

## **6 ECOLOGY**

### **6.1 Introduction**

6.1.1 This section of the report addresses ecological issues arising from the construction and operation of R9. The R9 alignment is directed mainly through industrial and urban areas and consequently there are few potential opportunities for significant ecological disturbance. The only areas of potential ecological impact are the areas adjacent to the Nam Wan Tunnel portal sites on Tsing Yi. Key ecological issues have therefore been identified for these areas. This ecological assessment is designed to:

- gain an appreciation of the existing baseline conditions by means of field visits to the locations of the portal sites;
- make an assessment of the ecological importance of the habitats and communities which could suffer from the construction of the portals;
- gain an initial understanding of the general range of engineering options under consideration so as to better understand, in principle, the likely conditions and circumstances within which the ecological context of the area is likely to change; and
- gain an appreciation of likely operational and construction impacts arising from the proposed works, the possible need for further studies for the final EIA and determine if a broad framework of ecological monitoring and auditing is warranted.

6.1.2 The ecological issues associated with the reclamation works have already been addressed under the EIA for the CT9 project.

### **6.2 Approach and Methodology**

6.2.1 For the purposes of this Report, data has been collected by inspection of aerial photographs and survey work. Additional information has also become available through the Land Requirements Report.

#### ***Aerial Photographs***

6.2.2 Aerial photographs were utilised to create a basic habitat overview. Aerial photographs for the area for the years 1963, 1973, 1983, 1989 and 1997 were inspected with a view to obtaining an indication of the vegetation development and land uses on the site over the past 30 years.

6.2.3 Basic habitat types present on the site were noted for verification in the field. Aerial photographs A45651/2 of the proposed Eastern Portal location flown at 2,000 feet (15<sup>th</sup> August 1997) and photographs CN 17258/9 of the proposed Western Portal location flown at 4,000 feet (25<sup>th</sup> June 1997) were found to be particularly useful for this purpose.

#### ***Surveys of Habitat Fauna and Flora***

6.2.4 The existing habitats on and near the proposed portal sites were surveyed and assessed during fieldwork carried out in October and November 1997 and the results of the habitat surveys are shown in Figure 6.1. Figure 6.2 shows the general habitat in the Study area and Figure 6.3 provides photographs of the portal areas.

6.2.5 A list of all plant species recorded in November 1997 on or near the proposed portal sites is presented at the end of this section.

### 6.3 Western Portal Site

6.3.1 The proposed Route 9 will emerge from the Nam Wan Tunnel below the existing Tsing Yi Road. From this position it will progress on structure to link with R3 and other existing roads.

#### *Terrestrial Habitat and Flora*

6.3.2 The below road option will emerge at approximately 25mPD. The land use and vegetation on and around the western portal site is shown on Figure 6.1. The main area, which the road passes over on structure, is formed land with temporary consultant's offices, laboratories and contractors' stores. This land has a few pioneer plant species but is of no ecological importance.

6.3.3 The portal site itself would be located on an engineered slope, partly formed from concrete and partly planted with exotic trees. Inspection of a recently cut tree near the existing road indicates that the planting was carried out approximately 7-8 years ago. Aerial photographs of this area taken in 1989 support this observation.

6.3.4 Planted species are exotic and local and include (See Table 6.4) :

- *Acacia auriculiformis* (frequent)
- *A. confusa* (dominant)
- *Castanopsis fissa* (occasional)
- *Casuarina equisetifolia* (frequent)
- *Eucalyptus citriodora* (occasional)
- *Lophostemon confertus* (occasional)

6.3.5 In addition to the above species, Bauhinia species are planted along the existing road. The planting suffers from a high level of disturbance and lack of management. However, all species appear to be growing well except for the *Casuarina equisetifolia*; some of which are in poor health. The planting is dense, no thinning having taken place and there is minimal under storey and layering.

