

**Drainage Service Department**

**Monthly Environmental Monitoring & Auditing report for**

**Contract No.DC/2006/11**

**Drainage Improvement in Southern Lantau**

**August 2011**

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## **EXECUTIVE SUMMARY**

This is the thirty-seventh monthly environmental Monitoring and audit (EM&A) report for “Drainage Improvement in Southern Lantau Investigation”. The environmental permit number is “EP-237/2005/B”. The report concludes the impact monitoring for the activities undertaken during the period of 1 August 2011 to 31 August 2011. Landscaping and railing installation were major site activities being carried out within this reporting month.

Noise and ecological monitoring were performed. Results obtained were checked against the previously established Action / Limit (A/L) levels. Additionally, the implementation status of environmental mitigation measures, event / action plan and environmental complaint handling procedures were inspected during weekly site environmental audit.

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

Impact monitoring for construction noise was conducted in the reporting period. No exceedance of A/L level was reported.

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

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 started in June 2011 and monitored bi-monthly..

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 mainly landscaping works. 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 thirty-seventh monthly Environmental Monitoring and Audit (EM&A) Report for “Drainage Improvement in Southern Lantau Investigation” project (Environmental Permit No. EP-237/2005/B)

## **2. Project Information**

### **2.1 Construction program**

Majority of construction works of “Drainage Improvement in Southern Lantau Investigation” project were completed in August 2011. The project comprises the following:

- Completion of all VOs. at TTT River
- Completion of granite facing construction at PNH 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.

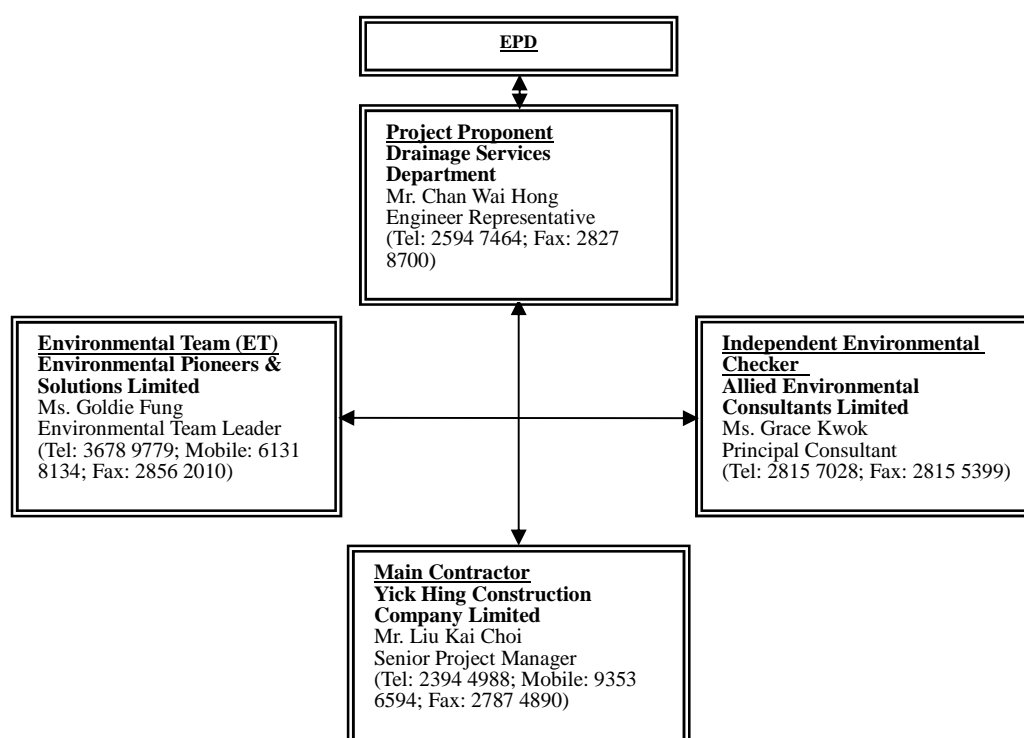


Figure. 2.2.1 Environmental Management structure for the project

## 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. Landscaping works.
2. Railing installation

#### **3.2 Construction activities for the coming month**

Proposed key construction works in the coming month will include:

1. Landscaping works.
2. Installation railing.

#### **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 (Appendix E) 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	Qty
Digital sound level meter	Model 949 Serial No: 8569	IEC 651 Type 1 IEC 804 Type 1	1
Windscreen	Microtech gefell model W2	N/A	1
Sound level calibrator	Model: SV30A	IEC 942 Type 1	1
Wind speed indicator	Kestrel K1000	N/A	1
Remarks: Calibration details for the sound level meter is given in Appendix C for reference			

### 4.3 Monitoring Locations

According to the Baseline Monitoring Report issued in May 2008 for the captioned project, four locations were 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.

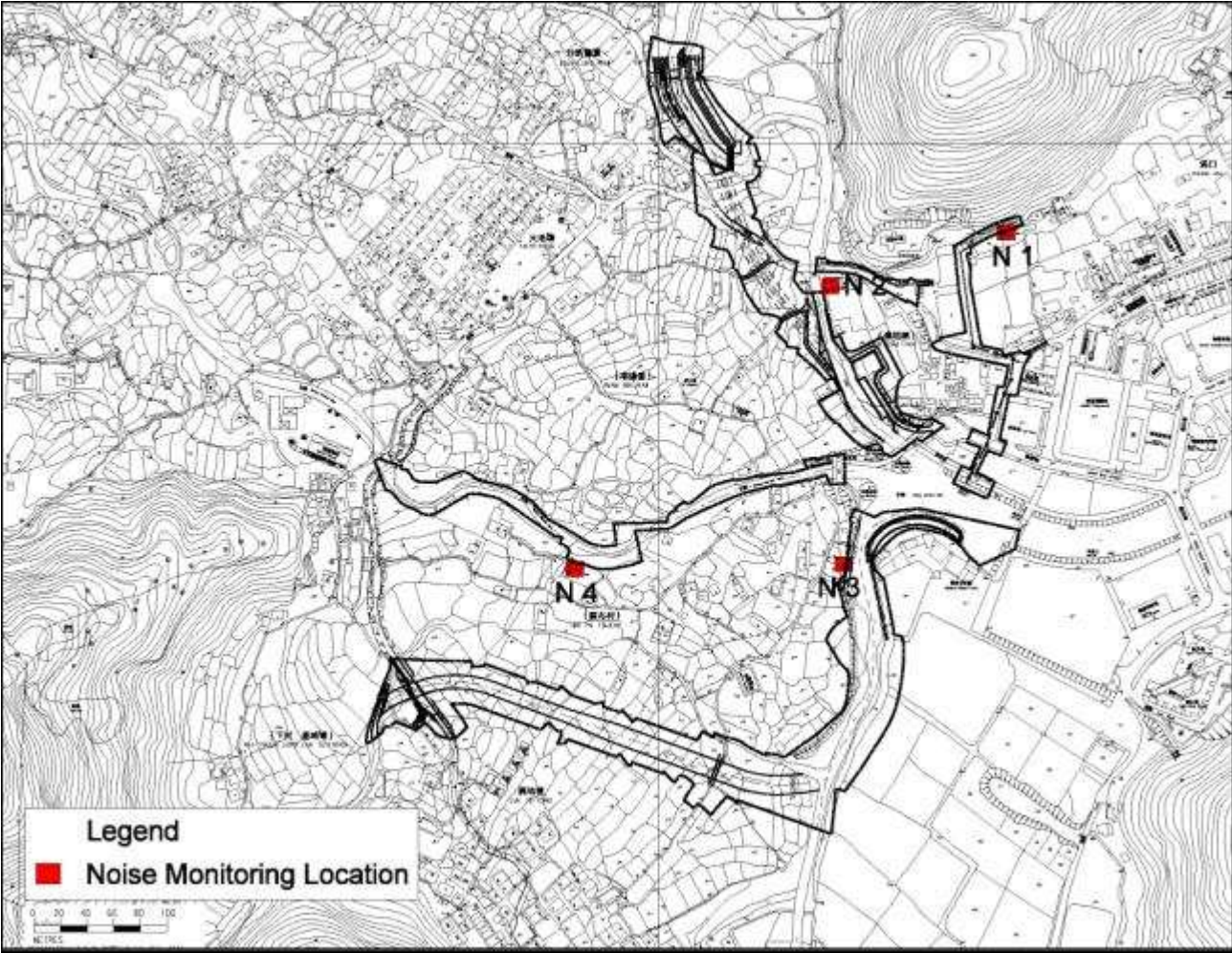


Figure 4.3.1 Impact noise monitoring locations

#### 4.4 Monitoring Results and Interpretation

Relevant details of the noise monitoring results are presented in Table 4.4.1. The results, ranged between 47.4dB (A) and 64.2dB (A) were within the limit levels and therefore, no exceedance was found.

