Drainage Service Department

Monthly Environmental Monitoring & Auditing report for

Contract No.DC/2006/11
Drainage Improvement in Southern Lantau

February 2012

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APPENDIXES

EXECUTIVE SUMMARY

This is the forty-third monthly environmental Monitoring and audit (EM&A) report for "Drainage Improvement in Southern Lantau". The environmental permit number is "EP-237/2005/B". And, the environmental permit (EP-434/2012) for operational phase was issued on 3 Jan 2012. The report concludes the post-construction phase monitoring for the activities undertaken during the period of 1 February 2012 to 29 February 2012.Establishment of all the landscaping works, construction of the outstanding works at Luk Tei Tong River and Rectification of the defective works at Pak Ngan Heung River were major site activities being carried out within this reporting month.

Ecological monitoring was performed. Results obtained were presented in this report. Additionally, the implementation status of environmental mitigation measures, event / action plan and environmental complaint handling procedures were inspected during monthly site environmental audit.

In general, waste management was satisfactory during the reporting month.

Refer to EPD memo received on 4 May 2011, post construction phase water quality monitoring was completed on 1 June 2011.

EPD had no objection to the three proposed changes of EM&A programme, namely the termination of noise monitoring, change of ET's site inspection frequency from weekly to monthly, and commencement of post-construction ecological monitoring effective from 1 Jan 2012.

According to the EM&A manual, the ecological water quality monitoring should be carried out every two months a year for 4 years after the completion of works. The post-construction phase ecological water quality monitoring was carried on 9 Jan 2012. Therefore, no ecological water quality monitoring results were presented in this report.

The 1st post-construction ecological monitoring was carried out in this reporting period.
During ecological monitoring survey, no White-shouldered Starling was recorded

breeding in the watch tower. There was no sign of disturbance from the Project to the watch tower. The watch tower may not be suitable for birds as nesting habitat. In addition, no disturbance on the flora and fauna in the river channels were observed during the ecological monitoring.

There was no complaint, notification of any summons and successful prosecutions against the project received during the reporting period.

Future site activities to be carried out will be establishment of all the landscaping works, construction of the outstanding works at Luk Tei Tong River and Rectification of the defective works at Pak Ngan Heung River. It is expected that environmental impact in different aspects will be resulted from the works. With reference to the EM&A manual and mitigation measure report, mitigation measures are proposed to be taken, if necessary.

The ET will continue to implement the environmental monitoring & audit programme in accordance with the EM&A Manual and Environmental Permit requirement.

1. Introduction

This is the forty-third monthly Environmental Monitoring and Audit (EM&A) Report for "Drainage Improvement in Southern Lantau" project Environmental Permit (EP-237/2005/B).

For the operation phase, the environmental permit number is (EP-434/2012) and is issued on 3 Jan 2012.

2. Project Information

2.1 Construction program

Majority of construction works of "Drainage Improvement in Southern Lantau" project will be completed in April 2012. The project comprises the following:

- Construction of approximately 80m long gabion with natural bed in Pak Ngan Heung River, approximately 180m of three cells 3m x 2m box culvert and approximately 100m of rectangular channel at Pak Ngan Heung River;
- Construction of approximately 250m of 0.75m wide U-Channel at Ling Tsui Tau Village in Mui Wo;
- Construction of bypass channel of about 350m and 240m long of gabion channels at Luk Tei Tong River respectively; and
- Widening three existing bottlenecks with gabion lined at Tai Tei Tong River

Appendix A shows the construction program and location plan of the project.

2.2 Project organization

The Main Contractor, Yick Hing Construction Company Limited, has commissioned Environmental Pioneers & Solutions Limited and Ecosystems Limited as the Environmental Team, which comprises the environmental team leader, the ecologists and the environmental technicians to undertake the environmental monitoring and audit work for this project.

The environmental management structure and is shown in Fig 2.2.1.

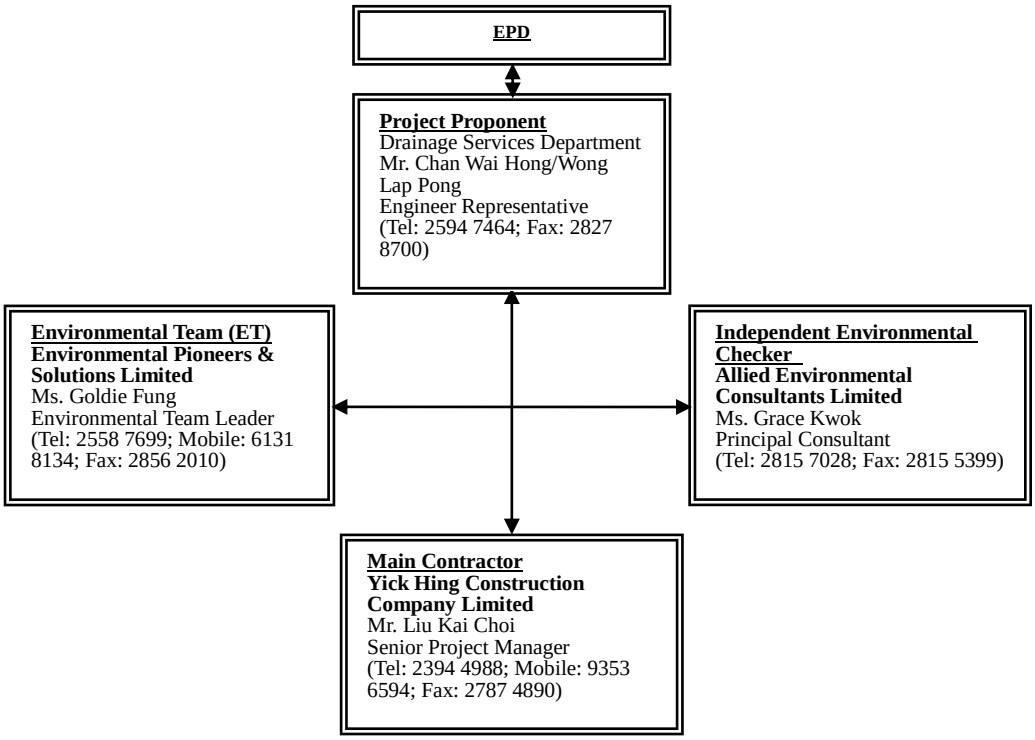


Figure. 2.2.1 Environmental Management structure for the project

2.3 Key personal contact information chart

Detailed contact of key persons involved in environmental aspect of the project is shown in Appendix B.

3. Construction Stage

3.1 Construction activities in the reporting month

Major activities in the reporting month included the followings:

1. Establishment of all the landscaping works
2. Construction of the outstanding works at Luk Tei Tong River
3. Rectification of the defective works at Pak Ngan Heung River

3.2 Construction activities for the coming month

Proposed key construction works in the coming month will include:

1. Establishment of all the landscaping works
2. Construction of the outstanding works at Luk Tei Tong River
3. Rectification of the defective works at Pak Ngan Heung River

3.3 Environmental Status

Appendix A shows the drawing of the project area.

Locations of the monitoring and control stations with environmental sensitive receivers are presented in Section 4.3, 5.3 and 6.3 for noise, water and ecological monitoring respectively.

4. Noise Monitoring

4.1 Monitoring Parameters and Methodology

The construction noise level was measured in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). $L_{eq\ (30minutes)}$ was used as the monitoring parameter for the impact monitoring in the time period between 0700 to 1900 hours on normal weekdays. For all other time period, $L_{eq\ (5minutes)}$ was employed for comparison with the Noise Control Ordinance (NCO) criteria.

Noise measurement results obtained from each monitoring location were recorded in the Construction Noise Monitoring Data Sheet immediately after the measurement. As supplementary information for data auditing, statistical results L_{10} and L_{90} were also be recorded for reference.

In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Action plan in Table 4.5.2, shall be carried out. This additional monitoring shall be carried out until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

4.2 Monitoring Equipment

The sound level meters and calibrators comply with the International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1) specifications as referred to in the Technical Memorandum (TM) to the Noise Control Ordinance was deployed as monitoring equipment for noise measurement.

Noise measurement was not be made in the presence of fog, rain, wind with a steady speed exceeding $5ms^{-1}$ or wind with gust exceeding $10ms^{-1}$. Thus wind speed was checked by the portable wind speed indicator capable of measuring the wind speed in m/s. Table 4.2.1 summarizes the equipment list for noise monitoring

Table 4.2.1 Equipment List for Noise Monitoring

Equipment	Manufacturer & Model No.	Precision Grade
Digital sound level meter	Model 949 Serial No: 8569	IEC 651 Type 1 IEC 804 Type 1
Windscreen	Microtech gefell model W2	N/A
Sound level calibrator	Model: SV30A Serial No: 7908	IEC 942 Type 1
Wind speed indicator	Kestrel K1000	N/A

4.3 Monitoring Locations

According to the Baseline Monitoring Report issued in May 2008 for the captioned project, four locations where are alternative from the locations proposed in EM&A manual, were designated for baseline noise monitoring. For the data validation, impact noise monitoring was undertaken in the same locations during the construction phase of the project. The proposed monitoring locations are summarized in Table 4.3.1. Figure 4.3.1 shows the Noise Monitoring Locations

Noise measurement in each monitoring locations were taken at a point 1m from the exterior of the selected premises and at a height with no disturbance to the dweller and least obstructed view.

Table 4.3.1 Noise Monitoring Locations during Construction Phase

Identification No.	Noise Monitoring Locations
N1	No. 73, Village House, Ling Tsui Tau Tsuen (ground level)
N2	No. 31, Village House, Ling Tsui Tau Tsuen (ground level)
N3	Fence wall outside No. 5 village house adjacent to Luk Tei Tong River Outlet (ground level)
N4	No. 23, Village House, Tai Tei Tong River (ground level)

In accordance with the requirements in the EM&A manual, weekly impact monitoring was conducted. For the time period between 0700 and 1900 hours on normal weekdays, and noise parameter of $L_{eq\ (30minutes)}$ was measured. As if the construction works were carried out during restricted period (ie. 1900-2300, 2300-0700 of next day and Sundays / general holiday), impact monitoring that comprises 3 consecutive $L_{eq\ (5minutes)}$ would be carried out.

