Drainage improvement in South Lantau and Construction of Mui Wo Village Sewerage Phase 1 – Construction phase EM&A

Proposal for fauna capture survey and translocation

1.1 Introduction

1.1.1 Background

To avoid or mitigate the impact to fauna species of conservation interest due to construction of the Project, as required in Condition 2.5 of the Permit, the ecologist of the ET shall carry out detailed capture-surveys to ascertain the presence of any fauna species, including the fish species of conservation interest such as Flagtail (*Kuhlia marginata*) and Predaceous Chub (*Parazacco spilurus*) and amphibian species of conservation interest such as Romer's Tree Frog (*Philautus romeri*) and Chinese Bullfrog (*Hoplobatrachus chinensis*), in the works area of the Project. Fauna species of conservation interest captured during the survey shall be translocated to nearby suitable habitats outside the works areas of the Project prior to the commencement of construction of the Project.

It is also required in the Permit, faunal survey and translocation proposal shall be submitted to the Director no later than one month before the commencement of construction of the Project. Before submission to the Director, the proposal shall be certified by the ET Leader and verified by the IEC as conforming to the information and recommendations contained in the approved EIA Report (Register No. AEIAR-093/2005).

This paper provides a specification for capture survey and translocation of fauna species of conservation importance as required by the Permit.

1.1.2 Mitigation measure

Given the records of fauna species of conservation importance during the EIA study, the severity of the potential impacts to those fauna, and their habitat requirements, the fauna survey for the Project will include two major elements for the faunal groups with relatively lower mobility: 1) fish capture survey and translocation, and 2) amphibian (or frog) capture survey and translocation. Other faunal groups with high mobility such as birds and mammals are capable

of evacuating the works area when the construction commence and thus specific capture surveys are not needed.

1.2 Fish Capture Survey and Translocation

1.2.1 Introduction

To protect the fish communities in the sections of stream courses subject to channelisation, a programme of capture-surveys will be conducted in the works areas of the Project prior to the commencement of construction works in the streams.

The below sections provide a specification for capture survey and translocation of fish species of conservation importance, Predaceous Chub (*Parazacco spilurus)* and Flagtail (*Kuhlia marginata*), as required by the Final EM&A Manual.

1.2.2 Background

There would be direct loss of lowland river habitats and associated riparian habitats due to channelisation in the project.

The proposed works at the rivers have the potential to cause direct injury/mortality to wildlife. Animals with lower mobility (e.g. fish) would be at higher risk, and could potentially be injured/killed by construction phase activities. Of particular concern would be potential direct impacts to two fish species of conservation importance that were recorded in those streams subject to construction works during the EIA study.

A single *Kuhlia marginata* (Spotted flagtail or Black-margined flagtail) was observed from the rocky upper reaches of Pak Ngan Heung River (PNH River) during the EIA study. This species was only recently discovered in Hong Kong and is known locally from only two other river/stream sites. Members of the Kuhliidae are widely distributed, ranging from Indonesia to Japan. Some of them are able to migrate into freshwater. *Kuhlia marginata* is primarily a freshwater species. Its extent of penetration into brackish and marine environments is uncertain. It has been found in freshwater habitats such as mid-hill rivers (moderately deep (1.5-3m), rocky, unshaded, flowing water areas; see www.fishbase.org). Although it is categorised as “Lower Risk”, i.e. least concern in the Redlist, *Kuhlia marginata* is endangered in Hong Kong due to habitat loss, and is considered of regional conservation concern by Fellowes *et al*. (2002).

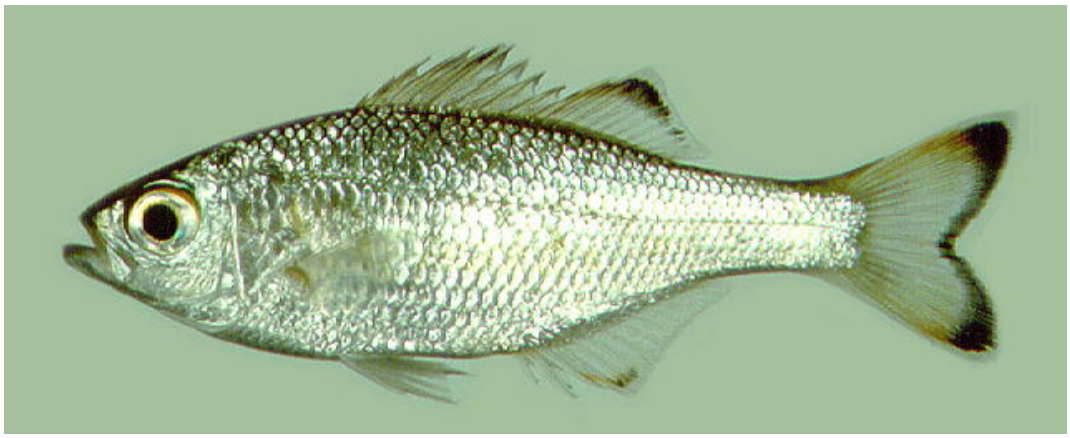


Photo : *Kuhlia marginata* (source: http://fishdb.sinica.edu.tw)

Parazacco spilurus was common in pools along the upper reaches in PNH and Tai Tei Tong (TTT) Rivers as reported in the EIA study. *Parazacco spilurus* distributes in East Asia including South China and Vietnam. Predaceous Chub (*Parazacco spilurus*) was previously misidentified in Hong Kong as *Opsariichthys bidens* (Man 1993), and is one of the commonest freshwater fishes in Hong Kong (Lee *et al*. 2004). It is a widespread species occurring in most unpolluted hill streams in both upper and lower courses. It is not in IUCN Red list, but its number in China is declining because of habitat loss and destructive fishing activities. *Parazacco spilurus* is classified as vulnerable in the China Red Data Book (Yue and Chen, 1998) because of its scientific value and restricted global range.

Photo : *Parazacco spilurus* (source: www.kepu.net.cn)

A technical circular was issued by ETWB in 2005 (ETWB TCW No. 5/2005) to illustrate the importance of natural streams and rivers in Hong Kong, and the approach for construction works involving natural streams and rivers. Mitigation measures suggested in the technical circular issued by ETWB in 2005 (ETWB TCW No. 5/2005) include translocation. According to the technical circular, construction works should be restrained to minimise possible

disturbance to streams/rivers. In case that construction works in or near natural streams/rivers are unavoidable, they should be carried out in an environmentally responsible manner and with appropriate mitigation measures to minimise any adverse impacts.

1.2.3 Mitigation Measure

As stated in Section 6.2.17 of the Final EM&A Manual, proposed works at the rivers have the potential to impact fish species of conservation interest. To minimize these potential impacts, it is recommended that capture-surveys for the proposed works areas are conducted prior to the commencement of construction works in the channel.

These surveys shall include fish species of conservation interest recorded during the EIA study (Flagtail *Kuhlia marginata* and Predaceous Chub *Parazacco spilurus*)

It is also stated in the EM&A Manual that for the Flagtail further surveys should be conducted to confirm the presence and numbers of fish in the streams closer to the time of construction. The baseline monitoring survey for the present EM&A programme was conducted in September 2007. No Flagtail individual was recorded in the three streams during the baseline monitoring.

1.2.4 Personnel

Fish Ecologist of the Environmental Team shall be engaged to carry out the works relating to the capture-surveys. The Fish Ecologist shall possess a degree in a relevant subject and shall be experienced in field survey and capture of fish, with at least 3 years experience on fish study and surveying in Hong Kong or otherwise approved by the Engineer. He shall possess demonstrated experience in handling, catching, transporting and keeping fish species. The qualification and experience of the qualified Fish Ecologist shall be certified by the Environmental Team (ET) Leader and verified by the Independent Environmental Checker (IEC). The qualified Fish Ecologist shall form part of the ET.

Mr. Lai Chi Sing has been appointed as the Fish Ecologist of the Environmental Team. His CV is attached in **Appendix A**.

1.2.5 Target species

The primary target species are fish species of conservation interest, in particular Predaceous Chub and Flagtail.

1.2.6 Areas for the capture survey

The capture areas for fish are defined as the sections of stream courses within the proposed works area to be temporarily bypassed and channelised as follows:

- Two sections of Pak Ngan Heung River (the 80m upstream section and the 100m downstream section) (see **Drawing 24519/EM/S3/001 of the Environmental Mitigation Measure Report**, or **Figure 1**); and
- The 240m downstream section of Luk Tei Tong River (see **Drawing 24519/EM/S3/002 of the Environmental Mitigation Measure Report**, or **Figure 2**).

The three bottleneck sections of Tai Tei Tong River would be widened. Existing streambed will be untouched and the river flow will be maintained without temporary bypass. The fish habitats will not be disturbed and capture survey is therefore not necessary.

The three permanent bypass channels, i.e. the 180m box culvert in Pak Ngan Heung River, the 200m U channel in Butterfly Hill and the 350m bypass channel for Luk Tei Tong (2) River, will be newly constructed channels, capture survey is therefore also not necessary.

1.2.7 Timing of the capture survey

It is stated in the Permit that the capture survey and translocation shall be conducted prior to the commencement of construction of the Project. However, in the Project, land-based construction works will be conducted first, while works in the rivers will not commence until the coming dry season starting in November 2008. If the fish capture survey is conducted prior to the commencement of construction, there will be a long time period before the river works actually commence (over 6 months), and fish will re-colonise the surveyed areas. The fish capture survey and translocation will thus be conducted prior to the commencement of constructions works in channel as stipulated in Section 6.2.17 of the Final EM&A Manual.

Capturing fish inside flowing streams/rivers is not an effective approach and might increase the potential risks of their injury during capture. It is required in the Permit that containment measures such as bunds and barriers shall be provided to for construction works in the rivers. This is considered a better situation for fish capture survey as the water has become static and the water level can be controlled (see below sections). Therefore the capture surveys at each capture area shall be conducted during construction stage, after

deployment of the temporary bunds/barriers for the channelised sections, but prior to commencement of the excavations/construction works into the contained stream courses.

