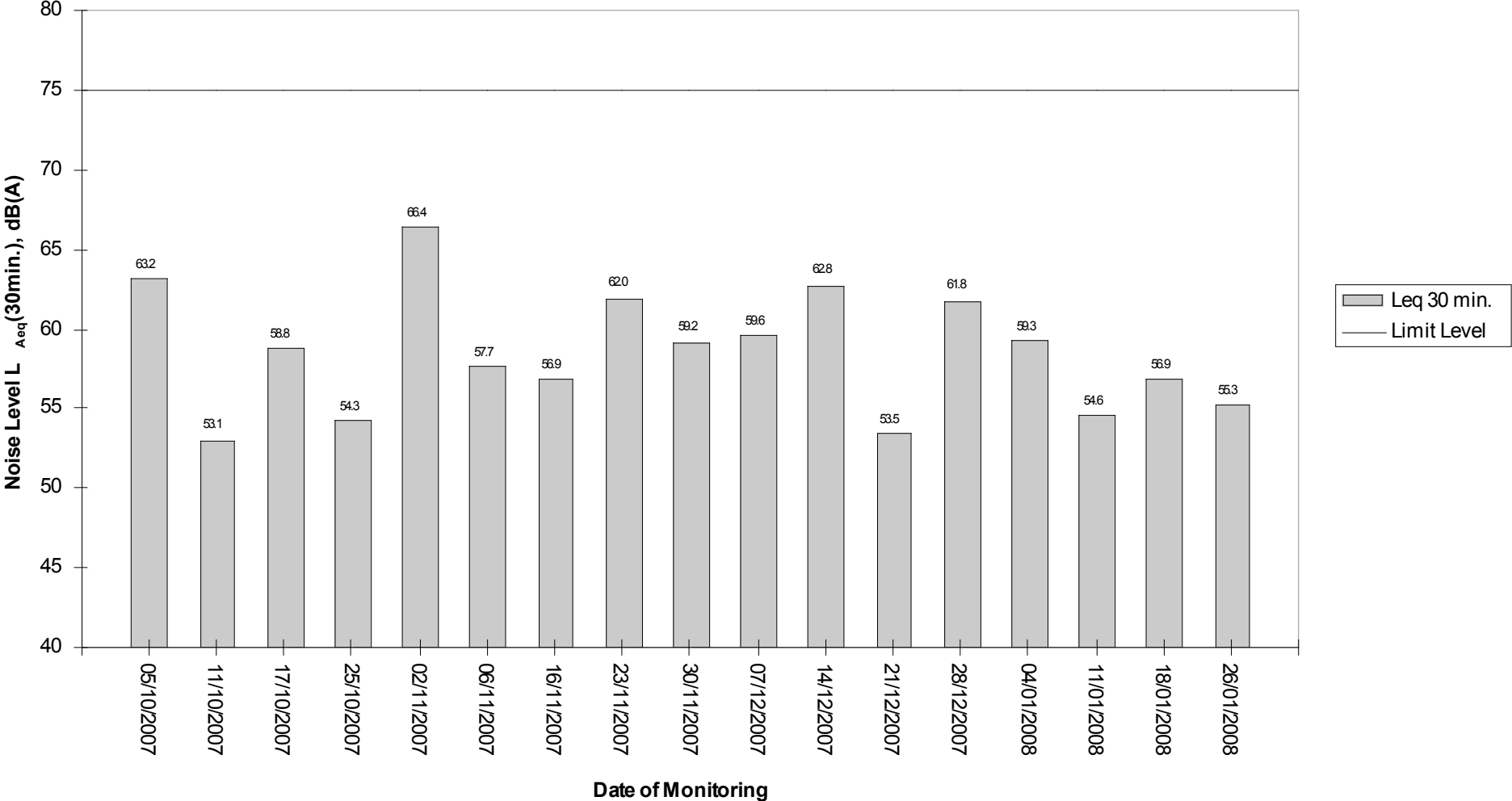
SS content at Pak Kong River



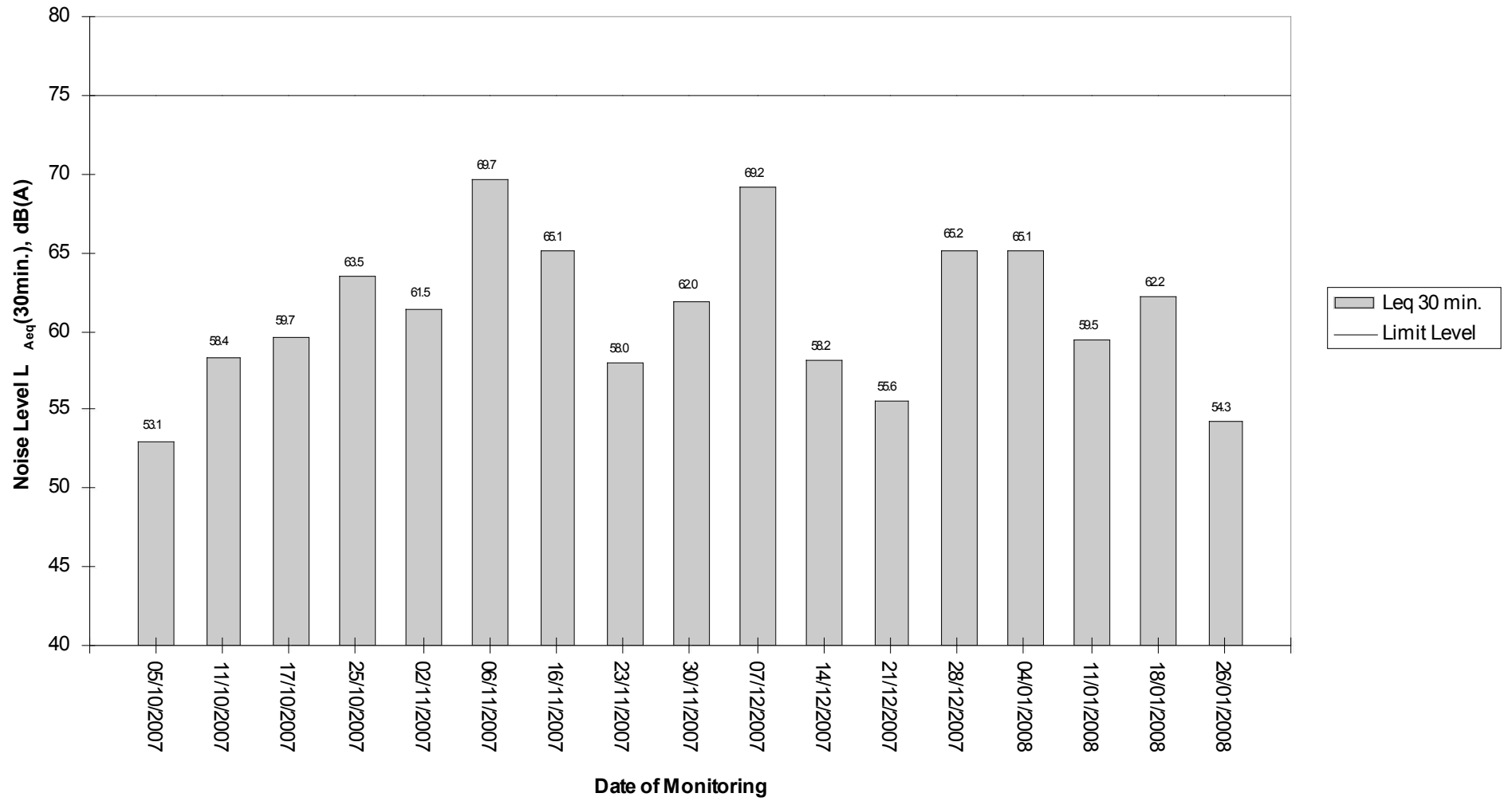
SS content at Sai Kung River



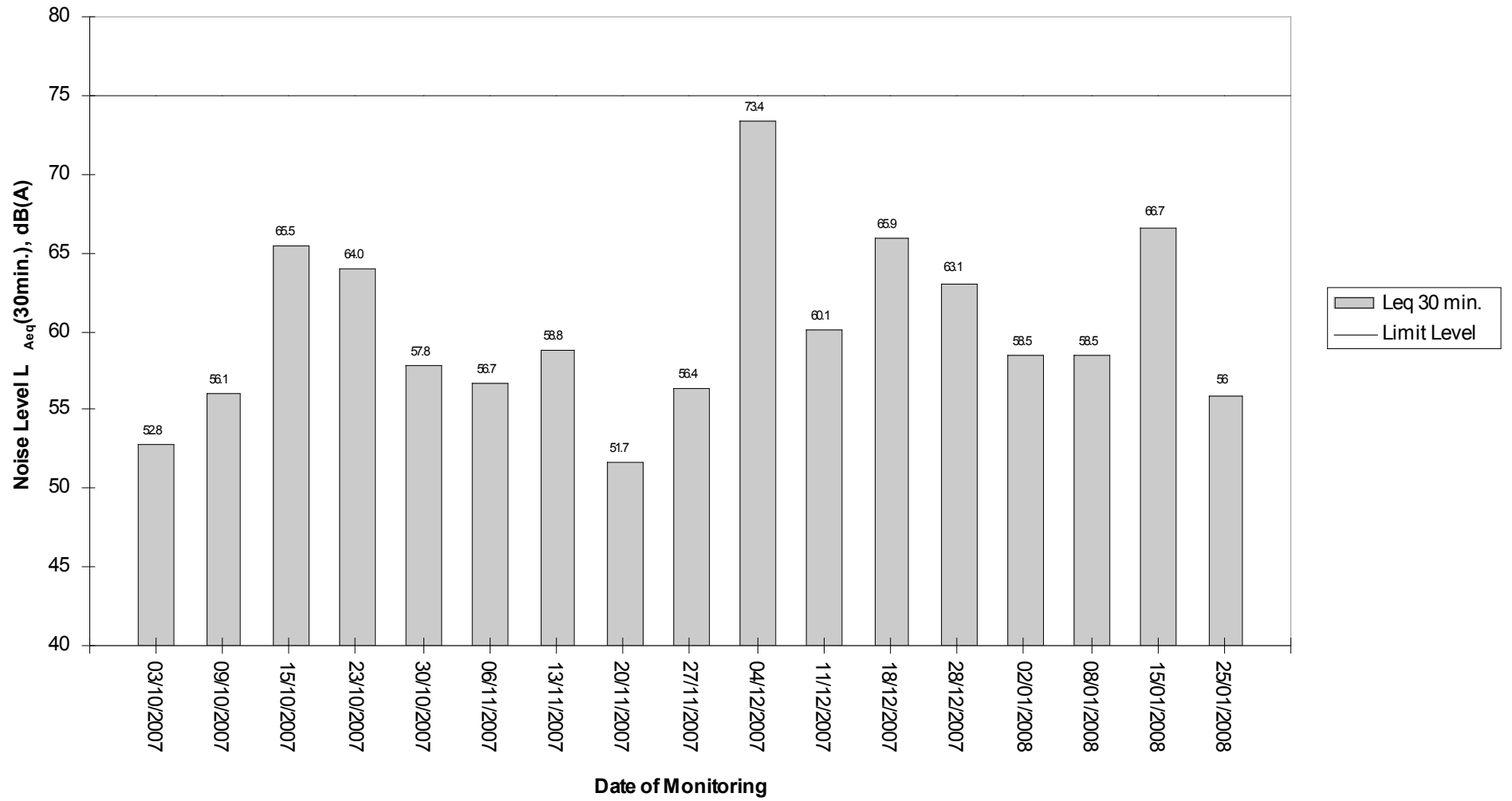
Daytime Noise Level Monitoring at HCM1



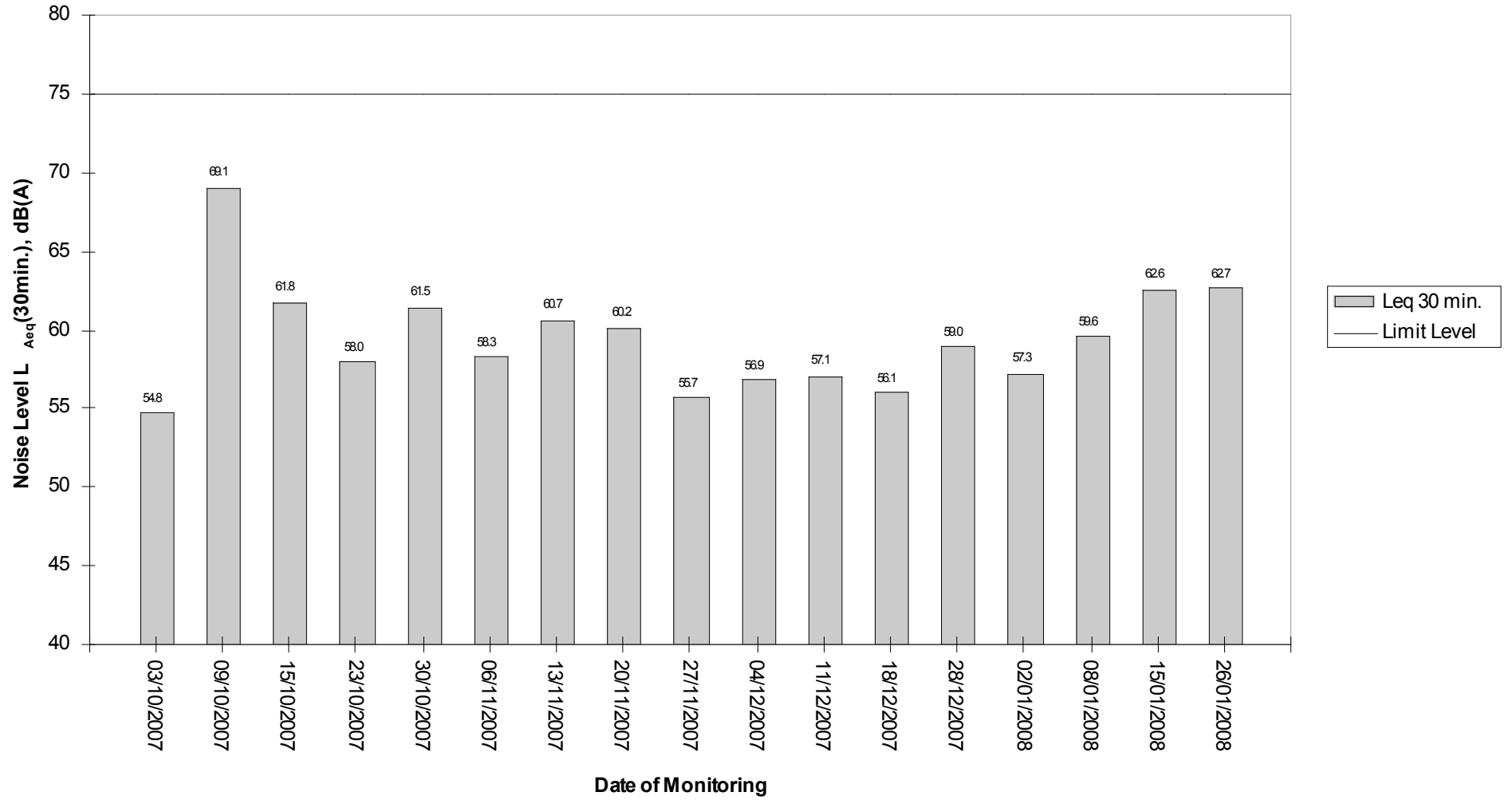
Daytime Noise Level Monitoring at HCM2



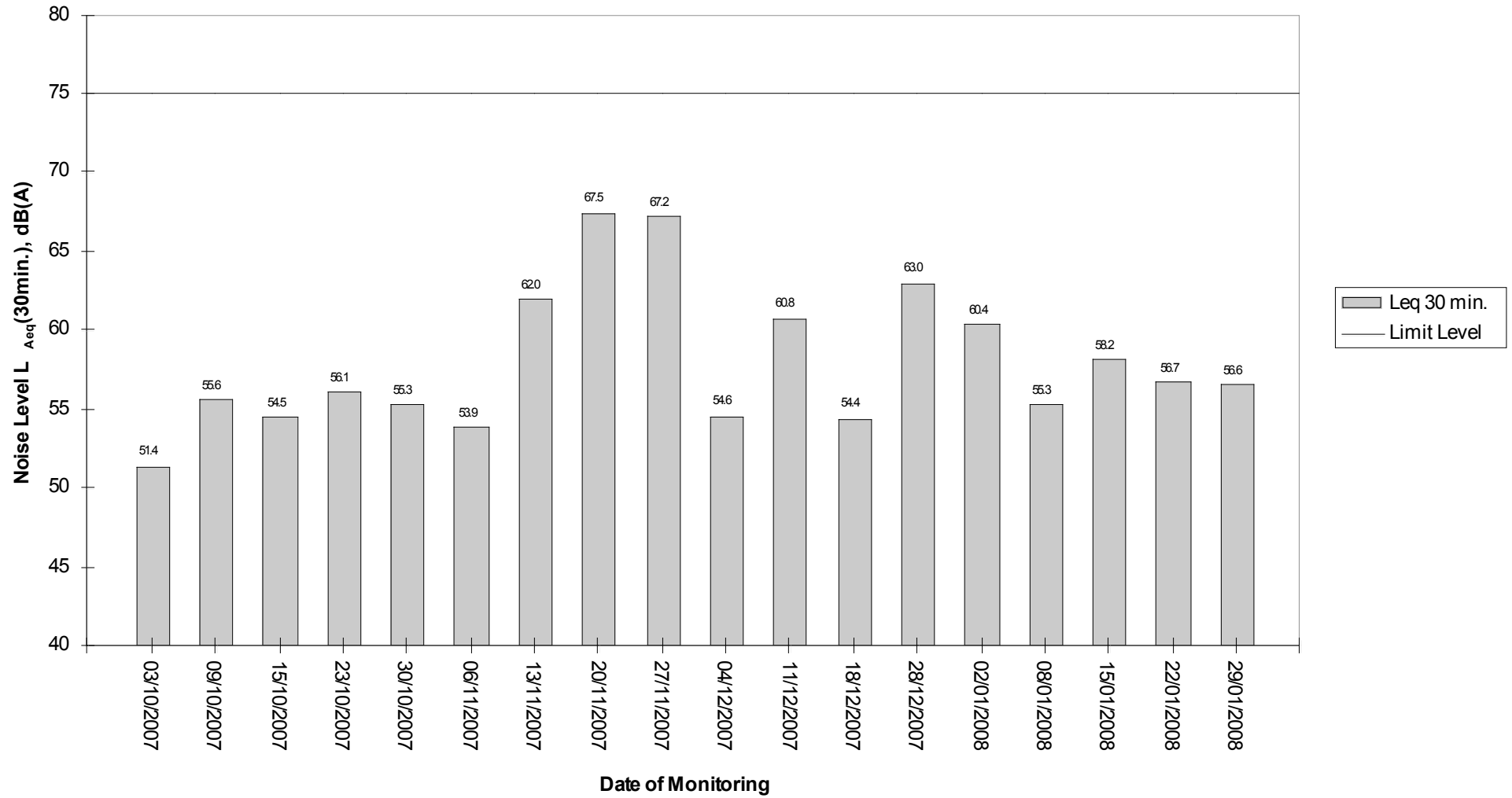
Daytime Noise Level Monitoring at PKM1



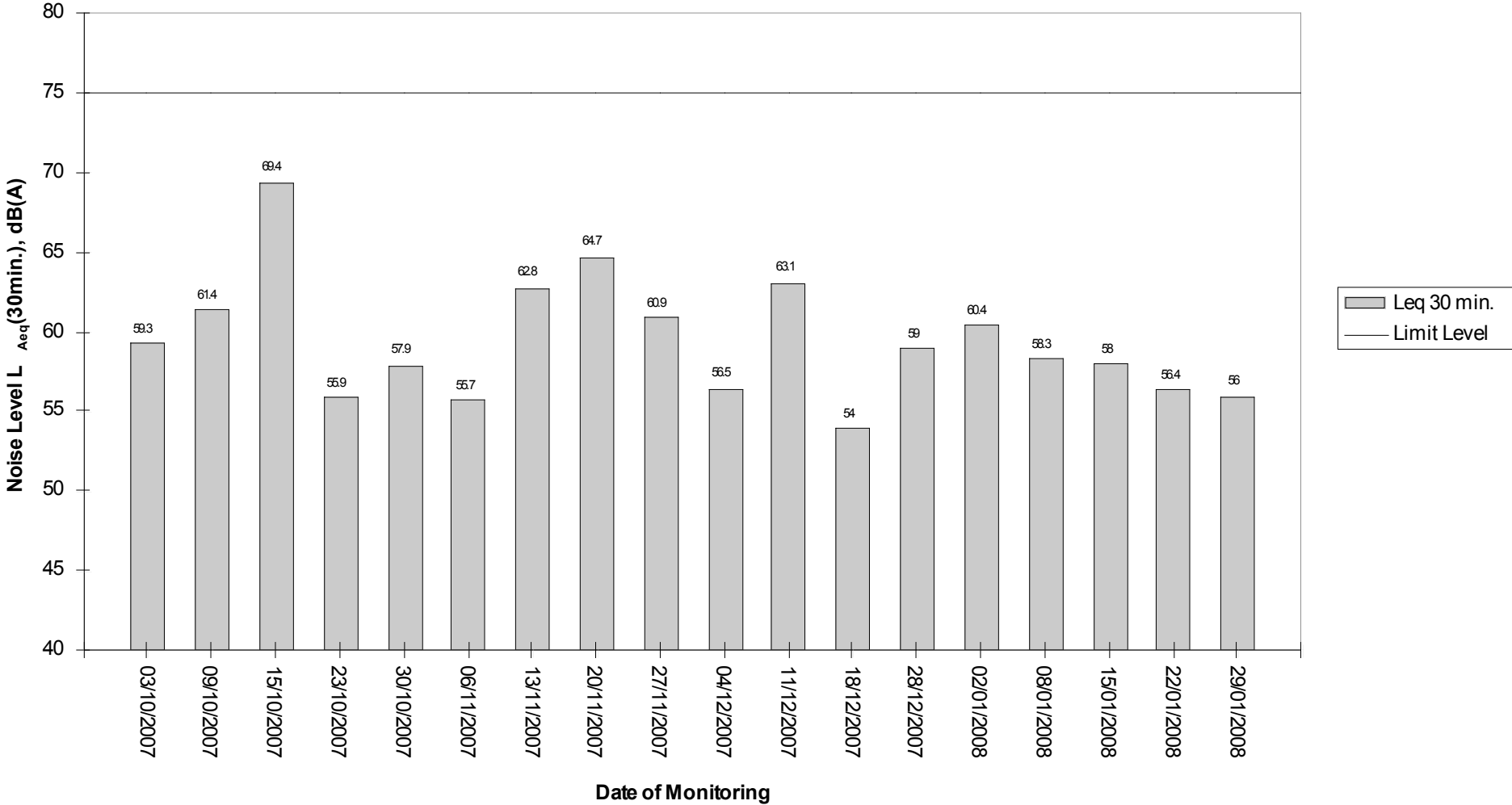
Daytime Noise Level Monitoring at PKM2



Daytime Noise Level Monitoring at SKM1



Daytime Noise Level Monitoring at SKM2



Appendix 5

Event Action Plan for Air Quality, Noise Level and Water Quality Monitoring

Event/ Action Plan for Air Quality

EVENT	ACTION			
	ET	IC(E)	ER	CONTRACTOR
ACTION LEVEL				
1. Receipt of complaint related to construction dust	<ol style="list-style-type: none"> 1. Identify source, investigate the causes of complaints and propose remedial measures; 2. Inform IC(E) and ER; 3. Conduct <i>ad hoc</i> monitoring to confirm finding; 4. Carrying out investigation to identify the source /reasons of complaints. Investigation shall be completed within 1 weeks; 5. Rectify any unacceptable practice; 6. Amended working methods if required; 7. Correspond to the complainant within 10 days to inform the cause of the nuisance and action taken. 	<ol style="list-style-type: none"> 1. Supervise Investigation process; 2. Check monitoring data submitted by ET; 3. Check Contractor's working method. 	<ol style="list-style-type: none"> 1. Notify Contractor. 	<ol style="list-style-type: none"> 1. Rectify any unacceptable practice; 2. Assist ET to find the root cause of the complaint; 3. Amend working methods if appropriate.
LIMIT LEVEL				
1. Exceedance for two <i>ad hoc</i> monitoring sample or more complaints in 3 months	<ol style="list-style-type: none"> 1. Identify source, investigate the causes of exceedance/complaints and propose remedial measures; 2. Inform ER, Contractor and EPD; 3. Repeat measurement to confirm finding; 4. Carrying out