

ROUTE 3 TAI LAM TUNNEL & YUEN LONG APPROACH
NORTHERN SECTION

Detailed Environmental Impact Assessment

Executive Summary

October 1995

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CONSULTANTS IN
ENVIRONMENTAL
SCIENCES (ASIA) LTD


ROUTE 3 CONTRACTORS CONSORTIUM

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BACKGROUND

1 INTRODUCTION

Route 3 Tai Lam Tunnel and Yuen Long Approach (R3 TLT & YLA) is an integral part of a transport network to serve the new airport at Chek Lap Kok and the proposed container terminals 10 and 11 on Lantau Island. An Environmental Assessment study for the R3 TLT & YLA (including the conveyor system under a separate cover, the EACS) Preliminary Design Stage 2 was completed in March 1994, hereafter referred to as the PDS2EA. The study was conditionally recommended for endorsement by the Advisory Council on the Environment (ACE) EIA Subcommittee on 5 July 1994 and was subsequently endorsed by the full ACE, subject to conditions given in Table 1.

The Hong Kong Government has awarded this project to a franchisee, Route 3 (CPS) Company Limited, that has delegated responsibilities for design and construction to Route 3 Contractors Consortium (R3CC). Appendix 5 Part 1 of the Project Agreement gives Construction Requirements containing specifications on environmental matters. These include commitments for R3CC to:

- 1) reinstate portions of fishponds remaining within the construction boundaries to their original condition including water quality and suitable enhancements to improve their ecological value;
- 2) prepare a Detailed Environmental Impact Assessment (DEIA) report to verify the findings of the PDS2EA and detail the environmental impacts of the Construction Proposal;
- 3) complete the four-season ecological survey as required by the ACE;
- 4) address key environmental issues described in Clause 10.2 of the Construction Requirements (see Section 5);
- 5) carry out off-site compensatory planting of native woodlands affected by the works;
- 6) develop and implement a comprehensive Environmental Monitoring and Audit programme to check on EIA predictions and if necessary, to remedy any non-conformances with relevant environmental standards.

Table 1 Recommendations of ACE's EIA Subcommittee on the PDS2EA

Recommendation	Status and Commentary
Additional ecological survey to cover 4 seasons before commencement of work.	Supplementary surveys were carried out from late August 1994 through January 1995 by Highways Department. R3CC has undertaken the continuation of this survey which was completed in May with the report submitted to ACE's EIA Subcommittee in September 1995.
Off-site compensatory planting at a ratio of no less than 3:1	R3CC will undertake the compensatory planting.
The final EIA to be submitted to ACE for consultation.	The DEIA for the Southern Section was endorsed by ACE in September 1995. The Northern Section DEIA will be submitted in October 1995.
Off-site restoration of wetland.	Highways Department believe that off-site restoration of wetland is not viable in this project. R3CC will however reinstate areas of ponds within the work site which are not required as part of construction, operation and maintenance of the permanent works.

The DEIA for R3 TLT & YLA was divided into 2 sets of reports: one for the Southern Section and one for the Northern Section. The divider being the Kam Sheung Access Road. The DEIA for the Southern Section was submitted to ACE in August 1995 and was endorsed in September 1995. It is understood that government would review the policy on wetland loss mitigation. The Southern Section DEIA consists of three volumes covering the main alignment, the conveyor system and the environmental monitoring and audit manual for the Southern Section.

Two Information Papers, one on the environmental impacts of the preliminary works during the first 6 months of the project and the other on the environmental impacts of the conveyor system, have been presented to ACE by R3CC. Both have been endorsed by ACE. Conditions for endorsing the Conveyor System Information Paper have been described in the Southern Section DEIA.

This Executive Summary is for the Northern Section DEIA.

2 OBJECTIVES

This Executive Summary highlights the findings and recommendations of the DEIA for the Northern Section of R3 TLT & YLA and describes the Environmental Monitoring and Audit (EM&A) programme. The DEIA consists of 2 volumes and the readers should refer to them for technical details:

- Volume 1: Detailed Environmental Impact Assessment
- Volume 2: Environmental Monitoring & Audit Manual

As specified in the Construction Requirements, the objectives of the DEIA are:

- to verify the findings of the PDS2EA;
- to assess in detail the environmental impacts of the Construction Proposals;
- to address any outstanding issues from the PDS2EA related to the refinement of impact mitigation measures; and
- to assess the environmental impacts of any changes between the current Construction Proposals and the project design used as a basis for the PDS2EA.

The DEIA meets the above objectives.

