

Issue No. : Issue 1
Issue Date : Mar 2017
Project No. : 1266

**AGREEMENT NO. CE 65/2013 (EP)
POST-CONSTRUCTION ECOLOGICAL
MONITORING OF RIVER IMPROVEMENT
WORKS IN UPPER LAM TSUEN RIVER
SHE SHAN RIVER AND UPPER TAI PO
RIVER – INVESTIGATION**

**POST-CONSTRUCTION ECOLOGICAL
MONITORING REPORT (No. 32)**

Prepared By:

ALLIED ENVIRONMENTAL CONSULTANTS LTD.

For:

Drainage Services Department

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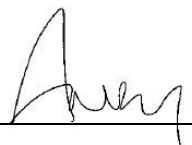
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**Agreement No. CE65/2013(EP)
Post-Construction Ecological Monitoring of River
Improvement Work in Upper Lam Tsuen River, She Shan
River and Upper Tai Po River – Investigation**

**Post-Construction Ecological Monitoring Report (No. 32)
Upper Lam Tsuen River**

August 2016



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September 2, 2016

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September 2, 2016

Ecology Team: China-Hong Kong Ecology Consultants

Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation Agreement No. CE65/2013(EP)

Post-Construction Ecological Monitoring Report (No. 32)

Upper Lam Tsuen River

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1 Introduction

- 1.1 Agreement No. CE65/2013(EP) Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation required a post-construction ecological monitoring programme when the project completed. The collected data are mainly used to assess ecological recovery process and effectiveness of ecological migration proposed and enforced during the construction period.
- 1.2 The scope of the ecological monitoring was detailed in EM & A Manual of the project. In brief, the survey aimed to collect data on abiotic factors such as water quality, substratum characteristics, water flow as well as flora and fauna.
- 1.3 China Hong Kong Ecology Consultants Ltd. was committed by Allied Environmental Consultants Ltd (AEC) to undertake the ecological monitoring tasks for the project for December 2014.
- 1.4 This is the number 32 post-construction ecological monitoring report for the project conducted **on 19th of August 2016**. It contains the following subsections:
- Summary of major points
 - Monitoring Methods and Results
 - Summary and Comments

2 Summary of Major Points

- Field ecological monitoring was undertaken **on 19th of August 2016**;
- Fauna and flora along the drainage project sections is in a process of re-establishing or restoration; Plants on river bed was experiencing seasonal changes in abundance and phonological appearance;
- The species richness of odonata was relatively high during current wet season;
- Bird diversity and abundance was in natural fluctuation;
- Abundance of a target river fauna (i.e. *Paramesotriton hongkongensis* adult was recorded in the potential habitats along the Lam Tsuen River); and
- Fish abundance was similar to last month with slight decrease.

3 Monitoring Methodology

3.1 Riparian Vegetation

Riparian vegetation, including aquatic and emergent, was sampled using line transects along the affected river channel and riparian habitat. Species, relative abundance and average heights were recorded. Vegetation surveys were conducted at four selected belt transects with two located at the lower portion (T3 and T4) of the river channel and another two at the upper section (T1 and T2) of the river respectively (**Figure 1**). The belt transects was run across the river channel in order to collect quantitative data of the vegetation, e.g., species inventory, height, percentage cover. Qualitative data of plants was collected by recording plant species, relative abundance along line transect.

Nomenclature and protection status of the species followed those documented in Lai *et al.* (2004) and Hong Kong Herbarium (2015).

3.2 Avifauna

Avifauna survey was conducted during post construction monitoring period. Special attention was given to the river channel and corridor area which birds used as feeding and foraging habitat. Avifauna surveys were undertaken in the early morning plus species recorded in the rest of the day when conducting other taxonomic groups (benthic, fish, insect) monitoring. Numerical abundance was recorded at fixed count points within a radius of 30-50m according to landscape feature and visual penetration extent. The duration of the point count of birds was standardized for 10 minutes at each location in order to collect comparable data. Transect count along accessible section of river channel were used in order to collect qualitative data. Binoculars and digital camera were the main items of equipment used. Nomenclature and protection status of the species follows the AFCD website (www.hkbiodiversity.net) and Carey *et al.* (2001).

The point count was conducted at four locations with two located at the lower portion of the river channel (T3&T4) and the other two located at the upper section of the river (T1&T2). The point count and survey transect locations for the bird survey and sampling sites for surveys of other faunal groups and flora were presented in **Figure 1**.

3.3 Adult Odonata Survey

Adult Odonata survey was conducted along transects (**Figure 1**). Binoculars, digital camera and hand net were utilized to aid identification. Numerical abundance, species identity and other notable behavior were recorded. Nomenclature and protection status of the species followed those documented in the AFCD website (www.hkbiodiversity.net), Wilson *et al.* (2004) and Tam *et al.* (2011). Adult Odonata survey was conducted along line transects in parallel with river channel within the works area where access was permitted.

3.4 Aquatic Macro-invertebrates

Macro-invertebrates in the river channel were surveyed. Sampling was conducted at five sampling locations including two sites located at the lower portion (T3 and T4) of the river channel and another two sites at the upper section (T1 and T2) of the river, as well as the reference site. Those sampling sites covered major type of river habitats, e.g. river pool and riffle (**Figure 1**) Five replicates were taken at each sampling point and pool together for further sample sorting and identification. Kick sampling and hand netting were the survey methodologies for river organisms. Dissection microscope and digital camera were used to aid identification and enumeration. Numerical abundance and species identity were recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net) and other literatures such as Dudgeon (1994).

3.5 Fish and Newt

Fish community and *Paramesotriton hongkongensis* at the specified river channel was monitored by live trapping, hand netting and direct observation methods.

Sampling was conducted at five sampling locations including two sites located at the lower portion (T3 and T4) of the river channel and another two sites at the upper section (T1 and T2) of the river, as well as reference site. Those sampling sites covered major type of river habitats, e.g. river pool and riffle (**Figure 1**). The number of the observed fish and newt was estimated and recorded. Nomenclature and protection status of the species followed those documented in the AFCD website (www.hkbiodiversity.net) and Lee *et al.* (2004).

3.6 Abiotic Data Collection

3.6.1 Water Quality Monitoring

Dissolved oxygen level, pH value, conductivity, salinity, BOD and nutrient level (nitrate and ammonium) were measured and analyzed by conventional methods in situ or in laboratory. The instruments for measuring dissolved oxygen level, pH value, conductivity, salinity were model: DO-5510, AZ8685, AZ8361 and AZ8374 respectively. All the instruments were calibrated every monitoring month according to the operation manuals in order to obtain the precise result. BOD test took 5 days to complete within darkness incubator with stable temperature at 20°C and was performed using model: DO-5510 for measuring dissolved oxygen. Nutrient levels including nitrate and ammonia were performed in laboratory by applying the In-house method SOP056 (FIA) and SOP057 (FIA) respectively.

3.6.2 Sediment Characteristics

Sediment/substrate characteristics were recorded of sediment cover in percentage e.g. mud, sand, rock, boulder and cemented bottom in the river bed at sampling sites.

3.6.3 Water Flow

Water flow rates in river channel were measured by recording the time taken for a floating object (e.g. floating ball) to cover a measured distance.

The sampling locations for surveys were presented in **Figure 1**.

4 Monitoring Results

4.1 Vegetation

Vegetation has generally covered the gabion and river bed along Lam Tsuen River (Photos 1-3). In total, 74 flora species were recorded within the survey transects along the river course. Some of the vegetation at river bed has been washed out by flooding, especially vegetation in lower section of the river.

The recorded floras were generally in good health, and the height of the dominated riparian grass and herb species were in a range from 0.2m to 1.5m as observed along survey transect. Dominant flora species were shown in the **Table 4.1** marked with relative abundance sign “+++”. Results of vegetation survey and belt transect survey were presented in **Table 4.1** and **Table 4.2**. **Figure 1** shows the transect line for the flora surveys.

4.2 Fauna

4.2.1 Avifauna

An avifauna survey was undertaken along survey transects and at four selected point count locations. In total, 19 species of birds were recorded during the bird survey and 4 of the total were wetland dependent species including *Ardeola bacchus*, *Egretta garzetta*, *Motacilla alba* and *Motacilla cinerea*. They were commonly observed foraging in the river channel. *Pycnonotus jocosus* was a dominated species along the river. All the birds in Hong Kong are under protection of Wild Animals Protection Ordinance (Cap. 170). Among the recorded species, *Ardeola bacchus* and *Egretta garzetta* are both classified as Regional Concern by Fellowes *et al.* (2002). *Centropus sinensis* was observed in the river, which is considered as Vulnerable in China Red Data Book. Apart from mentioned species above, the others recorded in Lam Tsuen River were common species in Hong Kong. Transect and Point Count locations were shown on **Figure 1**. Result of bird survey was presented in the **Table 4.3**.

4.2.2 Adult Odonata Survey

Odonata survey was performed, and a list of recorded odonata species at Upper Lam Tsuen River is shown in **Table 4.4**. In total, 13 odonata species were recorded during the survey and the recorded species was common species and widely distributed in Hong Kong (Photo 4). The result obtained this month is similar to previous surveys conducted in approximate period of last year. Species richness in this month is similar to last month. The abundance of odonata is high following commencement of peak emergence from spring. It is expected that number of odonata will keep in high abundance during wet season (Wilson *et al.*, 2004 & Tam *et al.*, 2011). Sampling location was shown in **Figure 1**.

4.2.3 Aquatic Macro-invertebrates

Upper Lam Tsuen River was flowing with constant water during survey. The river benthic fauna collected was mainly comprised of insects, molluscs and crustaceans (Photos 5-6). *Pomacea canaliculata* was found abundant along the river. Details of recorded of river benthic fauna refers to **Table 4.5**. Sampling location was shown on **Figure 1**.

4.2.4 Hong Kong Newt

Surveys of Hong Kong Newt were conducted at Upper Lam Tsuen River (Photo 7). Adult *Paramesotriton hongkongensis* (Photo 8) were observed at the Lam Tsuen River where the habitat consisted of riparian vegetation during the survey. Although the breeding period of Newt has been gone, they were still present in the potential habitats along the river (Dudgeon, 2003). Riparian vegetation grown along the channel especially along water margin could provide shelter and breeding habitat for Hong Kong Newt. Hong Kong Newt is listed in Wild Animals Protection Ordinance (Cap. 170) and classified as “Near Threatened” under IUCN Red List Status and as “Potential Global Concern” by Fellowes *et al.* (2002). Record of Hong Kong Newts can be referred to **Table 4.6**.

4.2.5 River Fish Fauna

Fish surveys were performed at Upper Lam Tsuen River during field monitoring. In total, 17 species of freshwater fish, including species recorded from reference site, were recorded. *Oreochromis niloticus*, *Zacco platypus* and *Rhinogobius* spp were the dominated species in the river. *Acrossocheilus parallens* is a rare freshwater fish that only recorded in few of reservoir catchments and streams in Hong Kong (Lee *et al.*, 2004) and listed as Global Concern by Fellowes (2002). It was observed along the surveyed river with pool. Except *Acrossocheilus parallens*, *Parazacco spilurus* is classified as Vulnerable in China Red Data Book and observed along the river with low abundance. Fish counting at 2 x 2 meter area were performed and number of fish individuals was similar to the record of last month with slight decrease. It is assumed that fish was dispersed due to flooding which frequently occurred during current wet season. Details of recorded of fish fauna refers to **Table 4.6**. Sampling location was shown on **Figure 1**.

4.3 **Abiotic Data**

Data on water quality and major river hydrological feature (water flow and substratum) of the river were collected and are presented in the **Table 4.7**.

Generally, the water was not polluted and nutrient levels were generally low. Results of water test were presented in the **Table 4.7**.

The river substratum was comprised of over 75-93% stones or rocks in most of the river sections with moderate water flow (up to 0.2m/second at pool and 0.5m/second at riffle).

5 **Summary and Commentary**

Post construction ecological monitoring was carried out August 2016 and relevant biotic and abiotic data was collected according to project specification and EM & A Manual. Benthic fauna was temporally de-faunated in river sections due to river bed engineering works during construction period between 2008 and early 2013 and is under recovery process after that period. Adult amphibian *Paramesotriton hongkongensis* was recorded at river channel

where the river margin covered with riparian vegetation. *Acrossocheilus parallens*, a rare freshwater fish species in Hong Kong, was observed at a few locations in the river channel with pool. Except *Acrossocheilus parallens*, *Parazacco spilurus* recorded in the river is also considered with conservation interest and observed along the river with low abundance. Relatively high abundance of odonata and the presence of summer bird visitor indicated the river was undergoing seasonal change.

Aquatic and riparian vegetation along river channel was re-established. Vegetation has generally covered the gabion and covered the river bed along Upper Lam Tsuen River.

The water quality of the surveyed river was not polluted although the river receives low concentration of nutrients from the nearby agriculture lands and resident houses.

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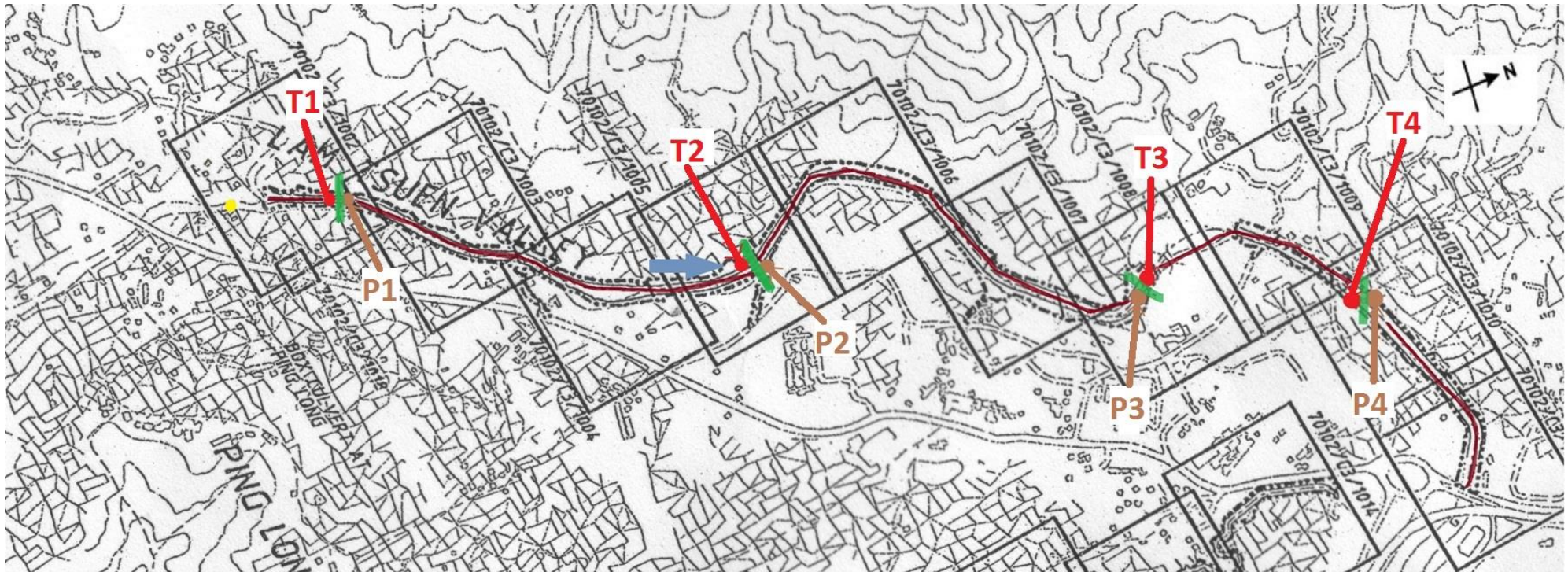
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FIGURES



Legend

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> — Belt transect -Vegetation -Sediment characteristics | <ul style="list-style-type: none"> ● Sampling station -Fish -Aquatic macroinvertebrate -Water quality and flow rate | <ul style="list-style-type: none"> ● Point count location -Avifauna |
| <ul style="list-style-type: none"> ● Reference sample | | <ul style="list-style-type: none"> — Line transect -Avifauna -Adult Odonate -Vegetation |

Figure1. Sampling Location of Ecological Survey and Monitoring at Upper Lam Tsuen River, Tai Po.

PHOTOS



Photo 1: General view of the river (Lower section)



Photo 2: General view of the river (Middle section)



Photo 3: General view of the river (Upper section)



Photo 4: Odonata – *Rhinocypha perforata perforata*



Photo 5: Aquatic samples



Photo 6: Aquatic samples



Photo 7: Kick sampling



Photo 8: Hong Kong Newt

TABLE

Table 4.2. Flora species recorded from belt transect survey at the Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Family	Species	Chinese name	Impact monitoring																Post construction monitoring																																					
			Jul-11				Jan-12				Jul-12				Aug-13				Dec-13				Jan-14																																	
			T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4																														
Poaceae	<i>Microstegium ciliatum</i>	剛莠竹																																																						
Fabaceae	<i>Pueraria lobata</i>	野葛	0.3	10							0.3	10							0.3	15	0.3	5																																		
Poaceae	<i>Pennisetum purpureum</i>	象草			1.2	2	2.5	10					2.5	5	2.5	5									0.3	10																														
Araceae	<i>Alocasia odora</i>	海芋																																																						
Caesalpiniaceae	<i>Cassia alata</i>	翅葉決明																																																						
Magnoliaceae	<i>Michelia alba</i>	白蘭																																																						
Poaceae	<i>Brachiaria mutica</i>	巴拉草	0.8	10	1	5					0.8	10	1	2	1.5	60					0.8	10	0.8	5	1	10	1	15																												
Moraceae	<i>Ficus hispida</i>	野棠櫟																					0.8	10	0.8	10																														
Asteraceae	<i>Mikania micrantha</i>	撒甘菊	0.4	5	0.5	3					0.4	2	0.4	5	0.5	3					0.4	2	0.4	5	0.5	3	0.5	10																												
Musaceae	<i>Musa paradisiaca</i>	大蕉																																																						
Ulmaceae	<i>Celtis sinensis</i>	朴樹																																																						
Araceae	<i>Pistia stratiotes L.</i>	大漂																																																						
Urticaceae	<i>Boehmeria nivea</i>	芋麻			1.5	10													0.8	2																																				
Asteraceae	<i>Bidens alba</i>	白花鬼針草	0.4	2	0.4	5	0.5	2	0.5	10	0.4	2	0.4	5	0.5	2	0.5	10	0.4	5	0.4	20	0.5	10	0.5	2																														
Poaceae	<i>Coix lacryma-jobi</i>	薏苡																																																						
Solanaceae	<i>Solanum nigrum</i>	龍葵			2	3																																																		
Cyperaceae	<i>Cyperus flabelliformis</i>	風車草																																																						
Poaceae	<i>Miscanthus floridulus</i>	五節芒																																																						
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐																																																						
Asteraceae	<i>Wedelia chinensis</i>	樹銀菊																																																						
Commelinaceae	<i>Commelina diffusa</i>	錦雞草			0.4	10																																																		
Asteraceae	<i>Erechtites hieracifolia</i>	革命菜							0.3	3	0.4	5													0.3	5																														
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																																						
Convolvulaceae	<i>Pharbitis nil</i>	牽牛																																																						
Verbenaceae	<i>Lantana camara</i>	馬鞭丹			0.5	2																																																		
Mimosaceae	<i>Leucaena leucocephala</i>	銀合歡																																																						
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜																																																						
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																																						
Poaceae	<i>Pennisetum alopecuroides</i>	鬍尾草																																																						
Amaranthaceae	<i>Celosia argentea</i>	青葙																																																						
Bare Gound				73		85		65		88		73		82		28		88		75		82		58		92		50		55		68		70		75		85		73		75		75		85		73		75		85		73		75

P1 - Point count location 1; P4 - Point count location 4

Table 4.2. Flora species recorded from belt transect survey at the Upper Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Family	Species	Chinese name	Post construction monitoring																									
			Feb-14				Mar-14				Apr-14				May-14				Jun-14				Jul-14					
			Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%
Poaceae	<i>Microstegum ciliatum</i>	剛莠竹																										
Fabaceae	<i>Pueraria lobata</i>	野葛					0.3	10																				
Poaceae	<i>Pennisetum purpureum</i>	象草					1.5	5																				
Araceae	<i>Alocasia odora</i>	海芋																										
Caesalpiniaceae	<i>Cassia alata</i>	翅荳豨																										
Magnoliaceae	<i>Michelia alba</i>	白蘭																										
Poaceae	<i>Brachiaria mutica</i>	巴拉草	0.8	10	0.8	10			1	13	1	13			0.5	5	0.6	10			0.6	10	0.5	5	0.6	6		
Moraceae	<i>Ficus hispida</i>	野菓榕																										
Asteraceae	<i>Mikania micrantha</i>	撒甘菊	0.5	10	0.5	5	0.5	10	0.4	10	0.5	10	0.5	5	0.5	10	0.4	10			0.3	5	0.3	15	0.3	5		
Musaceae	<i>Musa paradisiaca</i>	大蕉																										
Ulmaceae	<i>Celtis sinensis</i>	朴樹																										
Araceae	<i>Pistia stratiotes L.</i>	大漂																										
Urticaceae	<i>Boehmeria nivea</i>	芋麻																										
Asteraceae	<i>Bidens alba</i>	白花鬼針草	0.4	5			0.5	10			0.4	5			0.5	10			0.5	20	0.5	10	0.7	15	0.6	10	0.5	20
Poaceae	<i>Coix lacryma-jobi</i>	薏苡																										
Solanaceae	<i>Solanum nigrum</i>	龍葵																										
Cyperaceae	<i>Cyperus flabelliformis</i>	風車草																										
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Asteraceae	<i>Wedelia chinensis</i>	樹銀菊																										
Commelinaceae	<i>Commelina diffusa</i>	鋪地草			0.3	5							0.3	5									0.2	10				
Asteraceae	<i>Erechtites hieracifolia</i>	革命菜																										
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																										
Convulvaceae	<i>Pharbitis nil</i>	牽牛																										
Verbenaceae	<i>Lantana camara</i>	馬纓丹																										
Mimosaceae	<i>Leucaena leucocephala</i>	銀合歡																										
Brassicaceae	<i>Nasutum officinale</i>	西洋菜													0.2	5	0.2	50	0.2	5			0.2	2	0.2	2	0.2	1
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																										
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																										
Amaranthaceae	<i>Celosia argentea</i>	青葙					1	2																				
Bare Gound			75		85		73		75		72		82		73		75		63		70		12		65		65	

