Harbour-front Enhancement Committee
Sub-committee on Wan Chai Development Phase II Review
Expert Panel Forum on Sustainable Transport Planning and Central-Wan Chai Bypass
Submission to the Expert Panel

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Chapter 1 – Introduction

1.1 Purpose of the Submission

1.1.1 The proposed "Central-Wan Chai Bypass (CWB)" is a strategic route connecting the Rumsey Street Flyover in the west with the Island Eastern Corridor in the east. Upon its completion, it will form an integral part of Route 4 running from Chai Wan to Kennedy Town along the northern shore of Hong Kong Island.

1.1.2 There is a growing public sentiment against further reclamation of the Harbour, which gives rise to queries on the need for the CWB. This Submission seeks to present the history of the CWB, appraise the present and future traffic situation along the northern shore of Hong Kong Island, in particular the Central Business District (CBD), examine possible solutions, and examines the need for the CWB.

1.2 Background

1.2.1 The Central and Wan Chai Reclamation project consists of five phases, with the first three phases, namely Central Reclamation Phases I & II and the Wan Chai Development Phase I completed between 1993 and 1998. Central Reclamation Phase III is the fourth phase of the project, where construction is on-going. The fifth and the last phase of the project is the Wan Chai Development Phase II, the planning of which is under review. The CWB will run across the sites of Central Reclamation Phases I & III and Wan Chai Development Phase II, and then link up with the Island Eastern Corridor in Causeway Bay. The boundary of the Central and Wan Chai Reclamation areas and the routing of the CWB are shown in the figure in **Appendix 1.1.**

1.2.2 The need for the CWB was confirmed in the Second Comprehensive Transport Study (CTS-2) completed in 1989. This need was reconfirmed by the Third Comprehensive Transport Study (CTS-3) completed in 1999. A recent rerun of the CTS-3 transport model also generated results pointing to the need for the CWB.

1.2.3 On 19 April 2002, the Government gazetted the CWB project under the Roads (Works, Use & Compensation) Ordinance. The main elements of CWB works covered:-

(i) an interchange connecting the existing Rumsey Street Flyover with the CWB with slip roads to the distributor road system on the Central Reclamation

Phase I;

(ii) a dual three-lane road tunnel approximately 2.3 km in length between Central and Causeway Bay forming the Central-Wan Chai Bypass, with an eastbound exit to the Hong Kong Convention and Exhibition Centre (HKCEC) area;

(iii) two separate two-lane one-way tunnels of about 0.7 km in length from the HKCEC area to Causeway Bay;

(iv) a dual four-lane elevated carriageway of about 1 km in length linking the CWB and the existing Island Eastern Corridor; and

(v) an interchange with slip roads from the trunk road connecting to Victoria Park Road, Gloucester Road and Hing Fat Street.

The alignment of the then gazetted CWB is shown in figure in **Appendix 1.2**.

1.2.4 Concurrent with the gazetting of the CWB roadworks, the Government also gazetted the draft Wan Chai North Outline Zoning Plan (OZP) under the Town Planning Ordinance. In February 2003, the Society for Protection of the Harbour Limited (SPH) commenced legal proceedings and applied for judicial review of the decisions of the Town Planning Board (TPB) made in connection with the draft Wan Chai North OZP on the interpretation of the Protection of the Harbour Ordinance (PHO). As the legitimate standing of the Wan Chai North OZP would have a decisive bearing on the proposed CWB roadworks, the Government decided not to seek authorization for the CWB roadworks under the Roads (Works, Use & Compensation) Ordinance.

1.2.5 The judicial review proceeding with regard to the draft Wan Chai North OZP was ultimately determined by the Court of Final Appeal (CFA) in December 2003 and the CFA handed down its judgment on 9 January 2004. The CFA held that the statutory principle of protection and preservation of the Harbour under the PHO is a strong and vigorous one. In order to implement the statutory principle, there is a statutory presumption against reclamation in the Harbour. Its legal effect is not to impose an absolute bar against any reclamation. As a presumption, it is capable of being rebutted. However, the presumption can only be rebutted by establishing an overriding public need for reclamation, which can conveniently be referred to as the "Overriding Public Need Test". The single test is by its nature a demanding one. The public needs would be community needs and include the economic,

environmental and social needs of the community. Where there is a reasonable alternative to reclamation, an overriding need for reclamation would not be made out. All circumstances should be considered for a reasonable alternative including the economic, environmental and social implications of each alternative. The cost as well as the time and delay involved would be relevant.

1.2.6 The Government conducted a review on CRIII, which was completed in November 2003, based on the High Court's ruling in relation to the draft Wan Chai North OZP. Following the CFA judgment, the Government immediately carried out a further review on CRIII, entitled "A Review of Central Reclamation Phase III by applying the Court of Final Appeal's 'Overriding Public Need Test'" ("Further Review"). This Further Review was completed in April 2004 and confirmed that the CWB certainly satisfies the "Overriding Public Need Test". In this Further Review, the Government has examined various traffic management measures and concluded that, even with all those measures that were practicable in place to relieve traffic congestion, there is still a compelling and present need to provide the CWB. Traffic management measures will complement CWB but cannot replace it. There are no reasonable alternatives to CWB.

1.2.7 The Government is conducting a comprehensive review of the Wan Chai Development Phase II and the scope of CWB to ensure that the purpose and extent of the proposed works are in compliance with the "Overriding Public Need Test".

1.2.8 The findings of the review of the need for the CWB are presented in the following Chapters.

1.3 Structure of Submission

1.3.1 The structure of this submission is set out as follows:-

- Chapter 1 : Introduction and background of the CWB.
- Chapter 2 : Description of the existing road network along the northern shore of Hong Kong Island, the CWB's role as an essential link, the existing traffic pattern of the CBD, and the already existing traffic congestion problem.
- Chapter 3 : Description of the strategic traffic and transport studies completed previously, the traffic model assumptions and results.