3 THE PROJECT

3.1 The Main Line

The R3 TLT & YLA comprises the northern section of Route 3 from Tuen Mun Road in the south to Au Tau (near Yuen Long) in the north. The south interchange will connect to the northern end of the Ting Kau Bridge and Tuen Mun Road. The north interchange will connect to the New Territories Circular Road and the Yuen Long Southern Bypass.

The road will be a 12 km long fully graded divided dual 3-lane highway providing a direct link from the North West New Territories and the border crossing at Lok Ma Chau through to Tsuen Wan, Kwai Chung, Lantau, the West Kowloon Corridor and Hong Kong Island. It will include a 6.3 km stretch of the elevated Yuen Long Approach Road and a 3.8 km Tai Lam Tunnel. The Tai Lam Tunnel will consist of two separate 3-lane road tunnels and ventilation tunnels from the portals to the quarter points of the road tunnels. Ventilation plant buildings will be located at both portal areas.

Situated 1.5 km north of the Tai Lam Tunnel northern portal, there will be a 22-lane Toll Plaza and an Administration Building to accommodate the Central Monitoring and (Traffic) Control System. At the Toll Plaza, sliproads will connect the main roadway to Kam Sheung Road to the east.

3.2 The Conveyor System

The preliminary design identified the need to remove approximately 6 Mm³ of excavated spoil material when constructing the Tai Lam Tunnel and the Ting Kau Interchange. A conveyor system was deemed to be the most practical and environmentally acceptable method for transporting the material to a barge loading area. The amended design proposed by R3CC has reduced the estimated quantity to 4.5 Mm³.

The conveyor system will be installed along the hillsides and coastal area. Spoil will be transported via this system from the Tai Lam Tunnel portal area to a barge loading jetty located at Gemini Beaches. Barges will be used to transport this material for disposal. The entire length of the conveyor system is approximately 960 m.

Environmental impacts associated with the conveyor system have been fully covered in the Southern Section DEIA.

3.3 Design

An implicit component of the DEIA is to establish the Franchisee's design changes compared with the preliminary design. These are summarised as follows:

Environmental assumptions: No change to these has been made.

Engineering assumptions: Figure 1 shows the study area and refinements made to the design of the road. These can briefly be summarised as follows:

- The Toll Plaza layout has been modified to move the toll booths slightly south, resulting in less fill.
- South of the Au Tau interchange, Link Road J has been reduced in length. This will result in more cut and less fill.
- At the Au Tau interchange the alignment has been revised, resulting in less land take and wetland loss. In addition, roads on the edges of the interchange have been put onto low embankments.

Traffic assumptions: The traffic load has been reduced by 3.3% in total tunnel flow and 23% in heavy vehicles. In the PDS2EA, traffic figures were based on different assumptions about 'local' and 'cross border' traffic. The revised vehicle mix and forecasts used in this DEIA were based on a thorough review of the existing vehicle mixes on the main corridor of demand, and reflected the likely proportion of 'local' and 'cross border' traffic. The traffic study report from which the traffic load data were adopted in this DEIA has been endorsed by the Transport Department.

Identification of sensitive receivers: A detailed survey to identify all potential air and noise sensitive receivers for this assessment has been carried out as part of this DEIA to fulfill ACE's EIA Subcommittee requirements and PDS2EA recommendations.

4 THE DEIA STUDY AREA

To address environmental matters associated with the R3 TLT & YLA, the project is divided into a Southern Section and a Northern Section. The former comprises the Ting Kau Area, the Conveyor System, the South Portal, the Tai Lam Tunnel, the North Portal and the Yuen Long Approach up to and including the Kam Sheung Access Road. The latter comprises the remaining portion north of Kam Sheung Access Road

to the Au Tau interchange (Figure 1).

5 KEY ISSUES

The following key issues were depicted in the Construction Requirements.

Issues related to monitoring and/or mitigating environmental impacts (Clause 10.2):

- associated fixed noise sources of constructed facilities;
- traffic noise;
- effect on air quality, particularly along the Yuen Long Approach, at the portals and ventilation exhaust points of Tai Lam Tunnel and inside the tunnel;
- visual impact, and landscaping and environmental re-provisioning;
- ecological and heritage impact;
- water quality impact;
- disposal of soil, construction waste and unsuitable material;
- traffic impact to existing roads during construction;
- construction noise, dust and vibration..