P1 - Point count location 1, P4 - Point count location 4

Table 4.4. Odonate species recorded at the Upper Lam Tsuen River

Species name	Common name	Chinese name	Status	Commonness	Post construction monitoring								Post construction monitoring												
					Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16			
<i>Acisoma panorpoides panorpoides</i>	Asian Pintail	翅腹蜻	NP	VC						+															
<i>Brachythemis contaminata</i>	Asian Amberwing	黃翅蜻	NP	VC																					
<i>Ceragrion auranticum ryukyuanum</i>	Orange-tailed Sprite	琉球橘背蜻	NP	VC		+	+	+	+	+	+														
<i>Coeliccia cyanomelas</i>	Blue Forest Damsel	蒼紋乳腹蜻	NP	VC																					
<i>Copera marginipes</i>	Yellow Featherlegs	黃條腹蜻	NP	VC		+	+	+	+	+	+														
<i>Crocothemis servilia servilia</i>	Crimson Darter	紅蜻	NP	VC	+	+	+	+	+	+	+	+	+												
<i>Euphaea decorata</i>	Black-banded Gossamerwing	方帶縵蜻	NP	VC																					
<i>Icinogomphus pertinax</i>	Common Flangetail	翻土渠春蜓	NP	C			+	+	+	+	+														
<i>Ischnura senegalensis</i>	Common Blue Jewel	褐斑藍珠蟌	NP	VC																					
<i>Mnais lacteola</i>	Indochinese Copperwing	綠綠色蟌	P. LC	C																					
<i>Nannophya pygmaea</i>	Scarlet Dwarf	珠紅小蜻	P. LC	C																					
<i>Neurobasis chinensis</i>	Chinese Greenwing	綠翅色蟌	NP	VC	+	+	+	+	+	+	+	+	+												
<i>Neurobasis fulvia</i>	Russet Percher	縵腹蜻	NP	VC		+	+	+	+	+	+														
<i>Neurothemis tullia tullia</i>	Pied Percher	縵腹蜻	NP	C																					
<i>Orithetrum chrysis</i>	Red-faced Skimmer	紅面灰蜻	NP	VC							+	+	+	+											
<i>Orithetrum glaucum</i>	Common blue skimmer	黑尾灰蜻	NP	VC		+																			
<i>Orithetrum luconicum</i>	Marsh Skimmer	呂宋灰蜻	NP	VC						+	+	+	+												
<i>Orithetrum prasinum neglectum</i>	Common Red Skimmer	赤褐灰蜻	NP	VC			+	+	+	+															
<i>Orithetrum sabina sabina</i>	Green Skimmer	綠腹灰蜻	NP	VC																					
<i>Pantala flavescens</i>	Wandering Glider	蒼蜻	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Paracercion calamorum duveri</i>	Dusky Lilyquatter	藍尾蟌	P. LC	C																					
<i>Prodania autumnalis</i>	Black Threadtail	烏齒縵蜻	NP	VC		+	+	+	+	+	+														
<i>Pseudagrion rubriceps rubriceps</i>	Orange-faced Sprite	丹頂縵蜻	NP	UC			+	+	+	+															
<i>Rhinocypha perforata perforata</i>	Common Blue Jewel	三斑藍珠蟌	NP	VC				+	+	+	+	+													
<i>Rhyothemis variegata arria</i>	Variiegated Flutterer	斑腹縵蜻	NP	C																					
<i>Trihemis aurora</i>	Crimson Dropwing	縵腹蜻	NP	VC	+	+	+	+	+	+	+	+	+												
<i>Trihemis festiva</i>	Indigo Dropwing	縵腹蜻	NP	VC			+	+	+	+	+	+	+												
<i>Zygonyx iris insignis</i>	Emerald Cascader	彩紅蜻	P. PGC	VC																					
No. of species					4	9	11	13	14	15	13	9	7	2	3	1	3	7	11	14	14	15			

Note: NP – Not protected in Hong Kong; P-Protection in Hong Kong

“VC” – Very Common; “UC” – Uncommon; “C” - Common

“+” – Species exists in the study area

“++” – Species common in the study area

“+++” – Species abundant/dominant in study area

Commonness and status were decided according to AFCD biodiversity website (www.hkbiodiversity.net)

LC- Local Concern - Fellowes *et al* (2002)

PGC - Potential Global Concern - Fellowes *et al* (2002)

Table 4.5 Aquatic Macro invertebrates recorded at Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Species name	Chinese name	Status	Commonness	Baseline monitoring		Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring																						
				Jul-08		Aug-08		Jan-09				Jul-09				Jan-10				Jul-10				Jan-11				Jul-11				Jan-12				Jul-12				Aug-13												
				Upper stream	Lower stream	Upper stream	Lower stream	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4										
Molluscs																																																				
<i>Biomphalaria sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Brotia hainanensis</i>	--	NP	VC	+++	++	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Melanooides tuberculata</i>	縮螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Pomacea canaliculata</i>	福寿螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Radix plicatulus</i>	蓮花白螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Sinoatalia quadrata</i>	田螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
Insects																																																				
<i>Baetis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Caenis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Chironomus sp.</i>	孑孓	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Electrogenus sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Hydropsyche sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Indobaetis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Mnais sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Orithetrum sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
Crustaceans																																																				
<i>Caridina cantanensis</i>	廣東米蝦	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Cryptopotamon anacolathon</i>	細刺溪蟹	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Macrobrachium hainanense</i>	海南沼蟹	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
<i>Sommatia thephusa zankou</i>	東眼蟹	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+													
No. of species				9	12	10	11	10	11	3	2	9	10	3	3	2	9	12	5	3	2	7	12	5	4	2	7	15	13	11	13	15	16	4	1	1	2	17	9	6	5	0	15	10	8	5	1	16	12	11	7	3

Note: NP - Not protected in Hong Kong; P - Protected in Hong Kong
 "VC" - Very Common; "UC" - Uncommon; "C" - Common; "R" - Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the the study area
 Reference point was the sampling location outside the works area.

Table 4.5 Aquatic Macro invertebrates recorded at Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Species name	Chinese name	Status	Commonness	Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring															
				Dec-14				Jan-15				Feb-15				Mar-15				Apr-15				May-15				Jun-15				Jul-15				Aug-15				Sep-15				Oct-15			
				Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4				
Molluscs																																															
<i>Biomphalaria sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Brotia hainanensis</i>	--	NP	VC	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++							
<i>Melanooides tuberculata</i>	縮腹黑螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Pomacea canaliculata</i>	福寿螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Radix plicatulus</i>	羅白螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Sinotia quadrata</i>	田螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
Insects																																															
<i>Baetis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Caenis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Chironomus sp.</i>	孑孓幼虫	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Electrogenus sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Hydropsyche sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Indobaetis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Mnais sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Orithetrum sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
Crustaceans																																															
<i>Cardina cantanensis</i>	廣東赤蝦	NP	VC	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++							
<i>Cryptopotamon anacolathon</i>	細刺溪蟹	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Macrobrachium hainanense</i>	海南沼蟹	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
<i>Sommatia helphusa zankou</i>	東眼蟹	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+								
No. of species				13	12	12	13	11	13	11	11	13	12	11	11	11	13	13	12	12	11	9	12	15	12	11	9	11	13	12	11	9	11	13	12	12	9	11	13	12							

Note: NP - Not protected in Hong Kong; P - Protected in Hong Kong
 "VC" - Very Common; "UC" - Uncommon; "C" - Common; "R" - Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the the study area
 Reference point was the sampling location outside the works area.

Table 4.5 Aquatic Macro invertebrates recorded at Lam Tsuen River

(T1- located at upper river channel sampling site to T4 - located at lower river Channel sampling site)

Species name	Chinese name	Status	Commonness	Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring																
				Nov-15				Dec-15				Jan-16				Feb-16				Mar-16				Apr-16				May-16				Jun-16				Jul-16				Aug-16								
				Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4	Reference point	T1	T2	T3	T4					
Molluscs																																																
<i>Biomphalaria sp.</i>	--	NP	VC	+																																												
<i>Brotia hainanensis</i>	--	NP	VC	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++								
<i>Melanoides tuberculata</i>	縮螺黑螺	NP	VC																																													
<i>Pomacea canaliculata</i>	福寿螺	NP	VC	++	++	++	++	+++	++	++	++	++	+++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++								
<i>Radix plicatulus</i>	羅白螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Sinoatala quadrata</i>	田螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
Insects																																																
<i>Baetis sp.</i>	--	NP	VC	+																																												
<i>Caenis sp.</i>	--	NP	VC																																													
<i>Chironomus sp.</i>	孑孓幼虫	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Electrogenus sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Hydropsyche sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Indobaetis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Mnais sp.</i>	--	NP	VC																																													
<i>Orithetrum sp.</i>	--	NP	VC																																													
Crustaceans																																																
<i>Caridina cantanensis</i>	廣東赤蝦	NP	VC	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++								
<i>Cryptopotamon anacolathon</i>	細刺溪蟹	NP	VC																																													
<i>Macrobrachium hainanense</i>	海南沼蝦	NP	VC	+																																												
<i>Sommatia thephusa zankou</i>	東眼蟹	NP	VC																																													
No. of species				11	9	11	13	13	12	10	11	13	13	12	10	11	13	13	12	10	11	13	13	12	10	11	13	13	13	10	11	13	13	13	10	12	14	14	13	10	12	14	14	13	10	12	14	14

Note: NP - Not protected in Hong Kong; P - Protected in Hong Kong
 "VC" - Very Common; "UC" - Uncommon; "C" - Common; "R" - Rare
 +, occurred; ++, common; +++, abundant/dominant Species in the the study area
 Reference point was the sampling location outside the works area.

Table 4.7 Abiotic data for Upper Lam Tsuen River

(T1- located at upper river channel sampling site
to T4 - located at lower river Channel sampling site)

Parameter / date	Baseline monitoring	Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring										
	8-Aug	Jan-09				Jul-09				Jan-10				Jul-10				Jan-11				Jul-11				Jan-12				Jul-12				Aug-13						
Replicate	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4
DO (mg/L)	9.2	9.8	9.9	9.4	9.1	6.4	6.4	6.5	6.8	9.7	9.5	9.5	9.3	8.3	8.5	8.5	8.7	9.6	9.5	9.5	9.1	9.5	9.6	9.4	9.3	9.4	9.2	9.4	9.2	8.2	8	7.8	7.3	8.9	8.5	8.7	8.8			
pH	7.49	7.24	7.36	7.53	7.44	7.1	7.25	7	7.05	7.9	8.1	8.1	8.2	7.4	7.5	7.3	7.4	7.1	7.2	7.2	7.1	7.3	7.1	7.1	7.1	7.2	6.9	6.8	6.7	6.8	7.1	7.3	7.6	6.5	6.8	6.8	7.1			
Nitrate (mg N/L)	0.36	0.79	1.1	1.2	1.2	0.31	0.48	0.48	0.59	0.56	1.11	1.13	1.33	0.1	0.2	0.2	0.3	0.1	0.2	0.4	0.5	0.1	0.2	0.3	0.45	0.2	0.3	0.5	0.6	0.13	0.67	0.62	0.82	0.74	0.72	0.83	0.79			
Ammonia (mg/L)	<0.01	PO4-P (µg P/L): <100				0.02	0.02	0.02	0.03	0.01	0.16	0.17	0.07	0.2	0.4	0.2	0.2	0.05	0.07	0.07	0.1	0.06	0.05	0.08	0.1	0.04	0.05	0.06	0.2	0.01	0.02	0.04	0.03	0.02	0.03	0.03	0.04			
Salinity (ppt)	<0.1	<0.1	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Conductivity (µS/cm)	60	80	100	120	120	45	51	52	63	62	96	98	114	84	100	460	54	90	87	93	120	93	90	90	100	92	84	96	110	41	38	73	86	67	77	74	75			
BOD (mg/L)	<2	<2	<2	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2							
Water flow at pool (m/s)	0.1-0.3	0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2														
Water flow at riffle (m/s)	0.4-0.7	0.2-0.5				0.2-0.5				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6														
Sand (%)	15	15	10	10	10	10	10	10	10	15	8	8	8	15	8	8	8	15	8	8	8	15	8	8	8	10	15	10	10	10	10	10	10	10	10	10	10			
Stone (%)	80	80	88	88	88	88	88	88	88	70	90	90	90	90	90	90	70	90	90	90	70	90	90	90	70	80	70	80	70	60	60	60	60	75	75	75	75			
Mud (%)	5	5	2	2	2	2	2	2	2	5	2	2	2	5	2	2	2	5	2	2	2	5	2	2	2	5	10	15	10	20	30	30	30	30	30	30	30			

Table 4.7 Abiotic data for Upper Lam Tsuen River

(T1- located at upper river channel sampling site
to T4 - located at lower river Channel sampling site)

Parameter / date	Impact monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring											
	Dec-13				Jan-14				Feb-14				Mar-14				Apr-14				May-14				Jun-14				Jul-14				Aug-14				Sep-14							
Replicate	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4
DO (mg/L)	9.3	8.6	8.8	8.7	9.1	9.0	8.6	8.5	7.8	8.7	9.8	9.8	7.5	7.8	8.2	8.1	7.7	7.6	7.8	8.0	8.2	7.8	8.1	8.2	7.6	7.8	7.4	7.2	7.6	7.2	7.6	7.5	7.6	7.6	7.4	7.3	7.6	8.7	8.7	8.4	8.6			
pH	6.2	6.9	7.1	7.1	6.2	6.9	7.1	7.1	8.2	8.5	8	7.8	8.3	8.2	7.6	7.2	7.6	7.8	8.2	7.8	7.7	7.8	7.9	8.2	7.6	7.8	7.8	8.1	7.6	7.7	7.8	8	7.8	7.5	7.6	7.8	8.4	8.1	8.4	8.0				
Nitrate (mg N/L)	0.48	0.57	0.77	0.89	0.9	0.8	1.3	1.26	1.3	1.8	1.6	2.1	1.2	1.4	1.1	1.3	1.5	1.5	1.3	1.2	0.9	0.7	0.6	0.7	0.8	0.8	0.9	0.9	0.8	1.1	1.1	0.8	1.2	1.1	0.9	1.1	1.2	1.3	1.2	1.2				
Ammonia (mg/L)	<0.01	<0.01	<0.01	<0.01	0.04	0.1	0.12	0.15	0.05	0.04	0.1	0.12	0.06	0.04	0.04	0.1	0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Salinity (ppt)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0.02	0.03	0.03	0.01	0.02	0.03	0.03	0	0	0	0	0	0	0	0	0	0	0	0				
Conductivity (µS/cm)	62	64	90	110	72	78	88	108	78	87	118	119	120	123	125	123	96	114	120	122	82	80	72	66	39	58	69	70	43	85	72	75	75	78	82	86	73	77	74	72				
BOD (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2				
Water flow at pool (m/s)	0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2				0.01-0.2				0.03-0.2				0.03-0.2				0.03-0.2															
Water flow at riffle (m/s)	0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6				0.2-0.6															
Sand (%)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	10	5	5	5	10	5	5	5	10	5	5	5	10	5	5	8	10	5	5	8	10				
Stone (%)	90	85	85	85	90	85	85	85	90	85	85	80	90	85	85	80	90	85	85	75	90	85	85	75	93	90	90	75	93	90	90	85	93	90	90	75	93	90	90	75				
Mud (%)	5	10	10	10	5	10	10	10	5	10	10	10	5	10	10	15	5	10	10	15	5	10	10	15	2	5	5	15	2	5	5	15	2	5	2	15	2	5	2	15				

Agreement No. CE65/2013(EP)
Post-Construction Ecological Monitoring of River
Improvement Work in Upper Lam Tsuen River, She Shan
River and Upper Tai Po River – Investigation
Post-Construction Ecological Monitoring Report (No.32)
She Shan River

August 2016



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2 September, 2016

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2 September, 2016

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Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation

Agreement No. CE65/2013(EP) Post-Construction Ecological Monitoring Report (No.32) She Shan River

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1 Introduction

- 1.1 Agreement No. CE65/2013(EP) Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River – Investigation required a post-construction ecological monitoring programme when the project completed. The collected data are mainly used to assess ecological recovery process and effectiveness of ecological migration proposed and enforced during the construction period.
- 1.2 The scope of the ecological monitoring was detailed in EM & A Manual of the project. In brief, the survey aimed to collect data on abiotic factors such as water quality, substratum characteristics, water flow as well as flora and fauna.
- 1.3 China Hong Kong Ecology Consultants Ltd. was committed by Allied Environmental Consultants Ltd (AEC) to undertake the ecological monitoring tasks for the project from December 2014.
- 1.4 This is the number 32 post-construction ecological monitoring report for the project conducted **on 17th of August 2016**. It contains the following subsections:
 - Summary of major points
 - Monitoring Methods and Results
 - Summary and Comments

2 Summary of Major Points

- Field ecological monitoring was undertaken **on 17th of August 2016**;
- Fauna and flora along the drainage project sections is in a process of re-establishing or restoration;
- Fish abundance was similar to last month;
- Bird diversity and abundance was in natural fluctuation;
- Odonata abundance was similar to the record of last month; and
- *Paramesotriton hongkongensis* was not found during the survey.

3 Monitoring Methodology

3.1 Riparian Vegetation

Riparian vegetation, including aquatic and emergent, was sampled using line transects along the affected river channel and riparian habitat. Species, relative abundance and average heights were recorded. Vegetation survey was conducted at three selected belt transects located at the upper (T1), middle (T2) and lower portion (T3) of the river channel respectively (**Figure 1**). The belt transects was run across the river channel in order to collect quantitative data of vegetation, e.g., species inventory, height, percentage cover. Qualitative data of plants was collected by recording plant species along line transect, e.g., species inventory, relative abundance. Nomenclature and protection status of the species has followed those documented in the Lai *et al.* (2004) and Hong Kong Herbarium (2015).

3.2 Avifauna

Avifauna survey was conducted during the post construction monitoring period. Special attention was given to those stream channel area which birds used as feeding and foraging habitat. Avifauna surveys were undertaken in the early morning plus species recorded in the rest of the day when conducting other taxonomic groups (benthic, fish, insect) monitoring. Numerical abundance was recorded at fixed count points within a radius of 30 to 50m according to landscape feature and visual penetration extent. The duration of the point count of birds was standardized for 10 minutes at each location in order to collect comparable data. Transect count along accessible section of river channel were used in order to collect qualitative data. Binoculars and digital camera were the main items of equipment used. Nomenclature and protection status of the species has followed in the AFCD website (www.hkbiodiversity.net) and Carey *et al.* (2001).

The point count was conducted at three locations located at the lower (T3), middle (T2) and upper (T1) portion of the river channel respectively. The point count and survey transect locations for the bird survey and sampling sites for surveys of other faunal groups and flora were presented in **Figure 1**.

3.3 Adult Odonata Survey

Adult Odonata survey was conducted along transects (**Figure 1**). Binoculars, digital camera and hand net were utilized to aid identification. Numerical abundance, species identity and other notable behavior were recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net), Wilson *et al.* (2004) and Tam *et al.* (2011). Adult Odonata survey was conducted along line transects in parallel with river channel within the works area where access was permitted.

3.4 Aquatic Macro-invertebrates

Macro-invertebrates in the riverbed were surveyed. Four sampling sites were selected to collect necessary macro-invertebrate fauna for ecological monitoring information, which covered upper (T1), middle (T2) and lower (T3) sections of the river respectively, as well as reference site (**Figure 1**). Five replicates were taken at each sampling point and pool together for further sample process. Kick sampling and hand netting were the survey methodologies for stream organisms. Dissection microscope and digital camera were used to aid identification and enumeration. Numerical abundance, species identity was recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net), and other literatures such as Dudgeon (1994).

3.5 Fish Population and Hong Kong Newt

Fish community at the specified river channel was monitored by live trapping, hand netting and direct observation methods. Hong Kong newt was surveyed by direct observation and hand netting as well.

