Summary of Report on
Comparison of Trunk Road Tunnel & Flyover Options
In Accordance With The Overriding Public Need Test

Introduction

1. The Court of Final Appeal ("CFA") judgment handed down on 9 January 2004 in respect of a judicial review that the presumption against reclamation in the Protection of the Harbour Ordinance ("PHO") can only be rebutted by establishing an overriding public need for reclamation ("the Overriding Public Need Test"), and that there must be cogent and convincing materials available to enable the decision-maker to be satisfied that the test is fulfilled for rebutting the presumption against reclamation.

2. Under the comprehensive planning and engineering review of development and reclamation proposals for the Wan Chai Development Phase II project ("the WDII Review") and through an extensive public engagement process entitled "Harbour-front Enhancement Review – Wan Chai, Causeway Bay and Adjoining Areas", under the steer of the then Harbour-front Committee Sub-committee on WDII Review, undertaken from May 2005 to June 2007, a Trunk Road scheme (known as the Trunk Road Tunnel Variation 1, or "Trunk Road Tunnel") has been developed that satisfies the traffic and functional requirements for the Trunk Road. The Trunk Road comprises the Central-Wan Chai Bypass and Island Eastern Corridor Link. The Trunk Road scheme also accommodates harbour-front enhancement ideas that have been proposed by the public, and the scheme has the broad support of the public.

3. A report entitled "Report on Cogent and Convincing Materials to Demonstrate Compliance with the Overriding Public Need Test" ("CCM Report") was prepared in February 2007 setting out the process by which the Trunk Road scheme and its associated reclamation were derived and presents the "cogent and convincing materials" in support of the proposed reclamation required for such scheme under the PHO.

4. On 20 March 2008, the Court of First Instance ("CFI") of the High Court ruled that the PHO and the presumption against reclamation contained therein do apply to the proposed temporary reclamation works referred to in the Trunk Road scheme gazetted under the Roads (Works, Use and Compensation) Ordinance on 27 July 2007.

5. While the feasible options of the Trunk Road have been evaluated in Chapter 4 of the CCM Report issued in February 2007, details on temporary reclamation were not specifically elaborated in the comparison of feasible Trunk Road options i.e. the Tunnel Option and the Flyover Option (at that time on the ground of the temporary nature of those works). The report on "Comparison of Trunk Road Tunnel & Flyover Options in Accordance with the Overriding Public Need Test" supplements Chapter 4 of the CCM Report with additional materials to address separately the reclamation requirements of the feasible Trunk Road options, including the temporary reclamation requirements, and then the comparison of the Tunnel and Flyover Options with some further elaboration on their relative performance in all relevant aspects for the purposes of assessing both Options by reference to the Overriding Public Need Test.

Trunk Road Options

6. All possible alignments for the Trunk Road, including "offshore corridor", "inland corridor" and "foreshore corridor", and including suggestions from the public, have been examined, taking into account land use and infrastructural constraints, with a view to determining if there are any that do not require any reclamation for the Trunk Road construction. It is found that the feasible Trunk Road routeing is along the foreshore of Wan Chai and Causeway Bay. However, foreshore alignments do require reclamation for Trunk Road tunnel construction at the western and eastern ends of WDII.

7. Alternative Trunk Road ideas have been examined to determine if they would constitute a feasible "no reclamation" option. It was concluded that there is no feasible "no reclamation" alignment for the Trunk Road.

8. Following the examination of alternative Trunk Road alignments and methods of construction, including consideration of public views, two feasible schemes for the Trunk Road have been determined: a Tunnel Option (that is based on the Tunnel Variation 1) and a Flyover Option.

9. For the Tunnel Option, the Trunk Road starts off at the connection with Central Reclamation Phase III ("CRIII"), crosses over the MTR Tsuen Wan Line tunnel, continues through the Hong Kong Convention & Exhibition Centre (HKCEC) water channel and along the Wan Chai shoreline, in cut-and-cover tunnel, in

reclamation. The Trunk Road tunnel drops below seabed at the eastern end of the Wan Chai shoreline, staying below seabed beneath the former Wan Chai Public Cargo Working Area ("ex-PCWA") basin, and then passing beneath the Cross Harbour Tunnel ("CHT") portal and approach ramp at a level below –30mPD. Continuing eastwards, the Trunk Road tunnel stays beneath the seabed of the Causeway Bay Typhoon Shelter ("CBTS"). The Trunk Road tunnel then rises up above seabed to the ground level tunnel portal to the east of the CBTS, where the Trunk Road then rises up on flyover structure to connect with the existing elevated Island Eastern Corridor (IEC). The Tunnel Option layout is shown in **Figure 2.1**.