6.3.6 The species mixes of the planting above the Tsing Yi Road West are similar but some of the plants have been established longer. The lower slopes of the planted woodland or the low scrub grassland will be removed for the proposed works. The species affected include exotic species similar to those below the road, however they have been established for slightly longer (10 to 15 years).

6.3.7 Loss of natural tall scrub from the western portal area are expected to be insignificant under the preferred "below Tsing Yi Road" option since the portal will emerge through the concrete reinforced slope with only minimal removal of some adjacent roadside planting.

### *Terrestrial Fauna*

- 6.3.8 No amphibian or reptile were recorded within and around the West Portal area in the survey carried out in October and November 1997. Two common species of birds were seen during the surveys, i.e. one Grey Wagtail and a few Chinese Bulbuls (Table 6.2). There were no mammals seen during the surveys and no mammal scats, burrows and other visual signs were noticed.

### *Aquatic Fauna*

- 6.3.9 There is no aquatic habitat within the West Portal site. While there are a few constructed storm-water-discharge channels on the upper side of the Tsing Yi Road west, most of the channels were dry and only small spring water was present at two sections of the channels. No aquatic animals were observed in these channels.

### *Summary*

- 6.3.10 The entire area is considered to be of very low ecological significance and is not of local wildlife importance. No major ecological constraints have been identified on the western portal site. Whereas there are not significant ecological impacts and there are unlikely to be any major ecological impacts to this section, (the area contains only shrub and grassland species which are widely distributed elsewhere in Hong Kong), unnecessary disruption to remaining assemblages of the original terrain should be avoided as far as possible on conservation grounds. Construction activities should ensure that disturbance to areas of cut are minimised by restricting the extent of access clearance wherever possible and restoring cut areas by reshaping and planting with native species. This will also assist in minimising long term visual impacts

## **6.4 Eastern Portal Site**

- 6.4.1 Passing from east to west, the proposed Route 9 alignment will be above the existing Tsing Yi Road on structure and will pass into the existing hillside at approximately 64mPD. Existing habitats found on or near the portal site and route alignment are shown on Figure 6.1. Some of the habitats found on the site are man made including managed orchards and fruit trees. There have been agricultural holdings in this area (evident from the aerial photographs) for at least 30 years. In 1963 the area was barren and rocky, the main vegetation type being grassland. The scrub now present on the site appears to have developed only during the last 20-25 years.
- 6.4.2 The only two natural habitats found were natural tall scrub which, in the location of the proposed portal, is approximately above the 30m contour and a small natural rocky stream course which flows from the hillside just to the south of the proposed alignment and near to the pond and hut. The habitats present are described below.

### *Natural Tall Scrub*

- 6.4.3 Natural tall scrubland (defined as vegetation dominated by trees and shrubs of a height between 2-5 meters) with scattered, sometimes dense, native pine (*Pinus massoniana*) can be found above the 30m contour (See Table 6.4).
- 6.4.4 The main scrubland present is a community type commonly found throughout Hong Kong. Most of the species present are common including *Adiantum capillus-veneris*, *Eurya chinensis*, *Lycopodium scandens*, *Melastoma candidum*, *M. dodecandrum*,

*Raphiolepis indica*, *Rhamnus chinensis*, *Pinus massioniana*, *Rhodomyrtus tomentosa*, *Rhus chinensis*, *Schima superba*, *Smilax china* and *Viburnum sempervirens*.

- 6.4.5 This type of tall scrub, which is rich in fruit bearing shrubs and small trees, is of value as food for frugivorous birds in Hong Kong.
- 6.4.6 The type of scrubland found on the site is widespread in Hong Kong and sub-tropical China and the communities present are found extensively elsewhere in the Territory. No rare species were recorded from the tall scrub on this site.
- 6.4.7 The eastern portal site contains 3 *Cinnamomum camphora* trees, generally larger and older than the surrounding trees and likely to provide a niche for fauna. Specimens of the common Ramrod (or Hind's, *Arundinaria hindsii*) bamboo were also found (see Figure 6.1). With careful construction working methods, it should be possible to avoid impact on the three trees. This is not considered to be a key ecological issue.
- 6.4.8 It is estimated that the potential loss of trees and scrubland at or near the eastern portal will be less than 1 hectare. The impact is considered to be of low/moderate ecological significance. However, this estimate will be refined based on any further revisions of the portal design.