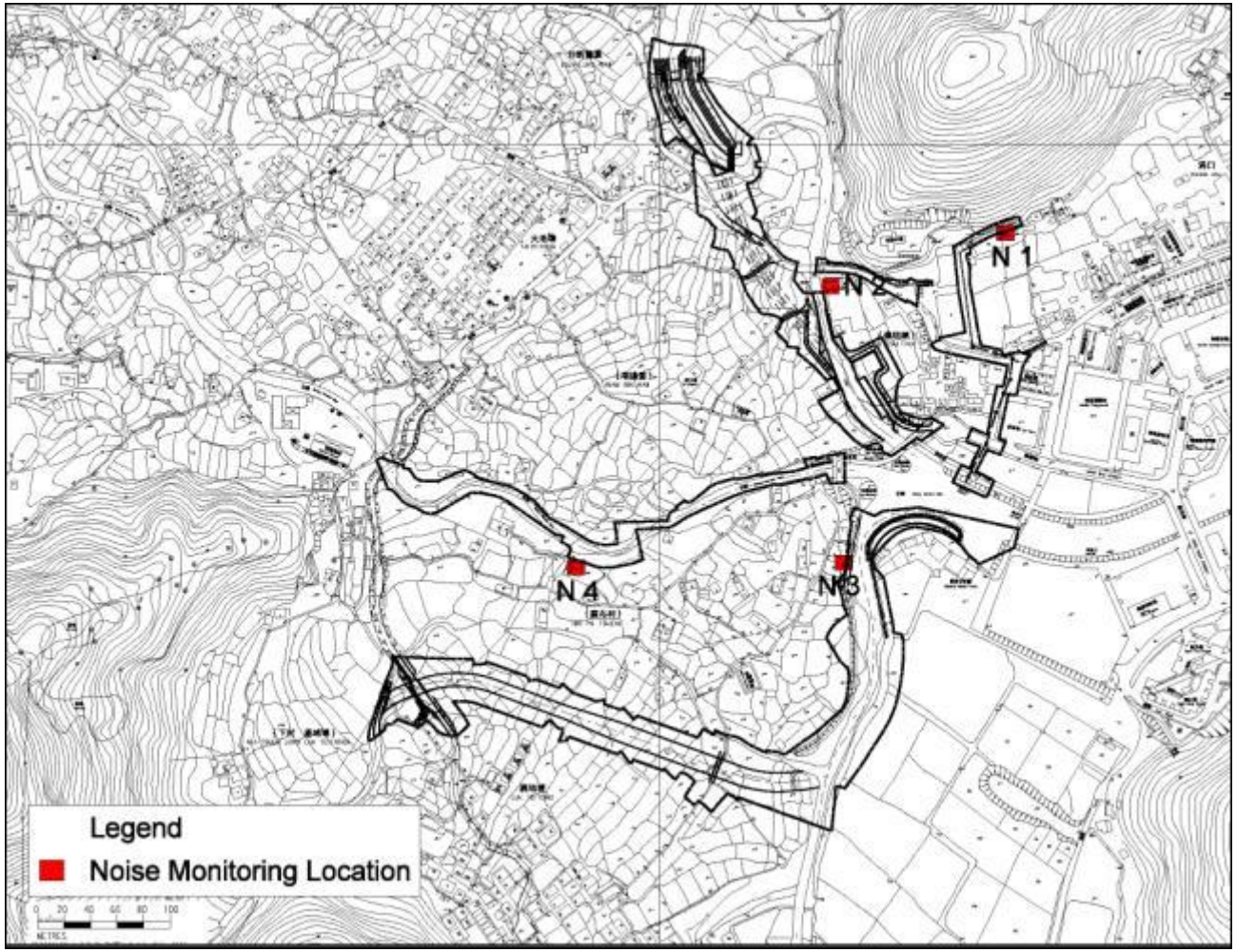


Figure 4.3.1 Impact noise monitoring locations

4.4 Monitoring Results and Interpretation

As EPD has no objection to the termination of weekly impact noise monitoring starting from 1 Jan 2012, no results were presented during the reporting period.

4.5 Action and Limit level for Construction noise

The Action and Limit (A/L) levels for construction noise are defined in Table 4.5.1. Should non-compliance of the criteria occur, action in accordance with the Action Plan in Table 4.5.2 should be carried out.

Table 4.5.1 Action and Limit Levels for Construction noise		
Time Period	**Action Level**	**Limit Level**
0700 – 1900 hours on normal weekdays	When one documented complaint is received	75dB(A)
Remarks: If works are to be carried out during restricted hours, the conditions stipulated in the construction noise permit issued by the Noise Control Authority have to be followed.		

Table 4.5.2 Event / Action Plan for Construction Noise

EVENT	**ACTION**			
	ET	**IC(E)**	**ER**	**Contractor**
Action Level	1. Notify IC(E) and Contractor; 2. Carry out investigation; 3. Report the results of investigation to the IC(E), ER and Contractor; 4. Discuss with the Contractor and formulate remedial measures; 5. Increase monitoring frequency to check mitigation effectiveness.	1. Review the analysed results submitted by the ET; 2. Review the proposed remedial measures by the Contractor and advise ER accordingly; 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures are properly implemented.	1. Submit noise mitigation proposals to IC(E); 2. Implement Noise mitigation proposals.
Limit Level	1. Identify source; 2. Inform IC(E), ER, EPD and Contractor; 3. Repeat measurements to confirm findings; 4. Increase monitoring frequency; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Inform IC(E), ER and EPD the causes and actions taken for the exceedances; 7. Assess effectiveness of Contractor's remedial actions and keep IC(E), EPD and ER informed of the results 8. If exceedance stops, cease additional monitoring	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures properly implemented; 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	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. Resubmit proposals if problem still not under control; 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated

4.6 Noise Mitigation Measures

As major construction activities had completed, no powered mechanical equipment or other site activity was observed within the site area that would cause noise impact to the surrounding environment.

5. Water Monitoring

5.1 Water Quality Monitoring Parameters and methodology

Turbidity in Nephelometric Turbidity Unit (NTU), Dissolved Oxygen (DO) in mg/L and Suspended Solids (SS) in mg/L are required to measure in this project. Turbidity, DO was measured in-situ while water samples were delivered to Accredited HOKLAS Laboratory for analysis of SS.

Other relevant data such as monitoring location, time, water depth, temperature, salinity, weather conditions and any other special phenomena and work underway at the construction site were recorded during sampling.

According to the requirement of the EM&A manual, two consecutive measurements for parameters of DO concentration, DO saturation and Turbidity are required to be taken at each monitoring location. When the difference in value between the first and second reading of DO or Turbidity is more than 25%, the reading would be discarded and further reading would be taken.

5.2 Monitoring Equipment

Turbidity, DO, Salinity, pH and temperature was measured by an instrument complied with the following requirements:

The instrument is a portable as well as weatherproof multimeter complete with cable and uses a DC power source. It is capable of measuring:

- A turbidity between 0-800NTU;
- A dissolved Oxygen level in the range of 0-20mg/L and 0-200% saturation;
- A temperature of 0-50^{o}C;
- Salinity in the range of 0-40ppt;
- pH in the range of 0-14.

Suspended solid was determined by the water samples collected from the monitoring locations for further analysis in accredited HOKLAS laboratory. Water samples were contained by polythene bottles, packed in ice (cooled in 4^{o}C without frozen) and delivered to the laboratory for analysis as soon as possible after collection. Duplicate samples from each independent sampling event were undertaken during impact monitoring.

5.3 Monitoring Locations

Seven locations included a control station in upstream of each stream/ river, a monitoring station at the end of each stream/ river of the works area and a monitoring station at Silver River were proposed for the impact water quality monitoring. Water samples were collected at mid-depth of each proposed monitoring stations for measurements and sample collection. The Location Plan is shown in Figure 5.3.1 for reference.

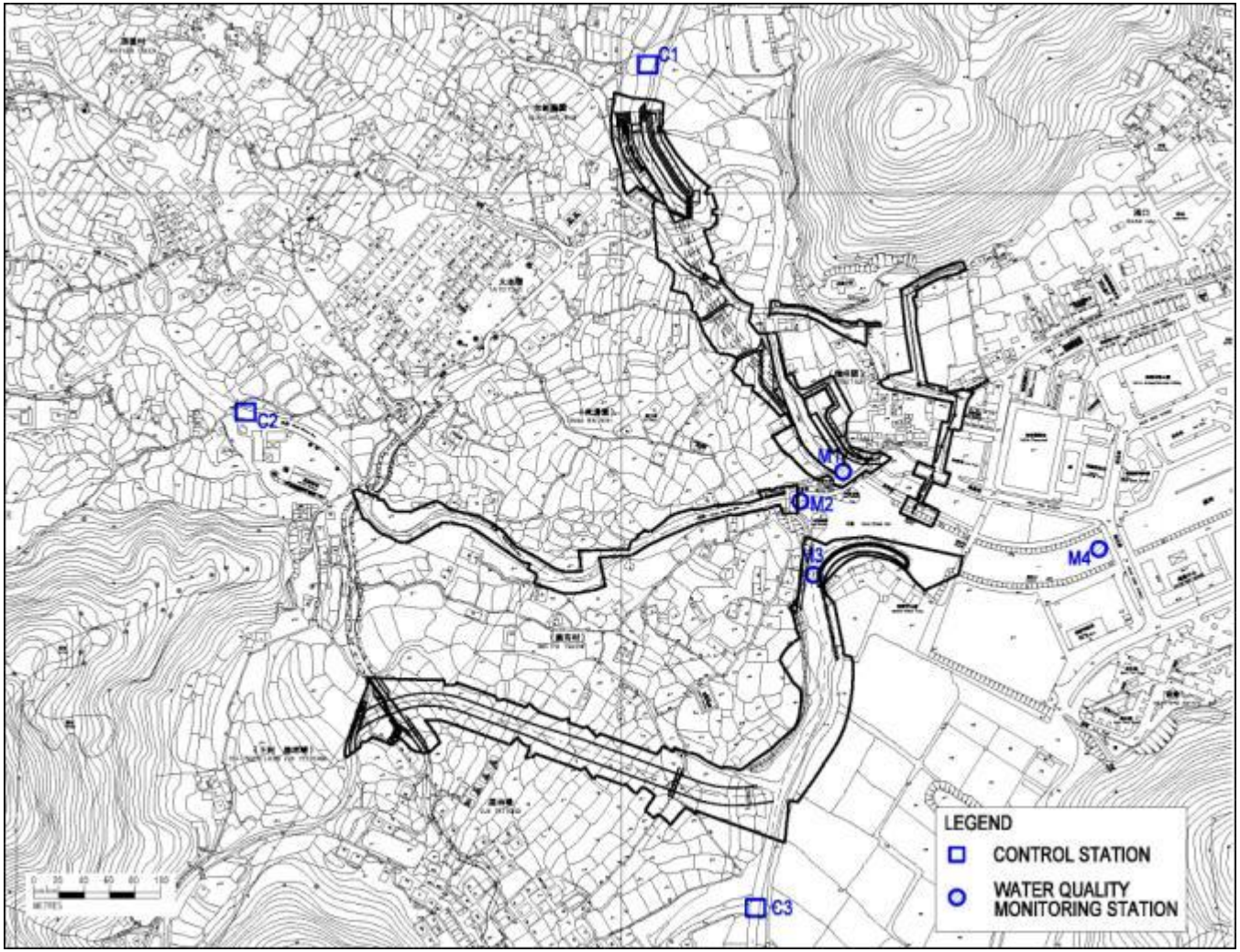


Figure 5.3.1 Water Quality Monitoring Locations

5.4 Monitoring Frequency

Impact water quality monitoring was undertaken three days per week and at ebb tides during the course of the construction river works. Upon the completion of the construction works, the monitoring exercises at the designated monitoring stations will be continued for four weeks in the same manner as the impact monitoring.

5.5 Monitoring Results and Interpretation

The water quality monitoring programme was completed on 1 June 2011. Therefore, no water quality results were presented in this report.

5.6 Action and limit level for Water Quality

Based on the criteria stipulated in EM&A manual Section 4.8 and baseline water quality monitoring data obtained, the A/L levels are shown in Table 5.6.1 and Table 5.6.2. If the water quality monitoring results at any impact stations exceeded the criteria, the actions in accordance with the Event and Action Plan in Table 5.6.3 should be taken.

