



JOB No.: TCS00694/13

**AGREEMENT NO. CE 45/2008 (CE)
LIANTANG/HEUNG YUEN WAI
BOUNDARY CONTROL POINT AND ASSOCIATED WORKS**

**MONITORING REPORT FOR WETLAND
COMPENSATION AREA (No.3) –DECEMBER 2020**

**PREPARED FOR
CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT**

Date	Reference No.	Prepared By	Certified By
13 January 2021	TCS00694/13/600/R2589v2		
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1	7 January 2021	First Submission
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15 January 2021

AECOM
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By Email & Post

Attention: Mr Owen NG

Dear Sir

**Agreement No. CE 45/2008 (CE)
Liantang/Heung Yuen Wai Boundary Control Point and Associated Works
Independent Environmental Checker – Investigation
Monitoring Report for Wetland Compensation Area (No. 3) – December 2020**

With reference to the Monitoring Report for Wetland Compensation Area (No. 3) for December 2020 (Version 2) certified by the ET Leader and received by IEC on 15 January 2021, please note that we have no adverse comments on the captioned submission. We herewith verify the captioned submission in accordance with Section 8.3.2.3 of the EM&A Manual.

Thank you for your attention and please do not hesitate to contact the undersigned on tel. 3995-8120 or by email to antony.wong@smec.com; or our Mr Arthur CHIU on tel. 3995-8144 or by email to arthur.chiu@smec.com.

Yours faithfully

Antony WONG
Independent Environmental Checker

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1. INTRODUCTION

1.1 GENERAL

- 1.1.1 The “Liantang/Heung Yuen Wai Boundary Control Point and Associated Works Project” (hereinafter referred to as “the Project”) comprises a new Boundary Control Point (BCP) proposed at Liantang/Heung Yuen Wai (LT/HYW), its connecting road and other associated works. According to the EIA Report, Section 9.7.6 and Section 9.8, the wetland habitat to be lost as a result of this Project is identified as freshwater wetland (mainly the abandoned wet agricultural land) only and located at Loi Tung, Wo Keng Shan and Nga Yiu Ha areas. On the basis of literature review and field surveys, the abandoned wet agricultural land found within the Assessment Area was found only in moderate to low ecological value.
- 1.1.2 Nonetheless, in view of its ecological potential and the ecological significance of cumulative loss of wetland, the loss of freshwater wetland is proposed to be compensated by creation of a freshwater wetland. Taking into consideration the existing situation of the habitats affected, the wetland created would be targeted for wetland communities in general (e.g. wetland associated insects and amphibians) instead of wetland-dependent birds in particular. CEDD discussed with EPD, AFCD and DSD, Wetland Compensation Area (WCA) is provided near the affected habitat areas for the purpose of on-site mitigation. Finally, the low-lying area contiguous with River Ganges near Ping Yeung Interchange proposed as a location of compensation wetland; boundaries and conceptual layout plan of the WCA respectively refer to **Figure 9.27** and **9.28** of the Habitat Creation and Management Plan (Revision 3) (hereinafter named “HCMP).
- 1.1.3 According to the approved HCMP, ecological monitoring at implementation and establishment periods should be conducted to cover the ecological attributes. Implementation of the wetland should commence within the construction phase after completion of the construction works at Ping Yeung Section. Prior to commencement of construction, an ecological baseline monitoring was conducted on the proposed wetland site by the Engineer on 25th August 2015, in which the findings would provide a baseline for evaluation of the success for the establishment of the wetland (details refer to S.4.2 of the approved HCMP).
- 1.1.4 Monitoring of WCA should be conducted at implementation and establishment stages. As advised by the Contractor, the implementation stage included construction of wetland was completed in September 2020. Subsequent monitoring at establishment stage would be conducted for one year duration. After establishment stage, AFCD will be responsible of maintenance and the monitoring works.
- 1.1.5 The establishment stage of wetland was commenced on 1st October 2020. This is the 3rd Monitoring Report for the Wetland Compensation Area presents the findings of the wetland monitoring for Reporting Month of **December 2020**.

2. MONITORING REQUIREMENT

2.1 REQUIREMENT

2.1.1 The requirements of monitoring of ecological attributes and water quality are presented below and they are basically in accordance with the approved HCMP.

2.1.2 The monitoring was conducted by the Environmental Team (ET) and supervised by a qualified Project ecologist as a member of the ET in accordance with Section 8.3.2.3 of the EM&A Manual and Section 5.3.2.4 of the EM&A Programme (rev. 07) approved by EPD. Monitoring Parameters and frequency of the implementation and establishment stage are summarized **Table 2-1**.

Table 2-1 Summary of Monitoring in Implementation and Establishment Stage

Monitoring Parameters	Frequency	Implementation Stage	Establishment Stage
Site Inspection	Weekly	✓	✓
Monitoring of Water level in the ponds	Monthly		✓
Monitoring of Water Quality	Once per month of in-situ parameters measurement		✓
	Once every six months of sample collection and laboratory testing analysis		✓
Monitoring of Vegetation Cover	Every six months		✓
Monitoring of Dragonflies	Twice per month between April and August; and Once per month between September and March		✓
Monitoring of Butterflies	Once per month		✓
Amphibians	Once per month between March and October; and Once every two Months between November and February		✓

2.2 ECOLOGICAL MONITORING

METHODOLOGY

Monitoring of Vegetation Cover

2.2.1 Detailed floristic surveys in the permanent open water as well as the area with fluctuate water level should be conducted for each of the wetland pond at a six monthly intervals, i.e., at the end of the wet season (September) and the end of the dry season (March). Quadrat sampling should be conducted at two location within each pond, i.e. at permanent open water designed last during dry season (wet zone) and on the seasonal water level fluctuation area (semi wet-dry zone); in which a single 2mx2m quadrat should be undertaken at a selected location away from any water inlet and outlet of the pond, and all plant species within the quadrat should be identified to species-level with their respective densities estimated.

