

## **1 INTRODUCTION**

The detailed design and construction consultancy assignment for the section of Route 9 between Tsing Yi and Cheung Sha Wan (the Project) was awarded to Ove Arup & Partners Hong Kong (Arup) on 6 February 1999. Main elements of the Works to be designed and constructed under the Assignment are shown in *Figure 1* with the following objectives:

- Complete Phase 1 of the Works, comprising the Ngong Shuen Chau Viaduct and its link with CT8, Route 9 between Cheung Sha Wan and Shatin and West Kowloon Highway, by Dec 2004.
- Complete Phase 2 of the Works, comprising viaducts in East & West Tsing Yi, the Nam Wan Tunnel, links with the Stonecutters Bridge and Cheung Tsing Highway (CTH), and the ramps linking CT9 with Stonecutters Bridge and Nam Wan Tunnel, by Dec 2006.

The Environmental Impact Assessment (EIA) Report of the Detailed Feasibility Study (DFS) of the Project was submitted on 21 July 1999 for approval in accordance with the EIA Ordinance, and was approved by EPD on 19 October 1999 with conditions as stated in EPD's letter ref: (32) in An(1) in EP2/N3/A/38 Pt 5. The road scheme has since been slightly modified as a result of design development.

The purpose of this Environmental Review is to review and update if the changes of road alignments based on the modified scheme (as shown on *Figure 1*) and the associated traffic forecasts will affect the findings of the DFS EIA Study. As the revised traffic forecasts may affect the findings of traffic noise and air quality impact assessment, the review is limited to the assessment of these two issues.

## 2 PROJECT DESCRIPTION

### 2.1 ROAD ALIGNMENT

Route 9 is a trunk road linking Lantau and Sha Tin. The North Lantau Highway and Lantau Link completed in 1997 form part of this route. The remaining two sections are that between Tsing Yi and Cheung Sha Wan (R9T) and that between Cheung Sha Wan and Sha Tin (R9S) (formerly known as Route 16). The section of Route 9 between Tsing Yi and Cheung Sha Wan will provide an alternative route to Route 3 Tsing Yi and Kwai Chung Sections (Cheung Tsing Highway, Cheung Tsing Tunnel, Cheung Tsing Bridge and Tsing Kwai Highway). It will be connected to the west with Tsing Ma Bridge and Ting Kau Bridge. To the east, it will be connected with West Kowloon Highway and the section of Route 9 between Cheung Sha Wan and Sha Tin. There will also be direct connections between Route 9 and the road networks near Container Terminals 8 and 9 (CT8 & CT9). The completion of the remaining two sections of Route 9 will provide Hong Kong with a new strategic east-west route with direct access to the container port.

Route 9 comprises three major elements, namely, Nam Wan Tunnel in Tsing Yi, Stonecutters Bridge across Rambler Channel and Ngong Shuen Chau Viaduct near Cheung Sha Wan. The overall alignment of Route 9 between Tsing Yi and Cheung Sha Wan is shown in *Figure 1*.

### 2.2 DESIGN MODIFICATIONS

In this design and construction assignment, the following principal revisions have been made to the Project:

- (C1) Straighten the horizontal alignment of Nam Wan Tunnel by shifting the western portal at Sai Tso Wan further north about 70m to minimise the amount of land for Route 9 viaducts at the tunnel entrance and exit (*See Figure 2*);
- (C2) Deletion of toll plaza;
- (C3) Provision of addition links to/from Container Terminal No. 8 (CT8) via Route 9 (R9) to Shatin, and the link roads from the proposed Container Terminal No. 9 (CT9) in Tsing Yi reclamation via Route 9 to North West New Territories; and
- (C4) Realignment of Container Port Road South and improvement of the existing roundabouts along Container Port Road South.

In particular, in the review and design of the CT8 and CT9 links to Route 9 in the current assignment, the following proposals were made:

- CT8 Links: In addition to the links from CT8 to Route 9 Westbound (Stonecutters Bridge) given in the DFS, the provision of links from CT8 to Route 9 Eastbound (Shatin) is to be provided. Several options have been assessed, and a total of four

ramps (E, F, E1 and F1) are now needed to connect Route 9 to CT8 as shown in *Figure 1*.