- Chapter 4 : The district traffic model focusing on Central / Wan Chai / Causeway Bay areas, description of the existing / proposed developments in Central and Wan Chai Reclamation areas, the traffic to be generated by these developments and the forecast traffic by the design year 2016.

- Chapter 5 : An overview of traffic management and other measures considered, including Electronic Road Pricing (ERP) to cope with the anticipated traffic congestion problem.

- Chapter 6 : Summary and conclusions.

Chapter 2 - Existing Road Network and Traffic Conditions

2.1 Existing Road Network

2.1.1 The CBD is currently served by the east-west Connaught Road Central / Harcourt Road / Gloucester Road Corridor ("the Corridor"). This Corridor is primarily a dual four-lane urban trunk road serving as a key east-west link for Hong Kong Island North. At the same time, it also serves as a distributor road providing north-south connections to various districts. Within the 4-km Corridor, there are nine (9) major interchanges / junctions providing access to and exit from district and local roads. They are (from west to east) :-

(i) Junction of Connaught Road Central / Pedder Street providing connections to the hinterland and the reclamation areas of Central District;

(ii) Interchange of Harcourt Road / Garden Road and Cotton Tree Drive providing connections to the Midlevels and Admiralty area;

(iii) Interchange of Harcourt Road / Fenwick Pier Street providing connection between Central District and Wan Chai North;

(iv) Interchange of Gloucester Road / Arsenal Street Flyover providing connection between Admiralty and Wan Chai North;

(v) Junctions of Gloucester Road / Fleming Road and Tonnochy Road providing connections to Wan Chai areas;

(vi) Interchange of Gloucester Road / Tonnochy Road Flyover providing connection between westbound Gloucester Road with Wan Chai North;

(vii) Interchange of Gloucester Road / Cross Harbour Tunnel providing connections between Hong Kong and Kowloon;

(viii) Interchange of Gloucester Road / Canal Road Flyover providing connections between Kowloon, Hong Kong North with Southern District; and

(ix) Interchange of Gloucester Road / Victoria Park Road Flyover providing connections to Causeway Bay, Tin Hau and Tai Hang areas.

2.1.2 The Corridor is currently serving as an “Urban Trunk Road”, meaning that it bears the responsibility of carrying the long-haul traffic between east and west of Hong Kong Island. It is also serving as a “Distributor Road” providing key accesses to its adjacent areas with very short connecting roads. The Corridor is over-saturated and too heavily used by the traffic towards its adjacent areas to discharge its intended function as an Urban Trunk Road. Furthermore, the Corridor has many junctions with side roads, underpasses and flyovers creating substantial weaving and merging movements. The problem is exacerbated by boarding and alighting of bus passengers at stops along the Corridor, with bus queues often tailing back from the stops. Traffic queues from any bottlenecks at its side roads or its main section will result in blockage of other movements and rapid deterioration of traffic condition. A minor accident or incident occurring along or at the vicinity of the Corridor may result in serious congestion and delay in the road network, and, in some more serious cases, gridlock of the whole CBD and complete blockage of the Corridor.

2.1.3 To the south of the Corridor, a number of distributor roads also provide east-west connections to various districts. These include Queen’s Road Central; Des Voeux Road Central; Queensway and Hennessy Road. However, the capacity of these roads are controlled by the signal controlled junctions along the roads, and they mainly provide access for public transport, and cater for loading / unloading activities and short to medium distance traffic in a more localized context. Scope for further improvement or upgrading of these roads to help relieve the burden of the Corridor is extremely limited. Instead, given the short connecting roads between these local roads and the Corridor, traffic queues in the former easily extend back to the latter.

2.2 Existing Traffic Pattern

2.2.1 The predominant traffic movement on the northern shore of Hong Kong Island is observed to be in the east-west direction along the Corridor. This is attributable to the concentration of commercial and business areas in Central and Admiralty areas, which generates significant traffic throughout the day.

2.2.2 The existing Corridor is already operating beyond its design capacity. Congestion along the Corridor is not limited to the typical morning and evening peak hours. Regular traffic congestion can be observed between 8 a.m. and 8 p.m. during week days. Eastbound traffic heading for the CBD often queues back to the Western Harbour Tunnel approach along the Rumsey Street Flyover and also the at-grade

Connaught Road Central. Traffic westbound to the CBD often tails back to the Wan Chai Sports Ground along Gloucester Road. In the morning peak hours, it takes more than five minutes to drive along the 0.7 km section of eastbound Connaught Road Central between Rumsey Street and Pedder Street. This represents a travelling speed of just over 7 km/hr. For the west bound direction, there have been occasions when the traffic queue extended all the way to Tai Koo Shing from Central, with the Journey Time Indicator at Island Eastern Corridor showing a journey time of 60 minutes or more to the other side of the harbour through Western Harbour Crossing. This corresponds with an average traffic speed of about 5 km/hr from North Point to Central. Extracts from Transport Department's Annual Traffic Census showing the existing traffic flows along the Corridor are in **Appendix 2.**

2.2.3 Regular traffic queues along the corridor are also found in the direction of the Cross Harbour Tunnel, the Aberdeen Tunnel and the Causeway Bay area. These regular traffic queues use up the valuable road spaces of the Corridor, rendering unnecessary delay to the through traffic between the eastern and western parts of Hong Kong Island.