investigation to identify the source /reasons of complaints. Investigation shall be completed within 1 weeks; 5. Correspond to the complainant within 10 days to inform the cause of the nuisance and action taken; 4. Increase monitoring frequency to daily; 6. Assess effectiveness of Contractor's remedial actions and keep IC(E), EPD and ER informed of the results; 7. If exceedance stops, cease <i>ad hoc</i> monitoring. 	<ol style="list-style-type: none"> 1. Supervise Investigation process; 2. Check monitoring data submitted by ET; 3. Check Contractor's working method; 4. Discuss with ET and Contractor on possible remedial measures; 5. Advise the ER on the effectiveness of the proposed remedial measures; 6. Supervise implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented; 4. If exceedance continues, consider what portion of the work is responsible and instruct the contractor to stop that portion of work until the exceedance is abated. 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IC(E) within 3 working days of notification; 3. Implement the agreed proposals; 4. Amend proposal if appropriate; 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

Event/Action Plan for Construction Noise

EVENT	ACTION			
	ET	IC(E)	ER	CONTRACTOR
ACTION LEVEL				
	<ol style="list-style-type: none"> 1. Undertake measurement to establish validity of complaint. 2. Identify the source(s) of the complaint. 3. Inform ER & IC(E) in writing. Discuss remedial actions required with ER & IC(E). 4. Increase monitoring frequency to assess efficacy of remedial measures. 5. If exceedance continues, meet with ER&IC(E) to review implementation of appropriate mitigation measures. 6. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Review the analyzed results submitted by the ET. 2. Review the proposed remedial measures by the Contractor and advise the ER & ET accordingly. 3. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of complaint and notify Contractor if proven. 2. Check monitoring data trends and Contractor's working methods. 