- **CT9 Links:** In addition to the links from CT9 to Route 9 Eastbound (Stonecutters Bridge) given in the DFS, the provision of links from CT9 to Route 9 Westbound (Nam Wan Tunnel) is to be provided. Several options have been assessed, and the recommendation of a CT9 interchange loop road with connections of Route 9 to CT9 by Ramp C and Ramp D as shown in *Figure 1* are proposed.

### **2.3 CHANGE OF TRAFFIC FORECASTS**

Revised traffic forecasts for the new links have been developed based on updated planning data and the proposed modifications. *Figure 3* and *Figure 4* present the traffic forecasts for the CT8 links and CT9 links for year 2021. The figures show the traffic data adopted in the DFS EIA Study as compared to those due to the recent update in this assignment.

Since the revised traffic forecasts may affect the proposed environmental mitigation measures as recommended in the DFS EIA Study, the Consultants have carried out a review to address the potential environmental implications.

### 3 ENVIRONMENTAL REVIEW

#### 3.1 NOISE

This section presents a review on the noise impact assessment undertaken in the DFS EIA Report. Any changes to the original findings are addressed in this section.

##### 3.1.1 Recommendations in the DFS EIA Study

The noise mitigation measures proposed in the DFS EIA Report are as follows:

- Provision of Low Noise Surfacing on all the new roads except the Route 9 slip road to CT9;
- Provision of a 3m high barrier along the main carriageways of Route 9 near the Lai Wan Interchange (LWI);
- Provision of a 3m high barrier on the Route 9/West Kowloon Highway Link road east bound (Ramp G); and
- Provision of a 5.1m high barrier with 2.8 cantilever on the CT9 slip road at Tsing Yi near the Tsing Yi Technical College.

The key issue areas and the specific noise mitigation measures proposed in the DFS EIA Report are tabulated in *Table 1*.

**Table 1 Noise Sensitive Receivers and Proposed Mitigation Measures**

Noise Sensitive Receivers	Road Alignment Concerned	Proposed Mitigation Measures
Tsing Yi Technical College (TYTC)	CT9 Slip Road	5.1m high barrier with 2.8 cantilever on the CT9 slip road
TYTC Visiting Staff Quarter (QTC)	CT9 Slip Road	5.1m high barrier with 2.8m cantilever on the CT9 slip road
Mei Foo Sun Chuen	Links between R9T and R9S (CT8 Links)	3m high noise barrier and low noise surfacing
Site 10 on West Kowloon Reclamation (WKR)	Links between R9T and WKR (Ramp G)	3m high noise barrier and low noise surfacing
Site 6 on WKR	Links between R9T (Ramp G)	3m high noise barrier and low noise surfacing

##### 3.1.2 Phase 1 Works

For the Phase 1 Works of the Project, the noise mitigation measures near CT8 links are reviewed.

The revised traffic forecast on the mainline of Route 9 near the CT8 links has shown an overall decrease of about 25% (at the western side of the CT8 links) to 37% (at the eastern side of the CT8 links) by comparing with the total flow indicated in the DFS EIA Report (*See Figure 3*). The forecasts for additional CT8 links (Ramps E1 and F1) have shown insignificant traffic flows, i.e. 81 and 95 vph respectively. As no

exceedance over the noise standard of 70 dB (A) has been predicted at the representative NSRs in the DFS EIA Study in this area and with the decrease in the updated traffic forecasts, it is expected that the findings in the DFS EIA Study will remain valid for this part of the Phase 1 Works.

### **3.1.3 Phase 2 Works**

For the Phase 2 Works of the Project, the noise mitigation measures near the CT9 links are reviewed.

The revised traffic forecast on CT9 slip road has shown an overall increase of 60% (including approximately 2 times increase in the northbound and 5% decrease in the southbound traffic) by comparing with the total flow indicated in the DFS EIA Report (*See Figure 4*). The overall increase in traffic on CT9 slip road will lead to an increase of about 3 dB (A) for the predicted noise levels for nearby NSRs. This will in turn lead to an exceedance of the EIAO-TM 70 dB (A) criterion on the top floor of the Tsing Yi Technical College Visiting Staff Quarters (QTC) as shown in *Table 2*, even with the implementation of 5.1m high barrier plus 2.8m cantilever (about 300m long) as originally proposed in the DFS EIA report. The location of the noise sensitive receivers (NSRs) at Tsing Yi area selected for noise impact assessment in the DFS EIA study is as shown in *Figure 5*.