Sampling was conducted at four proposed sampling locations at upper (T1), middle (T2), lower (T3) sections and reference site respectively. Those sampling sites covered major type of stream habitats, e.g. river pool and riffle (**Figure 1**). The number of the observed fish was estimated and recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net) and Lee *et al.* (2004).

3.6 Abiotic Data Collection

3.6.1 Water Quality Monitoring

Dissolved oxygen level, pH value, conductivity, salinity, BOD and nutrient level (nitrate and ammonium) were sampled and analyzed by conventional methods in situ or in laboratory. The instruments for measuring dissolved oxygen level, pH value, conductivity, salinity were model: DO-5510, AZ8685, AZ8361 and AZ8374 respectively. All the instruments were calibrated every monitoring month according to the operation manuals in order to obtain the precise result. BOD test took 5 days to complete within darkness incubator with stable temperature at 20°C and was performed using model: DO-5510 for measuring dissolved oxygen. Nutrient levels including nitrate and ammonia were performed in laboratory by applying the In-house method SOP056 (FIA) and SOP057 (FIA) respectively.

3.6.2 Sediment Characteristics

Sediment/substrate characteristics were recorded of sediment cover in percentage e.g. mud, sand, rock, boulder and cemented bottom in the stream bed at sampling sites.

3.6.3 Water Flow

Water flow rates in river channel were measured by recording the time taken for a floating object (e.g. floating ball) in a measured distance. The sampling locations for surveys were presented in **Figure 1**.

4 Monitoring Results

4.1 Vegetation

In total, 77 flora species was recorded within the survey transects along the river course. The recorded floras were generally common wetland species. The height of the dominated riparian grass and herb species were in a range from 0.2m to 1m as observed along survey transect. Dominant flora species were shown in the **Table 4.1** marked with relative abundance sign “+++”. Vegetation has partially covered the river bed in middle and lower sections (Photos 1-2) and generally covered the riverbed and riparian habitat in upper sections (Photo 3). Vegetation coverage along the river has averagely decreased because some of vegetation in the river bed has been washed out by flooding. Aquatic plants *Brachiaria mutica* was the most abundant plants found along the river channel. *Mucuna championii* and *Cibotium barometz* are classified as endangered and vulnerable in China respectively, were recorded in the woodland adjacent to She Shan River. *Cibotium barometz* is also classified as category II in wild plant under state protection. Results of

vegetation survey and belt transect survey were presented in **Table 4.1** and **Table 4.2**. **Figure 1** shows the transect line for the flora surveys.

4.2 Fauna

4.2.1 Avifauna

An avifauna survey was undertaken along survey transects and at three selected point count locations. In total, 23 species of birds were recorded during the bird surveys within project area. 7 recorded species were wetland dependant birds and observed foraging in the river channel including *Ardeola bacchus*, *Motacilla cinerea*, *Tringa ochropus*, *Egretta garzetta* (Photo 4), *Alcedo atthis* (Photo 5), *Amaurornis phoenicurus* and *Motacilla alba*. The dominant species of the river was a common species *Pycnonotus jocosus*. All the birds in Hong Kong are under protection of Wild Animals Protection Ordinance (Cap. 170). Some of wetland dependent species with conservation interest including *Ardeola bacchus* and *Egretta garzetta* were observed foraging in the river. *Ardeola bacchus* and *Egretta garzetta* are considered as Regional Concern by Fellowes *et al.* (2002). The recorded *Spilornis cheela*, was considered as Vulnerable in China Red Data Book and Local concern by Fellowes *et al.* (2002) respectively, was also protected under Endangered Species of Animals and Plants Ordinance (Cap. 586). Except foraging and roosting behaviour of some birds were observed, no other remarkable behaviour was noticed. Transect and Point Count locations were shown on **Figure 1**. Result of bird survey was presented in the **Table 4.3**.

4.2.2 Adult Odonata Survey

Odonata survey was performed and a list of recorded odonata species at She Shan River is shown in **Table 4.4**. The number of odonata species was recorded as similar as last month. The abundance of odonata is high following commencement of peak emergence from spring. It is expected that number of odonata will keep in high abundance during wet season (Wilson *et al.*, 2004 & Tam *et al.*, 2011). A total of 14 species was recorded, those recorded species were mostly common species in Hong Kong (Photos 6-7). The result of this month was similar to approximate period of last year. Sampling location was shown on **Figure 1**.

4.2.3 Aquatic Macro-invertebrates

Survey of aquatic marco-invertebrates was carried out (Photo 8). The river benthic fauna collected was mainly comprised of insects, mollusks and crustaceans (Photos 9-10). Details of recorded benthic fauna refer to **Table 4.5**. Sampling location was shown on **Figure 1**.

4.2.4 Hong Kong Newt

Survey of Hong Kong Newt was performed (Photo 8). Hong Kong Newt was not captured in this month. It is assumed that Newt would stay in terrestrial area during non-breeding period from April to August (Dudgeon, 2003). Hong Kong Newt is listed in Wild Animals Protection Ordinance (Cap. 170) and classified as “Near Threatened” under IUCN Red List Status and as “Potential Global Concern” by Fellowes *et al.* (2002). Record of Hong Kong Newts can be referred to **Table 4.6**.

4.2.5 Fish Fauna

Fish surveys were performed at She Shan River and total 12 species of freshwater fish were recorded. Native fish *Zacco platypus* and *Oreochromis niloticus* were abundant species dominating in the river channel. Among the recorded fish, *Parazacco spilurus* is classified as “Vulnerable” in Red China Data Book, it was commonly observed along the river with low abundance. The number of fish recorded is lower than the record of last month. It is assumed that fish was dispersed due to flooding which frequently occurred during current wet season. Details of recorded of fish fauna refers to **Table 4.6**. Sampling location was shown on **Figure 1**.

4.3 **Abiotic Data**

Data on water quality and major stream hydrological feature (water flow and substratum) of the stream were collected and are presented in the **Table 4.7**.

Generally, the water was not polluted and nutrient levels were low even though there were cultivation activities observed nearby the river. Results of water test are presented in the **Table 4.7**.

The river substratum was comprised of over 30-80% stones or rocks in large proportion of the river sections with slow water flow (up to 0.2m/second at pool and 0.5m/second at riffle).

5 **Summary and Commentary**

Ecological monitoring was carried out in current months and relevant biotic and abiotic data was collected according to project specification and EM & A Manual. *Paramesotriton hongkongensis* was not recorded during the survey. The rest of fauna was in a natural fluctuation.

Aquatic plants and riparian vegetation were generally established at new drainage channel. Vegetation has generally covered the riverbed and gabion in upper section and partially covered the rest portion of the river.

The water quality of the river was generally good along river channel. Water was clean and nutrient levels were low to moderate.

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FIGURE

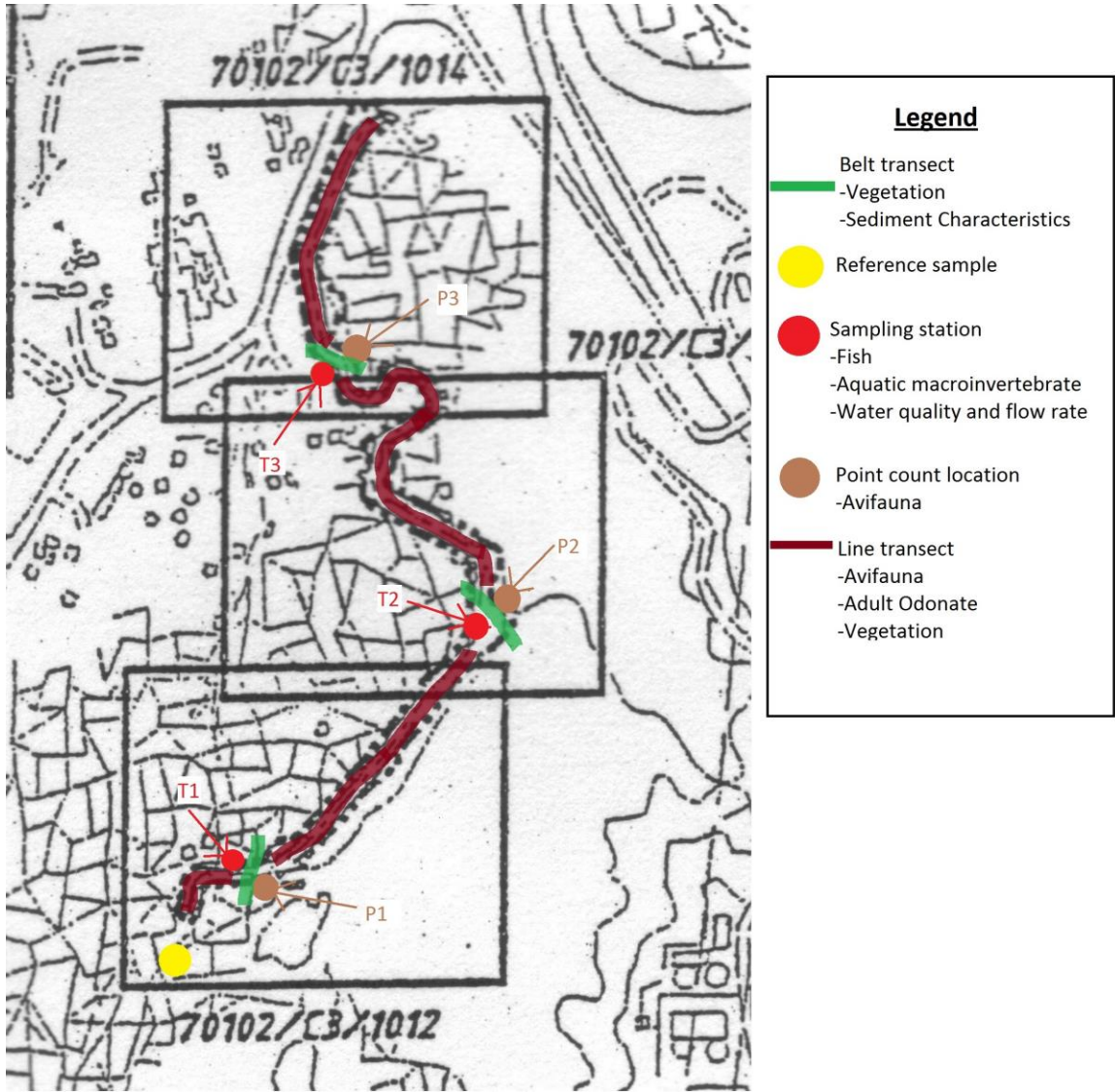


Figure 1. Sampling Location of Ecological Survey and Monitoring at She Shan River, Tai Po.

PHOTOS



Photo 1: General view of the river habitat
(Lower section)



Photo 2: General view of the river habitat
(Middle section)



Photo 3 : General view of the river habitat
(Upper section)



Photo 4 : Avifauna - *Egretta garzetta*



Photo 5 : Avifauna - *Alcedo atthis*



Photo 6 : Odonata –*Ictinogomphus pertinax*



Photo 7 : Odonata –*Crocothemis servilia servilia*



Photo 8 : Kick sampling



Photo 9 : Aquatic samples



Photo 10 : Aquatic samples

TABLE

Table 4.2. Flora species recorded from belt transect survey at the She Shan River
(T1 - Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Family	Species	Chinese name	Baseline monitoring						Impact monitoring						Impact monitoring						Impact monitoring						Impact monitoring										
			Jul-08			Aug-08			Jan-09			Jul-09			Jan-10			Jul-10			Jan-11			Jul-11			Jan-12										
			P1	P3	Transect	P1	P3	Transect	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3								
Commelinaceae	<i>Commelina diffusa</i>	節節草		0.2	20		10	6	0.2	2	0.1	5	0.2	5		0.2	10	0.3	60					0.5	50	0.5	50	0.2	45	0.2	10						
Poaceae	<i>Panicum repens</i>	枯骨草	0.3	5								0.2	5		0.6	5			0.6	25							0.3	30									
Asteraceae	<i>Mikania micrantha</i>	薇甘菊				0.2	7												0.2	5			1	20			0.3	5									
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜																									0.2	5									
Moraceae	<i>Ficus microcarpa</i>	細葉榕		0.7	5		0.6	7																													
Moraceae	<i>Ficus hispida</i>	對葉榕		3	10		3	10																													
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	0.5	5		0.5	3																1.5	30					1.5	30							
Fabaceae	<i>Pueraria lobata</i>	野葛		0.3	5	0.5	3	0.3	5		0.2	5	0.2	5																		0.3	2				
Araceae	<i>Colocasia esculenta</i>	芋					0.2	5																													
Urticaceae	<i>Boehmeria nivea</i>	芋麻	1.5	30		2	7					3	10						2	5																	
Asteraceae	<i>Bidens alba</i>	白花鬼針草												0.3	5	1	5			0.5	5											0.5	2				
Poaceae	<i>Pennisetum purpureum</i>	象草	3	50	1	60	3	80	2	60			4	40															1.5	20							
Poaceae	<i>Coix lacryma-jobi</i>	薏苡																1.5	20													1	1				
Amaranthaceae	<i>Alternanthera philoxeroides</i>	空心蓮子草	0.2	10		0.2	7							0.3	20																						
Poaceae	<i>Panicum maximum</i>	大黍						0.5	5													0.4	5			1.5	5				0.4	2					
Moraceae	<i>Broussonetia papyrifera</i>	構樹										6	5																								
Polygonaceae	<i>Polygonum chinense</i>	火炭母						0.1	10																												
Onagraceae	<i>Ludwigia hyssopifolia</i>	草龍																				0.4	5														
Cyperaceae	<i>Cyperus sp.</i>	莎草																				0.5	5														
Poaceae	<i>Miscanthus floridulus</i>	五節芒																					1.5	5													
Poaceae	<i>Brachiaria mutica</i>	巴拉草																																			
Blechnaceae	<i>Blechnum orientale</i>	烏毛蕨																																			
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																																			
Araceae	<i>Allocasia macrorrhizos</i>	海芋																																			
Lemnaceae	<i>Lemna minor</i>	浮萍																																			
Polygonaceae	<i>Polygonum hydropiper</i>	水蓼																																			
Cyperaceae	<i>Cyperus involucratus</i>	風車草																																			
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																			
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍																																			
Bare Gound									98		75		30		##		95		10		15		70		##		80		15		25		15		40		93

P1 – Point count location 1; P3 – Point count location 3

Table 4.2. Flora species recorded from belt transect survey at the She Shan River
(T1 - Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Family	Species	Chinese name	Impact monitoring						Impact monitoring						Impact monitoring						Impact monitoring						Post construction monitoring						Post construction monitoring											
			Jul-11			Jan-12			Jul-12			Jul-13			Dec-13			Jan-14			Feb-14																							
			T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3																		
Comelinaceae	<i>Commelina diffusa</i>	節節草	0.2	5	0.8	40	0.3	25	0.3	40	0.3	2	0.3	30	0.3	20	0.3	15	0.3	5	0.1	10	0.5	30	0.1	1	0.2	15	0.5	30	0.2	1	0.2	20	0.5	30	0.2	5						
Poaceae	<i>Panicum repens</i>	枯骨草	0.5	20																																								
Asteraceae	<i>Mikania micrantha</i>	薇甘菊	0.3	30			0.2	15			0.2	2									0.1	10			0.2	1	0.1	10			0.2	1	0.1	10			0.2	1						
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜																																										
Moraceae	<i>Ficus microcarpa</i>	細葉榕																																										
Moraceae	<i>Ficus hispida</i>	對葉榕																																										
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹		1.5	15		1	45	0.8	5			0.8	30			0.8	35																										
Fabaceae	<i>Pueraria lobata</i>	野葛																																										
Araceae	<i>Colocasia esculenta</i>	芋																																										
Urticaceae	<i>Boehmeria nivea</i>	苧麻																																										
Asteraceae	<i>Bidens alba</i>	白花鬼針草					1	5																																				
Poaceae	<i>Pennisetum purpureum</i>	象草		1.5	15		2.5	5	2.5	25											1.5	10	1.5	10		1.5	10	1.5	10			1.5	10	1.5	10									
Poaceae	<i>Coix lacryma-jobi</i>	薏苡					2.5	2																																				
Amaranthaceae	<i>Alternanthera philoxeroides</i>	空心蓮子草											0.1	5																														
Poaceae	<i>Panicum maximum</i>	大黍	1	15																																								
Moraceae	<i>Broussonetia papyrifera</i>	構樹																																										
Polygonaceae	<i>Polygonum chinense</i>	火炭母										0.2	2																															
Onagraceae	<i>Ludwigia hyssopifolia</i>	草龍																																										
Cyperaceae	<i>Cyperus sp.</i>	莎草											1	5																														
Poaceae	<i>Miscanthus floridulus</i>	五節芒																																										
Poaceae	<i>Brachiaria mutica</i>	巴拉草		1.5	20			1	15				1	15	1	10	1	20	1	50	1.5	60	0.8	20		1.5	60	0.8	20			1.5	55	0.8	25									
Blechnaceae	<i>Blechnum orientale</i>	烏毛蕨																			0.3	1																						
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																																										
Araceae	<i>Alocasia macrorrhizos</i>	海芋																																										
Lemnaceae	<i>Lemna minor</i>	浮萍																																										
Polygonaceae	<i>Polygonum hydropiper</i>	水蓼																																										
Cyperaceae	<i>Cyperus involucratus</i>	風車草																																										
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香													0.8	3			0.5	5			0.8	30				0.8	30					0.8	30									
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍																																										
Bare Gound				30		10			##	3		15		100		93		20		50		65		5		94		10		10		94		5		10		94		5		5		91

P1 – Point count location 1; P3 – Point count location 3

Table 4.2. Flora species recorded from belt transect survey at the She Shan River
(T1 - Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Family	Species	Chinese name	Post construction monitoring						Post construction monitoring						Post construction monitoring						Post construction monitoring						Post construction monitoring						Post construction monitoring											
			Mar-14						Apr-14						May-14						Jun-14						Jul-14						Aug-14						Sep-14					
			T1		T2		T3		T1		T2		T3		T1		T2		T3		T1		T2		T3		T1		T2		T3		T1		T2		T3							
Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%											
Commelinaceae	<i>Commelina diffusa</i>	箭筒草	0.3	20	0.5	35	0.3	6					0.5	30																														
Poaceae	<i>Panicum repens</i>	枯骨草				0.4	1																																					
Asteraceae	<i>Mikania micrantha</i>	薇甘菊	0.1	10				0.3	10	0.3	10	0.3	1	0.3	10	0.3	10	0.3	1	0.3	10	0.3	10	0.3	1	0.3	10	0.3	10	0.3	1	0.3	10	0.3	1									
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜						0.3	20					0.3	5					0.3	5					0.3	2			0.3	2	0.3	1		0.3	1								
Moraceae	<i>Ficus microcarpa</i>	細葉榕																																										
Moraceae	<i>Ficus hispida</i>	對葉榕																																										
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹																																										
Fabaceae	<i>Pueraria lobata</i>	野葛																																										
Araceae	<i>Colocasia esculenta</i>	芋																																										
Urticaceae	<i>Boehmeria nivea</i>	芋麻																																										
Asteraceae	<i>Bidens alba</i>	白花鬼針草				0.4	1			0.3	5	0.8	1			0.3	5	0.8	1			0.3	5	0.8	2			0.3	5	0.8	5		0.5	5	0.8	5								
Poaceae	<i>Pennisetum purpureum</i>	象草	1.5	5	1.5	5																																						
Poaceae	<i>Coix lacryma-jobi</i>	薏苡										0.8	1					0.8	1																1.2	1								
Amaranthaceae	<i>Alternanthera philoxeroides</i>	空心蓮子草																																										
Poaceae	<i>Panicum maximum</i>	大黍																																										
Moraceae	<i>Broussonetia papyrifera</i>	構樹																																										
Polygonaceae	<i>Polygonum chinense</i>	火炭母																																										
Onagraceae	<i>Ludwigia hyssopifolia</i>	草龍				0.4	1																																					
Cyperaceae	<i>Cyperus sp.</i>	莎草																																										
Poaceae	<i>Miscanthus floridulus</i>	五節芒																																										
Poaceae	<i>Brachiaria mutica</i>	巴拉草	1.5	60	0.8	30		1.5	50	1	50		1.5	40	1	40		1.5	45	1	45		1.5	45	1	45		1.5	50	1	50		1.5	50	1	50								
Blechnaceae	<i>Blechnum orientale</i>	烏毛蕨																																										
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草						2	20				2	15				2	15							2	12			2	10			2	10									
Araceae	<i>Alocasia macrorrhizos</i>	海芋									0.8	1								0.8	1									0.8	1				0.8	1								
Lemnaceae	<i>Lemna minor</i>	浮萍									N.A	5								N.A	5														N.A	1								
Polygonaceae	<i>Polygonum hydropiper</i>	水蓼																																										
Cyperaceae	<i>Cyperus involucratus</i>	鳳車草																																										
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香			0.8	25						1	2																						1	6								
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍																																										
Bare Ground				5		5	90		0		5	84		30		25	84		25		15	84		31		15	87		27		8	80		27		8	80							