It is anticipated that the various proposed works in different channels will not be conducted at the same time, but will be conducted by phase. The exact timing of the capture survey will be scheduled in sequence with the construction programme. Where practicable, the survey should be conducted in the dry season (between October and March), as the water levels in the streams would be lower.

1.2.8 Capture survey methods

The Fish Ecologist shall carry out detailed capture-surveys to ascertain the presence of any fauna species, including the fish species of conservation interest such as Flagtail (*Kuhlia marginata*) and Predaceous Chub (*Parazacco spilurus*), in the capture areas.

As stipulated in the EIA and EP, containment measures such as bunds and barriers shall be provided to restrict the carrying out of the construction works within the enclosed dry area of the rivers. This is considered a better situation for fish capture survey as the water has become static and the water level can be controlled. The capture surveys shall be conducted after the stream flow has been diverted. The channelised sections (Capture areas) will then be gradually drained down, and fish inside will concentrate in isolated pools. Those pools containing fish can be further drained down during the day of collection by pumping or siphoning by hand, depending on the site conditions as determined by the ecologist on the day of collection. A screen (netting of 1 mm mesh size) shall be put at the outlet during water drain down from the pool. Fish species of conservation interest shall be captured when the water level in the pool is sufficiently low for fish collection easily. Excavations/Construction works into the contained stream channels shall not be commenced before the sections are drained and the capture surveys are completed.

The construction shall be carried out in two longitudinal sections within the river channel, with half side enclosed by containment measures and another half maintained with natural flow. The first capture survey would be conducted in the enclosed section. After completion of the construction in the first half of the channel, the stream flow will be diverted back to the newly constructed channel. The remaining half of the channel will then be enclosed and the second capture survey would be commenced. The capture survey at each stream section will therefore be conducted in two phases.

1.2.9 After capture

The fish captured during the capture surveys should be relocated to receptor sites (see below sections) immediately after the capture (on the same day), as there might be some impacts or even casualty if the capture fish are kept in aquarium.

1.2.10 Receptor site

The two concerned fish species of conservation importance (Predaceous Chub and Flagtail), if to be translocated on the same day of capture, would be released to receptor sites upstream of the capture areas in Pak Ngan Heung River and Luk Tei Tong River as stated in the EIA report (see **Drawing 24519/EM/S3/005 of the Environmental Mitigation Measure Report**, or **Figure 3**). It is possible that other fish species of conservation interest are also collected in the capture-survey. According to the nature of these species, they should be released to the receptor sites upstream or downstream of the capture site. Primary freshwater species should be released to upstream receptor sites, while vagrant or estuarine species should be released to downstream receptor sites. The exact release location should be a section similar in size, water depth, substrate, water flow rate, degree of shading and amount of vegetation to the capture location. Density of fish in the release locations should be relatively low to avoid overstocking.

1.2.11 Reporting

A data sheet will be adopted for recording and reporting the data and findings in relation to the translocation programme. A sample data sheet is provided below:

Data sheet for fish capture survey				
Location		Date		
Weather		Temperature		
Capture equipment		Maintenance equipment		
Information of the capture individuals				
Species	Size (mm)	Conditions (Healthy/fair/poor)	Release location	Remarks

Locations of capture and release sites in each survey shall be marked on 1:1000 topographic maps. Photographs of individual captured fish species shall be taken. A report including detailed methodology, survey results and photographs shall be prepared at the completion of each capture-survey.

1.2.12 Methodology and implementation programme of aquaria maintenance

There might be some impacts or even casualty if the capture fish are kept in aquarium. As the nearby streams are still in good conditions as reported in the baseline monitoring report, it is feasible to release fish into the receptor sites, and aquarium for keeping the capture fish is not needed. Methods for the aquarium is thus not required.

1.2.13 Post-translocation Monitoring

If the captured fish are released immediately to the receptor sites (one at upstream Pak Ngan Heung River, one at upstream Luk Tei Tong River, and one at the downstream confluence) after capture, post-translocation monitoring would not be required, as the receptor sits would be outside the works area for the project and there would be no direct impacts from the project on the receptor sites. Furthermore, regular construction phase monitoring programme, both for water quality and ecology, might also provide information of the receptor sites which are in the vicinity of the project sites, specific post-translocation monitoring is thus not needed.

If the captured fish are released back to the capture areas after channelisation, the operational phase monitoring in accordance with the EM&A programme should be followed. No specific post-translocation monitoring is needed.

1.3 Frog Capture Survey and Translocation

1.3.1 Introduction

To avoid or mitigate the impact to amphibian species of conservation interest due to construction of the Project, capture-surveys for amphibian, in particular the two frog species of conservation importance recorded during the EIA study shall be carried out.

The below sections provide a specification for locating and transferring individuals of the two frog species of conservation importance, Romer's Tree Frog (*Philautus romeri*) and Chinese Bullfrog (*Hoplobatrachus chinensis*), as required by the Final EM&A Manual. .

1.3.2 Background of the mitigation measure

One Chinese Bullfrog was recorded from the surveys at the Luk Tei Tong Marsh area during the EIA study, and its presence within the LTT (2) River Bypass Channel works area could be occasional. Chinese Bullfrog is large, and is the second biggest frog in Hong Kong. This frog is up to 12.5 cm or more in length. The mantle is olive-brown with scattered black spots on wrinkled skin. Underside is whitish in color, with checkered spotting on the flank. Snout is tapering. Eyes are big. Eardrum is also big and prominent.

Romer's Tree Frog has been recorded at the Mui Wo Area in previous studies. Although none was recorded during the EIA study, the possibility of its presence within or close to some of the proposed works areas, particularly woodland habitats close to PNH River is still potential. Romer's Tree Frog is a small frog only up to 2.5 cm in length. The mantle is brownish with a characteristic X-marking and a dark band between eyes. Skin is peppered with fine granules. Snout is pointed and eardrum is conspicuous. Hind legs are long and slender, irregularly barred with brownish bands. All digits have small sucker discs.

Photo : Chinese Bullfrog. Source:

www.http://www.hkbiodiversity.net/html/tc/Amphibian.html

Photo : Romer's Tree Frog. Source:

www.http://www.hkbiodiversity.net/html/tc/Amphibian.html

There would be direct loss of lowland river habitats and associated riparian habitats due to channel construction from the project. The proposed works have the potential to cause direct injury/mortality to wildlife. Animals with low mobility would be potentially at risk, including the two amphibian species of conservation interest (Chinese Bullfrog and Romer's Tree Frog) that might exist within the works areas. Capture surveys will therefore be conducted prior to commencement of the construction works to locate any individuals of these two species within the works areas as mitigation for the potential impacts on frogs utilizing riparian habitats during the construction works in the streams, as recommended in the EIA report.

Habitats of Chinese Bullfrog include cultivated fields, ponds, streams and marshes (Chan *et al*. 2005). The habitat characteristics of Romer's Tree Frog have been studied in more details (Lau 1998). Two criteria recommended in Lau (1998) to select potential sites for translocation of Romer's Tree Frog are (a) the presence of large area of forest or plantation; (b) the presence of suitable breeding habitats, which is shaded, slow-flowing unpolluted waters with no fish. The presence of fishes will increase tadpole mortality significantly.

As reported in the EMM report for the detailed design study, the habitats to be affected by the drainage improvement works are not suitable for Romer's Tree Frog, due to the absence of large area of woodland and the presence of fishes. In addition, the marsh affected by the construction of floodway bypass in Luk Tei Tong was fairly dry. Water is brackish at Luk Tei Tong River and downstream section of Tai Tei Tong River. Most frog species are known to be absent from environment with waterbodies of high salinity (Karsen *et al*. 1998). These work areas are not considered important habitats for these two frog species. Furthermore, only one Chinese Bullfrog and no Romer's Tree Frog was found in the study area from field surveys during the EIA study. Abundance of these two frog species in the proposed project area may therefore be very low.

1.3.3 Personnel

Herpetofauna Ecologist of the Environmental Team shall be engaged to carry out the works relating to the capture-surveys. The Herpetofauna Ecologist shall possess a degree in a relevant subject and shall be experienced in field survey and capture of frogs, with at least 3 years experience on frog study and surveying in Hong Kong or otherwise approved by the Engineer. He should possess demonstrated experience in identification, handling, catching, transporting and keeping frog species. The qualification and experience of the Herpetofauna Ecologist shall be certified by the Environmental Team (ET)

Leader and verified by the Independent Environmental Checker (IEC). The qualified Herpetofauna Ecologist shall form part of the ET. As Romer's Tree Frog is protected under the Wild Animals Protection Ordinance Chapter 170), a suitable permit must be applied for the capture survey from the Agricultures, Fisheries and Conservation Department.

Mr. Kwok Hon Kai is appointed as the Herpetofauna Ecologist for the Environmental Team. His CV is provided in **Appendix A**.

1.3.4 Target species

The primary target of amphibian species are the two frog species of conservation interest recorded during the EIA study, i.e. Romer's Tree Frog and Chinese Bullfrog.

1.3.5 Areas for the capture survey

The frog capture survey of the translocation programme shall cover the riparian habitats and marsh habitat affected by the drainage improvement works. The works boundary for the Ling Tsui Tau U channel is within developed area (next to the existing pathways and village buildings), while the widening of the three bottleneck sections of Tai Tei Tong River would only involve minor works. These two locations are therefore not included in the frog capture survey. Locations of frog capture survey will include:

- Riparian habitats (including woodland) at the two sections of Pak Ngan Heung River;
- Riparian habitats at the downstream section of Luk Tei Tong River; and
- Marshland area in Luk Tei Tong to be covered by floodway bypass.