Issues related to ecology:

- determine the area, species and precise location of woodlands affected by the execution of works (Clause 10.3.2)
- complete the four seasons ecological survey already partially completed by Government and prepare a report identifying the need and measures to be taken to mitigate the impacts of the constructed facilities on ecology (Clause 10.1.6);
- for fish ponds affected by the temporary works but not required in the long term, determine suitable enhancements to improve their ecological value (Clause 9.3.3).

Issues related to environmental monitoring and audit:

- requirements for EM&A (Clauses 10.4 - 10.10)

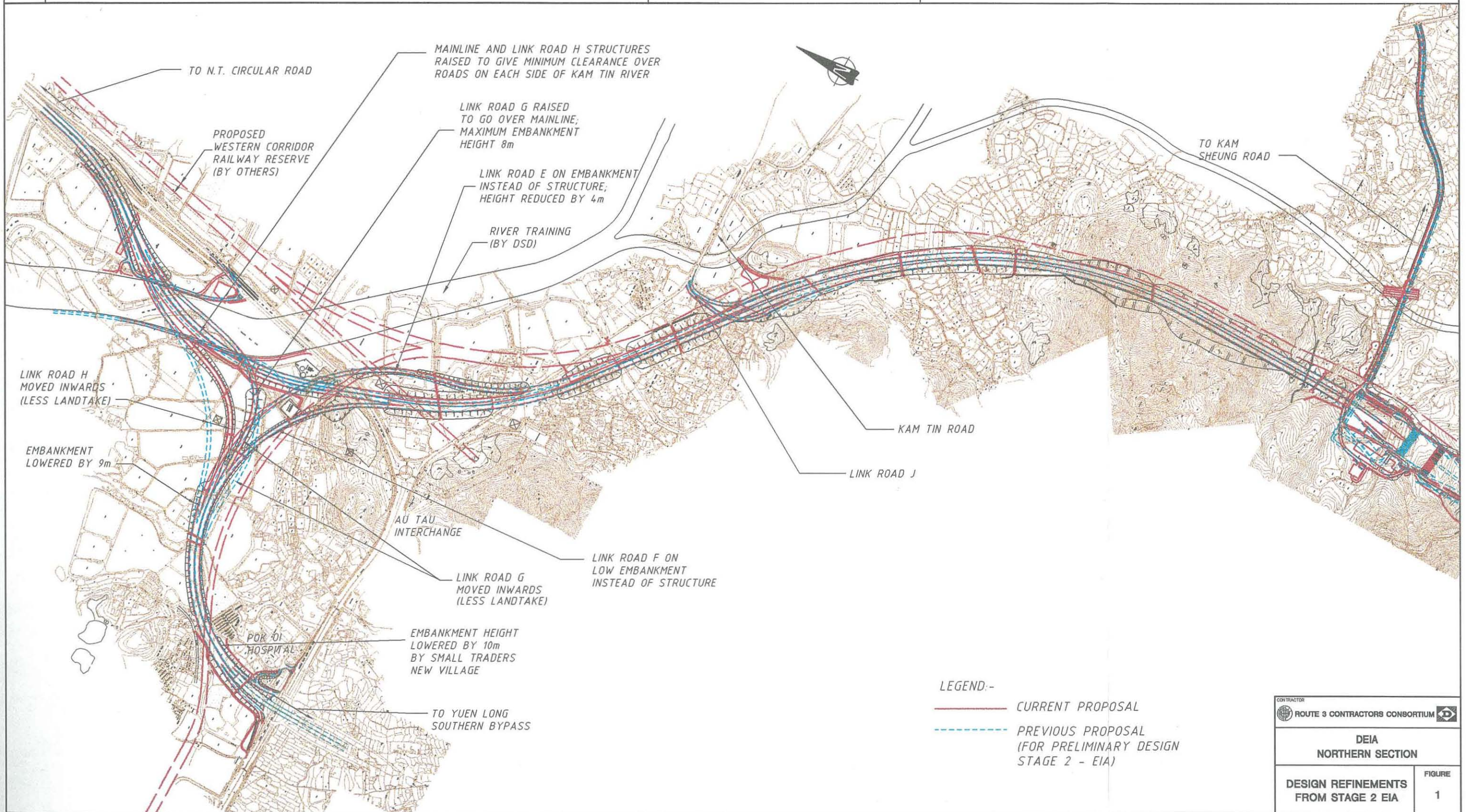
The above issues were covered by this Northern Section DEIA except traffic impact, air quality in the tunnel and the four seasons ecological survey. Traffic impact other than noise and air quality has been covered by the traffic consultant. Air quality at tunnel portals and ventilation shafts has been addressed in the Southern Section DEIA. Air quality in the tunnel is being covered by the ventilation engineers. The four seasons ecological survey has been presented in a separate report.