Table 4.2. Flora species recorded from belt transect survey at the She Shan River
(T1 - Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Family	Species	Chinese name	Post construction monitoring									Post construction monitoring									Post construction monitoring									Post construction monitoring									Post construction monitoring									Post construction monitoring								
			Dec-15			Jan-16			Feb-16			Mar-16			Apr-16			May-16			Jun-16																																			
			T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3																														
Commelinaceae	<i>Commelina diffusa</i>	節節草		0.3	10	0.2	5		0.3	5	0.2	5		0.3	5	0.2	5		0.3	10	0.2	5		0.3	5	0.2	8		0.3	5	0.2	8																								
Poaceae	<i>Panicum repens</i>	枯骨草																																																						
Asteraceae	<i>Mikania micrantha</i>	薇甘菊	0.5	10			0.5	10	0.5	5			0.5	10	0.5	5			0.5	10	0.5	10			0.5	10	0.5	8		0.5	10	0.5	8																							
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜						0.3	10					0.3	10					0.3	10					0.3	8			0.3	8																									
Moraceae	<i>Ficus microcarpa</i>	細葉榕																																																						
Moraceae	<i>Ficus hispida</i>	對葉榕																																																						
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹																																																						
Fabaceae	<i>Pueraria lobata</i>	野葛																																																						
Araceae	<i>Colocasia esculenta</i>	芋																																																						
Urticaceae	<i>Boehmeria nivea</i>	苧麻																																																						
Asteraceae	<i>Bidens alba</i>	白花鬼針草	1	30			1	30					1	30					1	35					1	15				1	15																									
Poaceae	<i>Pennisetum purpureum</i>	象草																																																						
Poaceae	<i>Coix lacryma-jobi</i>	薏苡	1	2			1	2					1	2					1	2					1	10				1	10																									
Amaranthaceae	<i>Alternanthera philoxeroides</i>	空心蓮子草																																																						
Poaceae	<i>Panicum maximum</i>	大黍																																																						
Moraceae	<i>Broussonetia papyrifera</i>	構樹																																																						
Polygonaceae	<i>Polygonum chinense</i>	火炭母																																																						
Onagraceae	<i>Ludwigia hyssopifolia</i>	草龍																																																						
Cyperaceae	<i>Cyperus sp.</i>	莎草																																																						
Poaceae	<i>Miscanthus floridulus</i>	五節芒																																																						
Poaceae	<i>Brachiaria mutica</i>	巴拉草	0.3	30	1	5	1	1	0.3	15	1	5	1	5	0.3	15	1	5	1	5	0.3	15	1	5	1	5	0.3	15	1	5	1	10	0.3	15	1	5	1	10																		
Blechnaceae	<i>Blechnum orientale</i>	烏毛蕨																																																						
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																																																						
Araceae	<i>Alocasia macrorrhizos</i>	海芋																																																						
Lemnaceae	<i>Lemna minor</i>	浮萍																																																						
Polygonaceae	<i>Polygonum hydropiper</i>	水蓼																																																						
Cyperaceae	<i>Cyperus involucratus</i>	鳳車草		1.2	5	0.4	2		1.2	5	0.4	2		1.2	5	0.4	2		1.2	5	0.4	2		1.2	5	0.4	2		1.2	5	0.4	5																								
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香				0.3	5		0.3	5				0.3	5				0.3	5				0.3	5			0.3	5		0.3	5																								
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍		0.3	5			0.3	5				0.3	5				0.3	5				0.3	5			0.3	5		0.3	5																									
Bare Ground				28		70		87		43		70		83		43		70		83		38		70		83		38		60		83		50		69		72		50		69		72												

P1 – Point count location 1; P3 – Point count location 3

Table 4.2 (Continuous). Flora species recorded from belt transect survey at the She Shan River

(T1 - Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Family	Species	Stream Transect Chinese name	Post construction monitoring						Post construction monitoring					
			Jul-16						Aug-16					
			T1		T2		T3		T1		T2		T3	
Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%	Height(m)	%			
Commelinaceae	<i>Commelina diffusa</i>	節節草												
Poaceae	<i>Panicum repens</i>	枯骨草			0.3	5	0.2	8			0.3	5	0.2	8
Asteraceae	<i>Mikania micrantha</i>	薇甘菊												
Brassicaceae	<i>Nasturtium officinale</i>	西洋菜							0.5	3	0.5	5		
Moraceae	<i>Ficus microcarpa</i>	細葉榕			0.3	5					0.3	5		
Moraceae	<i>Ficus hispida</i>	對葉榕												
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹			0.3	5	0.3	15			0.3	5	0.3	15
Fabaceae	<i>Pueraria lobata</i>	野葛												
Araceae	<i>Colocasia esculenta</i>	芋												
Urticaceae	<i>Boehmeria nivea</i>	苧麻												
Asteraceae	<i>Bidens alba</i>	白花鬼針草												
Poaceae	<i>Pennisetum purpureum</i>	象草	1	15					1	15				
Poaceae	<i>Coix lacryma-jobi</i>	薏苡												
Amaranthaceae	<i>Alternanthera philoxeroides</i>	空心蓮子草	1	10					1	10				
Poaceae	<i>Panicum maximum</i>	大黍												
Moraceae	<i>Broussonetia papyrifera</i>	構樹												
Polygonaceae	<i>Polygonum chinense</i>	火炭母												
Onagraceae	<i>Ludwigia hyssopifolia</i>	草龍												
Cyperaceae	<i>Cyperus sp.</i>	莎草												
Poaceae	<i>Miscanthus floridulus</i>	五節芒												
Poaceae	<i>Brachiaria mutica</i>	巴拉草			0.4	10	0.5	25			0.4	15	0.5	20
Blechnaceae	<i>Blechnum orientale</i>	烏毛蕨	0.3	15	1	5	1	10	0.3	15	1	10	1	10
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草												
Araceae	<i>Alocasia macrorrhizos</i>	海芋												
Lemnaceae	<i>Lemna minor</i>	浮萍												
Polygonaceae	<i>Polygonum hydropiper</i>	水蓼												
Cyperaceae	<i>Cyperus involucratus</i>	風車草												
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香												
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍			0.2	5	0.3	5			0.2	5	0.3	5
Bare Gound					0.3	5					0.3	5		
				60		65		37		57		50		42

P1 – Point count location 1; P3 – Point count location 3

Table 4.4. Odonate species recorded at the She Shan River

Species name	Common name	Chinese name	Status	Commonness	Post construction monitoring													
					Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16
<i>Agriocnemis pygmalis</i>	Wandering Midget	黃尾小蜻	NP	VC														
<i>Brachythemis contaminata</i>	Asian Amberwing	黃翅蜻	NP	VC														
<i>Burmagomphus vermicularis</i>	Dog-legged Clubtail	聯紋鐘春蜓	P, LC	C													+	
<i>Ceragrion auranticum ryukyuanum</i>	Orange-tailed Sprite	琉球橘黃蜻	NP	VC	+	+	+	+									+	+
<i>Copera ciliata</i>	Black-knees Featherlegs	白狹扇蜻	NP	VC													+	+
<i>Copera marginipes</i>	Yellow Featherlegs	黃狹扇蜻	NP	VC	+	+	+	+									+	+
<i>Crocothemis servilia servilia</i>	Crimson Darter	紅蜻	NP	VC	+	+	+	+	+	+							+	+
<i>Diplacodes trivialis</i>	Blue Percher	紋藍小蜻	NP	VC														
<i>Ictinogomphus pertinax</i>	Common Flanetail	霸王葉春蜓	NP	C	+	+	+	+	+								+	+
<i>Ischnura senegalensis</i>	Common Bluetail	褐斑黑痣蜻	NP	VC														+
<i>Nannophya pygmaea</i>	Scarlet Dwarf	侏紅小蜻	NP	C														
<i>Neurobasis chinensis chinensis</i>	Chinese Greenwing	華艷色蜻	NP	VC			+	+	+	+							+	+
<i>Neurothemis fulvia</i>	Russet Percher	網脈蜻	NP	VC	+	+	+	+									+	+
<i>Orthetrum chrysis</i>	Red-faced Skimmer	翠麗灰蜻	NP	VC			+	+	+	+							+	+
<i>Orthetrum glaucum</i>	Common blue skimmer	黑尾灰蜻	NP	VC														
<i>Orthetrum luzonicum</i>	Marsh Skimmer	呂宋灰蜻	NP	VC	+	+											+	+
<i>Orthetrum pruinosum neglectum</i>	Common Red Skimmer	赤褐灰蜻	NP	VC	+	+												
<i>Orthetrum Sabina sabina</i>	Green Skimmer	狹腹灰蜻	NP	C					+	+								
<i>Pantala flavescens</i>	Wandering Glider	黃蜻	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Prodasineura autumnalis</i>	Black Threadtail	烏齒原蜻	NP	VC	+	+	+											
<i>Pseudagrion pruinosum fraseri</i>	Ferruginous-faced Sprite	赤斑蜻	NP	C														
<i>Pseudagrion rubriceps rubriceps</i>	Orange-faced Sprite	丹頂斑蜻	NP	UC														
<i>Rhinocypha perforata perforata</i>	Common Blue Jewel	三斑鼻蜻	NP	VC	+	+	+	+	+								+	+
<i>Rhyothemis variegata arria</i>	Variegated Flutterer	斑麗翅蜻	NP	C	+	+	+	+									+	+
<i>Trithemis aurora</i>	Crimson Dropwing	曉靄蜻	NP	VC	+	+	+	+	+	+							+	+
<i>Trithemis festiva</i>	Indigo Dropwing	靄靄蜻	NP	VC	+	+	+	+	+	+	+						+	+
<i>Zygonyx iris insignis</i>	Emerald Cascader	彩紅蜻	P,PG	VC														
No of Species					13	13	13	12	9	7	2	3	1	3	10	12	15	14

Note: NP – Not protected in Hong Kong ; P - Protected in Hong Kong
“VC” – Very Common; “UC” – Uncommon; “C” - Common
“+” – Species exists in the study area
“++” – Species common in the study area
“+++” – Species abundance in the study area

Commonness and status were decided according to AFCD biodiversity website (www.hkbiodiversity.net)

LC- Local Concern - Fellowes *et al* (2002)

PGC - Potential Global Concern - Fellowes *et al* (2002)

Table 4.5 Aquatic Macro invertebrates recorded at She Shan River.

(T1- Upper stream section, T2 - middle stream section, T3 - Lower stream section)

Species	Chinese name	Sampling location		Baseline monitoring		Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring																				
				Jul-08	Aug-08	Jan-09			Jul-09			Jan-10			Jul-10			Jan-11			Jul-11			Jan-12			Jul-12			Jul-13			Dec-13														
		Status	Common-ness	Upper stream	Lower stream	Upper stream	Lower stream	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3								
Mollusks																																															
<i>Anodonta woodiana</i>	背角無齒蚌	NP	VC																																												
<i>Biomphalaria sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Brotia hainanensis</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Corbicula fluminea</i>	河螺	NP	VC																																												
<i>Melanoides tuberculata</i>	縮螺黑螺	NP	VC	+	+	+	++					+	+	+	+	+	+	+	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Pomacea canaliculata</i>	蘋果螺	NP	VC	+	++	+	+	+	+	+	+	+	+	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Radix plicatulus</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Sinotia quadrata</i>	田螺	NP	VC	+	+	+	++	+				+	+	++	++	+	+	++	++	+	++	++	+	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+									
Insects																																															
<i>Baetis sp.</i>		NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Caenis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Chironomus sp.</i>	鯉幼虫	NP	VC	+	+	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Euphaea sp.</i>		NP	VC																																												
<i>Indobaetis sp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Odonate larvae</i>		NP	VC																																												
<i>Orithrum spp.</i>	--	NP	VC						+	+																																					
<i>Pseudagrion spp.</i>	--	NP	UC																																												
<i>Pseudocloeon sp.</i>	--	NP	VC	+	+	+	+																																								
<i>Serratella sp.</i>		NP	VC	+	+	+	+																																								
Crustaceans																																															
<i>Caridina cantanensis</i>	廣東米蝦	NP	VC																																												
<i>Cryptopotamon anacoluthon</i>	鯉刺溪蟹	NP	VC																																												
No of Species				12	12	12	12	9	0	7	11	9	0	0	12	10	0	11	0	10	8	14	4	10	9	9	8	10	10	9	7	11	7	6	5	9	8	7	5	11	8	7	6	11	8	8	7

Note: NP – Not protected in Hong Kong;
P - protected species in Hong Kong
“VC” – Very Common; “UC” – Uncommon; “C” - Common
“+” – Species exists in the study area
“++” – Species common in the study area
“+++” – Species abundance in the study area
- Reference point was the sampling location outside the works area used to compare the with the data within works area.

Table 4.5 Aquatic Macro invertebrates recorded at She Shan River.

(T1- Upper stream section, T2 - middle stream section, T3 - Lower stream section)

Species	Chinese name	Sampling location		Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring											
				Jan-14				Feb-14				Mar-14				Apr-14				May-14				Jun-14				Jul-14				Aug-14				Sep-14				Oct-14				Nov-14			
				Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3
Mollusks																																															
<i>Anodonta woodiana</i>	背角無齒蚌	NP	VC																																												
<i>Biomphalaria sp.</i>	--	NP	VC					+																																							
<i>Brotia hainanensis</i>	--	NP	VC	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Corbicula fluminea</i>	河蚌	NP	VC	+																																											
<i>Melanoides tuberculata</i>	福壽螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Pomacea canaliculata</i>	福壽螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Radix plicatulus</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Sinotia quadrata</i>	田螺	NP	VC	+	+	+	+	++	+	+	+	++	+	+	+	++	+	+	+	++	+	+	+	++	+	+	+	++	+	+	+	++	+	+	+	++	+	+	+	++	+	+	+	++	+	+	+
Insects																																															
<i>Baetis sp.</i>		NP	VC	+				+	+			+	+	+		+				+				+				+	+			+	+	+		+	+	+		+	+	+		+	+	+	
<i>Caenis sp.</i>	--	NP	VC																																												
<i>Chironomus sp.</i>	蠅幼虫	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Euphaea sp.</i>		NP	VC																																												
<i>Indobaetis sp.</i>	--	NP	VC	+				+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+	
<i>Odonate larvae</i>		NP	VC																																												
<i>Orithrum spp.</i>	--	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Pseudagrion spp.</i>	--	NP	UC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Pseudocloeon sp.</i>	--	NP	VC																																												
<i>Serratella sp.</i>		NP	VC					+				+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+		+	+	+	
Crustaceans																																															
<i>Caridina cantanensis</i>	廣東米蝦	NP	VC																																												
<i>Cryptopotamon anacoluthon</i>	蟹刺溪蟹	NP	VC																																												
No of Species				11	8	8	7	13	10	9	8	14	12	12	9	14	12	13	9	11	11	13	8	10	12	13	8	10	11	14	7	10	12	15	6	12	12	14	8	12	12	13	7	12	11	13	7

Note: NP – Not protected in Hong Kong;
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“VC” – Very Common; “UC” – Uncommon; “C” - Common
“+” – Species exists in the study area
“++” – Species common in the study area
“+++” – Species abundance in the study area
- Reference point was the sampling location outside the works area used to compare the with the data within works area.

Table 4.5 Aquatic Macro invertebrates recorded at She Shan River.

(T1- Upper stream section, T2 - middle stream section, T3 - Lower stream section)

Species	Chinese name	Sampling location		Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring			Post construction monitoring							
		Status	Common-ness	Dec-14			Jan-15			Feb-15			Mar-15			Apr-15			May-15			Jun-15			Jul-15			Aug-15			Sep-15				
		Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3		
Mollusks																																			
<i>Anodonta woodiana</i>	背角無齒蚌	NP	VC																																
<i>Biomphalaria sp.</i>	--	NP	VC		+																														
<i>Brotia hainanensis</i>	--	NP	VC	+	+	+																													
<i>Corbicula fluminea</i>	河蚌	NP	VC																																
<i>Melanoides tuberculata</i>	福壽螺	NP	VC	+	+	+	+	+	+																										
<i>Pomacea canaliculata</i>	福壽螺	NP	VC	+	+	+	+	+	+																										
<i>Radix plicatulus</i>	--	NP	VC	+	+	+	+	+	+																										
<i>Sinotia quadrata</i>	田螺	NP	VC	+	+	+	+																												
Insects																																			
<i>Baetis sp.</i>		NP	VC						+																										
<i>Caenis sp.</i>	--	NP	VC																																
<i>Chironomus sp.</i>	鱒幼虫	NP	VC	+	+	+	+																												
<i>Euphaea sp.</i>		NP	VC																																
<i>Indobaetis sp.</i>	--	NP	VC	+																															
<i>Odonate larvae</i>		NP	VC																																
<i>Orithtrium spp.</i>	--	NP	VC	+	+	+	+																												
<i>Pseudagrion spp.</i>	--	NP	UC	+																															
<i>Pseudocloeon sp.</i>	--	NP	VC	+																															
<i>Serratella sp.</i>		NP	VC																																
Crustaceans																																			
<i>Caridina cantanensis</i>	廣東米蝦	NP	VC																																
<i>Cryptopotamon anacoluton</i>	鱧刺溪蟹	NP	VC																																
No of Species				10	8	13	6	10	11	14	6	7	10	12	6	9	12	13	6	9	12	13	6	9	12	13	6	9	12	14	6	9	12	15	6

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“+” – Species exists in the study area

“++” – Species common in the study area

“+++” – Species abundance in the study area

- Reference point was the sampling location outside the works

area used to compare the with the data within works area.

Table 4.6 Fish species and Hong Kong Newt recorded at She Shan River
 (T1 - Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Species	Commonness	Status	Baseline monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring												
			Jul-08		Aug-08		Jan-09				Jul-09				Jan-10				Jul-10				Jan-11				Jul-11				Jan-12				Jul-12				Jul-13				Dec-13				
			Upper stream	Lower stream	Upper stream	Lower stream	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3									
<i>Channa maculata</i>	斑鱧	NP	C																																												
<i>Clarias gariepinus</i>	革胡子鯰	NP	VC																																												
<i>Gambusia affinis</i>	食蚊魚	NP	VC			++	++	+		+	+	+					+			+	+	+	+	+	+	+																					
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C													+			+																												
<i>Oreochromis niloticus</i>	尼羅口鱒非鯽	NP	C			+	++			+	+			+		+		+	++							+	+	+	+	+	+	+	+	+	+	+	+	+									
<i>Parazacco spilurus</i>	吳鯪	NP, V	C	+	++	+	++	+	+	+	++	+	+				+	+							+																						
<i>Poecilia reticulata</i>	孔雀花魚將	NP	VC			++	++						+	+						+	+	+	+	+	+																						
<i>Pterocryptis cochinchinensis</i>	越南隱鱚	NP	C																																												
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+++	++	+++	+++	++		+	+	+						+	+	+	+	+	+																								
<i>Rhinogobius spp.</i>	鰻虎魚	NP	C			+	+	+																																							
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+	+	++	++	+		+	+	+				+++	+			+	+	+	+	+																							
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C					+	+											+	+																										
<i>Zacco platypus</i>	寬鳍鱚	NP	C	++	+	+	+	+				+	+		+					+	+																										
			2x2m fish number	80	60	80	60	30		15	45	30	0	0	300	30	0	13		20	5	20	200	22	16	3	0	6	4	2	3	8	2	4	0	4	2	2	0	5	3	4	2	5	3	4	2
			No of Species	4	4	9	9	6	1	6	9	7	1	0	5	7	1	6	0	7	3	9	8	8	6	1	0	8	0	2	1	8	6	1	0	9	7	7	3	9	8	8	3	8	8	7	6
Amphibian																																															
<i>Paramesotriton hongkongensis</i>	香港瘰螈	P, Cap 170, NT, PGC	R																																												

Note: NP – Not protected in Hong Kong
 “VC” – Very Common; “UC” – Uncommon; “C” - Common
 “+” – Species exists in the study area
 “++” – Species common in the study area
 “+++” – Species abundance in the study area
 - Reference point was the sampling location outside the works area used to compare the with the data within works area.
 “Cap 170” - List in Wild Animals Protection Ordinance (Cap.170)
 “NT” - Near Threatened in IUCN Red List Status
 “PGC” - Potential Global Concern by Fellowes *et al* (2002)
 “V” - Vulnerable - in Red China Data Book

Table 4.6 Fish species and Hong Kong Newt recorded at She Shan River
(T1 - Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Species		Status	Commonness	Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring											
				Jan-14				Feb-14				Mar-14				Apr-14				May-14				Jun-14				Jul-14				Aug-14				Sep-14				Oct-14				Nov-14			
				Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3				
<i>Channa maculata</i>	斑鱧	NP	C					+				+	+	+		+	+	+		+	+	+		+	+			+	+	+		+	+	+		+	+			+	+						
<i>Clarias gariepinus</i>	革胡子鯰	NP	VC					+				+				+				+				+				+				+				+				+							
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C	+				+				+				+				+				+				+				+				+				+							
<i>Oreochromis niloticus</i>	尼羅口鱒非鯽	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Parazacco spilurus</i>	吳鰱	NP, V	C	+	+	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Poecilia reticulata</i>	孔雀花魚將	NP	VC					+				+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Pterocryptis cochinchinensis</i>	越南隱鱗鯰	NP	C					+				+				+				+				+				+				+				+				+							
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Rhinogobius spp.</i>	鰻虎魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+	+	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C		+				+				+				+				+				+				+				+				+				+						
<i>Zacco platypus</i>	寬鳍鱮	NP	C	+	+	++	+	+	+	++	++	+	+	++	++	+	+	++	++	+	+	+	+	+	+	+	+	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++				
2x2m fish number				12	16	30	40	30	40	50	60	60	60	70	70	40	40	50	40	20	10	20	10	12	5	8	6	16	8	10	10	12	10	16	12	20	20	30	16	40	30	40	30	50	50	60	50
No of Species				8	8	7	7	12	8	7	7	12	11	11	8	12	11	12	9	10	10	13	9	10	9	11	9	9	8	11	10	9	9	12	10	9	9	12	10	8	9	11	10	8	9	12	8
Amphibian																																															
<i>Paramesotriton hongkongensis</i>	香港瘰螈	P, Cap 170, NT, PGC	R	+				+		+		+	+	+				+								+												+					+				