#### ***Cultivated Land***

- 6.4.9 The main trees under cultivation in orchards include mango (*Manifera indica*), Litchi (*Litchi chinensis*) and Longan (*Euphoria longan*). There are other scattered fruit trees, including Banana (*Musa paradisica*), Guava (*Pidium gujava*), Pomelo (*Citrus grandis*) and other citrus varieties. There is a belt of planted *Acacia confusa* above the orchards.
- 6.4.10 These areas of cultivation are generally of limited value to wildlife given the active discouragement by the occupiers, cultivation of the soil, the possible use of chemicals including fertilisers, the high levels of disturbance and lack of cover.
- 6.4.11 From the aerial photographs, it would appear that there has been some sort of agricultural or cultivated land in this area since at least the early 1960's and long before the main Tsing Yi Rd was constructed in the early 1970's.

#### ***Terrestrial Fauna***

##### Amphibians and Reptiles

- 6.4.12 Amphibians and reptiles were surveyed on 24th October 1997, 25th October 1997, 29th October 1997, 1st November 1997 (night survey) and 11th November 1997.
- 6.4.13 Habitats surveyed include the stream channel and its riparian boundaries (where accessible), woodland around fish ponds, planted woodland including orchards, houses within close proximity to the portal site and scrubland adjacent to the site. Amphibians and reptiles were encountered through direct sighting and active searching in potential hiding places.
- 6.4.14 One common species of amphibian and three species of reptiles were recorded during surveys and presented in Table 6.1 with the observed habitat.

### Birds

6.4.15 Bird surveys were conducted on the same dates as listed for amphibians and reptiles. Birds in various habitats near the proposed portal and its surrounding area (within approximately 500m from the site boundary), mainly upper valley and shrub hill, have been identified and counted. The surveyed area within the site boundary covered the stream course and its riparian habitat, ponds and the surrounding trees, planted woodland, orchards and houses. The densely vegetated upper valley and hill shrubland beyond the site boundary were surveyed along a footpath on the hill up to about 400 m from the site.

**Table 6.1 : Reptilian and Amphibian Fauna Record**

Common Name	Latin Name	Habitat Recorded
Amphibian		
Paddy frog	<i>Rana limnocharis</i>	Stream
Reptile		
Changeable lizard (1)	<i>Calotes versicolor</i>	Woodland
Reeves's smooth skink (2)	<i>Leiolopisma reevesi</i>	Woodland
Indo-Chinese rat snake (1)	<i>Ptyas korros</i>	pond side

Note : at the West and East Portal Areas of the Proposed Route 9, Tsing Yi Island, in October and November 1997

(1) Common throughout the territory

(2) Widely distributed throughout the territory

6.4.16 During five surveys in October and November 1997, a total of 19 bird species were recorded in the proposed west and east portal areas. Species abundance and status are presented in Table 6.2. No nests were found in the vicinity of the east or west portal sites.

**Table 6.2 : Bird Record**

Common Name	Latin Name	East Portal	West Portal	Abundance Data	Status
Night heron	<i>Nycticorax nycticorax</i>		+	LU	R
Black-eared kite	<i>Milvus lineatus</i>		+	WC	R
Osprey	<i>Pandion haliaetus</i>		+	LU	R
Spotted Dove	<i>Streptopelia chinensis</i>		+	WC	R
Common kingfisher	<i>Alcedo atthis</i>		+	WC	R
Grey wagtail	<i>Motacilla cinerea</i>	+	+	WC	WV
Olive-backed pipit	<i>Anthus hodgsoni</i>		+	WC	WV
Crested bulbul	<i>Pycnonotus jocosus</i>		++	WC	R
Chinese bulbul	<i>Pycnonotus sinensis</i>	+	+++	WC	R
Magpie robin	<i>Copsychus saurris</i>		+	WC	R
Grey thrush	<i>Turdus cardis</i>		+	RA	PM WV
Common tailorbird	<i>Orthotomus sutorius</i>		+	WC	R