Table 4.4.1 Noise monitoring results

Table 4.4.1 Noise Monitoring Results for the reporting month							
Location	Parameter	Date	Time	L <sub>Aeq</sub> dB(A)	Limit dB(A)	Exceedance	Weather
N1	Leq30min	1-Aug-11	15:00	55.7	75	N	Sunny
N1	Leq30min	8-Aug-11	15:00	53.6	75	N	Sunny
N1	Leq30min	15-Aug-11	15:10	58.1	75	N	Sunny
N1	Leq30min	22-Aug-11	14:05	50.1	75	N	Sunny
N2	Leq30min	1-Aug-11	14:20	64.2	75	N	Sunny
N2	Leq30min	8-Aug-11	14:25	55.5	75	N	Sunny
N2	Leq30min	15-Aug-11	14:30	52.5	75	N	Sunny
N2	Leq30min	22-Aug-11	13:40	47.4	75	N	Sunny
N3*	Leq30min	1-Aug-11	13:12	55.7	75	N	Sunny
N3*	Leq30min	8-Aug-11	12:05	49.2	75	N	Sunny
N3*	Leq30min	15-Aug-11	13:05	53.2	75	N	Sunny
N3*	Leq30min	22-Aug-11	13:30	55.5	75	N	Sunny
N4	Leq30min	1-Aug-11	13:45	47.6	75	N	Sunny
N4	Leq30min	8-Aug-11	13:50	48.4	75	N	Sunny
N4	Leq30min	15-Aug-11	13:50	48.6	75	N	Sunny
N4	Leq30min	22-Aug-11	12:50	49.7	75	N	Sunny

Remarks: Raw datasheet for noise monitoring are attached in Appendix E for reference.

Remark\*: The equivalent noise level of N3 is corrected by +3 dB from the raw data result due to the fact that free field measurement was carried out in the location.

#### 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.

There was no exceedance recorded in the reporting month.

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	<ol style="list-style-type: none"> <li>1. Notify IC(E) and Contractor;</li> <li>2. Carry out investigation;</li> <li>3. Report the results of investigation to the IC(E), ER and Contractor;</li> <li>4. Discuss with the Contractor and formulate remedial measures;</li> <li>5. Increase monitoring frequency to check mitigation effectiveness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the analysed results submitted by the ET;</li> <li>2. Review the proposed remedial measures by the Contractor and advise ER accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem;</li> <li>4. Ensure remedial measures are properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to IC(E);</li> <li>2. Implement Noise mitigation proposals.</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>1. Identify source;</li> <li>2. Inform IC(E), ER, EPD and Contractor;</li> <li>3. Repeat measurements to confirm findings;</li> <li>4. Increase monitoring frequency;</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>6. Inform IC(E), ER and EPD the causes and actions taken for the exceedances;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IC(E), EPD and ER informed of the results</li> <li>8. If exceedance stops, cease additional monitoring</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem;</li> <li>4. Ensure remedial measures properly implemented;</li> <li>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</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IC(E) within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still not under control;</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated</li> </ol>

#### **4.6 Noise Mitigation Measures**

The following mitigation measures were observed from the weekly site inspection in the reporting month:

- Implementation of the following good site practices:
  - Machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum.

## **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°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.

Detailed calibration records of the multimeter were shown in Appendix C for reference.