10. For the Flyover Option, the Trunk Road starts off at the connection with CRIII, crosses over the MTR Tsuen Wan Line tunnel, continues through the Hong Kong Convention & Exhibition Centre (HKCEC) water channel and along the Wan Chai shoreline, in cut-and-cover tunnel, in reclamation, same as the Tunnel Option. Towards the eastern end of the Wan Chai waterfront, the Trunk Road tunnel rises up to a ground level tunnel portal and then onto an elevated road structure to cross over the ex-PCWA basin, then over Kellett Island and the CHT portal, and stays on the elevated structure over the full length of the CBTS and connects to the existing elevated IEC at the eastern side of the CBTS. The Flyover Option layout is shown in **Figure 2.2**.

Comparison of Feasible Trunk Road Options

Extent of Reclamation

11. For construction of the Trunk Road Tunnel Option, an area of 12.7ha of permanent reclamation is needed to meet essential engineering requirements for construction of the Trunk Road Tunnel Option. It comprises land formation at the HKCEC west area (3.7ha), in the HKCEC water channel (1.6ha), along the Wan Chai shoreline (4.1ha) and North Point shoreline (3.3ha). In addition, an area taken to be 0.1ha of permanent reclamation (pile caps and dolphins) is needed for the construction of the elevated Trunk Road connection to the IEC at North Point.

12. For the construction of the Trunk Road Flyover Option, an area of 9.8ha of permanent reclamation is needed to meet essential engineering requirements. It comprises land formation at the HKCEC west area (3.7ha), in the HKCEC water channel (1.6ha), along the Wan Chai shoreline (4.5ha). In addition, an area of about 0.4ha of permanent reclamation comprising pile caps and dolphins that physically

occupy water area of the Harbour in the ex-PCWA basin and in the CBTS is needed for the construction of the elevated road section of the Flyover Option.

13. In summary, the extents of permanent reclamation for the Tunnel Option and Flyover Option are estimated to be as follows:

	Tunnel Option	**Flyover Option**
Permanent Reclamation - land formation - pile caps and dolphins	 12.7 ha 0.1 ha	 9.8 ha 0.4 ha

14. Alternative forms of construction have been examined for the construction of the Trunk Road Tunnel beneath the seabed of the CBTS and ex-PCWA to determine if there is any reasonable form of construction that would not require temporary works, in particular temporary reclamation. The only practically feasible form of construction for the Trunk Road is by cut-and-cover with diaphragm walls. This will require temporary reclamation to provide a dry working platform for the construction of the diaphragm walls and the cut-and-cover tunnel.

15. A minimum extent of temporary reclamation has been determined, that will serve solely to facilitate the Trunk Road Tunnel construction. Through a staged construction approach (**Figure 3.1**), the maximum affected area of the Harbour in respect of temporary reclamation in the CBTS will range from 1.8ha to a maximum of 3.7ha at any one time, for a period of 1 to just over 3 years for any given temporary reclamation area, whilst at the ex-PCWA the area of temporary reclamation will range from 0.7ha to a maximum of 1.2ha, with the durations of these temporary reclamation stages varying from 2.5 years to just over 3 years. These are the minimum extents of temporary reclamation required to facilitate the construction of the Trunk Road Tunnel Option. Further details are presented in the report on “Construction of the Trunk Road Tunnel in Causeway Bay Typhoon Shelter and at ex-Wan Chai Public Cargo Working Area” prepared by Highways Department.

16. For the Flyover Option, the new elevated Trunk Road has to connect to the IEC at the location of the Hing Fat Street slip roads. The section of the existing IEC

structure joining Victoria Park Road and the slip road from Hing Fat Street to the IEC have to be demolished and rebuilt for such connection. Temporary traffic diversions have to be arranged during the construction work to maintain the traffic flow.

