MOTT MACDONALD

Agreement No. DP01/2013 Ecological Survey and Assessment for Yuen Long Bypass Floodway

Additional Service – Ecological Monitoring for the Enhancement Measures
Executive Summary

Drainage Services Department

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Mott MacDonald Hong Kong Limited
registered in Hong Kong no. 236497

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E1 Background of the Project

Mott MacDonald Hong Kong Limited (MM) was commissioned by the Drainage Services Department (DSD) of the Government of the Hong Kong Special Administrative Region, to undertake the Ecological Survey and Assessment for Yuen Long Bypass Floodway (hereafter referred as "the Study") under Agreement No. DP 01/2013. This Study commenced on 26 July 2013. Following the completion of the works in 2016, further enhancement measures and a monitoring programme for the Yuen Long Bypass Floodway (YLBF) was recommended. In 2017, DSD implemented the suggested enhancement measures according to the recommendation, and subsequently commissioned MM an additional service for conducting the monitoring programme in late 2017 which was tailored to monitor the establishment of enhancement measures. A one-year ecological monitoring was conducted accordingly by the ecologists of MM from December 2017 to November 2018.

E2 Ecological Monitoring at YLBF

Ecological monitoring for the enhancement measures including both floral and faunal surveys at YLBF was conducted for a period of one year in a frequency of once per month. The monitoring programme is devised for the following enhancement measures implemented:

- Creation of wet floodplain at middle stream section (**Figure 1a**)
- Channel side planting near floodplain at middle stream section (**Figure 1b**)
- Deployment of floating platform at the downstream section (**Figure 1c**)

