

Drainage Service Department

Monthly Environmental Monitoring & Auditing report for

Contract No.DC/2006/11

Drainage Improvement in Southern Lantau


October 2012

Environmental Pioneers & Solutions Limited

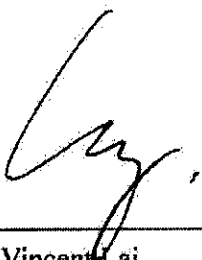
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EXECUTIVE SUMMARY

This is the fifty-first 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 1st October 2012 to 31st October 2012. Rectification of defects, general cleaning works and installation of CCTV at Lo Uk and completion of the outstanding works of the latrine and kitchen for House 5 at Ma Po Village were major site activities being carried out within this reporting month.

Ecological water quality monitoring and ecological monitoring were performed in this reporting month. 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 carried out in May 2011 and 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 Environmental Team (ET) site inspection frequency from weekly to monthly, and commencement of post-construction ecological monitoring effective from 1 Jan 2012.

Post-construction ecological monitoring report and ecological water quality monitoring results for the reporting month were provided under separate submission.

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

Future site activities will include completion of the outstanding works of the

latrine and kitchen for House 5, completion of the formation and concrete pavement and completion of the fencing works at Mo Po Village. It is expected that environmental impact in different aspects will be resulted from the site activities. 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 fifty-first 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 was 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 November 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 is shown in Fig 2.2.1.

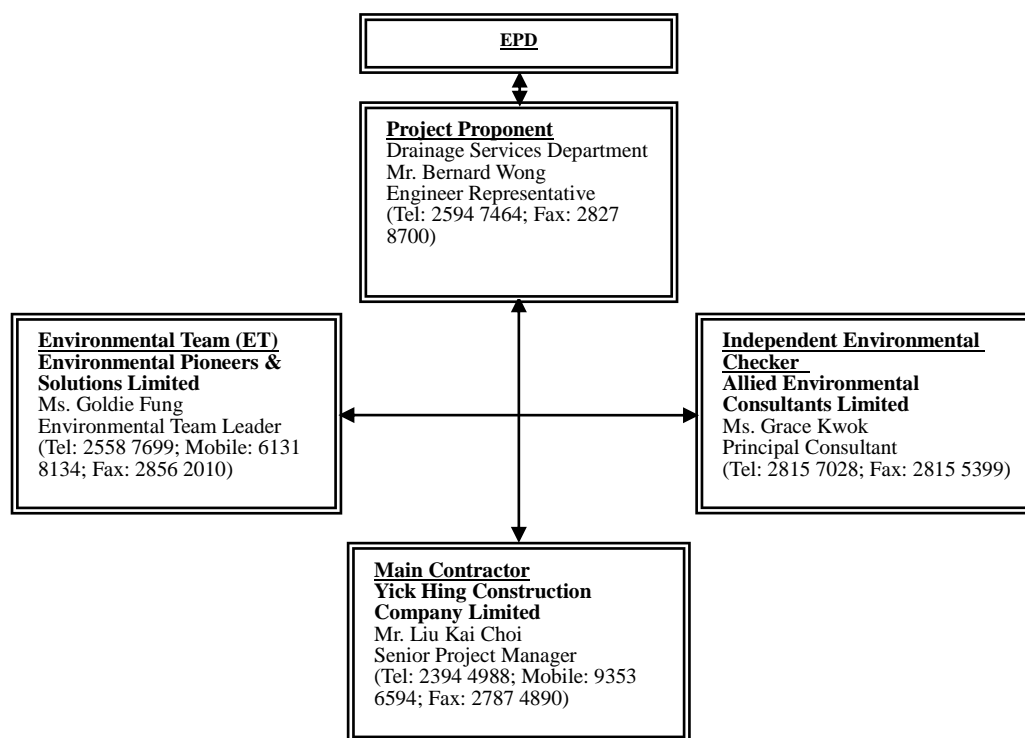


Figure. 2.2.1 Environmental Management structure for the project

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. Rectification of defects at Lo Uk.
2. General cleaning works at Lo Uk.
3. Installation of CCTV at Lo Uk.
4. Completion the outstanding works of the latrine and kitchen for House 5 at Ma Po Village.

3.2 Construction activities for the coming month

Proposed key construction works in the coming month will include:

1. Completion of the outstanding works of the latrine and kitchen for House 5 at Mo Po Village.
2. Completion of the formation and concrete pavement for House 5 at Ma Po Village.
3. Completion of the fencing works for House 5 at Mo Po Village

3.3 Environmental Status

Appendix A shows the location plan 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 criteria specified in the Noise Control Ordinance (NCO).

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 were designated for baseline noise monitoring, which were different from the original locations proposed in the EM&A manual. For the data validation, impact noise monitoring was taken in the same locations as the baseline monitoring during the construction phase. The proposed monitoring locations are summarized in Table 4.3.1. The Noise Monitoring Locations are shown in Figure 4.3.1.

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 of 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.