2.2.4 Other east-west secondary corridors, such as Queensway and Hennessy Road cannot help relieve the congestion problem along the Corridor as these roads are also heavily congested. Their capacity is constrained by the traffic signals and kerb-side loading / unloading activities of buses, taxis and goods vehicles.

2.3 The Missing Link - the CWB

2.3.1 The need to provide a strategic trunk road along the northern shore of Hong Kong Island has long been identified. A major part of this strategic road has been completed over the years. We have now the Island Eastern Corridor (IEC) running from the eastern end of the Island to Causeway Bay, and the elevated Connaught Road West Corridor from the western end to Central. The CWB is the missing link in the middle required to complete this strategic route. This road link, the CWB, is needed to divert through traffic away from the CBD and from the interchanges between the Corridor and the two tunnels (namely the Cross Harbour Tunnel and the Aberdeen Tunnel). It is also needed to cater for the anticipated natural growth of traffic and to alleviate the already existing congestion on the road networks. Without the CWB, there will not be sufficient capacity to serve the heavy demands at both the strategic and local levels. The CWB is needed to ensure the provision of a functional and balanced road network on Hong Kong Island.

2.3.2 As a parallel and complementary route to the Connaught Road Central / Harcourt Road / Gloucester Road Corridor, the CWB can provide a direct route between the eastern and western parts of Hong Kong Island. The CWB also needs to have adequate intermediate access points to serve the CBD so as to alleviate the burden of the Corridor. Its value and contribution to traffic flow can best be appreciated by looking at how traffic flow improved on King's Road after the opening of the IEC and the associated interchanges. The assumed alignment and configuration of the CWB will be discussed, in association with the review of the strategic and district traffic models, in Chapters 3 and 4 of this Submission.

Chapter 3 - Need for Central-Wan Chai Bypass as Identified in Strategic Traffic and Transport Studies

3.1 Previous Studies

3.1.1 The need to improve the flow of east-west traffic through Central and Wan Chai has been identified for a long time.

3.1.2 The Long Term Road Study completed in 1968 recommended that an elevated road should be constructed along Connaught Road Central between Connaught Road West and Harcourt Road Flyover to carry traffic through the CBD.

3.1.3 The First Comprehensive Transport Study (CTS-1) completed in 1976 also confirmed the need for an elevated road along Connaught Road Central. However, CTS-1 recognized the strong objections to the scheme on environmental grounds and recommended that alternative alignments should be studied.

3.1.4 A study for a "Waterfront Road Alternative" under the "Study of the Transportation Requirements for the Mid-levels and Central District" in 1983 recommended a Waterfront Road through Central from Connaught Road West to IEC.

3.1.5 In 1989, the "Central and Wan Chai Reclamation Feasibility Study" recommended, amongst other things, a Waterfront Road to improve the traffic condition along the Connaught Road Central/Harcourt Road/Gloucester Road corridor (the Corridor) and in the CBD.

3.1.6 The CTS-2 completed in 1989 re-confirmed the need for the Waterfront Road, which was called the Central-Wan Chai Bypass (CWB). The CTS-2 predicted that, without CWB, critical sections of the Corridor would be overloaded beyond their practical capacities during the peak hours by early 2000s.

3.2 The Third Comprehensive Transport Study

3.2.1 The need for the CWB was confirmed again in the CTS-3 completed in 1999, which recommended that the CWB should be implemented by mid-2000s as far as possible to relieve the anticipated congestion. A recent rerun of the CTS-3 transport model confirmed again the demand for the CWB, despite changes in land use planning assumptions and population projection of the territory.

3.2.2 The CTS-3 model re-run predicted that the peak-hour traffic demand along the Corridor will increase by about 30% from 2004 to 2016. As the Corridor is already operating beyond its capacity at present, the increase in traffic demand will result in longer queue lengths and even longer periods of traffic congestion every day in the Corridor in the future. It is expected that travelling along the 4-km Corridor will take about 45 minutes at a speed of 5km/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, and complete gridlock in the road network may easily occur. With the completion of the CWB, traffic along the critical sections of the Corridor will be within the capacity of the road and traffic congestion can be relieved. The volume to capacity ratios[1] predicted by the CTS-3 model at various locations are as follows:

Location	Without CWB		With CWB	
	2011	2016	2011	2016
Connaught Road Central	1.3[2]	1.3[2]	0.8	0.9
Harcourt Road	1.3[2]	1.3[2]	0.8	0.9
Gloucester Road	1.3[2]	1.3[2]	0.9	0.9
CWB	-	-	0.7	0.7

3.2.3 The CTS modelling techniques and input assumptions used in the recent CTS-3 model re-run are shown in **Appendix 3**.

[1] Volume to capacity (v/c) ratio is an indicator which reflects the performance of a road. A v/c ratio equal 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.

[2] V/c ratio of 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.

Chapters 4 – Traffic Forecast from District Traffic Model

4.1 District Traffic Model

4.1.1 In addition to the territorial or strategic traffic forecast which has established the need to provide additional highways infrastructures to cope with the future traffic demand, more detailed traffic assessments have also been carried out at project level.

4.1.2 A Project Review Study has been conducted for the CWB based on up-to-date planning assumptions and development intensity of the proposed Wan Chai Development Phase II area. The purpose of the Study is to review and reappraise the need for and the scope of the CWB using a district traffic model.

4.1.3 The latest district traffic model covers the Central, Wan Chai and Causeway Bay area and was set up using SATURN (Simulation and Assignment of Traffic to Urban Road Network) suite of traffic analysis programmes. SATURN is a combined simulation and assignment model particularly suitable for use in modelling congested urban road networks due to its ability to accurately represent junction delays, queues and traffic arriving / departing from each junction. It is accepted worldwide as a suitable tool for this purpose, and contains a much finer level of traffic zones and network details than the CTS-3 Strategic Model.