3. Remind the Contractor of his contractual obligations and discuss with ET, IC(E) and Contractor on proposed remedial actions. 4. Assess the efficacy of remedial actions and keep the Contractor informed. 5. Inform complainant of actions taken. 	<ol style="list-style-type: none"> 1. Submit proposals for remedial actions to ER within three working days of notification. 2. Amend proposals if required by the Engineer. 3. Implement the remedial actions immediately upon instruction. 4. Liaise with the ER to optimise the effectiveness of the agreed mitigation. 5. Amend proposals if appropriate.
LIMIT LEVEL				
	<ol style="list-style-type: none"> 1. Repeat measurement to confirm findings. 2. Identify the source(s) of impact. 3. Inform ER, IC(E) and EPD in writing. 4. Discuss remedial actions required with ER & IC(E). 5. Increase monitoring frequency to assess efficacy of remedial measures. 6. If exceedance continues, meet with ER&IC(E) to identify appropriate mitigation measures. 7. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by the ET. 2. Review Contractor's remedial actions to assure their effectiveness and advise the ER & ET accordingly. 3. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance and notify Contractor. 2. Check monitoring data trends and Contractor's working methods. 3. Discuss with ET, IC(E) and Contractor on proposed remedial actions to be implemented. 4. Assess the efficacy of remedial actions and keep the Contractor informed. 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated. 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance. 2. Submit proposals for remedial actions to ER within three working days of notification. 3. Amend proposals if required by the ER. 4. Implement the remedial actions immediately upon instruction. 5. Liaise with the ER to optimise the effectiveness of the agreed mitigation. 6. Resubmit proposals if problem still not under control. 7. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