2.2.2 On the other hand, the vegetation coverage by each species, as well as the percentage cover of bare ground and leaf litter cover (for the quadrat placed on area with fluctuate water level only), should be measured. Finally, the tallest height of each plant species should be measured to nearest cm; and presence of any rare or protected species should be identified.

2.2.3 The location of the quadrats should be determined on-site during the commencement of the vegetation monitoring, and to be marked by pole as such to facilitate the future monitoring and evaluation.

Monitoring of Dragonflies and Butterflies

- 2.2.4 Direct Observation and active searching along a number of fixed survey transects should be undertaken to monitor the dragonflies and butterflies within the constructed wetland. All dragonfly species observed should be identified and counted, and presence of dragonfly exuviae should also be inspected along the water edge wherever feasible so as to monitor qualitatively the breeding success of this fauna group. On the other hand, all butterfly species should be identified and numbers estimated quantitatively or semi-quantitatively.
- 2.2.5 The survey should be conducted during the middle of the day to coincide with the peak flight time for these species. The monitoring for dragonfly and butterfly should be undertaken on a monthly basis, but would be bi-monthly monitoring (i.e., twice per month) for dragonfly during the peak period of dragonfly emergency in April to August. The proposed transect routes are shown in the *Appendix A*.

Monitoring of Amphibians

- 2.2.6 As stated in the HCMP, breeding and development of larvae will be undertaken to monitor the amphibian activities within the constructed wetland; and depends on the site condition during the time of the survey, deployment of dip net and bottle-traps may also be undertaken to survey the presence of larvae in the water body.
- 2.2.7 The amphibian survey will be undertaken by observation and active searching in potential refuges, and primarily follow the fixed transect as proposed for the dragonfly/butterfly monitoring in each of the wetland pond. A walk through survey through the embankment and water edge of each pond will also be undertake whenever feasible without causing severe trampling of the planted vegetation.
- 2.2.8 The above monitoring will be conducted during the day-time on a monthly during March to October and on a bi-monthly during November to February. Furthermore, night time amphibian monitoring during the establishment phase of the constructed wetland, which has not been required in the HCMP but instructed by the Contractor, will also be undertaken by active searching and auditory detection in the monitoring months to supplement the day time monitoring work.

PERFORMANCE LIMITS AND ACTION PLANS

- 2.2.9 **Table 2-2** shows the ecological performance (i.e. Action Level (AL) and Limit Level (LL)) and the corresponding Contingency Plans defined in the Table 4.5 of the approved HCMP. The proposed plans will be reviewed and updated on a quarterly basis by the ER based on the monitoring results and situation of the site in future. Any proposed changes, if necessary, would be agreed with ET, Ecologist and IEC and submitted to relevant Authority for approval.

Table 2-2 Ecological Performance Limits and Contingency Plan

Parameters	Action Level	Limit Level	Action
Vegetation in permanent open water designed last during dry season	Area >10%	Area >20%	<ul style="list-style-type: none"> AL: Discuss among ETL, Ecologist, IEC, ER and the Contractor to identify and review the problem. Action plan for the limit level exceedance should be implemented in case further deterioration is expected. LL: The Contractor will be responsible to remove the vegetation.
Vegetation cover on the seasonal water level fluctuation area	Area <60%	Area <40%	<ul style="list-style-type: none"> AL: Double the monitoring frequency. Discuss among ETL, Ecologist, IEC, ER and the Contractor to identify and review the problem. Action plan for the limit level exceedance should be implemented in case further deterioration is expected. LL: Discuss among ETL, Ecologist, IEC, ER and the Contractor to identify and review the problem, in particular the species of planting.

Parameters	Action Level	Limit Level	Action
			The Contractor will be responsible to undertake supplemental planting.
Monitoring of Dragonflies	Species identified in the baseline monitoring* cannot be found in two successive monitoring periods	Species identified in the baseline monitoring* cannot be found in four successive monitoring periods	<ul style="list-style-type: none"> • AL: Double the monitoring frequency. Discuss among ETL, Ecologist, IEC, ER and the Contractor to identify and review the problem. Action plan for the limit level exceedance should be implemented in case the problem is likely due to the Project works or the design. • LL: Discuss among ETL, Ecologist, IEC, ER and the Contractor to identify and review the problem. ER/The Contractor to provide feasible mitigation measures in case the problem was due to the Project works. If necessary, ER to review the design and the Contractor to provide necessary modification.
Monitoring of Butterflies	Species identified in the baseline monitoring** cannot be found in two successive monitoring periods	Species identified in the baseline Monitoring** cannot be found in four successive monitoring periods	<ul style="list-style-type: none"> • AL: Double the monitoring frequency. Discuss among ETL, Ecologist, IEC, ER and the Contractor to identify and review the problem. Action plan for the limit level exceedance should be implemented in case the problem is likely due to the Project works or the design. • LL: Discuss among ETL, Ecologist, IEC, ER and the Contractor to identify and review the problem. ER/The Contractor to provide feasible mitigation measures in case the problem was due to the Project works. If necessary, ER to review the design and the Contractor to provide necessary modification.
Monitoring of Amphibians	Not observed	Not observed in two successive monitoring periods	<ul style="list-style-type: none"> • AL: Double the monitoring frequency. Discuss among ETL, Ecologist, IEC, ER and the Contractor to identify and review the problem. Action plan for the limit level exceedance should be implemented in case the problem is likely due to the Project works or the design. • LL: Discuss among ETL, Ecologist, IEC, ER and the Contractor to identify and review the problem. ER/The Contractor to provide feasible mitigation measures in case the problem was due to the Project works. If necessary, ER to review the design and the Contractor to provide necessary modification.