Note: NP – Not protected in Hong Kong
“VC” – Very Common; “UC” – Uncommon; “C” - Common
“+” – Species exists in the study area
“++” – Species common in the study area
“+++” – Species abundance in the study area
- Reference point was the sampling location outside the works area used to compare the with the data within works area.
“Cap 170” - List in Wild Animals Protection Ordinance (Cap.170)
“NT” - Near Threatened in IUCN Red List Status
“PGC”-Potential Global Concern by Fellowes *et al* (2002)
“V” - Vulnerable - in Red China Data Book

Table 4.6 Fish species and Hong Kong Newt recorded at She Shan River
(T1 - Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Species	Status	Commonness	Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring																
			Dec-14				Jan-15				Feb-15				Mar-15				Apr-15				May-15				Jun-15				Jul-15				Aug-15				Sep-15				
			Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3	Reference	T1	T2	T3					
<i>Channa maculata</i>	斑鱔	NP	C					+				+				+				+				+				+				+				+							
<i>Clarias gariepinus</i>	革胡子鯰	NP	VC			+		+	+			+	+			+	+			+	+			+	+			+	+			+	+			+	+						
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C			+		+	+			+	+			+	+			+	+			+	+			+	+			+	+			+	+						
<i>Oreochromis niloticus</i>	尼羅口鱒非鯽	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	+	+	+	++	+	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++				
<i>Parazacco spilurus</i>	吳鯪	NP, V	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Poecilia reticulata</i>	孔雀花魚	NP	VC			+		+	+			+	+			+	+			+	+			+	+			+	+			+	+			+	+						
<i>Pterocryptis cochinchinensis</i>	越南隆睛鱈	NP	C			+		+				+				+				+				+				+				+				+							
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Rhinogobius spp.</i>	鯢虎魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C			+		+				+				+				+				+				+				+				+							
<i>Zacco platypus</i>	寬鳍鱚	NP	C	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+	+	++	++	+				
	2x2m fish number			60	50	50	40	50	40	40	50	40	30	40	50	50	30	35	55	45	20	10	20	10	20	10	20	10	15	8	15	8	20	10	20	10	20	12	23	12			
	No of Species			7	6	11	9	7	8	11	8	7	9	12	8	8	10	12	9	8	10	13	10	8	8	13	10	8	8	13	10	8	8	13	7	8	8	13	6				
Amphibian																																											
<i>Paramesotriton hongkongensis</i>	香港瘳蟻	P, Cap 170, NT, PGC	R			+					+			+				+					+			+																	

Note: NP - Not protected in Hong Kong
 "VC" - Very Common; "UC" - Uncommon; "C" - Common
 "+" - Species exists in the study area
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 "+++ " - Species abundance in the study area
 - Reference point was the sampling location outside the works area used to compare the with the data within works area.
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 "NT" - Near Threatened in IUCN Red List Status
 "PGC"-Potential Global Concern by Fellowes *et al* (2002)
 "V" - Vulnerable - in Red China Data Book

Table 4.7 Abotic data for the Upper She Shan River

(T1- Upper stream section, T2 - middle stream section and T3 - Lower stream section)

Parameter / date	Baseline monitoring	Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring		
	Aug-08	Jan-09			Jul-09			Jan-10			Jul-10			Jan-11			Jul-11			Jan-12		
Replicate		T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
DO (mg/L)	8.9	--	9.1	8.3	6	5.8	6.5	--	8.9	--	8.2	8.3	8.3	8	8.5	8.8	8	8.5	9	8.6	8.2	8.8
pH	7.29	--	7.51	7.42	7.22	7.16	7.35	--	7.5	--	7.5	7.5	7.5	6.9	7	7.2	7	7.2	7.5	6.9	6.6	7.1
Nitrate (mg N/L)	0.5	--	1.6	1.5	0.22	0.3	0.4	--	0.75	--	0.1	0.14	0.2	0.1	0.2	0.7	0.1	0.3	0.4	0.2	0.2	0.4
Ammonia (mg N/L)	0.1	--	PO4-P (µg P/L) :<100	PO4-P (µg P/L) :110	0.83	0.97	0.99	--	0.03	--	0.25	0.2	0.12	0.1	0.1	0.12	0.1	0.1	0.15	0.2	0.2	0.3
Salinity (ppt)	<0.1	--	0.1	0.1	0	0	0	--	0	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	0	0
Conductivity (µS/cm)	90	--	140	170	116	114	116	--	105	--	410	410	390	110	111	115	120	115	130	122	118	126
BOD (mg/L)	<2	--	<2	4	<2	<2	<2	--	2	--	<2	3.2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Water flow at pool (m/s)	0.1-0.3	--	<0.01-0.1		<0.01	N.A	<0.01-0.1	--	<0.01-0.1	--	0.1	0	0	0.1	0	0	0.2	0.05	0.1	0.2	0.05	0.1
Water flow at riffle (m/s)	0.4-0.5	--	0.2-0.3		<0.01	N.A	0.2-0.3	--	0.01	--	0.1	0	0	0.1	0	0	0.2	0.1	0.1	0.2	0.1	0.1
Sand (%)	55	65	23	65	23	23	65	5	23	--	5	30	5	5	30	2	5	30	2	10	25	5
Stone (%)	25	30	75	30	75	75	30	40	75	--	40	65	80	40	65	2	40	65	2	45	65	5
Mud (%)	30	5	2	5	2	2	5	5	2	--	5	5	5	5	5	1	5	5	1	5	10	10
Concrete (%)	0	0	0	0	0	0	0	50	0	100	50	0	10	50	0	95	50	0	95	40	0	80

**Agreement No. CE65/2013(EP) Post-Construction
Ecological Monitoring of River Improvement Work in
Upper Lam Tsuen River, She Shan River and Upper Tai Po
River – Investigation
Post-Construction Ecological Monitoring Report (No. 32)
Upper Tai Po River**

August 2016



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September 2, 2016

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September 2, 2016

Ecology Team: China Hong Kong Ecology Consultants

**Post-Construction Ecological Monitoring of River
Improvement Work in Upper Lam Tsuen River, She Shan
River and Upper Tai Po River – Investigation
Agreement No. CE65/2013(EP)**

**Post-Construction Ecological Monitoring Report (No.32)
Upper Tai Po River**

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1 Introduction

- 1.1 The current post-construction ecological monitoring programme is under Agreement No. CE65/2013(EP) Post-Construction Ecological Monitoring of River Improvement Work in Upper Lam Tsuen River, She Shan River and Upper Tai Po River. The collected data are mainly used to assess ecological recovery process and effectiveness of ecological migration proposed and enforced during the construction period.
- 1.2 The scope of the ecological monitoring was detailed in EM & A Manual of the project. In brief, the survey aimed to collect data on abiotic factors such as water quality, substratum characteristics, water flow as well as flora and fauna.
- 1.3 China Hong Kong Ecology Consultants Ltd. was committed by Allied Environmental Consultants Ltd (AEC) to undertake the ecological monitoring tasks for the project from December 2014.
- 1.4 This is the number 32 post-construction ecological monitoring report for the project conducted **on 18th August 2016**. It contains the following subsections:
 - Summary of major points
 - Monitoring Methods and Results
 - Summary and Comments

2 Summary of Major Points

- Fauna and flora along the drainage project sections is in a process of re-establishing or restoration;
- Bird abundance was similar to those recorded during baseline survey;
- The abundance of target river fauna, i.e., fish *Parazacco spilurus* recorded was lower than those recorded during baseline monitoring (before fish capture/relocation took place). The reason for low fish population of *Parazacco spilurus* was due to river bed modification. The rare fish *Pseudobagrus trilineatus* was consistently recorded in the river during recent monitoring. The other target species, Hong Kong Newt *Paramesotriton hongkongensis*, was not found within works area during baseline, impact monitoring and it was recorded in the river during post construction monitoring. Apart from fauna species, 52 flora species was recorded within the survey transects along the river course. Some common herbs were observed generating on the embankment, which indicating that vegetation was recovering. Flora species of *Tibouchina semidecandra* and *Ipomoea pes-caprae* were planted on the gabion along the river for landscape purpose;
- The abundance of fish was similar to last month;
- The abundance of odonata was high during current wet season; and
- Newt was not recorded during the survey.

3 Monitoring Methodology

3.1 Riparian Vegetation

Riparian vegetation including aquatic and emergent was sampled by line transects along the affected river channel and riparian habitat. Species, relative abundance and average heights were recorded. Vegetation surveys were conducted at three selected belt transects with one located at the upper portion of the river channel (T1) and another one at the middle section of the river (T2), as well as reference site (**Figure 1**). The belt transects was run across the river channel in order to collect quantitative data of the vegetation, e.g., species inventory, height, percentage cover. Qualitative data of plants was collected by recording plant species along line transect, e.g., species inventory, relative abundance. Nomenclature and protection status of the species has followed those documented in Lai *et al.* (2004) and Hong Kong Herbarium (2015).

3.2 Avifauna

Avifauna survey was conducted during post construction monitoring period. Special attention was given to the river channel and corridor area which birds used as feeding and foraging habitat. Avifauna survey was undertaken in the early morning plus species recorded in the rest of the day when conducting other taxonomic groups (benthic, fish, insect) monitoring. Numerical abundance was recorded at fixed count points within a radius of 30 to 50m according to landscape feature and visual penetration extent. The duration of the point count of birds was standardized for 10 minutes at each location in order to collect comparable data. Transect count along accessible sections of river channel were used in order to collect qualitative data. Binoculars and digital camera were the main items of equipment used. Nomenclature and protection status of the species has followed in the AFCDD website (www.hkbiodiversity.net) and Carey *et al.* (2001).

The point count was conducted at two locations with one located at the lower portion of the river channel (T2) and the other located at the upper section of the river (T1). The point count locations, survey transect for bird survey and sampling sites for surveys of other faunal groups and flora was given in **Figure 1**.

3.3 Adult Odonata Survey

Adult Odonata surveys were conducted along transects (**Figure 1**). Binoculars, digital camera and hand net were utilized to aid identification. Numerical abundance, species identity and other notable behavior were recorded. Nomenclature and protection status of the species has followed those documented in the AFCDD website (www.hkbiodiversity.net), Wilson *et al.* (2004) and Tam *et al.* (2011). Adult Odonata survey was conducted along line transects in parallel with river channel within the works area where access was permitted.

3.4 Aquatic Macro-invertebrates

Macro-invertebrates in the river channel were surveyed in three sampling sites with two located at upper (T1) and middle (T2) proportion of the river respectively and one reference site. It aims to collect necessary macro-invertebrate fauna for ecological monitoring programme (**Figure 1**). Five replicates were taken at each sampling point and pool together for further sample sorting and identification. Kick sampling and hand netting were the survey methodologies for river organisms. Dissection microscope and digital camera were used to aid identification and enumeration. Numerical abundance and species identity were recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net) and other literatures such as Dudgeon (1994).

3.5 Fish and Newt

Fish community including target species *Parazacco spilurus* and *Paramesotriton hongkongensis* at the specified river channel was monitored by live trapping, hand netting and direct observation methods.

Sampling was conducted at three sampling locations with one located at upper section (T1) and one located at middle section (T2), as well as reference site. The selected sampling site covered major type of river habitats, e.g. river pool and riffle (**Figure 1**). The number of the observed fish and newt was estimated and recorded. Nomenclature and protection status of the species has followed those documented in the AFCD website (www.hkbiodiversity.net) and Lee *et al.* (2004).

3.6 Abiotic Data Collection

3.6.1 Water Quality Monitoring

Dissolved oxygen level, pH value, conductivity, salinity, BOD and nutrient level (nitrate and ammonium) were measured and analyzed by conventional methods in situ or in laboratory. The instruments for measuring dissolved oxygen level, pH value, conductivity, salinity were model: DO-5510, AZ8685, AZ8361 and AZ8374 respectively. All the instruments were calculated every monitoring month according to the operation manuals in order to obtain the precise result. BOD test took 5 days to complete within darkness incubator with stable temperature at 20°C and was performed using model: DO-5510 for measuring dissolved oxygen. Nutrient levels including nitrate and ammonia were performed in laboratory by applying the In-house method SOP056 (FIA) and SOP057 (FIA) respectively.

3.6.2 Sediment Characteristics

Sediment/substrate characteristics were recorded of sediment cover in percentage e.g. mud, sand, rock, boulder and cemented bottom in the river bed at sampling sites.

3.6.3 Water Flow

Water flow rates in river channel were measured by recording the time taken for a floating object (e.g. floating ball) in a measured distance. The sampling sites for surveys were given in **Figure 1**.

4 Monitoring Results

4.1 Vegetation

Major proportion of river bed and bank was concrete and without plant colonizing (Photos 1-3). Vegetation has sparsely covered the gabion wall along the upper Tai Po River and the river bed with some common plants (Photo 4) including invasive species *Mikania micrantha*, and native species *Commelina diffusa*. In total, 52 flora species were recorded within the survey transects along the river course. Abundant native species *Commelina diffusa* was the dominant species established in the river bed. After strong flooding event in previous months, vegetation has gradually recovered and established in some parts of the river. However, vegetation coverage in upper section was still low. The flora were generally in good health, and the height of the dominated riparian grass and herb species were in a range from 0.3m to 2m as observed along survey transect. Dominant flora species were shown in the **Table 4.1** marked with relative abundance sign “+++”. Results of vegetation survey and belt transect survey were presented in **Table 4.1** and **Table 4.2**. **Figure 1** shows the transect line for the flora surveys.

4.2 Fauna

4.2.1 Avifauna

An avifauna survey was undertaken along survey transects and at two defined point count locations. In total, 16 species of birds were recorded during bird survey. Among them, 4 species were wetland dependant birds observed feeding and roosting in the river channel including *Ardeola bacchus* (Photo 5), *Motacilla alba* (Photo 6), *Egretta garzetta* and *Motacilla cinerea*. A common species *Pycnonotus jocosus* was the dominant species of most of the proportion of the river. All the birds in Hong Kong are under protection of Wild Animals Protection Ordinance (Cap. 170). Some of the wetland dependent species recorded are classified as Regional Concern by Fellowes *et al.* (2002) including *Egretta garzetta* and *Ardeola bacchus*, which were usually observed feeding in the river. *Centropus sinensis* (Photo 7) was found in the river, which is considered as Vulnerable in China Red Data Book. Only foraging and roosting behaviour of some wetland dependent birds were noticed. Transect and Point Count locations were shown on **Figure 1**. Result of bird survey was presented in the **Table 4.3**.

4.2.2 Adult Odonata Survey

Odonata surveys were performed and a list of recorded odonata species at Upper Tai Po River is shown in **Table 4.4**. Number of odonata species recorded was similar to the record of last month and previous surveys conducted in approximate period of last year. In total, 10 species odonata was found, the recorded odonata species was common species in Hong Kong (Photos 8-9). The abundance of odonata is high following commencement of peak emergence from spring. It is expected that number of odonata will keep in high abundance during wet season (Wilson *et al.*, 2004 & Tam *et al.*, 2011). Sampling location was shown in **Figure 1**.

4.2.3 Aquatic Macro-invertebrates

Aquatic-net and kick sampling were performed at the river. The river benthic fauna collected was mainly comprised of insects, molluscs and crustaceans (Photo 10). Details of recorded of river benthic fauna refers to **Table 4.5**. Sampling location was shown on **Figure 1**.

4.2.4 Hong Kong Newt

Surveys of Hong Kong Newt were conducted at Upper Tai Po River. Newt was not captured in this month at reference site. Hong Kong Newt is listed in Wild Animals Protection Ordinance (Cap. 170) and classified as “Near Threatened” under IUCN Red List Status and as “Potential Global Concern” by Fellowes *et al.* (2002). Record of Hong Kong Newts can be referred to **Table 4.6**.

4.2.5 River Fish Fauna

Fish surveys were performed at Upper Tai Po River during surveys. In total, 12 species freshwater fish were recorded within project area. Fish abundance was low along the modified river channel. The *Parazacco spilurus*, *Glyptothorax pallozonum* and *Pseudobagrus trilineatus*, which have conservation interest, were restricted in the upper section of the surveyed river outside the works boundary where the habitat was not affected by construction works, while *Parazacco spilurus* is listed in China Red Data Book Status as Vulnerable and *Pseudobagrus trilineatus* is classified as Global Concern by Fellowes *et al.* (2002). The data showed that fish abundance was similar to the record of last month. Details of records of fish fauna refers to **Table 4.6**. Sampling location was shown on **Figure 1**.

4.3 **Abiotic Data**

Data on water quality and major river hydrological feature (water flow and substratum) of the river were collected and are presented in the **Table 4.7**.

Generally, the water was not polluted and nutrient levels were generally low. Results of water test were presented in the **Table 4.7**.

The river substratums of upper and lower sections were comprised of 40% stone and 60% concrete, 20% stone and 80% concrete respectively. Moderate water flow up to 0.3m/second at pool and 0.6m/second at riffle was measured.

5 **Summary and Commentary**

Post construction ecological monitoring was carried out in current month and relevant biotic and abiotic data was collected according to project specification and EM & A Manual. No Newt was recorded during the survey. Fishes abundance was recorded with tiny change in this month. Bird abundance was similar to those recorded during baseline survey. Species richness of odonata was high during current wet season.

Aquatic and riparian vegetation along river channel was re-established compared to those recorded during baseline surveys. Vegetation that was washed out by the flooding in previous month has been gradually recovered

except vegetation in the upper section. Vegetation has sparsely covered gabion wall and river bed along to the Upper Tai Po River.

The water quality of the surveyed river was not polluted as indicated by low nutrient concentration level of ammonium and nitrate although the river channel may receive discharge and runoff from the village areas.

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FIGURE

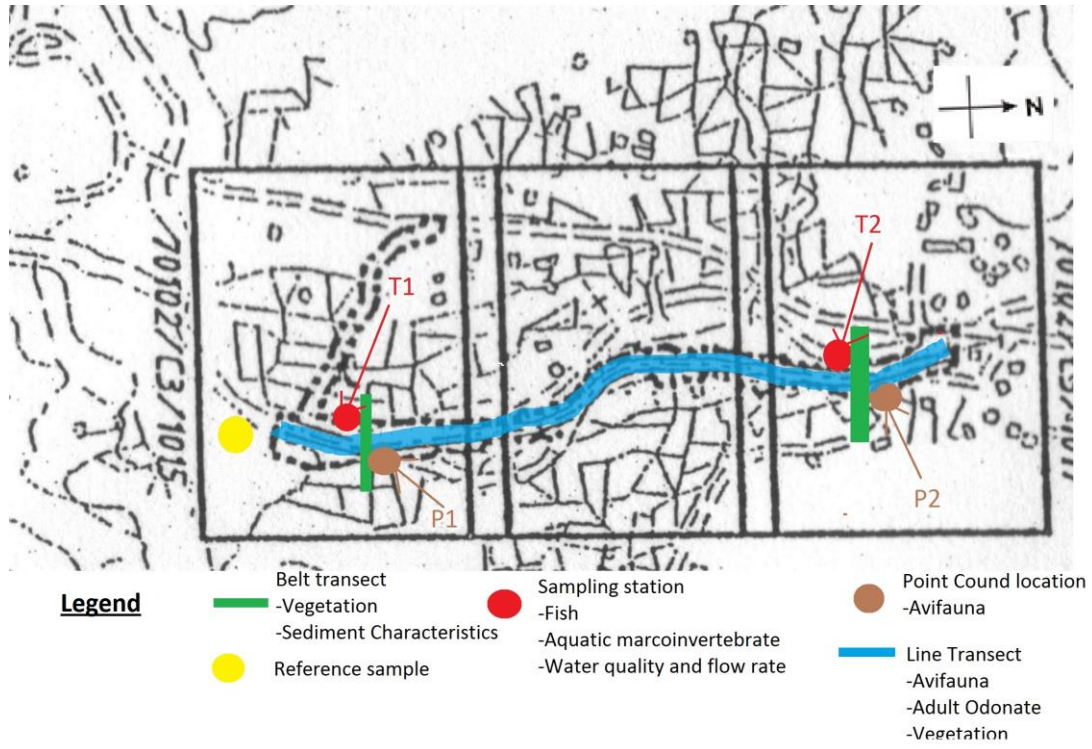


Figure 1. Sampling Location of Ecological Survey and Monitoring at Upper Tai Po River, Tai Po.