Figure 1: Overview of Ecological Enhancement Measures



a. Overview of floodplain



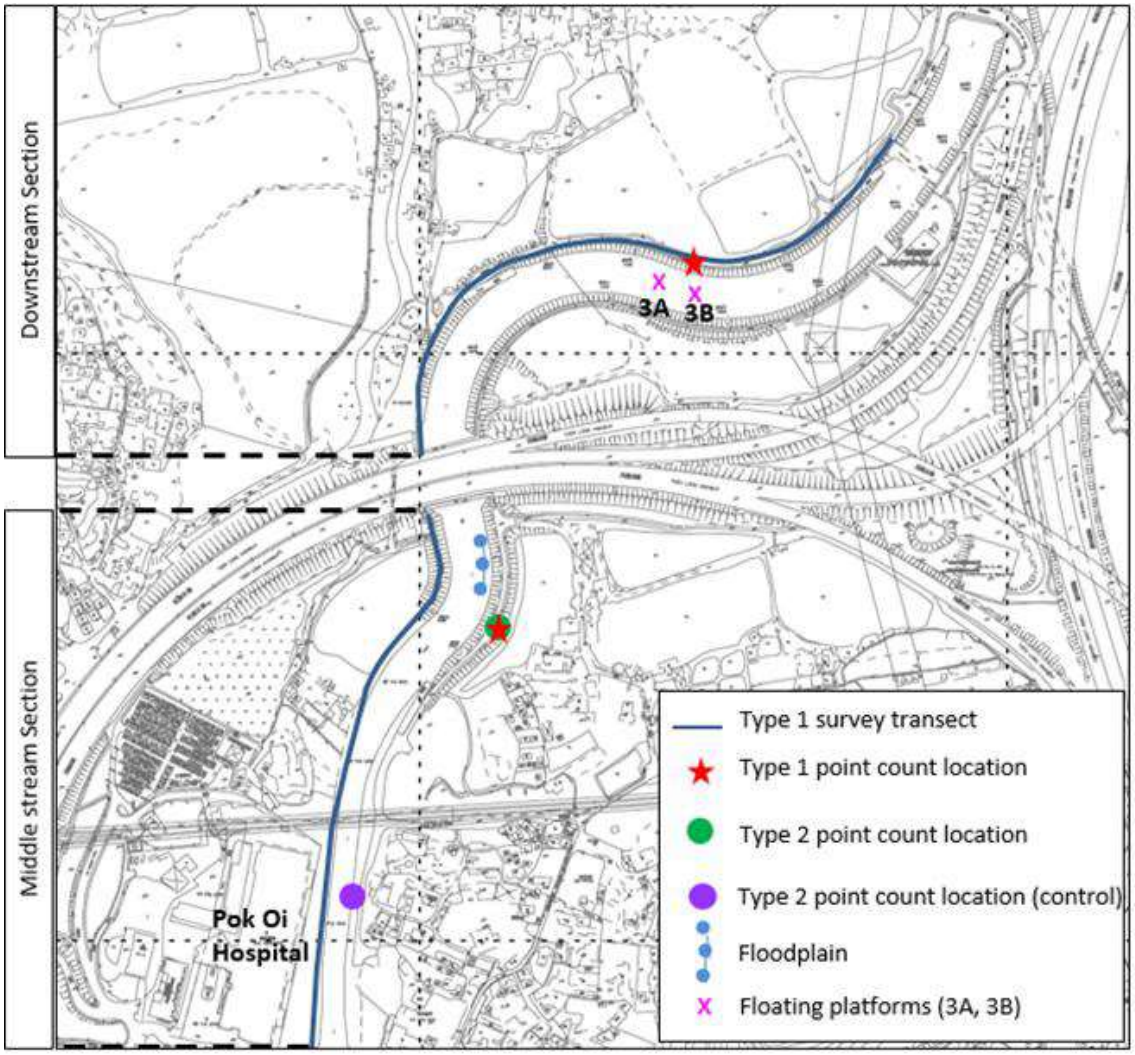
b. Overview of channel side planting



c. Overview of floating platform

The objective of this monitoring programme is to record through field survey the establishment of the wetland fauna and flora species associated with the ecological enhancement measures implemented. Three types of surveys were conducted for each fauna/flora group at the middle stream and downstream sections of the YLBF where the wet floodplain, channel side planting and floating platforms were implemented. Type 1 survey was designed for monitoring of general fauna and flora groups at the middle stream and downstream sections; type 2 survey was a quantitative survey for monitoring of the floodplain and control area at the middle stream section; and type 3 survey is qualitative survey for monitoring of the two platforms at the downstream section. The survey locations are shown in **Figure 2**.

Figure 2: Survey Location



E3 Results of Monitoring Surveys

Result of Type 1 Survey for the Middle Stream and Downstream Sections

The ecological information gathered in the Type 1 Survey show the ecological performance of the YLBF after the enhancement measures were implemented.

Flora

A total of 69 species were recorded, of which 40 flora species were native species. All the flora species are common in Hong Kong. No rare or protected plant species were recorded.

Bird

Twelve transect and point count surveys were conducted. A total of 52 bird species, including 24 wetland species among which 15 species are of conservation concern, were recorded in the whole survey period.

The numbers of bird species were compared with the previous stages. At downstream (**Figure 3**), it was observed that the numbers of wetland-dependent bird species are higher in additional monitoring stage especially during early 2018, probably due to the very low water level kept during the 2017/2018 dry season which was attractive to wetland-dependent species. At middle stream (**Figure 4**), the total number of bird species is slightly higher in additional monitoring stage whilst the number of wetland-dependent species recorded in various seasons is relatively stable.

Figure 3: Bird Species Number Recorded at Downstream in Various Monitoring Stages

