For Discussion
8 December 2003

Panel on Planning, Lands and Works
Panel on Environmental Affairs

Joint Meeting on 8 December 2003

Traffic and Transport Justifications for the Central – Wan Chai Bypass

INTRODUCTION

At the joint meeting of the Legislative Council Panel on Planning, Lands and Works and Panel on Environmental Affairs held on 27 November 2003, Members, after receiving views from deputations in discussing Central Reclamation III and Wanchai Development II, requested information on the following issues :

(a) elaboration on the cost-effectiveness of the Central-Wanchai Bypass (CWB), and in this connection, to clarify the basis of the estimated capital cost of the CWB and the estimated cost of time saved as set out in Annex E to Administration's letter dated 22 November 2003;

(b) whether and how the developments/changes which have taken place after the Hong Kong Third Comprehensive Transport Study (CTS-3) have been fully taken into account in the Administration's current analysis of the cost-effectiveness of the CWB; and

(c) an analysis of the feasibility and cost-effectiveness of various alternatives to construction of the CWB to solve the traffic congestion problem.

THE CWB – BACKGROUND AND TRAFFIC JUSTIFICATIONS

2. The background and traffic justifications of the CWB is set out in LC Paper No. CB(1)403/03-04(06) which is extracted below for easy reference.

Background

3. The CWB will be a strategic trunk road located at the northern shore of Hong Kong Island linking Rumsey Street Flyover with the Island Eastern Corridor via the Island Eastern Corridor Link (IECL). The CWB and IECL will form a parallel and complementary route to the existing Connaught Road Central/Harcourt Road/Gloucester Road corridor (the Corridor) so as to relieve its traffic loading. The CWB will have intermediate access points in Wan Chai near the Hong Kong Convention and Exhibition Centre at which the eastbound and westbound traffic of the CWB can exit and the Wan Chai traffic can join the CWB heading toward Island Eastern Corridor.

4. In 1987, the Territory Development Department (TDD) commissioned the "Central and Wan Chai Reclamation Feasibility Study" (CWRFS). The CWRFS recommended, amongst other, reclaiming the waterfront from Sheung Wan to Causeway Bay to provide land for the CWB and other major transport infrastructure to improve the traffic condition along the Corridor and in the Central Business District (CBD).

5. The Second Comprehensive Transport Study[1] (CTS-2), completed in 1989, reconfirmed the need for the CWB. The CTS-2 predicted that, without the CWB, critical sections of the Corridor would be overloaded beyond their practical capacities during the peak hours by 2001, resulting in long traffic queues along the Corridor and the local roads in the Central and Wan Chai areas. The need for the CWB was reinforced further in the Third Comprehensive Transport Study (CTS-3) completed in 1999.

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[1] Comprehensive Transport Studies (CTS) aim to provide a framework for which Government can develop a balanced transport strategy to facilitate the mobility of people and goods of Hong Kong in an environmentally sustainable manner. The CTS model is based on assumptions on land use planning, economic growth, vehicle fleet size and the road network information. The model is calibrated using field traffic survey data. It is used to forecast future demands on the transport system of Hong Kong. The CTS model simulates both passenger and goods vehicle movements in Hong Kong and identifies constraints in the road network system.

6. In a recent rerun of the CTS-3 transport model completed in 2003, the results indicated that the demand for the CWB remained firm, despite the changes in land use planning assumptions and the reduced population projection of the territory. The CTS-3 model predicted that the traffic volume during the peak hours in 2011 on critical sections of the Corridor will exceed their capacities by 30% if the CWB is not provided in time.

Traffic Justifications

7. The Corridor is operating beyond its capacity currently. Congestion along the Corridor is not limited to the typical morning and evening peak hours. Regular traffic congestion can be observed throughout the weekdays between 8 a.m. and 7 p.m.. Eastbound traffic heading to the CBD often queues back to the Western Harbour Tunnel approach along the Rumsey Street Flyover. Traffic westbound to the CBD often tails back to the Wan Chai Sports Ground along Gloucester Road. In the morning peak hour between 8 a.m. to 9 a.m., drivers need more than five minutes to pass through the 0.7km section of eastbound Connaught Road Central (CRC) between Rumsey Street and Pedder Street. This represents a travelling speed of just over 7 km/hr whereas the allowable travelling speed is 50 km/hr. It is expected that travelling along the 4-km Corridor will take about 45 minutes at a speed of about 5 km/hr in 2011 without the CWB. The stagnant traffic on the Corridor will have a spill over effect leading to congestion in the neighbouring roads in Central and Wan Chai. With the completion of the CWB and IECL, traffic along the critical sections of the Corridor will be retained to within the capacity of the road and traffic congestion can be relieved. The predicted volume to capacity (v/c) ratio[2] at various locations are summarised below :