Common Name	Latin Name	East Portal	West Portal	Abundance Data	Status
Yellow-browed warbler	Phylloscopus inornatus		+	WC	WV
Black-faced laughing thrush	Garrulax perspicillaus		+	WC	R
Japanese white-eye	Zosterops japonica		+++	WC	R
Rufous-backed shrike	Lanius schach		+	WC	R
Hwamei	Garrulax canorus		+	LU	R
Magpie	Pica pica		+	WC	R
Bunting	Emberiza sp.		+	-	-

Note: West and East Portal Areas of the Proposed Route 9, Tsing Yi Island, in October and November 1997.

Legend: LU : local but not uncommon PM : passage migrant  
R : resident RA : rare  
WC : widespread and common WV : winter visit  
+ : number of individual bird recorded between 1 to 5  
++ : number of individual bird recorded between 6 to 10  
+++ : number of individual bird recorded more than 11

6.4.17 All birds, nests, and eggs are protected in Hong Kong under the Wild Animals Protection Ordinance. Of the species seen, 14 out of 19 are widespread and common in Hong Kong. Dominant species occurring in the surveyed area are bulbuls and white eyes. A large flock of Chinese Bulbul (over 70 individuals) were seen on the hillside during one of these surveys. It is likely that the hill shrubs produce rich fruits and seeds, which attract significant number of birds, such as bulbuls to feed in the area.

6.4.18 Grey thrush or Japanese thrush (*Turdus cardis*) is a passage migrant and winter visitor in Hong Kong and is locally rare. However, the species is widely distributed and breeds in Japan and central China. In winter, the species migrates to South China including Hong Kong. One individual of this species was seen on the hill shrubland approximately 400 meters away from the east portal boundary and it is unlikely to be impacted by the Project.

6.4.19 Most of birds recorded in the east portal area were on the upper hillside approximately two to three hundred meters away from the portal boundary. Vibration, traffic noise, dust and visual intrusion due to construction and operation of the proposed portal will disturb bird life in the surroundings, but impacts are likely to be temporary.

6.4.20 In view of the small size and the non-unique features in terms of faunal composition and habitats, the construction and operation of the proposed tunnel portal is unlikely impose significant adverse impact on avi-fauna.

### ***Mammals***

6.4.21 Mammal surveys were undertaken by visual sighting on all survey occasions. Survey routes covered all habitats encountered in the areas, e.g. stream course and its riparian habitat, ponds and the surrounding banks, planted woodland, orchards, houses and hill shrubland. Attention was also paid to evidence of mammal species in the form of tracks, scats, burrows and other visual signs.

6.4.22 One bat (species unidentified) was observed flying over the pond during the night survey on the 1st November 1997. There was no evidence that the bat roosted within the site. There were buildings sighted nearby which would be a more likely roost site. No other mammals were seen during the surveys and no mammal scats, burrows or other visual signs were found.

#### ***Pond Habitat***

6.4.23 There are two ponds near the east portal site. The two ponds are separated by a large boulder. The upper pond is approximately 18 meters in length and 7 meters in width. The lower pond is approximately 18 meters in length and 9 meters in width. The lower pond has been managed in the past for production of mud carp, but the facility was deserted during the site surveys. The upper pond was however drained once (presumably by the pond user) during the field surveys and no fish were seen after refilling.