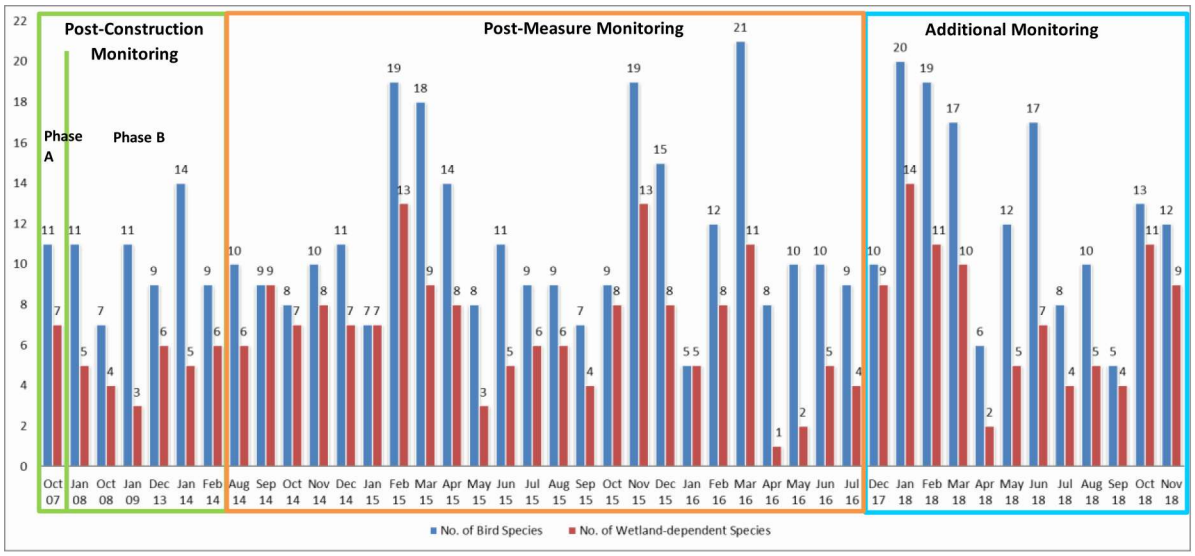
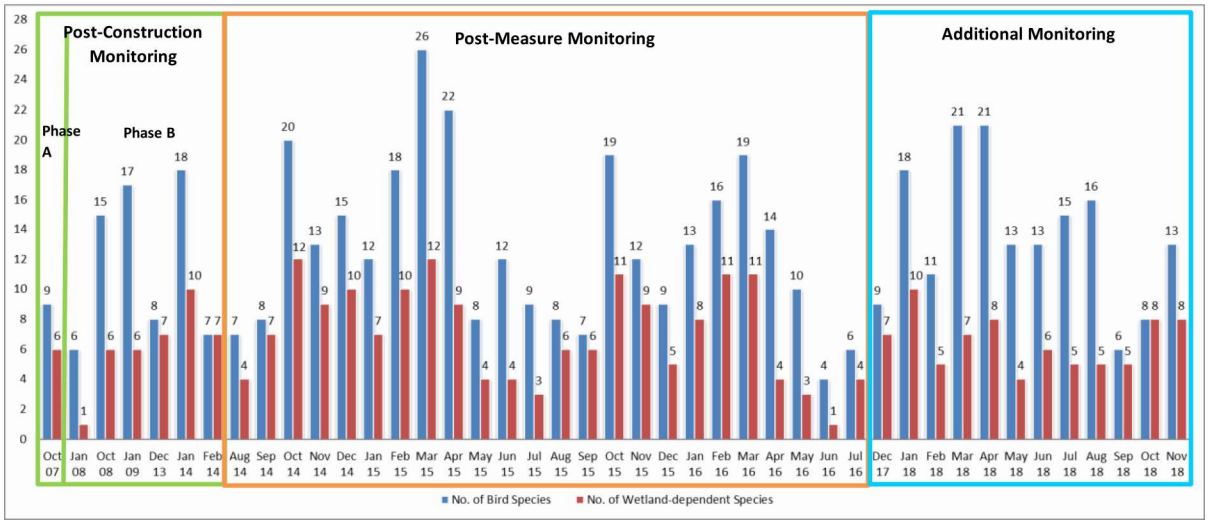


Figure 4: Bird Species Number Recorded at Middle Stream in Various Monitoring Stages



Dragonfly and Butterfly

Twelve dragonfly surveys were conducted during the monitoring period. A total of 15 dragonfly species were recorded during monitoring. The species recorded are common to lowland watercourse in Hong Kong. Nevertheless, it was found that the channel bed at middle stream section was kept covered under thin water layer during the survey period which is very favourable to the establishment of dragonfly colony. Besides, the floodplain design at middle stream section is also favourable for maintaining a wetland habitat for dragonfly.

Twelve butterfly surveys were conducted during the monitoring period. A total of 20 butterfly species were recorded during the surveys. Two uncommon species, the Bamboo Tree Brown *Lethe europa beroe* and the Dark Evening Brown *Melanitis phedima muskata* were recorded.

The number of dragonfly and butterfly species recorded in the post-measure monitoring (2014-2016) and additional monitoring (2017-2018) stages are extracted in **Table 1**.

Table 1: Summary of species recorded between August 2014 and July 2016 and between December 2017 and November 2018

	Aug 2014 – Jul 2016		Dec 2017 – Nov 2018	
	Downstream	Middle stream	Downstream	Middle stream
Dragonfly – No. of species recorded	11	7	13	12
Butterfly – No. of species recorded	12	11	14	12

Result of Type 2 Survey for the Floodplain and Control Area in Middle Stream

Type 2 survey conducted was a quantitative monitoring to compare the fauna species recorded in the floodplain created with the control area.

Flora

Two flora surveys were conducted during the monitoring period. A total of 11 species were recorded in the floodplain area and eight species were recorded in the control area. The flora species recorded are common in Hong Kong. No rare or protected plant species was recorded.

Bird

Twelve bird surveys were conducted during the monitoring period. A total of 27 species were recorded in the floodplain area while a total of 21 species were recorded in the control area. A comparison between birds at floodplain and control are shown in **Table 2**. The most remarkable record of bird species was Greater Painted-snipe, with its nest and eggs found at the channel (**Figure 5**).

Table 2: No. of bird species and total abundance at floodplain and control area

	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Species												
Floodplain	7	6	7	4	3	6	4	4	4	4	11	7
Control	5	5	2	3	6	10	5	3	6	4	7	5
Abundance												
Floodplain	9	6	9	4	3	11	14	10	4	4	11	10
Control	10	9	2	3	11	15	13	4	9	6	10	9

Figure 5: Greater Painted-snipe recorded during survey



Dragonfly

Twelve dragonfly surveys were conducted during the monitoring period. Number and diversity of dragonfly species recorded in floodplain and control areas were compared in **Table 3** which highlighted the floodplain area generally performed better in attracting dragonfly species.