### **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.

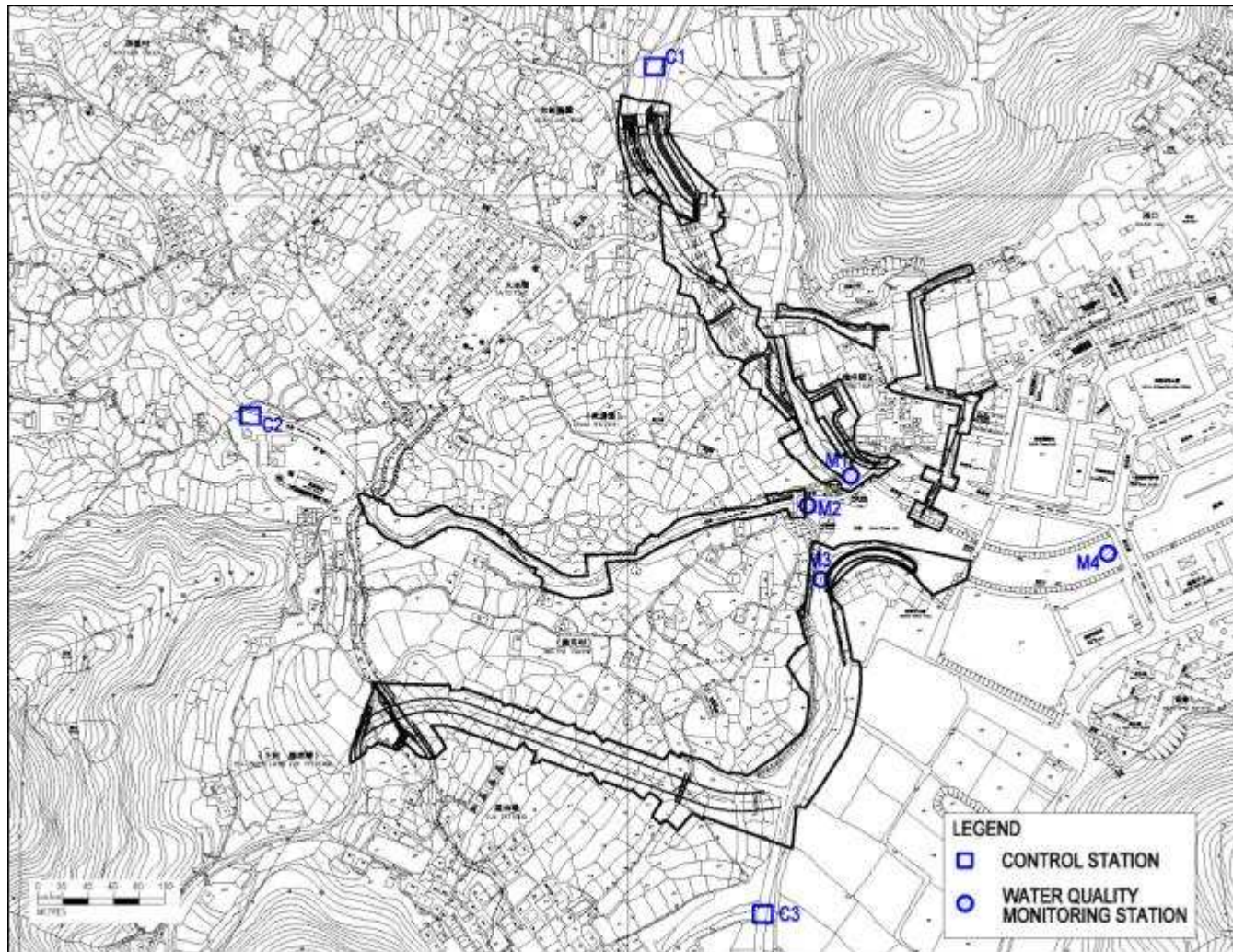


Figure 5.3.1 Water Quality Monitoring Locations

#### **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 was completed on 1 June 2011. Therefore, no water quality results will be 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"> <li>Repeat in <i>situ</i> measurement to confirm findings;</li> <li>Identify reasons for non-compliance and source(s) of impact;</li> <li>Inform IC(E) and Contractor;</li> <li>Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>Discuss mitigation measures with IC(E) and Contractor;</li> <li>Repeat measurement on next day of exceedance.</li> </ol>	<ol style="list-style-type: none"> <li>Discuss with ET and Contractor on the mitigation measures;</li> <li>Review proposals in mitigation measures submitted by Contractor and advise the ER accordingly;</li> <li>Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>Discuss with IC(E) on the proposed mitigation measures;</li> <li>make agreement on the mitigation measures to be implemented;</li> <li>Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>Inform the ER and confirm notification of the non-compliance in writing;</li> <li>Rectify unacceptable practice;</li> <li>Check all plant and equipment;</li> <li>Consider changes of working methods;</li> <li>Discuss with ET and IC(E) and propose mitigation measures to IC(E) and ER;</li> <li>Implement the agreed mitigation measures.</li> </ol>
Action level being exceed by more than two consecutive sampling days	<ol style="list-style-type: none"> <li>Repeat in <i>situ</i> measurement to confirm findings;</li> <li>Identify reasons for non-compliance and source(s) of impact;</li> <li>Inform IC(E) and Contractor;</li> <li>Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>Discuss mitigation measures with IC(E) and Contractor;</li> <li>Ensure mitigation measures are implemented; prepare to increase the monitoring frequency to daily</li> <li>Repeat measurement on next day of exceedance</li> </ol>	<ol style="list-style-type: none"> <li>Discuss with ET and Contractor on the mitigation measures;</li> <li>Review proposals in mitigation measures submitted by Contractor and advise the ER accordingly;</li> <li>Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>Discuss with IC(E) on the proposed mitigation measures;</li> <li>make agreement on the mitigation measures to be implemented;</li> <li>Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>Inform the ER and confirm notification of the non-compliance in writing;</li> <li>Rectify unacceptable practice;</li> <li>Check all plant and equipment;</li> <li>Consider changes of working methods;</li> <li>Discuss with ET and IC(E) and propose mitigation measures to IC(E) and ER within three working days;</li> <li>Implement the agreed mitigation measures.</li> </ol>
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>Repeat in <i>situ</i> measurement to confirm findings;</li> <li>Identify reasons for non-compliance and source(s) of impact;</li> <li>Inform IC(E) and Contractor;</li> <li>Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>Discuss mitigation measures with IC(E) and Contractor;</li> <li>Ensure mitigation measures are implemented;</li> <li>Increase the monitoring frequency to daily until no exceedance of Limit Level</li> </ol>	<ol style="list-style-type: none"> <li>Discuss with ET and Contractor on the mitigation measures;</li> <li>Review proposals in mitigation measures submitted by Contractor and advise the ER accordingly;</li> <li>Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>Discuss with IC(E) on the proposed mitigation measures;</li> <li>make agreement on the mitigation measures to be implemented;</li> <li>Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>Inform the ER and confirm notification of the non-compliance in writing;</li> <li>Rectify unacceptable practice;</li> <li>Check all plant and equipment;</li> <li>Consider changes of working methods;</li> <li>Discuss with ET and IC(E) and propose mitigation measures to IC(E) and ER;</li> <li>Implement the agreed mitigation measures.</li> </ol>

## **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**

Post-construction phase water quality monitoring was approved by EPD and completed on 1 June 2011. Therefore, no water quality monitoring was conducted in August 2011.

## **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.

Water Quality Monitoring along LTT and PNH River as well as LTT bypass channel was 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, 20<sup>th</sup> 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 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.

### **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)

The disused watchtowers are located at the confluence of the three rivers and next to LTT river.

The Location Plan for ecological is shown in Figure 6.1 for reference.

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

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

The Location Plan for ecological water monitoring is shown in Figure 6.2 for reference.