Table 5.6.1 Water quality criteria for monitoring

Parameters	Action	Limit
DO in mg/L (mid-depth)	- 5%-ile of baseline data	- 4mg/L
SS in mg/L (mid-depth)	- 95%-ile of baseline data; or - 120% of control station's SS on the same day of measurement	- 99%-ile of baseline; or - 130% of control station's SS on the same day of measurement
Turbidity in NTU (mid-depth)	- 95%-ile of baseline data; or - 120% of control station's turbidity on the same day of measurement	- 99%-ile of baseline; or - 130% of control station's turbidity on the same day of measurement

Table 5.6.2 Action and Limit Levels established according to baseline data

Parameters	Monitoring locations							
	M1		M2		M3		M4	
	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level
Turbidity (NTU)	15.2	16.9	5.3	6.5	16.8	26.0	16.2	18.0
DO (mg/L)	5.7	4.0	6.2	4.0	5.9	4.0	5.9	4.0
SS (mg/L)	12.2	12.8	3.1	4.2	12.4	17.7	13.9	15.2

Remarks:
For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits
For SS and turbidity, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Table 5.6.3 Event and action Plan for Water Quality

EVENT	ACTION			
	ET	**IC(E)**	**ER**	**Contractor**
Action Level being exceed by one sampling day	1. Repeat in *situ* measurement to confirm findings; 2. Identify reasons for non-compliance and source(s) 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.	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals in mitigation measures submitted by Contractor and advise the ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures.	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.	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.
Action level being exceed by more than two consecutive sampling days	1. Repeat in *situ* measurement to confirm findings; 2. Identify reasons for non-compliance and source(s) 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; prepare to increase the monitoring frequency to daily 7. Repeat measurement on next day of exceedance	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals in mitigation measures submitted by Contractor and advise the ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures.	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.	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 three working days; 6. Implement the agreed mitigation measures.
Limit level being exceeded by one sampling day	1. Repeat in *situ* measurement to confirm findings; 2. Identify reasons for non-compliance and source(s) 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. Increase the monitoring frequency to daily until no exceedance of Limit Level	1. Discuss with ET and Contractor on the mitigation measures; 2. Review proposals in mitigation measures submitted by Contractor and advise the ER accordingly; 3. Assess the effectiveness of the implemented mitigation measures.	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.	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.

5.7 Water Quality Mitigation Measures

Construction Run-off and Drainage

The site practices outlined in ProPECC PN 1/94 'Construction Site Drainage" should be followed as far as practicable during both construction and operation phase of the drainage improvement works in order to minimize surface runoff and the chance of erosion, and also to retain and reduce any suspended solids prior to discharge.

As recommended in the final EM&A manual, attention would be paid especially construction run-off and drainage, general construction activities, sewage discharged from construction workforce and river channel excavation works.

Contractor was recommended to provide sufficient water treatment facilities for accumulated site water and excavation activities carried out nearby river channel. Earth bunds should be provided to the construction site in / next to the river channel to form an enclosed, dry environment to minimize water quality impact.

5.8 Water Monitoring Schedule for the Next reporting period

As water quality monitoring (WQM) programme for the project was completed, no WQM will be conducted at next month.

6. Ecology Monitoring

6.1 Ecological Monitoring Parameters

According to the Final EM&A Manual, a specific ecological monitoring programme of the improved section of PNH and LTT Rivers is recommended. The monitoring parameters required to measure in this project and survey methodology are described below:

(1) Avifauna species and abundance: Birds will be surveyed quantitatively using transect count method. Birds within the river channel and on the riverbank will be identified and their abundance will be recorded.

(2) Aquatic macroinvertebrate community species composition and abundance: Survey on aquatic fauna will focus on determination of the diversity and abundance of stream aquatic communities. Sampling methods, such as active searching, direct observation, netting, and kick sampling, will be determined according to the site conditions during field survey.

(3) Fish community species composition and abundance: Sampling methods, such as active searching, direct observation, and hand netting, will be determined according to the site conditions during field survey.

(4) Adult odonate community species composition and abundance: Adult dragonfly will be surveyed quantitatively using transect count method. Adult dragonflies within the river channel and on the riverbank will be identified and their abundance will be recorded. Species requiring close examination will be netted.

(5) Aquatic, emergent and riparian vegetation community species composition and abundance: The area will be walked through. Plant species composition and their relative abundance will be recorded.

(6) Surveys of White-shouldered Starling Sturnus sinensis will be conducted at the disused watchtowers next to LTT river. Breeding of the White-shouldered Starlings will be determined by checking signs of attempt to breed or sign of breeding which include carrying nesting materials, to-and-fro movement of adults carrying food, presence of recently fledged juveniles, etc. The number of breeding pairs and the site observation will be recorded whenever possible.

According to the EM&A Manual, a new monitoring programme would be carried out to monitor the ecology of the LTT Bypass Channel and its Reference Site for post-construction phase monitoring. The monitoring parameters required to measure in this project and survey methodology are described below:

(1) Avifauna species and abundance: Birds will be surveyed quantitatively using transect count method. Birds within the river channel and on the riverbank will be identified and their abundance will be recorded.

(2) Aquatic macroinvertebrate community species composition and abundance: Survey on aquatic fauna will focus on determination of the diversity and abundance of stream aquatic communities. Sampling methods, such as active searching, direct observation, netting, and kick sampling, will be determined according to the site conditions during field survey.

(3) Fish community species composition and abundance: Sampling methods, such as active searching, direct observation, and hand netting, will be determined according to the site conditions during field survey.

(4) Adult odonate community species composition and abundance: Adult dragonfly will be surveyed quantitatively using transect count method. Adult dragonflies within the river channel and on the riverbank will be identified and their abundance will be recorded. Species requiring close examination will be netted.

(5) Aquatic, emergent and riparian vegetation community species composition and abundance: a 10m line transect will be randomly laid in each 50 m section of both Luk Tei Tong by-pass and its reference site,, and 5 1m x 1m quadrats will be placed regularly along the line transect. Percentage cover of each species within the quadrat was recorded to the nearest 10% (except "1" = present but insignificant cover, normally 1-2 individuals, and 5% = up to 5%). The conditions of vegetation will be described.

(6) Surveys of White-shouldered Starling *Sturnus sinensis*: Occurrence of White-shouldered Starling in and near the LTT Bypass Channel and Reference Site will be recorded during the bird survey. Behaviour related to nesting (e.g., carrying nesting materials, to-and-fro movement of adults carrying food, presence of recently fledged juveniles) will be reported.

(7) Herpetofauna community species composition and abundance: Herpetofauna surveys within the Reference Site and LTT Bypass Channel will be surveyed by active searching in potential habitats. Twenty minutes will be spent in each 50m section. Reptiles will be identified and their abundance will be recorded.

Amphibians will be identified by their calls and the number of calling males in each section will be recorded.

Water Quality Monitoring along LTT and PNH River as well as LTT bypass channel and its reference site will be carried out. Water quality monitoring will include Turbidity in Nephelometric Turbidity Unit (NTU), Dissolved Oxygen (DO) in mg/L and Suspended Solids (SS) in mg/L are required to measure in this project. Moreover, additional water monitoring parameters will be taken for the purposes of ecological monitoring of water quality in this project. The added information will include: BOD, Ammonia, Nitrate and Phosphate concentrations. Turbidity, DO, pH and water flow will be measured in-situ while water samples will be delivered to Accredited HOKLAS Laboratory accredited laboratory and the analyses followed the standard methods according to APHA Standard Methods for the Examination of Water and Wastewater, 20th Edition, or equivalent for analysis of SS, BOD, Ammonia, Nitrate and Phosphate concentrations.

Other relevant data such as monitoring location, time, water depth, temperature, salinity, weather conditions and any other special phenomena and work underway at the construction site will be recorded during sampling.

According to the requirement of the EM&A manual, two consecutive measurements for parameters of DO concentration, DO saturation and Turbidity are required to be taken at each monitoring. When the difference in value between the first and second reading of DO or Turbidity is more than 25%, the reading will be discarded and further reading will be taken.

6.2 Monitoring Equipment and Methodology

Turbidity, DO, Salinity, pH and Temperature will be measured by a instrument complied with the following requirements:

The instrument is a portable as well as weatherproof multimeter complete with cable and uses a DC power source. It is capable of measuring:

- A turbidity between 0-800NTU;
- A dissolved Oxygen level in the range of 0-20mg/L and 0-200% saturation;
- A temperature of 0-50^{o}C;

- Salinity in the range of 0-40ppt;
- pH in the range of 0-14.

Suspended solid was determined by the water samples collected from the monitoring locations for further analysis in accredited HOKLAS laboratory. Water samples were contained by polythene bottles, packed in ice (cooled in $4^{o}C$ without frozen) and delivered to the laboratory for analysis as soon as possible after collection. Duplicate samples from each independent sampling event were undertaken during impact monitoring.
Detailed calibration records of the multimeter were shown in Appendix C for reference.

6.3 Monitoring Locations

According to the Final EM&A Manual, the improved section of the river channels will be divided into 50m long sections, and ecological survey will be carried out in each of the 50m sections. A total of nine sections will be divided for the two rivers which include:
- Two sections for existing upstream of PNH river (i.e. the proposed 80m long trapezoidal channel)
- Two sections for existing downstream of PNH river (i.e. the proposed 100m long rectangular channel)
- Five sections for existing Luk Tei Tong River (i.e. the proposed 240m long trapezoidal channel)

For the monitoring programme for LTT Bypass and the Reference site, a total of ten sections (five sections in each) will be divided as shown in Figure 6.1.

The Location Plan for ecological monitoring for PNH River and LTT River is shown in Figure 6.2 for reference.

The improved sections of the river channels require to carrying out water quality monitoring for the ecological purpose. The sampling points for post-construction phase monitoring were undertaken in the same place as the impact monitoring proposed, where include:

- Three points for existing of PNH river
- Three points for existing of Luk Tei Tong River

For the new monitoring programme for LTT Bypass Channel and Reference Site, the sampling points for ecological water quality were established.

- Two points for LTT Bypass Channel
- Two points for reference Site

The Location Plan for ecological water quality monitoring for PNH and LTT River is shown in Figure 6.3 for reference.

The EWQM monitoring for LTT Bypass Channel and Reference Site were started on 1 Jan 2012 in accordance with EM&A manual Section 6.2.31 & 6.2.32 requirements.

The EWQM monitoring locations for LTT Bypass channel and Reference Site is shown in Figure 6.4 for reference.