Locations of these capture areas are shown in **Drawing 24519/EM/S3/003** and **004 of the Environmental Mitigation Measure Report (**or **Figure 4** and **5)**. Frogs within these work area boundary shall be searched and captured.

1.3.6 Timing of the capture survey

Capture-surveys at the capture areas shall be carried out during wet season (March/April – October) and one month before the construction works commence. Since the abundance of frogs recorded in EIA was very low, one month is considered adequate to translocate most frogs from the works areas. The exact timing of the capture survey should be determined in accordance with the construction programme.

1.3.7 Capture survey methods

The Herpetofauna Ecologist shall carry out detailed capture-surveys to ascertain the presence of frog species of conservation interest in particular Romer's Tree Frog and Chinese Bullfrog, in the capture areas.

The Herpetofauna Ecologist shall be well informed by the contractor of the construction programme. He shall be provided with the latest site plan showing the work area boundary. In addition, he shall be equipped with appropriate equipment when carrying out the translocation programme, e.g. head torch, dip nets, boots/runners suitable for slippery ground.

Night-time surveys shall be carried out as frogs are usually nocturnal. Frogs shall be located primarily by their calls and secondarily by active searching using torch to ensure effective coverage of both genders. As frogs are well camouflaged and have secretive behaviour, all potential hiding places should be inspected. Netting/hand catching shall be adopted. Abundance of frogs in the streams may be very low due to the presence of fishes, and hence trapping in stream habitat is not necessary. Frogs found/jump into streams will be caught using net. Suitable techniques should be used when frogs are collected using hands to avoid any injury on them. The ecologist can cup one hand over the frog to prevent its escape and then gently grab the frog by the waist, as recommended in Chan *et al*. (2005). Collected frogs shall be temporarily stored in plastic containers before release. There should be a small amount of water, just enough to cover the bottom of the container inside to maintain the moisture to prevent the stress of desiccation on the frogs.

Capture-surveys of frogs shall start one month in advance of the commencement of construction works and programmed as far as possible for consecutive nights schedule. If no individual of both species of conservation interest is found from a particular capture area for three consecutive surveys, the capture-survey for that capture area can be ceased. Other frog species ranked of conservation concern by Fellowes *et al*. (2002) found in the works area during the capture survey shall also be collected. In addition, tadpoles found shall be collected where possible and released to similar aquatic habitats not affected by the project. Netting shall be adopted for collection of tadpoles, in order to reduce the chance of injury.

1.3.8 Receptor site

All frogs captured during the survey shall be translocated to nearby suitable habitats outside the works areas prior to commencement of the construction.

It is recommended that frogs should not be maintained in captivity for too long (Heyer *et al*. 1994). Collected frogs shall be released on the same night/day to enhance their survival rate. Receptor sites shall be selected away from the works areas to prevent the released frogs from re-entering. Suitable habitats for the target species shall be identified in the receptor sites for translocation. Receptor sites suitable for Romer's Tree Frog shall be in Butterfly Hill and that for Chinese Bullfrog shall be the wet abandoned agricultural land west of Wang Tong (**Drawing 24519/EM/S3/005**, or **Figure 6**). The Herpetofauna Ecologist shall conduct on-site inspection of the receptor sites as specified to identify suitable habitats for translocation prior to commencement of the capture survey.

1.3.9 Reporting

A data sheet will be adopted for recording and reporting the data and findings in relation to the translocation programme. A sample data sheet is provided below:

Data sheet for frog capture survey				
Location		Date		
Weather		Temperature		
Capture equipment		Maintenance equipment		
Information of the capture individuals				
Species	Size (mm)	Conditions (Healthy/fair/poor)	Release location	Remarks

Locations of capture and release sites in each survey shall be marked on 1:5000 topographic maps. Photographs of individual captured frog shall be taken. A report including detailed methodology, survey results and photographs shall be prepared at the completion of each capture-survey.

1.3.10 Post-translocation Monitoring

The captured frogs would be released immediately to the receptor sites (Butterfly Hill and the wet abandoned agricultural land west of Wang Tong) after capture, and post-translocation monitoring would not be required, as the receptor sits would be outside the works area for the project and there would be no direct impacts from the project on the receptor sites. Furthermore, regular construction phase monitoring programme might also provide information on potential off-site disturbance impacts from the project, specific post-translocation monitoring in the receptor sites which are in the vicinity of the project sites is thus not needed.

1.4 Measures to Protect Stream Habitats

1.4.1 Land-based works

Box culvert and retaining structures near the confluence of the three rivers (i.e. PNH, TTT, and LTT Rivers) will be conducted during wet season. The areas for land-based works and the schedule of the land-based works are shown in **Appendices C** & **D**. The stream habitats would not be disturbed during the wet season, and the fish and frog capture surveys will be conducted in dry season before the works in stream channels commence.

1.4.2 Land-based works

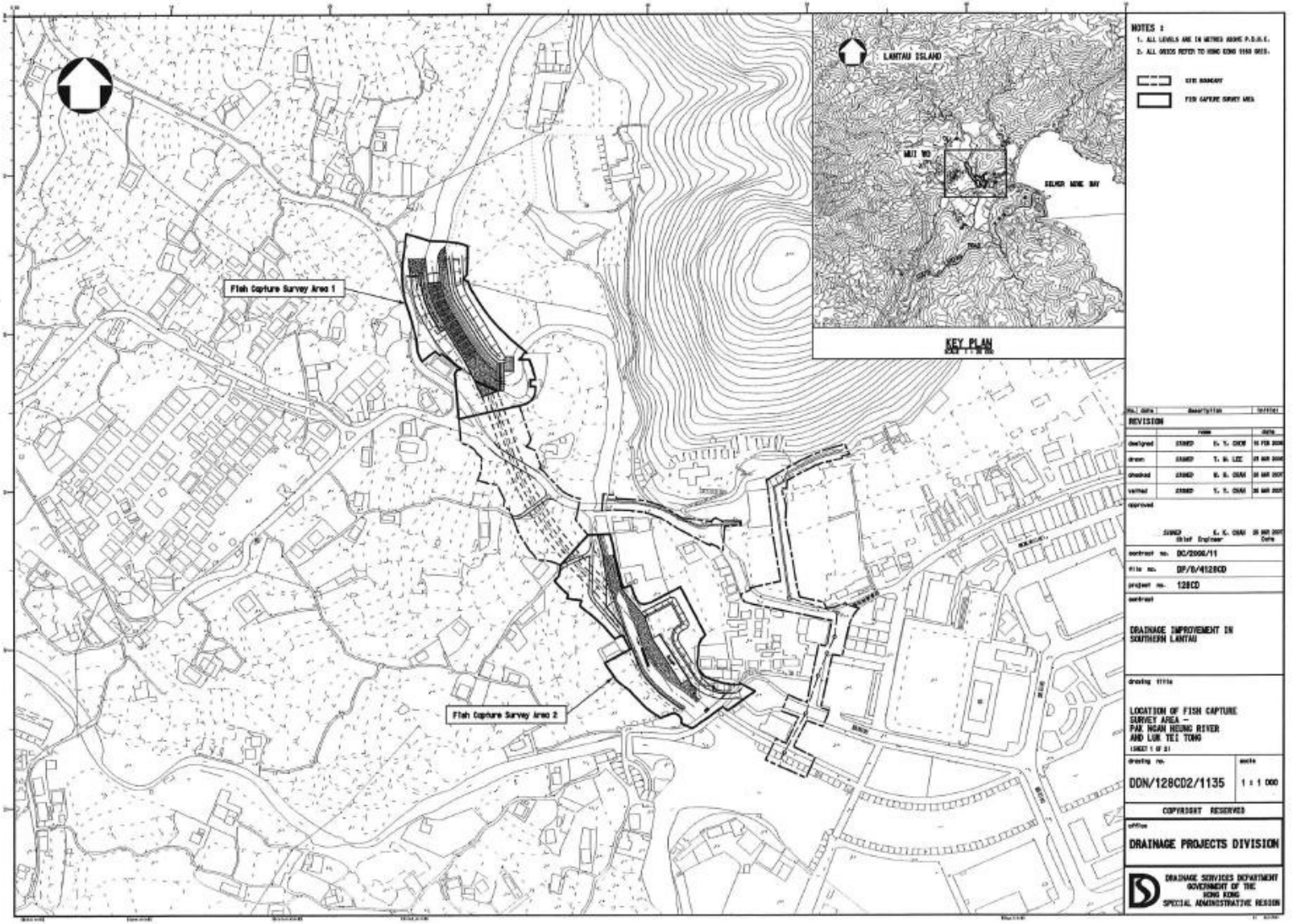
To avoid or mitigate the impact to stream habitats from land-based works during the wet season, mitigation measures are provided and are shown in **Appendix E**.

Appendix A

CVs of Fish Ecologist and Herpetofauna Ecologist

Appendix B

Figures for Fish and Frog Capture Surveys



NOTES :
1. ALL LEVELS ARE IN METRES ABOVE P.D.H.K.
2. ALL GRIDS REFER TO HONG KONG 1980 GRID.