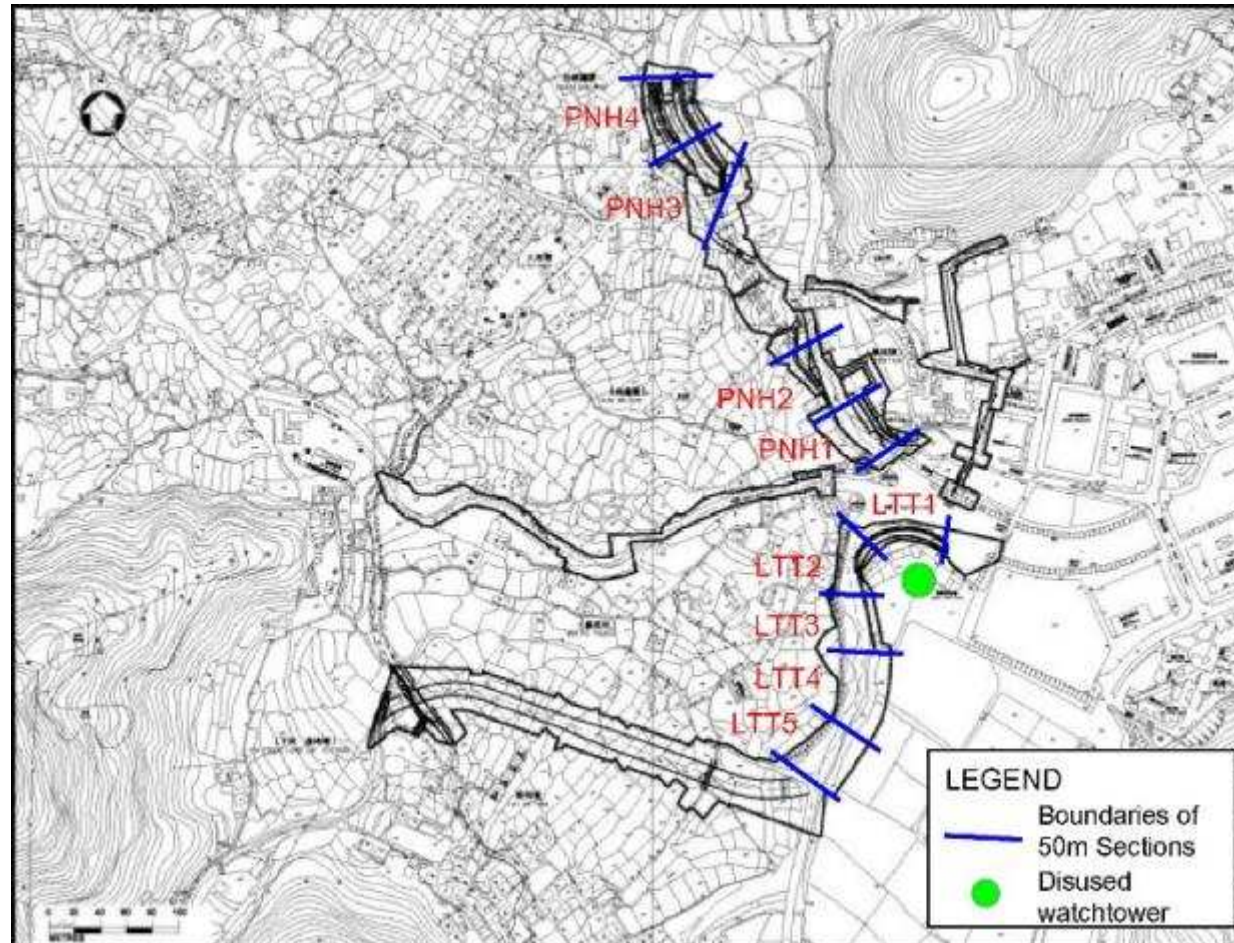


Figure 6.1 Ecological Monitoring Locations

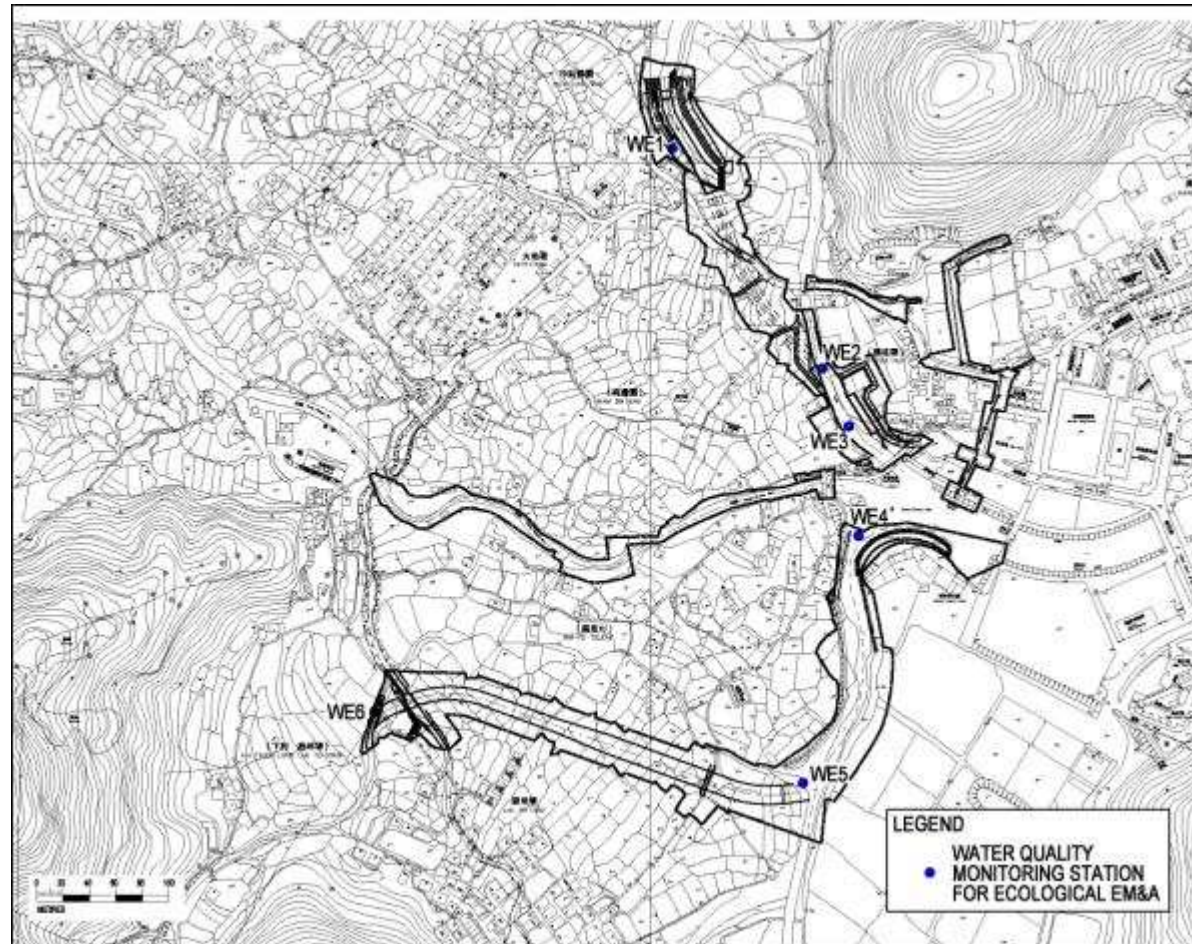


Figure 6.2 Ecological Water Quality monitoring locations

## 6.4 Monitoring Frequency

As proposed, ecological impact monitoring was carried out once for each monitoring location in the reporting month.

## 6.5 Monitoring results

### Pak Ngan Heung Stream N and S sections

#### Vegetation

Surveys were conducted on 31 August 2011. During the current monitoring session, construction of new rock gabion wall was completed, and soft landscape works are underway. Temporary works areas beyond both sides of gabions were planted with tree and shrub seedlings.

The walk through survey recorded a total of 59 species, including 15 trees, 2 shrub, 30 herbs and 4 grass species (Appendix D1) on PNH N section. 42 of the species recorded are natives, while 17 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. A number of ruderal species and seedlings of native trees colonised the sandy substrate occasionally deposited among stream bed rocks and gabions. These include *Mikania micrantha*, *Bidens pilosa*, *Emilia sonchifolia* and *Mallotus paniculatus*. No species of conservation interest was recorded. No quantitative surveys were carried out on both PNH3 and PNH4 due to occurrence of colonized vegetation on the new gabion banks.

Vegetation was only found on remnants of the old concrete bank along PNH S section. A total of 6 species recorded, 4 of which were native and 2 were exotic. It was composed of isolated individuals of mangrove (*Kandelia obovata*), exotic shrub (*Lantana camara*) and native trees (*Ficus supbera*) (Appendix D2). No species of conservation interest was recorded.

### ***Terrestrial Fauna***

Surveys were conducted on 22 August 2011.

Six species of birds were recorded in the proposed work area of the Pak Ngan Heung River (Table 6.5.2). Both are common in Hong Kong.

**Table 6.5.2 Avifauna in Pak Ngan Heung**

Common names	Latin names	PNH 1	PNH 2	PNH 3	PNH 4	Commonness & distribution
Little Egret	<i>Egretta garzetta</i>	1				CW
Common Sandpiper	<i>Actitis hypoleucos</i>	1				CW
Spotted Dove	<i>Streptopelia sinensis</i>				1	CW
Chinese Bulbul	<i>Pycnonotus sinensis</i>			1	2	CW
Magpie Robin	<i>Copsychus saularis</i>			1	1	CW
Japanese White-eye	<i>Zosterops japonica</i>				4	CW

CW = common and widespread

Three species of dragonfly were recorded in the proposed work area of the Pak Ngan Heung River (Table 6.5.3). All are very common in Hong Kong (Wilson 2004).

**Table 6.5.3 Dragonfly in Pak Ngan Heung River**

Common names	Latin names	PNH 1	PNH 2	PNH 3	PNH 4	Commonness & distribution
Green Skimmer	<i>Orthetrum sabina</i>			1		A
Crimson Dropwing	<i>Trithemis aurora</i>		1			A
Indigo Dropwing	<i>Trithemis festiva</i>				1	A

A = abundant

### ***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 monthly monitoring survey.

**Table 6.5.4 Aquatic Invertebrates and fish in Pak Ngan Heung**

Common names	Scientific names	PNH 1	PNH 2	PNH3	PNH4
<b>Invertebrates</b>					
Atyid shrimp	<i>Caridina elongata</i>				+++
Palaemond shrimp	<i>Macrobrachium hainanensis</i>			+	+
Crab	<i>Varuna litterata</i>				
Mitten Crab	<i>Eriocheir japonica</i>			+	+
<b>Fish</b>					
Mosquito fish	<i>Gamusia affinis</i>				+++
Goby	<i>Rhinogobius duospilus</i>				++
Barcheek Goby	<i>Rhinogobius giurinus</i>				
Swordtail	<i>Xiphophorus hellerii</i>				
Six-banded Barb	<i>Puntius semifasciolatus</i>				
Unidentified Cichlid fish					
Tilapia		+++	+++	+	
Predaceous Chub	<i>Parazacco spilurus</i>			++	++
Jarboa Terapon	<i>Terapon jarbua</i>				
Common Silver-biddy	<i>Gerres oyena</i>				
Mullet	<i>Mugil cephalus</i>	+++	+++		
Broken-band Hillstream Loach	<i>Liniparhomaloptera disparis</i>				

+ = 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 31 August 2011. During the current survey, construction of concrete channel bank and rock gabions and soft landscape works are completed, Some remnants of vegetation and mangroves remained at both LTT1 and LTT2 respectively, while a few grass, herb and climber colonised the gabion of LTT3 and LTT5.