* Targeted dragonfly species: Blue Dasher *Brachydiplax chalybea flavovittata*, Common Red Skimmer *Orthetrum pruinosum neglectum*, Wandering Glider *Pantala flavescens*, Pied Skimmer *Pseudothemis zonata* and Crimson Dropwing *Trithemis aurora*

** Targeted butterfly species: Common Mormon *Papilio polytes polytes*, Common Grass Yellow *Eurema hecabe hecabe*, Angled Castor *Ariadne ariadne alterna*, Great Egg-fly *Hypolimnas bolina kezia*, Common Sailer *Neptis hylas hylas*, Common Sergeant *Athyma perius perius* and Red Ring Skirt *Hestina assimilis assimilis*

2.3 WATER QUALITY MONITORING

REQUIREMENT

2.3.1 As stated in the approved HCMP, water level at the centre and in-situ water quality measurement in each pond will be performed once per month. As instructed by the Contractor, additional in-situ

water quality measurement/ water samples at the catchpits adjacent to the ponds should be conducted as well. Parameters of in-situ measurement include:

- Water level in the ponds
- Dissolved Oxygen (DO)
- Temperature
- pH
- Turbidity

2.3.2 In addition, every six months (end of the wet season, in September, and end of the dry season, in March) water samples should be collected at each pond and the following parameters should be tested by a HOKLAS laboratory:

- Ammoniacal nitrogen
- Biochemical oxygen demand
- Total oxidized nitrogen
- Total phosphorus
- Total reactive phosphorus (orthophosphate)

MONITORING EQUIPMENT

2.3.3 Water quality monitoring equipment used in the monitoring is listed in **Table 2-3**. All water quality monitoring equipment should be calibrated by HOKLAS accredited laboratory of three month intervals. The calibration certificates of monitoring equipment used for the monitoring in the Reporting Period are attached in **Appendix B**.

Table 2-3 Water Quality Monitoring Equipment

Equipment	Model
Depth board at the centre of the pond permanently installed in the wetland	Reading of the depth board at the centre of the pond
Thermometer & DO meter	YSI Professional DSS
pH meter	YSI Professional DSS
Turbidimeter	YSI Professional DSS
Sample Container	High density polythene bottles (provided by laboratory)
Storage Container	‘Willow’ 33-liter plastic cool box with ice pad

IN-SITU MEASUREMENT

Water depth Measurement

2.3.4 Monitoring of water depth should be conducted at centre of the pond. Since the access to the centre of the pond is unavailable due to safety concern, to facilitate the measurement of water level, a depth board was permanently installed at the centre of each pond and water level measurement should be taken by reading the depth board.

DO Measurement

2.3.5 YSI Professional DSS/ DO measuring instruments were portable and weatherproof. The equipment contained a membrane electrode with automatic temperature compensation. The equipment had a sensor and direct current (DC) power source and was capable of measuring:

- A DO level in the range of 0 – 20 mg/L and 0 – 200% saturation; and
- A temperature of 0 – 45 degree Celsius.

Turbidity Measurement

2.3.6 YSI Professional DSS/ turbidity measuring instruments were portable and weatherproof with DC power source, and had a photoelectric sensor capable of measuring turbidity level between 0–1000 NTU.

pH Measurement

2.3.7 YSI Professional DSS/ a portable pH meter capable of measuring a range between 0.0 and 14.0 was used to measure pH under the specified conditions according to the APHA Standard Methods.

2.3.8 All in-situ measurement equipment such as DO measuring instruments, turbidity measuring instruments and A portable pH meter, would be calibrated by HOKLAS accredited laboratory at three month intervals.

LABORATORY ANALYSIS

2.3.9 Chemical determination of all water samples were carried out by ALS Technichem (HK) Pty Ltd with the methodologies summarized in **Table 2-4**. The determination would be started within 24 hours of collection of water samples.

Table 2-4 Chemical Determination and Reporting Limit

Analyte Description	Method Reference	Report Limit (mg/L)
Ammoniacal nitrogen	APHA 4500NH3: G	0.01
Biochemical oxygen demand	APHA 5210B	2
Total oxidized nitrogen	APHA 4500P: J APHA4500NO3: I	0.01
Total phosphorus	APHA 4500P: J	0.01
Total reactive phosphorus (orthophosphate)	APHA 4500P: B&F	0.01

MONITORING PROCEDURE

2.3.10 Before in-situ measurement or water sampling, general information such as the date and time of sampling, weather condition as well as the personnel responsible for the monitoring would be recorded on the field data sheet.

2.3.11 Since the access to the centre of the pond was unavailable, at each pond measurements of water level would be taken by reading the depth board permanently installed in the wetland. A pair of high power binocular would be used where necessary.

2.3.12 The access to the centre of the pond is unavailable, due to safety concerns, water samples would be taken in a bucket to conduct in-situ measurement. At each pond, water sample would be collected at an accessible and safe location (such as on the balancing pipe at each pond). An extendable stick connected with and self-made sampling buckets would be used to collect the water samples at about 0.5m below surface gently.

2.3.13 For water samples for laboratory analysis, the sample container would be rinsed with a portion of the water sample. The collected water sample would be transferred to the high-density polythene bottles as provided by the laboratory, labeled with a unique sample number and sealed with a screw cap.

2.3.14 Water samples for laboratory measurement of chemical parameters would be collected in the preserved high density polythene bottles provided by the laboratory, packed in ice (cooled to 4 °C without being frozen), and delivered to the laboratory in the same day as the samples were collected.

2.3.15 Analysis of chemical parameters should be carried out in a HOKLAS accredited laboratory - ALS Technichem (HK) Pty Ltd. Sufficient water samples should be collected at the ponds for carrying out the laboratory determination. The determination work should start within 24 hours after collection of the water samples.

PERFORMANCE LIMITS AND ACTION PLANS

2.3.16 **Table 2-5** shows the proposed Wetland Water Quality Performance Limits and the corresponding Contingency Plans. The proposed plans will be reviewed and updated on a quarterly basis by the ER based on the monitoring results and situation of the site in future. Any proposed changes, if necessary, would be agreed with ET, Ecologist and IEC and submitted to relevant Authority for approval.