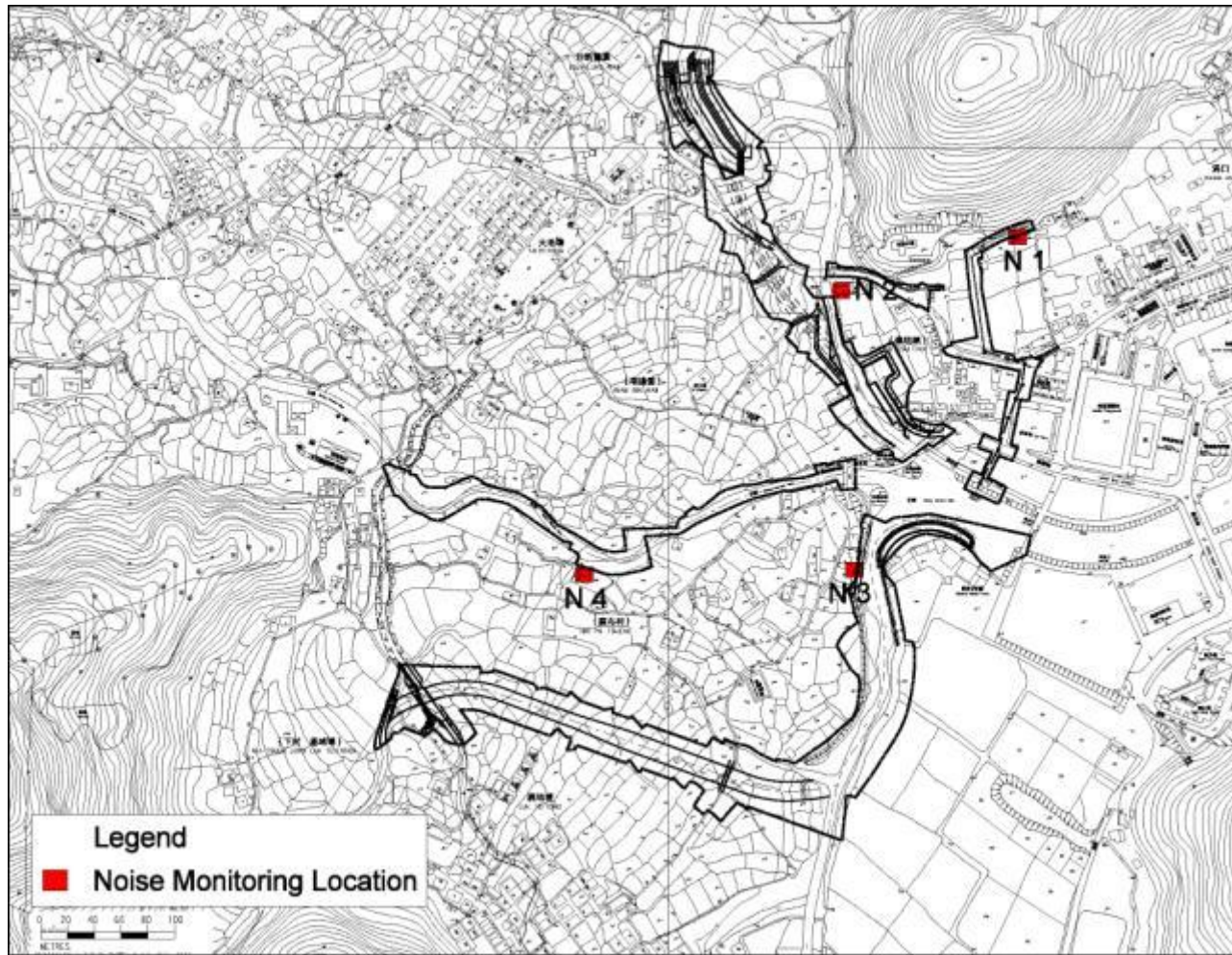


Figure 4.3.1 Impact noise monitoring locations

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.

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	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals to IC(E); 2. Implement Noise mitigation proposals.
Limit Level	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 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 	<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. 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

No noise mitigation measures were carried out, as major construction activities had been 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 be measured 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, 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 would be 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°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°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, which include 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.