The walk through survey recorded a total of 20 species, including 7 trees, 6 herb and and 1 grass species (Appendix D3). 15 species recorded are natives, while 5 were exotics. No quantitative survey was carried out due to sporadic occurrence of colonised vegetation on the new gabion banks.

### Terrestrial Fauna

The proposed work area of Luk Tei Tong River was divided into 5 sections. All recorded avifauna and dragonfly species are common in Hong Kong

Surveys were conducted on 22 August 2011.

A total of seven species of birds were recorded in these sections (Table 6.5.6). All are common in Hong Kong.

**Table 6.5.6 Avifauna in Luk Tei Tong River**

Common names	Latin names	LTT 1	LTT 2	LTT 3	LTT 4	LTT 5	Commonness & distribution
Little Egret	<i>Egretta garzetta</i>	2	1				CW
Grey Heron	<i>Ardea cinerea</i>		2				CL
Spotted Dove	<i>Streptopelia sinensis</i>				1		CW
Chinese Bulbul	<i>Pycnonotus sinensis</i>			2		2	CW
Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>				3		CW
Magpie Robin	<i>Copsychus saularis</i>			1			CW
Crested Myna	<i>Acridotheres crisatellus</i>					6	CW

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

Four species of dragonfly were recorded in the Luk Tei Tong River in August 2011 (Table 6.5.7). All are common/very common in Hong Kong (Tam *et al.* 2011)

**Table 6.5.7 Dragonfly in Luk Tei Tong River**

Common names	Latin names	LTT 1	LTT 2	LTT 3	LTT 4	LTT 5	Commonness & distribution
Green Skimmer	<i>Orthetrum sabina</i>			1	2		A
Common Blue Skimmer	<i>Orthetrum glaucum</i>		1				A
Crimson Dropwing	<i>Trithemis aurora</i>					4	A
Indigo Dropwing	<i>Trithemis festiva</i>				1	3	A

A = abundant

### Aquatic invertebrates and fish

3 species of fish, 3 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 as well as the baseline monitoring survey.

**Table 6.5.8 Aquatic invertebrates and fish in Luk Tei Tong River**

Common names	Scientific names	LTT1	LTT2	LTT3	LTT4	LTT5
<b>Invertebrates</b>						
Mangrove clam	<i>Geloina erosa</i>					
Rock oyster	<i>Saccostrea cuculata</i>	+++	+++			
Snail	<i>Melanooides tuberculata</i>				+++	+++
Snail	<i>Terebralia</i> sp.					
Snail	<i>Nerita</i> sp.	+++	+++			
Snail	<i>Littoraria articulata</i>	++	+++			
Crab	<i>Varuna litterata</i>					
Fiddler crab	<i>Uca lactea</i>					
Fiddler crab	<i>Uca arcuata</i>					
Fiddler crab	<i>Uca crassipes</i>					



Crab	<i>Perisesarma bidens</i>	++				
Mangrove mud crab	<i>Scylla paramamosain</i>	+				
Mitten crab	<i>Eriocheir japonica</i>	+				
<b>Fish</b>						
Common mudskipper	<i>Periophthalmus cantonensis</i>	+				
Tilapia		+++	+++			
Jarbuga terapon	<i>Terapon jarbua</i>					
Mullet	<i>Mugil cephalus</i>	+++	+++	+		
Common Silver-biddy	<i>Gerres oyena</i>					
Barcheek Goby	<i>Rhinogobius giurinus</i>					

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

### Disused Watchtowers

Surveys were conducted on 22 August 2011.

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 August 2011 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.

### Ecological Water Quality Monitoring (EWQM)

The post-construction EWQM was started on 1 June 2011 and conducted in bi-monthly, which was carried out in July 2011. Therefore, post-construction EWQM was not carried during this reporting month. No EWQM results were presented in this report.

## 6.6 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	

## 6.7 Ecological monitoring Schedule

The next ecological surveys are scheduled on 23 and 26 September 2011, while ecological water quality monitoring is scheduled on 9 September 2011.

## **7. Action taken in Event of Exceedance**

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

During the reporting period there was no exceedance for noise, ecological measurements recorded; therefore no actions were taken.

## 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 <sup>st</sup> to 31 <sup>st</sup> Aug 11	104.6 (tons)	0	Nil
Total	36843.26 (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
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 H.

## 10. Complaint Log

There was no formal complaint received during the reporting month.

	Noise	Water	Ecology	Cultural	Others
August 2011	0	0	0	0	0
Total	0	1	0	0	1

## 11. Site Environmental Audits

### 11.1 Site Inspection

With an intention to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented, regular environmental site inspections have been scheduled.

Within the reporting month, site inspections were conducted on 1, 8, 15, 22 and 25 August 2011

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
Nov & 31 Dec 10, 1 August 11	Open stockpile of earth material was observed at PNH fish ladder site	Contractor was advised to provide tarpaulin covering to earthy stockpile to prevent erosion and dust generation	Open stockpile of earth material was cleaned.	25 August 11
4, 13, 20, 27 May 11, 4, 14 , 18 July 11, 1,8,15,25 August 11	C&D wastes, site materials and general wastes were observed within site area	Contractor should remove wastes and site materials from the concerned area as soon as possible as works finished	To be followed during next reporting period.	ongoing
18 Mar 11, 4 April 11, 4, 18, 25 July 11	Stockpile of earthy Materials were observed without protective measure	<b>Contractor should provide tarpaulin cover to the stockpiles to prevent dust generation</b>	Still outstanding. To be followed during the next reporting period	Ongoing
4, 14 July 11 1 August 11	Damaged geo-textile was observed	Contractor was recommended to replace the geo-textile.	To be followed during next reporting period.	ongoing
14 July 11	Not enough washing facilities were provided for washing wheels of vehicle for dust suppression.	Contractor was advised to provide washing facilities for washing wheels of vehicles before leaving construction site.	It was observed that the wheels of motor vehicle were cleaned by watering before leaving the site.	1 August 11
1.8,15,22 August 11	Liquid petrol gas container was placed on open area without cover.	Contractor was advised to place the liquid gas container I at proper place.	The LPG was removed.	25 August 11

## **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.

Findings of monthly survey was still pending therefore relevant was not provided in this reporting month.

## **12. Future key issues**

Landscaping and installation of railing 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 and evacuation.

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**

Landscaping works and railing installation were major site activities being carried out within this reporting period.

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 weekly basis. Also monthly site meeting and inspection audits with the above parties and IEC were carried out on 25 August 11.

For noise level monitoring, all results were within the established A/L limits.

For water quality monitoring, Post-construction WQM has been completed on 1 June 2011. The post-construction phase ecological water quality monitoring will be conducted bi-monthly. As the EWQM was carried out in July 11, No results were presented in this report.

During ecological monitoring survey, no White-shouldered Starling was recorded breeding in the watch tower. The breeding season of White-shouldered Starling in this year has not begun. The absence of nesting of White-shouldered Starling in the watch tower did not seem to be related to construction works in Luk Tei Tong River. A bird species nests in village houses should be to certain extent disturbance tolerant.

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**



## Appendix B Key Personal Contact information chart

<b>Organization Name</b>	<b>Role</b>	<b>Title</b>	<b>Name</b>	<b>Telephone</b>	<b>Fax Number</b>
Drainage Service Department	Project Proponent	Engineering Representative	Mr. Chan Wai Hong	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	3678 9779	2856 2010

## Appendix C

# **Calibration Certificates for Measuring Equipments**



# Calibration Certificate

Certificate No. **11495**

Page 1 of 2 Pages

**Customer :** Environmental Pioneers and Solutions Limited

**Address :** Flat B, 6/F., Hop Shi Factory Building, 29 Lee Chung Street, Chai Wan, Hong Kong.

**Order No. :** Q10260

**Date of receipt :** 15-Mar-11

## Item Tested

**Description :** Sound Level Calibrator

**Manufacturer :** Svantek

**Model :** SV30A

**Serial No. :** 7908

## Test Conditions

**Date of Test :** 17-Mar-11

**Supply Voltage :** --

**Ambient Temperature :** (23 ± 3)°C

**Relative Humidity :** (50 ± 25) %

## Test Specifications

Calibration check.