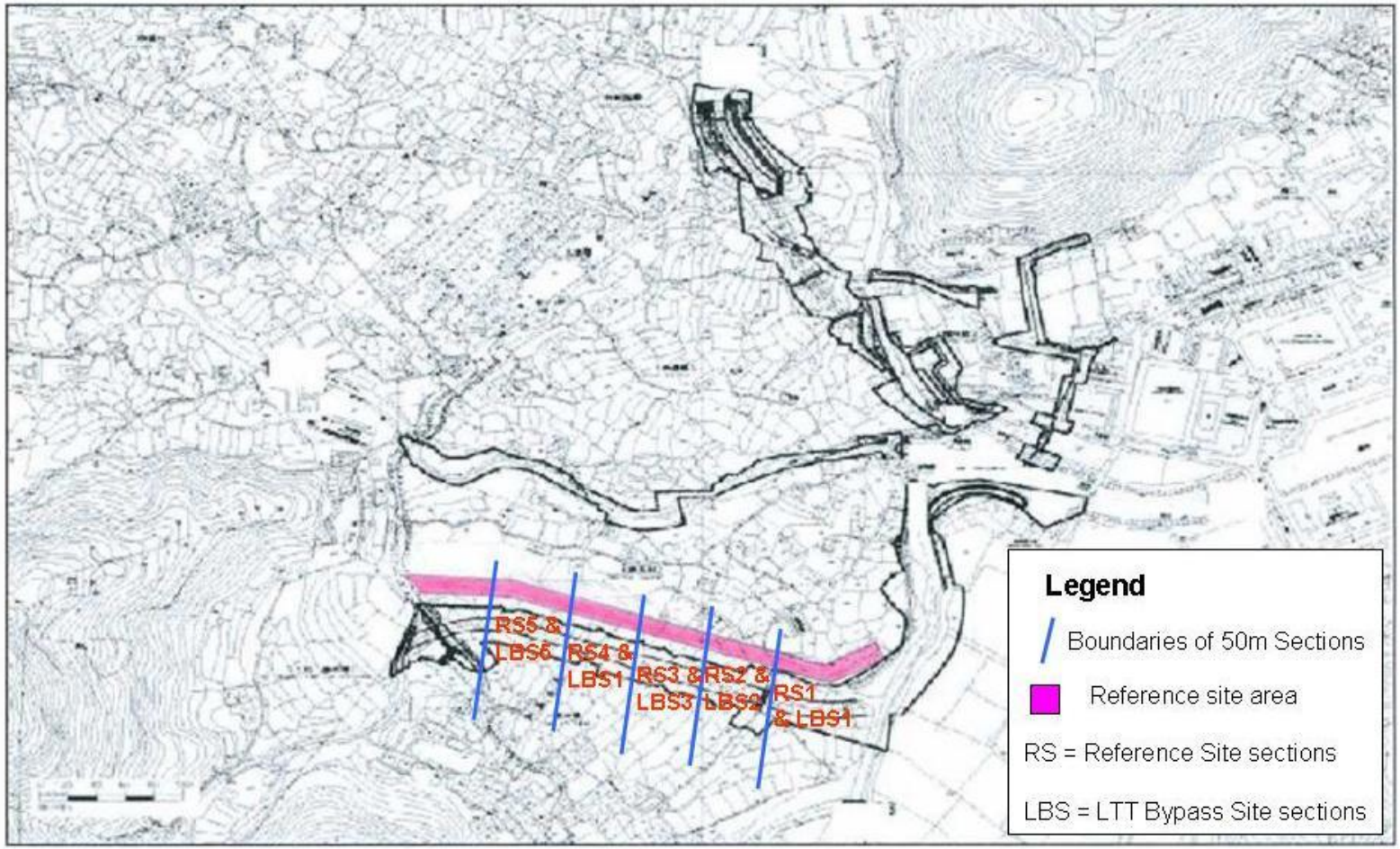


Figure 6.1 Ecological Monitoring Locations for LTT Bypass Channel and Reference Site