DESIGN REFINEMENTS:

OVERALL, ROADS ON EDGES OF INTERCHANGE HAVE BEEN MOVED INWARDS AND PUT ON LOW EMBANKMENT

MAIN LINE - NO DIFFERENCE
LINK J - REDUCED IN LENGTH
LESS FILL

NO DIFFERENCES



DETAILED ENVIRONMENTAL IMPACT ASSESSMENT FOR THE NORTHERN SECTION

6 NOISE

Construction noise predictions confirm the PDS2EA findings that the daytime criterion of 75 dB(A) would be exceeded at sensitive receivers in the vicinity of the Small Traders New Village. Exceedances would occur on approximately 30 days over a 9-month period during embankment formation. To mitigate against such impact at this locality, R3CC will construct hoardings, retaining walls and temporary noise barriers to shield these receivers during embankment formation activities. With these additional measures, exceedances will still occur during the preparatory works, prior to completion of the retaining walls, and during embankment construction. The short source-receiver distance makes such exceedances inevitable. However, the exceedances will be for limited periods, and the above measures will keep their duration and frequency to a minimum.

Apart from the above specific mitigation measures, R3CC is also committed to the following noise mitigation measures during construction:

- Noisy equipment and activities to be sited as far from sensitive receivers as is practical.
- Noisy plant or processes to be replaced by quieter alternatives or fitted with silencing measures where possible.
- Sensible planning and scheduling of noisy activities. For example, bored piling will not be undertaken concurrently with other structural works when near certain sensitive receivers.
- Idle equipment to be turned off or throttled down. Equipment to be properly maintained and used no more often than is necessary.
- The number of operating powered mechanical equipment items to be reduced where possible.
- Acoustic screening of water pumps during earthworks and hand held beakers during structural works when activities occur in certain chainages or near certain sensitive receivers.
- Early implementation of indirect technical remedies.

Construction during restricted hours requires a Construction Noise Permit (CNP). R3CC will comply with CNP conditions.

Using year 2011 as the design year, 531 dwellings and the Pok Oi Hospital would be exposed to traffic noise levels in excess of the Hong Kong Planning Standards and Guidelines (HKPSG) limits of 70 dB(A) for residential dwellings and 55 dB(A) for hospitals from the Northern Section of Route 3 with no mitigation measure except friction course road surfacing and 0.8 m high parapets on bridges.

Six mitigation options consisting of a combination of barrier heights and enclosures along certain sections of the road were evaluated. Taking into consideration engineering constraints, foundation requirements, visibility and visual implications, restrictions to emergency services and maintenance problems, the option as illustrated in Figure 2 was selected as the preferred option. This option involves the erection of barriers ranging from 0.8 m to 4 m in height along sections of Route 3.

With the implementation of the preferred mitigation option, the estimated number of dwellings exposed to traffic noise levels in excess of 70 dB(A) was reduced to 120. Among these, 47 were estimated to meet the eligibility criteria for indirect technical remedies. ExCo approval is required for implementing indirect technical remedies at residential dwellings. R3CC will provide details on the indirect technical remedies in a detailed mitigation design package for implementation.

With the implementation of Route 3, the Pok Oi Hospital will be exposed to traffic noise in excess of the HKPSG standard of 55 dB(A) for hospitals. Direct mitigation alone (under the preferred option) with 4 m high barriers on Route 3 cannot bring down the noise levels at the hospital to within the HKPSG limit. The need for indirect technical remedies at the hospital is in line with the initial findings of the PDS2EA. Indirect technical remedies applied to the affected sensitive facades will be provided by R3CC.

7 AIR QUALITY

R3CC is committed to the following dust mitigation measures during construction:

- Exercise good site practices such as speed control, wheel wash, regular wetting of unpaved haul roads and stockpile protection that are normally included in construction contract clauses.

- Undertake steps to minimise dust during blasting such as wetting the blast face and blasting with an 'open face' to reduce dust dispersion vertically.

With these commitments taken into account in dispersion modelling, dust levels (in terms of total suspended particulate (TSP)) were predicted to comply with the 1-hr average TSP guideline as well as the Air Quality Objectives (AQO) for 24-hr and annual average TSP at all sensitive receivers. The dust levels will be monitored through the EM&A programme during construction and additional mitigation will be taken if needed.