--	--	--	--	--

Event/Action Plan for Water Quality Monitoring

EVENT	ACTION			
	ET	IC(E)	ER	CONTRACTOR
ACTION LEVEL				
Action Level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings; 2. Identify reasons for non-compliance and sources of impact; 3. Inform IC(E) and Contractor; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IC(E) and Contractor; 6. Repeat measurement on next day of exceedance. 	<ol style="list-style-type: none"> 1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IC(E) on the proposed mitigation measures; 2. make agreement on the mitigation measures to be implemented; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET and IC(E) and propose mitigation measures to IC(E) and ER; 6. Implement the agreed mitigation measures.
LIMIT LEVEL				
Action Level being exceeded by more than two consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings; 2. Identify reasons for non-compliance and sources of impact; 3. Inform IC(E) and Contractor; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IC(E) and Contractor; 6. Ensure mitigation measures are implemented; 7. Prepare to increase the monitoring frequency to daily; 8. Repeat measurement on next day of exceedance. 	<ol style="list-style-type: none"> 1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IC(E) on the proposed mitigation measures; 2. Make agreement on the mitigation measures to be implemented; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET and IC(E) and propose mitigation measures to IC(E) and ER within 3 working days; 6. Implement the agreed mitigation measures.

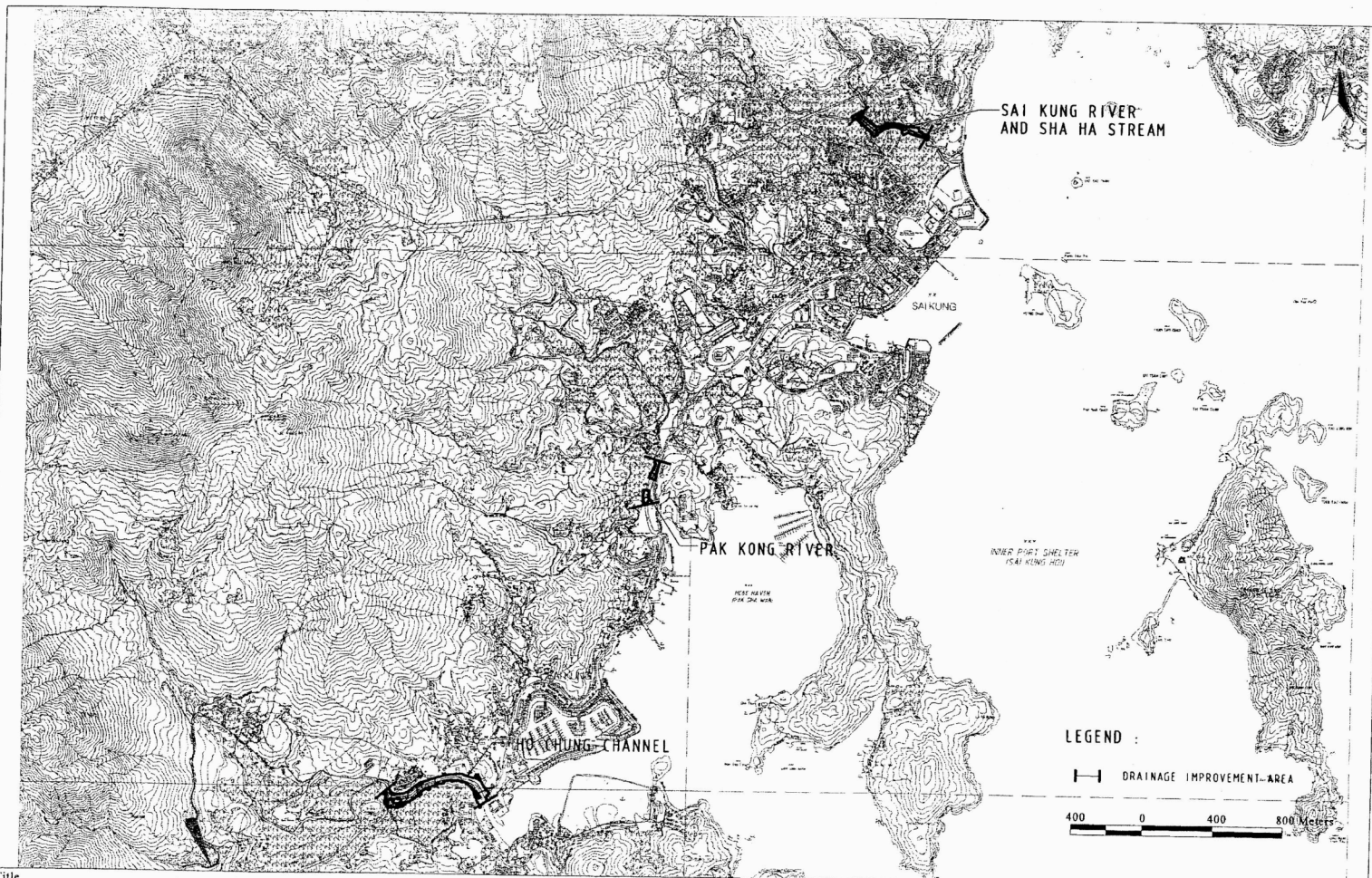
Event/Action Plan for Water Quality Monitoring(continued)

EVENT	ACTION			
	ET	IC(E)	ER	CONTRACTOR
ACTION LEVEL				
Limit Level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings; 2. Identify reasons for non-compliance and sources of impact; 3. Inform IC(E), Contractor and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IC(E), ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit Level. 	<ol style="list-style-type: none"> 1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IC(E), ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET, IC(E) and ER and propose mitigation measures to IC(E) and ER within 3 working days; 6. Implement the agreed mitigation measures.
LIMIT LEVEL				
Limit Level being exceeded by more than two consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings; 2. Identify reasons for non-compliance and sources of impact; 3. Inform IC(E), Contractor and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IC(E), ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit Level for two consecutive days. 	<ol style="list-style-type: none"> 1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IC(E), ET and Contractor on the proposed mitigation measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the mitigation measures to be implemented; 4. Assess the effectiveness of the implemented mitigation measures; 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the marine work until no exceedance of Limit Level. 	<ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes of working methods; 5. Discuss with ET, IC(E) and ER and propose mitigation measures to IC(E) and ER within 3 working days; 6. Implement the agreed mitigation measures; 7. As directed by the ER, to slow down or to stop all or part of the marine work or construction activities.