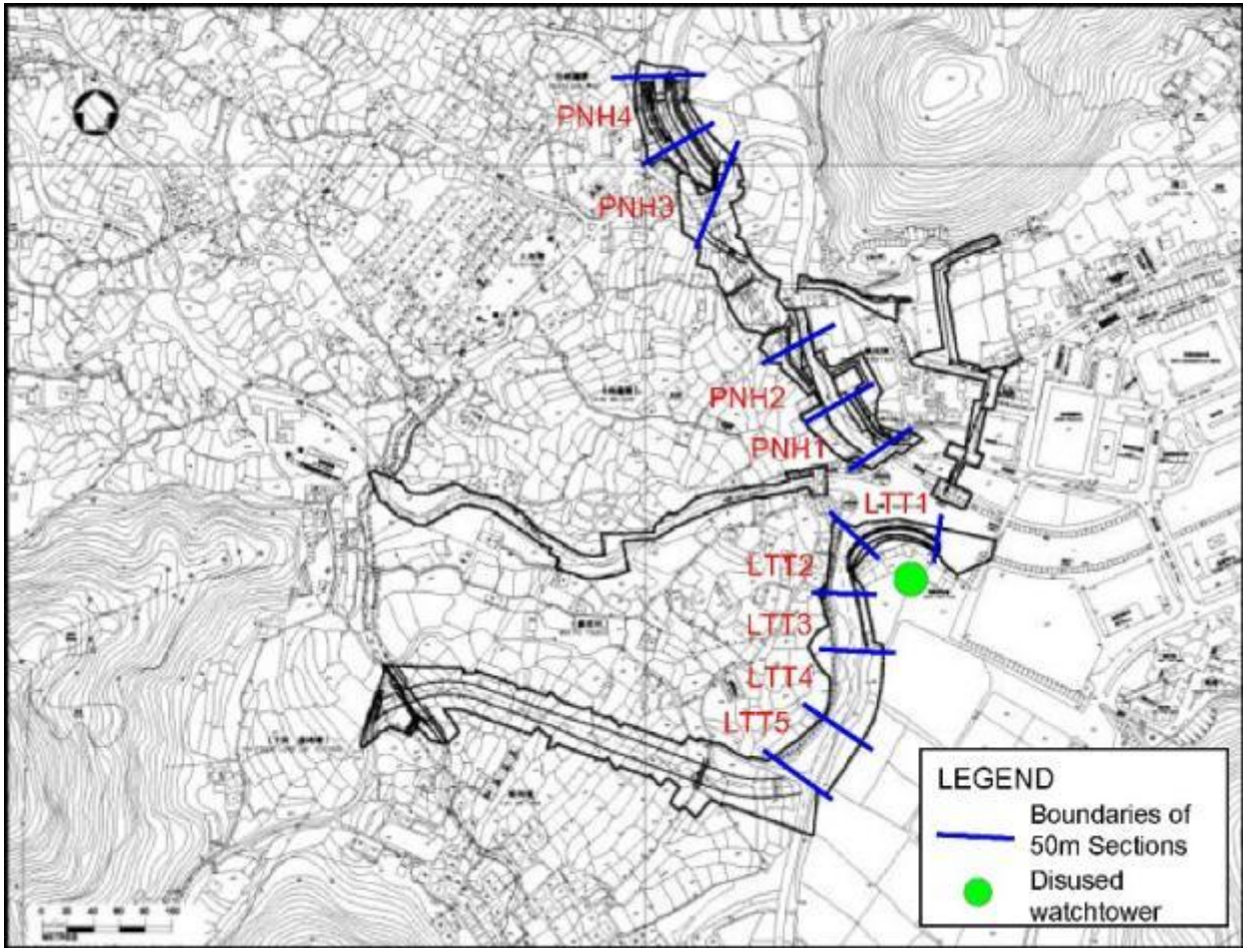


Figure 6.2 Ecological Monitoring Locations

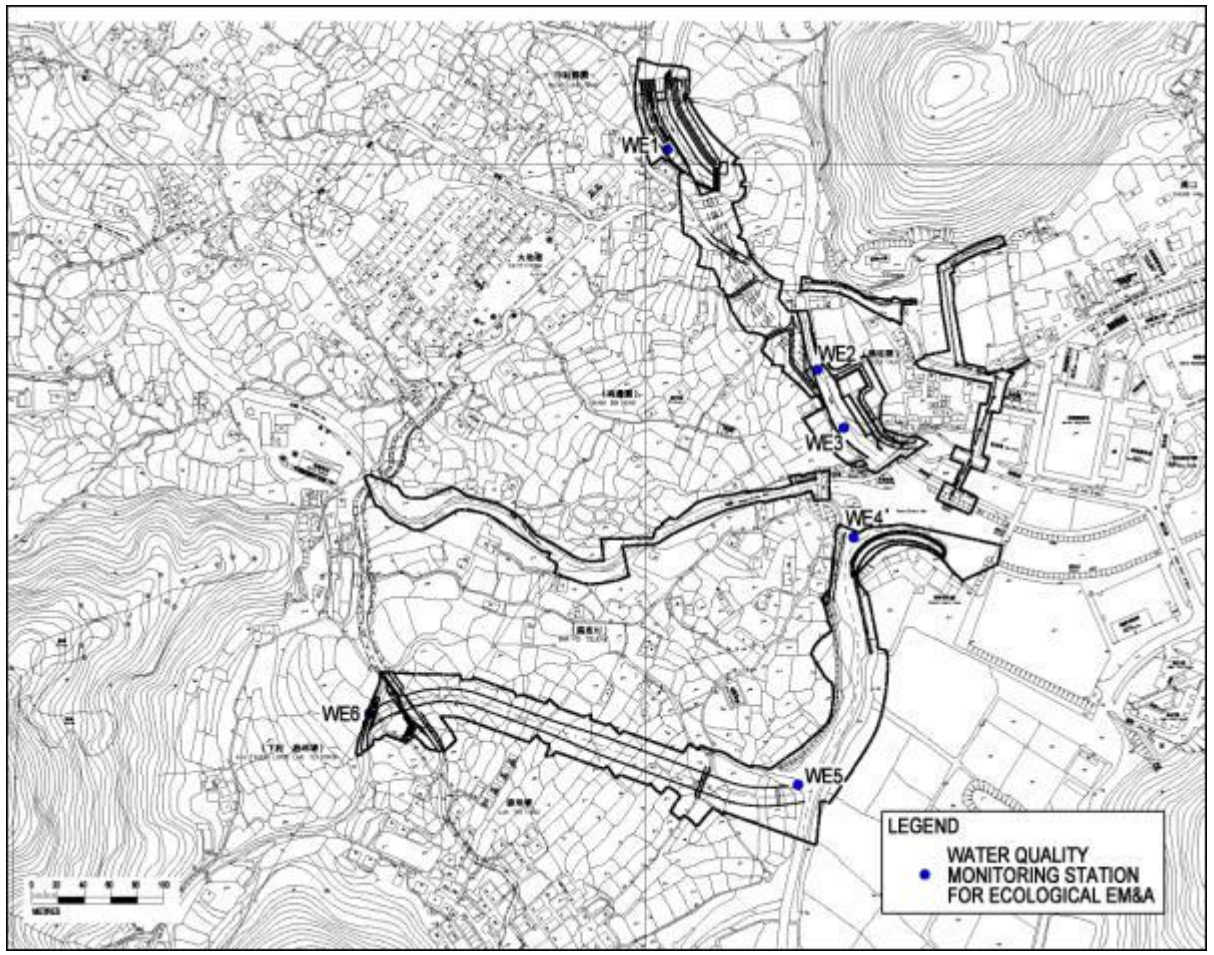


Figure 6.3 Ecological Water Quality monitoring locations

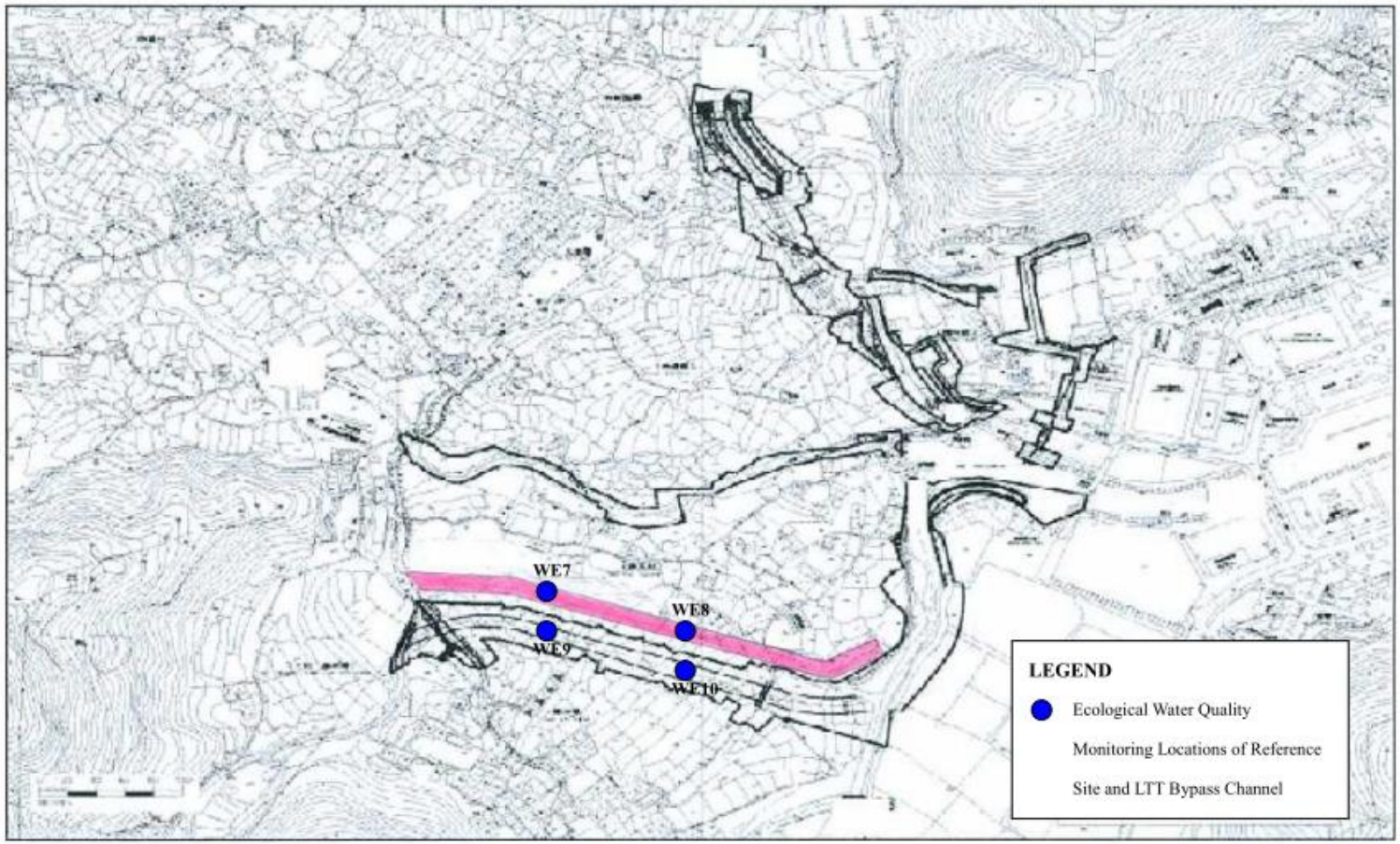


Figure 6.4 Ecological Water Quality Monitoring Locations for LTT Bypass Channel and Reference Site

6.4 Monitoring Frequency

As proposed, the post-construction ecological monitoring is carried out every two months a year for 4 years after the completion of works. This is the first monitoring session for the post-construction phase.

6.5 Monitoring results

Pak Ngan Heung Stream N and S sections

Vegetation

Surveys were conducted on 21 February 2012. Vegetation recorded was plants recolonised on stream bed, new rock gabion and remnant of the old stream bank. Vegetation management including clearance of Mikania was implemented on the rock gabion and stream bed.

The walk through survey recorded a total of 33 species, including 13 tree, 2shrub, 11 herb and 2 grass species (Appendix C1) on PNH N section. 24 of the species recorded are natives, while 9 were exotics. Remnants of vegetation including native trees (e.g. *Macaranga tanarius)* and grasses species (e.g. *Microstegium ciliatum*) were still seen along the east stream bank. Newly planted species included seedlings of such as *Ficus microcarpa, Gardenia jasminoides, Celtis sinensis, Liquidambar formosana* and *Mallotus paniculatus*. No species of conservation interest was recorded.

Vegetation was only found on remnants of the old concrete bank along PNH S section. A total of 4 species recorded, 2 of which were native and 2 were exotic. It was composed of exotic shrub (*Lantana camara*) and native trees (*Ficus supbera*) (Appendix C2). No species of conservation interest was recorded. No vegetation was observed on the new rock gabion on the lower section near the estuary.

Terrestrial Fauna

Surveys were conducted on 20 February 2012.

Two species of birds were recorded in Pak Ngan Heung River (Table 6.5.1). Both are common in Hong Kong.

Table 6.5.1 Avifauna in Pak Ngan Heung

Common names	**Latin names**	**PNH 1**	**PNH 2**	**PNH 3**	**PNH 4**	**Commonness & distribution**
Chinese Bulbul	*Pycnonotus sinensis*				1	CW
Japanese White-eye	*Zosterops japonica*			1		CW

CW = common and widespread

No dragonfly was recorded in Pak Ngan Heung River in February 2012.

Aquatic fauna and fish

5 species of fish and 3 crustacean were recorded in the 4 sections at PNH. All are common and widespread in Hong Kong. Though Predaceous Chub was observed, the another one fish species of conservation concern reported in the EIA report, i.e. Flagtail *Kuhlia marginata*, was not recorded in PNH during the present monitoring survey.

Table 6.5.2 Aquatic Invertebrates and fish in Pak Ngan Heung

Common names	**Scientific names**	**PNH 1**	**PNH 2**	**PNH3**	**PNH4**
Invertebrates					
Atyid shrimp	*Caridina elongata*				++
Palaemond shrimp	*Macrobrachium hainanensis*			+	+
Crab	*Varuna litterata*				
Mitten Crab	*Eriocheir japonica*			+	+
Fish					
Mosquito fish	*Gamusia affinis*				++

Goby	*Rhinogobius duospilus*				
Barcheek Goby	*Rhinogobius giurinus*				
Swordtail	*Xiphophorus hellerii*				
Six-banded Barb	*Puntius semifasciolatus*				
Unidentified Cichlid fish					
Tilapia		++	+++	++	
Predaceous Chub	*Parazacco spilurus*			++	
Jarbua Terapon	*Terapon jarbua*	+	+		
Common Silver-biddy	*Gerres oyena*				
Mullet	*Mugil cephalus*	+++	+++		
Broken-band Hillstream Loach	*Liniparhomaloptera disparis*				

+ = Occasional, less than 5 individuals were found; ++ = Common, 5 – 20 individuals were found; +++ = Abundant, more than 20 individuals were found.

Luk Tei Tong Stream Section

Vegetation

Surveys were conducted on 21 February 2011. A few tree and grass species were observed in old rock bank of Section 1, which is subject to regular vegetation clearance as part of the maintenance work. Remnants of mangrove stand dominated by Kandelia obovata remained in Section 2. A few grasse and herb species colonised the new rock gabion of Section 3 and 4, while mangrove, grasses and herbs recolonised the junction between Section 5 and LTT bypass channel. The walk through survey recorded a total of 23 species, including 6 tree, 7 herb and and 4 grass species (Appendix C3). 18 species recorded are natives, while 5 were exotics.

Terrestrial Fauna

The Luk Tei Tong River was divided into 5 sections.

Surveys were conducted on 20 February 2012.

A total of nine species of birds were recorded in these sections (Table 6.5.3). All are common in Hong Kong.

Table 6.5.3 Avifauna in Luk Tei Tong River

Common names	**Latin names**	**LTT 1**	**LTT 2**	**LTT 3**	**LTT 4**	**LTT 5**	**Commonness & distribution**
Little Egret	*Egretta garzetta*	1					CW
Great Egret	*Casmerodius alba*	2					CL
Chinese Pond Heron	*Ardeola bacchus*		1				CW
Grey Heron	*Ardea cinerea*	2					CL
Black-crowned Night Heron	*Nycticorax nycticorax*	2					CL
Common Sandpiper	*Actitis hypoleucos*	1					CW
White Wagtail	*Motacilla alba*		1				CW
Rufous-backed Shrike	*Lanius schach*				1		CW
Crested Myna	*Acridotheres cristatellus*				2	2	CW

CW = common and widespread, CL = common/uncommon and localised

No dragonfly was recorded in the Luk Tei Tong River in 20 February 2012.

Aquatic invertebrates and fish

4 species of fish, 2 species of crustacean and 4 species of mollusks were recorded in the 5 sections at LTT. All are common and widespread in Hong Kong. The two fish species of conservation concern reported in the EIA report, i.e. Flagtail *Kuhlia marginata* and Predaceous Chub *Parazacco spilurus* were not recorded in LTT during the present monitoring.

Table 6.5.4 Aquatic invertebrates and fish in Luk Tei Tong River

Common names	Scientific names	LTT1	LTT2	LTT3	LTT4	LTT5
Invertebrates						
Mangrove clam	*Geloina erosa*					
Rock oyster	*Saccostrea cuculata*	+++	+			
Snail	*Melanoides tuberculata*				+++	+++
Snail	*Terebralia* sp.					
Snail	*Nerita* sp.	+++	+++			
Snail	*Littoraria articulata*		+++			
Crab	*Varuna litterata*					
Fiddler crab	*Uca lactea*					
Fiddler crab	*Uca arcuata*					
Fiddler crab	*Uca crassipes*					
Crab	*Perisesarma bidens*					
Mangrove mud crab	*Scylla paramamosain*	+				
Mitten crab	*Eriocheir japonica*	+				
Fish						
Common mudskipper	*Periophthalmus cantonensis*	++	+			
Tilapia		++	+			
Jarbua terapon	*Terapon jarbua*					
Mullet	*Mugil cephalus*	+++	+++			
Common Silver-biddy	*Gerres oyena*					

Barcheek Goby	*Rhinogobius giurinus*				+	+

+ = Occasional, less than 5 individuals were found; ++ = Common, 5 – 20 individuals were found; +++ = Abundant, more than 20 individuals were found.

Luk Tei Tong Bypass Channel & Reference Site

Vegetation

A total of 16 plant species with an average cover of 100.5% were recorded within the quadrats at LTT Bypass Channel (Table 6.5.5, Appendix C3). Section 1 of LTT Bypass Channel which may be subject to tidal influence during high tide, was colonised with a sedge *Fimbristlyis ferruginea*. Most of the upper sections of LTT Bypass Channel were densely covered with vegetation dominated by the exotic herb *Wedelia trilobata*. Other grass species recorded included *Apluda mutica* and *Panicum maximum*. The remaining recorded species only formed a small composition of the plants recorded. During the survey, other than Section 1 which recorded some open water, other sections were fairly dry.

The reference site varied greatly in terms of physical conditions and species composition. Section 1 was covered by shallow standing water while the other sections were fairly dry. Species recorded including *Wedelia trilobata* and *Cynodon dactylon*. A total of 19 plant species with an average cover of 65.8% were recorded within the sampling quadrats (Table 6.5.5, Appendix C3).

Table 6.5.5 Comparison of LTT Bypass Channel and Reference Site

	LTT Bypass Channel	Reference Site
Total No. Species	16.0	19.0
Average Vegetation Cover (%)	100.5	65.8
Bare/Litter (%)	11.2	40.6
Open Water (%)	3.3	0.8

Terrestrial Fauna

The Luk Tei Tong Bypass Channel and Reference Site were each divided into 5 sections.

Surveys of birds, dragonflies and herpetofauna were conducted on 20 February 2012.

Three species of birds were recorded in the Luk Tei Tong Bypass Channel, while four species in Reference Site (Table 6.5.6). All are common in Hong Kong.