PHOTOS



Photo 1: General view of the river channel
(Reference site)



Photo 2: General view of the river channel
(Upper section)



Photo 3: General view of the river channel
(Middle section)



Photo 4: Vegetation sparsely growing on
gabion (Middle section)



Photo 5: Avifauna – *Ardeola bacchus*



Photo 6: Avifauna – *Motacilla alba*

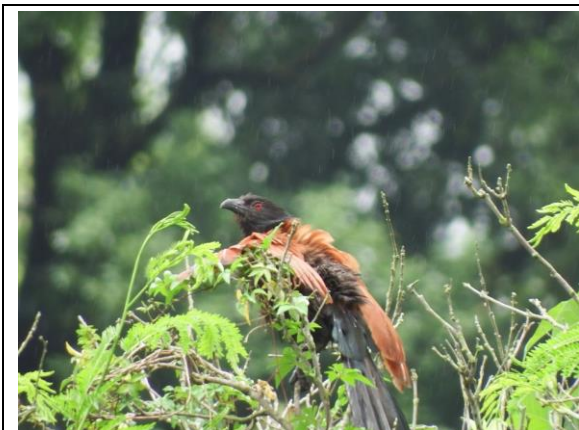


Photo 7: Avifauna – *Centropus sinensis*



Photo 8: Odonata – *Trithemis Aurora*

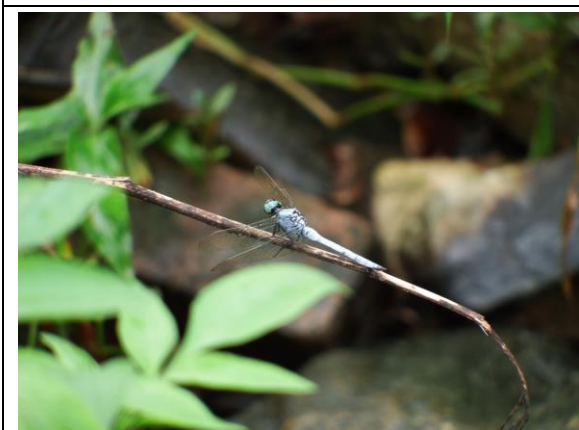


Photo 9: Odonata – *Orthetrum luzonicum*



Photo 10: Aquatic sample

TABLE

Table 4.1. Flora species recorded at the transect along the Upper Tai Po River including riparian habitat.

Family	Species name	Species name in Chinese	Baseline	Impact Monitoring								Post Construction Monitoring					Post Construction Monitoring									
			Oct-07	Jan-09	Jul-09	Jan-10	Jul-10	Jan-11	Jul-11	Jan-12	Jul-12	Mar-13	Jul-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15
Moraceae	<i>Ficus variegata</i>	青果榕														+	+	+	+	+	+	+	+	+	+	+
Musaceae	<i>Musa paradisiaca</i>	大蕉	+	+	+	+	+									+	+	+	+	+	+	+	+	+		+
Myrtaceae	<i>Psidium guajava</i>	番石榴	+	+	+	+	+	+																		
Myrtaceae	<i>Cleistocalyx operculatus</i>	水翁	+	+	+	+	+	+	+							+	+	+	+	+	+	+	+	+	+	+
Oleaceae	<i>Ligustrum sinense</i>	山指甲																								+
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																				+	+	+	+	+
Oxalidaceae	<i>Oxalis corniculata</i>	酢漿草																					+	+	+	+
Plantaginaceae	<i>Plantago major</i>	車前草																					+	+	+	+
Poaceae	<i>Panicum repens</i>	枯骨草	+	+	+	+	+	+	+							+	+	+	+	+	+	+	+	+	+	+
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	++
Poaceae	<i>Pennisetum purpureum</i>	象草	+	+	+	+	+	+																		
Poaceae	<i>Coix lacryma-jobi</i>	慈苳	+	+	+	+	+	+																		+
Poaceae	<i>Phragmites karka</i>	卡開蘆	+	+	+	+	+	+																		+
Poaceae	<i>Miscanthus floridulus</i>	五節芒																								+
Poaceae	<i>Brachiaria mutica</i>	巴拉草																								+
Poaceae	<i>Digitaria radicata</i>	紅尾翎																								++
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																								+
Polygonaceae	<i>Polygonum barbatum</i>	毛蓼	+	+	+	+	+	+								+	+	+	+	+	+	+	+	+	+	
Polygonaceae	<i>Polygonum chinense</i>	火炭母																								+
Polygonaceae	<i>Rumex crispus</i>	假菠菜																								+
Rutaceae	<i>Clausena lansium</i>	黃皮	+	+	+	+	+	+																		
Sapindaceae	<i>Dimocarpus longan</i>	龍眼	+	+	+	+	+	+																		
Sapindaceae	<i>Litchi chinensis</i>	荔枝	+	+	+	+	+	+																		
Scrophulariaceae	<i>Scoparia dulcis</i>	冰糖草																								+
Solanaceae	<i>Solanum torvum</i>	水茄	+	+	+	+	+	+								+	+	+	+	+	+	+	+	+	+	
Solanaceae	<i>Solanum nigrum</i>	龍葵				+	+	+	+																	+
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨	+	+	+	+	+	+																		+
Ulmaceae	<i>Celtis sinensis</i>	朴樹	+	+	+	+	+	+																		+
Urticaceae	<i>Boehmeria nivea</i>	苧麻	+	+	+	+	+	+																		+
Urticaceae	<i>Pouzolzia zeylanica</i>	霧水葛														+	+	+	+	+	+	+	+	+	+	+
Verbenaceae	<i>Lantana camara</i>	馬纓丹	+	+	+	+	+	+																		+
Poaceae	<i>Eleusine indica</i>	牛筋草																								+
Brassicaceae	<i>Rorippa indica</i>	塘葛菜																								+
Poaceae	<i>Isachne globosa</i>	柳葉箬																								+
Poaceae	<i>Paspalum distichum</i>	雙穗雀稗																								+
Cyperaceae	<i>Cyperus involucratus</i>	風車草																								+
Dioscoreaceae	<i>Dioscorea alata</i>	參薯																								+
Menispermaceae	<i>Stephania longia</i>	蕺菜																								+
Polygonaceae	<i>Polygonum hydropiper</i>	水蓼																								+
Balsaminaceae	<i>Impatiens walleriana</i>	非洲鳳仙																								+
Rubiaceae	<i>Paederia scandens</i>	雞矢藤																								+
Ulmaceae	<i>Trema tomentosa</i>	山黃麻																								+
Verbenaceae	<i>Duranta erecta</i>	假連翹																								+
Floating plant																										
Lemnaceae	<i>Lemna minor</i>	浮萍																								+
No of Species			38	38	38	39	39	34	11	12	4	17	23	27	36	39	59	60	61	61	61	62	63	63	63	61

Note:
+, occurred; ++, common; +++, abundant/dominant species recorded in study area

Table 4.1. Flora species recorded at the transect along the Upper Tai Po River including riparian habitat.

Family	Species name	Species name in Chinese	Post Construction Monitoring				Post Construction Monitoring					Post Construction Monitoring								
			Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16
Moraceae	<i>Ficus variegata</i>	青果榕	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Musaceae	<i>Musa paradisiaca</i>	大蕉	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Myrtaceae	<i>Psidium guajava</i>	番石榴																		
Myrtaceae	<i>Cleistocalyx operculatus</i>	水翁	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Oleaceae	<i>Ligustrum sinense</i>	山指甲	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Oxalidaceae	<i>Oxalis corniculata</i>	酢漿草	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Plantaginaceae	<i>Plantago major</i>	車前草																		
Poaceae	<i>Panicum repens</i>	枯骨草	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Poaceae	<i>Pennisetum purpureum</i>	象草	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Poaceae	<i>Coix lacryma-jobi</i>	薏苡	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Poaceae	<i>Phragmites karka</i>	卡開蘆	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Poaceae	<i>Miscanthus floridulus</i>	五節芒	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Poaceae	<i>Brachiaria mutica</i>	巴拉草	+++	+++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	
Poaceae	<i>Digitaria radicata</i>	紅尾翎	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Polygonaceae	<i>Polygonum barbatum</i>	毛蓼																		
Polygonaceae	<i>Polygonum chinense</i>	火炭母	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Polygonaceae	<i>Rumex crispus</i>	假菠菜	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Rutaceae	<i>Clausena lansium</i>	黃皮																		
Sapindaceae	<i>Dimocarpus longan</i>	龍眼																		
Sapindaceae	<i>Litchi chinensis</i>	荔枝																		
Scrophulariaceae	<i>Scoparia dulcis</i>	冰糖草	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Solanaceae	<i>Solanum torvum</i>	水茄																		
Solanaceae	<i>Solanum nigrum</i>	龍葵	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Ulmaceae	<i>Celtis sinensis</i>	朴樹	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Urticaceae	<i>Boehmeria nivea</i>	苧麻	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Urticaceae	<i>Pouzolzia zeylanica</i>	霧水葛	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Verbenaceae	<i>Lantana camara</i>	馬纓丹	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Poaceae	<i>Eleusine indica</i>	牛筋草	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Brassicaceae	<i>Rorippa indica</i>	塘葛菜	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Poaceae	<i>Isachne globosa</i>	柳葉箬	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Poaceae	<i>Paspalum distichum</i>	雙穗雀稗	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Cyperaceae	<i>Cyperus involucreatus</i>	風車草	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Dioscoreaceae	<i>Dioscorea alata</i>	參薯	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Menispermaceae	<i>Stephania longa</i>	蕺菜	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Polygonaceae	<i>Polygonum hydropiper</i>	水蓼	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Balsaminaceae	<i>Impatiens walleriana</i>	非洲鳳仙	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Rubiaceae	<i>Paederia scandens</i>	雞矢藤	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Ulmaceae	<i>Trema tomentosa</i>	山黃麻	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Verbenaceae	<i>Duranta erecta</i>	假連翹	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Floating plant																				
Lemnaceae	<i>Lemna minor</i>	浮萍	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
No of Species			63	66	67	67	67	67	67	67	67	67	65	65	66	66	52	52	52	52

Note:

+, occurred; ++, common; +++, abundant/dominant species recorded in study area

Table 4.2. Flora species recorded from belt transect survey at the Upper Tai Po stream (T1- Upper stream sampling site and T2 - Lower stream sampling site)

Family	Species	Chinese name	Baseline survey				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring																		
			Oct-07		Jan-09				Jul-09				Jan-10				Jul-10				Jan-11				Jul-11																
			P1		P2		Reference		T1		T2		Reference		T1		T2		Reference		T1		T2		Reference		T1		T2		Reference		T1		T2						
			Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%							
Asteraceae	<i>Mikania micrantha</i>	薇甘菊	0.4	15	1	40	0.5	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5	5							
Moraceae	<i>Ficus hispida</i>	對葉榕	1	2			5	5			5	5			5	5	5	5			5	5			5	5															
Ulmaceae	<i>Celtis sinensis</i>	朴樹	5	2					6	15			6	15									4m	5																	
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	1.2	45	1.2	30			0.8	10	0.5	12			0.7	30					1	35	1	5	0.5	10	1	15	1	5	0.5	2	1	2							
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐	2	2			5	5	3	5	1.5	4	5	5	3	5	1.5	5	5	5		5	5			4m	5														
Araceae	<i>Alocasia odora</i>	海芋	1.5	23						1.5	25			2	30								2	10					0.4	3											
Araceae	<i>Colocasia esculenta</i>	芋	0.3	<1	0.4	<1	0.3	2					0.3	2	0.8	5			0.3	1																					
Myrtaceae	<i>Cleistocalyx operculatus</i>	水翁			0.6	1	0.4	10	7	5			0.4	10	7	5			0.4	10					0.4	5	5m	5													
Athyriaceae	<i>Callipteris esculenta</i>	菜蕨					0.8	10			0.4	10	0.8	10			0.4	2	0.8	6			0.8	6																	
Poaceae	<i>Phragmites karka</i>	卡開蘆					1.5	51					1.5	51					1.5	53			1.5	10			1.5	2			1.5	2									
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨	0.4	10					0.4	10					0.4	2																									
Equisetaceae	<i>Equisetum debile</i>	筆管草			0.6	<1	0.3	2					0.3	2					0.3	2																					
Asteraceae	<i>Ageratum conyzoides</i>	勝紅薊						0.4	2					0.4	2													0.3	2	1.2	10										
Commelinaceae	<i>Commelina diffusa</i>	簡箭草															0.2	5	0.2	5			0.5	20					0.2	4											
Solanaceae	<i>Solanum nigrum</i>	龍葵																0.4	5														0.5	4							
Euphorbiaceae	<i>Mallotus paniculatus</i>	白楸															0.3	5															0.3	5							
Poaceae	<i>Eleusine indica</i>	牛筋草											0.5	5																			0.3	5							
Poaceae	<i>Pennisetum purpureum</i>	象草							3	4																															
Asteraceae	<i>Wedelia chinensis</i>	蟛蜞菊																																							
Asteraceae	<i>Bidens alba</i>	白花鬼針草																									0.5	5		3				0.2	2						
Poaceae	<i>Panicum repens</i>	枯骨草																											1.5	5											
Poaceae	<i>Coix lacryma-jobi</i>	薏苡																																							
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍																																							
Cucurbitaceae	<i>Benincasa hispida</i>	冬瓜																										0.2	5												
Fabaceae	<i>Pueraria lobata</i>	野葛																																							
Convolvulaceae	<i>Merremia hederacea</i>	魚黃草																																							
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																																							
Poaceae	<i>Brachiaria mutica</i>	巴拉草																																							
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																							
Malvaceae	<i>Hibiscus rosa-sinensis</i>	大紅花																																							
Cyperaceae	<i>Cyperus sp.</i>	莎草																																							
Balsaminaceae	<i>Impatiens walleriana</i>	非洲鳳仙																																							
Amaranthaceae	<i>Celosia argentea</i>	青葙																																							
Bare Gound							10		73		10		10		78		6		10		73		88		9		15		65		68		80		89		71		100		89

- Reference point was the sampling location outside the works area used to compare with the data within works area.

P1 – Point count location 1; P2 – Point count location 2

Table 4.2. Flora species recorded from belt transect survey at the Upper Tai Po stream (T1- Upper stream sampling site and T2 - Lower stream sampling site)

		Impact monitoring				Impact monitoring				Impact monitoring				Impact monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring										
		Jan-12		Jul-12		Mar-13		Jul-13		Jan-14		Feb-14		Mar-14																						
Stream		Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2											
Family	Species	Chinese name	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%										
Asteraceae	<i>Mikania micrantha</i>	微甘菊	0.4	20				0.4	10				0.4	40	0.4	3			0.4	40	0.4	5			0.4	40	0.4	8			0.4	40	0.4	8		
Moraceae	<i>Ficus hispida</i>	對葉榕																																		
Ulmaceae	<i>Celtis sinensis</i>	朴樹																																		
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹			1	55									0.6	3					0.6	3					0.6	5			0.6	5				
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐																																		
Araceae	<i>Alocasia odora</i>	海芋																																		
Araceae	<i>Colocasia esculenta</i>	芋						0.3	2				0.3	5					0.3	3					0.3	3			0.3	3						
Myrtaceae	<i>Cleistocalyx operculatus</i>	水翁																																		
Athyriaceae	<i>Callipteris esculenta</i>	菜蕨																																		
Poaceae	<i>Phragmites karka</i>	卡開蘆											1.2	5					1.2	2					1.2	2			1.2	2						
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																		
Equisetaceae	<i>Equisetum debile</i>	筆管草																																		
Asteraceae	<i>Ageratum conyzoides</i>	勝紅薊	0.4	20																																
Commelinaceae	<i>Commelina diffusa</i>	簡箭草	0.4	10				0.4	5				0.4	5					0.4	6					0.4	6			0.4	6						
Solanaceae	<i>Solanum nigrum</i>	龍葵																																		
Euphorbiaceae	<i>Mallotus paniculatus</i>	白楸																																		
Poaceae	<i>Eleusine indica</i>	牛筋草												0.3	3					0.3	3						0.3	3				0.3	3			
Poaceae	<i>Pennisetum purpureum</i>	象草																																		
Asteraceae	<i>Wedelia chinensis</i>	麒麟菊																																		
Asteraceae	<i>Bidens alba</i>	白花鬼針草						0.3	10				0.3	10	0.3	10			0.3	15	0.3	10			0.3	15	0.3	10			0.3	15	0.3	10		
Poaceae	<i>Panicum repens</i>	枯骨草	1.5	5									0.6	5					0.6	5					0.6	5			0.6	5	0.6	2				
Poaceae	<i>Coix lacryma-jobi</i>	薏苡	1.5	5			1.5	5				1.5	3																							
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍	0.2	5			0.2	5																												
Cucurbitaceae	<i>Benincasa hispida</i>	冬瓜																																		
Fabaceae	<i>Pueraria lobata</i>	野葛						0.2	5				0.2	10					0.2	10					0.2	10			0.2	10						
Convolvulaceae	<i>Merremia hederacea</i>	魚黃草						0.2	5																											
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草																																		
Poaceae	<i>Brachiaria mutica</i>	巴拉草																																		
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																		
Malvaceae	<i>Hibiscus rosa-sinensis</i>	大紅花												0.6	5				0.6	5					0.6	5			0.6	5			0.6	5		
Cyperaceae	<i>Cyperus sp.</i>	莎草																																		
Balsaminaceae	<i>Impatiens walleriana</i>	非洲鳳仙																																		
Amaranthaceae	<i>Celosia argentea</i>	青葙																																		
Bare Gound			35		100		100	20		100		100	10					20		76				19		74			19		69			19		67

- Reference point was the sampling location outside the works area used to compare with the data within works area.

P1 – Point count location 1; P2 – Point count location 2

Table 4.2. Flora species recorded from belt transect survey at the Upper Tai Po stream (T1- Upper stream sampling site and T2 - Lower stream sampling site)

Family	Species	Chinese name	Post construction monitoring								Post construction monitoring								Post construction monitoring								Post construction monitoring								Post construction monitoring								Post construction monitoring							
			Reference	Apr-14				Reference	May-14				Reference	Jun-14				Reference	Jul-14				Reference	Aug-14				Reference	Sep-14				Reference	Oct-14																
				Height (m)	%	Height (m)	%		Height (m)	%	Height (m)	%		Height (m)	%	Height (m)	%		Height (m)	%	Height (m)	%		Height (m)	%	Height (m)	%		Height (m)	%	Height (m)	%		Height (m)	%	Height (m)	%													
																																						T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1
Asteraceae	<i>Mikania micrantha</i>	微甘菊	0.3	5	0.3	20	(concret section)	0.3	5	0.3	25	(concret section)	0.3	5	0.3	25	(concret section)	0.4	8	0.4	25	(concret section)	0.4	10	0.4	28	(concret section)	0.4	10	0.4	28	(concret section)	0.4	10	0.4	30	(concret section)													
Moraceae	<i>Ficus hispida</i>	對葉榕																																																
Ulmaceae	<i>Celtis sinensis</i>	朴樹																																																
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	0.4	5				0.4	5				0.4	5						0.6	5																													
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐			0.5	1					0.5		1										0.6	1																										
Araceae	<i>Alocasia odora</i>	海芋																																																
Araceae	<i>Colocasia esculenta</i>	芋																																																
Myrtaceae	<i>Cleistocalyx operculatus</i>	水翁																																																
Athyriaceae	<i>Callipteris esculenta</i>	菜蕨																																																
Poaceae	<i>Phragmites karka</i>	卡開蘆	1.5	5				1.5	5				1.5	5						1.5	5																													
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																																
Equisetaceae	<i>Equisetum debile</i>	筆管草																																																
Asteraceae	<i>Ageratum conyzoides</i>	勝紅菊																																																
Commelinaceae	<i>Commelina diffusa</i>	箭筈草			0.1	5					0.1		3																																					
Solanaceae	<i>Solanum nigrum</i>	龍葵																																																
Euphorbiaceae	<i>Mollotus paniculatus</i>	白楸																																																
Poaceae	<i>Eleusine indica</i>	牛筋草																																																
Poaceae	<i>Pennisetum purpureum</i>	象草																																																
Asteraceae	<i>Wedelia chinensis</i>	蟛蜞菊																																																
Asteraceae	<i>Bidens alba</i>	白花鬼針草																																																
Poaceae	<i>Panicum repens</i>	枯骨草	0.3	5				0.3	3				0.3	3						0.4	3																													
Poaceae	<i>Coix lacryma-jobi</i>	薏苡																																																
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍																																																
Cucurbitaceae	<i>Benincasa hispida</i>	冬瓜																																																
Fabaceae	<i>Pueraria lobata</i>	野葛	0.4	10				0.4	15				0.4	15						0.4	15																													
Convolvulaceae	<i>Merremia hederacea</i>	魚黃草																																																
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草		1.5	5				1.5	5				1.5	5						1.5		5																											
Poaceae	<i>Brachiaria mutica</i>	巴拉草																																																
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																																
Malvaceae	<i>Hibiscus rosa-sinensis</i>	大紅花																																																
Cyperaceae	<i>Cyperus sp.</i>	莎草																																																
Balsaminaceae	<i>Impatiens walleriana</i>	非洲鳳仙																																																
Amaranthaceae	<i>Celosia argentea</i>	青葙																																																
Bare Gound				70		69				67		66								64		65								58		61																		

- Reference point was the sampling location outside the works area used to compare with the data within works area.

