

## **2. PROJECT DESCRIPTION**

### **2.1 Introduction**

The scope of works for the proposed widening of Tolo Highway and Fanling Highway project includes the following: -

- (i) Widening a 4.7 km section of the Tolo Highway and a 4.0 km section of the Fanling Highway between Island House Interchange and Wo Hop Shek Interchange from the existing dual 3-lane to dual 4-lane;
- (ii) Widening of the interchange sections at Island House Interchange, Tai Po North Interchange and Lam Kam Road Interchange from existing dual 2-lane to dual 3-lane including realigning the various slip roads;
- (iii) Improving the existing sub-standard merging arrangement at the southbound carriageway of the Wo Hop Shek Interchange;
- (iv) Modifying and reconstructing the highway bridges, underpasses and footbridges intersecting the highways; and
- (v) Associated civil, geotechnical, landscaping, drainage electrical and mechanical installations, traffic control and surveillance systems, and environmental mitigation measures.

### **2.2 Alignment (see Drawings 551/R/9001 to 9016)**

The preferred alignment is the result of a detailed and complex selection process involving many aspects of engineering, traffic, environmental, land, programme and costs being taken into consideration in determining the alignment. A further constraint on the design is that, as a road-widening scheme, the alignment must essentially follow the existing road.

The preferred alignment essentially follows the existing route, as proposed in the PPFs, with parallel widening throughout. Symmetrical widening was also considered but discounted owing to one side of the route being very heavily constrained relative to the other side. The alignment has however been considerably advanced and refined in order to address the many constraints along the route, with detailed investigations into various sub-alignments. The two carriageways are referred to as northbound and southbound for the Fanling bound and Kowloon bound traffic respectively.

The description of the alignment may be separated into two sections essentially conforming to the named sections of the route. These are the Tolo Highway between Island House and Lam Kam Interchanges, and the Fanling Highway between Lam Kam and Wo Hop Shek Interchanges. The alignment of Tolo Highway is heavily constrained both horizontally and vertically by the hilly terrain, which in general is falling to the northeast and the Lam Tsuen River. The alignment of Fanling Highway runs over the River Indus flood plain and is therefore relatively level, but as a consequence is more heavily constrained by existing infrastructure and land issues.

#### **2.2.1 Tolo Highway (Island House Interchange to Lam Kam Road Interchange)**

The widening of Tolo Highway commences at the south of Island House Interchange, at the interface with the "south section" of Tolo Highway being widened under "Project 561TH - Widening of Tolo Highway between Island House Interchange and Ma Liu Shiu Interchange". Widening of this south section commenced in March 1999 for completion in end 2001. The existing two lanes through Island House Interchange are widened to three lanes, which

requires the staged demolition and reprovisioning of two of the three over-bridges, carrying the northbound off-slips from Tolo Highway to Yuen Shin and Tai Po Roads. The third bridge, carrying the Tai Po Road, is retained, as there is no alternative route available for this traffic.

The two carriageways then diverge, the northbound following the existing nearside edge of carriageway over the Lam Kam Railway Bridge, whilst the southbound is taken on a new structure over the KCRC tracks. The two carriageways continue up to and through Bridge Nos. 11 and 10, where again, separate structures are required for the southbound carriageway. The nearside edge of the northbound carriageway continues to follow the existing nearside edge through this section, with the widening works adjacent to the existing southbound carriageway. West of Bridge No. 10 the widening shifts to the opposite side in order to avoid the Monastery. Once past this constraint, the widening reverts to the southbound carriageway side.

On the approach to Bridge No.12 the two carriageways again diverge with the southbound being built on a new structure adjacent to the existing. This arrangement continues through Bridge Nos. 13 and 15 at the Tai Po North Interchange. The on-slip from the Tai Po Tai Wo Road to the southbound carriageway is required to be completely realigned as a result of the parallel widening.

North of Bridge No.15 the widening switches sides to be adjacent to the northbound carriageway on the approach to the Lam Kam Road Interchange and the Lam Kam Flyover. The carriageways again separate at the Lam Kam Flyover although this time the new structure is constructed for the northbound carriageway and the southbound is carried on the existing.

The carriageways are reduced to three lanes through the interchange with a full width hard shoulder. The southbound on-slip is retained in its existing state but the northbound off-slip is realigned. The off-slip ties back into the existing just prior to the pedestrian subway.