6.4.24 Qualitative samples were collected from the edge of the two ponds by using a hand net. Five aquatic macroinvertebrate taxa were recorded. These comprised two species of freshwater shrimps (*Neocaridina serrat* and *Caridina lanceifrons*) and three taxa of dipteran larvae (Table 6.3). Paddy frogs (*Rana limnocharis*) were seen in the two ponds and an Indo-Chinese rat snake (*Ptyas korros*) was seen on a vegetated pond side. The snake is known to feed on frogs and small rodents.

#### ***Stream Habitat***

6.4.25 At the east portal, there is one stream draining a small valley. The water flow in the stream is not permanent and most of the stream course was dried up during one of the field surveys (on the 11th November 1997). The stream course is composed of riffles and a few small pools. Stream bottom consists of soft and hard substrates with a range from sand deposits to large boulders.

6.4.26 Samples were taken from two stream sites on 26 October 1997. Sample sites were identified as site A which is below the fish pond (by approximately 20 meters) and site B which is located in the middle of the stream course between fishponds and Tsing Yi Road east. A kick sampler was used for sampling stream fauna.

6.4.27 Aquatic fauna at the stream was dominated by freshwater shrimps, i.e. *Caridina lanceifrons*. Ten macroinvertebrate taxa were identified from the site A and four taxa were recorded from site B (Table 6.3). One species of frog (*Rana limnocharis*) was recorded at the middle reach of the stream during a night survey. No fish were seen in the stream during this survey.

6.4.28 The aquatic faunal species and taxa recorded in the current surveys are common and widespread in Hong Kong and South China. There is no unique ecological and conservation value of the ponds based on the stream habitats and the associated fauna which have been identified. Nevertheless wetland habitats are not common in Hong Kong and, despite the man-made nature of some of the water bodies, unnecessary disruption to remaining assemblages of aquatic habitats should be avoided as far as possible on conservation grounds. Construction activities should ensure that disturbance to pond and stream areas is minimised by restricting the extent of access clearance wherever possible and restoring cut areas by reshaping and planting with native species. This will also assist in minimising long term visual impacts.

6.4.29 The extent of works for the tunnel portal and the access road, as currently indicated, suggest that the pond habitat area will be avoided, thus impacts on the pond ecosystem can be minimised. The upper section of the transient stream will be re-routed.

**Table 6.3 : Aquatic Macro-Invertebrates Record**

Taxa	No of individual
Pond	
Crustacea: Neocaridina serrata	6
Crustacea: Caridina lanceifrons	48
Diptera: Orthocladiinae #1	22
Diptera: Culex sp.	14
Chironomidae: Chironomus sp.	12
Stream (Site A)	
Crustacea: Neocaridina serrata	5
Crustacea: Caridina lanceifrons	62
Trichoptera: Cheumatopsyche sp.	2
Trichoptera: Psychomyia sp.	1
Trichoptera: Lepidostoma sp.	3
Trichoptera: Helicopsyche sp.	1
Coleoptera: cf. Ordobrevia sp.	1
Diptera: Tanypus sp.	1
Diptera: Orthocladiinae #1	11
Diptera: Orthocladiinae #2	6
Stream (Site B)	
Crustacea: Neocaridina serrata	7
Crustacea: Caridina lanceifrons	34
Trichoptera: Lepidostoma sp.	1
Trichoptera: Psychomyia sp.	2

Note: collected from ponds and stream near the East Portal site of the proposed Route 9, Tsing Yi Island, in October 1997.

## 6.5 Assessment and Summary of Key Ecological Resources

6.5.1 Based on the findings to date, the western portal below road option is not considered to be of any ecological importance. The natural tall scrub and stream course habitats present at the western portal above road option and eastern portal are typical of their kind in Hong Kong but since they are of local wildlife interest they should be left undisturbed if possible. In this context, they should be protected from damage as far as possible and any impacts should be mitigated.