Table 2-5 Water Quality Performance Limits and Contingency Plan

Parameters	Action Level	Limit Level	Action
Flooding/ storm damage	NA	NA	Discuss among ETL, Ecologist, IEC, ER and the Contractor to damage review and determine damage. If necessary, ER to review design and agree mitigation measures with ETL, Ecologist and IEC, and the Contractor to undertake repairs/modifications.
Area of water coverage in wet season	<50%	Water in one of the ponds is isolated	<ul style="list-style-type: none"> • AL: Double the monitoring frequency. Discuss among ETL, Ecologist, IEC, ER to identify and review the problem. Action plan for limit level exceedance should be implemented in case further deterioration is expected. • LL: Discuss among ETL, Ecologist, IEC, ER to identify and review the problem. If necessary, ER to review design and agree on mitigation measures with ETL, Ecologist and IEC, and the Contractor to undertake repairs/ medication to establish linkage for all water ponds.
Area of water coverage in dry season	<10%	Water depth in one of the ponds <100mm	
pH	pH value outside 6.0–8.5	pH value outside 5.5–9.0	<ul style="list-style-type: none"> • AL: Double the monitoring frequency. Discuss among ETL, Ecologist, IEC, ER to identify and review the problem. Action plan for limit level exceedance should be implemented in case further deterioration is expected. • LL: Discuss among ETL, Ecologist, IEC, ER to identify and review the problem and necessary agree on mitigation measures. The Contractor will be responsible to undertake repairs/ medication to resume the water quality.
Dissolved oxygen	≤ 2 mg/L	≤ 1 mg/L	
Turbidity	According to the reference documents, turbidity is not a key parameter, it is for reference only and no action level is set.		
Biological Oxygen Demand (BOD)	According to the reference documents, BOD is not a key parameter, it is for reference only and no action level is set.		
Ammoniacal nitrogen	> 3 mg/L	> 6 mg/L	<ul style="list-style-type: none"> • AL: Double the monitoring frequency. Discuss among ETL, Ecologist, IEC, ER to identify and review the problem. Action plan for limit level exceedance should be implemented in case further deterioration is expected. • LL: Discuss among ETL, Ecologist, IEC, ER to identify and review the problem. If necessary, ER to review design and agree on mitigation measures with ETL, Ecologist and IEC, and the Contractor to undertake repairs/ medication to establish linkage for all water ponds.
Total oxidized nitrogen	> 5 mg/L	> 10 mg/L	
Total phosphorus	> 5 mg/L	> 10 mg/L	
Total reactive phosphorus (orthophosphate)	> 5 mg/L	> 10 mg/L	

3. MONITORING RESULTS

3.1 RESULT OF ECOLOGICAL MONITORING

Monitoring of Vegetation Cover

- 3.1.1 Monitoring of vegetation cover is not required in the monitoring month. This survey should be conducted for each of the wetland pond at a six monthly intervals, i.e., at the end of the wet season (September) and the end of the dry season (March).

Monitoring of Dragonflies and Butterflies

- 3.1.2 Monitoring of Dragonflies and Butterflies was undertaken within the WCA on 22nd December 2020, and the weather during the time of monitoring is fine with sunny period. A total of 3 dragonfly/damsel fly and 11 butterfly species were recorded within the WCA during the monitoring month, and no dragonfly exuviae were found during the monitoring. The dragonfly and butterfly species recorded during the monitoring are summarized in **Table 3-1 and 3-2**.

Table 3-1 Dragonfly Recorded within the Wetland Compensation Area during the Monitoring Month

Common Name	Scientific Name	Chinese Name	Reference Species*	Abundance
Blue Dasher	<i>Brachydiplax chalybea flavovittata</i>	藍額疏脈蜻	Y	0
Common Red Skimmer	<i>Orthetrum prunosum neglectum</i>	赤褐灰蜻	Y	0
Wandering Glider	<i>Pantia flavescens</i>	黃蜻	Y	1
Pied Skimmer	<i>Pseudothemis zonata</i>	玉帶蜻	Y	0
Crimson Dropwing	<i>Trithemis aurora</i>	曉褐蜻	Y	3
Russet Percher	<i>Neurothemis fulvia</i>	網脈蜻	N	2
TOTAL No. of Species Recorded				3

* Species recorded during the baseline monitoring and referenced for in the contingency plan (Table 4-5 of the HCMP)

Table 3-2 Butterfly Species Recorded within the Wetland Compensation Area during the Monitoring Month

Common Name	Scientific Name	Chinese Name	Reference Species*	Abundance [^]
Common Mormon	<i>Papilio polytes polytes</i>	玉帶鳳蝶	Y	Nil
Common Grass Yellow	<i>Eurema hecabe hecabe</i>	寬邊黃粉蝶	Y	Nil
Angled Castor	<i>Ariadne ariadne alterna</i>	波峽蝶	Y	Nil
Great Egg-fly	<i>Hypolimnas bolina kezia</i>	幻紫斑蛺蝶	Y	Nil
Common Sailer	<i>Neptis hylas hylas</i>	中環蛺蝶	Y	+
Common Sergeant	<i>Athya perius perius</i>	玄珠帶蛺蝶	Y	Nil
Red Ring Skirt	<i>Hestina assimilis assimilis</i>	黑脈蛺蝶	Y	Nil
White-edged Blue Baron	<i>Euthalia phemius</i>	尖翅翠蛺蝶	N	+
Blue-spotted Crow	<i>Euploea midamus</i>	藍點紫斑蝶	N	+
Dark Cerulean	<i>Jamides bochus bochus</i>	雅灰蝶	N	++
Gram Blue	<i>Euchrysops cnejus cnejus</i>	棕灰蝶	N	++
Indian Cabbage White	<i>Pteris candidia</i>	東方菜粉蝶	N	+++
Lemon Pansy	<i>Junonia lemonias lemonias</i>	蛇眼蛺蝶	N	++
Purple Sapphire	<i>Heliophorus epicles</i>	斜斑彩灰蝶	N	+
Bushbrowns	<i>Mycalasis sp.</i>	眉眼蝶屬	N	+
Small Grass Blue	<i>Pseudozizeeria maha serica</i>	酢漿灰蝶	N	++
South China Bush Brown	<i>Mycalasis zonata</i>	平頂眉眼蝶	N	+
TOTAL No. of Species Recorded				11