Table 3: No. of dragonfly species and total abundance at floodplain and control area

	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Species												
Floodplain	0	2	0	1	4	0	5	5	0	2	1	3
Control	0	0	0	3	3	3	0	4	0	1	1	5
Abundance												
Floodplain	0	4	0	1	4	0	43	16	0	7	1	4
Control	0	0	0	3	4	5	0	8	0	1	2	7

Figure 6: Scarlet Basker (*Urothemis signata signata*) recorded during survey



Result of Type 3 Survey for the Floating Platforms at Downstream

Type 3 survey conducted was to monitor the vegetation and associated fauna established at the floating platform deployed.

Flora

Twelve flora surveys were conducted during the monitoring period. The established floating platforms were colonized by a variety of weed and grass species, some of those are exotic species, and one species, *Mikania micrantha*, is an invasive species.

Birds

Thirteen bird surveys were conducted during the monitoring period. A total of 6 wetland-dependent bird species including Chinese Pond Heron, Little Egret, White-breasted Waterhen, Northern Shoveler, Grey Wagtail and White Wagtail were found using the floating platform for feeding.

Planting Along the Channel Side at Middle Stream Section

Regular checks for the general conditions of the planting of *Cleistocalyx operculatus* along the channel side at middle section were carried out. They were generally in good conditions.

Target Species

According to the Ecological Habitat Management Plan (EHMP) for YLBF, 18 bird species were predicted to be benefited from provision of shallow pond. During the one-year ecological monitoring period from December 2017 to November 2018, 12 out of 18 target species were achieved. In addition to the species list recorded during the original study period, two more species, namely Black-faced Bunting and Common Teal (Eurasian Teal), were recorded in this one-year survey period.

E4 Discussion and Recommendation

General Condition and Ecological Value of YLBF

The ecological performance of the YLBF has been largely influenced by the water level amidst seasonal variation. The low water level at the downstream section at the first two quarters incurred establishment of riparian vegetation which attracted wetland-dependent fauna use.

On the other hand, the thin layer of water maintained at the middle stream section provided a good wetland condition for wetland-dependent fauna. One target species, Greater Painted-snipe, was often seen in this period with a nesting record. Breeding record of this species is not common in artificial drainage channel. Total target bird species recorded in YLBF has reached 12 out of 18 targets during the one-year survey period. The species list showcased the ecological potential of the YLBF, especially if the water level can be meticulously manipulated.

Recommendation of Enhancement Measures

Floodplain Design

The function of the floodplain is greatly determined by the water level of the channel. During wet season, no significant difference between the floodplain and control areas are noted as the installation is submerged in water, causing the floodplain design unlikely to function. In dry season, when the channel bed is dried up, the floodplain design functioned as a supplementary wetland providing habitat for wetland fauna, noticeably bird and dragonfly. Although the quantitative survey result could not statistically prove the effect, the significance can be observed during field survey, in which habitat niches, such as pond and riffle, were created in the channel bed, and wetland fauna are noted associated with these features.

The floodplain is generally a maintenance-free design with maintenance effort kept at a minimum level. During the monitoring period, filled pond area created a wetland habitat, sediment and slit were stuck in the diversion channels which blocked the water from flowing in and out of the pond area. It is recommended that the clearance of the diversion channels to be conducted on a regular basis to maintain free-flowing of water.

Floating Platform

The water level in the proximity and the overgrown weeds at the platform are two factors affecting the performance of the floating platform. Regardless, a few species were noted feeding on the platform during the survey period showing its supplementary ecological function (see **Figure 7**).

Deployment of floating platform at YLBF has encountered a maintenance issue that was not encountered in other static waters. In early 2018, very low water conditions left the floating platforms stranded at the channel bed and the shape of the platform was distorted. Therefore, condition checks of the floating platform are required at very low water conditions.

Overgrowth of exotic flora species is another common issue for floating platform at YLBF. Recommendations are made to keep regular maintenance of vegetation and removal of exotic species for the floating platform. Alternatively, reviews of the design of floating platform can be done to suppress the growth of exotic flora species, so the maintenance effort can be kept minimum.

Channel Side Planting

The expected function of the *Cleistocalyx operculatus* as shading is yet to be attained as the plating is still in a young stage not yet to be fully established. It is believed that they will flourish progressively and provide a beneficial effect to the YLBF afterwards as the trees have withstood powerful typhoon in 2018.

Figure 7: Chinese Pond Heron on floating platform