- 6.5.2 The proposed eastern portal site is considered to be of local terrestrial ecological interest. The natural scrub and freshwater stream are more natural habitats and these areas should be left undisturbed if possible since they would be generally more difficult to recreate.
- 6.5.3 Limited impacts on flora and fauna will result primarily from a loss of habitat during the construction phase of the project. The extent of ecological impact and the loss of the ecological resources will be minimal. It appears that the Project as currently conceived will have insignificant ecological impact.
- 6.5.4 Operational Impacts such as habitat fragmentation, caused by extensive linear projects, such as roads like R9, can have adverse ecological implications such as reduction in territory size, availability of local food sources and feeding grounds etc. However, given that the road is mainly on structure or in tunnel, habitat fragmentation is not a key issue for this Project.
- 6.5.5 Adverse ecological impacts could occur to watercourse habitats by way of contaminated surface water runoff arising from the road. In the event of spillage or other accidental discharge onto the road, local streams could be impacted. However, given the nature, extent and limited ecological significance of the stream on Tsing Yi near the portal, any adverse ecological impacts are likely to be very limited.
- 6.5.6 The road is planned to carry large numbers of industrial / heavy vehicles. Detrimental effects from vehicle generated air pollution on adjacent vegetation are unlikely to be significant given the elevation of the structures and the limited extent of the habitats impacted. Any impact arising from airborne pollutants is likely to be slight to insignificant.
- 6.5.7 The major direct ecological impacts of the proposed works in the eastern portal site during the construction phase include:
- less than 1 hectare of scrubland which is commonly found in Hong Kong will be lost.
  - the upper section of the transient stream with only common aquatic fauna will be re-routed.
  - area for construction of access, haul roads and the need for storage or works places.

The ecological significance of these impacts is considered low to medium.

## **6.6 Mitigation Measures**

- 6.6.1 Losses are unavoidable and mitigation of these impacts is an acceptable alternative. Practicable measures are being explored to mitigate the on-site ecological impacts. Mitigation measures will involve all or some of the following concepts. Given the limited extent of the habitats involved and the degree of ecological importance, off-site compensation measures are not considered necessary for this Project.
- 6.6.2 Existing natural habitats such as natural scrub, stream courses and associated riparian habitats should remain undisturbed wherever possible. This can be achieved by designing the road levels, structures, tunnels and subsequent cut and fill slopes such that sensitive habitats are avoided as far as possible. These have been indicated in a landscape context in section 5.

6.6.3 Rehabilitation of disturbed areas with native species, local to the area should be encouraged in the detailed design of mitigation measures. Plant species of known ecological value to different wildlife groups should be selected where possible. In this context it will be important to choose species that are available for planting and that are likely to establish successfully on Tsing Yi. However, it should be noted that due to the linear nature of the project there will be limited areas available for replanting within the study area.

6.6.4 The following is a list of recommended trees and shrubs for planting :

Native/exotic plant species identified are shown in Table 6.4.