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[2] Volume to capacity (v/c) ratio is an indicator which reflects the performance of a road. A v/c ratio equal to or less than 1.0 means that a road has sufficient capacity to cope with the volume of vehicular traffic under consideration and the resultant traffic will flow smoothly. A v/c ratio above 1.0 indicates the onset of congestion; that above 1.2 indicates more serious congestion with traffic speeds deteriorating progressively with further increase in traffic. 1.3 may be considered as a limiting v/c ratio. The road cannot physically handle a greater volume of traffic and as demand increases beyond this level, longer and longer queues would result.

Location	Without CWB and P2		With CWB and P2	
	2011	2016	2011	2016
Connaught Road Central	1.3	1.3	0.8	0.9
Harcourt Road	1.3	1.3	0.8	0.9
Gloucester Road	1.3	1.3	0.9	0.9
CWB	-	-	0.7	0.7

8. Other east-west secondary corridors, such as Hennessy Road and Queensway will not be able to help relieving the congestion problem along the main Corridor as they will also be heavily congested. This is because their capacity will be constrained by the traffic signals and kerbside loading/unloading activities of buses, taxis and goods vehicles.

THE ADMINISTRATION'S RESPONSE TO VIEWS EXPRESSED BY THE DEPUTATIONS

Cost Effectiveness of the CWB

9. The Internal Rate of Return (IRR) of a project refers to the annual discount rate which makes the total return from the project over its project life just equal to the total investment. The general formula is –

$$\sum_{i=0}^{n} \frac{B_i - C_i}{(1+r)^i} = 0$$

where
- r = IRR
- i = current year ($i = 0$ for base year)
- B_i = benefit accrued from the project in year i
- C_i = cost incurred on the project in year i
- n = project life (assumed at 40 years)

10. In measuring the cost effectiveness of a project, Government looks at the overall benefit brought to the community by the project. For transport infrastructure, the bulk of such benefit refers to the saving in travelling time for the public and congestion relief to adjacent roads. In applying the formula above to measure the cost effectiveness of the CWB, we have adopted the following input parameters :

(a) the estimated capital cost of the project to be $8,706 million which includes costs for 5 main works packages –

(i) the Central interchange;
(ii) CWB tunnel construction on CRIII;
(iii) CWB tunnel construction on WDII;
(iv) electrical and mechanical works and tunnel installation works; and
(v) the Island Eastern Corridor Link.

(b) on the first year of operation, about 365,000 road users will benefit from using the new road;

(c) the average time saved by each passenger is 20 minutes;

(d) there are 300 days in a year that the CWB will be fully used; and

(e) the cost of passenger time is $60 per hour.

(b) to (e) above brings the calculation of cost of the time saved in the first year to $2,193 million. Using the IRR equation above, we evaluate that the investment on the CWB will generate an Economic Internal Rate of Return (EIRR) of about 28% after 40 years of operation. The calculation is shown in further detail in **Annex A**.

Update Since CTS-3

11. The need for the CWB was identified in the Central and Wan Chai Reclamation Feasibility Study in 1987 and reaffirmed in CTS-3 completed in 1999. In-between the Comprehensive Transport Studies, we conduct updates of our transport model from time to time to take into account latest planning assumptions and parameters. We have conducted a rerun of the CTS-3 transport model in 2003 with the latest set of planning assumptions. The different planning assumptions that have been used in CTS-3 and the 2003 rerun of CTS-3 is at **Annex B**. Despite the changes in the planning assumptions, the need for the CWB remains firm.

Feasibility and Cost-Effectiveness of Alternatives to Construction of the CWB

12. At the meeting on 27 November 2003, the deputations suggested various alternative measures to constructing the CWB. We have indeed considered the feasibility of these alternatives in relieving traffic congestion in the Central and Wan Chai areas and concluded that the CWB is needed to relieve the congestion problem.