* Species recorded during the baseline monitoring and referenced for in the contingency plan (Table 4-5 of the HCMP)

[^]Relative Abundance: + rare, ++ infrequent, +++ common, ++++ very common

3.1.3 As shown in the tables above, the monitoring findings include 1 of the dragonfly species (Crimson Dropwing) and 1 of the butterfly species (the Common Sailor) recorded in the baseline monitoring, as such the corresponding action level as defined in the HCMP (i.e., *when species identified in the baseline monitoring cannot be found in two successive monitoring periods*) have not been triggered and no follow up action would be required.

Monitoring of Amphibian

3.1.4 Day-time and night-time monitoring of amphibian were undertaken within the WCA on 22nd December 2020, and presence of amphibian (including larvae) have not been observed/found within the WCA in the reporting month.

3.1.5 It is noted that the lowest temperature recorded by Hong Kong Observatory in the Ta Kwu Ling station on the day of monitoring is 10.5 °C, and the cooler air temperature which may affect the activity level of the cold-blooded animal. Nonetheless, the necessity to undertake any action corresponded to the action plan will be evaluated after the next monitoring.

3.2 RESULT OF WATER QUALITY

3.2.1 The Reporting Month, in-situ measurement of the water quality monitoring is on 18th December 2020, which it was during dry season. Additional in-situ water quality measurement/ water samples at the catchpits adjacent to the ponds was commenced in the Reporting Month. Detailed monitoring results including in-situ measurements are shown in *Appendix C*. The monitoring results are summarized in *Table 3-3*.

Table 3-3 Summary of Water Quality Monitoring Results

Location	Water depth(m)	DO (Averaged) (mg/L)	Temp (Averaged) (°C)	Turbidity (Averaged) (NTU)	pH (Averaged) (unit)
Pond A	3.0	11.4	12.8	2.2	7.6
Pond B	3.0	11.9	12.1	5.8	7.8
Pond C	3.0	11.4	12.0	4.3	7.7
Pond D	3.0	11.6	12.3	3.4	7.7
Pond E	3.0	11.8	12.3	5.1	7.8
Pond F	2.7	9.9	13.7	6.2	7.6
Pond G	2.7	9.3	15.4	5.5	7.3
Catchpit of Pond C	0*				
Catchpit of Pond E	0*				
Catchpit 1 of Pond F	0*				
Catchpit 2 of Pond F	0*				
Catchpit of Pond G	0*				

Remarks: (*) During the water monitoring, the catchpit was observed dried up and sampling was unable to be carried out.

3.2.2 As clarified by the Contractor and RE, the water surface area of each pond could be determined based on the measured water depth and then convert them to water surface area. The conversion table is shown in *Appendix D* and it is derived from the “Depth-Area Curve” in the HCMP construction drawings. The summary of area of water coverage of each pond is presented in *Table 3-4*.

Table 3-4 Summary Area of Water Coverage of each Pond

Location	Area of the Pond Full Coverage (m ²)	Surveying in the Reporting Month		
		Water depth (m)	Area of Water Coverage by Calculation (m ²)	Area of water coverage (%)
Pond A	911.9	3.0	493.0	54%
Pond B	991.9	3.0	522.4	53%

Location	Area of the Pond Full Coverage (m ²)	Surveying in the Reporting Month		
		Water depth (m)	Area of Water Coverage by Calculation (m ²)	Area of water coverage (%)
Pond C	1090.0	3.0	593.7	54%
Pond D	1287.0	3.0	746.3	58%
Pond E	770.0	3.0	376.7	49%
Pond F	1123.0	2.7	558.1	50%
Pond G	931.0	2.7	535.3	57%

3.3 SITE INSPECTION

3.3.1 Site inspection for the establishment of WCA was conducted by ET on 4th, 9th, 17th, 22nd and 30th December 2020. There was no sign of flooding/ storm damage observed. The planted vegetation in the WCA was visually in fair condition and no significant litter or vandalism were observed. Photographic records showing the condition of the WCA and general view of the existing vegetation in the Reporting Month are shown in *Appendix E*.

3.4 CONCLUSION

Ecological

3.4.1 Ecological monitoring has been undertaken within the Wetland Construction Area during the reporting month, i.e., 22nd Dec'20, and covered the wildlife groups as specified in the HCMP, i.e., dragonfly (including exuviae), butterfly, and amphibian (larvae). The findings of the monitoring have been evaluated against the performance limit and contingency plan, and follow-up action would not be required because neither the action or limit level of the formal two faunal groups were reached, and the necessity to undertake any action corresponded to the action plan for amphibian, in which none of this animal was recorded in the monitoring month, will be evaluated after the next monitoring.

Water Quality

3.4.2 In-situ measurement water quality monitoring has been undertaken within the Wetland Construction Area during the reporting month. The findings of the monitoring have been evaluated against the performance limit and contingency plan, and follow-up action would not be required because neither the action or limit level were reached.