During operation, nitrogen dioxide (NO₂) levels from traffic emission were predicted to meet AQO requirements at the sensitive receivers under the no noise mitigation scenario.

Barriers up to 4 m will be built for noise mitigation. These would alter the dispersion pattern of NO₂. Dispersion modelling was conducted with the barriers under the preferred noise mitigation option in place. Results show no exceedance of AQOs for NO₂ at the sensitive receivers.

8 WATER QUALITY

Water quality impacts discussed in the PDS2EA remain valid, but design changes have resulted in less fill activities. This will lessen water quality impact during construction on Kam Tin River, the major sensitive receiver.

Site run-off and the draining of fish pond water are two key issues during construction. The former will be controlled by installing sedimentation tanks at appropriate locations. These tanks will be cleaned regularly to ensure effective performance. When construction works are completed at exposed slopes with soft material, R3CC will hydroseed as soon as possible. R3CC is in the process of obtaining consent to discharge the pond water from EPD. Bottom slurry will be pumped to sedimentation basins for settling and will not be discharged into streams.

During operation, water quality impacts may arise from road run-off. Such run-off is similar to that generated from any other large scale road infrastructure. The impact will be reduced through the installation of silt traps at strategic locations and effective management in the event of spillages or traffic accidents. The silt traps will be regularly cleaned and maintained to ensure proper functioning.

9 ECOLOGY

Table 2 compares habitat loss in the Northern Section between the preliminary design and the present design assuming that all vegetation within the construction boundary would be removed. In the case of shrubland, grassland and agriculture/built-up habitats, the apparent increase in habitat loss could well be attributed to the greater degree of detail shown on the latest plans as compared to the preliminary design plans. The areas of fish ponds to be lost permanently were reduced.

Table 2 Estimated loss of habitats

Habitat	Preliminary design	Finalized design
Woodland	0.8 ha	0.8 ha
Shrubland	2.3 ha	3.0 ha
Grassland	2.0 ha	2.4 ha
Agriculture/Disturbance ¹	24.9 ha	34.0 ha
Fish Ponds ²	13.69 ha	13.09 ha
Marsh	0.44 ha	0.44 ha

- 1 Includes cultivated land, buildings and roads
- 2 Permanent loss only

The project will affect 55 ponds totalling 34.08 ha in the Northern Section. Of these, 20.99 ha will be restored to their original conditions upon completion of construction, and 13.09 ha will be permanently lost. The majority of ponds lost permanently (12.49 ha) are Grade C ponds according to the classification scheme by the Agriculture and Fisheries Department (AFD). Grade C ponds are defined as 'areas with scattered small fish ponds and substantial amount of fish ponds are either idle or filled, and are subject to high development pressure due to proximity to development'.

R3CC is committed to the following impact avoidance and habitat loss mitigation measures:

- Carry out 3:1 compensation planting of native woodlands permanently lost by the works through off-site planting with native species. Woodland restoration will take place within the project boundaries on upland cut and fill slopes. Outside the project area woodland restoration will take place between the road alignment and the Tai Lam Country Park boundary west of Ma On

Kong. This will restore appropriate habitats for upland birds.

- Re-instate fish ponds lost to temporary works and create 'stream' channels, totalling 20.99 ha. Where applicable, small ponds will be joined during restoration to form ponds large enough to be commercially viable. Short stream channels within the Au Tau interchange will be created and revegetated with bamboo and other riparian species to provide a variety of habitats suitable for use by a diversity of bird species.

R3CC will comply fully with Construction Requirements Clauses 9.3.2 and 9.3.3. The former specifies maintenance of fish ponds within the works area that are not required for construction of the works and reinstatement of these ponds to their original condition including water quality on completion of construction. The latter specifies reinstatement of fish ponds within the works sites which are required temporarily for the works to their original conditions including provision of suitable enhancements to improve their ecological value.

The contribution of Route 3 to the cumulative loss of wetlands in the New Territories has been discussed in detail with government departments (Agriculture and Fisheries Department, Environmental Protection Department, Highways Department) and ACE during the approval process for the Southern Section DEIA. It is R3CC's understanding that this issue and associated off-site wetland compensation is being addressed as a separate matter through a review of policy on wetland loss mitigation by government. This issue is beyond the contractual requirements of R3CC.

10 VISUAL AND LANDSCAPE

Visual and landscape impacts and mitigation recommendations described in the PDS2EA remain valid since design revisions during construction and operation are minimal. In particular the total size of the Au Tau interchange has been reduced, resulting in considerably less visual impact than was predicted in the PDS2EA.