SITE BOUNDARY

FISH CAPTURE SURVEY AREA

REVISION

	name	date
designed	ISAND Y. T. CHOW	15 FEB 2008
drawn	ISAND T. W. LEE	29 MAR 2008
checked	ISAND W. K. CHAN	29 MAR 2008
vetted	ISAND Y. T. CHOW	29 MAR 2008
approved	ISAND K. K. CHAN Chief Engineer	29 MAR 2008 Date

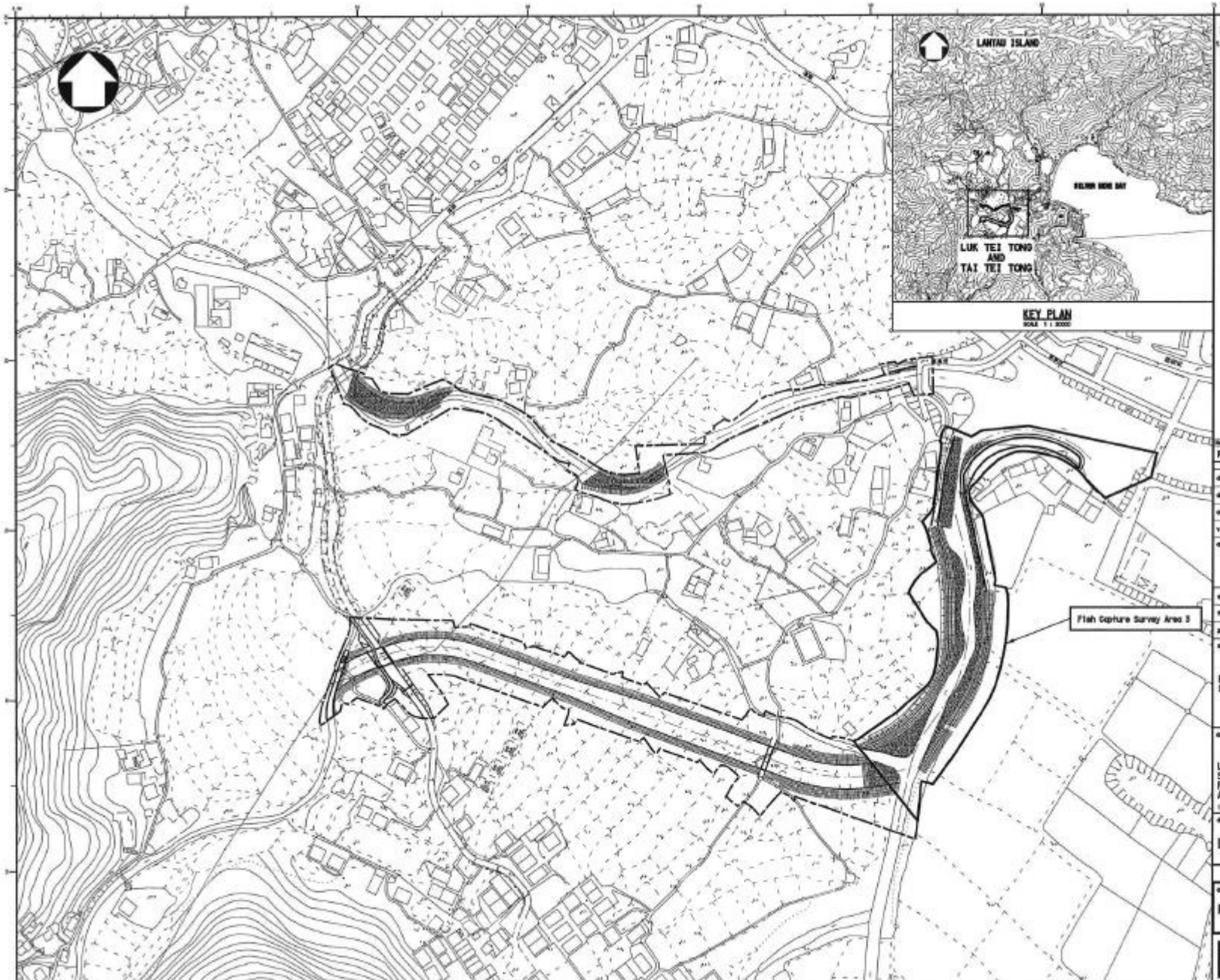
contract no. DC/2006/11
file no. DP/D/4128CD
project no. 128CD

contract
DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

drawing title
LOCATION OF FISH CAPTURE SURVEY AREA – PAK NGAN HEUNG RIVER AND LUK TEI TONG
(SHEET 1 OF 2)

drawing no. DDN/128CD2/1135
scale 1 : 1 000

office
DRAINAGE PROJECTS DIVISION
DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION



NOTES :

1. FOR GENERAL NOTES AND LEGENDS, REFER TO SHEET 1 OF LOCATION OF FISH CAPTURE SURVEY AREA - PAK NGAN HEUNG RIVER AND LUK TEI TONG.

REVISION

	name	date
designed	JIMED	H. Y. CHOW
drawn	JIMED	Y. M. LEE
checked	JIMED	W. S. CHOI
vetted	JIMED	Y. Y. CHOI
approved	JIMED Chief Engineer	K. K. CHOW

contract no. DC/2006/11

file no. DP/S/128CD

project no. 128CD

contract

DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

drawing title

LOCATION OF FISH CAPTURE SURVEY AREA - PAK NGAN HEUNG RIVER AND LUK TEI TONG

(SHEET 2 OF 2)

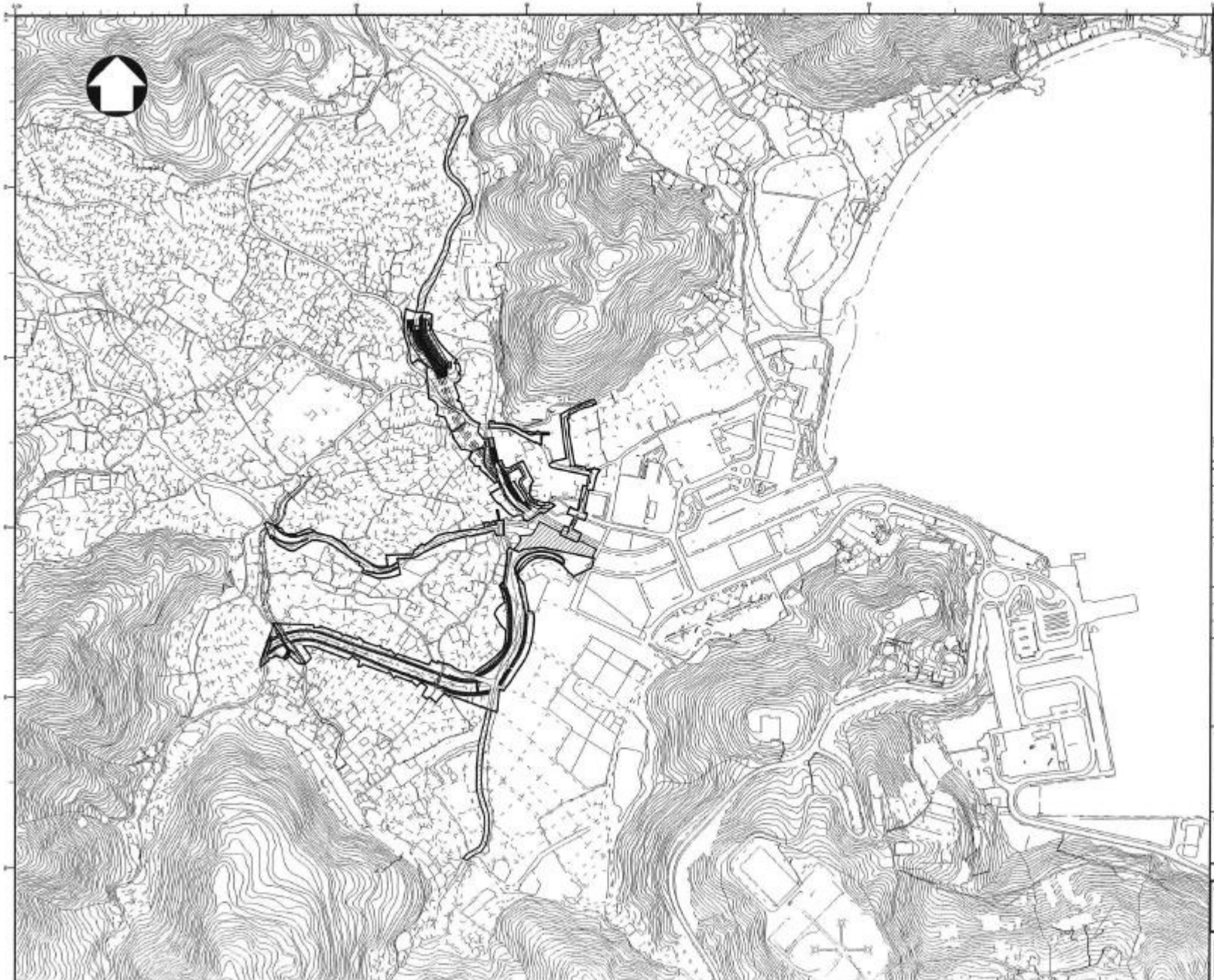
drawing no. DDN/128CD2/1136

scale 1 : 1 000

office

DRAINAGE PROJECTS DIVISION

DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE
HONG KONG
SPECIAL ADMINISTRATIVE REGION



NOTES :