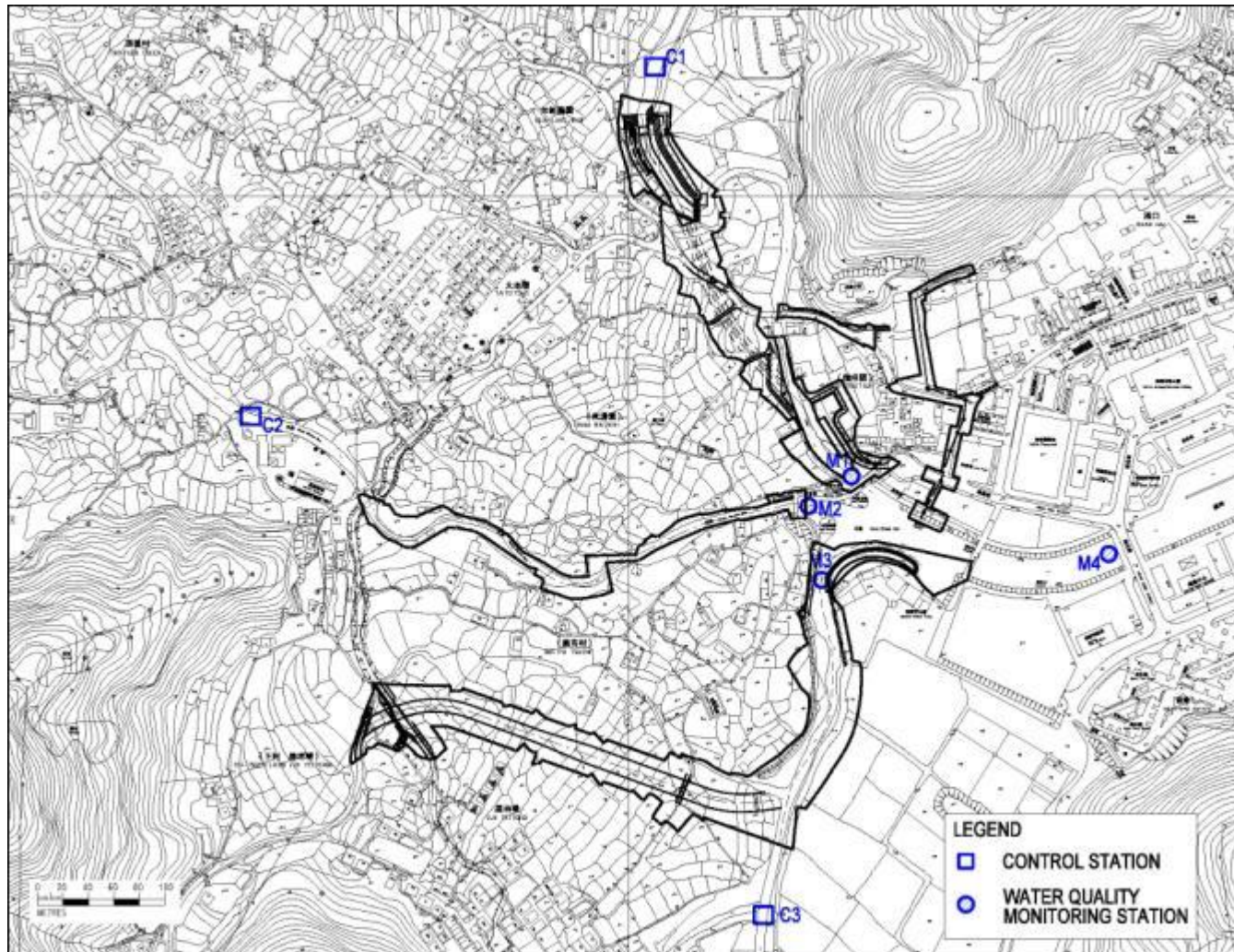


Figure 5.3.1 Water Quality Monitoring Locations

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 data 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	<ol style="list-style-type: none"> 1. Repeat in <i>situ</i> 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. 	<ol style="list-style-type: none"> 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. 	<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.
Action level being exceed by more than two consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat in <i>situ</i> 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 	<ol style="list-style-type: none"> 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. 	<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 three working days; 6. Implement the agreed mitigation measures.
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat in <i>situ</i> 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 	<ol style="list-style-type: none"> 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. 	<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.

5.7 Water Quality Mitigation Measures

Construction Run-off and Drainage

Referring to the site practices outlined in ProPECC PN 1/94 ‘Construction Site Drainage’, during both construction and operation phase of the drainage improvement works, mitigation measures have to be taken as far as practicable to minimize surface runoff and soil erosion, in order to prevent washing away of construction materials, soil, silt or debris discharged to any drainage system.

Also recommended in the final EM&A manual, precaution against construction run-off, sewage discharged from construction workforce and river channel excavation works during general construction activities.

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) of this project was completed, no WQM will be carried out in this reporting month and coming months.

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 Pak Ngan Heung (PNH) and Luk Tei Tong (LTT) Rivers is recommended. The monitoring parameters are required to be measured 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 be measured 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 parameters include Turbidity in Nephelometric Turbidity Unit (NTU), Dissolved Oxygen (DO) in mg/L and Suspended Solids (SS) in mg/L are required to be measured in this project. Moreover, additional water quality monitoring parameters will be measured for the purposes of ecological water quality monitoring of this project. The additional parameter 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°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 collected by polythene bottles, packed in ice (cooled in 4°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.

6.3 Monitoring Locations

According to the Final EM&A Manual, the improved section of the PNH and LTT river channels will be divided into section for the ecological survey. By divided into 50m per section, there are totally nine sections on the PNH & LTT Rivers for the ecological survey. The nine sections 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)

The Location Plan of ecological monitoring for PNH River and LTT River is shown in Figure 6.1 for reference.

For LTT Bypass Channel and the Reference Site, there are totally ten sections for the ecological survey on above areas. The ten sections include:

- Five sections at LTT Bypass Channel
- Five sections at the Reference Site

The Location Plan for ecological monitoring for LTT Bypass Channel and Reference Site is shown in Figure 6.2 for reference.