--	--	--	--	--

Appendix 6

Figures



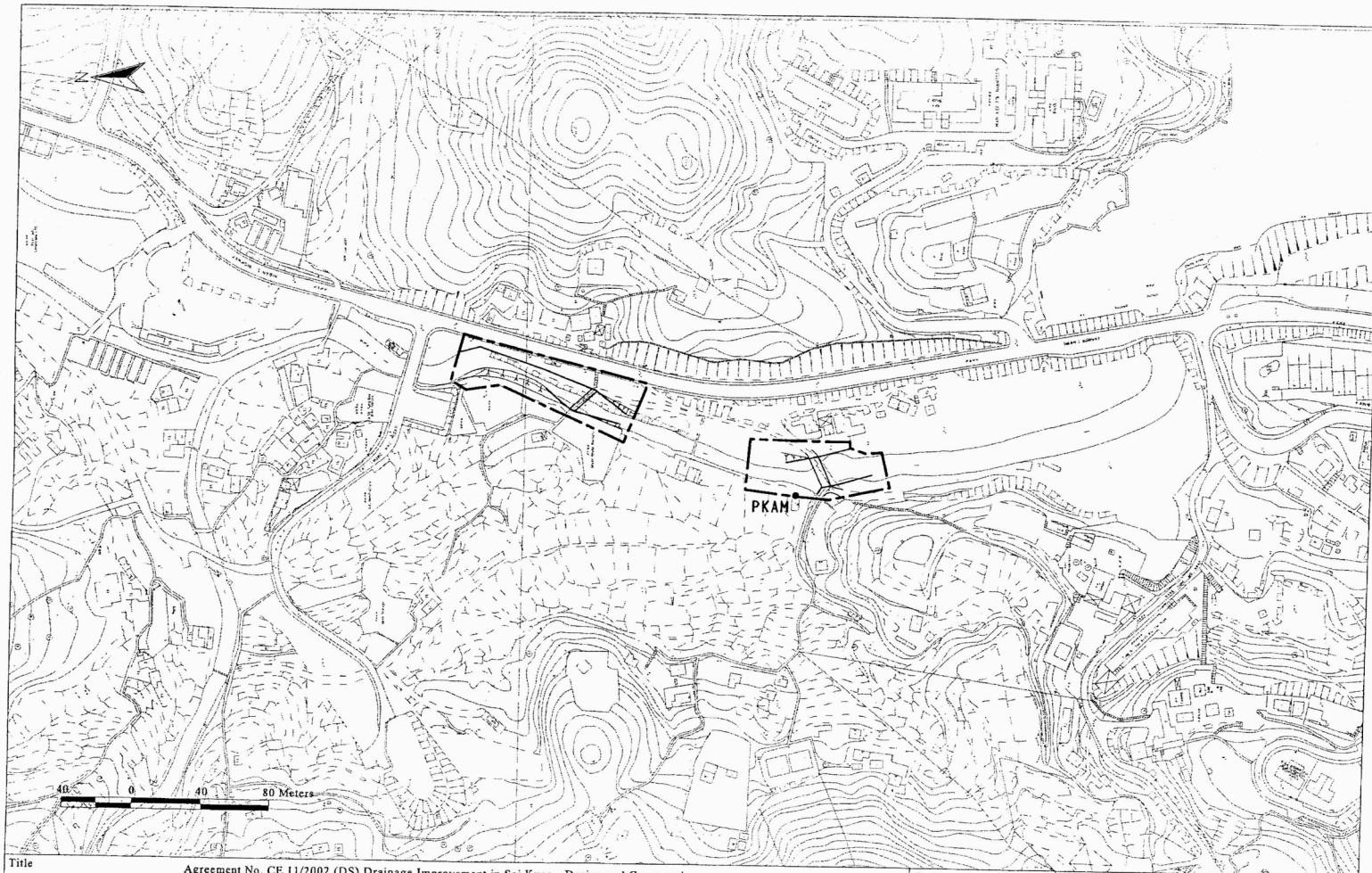
Title Agreement No. CE 11/2002 (DS) Drainage Improvement in Sai Kung - Design and Construction

Location Plan of Sai Kung River and Sha Ha Stream, Pak Kong River and Ho Chung Channel

K:\A05602\Drawing\Report\EM&A\Final-Nov04\LocationPfc.dgn

Scale	As Shown	Project No.	A05602
Date	Nov 2004	Figure No.	1.1

Maunsell
 MAUNSELL ENVIRONMENTAL
 MANAGEMENT CONSULTANTS LTD



Title Agreement No. CE 11/2002 (DS) Drainage Improvement in Sai Kung - Design and Construction

Location of Air Monitoring Station (Pak Kong River)

Scale As Shown

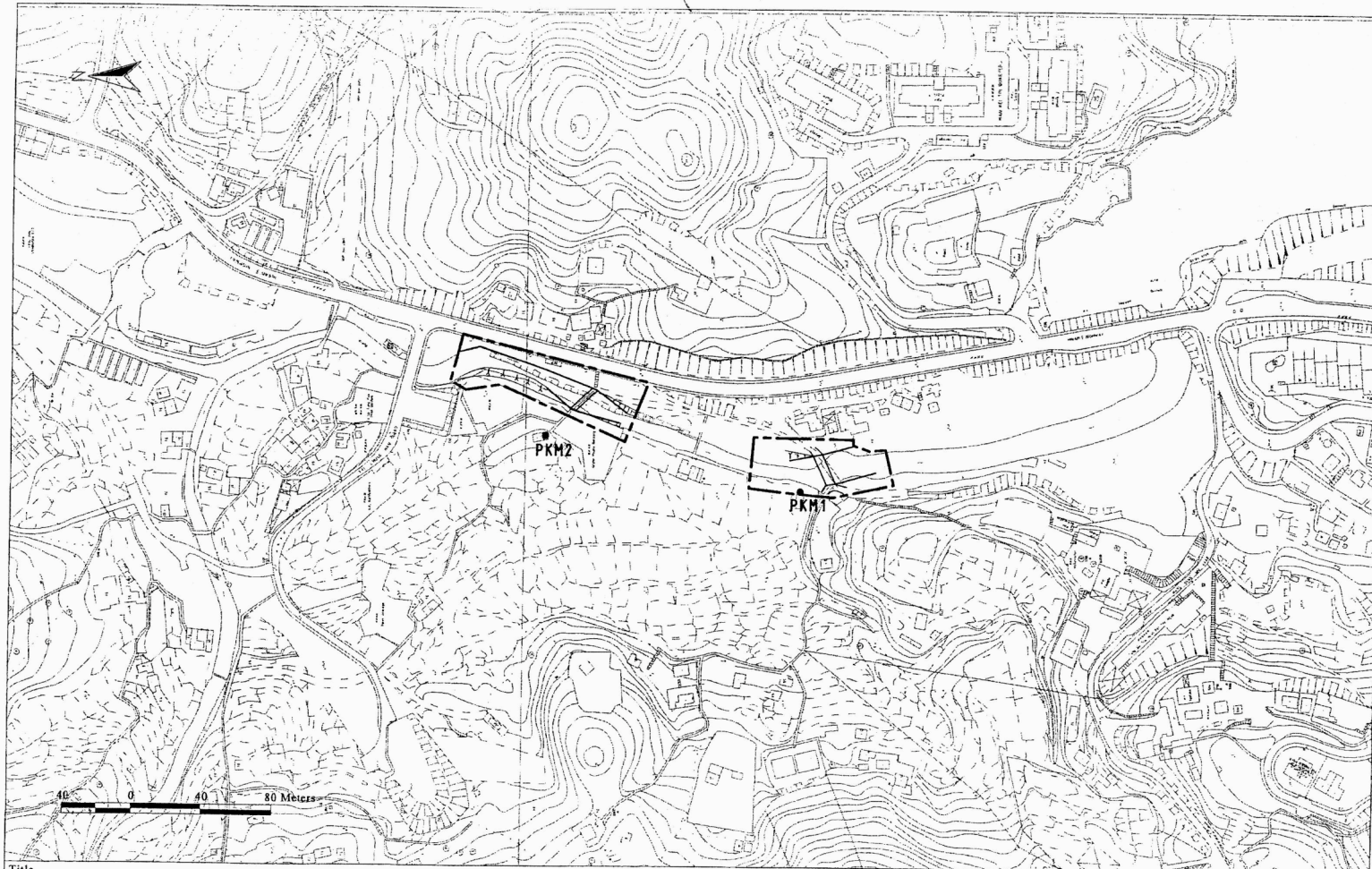
Project No. A05602

Date Nov 2004

Figure No. 2.2

Maunsell
MAUNSELL ENVIRONMENTAL
 MANAGEMENT CONSULTANTS LTD

K:\A05602\Drawing\Report\EM&A\Final-Nov04\A5R-PKR.dgn



Title Agreement No. CE 11/2002 (DS) Drainage Improvement in Sai Kung - Design and Construction

Noise Monitoring Stations (Pak Kong River)

