Drainage Service Department

Monthly Environmental Monitoring & Auditing report for

Contract No.DC/2009/22
Drainage Improvement in Shuen Wan, Tai Po – Contract 1

March 2013

Environmental Pioneers & Solutions Limited
Flat A, 19/F, Chaiwan Industrial Building,
20 Lee Chung Street, Chai Wan, Hong Kong
Tel: 2556 9172 Fax: 2856 2010

APPROVAL SHEET

The Contents of this report have been

Certified by:

Signature: _____ Date: 22-APR-2013

Miss. Goldie Fung
(Environmental Team Leader)

Ecologist (Asia Ecological Consultants Ltd.)

Signature: _____ Date: 22 April 2013

Dr. Michael Leven
(Ecologist)

RLA (Environmental Resources Management)

Signature: _____ Date: 22/4/2013

Miss. Christina Ip
(RLA)

and Verified by:

IEC (ENVIRON Hong Kong Limited)

Signature: _____ Date: 22. April. 2013

Mr. Tony Cheng
(IEC)

TABLE OF CONTENT

LIST OF APPENDIXES

EXECUTIVE SUMMARY

This is the twenty-fifth monthly Environmental Monitoring and Audit (EM&A) Report for the drainage improvement works in Shuen Wan, Tai Po under Drainage Services Department Contract No. DC/2009/22 entitled "Drainage Improvement Works in Shuen Wan, Tai Po – Contract 1". This report concludes the impact monitoring for the activities undertaken during the period from 1st of March 2013 to 31st March 2013. The major site activities in this reporting period were mainly construction of outfall structure of tidal measuring system, construction of cable draw pit & ducting, installation of E&M equipment, construction of DN2100 storm relief drain (CH 5 to CH 20 and CH 177 to 22o) at Ting Kok Road, construction of intakes structure of relief drain, construction of the proposed box culvert bay 2, 3, 8A, 15 and 16 and construction of Twin 2800 dia. Pipe and by pipe jacking method.

The Environmental Team (ET) is responsible for the EM&A works required in the EM&A manual (revision 3). Site inspections were carried out on weekly basis to investigate and audit the equipment and work methodologies with respect to pollution control and environmental mitigation. The weekly inspections records and photos taken were kept.

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

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

Furthermore, impact monitoring for water quality was conducted. Total 4 abnormal incidents of water quality criteria were recorded in this reporting month. During the reporting period, construction of intake structure was conducted. Proper mitigation measures were implemented by contractor to avoid site water release to the Wai Ha river and no particular observation of defective site activities were found causing water contamination. The exceedances of Turbidity and SS were believed to be mainly attributed by natural fluctuation. And, since the recorded levels of Turbidity at control station had also exceeded its baseline action level, the exceedances recorded at W2 were unlikely to be related to the Project.

No exceedance of A/L level was reported for the monitoring of hydrological characteristics in the reporting period.

The ECA was handed over to AFCD on 16th October 2012 and the post-establishment phase monitoring has then commenced and undertaken by AFCD. Therefore, no site visit and ecological monitoring by the Wetland Specialist from the Main Contractor and the Ecologist from the IEC respectively were carried out in the reporting month.

According to Table 6.17 of the EM&A Manual, ecological monitoring of the ECA will be carried out by qualified ecologists during the 1-year wetland establishment period of the ECA before handing over to AFCD for their post establishment monitoring. Establishment phase of the ECA began in September 2011, ecological monitoring programme was conducted and monitoring data was presented in respective monthly EM&A reports. Ecological monitoring programme ended in September 2012 and hence there will be no ECA report attached in EM&A reports.

According to the condition of Section 6.11 of the EM&A Manual, monitoring of the transplanted sapling has been covered a period of 12 months after the transplant. Therefore, the monitoring for Pavetta hongkongensis was not carried out in this reporting period.

Visual and landscape monitoring has been conducted for the project. Details of the observations are referred to sections 7.

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

Site works proposed to be carried out in the upcoming month at Area A & B are refer to section 2.2.

It is expected that noise, air and water quality impacts will be resulted from the works. ET has reminded the contractor to provide environmental pollution control measures wherever necessary and to keep a good environmental management at site practice. The recommended mitigation measures proposed for the project as well as implementation status are refer to section 12.3.

The ET will continue to implement the environmental monitoring & audit programme in accordance with the EM&A Manual (revision 3) and Environmental Permit requirement.

1 Introduction

This is the twenty-fifth monthly Environmental Monitoring and Audit (EM&A) Report for the drainage improvement works in Shuen Wan, Tai Po under Drainage Services Department Contract No. DC/2009/22 entitled "Drainage Improvement Works in Shuen Wan, Tai Po – Contract 1". The site layout plan is shown in Appendix A. The Environmental Team, Environmental Pioneers & Solutions Limited was appointed by Kwan Lee – Kuly Joint Venture to prepare the report. The report is to be submitted to the Contractor, the Engineer and the IEC.

This report presents the results of the environmental monitoring of the project activities conducted within the reporting period from 1st March 2013 to 31st March 2013. This report included the noise monitoring, water quality monitoring, hydrological characteristics monitoring, visual and landscape monitoring, and regular site inspections once per week for verification of implementation of the mitigation measures as recommended in the Environmental Permit (EP-303/2008) (EP), EM&A Manual (revision 3) and the Contractor's Environmental Management Plan (EMP).

2 Construction Stage

2.1 Construction activities in the reporting period

Major activities in the reporting period included the followings:

Area A.:

- Construction of outfall Structure of Tidal Measuring System
- Construction of Cable draw pit & ducting.
- Installation of E&M Equipment
- Construction of DN2100 storm relief drain (CH 5 to CH20 and Ch 177 to 220) at Ting Kok Road.
- Construction of Intake Structure of storm relief drain

Area B.:

- Construction of the proposed box culvert bay 2, 3 8A, 15 and 16 (Including Sheetpiling, Excavation, Concreting, Steel Bar Fixing)
- Construction of Twin 2800 dia. Pipe by Pipe Jacking Method

2.2 Construction activities for the coming month

Proposed key construction works in the coming month will include:

Area A (Pumping Station)

1. Construction of outfall Structure of Tidal Measuring System
2. Construction for Cable draw pit & ducting.
3. Installation of E&M Equipment
4. Backfilling
5. Construction of Green Roof of Pumping Station
6. Construction of DN2100 storm relief drain (CH 5 to CH20 and Ch 177 to 220) at Ting Kok Road.
7. Construction of Box Culvert connecting to Twin 2800 dia. Pipe

Area B (Tung Tsz Nursery)

1. Construction of the proposed box culvert bay 2, 3, 14, 15, 16 and 17 (Including Sheetpiling, Excavation, Concreting, Steel Bar Fixing)
2. Construction of Twin 2800 dia. Pipe by Pipe Jacking Method

2.3 Environmental Status

Appendix A shows the drawing of the project area.

Locations of the monitoring and control stations with environmental sensitive receivers are presented in Section 3.3, 4.3, and 5.3 for noise, water quality, and hydrological characteristics respectively.

3 Noise Monitoring

3.1 Monitoring Parameters and Methodology

The construction noise level was measured in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). $L_{eq\ (30minutes)}$ was used as the monitoring parameter for the impact monitoring in the time period between 0700 to 1900 hours on normal weekdays. For all other time period, $L_{eq\ (5minutes)}$ was employed for comparison with the Noise Control Ordinance (NCO) criteria.

Noise measurement results obtained from each monitoring location were recorded in the Construction Noise Monitoring Data Sheet (**Appendix D**) immediately after the measurement. As supplementary information for data auditing, statistical results L_{10} and L_{90} were also be recorded for reference.

In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Action plan in Table 3.5.2, shall be carried out. This additional monitoring shall be carried out until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

3.2 Monitoring Equipment

The sound level meters and calibrators comply with the International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1) specifications as referred to in the Technical Memorandum (TM) to the Noise Control Ordinance was deployed as monitoring equipment for noise measurement.

Noise measurement was not be made in the presence of fog, rain, wind with a steady speed exceeding $5ms^{-1}$ or wind with gust exceeding $10ms^{-1}$. Thus wind speed was checked by the portable wind speed indicator capable of measuring the wind speed in m/s. Table 3.2.1 summarizes the equipment list for noise monitoring

Table 3.2.1 Equipment List for Noise Monitoring

Equipment	Manufacturer & Model No.	Precision Grade	Qty
Integrated sound level meter	Svantek 949	IEC 651 Type 1 IEC 804 Type 1	1
Windscreen	Microtech gefell model W2	N/A	1
Acoustical calibrator	Svantek SV30A	IEC 942 Type 1	1
Wind speed indicator	Kestrel K1000	N/A	1
Remarks: Calibration details of the sound level meter is given in **Appendix C** for reference			

3.3 Monitoring Locations

According to the Environmental Monitoring and Audit manual, impact noise monitoring for contract 1 was undertaken at two locations during the construction phase of the project. The proposed monitoring locations are summarized in Table 3.3.1. Figure 3.3.1 shows the Noise Monitoring Locations.

Noise measurement at each monitoring location was taken at a point 1m from the exterior of the selected premises and at a height of 1.2m above ground with no disturbance to the dweller and least obstructed view.

Table 3.3.1 Noise Monitoring Locations during Construction Phase

Noise Monitoring Station	Location
M1	14, Shuen Wan Chim Uk
AL1	Joint Village Office for Villages in Shuen Wan, Tai Po

In accordance with the requirements in the EM&A manual (revision 3), weekly impact monitoring was conducted. For the time period between 0700 and 1900 hours on normal weekdays, and noise parameter of $L_{eq\ (30minutes)}$ was measured. As if the construction works were carried out during restricted period (i.e. 1900-2300, 2300-0700 of next day and Sundays / general holiday), impact monitoring that comprises 3 consecutive $L_{eq\ (5minutes)}$ would be carried out.

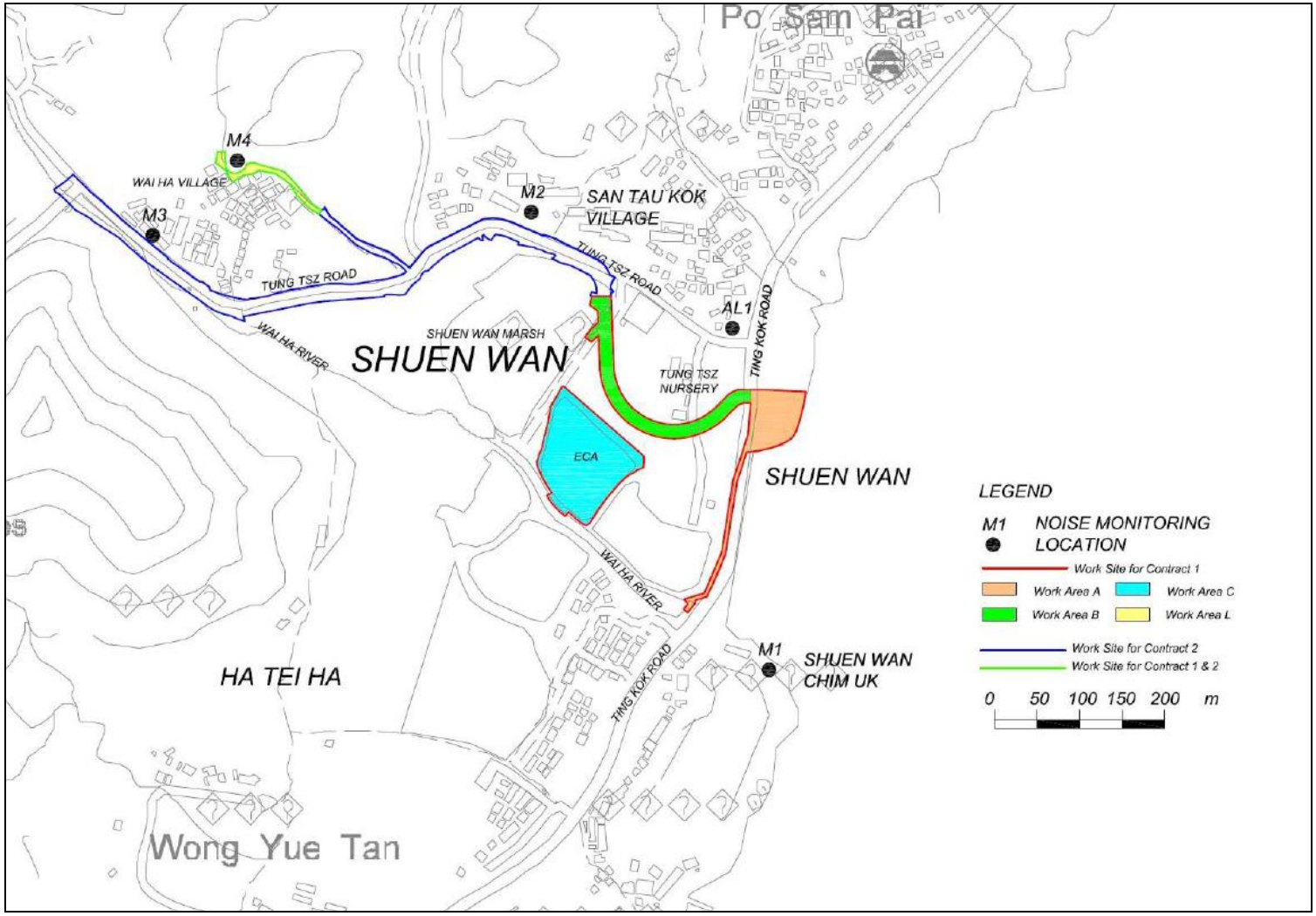


Figure 3.3.1 Impact noise monitoring locations

3.4 Monitoring Results and Interpretation

Relevant details of the noise monitoring results are presented in Table 3.4.1. The results of M1 ranged between 61.6dB (A) and 62.8dB (A), and AL1 ranged between 64.1dB (A) and 67.1dB (A), were within the limit levels and therefore, no exceedance was found.

Table 3.4.1 Noise Monitoring Results for the reporting period

Location	Parameter	Date*	Time	L_{Aeq} dB(A)	Limit dB(A)	Exceedance	Weather
M1	$L_{eq\ 30mins}$	6-Mar-13	14:10	62.3	75	N	Sunny
M1	$L_{eq\ 30mins}$	13-Mar-13	14:00	61.6	75	N	Sunny
M1	$L_{eq\ 30mins}$	20-Mar-13	16:00	61.9	75	N	Cloudy
M1	$L_{eq\ 30mins}$	27-Mar-13	14:00	62.8	75	N	Overcast
AL1	$L_{eq\ 30mins}$	6-Mar-13	14:45	67.1	75	N	Sunny
AL1	$L_{eq\ 30mins}$	13-Mar-13	14:40	66.2	75	N	Sunny
AL1	$L_{eq\ 30mins}$	20-Mar-13	16:35	65.2	75	N	Cloudy
AL1	$L_{eq\ 30mins}$	27-Mar-13	14:35	64.1	75	N	Overcast

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

3.5 Action and Limit level for Construction Noise

The Action and Limit (A/L) levels for construction noise are defined in Table 3.5.1. Should non-compliance of the criteria occur, action in accordance with the Action Plan in Table 3.5.2 should be carried out.

There was no exceedance recorded in the reporting period.

Table 3.5.1 Action and Limit Levels for Construction noise

Time Period	Action Level	Limit Level
0700 – 1900 hours on normal weekdays	When one documented complaint is received	75dB(A)
Remarks: If works are to be carried out during restricted hours, the conditions stipulated in the construction noise permit issued by the Noise Control Authority have to be followed.		

3.6 Monitoring Schedule for the next reporting period

Noise monitoring schedule is proposed to be carried out on 3rd, 10th, 17th and 24th of April 2012.

Table 3.5.2 Event / Action Plan for Construction Noise

EVENT				
	ET Leader	**IEC**	**ER**	**CONTRACTOR**
Action Level	1. Notify IEC and Contractor. 2. Carry out investigation. 3. Report the results of investigation to the IEC, ER and Contractor. 4. Discuss with the Contractor and formulate remedial measures. 5. Increase monitoring frequency to check mitigation effectiveness.	1. Review the analysed results submitted by the ET. 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify Contractor. 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Check remedial measures are properly implemented.	1. Submit noise mitigation proposals to IEC. 2. Implement noise mitigation proposals.

Limit Level	1. Notify IEC, ER, EPD and Contractor. 2. Identify source. 3. Repeat measurements to confirm findings. 4. Increase monitoring frequency. 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented. 6. Inform IEC, ER and EPD the causes and actions taken for the exceedances. 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results. 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions. 2. Review Contractor's' remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of 2. Notify Contractor. 3. Require Contractor 4. Check remedial measures properly implemented. 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	1. Take immediate action to avoid f urther exceedance. 2. Submit proposals for remedial actions to IEC within 3 working days of notification. 3. Implement the agreed proposals. 4. Resubmit proposals if problem still not under control. 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

4 Water Monitoring

4.1 Water Quality Monitoring Parameters and Methodology

Turbidity in Nephelometric Turbidity Unit (NTU), and Dissolved Oxygen (DO) in mg/L, temperature, and pH measurements were in-situ measurements and suspended solids measurements were performed by a HOKLAS accredited laboratory using recommended reference method APHA 2540D.

4.2 Monitoring Equipment

Turbidity, DO, Salinity, pH and temperature was measured by an instrument complied with the following requirements:

The instrument is a portable as well as weatherproof multimeter complete with cable and uses a DC power source. It is capable of measuring:

- A turbidity between 0-800NTU;
- A dissolved Oxygen level in the range of 0-20mg/L and 0-200% saturation;
- A temperature of 0-50^{o}C;
- Salinity in the range of 0-40ppt;
- pH in the range of 0-14.

The measurements were performed by a portable and weatherproof multi-meter, model TOA-DKK WQC-24. The equipment was calibrated and verified by certified laboratory every 3 months to ensure they perform to the same level of accuracy as stated in the manufacturer's specification. Detailed calibration records of the multi-meter were shown in **Appendix C** for reference

Suspended solids were determined by the water samples collected from the monitoring locations for further analysis in accredited HOKLAS laboratory. Water samples were contained by polythene bottles, packed in ice (cooled in 4^{o}C without frozen) and delivered to the laboratory for analysis as soon as possible after collection.

4.3 Monitoring Locations

In accordance with the EM&A Manual (revision 3), monitoring stations for contract 1 were established at two locations, which are summarized in Table 4.3.1.

Table 4.3.1 – Water Quality Monitoring Stations

Monitoring Station	Location	Coordinates
W1	Between the Shuen Wan Marsh and ECA	E:839301 N:836386
W2	Between Tolo Harbour and Proposed Penstock	E:839542 N:836184

As illustrated in Figure 4.3.1, W1 served as the control station while W2 was the monitoring location of water quality.

According to the approved proposal of revision for Action/Limit Level Criteria of Water Quality Monitoring, two reference points (C1 & C2) were added.

Should the water quality parameters monitoring results at the monitoring station W2 exceed the water quality criteria, the water quality monitoring data of two reference points (C1 and C2) will be used as the supplementary information. The monitoring data of C1 should be used for comparison with the monitoring data of W2 that taken at flood tide; and the monitoring data of C2 should be used for comparison with the monitoring data of W2 that taken at ebb tide. The comparison of water quality between W2 and C1 at flood tide and between W2 and C2 at ebb tide is to prove whether influence of water quality is caused by the construction activities. The details of C1 and C2 are referred to the previous submission.

In accordance with the EM&A Manual (revision 3), measurements shall be taken at 3 water depths, namely, 1m below water surface, mid-depth and 1m above river bed, except where the water depth less than 6m, the mid-depth station may be omitted. Should the water depth be less than 3m, only the mid-depth station will be monitored.

As the depth of water was less than 3m, water samples were collected at mid-depth of each proposed monitoring stations for measurements and sample collection.

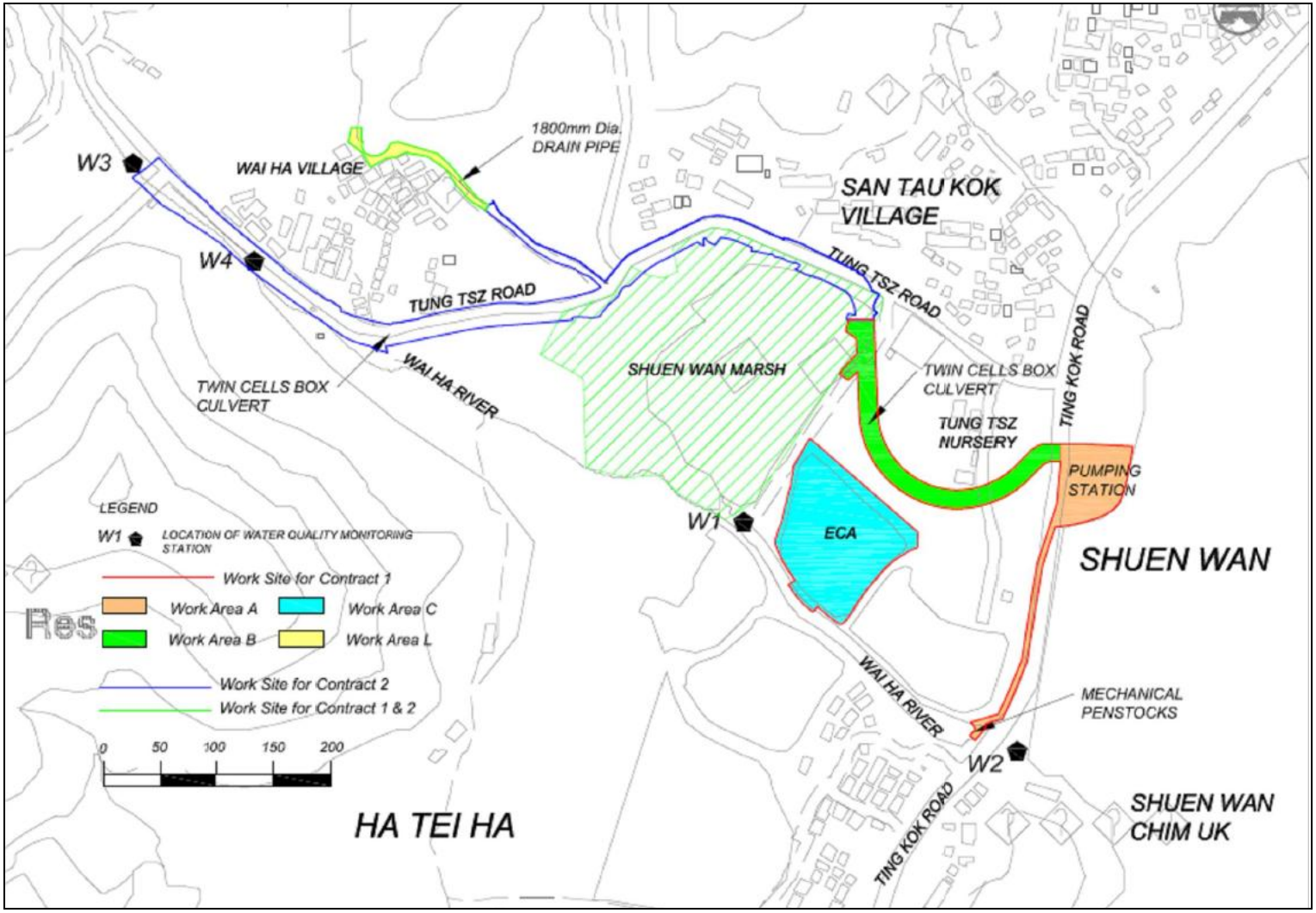


Figure 4.3.1 Water Quality Monitoring Locations

4.4 Monitoring Frequency

Impact water quality monitoring for each monitoring station were performed at mid-flood or mid-ebb tides for 3 days per week during the course of the construction river works.

Monitoring were carried out on 1st, 4th, 6th, 8th, 11th, 13th, 15th, 18th, 20th, 22nd, 25th and 27th of March 2013.

4.5 Monitoring Results and Interpretation

Water quality monitoring was carried out twelve times in this reporting month. Detailed on-site measurements are shown in **Appendix E**. Table 4.5.1 presents consolidated results throughout the reporting month.

There were 4 abnormal incidents of water quality limits (Turbidity) were recorded in this reporting month according to the established action and limit levels. ET has arranged site investigations for the abnormal incidents. No construction activities were carried out at the river bed. During the reporting period, construction of intake structure was conducted. Proper mitigation measures were implemented by contractor to avoid site water release to the Wai Ha river and no particular observation of defective site activities were found causing water contamination. The exceedances of Turbidity and SS were believed to be mainly attributed by natural fluctuation, since the recorded levels of Turbidity at control station had also exceeded its baseline action level, the exceedances recorded at W2 were unlikely to be related to the Project.

The water condition of Wai Ha River is presented in photo attached in **Appendix M.**

Table 4.5.1 Summary of Water Quality Monitoring Results of this reporting month

	Average of Monitoring Results					
	Temperature (°C)	*Turbidity (NTU)*	*pH*	*Dissolved Oxygen (mg/L)*	*Dissolved Oxygen (%)*	*Suspended Solids (mg/L)*
W1	23.6	7.8	8.78	6.3	73.7	11.4
W2	22.1	2.8	7.74	7.52	90.6	3.3
C1	21.5	2.9	9.3	8.56	98.0	3.2
C2	23.5	3.3	9.73	6.93	81.2	4.5

Table 4.5.2 Interpretations of abnormal incidents recorded in the reporting month

Date	**Tide**	**Parameter**	**Interpretations**
4/3/2013	Ebb	Turbidity	Exceedance was caused by natural fluctuation
6/3/2013	Flood	Turbidity	Exceedance was caused by natural fluctuation
11/3/2013	Ebb	SS	Exceedance was caused by natural fluctuation
13/3/2013	Ebb	Turbidity	Exceedance was caused by natural fluctuation

4.6 Action and limit level for Water Quality

Based on the criteria stipulated in EM&A manual (revision 3) and baseline water quality monitoring data obtained, the A/L levels are shown in Table 4.6.1, Table 4.6.2. The A/L levels for W1 were ignored since W1 functions as the control station for contract 1. If the water quality monitoring results at any impact stations exceeded the criteria, the actions in accordance with the Event and Action Plan in Table 4.6.3 should be taken.

Table 4.6.1 Action and Limit Levels for Water Quality at All Monitoring Stations

Parameters	**Action**	**Limit**
DO in mg/L	5 percentile of baseline data	4 mg/L
pH	N/A	6.0 – 9.0
SS in mg/L	95 percentile of baseline data or 120% of upstream control station's SS	99 percentile of baseline data or 130% of upstream control station's SS
Turbidity in NTU	95 percentile of baseline data or 120% of upstream control station's Turbidity	99 percentile of baseline data or 130% of upstream control station's Turbidity

Table 4.6.2 Action and Limit Levels for Water Quality at All Monitoring Stations

Parameters	**Monitoring Stations (Flood Tide)**				**Monitoring Stations (Ebb Tide)**			
	W1		**W2**		**W1**		**W2**	
	Action Level	**Limit Level**	**Action Level**	**Limit Level**	**Action Level**	**Limit Level**	**Action Level**	**Limit Level**
DO (mg/L)	8.07	8.07	7.81	7.69	7.12	7.02	6.77	6.31
pH	N/A	6.0-9.0	N/A	6.0-9.0	N/A	6.0-9.0	N/A	6.0-9.0
SS (mg/L)	7.7	8.1	7.7	8.6	10.5	10.9	9.4	9.9
Turbidity (NTU)	4.9	5.3	1.7	1.8	4.2	4.7	3.0	3.5

Remarks:

For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits

For SS and turbidity, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

Table 4.6.3 Event and action Plan for Water Quality

Event	ET Leader	IEC	ER	Contractor
ACTION LEVEL				
Action level being exceeded by one sampling day	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC, Contractor and Engineer; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented. 7. Repeat measurement on next day of exceedance.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Make agreement on mitigation measures to be implemented; 3. Assess effectiveness of implemented mitigation measures.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes in working methods; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures.

Action level being exceeded by more than two consecutive sampling days	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC, Contractor and Engineer; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented. 7. Prepare to increase the monitoring frequency to daily; 8. Repeat measurement on next day of exeedance.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Make agreement on mitigation measures to be implemented; 3. Assess effectiveness of implemented mitigation measures.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes in working methods; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures.
LIMIT LEVEL				
Limit level being exceeded by one sampling day	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review	1. Discuss proposed mitigation measures with IEC, ET and Contractor;	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify

	impact; 3. Inform EPD, IEC, Contractor and Engineer; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit level.	proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	2. Request Contractor to critically review the working methods; 3. Make agreement on mitigation measures to be implemented; 4. Assess effectiveness of implemented mitigation measures.	unacceptable practice; 3. Check all plant and equipment; 4. Consider changes in working methods; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures.
Limit level being exceeded by more than two consecutive sampling days	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform EPD, IEC, Contractor and Engineer; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC,	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Request Contractor to critically review the working methods; 3. Make agreement on mitigation measures to	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes in working methods; 5. Discuss with ET, IEC and Engineer and propose

	Engineer and Contractor; 6. Ensure mitigation measures are implemented. 7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.	implemented mitigation measures.	be implemented; 4. Assess effectiveness of implemented mitigation measures; 5. Consider and if necessary instruct Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit Level.	mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures; 7. As directed by the Engineer, slow down or stop all or part of the construction activities until no exceedance of Limit level.

4.7 Monitoring Schedule for the next reporting period

Water quality monitoring schedule is proposed to be carried out on 3rd, 6th, 8th, 10th, 12th, 15th, 17th, 19th, 22nd, 24th, 26th and 29th of April 2013.

5 Hydrological Characteristics Monitoring

5.1 Hydrological Characteristics Monitoring Parameters and Methodology

Impact monitoring of hydrological characteristics was undertaken to establish hydrological characteristics of sections of Wai Ha River adjacent to Drainage Improvement Works in Shuen Wan, Tai Po.

The hydrological characteristics of sections of Wai Ha River were measured by water flow rate and depth.

5.2 Monitoring Equipment

Monitoring performed by a portable echo-sounder, model Greyline Stingray. The equipment was calibrated and verified by certified laboratory or manufacturer every year to ensure they perform to the same level of accuracy as stated in the manufacturer's specification.

Calibration Certificate of the multi-meter is given in **Appendix C**.

5.3 Monitoring Locations

In accordance with the EM&A Manual (revision 3), monitoring stations for contract 1 were established at two locations and summarized in Table 5.3.1.

Table 5.3.1 – Water Quality Monitoring Stations

Monitoring Station	**Location**	**Coordinates**
H1	Between the Shuen Wan Marsh and ECA	E:839301 N:836386
H2	Route to Sam Kung Temple	E:839163 N:836433

As illustrated in Figure 5.3.1, H2 served as the control station while H1 was the monitoring location of hydrological characteristics.

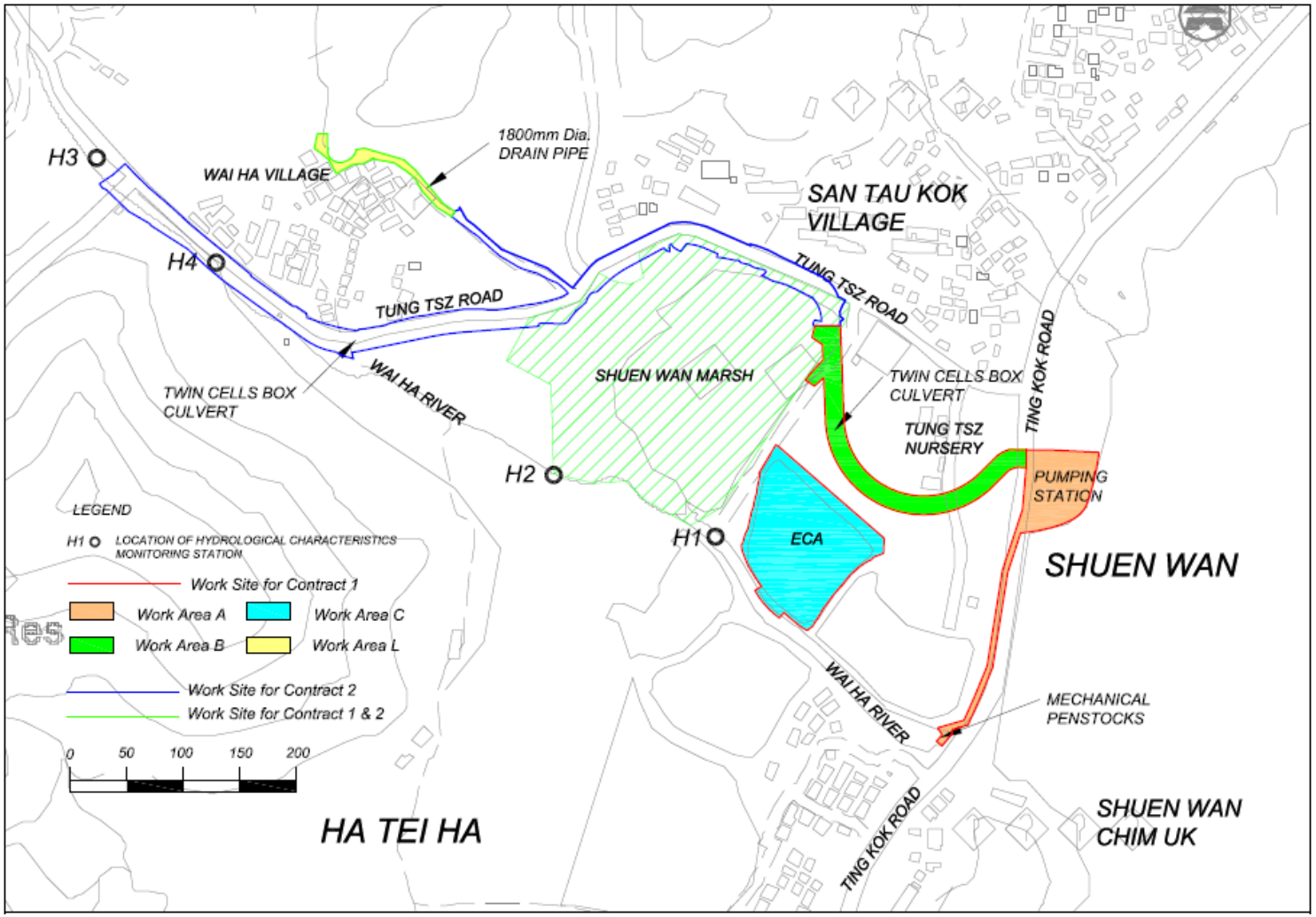


Figure 5.3.1 Hydrological Characteristics Monitoring Locations

5.4 Monitoring Frequency

Hydrological characteristics monitoring for each monitoring station were performed at mid-flood and mid-ebb tides for once per week during the course of the construction river works.