4.2 Modelling Approach

4.2.1 For the purpose of testing the future traffic situation, the design year 2016 was adopted in this assignment. The corresponding CTS-3 design year cordon matrices were used to define the boundary conditions of the district area traffic model. Three sets of traffic forecast were undertaken to simulate the traffic situation at the Central, Wan Chai and Causeway Bay areas. The three test scenarios are as follows:

Scenario A

With CWB, and **with** the associated slip roads and the at-grade roads in Central Reclamation Phase III and Wan Chai Development Phase II.

Scenario B

Without CWB, and **without** the at-grade roads in Central Reclamation Phase III and Wan Chai Development Phase II.

Scenario C

With CWB, but **without** intermediate slip roads in Wan Chai.

4.2.2 Peak hours traffic flows were simulated for the three test scenarios. Under **Scenario B**, all proposed developments within the reclamation areas were also taken out.

4.2.3 The model was then calibrated and validated using flows on major road links and turning movements observed in 2004 to ensure that the model was capable of reproducing and predicting the traffic conditions in the Study Area satisfactorily.

4.3 Model Input Assumptions

4.3.1 The following new road network configuration and land use proposal were assumed in the district traffic model. It should however be noted that they might not reflect the final road scheme nor the final land use proposal as the subject is still under review in the Wan Chai Development Phase II Review Study.

Proposed CWB Configuration

4.3.2 As the scope of the CWB works has not been finalised, the configuration of the proposed CWB being tested in the district traffic model was made to fulfil the following general functional requirements:-

(a) the CWB would mainly be a dual-3 lane road, with local widening to suit the slip roads;

(b) with an interchange at the west (the Central Interchange) connecting the existing Rumsey Street Flyover with the CWB with slip roads to the distributor road system on the Central Reclamation Phase I;

(c) with an interchange at the east (the Causeway Bay Interchange) connecting IEC;

(c) with a slip road for traffic from Central leaving the eastbound CWB at Wan Chai North;

(d) with a slip road for traffic from Wan Chai North entering the eastbound CWB

to North Point;

(e) with a slip road for traffic from the IEC leaving the westbound CWB at Wan Chai North; and

(f) with a slip road for traffic from Causeway Bay entering the westbound CWB to Central.

Proposed At-grade Roads

4.3.3 The at-grade roads within the site of Central Reclamation Phase III, which had been authorized and were now under construction, were included without change in the district traffic model. It was assumed that the proposed Road P2 within the limit of Central Reclamation Phase III would be extended eastward to Wan Chai Development Phase II as a through road and would mainly be a dual 2-lane road. Within Wan Chai, the Road P2 would run between the gap of HKCEC Phases 1 & 2 and then connecting to the existing Hung Hing Road. Hung Hing Road would either be widened in-situ or realigned to cope with the anticipated traffic flow. It was also assumed that the existing Hung Hing Road Flyover from Wan Chai North to Gloucester Road would be widened from one lane to two lanes.

Proposed Land Use in Central Reclamation Phase III

4.3.4 One additional parameter affecting the traffic flows within the study area in this district traffic model is the type, scale and density of developments that will take place in the study area in the future design year. In this respect, we have made reference to the Approved Outline Zoning Plans of the study area as described below.

4.3.5 The latest Approved Outline Zoning Plans have been used to determine the type, size and density of developments that will take place. For Central District, the proposed developments contained in the Approved Outline Zoning Plan (OZP) for Central District (Plan No. S/H4/12) and the Approved OZP for the Central District (Extension) (Plan No. S/H24/6) have been included into the district traffic model.

4.3.6 For Wan Chai North area, the Wan Chai North OZP (Plan No. S/H25/1) is being reviewed. In view of this review, no new development within Wan Chai North has been assigned to the district traffic model.

4.3.7 The location plan of the proposed future developments in Central Reclamation areas is shown at **Appendix 4.1**. The particulars of these sites are shown at **Appendix 4.2**.

Traffic Demand from the Proposed Developments

4.3.8 The developments will generate additional traffic demands and the trip rates for each type of development are presented at **Appendix 4.3**.

4.3.9 Based on the above rates, the resulting trips generation and attraction for the developments are tabulated at **Appendix 4.4**.

4.4 District Traffic Forecast

4.4.1 In order to reflect the latest development situation in the concerned local area, the most updated traffic trips from the Central Reclamation areas as derived above was assigned into the traffic model. The SATURN application programme was then applied in the assignment until the projected traffic flows reached the state of equilibrium.

4.4.2 Using the above network and proposed developments as input, the model was applied to predict traffic condition in the area in 2016 for the three test scenarios. The summary of results, in the form of Volume to Capacity (V/C) ratio of major road links, can be found at **Appendix 4.5**. The summary of critical junction capacity assessment can be found at **Appendix 4.6**. The forecast traffic flows along the Corridor and CWB can be found at **Appendix 4.7**.

4.4.3 Under **Scenario A** (i.e. with the CWB), the traffic forecast indicated that both the Corridor and the CWB would generally operate with some spare capacities. Nevertheless, the access lanes to the Cross Harbour Tunnel (CHT) would still be congested during the peak hours. This inherent problem would remain unless the problem of unbalanced usage of the three cross harbour tunnels could be resolved.