(a) Full utilisation of the Western Harbour Crossing (WHC)

13. We have considered the suggestion of adopting an equal toll for WHC and Cross Harbour Tunnel (CHT) so as to increase utilisation of the former but this approach is not expected to relieve significantly congestion in the Central and Wan Chai areas as most of the traffic would still need to go through Central, except for the small percentage of traffic from and to the western part of the Hong Kong Island.

14. According to the result of our traffic model, it is predicted that the possible relieving effect of an equal toll on Gloucester Road (GR) would be less than 2%. This is because the diversion of traffic from CHT to WHC is likely to result in a corresponding increase in traffic volume along Connaught Road Central (CRC), adding to the traffic congestion thereat. Therefore, the overall traffic condition of the Corridor is not expected to improve under such a hypothetical toll regime.

15. This could be attributable to the fact that some additional traffic in the east would be attracted to use WHC via the Corridor. Similarly for cross-harbour traffic from the Southern district via the Aberdeen Tunnel, they would have to travel along the Corridor before they can use WHC to take advantage of the lower toll. On the other hand, traffic from the Central district originally destined to use CHT would be removed away from the GR/Harcourt Road (HR) but part of it would be added back to the CRC if they are diverted to use WHC under a cheaper toll. For the cross-harbour traffic from Wanchai diverted from CHT to WHC, the reduction in traffic in the eastern part of GR will result in increase in traffic in the western part of the Corridor. There

would hence be a balancing out effect overall. Furthermore, the amount of cross harbour traffic, estimated to be about 20%, is relatively minor when compared to the bulk of the non-cross harbour traffic using the Corridor, the volume of which is not at all affected by the toll levels of the cross harbour tunnels.

16. When the toll levels of WHC and CHT becomes the same, some CHT traffic would shift to use WHC while some Eastern Harbour Crossing (EHC) traffic would shift to use CHT to take advantage of the relief of traffic congestion of CHT. This will result in a slight increase of about 2% in traffic demand on the section of GR east of CHT (near Excelsior) aggravating the congestion thereat.

17. Therefore, the "equal toll" option does not provide an effective solution to congestion along the Corridor. Moreover, such arrangement would also be subject to a commercial agreement with the tunnel operators.

(b) Extension of the MTR to Kennedy Town

18. The extension of the West Hong Kong Island Line to Belcher by 2011 was adopted as an assumption in our rerun of the traffic model in 2003. The result showed that extending the MTR to Kennedy Town will not help relieve congestion in the Corridor. This is because most bus routes run along the inner roads including Des Voeux Road and Queen's Road. Any reduction in bus service as a result of diversion of passengers to the MTR will be limited and will at most provide slight relief to the already congested inner roads.

(c) Provision of hillside escalators from Central to Mid-levels

19. Providing additional escalator links will help relieve the traffic burden along the roads in the Mid-levels but will not help relieve congestion in the Central and Wan Chai areas.

(d) Provision of bus-bus interchanges (BBIs) at the fringe areas of Central

20. We have taken active steps in rationalising and restructuring bus routes in the past five years. The number of bus trips going through Central has been reduced by more than 10% as a result. We are now examining a proposal on several potential BBIs in the CBD. We consider that the scope of further reduction in bus trips going through Central is unlikely to be of a significant scale.

(e) Restricting loading and unloading times in Central

21. Confining the loading/unloading activities to night time could adversely affect the commercial activities in the district. We need to balance the interest of businesses and other trades. Currently, the loading/unloading facilities are already provided on a restrictive basis taking into account the need to minimise any adverse impact on traffic.

(f) Adoption of Electronic Road Pricing (ERP)

22. A Feasibility Study on ERP (the Study) was completed in April 2001 to examine the practicability of implementing an ERP system in Hong Kong and the need for such a system to meet transport objectives. While the Study concluded that the implementation of an ERP system in Hong Kong is feasible from the technical point of view, it also considered that given that peak hour travel speed in urban areas is forecast to remain above 20 km/hour, drastic restraint measures such as ERP were not warranted on traffic management grounds before 2006 for Hong Kong Island and 2011 for Kowloon at the earliest if the growth of the private vehicle fleet is no more than 3% per year. The Study also pointed out that ERP could only work where there was a high level of consensus in the community. After considering all the relevant factors with reference to the above conclusions, the Administration decided that ERP should not be pursued at that time and informed the Legislative Council of the decision.