Monitoring was carried out on 1st, 8th, 15th and 22nd of March 2013.

5.5 Monitoring Results and Interpretation

Hydrological characteristics monitoring was carried out four times in this reporting period. The monitoring results are summarized in Table 5.5. All results were within the action and limit levels, therefore, no exceedance was found.

Table 5.5 Summary of Water Quality Monitoring Results

	Average of Monitoring Results	
	Water Depth (m)	Water Flow Rate (m^3/s)
H1(Flood)	~0.450	0.188
H1(Ebb)	~0.180	0.188
H2(Flood)	~0.405	1.130
H2(Ebb)	~0.225	1.036

Details of the monitoring data were presented in **Appendix F**.

5.6 Action and limit level for Hydrological Characteristics

The Action and Limit levels for all monitoring stations are summarized in Table 5.6.1, which would be applied for compliance assessment of hydrological characteristics for this project. If the hydrological characteristics monitoring results at any impact stations exceeded the criteria, the actions in accordance with the Event and Action Plan in Table 5.6.2 should be taken.

Table 5.6.1 Action and Limit Levels for Hydrological Characteristics at All Monitoring Stations

Parameters	**Action**	**Limit**
Water Depth at Mid-flood (m)	0.08	0.06
Water Depth at Mid-ebb (m)	0.08	0.06
Water Flow Rate (m^3/s)	120% of control station's water flow rate on the same day of measurement	140% of control station's water flow rate on the same day of measurement

Table 5.6.2 Event and action Plan for Hydrological Characteristics

Event	ET Leader	IEC	ER	Contractor
ACTION LEVEL				
Action level being exceeded by one sampling day	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC, Contractor and Engineer; 4. Check monitoring data, Contractor's working methods and any excavation works or dewatering processes; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented. 7. Repeat measurement on next day of exceedance.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Make agreement on mitigation measures to be implemented; 3. Assess effectiveness of implemented mitigation measures.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check working methods and any excavation works or dewatering processes; 4. Consider changes in working methods and plans; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures.
Action level being exceeded by more than two consecutive sampling days	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC, Contractor and Engineer; 4. Check monitoring data, Contractor's working methods and any excavation works or dewatering	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly;	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Make agreement on mitigation measures to be implemented; 3. Assess	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check working methods and any excavation works or dewatering

	processes; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented. 7. Prepare to increase the monitoring frequency to daily; 8. Repeat measurement on next day of exeedance.	3. Assess effectiveness of implemented mitigation measures.	effectiveness of implemented mitigation measures.	processes; 4. Consider changes in working methods and plans; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures.
LIMIT LEVEL				
Limit level being exceeded by one sampling day	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform AFCD, IEC, Contractor and Engineer; 4. Check monitoring data, and Contractor's working methods and any excavation works or dewatering processes; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit level.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Request Contractor to critically review the working methods; 3. Make agreement on mitigation measures to be implemented; 4. Assess effectiveness of implemented mitigation measures.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check working methods and any excavation works or dewatering processes; 4. Consider changes in working methods and plans; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures.
Limit level being	1. Repeat in-situ measurements to	1. Discuss mitigation	1. Discuss proposed	1. Inform Engineer and confirm in

exceeded by more than two consecutive sampling days	confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform AFCD, IEC, Contractor and Engineer; 4. Check monitoring data, and Contractor's working methods and any excavation works or dewatering processes; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented. 7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.	measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	mitigation measures with IEC, ET and Contractor; 2. Request Contractor to critically review the working methods; 3. Make agreement on mitigation measures to be implemented; 4. Assess effectiveness of implemented mitigation measures; 5. Consider and if necessary instruct Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit Level.	writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check working methods and any excavation works or dewatering processes; 4. Consider changes in working methods and plans; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures; 7. As directed by the Engineer, slow down or stop all or part of the construction activities until no exceedance of Limit level.

5.7 Monitoring Schedule for the next reporting period

Hydrological characteristics monitoring schedule is proposed to be carried out on 6th, 12th, 19th and 26th of April 2013.

6 Ecological Monitoring of ECA

6.1 Ecological Monitoring of ECA

6.1.1 Scope of Monitoring

A specific ecological monitoring programme and ecological monitoring requirements of the ECA are detailed in Section 7 of the approved Habitat Creation Plan (HCP) and Section 6.18 of the approved updated Environmental Monitoring & Audit (EM&A) Manual of the Project.

During the construction phase of the ECA, monthly monitoring of vegetation health (including the planted, retained and transplanted trees and shrubs, and the proposed planting) and weekly site inspections should be undertaken. Monthly monitoring of *in situ* water quality will be carried out once the ECA is filled with water from the nearby Wai Ha River.

During the 12-month establishment phase of the ECA, monitoring of habitat types, vegetation cover, intertidal fauna and other fauna (including avifauna, herpetofauna, fish, odonates and butterflies) will be undertaken on a six-monthly basis, while the vegetation health and *in situ* water quality will be monitored monthly. Site inspections will be conducted twice per month.

The ECA was formally handed over to AFCD on 16th October 2012. The wire mesh fences and gate at the northwestern part of the ECA were fixed and reinstated by the Main Contractor. No site visit and ecological monitoring by the Wetland Specialist from the Main Contractor and the Ecologist from the IEC respectively were carried out in November 2012. The post-establishment phase monitoring and management of the ECA have commenced and to be undertaken by the AFCD in accordance with the monitoring and management items stipulated in the latest approved EM&A Manual of the Project

6.2 Monitoring Results

According to Table 6.17 of the EM&A Manual, ecological monitoring of the ECA will be

carried out by qualified ecologists during the 1-year wetland establishment period of the ECA before handing over to AFCD for their post establishment monitoring. Establishment phase of the ECA began in September 2011, ecological monitoring programme was conducted and monitoring data was presented in respective monthly EM&A reports. Ecological monitoring programme ended in September 2012 and hence there will be no ECA report attached in EM&A reports.

6.2.1 Description of monitoring of transplanted Pavetta hongkongensis in Ecological Compensatory Area

According to the latest Transplantation Proposal, monitoring of the transplanted individual of *Pavetta hongkongensis* will cover a period of 12 months after the transplanting exercise. The monitoring will be conducted once a week in the first 3 months and once in each subsequent month in the remaining monitoring period. Health condition and growth of each transplanted individuals will be assessed and photographic records will be undertaken for each inspection.

6.2.2 Description of transplanted Pavetta hongkongensis and remarks

The monitoring of the transplanted individual of Pavetta hongkongensis has been covered a period of 12 months. Therefore, the monitoring for Pavetta hongkongensis was not carried out in this reporting period.

7 Landscape and Visual

7.1 Introduction

The Landscape and Visual Monitoring of the Project is conducted to fulfill Clauses 5.2 and 5.4 of EP-303/2008 and the monitoring requirements in accordance with Section 7 of the approved updated EM&A Manual (approved by EPD on 31st May 2012) of the Project. A Baseline Review on updating the landscape and visual condition, and the mitigation measures of the Project (including Contracts 1 and 2 of the Project) was undertaken before the commencement of the Project. The review findings were updated in the Baseline Environmental Monitoring Report submitted to the EPD on 14th February 2011.

This monthly monitoring report will detail the scope of landscape and visual monitoring work, monitoring findings and observations, and any recommendations and advice on proper implementation of the landscape mitigation measures in the works areas under Contract 1 of the Project.

7.2 Scope of Monitoring

7.2.1 Monitoring Objectives

Landscape and Visual Monitoring of the Project should be conducted in a bi-weekly basis for checking the design, implementation and maintenance of the landscape and visual mitigation measures throughout the construction phase and in a quarterly basis during operational phase of the Project. Observations of any potential conflicts between the proposed mitigation measures and the project works carried out by the Contractors should be recorded. Recommendation and advice on proper implementation of the landscape mitigation measures should be provided to the Contractor for minimizing any potential impacts on the landscape and visual elements.

7.2.2 Monitoring during Construction Phase

The following landscape and visual mitigation measure should be implemented during the construction phase of the project to minimize the potential impacts:

- Visual Screen – Use of hoardings as visual screens for the construction in the works areas;
- Contaminant/ Sediment Control – Use of temporary barriers, covers and drainage provision around the construction works as contaminant/ sediment control to prevent the contaminants and sediments from entering the sensitive water-based habitats;
- Pollution Control – Implementation of pollution control measures to minimize any adverse environmental impacts to the surrounding habitats;
- Liaison with Nursery – Liaison with the nursery operator as necessary to minimize any adverse impact to the daily operation and plant holding capacity of the nursery;
- Existing Trees within Works Area – Maintenance and protection of the existing trees, especially their crowns, trunks and roots, within work sites; and

- Construction Light – Provision of construction light should be controlled at night to avoid excessive glare to the surrounding villages and to Plover Cove.

7.2.3 Monitoring during Operational Phase

The following landscape and visual mitigation measure should be implemented during the operational phase of the project to minimize the potential impacts:

- Viewing area formation by planting with shrubs, grasses and benches along the area;
- Architectural design of the pump house will help it fit into the existing suburban, natural to semi-natural surroundings;
- Landscape design of pump house by providing sufficient planting around its boundary fence;
- Enhancement planting along Tung Tsz Road with shrubs/ trees of suitable species to help protect the stream and marshes;
- Construction of box culvert should be with at least 1.0m soil depth for enhancement planting;
- Transplanting of existing affected trees to adjacent locations should be carried out;
- Preparation for transplanting is needed to allow sufficient time for root pruning and rootball preparation prior to transplanting; and
- Reinstatement of affected area should be carried out to check that the works areas are properly reinstated.

7.3 Landscape and Visual Monitoring Results

7.3.1 Monitoring Date(s)

This monthly Landscape and Visual Monitoring (March 2013) was conducted to cover only Areas A, B and C of Contract 1 of the Project. The bi-weekly monitoring was conducted on 7th and 21st March 2013.

Area C (i.e. Ecological Compensatory Area (ECA)) was formally handed over to AFCD on 16th October 2012 for management and maintenance. No access into the ECA is allowed after the handover.

All photos stated in this section are recorded in **Appendix G**.

The bi-weekly monitoring for Contract 2 was also undertaken on 7th and 21st March 2013. The monitoring findings and recommendation will be submitted in a separate Monthly EM&A Report under Contract DC/2010/02.

7.3.2 Visual Screen

No follow-up action by the Contractor is required as from the *Monthly EM&A Report for February 2013*.

Observation

Construction hoardings have been erected in Area A along the entire site boundary. Temporary construction hoardings have been erected around Wai Ha River estuary since the building of an automatic mechanical penstock at the area. The construction works along Ting Kok Road was completed and the road was reinstated in February 2013. On the other hand, new sections of the road have been surrounded with temporary hoarding next to the main entrance of Area A and to the southwest of Area A along Ting Kok Road for another phase of the construction work since February 2013 (**Photo 1**). As the works have been continued in March 2013, the main entrance of Area A relocated to the north of the previous one (**Photo 2**). Since January 2013, active construction works for the installation of drainage pipe and the associated structure have been noticed at the eastern part of Area A with the removal of site hoarding along the eastern boundary of Area A.

A section of temporary hoarding has been erected from northwest to southwest parts (i.e. Phase 1 construction works) of Tung Tsz Nursery in Area B (approximately along the works boundary from Trees U42 to U62). Another section of temporary hoarding has been erected from southwest to eastern parts (i.e. Phase 2 construction works) of the Nursery since May 2012 and connected with the Phase I construction works area. An open section with no construction work has been maintained as a major road access inside Tung Tsz Nursery for their daily operations.

The gate of the adjacent housing area near the previous main entrance of Area C has been

reinstated at its original location by the Contractor since November 2012.

Recommendation

No specific recommendation is required.

7.3.3 Contaminant/ Sediment Control

No follow-up action by the Contractor is required as from the *Monthly EM&A Report for February 2013.*

Observation

Area A

Provision of dust control measure (such as wheel washing facilities) has been maintained at the exit point of Area A.

Used water for washing vehicular wheel and groundwater from the excavated sites were pumped into the silt/sand removal facilities for filtration before discharging into the manhole adjacent to Area A.

Area B

Dust control measure (such as wheel washing facilities) has been resumed since October 2012. The construction vehicles were washed at the entrance of the access road leading towards the works area at northwestern part of Tung Tsz Nursery. Used water and groundwater from the built box culvert and the construction site within the Nursery were collected and drained directly to the sedimentation tanks placed adjacent to the fenced Area C. The water was further filtered through the silt/sand removal facilities in the tank before discharging into the manhole adjacent to Area C.

Area C

Area C was formally handed over to AFCD on 16th October 2012 for management and maintenance. The pond of the ECA has connected with the Wai Ha River directly. No water resulting from normal wetland maintenance practice was pumped out from the

ECA.

Recommendation

No specific recommendation is required.

7.3.4 Pollution Control

All used water for washing vehicular wheel and construction works was filtered and drained to the manholes and drainage points, as following the recommendation stated in *Monthly EM&A Report for February 2013.*

Observation

Area A

Provision of vehicular wheel washing facilities was observed at the exit point of Area A to reduce the contamination to the surrounding habitats in Plover Cove. Used water for washing vehicular wheel and groundwater from the excavated sites were pumped into the silt/sand removal facilities for filtration before discharging into the manhole and drainage points adjacent to Area A. The drainage pipes were maintained to discharge the used water to the manhole. No direct discharge of water into the adjacent Wai Ha River was observed from the works area for building the automatic mechanical penstock at Wai Ha River estuary as active civil works were not observed.

Area B

All used water was collected and drained directly to the sedimentation tank placed adjacent to the fenced Area C. This water was further filtered through the silt/sand removal facilities in the tank before discharging into the manhole adjacent to Area C.

Area C

Area C was formally handed over to AFCD on 16th October 2012 for management and maintenance. The pond of the ECA has been connected to Wai Ha River directly as following the scheme design of Habitat Compensatory Plan. No direct discharge of turbid

water into the adjacent Wai Ha River was observed through the fence of Tung Tsz Nursery (**Photo 3**).

Recommendation

No specific recommendation is required for Areas A, B and C. As a reminder, the Contractor should regularly check the condition and locations of the drainage pipes and ensure that all used water should be appropriately filtered and discharged to the manholes/other discharge points agreed by the Engineer and EPD. This is to avoid any potential contamination to the vegetation in Shuen Wan marsh and other vegetated/marinated areas adjacent to the active works area.

7.3.5 Liaison with Nursery

Active construction works within Tung Tsz Nursery has been extended to the east of the nursery in connection with Ting Kok Road since May 2012. All of these active construction works area were demarcated with construction hoardings.

The health condition and stability of the tree *Grevillea robusta* (U58) has been closely monitored on a bi-weekly basis. Watersprouts were still observed along the trunk.

The works practice and maintenance of trees within the nursery generally follow the recommendation as stated in *Monthly EM&A Report for February 2013*. Any observed issues related to the liaison with the nursery are highlighted in this section.

Observation

The temporary hoarding has been erected from northwest to southwest parts of Tung Tsz Nursery in Area B since April 2011. Phase 2 construction works have continued and temporary hoardings have been erected since May 2012. The major road access within the Nursery has been maintained to minimize the impact on the nursery's daily operation resulting from the construction works.

Regular monitoring for all transplanted trees within the nursery was conducted on a

bi-weekly basis. For tree U58 (*Grevillea robusta*) (**Photo 4**), leaves as watersprouts were observed along the branches and the trunk. U58 has remained in fairly poor physiological condition in February 2013. Regular monitoring has to be continued to update its health and structural condition.

As reported in the previous *Monthly EM&A Reports*, the retained tree U68 (*Gmelina arborea*) was found fallen after the severe typhoon in July 2012, with its leaning trunk being pruned and removed in August 2012 (as reported in *Monthly EM&A Report for August 2012*). As reported since the *Monthly EM&A Report for November 2012*, the developed watersprouts at the remained stump was recorded. The watersprouts were removed as inspected in December 2012 while it has resprouted as observed since January 2013. Watersprouts were still observed in March 2013 (**Photo 5**).

No muddy water was found leaking out through the temporary hoarding into the nursery.

Recommendation

The works area and the construction works should be properly managed and implemented without influencing the daily operation of the nursery (i.e. provide enough access road and works area for the nursery operation).

All transplanted trees should be watered regularly (e.g. at least every two days during the dry season) by the appointed landscape contractor. Meanwhile, the Contractor should prevent forming waterlogged areas or leakage of used water from the active construction works area into the Nursery. This is to prevent causing any nuisance to the nursery's daily operation.

Regular monitoring and watering of *Grevillea robusta* (U58) are still recommended to be the major treatment to the tree. The appointed landscape contractor and the Contractor should closely monitor the health conditions of all transplanted and retained trees throughout the construction period of the Project.

7.3.6 Existing Trees within Works Areas

Maintenance of the existing trees within the works areas generally follows the recommendations as stated in *Monthly EM&A Report for February 2012*, except the observations as highlighted in the following sections.

Observation

Area A

Since October 2012, E18 (*Melaleuca cajuputi* subsp. *cumingiana*) originally located within the TPZs nearby the main gate have been relocated to the northeastern part of Area A and subsequently relocated to the northeastern part of Area A in November 2012 due to its direct conflict with the works. As observed in March 2013, the tree was found in poor condition due to transplantation shock and poor planting skills (**Photo 6**).

The tree to be transplanted E16 (*Bombax ceiba*) has been relocated to the southern side of Area A next to the site hoarding since July 2012. The orange construction net used as temporary TPZ was found removed. However, the tree was in fair condition during the monitoring in March 2013 (**Photo 7**).

Two untagged trees (*Melaleuca cajuputi* subsp. *cumingiana*) were found in the northeastern part of Area A in February 2013. Dry leaves were found on the canopy of one of these trees during the monitoring in March 2013.

E97 (*Celtis sinensis*) has been relocated at the northeastern part of Area A since December 2012 and the tree was still in poor health condition due to transplantation shock (**Photo 8**).

No other significant damages on the crowns, trunks and roots of the remaining trees resulting from the construction machinery were observed during the monitoring in March 2013 in Area A..

Area B

As highlighted in the Section "Liaison with Nursery", watersprouts and new leaves were observed on the trunk and branches of the transplanted tree U58 (*Grevillea robusta*) but its physiological condition has still remained fairly poor after the transplant.

The transplanted tree U61 (*Lysidice rhodostegia*) was still found leaning severely with its propping uplifted (**Photo 9**).

The transplanted tree U55 (*Pterocarpus indicus*) was planted directly into the ground as permitted by the nursery (**Photo 10**). Decayed wood was found along the tree trunk possibly due to the previous wood borer problems. As reported in the *Monthly EM&A Report for February 2013*, pest control measure was conducted by the appointed landscape contractor in January 2013. However, the presence of an anti-grass film (**Photo 11**) covering almost the whole trunk flare and the soil ground around within the tree root zone might retain too much moisture around the trunk flare, hence creating a favorable environment for the growth of fungi and pests around the trunk flare. This would adversely affect the tree health in the long run.

The tree to be transplanted T102 (*Melaleuca cajuputi* subsp. *cumingiana*) has been relocated to the southern part within the Phase 2 construction area of Area B next to the hoarding since November 2012 (**Photo 12**). The tree still appeared in very poor condition as almost no green leaves were noted in the canopy in March 2013.

No recovery signs have been observed on the relocated trees U34 (**Photo 13**), U35 (**Photo 14**) and U37 (**Photo 15**) and they are regarded as dead specimens**.**

Waterlogging problem was found in the areas around the trunk bases of three relocated trees (U76, U77 and U78) before. The relocated tree U77 (*Terminalia catappa*) was suspected to be dead as no leaves was observed in the canopy (**Photo 16**). Soil was deposited close to the tree and even on the trunk of U77 as inspected on 21st March 2013 (**Photo 16**). U76 and U78 (*Terminalia catappa*) were observed in poor condition with sparse foliage in March 2013 (**Photo 17**). However, with the onset of wet season, new leaves and buds were observed on U78 as inspected on 21st March 2013 (**Photo 18**).

Another relocated tree U79 (*Terminalia catappa*) on the southwest of U76 was found in poor condition with sparse foliage in March 2013 (**Photo 19**). Resprouting was observed during the monitoring on 21st March 2013.

Many relocated trees in Phases 1 and 2 works area within the Nursery were in fairly poor to fair condition due to the poor transplantation skills and poor site condition (e.g. tree root zones have been disturbed by used, turbid liquid or grease). Proper tree protection (e.g. guying and temporary TPZ) and draining/ removal of turbid liquid or grease should be implemented to maintain the existing trees.

The remaining trees, including retained and transplanted specimens, within the nursery were maintained generally in fair condition, with no significant damage on tree crowns, trunks and roots observed during the monitoring in March 2013

Area C

Area C was formally handed over to AFCD on 16th October 2012 for management and maintenance. The area was fenced off and no access was allowed.

Recommendations

Area A

Maintenance of proper TPZs with no temporarily stored construction materials, excessive stockpiled soil and waterlogged condition around the tree trunk flares have been the major tree management issues in Areas A and B. The Contractor should continue notifying the on-site workers not to stockpile soil/construction materials or place construction equipment within and close to the TPZs or lower trunk/trunk flare. Any temporarily stored construction materials/ equipment and excessive water around the trunk flares should be removed or drained immediately. The Contractor should remind the operators of the construction machines and on-site workers to be aware of the presence of these relocated and retained trees nearby their works, and prevent the accidental damage on these trees as far as practical.

The Contractor should continue the maintenance of proper tagging system for all trees within and outside the hoarded site in order to facilitate the monitoring of their existing condition.

All retained trees or trees to be transplanted should be watered regularly (e.g. at least every two days) by the landscape contractor or on-site workers. The Contractor should conduct regular inspection on the health condition and protection measures of each existing trees within the Area A. In particular, regular watering should be applied on those relocated trees with regard to their poor health condition. If these trees or other transplanted/ relocated trees are found to be dead specimens in the wet season, the Contractor should replace these specimens.

Area B

All transplanted trees should be watered regularly (e.g. at least every two days during the dry season) by the landscape contractor. This is a necessary maintenance practice to improve the survival rates and growth for trees showing poor health condition as a result of the transplantation shock. Regular check of the tree health should be conducted. Proper protective measures such as guying and TPZs are recommended especially for the newly transplanted/ relocated trees. Waterlogged areas (e.g. around trunk bases of U76, U77 and U78) should be avoided and all used water around the tree trunk flares and close to the tree root zones should be drained out immediately. To prevent accidental drainage of used water into the tree root zones of the relocated trees, the Contractor is recommended to establish a proper separation (e.g. sandbags barriers or wooden plates) between the trees (especially U76, T77 and U78) and the ground of the active construction work. If in such circumstance that there is direct conflict between certain tree parts of the retained, transplanted or relocated tree(s) and the construction works/ machinery, the pruning works should be carried out in accordance with any local, national or international standards related to tree remedial works.

Regular inspection of the tree health of U55 and U58, and stability of the leaning tree U61 should be undertaken to update their health condition and any tree defects. The Contractor is recommended to replant the leaning tree U61 or establish appropriate tree propping system to minimize its potential failure risk to the targets. If these trees or other

transplanted/ relocated trees are found to be dead specimens in the wet season, the Contractor should replace these specimens.

For the transplanted tree U55, it is recommended to remove the anti-grass sheet from the root flare by cutting the sheet to create a circle of at least 1.5 m diameter around the tree. However, the Contractor should liaise with the Nursery Operator if the sheet is allowed to be removed for improving the tree health in the long run.

The Contractor is recommended to re-tag the translocated trees and regularly check the condition of the tags. All tree tags on the trees should be managed properly by the Contractor throughout the construction and establishment phases

Area C

As Area C was handed over to AFCD for management and maintenance, no further recommendation is given.

7.3.7 Construction Lights

No follow-up action on maintenance of construction light is required as from the *Monthly EM&A Report for February 2012.*

Observation

No construction light impact to the surrounding villages and to Plover Cove as all construction activities and construction sites are halted at 1800. No construction light at night is provided by the Contractor.

Recommendation

No specific recommendation is required.

7.4 Audit Schedule

The next bi-weekly Landscape & Visual Monitoring in April 2013 is scheduled to be conducted in the weeks of 1st, 15th and 29th April 2013.

8 Action taken in Event of Exceedance

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

During the reporting month there was no exceedance for noise, hydrological characteristics, and ecological measurements recorded; therefore, no actions were taken.

There were 4 abnormal incidents of water quality limits (Turbidity) were recorded in this reporting month according to the established action and limit levels. ET has arranged site investigations for the abnormal incidents. No construction activities were carried out at the river bed. During the reporting period, construction of intake structure was conducted. Proper mitigation measures were implemented by contractor to avoid site water release to the Wai Ha river and no particular observation of defective site activities were found causing water contamination. The exceedances of Turbidity and SS were believed to be mainly attributed by natural fluctuation, since the recorded levels of Turbidity at control station had also exceeded its baseline action level, the exceedances recorded at W2 were unlikely to be related to the Project.

The water condition of Wai Ha River is presented in photo attached in **Appendix M**.

9 Construction waste disposal

It is the contractor's responsibility to ensure that all wastes produced during the construction phase for the drainage improvement works are handled, stored and disposed of in accordance with good waste management practices and EPD's regulation and requirement. Waste materials generated during construction activities, such as construction and demolition (C&D) material, chemical wastes and general refuse, are recommended to be audited at regular intervals to ensure that proper storage, transportation and disposal practices are being implemented.

Table 9.1 is a summary of figures of the construction wastes disposal provided by Contractor.

Table 9.1 Summary of Construction Waste Disposal

Month	Actual Quantities of Inert C & D Materials Generated Monthly						Actual Quantities of C & D Wastes Generated Monthly				
	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fill	Imported Fill	Metals	Paper/cardboard packaging	Plastics (see note3)	Chemical Waste	Others, e.g. general refuse
	(in'000m3)	(in'000m3)	(in'000m3)	(in'000m3)	(in'000m3)	(in'000m3)	(in'000kg)	(in'000kg)	(in'000kg)	(in'000kg)	(in'000kg)
Year2011	11.758	0.00	9.703	0.665	0.750	0.556	0.00	0.00	0.00	0.00	0.165
Year 2012	10.737	0.00	9.884	1.185	0.05	0.00	2.37	0.00	0.00	0.00	0.192
Jan 13	0.291	0.00	0.24	0.00	0.05	0.01	0.00	0.00	0.00	0.00	0.00
Feb 13	0.190	0.00	0.16	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.035
Mar 13	1.14	0.00	1.13	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Total	22.975	0.00	21.117	1.85	0.80	0.566	2.37	0.00	0.00	0.00	0.41

Forecast of Total Quantities of C & D Materials to be Generated from the Contract											
	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fill	Imported Fill	Metals	Paper/cardboard packaging	Plastics (see note3)	Chemical Waste	Others, e.g. general refuse
	(in'000m3)	(in'000m3)	(in'000m3)	(in'000m3)	(in'000m3)	(in'000m3)	(in'000kg)	(in'000kg)	(in'000kg)	(in'000kg)	(in'000kg)
	0.05	0	0.1	0.1	0.05	0.01	0	1	0.05	0.1	0.05

Notes (1) The Performance targets are given in PS Clause 26.23 (14)

(2) The waste flow table shall also include C & D materials that are specified in the Contract to be imported for used at the sites

(3) Plastics refer to plastics bottles/containers, plastic sheets/foam from packaging materials.

(4) The summary table shall be submitted to the Engineer's Representative monthly together with the Waste Flow Table for review and monitoring in accordance with the PS Clause 25.20A(4)

10 Status of Permits and Licenses obtained

Table 10.1 is the updated status of environmental related permits/ license obtained for the construction activities.

Table 10.1 Status of Permits and Licenses Obtained

Description	License / Permit No.#	Date of Issue	Site	Date of expiry	Status
Environmental Permit	EP-303/2008	2008/2/25	Area A, B & C	not applicable	Valid
Discharge License	WT00006448-2010	2010/6/15	Area A, B & C	30/6/2015	Valid
Registration as a Chemical Waste Producer	316597	2010/4/26	Area A, B & C	not applicable	Valid
Waste Disposal	7010348	2010/3/2	Area A, B & C	not applicable	Valid

11 Compliant Log

There was no formal complaint received during the reporting period. Therefore, follow up actions for the environmental complaint is not required.

Table 11.1 Summary of Formal Complaints received

	Noise	Water	Ecology	Others
Year 2011	0	0	0	0
Year 2012	0	0	0	0
January 2013	0	0	0	0
February 2013	0	0	0	0
March 2013	0	0	0	0
Total	0	0	0	0

12 Site Environmental Audits

12.1 Site Inspection

Site inspections were undertaken weekly to inspect the construction activities in active site areas to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented.

Within this reporting period, site inspections were conducted on 7th, 14th, 21st and 25th of March 2013. A detailed checklist of each site inspection together with comments and relevant photos have been filed and kept. The findings from inspection were summarized in Table 12.1.

Table 12.1 Summary results of site inspections findings

Date	Findings	Identification	Advice from ET	Action taken	Closing date	Remarks
17, 24 & 28 Jan 13 6, 15 & 21 Feb 13 7, 14, 21 & 25 Mar 13	Construction materials inside the tree protection zone were observed at Area B.	Observation	Contractor was reminded that construction materials inside the tree protection zone should be removed as soon as possible.	Outstanding	N/A	
21 Feb 13	Open stockpile was observed at Aare B.	Observation	Contractor was reminded that the stockpile should be covered with tarpaulin sheets for dust suppression.	Open stockpile was covered with tarpaulin sheets by contractor at Area B.	7 Mar 2013	
26 Feb 13 7 Mar 13	Construction materials were observed at Ting Kok Road.	Observation	Contractor was reminded that the vehicles should be washed for the removal of dusty materials before leaving from the site area.	Construction materials were cleaned by contractor.	14 Mar 2013	

Date	Findings	Identification	Advice from ET	Action taken	Closing date	Remarks
14 , 21 & 25 Mar 13	Damaged tree protective fencing was observed at Area A.	Observation	Contractor was reminded to replace the tree protective fencing as soon as possible.	Outstanding	N/A	
25 Mar 13	Power generator was not placed into the drip tray at Area B.	Observation	Contractor was reminded that the drip tray should be provided for all the power generators.	Outstanding	N/A	
25 Mar 13	Drip tray was not provided for the chemical material at Area B.	Observation	Contractor was reminded to provide the drip tray as soon as possible.	Outstanding	N/A	
25 Mar 13	The public U-channel was blocked by the construction materials at Area B.	Observation	Contractor was reminded to clear the construction materials as soon as possible.	Outstanding	N/A	

12.2 Compliance with legal and Contractual requirement

There was no non-compliance recorded for the month of March 2013.

12.3 Implementation status and effectiveness of the mitigation measures

Contractor has implemented mitigation measures to address those problems as advised by ER and ET. Some of the measures taken by the contractor were considered as effective to minimize negative impact to the environment. Ongoing investigation will be carried out to observe performance and effectiveness of those measures. Outstanding environmental items will be inspected in next month.

As there were some ongoing follow up practices, contractor was reminded to regularly review and rectify the discrepancy once found and maintain good site condition. The contractor implemented various environmental mitigation measures as recommended in the Environmental Permit and Final Mitigation Measures Report.

The recommend mitigation measures of EM&A manual (revision 3) are presented in **Appendix H (A)**.

The implemented statues of mitigation measures are presented in **Appendix H (B)**

13 Future Key issues and recommendations

According to the forecasted site activities, key environmental issued to be considered should at least include:

- Site water control and relevant protective measures.
- Quality of effluent discharge from Area A.
- Control and disposal for construction wastes generated from works.

Tree protective measure for tree planting and transplanting, such as tree protection zone and regular watering.

14 Conclusions

Construction of outfall structure of tidal measuring system, construction of cable draw pit & ducting, installation of E&M equipment, construction of DN2100 storm relief drain (CH 5 to CH 20 and CH 177 to 22o) at Ting Kok Road, construction of intakes structure of relief drain, construction of the proposed box culvert bay 2, 3, 8A, 15 and 16 and construction of Twin 2800 dia. Pipe and by pipe jacking method were major site activities being carried out within this reporting period.

Regular site meetings and inspection audits led by the seniors for discussing site environmental matters were held among Project Proponent, Contractor and the ET on weekly basis. Also monthly site meeting and inspection audits with the above parties and IEC were carried out on 25th of March 2013.

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

For water quality monitoring, total 4 abnormal incidents of water quality criteria were recorded in this reporting month. During the reporting period, construction of intake structure was conducted. Proper mitigation measures were implemented by contractor to avoid site water release to the Wai Ha river and no particular observation of defective site activities were found causing water contamination. The exceedances of Turbidity and SS were believed to be mainly attributed by natural fluctuation. And, since the recorded levels of Turbidity at control station had also exceeded its baseline action level, the exceedances recorded at W2 were unlikely to be related to the Project.