4.4.4 Under **Scenario B** (i.e., without the CWB), many critical sections along the Corridor would have V/C ratios of 1.3 or above, indicating that the Corridor would be very congested, with extended traffic queues and prolonged peak hours. During peak hours, the westbound 3-lane link road between IEC and Victoria Park Road would have a V/C ratio as high as 1.55. This bottleneck would cause extensive traffic queues along the entire length of the IEC. The sections of both eastbound and

westbound Harcourt Road would have V/C ratios of above 1.3, indicating that congestion would persist. The congestion would extend toward the Central District. The eastbound Connaught Road Central near Exchange Square would have a V/C ratio of near 1.3 while the weastbound Connaught Road Central near Jardine House would operate at V/C ratio of above 1.4. The junction of Connaught Road Central and Connaught Place would have serious capacity problem, causing extensive traffic queue along Connaught Place and Man Yiu Street.

4.4.5 Under **Scenario C** (i.e., with the CWB but without the intermediate slip roads in Wan Chai), the amount of traffic utilizing the CWB will reduce by about 30%. Several sections of Gloucester Road would operate at above capacity during both AM and PM peak hours. Most of the traffic that would have used the CWB under **Scenario A** would shift back to the Corridor. The function of CWB acting as a relief road for the Corridor will be weakened. Part of the eastbound traffic would shift to Road P1 and Road P2, causing the junctions of Man Po Street / Man Yiu Street / Road P1 working at a Reserve Capacity (RC) of -15% during peak hours. Additional land would be required near the waterfront promenade for the junction improvement works in order to bring the junction reserve capacity back to positive. The junction of Fleming Road / Harbour Road would operate at a RC of -25% during peak hours, meaning that long junction delay would occur along Fleming Road. This would paralyse the Wan Chai District as Fleming Road is the most important distributor road connecting the hinterland of Wan Chai with the Wan Chai waterfront.

Chapter 5 – Review on ERP and Other Traffic Management Measures

5.1. Introduction

5.1.1 The common argument against CWB is that the traffic congestion problem could be resolved by traffic management measures. Electronic Road Pricing (ERP) has been specially mentioned. This Chapter explains why traffic management measures and ERP could not replace CWB.

5.1.2 The Administration has all along tackled traffic issues from both the supply and demand angles. The following three-pronged approach was clearly stated in the 1990 White Paper on Transport Policy which concentrated on the continued development of Hong Kong's transport system:

> Managing road use;
> Expanding and improving public transport; and
> Improving the road network.

5.2. Managing Road Use

5.2.1 Hong Kong has probably the highest density of vehicles for every kilometre of road among major cities in the world. Effective management of road use is essential and Hong Kong has done a lot in this area. We have implemented a variety of traffic management measures including:

> one-way gyratory road systems
> reduction of conflicting movements at road junctions
> segregation of through traffic from access traffic
> entry restrictions
> bus priority measures and rationalisation of bus routes
> area traffic control and traffic surveillance
> loading/unloading control measures
> parking restrictions
> control of roadworks
> suppressing growth of private car fleet size

5.2.2 We have considered further actions in these areas. As described below, our finding is that they are not sufficiently effective in solving the congestion problem. Considerations on Electronic Road Pricing are described in detail in Section 5.4

below.

Fiscal measures to further suppress car ownership

5.2.3 Apart from traffic management measures, Hong Kong is imposing one of the world's highest levels of First Registration Tax (FRT), Annual Licence Fee (ALF) and fuel duty on private car as a means to manage the demand of private car ownership and usage. As a result, about 90% of all passenger trips are already carried by public transport mode. Room for further shifting the remaining private car mode to public transport mode is limited. Hong Kong has already achieved a very low private car ownership rate of 50 per 1 000 population, as compared with London and Singapore of 350 and 120 respectively.

Full utilization of the Western Harbour Crossing (WHC)

5.2.4 The suggestion of adopting an equal toll for WHC and Cross Harbour Tunnel (CHT) so as to increase utilization of the former 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[3]. For the testing of different possibilities of toll levels among the three cross harbour tunnels, we have evaluated the case in which the CHT charged a higher level of toll than that charged by the WHC. Under such a tolling regime, WHC would experience a great surge in traffic volume, a substantial proportion of which is diverted from CHT. This would strain further the already heavily congested Connaught Road Central and the road network in the CBD if the CWB and related roads are not built to relieve these roads. Therefore, this suggestion would only further exacerbate the already serious congestion of the road network in Central.

Imposing further stopping restrictions

5.2.5 Administrative measures such as imposing entry restriction, stopping restriction and load/unloading restriction against certain types of vehicles on certain roads will certainly address some local traffic issues. However, we have to balance the

[3] The actual average traffic throughput of WHC, CHT and EHC in response to the toll increase at CHT from $10 to $20 for private cars which took effect on 1 September 1999 were 37,800, 119,000 and 67,000 daily vehicles respectively for the 12-month period before the toll increase while the three tunnels recorded 42,300, 118,100 and 71,900 vehicles daily respectively for the 12-month period after the increase. Therefore, the effect of doubling the CHT toll on reducing traffic using CHT was only 900 vehicles daily or less than 1% of its original volume.

interests of different parties, including the trucking industry, the business operators and other road users. We have regularly received requests from the associations of the truck operators demanding the opening up of restricted zones and reducing the restriction hours to help their business.

5.2.6 Currently, the on-street loading/unloading (L/UL) facilities within the CBD are already provided on a restrictive basis in terms of time and location taking into account the need to minimize any adverse impact on traffic. In cases where capacities of internal roads are constrained, they are due primarily to the signalised junctions rather than the L/UL activities. Confining the L/UL activities to night time could also adversely affect the commercial activities in the CBD.

5.2.7 In order to achieve the highest capacity of the CRC/HR/GR Corridor, we have already imposed severe restrictions on L/UL activities along majority sections of the Corridor. Imposing further restrictions on L/UL activities along the internal roads of the CBD cannot help relieve the congestion along the Corridor but will have serious impact on the business activities in the CBD.