Ecological water quality monitoring (EWQM) for the improved sections of the river channels was required. The locations of sampling point for post-construction phase monitoring were the same locations for the impact

monitoring. The locations include:

- Three points at PNH River
- Three points at Luk Tei Tong River

The Location Plan of EWQM for PNH River and LTT River is shown in Figure 6.3 for reference.

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

The Locations of sampling points for EWQM at LTT Bypass Channel and Reference Site include:

- Two points at LTT Bypass Channel
- Two points at Reference Site

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

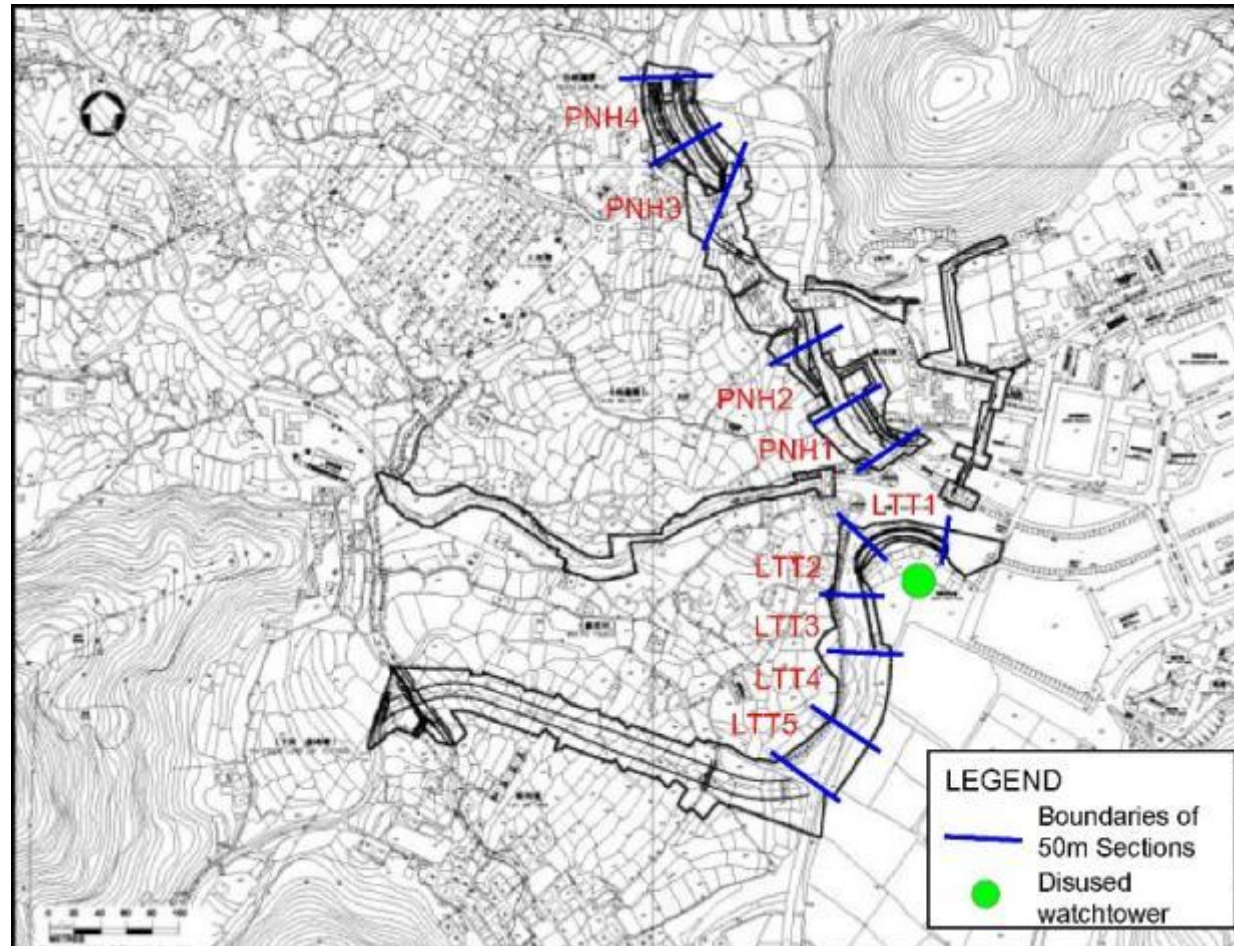


Figure 6.1 Ecological Monitoring Locations

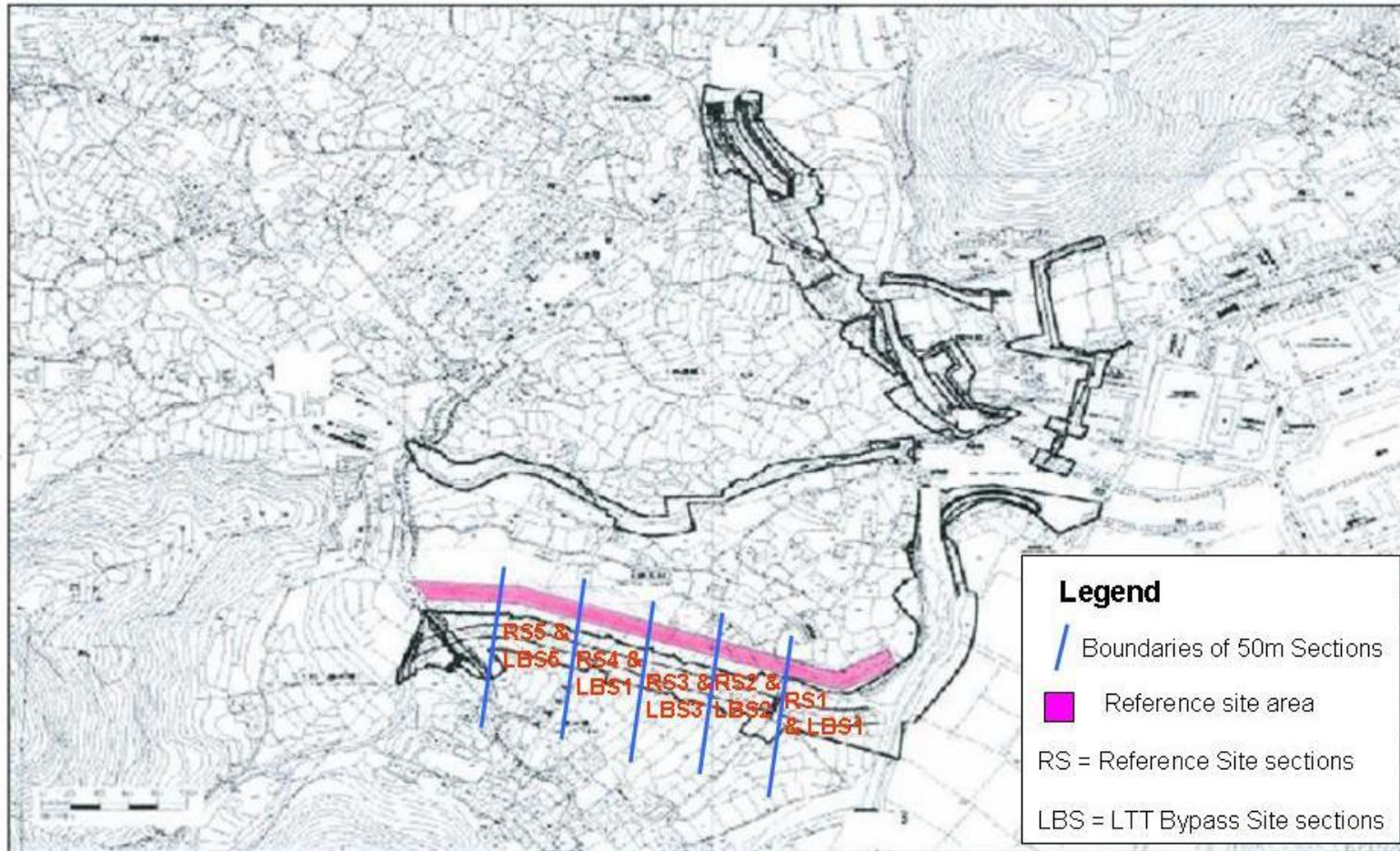


Figure 6.2 Ecological Monitoring Locations for LTT Bypass Channel and Reference Site