Landscape issues are being addressed in the Landscape AIP (approval in principle) Package. The AIP forms the basis of the detailed design taking into account the landscaping and off-site planting objectives and recommendations in this DEIA. The landscape in the vicinity of the Northern Section of

Route 3 could change considerably through the construction of the Western Corridor Railway and the Kam Tin River Drainage Control Project. Where possible, the detailed Landscape AIP Package has taken these future developments into account.

11 WASTE MANAGEMENT

Of the 3.41 Mm³ rock and soft spoil excavated, 92% (3.14 Mm³) will be re-used as fill material on site. The remaining 8% (0.27 Mm³) will be disposed of off-site. R3CC is investigating the possible re-use of the remaining spoil on other projects to further reduce the quantity for disposal.

Approximately 0.2 Mm³ of pond mud will be generated. The mud, if found to be uncontaminated, will be re-used on site. Approximately 2/3 (0.13 Mm³) can be mixed with rockfill for embankment construction and with completely decomposed granite for landscaping or formation of noise barriers. The remaining 1/3 (0.07 Mm³) will be disposed of at the Pillar Point landfill or a strategic landfill.

If the pond mud is found to be contaminated, it will be transported to the Pillar Point landfill for disposal. Contaminated mud will not be re-used on site.

Construction wastes will be disposed of in accordance with the New Disposal Arrangement for Construction Waste issued by EPD. Materials such as wood, glass, plastic, steel and other metals that cannot be re-used on site will be disposed of at a landfill. Wastes such as concrete and rubble, if not re-used on site, will be transported to a public dump for disposal.

12 CONCLUSION

This DEIA has evaluated in detail potential environmental impacts during the construction and operation of the Northern Section of R3 TLT & YLA in accordance with the Construction Requirements. It also considered cumulative impacts from the Southern Section. Design changes compared to the preliminary design stage 2 are slight. Potential impacts predicted in this DEIA confirm the PDS2EA findings. R3CC is committed to implement all the recommendations and mitigation measures in the DEIA.