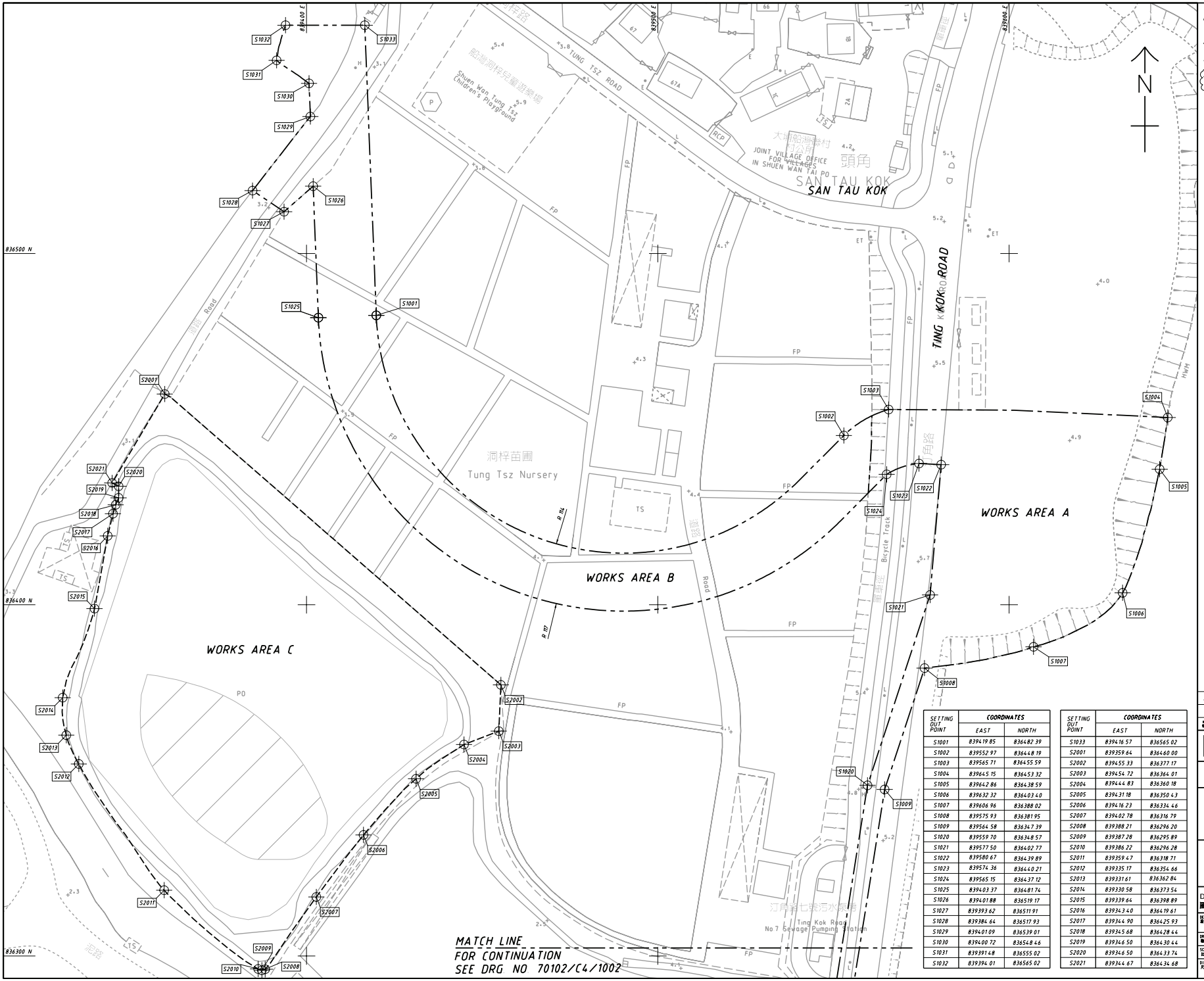
Also, there were not any notifications of summons recorded during the reporting period. Furthermore, there were not any formal prosecution and complaints recorded.

ET has reminded the contractor to provide environmental pollution control measures wherever necessary, and to keep a good environmental management at site practice.

The ET will continue to implement the environmental monitoring & audit programme in accordance with the EM&A Manual (revision 3) and

Environmental Permit requirement.

Appendix A: Site Location Plan



SETTING OUT POINT	COORDINATES EAST	NORTH
S1001	839419 85	836482 39
S1002	839552 97	836448 19
S1003	839565 71	836455 59
S1004	839645 15	836453 32
S1005	839642 86	836438 59
S1006	839632 32	836403 40
S1007	839606 96	836388 02
S1008	839575 93	836381 95
S1009	839564 58	836347 39
S1020	839559 70	836348 57
S1021	839577 50	836402 77
S1022	839580 67	836439 89
S1023	839574 36	836440 21
S1024	839565 15	836437 12
S1025	839403 37	836481 74
S1026	839401 88	836519 17
S1027	839393 62	836511 91
S1028	839384 64	836517 93
S1029	839401 09	836539 01
S1030	839400 72	836548 46
S1031	839391 48	836555 02
S1032	839394 01	836565 02

SETTING OUT POINT	COORDINATES EAST	NORTH
S1033	839416 57	836565 02
S2001	839359 64	836440 00
S2002	839455 33	836377 17
S2003	839454 72	836364 01
S2004	839444 83	836360 18
S2005	839431 18	836350 43
S2006	839416 23	836334 46
S2007	839402 78	836316 79
S2008	839388 21	836296 20
S2009	839387 28	836295 89
S2010	839386 22	836296 28
S2011	839359 47	836318 71
S2012	839335 17	836354 66
S2013	839331 61	836362 84
S2014	839330 58	836373 54
S2015	839339 64	836398 89
S2016	839343 40	836419 61
S2017	839344 90	836425 93
S2018	839345 68	836428 44
S2019	839346 50	836430 44
S2020	839346 50	836433 74
S2021	839344 67	836434 68

REV. 修訂	DESCRIPTION 內容摘要	BY EC	BY PC	DATE 日期
A	TENDER ADDENDUM NO.2	ECYP	RCYK	10-09
-	TENDER DRAWING	ECYP	RCYK	09-09

DRAINAGE SERVICES DEPARTMENT, THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

DRAINAGE IMPROVEMENT WORKS IN SHUEN WAN, TAI PO - CONTRACT 1

SETTING OUT PLAN FOR WORKS AREA A, B AND C

SHEET 1 OF 2

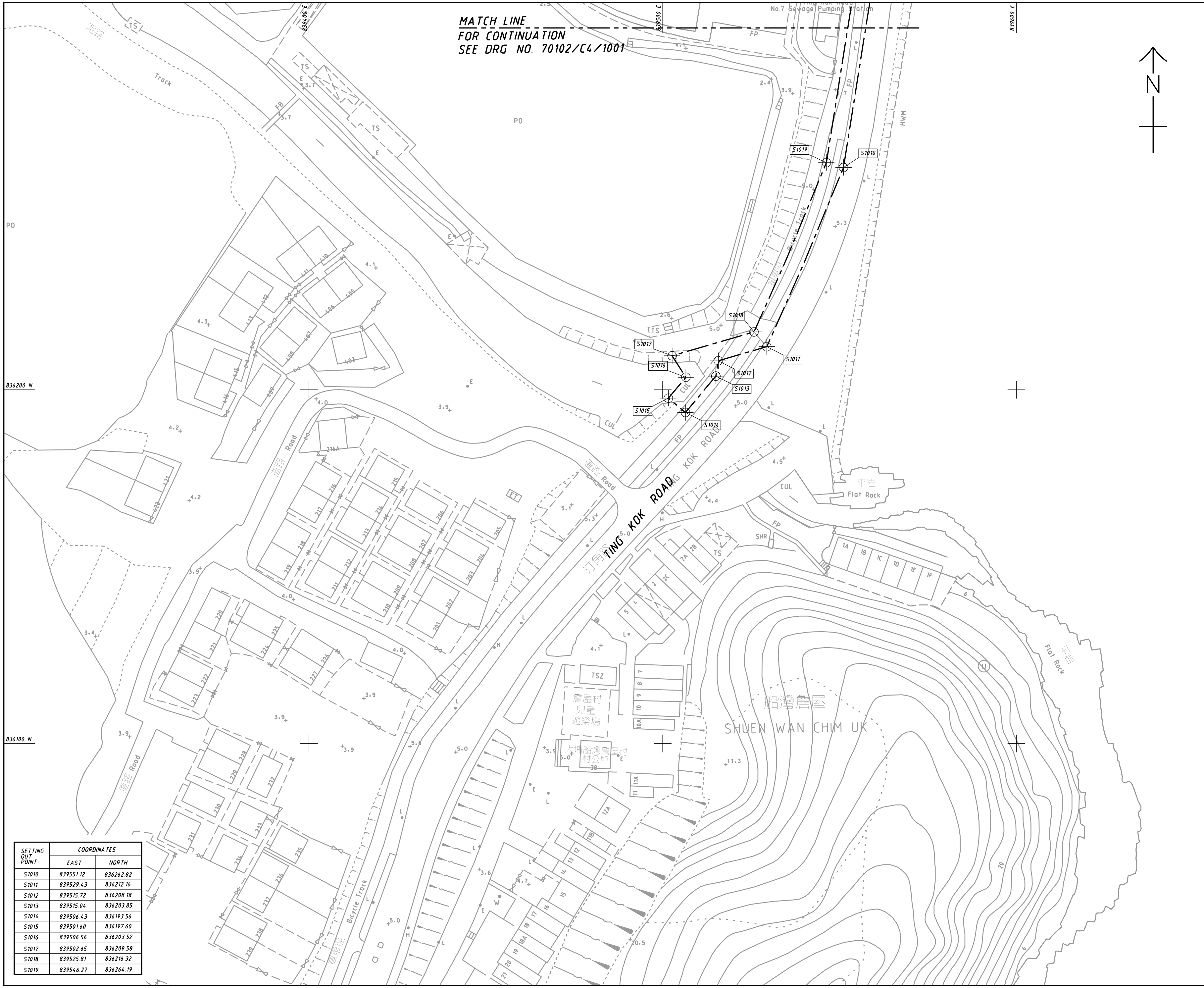
AECOM

DRG.NO. 圖紙編號 70102/C4/1001A

DESIGNED BY 設計	CPWU	CONTRACT NO. 合約編號	DC/2009/22
DRAWN BY 繪圖	LWL	P. DIV. APPROVED 負責人	DML
SCALE 比例	A1 1 500	STATUS 階段	
DIMENSIONS ARE IN 尺寸單位	METRES		

2010-2-5 11:54:09

p:\projects\70102\1000\TENDER ADDENDUM NO 2\1001A.dgn



NOTE:

1. FOR NOTES AND LEGEND SEE DRAWING NO. 70102/C4/1001

SETTING OUT POINT	COORDINATES	
	EAST	NORTH
S1010	839551.12	836262.82
S1011	839529.43	836212.16
S1012	839515.72	836208.18
S1013	839515.04	836203.85
S1014	839506.43	836193.56
S1015	839501.60	836197.60
S1016	839506.56	836203.52
S1017	839502.65	836209.58
S1018	839525.81	836216.32
S1019	839546.27	836264.19

REV. 修訂	DESCRIPTION 內容摘要	D.E.	P.E.	DATE 日期
-	TENDER DRAWING	ECYP	RCYK	09-09

CHECKED 複核

DRAINAGE SERVICES DEPARTMENT, THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

DRAINAGE IMPROVEMENT WORKS IN SHUEN WAN, TAI PO - CONTRACT 1

SETTING OUT PLAN FOR WORKS AREA A, B AND C

SHEET 2 OF 2

AECOM

DRG.NO. 圖紙編號 70102/C4/1002

DESIGNED BY 設計 CPWU	CONTRACT NO. 合約編號 DC/2009/22	P. Dir. APPROVED 批准人 DML
DRAWN BY 繪圖 LWL	STATUS 階段	
SCALE 比例 A1 1 : 500		
DIMENSIONS ARE IN 尺寸單位 METRES		

2010-2-5 13:32:23

p:\projects\70102\1000\TENDER DRAWING\1002.dgn

Appendix B: Key Personal Contact Information Table

Post	Name	Contact No.	Contact Fax	e-mail
Project Manager	Mr. W. K. Chan	6821 1136	2674 6688	dc200922jv_pmcwk @yahoo.com.hk
Site Agent	Mr. C. L. Wong	9280 0166	2674 6688	dc200922jv_sa@yaho o.com.hk
Environmental Officer / Sub-agent	Mr. K. M. Ma	9552 1734	2674 6688	dc200922jv_suba@ya hoo.com.hk
Environmental Supervisor	Mr. Anthony Chan	9179 2092	2674 6688	anthony277@hotmail. com
Asia Ecological Consultants Ltd. (Wetland Specialist)	Dr. Mike Leven	2486 2885	2471 8389	mrleven@asiaecol.co m.hk
Environmental Pioneers & Solutions Limited (Environmental Team)	Miss Goldie Fung	2556 9172	2856 2010	goldiefung@fseng.co m.hk

Appendix C: Calibration Certificates for Measuring Instruments

Hong Kong Calibration Ltd.
香 港 校 正 有限公司

Calibration Certificate

Certificate No. **28553** Page 1 of 5 Pages

Customer : Environmental Pioneers and Solutions Limited

Address : Flat A, 19/F., Chai Wan Industrial Centre Building, 21 Lee Chung Street, Chai Wan, HK.

Order No. : Q23300 **Date of receipt :** 11-Dec-12

Item Tested

Description : Sound Level Meter

Manufacturer : SVAN

Model : 955 **Serial No.** : 27302

Test Conditions

Date of Test : 8-Jan-13 **Supply Voltage :** --

Ambient Temperature : (23 ± 3)°C **Relative Humidity :** (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure: Z01.

Test Results

All results were within the IEC 61672 Type1, IEC 1260 Class1 and manufacturer's specification.

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

Main Test equipment used:

Equipment No.	Description	Cert. No.	Traceable to
S017	Multi-Function Generator	C127181	SCL-HKSAR
S024	Sound Level Calibrator	28588	NIM-PRC & SCL-HKSAR

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

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

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

Calibrated by : P. F. Wong

Approved by : Dorothy Cheuk

Date: 8-Jan-13

This Certificate is issued by:
Hong Kong Calibration Ltd.
Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street,Kwai Chung, NT,Hong Kong.
Tel: 2425 8801 Fax: 2425 8646

E

Calibration Certificate

Results :

1. **Self-generated noise:** 2.0 dBA (Mfr's Spec (Electrical) ≤14 dBA)

2. **Acoustical signal test**

UUT Setting				Applied Value (dB)	UUT Reading (dB)	
Range (dB)	Frequency Weighting	Time Weighting	1/1 Octave Filter		Before adjust	After adjust
25-120	A	F	OFF	94.0	--	93.5
		S	OFF		--	93.5
	C	F	OFF		--	93.5
	A	F	OFF	114.0	--	113.9
		S	OFF		--	113.9
	C	F	OFF		--	113.9
	A	F	ON	94.0	--	93.5
	A	F	ON	114.0	--	113.9
45-139	A	F	OFF	94.0	*91.6	93.5
		S	OFF		--	93.5
	C	F	OFF		--	93.5
	A	F	OFF	114.0	--	113.9
		S	OFF		--	113.9
	C	F	OFF		--	113.9
	A	F	ON	94.0	--	93.5
	A	F	ON	114.0	--	113.9

Mfr's Spec. : ± 0.7 dB
Uncertainty : ± 0.1 dB

3 **Electrical signal tests of frequency weightings** (A weighting)

Frequency	Attenuation (dB)	IEC 61672 Type 1 Spec.
31.5 Hz	-39.5	- 39.4 dB, ± 2 dB
63 Hz	-26.5	- 26.2 dB, ± 1.5 dB
125 Hz	-16.2	- 16.1 dB, ± 1.5 dB
250 Hz	-8.7	- 8.6 dB, ± 1 dB
500 Hz	-3.3	- 3.2 dB, ± 1.4 dB
1 kHz	0.0 (Ref)	0 dB, ± 1.1 dB
2 kHz	+1.2	+ 1.2 dB, ± 1.6 dB
4 kHz	+1.0	+ 1.0 dB, ± 1.6 dB
8 kHz	-1.1	- 1.1 dB, + 2.1 dB ~ -3.1 dB
16 kHz	-6.9	- 6.6 dB, + 3.5 dB ~ - 17.0 dB

Uncertainty : ± 0.1 dB

Calibration Certificate

4. Frequency & Time weightings at 1 kHz

4.1 Frequency Weighting (Fast)

UUT Setting	Applied Value (dB)	UUT Reading (dB)	Difference (dB)	IEC 61672 Type 1 Spec.
A	94.0	93.5 (Ref.)	- -	± 0.4 dB
C	94.0	93.5	0.0	

4.2 Time Weighting (A-weighted)

UUT Setting	Applied Value (dB)	UUT Reading (dB)	Difference (dB)	IEC 61672 Type 1 Spec.
Fast	94.0	93.5 (Ref.)	- -	± 0.3 dB
Slow	94.0	93.5	0.0	
Time-averaging	94.0	93.5	0.0	

Uncertainty : ± 0.1 dB

5. Level linearity on the reference level range

UUT Range	Applied Value (dB)	UUT Reading (dB)	Difference (dB)	IEC 61672 Type 1 Spec.
140 dB (Ref Level)	137.0	136.5	0.0	± 1.1 dB
	136.0	135.5	0.0	
	135.0	134.5	0.0	
	134.0	133.5	0.0	
	129.0	128.5	0.0	
	124.0	123.5	0.0	
	119.0	118.5	0.0	
	114.0	113.5	0.0	
	109.0	108.5	0.0	
	104.0	103.5	0.0	
	99.0	98.5	0.0	
	94.0	93.5 (Ref)	--	
	89.0	88.5	0.0	
	84.0	83.5	0.0	
	79.0	78.5	0.0	
	74.0	73.5	0.0	
	69.0	68.5	0.0	
	64.0	63.5	0.0	
	59.0	58.5	0.0	
	54.0	53.5	0.0	
	49.0	48.4	0.1	
	48.0	47.4	0.1	

Uncertainty : ± 0.1 dB

Calibration Certificate

6. Toneburst response (4kHz)

UUT Setting	Tone Burst Duration(ms)	UUT Reading(dB)	Difference (dB)	IEC 61672 Type 1 Spec.
Fast	Steady	137.0(Ref)	--	--
	200	136.0	-1.0	-1.0 ± 0.8dB
	2	118.9	-18.1	-18.0, +1.3 dB ~ -1.8 dB
	0.25	109.9	-27.1	-27.0, +1.3 dB ~ -3.3 dB
Slow	Steady	137.0(Ref)	--	--
	200	129.5	-7.5	-7.4 ± 0.8dB
	2	109.9	-27.1	-27.0, +1.3 dB ~ -3.3 dB
Time averaging	Steady	137.0(Ref)	--	--
	200	130.0	-7.0	-7.0±0.8dB
	2	110.8	-26.2	-27.0, +1.3 dB ~ -1.8 dB
	0.25	102.0	-35.0	-36.0, +1.3 dB ~ -3.3 dB

Uncertainty : ± 0.1 dB

7. Peak C sound level (140 dB Range, C-weighted, Fast)

Freq(Hz)	Signal Type	Indication of overload	UUT reading (dB)	Difference (dB)	IEC 61672 Type 1 Spec.
8000	Steady	--	132.0	--	3.2 ± 2.4 dB
	Complete-cycle	No	135.3	3.3 dB	
500	Steady	--	132.0	--	2.4 ± 1.4 dB
	+ve half-cycle	No	129.3	2.7 dB	
	-ve half-cycle	No	129.1	2.9 dB	

Uncertainty : ± 0.1 dB

Calibration Certificate

8. Overload indication (140 dB range, A-weighted, Time-average, 4kHz)

UUT Reading at overload (dB)		Difference (dB)	IEC 61672 Type 1 Spec.
+ ve one half cycle	- ve one half cycle		
137.0	138.5	1.5	< 1.8 dB

The overload indicator latched on until reset

Uncertainty : ± 0.1 dB

9. Filter Characteristics

9.1 1/1 – Octave Filter

Frequency	Attenuation (dB)	IEC 1260 Class 1 (dB)
125 Hz	-76.4	< - 61
250 Hz	-70.5	< - 42
500 Hz	-36.3	< - 17.5
707 Hz	-4.3	- 2 ~ - 5
1 kHz (Ref)	--	--
1.414 kHz	-2.1	- 2 ~ - 5
2 kHz	-50.6	< - 17.5
4 kHz	-82.3	< - 42
8 kHz	-82.5	< - 61

Uncertainty : ± 0.25 dB

Remarks : 1. UUT : Unit-Under-Test
2. The uncertainty claimed is for a confidence probability of not less than 95%.
3. Atmospheric Pressure : 1010 hPa.
4. Preamplifier model : SV 12L , S/N : 25732
5. Firmware Version: 6.12.4
6. Power Supply Check: OK
7. The UUT was adjusted with the supplied sound calibrator at the reference sound pressure level before the calibration.
8. *Out of specification.

---------- END ----------

Hong Kong Calibration Ltd.
香港校正有限公司

Calibration Certificate

Certificate No. **28554** Page 1 of 2 Pages

Customer : Environmental Pioneers and Solutions Limited

Address : Flat A, 19/F., Chai Wan Industrial Centre Building, 21 Lee Chung Street, Chai Wan, HK.

Order No. : Q23300 **Date of receipt :** 11-Dec-12

Item Tested

Description : Sound Level Calibrator

Manufacturer : Svantek

Model : SV30A **Serial No.** : 29085

Test Conditions

Date of Test : 3-Jan-13 **Supply Voltage** : --

Ambient Temperature : (23 ± 3)°C **Relative Humidity :** (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure : F21, Z02.

Test Results

All results were within the IEC 942 Class1 specification.

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

Main Test equipment used:

Equipment No.	Description	Cert. No.	Traceable to
S014	Spectrum Analyzer	13535	NIM-PRC & SCL-HKSAR
S024	Sound Level Calibrator	28588	NIM-PRC & SCL-HKSAR
S041	Universal Counter	28347	SCL-HKSAR
S206	Sound Level Meter	16338	SCL-HKSAR

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

The test equipment used for calibration are traceable to International System of Units (SI).
The test results apply to the above Unit-Under-Test only

Calibrated by : P. F. Wong

Approved by : Dorothy Cheuk

Date: 3-Jan-13

This Certificate is issued by:
Hong Kong Calibration Ltd.
Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.
Tel: 2425 8801 Fax: 2425 8646

E

Calibration Certificate

Certificate No. 28554

Results :

1. Level Accuracy

UUT Nominal Value (dB)	Measured Value (dB)	IEC 942 Class 1 Spec.
94	94.03	± 0.3 dB
114	114.02	

Uncertainty : ± 0.2 dB

2. Frequency

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

Uncertainty : $\pm 3.6 \times 10^{-6}$

3. Level Stability : 0.0 dB
IEC 942 Class 1 Spec. : ± 0.1 dB
Uncertainty : ± 0.01 dB

4. Total Harmonic Distortion : < 0.1 %
IEC 942 Class 1 Spec. : < 3 %
Uncertainty : ± 2.3 % of reading

Remark : 1. UUT : Unit-Under-Test
2. The above measured values are the mean of 3 measurements.
3. The uncertainty claimed is for a confidence probability of not less than 95%.
4. Atmospheric Pressure : 1010 hPa.

---------- END ----------

ALS Technichem (HK) Pty Ltd

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT:	MR ALLEN CHAN	**WORK ORDER:**	HK1302895
CLIENT:	ENVIRONMENTAL PIONEERS & SOLUTIONS LIMITED	**LABORATORY:**	HONG KONG
ADDRESS:	FLAT A, 19/F, CHAI WAN INDUSTRIAL BUILDING, 20 LEE CHUNG STREET, CHAI WAN, HONG KONG	**DATE RECEIVED:**	01/02/2013
		DATE OF ISSUE:	15/02/2013

COMMENTS

It is certified that the item under calibration/checking has been calibrated/checked by corresponding calibrated equipment in the laboratory.
Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal aceptance criteria of ALS will be followed.

Scope of Test:	Conductivity, Dissolved Oxygen, pH, Temperature and Turbidity
Description:	WATER QUALITY MULTI-METER
Brand Name:	TOA DKK
Model No.:	WMS-24
Serial No.:	685940
Equipment No.:	--
Date of Calibration:	08 February, 2013

NOTES

This is the Final Report and supersedes any preliminary report with this batch number.
Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

ISSUING LABORATORY: HONG KONG

Address

ALS Technichem (HK) Pty Ltd

11/F Chung Shun Knitting Centre
1-3 Wing Yip Street
Kwai Chung
HONG KONG

Phone: 852-2610 1044
Fax: 852-2610 2021
Email: hongkong@alsglobal.com

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1302895
Date of Issue: 15/02/2013
Client: ENVIRONMENTAL PIONEERS & SOLUTIONS LIMITED

Description: WATER QUALITY MULTI-METER
Brand Name: TOA DKK
Model No.: WMS-24
Serial No.: 685940
Equipment No.: --
Date of Calibration: 08 February, 2013 Date of next Calibration: 08 May, 2013

Parameters:

Conductivity

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

Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
146.9	143.0	-2.7
6667	7100	6.5
12890	13100	1.6
58670	60400	2.9
	Tolerance Limit (±%)	10.0

Dissolved Oxygen

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

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
3.14	3.07	-0.07
6.20	6.29	0.09
8.54	8.60	0.06
	Tolerance Limit (±mg/L)	0.20

pH Value

Method Ref: APHA 21st Ed. 4500H:B

Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	4.00	0.00
7.0	6.89	-0.11
10.0	9.91	-0.09
	Tolerance Limit (±pH unit)	0.20

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)
10.0	10.3	0.3
22.0	21.3	-0.7
38.0	37.9	-0.1
	Tolerance Limit (±°C)	2.0

Turbidity

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

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.0	--
4	4.3	7.5
40	38.9	-2.8
80	84.4	5.5
400	391.0	-2.3
800	782.5	-2.2
	Tolerance Limit (±%)	10.0

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

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

Hong Kong Calibration Ltd.
香港校正有限公司

Calibration Certificate

Certificate No. **27765** Page 1 of 2 Pages

Customer : Environmental Pioneers and Solutions Limited

Address : Flat A, 19/F., Chai Wan Industrial Centre Building, 20 Lee Chung Street, Chai Wan, HK.

Order No. : Q22905 **Date of receipt :** 9-Nov-12

Item Tested

Description : Protable Level-Velocity Logger

Manufacturer : Greyline

Model : Stingray **Serial No. :** 45525

Test Conditions

Date of Test : 10-Dec-12 **Supply Voltage :** --

Ambient Temperature : (23 ± 3)°C **Relative Humidity :** (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure: V12, T03, M07.

Test Results

All results were within the tolerance(s).

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

Main Test equipment used:

Equipment No.	Description	Cert. No.	Traceable to
S179	Std. Tape	20976	NIM-PRC
S136A	Stop Watch	26076	SCL-HKSAR
S214A	Std. Thermo-Hygrometer	21518	SCS-SWISS, NIM-PRC

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

The test equipment used for calibration are traceable to International System of Units (SI).
The test results apply to the above Unit-Under-Test only

Calibrated by : S. K. Tang

Approved by : Alan Chu

Date: 10-Dec-12

This Certificate is issued by:
Hong Kong Calibration Ltd.
Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.
Tel: 2425 8801 Fax: 2425 8646

Calibration Certificate

Certificate No. 27765

Results :

1. Flow Rate

Applied Value (Ft/s)	UUT Reading (Ft/s)	Tolerance	Uncertainty
1.34	1.4	± 5 % f.s	± 1 %

2. Level

Applied Value (Ft)	UUT Reading (Ft)	Tolerance	Uncertainty
1.00	1.0	± 5 % f.s.	± 0.1 %
2.00	2.0		
3.00	3.0		
4.00	4.0		

3. Temperature

Applied Value (℃)	UUT Reading (℃)	Tolerance	Uncertainty
23.0	22	± 2 ℃	± 0.2 ℃

Remarks : 1. UUT : Unit-Under-Test
2. The uncertainty claimed is for a confidence probability of not less than 95%.
3. Sensor Used : Model : QZ02L-UT-01-PS
S/N : 10D18289

---------- END ----------

Appendix D: Construction Noise Monitoring Data

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

Noise Monitoring Data Sheet

Monitoring Location		M1	AL1
Monitoring Method		Façade	Façade
Date of Monitoring		6/3/2013	6/3/2013
Weather Condition		Sunny	Sunny
Measurement Start Time (hh:mm)		14:10	14:45
Measurement Time Length (mins)		30 mins	
SLM Model & S/N		SVAN 955	
Wind Speed (m/s)		0.2	0.2
Measurement Results	L_{eq} (dB(A))	62.3	67.1
	L_{10} (dB(A))	65.4	68.6
	L_{90} (dB(A))	53.1	49.2
Major Construction Noise Source(s) During Monitoring		The measured noise level was dominated by the background noise in the immediate vicinity of the monitoring location due to its large distance from the construction activities	The measured noise level was dominated by the background noise in the immediate vicinity of the monitoring location due to its large distance from the construction activities
Other Noise Source(s) During Monitoring		– Background Noise – Traffic Noise	– Background Noise – Traffic Noise

	Name	Signature	Date
Perpared by:	Lau Kai Chung	**Lau Kai Chung**	6/3/2013

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

Noise Monitoring Data Sheet

Monitoring Location		M1	AL1
Monitoring Method		Façade	Façade
Date of Monitoring		13/3/2013	13/3/2013
Weather Condition		Sunny	Sunny
Measurement Start Time (hh:mm)		14:00	14:40
Measurement Time Length (mins)		30 mins	
SLM Model & S/N		SVAN 955	
Wind Speed (m/s)		0.2	0.2
Measurement Results	L_{eq} (dB(A))	61.6	66.2
	L_{10} (dB(A))	62.8	67.9
	L_{90} (dB(A))	50.9	54.2
Major Construction Noise Source(s) During Monitoring		The measured noise level was dominated by the background noise in the immediate vicinity of the monitoring location due to its large distance from the construction activities	The measured noise level was dominated by the background noise in the immediate vicinity of the monitoring location due to its large distance from the construction activities
Other Noise Source(s) During Monitoring		– Background Noise – Traffic Noise	– Background Noise – Traffic Noise

	Name	Signature	Date
Perpared by:	Lau Kai Chung	**Lau Kai Chung**	13/3/2013

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

Noise Monitoring Data Sheet

Monitoring Location		M1	AL1
Monitoring Method		Façade	Façade
Date of Monitoring		20/3/2013	20/3/2013
Weather Condition		Sunny	Sunny
Measurement Start Time (hh:mm)		16:00	16:35
Measurement Time Length (mins)		30 mins	
SLM Model & S/N		SVAN 955	
Wind Speed (m/s)		0.4	0.4
Measurement Results	L_{eq} (dB(A))	61.9	65.2
	L_{10} (dB(A))	62.8	66.4
	L_{90} (dB(A))	48.1	56.6
Major Construction Noise Source(s) During Monitoring		The measured noise level was dominated by the background noise in the immediate vicinity of the monitoring location due to its large distance from the construction activities	The measured noise level was dominated by the background noise in the immediate vicinity of the monitoring location due to its large distance from the construction activities
Other Noise Source(s) During Monitoring		– Background Noise – Traffic Noise	– Background Noise – Traffic Noise

	Name	Signature	Date
Perpared by:	Lau Kai Chung	**Lau Kai Chung**	20/3/2013

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

Noise Monitoring Data Sheet

Monitoring Location		M1	AL1
Monitoring Method		Façade	Façade
Date of Monitoring		27/3/2013	27/3/2013
Weather Condition		Sunny	Sunny
Measurement Start Time (hh:mm)		14:00	14:35
Measurement Time Length (mins)		30 mins	
SLM Model & S/N		SVAN 955	
Wind Speed (m/s)		0.4	0.4
Measurement Results	L_{eq} (dB(A))	62.8	64.1
	L_{10} (dB(A))	63.1	65.8
	L_{90} (dB(A))	50.3	48.1
Major Construction Noise Source(s) During Monitoring		The measured noise level was dominated by the background noise in the immediate vicinity of the monitoring location due to its large distance from the construction activities	The measured noise level was dominated by the background noise in the immediate vicinity of the monitoring location due to its large distance from the construction activities
Other Noise Source(s) During Monitoring		– Background Noise – Traffic Noise	– Background Noise – Traffic Noise

	Name	Signature	Date
Perpared by:	Lau Kai Chung	**Lau Kai Chung**	27/3/2013

Appendix E: Water Quality Monitoring Data

Remark:

Red highlighting: The value is exceeding limit level

Yellow highlighting: The value is exceeding action levele

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling： 1/3/2013

Weather： Sunny

Monitoring Location	W1	W2	C2
Time (hhmm)	14:30	16:05	13:30
Tide Mode	Mid-ebb		N/A
Water Depth (m)	<1	<1	<1
pH value	8.30	7.67	8.30
Temperature (^{o}C)	22.7	22.4	22.7
Turbidity (NTU)	3.2	2.5.	1.5
DO (mg/L)	6.60	6.78	7.60
DO Saturation (%)	75%	75%	87%
Suspended Solids (mg/L)	5.0	2.4	2.0

Remark or Observation：

	Name	Signature	Date
Prepared By：	Lau kai chung	**Lau kai chung**	1/3/2013

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling : 4/3/2013

Weather : Sunny

Monitoring Location	**W1**	**W2**	**C2**
Time (hhmm)	17:00	16:10	11:33
Tide Mode	Mid-ebb		N/A
Water Depth (m)	<1	<1	<1
pH value	8.90	7.69	10.40
Temperature (^{o}C)	21.9	22.4	21.8
Turbidity (NTU)	4.4	3.3	2.5
DO (mg/L)	6.90	6.87	7.50
DO Saturation (%)	78%	80%	85%
Suspended Solids (mg/L)	4.0	3.2	2.0

Remark or Observation :

	Name	**Signature**	**Date**
Prepared By :	Lau kai chung	**Lau kai chung**	4/3/2013