17. The only reasonable and practically feasible manner in which the temporary traffic arrangement could be implemented, in order to maintain traffic flows through this area of construction and to facilitate the construction and demolition works of the Flyover Option, would be by temporary filling in of the south-eastern corner of the CBTS. The resultant temporary reclamation required for temporary traffic arrangements will fill in the south-eastern corner of the typhoon shelter, with an area of about 3.3ha as shown in **Figure 3.2**.

18. For the purpose of comparative appraisal of temporary reclamation areas for the Tunnel and Flyover Options, installation of noise barriers is also assumed for the Flyover Option along the existing IEC to a similar extent as would be provided for the Tunnel Option, so that both Trunk Road options would provide a similar level of benefit to North Point residents. However, it should be borne in mind that the actual extent of noise barrier required along the North Point shoreline beyond the physical tie-in of the Flyover Option to the existing IEC, in the event that the Flyover Option were to be implemented, would be subject to further detailed assessment including noise assessment under the Environmental Impact Assessment Ordinance. Along the North Point shoreline, a temporary diversion of the elevated IEC will be required to enable the reconstruction of the existing flyover structure with noise barriers. This traffic diversion would entail the construction of a temporary elevated flyover adjacent to the existing IEC. Concrete pile caps would need to be constructed in the Harbour and these would be regarded as temporary reclamation. This area of temporary reclamation would be about 0.1ha. This temporary reclamation could not, practically speaking, be implemented in stages, as the whole of the temporary traffic arrangements scheme would be required for the whole time.

19. Moreover, the temporary traffic arrangements at the south-eastern corner of the CBTS would be concurrent with those at North Point, so the temporary reclamation associated with the temporary bridge foundations would need to be in place at the same time as the temporary reclamation for traffic diversions in the CBTS.

20. Therefore, for the Flyover Option, the temporary reclamation area required for the construction of the Flyover Option that will be in place at any one time would be approximately 3.4ha, and this would be in place for a period of around 4 years.

This is considered to be the minimum overall extent of temporary reclamation required to facilitate the construction of the Trunk Road Flyover Option across the seabed of the ex-PCWA, CBTS and along the North Point shoreline.

21. In summary, the extents of temporary reclamation for the Tunnel Option and Flyover Option are estimated to be as follows:

	Tunnel Option	**Flyover Option**
Temporary Reclamation [1] (during construction)	CBTS: 3.7 ha ex-PCWA: 1.2 ha	CBTS & ex-PCWA: 3.3 ha North Point: 0.1 ha

[1] at the stage when the area of temporary reclamation is the largest

22. Based on the above, it is found that the Flyover Option will result in a lesser extent of permanent reclamation than the Tunnel Option of about 2.6ha, and the Flyover Option will require a lesser extent of temporary reclamation during construction than the Tunnel Option of about 1.5ha.

Performance of Tunnel and Flyover Options

23. Since the extent of reclamation required by the Tunnel Option is greater than that of the Flyover Option, it must, in line with the CFA judgment, be considered whether the Flyover Option is a “reasonable alternative” to the Tunnel Option, through consideration of all circumstances including “the social, environmental and economic implications”.

24. The PHO requires the Harbour to be protected and preserved as a special public asset and a natural heritage of the Hong Kong people, and establishes a presumption against reclamation in the Harbour. Notwithstanding that there is an overriding need for reclamation for the project, it is essential to find the option that will best serve to protect and preserve the Harbour, with the minimum area of the Harbour affected by reclamation. In this regard, the area of the Harbour affected by the Trunk Road Tunnel and Flyover Options is of concern. In this connection, it must be understood that the affected area of the Harbour is not “reclamation” within the meaning of the PHO.

25. Therefore, when examining the Trunk Road options, it is not only the land formation by reclamation that should be of concern, but also the water areas of the Harbour affected by the scheme, in order to determine which option would serve best to protect and preserve the Harbour. In considering the affected area of the Harbour, the following aspects have been examined for comparison, besides the permanent and temporary reclamation:

(i) flyover structures over water (the plan area of elevated highway structures that cross over water); and

(ii) affected water area (areas of the Harbour obstructed by Trunk Road structures, or where marine uses are restricted).