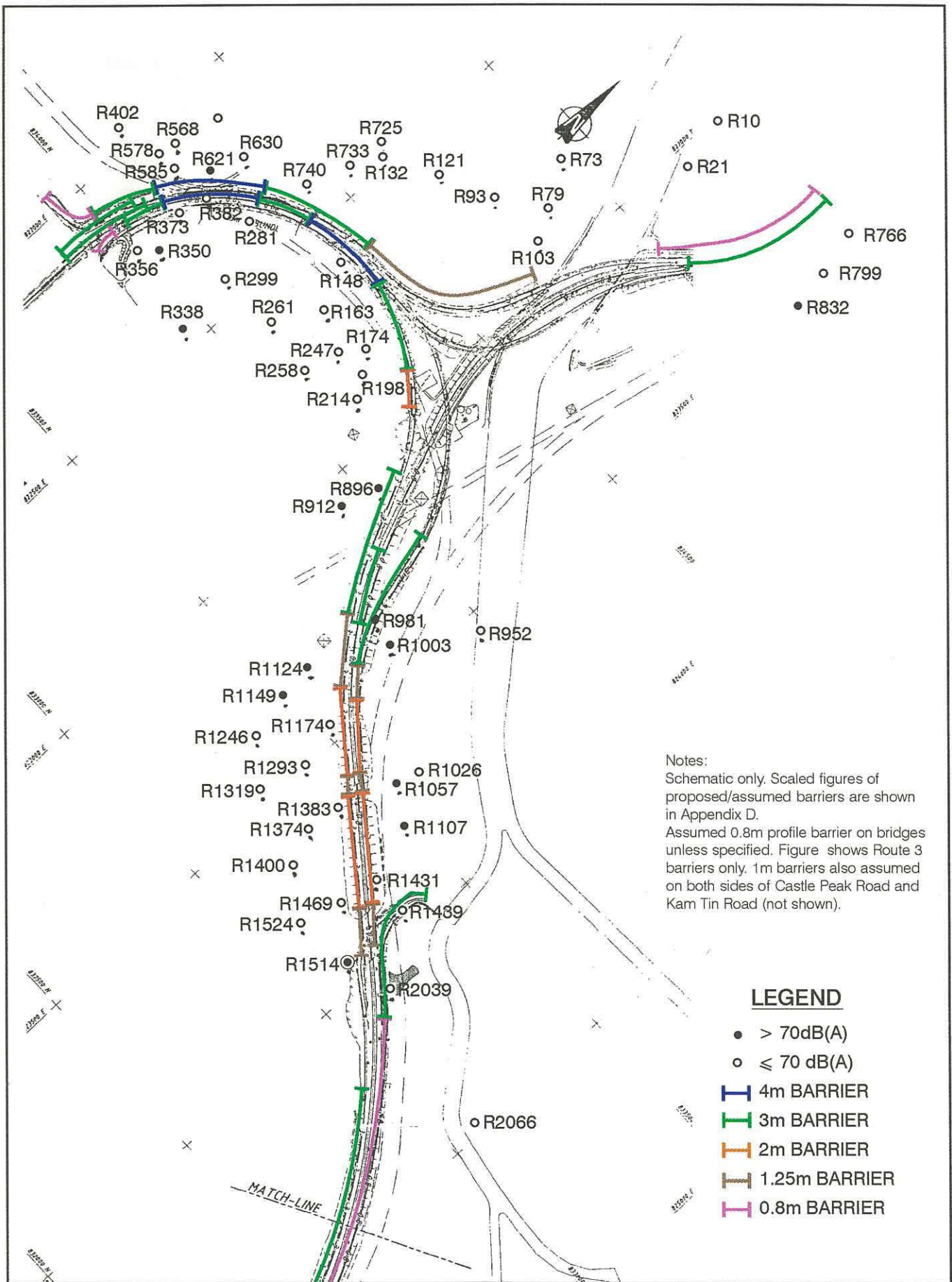
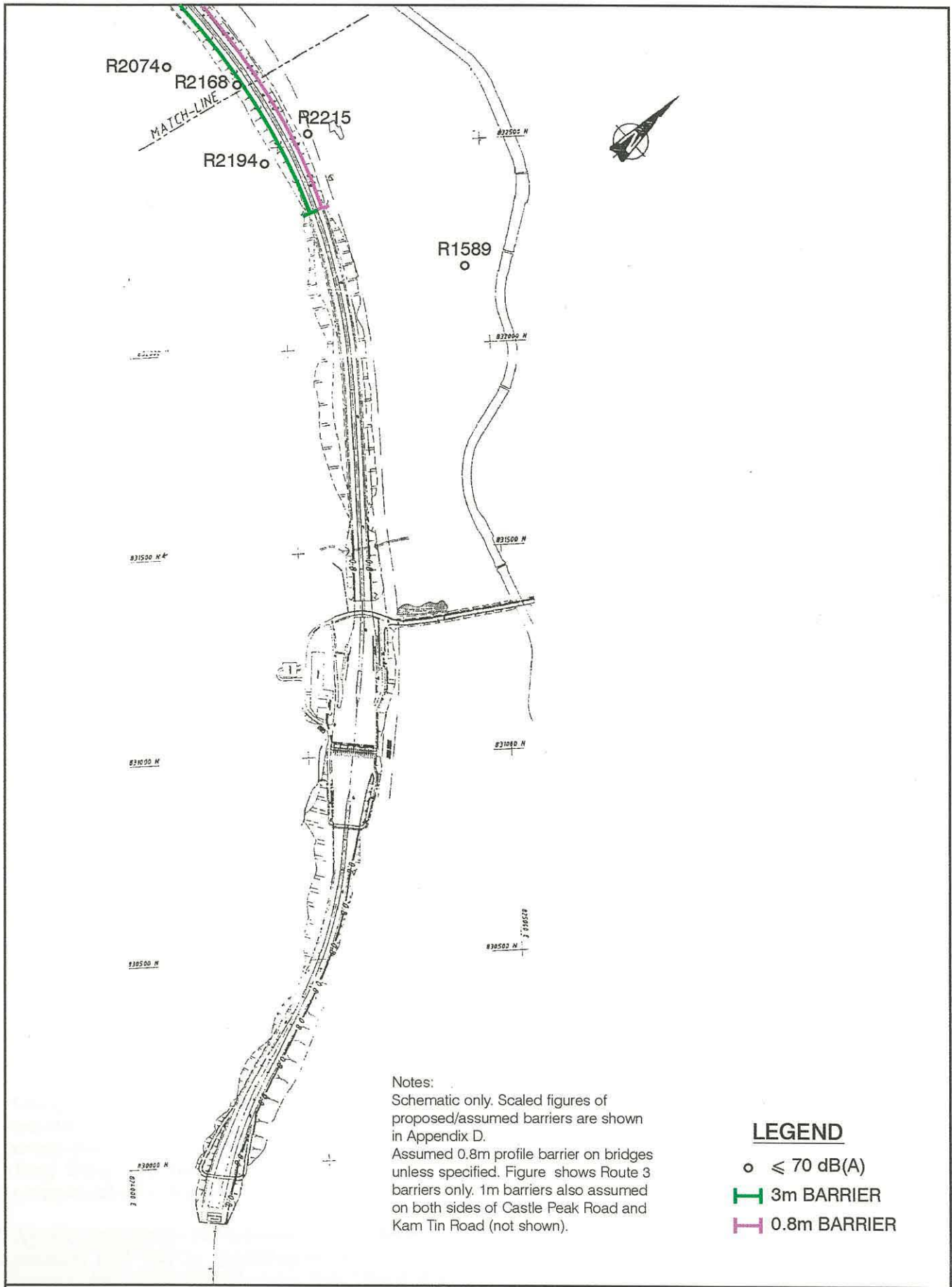