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling : 6/3/2013

Weather : Sunny

Monitoring Location	**W1**	**W2**	**C1**
Time (hhmm)	10:21	14:00	14:10
Tide Mode	Mid-flood		
Water Depth (m)	<1	<1	<1
pH value	8.50	7.98	7.81
Temperature (^{o}C)	23	21.3	21.5
Turbidity (NTU)	4.70	3.6	2.90
DO (mg/L)	6.30	8.35	8.56
DO Saturation (%)	74%	98%	98%
Suspended Solids (mg/L)	24.0	5.2	3.2

Remark or Observation :

	Name	**Signature**	**Date**
Prepared By :	Lau kai chung	**Lau kai chung**	6/3/2013

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling : 8/3/2013

Weather : Sunny

Monitoring Location	**W1**	**W2**	**C2**
Time (hhmm)	10:21	11:00	10:28
Tide Mode	Mid-ebb		N/A
Water Depth (m)	<1	<1	<1
pH value	9.00	7.88	9.50
Temperature (^{o}C)	24.6	23.1	24.4
Turbidity (NTU)	5.0	1.8	3.1
DO (mg/L)	6.00	7.45	6.40
DO Saturation (%)	70%	92%	91%
Suspended Solids (mg/L)	7.0	5.0	2.0

Remark or Observation :

	Name	**Signature**	**Date**
Prepared By :	Lau kai chung	**Lau kai chung**	8/3/2013

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling : 11/3/2013

Weather : Sunny

Monitoring Location	**W1**	**W2**	**C2**
Time (hhmm)	11:30	13:30	11:00
Tide Mode	Mid-ebb		N/A
Water Depth (m)	<1	<1	<1
pH value	8.30	7.96	9.10
Temperature (^{o}C)	22.7	22.8	22.4
Turbidity (NTU)	8.3	3.0	1.6
DO (mg/L)	6.60	8.16	7.20
DO Saturation (%)	77%	106%	84%
Suspended Solids (mg/L)	9.0	9.8	6.0

Remark or Observation :

	Name	**Signature**	**Date**
Prepared By :	Lau kai chung	**Lau kai chung**	11/3/2013

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling : 13/3/2013

Weather : Sunny

Monitoring Location	**W1**	**W2**	**C2**
Time (hhmm)	10:49	14:00	10:21
Tide Mode	Mid-ebb		N/A
Water Depth (m)	<1	<1	<1
pH value	9.00	7.68	9.90
Temperature (^{o}C)	24.7	21.7	24.6
Turbidity (NTU)	10.7	4.1	2.3
DO (mg/L)	5.60	7.98	6.60
DO Saturation (%)	68%	106%	79%
Suspended Solids (mg/L)	17.0	8.0	4.0

Remark or Observation :

	Name	**Signature**	**Date**
Prepared By :	Lau kai chung	**Lau kai chung**	13/3/2013

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling： 15/3/2013

Weather： Sunny

Monitoring Location	**W1**	**W2**	**C2**
Time (hhmm)	14:02	16:00	9:44
Tide Mode	Mid-ebb		N/A
Water Depth (m)	<1	<1	<1
pH value	9.50	7.65	10.20
Temperature (^{o}C)	22.9	22.4	23.4
Turbidity (NTU)	4.6	2.7	0.8
DO (mg/L)	6.50	6.80	6.70
DO Saturation (%)	73%	75%	80%
Suspended Solids (mg/L)	11.0	1.0	9.0

Remark or Observation：

	Name	**Signature**	**Date**
Prepared By：	Lau kai chung	**Lau kai chung**	15/3/2013

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling : 18/3/2013

Weather : Sunny

Monitoring Location	**W1**	**W2**	**C2**
Time (hhmm)	9:24	16:00	9:47
Tide Mode	Mid-ebb		N/A
Water Depth (m)	<1	<1	<1
pH value	9.00	7.78	10.30
Temperature (^{o}C)	22.8	22.7	23
Turbidity (NTU)	3.1	2.6	0.6
DO (mg/L)	7.20	7.55	7.50
DO Saturation (%)	85%	85%	48%
Suspended Solids (mg/L)	9.0	1.0	2.0

Remark or Observation :

	Name	**Signature**	**Date**
Prepared By :	Lau kai chung	**Lau kai chung**	18/3/2013

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling： 20/3/2013

Weather： Sunny

Monitoring Location	**W1**	**W2**	**C2**
Time (hhmm)	17:00	16:00	09:15
Tide Mode	Mid-ebb		N/A
Water Depth (m)	<1	<1	<1
pH value	8.60	7.85	9.70
Temperature (^{o}C)	24.2	22.1	24.3
Turbidity (NTU)	14.5	2.4	7.3
DO (mg/L)	5.40	7.90	6.30
DO Saturation (%)	65%	106%	76%
Suspended Solids (mg/L)	11.0	1.0	10.0

Remark or Observation：

	Name	**Signature**	**Date**
Prepared By：	Lau kai chung	**Lau kai chung**	20/3/2013

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling : 22/3/2013

Weather : Sunny

Monitoring Location	**W1**	**W2**	**C2**
Time (hhmm)	17:00	10:10	16:30
Tide Mode	Mid-ebb		N/A
Water Depth (m)	<1	<1	<1
pH value	8.80	7.83	10.20
Temperature (^{o}C)	25.7	21.7	24.8
Turbidity (NTU)	11.7	2.5	10.9
DO (mg/L)	6.60	7.56	7.00
DO Saturation (%)	81%	90%	83%
Suspended Solids (mg/L)	10.0	1.0	4.0

Remark or Observation :

	Name	**Signature**	**Date**
Prepared By :	Lau kai chung	**Lau kai chung**	22/3/2013

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling : 25/3/2013

Weather : Rainy

Monitoring Location	**W1**	**W2**	**C2**
Time (hhmm)	16:05	12:40	10:30
Tide Mode	Mid-ebb		N/A
Water Depth (m)	<1	<1	<1
pH value	8.60	7.59	9.60
Temperature (^{o}C)	24.8	21	24.2
Turbidity (NTU)	13.3	1.9	2.7
DO (mg/L)	4.70	6.94	5.80
DO Saturation (%)	57%	91%	69%
Suspended Solids (mg/L)	15.0	1.0	4.0

Remark or Observation :

	Name	**Signature**	**Date**
Prepared By :	Lau kai chung	**Lau kai chung**	25/3/2013

Environmental Pioneers & Solutions Limited
Water Quality Monitoring - Summary of On-Site Measurement Results

Date of Sampling : 27/3/2013

Weather : Rainy

Monitoring Location	**W1**	**W2**	**C2**
Time (hhmm)	15:15	14:00	11:30
Tide Mode	Mid-ebb		N/A
Water Depth (m)	<1	<1	<1
pH value	8.90	7.36	9.80
Temperature (^{o}C)	23.1	21.3	23.1
Turbidity (NTU)	9.7	2.6	2.8
DO (mg/L)	7.20	7.89	7.60
DO Saturation (%)	84%	83%	89%
Suspended Solids (mg/L)	15.0	1.0	4.0

Remark or Observation :

	Name	**Signature**	**Date**
Prepared By :	Lau kai chung	**Lau kai chung**	27/3/2013

Appendix F: Hydrological Characteristics Monitoring Data

Location	Position	Tide	Date**	Time	Weather	Water Depth (m)*	Water Flow (m/s)	Water Flow (m^3/s)
H1	Mid	Flood	1-Mar-2013	10:05	Sunny	0.48	0.12	0.150
H1	Mid	Flood	8-Mar-2013	15:50	Sunny	0.36	0.18	0.225
H1	Mid	Flood	15-Mar-2013	9:50	Sunny	0.36	0.06	0.075
H1	Mid	Flood	22-Mar-2013	14:30	Rainy	0.6	0.24	0.300
H2	Mid	Flood	1-Mar-2013	9:30	Sunny	0.36	0.12	0.754
H2	Mid	Flood	8-Mar-2013	15:20	Sunny	0.3	0.24	1.507
H2	Mid	Flood	15-Mar-2013	9:25	Sunny	0.48	0.12	0.754
H2	Mid	Flood	22-Mar-2013	14:00	Rainy	0.48	0.24	1.507
H1	Mid	Ebb	1-Mar-2013	15:55	Sunny	0.12	0.12	0.150
H1	Mid	Ebb	8-Mar-2013	10:50	Sunny	0.24	0.06	0.075
H1	Mid	Ebb	15-Mar-2013	15:50	Sunny	0.12	0.12	0.150
H1	Mid	Ebb	22-Mar-2013	10:00	Rainy	0.24	0.30	0.375
H2	Mid	Ebb	1-Mar-2013	15:25	Sunny	0.24	0.18	1.130
H2	Mid	Ebb	8-Mar-2013	10:25	Sunny	0.18	0.12	0.754
H2	Mid	Ebb	15-Mar-2013	15:15	Sunny	0.24	0.12	0.754
H2	Mid	Ebb	22-Mar-2013	9:30	Rainy	0.24	0.24	1.507

Appendix G: Landscape and Visual Monitoring Photos

Photo 1 – Construction in a new section of road next to the main entrance of Area A was commenced.

Photo 2 – The main entrance of Area A was relocated to the north of the previous one.

Photo 3 – No discharge of muddy water was observed in Area C.

Photo 4 – Overall view of the transplanted tree U58 *Grevillea robusta*.

Photo 5 – Resprouts from the remained stump of U68.

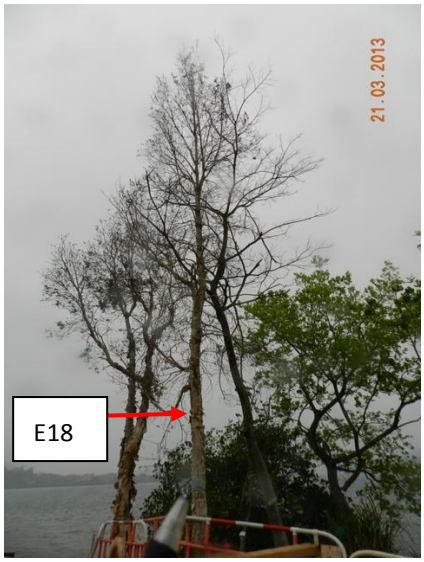


Photo 6 – Poor condition of relocated tree E18 (*Melaleuca cajuputi* subsp. *cumingiana*).

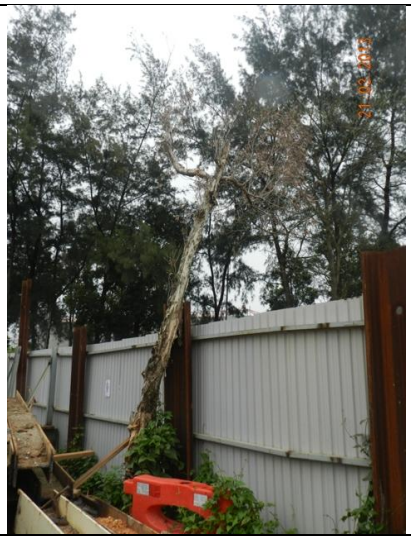
	
Photo 7 – Fair health condition of relocated tree E16 (*Bombax ceiba*).	Photo 8 – E97 relocated in the northeastern part of Area A was found in poor condition
	
Photo 9 – Severe leaning tree trunk of the transplanted tree U61 was observed in Area B.	Photo 10 – Fairly poor condition of the transplanted tree U55 in Area B.
	
Photo 11 – Anti-grass film covering almost of the whole trunk flare of U55 and its surrounding soil ground in Area B.	Photo 12 – Poor condition of the relocated tree T102 as observed within the Phase 2 works area of Area B.

	
Photo 13 – No recovery sign of the relocated tree U34 in Area B was observed.	Photo 14 – No recovery sign of the relocated tree U35 was observed.
	
Photo 15 – No recovery sign of the relocated tree U37 was observed.	Photo 16 – The relocated tree U77 in Area B was suspected dead as no foliage was found in the canopy, and soil was deposited on its trunk.

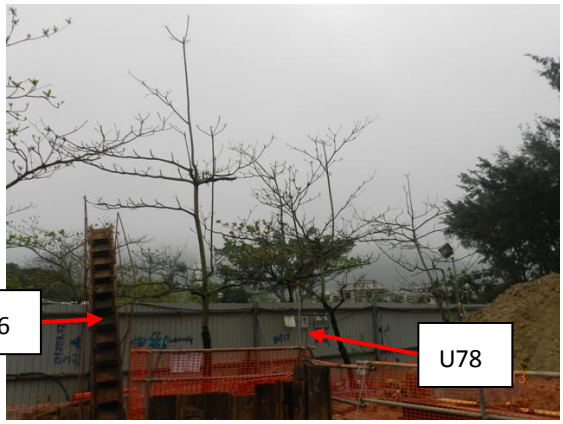



Photo 17 – Poor health condition was observed in the canopies of the relocated trees U76 and U78 in Area B.	Photo 18 – New leaves and buds were found on the canopy of U78.

Photo 19 – New leaves and buds were observed on the canopy of the relocated trees U79 in Area B.

Appendix H:

A)

The recommended mitigation measures of EM&A manual (revision 3)

B)

Implementation status of environmental protection and mitigation measures

A) The recommended mitigation measures of EM&A manual (revision 3)

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
A		***Noise Impact***					
S 3.30	2.18	Good Site Practice: ▪ Only well-maintained plant shall be operated on-site and plant shall be serviced regularly during the construction program ▪ Silencers or mufflers on construction equipment shall be utilized and shall be properly maintained during the construction program ▪ Mobile plant, if any, shall be sited as far from NSRs as possible ▪ Machines and plant (such as	To minimize construction noise impacts	Contractor	Works areas	Construction phase	EIAO-TM NCO

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		trucks) that may be in intermittent use shall be shut down between work periods or shall be throttled down to a minimum ▪ Plant known to emit noise strongly in one direction shall, wherever possible, be orientated so that the noise is directed away from the nearby NSRs ▪ Material stockpiles and other structures shall be effectively utilized, wherever practicable, in screening noise from on-site construction activities.					
S 3.31 - 3.32	2.19	Use of quieter PME	To minimize construction noise impacts	Contractor	Works areas	Construction phase	EIAO-TM NCO
S 3.33 – 3.34	2.20-2. 21	Use of temporary noise barrier	To minimize construction noise impacts	Contractor	Works areas as shown in Figure	Construction phase	EIAO-TM NCO

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
3.36-3.38	2.23-2.24				3.5		
S 3.35 and Table 3.6	2.22	Use of alternative quieter construction method (the Low Impact Method)	To minimize construction noise impacts	Contractor	Part of the works area for pipe laying in Wai Ha (refer to Figure 3.5)	Construction phase	EIAO-TM NCO
3.36 -3.38	2.23-2.24	Use of noise enclosure	To minimize construction noise impacts	Contractor	Part of the works area for pipe laying in Wai Ha (refer to Figure 3.5)	Construction phase	EIAO-TM NCO
B		***Air Quality Impact***					
S4.16	3.5	Implementation of mitigation measures stipulated in the Air Pollution Control (Construction Dust) Regulation and good site practices including but not limited to the following:	To minimize construction dust impacts	Contractor	Construction Sites	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		▪ Use of regular watering to reduce dust emissions from exposed site surfaces and unpaved road, with complete coverage, particularly during dry weather; ▪ Use of frequent watering for particularly dusty static construction areas and areas close to ASRs; ▪ Tarpaulin covering of all dusty vehicle loads transported to, from and between site location; ▪ Establishment and use of vehicle wheel and body washing facilities at the exit points of the site; ▪ Routing of vehicles and					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		positioning of construction plant should be at the maximum possible distance from ASRs. ▪ Stockpiled excavated materials should be covered with tarpaulin, and should be removed off-site within 24 hours to avoid any odour nuisance arising.					
C		***Water Quality Impact***					
S5.29	4.5	Construction Site Run-off and Drainage: ▪ Before commencing any site formation work, all sewer and drainage connections shall be sealed to prevent debris, soil, sand etc. from entering public	To minimize water quality impacts	Contractor	Works sites	Construction phase	ProPECC PN 1/94 Construction Site Drainage

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		sewers/drains. ▪ Temporary ditches shall be provided to facilitate run-off discharge into appropriate watercourses, via a silt retention pond. No site run-off shall enter the fishponds at Shuen Wan. ▪ Sand/silt removal facilities such as sand traps, silt traps and sediment basins shall be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standard under the Water Pollution Control Ordinance. The design of silt removal facilities shall be based on the guidelines provided in ProPECC PN 1/94. All drainage					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		facilities and erosion and sediment control structures shall be inspected monthly and maintained to ensure proper and efficient operation at all times and particularly during rainstorms. ▪ Water pumped out from excavated pits shall be discharged into silt removal facilities. ▪ During rainstorms, exposed slope/soil surfaces shall be covered by a tarpaulin or other means. Other measures that need to be implemented before, during, and after rainstorms as summarized in ProPECC PN 1/94 shall be followed.					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		▪ Exposed soil areas shall be minimized to reduce potential for increased siltation and contamination of runoff. ▪ Earthwork final surfaces shall be well compacted and subsequent permanent work or surface protection shall be immediately performed to reduce the potential of soil erosion. ▪ Open stockpiles of construction materials or construction wastes on-site shall be covered with tarpaulin or similar fabric during rainstorms.					
S5.30	4.7	Further precautionary measures during rainy season:	To minimize water quality impacts to the designated Conservation Area	Contractor	Works areas near the Conservation Area	Rainy seasons during construction	EIAO-TM Water Pollution Control Ordinance

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		▪ For the construction of the box culvert next to the existing channel of the Wai Ha River, sand bags should be deployed around the boundary of the works trench to prevent muddy water ingress into the adjacent CA or Wai Ha River. Sand bags should also be used to surround the excavated trench. Generally, the sand bags will be placed up to a height of 300mm to provide adequate allowance for the built-up water level during rainstorm event. With sand bags in place, surface runoff will be intercepted and flow to Wai Ha River or collected by the existing drainage system as usual. ▪ For the construction of the box				phase	(WPCO)

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		culvert in the extreme northeast corner of Shuen Wan Marsh Conservation Area sand bags should be deployed along the limit of the works area to prevent muddy water ingress into the CA. Sand bags should be placed to a height of at least 300mm from ground level and +2.5 mPD (whichever is greater) to provide adequate allowance for the built-up water level during rainstorm events. Unpolluted surface runoff within the works area should then be collected and directed into the existing drainage system. ▪ Sheet-piles, which would be installed around the works trench near the Conservation Area, would					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		be extended above ground level for about 2m to serve as hoardings to isolate the works site. ▪ Tarpulin sheets would be used to cover the excavation areas during heavy rainstorms. This would prevent the ingress of rainwater into the trench minimising the risk of muddy water getting into Wai Ha River and the adjacent Conservation Area. ▪ Any concrete washing water would be contained inside the works site surrounded by the extended sheet piles. A pump sump at the bottom of the trench would be provided to pump any excess water during concrete washing.					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		▪ Stockpiling the excavated materials adjacent to the Conservation Area would not be allowed. The excavated materials would be either removed off site immediately after excavation, or stockpile at location(s) away from the Conservation Area. The stockpile locations shall be approved by the site engineer.					
S5.31-S 5.32	4.8-4.9	General Construction Activities: ▪ Debris and refuse generated on-site should be collected, handled and disposed of properly to avoid entering the Wa Ha River and fish ponds at Shuen Wan. Stockpiles of cement and other construction materials should be kept covered	To minimize water quality impacts	Contractor	Works sites	Construction phase	EIAO-TM WPCO

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		when not being used. ▪ Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. To prevent spillage of fuels and solvents to nearby water bodies, all fuel tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank. The bund should be drained of rainwater after a rain event.					
S5.33	4.10	Sewage from Construction workforce: ▪ Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site. A	To minimize water quality impacts	Contractor	Works sites	Construction phase	EIAO-TM WPCO

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		licensed contractor would be responsible for appropriate disposal and maintenance of these facilities.					
S5.34	4.11	River Channel Excavation Works: ▪ The excavation works within the upstream end of the existing river channel of the Wai Ha River for the construction of the proposed box culvert shall be carried out in dry condition. Containment measures such as bunds and barriers shall be used within the affected length of the river channel and the excavation works restricted to within an enclosed dry section of the channel. The excavation works within Wai Ha River shall be restricted to the period from October	To minimize water quality impacts	Contractor	Works sites	Construction phase	EIAO-TM WPCO

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		to April.					
D		***Waste Management Implications***					
S6.20 – 6.22	5.5	Good site practices: ▪ Nomination of approved personnel, such as a site manager, to be responsible for good site practices and making arrangements for collection of all wastes generated at the site and effective disposal to an appropriate facility. ▪ Training of site personnel in proper waste management and chemical waste handling procedures. ▪ Provision of sufficient waste disposal points and regular	To reduce waste management impacts	Contractor	Works sites	Construction phase	ETWB TCW No.19/2005 ETWB TCW No.31/2004

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		collection for disposal. ▪ Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers. ▪ Separation of chemical waste for special handling and appropriate treatment at the Chemical Waste Treatment Facility. ▪ Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors. ▪ A Waste Management Plan					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		should be prepared and submitted to the Engineer for approval. One may make reference to ETWB TCW No. 15/2003 for details. ▪ A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be proposed.					
S6.23-6.24	5.7	Waste reduction measures: ▪ Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal. ▪ To encourage collection of aluminium cans by individual collectors, separate labelled bins	To achieve waste reduction	Contractor	Works sites	Construction phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		shall be provided to segregate this waste from other general refuse generated by the work force. ▪ Any unused chemicals or those with remaining functional capacity shall be recycled. ▪ Maximising the use of reusable steel formwork to reduce the amount of C&D material. ▪ Proper storage and site practices to minimise the potential for damage or contamination of construction materials. ▪ Plan and stock construction materials carefully to minimise amount of waste generated and					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		avoid unnecessary generation of waste.					
S6.25-6.26		Construction & Demolition (C&D) Material: ▪ Excavated material with suitable characteristics/size should be reused on-site as fill material as far as practicable, such as for backfilling of the box culvert and drainage pipe works. ▪ Suitable areas should be designated within the works site boundaries for temporary stockpiling of C&D material. ▪ Within stockpile areas, the following measures should be taken to control potential environmental	To minimize off-site disposal of C&D material To minimize environmental impacts during the handling of C&D material	Contractor	Works sites	Construction phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		impacts or nuisance: - covering material during heavy rainfall; - locating stockpiles to minimize potential visual impacts; and - minimizing land intake of stockpile areas as far as possible. ▪ When disposing C&D material at a public filling area, the material shall only consist of soil, rock, concrete, brick, cement plaster/mortar, inert building debris, aggregates and asphalt. The material shall be free from marine mud, household refuse, plastic, metals, industrial and chemical waste, animal and vegetable matter, and other material considered to be					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		unsuitable by the Filling Supervisor.					
S6.27		Chemical waste: ▪ Contractor should register with the EPD as a Chemical Waste Producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. ▪ Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. ▪ Appropriate labels should be securely attached on each chemical waste container indicating the	To minimize environmental impacts during the handling, transportation and disposal of chemical waste	Contractor	Works sites	Construction phase	EIAO-TM Waste Disposal (Chemical Waste) (General) Regulation

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		corresponding chemical characteristics of the chemical waste, such as explosives, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. ▪ The Contractor should use a licensed collector to transport and dispose of the chemical wastes generated at the Chemical Waste Treatment Centre at Tsing Yi, or other licenced facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.					
S6.28		General refuse: ▪ It should be stored in enclosed bins or compaction units separate from C&D material. ▪ A reputable waste collector	To minimize environmental impacts during the handling and transportation of general refuse	Contractor	Works sites	Construction phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		should be employed by the contractor to remove general refuse from the site, separately from C&D material. ▪ An enclosed and covered area is preferred to reduce the occurrence of 'wind blown' light material.					
E		***Ecological Impact***					
S. 7.95	6.6	▪ Sheet-pilings, which will be installed around the trench of excavation, should be extended above ground level for ~2m to act as hoarding to isolate the works site. ▪ The trenching works for the construction of the proposed box culvert should be carried out in phases, with a trench length of not	To minimize the impacts on the stream and natural river bank	Contractor	Whole site	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		more than 120m in each phase. The trench should be backfilled and compacted with suitable materials upon completion of each phase of the construction works.					
S7.117	6.6	▪ The construction of intercept point of twin cell box culvert at the upstream of Wai Ha River should be confined to only one side of the river bank. ▪ To restore and enhance the ecological value of the stream, the affected river bank should be reinstated to its original condition or lined with rock-filled gabion. ▪ Planting pits should be provided in the gabion bank to allow the re-establishment of riparian vegetation.	To minimize the impacts on the stream and natural river bank	Contractor	Whole site	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		▪ The existing natural riverbed and substrates should be retained and the natural pool-riffle sequence should be re-created in the new channel bed.					
S 7.118	6.7	▪ All works carried out within the the river channel of Wai Ha River should be carried out from October to April, with construction carried out by land-based plant. ▪ Works within river/stream channels should be restricted to an enclosed dry section of the river, with containment measures such as bunds and barriers used within the river to minimize the impacts upon the downstream water body.	To minimise sedimentation/ water quality impacts	Contractor	Whole Site	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		▪ Site runoff should be directed towards regularly cleaned and maintained silt traps and oil/grease separators to minimize the risk of sedimentation and pollution of river water. ▪ The silt and oil/grease separators should be appropriately designed for the local drainage and ground conditions. ▪ To minimize leakage and loss of sediments during excavation in narrow channels, tightly sealed closed grab excavators should be deployed where material to be handled is wet.					
S 7.119	6.8	▪ The construction of the proposed box-culvert would have the potential to directly impact a few	To protect plant species of conservation interest	Contractor/ qualified botanist/horticu	Whole site	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		individual of a plant species of conservation interest (Hong Kong Pavetta, *Pavetta hongkongensis*). The affected individuals should be transplanted to a suitable nearby habitats prior to the construction phase. ▪ A detailed vegetation survey of the affected species of conservation interest should be conducted by a suitably qualified botanist/ecologist to identify the affected individuals in order to provide details for transplantation scheme. ▪ Transplantation should be supervised by a suitably qualified botanist/horticulturalist. A detailed transplantation methodology should be formulated during the detailed design stage of this Project.		lturalist			

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
S 7.120	6.9	▪ Noise mitigation measures such as the use of quieter construction plant and temporary noise barriers should be implemented to minimize disturbance to habitats adjacent to the works areas. ▪ Temporary noise barriers should be used during the construction of the box-culvert along Tung Tsz Road, the floodwater pumping station, the mechanical gate, and drainage pipe to minimize potential construction phase disturbance to ardeids and avifauna foraging in marsh habitat. ▪ Noise generating construction works near the Shuen Wan Egretry SSSI should be avoided as far as practicable during the breeding season (March to June) of the	To minimise disturbance impacts.	Contractor	Whole site	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		ardeids. ▪ Works near the SSSI (i.e. installation of mechanical gate) should be restricted to be executed outside the breeding season by provision of special conditions in the contract document. ▪ Hoardings with minimum height of 2m should be set up along the south side of the proposed box culvert works area adjacent to the marsh, extending at least 20m at both ends, throughout the construction period.					
S 7.121	6.10	▪ Placement of equipment or stockpile in designated works areas and access routes selected on existing disturbed land to minimise disturbance to natural or	To minimise disturbance to habitats.	Contractor	Whole site	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		moderate-high ecological value habitats.					
S 7.121	6.10	▪ Construction activities should be restricted to work areas that would be clearly demarcated. The work areas should be reinstated after completion of the works.	To minimise disturbance to natural habitats outside works area.	Contractor	Whole site	Construction Phase	EIAO-TM
S 7.121	6.10	▪ Waste skips should be provided to collect general refuse and construction wastes. The wastes would be disposed of timely and properly off-site.	To minimise disturbance to habitats.	Contractor	Whole site	Construction Phase	EIAO-TM
S 7.121	6.10	▪ General drainage arrangements should include sediment and oil traps to collect and control construction site run-off.	To minimise sedimentation/ water quality impacts	Contractor	Whole site	Construction Phase	EIAO-TM
S 7.121	6.10	▪ Open burning on works sites is illegal, and should be strictly prohibited.	To prevent accidental hill-fires.	Contractor	Whole site	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
S 7.122	6.11	▪ De-silting should be limited to the dry season.	To minimise sedimentation/ water quality impacts	Maintenance parties of the channel	Whole site	Operation Phase	EIAO-TM
S 7.122	6.11	▪ Waste material produced during de-silting should be disposed of in a timely and appropriate manner.	To minimise sedimentation/ water quality impacts	Maintenance parties of the channel	Whole site	Operation Phase	EIAO-TM
S 7.123	6.12	▪ Planting of trees should be provided within the project area to compensate for the unavoidable loss of approximately 0.08ha secondary woodland habitat due to the Project. ▪ Planting of trees and other vegetation within project area along the banks of Wai Ha River and Tung Tsz Road should be carried out to provide compensation for unavoidable tree-felling and loss of riparian vegetation resulting from the	To compensate the loss of vegetation	Contractor	Whole site	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		Project. ▪ The compensatory planting should make use of native plant species with flowers/fruits attractive to wildlife.					
S 7.124	6.13	▪ Compensation would be required for the loss of a small area of marsh habitat (about 0.30ha) within the CA resulting from the construction of the box-culvert. ▪ An existing low ecological value recreational fishpond on government land adjacent to the marsh would be used as a proposed area (about 0.8ha) for the compensation for the marsh as well as secondary woodland habitats loss (0.08ha). ▪ The pond should be enhanced by removing boardwalks around the	To compensate the loss of marsh habitat and enhance the quality compensatory habitat	Contractor / qualified ecologist	The recreational fish pond located to the southwest of the existing Tung Tsz Nursery	Construction Phase	EIAO-TM

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
		existing pond, and restoring vegetation along the pond bunds, and it would be re-profiled to provide areas of shallow water (approximately 15-50cm deep), creating a suitable foraging habitat for avifauna, particularly ardeids and other waders. ▪ Screen planting of shrubs and trees along the south-eastern bund of the pond should be implemented to minimise disturbance to avifauna and other wildlife from the adjacent recreational fishpond. The enhanced pond is expected to provide a moderate-high ecological value wetland habitat.					