26. The assessment of social, environmental and economic implications of the Flyover Option, in respect of the comparison on the performance of the Tunnel and Flyover Options, is summarised in Table 1.

Table 1 Comparison on Performance of Tunnel and Flyover Options

		Tunnel Option	**Flyover Option**
Social Implications			
Protection of the Harbour Affected area of the Harbour[(1)]: (i) Flyover structures over water (ii) Affected water area [(1)] this is not "reclamation" within the meaning of the PHO		0.3 ha	2.6 ha 4.0 ha
Planning and land use considerations	Along Wan Chai shoreline	Land formed can be used for harbour-front enhancement and pedestrian access to the waterfront.	Land formed is partly occupied by the tunnel portal which limits the area for harbour-front enhancement and constrains pedestrian access to the waterfront.

		Tunnel Option	Flyover Option
	ex-PCWA	ex-PCWA basin can be developed into a vibrant marine recreational facility.	Bridge piers and the low headroom clearance of the flyover restrict the development of the ex-PCWA basin as a marine recreational facility.
	Northern side of Victoria Park	Victoria Park can be extended to the harbour-front via a landscaped deck over the roads. Part of the northern edge of the park will be affected by Slip Road 8.	With the flyover running along the northern side of Victoria Park, a landscaped deck for extension of Victoria Park is impractical.
	CBTS	The existing CBTS is preserved.	Part of the water area and the existing promenade will be occupied by bridge piers and marine uses will be restricted.
	North Point	The seaward portion of some existing and planned developments along the North Point shore will be affected and will require resumption. Part of land formed can be used for harbour-front enhancement and pedestrian access.	No major impact on the existing and planned developments at North Point. Significant new public open space not provided and harbour-front enhancement cannot be achieved.
	Continuous waterfront promenade	A continuous waterfront promenade in Wan Chai, Causeway Bay and North Point can be provided.	Flyover structures at CBTS disrupt the provision of a continuous waterfront promenade.
Public views		Overwhelming support throughout the public	No support during public engagement at the time

		Tunnel Option	Flyover Option
		engagement process.	when feasible Trunk Road options were being examined.
Impact to existing traffic		Traffic diversions at new tie-in to IEC, but no major traffic disruption.	Complex temporary traffic arrangements at CBTS and at connection with IEC at North Point. Major traffic disruption and delays at tie-in to IEC and due to reconstruction of Victoria Park Road connections.
Time of implementation (time of construction)		7 years	6 years
Environmental Implications			
Environmental nuisance and impacts during construction	Air quality	No construction air quality impacts.	No construction air quality impacts.
	Noise	Main concern is noise from demolition at IEC connection, which can be mitigated.	Main concern is noise from demolition at IEC connection, which can be mitigated, but twice the length of road structure to be demolished, therefore much more noise nuisance.
	Water quality	No major construction phase impacts.	No major construction phase impacts.
	Landscape and visual impacts	Substantial to moderate landscape impacts and moderate visual impacts during construction.	Substantial to moderate landscape impacts and moderate visual impacts during construction.

		Tunnel Option	Flyover Option
Operational environmental impacts	Air quality	No operational air quality impacts. Air quality at eastern portal mitigated through design.	Significant contribution to air pollution levels from open road emissions in Causeway Bay.
	Noise	With mitigation measures (noise barriers) at tie-in to IEC, no noise impacts.	Extensive mitigation (noise barriers all the way through Causeway Bay and North Point).
	Water quality	No major operational impacts.	No major operational impacts.
	Landscape and visual impacts	Overall urban landscape character would be enhanced, visual impacts are acceptable with mitigation in the short term and beneficial with mitigation in the long term.	Adverse impact to landscape character, significant adverse visual impacts in Wan Chai and Causeway Bay caused by flyover. Dominating visual presence of elevated road structure is against public desire.
Economic Implications			
Costs *(including WDII works & CWB in WDII)*	Total construction	HK$20B	HK$11B
	Total annual recurrent	HK$110M	HK$75M

27. After consideration of all the social, environmental and economic implications, the Flyover Option, even though it requires a lesser extent of permanent and temporary reclamation, should not be regarded as a reasonable alternative to the Tunnel Option for the following reasons:

- In respect of protection of the Harbour, the Flyover Option will affect a

substantially greater area of the Harbour than the Tunnel Option (some 6.3ha more), and as such the Flyover Option has a major drawback in terms of protection and preservation of the Harbour as intended by the PHO.