No White-shouldered Starling was recorded in the Luk Tei Tong Bypass Channel or Reference Site.

Table 6.5.6 Avifauna in Luk Tei Tong Bypass channel and Reference Site

Common names	**Latin names**	**LBC1**	**LBC2**	**LBC3**	**LBC4**	**LBC5**	**RS 1**	**RS 2**	**RS 3**	**RS 4**	**RS 5**	**Commonness & distribution**
Chinese Bulbul	*Pycnonotus sinensis*									3		CW
Red-vented Bulbul	*Pycnonotus aurigaster*										3	CW
Spotted Dove	*Streptopelia chinensis*		1	2								CW
Yellow-bellied Prinia	*Prinia flaviventris*						1					CW
Black-necked Starling	*Sturnus nigricollis*	2	6									CW
Crested Myna	*Acridotheres cristatellus*	6	2				6					CW

No dragonfly was recorded in the Luk Tei Tong Bypass Channel or Reference Site in February 2012.

No herpetofauna was recorded in the Luk Tei Tong Bypass Channel or Reference Site in February 2012.

Aquatic invertebrates and fish

Surveys of fish and macroinvertebrates were conducted in Luk Tei Tong Bypass Channel and Reference Site. But basically both were not aquatic habitats for fish or macroinvertebrates. No fish or macroinvertebrates was

found in either Luk Tei Tong Bypass Channel or Reference Site.

Disused Watchtowers

Surveys were conducted on 20 February 2012.

There was no sign (e.g., adults carrying food or nesting materials) of use of the watchtower as nesting habitat by White-shouldered Starling.

White-shouldered Starling was not observed during the February 2012 monitoring. No bird of other species was observed entering the watchtower.

Since the monitoring surveys commenced in August 2008, no bird was observed entering the watchtower. It seems the birds do not prefer the watchtower as nesting habitat.

6.6 Ecological Water Quality Monitoring (EWQM)

The post-construction phase EWQM was started on 1 June 2011 and conducted on a bi-monthly basis. Post-construction EWQM was conducted in Jan 12. Therefore, post-construction EWQM was not carried out during this reporting period.

The Monitoring Schedule was shown in Appendix D.

Table 6.10 shows the baseline results of Ecological Water Quality Monitoring, from the information given in Baseline Monitoring Report.

Table 6.10 Baseline Results of Ecological water quality monitoring

Parameters	WE1	WE2	WE3	WE4	WE5	WE6
Suspended Solid (mg/l)	1.0	2.0	3.0	3.0	<1	<1
Nitrogen (Ammonia) (mg/l)	0.07	0.12	0.11	0.23	0.03	0.02
Nitrogen (Nitrate) (mg/l)	0.12	0.13	0.13	0.31	0.04	0.05
Phosphorous (mg/l)	0.04	0.06	0.06	0.09	0.06	0.05
BOD_5 (mg/l)	<2	<2	<2	<2	<2	<2
DO (mg/l)	6.58	6.82	6.37	7.61	6.87	5.70
Turbidity (NTU)	4.44	5.12	5.93	6.96	4.65	2.73
PH	6.4	7.1	7.0	6.8	6.6	6.1
Salinity (ppt)	<0.1	0.1	0.3	7.6	0.1	<0.1

6.7 Action and Limit level for Monitoring of White-shouldered Starlings

A simple Event and Action Plan is shown in Table 6.6.1. Should the Event occur, action in accordance with the Action Plan should be carried out.

There was no recorded event in the reporting month.

Table 6.6.1 Event / Action Plan for Monitoring of White-shouldered Starlings

EVENT	ACTION	
	ET Leader	Contractor
Identification of disturbance to breeding White-shouldered Starlings	1. Increase frequency of monitoring to twice weekly	1. Check all construction actions and working methods
	2. Notify Site Engineer	2. Submit proposals for remedial action to prevent abandonment of the breeding site.
	3. Review construction activities of previous week.	3. Implement remedial action.

	4. Identify any changes in construction activities in previous week	4. Liaise with ET regarding effectiveness of remedial actions.
	5. Discuss remedial actions with Site Engineer	

6.8 Ecological monitoring Schedule

The next ecological surveys are scheduled on 13 April 2012, while post-construction ecological water quality monitoring is scheduled on 26 March 2012.

7. Action taken in Event of Exceedence

If the measurements (Noise, Water, Ecology) exceed the action / limit level, exceedance details will be reported and follow-up actions will be taken by relevant parties involved.

As no monitoring was conducted in the reporting period, no exceedance was recorded.

8. Construction waste disposal

It is the contractor's responsibility to ensure that all wastes produced during the construction phase for the drainage improvement works are handled, stored and disposed of in accordance with good waste management practices and EPD's regulation and requirement. Waste materials generated during construction activities, such as construction and demolition (C&D) material, chemical wastes and general refuse, are recommended to be audited at regular intervals to ensure that proper storage, transportation and disposal practices are being implemented.

Contractor has completed the registration of Waste Producer under the Waste Disposal (Chemical Waste)(General) Regulation. The Waste Producer Number, WPN 5213-950-Y2443-03 was assigned by EPD on 12 Aug 2008. The Contractor would be responsible for the implementation of any mitigation measure to minimize waste or redress problems arising from the waste materials.

Table 8.1 is a summary of figures of the construction wastes disposal provided by Contractor.

Table 8.1 Summary of Construction Waste Disposal

	Amount of Construction Waste disposed		
Month	**Inert Waste (to Public Fill)**	**Non-inert Waste (to Landfill)**	**Chemical Waste (to treatment plant)**
1st to 29th Feb 12	10.0 (tons)	0	Nil
Total	36917.06 (tons)	247.43 (ton)	0

9. Status of Permits and Licenses obtained

Table 9.1 is the updated status of environmental related permits/ license obtained for the construction activities

Table 9 .1 Status of Permits and Licenses Obtained

Description	License / Permit No.#	Date of Issue	Date of Expiry	Remarks
Environmental Permit	EP-237/2005/A	05 Mar 2007	--	Issued
Varied Environmental Permit	EP-237/2005/B	23 April 2009	--	Issued
Environmental Permit for operational phase	EP-434/2012	3 Jan 2012		Issued
Registration of C&D Waste Producer	7006521	--	--	Issued
Chemical Waste Producer	5213-950-Y2443-03	12 Aug 2008	--	Issued
Construction Noise Permit	N/A	N/A	N/A	N/A
Effluent Discharge License	EP890/W2/XG032 EP890/W2/XG033 EP890/W2/XG034 EP890/W2/XG035 EP890/W2/XG036 EP890/W2/XG037 EP890/W2/XG038 EP890/W2/XG039 EP890/W2/XG040 EP890/W2/XG041	23 Oct 2008	31 Oct 2013	Issued

The contractor implemented various environmental mitigation measures as recommended in the Environmental Permit and Final Mitigation Measures Report. The implemented schedule is presented in Appendix E.

10. Complaint Log

There was no formal complaint received during the reporting month.

Table 10.1 Summary of Formal Complaints received

	Noise	Water	Ecology	Cultural	Others
Feb 2012	0	0	0	0	0
Total	0	1	0	0	1

11. Site Environmental Audits

11.1 Site Inspection

Starting from 1 Jan 2012, the frequency of ET's regular site inspection changed from weekly to monthly basis. In the reporting month, the site inspection was conducted on 23 Feb 2012.

A detailed checklist of each site inspection together with comments, relevant photos and maps have been filed and kept. A summary of observation and follow-up action is shown in Table 11.1

Table 11.1 Summary of site inspection

Date	Observations	Advice from ET	Action taken	Closing Date
23 Feb 2012	No major environmental deficiency is observed.	N/A	N/A	N/A

11.2 Compliance with legal and Contractual requirement

ET leader has reviewed the progress and programme of the works to check any relevant environmental laws has not violated.

11.3 Environmental Complaint and follow up actions

During this reporting period, there was no documented complaint received. Therefore, follow up actions for the environmental complaint is not required.

12. Future key issues

Establishment of all the landscaping works, construction of the outstanding works at Luk Tei Tong River and Rectification of the defective works at Pak Ngan Heung River would be major site activities to be carried out in the upcoming month. Although environmental impact arisen from those activities would be expected to be minimal, Contractor was still reminded to pay serious attention to the following key issues:

- Dust generation due to handling of earthy material and dusty site surface.
- Housekeeping of site, such as stockpiling of C&D waste and earthy material.
- Removal of wastes as part of site clearance.

Contractor was recommended to provide tarpaulin coverings to all earthy stockpiles on site. Dusty static area should be dampened regularly to avoid dust generation.

Contractor should also prevent excessive storage of wastes on site. Wastes should be collected and disposed to designated public fill.

13. Conclusions

Establishment of all the landscaping works, construction of the outstanding works at Luk Tei Tong River and Rectification of the defective works at Pak Ngan Heung River were major site activities being carried out within this reporting month.

Regular site meetings and inspection audits led by the seniors for discussing site environmental matters were held among Project Proponent, Contractor and the ET on monthly basis. Monthly site meeting and inspection audits with the above parties and IEC were carried out on 23 Feb 2012.

Noise monitoring was terminated on 31 Dec 2011. No results were presented.

For water quality monitoring, Post-construction WQM has been completed on 1 June 2011. The post-construction phase ecological water quality monitoring was not carried in Feb 2012.

EPD had no objection to the three proposed changed of EM&A programme, namely the termination of noise monitoring, change of ET's site inspection frequency from weekly to monthly, and commencement of post-construction ecological monitoring effective from 1 Jan 2012.

The 1st post-construction ecological monitoring was carried out in this reporting period.

During ecological monitoring survey, no White-shouldered Starling was recorded breeding in the watch tower.

No bird was observed entering the watchtower since the monitoring surveys commenced in August 2008. Also, no breeding was recorded in the baseline survey in September 2007. It appears that the birds do not prefer to roost or nest in the watch tower.

Also, there were not any notifications of summons recorded during the reporting period. Furthermore, there were not any formal prosecution and complaints recorded.

ET has reminded the contractor to provide environmental pollution control measures wherever necessary; and to keep a good environmental management at site practice.

The ET will continue to implement the environmental monitoring & audit programme in accordance with the EM&A Manual and Environmental Permit requirement.