EIA Ref.	EM&A Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measure & Main Concern to Address	Who to implement the measure?	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?
F		***Landscape and Visual***					
Table 8.4	7.6	Visual screen, contaminant/ liaison with nursery, protection of existing trees with works area and construction light are used or practiced to mitigate the impacts during construction phase.	To mitigate the landscape	Contractor	Whole site	Construction	EIAO-TM
Table 8.4	7.7	Viewing area formation, architectural design for pump house, landscape design for pump house, enhancement planting along Tung Tsz Road, sufficient soil depth for enhancement planting, transplanting of trees to adjacent locations, preparation for transplanting and reinstatement of affected area are practiced to mitigate the impacts during operational phase.	To mitigate the landscape and visual impacts during the operational phase.	Contractor	Whole site	Detail Design / Operational Phase	EIAO-TM

Appendix H:

A)

The recommend mitigation measures of EM&A manual (revision 3)

B)

Implementation status of environmental protection and mitigation measures

B) Implementation status of environmental protection and mitigation

EM&A Ref.	Recommended Mitgation Measures	Objectives of the Recommended Measure & main concern to Address	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?	Implementation status
2.18	Use well maintained construction plant	To minimize construction noise impact	Works areas	Construction phase	EIAO-TM NCO	Implemented
	Shut down plants between work periods					Implemented
	Install silencers on construction equipment					Implemented
	Locate mobile plant far away from NSRs					Implemented
	Quiet plants should be used					Implemented
2.19	Use of quieter PME					Not applicable
2.20 - 2.21	Use of temporary noise barrier		Pipe laying in Wai Ha			Not applicable
2.22	Use of alternative quieter construction method		Part of the Works Pipe laying in Wai Ha			Not applicable
2.23 – 2.24	Use of noise enclosure		Pipe laying in Wai Ha			Not applicable

EM&A Ref.	Recommended Mitgation Measures	Objectives of the Recommended Measure & main concern to Address	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?	Implementation status
3.5	Implement regular watering and vehicle washing facilities	To minimize construction dust impact	Construction Site	Construction phase	EIAO-TM	Outstandinng
	Cover excavated or stockpile of dusty material by impervious sheeting or sprayed with water					Implemented
	Use tarpaulin to cover dusty materials on vehicles					Implemented
4.5	Provide silt trap and oil interceptor to remove the oil, lubricants, grease, silt, grit and debris from the wastewater before pumped to the public storm water drainage system	To minimize water quality impact	Construction Site	Construction phase	EIAO-TM WPCO	Implemented
4.5	During rainstorms, exposed slope/soil surfaces shall be covered by a tarpaulin or other means. Others measures that need to be implemented before, during, and after rainstorms as summarized in ProPECC PN 1/94 shall be followed					Not applicable

EM&A Ref.	Recommended Mitgation Measures	Objectives of the Recommended Measure & main concern to Address	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?	Implementation status
4.10	Provide site toilet facilities	To minimize water quality impact	Construction Site	Construction phase	EIAO-TM WPCO	Implemented
4.7	Further precautionary measures during rainy season: For the construction of the box culvert next to the existing channel of the Wai Ha River, sand bags should be deployed around the boundary of the works trench to prevent muddy water ingress into the adjacent CA or Wai Ha River. Sand bags should also be used to surround the excavated trench. Generally, the sand bags will be placed up to a height of 300mm to provide adequate allowance for the built-up water level during rainstorm event. With sand bags in place, surface runoff will be intercepted and flow to Wai Ha River or collected by the existing drainage system as usual. For the construction of the box culvert in the extreme northeast corner of Shuen Wan Marsh Conservation Area sand bags should be deployed along the limit of the works area to prevent muddy water ingress into the CA. Sand bags should be placed to a height of at least 300mm from round level and +2.5 mPD (whichever is greater) to provide adequate allowance	To minimize water quality impact to the designated Conservation Area	Works areas near the Conservation Area	Rainy seasons during construction	EIAO-TM WPCO	Not applicable

EM&A Ref.	Recommended Mitgation Measures	Objectives of the Recommended Measure & main concern to Address	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?	Implementation status
	for the built-up water level during rainstorm events. Unpolluted surface runoff within the works area should then be collected and directed into the existing drainage system. Sheet-piles, which would be installed around the works trench near the Conservation Area, would be extended above ground level for about 2m to serve as hoardings to isolate the works site. Tarpulin sheets would be used to cover the excavation areas during heavy rainstorms. This would prevent the ingress of rainwater into the trench minimising the risk of muddy water getting into Wai Ha River and the adjacent Conservation Area. Any concrete washing water would be contained inside the works site surrounded by the extended sheet piles. A pump sump at the bottom of the trench would be provided to pump any excess water during concrete					
5.9	Reuse excavated material as much as possible	To achieve waste reduction	Works areas	Construction phase	EIAO-TM	Implemented
5.7	Any unused chemicals or those with remaining functional capacity shall be recycled.					Not applicable
	Recycle scrap metals or abandoned equipment					Implemented

EM&A Ref.	Recommended Mitgation Measures	Objectives of the Recommended Measure & main concern to Address	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?	Implementation status
5.5	A recording system for the amount of wastes generated, recycled and disposed should be proposed	To reduce waste management impacts	Works areas	Construction phase	ETWB TCW No. 19/2005 ETWB TCW NO. 31/2004	Implemented
5.9	Adopt a trip ticket system for the disposal of C&D materials					Implemented
5.11	All general refuse should be segregated and stored in enclosed bins or compaction units					Implemented
5.10	Contractor should be a required to register with the EPD as a Chemical Waste Producer and to follow the guidelines states in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.	To minimize the environmental impacts associated with the handling, transportation and disposal of chemical waste.	Work site	Construction phase	EIAO-TM Waste Disposal (Chemical Waste)(General) Regulation	Implemented
	Good quality containers compatible with the chemical wastes should be used, and Incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosives, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc.					Not applicable

EM&A Ref.	Recommended Mitgation Measures	Objectives of the Recommended Measure & main concern to Address	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?	Implementation status
5.5	A recording system for the amount of wastes generated, recycled and disposed should be proposed	To reduce waste management impacts	Works areas	Construction phase	ETWB TCW No. 19/2005 ETWB TCW NO. 31/2004	Implemented
6.6	Sheet-pilings, which will be installed around the trench of excavation, should be extended above ground level for ~2m to act as hoarding to isolate the works site. The trenching works for the construction of the proposed box culvert should be carried out in phases, with a trench length of not more than 120m in each phase. The trench should be backfilled and compacted with suitable materials upon completion of each phase of the construction works.	To minimize the impacts on the steam and natural river bank.	Whole site	Construction phase	EIAO-TM	Implemented
6.6	The construction of intercept oint of twin cell box culvert at the upstream of Wai Ha River should be confined to only one side of the river bank. To restore and enhance the ecological value of the stream, the affected river bank should be reinstated to its original condition or lined with rock-filled gabion. Planting pits should be provided in the gabion bank to allow the re-establishment of riparian vegetation.	To minimize the impacts on the steam and natural river bank.	Whole site	Construction phase	EIAO-TM	No applicable

EM&A Ref.	Recommended Mitgation Measures	Objectives of the Recommended Measure & main concern to Address	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?	Implementation status
	The existing natural riverbed and substrates should be retained and the natural pool-riffle sequence should be re-created in the new channel bed.					
6.7	All works carried out within the the river channel of Wai Ha River should be carried out from October to April, with construction carried out by land-based plant. Works within river/stream channels should be restricted to an enclosed dry section of the river, with containment measures such as bunds and barriers used within the river to minimize the impacts upon the downstream water body. Site runoff should be directed towards regularly cleaned and maintained silt traps and oil/grease separators to minimize the risk of sedimentation and pollution of river water. The silt and oil/grease separators should be appropriately designed for the local drainage and ground conditions. To minimize leakage and loss of sediments during excavation in narrow channels, tightly sealed closed grab excavators should be deployed where material to be handled is wet.	To minimize sedimentation/ water quality impacts	Whole site	Construction phase	EIAO-TM	No applicable

EM&A Ref.	Recommended Mitgation Measures	Objectives of the Recommended Measure & main concern to Address	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?	Implementation status
6.8	The construction of the proposed box-culvert would have the potential to directly impact a few individual of a plant species of conservation interest (Hong Kong Pavetta, Pavetta hongkongensis). The affected individuals should be transplanted to a suitable nearby habitats prior to the construction phase. A detailed vegetation survey of the affected species of conservation interest should be conducted by a suitably qualified botanist/ecologist to identify the affected individuals in order to provide details for transplantation scheme. Transplantation should be supervised by a suitably qualified botanist/horticulturalist. A detailed transplantation methodology should be formulated during the detailed design stage of this Project.	To protect plant species of conservation interest	Whole site	Construction phase	EIAO-TM	No applicable
6.9	Placement of equipment or stockpile in designated works areas and access routes selected on existing disturbed land to minimize disturbance to natural or moderate-high ecological value habitats.	To minimise disturbance to habitats.	Whole site	Construction phase	EIAO-TM	No applicable
6.13	General drainage arrangements should include sediment and oil traps to collect and control construction site run-off.	To minimise sedimentation/ water quality impacts	Whole site	Construction phase	EIAO-TM	Implemented

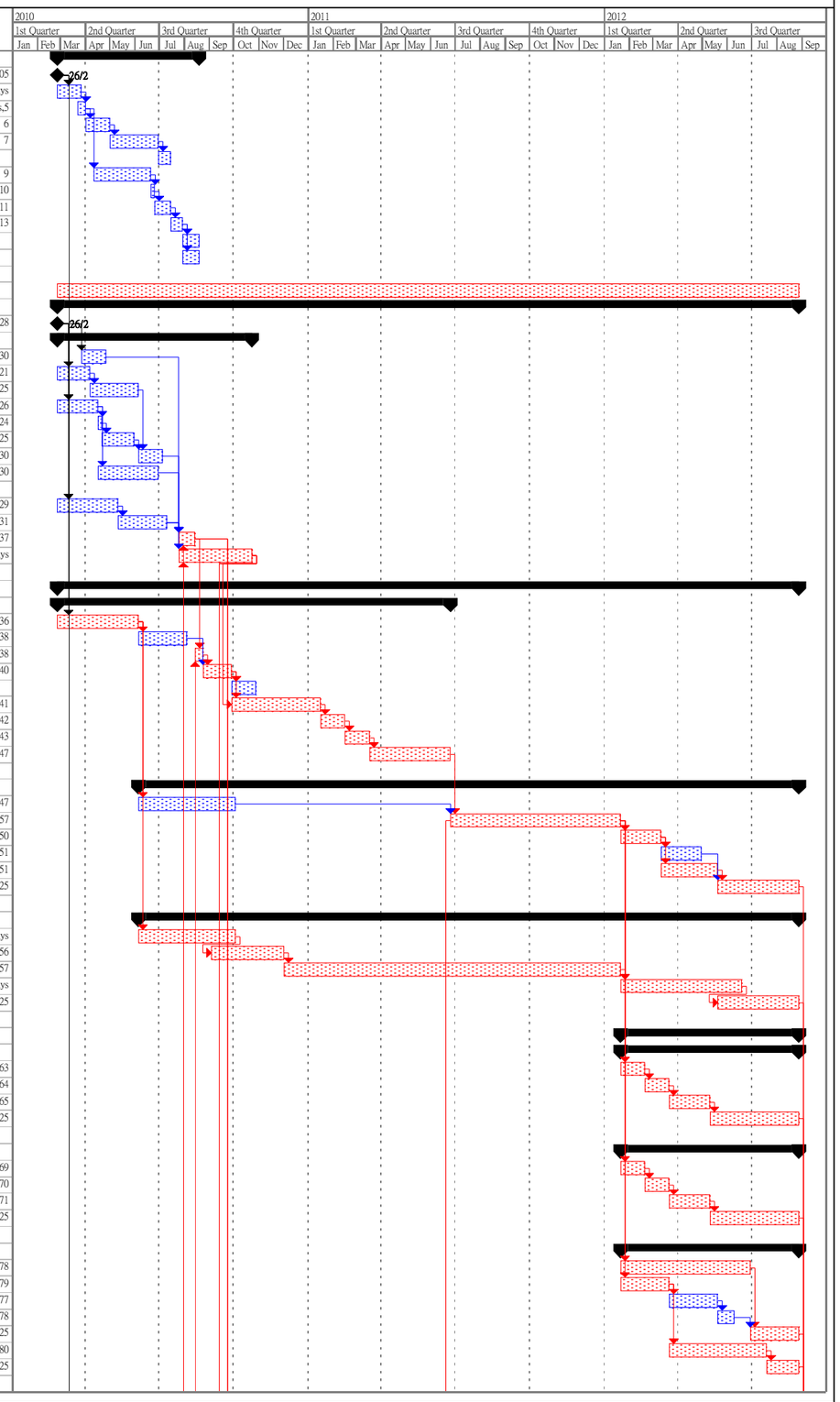
EM&A Ref.	Recommended Mitgation Measures	Objectives of the Recommended Measure & main concern to Address	Location of the measure	When to implement the measure?	What requirements or standards for the measure to achieve?	Implementation status
6.13	Construction activities should be restricted to work areas that would be clearly demarcated. The work areas should be reinstated after completion of the works.	To minimise disturbance to natural habitats outside works area.	Whole site	Construction phase	EIAO-TM	Implemented
6.13	Placement of equipment or stockpile in designated works areas and access routes selected on existing disturbed land to minimize disturbance to natural or moderate-high ecological value habitats.	To minimise disturbance to natural habitats	Whole site	Construction phase	EIAO-TM	Implemented
7.6	Visual screen, contaminant/ liaison with nursery, protection of existing trees with works area and construction light are used or practiced to mitigate the impacts during construction phase	To mitigate the landscape and visual impacts during the Construction phase	Whole site	Construction phase	EIAO-TM	Implemented
7.7	Viewing area formation , architectural design for pump house, landscape design for pump hose, enhancement planting along Tung Tsz Road, sufficient soil depth for enhancement planting, transplanting of trees to adjacent locations preparation for transplanting and reinstatement of affected area are practiced to mitigate the impacts during operational phase.	To mitigate the landscape and visual impacts during the operational phase	Whole site	Detail Design / Operational Phase	EIAO-TM	Not Applicable

Appendix I: Construction Pogramme

Contract No.: DC/2009/22
Contract Title: Drainage Improvement Works in Shuen Wan, Tai Po - Contract 1

Master Programme (Rev. 6)

ID	ID no. in Rev. 5	ID no. in Rev. 4	ID no. in Rev. 3	ID no. in Rev. 2	Task Name	Duration	Start	Finish	Predecessors	Successors
1	**1**	**1**	**1**	1	**Preliminary Works (Area I - Pak Shek Kok)**	**175 days**	**Fri 26/2/10**	**Thu 19/8/10**		
2	2	2	2	2	Commencement of Works	0 days	Fri 26/2/10	Fri 26/2/10		3,83,88,105
3	3	3	3	3	Design & Construction of Site Hoarding	30 days	Fri 26/2/10	Sat 27/3/10	2	4FS-5 days
4	4	4	4	4	Site Clearance	10 days	Tue 23/3/10	Thu 1/4/10	3FS-5 days	8FS+10 days,5
5	5	5	5	5	Design of Engineer's Site Office	30 days	Fri 2/4/10	Sat 1/5/10	4	6
6	6	6	6	6	Construction of Engineer's Site Office	60 days	Sun 2/5/10	Wed 30/6/10	5	7
7	7	7	7	7	Engineer's Site Office - Setup the Internal Finishing / Furniture/ Equipment	15 days	Thu 1/7/10	Thu 15/7/10	6	
8	8	8	8	8	Construction of Contractor's Accommodation	70 days	Mon 12/4/10	Sun 20/6/10	4FS+10 days	9
9	9	9	9	9	Installation of Sewerage Storage Tank	5 days	Mon 21/6/10	Fri 25/6/10	8	10
10	10	10	10	10	Contractor Accommodation - Setup the Internal Finishing / Furniture / Equipment	20 days	Sat 26/6/10	Thu 15/7/10	9	11
11	11	11	11	11	Establishment of Vehicular Gate, Storage Area	15 days	Fri 16/7/10	Fri 30/7/10	10	12,13
12	12	12	12	12	Establishment of Welfare Facilities for Workers	20 days	Sat 31/7/10	Thu 19/8/10	11	
13	13	13	13		Temporary Drainage System	20 days	Sat 31/7/10	Thu 19/8/10	11	
14										
15	15	15	15	15	**Time for Completion of Section I**	915 days	Fri 26/2/10	Tue 28/8/12		
16	**16**	**16**	**16**	16	**Section I (Area A,B - Shuen Wan)**	**915 days**	**Fri 26/2/10**	**Tue 28/8/12**		
17	17	17	17	17	Commencement of Works	0 days	Fri 26/2/10	Fri 26/2/10		19FS+30 days,35,111,22,20,28
18	**18**	**18**	**18**	18	**Preliminary Works**	**240 days**	**Fri 26/2/10**	**Sat 23/10/10**		
19	19	19	19	19	Seek clarification regarding Environmental Permit	30 days	Sun 28/3/10	Mon 26/4/10	17FS+30 days	30
20	20	20	20	20	Design of TTA Scheme for Site Access	40 days	Fri 26/2/10	Tue 6/4/10	17	21
21	21	21	21	21	Submission of TTA to TMLG for Approval	60 days	Wed 7/4/10	Sat 5/6/10	20	25
22	22	22	22	22	Site Clearance	50 days	Fri 26/2/10	Fri 16/4/10	17	23,26
23	23	23	23	23	Project Signboard	5 days	Sat 17/4/10	Wed 21/4/10	22	24
24	24	24	24	24	Hoarding Erection	40 days	Thu 22/4/10	Mon 31/5/10	23	25
25	25	25	25	25	Establish Site Access	30 days	Sun 6/6/10	Mon 5/7/10	24,21	30
26	26	26	26	26	Ground Investigation	75 days	Sat 17/4/10	Wed 30/6/10	22	30
27										
28	28	28	28	28	Tree Survey	75 days	Fri 26/2/10	Tue 11/5/10	17	29
29	29	29	29	29	Submission of Tree Survey Record	60 days	Wed 12/5/10	Sat 10/7/10	28	30,31
30	30	30	30	30	Tree Felling	20 days	Mon 26/7/10	Sat 14/8/10	29,139,25,26,19	94,99,37
31	31	31	31	31	Tree Transplanting	90 days	Mon 26/7/10	Sat 23/10/10	29,139	94FS-30 days,99FS-30 days,40FS-30 days
32										
33	**33**	**33**	**33**	33	**Pumping Station**	**915 days**	**Fri 26/2/10**	**Tue 28/8/12**		
34	**34**	**34**	**34**	34	**Piling Works**	**485 days**	**Fri 26/2/10**	**Sat 25/6/11**		
35	35	35	35	35	Submission of Method Statement	100 days	Fri 26/2/10	Sat 5/6/10	17	46,54,36
36	36	36	36		Material Ordering & Delivery to Site	60 days	Sun 6/6/10	Wed 4/8/10	35	38
37	37	37	37	36	Ground Preparation for Piling	10 days	Sun 15/8/10	Tue 24/8/10	139,30	38
38	38	38	38	37	Preliminary Pile	35 days	Wed 25/8/10	Tue 28/9/10	37,36	39,40
39	39	39	39	39	Loading Test	30 days	Wed 29/9/10	Thu 28/10/10	38	
40	40	40	40	38	Working Piles	110 days	Wed 29/9/10	Sun 16/1/11	38,31FS-30 days	41
41	41	41			Loading Test for working piles	30 days	Mon 17/1/11	Tue 15/2/11	40	42
42	42	42	41	40	Sheetpiling	30 days	Wed 16/2/11	Thu 17/3/11	41	43
43	43	43	42	41	Excavation to Pile Cut Off Level / Shoring	100 days	Fri 18/3/11	Sat 25/6/11	42	47
44										
45	**45**	**45**	**44**	43	**Main Structure of Pumping Station**	**815 days**	**Sun 6/6/10**	**Tue 28/8/12**		
46	46	46	45	44	Temporary Works Submission	120 days	Sun 6/6/10	Sun 3/10/10	35	47
47	47	47	46	45	Reinforced Concrete Works	210 days	Sun 26/6/11	Sat 21/1/12	46,43	118SS+80 days,75,48,68,62,74,57
48	48	48	47	46	Roofing	50 days	Sun 22/1/12	Sun 11/3/12	47	49,50
49	49	49	48	47	Manmade Slope	50 days	Mon 12/3/12	Mon 30/4/12	48	51
50	50	50	49	48	Internal Finishing Works	70 days	Mon 12/3/12	Sun 20/5/12	48	51
51	51	51	50	49	External Finishing Works	100 days	Mon 21/5/12	Tue 28/8/12	50,49	125
52										
53	**53**	**53**	**52**	51	**E & M**	**815 days**	**Sun 6/6/10**	**Tue 28/8/12**		
54	54	54	53	52	Submission of E & M Design	120 days	Sun 6/6/10	Sun 3/10/10	35	55FS-30 days
55	55	55	54	53	Approval of E & M Design	90 days	Sat 4/9/10	Thu 2/12/10	54FS-30 days	56
56	56	56	55	54	Fabrication & Delivery of Plant & Material	415 days	Fri 3/12/10	Sat 21/1/12	55	57
57	57	57	56	55	Plumbing & E&M works	150 days	Sun 22/1/12	Tue 19/6/12	56,47	58FS-30 days
58	58	58	57	56	Final Testing Works	100 days	Mon 21/5/12	Tue 28/8/12	57FS-30 days	125
59										
60	**60**	**60**	**59**	58	**External Structure**	**220 days**	**Sun 22/1/12**	**Tue 28/8/12**		
61	**61**	**61**	**60**	59	**Pumping Station to Outfall Structure**	**220 days**	**Sun 22/1/12**	**Tue 28/8/12**		
62	62	62	61	60	Installation of Cofferdam & Site Hoarding Phase 2	30 days	Sun 22/1/12	Mon 20/2/12	47	63
63	63	63	62	61	Excavation	30 days	Tue 21/2/12	Wed 21/3/12	62	64
64	64	64	63	62	Constrcution of 2nos. of 1500mm dia. Drainage Pipes	50 days	Thu 22/3/12	Thu 10/5/12	63	65
65	65	65	64	63	2 nos. of Outfall Structures	110 days	Fri 11/5/12	Tue 28/8/12	64	125
66										
67	**67**	**67**	**66**	65	**Tide Level Monitoring Chamber**	**220 days**	**Sun 22/1/12**	**Tue 28/8/12**		
68	68	68	67	66	Installation of Cofferdam & Site Hoarding Phase 2	30 days	Sun 22/1/12	Mon 20/2/12	47	69
69	69	69	68	67	Excavation	30 days	Tue 21/2/12	Wed 21/3/12	68	70
70	70	70	69	68	Construction of Pipe & Tide Level Monitoring Chambers	50 days	Thu 22/3/12	Thu 10/5/12	69	71
71	71	71	70	69	Outfall Structure	110 days	Fri 11/5/12	Tue 28/8/12	70	125
72										
73	**73**	**73**	**72**	71	**External Misc. Works**	**220 days**	**Sun 22/1/12**	**Tue 28/8/12**		
74	74	74	73	72	Boundary Wall & Fencing	160 days	Sun 22/1/12	Fri 29/6/12	47	78
75	75	75	74	73	3nos. of Flow Measurement chambers and Pipes	60 days	Sun 22/1/12	Wed 21/3/12	47	76,79
76	76	76	75	74	Surface Drainage System & Catchpits	60 days	Thu 22/3/12	Sun 20/5/12	75	77
77	77	77	76	76	Concrete Pavement	20 days	Mon 21/5/12	Sat 9/6/12	76	78
78	78	78	77	77	Landscaping Works	60 days	Sat 30/6/12	Tue 28/8/12	77,74	125
79	79	79	78		225mm dia. Sewer Across Ting Kok Road and Connection to Existing Manholes	120 days	Thu 22/3/12	Thu 19/7/12	75	80
80	80	80			Sewer Manhole SM1	40 days	Fri 20/7/12	Tue 28/8/12	79	125
81										



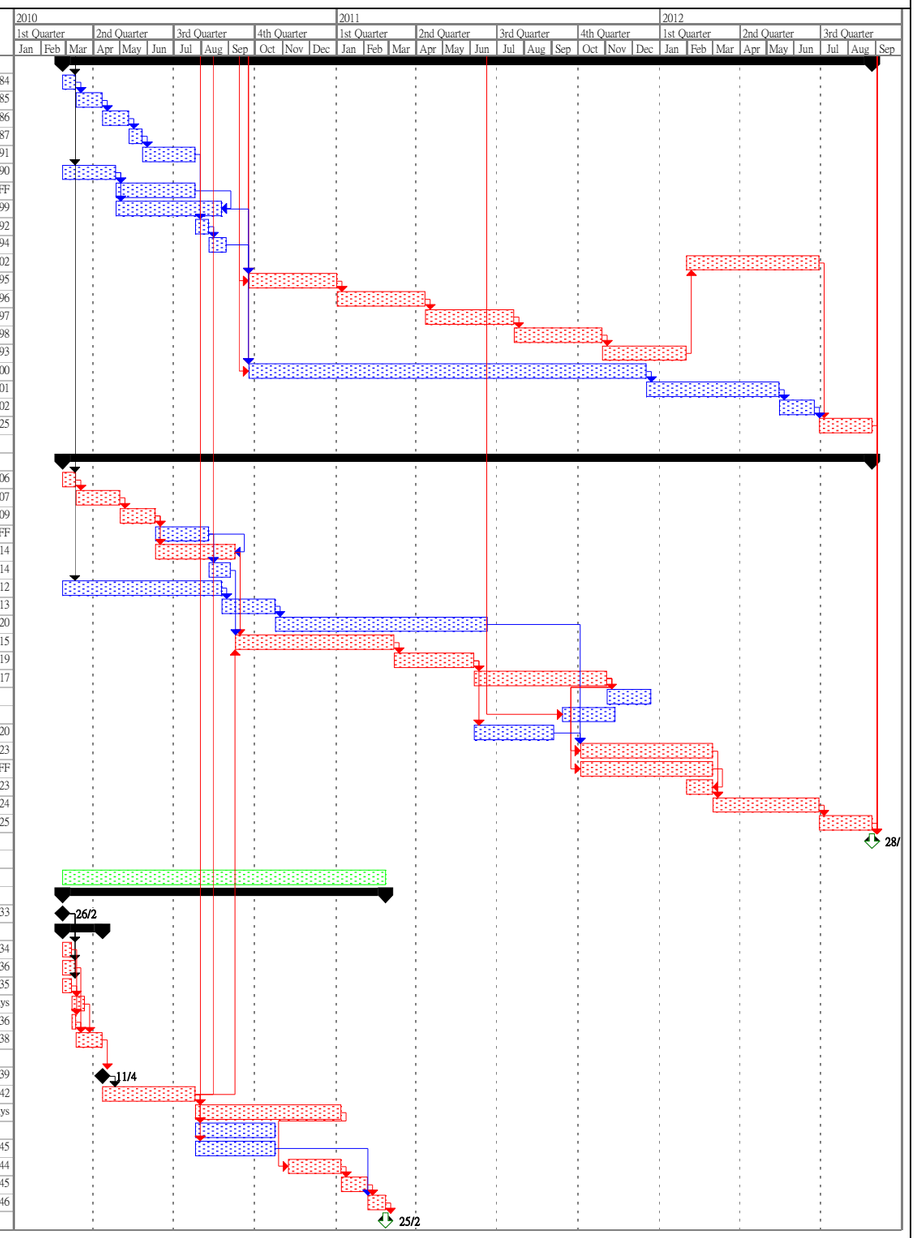
Master Programme - Rev. 6
Data Date: 2010-2-26

Task | Progress | Summary | Rolled Up Critical Task | Rolled Up Progress | External Tasks | Group By Summary
Critical Task | Milestone | Rolled Up Task | Rolled Up Milestone | Split | Project Summary | Deadline

Contract No.: DC/2009/22
Contract Title: Drainage Improvement Works in Shuen Wan, Tai Po - Contract 1

Master Programme (Rev. 6)

ID	ID no. in Rev. 5	ID no. in Rev. 4	ID no. in Rev. 3	ID no. in Rev. 2	Task Name	Duration	Start	Finish	Predecessors	Successors
82	**82**	**82**	**80**	79	**Twin Cell Box Culvert**	**915 days**	**Fri 26/2/10**	**Tue 28/8/12**		
83	83	83	81	80	Liaison with LCSD	15 days	Fri 26/2/10	Fri 12/3/10	2	84
84	84	84	82	81	Determination of Box Culvert Alignment	30 days	Sat 13/3/10	Sun 11/4/10	83	85
85	85	85	83	82	Record Survey	30 days	Mon 12/4/10	Tue 11/5/10	84	86
86	86	86	84	83	Condition Survey of Existing Structure	15 days	Wed 12/5/10	Wed 26/5/10	85	87
87	87	87	85	84	Submission of Method Statement to LCSD	60 days	Thu 27/5/10	Sun 25/7/10	86	91
88	88	88	86	85	Design of Temporary Traffic Arrangement	60 days	Fri 26/2/10	Mon 26/4/10	2	89,90
89	89	89	87	86	Submission of TTA to TMLG for Approval	90 days	Tue 27/4/10	Sun 25/7/10	88	90FF
90	90	90	88	87	Excavation Permit	120 days	Tue 27/4/10	Tue 24/8/10	88,89FF	99
91	91	91	89	88	Temporary Removal of Structure and Facilities / Reprovision	15 days	Mon 26/7/10	Mon 9/8/10	87	92
92	92	92			Provision of Temporary Irrigation Pipes	20 days	Tue 10/8/10	Sun 29/8/10	91	94
93	93	93	91	89	Box Culvert at Chainage 0 - 25	150 days	Wed 1/2/12	Fri 29/6/12	98	102
94	94	94	92	90	Box Culvert at Chainage 25 - 75	100 days	Fri 24/9/10	Sat 1/1/11	31FS-30 days,30,92	95
95	95	95	93	91	Box Culvert at Chainage 75 - 125	100 days	Sun 2/1/11	Mon 11/4/11	94	96
96	96	96	94	92	Box Culvert at Chainage 125 - 175	100 days	Tue 12/4/11	Wed 20/7/11	95	97
97	97	97	95	93	Box Culvert at Chainage 175 - 225	100 days	Thu 21/7/11	Fri 28/10/11	96	98
98	98	98	96	94	Box Culvert at Chainage 225 - 275	95 days	Sat 29/10/11	Tue 31/1/12	97	93
99	99	99	97	95	Box Culvert at Chainae 275 - 300	450 days	Fri 24/9/10	Sat 17/12/11	90,31FS-30 days,30	100
100	100	100	98	96	Box Culvert at Chainage 300 - 350 (Including Outfall & Desilting Chamber)	150 days	Sun 18/12/11	Tue 15/5/12	99	101
101	101	101	99		1200mm dia. Drainage Pipe	40 days	Wed 16/5/12	Sun 24/6/12	100	102
102	102	102	100	97	Reinstallation and Reinstatement of Existing Structure, Facilities and Trees	60 days	Sat 30/6/12	Tue 28/8/12	93,101	125
103										
104	**104**	**104**	**102**	99	**Dia. 2100mm Drainage Pipe**	**915 days**	**Fri 26/2/10**	**Tue 28/8/12**		
105	105	105	103	100	Record Survey	15 days	Fri 26/2/10	Fri 12/3/10	2	106
106	106	106	104	101	Site Investigation (Trial Pit)	50 days	Sat 13/3/10	Sat 1/5/10	105	107
107	107	107	105	102	Design of Temporary Traffic Arrangement	40 days	Sun 2/5/10	Thu 10/6/10	106	108,109
108	108	108	106	103	Submission of TTA to TMLG for Approval	60 days	Fri 11/6/10	Mon 9/8/10	107	110,109FF
109	109	109	107	104	Excavation Permit	90 days	Fri 11/6/10	Wed 8/9/10	107,108FF	114
110	110	110	108		Liaison with HyD / LCSD for Planter Removal	25 days	Tue 10/8/10	Fri 3/9/10	108	114
111	111	111	109	105	E&M Design of Penstocks	180 days	Fri 26/2/10	Tue 24/8/10	17	112
112	112	112	110	106	Submission for Approval	60 days	Wed 25/8/10	Sat 23/10/10	111	113
113	113	113	111	107	Fabrication & Delivery of Penstocks	240 days	Sun 24/10/10	Mon 20/6/11	112	120
114	114	114	112	108	MH 04 to MH 05	180 days	Thu 9/9/10	Mon 7/3/11	109,139,110	115
115	115	115	113	109	MH 03 to MH 04	90 days	Tue 8/3/11	Sun 5/6/11	114	116,119
116	116	116	114	110	Intake to MH 03	150 days	Mon 6/6/11	Wed 2/11/11	115	120FS-30 days,121FS-30 days,117
117	117	117	115	115	Reinstatement of Existing Planter	50 days	Thu 3/11/11	Thu 22/12/11	116	
118	118	118	116	111	MH 05 to MH 06	60 days	Wed 14/9/11	Sat 12/11/11	47SS+80 days	
119	119	119			Temporary Drainage Management Plan	90 days	Mon 6/6/11	Sat 3/9/11	115	120
120	120	120	118	112	Intake (As required in Dry Season)	150 days	Tue 4/10/11	Thu 1/3/12	116FS-30 days,113,119	123
121	121	121	119	113	Modification of Existing Outlet Structure of Wai Ha River	150 days	Tue 4/10/11	Thu 1/3/12	116FS-30 days	122FF
122	122	122	120	114	Installation of 4 nos of Mechanical Penstocks	30 days	Wed 1/2/12	Thu 1/3/12	121FF	123
123	123	123	121		E & M Works	120 days	Fri 2/3/12	Fri 29/6/12	122,120	124
124	124	124	122		Misc. Works & Reinstatement	60 days	Sat 30/6/12	Tue 28/8/12	123	125
125	125	125	123	116	**Completion of Section I**	0 days	Tue 28/8/12	Tue 28/8/12	78,124,102,51,58,65,71,80	
126										
127	127	127	125	118	**Time for Completion of Section II**	365 days	Fri 26/2/10	Fri 25/2/11		
128	**128**	**128**	**126**	119	**Section II (Area C - Ecological Compensation Area at Shuen Wan)**	**365 days**	**Fri 26/2/10**	**Fri 25/2/11**		
129	129	129	127	120	Commencement of Works	0 days	Fri 26/2/10	Fri 26/2/10		131,132,133
130	**130**	**130**	**128**	121	**Preliminary Works**	**45 days**	**Fri 26/2/10**	**Sun 11/4/10**		
131	131	131	129	122	Site Clearance	10 days	Fri 26/2/10	Sun 7/3/10	129	134
132	132	132	130	123	Hoarding Erection	15 days	Fri 26/2/10	Fri 12/3/10	129	136
133	133	133	131	124	Pumping Water out of Pond	10 days	Fri 26/2/10	Sun 7/3/10	129	135
134	134	134	132	125	Check actual Tidal against Predicted Tidal Level	15 days	Mon 8/3/10	Mon 22/3/10	131	136FS-10 days
135	135	135	133	126	Survey Existing Pond Bed	5 days	Mon 8/3/10	Fri 12/3/10	133	136
136	136	136	134	127	Design of of Ecological Compensation Area	30 days	Sat 13/3/10	Sun 11/4/10	135,134FS-10 days,132	138
137										
138	138	138	136	129	Submission of Design of Ecological Compensation Area to EPD for Approval	0 days	Sun 11/4/10	Sun 11/4/10	136	139
139	139	139	137	130	Refer to Permit Requirement plus 15 weeks for Approval and Commencement of Works	105 days	Mon 12/4/10	Sun 25/7/10	138	140,114,30,31,37,141,142
140	140	140	138	131	Fill of Pond to Designed Level	165 days	Mon 26/7/10	Thu 6/1/11	139	143FS-60 days
141	141	141	139	132	Transplanting	90 days	Mon 26/7/10	Sat 23/10/10	139	
142	142	142			Temporary Drainage Management Plan	90 days	Mon 26/7/10	Sat 23/10/10	139	145
143	143	143	141	133	Planting Works at Upper Level	60 days	Mon 8/11/10	Thu 6/1/11	140FS-60 days	144
144	144	144	142	134	Planting Works at Lower Level	30 days	Fri 7/1/11	Sat 5/2/11	143	145
145	145	145	143	135	Setting up Water Circulation System	20 days	Sun 6/2/11	Fri 25/2/11	144,142	146
146	146	146	144	136	**Completion of Section II**	0 days	Fri 25/2/11	Fri 25/2/11	145	



Master Programme - Rev. 6
Data Date: 2010-2-26

Task | Progress | Summary | Rolled Up Critical Task | Rolled Up Progress | External Tasks | Group By Summary
Critical Task | Milestone | Rolled Up Task | Rolled Up Milestone | Split | Project Summary | Deadline