1. ALL LEVELS ARE IN METRES ABOVE P.D.H.K.
2. ALL GRIDS REFER TO HONG KONG 1980 GRID.

POTENTIAL RECEPTOR SITE FOR FISH

SITE BOUNDARY

No.	date	description	initial
REVISION			

	name	date
designed	JUNED T. T. CHOW	11 FEB 2008
drawn	JUNED T. S. LEE	22 MAR 2008
checked	JUNED S. S. CHAN	26 MAR 2008
vetted	JUNED T. T. CHAN	26 MAR 2008
approved	JUNED S. S. CHAN (Chief Engineer)	26 MAR 2008 Date

contract no. DC/2006/11

file no. DP/S/4128CD

project no. 128CD

contract

DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

drawing title

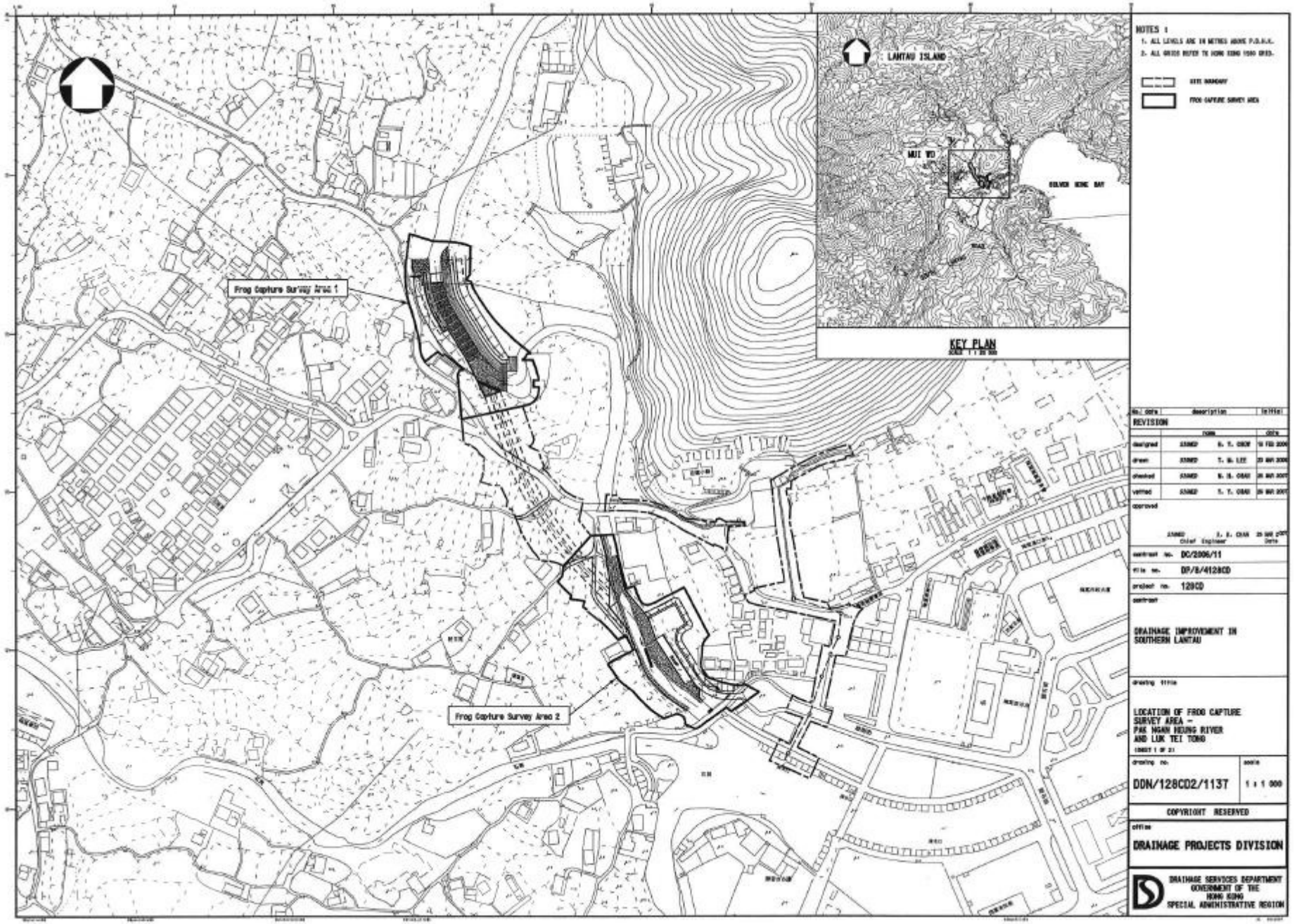
LOCATION OF FISH RECEPTOR SITES

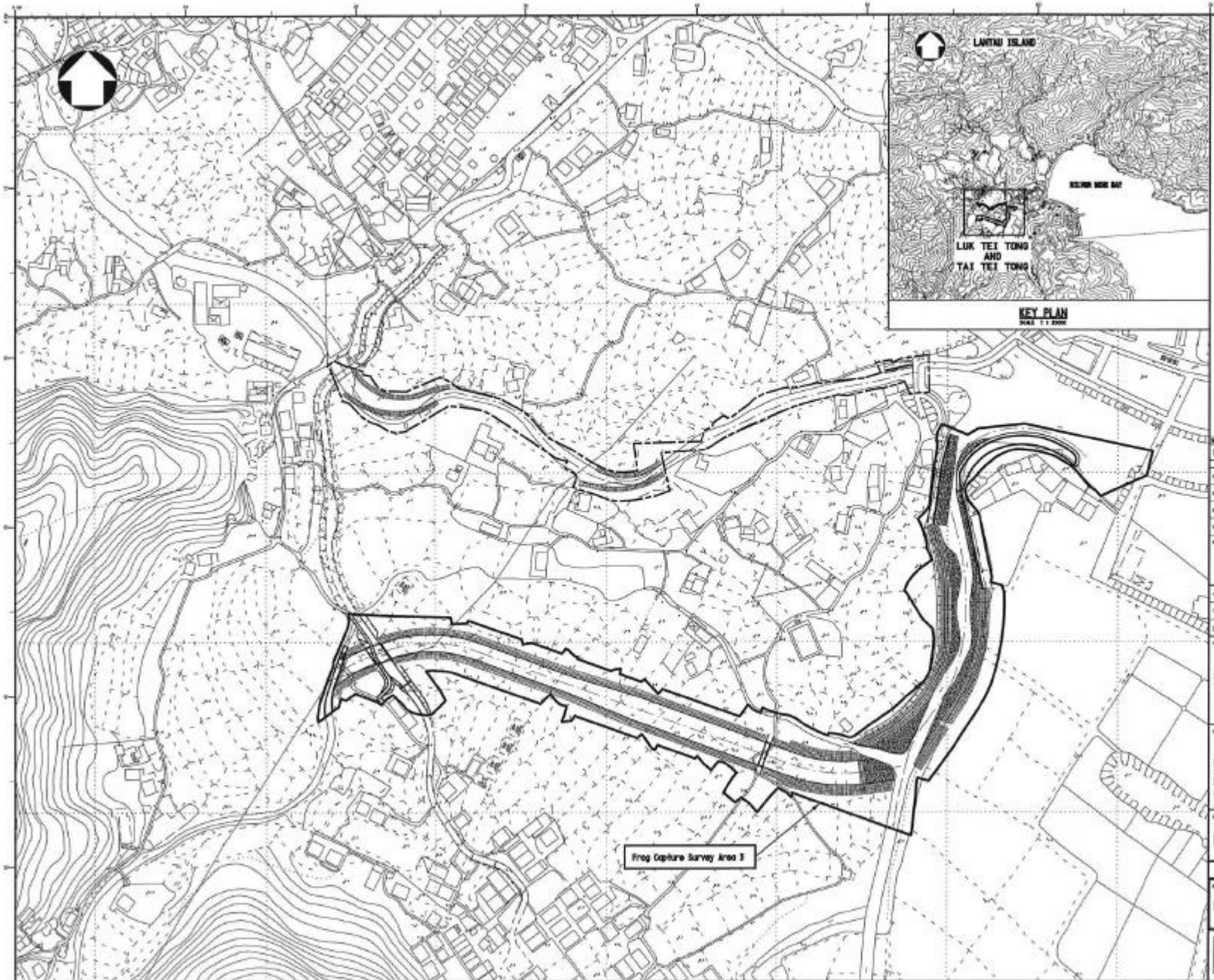
drawing no.	scale
DDN/128CD2/1139	1 : 2 500

office

DRAINAGE PROJECTS DIVISION

DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE
HONG KONG
SPECIAL ADMINISTRATIVE REGION


Frog Capture Survey Area 1
Frog Capture Survey Area 2
LANTAU ISLAND
MUI WO
SILVER MINE BAY
KEY PLAN
NOTES :
1. ALL LEVELS ARE IN METRES ABOVE P.D.B.M.
2. ALL GRIDS REFER TO HONG KONG 1980 GRID.
SITE BOUNDARY
FROG CAPTURE SURVEY AREA
REVISION
No. | Date | Description | Initial
designed | ENGD | S. T. CHOW | 16 FEB 2006
drawn | ENGD | T. S. LEE | 23 MAY 2006
checked | ENGD | S. T. CHAN | 25 MAY 2007
verified | ENGD | S. T. CHAN | 25 MAY 2007
approved
ENGD Chief Engineer | S. T. CHAN | 25 MAY 2007 Date
contract no. DC/2006/11
file no. DP/S/4128CD
project no. 128CD
contract
DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU
drawing title
LOCATION OF FROG CAPTURE SURVEY AREA – PAK NGAN HEUNG RIVER AND LUK TEI TONG
(SHEET 1 OF 2)
drawing no. DDN/128CD2/1137
scale 1 : 1 000
COPYRIGHT RESERVED
office
DRAINAGE PROJECTS DIVISION
DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION



NOTES :

1. FOR GENERAL NOTES AND LEGENDS, REFER TO SHEET 1 OF LOCATION OF FROG CAPTURE SURVEY AREA – PAK NGAN HEUNG RIVER AND LUK TEI TONG

REVISION

	name	date
designed	SIGNED T. Y. CHOW	16 FEB 2006
drawn	SIGNED T. M. LEE	25 MAR 2006
checked	SIGNED K. S. CHAN	29 MAR 2007
vetted	SIGNED T. Y. CHOW	29 MAR 2007
approved		
	SIGNED K. S. CHAN Chief Engineer	29 MAR 2007 Date

contract no. DC/2005/11

file no. DP/S/4128CD

project no. 128CD

contract

DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

drawing title

LOCATION OF FROG CAPTURE SURVEY AREA – PAK NGAN HEUNG RIVER AND LUK TEI TONG

(SHEET 2 OF 2)