Appendix A

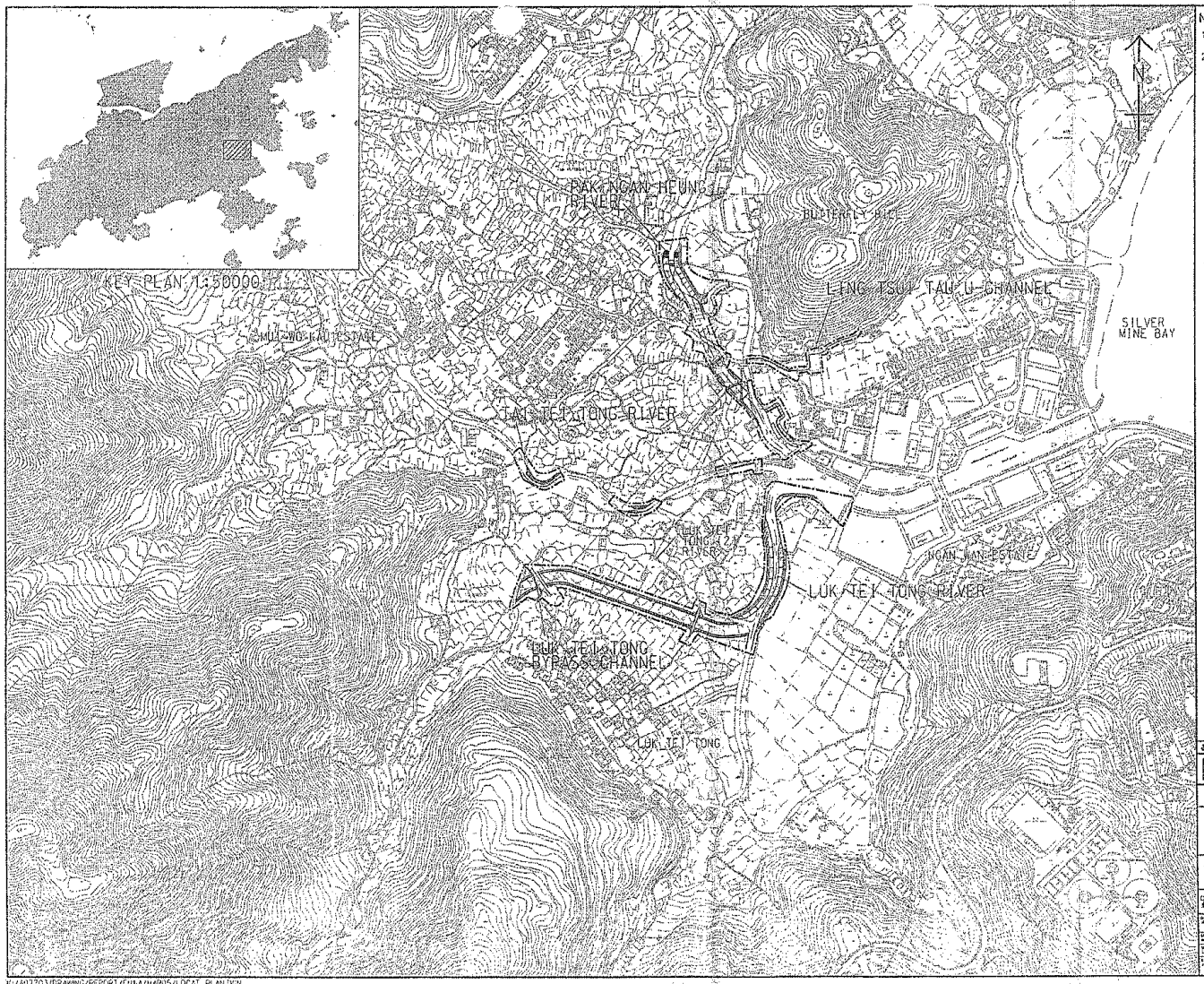
Construction Programme and Location Plan

Contract No.: DC/2006/11

Contract Name.: Drainage Improvement Works In Southern Lantau and Construction of Mui Wo Village Sewerage Phase I

Working Schedule for Outstanding Works and Handover (Data dated on February 2012)

Section of Works	Location	Jan 2012				Feb 2011				Mar 2012				Apr 2012			
		W1	*W2*	*W3*	*W4*	*W1*	*W2*	*W3*	*W4*	*W1*	*W2*	*W3*	*W4*	*W1*	*W2*		
Section 1																	
	Tai Tei Tong River																
1.6	Defects rectification works																
1.7	Handover period																
1.8	Prepare and submit as-built drawing																
Section 3																	
	Pak Ngan Heung River																
3.1	Construct railing and fencing																
3.2	Defects rectification works																
3.3	Handover period																
3.4	Prepare and submit as-built drawing																
	Luk Tei Tong																
3.5	Construct railing and fencing																
3.6	Defects rectification works																
3.7	PCCW and HGC Diversion at Box B																
3.8	Handover period																
3.9	Prepare and submit as-built drawing																
3.10	Reprovisional Works for House 4 (Lam House)																
3.11	Reprovisional Works for House 5 (Lit's Hosue)																
3.12	Repairing Works at Yuen's Compound																
Section 4																	
4.1	***Landscaping works for estiblishment***																
	(planting completed)																



NOTES:

1. GRID LINES ARE HONG KONG GRID 1980
2. ALL LEVELS ARE IN METERS AND REFERRED TO H.K.P.D.

DRAINAGE SERVICES DEPARTMENT, THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

STORMWATER IMPROVEMENT IN SOUTHERN KOWLOON INVESTIGATION

LOCATION PLAN OF THE PROJECT

Metcalf & Eddy Ltd 美地工程顧問有限公司

ORIG NO. 1.1

SEP 2004

PRELIMINARY

1:50000

METRES

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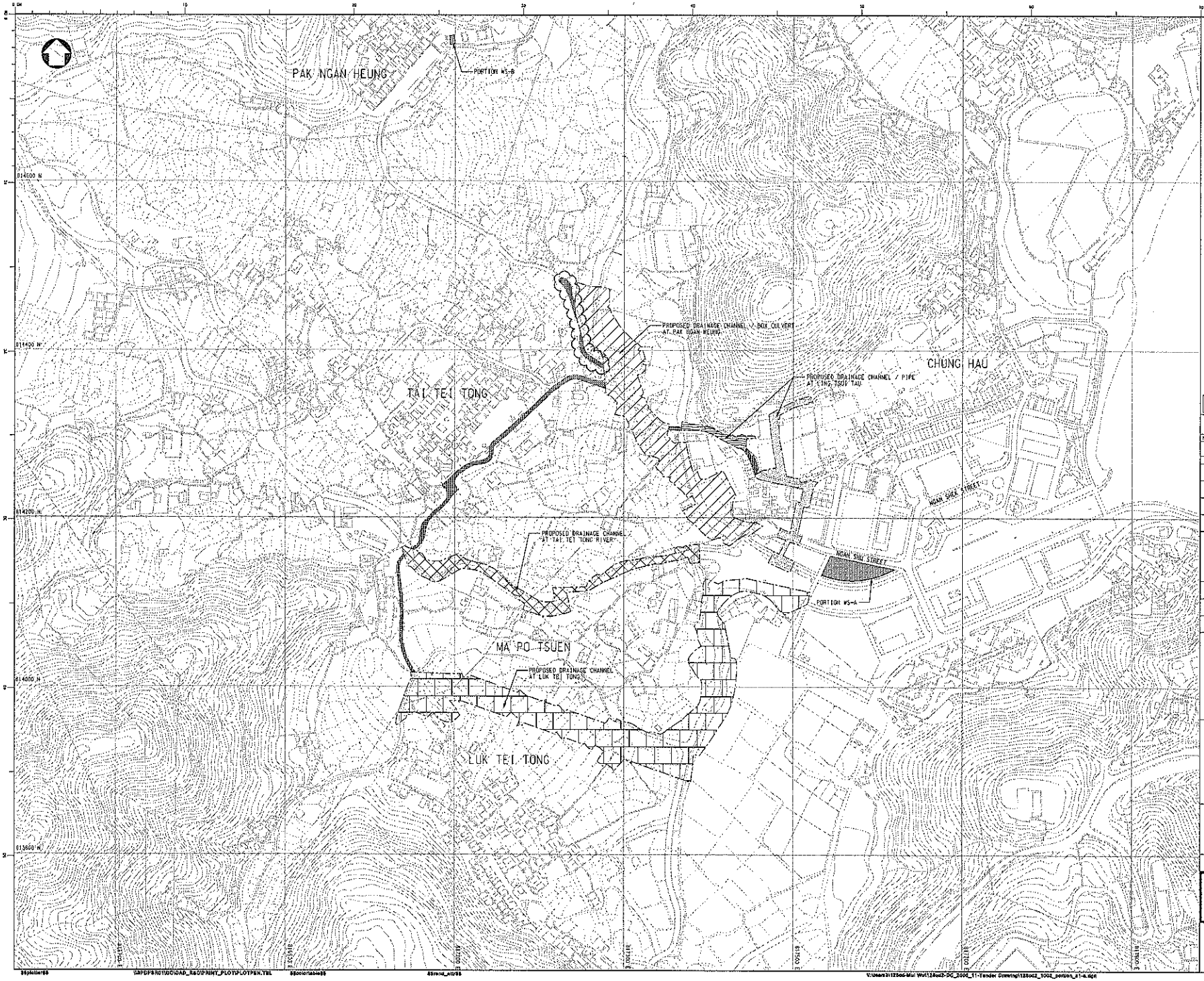

NOTES :

1. ALL LEVELS ARE IN METRES ABOVE P.D.H.K..
2. ALL GRIDS REFER TO HONG KONG 1980 GRID.

LEGENDS :

- SITE BOUNDARIES
- PORTION D1 - PAK NGAN HEUNG
- PORTION D2 - LING TSUI TAU (A)
- PORTION D3 - LING TSUI TAU (B)
- PORTION D4 - TAI TEI TONG RIVER
- PORTION D5 - LUK TEI TONG
- PORTION D6 - PUI O
- PORTION D7 - LO UK TSUEN
- PORTION D8 - CHEUNG SHA SHEUNG TSUEN
- PORTION D9 - EMERGENCY VEHICULAR ACCESS (EVA) AT HUI WO

FOR TENDER PURPOSES ONLY

No.	date	description	initial
A	16 MAY 2007	GENERAL REVISION	SIGNED H. Y. CHAN Ext4

REVISION

	name		date
designed	SIGNED	H. Y. CHOW	12 FEB 2006
drawn	SIGNED	B. D. CHAN	23 MAR 2007
checked	SIGNED	W. H. CHAN	10 MAY 2007
vetted	SIGNED	T. Y. CHAN	11 MAY 2007

approved

SIGNED K. K. CHAN Chief Engineer — 14 MAY 2007 Date

contract no. DC/2006/11

file no. DP/6/4128CD

project no. 128CD

contract

DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

drawing title

PORTIONS OF SITE - SOUTHERN LANTAU

(SHEET 1 OF 2)

drawing no.	scale
DDN/128CD2/1002A	1 : 2000

office

DRAINAGE PROJECTS DIVISION

DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE
HONG KONG
SPECIAL ADMINISTRATIVE REGION

A1 841x594

Appendix B Key Personal Contact information chart

Organization Name	Role	Title	Name	Telephone	Fax Number
Drainage Service Department	Project Proponent	Engineering Representative	Mr. Chan Wai Hong/Mr. Wong Lap Pong	2594 7464	2827 8700
Allied Environmental Consultants Limited	Independent Environmental Checker (IEC)	Principal Consultant	Ms. Grace Kwok	2815 7028	2815 5399
Yick-Hing Construction Company Limited	Main Contractor	Senior Project Manager	Mr. Liu Kai Choi	2394 4988	2787 4890
Environmental Pioneers & Solutions Limited	Environmental Team (ET)	Environmental Team Leader	Ms. Goldie Fung	2558 7699	2856 2010

Appendix C1 Plant species recorded at Pak Ngan Heung River (N)