P1 – Point count location 1; P2 – Point count location 2

Table 4.2. Flora species recorded from belt transect survey at the Upper Tai Po stream (T1- Upper stream sampling site and T2 - Lower stream sampling site)

Family	Species	Chinese name	Post construction monitoring Jun-15				Post construction monitoring Jul-15				Post construction monitoring Aug-15				Post construction monitoring Sep-15				Post construction monitoring Oct-15				Post construction monitoring Nov-15				Post construction monitoring Dec-15																															
			Reference		T1		T2		Reference		T1		T2		Reference		T1		T2		Reference		T1		T2		Reference		T1		T2																											
			Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%																										
Asteraceae	<i>Mikania micrantha</i>	薇甘菊	0.5	10			0.3	3					0.5	10					0.5	10					0.5	10					0.5	5																										
Moraceae	<i>Ficus hispida</i>	對葉榕																																																								
Ulmaceae	<i>Celtis sinensis</i>	朴樹																																																								
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	1	5			1	3	1	5			1	5	1	1			1	5	1	1			1	5	1	3			1	5	1	3																								
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐					0.5	1										1.5	5					1.5	5								1.5	5																								
Araceae	<i>Alocasia odora</i>	海芋																																																								
Araceae	<i>Colocasia esculenta</i>	芋	0.5	5					0.5	5	1.2	10			0.5	5	1.2	5			0.5	5	1.2	5			0.5	5	1.2	5			0.5	5	1.2	5																						
Myrtaceae	<i>Cleistocalyx operculatus</i>	水翁																																																								
Athyriaceae	<i>Callipteris esculenta</i>	菜蕨																																																								
Poaceae	<i>Phragmites karka</i>	卡開蘆	1.5	10					1.5	10					1.5	10					1.5	10					1.5	10			1.5	7																										
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																																								
Equisetaceae	<i>Equisetum debile</i>	筆管草	0.3	5					0.3	5					0.3	5					0.3	5					0.3	5			0.3	5																										
Asteraceae	<i>Ageratum conyzoides</i>	勝紅蕪			0.3	5																																																				
Commelinaceae	<i>Commelina diffusa</i>	箭筒草	0.3	10			0.5	35	0.3	10			0.4	40	0.4	10	0.2	20	0.4	30	0.4	10	0.2	5	0.4	30	0.4	10	0.2	15	0.4	30	0.4	10	0.2	20	0.4	30	0.4	10	0.2	20	0.4	30														
Solanaceae	<i>Solanum nigrum</i>	龍葵																																																								
Euphorbiaceae	<i>Mallotus paniculatus</i>	白楸																																																								
Poaceae	<i>Eleusine indica</i>	牛筋草																																																								
Poaceae	<i>Pennisetum purpureum</i>	象草																																																								
Asteraceae	<i>Wedelia chinensis</i>	鵝蝦菊																																																								
Asteraceae	<i>Bidens alba</i>	白花鬼針草	0.7	5			0.6	2	0.7	5			0.5	5	0.7	5			0.5	5	0.7	5			0.5	5	0.7	5			0.5	5	0.7	5			0.5	5																				
Poaceae	<i>Panicum repens</i>	枯骨草	0.4	5			0.4	5					0.4	5					0.4	5					0.4	5					0.4	5																										
Poaceae	<i>Coix lacryma-jobi</i>	薏苡																																																								
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍																																																								
Cucurbitaceae	<i>Benincasa hispida</i>	冬瓜																																																								
Fabaceae	<i>Pueraria lobata</i>	野葛																																																								
Convolvulaceae	<i>Merremia hederacea</i>	魚黃草																																																								
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草			2	7			2.5	20	2	30			2.5	5	2	20			2.5	5	2	20			2	7	2	20			2	10	2	20			2	10	2	20																
Poaceae	<i>Brachiaria mutica</i>	巴拉草						1.2	50	0.5	15			1.2	30	0.5	15			1.2	2	0.5	15			1.2	2	0.5	15			1.2	2	0.5	15			1.2	2	0.5	15																	
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香			0.3	5																																																				
Malvaceae	<i>Hibiscus rosa-sinensis</i>	大紅花																																																								
Cyperaceae	<i>Cyperus sp.</i>	莎草			0.2	5			0.2	5					0.2	5					0.2	2					0.2	2					0.2	2																								
Balsaminaceae	<i>Impatiens walleriana</i>	非洲鳳仙					1	3																																																		
Amaranthaceae	<i>Celosia argentea</i>	青葙	1.7	5					1.7	5					1.7	5					1.7	5					1.7	5					1.7	5																								
Bare Gound				40			85			46				40				34		25					40			83			25			40			66			25			40			58			25			51			58			25

- Reference point was the sampling location outside the works area used to compare with the data within works area.

P1 – Point count location 1; P2 – Point count location 2

Table 4.2. Flora species recorded from belt transect survey at the Upper Tai Po stream (T1- Upper stream sampling site and T2 - Lower stream sampling site)

Family	Species	Chinese name	Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring				Post construction monitoring																			
			Jan-16		Feb-16		Mar-16		Apr-16		May-16		Jun-16		Jul-16																															
			Reference	T1	Reference	T1	Reference	T1	Reference	T1	Reference	T1	Reference	T1	Reference	T1																														
			Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%	Height (m)	%														
Asteraceae	<i>Mikania micrantha</i>	薇甘菊	0.5	5			0.5	5					0.6	5							0.6	5					0.6	5																		
Moraceae	<i>Ficus hispida</i>	對葉榕																																												
Ulmaceae	<i>Celtis sinensis</i>	朴樹																																												
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	1	5	1	3	1	5	1	3	1.2	5	1	3	1.2	5	1	3	1.2	5	1.2	5			1.2	5			1.2	5																
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐											1.5	5							1.5	5					1.5	5			1.5	10														
Araceae	<i>Alocasia odora</i>	海芋																																												
Araceae	<i>Colocasia esculenta</i>	芋	0.5	5	1.2	5	0.5	5	1.2	5	0.5	5	1.2	5	0.5	5	1.2	5	0.5	5	0.5	5			0.5	5			0.5	5																
Myrtaceae	<i>Cleistocalyx operculatus</i>	水翁																																												
Athyriaceae	<i>Callipteris esculenta</i>	菜蕨																																												
Poaceae	<i>Phragmites karka</i>	卡開蘆	1.5	7			1.5	7			1.5	7			1.5	7			1.5	7					1.5	5			1.5	5																
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨																																												
Equisetaceae	<i>Equisetum debile</i>	筆管草	0.3	5			0.3	5			0.3	5			0.3	5			0.3	5					0.3	5			0.3	5																
Asteraceae	<i>Ageratum conyzoides</i>	勝紅薊																																												
Commelinaceae	<i>Commelina diffusa</i>	箭筈草	0.4	10	0.2	25	0.4	35	0.4	10	0.2	25	0.4	35	0.4	10	0.3	25	40	0	0.4	8	0.3	20	40	0	0.4	5	0.3	5	0.4	2	0.4	5	0.3	5	0.4	2	0.4	5	0.3	5	0.4	2	0.4	5
Solanaceae	<i>Solanum nigrum</i>	龍葵																																												
Euphorbiaceae	<i>Mallotus paniculatus</i>	白楸																																												
Poaceae	<i>Eleusine indica</i>	牛筋草																																												
Poaceae	<i>Pennisetum purpureum</i>	象草																																												
Asteraceae	<i>Wedelia chinensis</i>	蟛蜞菊																																												
Asteraceae	<i>Bidens alba</i>	白花鬼針草	0.7	5			0.5	5			0.5	5			0.5	5			0.7	5			0.5	5			0.7	5			0.5	5			0.7	5			0.5	5						
Poaceae	<i>Panicum repens</i>	粘骨草	0.4	5			0.4	5			0.4	5			0.4	5			0.4	5			0.4	5			0.4	5			0.4	5			0.4	5			0.4	5						
Poaceae	<i>Coix lacryma-jobi</i>	薏苡																																												
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍																																												
Cucurbitaceae	<i>Benincasa hispida</i>	冬瓜																																												
Fabaceae	<i>Pueraria lobata</i>	野葛																																												
Convolvulaceae	<i>Merremia hederacea</i>	魚黃草																																												
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草		2	10		2	20		2	10		2	20		2	10		2	20		2	8		2	10		2	3		2	3		2	3		2	3		2	5					
Poaceae	<i>Brachiaria mutica</i>	巴拉草		1.2	2		0.5	15		1.2	2		0.5	15		1.2	2		0.5	15		1.2	2		0.5	10		1.2	2		1.2	2		1.2	2		1.2	2		1.2	2					
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香																																												
Malvaceae	<i>Hibiscus rosa-sinensis</i>	大紅花																																												
Cyperaceae	<i>Cyperus sp.</i>	莎草		0.2	2					0.2	2				0.2	2					0.2	2																								
Balsaminaceae	<i>Impatiens walleriana</i>	非洲鳳仙																																												
Amaranthaceae	<i>Celosia argentea</i>	青葙	1.7	5			1.7	5			1.7	5			1.7	5			1.7	5			1.7	5			1.7	5			1.7	5			1.7	5			1.7	5						
Bare Gound				48		53		20		48		53		20		48		53		55		50		60		70		55		93		85		55		93		85		55		93		72		

- Reference point was the sampling location outside the works area used to compare with the data within works area.

P1 – Point count location 1; P2 – Point count location 2

Table 4.2. Flora species recorded from belt transect survey at the Upper Tai Po stream (T1- Upper stream sampling site and T2 - Lower stream sampling site)

		Post construction monitoring						
		Stream	Aug-16					
		Transect	Reference		T1		T2	
Family	Species	Chinese name	Height (m)	%	Height (m)	%	Height (m)	%
Asteraceae	<i>Mikania micrantha</i>	薇甘菊	0.6	5				
Moraceae	<i>Ficus hispida</i>	對葉榕						
Ulmaceae	<i>Celtis sinensis</i>	朴樹						
Poaceae	<i>Microstegium ciliatum</i>	剛秀竹	1.2	5				
Euphorbiaceae	<i>Macaranga tanarius</i>	血桐					1.5	10
Araceae	<i>Alocasia odora</i>	海芋						
Araceae	<i>Colocasia esculenta</i>	芋	0.5	5				
Myrtaceae	<i>Cleistocalyx operculatus</i>	水翁						
Athyriaceae	<i>Callipteris esculenta</i>	菜蕨						
Poaceae	<i>Phragmites karka</i>	卡開蘆	1.5	5				
Thelypteridaceae	<i>Cyclosorus parasiticus</i>	華南毛蕨						
Equisetaceae	<i>Equisetum debile</i>	筆管草	0.3	5				
Asteraceae	<i>Ageratum conyzoides</i>	勝紅薊						
Commelinaceae	<i>Commelina diffusa</i>	節節草	0.4	5	0.3	5	0.4	5
Solanaceae	<i>Solanum nigrum</i>	龍葵						
Euphorbiaceae	<i>Mallotus paniculatus</i>	白楸						
Poaceae	<i>Eleusine indica</i>	牛筋草						
Poaceae	<i>Pennisetum purpureum</i>	象草						
Asteraceae	<i>Wedelia chinensis</i>	蟛蜞菊						
Asteraceae	<i>Bidens alba</i>	白花鬼針草	0.7	5			0.5	8
Poaceae	<i>Panicum repens</i>	枯骨草	0.4	5				
Poaceae	<i>Coix lacryma-jobi</i>	薏苡						
Convolvulaceae	<i>Ipomoea cairica</i>	五爪金龍						
Cucurbitaceae	<i>Benincasa hispida</i>	冬瓜						
Fabaceae	<i>Pueraria lobata</i>	野葛						
Convolvulaceae	<i>Merremia hederacea</i>	魚黃草						
Poaceae	<i>Pennisetum alopecuroides</i>	狼尾草					2	5
Poaceae	<i>Brachiaria mutica</i>	巴拉草			1.2	2		
Onagraceae	<i>Ludwigia erecta</i>	美洲水丁香						
Malvaceae	<i>Hibiscus rosa-sinensis</i>	大紅花						
Cyperaceae	<i>Cyperus sp.</i>	莎草						
Balsaminaceae	<i>Impatiens walleriana</i>	非洲鳳仙						
Amaranthaceae	<i>Celosia argentea</i>	青葙	1.7	5				
Bare Gound				55		93		72

- Reference point was the sampling location outside the works area used to compare with the data within works area.

P1 – Point count location 1; P2 – Point count location 2

Table 4.4. Odonate species recorded at the Upper Tai Po River

Species	Common name	Chinese name	Status	Commonness	Baseline survey	Impact monitoring					Impact monitoring				
					Oct-07	Jan-09	Jul-09	Jan-10	Jul-10	Jan-11	Jul-11	Jan-12	Jul-12	Mar-13	Jul-13
<i>Aethriamanta brevipennis brevipennis</i>	Elusive Adjutant	短腹異蜻	NP	U											
<i>Macrodiplax cora</i>	Coastal Glider	高翔濼蜻	NP	C											
<i>Ceriagrion auranticum ryukyuanum</i>	Orange-tailed Sprite	琉球橘黃蟴	NP	VC											
<i>Copera marginipes</i>	Yellow Featherlegs	黃狹扇蟴	NP	VC											
<i>Crocothemis servilia servilia</i>	Crimson Darter	紅蜻	NP	VC	+		+		+						
<i>Euphaea decorata</i>	Black-banded Gossamerwing	方帶幽蟴	NP	VC							+				
<i>Neurobasis chinensis</i>	Chinese Greenwing	華艷色蟴	NP	C					+						
<i>Neurothemis fulvia</i>	Russet Percher	網脈蜻	NP	VC											
<i>Orthetrum chrysis</i>	Red-faced Skimmer	華麗灰蜻	NP	VC		+	+		+				+		+
<i>Orthetrum glaucum</i>	Common blue skimmer	黑尾灰蜻	NP	VC	+	+	+								+
<i>Orthetrum luzonicum</i>	Marsh Skimmer	呂宋灰蜻	NP	VC									+		
<i>Orthetrum pruinosum neglectum</i>	Common Red Skimmer	赤褐灰蜻	NP	VC											
<i>Palpopleura sexmaculata sexmaculata</i>	Asian Widow	六斑曲緣蜻	NP	C										+	
<i>Pantala flavescens</i>	Wandering Glider	黃蜻	NP	VC	+		+	+	+	+	++	+	+	+	+
<i>Paracercion calamorum dyeri</i>	Dusky Lilysquatter	葦尾蟴	P, LC	C											
<i>Prodasineura autumnalis</i>	Black Threadtail	烏齒原蟴	NP	VC											
<i>Pseudagrion rubriceps rubriceps</i>	Orange-faced Sprite	丹頂斑蟴	NP	C							+				
<i>Rhinocypha perforata</i>	Common Blue Jewel	三斑鼻蟴	NP	VC					+						
<i>Trithemis Aurora</i>	Crimson dropwing	曉褐蜻	NP	VC	+				+						
<i>Trithemis festiva</i>	Indigo Dropwing	慶褐蜻	NP	VC							+		+		+
<i>Urothemis signata signata</i>	Scarlet Basket	赤斑曲鈎脈蜻	NP	C							+				
<i>Zygonyx iris insignis</i>	Emerald Cascader	彩虹蜻	P	P,PGC											
No of Species					4	2	4	1	6	1	5	1	5	1	4

Note: NP – Not protected in Hong Kong P- Protected in Hong Kong

“VC” – Very Common; “UC” – Uncommon; “C” - Common

“+” – Species exists in the study area

“++” – Species common in the study area

“+++” – Species abundance in the study area

Commonness and status were decided according to AFCD biodiversity website (www.hkbiodiversity.net)

LC- Local Concern - Fellowes *et al* (2002)

PGC - Potential Global Concern - Fellowes *et al* (2002)

Table 4.4. Odonate species recorded at the Upper Tai Po River

Species	Common name	Chinese name	Status	Commonness	Post construction monitoring										Post construction monitoring							
					Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	
<i>Aethriamanta brevipennis brevipennis</i>	Elusive Adjutant	短腹異蜻	NP	U																		
<i>Macrodiplax cora</i>	Coastal Glider	高翔濤蜻	NP	C																		
<i>Ceragrion auranticum ryukyuanum</i>	Orange-tailed Sprite	琉球橘黃蟳	NP	VC				+	+						+						+	+
<i>Copera marginipes</i>	Yellow Featherlegs	黃狹扇蟳	NP	VC								+	+	+	+						+	+
<i>Crocothemis servilia servilia</i>	Crimson Darter	紅蜻	NP	VC					+													
<i>Euphaea decorata</i>	Black-banded Gossamerwing	方帶幽蟳	NP	VC								+	+									
<i>Neurobasis chinensis</i>	Chinese Greenwing	華艷色蟳	NP	C			+	+	+			+	+	+	+	+					+	+
<i>Neurothemis fulvia</i>	Russet Percher	網脈蜻	NP	VC																		
<i>Orthetrum chrysis</i>	Red-faced Skimmer	華麗灰蜻	NP	VC	+																	
<i>Orthetrum glaucum</i>	Common blue skimmer	黑尾灰蜻	NP	VC											+	+						
<i>Orthetrum luzonicum</i>	Marsh Skimmer	呂宋灰蜻	NP	VC								+	+	+	+						+	+
<i>Orthetrum pruinosum neglectum</i>	Common Red Skimmer	赤褐灰蜻	NP	VC																		+
<i>Palpopleura sexmaculata sexmaculata</i>	Asian Widow	六斑曲緣蜻	NP	C																		
<i>Pantala flavescens</i>	Wandering Glider	黃蜻	NP	VC											+	+						
<i>Paracercion calamorum dyeri</i>	Dusky Lilysquatter	葦尾蟳	P, LC	C				+														
<i>Prodasineura autumnalis</i>	Black Threadtail	烏齒原蟳	NP	VC																		
<i>Pseudagrion rubriceps rubriceps</i>	Orange-faced Sprite	丹頂斑蟳	NP	C							+											+
<i>Rhinocypha perforata</i>	Common Blue Jewel	三斑鼻蟳	NP	VC											+	+					+	+
<i>Trithemis Aurora</i>	Crimson dropwing	曉褐蜻	NP	VC			+					+	+	+	+	+	+	+	+	+	+	+
<i>Trithemis festiva</i>	Indigo Dropwing	慶褐蜻	NP	VC	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+
<i>Urothemis signata signata</i>	Scarlet Basket	赤斑曲鈎脈蜻	NP	C																		
<i>Zygonyx iris insignis</i>	Emerald Cascader	彩虹蜻	P	P,PGC										+	+	+	+					
No of Species					2	1	3	4	4	2	5	7	8	9	6	2	2	1	3	6	7	

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“+” – Species exists in the study area

“++” – Species common in the study area

“+++” – Species abundance in the study area

Commonness and status were decided according to AFCD biodiversity website (www.hkbiodiversity.net)

LC- Local Concern - Fellowes *et al* (2002)

PGC - Potential Global Concern - Fellowes *et al* (2002)

Table 4.4. Odonate species recorded at the Upper Tai Po River

Species	Common name	Chinese name	Status	Commonness	Post construction monitoring															
					Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	
<i>Aethriamanta brevipennis brevipennis</i>	Elusive Adjutant	短腹異蜻	NP	U												+	+	+		
<i>Macrodiplax cora</i>	Coastal Glider	高翔濼蜻	NP	C	+	+														
<i>Ceragrion auranticum ryukyuanum</i>	Orange-tailed Sprite	琉球橘黃蟻	NP	VC	+	+	+	+									+	+	+	+
<i>Copera marginipes</i>	Yellow Featherlegs	黃狹扇蟻	NP	VC	+	+	+	+												
<i>Crocothemis servilia servilia</i>	Crimson Darter	紅蜻	NP	VC		+	+	+	+	+								+	+	+
<i>Euphaea decorata</i>	Black-banded Gossamerwing	方帶幽蟻	NP	VC																
<i>Neurobasis chinensis</i>	Chinese Greenwing	華艷色蟻	NP	C			+	+	+							+	+	+	+	+
<i>Neurothemis fulvia</i>	Russet Percher	網脈蜻	NP	VC		+	+	+												
<i>Orthetrum chrysis</i>	Red-faced Skimmer	華麗灰蜻	NP	VC			+	+	+	+				+	+	+	+	+	+	+
<i>Orthetrum glaucum</i>	Common blue skimmer	黑尾灰蜻	NP	VC					+	+										
<i>Orthetrum luzonicum</i>	Marsh Skimmer	呂宋灰蜻	NP	VC	+	+	+									+	+	+	+	+
<i>Orthetrum pruinosum neglectum</i>	Common Red Skimmer	赤褐灰蜻	NP	VC	+	+										+	+	+	+	+
<i>Palpopleura sexmaculata sexmaculata</i>	Asian Widow	六斑曲緣蜻	NP	C	+	+														
<i>Pantala flavescens</i>	Wandering Glider	黃蜻	NP	VC					+	+	+	+	+	+	+	+	+	+	+	+
<i>Paracercion calamorum dyeri</i>	Dusky Lilysquatter	葦尾蟻	P, LC	C																
<i>Prodasineura autumnalis</i>	Black Threadtail	烏齒原蟻	NP	VC			+													
<i>Pseudagrion rubriceps rubriceps</i>	Orange-faced Sprite	丹頂斑蟻	NP	C	+	+														
<i>Rhinocypha perforata</i>	Common Blue Jewel	三斑鼻蟻	NP	VC	+	+	+	+	+								+	+	+	+
<i>Trithemis Aurora</i>	Crimson dropwing	曉褐蜻	NP	VC					+	+						+	+	+	+	+
<i>Trithemis festiva</i>	Indigo Dropwing	慶褐蜻	NP	VC	+	+	+	+	+			+				+	+	+	+	+
<i>Urothemis signata signata</i>	Scarlet Basket	赤斑曲鈎脈蜻	NP	C																
<i>Zygonyx iris insignis</i>	Emerald Cascader	彩虹蜻	P	P,PGC																
No of Species					9	11	10	8	8	5	1	2	1	2	7	10	11	11	10	