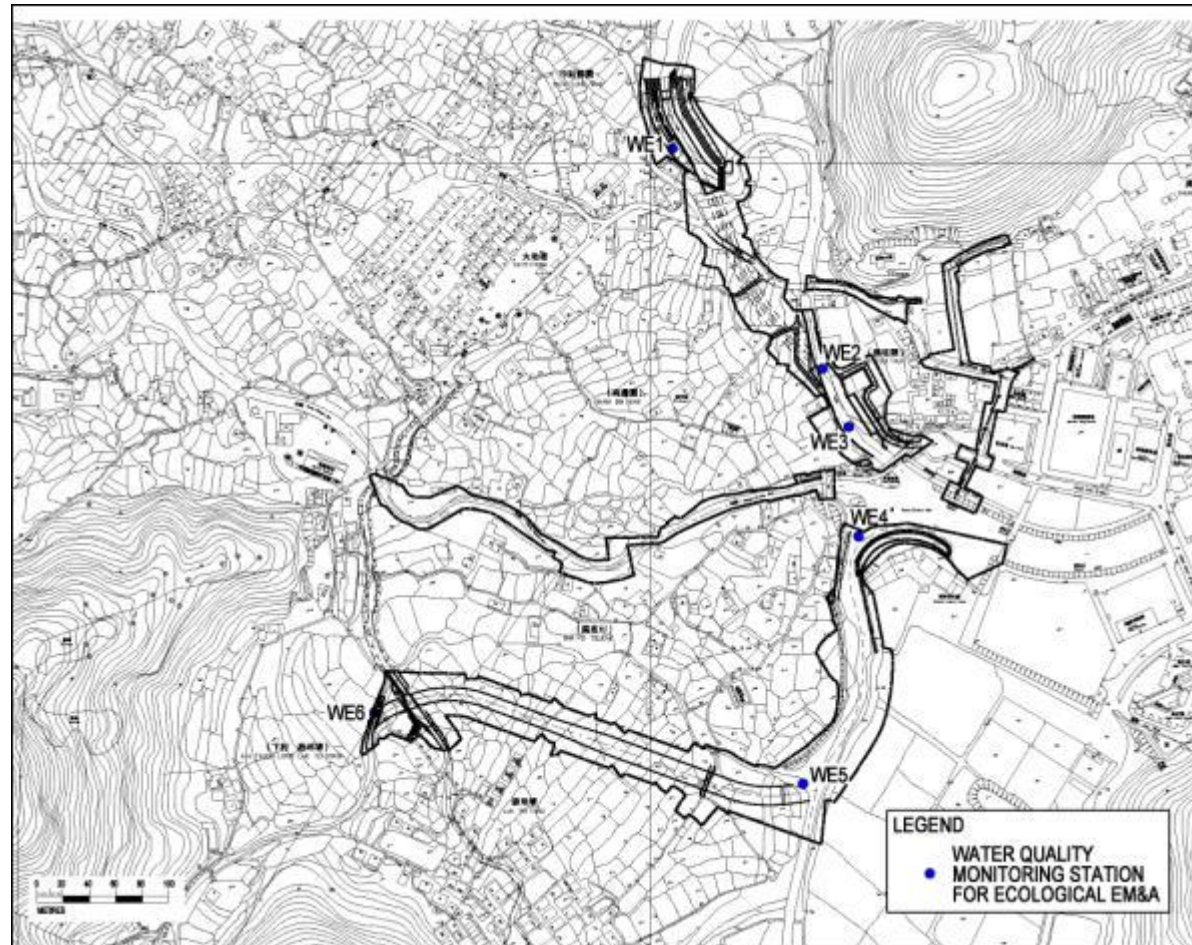


Figure 6.3 Ecological Water Quality monitoring locations

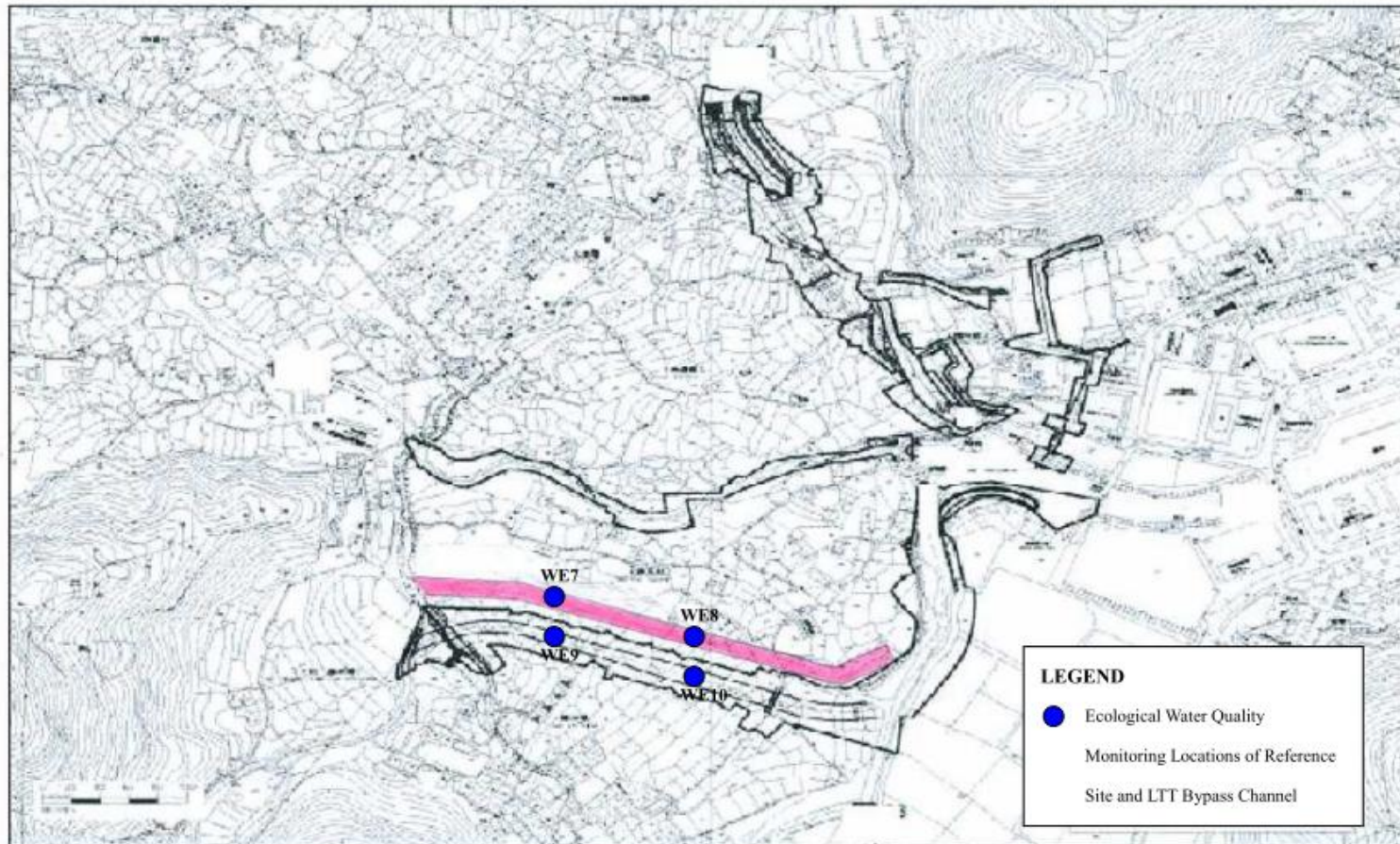


Figure 6.4 Ecological Water Quality Monitoring Locations for LTT Bypass Channel and Reference Site

6.4 Monitoring Frequency

The post-construction ecological monitoring should be carried out every two months a year for 4 years after the completion of works.

6.5 Monitoring Results

The post-construction ecological monitoring and ecological water quality monitoring were carried out in the reporting month. And, the post-construction ecological monitoring report for the reporting month was provided under separate submission.

6.6 Ecological Water Quality Monitoring (EWQM)

The post-construction EWQM have started on 1 June 2011 and conducted on a bi-monthly basis. The post-construction EWQM results for the reporting month were provided under separate submission.

The Monitoring Schedule was shown in Appendix C.

Table 6.6.1 shows the baseline results of Ecological Water Quality Monitoring, from the information given in Baseline Monitoring Report.

Table 6.6.1 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 6.7.1. 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 6.7.1 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 and ecological water quality monitoring are scheduled in December 2012.

7. Action taken in Event of Exceedance

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

Month	Amount of Construction Waste disposed		
	Inert Waste (to Public Fill)	Non-inert Waste (to Landfill)	Chemical Waste (to treatment plant)
1 st to 31 st Oct 12	1.0 (tons)	0	Nil
Total	36960.06 (tons)	249.43 (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 D.

10. Complaint Log

There was no formal complaint received during the reporting month.

	Noise	Water	Ecology	Cultural	Others
Oct 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 30 Oct 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.

Date	Observations	Advice from ET	Action taken	Closing Date
30 Oct 12	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

Completion of the outstanding works of the latrine and kitchen, completion of the formation and concrete pavement and completion of the fencing works for House 5 at Mo Po Village 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 attention seriously 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