Appendix J: Three month rolling programme

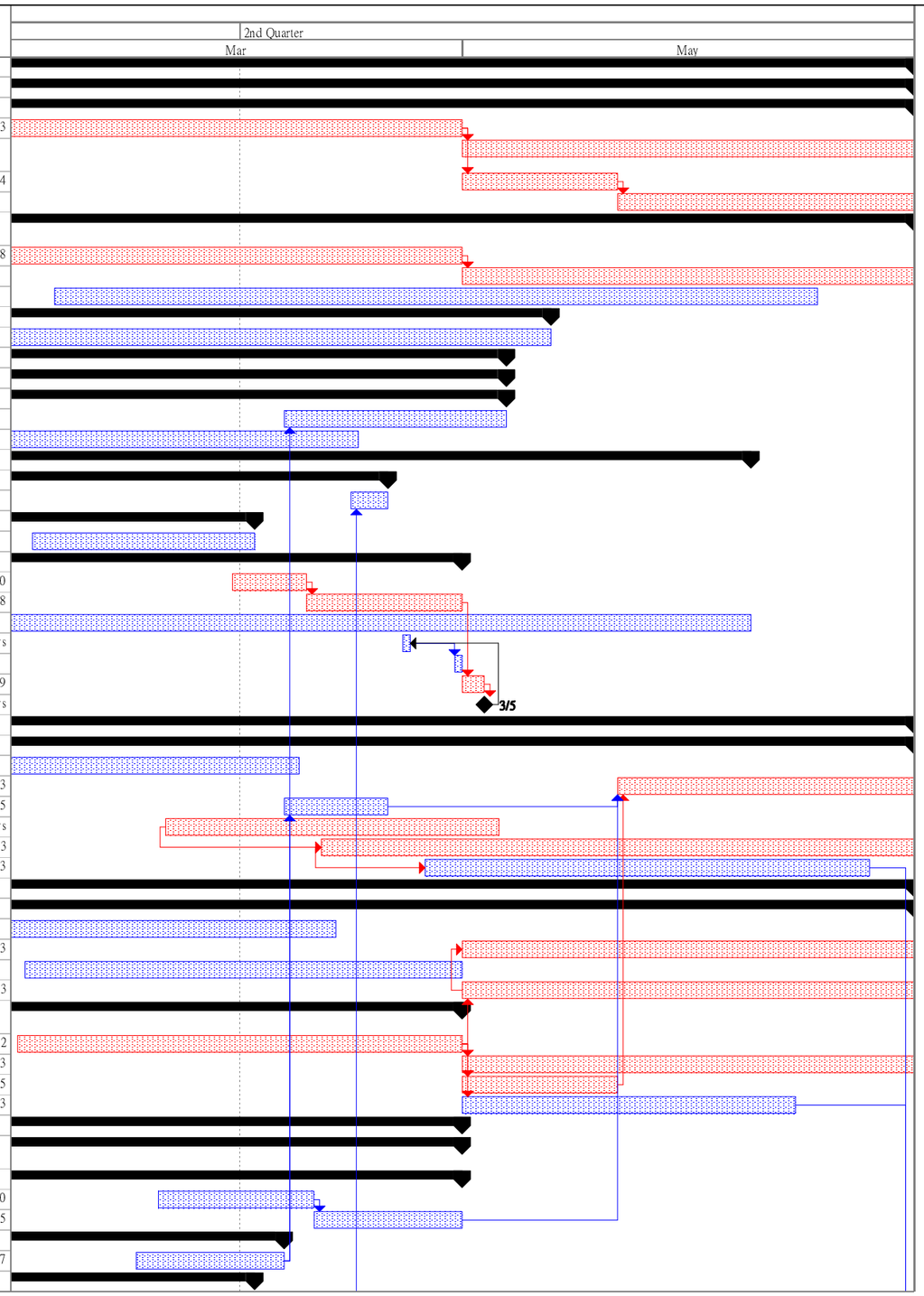
Kwan Lee - Kuly Joint Venture

Contract No.: DC/2009/22

Contract Title: Drainage Improvement Works in Shuen Wan, Tai Po - Contract 1

3 Months Rolling Programme (April 2013 to June 2013)

ID	Task Name	Duration	Start	Finish	Predecessors	Successors
14	**Section I (Area A,B - Shuen Wan)**	**1221 days**	**Fri 26/2/10**	**Sun 30/6/13**		
17	**Extension of Time**	**306 days**	**Wed 29/8/12**	**Sun 30/6/13**		
19	**Claim no. 20 - DN2800 twin pipes crossing Ting Kok Road**	**180 days**	**Wed 2/1/13**	**Sun 30/6/13**		
21	excavation & pipe jacking	119 days	Wed 2/1/13	Tue 30/4/13		22,23
22	construction of Box Culvert - Bay no. 17, 18, 8A & transition at Jacking Pit	61 days	Wed 1/5/13	Sun 30/6/13	21	
23	construction of Box Culvert - transition at Receiving Pit	21 days	Wed 1/5/13	Tue 21/5/13	21	24
24	boundary wall / pavement near Receiving Pit	40 days	Wed 22/5/13	Sun 30/6/13	23	
25	**Utilities in conflict with DN2100 pipe - uncharted watermain (Claim no. 14) / DN450 rising main & thrust block**	**180 days**	**Wed 2/1/13**	**Sun 30/6/13**		
27	CH 180~215 / CH 215~230	119 days	Wed 2/1/13	Tue 30/4/13		28
28	Boundary Wall / Pavement / Planter in PS	61 days	Wed 1/5/13	Sun 30/6/13	27	
29	EOT claims due to Inclement Weather	103 days	Thu 7/3/13	Mon 17/6/13	18	
30	**Delay by CLP Power Supply**	**157 days**	**Fri 7/12/12**	**Sun 12/5/13**		
32	E & M Works - Testing & Commissioing	119 days	Mon 14/1/13	Sun 12/5/13	31	
52	**Pumping Station**	**1166 days**	**Fri 26/2/10**	**Mon 6/5/13**		
64	**Main Structure of Pumping Station**	**1066 days**	**Sun 6/6/10**	**Mon 6/5/13**		
76	**Other Works**	**359 days**	**Sun 13/5/12**	**Mon 6/5/13**		
77	Manmade Slope/roofing	30 days	Sun 7/4/13	Mon 6/5/13	285	
82	External Finishing Works	100 days	Mon 7/1/13	Tue 16/4/13	81	
84	**E&M Works**	**1105 days**	**Mon 31/5/10**	**Sat 8/6/13**		
128	**Drain Intake at Ting Kok Road**	**200 days**	**Wed 3/10/12**	**Sat 20/4/13**		
130	Installation of Stoplog SL07A	5 days	Tue 16/4/13	Sat 20/4/13	316,129	
131	**Box Culvert**	**65 days**	**Mon 28/1/13**	**Tue 2/4/13**		
132	Installation of Manual Penstock, SG06 at MH06	30 days	Mon 4/3/13	Tue 2/4/13	290,295	
135	**Testing & Commissioning**	**275 days**	**Mon 30/7/12**	**Tue 30/4/13**		
139	Wet Commissioning Test of Pumps	10 days	Sun 31/3/13	Tue 9/4/13	138,122	140
140	System Commissioning	21 days	Wed 10/4/13	Tue 30/4/13	139	148
143	Submission of Revised O&M Manual	609 days	Sun 9/10/11	Sat 8/6/13		
144	1st Session of Training	1 day	Tue 23/4/13	Tue 23/4/13	149FF-10 days	145FS+6 days
145	2nd Session of Training	1 day	Tue 30/4/13	Tue 30/4/13	144FS+6 days	
148	Plant Handover to Client	3 days	Wed 1/5/13	Fri 3/5/13	140	149
149	Anticipated Completion Date	0 days	Fri 3/5/13	Fri 3/5/13	148	144FF-10 days
151	**External Structure**	**181 days**	**Tue 1/1/13**	**Sun 30/6/13**		
163	**External Misc. Works**	**143 days**	**Fri 8/2/13**	**Sun 30/6/13**		
164	Plumbing Works	60 days	Fri 8/2/13	Mon 8/4/13	166SS	
165	Boundary Wall & Fencing	40 days	Wed 22/5/13	Sun 30/6/13	219,280,167	333
167	Sewer Manhole SM1	14 days	Sun 7/4/13	Sat 20/4/13	285	165
168	Backfiling for Road Work, Surface Drainage System & Catchpits	45 days	Fri 22/3/13	Sun 5/5/13	166,161,222	169SS+21 days
169	Road work / Concrete Pavement	80 days	Fri 12/4/13	Sun 30/6/13	168SS+21 days	170SS+14 days,333
170	Planter/Landscaping Works	60 days	Fri 26/4/13	Mon 24/6/13	169SS+14 days	333
172	**Box Culvert**	**1221 days**	**Fri 26/2/10**	**Sun 30/6/13**		
185	**Single Cell Box Culvert**	**784 days**	**Mon 9/5/11**	**Sun 30/6/13**		
196	Box Culvert at Chainage 12.5 to 40 (Bay 2, 3)	80 days	Thu 24/1/13	Sat 13/4/13	195,197	
198	Box Culvert at Chainage 128 to 141.5 (Bay 8A)	61 days	Wed 1/5/13	Sun 30/6/13	202SS	333
200	Box Culvert at Chainage 214 to 228 (Bay 14)	59 days	Sun 3/3/13	Tue 30/4/13	201	
202	Box Culvert at Chainage 250 - 274 (Bay 17, 18)	61 days	Wed 1/5/13	Sun 30/6/13	201,217	198SS,333
203	**Pipes Laying by Trenchless Method from Chainage 285 to 305**	**399 days**	**Wed 28/3/12**	**Tue 30/4/13**		
217	Grouting, excavation & Pipe Installation (2nd Pipeline)	60 days	Sat 2/3/13	Tue 30/4/13	216	219,224,218,202
218	Box Culvert at Chainage 274 to 285 (transition -JP)	61 days	Wed 1/5/13	Sun 30/6/13	201,217	333
219	Box Culvert at Chainage 305 to 310 (transition - RP)	21 days	Wed 1/5/13	Tue 21/5/13	217	165
224	Reinstatement of Planters	45 days	Wed 1/5/13	Fri 14/6/13	217	333
226	**Dia. 2100mm Drainage Pipe**	**1160 days**	**Fri 26/2/10**	**Tue 30/4/13**		
244	**Construction of 2100mm Pipe & Existing Stormwater Drain along Ting Kok Road**	**595 days**	**Wed 14/9/11**	**Tue 30/4/13**		
275	**5th Section (25m from CH180 to CH215)**	**72 days**	**Mon 18/2/13**	**Tue 30/4/13**		
279	Concrete Pipe Installation and Manhole Construction	21 days	Thu 21/3/13	Wed 10/4/13	278	280
280	Backfill and Reinstatement	20 days	Thu 11/4/13	Tue 30/4/13	279	165
281	**6th Section (25m from CH215 to CH230)**	**80 days**	**Thu 17/1/13**	**Sat 6/4/13**		
285	Backfill and reinstatement	20 days	Mon 18/3/13	Sat 6/4/13	284	167,77
302	**Construction of DN1800 Pipes by Trenchless Method**	**330 days**	**Tue 8/5/12**	**Tue 2/4/13**		



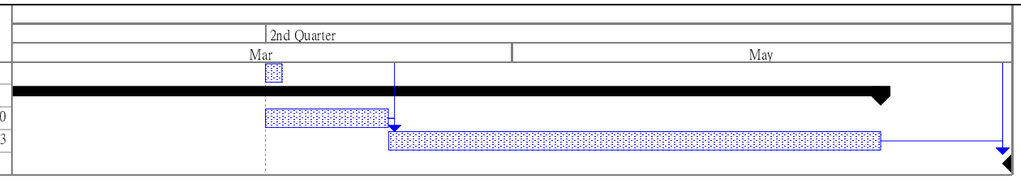
Task
Critical Task
Milestone
Summary
Rolled Up Task
Rolled Up Critical Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
Project Summary
Group By Summary
Inactive Task
Progress
Deadline

Contract No.: DC/2009/22

Contract Title: Drainage Improvement Works in Shuen Wan, Tai Po - Contract 1

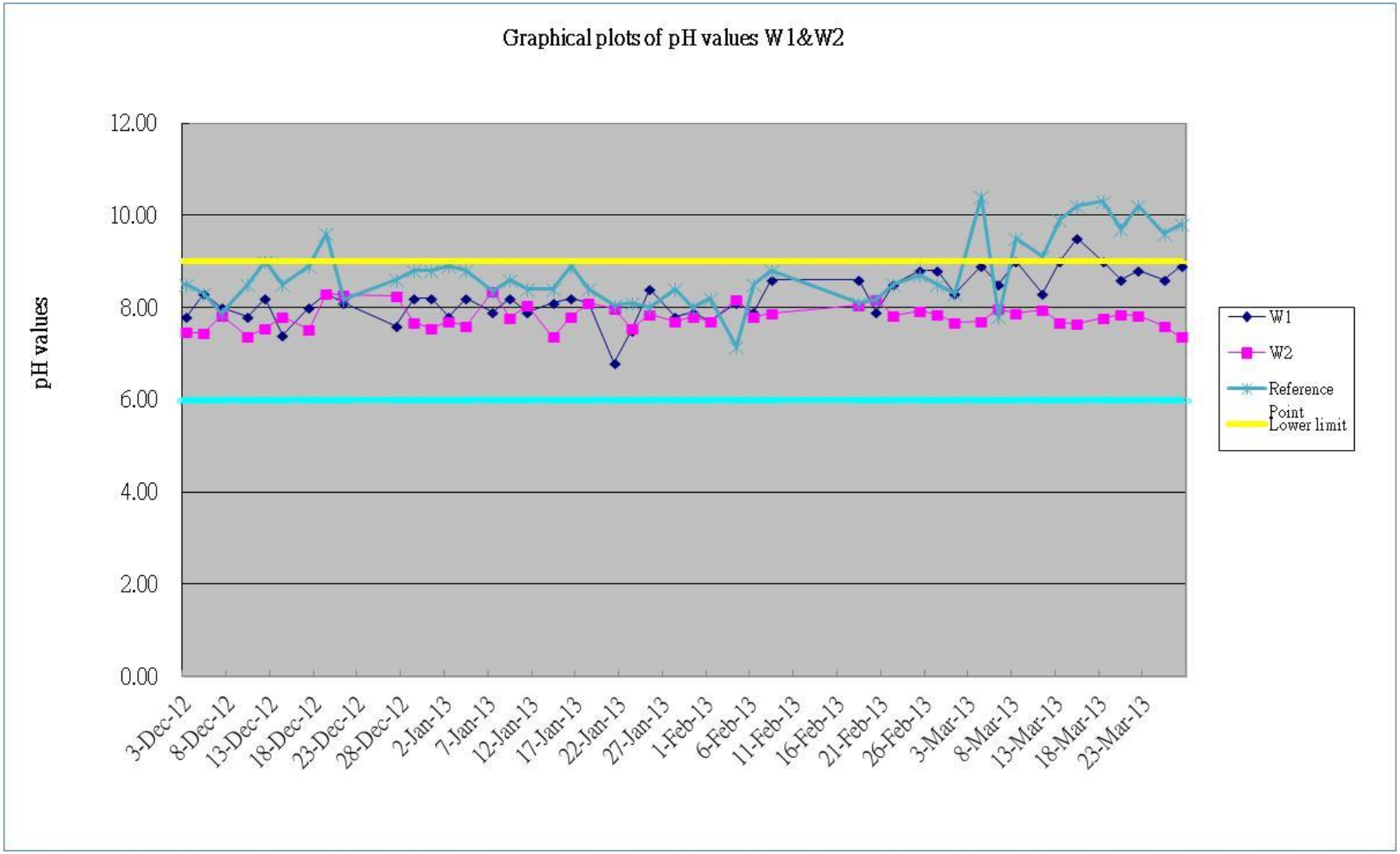
3 Months Rolling Programme (April 2013 to June 2013)

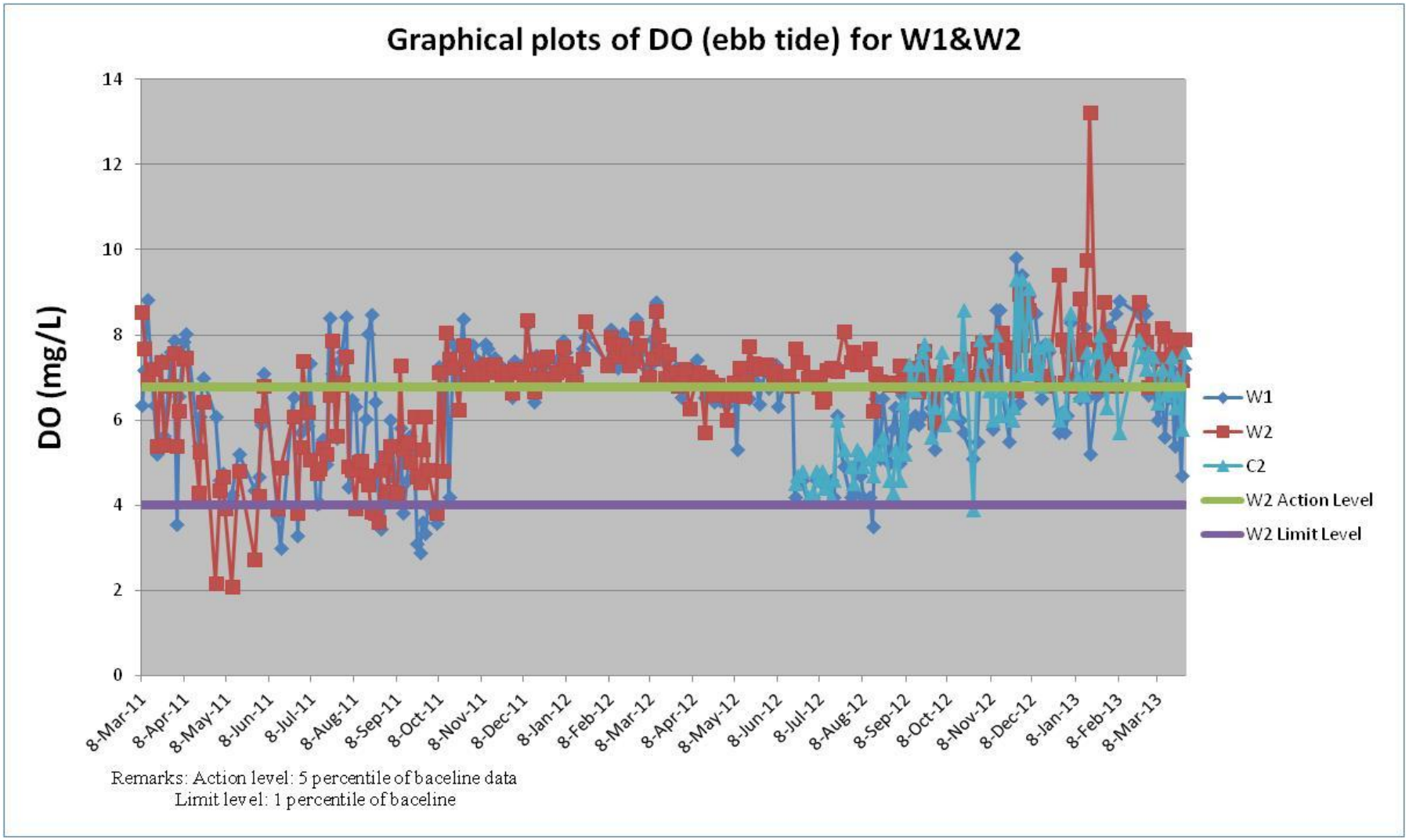
ID	Task Name	Duration	Start	Finish	Predecessors	Successors
308	Grouting	2 days	Mon 1/4/13	Tue 2/4/13	307	
309	**Intake (As required in Dry Season) - Section 1**	**600 days**	**Mon 24/10/11**	**Fri 14/6/13**		
316	Intake - Section 2	15 days	Mon 1/4/13	Mon 15/4/13	307	332,130
332	Misc. Works & Reinstatement	60 days	Tue 16/4/13	Fri 14/6/13	316	333
333	**Completion of Section I**	0 days	Sun 30/6/13	Sun 30/6/13	218,198,202,224,165,169	

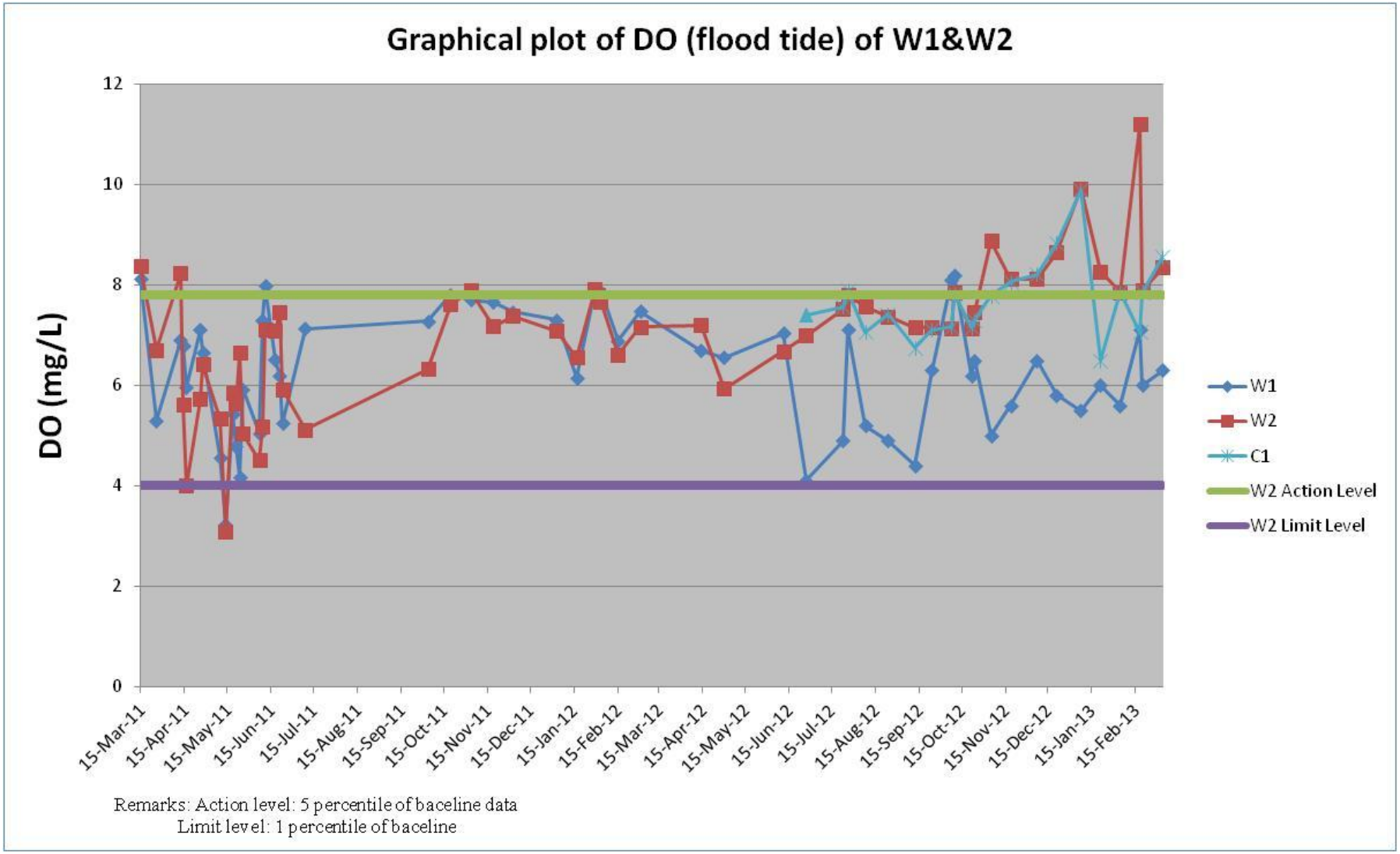


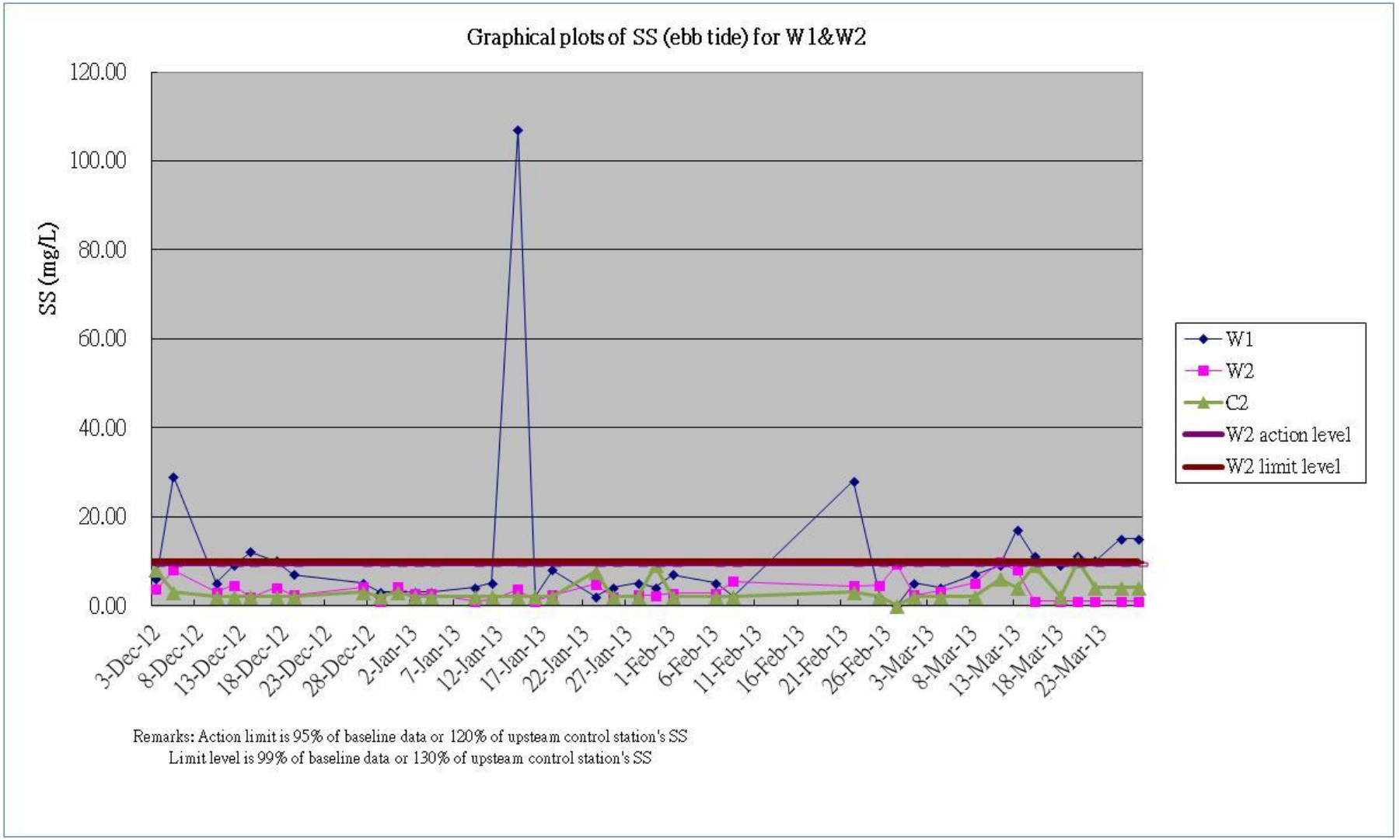
Task		Summary		Rolled Up Milestone		External Tasks		Inactive Task	
Critical Task		Rolled Up Task		Rolled Up Progress		Project Summary		Progress	
Milestone		Rolled Up Critical Task		Split		Group By Summary		Deadline	

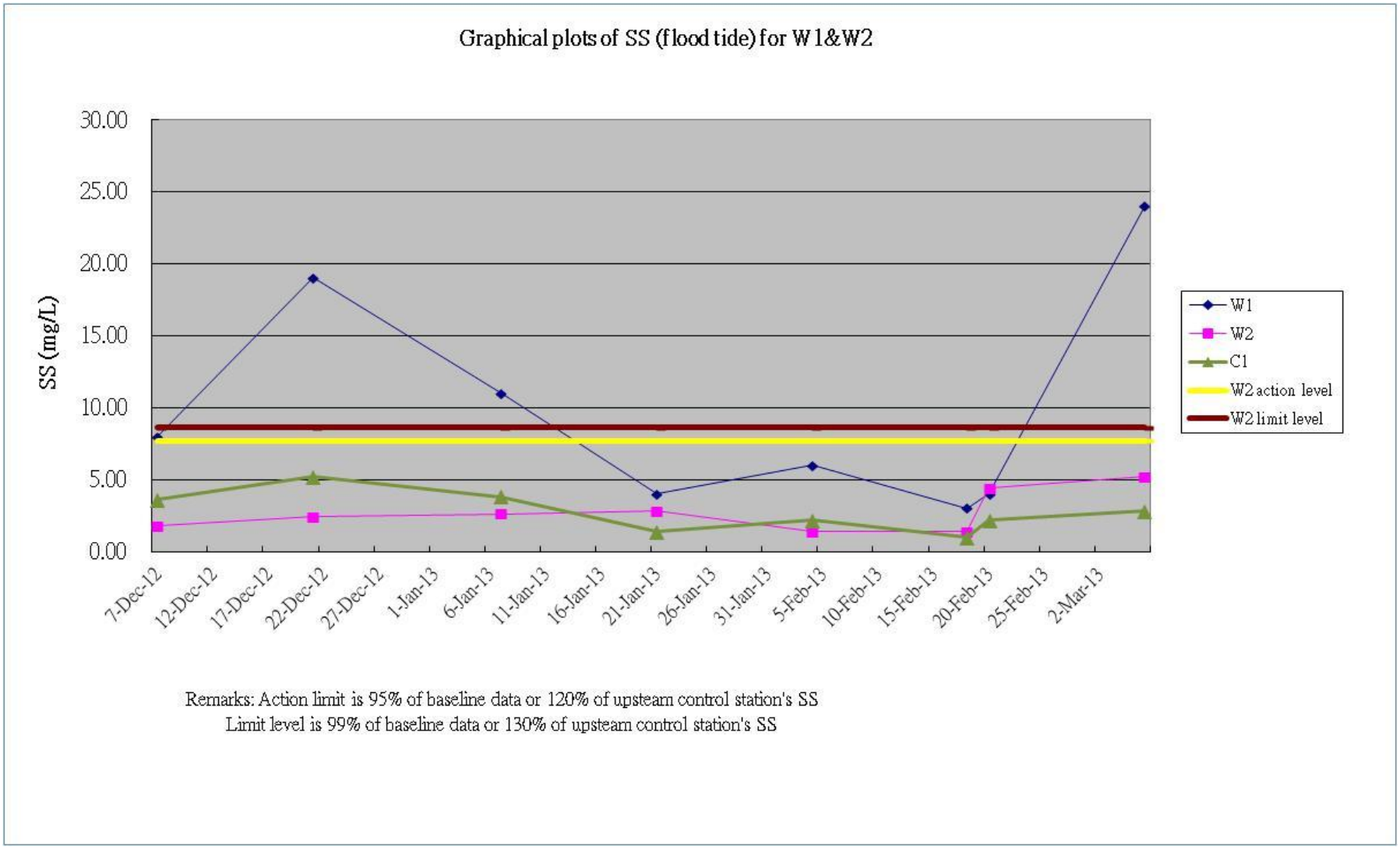
Appendix K: Graphical plots of trends of monitored parameter

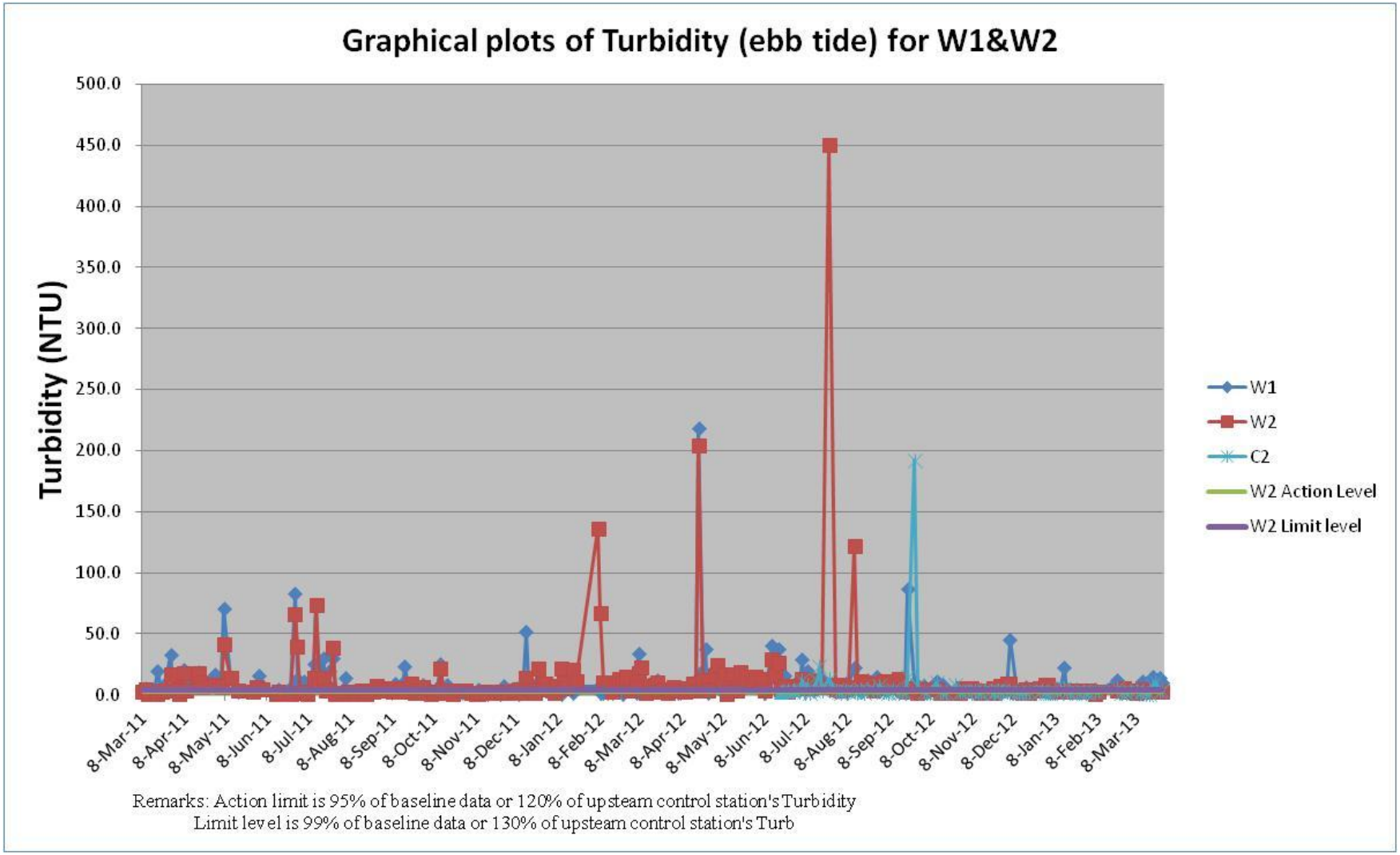

Graphical plots of pH values W1&W2
pH values
12.00
10.00
8.00
6.00
4.00
2.00
0.00
3-Dec-12
8-Dec-12
13-Dec-12
18-Dec-12
23-Dec-12
28-Dec-12
2-Jan-13
7-Jan-13
12-Jan-13
17-Jan-13
22-Jan-13
27-Jan-13
1-Feb-13
6-Feb-13
11-Feb-13
16-Feb-13
21-Feb-13
26-Feb-13
3-Mar-13
8-Mar-13
13-Mar-13
18-Mar-13
23-Mar-13
W1
W2
Reference
Point
Lower limit