<i>Trees</i>		<i>Shrubs</i>
<i>Acronychia pedunculata</i>	<i>Machilus thunbergii</i>	<i>Callicarpa pedunculata</i>
<i>Aporosa chinensis</i>	<i>Machilus velutina</i>	<i>Clerodendrum spp</i>
<i>Aquilaria sinensis</i>	<i>Mallotus paniculatus</i>	<i>Eurya chinensis</i>
<i>Bridelia monoica</i>	<i>Morus alba</i>	<i>Eurya japonica</i>
<i>Castanopsis spp</i>	<i>Myrica rubra</i>	<i>Ilex asprella</i>
<i>Celtis sinensis</i>	<i>Ormosia spp.</i>	<i>Ilex pubescens</i>
<i>Cinnamomum camphora</i>	<i>Pentaphylax euryoides</i>	<i>Ilex rotunda</i>
<i>Cinnamomum parthenoxylon</i>	<i>Prunus phaeosticta</i>	<i>Ligustrum sinense</i>
<i>Cratoxylon ligustrinum</i>	<i>Quercus glauca</i>	<i>Melastoma candidum</i>
<i>Diospyros morrisiana</i>	<i>Quercus myrsinaefolia</i>	<i>Melastoma sanguinum</i>
<i>Diospyros eriantha</i>	<i>Quercus championi</i>	<i>Microcos paniculata</i>
<i>Endospermum chinense</i>	<i>Quercus bambusaefolia</i>	<i>Mussaenda pubescens</i>
<i>Ficus microcarpa</i>	<i>Reevesia thyrsoides</i>	<i>Psychotria rubra</i>
<i>Ficus subulata</i>	<i>Rhodoleia championi</i>	<i>Raphiolepis indica</i>
<i>Ficus variegata</i>	<i>Sapium discolor</i>	<i>Rhamnus chinensis</i>
<i>Garcinia oblongifolia</i>	<i>Sapium sebiferum</i>	<i>Rhododendron simsii</i>
<i>Gordonia axillaris</i>	<i>Schefflera octophylla</i>	<i>Rhodomyrtus tomentosa</i>
<i>Ilex cinerea</i>	<i>Schima spuerba</i>	<i>Vitex negundo</i>
<i>Itea chinensis</i>	<i>Sterculia lanceolata</i>	<i>Wickstroemia spp.</i>
<i>Liquidamber formosana</i>	<i>Symplocos glauca</i>	
<i>Litsea spp.</i>	<i>Symplocos spp.</i>	
<i>Machilus breviflora</i>	<i>Syzygium spp.</i>	
<i>Machilus oreophila</i>	<i>Viburnum odoratissimum</i>	
	<i>Viburnum sempervirens</i>	

Note 1 Many of the trees and shrubs on this list have already been recorded on this site or in the surrounding areas.

Note 2 Some of the species may not be readily available in local nurseries.

Note 3 Some of the species listed require sheltered locations and reasonable soil conditions and would not be suitable for planting on the exposed cut slopes.

6.6.5 Standard controls for tree preservation and minimising habitat degradation should be adopted. Examples are given as follows:

- If any trees, or areas of vegetation are required to be removed during the execution of the Works, which are not specifically required to be removed or otherwise catered for, the Contractor shall draw the attention of the Engineer or Engineer's Representative.

- The contractor shall take necessary precautions against disturbance of trees or vegetated areas. The contractor shall be liable for any damage resulting from the works and shall be required to make good the damage.
- For trees not requiring removal as part of the works, no tree roots of 25mm diameter or more may be severed without the Engineer's approval.
- For trees not requiring removal as part of the works, efforts should be made to protect exposed roots of 50mm diameter or more, preferably through the use of dampened hessian or similar material. They should be immediately covered with suitable backfill material upon completion of the works.
- No excavated material shall be stacked directly against the trunk of any tree unless hoarding is erected to effectively protect the tree. The type of hoarding shall be approved by the Engineer.
- Backfilling of excavation close to trees shall utilise soil containing stones under 50mm diameter and free from road metalling and other possible causes of damage or pollution. Use of impact rammers close to or above tree roots must be done with care to avoid damage to the tree roots.
- No pruning, lopping or cutting of trees may be undertaken without the approval of the Engineer.

## **6.7 Summary**

- 6.7.1 The areas surrounding the proposed eastern portal site are of local ecological interest and it is predicted that the ecological impacts would be limited. Ecological impacts are also likely to be insignificant for the western portal.
- 6.7.2 There are two habitat types present on the eastern portal that are of local ecological interest; these are the natural scrub and the stream. Special attention should be paid to ensure their protection during construction. The impacts on the stream identified will very much be determined by the chosen engineering methods for the road in this vicinity. It seems likely, given the location of the stream, that impacts can be eliminated by careful attention at the construction phase.
- 6.7.3 Surveys have not revealed any key habitats or species of particular ecological interest and the extent of damage to existing habitats is not expected to be extensive. A detailed ecological monitoring and audit programme is not considered appropriate for this project given the limited importance of the existing habitats and limited extent of the predicted impacts.
- 6.7.4 Based on the findings of the assessment and on the assessment of the limited quality of the habitats investigated, it is recommended that works should concentrate on avoiding any damage or disturbance to natural habitats. Works sites should be sensitively located and any cut / fill requirements balanced. Disturbed areas should be reinstated and replanted with native species wherever possible and works designed to facilitate replanting and the survival of replantation. Further detailed ecological surveys are not considered necessary. Table 6.5 provides a summary of the ecological impacts.