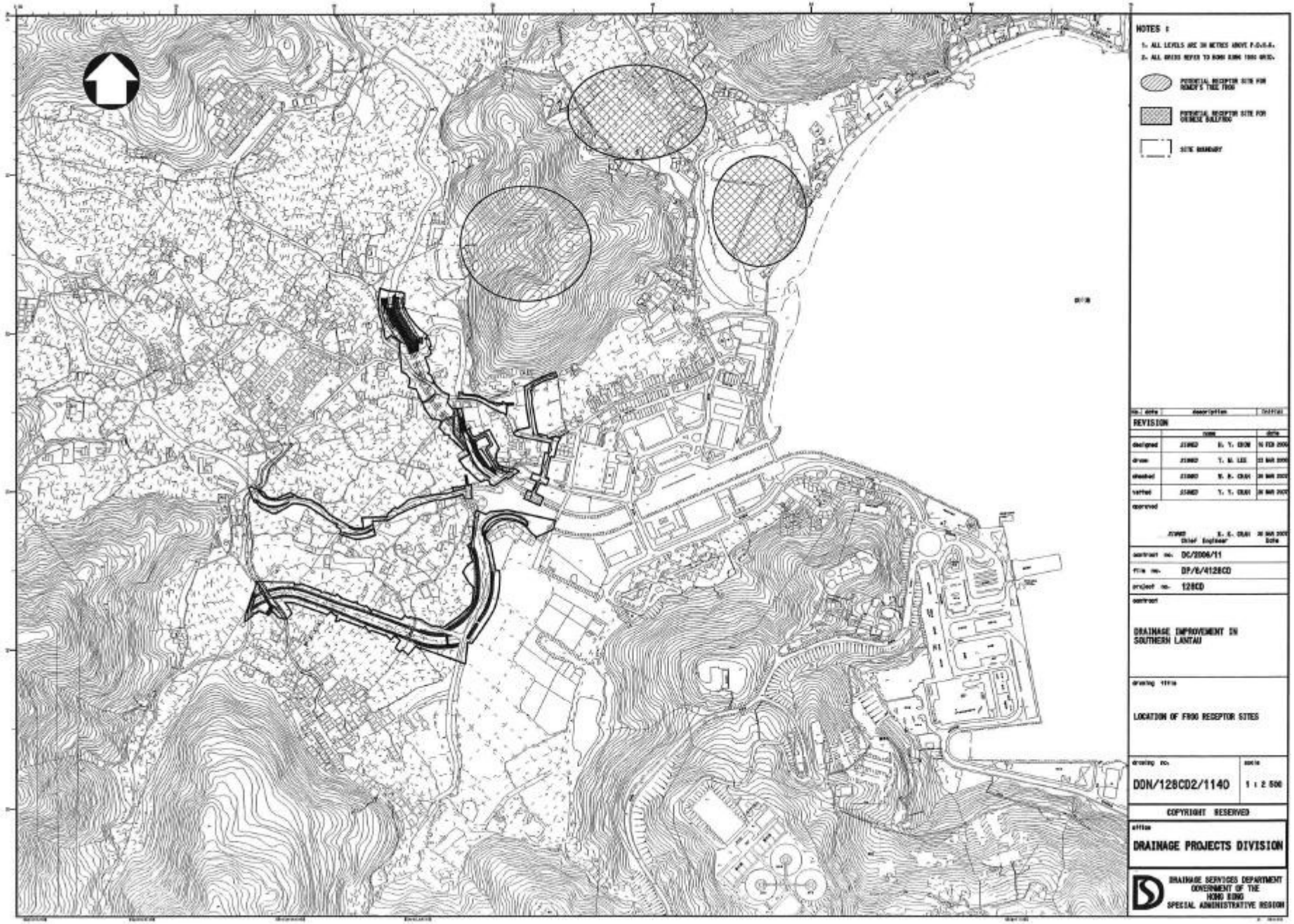
drawing no. DDN/128CD2/1138

scale 1 : 1 000

office

DRAINAGE PROJECTS DIVISION

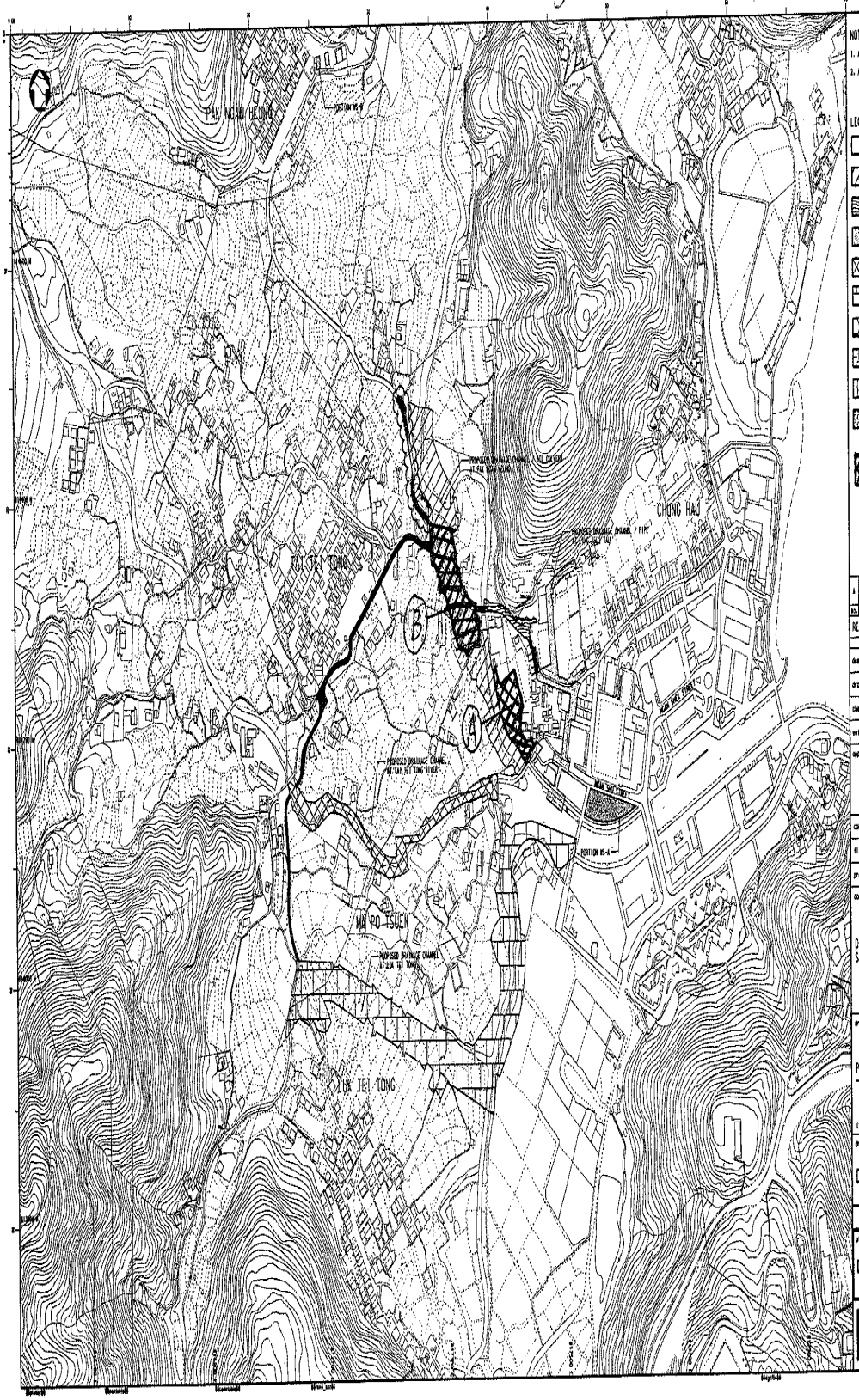
DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE
HONG KONG
SPECIAL ADMINISTRATIVE REGION


NOTES :
1. ALL LEVELS ARE IN METRES ABOVE P.D.B.M.
2. ALL GRIDS REFER TO HONG KONG 1980 GRID.
POTENTIAL RECEPTOR SITE FOR ROMER'S TREE FROG
POTENTIAL RECEPTOR SITE FOR CHINESE BULFROG
SITE BOUNDARY
REVISION
description
designed
drawn
checked
verified
approved
Chief Engineer
contract no. DC/2006/11
file no. DP/E/4128CD
project no. 128CD
contract
DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU
drawing title
LOCATION OF FROG RECEPTOR SITES
drawing no.
DDN/128CD2/1140
scale
1 : 2 500
COPYRIGHT RESERVED
office
DRAINAGE PROJECTS DIVISION
DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE
HONG KONG
SPECIAL ADMINISTRATIVE REGION

Appendix C

Areas of Land-based Works

Sketch No. L090/1



NOTES :

1. ALL LEVELS ARE IN METRES ABOVE P.D.B.L..
2. ALL GRIDS REFER TO HONG KONG 1980 GRID.

LEGENDS :

- SITE BOUNDARIES
- PORTION 01 - PAK NGAN HEUNG
- PORTION 02 - LING TSUI TAU (A)
- PORTION 03 - LING TSUI TAU (B)
- PORTION 04 - TAI JEI TONG RIVER
- PORTION 05 - LAK JEI TONG
- PORSION 06 - PUI O
- PORTION 07 - LO UK TSUEN
- PORTION 08 - CHUNG SAN SHEUNG TSUEN
- PORTION 09 - EMERGENCY VEHICULAR ACCESS (EVA) AT MUI WO