5.3. Expanding and Improving Public Transport Services

5.3.1 We have made substantial improvements over the years in the coverage and quality of our rail and bus network. The length of our rail network has increased by about 86% over the last ten years. Through theses improvements and our demand management measures, we have had probably the highest usage of public transport (about 90% of all passenger trips) amongst world-class cities with similar or higher level of developments. We have considered further improvements described below. Our conclusion is that they are not effective in solving the congestion problem along the corridor.

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

5.3.2 Bus traffic accounts for less than 5% of all traffic going into Central. Therefore reduction of bus trips is unlikely to bring about significant improvement in the traffic condition along the corridor. Notwithstanding the above, 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 15% since 1999. We shall continue to search and examine proposals on potential BBIs in the fringe areas of Central District. However, as most buses are operating along the inner roads such as Des Voeux Road, Queen’s Road and Hennessy Road, the scope of further reduction

in bus trips along the Corridor is unlikely to be of a significant scale.

Extension of the MTR to HK Island West

5.3.3 The West Hong Kong Island Line is one of the network assumptions in the latest re-run of the CTS-3 traffic model. The results show that extending the MTR to Island West 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.

Provision of hillside escalators from Central to Mid-levels

5.3.4 Providing additional escalator links will help relieve the traffic burden along the roads in the Mid-levels but will not help relieve congestion along the Corridor. Experience of the existing Central – Mid-levels Escalator Link is that the Link helped relieve pressure on public transport demand in the Mid-levels, but there was no drop in traffic volume after the Link was opened.

5.4 Electronic Road Pricing (ERP)

ERP Study Completed in 2001

5.4.1 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 was feasible from the technical point of view, it considered that drastic restraint measures such as ERP were not warranted on traffic management grounds if the growth of the private vehicle fleet was no more than 3% per year. After considering all the relevant factors with reference to the above conclusions, the Government decided that ERP should not be pursued at that time. The Final Report and the Executive Summary of the Study have been posted on Transport Department's website for public inspection.

ERP Requires Public Consensus

5.4.2 The Study also pointed out that ERP could only be implemented where there was a high level of consensus in the community.

Overseas Experience in London and Singapore

5.4.3 Despite the decision not to proceed with ERP in 2001, the Government has been monitoring closely overseas development in road pricing schemes. The objective of road pricing schemes in London and Singapore is mainly to regulate traffic to and from the charging zone. The charges of the London Congestion Charging (LCC) Scheme apply only to vehicles travelling inside, not on or outside the boundary. The ring road around the charging zone provides an alternative route for through traffic not entering central London. Similarly, the ERP System in Singapore charges only those vehicles passing through the gantries installed at entry points into the Restricted Zone (RZ). There are numerous signboards to forewarn the drivers of the ERP gantries and escape routes are provided so that motorists would not be forced unwittingly to enter the RZ and pay the ERP charge.

ERP Needs a Bypass

5.4.4 Experience in London and Singapore has shown that implementation of ERP needs to be supported by alternative routes or bypasses having sufficient capacity to receive the diverted traffic generated from those wishing to avoid entering the charging zone. A recent study sponsored by the European Community on urban road pricing in eight European cities has also confirmed that alternative routes lying outside the charged area are expected for such charging schemes. Such alternative routes are fair and necessary as it gives motorists an option whether to pay the charge or not. This points to the need for CWB. In Hong Kong, because of the geographical constraints around the CBD, such an alternative route does not exist. The use of ERP would not be effective in the absence of CWB, which is needed to divert the east-west through traffic. The through traffic accounts for 40% of the traffic flows across CBD. Without an alternative route or a bypass, all motorists travelling in the east-west direction would be forced to pay even though they do not want to go into the CBD.

ERP is no substitute for CWB

5.4.5 We cannot rely on demand management measures alone to effectively solve a major congestion problem. An example is the three cross harbour tunnels in Hong Kong. Clearly Hong Kong needs all three tunnels now. The fact that we cannot merely increase the toll of Cross Harbour Tunnel and suppress demand of cross harbour traffic to a level so low that the Eastern Harbour Crossing and Western Harbour Crossing would not be needed shows that we must expand our road infrastructure to

meet a reasonable demand. Any suppression to a level below this reasonable demand will cause damaging effects to our economy and livelihood. ERP is a demand management measure and similarly it has its limitations. We need new infrastructure to meet the reasonable demand. We need the bypass to provide an alternative route for through traffic to bypass the ERP charging zone. ERP complements CWB, but cannot replace it.

Comparing London with Hong Kong (see Table 5.1)

5.4.6 London had practically minimal demand management measure in respect of car ownership before LCC. Therefore, London had a much higher car ownership rate than Hong Kong (350 per 1 000 population in London compared with 50 in Hong Kong). Also, the percentage of private car traffic going into the London CBD is higher than that in Hong Kong (51% before LCC compared with 38% in Hong Kong). It shows that we have already removed a lot of non-essential traffic out of the CBD through the existing traffic demand management measures. Clearly it will be harder for Hong Kong to achieve any further reduction since we are already at a very low level.

Table 5.1 – Comparison of London and Hong Kong Situation

Key Data	London	Hong Kong
Car Ownership per 1,000 Population	350	50
Public Transport Passenger Trip per Day	45% - 77% depending on location	90%
Private Car Passenger Trip per Day	23% - 55% depending on location	10%
Private Car Traffic into CBD	51% (before charging) 39% (after charging)	38%

5.4.7 After the implementation of LCC with the initial daily charge set at five sterling pounds, car movements reduced by 34% but those movements for taxis, buses and motorcycles increased by 16%, 33% and 9% respectively (see Table 5.2). The overall traffic circulating within the charging zone has only reduced by 15%[4]. It should be noted that the reduction of 15% is related to daily volume. The reduction in peak hour flow in key corridors is likely to be less. If the same effect applies to Hong Kong, the net traffic reduction in daily volume would only be about 8% since

[4] *Central London Congestion Charging: Impacts Monitoring Third Annual Report – April 2005*

Hong Kong has a different vehicle composition from London, and the reduction in peak hour flows along the Corridor would be lower.