- Unlike the Tunnel Option, the Flyover Option cannot meet public aspirations for harbour-front enhancement or accommodate reasonably expected harbour-front planning improvements, and land use opportunities for providing similar extent and quality of harbour-front are comparatively limited.

- The Flyover Option goes against the public views and the strong desire by the public for the Trunk Road to be underground rather than, in effect, an extension of the elevated IEC along the shoreline.

- In terms of traffic disruption, construction of the Flyover Option will result in severe disruption to traffic flows and cause substantial delay to journey times, compared to the Tunnel Option which can be constructed with minimal traffic disruption or delay.

- In respect of the environment, the Flyover Option will, comparatively, cause greater air and noise impacts than the Tunnel Option. But it is the visual impact of the Flyover Option that is of greatest concern. Quite clearly, the dominating visual presence along the harbour-front of the Flyover Option goes against the public desire NOT to have an extension of the existing elevated IEC all the way along the Causeway Bay and Wan Chai shoreline. The underground tunnel of the Tunnel Option, on the other hand, will have no adverse visual impacts, and indeed the Tunnel Option will bring visual benefits in the end.

- From the PHO point of view and taking into account the added social and environmental value of harbour-front enhancement, the higher costs associated with a scheme that could fulfil all the above requirements would be considered money well justified. Therefore, although the Flyover Option does perform better than the Tunnel Option in respect of time for construction and costs, these are clearly outweighed by the above factors.

28. Overall, the Flyover Option is not considered a reasonable alternative to the Tunnel Option particularly in respect of key aspects of: protection of the Harbour,

harbour-front enhancement, environmental impacts and, not least, public acceptance.

29. In comparing the two options, it has been demonstrated that, in most respects, the Tunnel Option performs better than the Flyover Option. The Tunnel Option:

- will result in a lesser affected area of the Harbour;
- will have more opportunities for harbour-front enhancement and providing access to the waterfront;
- has received public support through extensive public engagement activities;
- will cause less traffic disruption during construction;
- will cause less extensive air and noise impacts; and
- will have no adverse visual impact.

Only in respect of time for construction and costs can the Flyover Option be seen as performing better than the Tunnel Option.

Conclusions

30. In comparing the extent of reclamation, the Flyover Option will result in a lesser extent of permanent reclamation than the Tunnel Option by around 2.6ha. The Flyover Option will also result in a lesser extent of temporary reclamation than the Tunnel Option by around 1.5ha during construction. However, the temporary reclamation of the Tunnel Option will be short term and will have no permanent effect on the Harbour. Moreover, such temporary reclamation is necessary with a view to avoiding more extensive permanent reclamation.

31. The Flyover Option is not considered a reasonable alternative to the Tunnel Option in that the Flyover Option, though involving a lesser degree of “reclamation” within the meaning of the PHO, will in fact affect a greater extent of the Harbour when other areas of the Harbour impinged upon by the infrastructure of the Flyover Option are taken into account, as well as in terms of limited harbour-front enhancement, severe traffic disruption during construction and, importantly, the environmental and

visual impacts – taking also into account the overwhelming public support for the Tunnel Option. The higher costs of the Tunnel Option in economic terms are not considered to be excessive bearing in mind that they are offset and, indeed, outweighed by the much more significant social and environmental benefits of the Tunnel Option in comparison with the Flyover Option. In all circumstances, including social, environmental and economic implications, it is therefore concluded that the Flyover Option is NOT a reasonable alternative to the Tunnel Option.

32. The Trunk Road Tunnel serves best to protect and preserve the Harbour, among all the options that have been assessed and is consistent with the PHO as clarified by the CFA judgment. This option has predominant public support as the preferred Trunk Road scheme, following extensive consultations with various public, advisory and relevant statutory bodies.

Civil Engineering and Development Department
October 2008