Scale	As Shown	Project No.	A05602
Date	Nov 2004	Figure No.	3.2



K:\A05602\Drawing\Report\EM&A\Final-Nov04\NSR-PKR.dgn

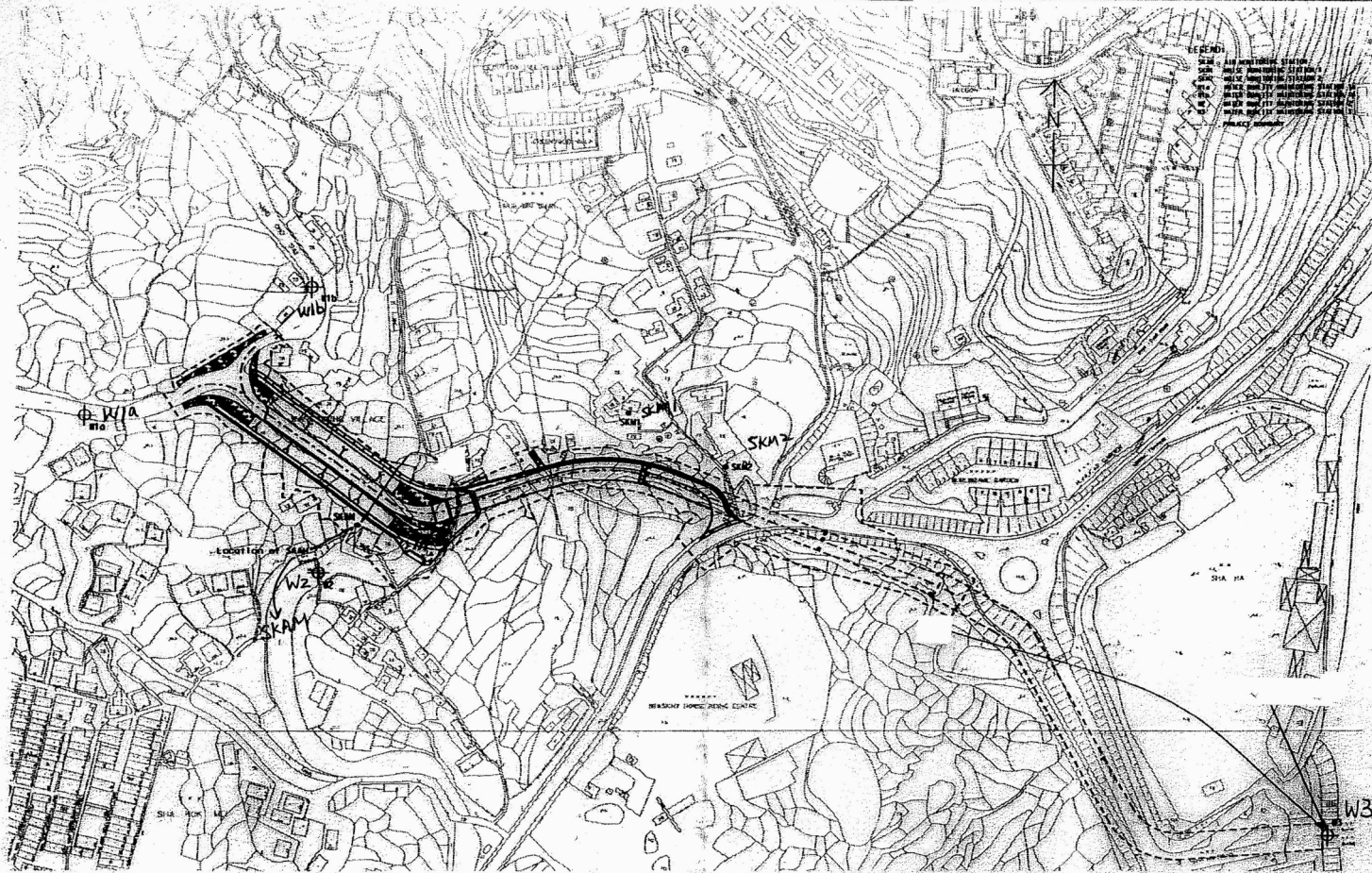
FUGRO TECHNICAL SERVICES LIMITED

Materialab Division,
Fugro Development Centre,
5 Lok Yi Street, 17 M.S. Castle Peak Road,
Tai Lam, Tuen Mun, N.T., Hong Kong.

Tel : +852-2450 8233
Fax : +852-2450 6138
E-mail : mattlab@fugro.com.hk
Website : www.fugro.com

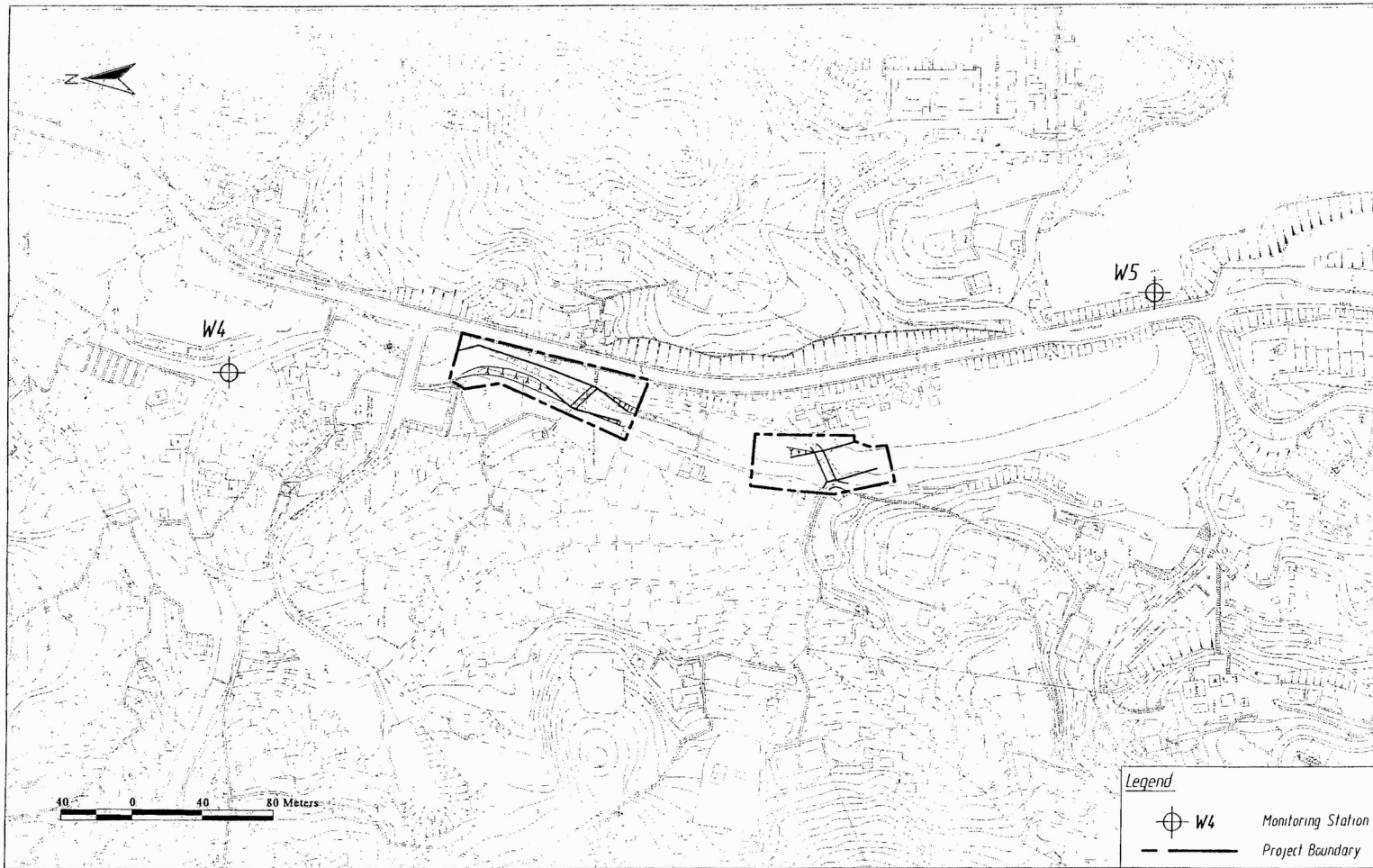
Figure No. 4.2
Locations of Air, Noise and Water
Monitoring Station at Sha Ha and Sai
Kung River

Materialab



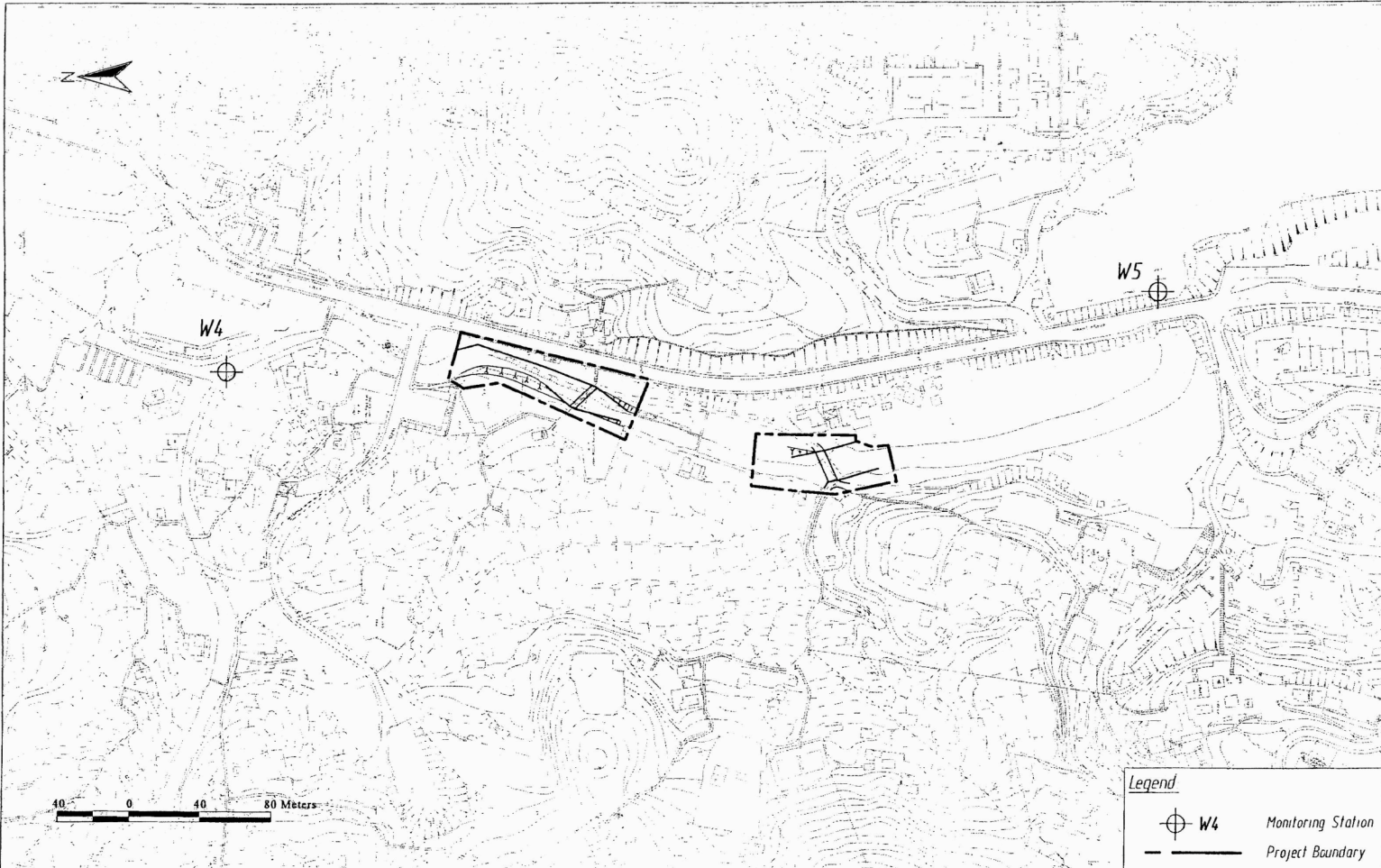
The copyright of this document is owned by Fugro Technical Services Limited. It may not be reproduced except with prior written approval from the Company.