Land based works

No.	date	description	initial(s)
A	16 OCT 2007	ADMIN REVISION	K. K. CHAN

REVISION

	name	date
designed	SIGNED N. T. CHOW	10 FEB 2006
drawn	SIGNED D. D. CHAN	23 MAR 2007
checked	SIGNED W. N. CHAN	10 MAY 2007
vetted	SIGNED L. Y. CHAN	11 MAY 2007

approved

SIGNED K. K. CHAN 16 OCT 2007
Chief Engineer Date

contract no. DC/2006/11

file no. DP/D/4128CD

project no. 128CD

contract

DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

drawing title

PORTIONS OF SITE - SOUTHERN LANTAU

(SHEET 1 OF 2)

drawing no. DDN/128CD2/1002A

scale 1 : 2000

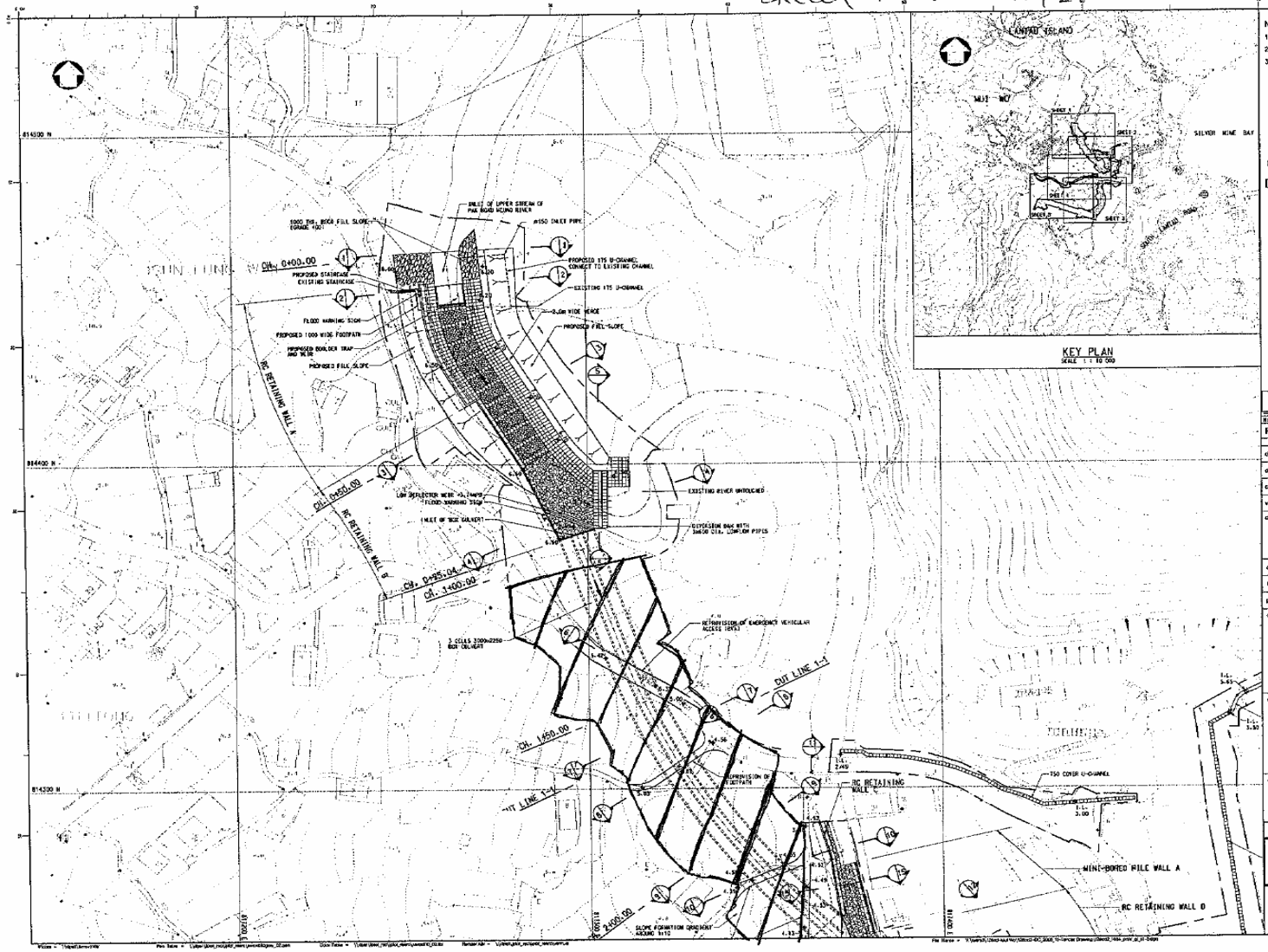
office

DRAINAGE PROJECTS DIVISION

DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE
HONG KONG
SPECIAL ADMINISTRATIVE REGION

A1 841x594

Sketch No. L090/2.



KEY PLAN
SCALE 1 : 10 000

NOTES :
1. ALL LEVELS ARE IN METRES ABOVE P.D.W.K.
2. ALL GRIDS REFER TO HONG KONG 1980 GRID.
3. THE DRAINAGE MARKER PLATE SHALL BE ELECTED AT 50 METRE INTERVAL.

LEGEND :

SITE BOUNDARY

Land based Works 'B'

THIS IS A WORKING DRAWING

no.	date	description	initial
REVISION			

		name	date
designed		H. Y. CHOW	16 FEB 2006
drawn		W. H. KO	23 MAR 2006
checked		W. H. CHAN	24/5/07
vetted		Y. Y. CHAN	31.5.07

approved

K. K. CHAN
Chief Engineer
Date

contract no. DC/2006/11
file ref. DP/B/4128CD
project no. 128CD
contract

DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

drawing title

GENERAL LAYOUT - MUI WO

SHEET 1 OF 51

drawing no. DDN/128CD2/1004

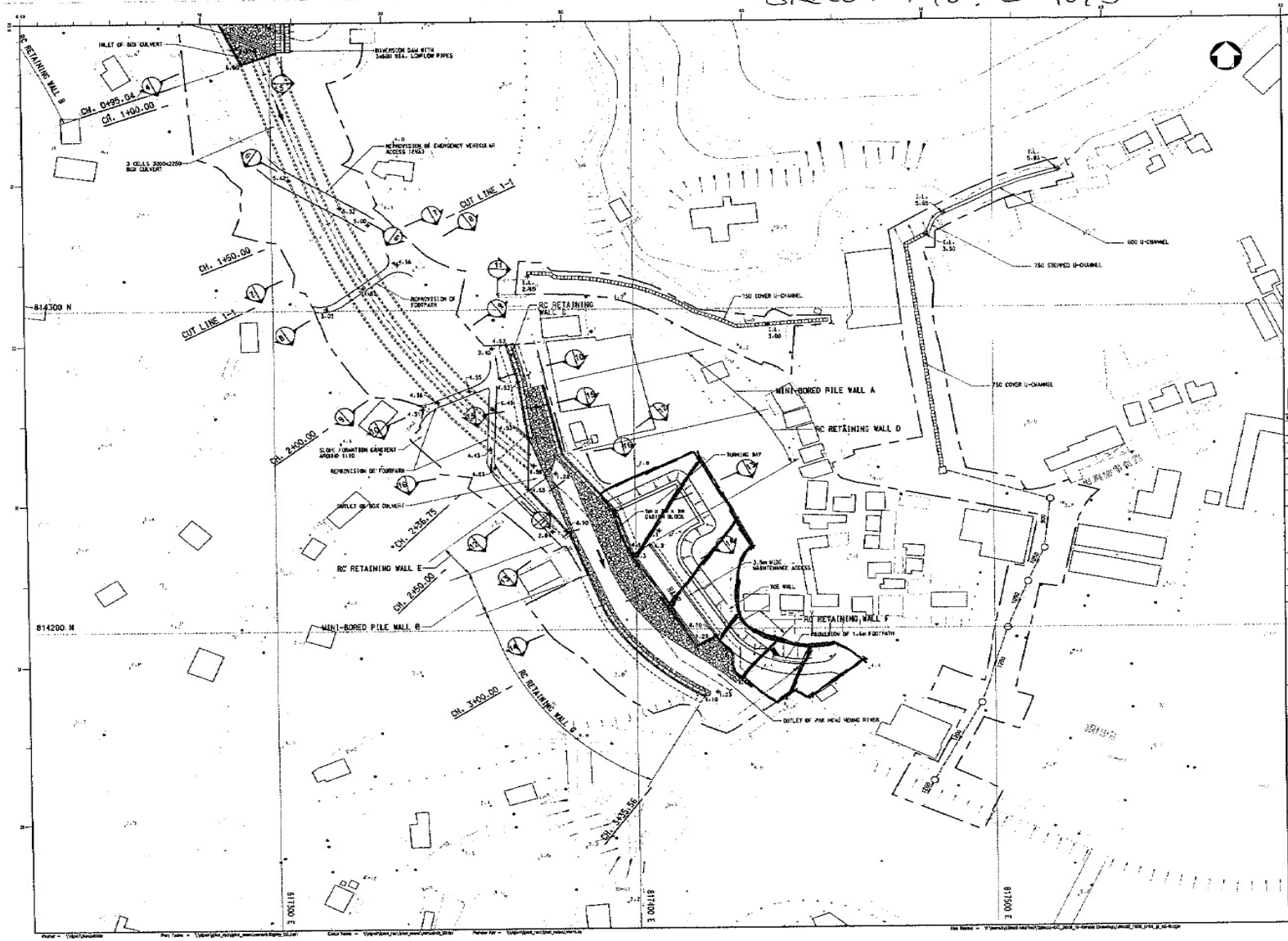
scale 1 : 500 OR AS SHOWN

office

DRAINAGE PROJECTS DIVISION

DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

Sketch No. L0913



NOTES :

1. FOR GENERAL NOTES & LEGEND, REFER TO SHEET 1 OF GENERAL LAYOUT - MUI WO.

Land based Works 'A'