**Table 6.4 : Plant Species Recorded From the Proposed Portal Areas on Tsing Yi in November 1997**

<b>Exotic and Local Trees Planted near the Western Portal Site on Tsing Yi</b>		
<i>Acacia auriculiformis</i> (E)	<i>Acacia confusa</i> (E)	<i>Bauhinia spp.</i> (N)
<i>Castanopsis fissa</i> (N)	<i>Casuarina equisetifolia</i> (E)	<i>Eucalyptus citriodora</i> (E)
<i>Lophostemon confertus</i> (E)		
<b>Fruit and Orchard Trees Planted near the Eastern Portal on Tsing Yi</b>		
<i>Acacia confusa</i> (planted as shelter belt around orchards?)(E)		
<i>Carica papaya</i> (N)	<i>Citrus grandis</i> (E)	<i>Citrus spp.</i> (E)
<i>Euphoria longan</i> (N)	<i>Litchi chinensis</i> (N)	<i>Manifera indica</i> (E)
<i>Musa paradisiaca</i> (E)	<i>Psidium guajava</i> (N)	
<b>Tall Scrub Species near the Eastern Portal on Tsing Yi</b>		
<b>TREES</b>		
<i>Bridelia monoica</i> (N)	<i>Cinnamomum camphora</i> (E)	<i>Mallotus paniculatus</i> (N)
<i>Melia azedarach</i> (E)	<i>Microcos paniculata</i> (N)	<i>Phyllanthus emblica</i> (N)
<i>Pinus massoniana</i> (N)	<i>Rhus chinensis</i> (N)	<i>Rhus succedanea</i> (N)
<i>Sapium discolor</i> (E)	<i>Schefflera octophylla</i> (N)	<i>Sterculia lanceolata</i> (N)
<i>Symplocos glauca</i> (N)		
(E) - Exotic, (N) - Native		
<b>SHRUBS, GRASSES, HERBS &amp; FERNS</b>		
<i>Adiantum capillus-veneris</i>	<i>Aster benthamii</i>	<i>Baeckia frutescens</i>
<i>Centella asiatica</i>	<i>Cibotium barometz</i>	<i>Dianella ensifolia</i>
<i>Diospyros spp.</i>	<i>Eurya chinensis</i>	<i>Ficus variolosa</i>
<i>Fimbristylis miliacea</i>	<i>Impatiens chinensis</i>	<i>Imperata cylindrica</i>
<i>Ipomea spp.</i>	<i>Itea chinensis</i>	
<i>Lantana camara</i>	<i>Ligustrum sinensis</i>	<i>Lirope spicata</i>
<i>Lygodium scandens</i>	<i>Melastoma candidum</i>	<i>M. docecandrum</i>
<i>M. sanguinium</i>	<i>Raphiolepis indica</i>	<i>Rhamnus chinensis</i>
<i>Rhodomyrtus tomentosa</i>	<i>Rosa spp</i>	<i>Rumex spp.</i>
<i>Rubus parvidoliis</i>	<i>R. reflexus</i>	<i>Smilax china</i>
<i>S. lanecolata</i>	<i>Sonchus oleraceus</i>	

**Table 6.5 : Table of Ecological Impacts**

Potential Impact	Mitigation
Less than 1 ha scrubland loss	Replanting and avoid damage during construction phase
Low Impact on stream at eastern portal	Minimising damage through detail design and good site practice during construction
General damage to habitats during construction	Good site practice and replanting of disturbed area