As such, the proposed noise mitigation measure has to be revised to further reduce the noise impacts. Based on our assessment, an extension in the length of the proposed noise barrier by 50m to the south of the barrier as shown in *Figure 6* will be required. *Table 2* shows the predicted noise levels with the additional mitigation measure which indicate that compliance of the traffic noise criterion can be achieved with the extension of the noise barrier to the south of the original proposal.

In addition, the details of our assessment, including a breakdown of noise levels at NSRs at Tsing Yi area is given in the attached *Annex A*.

**Table 2 Predicted Noise Levels for the Concerned NSRs Using Revised Traffic Forecast for 2021**

NSR	Tsing Yi Road, dB(A)	R9 Slip Road, dB(A)	Total Predicted Noise Level, dB(A)	With Additional Mitigation Measure, dB(A)
TYTC (1)	62	60	64	64
TYTC (2)	68	65	70	70
QTC	66	69	<b>71</b>	70

Note: TYTC stands for Tsing Yi Technical College  
QTC stands for the Tsing Yi Technical College Visiting Staff Quarters

### 3.2 AIR QUALITY

This section assesses the air quality impacts arising from the changes as mentioned in Section 2.2.

#### 3.2.1 Potential Impact after Modification

As described in Section 2.2, for the C1 change, the affected area will be shifted northward in which the air quality at the industrial building located at west side of R9 will be improved.

For C2 change, the traffic volume is decreased about 25% after deletion of toll plaza, therefore, the air quality impact will be reduced.

For C4 change, the realignment and improvement of roundabout would not induce additional traffic, therefore, the air quality impact predicted will be similar to that of the DFS EIA Report.

For the additional links to/from CT8, the traffic volume is decreased by about 25% at the western end of the R9-CT8 section and about 37% at the eastern end of the R9-CT8 section, therefore, the air quality at the adjacent uses will be improved.

The major changes among the revisions are the provision of change in C3 related to R9-CT9 section, where after reviewing the traffic forecasts at the year 2021, a significant increase of traffic volume were found.

Therefore, the following assessment will concentrate on the corresponding air quality impact (before and after the changes of Route 9 alignment) at CT9 area.

#### 3.2.2 Air Quality Assessment

In the DFS EIA Report, NO<sub>2</sub> is the pollutant of major concern. The impact of NO<sub>2</sub> from traffic emissions thus was modelled. The air impacts arising from R9 before and after the modification will be assessed in our review study.



- standard deviation of wind direction 18 degree; and
- temperature 298 K.

It is assumed that 20% of NO<sub>x</sub> will be converted to NO<sub>2</sub>.

Background NO<sub>2</sub> concentration of 70 µgm<sup>-3</sup> recommended in the DFS EIA was taken into account in our assessment.

### *Assessment Results*

The maximum hourly NO<sub>2</sub> concentration together with the background concentration predicted at ASRs are presented in *Table 5* below.

**Table 5 Maximum Hourly NO<sub>2</sub> levels with background (mgm<sup>-3</sup>)**

ASRs	Height above Ground (m)	Predicted Hourly NO <sub>2</sub> Levels <sup>(i)</sup>	
		Before Modification	After Modification
A1	1.5	85	96
A2	1.5	78	85
A3	1.5	96	123
	10	93	111
AQO Criteria		300	300

Note:

(i) Background NO<sub>2</sub> concentration of 70 µgm<sup>-3</sup> has been included in the prediction.

The predicted maximum hourly concentration for NO<sub>2</sub>, after modification, is 123µgm<sup>-3</sup> at 1.5 m above ground level at ASRs A3 (area to be developed into container-related building and a potential site for commercial development) which is 40 m from R9. There is no exceedance of AQO criteria found in all the identified ASRs.

Sample output files are shown in *Annex B*.

### **3.2.3 Conclusion**

The proposed modifications of the connection arrangements between Route 9 and the local road networks near CT8 and CT9 would not affect the air quality at the adjacent sensitive uses



**4 OVERALL CONCLUSIONS**

The findings of this Review have indicated that, as a result of the proposed modifications of the connection arrangements between Route 9 and the local road networks near CT8 and CT9, the only change to the mitigation measures as recommended in the approved EIA report is the extension of a 50m long noise barrier further to the south of the barrier at the CT9 Slip Road as shown in *Figure 6*.

Annex A

## Breakdown of noise levels for NSR at Tsing Yi area

Annex B

## Sample CALINE4 Model Output File