Ref. Document/Procedure : F21, Z02.

## Test Results

All results were within the IEC 942 Class 1 specification.

The results are shown in the attached page(s).

Main Test equipment used:


<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S014	Spectrum Analyzer	03926	NIM-PRC & SCL-HKSAR
S024	Sound Level Calibrator	04062	NIM-PRC & SCL-HKSAR
S041	Universal Counter	04461	SCL-HKSAR
S206	Sound Level Meter	04462	SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI).

The test results apply to the above Unit-Under-Test only

**Calibrated by :**   
P. F. Wong

**Approved by :**   
Dorothy Cheuk

**Date:** 21-Mar-11

This Certificate is issued by:

Hong Kong Calibration Ltd.

Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.

Tel: 2425 8801 Fax: 2425 8646



# Calibration Certificate

Certificate No. 11495

Page 2 of 2 Pages

Results :

## 1. Level Accuracy

UUT Nominal Value (dB)	Measured Value (dB)	IEC 942 Class 1 Spec.
94	94.08	± 0.3 dB
114	114.18	

Uncertainty : ± 0.1 dB

## 2. Frequency

UUT Nominal Value	Measured Value	IEC 942 Class 1 Spec.
1 kHz	1.000 kHz	± 2 %

Uncertainty : ± 3.6 x 10<sup>-6</sup>

## 3. Level Stability : 0.0 dB

IEC 942 Class 1 Spec. : ± 0.1 dB

Uncertainty : ± 0.01 dB

## 4. Total Harmonic Distortion : < 1.0 %

IEC 942 Class 1 Spec. : < 3 %

Uncertainty : ± 2.3 % of reading

Remark : 1. UUT : Unit-Under-Test

2. The above measured values are the mean of 3 measurements.

3. The uncertainty claimed is for a confidence probability of not less than 95%.

4. Atmospheric Pressure : 1012 hPa.

----- END -----



# Calibration Certificate

Certificate No. **11218**

Page **1** of **3** Pages

**Customer :** Environmental Pioneers and Solutions Limited

**Address :** Flat B, 6/F., Hop Shi Factory Building, 29 Lee Chung Street, Chai Wan, Hong Kong.

**Order No. :** Q10260

**Date of receipt :** 1-Mar-11

## Item Tested

**Description :** Digital Sound Level Meter

**Manufacturer :** SVAN

**Model :** 949

**Serial No. :** 8569

## Test Conditions

**Date of Test :** 14-Mar-11

**Supply Voltage :** --

**Ambient Temperature :** (23 ± 3)°C

**Relative Humidity :** (50 ± 25) %

## Test Specifications

Calibration check.

Ref. Document/Procedure: Z01.

## Test Results

All results were within the IEC 651 Type 1 & IEC 804 Type 1 specification after adjustment.

The results are shown in the attached page(s).

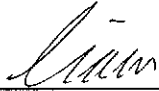
Main Test equipment used:

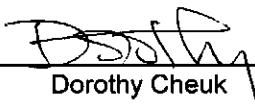
<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S017A	Multi-Function Generator	07279	SCL-HKSAR
S024	Sound Level Calibrator	04062	NIM-PRC & SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI).

The test results apply to the above Unit-Under-Test only

**Calibrated by :**   
P. F. Wong

**Approved by :**   
Dorothy Cheuk

**Date:** 15-Mar-11





# Calibration Certificate

Certificate No. 11218

Page 2 of 3 Pages

Results :

## 1. SPL Accuracy

UUT Setting				Applied Value (dB)	UUT Reading (dB)	
Level Range	Octave Filter	Weight	Response		Before Adjust.	After Adjust.
105 dB	OFF	A	Fast	94.0	*92.2	93.9
			Slow		--	93.9
		C	Fast		--	93.9
130 dB	OFF	A	Fast	94.0	--	93.9
			Slow		--	93.9
		C	Fast		--	93.9
	OFF	A	Fast	114.0	--	113.9
			Slow		--	113.9
		C	Fast		--	113.9

IEC 651 Type 1 Spec. :  $\pm 0.7$  dB

Uncertainty :  $\pm 0.1$  dB

## 2. Level Stability : 0.0 dB

IEC 651 Type 1 Spec. :  $\pm 0.3$  dB

Uncertainty :  $\pm 0.01$  dB

## 3. Linearity

### 3.1 Level Linearity

UUT Range	Applied Value (dB)	UUT Reading (dB)	Variation (dB)	IEC 651 Type 1 Spec. (inside Primary)
130	114.0	113.9	0.0	$\pm 0.7$ dB
	104.0	103.9	0.0	
	94.0	93.9 (Ref.)	--	
105	84.0	83.9	0.0	
	74.0	74.0	+0.1	
	64.0	64.1	-0.2	
	54.0	54.1	-0.2	

Uncertainty :  $\pm 0.1$  dB



# Calibration Certificate

Certificate No. 11218

Page 3 of 3 Pages

### 3.2 Differential level linearity

UUT Range	Applied Value (dB)	UUT Reading (dB)	Variation (dB)	IEC 651 Type 1 Spec.
130	84.0	83.9	0.0	± 0.4 dB
	94.0	93.9 (Ref.)	--	
	95.0	95.0	-0.1	± 0.2 dB

Uncertainty : ± 0.1 dB

### 4. Frequency Weighting

A weighting

Frequency	Attenuation (dB)	IEC 651 Type 1 Spec.
31.5 Hz	-39.7	- 39.4 dB, ± 1.5 dB
63 Hz	-26.5	- 26.2 dB, ± 1.5 dB
125 Hz	-16.5	- 16.1 dB, ± 1 dB
250 Hz	-9.0	- 8.6 dB, ± 1 dB
500 Hz	-3.5	- 3.2 dB, ± 1 dB
1 kHz	0.0 (Ref)	0 dB, ± 1 dB
2 kHz	+1.5	+ 1.2 dB, ± 1 dB
4 kHz	+1.4	+ 1.0 dB, ± 1 dB
8 kHz	-0.7	- 1.1 dB, + 1.5 dB ~ -3 dB
16 kHz	-6.6	- 6.6 dB, + 3 dB ~ -∞

Uncertainty : ± 0.1 dB

### 5. Time Averaging

Applied Burst duty Factor	Applied Leq. Value (dB)	UUT Reading (dB)	IEC 804 Type 1 Spec.
continuous	40.0	--	--
1/10	40.0	40.1	± 0.5 dB
1/10 <sup>2</sup>	40.0	40.0	
1/10 <sup>3</sup>	40.0	40.2	± 1.0 dB
1/10 <sup>4</sup>	40.0	40.0	

Uncertainty : ± 0.1 dB

Remarks : 1. UUT : Unit-Under-Test

2. The uncertainty claimed is for a confidence probability of not less than 95%.

3. Atmospheric Pressure : 1 010 hPa.

4. \*Out of Specification

----- END -----

Appendix D1 Plant species recorded at Pak Ngan Heung River (N)