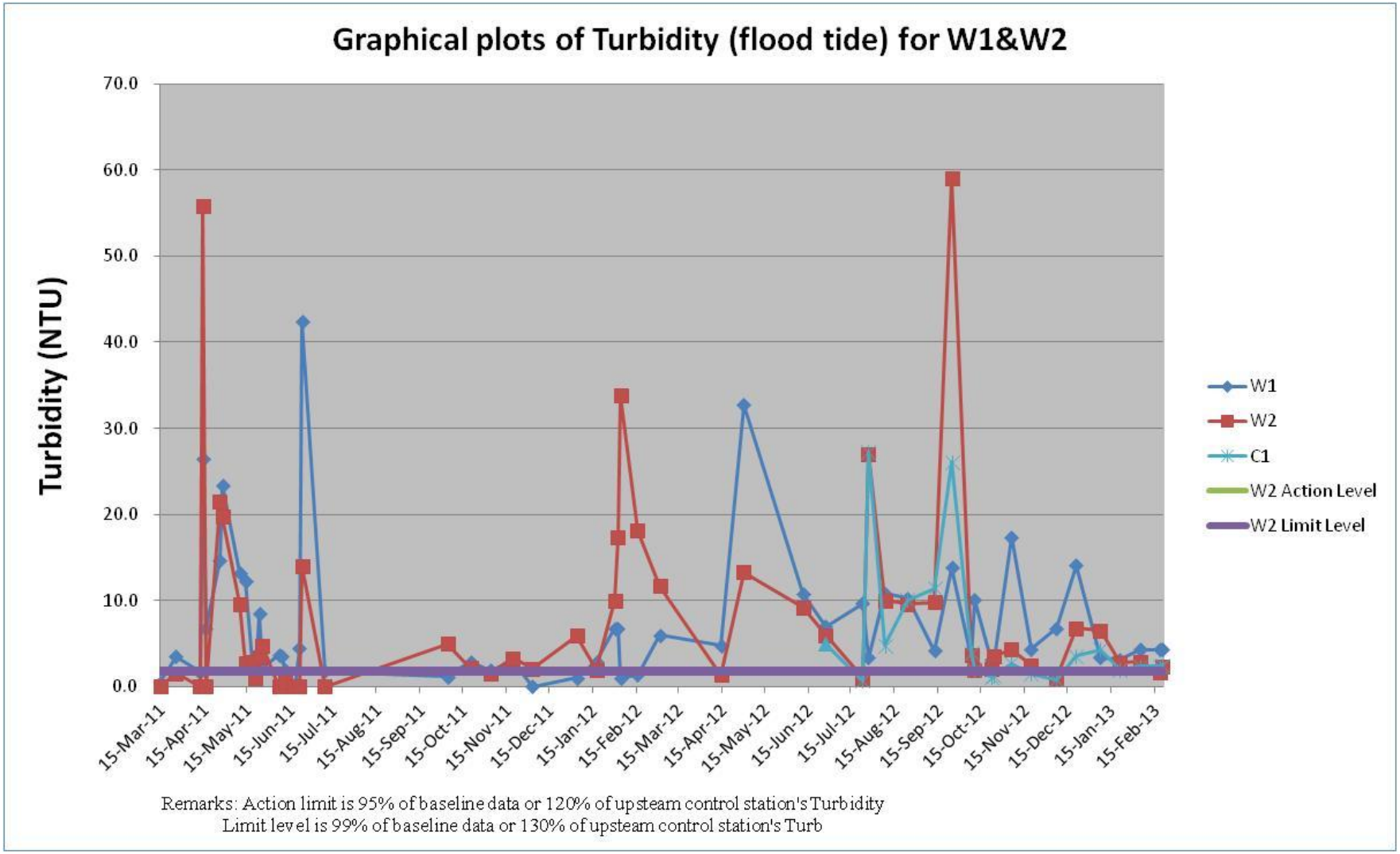

Graphical plots of DO (ebb tide) for W1&W2
DO (mg/L)
14
12
10
8
6
4
2
0
8-Mar-11
8-Apr-11
8-May-11
8-Jun-11
8-Jul-11
8-Aug-11
8-Sep-11
8-Oct-11
8-Nov-11
8-Dec-11
8-Jan-12
8-Feb-12
8-Mar-12
8-Apr-12
8-May-12
8-Jun-12
8-Jul-12
8-Aug-12
8-Sep-12
8-Oct-12
8-Nov-12
8-Dec-12
8-Jan-13
8-Feb-13
8-Mar-13
W1
W2
C2
W2 Action Level
W2 Limit Level
Remarks: Action level: 5 percentile of baceline data
Limit level: 1 percentile of baceline

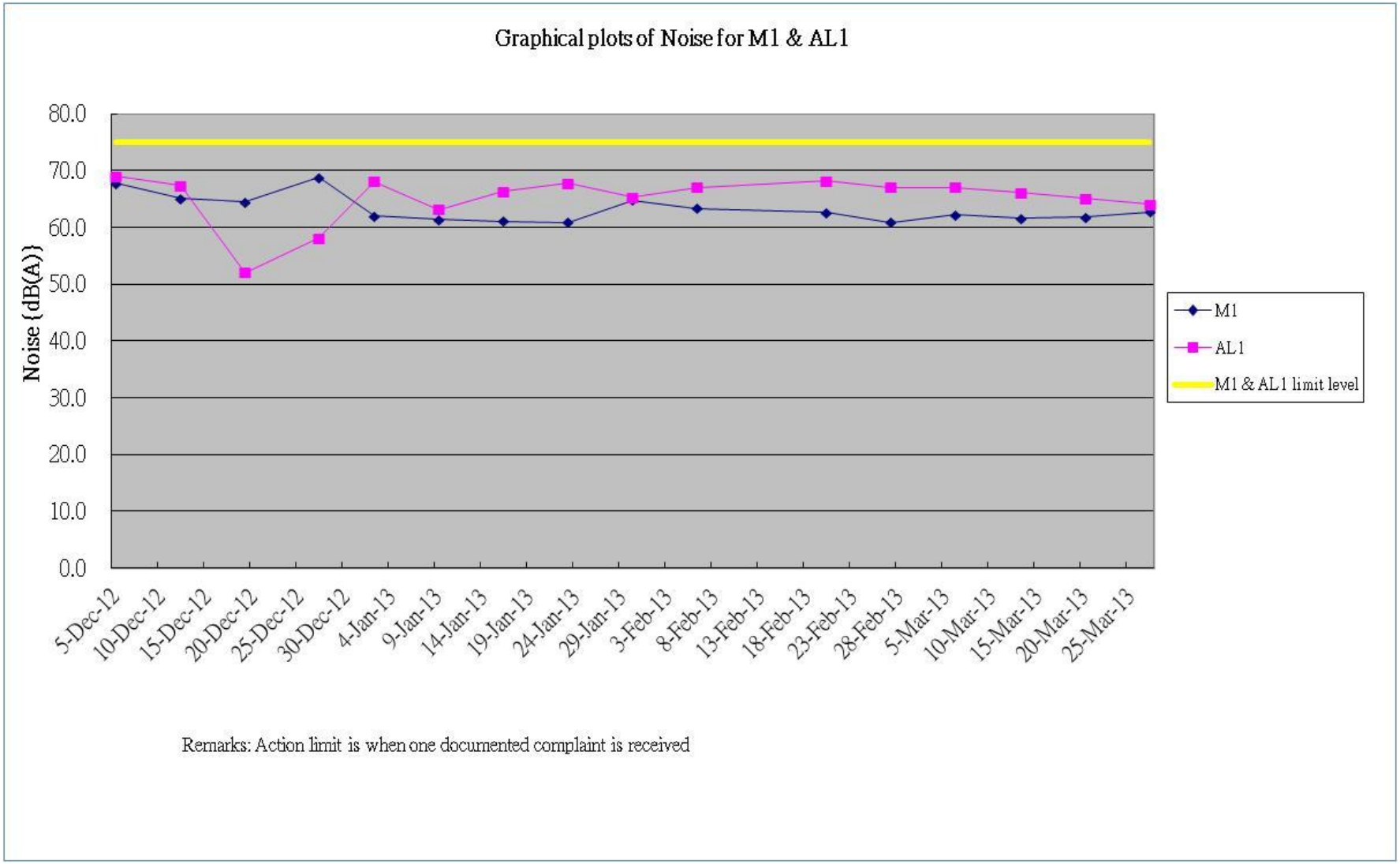

Graphical plot of DO (flood tide) of W1&W2
DO (mg/L)
12
10
8
6
4
2
0
15-Mar-11
15-Apr-11
15-May-11
15-Jun-11
15-Jul-11
15-Aug-11
15-Sep-11
15-Oct-11
15-Nov-11
15-Dec-11
15-Jan-12
15-Feb-12
15-Mar-12
15-Apr-12
15-May-12
15-Jun-12
15-Jul-12
15-Aug-12
15-Sep-12
15-Oct-12
15-Nov-12
15-Dec-12
15-Jan-13
15-Feb-13
W1
W2
C1
W2 Action Level
W2 Limit Level
Remarks: Action level: 5 percentile of baceline data
Limit level: 1 percentile of baceline

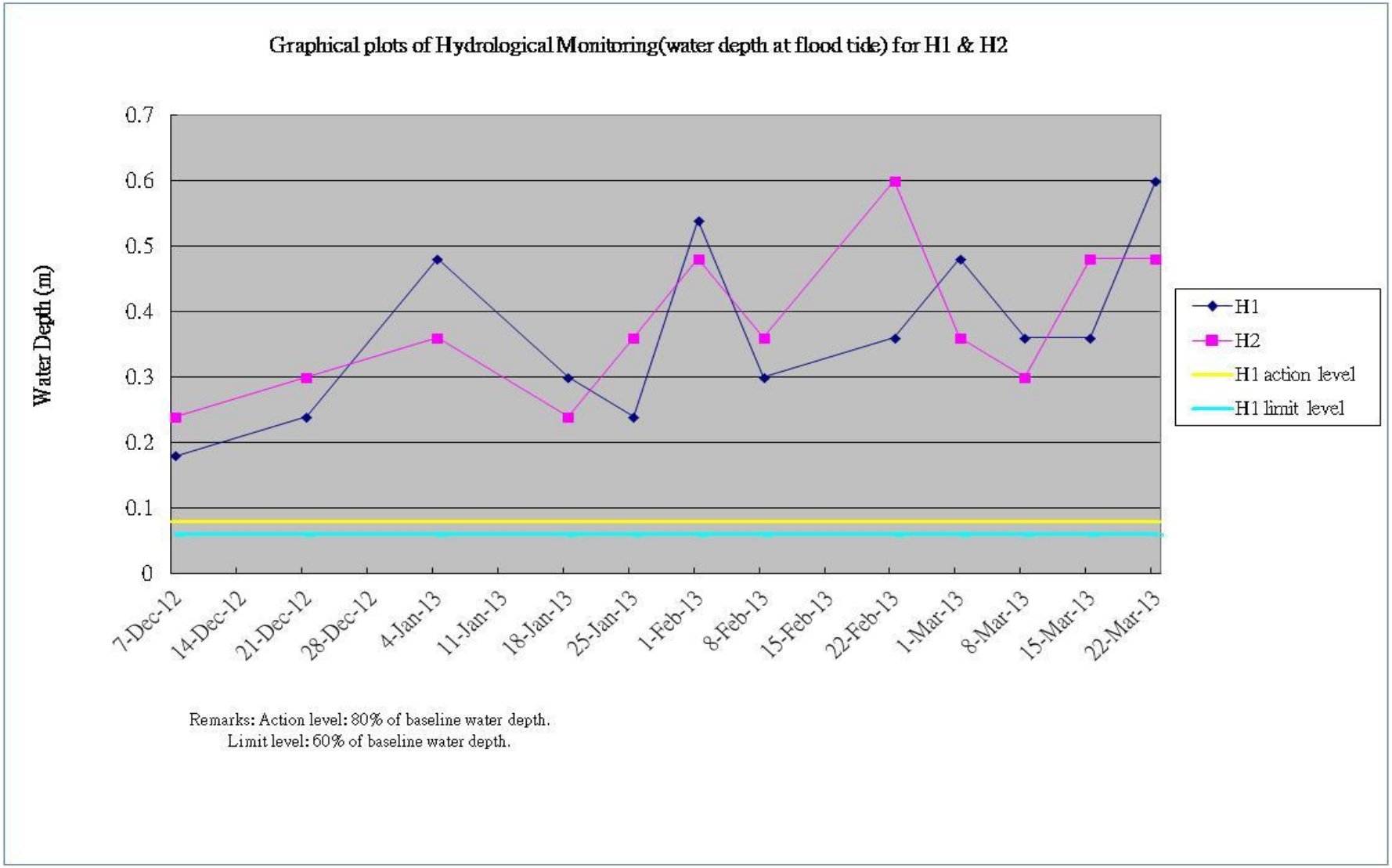

Graphical plots of SS (ebb tide) for W1&W2
SS (mg/L)
120.00
100.00
80.00
60.00
40.00
20.00
0.00
3-Dec-12
8-Dec-12
13-Dec-12
18-Dec-12
23-Dec-12
28-Dec-12
2-Jan-13
7-Jan-13
12-Jan-13
17-Jan-13
22-Jan-13
27-Jan-13
1-Feb-13
6-Feb-13
11-Feb-13
16-Feb-13
21-Feb-13
26-Feb-13
3-Mar-13
8-Mar-13
13-Mar-13
18-Mar-13
23-Mar-13
W1
W2
C2
W2 action level
W2 limit level
Remarks: Action limit is 95% of baseline data or 120% of upsteam control station's SS
Limit level is 99% of baseline data or 130% of upsteam control station's SS

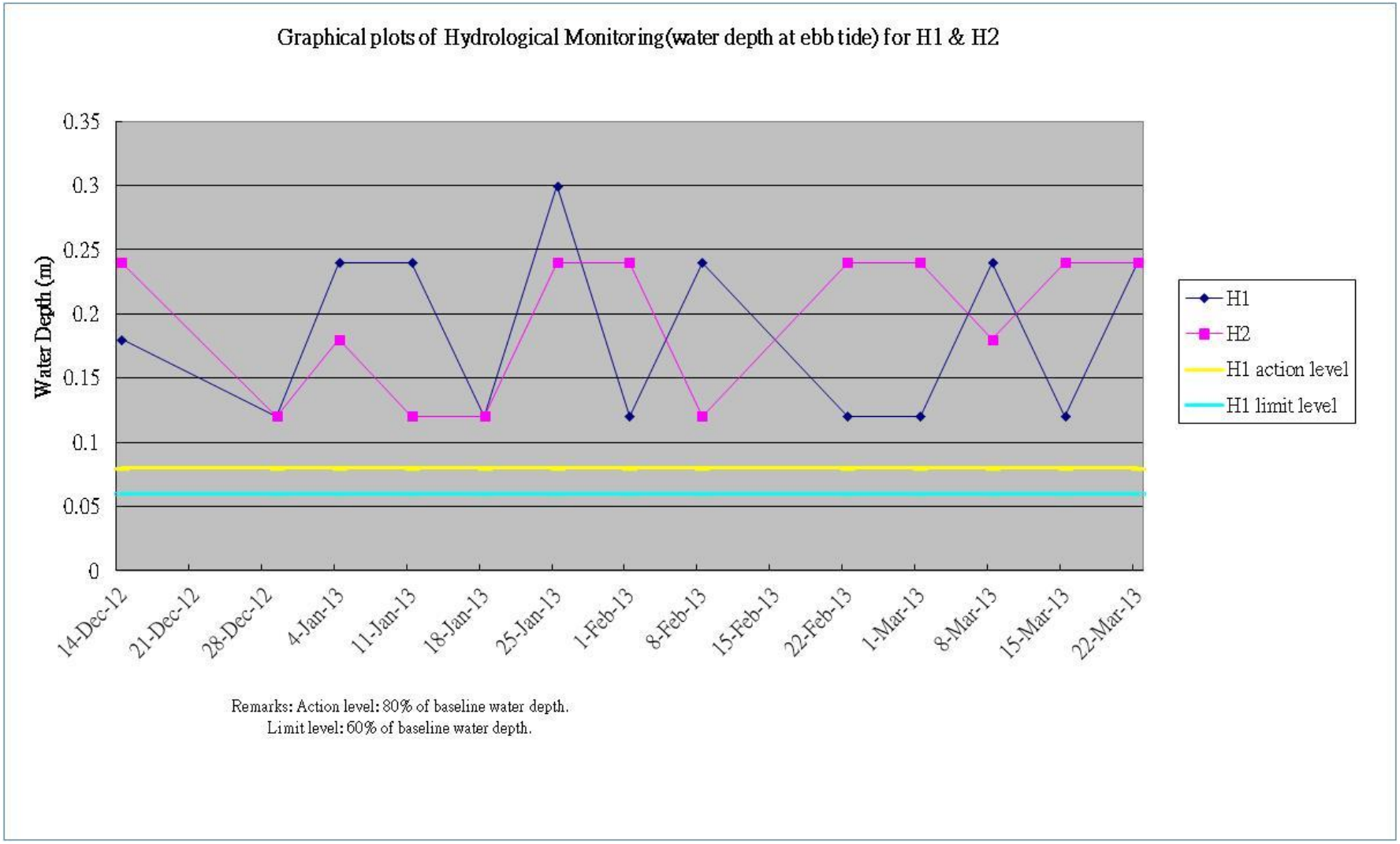

Graphical plots of SS (flood tide) for W1&W2
SS (mg/L)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
7-Dec-12
12-Dec-12
17-Dec-12
22-Dec-12
27-Dec-12
1-Jan-13
6-Jan-13
11-Jan-13
16-Jan-13
21-Jan-13
26-Jan-13
31-Jan-13
5-Feb-13
10-Feb-13
15-Feb-13
20-Feb-13
25-Feb-13
2-Mar-13
W1
W2
C1
W2 action level
W2 limit level
Remarks: Action limit is 95% of baseline data or 120% of upsteam control station's SS
Limit level is 99% of baseline data or 130% of upsteam control station's SS

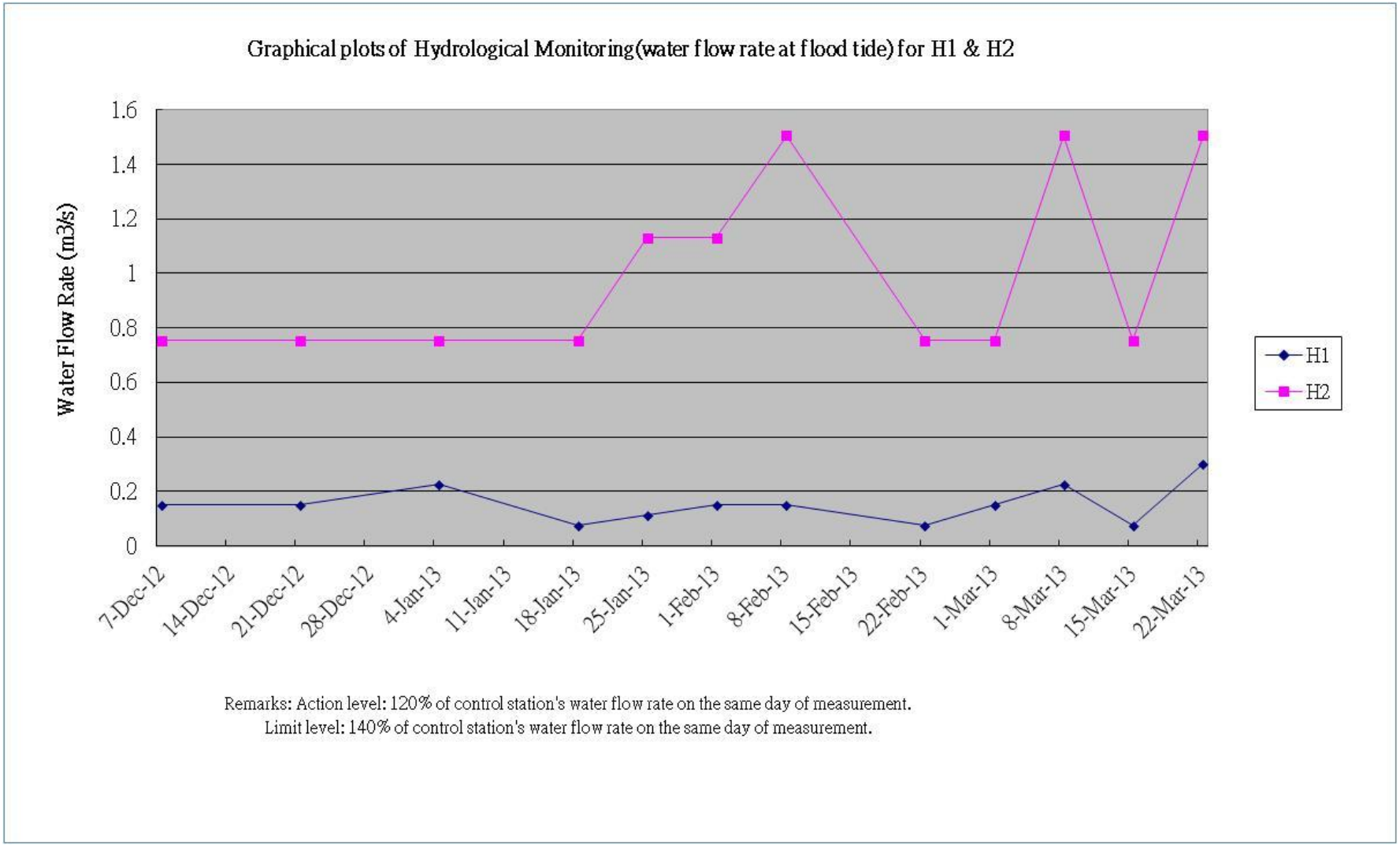

Graphical plots of Turbidity (ebb tide) for W1&W2
Turbidity (NTU)
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
8-Mar-11
8-Apr-11
8-May-11
8-Jun-11
8-Jul-11
8-Aug-11
8-Sep-11
8-Oct-11
8-Nov-11
8-Dec-11
8-Jan-12
8-Feb-12
8-Mar-12
8-Apr-12
8-May-12
8-Jun-12
8-Jul-12
8-Aug-12
8-Sep-12
8-Oct-12
8-Nov-12
8-Dec-12
8-Jan-13
8-Feb-13
8-Mar-13
W1
W2
C2
W2 Action Level
W2 Limit level
Remarks: Action limit is 95% of baseline data or 120% of upsteam control station's Turbidity
Limit level is 99% of baseline data or 130% of upsteam control station's Turb

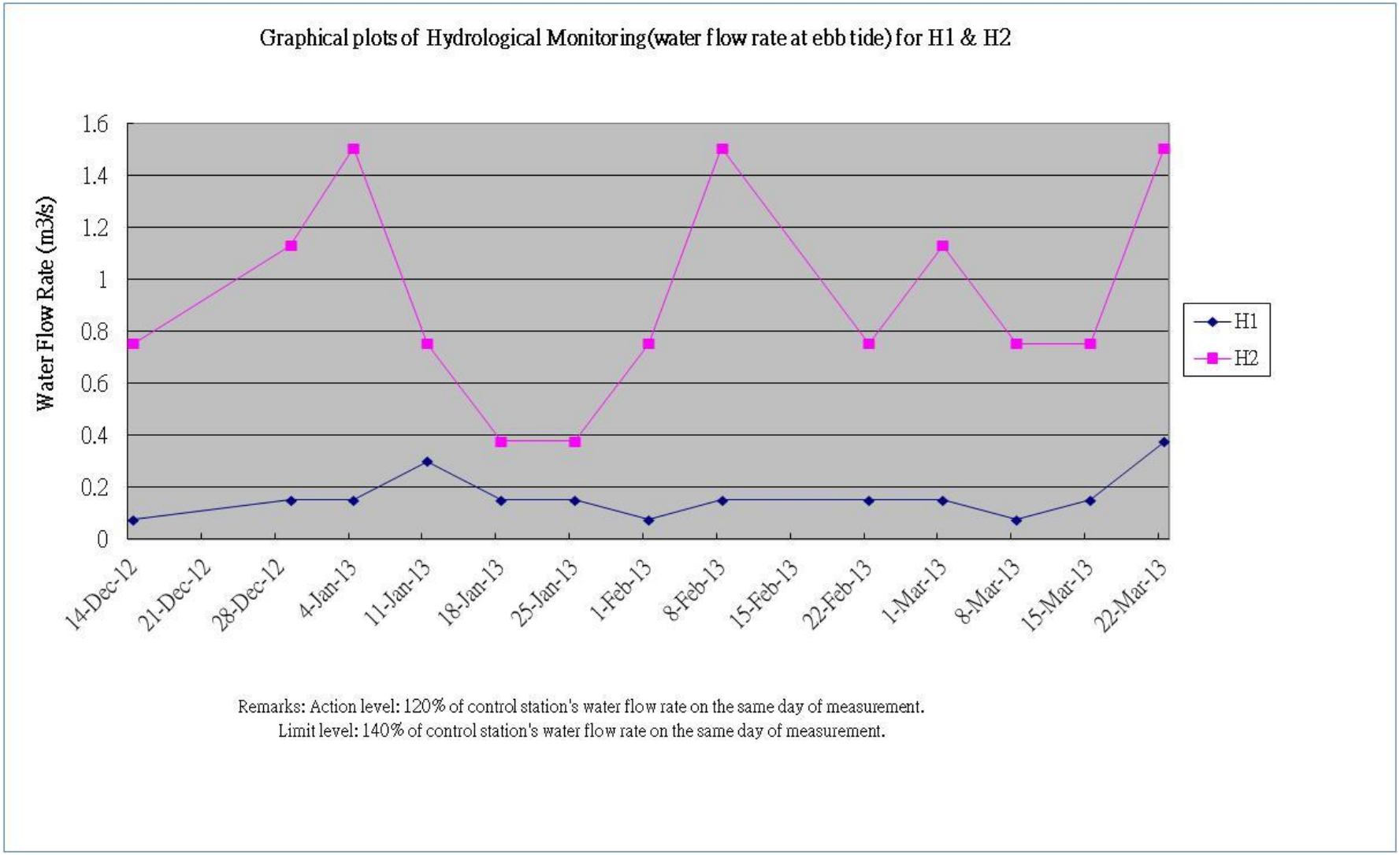

Graphical plots of Turbidity (flood tide) for W1&W2
Turbidity (NTU)
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
15-Mar-11
15-Apr-11
15-May-11
15-Jun-11
15-Jul-11
15-Aug-11
15-Sep-11
15-Oct-11
15-Nov-11
15-Dec-11
15-Jan-12
15-Feb-12
15-Mar-12
15-Apr-12
15-May-12
15-Jun-12
15-Jul-12
15-Aug-12
15-Sep-12
15-Oct-12
15-Nov-12
15-Dec-12
15-Jan-13
15-Feb-13
W1
W2
C1
W2 Action Level
W2 Limit Level
Remarks: Action limit is 95% of baseline data or 120% of upsteam control station's Turbidity
Limit level is 99% of baseline data or 130% of upsteam control station's Turb


Graphical plots of Noise for M1 & AL1
Noise {dB(A)}
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
5-Dec-12
10-Dec-12
15-Dec-12
20-Dec-12
25-Dec-12
30-Dec-12
4-Jan-13
9-Jan-13
14-Jan-13
19-Jan-13
24-Jan-13
29-Jan-13
3-Feb-13
8-Feb-13
13-Feb-13
18-Feb-13
23-Feb-13
28-Feb-13
5-Mar-13
10-Mar-13
15-Mar-13
20-Mar-13
25-Mar-13
M1
AL1
M1 & AL1 limit level
Remarks: Action limit is when one documented complaint is received


Graphical plots of Hydrological Monitoring(water depth at flood tide) for H1 & H2
Water Depth (m)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
7-Dec-12
14-Dec-12
21-Dec-12
28-Dec-12
4-Jan-13
11-Jan-13
18-Jan-13
25-Jan-13
1-Feb-13
8-Feb-13
15-Feb-13
22-Feb-13
1-Mar-13
8-Mar-13
15-Mar-13
22-Mar-13
H1
H2
H1 action level
H1 limit level
Remarks: Action level: 80% of baseline water depth.
Limit level: 60% of baseline water depth.


Graphical plots of Hydrological Monitoring (water depth at ebb tide) for H1 & H2
Water Depth (m)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
14-Dec-12
21-Dec-12
28-Dec-12
4-Jan-13
11-Jan-13
18-Jan-13
25-Jan-13
1-Feb-13
8-Feb-13
15-Feb-13
22-Feb-13
1-Mar-13
8-Mar-13
15-Mar-13
22-Mar-13
H1
H2
H1 action level
H1 limit level
Remarks: Action level: 80% of baseline water depth.
Limit level: 60% of baseline water depth.


Graphical plots of Hydrological Monitoring (water flow rate at flood tide) for H1 & H2
Water Flow Rate (m3/s)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
7-Dec-12
14-Dec-12
21-Dec-12
28-Dec-12
4-Jan-13
11-Jan-13
18-Jan-13
25-Jan-13
1-Feb-13
8-Feb-13
15-Feb-13
22-Feb-13
1-Mar-13
8-Mar-13
15-Mar-13
22-Mar-13
H1
H2
Remarks: Action level: 120% of control station's water flow rate on the same day of measurement.
Limit level: 140% of control station's water flow rate on the same day of measurement.


Graphical plots of Hydrological Monitoring(water flow rate at ebb tide) for H1 & H2
Water Flow Rate (m3/s)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
14-Dec-12
21-Dec-12
28-Dec-12
4-Jan-13
11-Jan-13
18-Jan-13
25-Jan-13
1-Feb-13
8-Feb-13
15-Feb-13
22-Feb-13
1-Mar-13
8-Mar-13
15-Mar-13
22-Mar-13
H1
H2
Remarks: Action level: 120% of control station's water flow rate on the same day of measurement.
Limit level: 140% of control station's water flow rate on the same day of measurement.

Appendix L: Ecological monitoring report

Agreement No. DP/01/2010
Drainage Improvement Works in Shatin and Tai Po:
Ecological Monitoring in area under Contract 1
(Report 13a for Mar 2013)

Prepared for:

Drainage Services Department

Prepared by:
ENVIRON Hong Kong Limited

Date:
April 2013

Reference Number:
R3051_V1.0

ENVIRON

Agreement No. DP/01/2010
Drainage Improvement Works in Shatin and Tai Po:
Ecological Monitoring in area under Contract 1
(Report 13a for Mar 2013)

Prepared by:

Max Lee
Assistant Environmental Consultant

Approved by:

Tony Cheng
Project Manager

ENVIRON Hong Kong Limited
Room 2310, China Resources Building
26 Harbour Road, Wan Chai, Hong Kong
Tel: (852) 3743 0788
Fax: (852) 3548 6988
Email: hkinfo@environcorp.com

Q:\Projects\DSDSHUWNEM00\Report\Bi-Monthly Construction Phase Ecological Monitoring Report\201303\13a

Contents

Page

List of Tables

List of Figures

1. Introduction

5.1 Project description

The Drainage Improvement Works in Shuen Wan was undertaken to minimize the potential flooding impacts in Sha Tin and Tai Po area. Although the Ecological Impact Assessment in the EIA Report identified that ecological impacts resulting from the proposed drainage improvement works at Shuen Wan were anticipated to be very minor in scale, ecological mitigation and ecological monitoring were recommended in the EM&A Manual (http://env-shuenwan.com/pdf/review_note_em&a_rev.3.pdf) as stipulated under Environment Permit No. EP-303/2008.

5.2 Scope of ecological impact monitoring was described in the Particular Specifications and EM & A Manual of the projects. In brief, the monitoring tasks include regular check on the retained and transplanted trees and shrubs, monitoring on fauna groups and aquatic fauna within the works area and any ecologically sensitive area within 100 m of the works boundary.

5.3 China-Hong Kong Ecology Consultants Co. was commissioned by ENVIRON Hong Kong Limited to perform the ecological impact monitoring survey for areas under Contract 1 starting from March 2011.

5.4 The outline of this ecological monitoring report was as follow:

- Highlights of this report
- Summary of construction activities for the month
- Monitoring methodology
- Monitoring data
- Remedial measures adopted to the adverse condition
- Record of complains and remedial measures
- Review of monitoring results
- Forecast of works programme and monitoring requirements
- Comments and brief summary

5.5 This is the report No. 13a ecological monitoring conducted on 29th March 2013 within the works boundary under Contract 1 and area within 100 m from the works boundary.

2. Highlights of this report

- Field survey was conducted on 29th March 2013
- Construction activities of Contract 1 was continued since March 2011
- Lower number of species was observed within the works area under Contract 1, in particular stream ecological monitoring point 2 (SEMP 2) due to recent river diversion for Ecological Compensatory Area (ECA) construction.
- Habitats in the 100 m buffer area retain its natural condition.