5.4.8 In view of the findings of the previous ERP Study and overseas experience, the provision of an alternative route or bypass is an essential prerequisite for the implementation of ERP. The Government has been monitoring the development of the ERP technology as well as the transport and environmental needs for the application of ERP. In further studying the issue, the Government will take into account all relevant considerations such as public acceptability, charge rate, vehicle growth rate, privacy concerns, cost implication on road users and impact on business, etc. The Government will also need to revamp the traffic model with more up-to-date traffic data, and to conduct thorough tests to assess the likely effects of ERP and its associated impacts.

Table 5.2 – Vehicle Composition in London and Hong Kong Entering CBD

	London Congestion Charging[5]			**Hong Kong[6]**
	Vehicle Composition During Charging Hours		**Increase / decrease of Traffic Volume**	**Vehicle Composition At Morning Peak Period**
	Before (2002 Average)	**After (2004 Average)**		
Cars	0.51	0.39	-34%	0.38
Vans	0.15	0.15	-12%	0.07
Lorries & others	0.04	0.04	-15%	0.01
Taxis	0.15	0.20	+16%	0.36
Bus & coach	0.04	0.06	+33%	0.15
Motorcycles	0.07	0.10	+9%	0.03
Pedal cycles	0.04	0.06	+29%	-
Total	**1.00**	**1.00**	**-15%**	**1.00**

[5] *Central London Congestion Charging: Impacts Monitoring Third Annual Report – April 2005*
[6] *The Annual Traffic Census 2004: Hong Kong Internal Cordon, p. A 4-5, Transport Department, HK SAR Government – June 2005*

Chapter 6 - Conclusions

6.1 The east-west corridor serving the CBD on Hong Kong Island is already operating beyond its maximum capacity as predicted by previous transport studies. Previous and recent strategic transport studies have predicted further increase in traffic demand along the east-west corridor, and confirmed the need for a parallel waterfront trunk road, the CWB, to avoid more extensive and frequent traffic congestion and even gridlock in the road network.

6.2 Traffic management and fiscal measures are already in place to maximize the capacity of the existing road network and suppress traffic demand. Further measures including ERP have also been considered. All these existing and proposed measures, however, cannot resolve the traffic congestion problem along the east-west corridor. In other words, the CWB is essential, and ERP can complement the Bypass but cannot replace it.

6.3 A district traffic study has been conducted to determine the configuration of the CWB. The study confirms that the CWB should have a dual 3-lane configuration, and that intermediate slip roads are essential to achieve the objective of building the trunk road, i.e. divert traffic away from the existing east-west corridor and provide adequate relief to it.