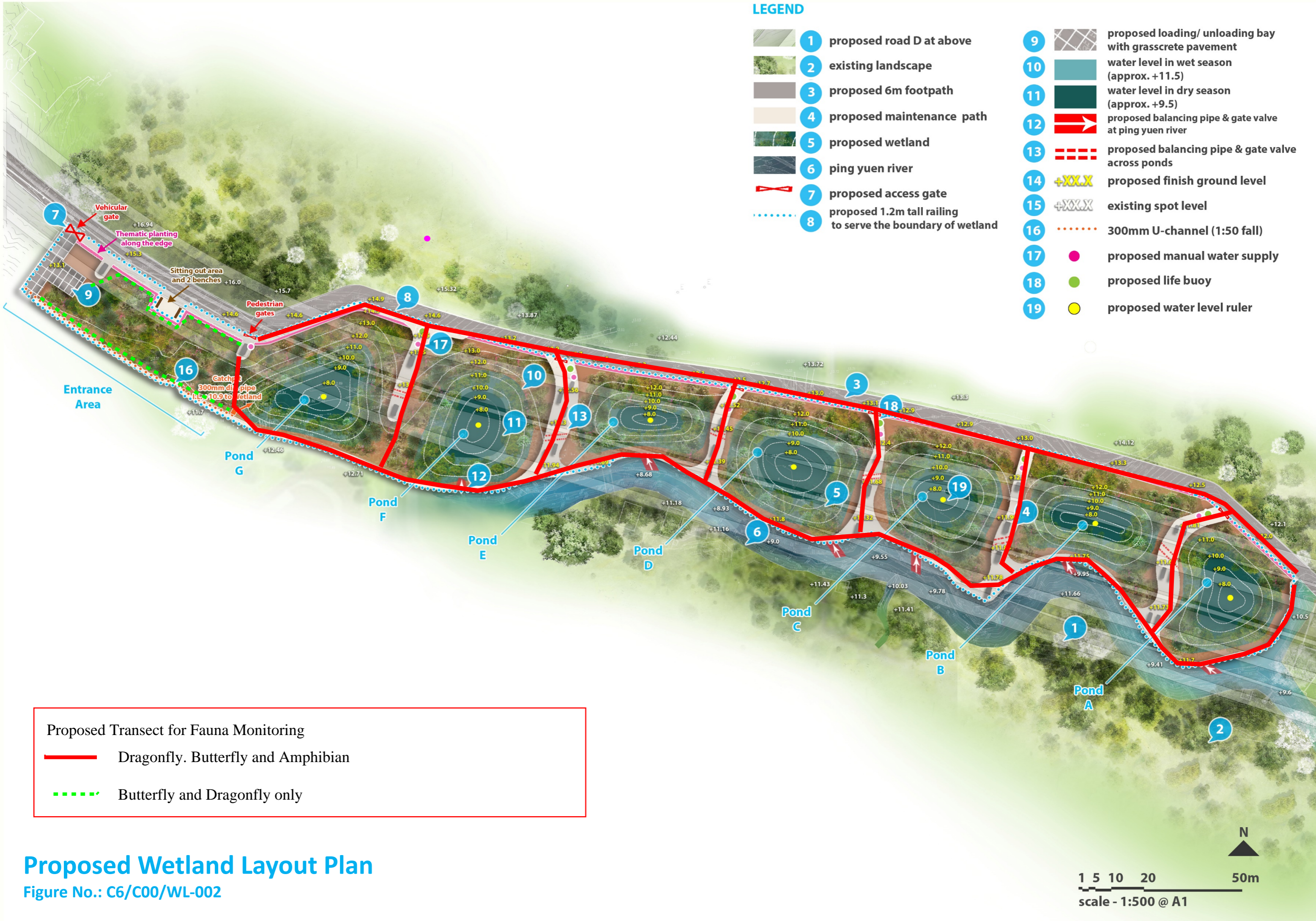
3.4.3 Moreover, areas of water coverage of each pond as calculated by conversion were all over 10% which did not triggered any Action/ Limit level in dry season. Therefore, the contingency plan of follow-up action was not required.

Appendix A

Layout Plan of the Wetland Compensation Area

LEGEND

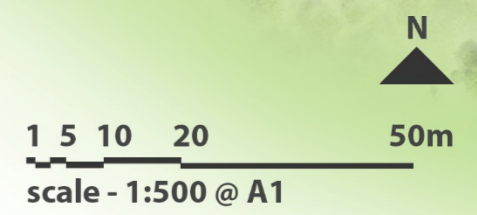
- 1 proposed road D at above
- 2 existing landscape
- 3 proposed 6m footpath
- 4 proposed maintenance path
- 5 proposed wetland
- 6 ping yuen river
- 7 proposed access gate
- 8 proposed 1.2m tall railing to serve the boundary of wetland
- 9 proposed loading/ unloading bay with grasscrete pavement
- 10 water level in wet season (approx. +11.5)
- 11 water level in dry season (approx. +9.5)
- 12 proposed balancing pipe & gate valve at ping yuen river
- 13 proposed balancing pipe & gate valve across ponds
- 14 +XXX.X proposed finish ground level
- 15 +XXX.X existing spot level
- 16 300mm U-channel (1:50 fall)
- 17 ● proposed manual water supply
- 18 ● proposed life buoy
- 19 ● proposed water level ruler



Proposed Transect for Fauna Monitoring

- Dragonfly, Butterfly and Amphibian
- - - - - Butterfly and Dragonfly only

Proposed Wetland Layout Plan
 Figure No.: C6/C00/WL-002



Appendix B

Calibration Certificate of Monitoring Equipment



REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT: **BEN TAM**
CLIENT: **ACTION UNITED ENVIRONMENT SERVICES AND CONSULTING**
ADDRESS: **RM A 20/F., GOLD KING IND BLDG,
NO. 35-41 TAI LIN PAI ROAD,
KWAI CHUNG, N.T. HONG KONG**

WORK ORDER: **HK2037829**
SUB-BATCH: **0**
LABORATORY: **HONG KONG**
DATE RECEIVED: **06-Oct-2020**
DATE OF ISSUE: **14-Oct-2020**

SPECIFIC COMMENTS

Equipment information (Brand name, Model No., Serial No. and Equipment No.) is provided by client. The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.

The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the laboratory or quoted from relevant international standards.

The "Next Calibration Date" is recommended according to best practice principle as practised by the laboratory or quoted from relevant international standards.

The validity of equipment/ meter performance only applies to the result(s) stated in the report.