<i>Species</i>	Habit	Native	Relative Abundance	Occurrence	
				PNH3	PNH4
<i>Acacia confusa</i>	tree	no	occasional		+
<i>Achyranthes aspera</i>	herb	yes	scarce		+
<i>Ageratum conyzoides</i>	herb	yes	scarce		+
<i>Alangium chinense</i>	tree	yes	scarce		+
<i>Alocasia macrorrhiza</i>	herb	yes	occasional		+
<i>Amaranthus viridus</i>	herb	yes	scarce		
<i>Annona squamosa</i>	tree	no	scarce		+
<i>Bidens pilosa</i>	herb	no	occasional		+
<i>Bridelia tomentosa</i>	tree	yes	scarce		+
<i>Cinnamomum camphora</i>	tree	yes	scarce		+
<i>Celosia argentea</i>	herb	yes	scarce		+
<i>Celtis sinensis</i>	tree	yes	scarce		+
<i>Centotheca lappacea</i>	herb	yes	scarce		+
<i>Cocculus orbiculatus</i>	climber	yes	scarce		+
<i>Commelina</i> sp.	herb	yes	scarce		+
<i>Conyza canadensis</i>	herb	no	scarce		
<i>Conyza sumatrensis</i>	herb	no	scarce	+	+
<i>Crassocephalum crepidioides</i>	herb	yes	scarce		
<i>Cyperus rotundus</i>	herb	yes	scarce		
<i>Desmodium heterocarpon</i>	shrub	yes	scarce		+
<i>Dimocarpus longan</i>	tree	no	occasional		+
<i>Drymaria diandra</i>	herb	yes	scarce		
<i>Eleusine indica</i>	herb	yes	scarce		+
<i>Emilia sonchifolia</i>	herb	yes	scarce		
<i>Eupatorium catarium</i>	herb	no	scarce		+
<i>Euphorbia hirta</i>	herb	no	scarce		+
<i>Ficus hispida</i>	tree	yes	scarce		+
<i>Ficus superba</i>	tree	yes	occasional		+
<i>Hedychium coronarium</i>	herb	no	occasional		+
<i>Ipomoea cairica</i>	climber	no	scarce		+
<i>Lindernia rotundifolia</i> 'Aurea'	herb	no	scarce		

<i>Liquidambar formosana</i>	tree	yes	occasional		+
<i>Ludwigia</i> sp.	herb	yes	scarce		+
<i>Lygodium japonicum</i>	fern	yes	scarce		+
<i>Macaranga tanarius</i>	tree	yes	occasional		+
<i>Mallotus paniculatus</i>	tree	yes	occasional		+
<i>Microcos paniculata</i>	tree	yes	scarce		+
<i>Mikania micrantha</i>	climber	no	occasional	+	+
<i>Mimosa pudica</i>	herb	no	scarce		+
<i>Neyraudia reynaudiana</i>	grass	yes	scarce		+
<i>Paederia scandens</i>	climber	yes	scarce		+
<i>Panicum maximum</i>	grass	no	scarce	+	+
<i>Paspalum conjugatum</i>	herb	no	scarce		+
<i>Paspalum paspaloides</i>	grass	yes	scarce		
<i>Peperomia pellucida</i>	herb	no	scarce		+
<i>Phyllanthus</i> sp.	shrub	yes	scarce		+
<i>Pogostemon auricularius</i>	herb	yes	scarce		+
<i>Polygonum hydropiper</i>	herb	yes	scarce		+
<i>Polygonum perfoliatum</i>	climber	yes	scarce		+
<i>Pterocypsela indica</i>	herb	yes	scarce		+
<i>Pueraria phaseoloides</i>	climber	yes	scarce		+
<i>Rhus hypoleuca</i>	tree	yes	scarce		+
<i>Saccharum arundinaceum</i>	grass	yes	scarce		+
<i>Scleria</i> sp.	herb	yes	scarce		+
<i>Sida acuta</i>	herb	yes	scarce		+
<i>Spilanthes paniculata</i>	herb	yes	scarce		+
<i>Sterculia lanceolata</i>	tree	yes	scarce		+
<i>Urena lobata</i>	herb	yes	scarce		+
<i>Wedelia triloba</i>	climber	no	scarce		+

Appendix D2 Plant species recorded at Pak Ngan Heung River (S)

			Relative	Occurrence	
Species	Habit	Native	Abundance	PNH1	PNH2
<i>Ficus microcarpa</i>	tree	yes	scarce		+
<i>Ficus superba</i>	tree	yes	occasional		+
<i>Ipomoea cairica</i>	climber	yes	occasional		+
<i>Kandelia obovata</i>	tree	yes	scarce	+	+
<i>Panicum maximum</i>	grass	no	common		+
<i>Pilea microphylla</i>	herb	no	scarce		+

Appendix D3 Plant species recorded at Luk Tei Tong River

Species	Habit	Native	Relative	Occurrence				
			Abundance	LTT1	LTT2	LTT3	LTT4	LTT5
<i>Acanthus ilicifolius</i>	shrub	yes	scarce		+	+		
<i>Alysicarpus vaginalis</i>	herb	yes	scarce	+				
<i>Bidens pilosa</i>	herb	no	scarce	+		+	+	
<i>Celtis sinensis</i>	tree	yes	scarce	+				
<i>Clerodendrum inerme</i>	shrub	yes	scarce					+
<i>Conyza sumatrensis</i>	herb	no	scarce					+
<i>Cyperus imbricatus</i>	herb	yes	scarce					+
<i>Ficus hispida</i>	tree	yes	scarce	+				
<i>Ficus microcarpa</i>	tree	yes	scarce	+				
<i>Fimbristylis ferruginea</i>	herb	yes	scarce					+
<i>Gymnanthera oblonga</i>	climber	yes	scarce	+				
<i>Hibiscus tiliaceus</i>	tree	yes	scarce	+				
<i>Kandelia obovata</i>	tree	yes	occasional	+	+	+		+
<i>Leucaena leucocephala</i>	tree	no	scarce					
<i>Panicum maximum</i>	grass	no	scarce			+	+	+
<i>Phyllanthus urinaria</i>	shrub	yes	scarce					+
<i>Pueraria phaseoloides</i>	climber	yes	scarce	+				
<i>Rhynchelytrum repens</i>	herb	no	scarce	+				
<i>Scolopia chinensis</i>	tree	yes	scarce					+
<i>Severinia buxifolia</i>	shrub	yes	scarce					+

# **Appendix E**

## **Construction Noise**

### **Monitoring Data Sheet**



大成環境科技拓展有限公司  
Environmental Pioneers and Solutions Limited

**Construction Noise Monitoring Data Sheet**

Monitoring Location		N1	N2
Description of Location		Façade	Façade
Date of Monitoring		1/8/2011	
Measurement Start Time (hhmm)		15:00	14:20
Measurement Time Length (mins.)		30 mins	
Noise Meter Model/ Identification		ACO Japan, model 6224	
Calibrator Model/ Identification		Castle Group, GA607	
Wind Speed (m/s)		0.2	0.2
Measurement Results	L90 (dB(A))	47.2	49.4
	L10 (dB(A))	55.2	67.9
	Leq (dB(A))	55.7	64.2
Weather condition:			
Major Construction Noise Source(s) During Monitoring		No construction work has been carried out during monitoring.	-Drilling
Other Noise Source(s) During Monitoring		1. Public noise 2. Traffic noise	1. Public noise 2. Traffic noise
Remarks			

Name & Designation

Signature

Date:

Prepared by: Allen Chan Allen 1/8/2011





大成環境科技拓展有限公司  
Environmental Pioneers and Solutions Limited

Construction Noise Monitoring Data Sheet

Monitoring Location		N3	N4
Description of Location		Freefield	Facade
Date of Monitoring		1/8/2011	
Measurement Start Time (hhmm)		13:00	13:45
Measurement Time Length (mins.)		30 mins	
Noise Meter Model/ Identification		ACO Japan, model 6224	
Calibrator Model/ Identification		Castle Group, GA607	
Wind Speed (m/s)		0.1	0.2
Measurement Results	L90 (dB(A))	50.0	49.8
	L10 (dB(A))	54.7	51.1
	Leq (dB(A))	52.7	47.6
Weather condition:		0	
Major Construction Noise Source(s) During Monitoring		No construction work has been carried out during monitoring.	No construction work has been carried out during monitoring.
Other Noise Source(s) During Monitoring		1. Background noise	1. Background noise
Remarks			