Figure 2 The Preferred Noise Mitigation Option



Notes:
 Schematic only. Scaled figures of proposed/assumed barriers are shown in Appendix D.
 Assumed 0.8m profile barrier on bridges unless specified. Figure shows Route 3 barriers only. 1m barriers also assumed on both sides of Castle Peak Road and Kam Tin Road (not shown).

LEGEND

- ≤ 70 dB(A)
- ▬ 3m BARRIER
- ▬ 0.8m BARRIER

Figure 2 The Preferred Noise Mitigation Option (continued)

ENVIRONMENTAL MONITORING AND AUDIT

13 INTRODUCTION

An EM&A Manual has been prepared to satisfy Clause 10.9 of the Construction Requirements. Other relevant requirements are summarised as follows:

- Environmental team (Clause 10.4.3)
- Monitoring and audit schedule (Clause 10.4.4)
- Trigger, action and target levels and action plan (Clauses 10.4.5 and 10.4.6)
- Air quality monitoring (Clause 10.5)
- Noise monitoring (Clause 10.6)
- Water quality monitoring (Clause 10.7)
- Reporting requirements (Clauses 10.8 and 10.10)

14 ORGANISATION

An Environmental Team (ET) has been organised for carrying out environmental monitoring and audit during the construction phase. The construction programme will last 38 months.

15 TRIGGER, ACTION AND TARGET LEVELS

It is an accepted practice to apply a preset range of *trigger, action and target* (TAT) levels to the parameters monitored as a framework for interpreting and auditing monitoring results. An action plan has been developed for each level of exceedance which describes actions to be taken by the ET, the Contractor and other related parties to mitigate against pollution.

16 ENVIRONMENTAL MONITORING AND AUDIT

A comprehensive programme for monitoring of air quality, noise and freshwater quality before (baseline), during (compliance) and after (operational) the construction of R3 will be carried out.

Ecological monitoring and audit during construction includes the audit of revegetation, avifauna in revegetated areas, ardeid use of Ko Po Tsuen and Tung Shing Lei, fish pond design and fish pond contamination by metals.

A pond reinstatement and maintenance plan has been prepared and will be implemented to meet the requirements under Clauses 9.3.2 and 9.3.3 of the Construction Requirements.

17 POLLUTION CONTROL REQUIREMENTS

During on-site environmental monitoring, the ET will observe and record the effectiveness of mitigation measures, working practices, and site and equipment maintenance conditions. Site inspection checklists for air quality, noise, water and waste management will be used to facilitate the observation and recording of site conditions.

18 IMPACT PREDICTION REVIEW

The Environmental Manager of the ET will review the works programme each month to predict potential impacts and impacted areas and duration due to works activities in the following month. If necessary, the EM&A programme for the following month will be modified to take account of such predictions.

19 REPORTING

A Monitoring and Audit Report will be prepared and submitted each month. The report will include descriptions on monitoring methodology, monitoring and audit results, site inspection report, complaints received, impact prediction review, and the programme for works activities and monitoring schedule for the upcoming month.

20 ENVIRONMENTAL COMPLAINTS RESPONSE

Procedures to log, investigate, validate and respond to complaints received through EPD hotline or other direct enquiries have been established. A complaint response action plan will be set in motion when complaints are received.

21 ENVIRONMENTAL COMMITMENT OF R3CC

R3CC has made a commitment to implement the mitigation measures indicated in this DEIA and to ensure that the mitigation measures which relate to the construction practices, indicated in the Environmental Monitoring and Audit report, are adhered to. This commitment should ensure that any operational and construction impacts will comply with the established criteria and contract conditions.