23. The availability of a reasonable alternative route is key to obtaining community support for the implementation of any such scheme. The magnitude of the forecast growth in traffic moreover demands infrastructure improvement in addition to traffic management measures. The provision of an alternative east-west corridor in the form of CWB is hence crucial in any proposal to address the congestion of CBD.

24. The completion of the CWB will provide a more efficient transport network to sustain the long term growth of Hong Kong. On the other hand, ERP is a traffic management measure for the management of traffic demand in a specific area and cannot serve as a replacement of the CWB. The CWB would still be necessary to provide an alternative route for the through traffic.

25. In sum, given that the predicted traffic volume during the peak hours in 2011 on critical sections of the Corridor will exceed their capacities by 30%, the alternative measures will not be able to achieve a reduction in traffic volume on the Corridor to within capacity level. The CWB is therefore the ultimate solution to resolve the traffic congestion problem in the Central and Wan Chai areas.

ADVICE SOUGHT

26. Members are invited to note the content of this paper.

Environment, Transport and Works Bureau
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Annex A

EIRR Calculation for the Central-Wanchai Bypass

Operating Year	Year	Cost ($M)		Benefits ($M)	Net Benefit ($M)
		Design and Construction	Recurrent	Public and Private Transport Users	
	2009	(500)			(500)
	2010	(2,400)			(2,400)
	2011	(3,000)			(3,000)
1	2012	(2,806)	(102)	2,193	(715)
2	2013		(109)	2,336	2,228
3	2014		(116)	2,486	2,370
4	2015		(123)	2,642	2,519
			(131)	2,806	2,676
6	2017		(134)	2,890	2,756
7	2018		(138)	2,977	2,839
8	2019		(143)	3,066	2,924
9	2020		(144)	3,097	2,953
			(145)	3,128	2,982
11	2022		(147)	3,159	3,012
12	2023		(148)	3,191	3,042
13	2024		(150)	3,223	3,073
14	2025		(151)	3,255	3,104
15	2026		(153)	3,288	3,135
16	2027		(154)	3,320	3,166
17	2028		(156)	3,354	3,198
18	2029		(158)	3,387	3,230
19	2030		(159)	3,421	3,262
20	2031		(161)	3,455	3,295
21	2032		(162)	3,490	3,327
22	2033		(164)	3,525	3,361

Operating Year	Year	Cost ($M)		Benefits ($M)	Net Benefit ($M)
		Design and Construction	Recurrent	Public and Private Transport Users	
23	2034		(166)	3,560	3,394
24	2035		(167)	3,596	3,428
25	2036		(169)	3,631	3,463
26	2037		(171)	3,668	3,497
27	2038		(172)	3,704	3,532
28	2039		(174)	3,742	3,568
29	2040		(176)	3,779	3,603
30	2041		(178)	3,817	3,639
31	2042		(179)	3,855	3,676
32	2043		(181)	3,893	3,712
33	2044		(183)	3,932	3,749
34	2045		(185)	3,972	3,787
35	2046		(187)	4,011	3,825
36	2047		(188)	4,052	3,863
37	2048		(190)	4,092	3,902
38	2049		(192)	4,133	3,941
39	2050		(194)	4,174	3,980
40	2051		(196)	4,216	4,020
		(8,706)	(6,396)	137,517	122,415

EIRR = 28%

Annex B

Input Assumptions Adopted in CTS-3 (1999) and Rerun of CTS-3 (2003)

	CTS-3 (1999)	CTS-3 (2003)
Population by 2016	8.9 million	8.0 million
Employment by 2016	4.3 million	3.9 million
Gross Domestic Product	4.4 % p.a. (average growth rate between 1997 and 2016)	3% (assumed a constant rate of 3% for years beyond 2002)
Vehicle fleet size (Private Vehicles)	618,000	530,000
Vehicle fleet size (Goods Vehicles)	184,000	120,000
Land use planning	The following reclamation developments had been assumed : • Central Reclamation Phase III (CRIII); • Wan Chai Development Phase II (WDII); • Western District Development ("WDD" or formerly known as Green Island Development); and	Changes to assumptions in reclamation developments: • much reduced scale of SEKD, CRIII and WDII; and • no WDD. Implications : reduced population and employment levels have been taken on board.

	CTS-3 (1999)	**CTS-3 (2003)**
	• a much bigger scale of reclamation at South East Kowloon (SEKD).	
Highway Network	Both Route 7 and Route 10 in place around 2006.	Need for Route 7 and Route 10 deferred. Timing to be reviewed.