THIS IS A WORKING DRAWING

No.	date	description	initial
REVISION			

	name	date
designed	H. Y. CHOI	16 FEB 2006
drawn	W. H. KO	23 MAR 2006
checked	W. H. CHAN	29/5/07
vetted	Y. K. CHAN	30.5.07
approved	P. K. CHAN, Chief Engineer	Date

contract no. DC/2006/11

file no. DP/8/4128CD

project no. 128CD

contract

DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

drawing title

GENERAL LAYOUT - MUI WO

(SHEET 2 OF 5)

drawing no. DDN/128CD2/1005

scale 1 : 500 OR AS SHOWN

office DRAINAGE PROJECTS DIVISION

DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

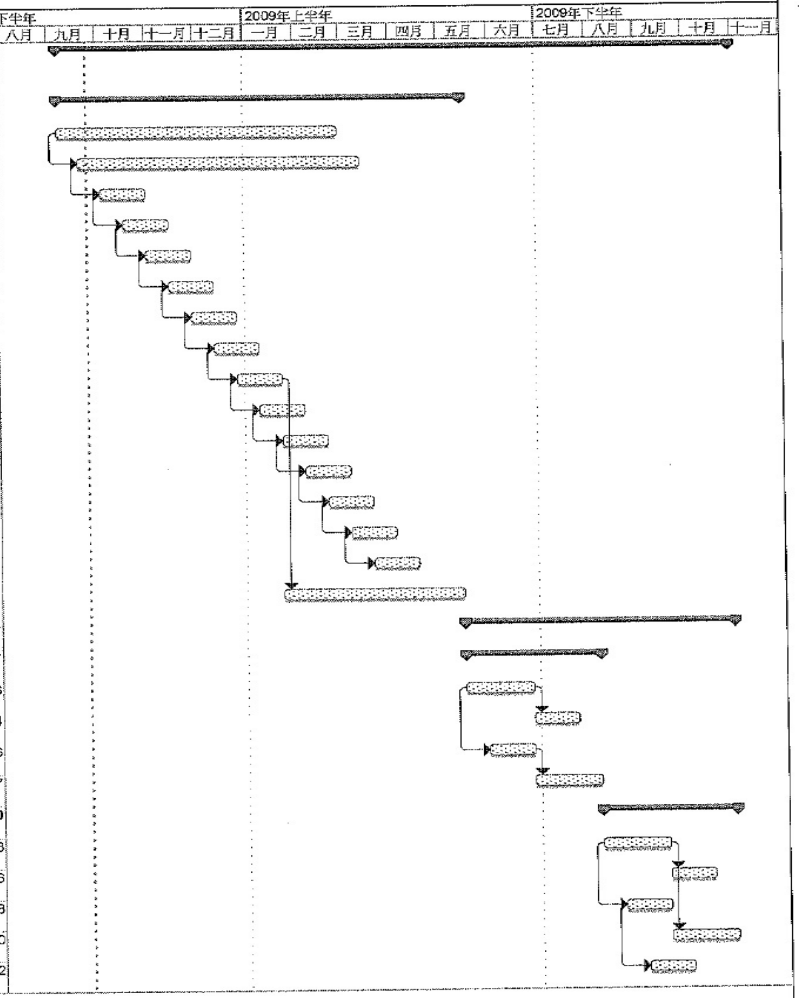
Appendix D

Work Schedule for Land-based Works

DSD CONTRACT NO - DC/2006/11 - DRAINAGE IMPROVEMENT IN SOUTHERN LANTAU

MUI WO, PUI O & CHEUNG SHA, LANTAU ISLAND

識別碼	Sect.	Task Name	Portion/Ch	工期	開始時間	完成時間
1		**DRAINAGE IMPROVEMENT WORKD IN SOUTHERN LANTAU ISLAND**		**360 days**	**2008/9/7**	**2009/10/30**
2						
3		**Pak Ngan Heung River Box Culvert**	**D1 / CH 95_250**	**216 days**	**2008/9/7**	**2009/5/15**
4		Excavation for RC BC		150 days	2008/9/7	2009/2/27
5		Blinding for RC BC Formation		150 days	2008/9/20	2009/3/13
6		R C Box Culvert (3x3mx2.25m) Bay 13	CH 250	24 days	2008/10/4	2008/10/31
7		R C Box Culvert (3x3mx2.25m) Bay 12		24 days	2008/10/18	2008/11/14
8		R C Box Culvert (3x3mx2.25m) Bay 11		24 days	2008/11/1	2008/11/28
9		R C Box Culvert (3x3mx2.25m) Bay 10		24 days	2008/11/15	2008/12/12
10		R C Box Culvert (3x3mx2.25m) Bay 9		24 days	2008/11/29	2008/12/26
11		R C Box Culvert (3x3mx2.25m) Bay 8		24 days	2008/12/13	2009/1/9
12		R C Box Culvert (3x3mx2.25m) Bay 7		24 days	2008/12/27	2009/1/23
13		R C Box Culvert (3x3mx2.25m) Bay 6		24 days	2009/1/10	2009/2/6
14		R C Box Culvert (3x3mx2.25m) Bay 5		24 days	2009/1/24	2009/2/20
15		R C Box Culvert (3x3mx2.25m) Bay 4		24 days	2009/2/7	2009/3/6
16		R C Box Culvert (3x3mx2.25m) Bay 3		24 days	2009/2/21	2009/3/20
17		R C Box Culvert (3x3mx2.25m) Bay 2		24 days	2009/3/7	2009/4/3
18		R C Box Culvert (3x3mx2.25m) Bay 1	CH 95	24 days	2009/3/21	2009/4/17
19		Backfilling for RC BC		96 days	2009/1/24	2009/5/15
20		**Reinforced Concrete Retaining Walls**	**D1**	**144 days**	**2009/5/16**	**2009/10/30**
21		**R C Retaining Wall F & Ramp (near Confluence)**	**CH320_335**	**72 days**	**2009/5/16**	**2009/8/7**
22		Ramp		36 days	2009/5/16	2009/6/26
23		Retaining Wall F - Bay 1		24 days	2009/6/27	2009/7/24
24		Retaining Wall F - Bay 2		24 days	2009/5/30	2009/6/26
25		Retaining Wall F - Bay 3		36 days	2009/6/27	2009/8/7
26		**R C Retaining Wall G (near Confluence)**	**CH270_335**	**72 days**	**2009/8/8**	**2009/10/30**
27		Retaining Wall G - Bay 1		36 days	2009/8/8	2009/9/18
28		Retaining Wall G - Bay 2		24 days	2009/9/19	2009/10/16
29		Retaining Wall G - Bay 3		24 days	2009/8/22	2009/9/18
30		Retaining Wall G - Bay 4		36 days	2009/9/19	2009/10/30
31		Retaining Wall G - Bay 5		24 days	2009/9/5	2009/10/2



Task Progress Summary External Tasks Split

Split Milestone Project Summary External MileTask

Appendix E

Measures to Protect Stream Habitats

To minimize the potential impact to the fish species of conservation interest due to land based work, the following mitigation measures should be implemented by the Contractor:

- The Contractor shall observe and comply with the Water Pollution Control Ordinance and its subsidiary regulation.
- To avoid or minimize ecological and water quality impacts due to the construction works, no excavation works shall be carried out at the confluence of Pak Ngan Heung River, Tai Tei Tong River and Luk Tei Tong River any time between April and October unless otherwise agreed by the Director of Environmental Protection Department.
- No works except land-based construction works within the confluence of Pak Ngan Heung River, Tai Tei Tong River and Luk Tei Tong River shall be carried out any time between April and October unless otherwise agreed by the Director of Environmental Protection Department.
- Containment measures such as bunds and barriers shall be provided to restrict the carrying out of the construction works within the enclosed dry area for Pak Ngan Heung River, Luk Tei Tong River and Tai Tei Tong River.
- The Contractor shall carry out the works in such a manner as to minimise adverse impacts on the water quality during execution of the works. In particular he shall take appropriate measures to minimise impacts on the water quality within and outside the Site, on the transport routes and at the loading, and dumping areas.
- The contractor shall follow the practices, and be responsible for the design, construction, operation and maintenance of all the mitigation measures as specified in the Professional Persons Environmental Consultative Committee Practice Note (ProPECC PN) 1/94 "Construction Site Drainage" issued by the Director of Environmental Protection. The design of the mitigation measures shall be submitted by the Contractor to the Engineer for approval.
- Surface run-off from the construction site shall be directed into adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins before discharge into storm drains. Channels, earth bunds or sand bag barriers shall be provided on site to properly direct stormwater to such silt removal facilities. No site run-off shall enter the freshwater marshes at Luk Tei Tong.

- Prior to commencement of site formation works and earthworks, catchpits and perimeter channels shall be constructed, and all sewer and drainage connection shall be sealed to prevent debris, soil, sand etc. from entering public sewers/drains.
- Site removal facilities, channels and manholes shall be maintained with the deposited silt and grit being removed at least once a week, and at the onset of and after each rainstorm to ensure that these facilities are functioning at all times.
- On-site storage of construction materials (e.g. aggregates and sand) shall be covered with tarpaulin or similar fabric during rainstorms. Measures such as providing sand bag barriers shall be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.
- At all parts of all works areas and construction sites, and throughout the full duration of the construction contract(s), debris and rubbish on site shall be properly handled and disposed of to avoid entering the water column and causing water quality impacts. Temporary on-site storage of excavated materials shall be covered with tarpaulin or similar fabric during rainstorms. Any washout of construction or excavated materials should be diverted to the drainage system via sediment traps.
- All excavated or filled surfaces shall be protected from erosion.
- Excavation works shall be carried out by land-based plants. To minimise leakage and loss of sediments during excavation in narrow channels, tightly sealed closed grab excavators shall be used to handle wet material.
- If any office or toilet facility is erected within or in the vicinity of the site, foul water from such office and toilet facility shall be directed to public foul sewerage system or to a sewage treatment and disposal facility either directly or indirectly by means approved by the Engineer.