Equipment Type: Multifunctional Meter
Service Nature: Performance Check
Scope: Conductivity, Dissolved Oxygen, pH Value, Turbidity, Salinity and Temperature
Brand Name/ Model No.: YSI Professional DSS
Serial No./ Equipment No.: 20J101862/ 15H103928 (EQW018)
Date of Calibration: 12-October-2020

GENERAL COMMENTS

This is the Final Report and supersedes any preliminary report with this batch number.

Ms. Lin Wai Yu, Iris
Assistant Manager - Inorganic

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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



WORK ORDER: HK2037829
SUB-BATCH: 0
DATE OF ISSUE: 14-Oct-2020
CLIENT: ACTION UNITED ENVIRONMENT SERVICES AND CONSULTING

Equipment Type: Multifunctional Meter
Brand Name/ Model No.: YSI Professional DSS
Serial No./ Equipment No.: 20J101862/ 15H103928 (EQW018)
Date of Calibration: 12-October-2020 **Date of Next Calibration:** 12-January-2021

PARAMETERS:

Conductivity Method Ref: APHA (21st edition), 2510B

Expected Reading (µS/cm)	Displayed Reading (µS/cm)	Tolerance (%)
146.9	151.8	+3.3
6667	6782	+1.7
12890	12701	-1.5
58670	58210	-0.8
	Tolerance Limit (%)	±10.0

Dissolved Oxygen Method Ref: APHA (21st edition), 4500O: G

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
3.28	3.13	-0.15
5.02	4.96	-0.06
7.29	7.34	+0.05
	Tolerance Limit (mg/L)	±0.20

pH Value Method Ref: APHA (21st edition), 4500H: B

Expected Reading (pH unit)	Displayed Reading (pH unit)	Tolerance (pH unit)
4.0	4.08	+0.08
7.0	6.94	-0.06
10.0	10.07	+0.07
	Tolerance Limit (pH unit)	±0.20

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Ms. Lin Wai Yu, Iris
 Assistant Manager - Inorganic

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



WORK ORDER: HK2037829
SUB-BATCH: 0
DATE OF ISSUE: 14-Oct-2020
CLIENT: ACTION UNITED ENVIRONMENT SERVICES AND CONSULTING

Equipment Type: Multifunctional Meter
Brand Name/ Model No.: YSI Professional DSS
Serial No./ Equipment No.: 20J101862/ 15H103928 (EQW018)
Date of Calibration: 12-October-2020 **Date of Next Calibration:** 12-January-2021

PARAMETERS:

Turbidity Method Ref: APHA (21st edition), 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.93	--
4	4.28	+7.0
40	41.76	+4.4
80	82.59	+3.2
400	410.72	+2.7
800	832.10	+4.0
	Tolerance Limit (%)	±10.0

Salinity Method Ref: APHA (21st edition), 2520B

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
0	0.01	--
10	9.85	-1.5
20	19.74	-1.3
30	29.82	-0.6
	Tolerance Limit (%)	±10.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Ms. Lin Wai Yu, Iris
 Assistant Manager - Inorganic

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



WORK ORDER: HK2037829
SUB-BATCH: 0
DATE OF ISSUE: 14-Oct-2020
CLIENT: ACTION UNITED ENVIRONMENT SERVICES AND CONSULTING

Equipment Type: Multifunctional Meter
Brand Name/ Model No.: YSI Professional DSS
Serial No./ Equipment No.: 20J101862/ 15H103928 (EQW018)
Date of Calibration: 12-October-2020 Date of Next Calibration: 12-January-2021

PARAMETERS:

Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
10.5	10.3	-0.2
20.5	21.0	+0.5
39.0	39.3	+0.3
	Tolerance Limit (°C)	±2.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Ms. Lin Wai Yu, Iris
Assistant Manager - Inorganic

Appendix C

Water Quality Monitoring Data

Summary of Wetland Water Quality Data of December 2020

Location	Time	Depth (m)	Temp (oC)		DO (mg/L)		DO (%)		Turbidity (NTU)		Salinity		pH	
Pond A	11:20	3.0	12.7	12.8	11.36	11.4	107.6	107.7	2.2	2.2	0.15	0.2	7.63	7.6
			12.8		11.41		107.8		2.2		0.15		7.65	
Pond B	11:30	3.0	12.1	12.1	11.78	11.9	109.8	110.5	5.8	5.8	0.12	0.1	7.75	7.8
			12.1		11.92		111.1		5.8		0.12		7.75	
Pond C	11:40	3.0	11.9	12.0	11.41	11.4	105.8	105.7	4.2	4.3	0.11	0.1	7.68	7.7
			12		11.38		105.6		4.3		0.11		7.68	
Pond D	13:05	3.0	12.3	12.3	11.56	11.6	108.1	108.3	3.4	3.4	0.10	0.1	7.72	7.7
			12.3		11.59		108.4		3.4		0.10		7.72	
Pond E	12:55	3.0	12.3	12.3	11.9	11.8	107.4	108.0	5.0	5.1	0.09	0.1	7.83	7.8
			12.3		11.6		108.5		5.1		0.09		7.83	
Pond F	12:45	2.7	13.7	13.7	9.96	9.9	96.1	96.0	6.3	6.2	0.14	0.1	7.63	7.6
			13.7		9.93		95.8		6.2		0.14		7.63	
Pond G	12:35	2.7	15.4	15.4	9.33	9.3	93.3	93.4	5.5	5.5	0.18	0.2	7.34	7.3
			15.3		9.34		93.4		5.6		0.18		7.34	
Pond C Catchpit	11:45	0.0												
Pond E Catchpit	11:55	0.0												
Pond F Catchpit 1	12:05	0.0												
Pond F Catchpit 2	12:15	0.0												
Pond G Catchpit	12:25	0.0												