Name & Designation

Signature

Date:

Prepared by: Allen Chan Allen 1/8/2011



大成環境科技拓展有限公司  
Environmental Pioneers and Solutions Limited

**Construction Noise Monitoring Data Sheet**

Monitoring Location		N1	N2
Description of Location		Façade	Façade
Date of Monitoring		8/8/2011	
Measurement Start Time (hhmm)		15:00	14:25
Measurement Time Length (mins.)		30 mins	
Noise Meter Model/ Identification		ACO Japan, model 6224	
Calibrator Model/ Identification		Castle Group, GA607	
Wind Speed (m/s)		0.2	0.3
Measurement Results	L90 (dB(A))	47.8	43.9
	L10 (dB(A))	60.8	61.5
	Leq (dB(A))	53.6	55.5
Weather condition:		Rain	
Major Construction Noise Source(s) During Monitoring		No construction work has been carried out during monitoring.	No construction work has been carried out during monitoring.
Other Noise Source(s) During Monitoring		1. Public noise 2. Traffic noise	1. Public noise 2. Traffic noise
Remarks			

Name & Designation

Signature

Date:

Prepared by:

Allen Chan

Allen

8/8/2011



大成環境科技拓展有限公司  
Environmental Pioneers and Solutions Limited

**Construction Noise Monitoring Data Sheet**

Monitoring Location		N3	N4
Description of Location		Freefield	Facade
Date of Monitoring		8/8/2011	
Measurement Start Time (hhmm)		13:12	13:50
Measurement Time Length (mins.)		30 mins	
Noise Meter Model/ Identification		ACO Japan, model 6224	
Calibrator Model/ Identification		Castle Group, GA607	
Wind Speed (m/s)		0.2	0.1
Measurement Results	L90 (dB(A))	39.2	47.6
	L10 (dB(A))	49.8	53.4
	Leq (dB(A))	46.2	48.4
Weather condition:		Rain	
Major Construction Noise Source(s) During Monitoring		No construction work has been carried out during monitoring.	No construction work has been carried out during monitoring.
Other Noise Source(s) During Monitoring		1. Background noise	1. Background noise
Remarks			

Name & Designation

Signature

Date:

Prepared by: Allen Chan Allen 8/8/2011



大成環境科技拓展有限公司  
Environmental Pioneers and Solutions Limited

Construction Noise Monitoring Data Sheet

Monitoring Location		N1	N2
Description of Location		Façade	Façade
Date of Monitoring		15/8/2011	
Measurement Start Time (hhmm)		15:10	14:30
Measurement Time Length (mins.)		30 mins	
Noise Meter Model/ Identification		ACO Japan, model 6224	
Calibrator Model/ Identification		Castle Group, GA607	
Wind Speed (m/s)		0.2	0.1
Measurement Results	L90 (dB(A))	43.4	45.0
	L10 (dB(A))	58.5	53.6
	Leq (dB(A))	58.1	52.5
Weather condition:		Cloudy	
Major Construction Noise Source(s) During Monitoring		No construction work has been carried out during monitoring.	No construction work has been carried out during monitoring.
Other Noise Source(s) During Monitoring		1. Traffic noise 2. Public noise	1. Public noise 2. Traffic noise
Remarks			

Name & Designation

Signature

Date:

Prepared by: Allen Chan Allen 15/8/2011



大成環境科技拓展有限公司  
Environmental Pioneers and Solutions Limited

**Construction Noise Monitoring Data Sheet**

Monitoring Location		N3	N4
Description of Location		Freefield	Facade
Date of Monitoring		15/8/2011	
Measurement Start Time (hhmm)		13:05	13:50
Measurement Time Length (mins.)		30 mins	
Noise Meter Model/ Identification		ACO Japan, model 6224	
Calibrator Model/ Identification		Castle Group, GA607	
Wind Speed (m/s)		0.2	0.2
Measurement Results	L90 (dB(A))	47.6	46.4
	L10 (dB(A))	53.4	51.7
	Leq (dB(A))	50.2	48.6
Weather condition:		Cloudy	
Major Construction Noise Source(s) During Monitoring		No construction work has been carried out during monitoring.	No construction work has been carried out during monitoring.
Other Noise Source(s) During Monitoring		1. Background noise 2. Public noise	1. Background noise
Remarks			

Name & Designation

Signature

Date:

Prepared by: Allen Chan Allen Chan 15/8/2011



大成環境科技拓展有限公司  
Environmental Pioneers and Solutions Limited

Construction Noise Monitoring Data Sheet

Monitoring Location		N1	N2
Description of Location		Façade	Façade
Date of Monitoring		22/8/2011	
Measurement Start Time (hhmm)		14:30	13:40
Measurement Time Length (mins.)		30 mins	
Noise Meter Model/ Identification		ACO Japan, model 6224	
Calibrator Model/ Identification		Castle Group, GA607	
Wind Speed (m/s)		0.1	0.1
Measurement Results	L90 (dB(A))	43.4	45.1
	L10 (dB(A))	58.5	51.2
	Leq (dB(A))	50.1	47.4
Weather condition:		Fine	
Major Construction Noise Source(s) During Monitoring		No construction work has been carried out during monitoring.	No construction work has been carried out during monitoring.
Other Noise Source(s) During Monitoring		1. Public noise 2. Traffic noise	1. Public noise 2. Traffic noise
Remarks			

Name & Designation

Signature

Date:

Prepared by: Allen Chan Allen 22/8/2011



大成環境科技拓展有限公司  
Environmental Pioneers and Solutions Limited

**Construction Noise Monitoring Data Sheet**

Monitoring Location		N3	N4
Description of Location		Freefield	Facade
Date of Monitoring		22/8/2011	
Measurement Start Time (hhmm)		13:30	12:50
Measurement Time Length (mins.)		30 mins	
Noise Meter Model/ Identification		ACO Japan, model 6224	
Calibrator Model/ Identification		Castle Group, GA607	
Wind Speed (m/s)		0.5	0.4
Measurement Results	L90 (dB(A))	45.0	46.4
	L10 (dB(A))	53.6	58.9
	Leq (dB(A))	52.5	49.7
Weather condition:		Fine	
Major Construction Noise Source(s) During Monitoring		No construction work has been carried out during monitoring.	No construction work has been carried out during monitoring.
Other Noise Source(s) During Monitoring		1. Background noise	1. Background noise
Remarks			

Name & Designation

Signature

Date:

Prepared by: Allen Chan Allen 22/8/2011

Appendix F  
Monitoring Schedule  
for August 2011



# Environmental Pioneers and Solutions Limited

## DC/2006/11 - DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

### Master Schedule of EM&A works in August 2011

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

Noise Monitoring Locations: Total 4 Locations as N1, N2, N3 and N4

**Appendix G Implementation Status of environmental protection / mitigation measures**

<b>Environmental Aspect</b>	<b>Protection / Mitigation Measures</b>	<b>Implementation status</b>	<b>Follow-up action</b>
<b>Air Quality</b>	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	-
<b>Noise</b>	Use of quiet powered mechanical equipment (PME)	Implemented	-
	Adoption of movable noise barriers and temporary noise barriers	Implemented	-
	Application of good site practices mentioned in EM&A manual Clause 3.8.1	Implemented	-
<b>Water Quality</b>	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.	Implemented	-
	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.	Implemented	-
	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.	Implemented	-
	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 <sup>3</sup> 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.	Not available	-
	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.	Implemented	-

<b>Environmental Aspect</b>	<b>Protection / Mitigation Measures</b>	<b>Implementation status</b>	<b>Follow-up action</b>
	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	-
<b>Ecology</b>	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	Implemented	-
	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	Implemented	-
<b>Chemical and Solid Waste</b>	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.	Deficiencies found	
	All waste disposals managed in a proper manner i.e. trip ticket system implementation.	Implemented	-

## Appendix H

Graphical plot of noise  
monitoring results