## **2.2.2 Fanling Highway (Lam Kam Road Interchange to Wo Hop Shek Interchange)**

The Brief for this Assignment specifically requires an examination of alternative elevated options for the northbound carriageway of Fanling Highway between Lam Kam Road Interchange and Wo Hop Shek Interchange in order to minimize land resumption at Tai Hang.

Five alignment options were investigated:

PPFS Alignment	-	Four Lane At-Grade Widening Option
Alignments 1 & 1A	-	Four Lane Elevated Widening Option
Alignments 2 & 2A	-	Two Lane Elevated and Two Lane At-Grade Widening Option

*PPFS Alignment:* The proposed alignment would require parallel widening adjacent to the northbound carriageway, due to the constraint of the KCR track and Dongjiang watermain to the east of the existing route. This would require the reprovisioning of Tai Wo Service Road West parallel to the existing road and resumption of some private lots. The reprovisioned road would merge again with the existing highway south of Kiu Tau Road junction. The widening of the main alignment would revert to being adjacent to the southbound carriageway south of Wo Hop Shek, before aligning with the centre of the existing road through the Wo Hop Shek Interchange.

*Alignment 1:* This option is for a four lane elevated carriageway. The elevated carriageway would commence just before Lam Kam Flyover and follow the line on separate structure. At Lam Kam Road Interchange, an up ramp would be provided onto the mainline northbound carriageway for traffic from Lam Kam roundabout and Hong Lok Yuen. The four lane

elevated structure would then essentially follow the line of the at-grade widening option passing over the existing bridges until it descends to at-grade at Ch. 7080. The total length would be about 2.3 km.

*Alignment 1A:* This variation on Alignment 1 avoids any conflict with an Over Head Line and Tau Pass Culvert by ramping down from the Lam Kam Flyover, as for the existing alignment, continuing at-grade between Ch. 5570 and 5700 and then ramping up to an elevated section at Ch. 5900, which then continues through to the original descent point.

*Alignment 2:* This alignment is for a two lane elevated road with a further two lanes at-grade. It would essentially have its starting point as the four lane elevated option, follow the same line and have its landing point as for the four lane elevated option.

*Alignment 2A:* Similar to Alignment 1A, this amendment to Alignment 2 ramps down from the Lam Kam Flyover to avoid conflict with the OHL and Tau Pass Culvert, and then two lanes ramping up again to the elevated section.

A multi-criterion evaluation approach was adopted to allow the options to be assessed under the basic evaluation categories of land, traffic, engineering, environmental, and costs.

Under the basic Environmental category, the alignments were assessed under an expanded group of sub criteria of Noise, Air Quality and Landscape and Visual impacts to allow a greater level of refinement in the investigation process. The main differences between the alignments in terms of environmental performance are presented in Table 2.1 below.

**Table 2.1 Main Differences between the Alignments**

	<b>PPFS Alignment</b>	<b>Alignments 1 &amp; 1A</b>	<b>Alignments 2 &amp; 2A</b>
<b>Air Quality</b>	High air quality impacts due to close proximity of highway and the ASRs. Worst amongst all the options.	Deck of elevated road will overhang some of the ASRs.	Air Quality impact less than that for the PPFS Alignment but higher than for Alignments 1 & 1A.
<b>Noise</b>	NSRs will be affected by 3 main noise source lines: Fanling Highway s/b and n/b and TWSRW.  Existing first layer of NSRs at Tai Hang will cease with existing buffered NSRs becoming the future first layer of NSRs.  Traffic noise levels at the first layer of NSRs are likely to be high. Inner NSRs will likely be less impacted due to the limited line of sight to the roadways.  Noise barriers required. Total area less than for the Alternative Alignments.	One of the primary noise source lines (Fanling Highway n/b) is raised to an elevation higher than all surrounding NSRs.  First layer of NSRs will be slightly less impacted. However, noise levels are still anticipated to be high. Noise from the elevated carriageway will become more noticeable to the “inner” NSRs and NSRs located to the east (such as Tai Wo).  Structural borne noise will result from heavy vehicles using the viaduct.  Noise barriers will be required. Total area more than for PPFS Alignment.	NSRs will be affected by 4 noise source lines: Fanling Highway s/b and n/b (at-grade and elevated) and TWSRW.  First layer at-grade NSRs will continue to be significantly impacted due to close proximity to the roadways as well as the expected high traffic flows. Inner NSRs will become more impacted by the elevated carriageway.  Structural borne noise will result from heavy vehicles using the viaduct.  Noise barriers will be required. Total area more than the other alignments.