3. Summary of construction activities for the month

Major construction activities carried out in Contract 1 by the contractor during the present monitoring period (March 2013) includes:

Area A (Pumping Station)

- Construction of outfall structure of Tidal Measuring System
- Construction of Cable draw pit & ducting
- Installation of E&M Equipment
- Construction of DN2100 storm relief drain (CH5 to CH20 and CH177 to CH220) at Ting Kok Road.
- Construction of Intake Structure of storm relief drain

Area B (Tung Tsz Nursery)

- Construction of the proposed box culvert bay 2, 3, 8A, 15 and 16 (Including Sheetpiling, Excavation, Concreting, Steel Bar Fixing)
- Construction of Twin 2800 dia. Pipe by Pipe Jacking Method

Area C (ECA)

- Handovered to AFCD.

4. Monitoring Methodology

Ecological monitoring methods were generally followed those described in the baseline ecological surveys (DC/2009/22). However, sampling area maybe reduced because of habitat change, for instance, deforestation and channel modification due to drainage works, where sampling was not applicable. Survey data and evaluation are detailed in the following sections.

4.1 Vegetation survey

Vegetation survey was performed along the designated transects (**Figure 1**) for ecological monitoring as described in the project specifications to monitor the vegetation health which could be adversely influenced by any bad site practice. Qualitative data of plants within the works boundary and wetland vegetation in the 100 m buffer area of Contract 1 adjacent to construction site and wetland was recorded. Riparian vegetation including aquatic and emergent at 4 stream ecological monitoring points (hereinafter referred to as "SEMP") under Contract 1 (i.e. SEPM 1 &2; **Figure 2 & 3**) along the affected stream channel and riparian habitat was recorded in terms of species, relative abundance and average heights. Any signs of damages and adverse health problems directly caused the works were recorded and reported. Nomenclature and protection status of the species followed those documented in the AFCD website (www.hkbiodiversity.net) and Hong Kong Herbarium (2004).

4.2 Avifauna

Bird survey was conducted by following the proposed transects which cover the major ecologically sensitive areas of the Project (**Figure 1**). All bird species were recorded with special attention paid on the species of conservation importance and wetland-dependent species. List of bird species recorded and the relative abundance was provided.

4.3 Herpetofauna

Hepetofauna survey was conducted via direct observation and active searching along the survey transects with a focus in the work areas (**Figure 1**). All reptiles and amphibians encountered or heard were recorded. Nomenclature and conservation status of herpetofauna species follows AFCD website (www.hkbiodiversity.net).

4.4 Butterflies and Odonata

Odonates and butterfly survey of different habitats within the Study Area was conducted along the proposed transect (**Figure 1**). All butterflies and odonata were identified and relative abundance was recorded. Nomenclauture and status of conservation of butterflies follows Lo & Hui (2005) while that of odonata follows AFCD websites (www.hkbiodiversity.net).

4.5 Mammals

As the monitoring site was situated near traffics, plant nursery and residential buildings, mammals were unlikely inhabited at the site except rodents, domestic dogs and cats. Detailed mammal monitoring was not conducted. However, any sighting, tracks and signs of mammals encountered during survey of other faunal groups was recorded. Bat was surveyed by search for potential colony habitat, such as palm trees, which are often used by fruit bats as nesting sites.

4.6 Aquatic fauna

Monitoring of aquatic fauna was carried out mainly by bank-side observation, sometimes with the aid of binoculars, at two stream ecological monitoring points under Contract 1 (i.e. SEMP 1 & 2). These points are selected for covering representative sections of Wai Ha River and are shown in **Figure 1**. Netting and fish traps were also deployed at these points to collect supplementary data. Aquatic fauna seen/collected was identified *in situ* to the lowest possible taxon and relative abundance was presented.

5. Monitoring data

5.1 Vegetation survey

The habitats identified in area under Contract 1 are marine, recreational fish pond, river course, wooded area, mangrove, marsh and developed area (including village). Vegetation were found in wooded area, mangrove, marsh, develop area and river bank. During the current monitoring period, some riparian climbers (*Cocculus orbiculatus*) at SEMP 2 was removed due to direct conflict with the construction of ECA. The riparian vegetations were dominated by *Leucaena leucocephala* and *Plantago major* with average coverage ranged from 15% to 40% (**Table 1**). A list of plant species recorded from different habitats within the assessment area under Contract 1 is presented on **Table 2**. A total of 130 species were recorded within the assessment boundary of Contract 1 in which 121 species were recorded within the buffer area, while 52 species recorded within the work areas under Contract 1. No protected species were recorded.

5.2 Avifauna

A total of 14 bird species were recorded in the current survey under Contract 1(**Table 3**). In the work area under Contract 1, 2 bird species were recorded in which none are considered to be of conservation concern. A total of 14 bird species were recorded in the 100m buffer area in which one wetland dependent species *Ardeola bacchus* is recognized as being regional conservation concern, though it is common in suitable habitats in Hong Kong. (Viney et al., 2005).

5.3 Herpetofauna

No reptile was recorded within the assessment area. Mating call of Gunter's Frog, was heard from the water of pools, ditches and river bank within the 100m buffer zone. Common Toad was found on both work area and buffer zone of the site. The species recorded belongs to common species in Hong Kong. (**Table 4**).

5.4 Butterflies

A total of 10 butterfly species were recorded during surveys (**Table 5**). Only 2 butterfly species were recorded within the work boundary of Contract 1, while most of the butterfly species were inhibiting outside the proposed construction area in which none of the species are of the conservation concern.

5.5 Odonata

A total of 4 odonata species were recorded during the surveys (**Table 6**). The species Wandering glider (*Pantala flavescens*) was found within the work boundaries under Contract 1, while most of the observed odonata species were largely inhabiting along the river bank in the 100m buffer area.

5.6 Mammal

A few Short-nosed Fruit Bats *Cynopterus sphinx* were observed nesting in a few palm trees at the playground near Ting Kok Nursery Community Garden within Contract 1 boundary. No other mammals or trace of mammals was observed within the assessment area.

5.7 Aquatic fauna

Under Contract 1 (i.e. SEMP 1 & 2), a total of 9 fish species, 2 crustaceans, 1 bivalve and 1 snail were recorded and most of them were residing in brackish environments (**Table 7**). Some river works were carried out in SEMP 1 as showed in **Figure 2**. Overall, no protected or rare species were recorded.

6. Remedial measures adopted to the adverse condition

There was no non-compliance event recorded within this reporting month.

7. Record of complains and remedial measures

There was no complaint in relation to environmental issue recorded in this reporting month.

8. Review of the monitoring results

During the present survey period, construction activities were carried out at works area under Contract 1, while 100 m buffer area remains natural. Much of the construction activities are carried out at Tung Tsz Nursery and pumping station under Contract 1. In general, lower numbers of species were recorded within the works area under Contract 1 than that of 100 m buffer area because of the associated constructions and urbanized in nature. It is noted that the diversity of aquatic fauna in SEMP 2 under Contract 1 is relatively lower because of the recent river works at SEMP 1 where has been regarded as the corridor for aquatic fauna to move between Wai Ha River and the marine area outside the assessment area. However, most of the construction activities are restricted in the developed area with low ecological significance. As mitigation measures recommended in the EM&A Manual were properly

implemented during the current survey, and hence the residual environmental impacts would be minimized.

9. Forecast of works programme and monitoring requirements

The tentative construction activities undertaken by the contractor in the coming months are as follows:

Area A (Pumping Station)

- Construction of outfall structure of Tidal Measuring System
- Construction for Cable draw pit & ducting
- Installation of E&M Equipment
- Backfilling
- Construction of Green Roof of Pumping Station
- Construction of DN2100 storm relief drain (CH5 to CH20 and CH177 to CH220) at Ting Kok Road
- Construction of Box Culvert connecting to Twin 2800 dia. Pipe

Area B (Tung Tsz Nursery)

- Construction of the proposed box culvert bay 2, 3, 14, 15, 16 and 17(Including Sheetpiling, Excavation, Concreting, Steel Bar Fixing)
- Construction of Twin 2800 dia. Pipe by Pipe Jacking Method

Area C (ECA)

- Handovered to AFCD

The monitoring programme described in EM&A will strictly follow to verify compliance of environmental requirements and the proper implementation of all necessary mitigation measures.

10. Comments and summary

The bi-monthly ecological impact monitoring under Contracts 1 (excluding the ECA) was conducted in March 2013 and relevant flora and fauna data were collected according to project specification and EM & A Manual. As indicated by the low diversity and abundance of species recorded within the work areas, habitats within the work boundary under Contracts 1 offer few ecological opportunities for inhabitation of fauna and flora. Given that the construction activities are restricted in the developed area with proper mitigation measures being implemented, disturbances associated with the current construction activities are largely affecting area with low ecological significance. On the other hand, the natural habitats in the

100 m buffer area are retained at acceptable condition, and hence the 100 m buffer area has not been significantly affected by the construction works.

11. References

Lo PYF & Hui WL (2005). *Hong Kong Butterflies* (2nd Edition). Friends of Country Parks. Hong Kong.

Wilson KDP (2003). *Field Guide to the Dragonflies of Hong Kong*. Agriculture, Fisheries and Conservation Department. Hong Kong.

Viney C, Philips K, Lam CY (2005). *The Birds of Hong Kong and South China* (8th Edition). Hong Kong Government Information Service. Hong Kong.

Hong Kong Herbarium (2004*). Check List of Hong Kong Plants*. Agriculture, Fisheries and Conservation Department. Hong Kong.

AFCD, Hong Kong Biodiversity Website:
http://www.afcd.gov.hk/english/conservation/hkbiodiversity/database/search.asp

Lee VLF, La, SKS, Ng FKY, Chan TKT, Young MLC (2004). *Field Guide to the freshwater fish of Hong Kong*. Agriculture, Fisheries and Conservation Department. Hong Kong.

Shek CT (2006) A *Field Guide to the Terrestrial Mammals*. Agriculture, Fisheries and Conservation Department. Hong Kong.

Fellowes, J.R., Lau, M.W.N., Dudgeon, D., Reels, G., Ades, G.W.J., Carey, G.J., Chan, B.P.L., Kendrick, R.C., Lee, K.S., Leven, M.R., Wilson, K.D.P. & Yu, Y.T. (2002). Wild animals to watch: Terrestrial and freshwater fauna of conservation concern in Hong Kong. *Memoirs of the Hong Kong Natural History Society* 25: 123-159.

Karsen SJ, Lau MWN, Bogadek A (1986) *Hong Kong Amphibians and Reptiles*. The Urban Council Hong Kong. Hong Kong.

Figure

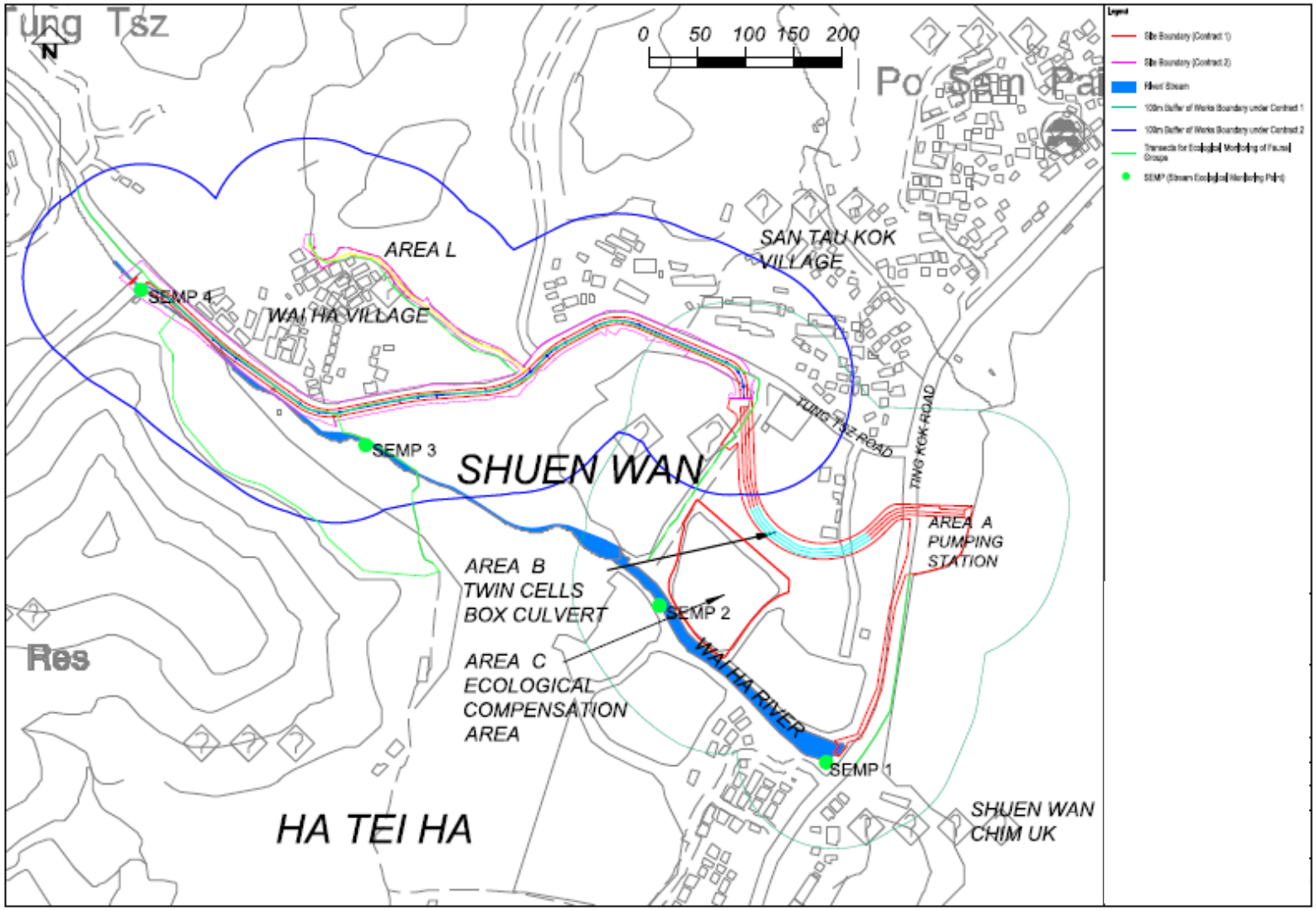


Figure: 1	ENVIRON
Title: Map showing the ecological monitoring transect and the boundary of assessment area.	Drawn by: ML
	Checked by: ML
Project: Agreement No. DP/01/2010 Drainage Improvement Works in Shatin and Tai Po: Ecological Monitoring in area under Contract 1 (Mar 2013, Report 13a)	Rev.: 1.0
	Date: Apr 2013

Figure: 2	ENVIRON
Title: SEMP 1, the first sampling point of Wai Ha River under Contract 1.	Drawn by: ML
	Checked by: ML
Project: Agreement No. DP/01/2010 Drainage Improvement Works in Shatin and Tai Po: Ecological Monitoring in area under Contract 1 (Mar 2013, Report 13a)	Rev.: 1.0
	Date: Apr 2013

Figure: 3	ENVIRON
Title: SEMP 2, the second sampling point along Wai Ha River under Contract 1.	Drawn by: ML
	Checked by: ML
Project: Agreement No. DP/01/2010 Drainage Improvement Works in Shatin and Tai Po: Ecological Monitoring in area under Contract 1 (Mar 2013, Report 13a)	Rev.: 1.0
	Date: Apr 2013

Table

Table 1. List of riparian vegetation and coverage (%) recorded from two stream sampling points under Contract 1 (i.e. SEMP 1, 2).

			Sampling point	**SEMP 1**		**SEMP 2**	
Species	**Family**	**Growth form**	**Status in Hong Kong**	**Height (cm)**	**%**	**Height (cm)**	**%**
Albizia lebbeck	MIMOSACEAE	Tree	E			400	10
Arundinella nepalensis	POACEAE	Perennial Herb	N			150	2
Bidens alba	ASTERACEAE	Herb	E	30	10		
Celtis sinensis	ULMACEAE	Tree	N			500	10
Eclipta prostrata	ASTERACEAE	Perennial herb	N	30	1		
Ficus virens	MORACEAE	Tree	N	100	1		
Kandelia obovata	RHIZOPHORACEAE	Shrub or Small Tree	N			150	4
Leucaena leucocephala	MIMOSACEAE	Small Tree	E			600	40
Macaranga tanarius	EUPHORBIACEAE	Tree	N			100	1
Mikania micrantha	ASTERACEAE	Climbing Herb	E	10	1		
Pennisetum alopecuroides	POACEAE	Perennial Herb	N	250	10		
Plantago major	PLANTAGINACEAE	Perennial herb	N	30	15		
Bare	n/a	n/a	n/a	n/a	62	n/a	33

*Key:
E = Exotic
N = Native
n/a = not available

Table 2. List of vegetation recorded from works area under Contracts 1 and 100 m buffer area in the impact monitoring survey conducted in March 2013. Vegetation species presents in the identified location was indicated by "V".

Habitat	Species name	Family	Growth form	*Status in Hong Kong	Work Area under Contract 1	100 m buffer area under Contract 1
Stream	*Chrysalidocarpus lutescens*	ARECACEAE	Shrub Palm	E		V
	Melia azedarach	MELIACEAE	Tree	E		V
	Murraya paniculata	RUTACEAE	Small Tree	E		V
	Lantana camara	VERBENACEAE	Shrub	E		V
	Ficus hispida	MORACEAE	Tree	N		V
	Ficus virens	MORACEAE	Tree	N		V
	Chrysopogon aciculatus	POACEAE	Perennial Herb	N		V
	Microstegium ciliatum	POACEAE	Perennial Procumbent Herb	N		V
	Mucuna birdwoodiana	FABACEAE (PAPILIONACEAE)	Climber: Vine	N		V
	Pistia stratiotes	ARACEAE	Floating Aquatic Herb	N		V
	Cyperus flabelliformis	CYPERACEAE	Herb	E		V
	Acanthopanax gracilistylus	ARALIACEAE	Shrub	E		V
	Ficus triangularis	MORACEAE	Tree	E		V
	Spirodela polyrrhiza	LEMNACEAE	Floating Small Herb	N		V
	Glochidion zeylanicum	EUPHORBIACEAE	Shrub or Small Tree	N		V
	Sterculia lanceolata	STERCULIACEAE	Semi-deciduous Tree	N		V
	Albizia lebbeck	MIMOSACEAE	Tree	E		V

Habitat	Species name	Family	Growth form	*Status in Hong Kong	Work Area under Contract 1	100 m buffer area under Contract 1
	Arundinella nepalensis	POACEAE	Perennial Herb	N		V
	Bidens alba	ASTERACEAE	Herb	E		V
	Clerodendrum inerme	VERBENACEAE	Shrub	N		V
	Coculus orbiculatus	MENISPERMACEAE	Climber: Vine	N		V
	Hibiscus tiliaceus	MALVACEAE	Tree or Shrub	N		V
	Leucaena leucocephala	MIMOSACEAE	Small Tree	E		V
	Manilkara zapota	SAPOTACEAE	Tree	E		V
	Sapium discolor	EUPHORBIACEAE	Tree	N		V
Developed area	*Pericampylus glaucus*	MENISPERMACEAE	Woody Vine	N		V
	Ficus variegata var. chlorocarpa	MORACEAE	Tree or Shrub	N	V	V
	Citrus reticulata Blanco	RUTACEAE	Small Tree	E		V
	Salvia japonica	LAMIACEAE (LABIATAE)	Herb	N		V
	Morus alba	MORACEAE	Tree or Shrub	N		V
	Emilia sonchifolia	ASTERACEAE	Herb	N		V
	Clausena lansium	RUTACEAE	Small Tree	E		V
	Pyrostegia venusta	BIGNONIACEAE	Climber: Vine	E		V
	Psidium guajava	MYRTACEAE	Tree	E		V
	Catharanthus roseus	APOCYNACEAE	Subshrub	N		V
	Archontophoenix alexandrae	ARECACEAE	Tree Palm	E		V
	Desmodium heterocarpon	FABACEAE (PAPILIONACEAE)	Shrub	N		V
	Rhinacanthus nasutus	ACANTHACEAE	Herb	E		V
	Acacia confusa	MIMOSACEAE	Tree	E	V	V
	Artocarpus macrocarpon	MORACEAE	Tree	E	V	V
	Averrhoa carambola	OXALIDACEAE	Small Tree	E	V	V

Habitat	Species name	Family	Growth form	*Status in Hong Kong	Work Area under Contract 1	100 m buffer area under Contract 1
	Bauhinia blakeana	CAESALPINIACEAE	Tree or Shrub	N	V	V
	Bauhinia variegata	CAESALPINIACEAE	Tree	E	V	V
	Bridelia tomentosa	EUPHORBIACEAE	Shrub or Small Tree	N	V	V
	Calliandra haematocephala	MIMOSACEAE	Shrub	E	V	V
	Caryota ochlandra	ARECACEAE	Tree palm	E	V	V
	Cassia spectabilis	CAESALPINIACEAE	Small Tree	E	V	V
	Casuarina equisetifolia	CASUARINACEAE	Tree	E	V	V
	Citrus grandis	CASUARINACEAE	Tree	E	V	V
	Cordyline fruticosa	AGAVACEAE	Shrub	E	V	V
	Cynodon dactylon	POACEAE	Perennial Herb	N	V	V
	Dracaena draco	AGAVACEAE	Tree	E	V	V
	Elaeocapus haminanensis	ELAEOCARPACEAE	Small Tree	E	V	V
	Eleusine indica	POACEAE	Herb	N	V	V
	Eriobotrya japonica	ROSACEAE	Small Tree	E	V	V
	Ficus benjamina	MORACEAE	Tree	E	V	V
	Ficus elastica	MORACEAE	Tree	E	V	V
	Ficus simplicissima	MORACEAE	Shrub	N	V	V
	Hibiscus rosa-sinensis	MALVACEAE	Shrub	E	V	V
	Lantana camara	VERBENACEAE	Shrub	E	V	V
	Litchi chinensis	SAPINDACEAE	Tree	E	V	V
	Lumnitzera racemosa	COMBRETACEAE	Shrub or Small Tree	N	V	V
	Lygodium japonicum	LYGODIACEAE	Climbing Herb	N	V	V
	Melaleuca quinquenervia	MYRTACEAE	Tree	E	V	V
	Oxalis corniculata	OXALIDACEAE	Perennial Herb	N	V	V
	Phoenix roebelenii	ARECACEAE	Small Tree Palm	E	V	V

Habitat	Species name	Family	Growth form	*Status in Hong Kong	Work Area under Contract 1	100 m buffer area under Contract 1
	Polygonum hydropiper	POLYGONACEAE	Herb	N	V	V
	Psychotria serpens	RUBIACEAE	Climber: Vine	N	V	
	Pterocypsela indica	ASTERACEAE	Herb	N	V	V
	Rhapis excelsa	ARECACEAE	Shrub Palm	N	V	V
	Sansevieria trifasciata	AGAVACEAE	Perennial Herb	E	V	V
	Schefflera actinophylla	ARALIACEAE	Climbing Shrub	E	V	V
	Schefflera heptaphylla	ARALIACEAE	Tree	N	V	V
	Sesbania cannabina	FABACEAE	Herb	E	V	V
	Terminalia catappa	COMBRETACEAE	Large Tree	E	V	V
	Thuja orientalis	CUPRESSACEAE	Tree	E	V	V
	Tradescantia spathacea	COMMELINACEAE	Herb	E	V	V
	Youngia japonica	ASTERACEAE	Herb	N	V	V
	Acanthus ilicifolius	ACANTHACEAE	Shrub	N		V
	Acrostichum aureum	ACROSTICHACEAE	Herb	N		V
	Aegiceras corniculatum	MYRSINACEAE	Shrub	N		V
	Alocasia odora	ARACEAE	Perennial Herb	N		V
	Avicennia marina	VERBENACEAE	Shrub	N		V
	Digitaria ciliaris	POACEAE	Herb	N		V
	Panicum repens L.	POACEAE	Perennial Herb	N		V
	Pennisetum alopecuroides	POACEAE	Perennial Herb	N		V
	Phragmites anstralis	POACEAE	Perennial Herb	N		V
	Plantago major	PLANTAGINACEAE	Perennial herb	N		V
	Solanum nigrum	SOLANACEAE	Herb	N		V
	Bombax ceiba	BOMBACACEAE	Tree	E	V	
	Bidens alba	ASTERACEAE	Herb	E	V	
	Panicum maximum	GRAMINEAE	Herb	E	V	
	Microstegium ciliatum	POACEAE	Perennial	N	V	

Habitat	Species name	Family	Growth form	*Status in Hong Kong	Work Area under Contract 1	100 m buffer area under Contract 1
			Procumbent Herb			
	Leucaena leucocephala	MIMOSACEAE	Small Tree	E	V	
Plantation	*Bischofia javanica*	EUPHORBIACEAE	Tree	N		V
	Scolopia chinensis	FLACOURTIACEAE	Tree or Large Shrub	N		V
	Piper hancei	PIPERACEAE	Climber: Vine	N		V
	Dimocarpus longan	SAPINDACEAE	Tree	E		V
	Paederia scandens	RUBIACEAE	Climber: Vine	N		V
	Cleistocalyx operculatus	MYRTACEAE	Tree	N		V
	Antidesma bunius	EUPHORBIACEAE	Tree	N		V
	Litsea monopetala	LAURACEAE	Small Tree	N		V
	Microcos paniculata	TILIACEAE	Shrub or Small Tree	N		V
	Maesa perlarius	MYRSINACEAE	Shrub	N		V
	Boehmeria nivea (L.) Gaudich.	URTICACEAE	Subshrub or shrub	E		V
	Mallotus apelta	EUPHORBIACEAE	Shrub or Small Tree	N		V
	Sapindus saponaria	SAPINDACEAE	Tree	N		V
	Aporusa dioica	EUPHORBIACEAE	Tree	N		V
	Wedelia chinensis	ASTERACEAE	Perennial Herb	N		V
	Carica papaya	CARICACEAE	Tree	E		V
	Rubus reflexus	ROSACEAE	Climbing Shrub	N		V
	Brassica rapa	BRASSICACEAE (CRUCIFERAE)	Biennial Herb	E		V
	Mucuna championii Benth.	FABACEAE	Climbing Vine	N		V

Habitat	Species name	Family	Growth form	*Status in Hong Kong	Work Area under Contract 1	100 m buffer area under Contract 1
	Pinus massoniana	PINACEAE	Tree	N		V
Ting Kok Nursery Community Garden	*Bauhinia purpurea*	CAESALPINIACEAE	Tree	E	V	
	Callistemon viminalis	MYRTACEAE	Tree	E	V	
	Dillenia indica	DILLENIACEAE	Tree	E	V	
	Lonicera japonica	CAPRIFOLIACEAE	Climber: Vine	N	V	
	Tabebuia chrysantha	BIGNONIACEAE	Small Tree	E	V	
	Wisteria sinensis	FABACEAE	Climber: Vine	E	V	
Wooded area	*Celtis sinensis*	ULMACEAE	Tree	N		V
	Ligustrum sinensis	OLEACEAE	Tree or Shrub	N		V
	Macaranga tanarius	EUPHORBIACEAE	Tree	N		V
	Pandanus tectorius	PANDANACEAE	Shrub or Small Tree	N		V
	Excoecaria agallocha	EUPHORBIACEAE	Tree	N		V
	Kandelia obovata	RHIZOPHORACEAE	Shrub or Small Tree	N		V
	Thespesia populnea	MALVACEAE	Tree or Shrub	N		V
	Zoysia sinica	POACEAE	Perennial Herb	N		V
Marsh	*Acanthus ilicifolius*	ACANTHACEAE	Shrub	N		V
	Acrostichum aureum	ACROSTICHACEAE	Herb	N		V
	Aegiceras corniculatum	MYRSINACEAE	Shrub	N		V
	Alocasia odora	ARACEAE	Perennial Herb	N		V
	Avicennia marina	VERBENACEAE	Shrub	N		V
	Digitaria ciliaris	POACEAE	Herb	N		V
	Ficus hispida	MORACEAE	Tree	N		V
	Hibiscus tiliaceus	MALVACEAE	Tree or Shrub	N		V
	Ipomea cairica	CONVOLVULACEAE	Climber: Twining	E		V

Habitat	Species name	Family	Growth form	*Status in Hong Kong	Work Area under Contract 1	100 m buffer area under Contract 1
			Herb			
	Kandelia obovata	RHIZOPHORACEAE	Shrub or Small Tree	N		V
	Macaranga tanarius	EUPHORBIACEAE	Tree	N		V
	Mikania micrantha	ASTERACEAE	Climbing Herb	E		V
	Panicum repens L.	POACEAE	Perennial Herb	N		V
	Pennisetum alopecuroides	POACEAE	Perennial Herb	N		V
	Phragmites anstralis	POACEAE	Perennial Herb	N		V
	Plantago major	PLANTAGINACEAE	Perennial herb	N		V
	Polygonum lapathifolium	POLYGONACEAE	Herb	N		V
	Pueraria lobata	FABACEAE	Climber: Vine	N		V
	Schefflera heptaphylla	ARALIACEAE	Tree	N		V
	Solanum nigrum	SOLANACEAE	Herb	N		V
	Solanum torvum	SOLANACEAE	Shrub	E		V

***Key:**
E = Exotic
N = Native

Table 3. List of avifauna species and maximum counts recorded from the impact monitoring survey in March 2013 at work area under Contracts 1 and 100 m buffer area.

Species	Common name	Habitat	Conservation status in Hong Kong	Work area: Contract 1	100m buffer area
Ardea cinerea	Grey Heron	W			1
Ardeola bacchus	Chinese Pond Heron	W	RC		1
Casmerodius alba	Great Egret	W			1
Acridotheres cristatellus	Crested Myna				2
Copsychus saularis	Oriental Magpie Robin				1
Egretta garzetta	Little Egret	W			1
Garrulax perspicillatus	Masked Laughing thrush				3
Orthotomus sutorius	Common Tailorbird				1
Passer montanus	Eurasian Tree Sparrow				4
Pycnonotus jocosus	Red-whiskered Bulbul				3
Pycnonotus sinensis	Chinese Bulbul				2
Streptopelia chinensis	Spotted Dove			1	3
Sturnus nigricollis	Black-collared Starling				2
Zosterops japonicus	Japanese White-eye			2	4
Total number of species:				2	14

*** Key:**

W = Wetland dependent spices ; RC = Regional Concern

Table 4. List of herpetofauna and maximum counts recorded from the impact monitoring survey in March 2013 at work area under Contracts 2 and 100 m buffer area..

Species	**Common name**	**Conservation status in Hong Kong**	**Work area: Contract 1**	**100m Buffer area of Contract 1**
Rana guentheri	Gunther's Frog	Common		1@
Bufo melanostictus	Common Toad	Common	1	1

Key:
@-Calling heard

Table 5. Relative abundance of butterfly species recorded under Contracts 2 in impact monitoring survey during March 2013.

Species	**Common name**	**Conservation status in Hong Kong**	**Work area: Contract 1**	**100m Buffer area of Contract 1**
Delias pasithoe	Red-base Jezebel	Common	+	+
Eurema hecabe	Common Grass Yellow	Common		+
Lethe verma	Straight-banded Treebrown	Common		+
Mycalesis mineus	Dark-brand Bush Brown	Common		+
Mycalesis zonata	South China Bush Brown	Common		+
Neptis hylas	Common Sailer	Common		+
Papilio bianor bianor	Chinese Peacock	Common		+
Papilio polytes polytes	Common Mormon	Common		+
Pieris canidia	Indian Cabbage White	Common	+	++
Pseudozjzeeria maha	Pale Grass Blue	Common		+

Key:

+ : Species exists in the survey area

++ : Species common in the survey area

+++ : Species abundant in the survey area

Table 6. Relative abundance of odonata species recorded under Contracts 2 in impact monitoring survey during March 2013.

Species	**Common name**	**Conservation status in Hong Kong**	**Work area: Contract 1**	**100m Buffer area of Contract 1**
Ceriagrion auranticum ryukyuanum	Orange-tailed Sprite	Abundant		+
Pantala flavescens	Wandering Glider	Abundant	+	+
Prodasineura autumnalis	Black Threadtail	Abundant		+
Pseudagrion rubriceps rubriceps	Orange-faced Sprite	Common		+

Key:

+ : Species exists in the survey area

++ : Species common in the survey area

+++ : Species abundant in the survey area

Table 7. Relative abundance of aquatic species recorded in Wai Ha River within the 100 m buffer of works boundary under Contracts 1 in the impact monitoring survey during March 2013.

Species	**Common name**	**[1]Life-cycle characteristics**	**[2]Origin**	**SEMP 1**	**SEMP 2**
Ambassis gymnocephalus	Glassperch	M	N	+	
Cyprinus carpio	Common Carp	F	I		+
Gerres macracanthus	Longspine Silverbiddy	M	N	+	
Mugil cephalus	Flatehead Grey Mullet	M	N	+	
Opsariichthys evolans	Minnow	F	N	+	
Oreochromis mossambicus	Mozambique Tilapa	F	I	++	+
Oreochromis niloticus	Nile Tilapa	F	I	++	+
Poecilia reticulata	Guppy	F	I		+
Tilapia zillii	Redbelly Tilapa	F	I	+	
Sesarma (Perisesarma) bidens	Sesarmine crab	M	N		+
Uca arcuata	Fiddler Crab	M	N		+
Saccostrea cucullata	Rock Oyster	M	N	+	+
Cerithidea cingulata	Mud snail	M	N	+	
Total number of species:	**13**			**9**	**7**

Key:

Relative abundance:
+ : Species exists in the survey area
++ : Species common in the survey area
+++ : Species abundant in the survey area

[1] Life-cycle characteristics:
M = Marine vagrant
F = Freshwater species

[2]Origin:
N = Native
I = Introduced; / = not available

Appendix M. Photo of Wai Ha River in March 2013

	
Photo 1. Wai Ha River at W2	**Photo 2**. Wai Ha River at C1
	
Photo 3. Wai Ha River at W2	**Photo 4**. Wai Ha River at C1
	
Photo5. Wai Ha River at W2	**Photo6.** Wai Ha River at C1

	
Photo7. Wai Ha River at W2	**Photo8.** Wai Ha River at C1