Appendix D

Conversion Sheet for Area of Water Coverage in each Pond

Area of Water Coverage Conversion Sheet

Water depth (m)	Pond A		Pond B		Pond C		Pond D		Pond E		Pond F		Pond G	
	Water Level (m)	Area_2 D (m2)	Water Level (m)	Area_2 D (m2)	Water Level (m)	Area_2 D (m2)	Water Level (m)	Area_2 D (m2)	Water Level (m)	Area_2 D (m2)	Water Level (m)	Area_2 D (m2)	Water Level (m)	Area_2 D (m2)
4.0	11.5	911.9	11.5	991.9	11.5	1090.0	11.5	1287.0	11.5	770.0	11.5	1123.0	11.5	931.0
3.9	11.4	866.5	11.4	935.8	11.4	1020.8	11.4	1216.2	11.4	711.0	11.4	1065.6	11.4	897.4
3.8	11.3	821.0	11.3	879.7	11.3	951.6	11.3	1145.4	11.3	652.0	11.3	1008.2	11.3	863.8
3.7	11.2	775.5	11.2	823.6	11.2	882.4	11.2	1074.6	11.2	593.0	11.2	950.8	11.2	830.2
3.6	11.1	730.0	11.1	767.5	11.1	813.2	11.1	1003.8	11.1	534.0	11.1	893.4	11.1	796.6
3.5	11.0	684.5	11.0	711.4	11.0	744.0	11.0	933.0	11.0	475.0	11.0	836.0	11.0	763.0
3.4	10.9	646.2	10.9	673.6	10.9	713.9	10.9	895.7	10.9	455.3	10.9	801.3	10.9	734.5
3.3	10.8	607.9	10.8	635.8	10.8	683.9	10.8	858.3	10.8	435.7	10.8	766.5	10.8	706.1
3.2	10.7	569.6	10.7	598.0	10.7	653.8	10.7	821.0	10.7	416.0	10.7	731.8	10.7	677.6
3.1	10.6	531.3	10.6	560.2	10.6	623.7	10.6	783.7	10.6	396.3	10.6	697.1	10.6	649.1
3.0	10.5	493.0	10.5	522.4	10.5	593.7	10.5	746.3	10.5	376.7	10.5	662.3	10.5	620.7
2.9	10.4	465.4	10.4	497.7	10.4	563.6	10.4	709.0	10.4	357.0	10.4	627.6	10.4	592.2
2.8	10.3	437.8	10.3	473.0	10.3	533.5	10.3	671.7	10.3	337.3	10.3	592.9	10.3	563.7
2.7	10.2	410.2	10.2	448.3	10.2	503.5	10.2	634.3	10.2	317.7	10.2	558.1	10.2	535.3
2.6	10.1	382.6	10.1	423.6	10.1	473.4	10.1	597.0	10.1	298.0	10.1	523.4	10.1	506.8
2.5	10.0	355.0	10.0	398.9	10.0	443.3	10.0	559.7	10.0	278.3	10.0	488.7	10.0	478.3
2.4	9.9	331.2	9.9	378.9	9.9	413.3	9.9	522.3	9.9	258.7	9.9	453.9	9.9	449.9
2.3	9.8	307.4	9.8	358.9	9.8	383.2	9.8	485.0	9.8	239.0	9.8	419.2	9.8	421.4
2.2	9.7	283.6	9.7	338.9	9.7	353.1	9.7	447.7	9.7	219.3	9.7	384.5	9.7	392.9
2.1	9.6	259.8	9.6	318.9	9.6	323.1	9.6	410.3	9.6	199.7	9.6	349.7	9.6	364.5
2.0	9.5	236.0	9.5	298.9	9.5	293.0	9.5	373.0	9.5	167.0	9.5	315.0	9.5	336.0
1.9	9.4	222.3	9.4	280.6	9.4	276.8	9.4	353.4	9.4	157.9	9.4	298.1	9.4	319.1
1.8	9.3	208.6	9.3	262.3	9.3	260.6	9.3	333.9	9.3	148.7	9.3	281.3	9.3	302.2
1.7	9.2	194.9	9.2	244.0	9.2	244.4	9.2	314.3	9.2	139.6	9.2	264.4	9.2	285.3
1.6	9.1	181.2	9.1	225.7	9.1	228.2	9.1	294.7	9.1	130.5	9.1	247.5	9.1	268.4
1.5	9.0	167.5	9.0	207.4	9.0	212.0	9.0	275.1	9.0	121.3	9.0	230.7	9.0	251.5
1.4	8.9	153.8	8.9	191.3	8.9	195.8	8.9	255.6	8.9	112.2	8.9	213.8	8.9	234.6
1.3	8.8	140.1	8.8	175.2	8.8	179.6	8.8	236.0	8.8	103.1	8.8	196.9	8.8	217.7
1.2	8.7	126.4	8.7	159.1	8.7	163.3	8.7	216.4	8.7	93.9	8.7	180.1	8.7	200.7
1.1	8.6	112.7	8.6	143.0	8.6	147.1	8.6	196.8	8.6	84.8	8.6	163.2	8.6	183.8
1.0	8.5	99.0	8.5	126.9	8.5	130.9	8.5	177.3	8.5	75.7	8.5	146.3	8.5	166.9
0.9	8.4	90.0	8.4	111.7	8.4	114.7	8.4	157.7	8.4	66.5	8.4	129.5	8.4	150.0
0.8	8.3	81.0	8.3	96.5	8.3	98.5	8.3	138.1	8.3	57.4	8.3	112.6	8.3	133.1
0.7	8.2	72.0	8.2	81.3	8.2	82.3	8.2	118.5	8.2	48.3	8.2	95.7	8.2	116.2
0.6	8.1	63.0	8.1	66.1	8.1	66.1	8.1	99.0	8.1	39.1	8.1	78.9	8.1	99.3
0.5	8.0	54.0	8.0	50.9	8.0	49.9	8.0	79.4	8.0	30.0	8.0	62.0	8.0	82.4

Remarks:

Area of water coverage <50%

Area of water coverage <10%

Appendix E

Photographic Records

Photographic Record of Wetland Compensation Area



Ponds A



Pond B



Pond C



Pond D



Pond E



Pond F



Pond G



Ping Yuen River