	PPFS Alignment	Alignments 1 & 1A	Alignments 2 & 2A
<b>Ecology</b>	No area of significant ecological value affected.	No area of significant ecological value affected.	No area of significant ecological value affected.
<b>Landscape and Visual</b>	Significant adverse visual impact during construction.  Moderate adverse residual impacts.	Significant adverse visual impact during construction phase.  Significant adverse residual impacts.	Significant adverse visual impact during construction phase.  Significant adverse residual impacts.

A numerical weighting technique was then used to determine the preferred option. Firstly, weightings were assigned to each category according to their relative importance as follows: Land (25%), Traffic (22%), Engineering (19%); Environmental (19%) and Costs (15%). Secondly, a score was applied to the impact of the issues within each category as follows: 1 = Very Bad; 2 = Bad; 3 = Medium; 4 = Good; and 5 = Very Good.

From the environmental considerations, alignments producing lower levels of construction and operational noise impacts or likely to affect the least number of Noise Sensitive Receivers were scored higher. Alignments providing lower air impacts or likely to affect fewer receivers were scored higher and alignments that are less visually intrusive and have lower impacts upon sensitive landscape areas were scored higher.

Preliminary assessments result for the environmental category is summarised in Table 2.2 below.

**Table 2.2 Scoring Result for Environmental Category**

	PPFS Alignment	Alignment 1	Alignment 1A	Alignment 2	Alignment 2A
Score	3	1	1	1	1

In environmental terms therefore, the PPFS Alignment performed the best with a score of 3 and all the alternative alignments scored 1. The PPFS Alignment also came top compared with all the other alternative alignments taking all criteria into account. The PPFS Alignment was thus retained as a result of the comparative assessment. Further details of the investigation are provided in the Report on “*Alternative Elevated Option for Northbound Carriageway of Fanling Highway between Lam Kam Interchange and Wo Hop Shek Interchange*”.

To the north of the Lam Kam Road Interchange the proposed northbound carriageway descends to grade at the same position as the existing, and the two carriageways then continue adjacent to each other. The northbound on-slip from Lam Kam Road Interchange is reprovided adjacent to the new structure, whilst the southbound off-slip is retained with only a slight adjustment at the nosing location. Due to the constraint of the KCRC alignment and the Dongjiang water mains immediately to the east of the existing southbound carriageway, the existing nearside edge of this carriageway is retained and the widening is provided on the west side. Accordingly, Tai Wo Service Road West also has to be relocated westwards.

At Ch. 5900 the Fanling Highway moves away from the water mains and the KCRC alignment, and as there are more constraints on the west side of the highway the widening switches over to the east. This arrangement then continues through to the Wo Hop Shek Interchange. On the east side of the route the area is largely undeveloped, but the road does run adjacent to the Ma Wat Ho River.

At the Wo Hop Shek Interchange the southbound on slip from Jockey Club Road will be realigned and the merging arrangement improved. No works are proposed to the northbound off slips to Pak Wo Road westbound and eastbound. Although consideration has been given to improving the merging arrangement for the southbound on slip from Pak Wo Road this is constrained by the location of the overbridge abutments, and no improvement is possible.

### **2.3 Construction Activities**

Construction of the Project will be carried out between 2002 and 2006. The preliminary construction programme assumed for the assessment of environmental impacts is shown in Appendix 1.1. Since at this stage in the Project there are uncertainties over the way that individual contractors will programme elements of the work, the programme has adopted a worst case scenario and assumes that certain activities will be carried out concurrently. Assessed impacts are therefore always conservative.

### **2.4 Traffic Forecasts**

For the purpose of this EIA study, traffic flows for the year 2020 have been forecast for all major roads within 300 m of Tolo Highway / Fanling Highway. Traffic flows for the year 2002, 2006, 2011 and 2016 have also been forecast and are included in Appendix 5.3.