			Relative	Occurrence	
Species	Habit	Native	Abundance	PNH3	PNH4
Acacia confusa	tree	no	occasional		+
Achyranthes aspera	herb	yes	scarce		+
Alangium chinense	tree	yes	scarce		+
Alocasia odora	herb	yes	occasional		+
Alternanthera phyloxoides	herb	no	scarce	+	
Amaranthus viridus	herb	yes	scarce		+
Annona squamosa	tree	no	scarce		+
Bidens pilosa	herb	no	occasional		+
Bridelia tomentosa	tree	yes	scarce		+
Celtis sinensis	tree	yes	scarce		+
Christella parasitca	fern	yes	scarce		+
Commelina sp.	herb	yes	scarce		+
Conyza sumatrensis	herb	no	scarce		+
Desmodium heterocarpon	herb	yes	scarce		+
Dimocarpus longan	tree	no	occasional		+
Ficus hirta	herb	yes	scarce		+
Ficus microcarpa	tree	yes	scarce		+
Ficus superba	tree	yes	occasional		+
Gardenia jasminoides	shrub	yes	occassional		+
Hedychium coronarium	herb	no	occasional		+
Lemna minor	tree	yes	scarce	+	
Liquidambar formosana	tree	yes	occasional		+
Lygodium japonicum	fern	yes	scarce		+
Macaranga tanarius	tree	yes	occasional		+
Mallotus paniculatus	tree	yes	occasional		+
Microstegium ciliatum	grass	yes	common		+
Mikania micrantha	climber	no	abundant	+	+
Paedaria tomentosa	climber	yes	scarce	+	+
Panicum maximum	grass	no	scarce	+	+
Phyllanthus sp.	shrub	yes	scarce		+
Polygonum hydropiper	herb	yes	scarce		+
Pueraria phaseoloides	climber	yes	scarce		+
Sterculia lanceolata	tree	yes	scarce		+

Appendix C2 Plant species recorded at Pak Ngan Heung River (S)

			Relative	Occurrence	
Species	Habit	Native	Abundance	PNH1	PNH2
Ficus superba	tree	yes	occasional		+
Ipomoea cairica	climber	yes	occasional		+
Lantana camara	shrub	no	scarce		+
Panicum maximum	grass	no	common		+

Appendix C3 Plant species recorded at Luk Tei Tong River

			Relative	Occurrence				
Species	Habit	Native	Abundance	LTT1	LTT2	LTT3	LTT4	LTT5
Acanthus ilicifolius	shrub	yes	scarce		+			
Bidens pilosa	herb	no	scarce	+			+	+
Cannavalia maritima	climber	yes	scarce					+
Celtis sinensis	tree	yes	scarce	+				
Clerodendrum inerme	shrub	yes	scarce					+
Commelina diffusa	herb	yes	scarce				+	
Mariscus javanicus	herb	yes	scarce					+
Ficus hispida	tree	yes	scarce	+				
Ficus microcarpa	tree	yes	scarce	+				
Fimbristylis ferruginea	herb	yes	scarce					+
Hibiscus tiliaceus	tree	yes	scarce	+				
Kandelia obovata	tree	yes	occasional		+			+
Ipomora triloba	climber	yes	scarce					+
Mikania micrantha	herb	no	scarce	+			+	
Neyraudia reynaudiana	grass	no	scarce				+	+
Panicum maximum	grass	yes	scarce	+				
Phragmites australis	grass	yes	scarce					+
Rhynchelytrum repens	herb	no	scarce	+				
Saccharum arundinaceum	grass	yes	scarce	+				
Scolopia chinensis	tree	yes	scarce					+
Severinia buxifolia	shrub	yes	scarce					+
Solanum nigrum	herb	yes	scarce				+	
Widelia triloba	climber	no	scarce				+	+

Appendix C3 Plant species recorded at Luk Tei Tong River and Reference Site

LLT Bypass Channel

	Average Percentage Cover					
Species	LBC1	LBC2	LBC3	LBC4	LBC5	Average
Apluda mutica	0.0	58.0	4.6	9.0	3.4	12.50
Axonopus compressus	0.0	22.0	0.0	0.2	0.2	3.73
Crotalaria pallida	0.0	0.0	6.2	0.0	0.0	1.03
Cyperus altnernifolius	0.2	0.0	0.0	0.0	0.0	0.03
Eupatorium catarium	0.0	0.2	0.2	1.0	0.2	0.43
Fimbristylis ferruginea	53.0	0.0	0.0	0.0	0.0	8.83
Ipomoea cairica	0.0	1.8	2.2	0.0	0.0	0.70
Mikania micrantha	0.0	0.0	2.0	2.0	0.0	3.83
Mimosa pudica	0.0	1.2	0.2	0.0	0.0	1.57
Paspalum conjugatum	0.0	3.0	0.0	0.0	0.0	0.50
Wedelia trilobata	0.0	76.0	100.0	100.0	96.0	62.00
Panicum maximum	0.0	0.0	0.0	0.0	10.6	4.43
Conyza canadensis	0.0	0.0	0.0	0.0	0.0	0.03
Bidens alba	0.0	0.0	0.0	0.0	0.0	0.67
Aster subulatus	0.0	0.0	0.0	0.0	0.0	0.17
Commelina sp.	0.0	0.0	0.0	0.0	0.0	0.07
Total Cover	53.2	162.2	115.4	112.2	110.4	100.53
Bare/Litter	47.0	0.0	0.0	0.0	0.0	11.2
Open Water	20.0	0.0	0.0	0.0	0.0	3.3

Reference Site

	Average Percentage Cover					
Species	RS1	RS2	RS 3	RS4	RS5	Average
Alternanthera sessilis	0.0	0.2	0.0	0.0	0.0	0.04
Apluda mutica	0.0	0.0	10.0	18.0	0.0	5.60
Axonopus compressus	0.0	30.0	0.0	0.0	10	8.00
Bidens alba	0.0	0.0	0.0	0.0	0.2	0.04
Cardamine flexuosa	0.2	0.0	0.0	0.0	0.0	0.04
Commelina sp.	36.0	0.0	0.2	0.0	0.0	7.24
Cyclosourus interruptus	0.0	0.0	0.2	0.0	0.0	0.04
Cynodon dactylon	0.0	0.0	0.0	60.0	68	25.60
Dactyloctenium aegyptium	0.0	0.0	0.0	0.2	0.0	0.04

	Average Percentage Cover					
Species	RS1	RS2	RS 3	RS4	RS5	Average
Eupatorium catarium	0.0	0.0	1.2	0.0	2.2	0.68
Euphorbia hirta	0.0	0.0	0.2	0.0	0.0	0.04
Ipomoea cairica	1.2	0.0	0.0	0.0	0.0	0.24
Mimosa pudica	0.0	0.0	0.2	4.2	0.6	1.00
Paspalum conjugatum	0.0	0.0	0.2	0.0	0.2	0.08
Phyllodium puchellum	0.0	0.0	0.0	0.0	0.2	0.04
Sageretia thea	0.0	0.0	0.0	0.4	0.0	0.08
Spilanthes paniculata	0.0	0.0	0.0	0.0	0.2	0.04
Urena lobata	0.0	1.0	0.0	10.2	0.2	2.28
Wedelia trilobata	16.0	0.0	52.0	5.4	0.2	14.72
Total Cover	53.4	31.2	64.2	98.4	82.0	65.8
Bare/Litter	46	70	46.0	17	24.0	40.6
Open Water	4	0.0	0.0	0.0	0.0	0.8

Appendix D

Monitoring Schedule for Feb 2012

Environmental Pioneers and Solutions Limited

DC/2006/11 - DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

Master Schedule of EM&A works in February 2012

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			2/1	2/2	2/3	2/4
2/5	2/6	2/7	2/8	2/9	2/10	2/11
2/12	2/13	2/14	2/15	2/16	2/17	2/18
2/19	2/20	2/21	2/22	2/23	2/24	2/25
	Ecological Monitoring	Ecological Monitoring		**Site inspection**		
2/26	2/27	2/28	2/29			

Appendix E Implementation Status of environmental protection / mitigation measures

Environmental Aspect	Protection / Mitigation Measures	Implementation status	Follow-up action
Air Quality	Use of regular watering to reduce dust emissions from exposed site surfaces and unpaved road, with complete coverage.	Inplemented	-
	Use of frequent watering for particular dusty static construction areas and areas close to ASRs.	Implemented	-
	Tarpaulin covering of all dusty vehicle loads transported to and from and between site location;	Ipmplemeted	-
	Establishment and use of vehicle wheel and body washing facilities at the exit points of the site.	Implemented	-
	Routing of vehicles and positioning of construction plant should be at the maximum possible distance from ASRs.	Implemented	-
Noise	Use of quiet powered mechanical equipment (PME)	Not applicable	-
	Adoption of movable noise barriers and temporary noise barriers	Not applicable	-
	Application of good site practices mentioned in EM&A manual Clause 3.8.1	Implemented	-
Water Quality	Before commencing any site formation works, all sewer and drainage connections should be sealed to prevent debris, soil, sand etc. from entering public sewers/drains.	Not applicable	-
	Temporary ditches should be provided to facilitate run-off discharge into appropriate watercourses, via a silt retention pond. No site run-off should enter the freshwater marshes at Luk Tei Tong.	Not applicable	-
	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.	Implemented	-
	Water pumped out from foundation excavations should be discharged into silt removal facilities.	Not applicable	-
	During rainstorms, exposed slope surface should be covered by a tarpaulin or the means.	Implemented	-
	Exposed soil areas should be minimized to reduce potential for increased siltation and contamination of runoff.	Implemented	-
	Exposed soil surfaces should be protected by paving or fill material as soon as possible to reduce potential of soil erosion.	Implemented	-
	Open stockpiles of construction materials or construction wastes on-site of more than $50m^3$ should be covered with tarpaulin or similar fabric during rainstorms.	Implemented	-
	Oils and fuels should only be used and stored on designated areas which have pollution prevention facilities.	Implemented	-
	Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site.	Implemented	-
	The excavation and widening works for the drainage improvements to the Pak Ngan Heung River, Tai Tei Tong River, Luk Tei Tong River and Luk Tei Tong By-pass Channel should be carried out in sections (approximately 300–400 m in length) and in dry condition.	Not applicable	-

Environmental Aspect	Protection / Mitigation Measures	Implementation status	Follow-up action
	Maintenance desiltng of the re-profiled river channels of the Pak Ngan Heung River, Tai Tei Tong River, Luk Tei tong River and Luk Tei Tong By-pass Channel, temporary barrier walls should be used to provide a dry zone for desiltng work.	Not applicable at this stage	-
Ecology	Existing natural habitats should be retained as far as practicable	Implemented	-
	Boundary of working areas should be identified to prevent loss of vegetation	Implemented	-
	All existing trees / plant should be well protected within the site or transplanted properly	Implemented	-
	Turf removal from the Luk Tei Tong marsh due to the construction of Luk Tei Tong Bypass Channel shall be minimized	Not applicable	-
	Turf from the Luk Tei Tong marsh shall be properly removed, stored, maintained and reused for lining the riverbed of the Luk Tei Tong Bypass Channel	Not applicable	-
Chemical and Solid Waste	Chemical wastes should be properly stored in a proper store as per statutory requirements (i.e. on a hard standing, within an enclosed and locked area)	Implemented	-
	Chemical waste stores should be provided with fire precaution facilities (i.e. fire extinguisher, no smoking warning etc).	Implemented	-
	Chemical wastes should be properly stored in corrosion resistant containers placed inside the store and labelled with warning signs in English and Chinese.	Implemented	-
	Chemical wastes should be disposed of by licensed chemical waste collector with supporting delivery records.	Implemented	-
	All containers for fuel, diesel and fluid chemical (in use) and oil filled stationery plants located with proper drip pans.	Implemented	-
	Construction wastes should be managed and disposed to the designated public fill and landfill areas in acceptable manner.	Implemented	
	All waste disposals managed in a proper manner i.e. trip ticket system implementation.	Implemented	-