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“+” – Species exists in the study area

“++” – Species common in the study area

“+++” – Species abundance in the study area

Commonness and status were decided according to AFCD biodiversity website (www.hkbiodiversity.net)

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PGC - Potential Global Concern - Fellowes *et al* (2002)

Table 4.5 Aquatic Macro invertebrates recorded at Upper Tai Po River (T1- Upper stream sampling site and T2- Lower stream sampling site)

Species	Chinese name	Sampling point	Baseline survey		Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			
			Oct-07	Jan-09	Jul-09	Jan-10	Jul-10	Jan-11	Jul-11	Jan-12	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	
Mollusca																										
<i>Biomphalaria sp.</i>	--	NP	VC		+			+			+	+			+	+					+					
<i>Brotia hainanensis</i>	--	NP	VC	++	+	++		++			++	+	++		+						+	+		+		
<i>Melanoides tuberculata</i>	縮螺黑螺	NP	VC					+		+	+				+						+			+		
<i>Physella acuta</i>	尖膀胱螺	NP	VC														+	+	++					+		
<i>Pomacea canaliculata</i>	蘋果螺	NP	VC					+		+	++	+		+		++				+	+		+	+		
<i>Radix plicatulus</i>	羅白螺	NP	VC			++						+	+		+	+					+	+	+	+		
<i>Sinotaia quadrata</i>	田螺	NP	VC					++		+	++				++						+			+		
Insects																										
<i>Anisocentropus sp.</i>	--	NP	VC												+											
<i>Arctopora sp.</i>	--	NP	VC												+											
<i>Aulocodes sp.</i>	--	NP	VC								+				+											
<i>Baetis sp.</i>	--	NP	VC	+		+				+				+	+											
<i>Chironomus sp.</i>	蠓幼虫	NP	VC	+	+	+				+			+	+	+					+	+	+	+	+		
<i>Ephemera sp.</i>	--	NP	VC																							
<i>Indobaetis sp.</i>	--	NP	VC	+		+				+	+			+	+											
<i>Mnais sp.</i>	--	NP	VC			+	+			+				+	+						+	+		+		
Odonate Larvae	--	NP	VC																							
<i>Orthetrum sp.</i>	--	NP	VC	+	+	+				+	+			+	+								+	+		
<i>Perla sp.</i>	--	NP	VC											+												
<i>Rhaphium sp.</i>	--	NP	VC																							
<i>Tipulidae spp.</i>	--	NP	VC											+												
Crustacea																										
<i>Caridina cantonensis</i>	廣東水蝦	NP	VC			+				+	++			+	++	+		+	+	+	+		+	+		
<i>Cryptopotamon anacoluthon</i>	觀刺溪蟹	NP	C			+				+				+	+						+					
<i>Macrobrachium hainanense</i>	海南沼蝦	NP	VC			+				+	+			+	+	+		+	+	+	+		+	+		
No of Species				5	6	9	0	5	11	2	5	11	12	6	11	16	8	10	6	5	12	4	4	10	6	4

Note:
 "NP" – Not protected in Hong Kong
 r - Listed in wild animals protection Ordinance (c.ap. 170) and listed as "Near Threatened" in IUCN Red List Status
 "VC" – Very Common; "UC" – Uncommon; "C" – Common
 "+" – Species exists in the study area
 "++" – Species common in the study area
 "+++" – Species abundance in the study area
 - Reference point was the sampling location outside the works area used to compare the with the data within works area.

Table 4.5 Aquatic Macro invertebrates recorded at Upper Tai Po River (T1 - Upper stream sampling site and T2 - Lower stream sampling site)

Species	Chinese name	Sampling point	Post construction monitoring																		Post construction monitoring																		
			Sep-14			Oct-14			Nov-14			Dec-14			Jan-15			Feb-15			Mar-15			Apr-15			May-15			Jun-15			Jul-15			Aug-15			
			Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2				
Mollusca																																							
<i>Biomphalaria sp.</i>	-	NP	VC	+			+								+			+	+	+	+				+				+										
<i>Brotia hainanensis</i>	-	NP	VC	+	+	+	+	+				+	+		+	+		+			+	+		+	+		+	+		+	+		+	+					
<i>Melanoides tuberculata</i>	縮螺黑螺	NP	VC	+			+					+			+			+			+			+			+			+			+						
<i>Physella acuta</i>	尖唇肺螺	NP	VC	+			+					+			+			+			+			+			+			+			+						
<i>Pomacea canaliculata</i>	福果螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			
<i>Radix plicatulus</i>	羅白螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			
<i>Sinotaia quadrata</i>	田螺	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			
Insects																																							
<i>Anisocentropus sp.</i>	-	NP	VC	+			+	+				+	+		+			+			+			+			+			+			+						
<i>Arctopora sp.</i>	-	NP	VC	+			+					+			+			+			+			+			+			+			+						
<i>Aulocodes sp.</i>	-	NP	VC	+			+					+			+			+			+			+			+			+			+						
<i>Baetis sp.</i>	-	NP	VC	+	+		+	+				+	+		+			+	+	+	+			+			+			+			+						
<i>Chironomus sp.</i>	蠓幼虫	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
<i>Ephemera sp.</i>	-	NP	VC	+	+		+	+				+	+		+			+	+		+			+			+			+			+						
<i>Indobaetis sp.</i>	-	NP	VC	+	+		+	+				+	+		+			+			+			+			+			+			+						
<i>Mnais sp.</i>	-	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
Odonate Larvae	-	NP	VC	+			+					+			+			+			+			+			+			+			+						
<i>Orthetrum sp.</i>	-	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
<i>Perla sp.</i>	-	NP	VC	+			+					+			+			+			+			+			+			+			+						
<i>Rhaphium sp.</i>	-	NP	VC	+			+					+			+			+			+			+			+			+			+						
<i>Tipulidae spp.</i>	-	NP	VC	+			+					+			+			+			+			+			+			+			+						
Crustacea																																							
<i>Caridina cantonensis</i>	廣東米蝦	NP	VC	+	+	+	+	++	+	+	++	+	++	+	+	++	+	+	+	++	++	+	++	++	+	++	++	+	++	++	+	++	++	+	++	++	+		
<i>Cryptopotamon anacoluthon</i>	觀刺溪蟹	NP	C	+			+					+			+			++	++	+	+		+			+			+			+							
<i>Macrobrachium hainanense</i>	海南沼蝦	NP	VC	+	+		+	+				+	+		+	+		+			+	+		+			+			+			+						
No of Species				19	12	8	19	13	7	19	11	6	16	10	5	19	10	5	18	7	4	19	7	5	20	7	4	15	7	4	15	7	4	15	7	4	16	6	4

Note:
 "NP" - Not protected in Hong Kong
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 "VC" - Very Common; "UC" - Uncommon; "C" - Common
 "+" - Species exists in the study area
 "++" - Species common in the study area
 "+++" - Species abundance in the study area
 - Reference point was the sampling location outside the works area used to compare the with the data within works area.

Table 4.5 Aquatic Macro invertebrates recorded at Upper Tai Po River (T1 - Upper stream sampling site and T2- Lower stream sampling site)

Species	Chinese name	Sampling point	Post construction monitoring									Post construction monitoring																													
			Sep-15			Oct-15			Nov-15			Dec-15			Jan-16			Feb-16			Mar-16			Apr-16			May-16			Jun-16			Jul-16			Aug-16					
			Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2			
Mollusca																																									
<i>Biomphalaria sp.</i>	--	NP	VC	+			+			+			+			+			+			+			+			+			+			+			+			+	
<i>Brotia hainanensis</i>	--	NP	VC	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	
<i>Melanoides tuberculata</i>	縮螺黑螺	NP	VC	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+		
<i>Physella acuta</i>	尖唇肺螺	NP	VC																																						
<i>Pomacea canaliculata</i>	蘋果螺	NP	VC	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	+	+	++	
<i>Radix plicatulus</i>	羅白螺	NP	VC	+			+			+			+			+			+			+			+			+			+			+			+			+	
<i>Sinotaia quadrata</i>	田螺	NP	VC	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	
Insects																																									
<i>Anisocentropus sp.</i>	--	NP	VC	+			+			+			+			+			+			+			+			+			+			+			+			+	
<i>Arctopora sp.</i>	--	NP	VC	+			+			+			+			+			+			+			+			+			+			+			+			+	
<i>Aulocodes sp.</i>	--	NP	VC																																						
<i>Baetis sp.</i>	--	NP	VC																																						
<i>Chironomus sp.</i>	蠓幼虫	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Ephemera sp.</i>		NP	VC																																						
<i>Indobaetis sp.</i>	--	NP	VC	+			+			+			+			+			+			+			+			+			+			+			+			+	
<i>Mnais sp.</i>	--	NP	VC	+			+			+			+			+			+			+			+			+			+			+			+			+	
Odonate Larvae	--	NP	VC	+			+			+			+			+			+			+			+			+			+			+			+			+	
<i>Orthetrum sp.</i>	--	NP	VC	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	
<i>Perla sp.</i>	--	NP	VC	+			+			+			+			+			+			+			+			+			+			+			+			+	
<i>Rhaphium sp.</i>	--	NP	VC																																						
<i>Tipulidae spp.</i>	--	NP	VC																																						
Crustacea																																									
<i>Caridina cantonensis</i>	廣東米蝦	NP	VC	++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	+		++	
<i>Cryptopotamon anacoluthon</i>	觀刺溪蟹	NP	C																																						
<i>Macrobrachium hainanense</i>	海南沼蝦	NP	VC	+			+			+			+			+			+			+			+			+			+			+			+			+	
No of Species				16	6	3	16	6	3	16	6	3	16	6	3	16	6	3	16	6	3	16	6	3	15	6	3	15	6	3	15	6	3	15	6	3	15	6	3		

Note:
 "NP" – Not protected in Hong Kong
 r - Listed in wild animals protection Ordinance (c.ap. 1/0) and listed as "Near Threatened" in IUCN Red List Status
 "VC" – Very Common; "UC" – Uncommon; "C" – Common
 "+" – Species exists in the study area
 "++" – Species common in the study area
 "+++" – Species abundance in the study area
 - Reference point was the sampling location outside the works area used to compare the with the data within works area.

Table 4.6 Fish species and Hong Kong Newt recorded at Upper Tai Po River (T1- Upper stream sampling site and T2 - Lower stream sampling

Species	Status	Commonness	Baseline survey		Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring			Impact monitoring						
			Oct-07		Jan-09			Jul-09			Jan-10			Jul-10			Jan-11			Jul-11			Jan-12			
			T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	
<i>Cyprinus carpio var. viridiviolaceus</i>	錦鯉	NP	C																							
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	++			+			+	+			+	+++		+	+	+		+	+	++		
<i>Glyptothorax pallozonum</i>	白線紋胸鮡	NP	R																							
<i>Liniparhomaloptera disparis</i>	擬平鰈	NP	C																							
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C			+			+			+			+			+			+					
<i>Oreochromis niloticus</i>	尼羅口孵非鯽	NP	C	+											+				+	+		+	+			
<i>Parazacco spilurus</i>	異鰈	V and	C	++		+	+		+			+			+	+		+	+		+	+	+			
<i>Poecilia reticulata</i>	孔雀花魚	NP	C	++	+			++			+		+	+++		+	++			+	+		+	+		
<i>Pseudobagrus trilineatus</i>	三線擬鱧	NP,GC	R																							
<i>Pseudogastromyzon myersi</i>	麥氏擬腹吸鰈	NP	C	+		+			+			+			+	+		++	++		+	+		+		
<i>Pterocryptis cochinchinensis</i>	越南隱鱧	NP	C																							
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+		+	+		+	+	+	+	++		+	+	++	+			+		+	+		
<i>Rhinogobius spp.</i>	鰕虎魚	NP	C	+		+	+		+			+	++	+	+	++	+			+		+	+			
<i>Schistura fasciolata</i>	橫紋南鰈	NP	C	+		+			+	+		+			+	+		+	+		+	+				
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	++		+			+	+	++	+	+	++	+	+	++	+	+		+	+	+	++		
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C	+																	+		+	++		
		2x2m fish		70	60	15	8	25	10	20	100	10	2	8	10	7	100	10	5	20	6	2	4	6	2	5
		No of Speices		10	2	7	3	2	7	4	4	7	5	5	7	9	7	8	5	3	11	2	7	10	3	5
Amphibian																										
<i>Paramesotriton hongkongensis</i>	香港瘰螈	P	UC																							

Note: NP – Not protected in Hong Kong; P - Protected in Hong Kong

“VC” – Very Common; “UC” – Uncommon; “C” - Common

“+” – Species exists in the study area

“++” – Species common in the study area

“+++” – Species abundance in the study area

V – Listed as vulnerable in China Fish Red Data Book

GC- Global Concern - Fellowes *et al* (2002)

- Reference point was the sampling location outside the works area used to compare with the data within works area.

Table 4.6 Fish species and Hong Kong Newt recorded at Upper Tai Po River (T1- Upper stream sampling site and T2 - Lower stream sampling

Species	Commonness	Status	Impact monitoring			Impact monitoring			Impact monitoring			Post construction monitoring									Post construction monitoring																		
			Jul-12			Mar-13			Jul-13			Jan-14			Feb-14			Mar-14			Apr-14			May-14			Jun-14			Jul-14			Aug-14			Sep-14			
			Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2				
<i>Cyprinus carpio var. viridiviolaceus</i>	錦鯉	NP	C																																				
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+																
<i>Glyptothorax pallozonum</i>	白線紋胸鮡	NP	R																																				
<i>Liniparhomaloptera disparis</i>	擬平鮎	NP	C																																				
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C	+			+																																
<i>Oreochromis niloticus</i>	尼羅口鱈非鯽	NP	C			+									+																								
<i>Parazacco spilurus</i>	異鱔	V and NP	C	+			+							+	+																								
<i>Poecilia reticulata</i>	孔雀花魚	NP	C																																				
<i>Pseudobagrus trilineatus</i>	三線擬鱮	NP,GC	R				+																																
<i>Pseudogastromyzon myersi</i>	麥氏擬腹吸鰍	NP	C	+			+																																
<i>Pterocryptis cochinchinensis</i>	越南隱鱮	NP	C																																				
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+			+							+	+																								
<i>Rhinogobius spp.</i>	鰕虎魚	NP	C	+	+		+							+	+																								
<i>Schistura fasciolata</i>	橫紋南鰍	NP	C	+			+	+						+	+																								
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+			+							+																									
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C																																				
		2x2m fish		5	2	2	5	2	1	5	2	1	12	8	6	10	12	10	16	10	8	16	10	8	12	4	2	12	4	2	15	5	4	20	8	5	30	10	10
		No of Speices		8	2	2	9	2	1	9	4	1	9	4	3	8	5	4	10	6	4	13	6	4	13	3	1	12	2	2	12	2	2	12	3	4	12	3	4
Amphibian																																							
<i>Paramesotriton hongkongensis</i>	香港瘰螈	P	UC																																				

Note: NP – Not protected in Hong Kong; P - Protected in Hong Kong

“VC” – Very Common; “UC” – Uncommon; “C” - Common

“+” – Species exists in the study area

“++” – Species common in the study area

“+++” – Species abundance in the study area

V – Listed as vulnerable in China Fish Red Data Book

GC- Global Concern - Fellowes *et al* (2002)

- Reference point was the sampling location outside the works area used to compare with the data within works area.

Table 4.6 Fish species and Hong Kong Newt recorded at Upper Tai Po River (T1- Upper stream sampling site and T2 - Lower stream sampling

		Post construction monitoring																																
		Oct-15			Nov-15			Dec-15			Jan-16			Feb-16			Mar-16			Apr-16			May-16			Jun-16			Jul-16			Aug-16		
Species		Status	Commonness	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	Reference	T1	T2	
<i>Cyprinus carpio</i> var. <i>viridiviolaceus</i>	錦鯉	NP	C																															
<i>Gambusia affinis</i>	食蚊魚	NP	VC	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		
<i>Glyptothorax pallozonum</i>	白線紋胸鮡	NP	R																															
<i>Liniparhomaloptera disparis</i>	擬平鰈	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Misgurnus anguillicaudatus</i>	泥鰍	NP	C																															
<i>Oreochromis niloticus</i>	尼羅口孵非鯽	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Parazacco spilurus</i>	異鰱	V and NP	C	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		
<i>Poecilia reticulata</i>	孔雀花魚	NP	C																															
<i>Pseudobagrus trilineatus</i>	三線擬鱨	NP,GC	R	+			+			+			+			+			+			+			+			+			+			
<i>Pseudogastromyzon myersi</i>	麥氏擬腹吸鰍	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Pterocryptis cochinchinensis</i>	越南隱鱔	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Puntius semifasciolatus</i>	七星魚	NP	C	+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		+	+		
<i>Rhinogobius spp.</i>	鰕虎魚	NP	C	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
<i>Schistura fasciolata</i>	橫紋南鰍	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Xiphophorus hellerii</i>	劍尾魚	NP	C	+			+			+			+			+			+			+			+			+			+			
<i>Xiphophorus variatus</i>	雜色劍尾魚	NP	C																															
		2x2m fish		20	10	5	35	15	10	45	20	5	50	15	5	45	20	5	45	20	5	40	15	5	25	10	5	25	10	5	20	7	2	
		No of Speices		12	4	1	12	4	1	12	4	1	11	4	1	11	4	1	11	4	1	11	4	1	12	2	1	11	2	1	12	2	1	
Amphibian																																		
<i>Paramesotriton hongkongensis</i>	香港瘰螈	P	UC	+			+			+			+			+			+			+			+			+			+			

Note: NP – Not protected in Hong Kong; P - Protected in Hong Kong
“VC” – Very Common; “UC” – Uncommon; “C” - Common
“+” – Species exists in the study area
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“+++” – Species abundance in the study areae
V – Listed as vulnerable in China Fish Red Data Book
GC- Global Concern - Fellowes *et al* (2002)
- Reference point was the sampling location outside the works area used to compare with the data within works area.

Table 4.7 Abotic data for Upper Tai Po River (T1- Upper stream sampling site and T2- Lower stream sampling site)

Parameters/ Date	Baseline survey		Impact monitoring												Impact monitoring						
	Oct-07	Jan-09		Jul-09		Jan-10		Jul-10		Jan-11		Jul-11		Jan-12		Jul-12		Mar-13		Jul-13	
Replicate	T1	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
DO (mg/L)	8.2	9	4	6.3	6	9.4	8.8	9	6.5	10.5	9.8	9	8.2	8.8	8.4	7.6	7.8	7.9	8.1	8	7.8
pH	6.9	7.18	6.86	7.28	6.96	8.2	8.5	7.3	7.2	6.9	7.1	7.1	7.3	6.8	7.6	6.9	7.8	6.8	7.5	7.2	7.6
Nitrate (mg N/L)	0.39	0.1	1.3	0.07	1.32	0.12	0.71	0.1	0.5	0.1	0.5	0.1	0.5	<0.1	0.5	0.29	0.26	0.15	0.22	0.21	0.29
Ammonia (mg/L)	<0.01	PO4-P (µg P/L): <100		0.01	0.22	<0.01	0.2	0.1	0.2	0.01	0.3	0.01	0.2	<0.01	0.3	<0.01	0.03	<0.01	0.02	<0.01	0.04
Salinity (ppt)	<0.1	<0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0.01	0.01	0.02	0.01	0.01
Conductivity (mS/cm)	40	40	190	34	118	42	72	49	43	50	60	50	60	65	74	52	54	54	58	44	42
BOD (mg/L)	<2	<2	12	<2	<2	<2	2	<2	2	2	<2	<2	2	<2	3	<2	<2	<2	<2	<2	<2
Water flow at pool (m/s)	0.01-0.2	0.01-0.2		0.01-0.2		0.01-0.2		0.01-0.2		0.01-0.2		0.01-0.2		0.01-0.2		0.01-0.2		0.01-0.2		0.01-0.2	
Water flow at riffle (m/s)	0.2-0.5	0.2-0.5		0.2-0.5		0.2-0.5		0.2-0.5		0.2-0.5		0.2-0.5		0.2-0.5		0.2-0.5		0.2-0.5		0.2-0.5	
Sand (%)	15	15		15	25	15	25	15	25	15	25	15	15	15	15	15	15	0	0	0	0
Stone (%)	80	80		80	70	80	70	80	70	80	70	80	70	80	70	80	70	40	20	40	20
Mud (%)	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5	0	0	0	0
Concrete(%)	0	0	0	0	0	0	0	0	0	0	0	0	10	0	10	0	10	60	80	60	80