Major site activities that carried out within this reporting month included rectification of defects, general cleaning works and installation of CCTV at Lo Uk and completion of the outstanding works of the latrine and kitchen for House 5 at Ma Po Village.

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

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

Regular site meetings and inspection audits on environmental matters were held among Project Proponent, Contractor, IEC and ET on monthly basis. The monthly site meeting and inspection audit in this reporting month was carried out on 30 October 2012.

Post-construction water quality monitoring has been completed on 1 June 2011.

According to the EM&A Manual, the post-construction ecological monitoring and EWQM are required to be carried out once every two months. The post-construction ecological monitoring and EWQM were carried out in the reporting month. And, the post-construction ecological monitoring report and ecological water quality monitoring results for the reporting month were provided under separate submission.

Furthermore, there were no notifications of summons. No formal prosecution and complaints recorded during this reporting period.

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

Section of Works	Description of works	Oct 2012				Nov 2012				Dec 2012			
		W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4
A	Drainage works at Lo Uk												
a	Rectification of defects												
b	General cleaning works												
c	Installation of CCTV												
B	Reprovisional Works for House 5 (Lit's Hosue)												
a	Completion of the outstanding works of the latrine and kitchen												
b	Completion of the formation and conc pavement												
c	Completion of the fencing works												

NOTES :

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

LEGENDS :

- SITE BOUNDARIES
- ▨ PORTION D1 - PAK NGAM BEIING
- ▩ PORTION D2 - LING TSHU TSHU LAI
- ▩ PORTION D3 - LING TSHU TSHU LAI (B)
- ▩ PORTION D4 - TAI TEI TONG RIVER
- ▩ PORTION D5 - LUK TEI TONG
- ▩ PORTION D6 - FUI O
- ▩ PORTION D7 - LO UK TSEEN
- ▩ PORTION D8 - CHEUNG SHIA SHEUNG YEEHEE
- ▩ PORTION D9 - EMERGENCY VEHICULAR ACCESS (EVA) AT BUI WU

FOR TENDER PURPOSES ONLY

DRAWING NO.		DATE	
1		12 FEB 2006	
DRAWN BY		CHECKED BY	
H. T. CHAN		W. H. CHAN	
DATE		DATE	
12 FEB 2006		10 MAY 2007	
APPROVED BY		DATE	
L. S. CHAN		11 MAY 2007	

Contract no: DC/2006/11
 File no: DP/06/4128CD
 Project no: 128CD
 Contract:

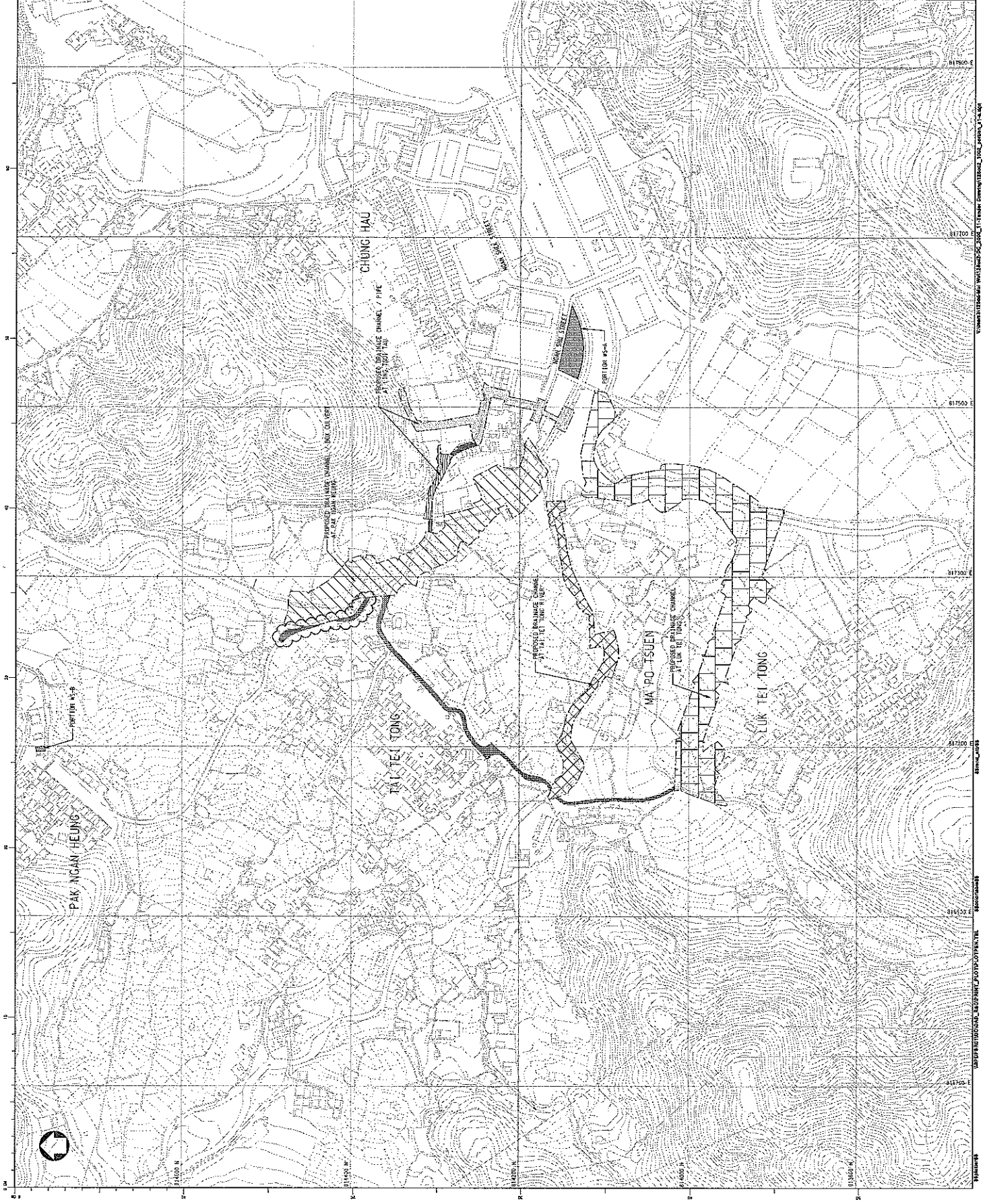
DRAINAGE IMPROVEMENT IN
 SOUTHERN LANTAU

Drawing title:
 PORTIONS OF SITE
 - SOUTHERN LANTAU

Scale:
 1 : 2000
 Drawing no:
 DDM/128CDZ/1002A

Sheet 1 of 2
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DRAINAGE PROJECTS DIVISION
 DRAINAGE SERVICES DEPARTMENT
 GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION



Comments: ...
 Date: ...
 Author: ...
 Drawing No: ...
 Project No: ...
 Scale: ...
 Status: ...
 File Path: ...

Appendix B Key Personal Contact information chart

Organization Name	Role	Title	Name	Telephone	Fax Number
Drainage Service Department	Project Proponent	Engineering Representative	Mr. Bernard Wong	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 C

Monitoring Schedule for October 2012

Environmental Pioneers and Solutions Limited

DC/2006/11 - DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

Master Schedule of EM&A works in October 2012

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	10/1	10/2	10/3	10/4	10/5	10/6
10/7	10/8	10/9	10/10	10/11	10/12	10/13
10/14	10/15	10/16	10/17	10/18	10/19	10/20
10/21	10/22	10/23	10/24	10/25	10/26	10/27
10/28	10/29	10/30	10/31			
		Site Inspection				

Appendix D 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.	Implemented	-
	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;	Implemented	-
	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 desilting 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 desilting 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	-