Title Agreement No. CE 11/2002 (DS) Drainage Improvement in Sai Kung - Design and Construction Water Quality Monitoring Stations (Pak Kong River)	Scale As Shown	Project No. A05602	
	Date Nov 2004	Figure No. 4.3	

K:\A05602\Drawing\Report\NEM&A\Final-Nov04\WQMS-PKR.dgn



Title Agreement No. CE 11/2002 (DS) Drainage Improvement in Sai Kung - Design and Construction

Water Quality Monitoring Stations (Pak Kong River)

Scale As Shown

Date Nov 2004

Project No. A05602

Figure No. 4.3

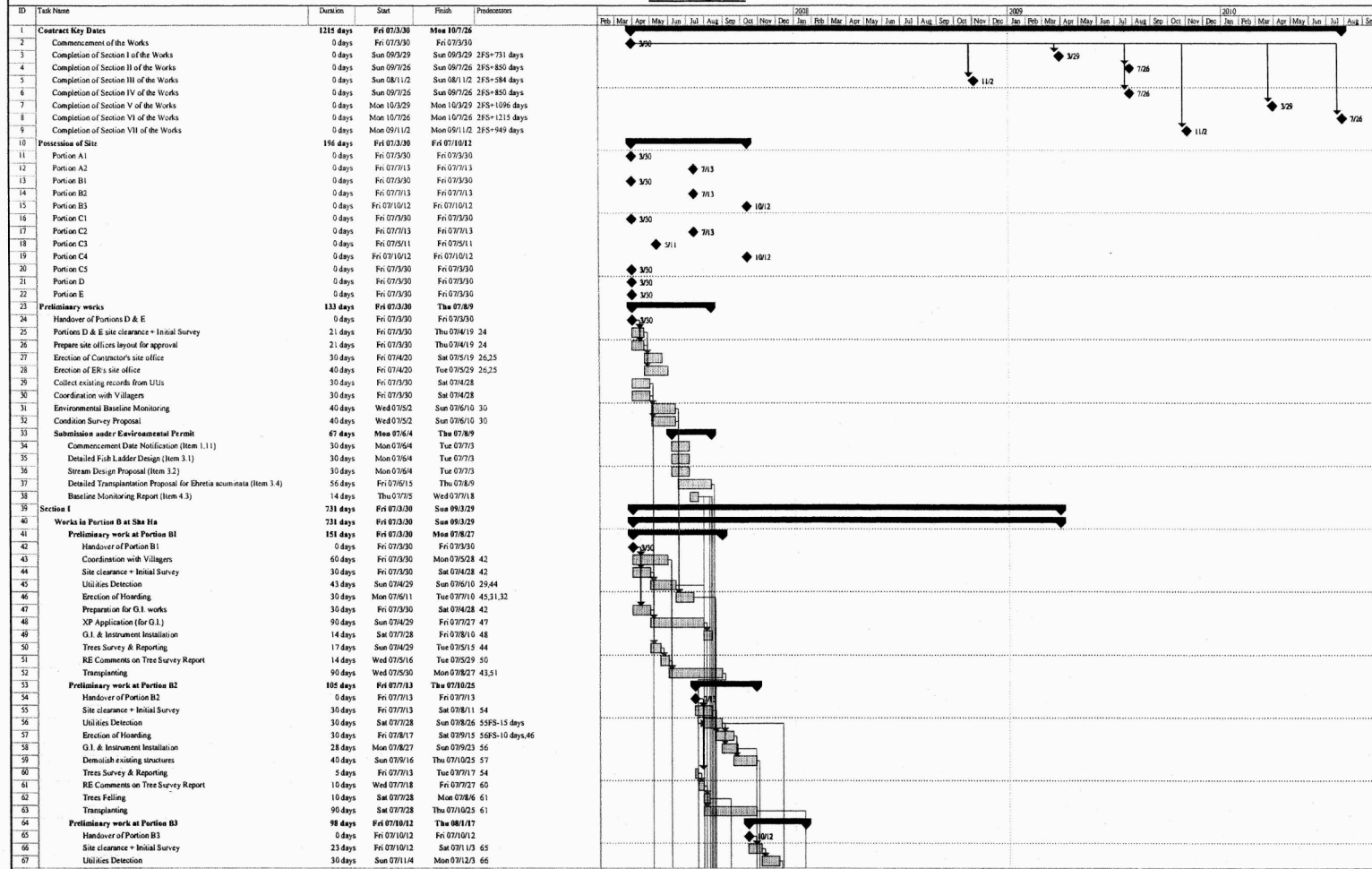
Maunsell
BRUNSELL ENVIRONMENTAL
 MANAGEMENT CONSULTANTS LTD

K:\A05602\Drawing\Report\EM&A\Final-Nov04\WQMS-PKR.dgn

Appendix 7
Work Program

Contract No. DC/2006/01 - Drainage Improvement Works in Sai Kung

Master Programme

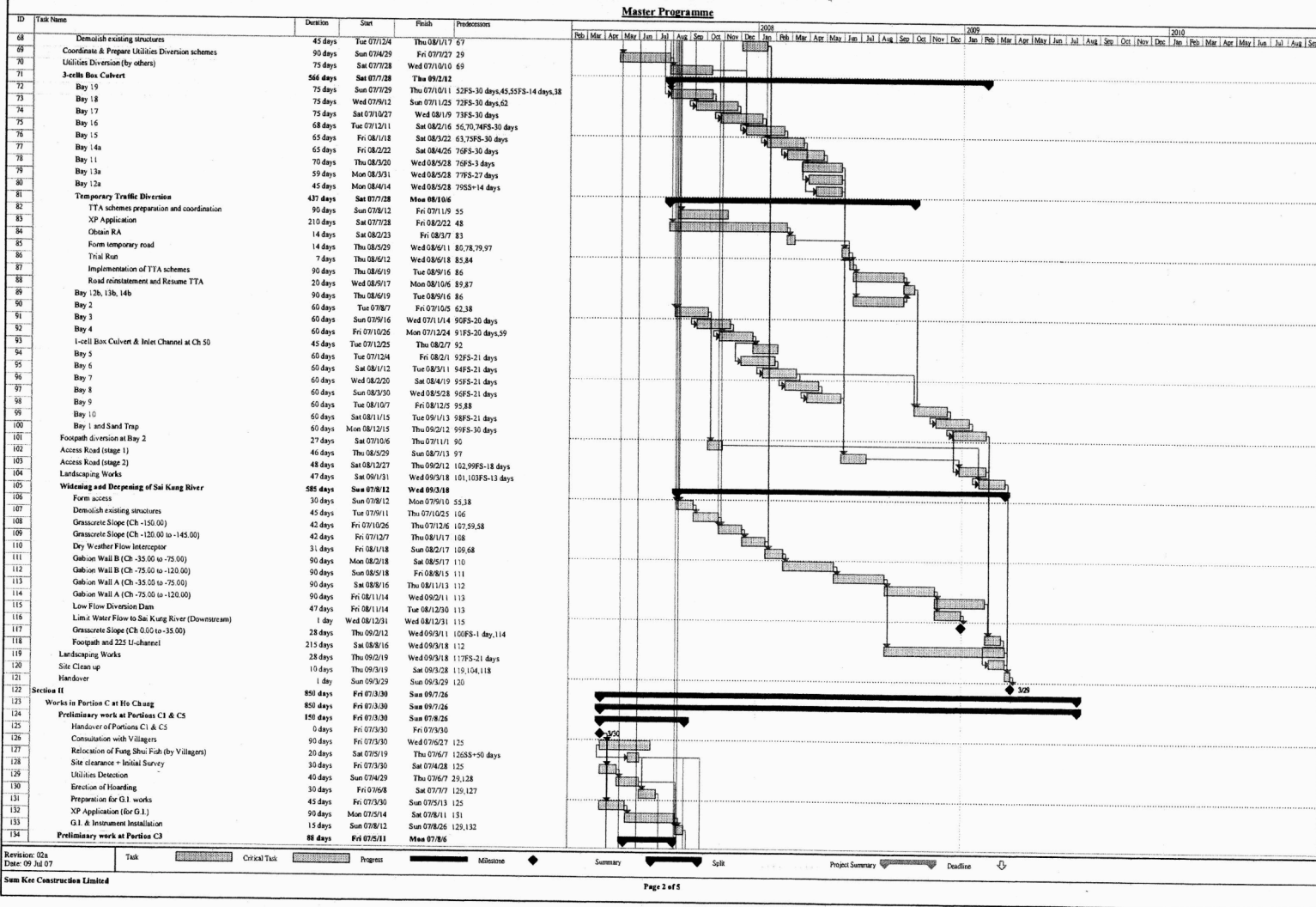


Revision: 02a
Date: 09 Jul 07

Task Legend: Critical Task Progress Milestone Summary Split Project Summary Deadline

Sum Kee Construction Limited

Contract No. DC/2006/01 - Drainage Improvement Works in Sai Kung

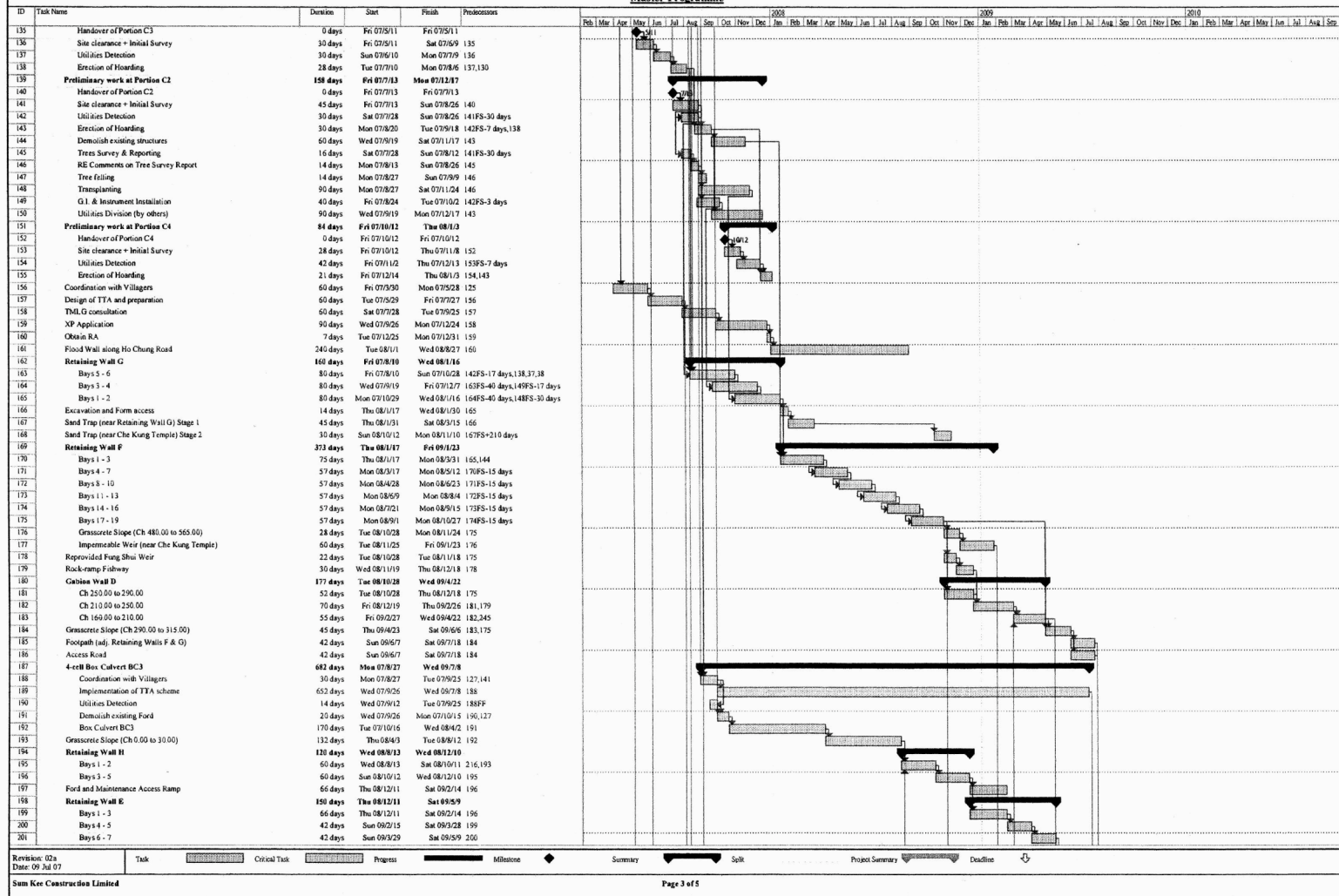


Revision: 024
Date: 09 Jul 07

Sum Kee Construction Limited

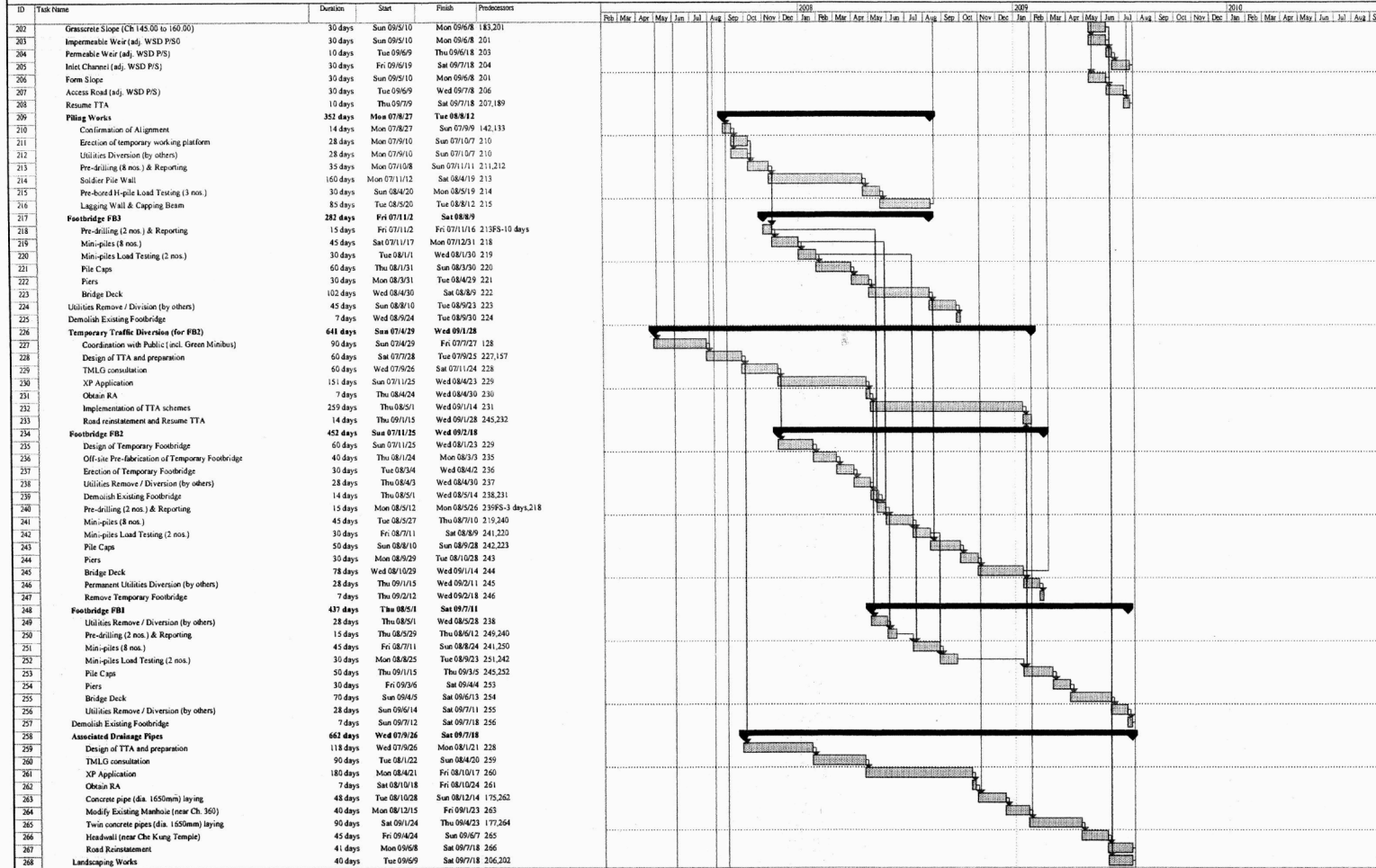
Contract No. DC/2006/01 - Drainage Improvement Works in Sai Kung

Master Programme



Contract No. DC/2006/01 - Drainage Improvement Works in Sai Kung

Master Programme



Revision: 02a
Date: 09 Jul 07

Sam Kee Construction Limited

Contract No. DC/2006/01 - Drainage Improvement Works in Sai Kung

Master Programme