Appendices 1.1 & 1.2

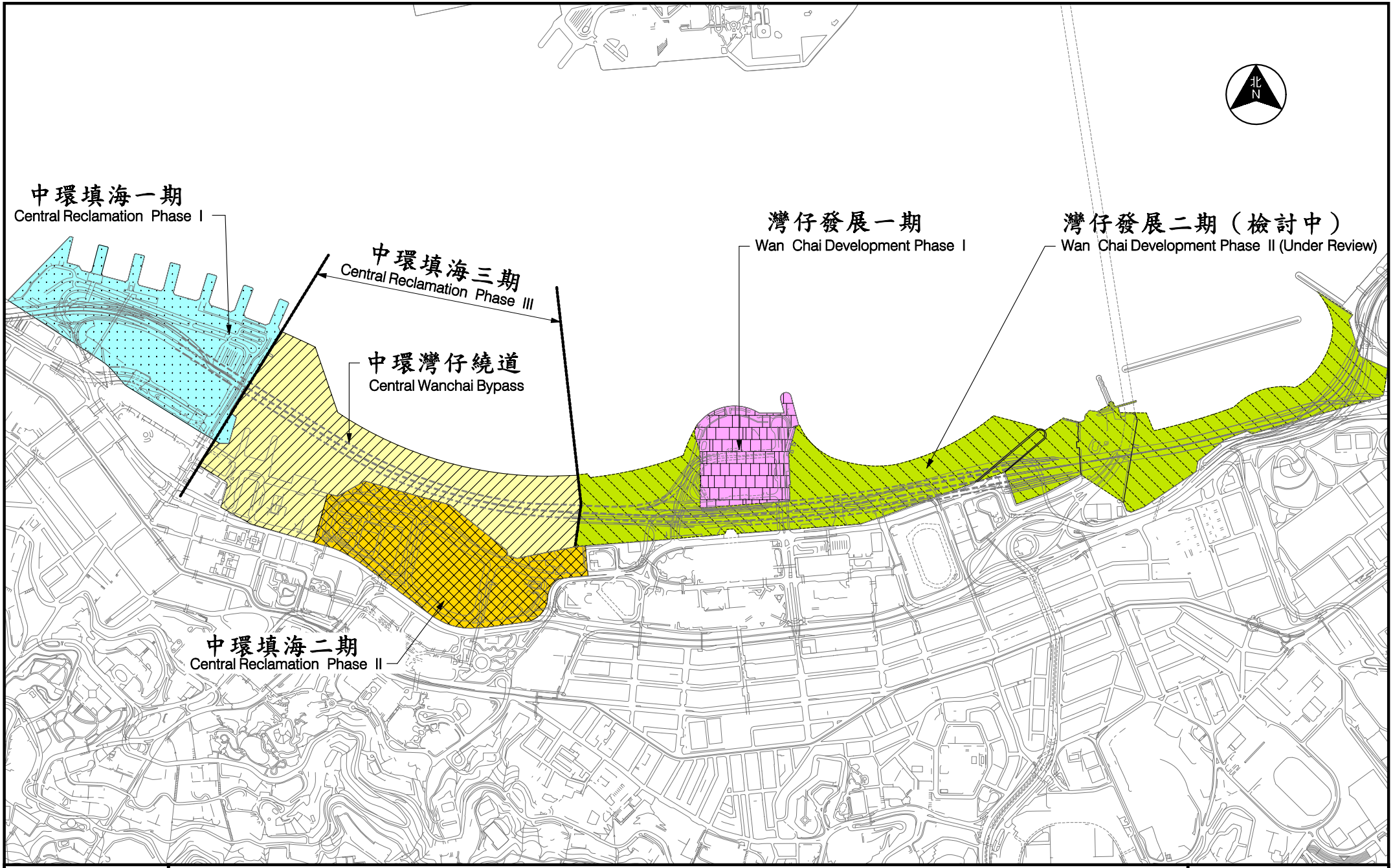

圖 1.1
Figure 1.1

中環灣仔填海
Central and Wan Chai Reclamation

運輸署
Transport Department

附件 1.1 Appendix 1.1

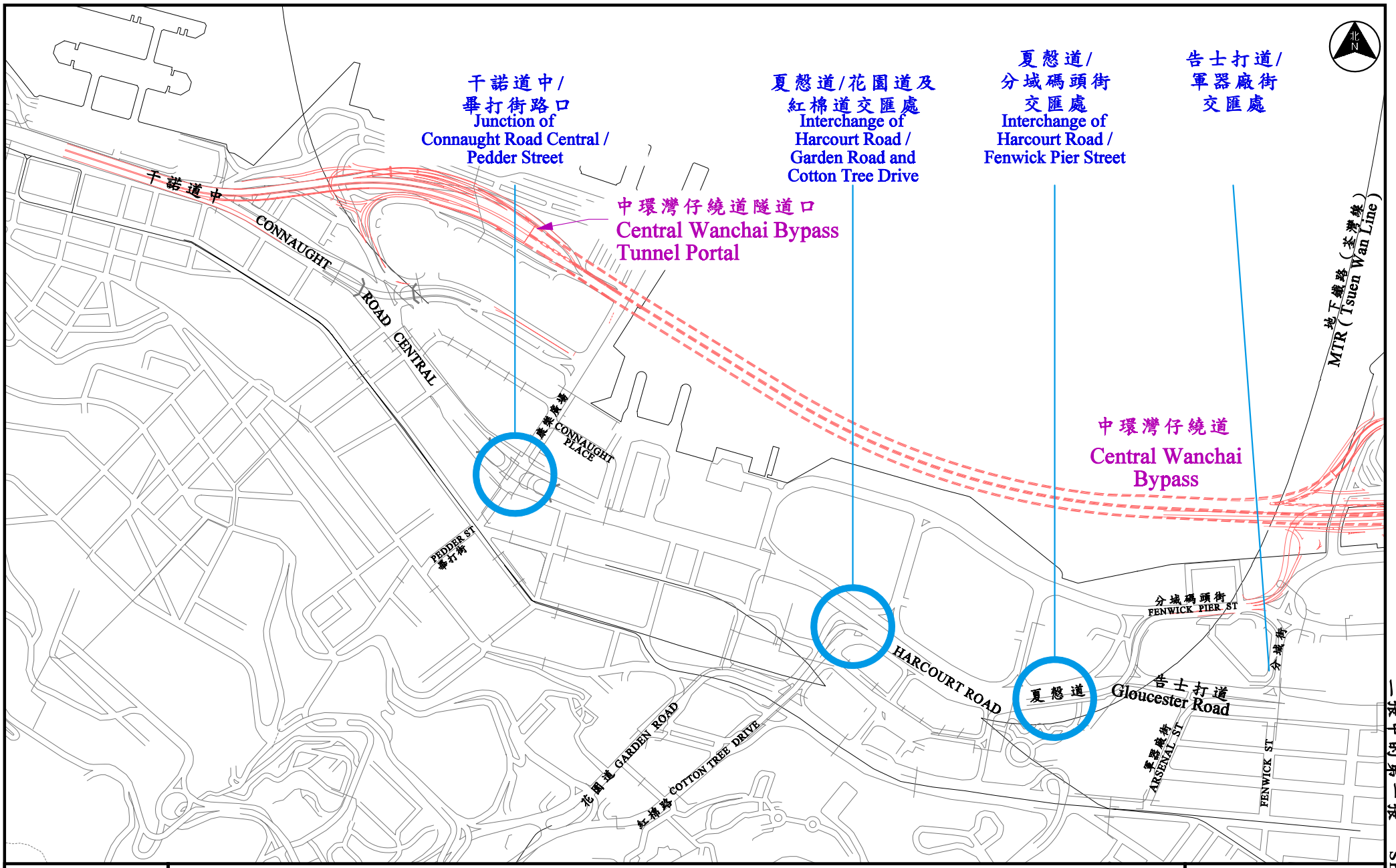

圖1.2
Figure 1.2

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Sheet 1 of 2

中環-灣仔繞道 (前方案)
Central - Wan Chai Bypass (Former Scheme)

運輸署
Transport Department

附件 1.2
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Appendix 1.2
Sheet 1 of 2

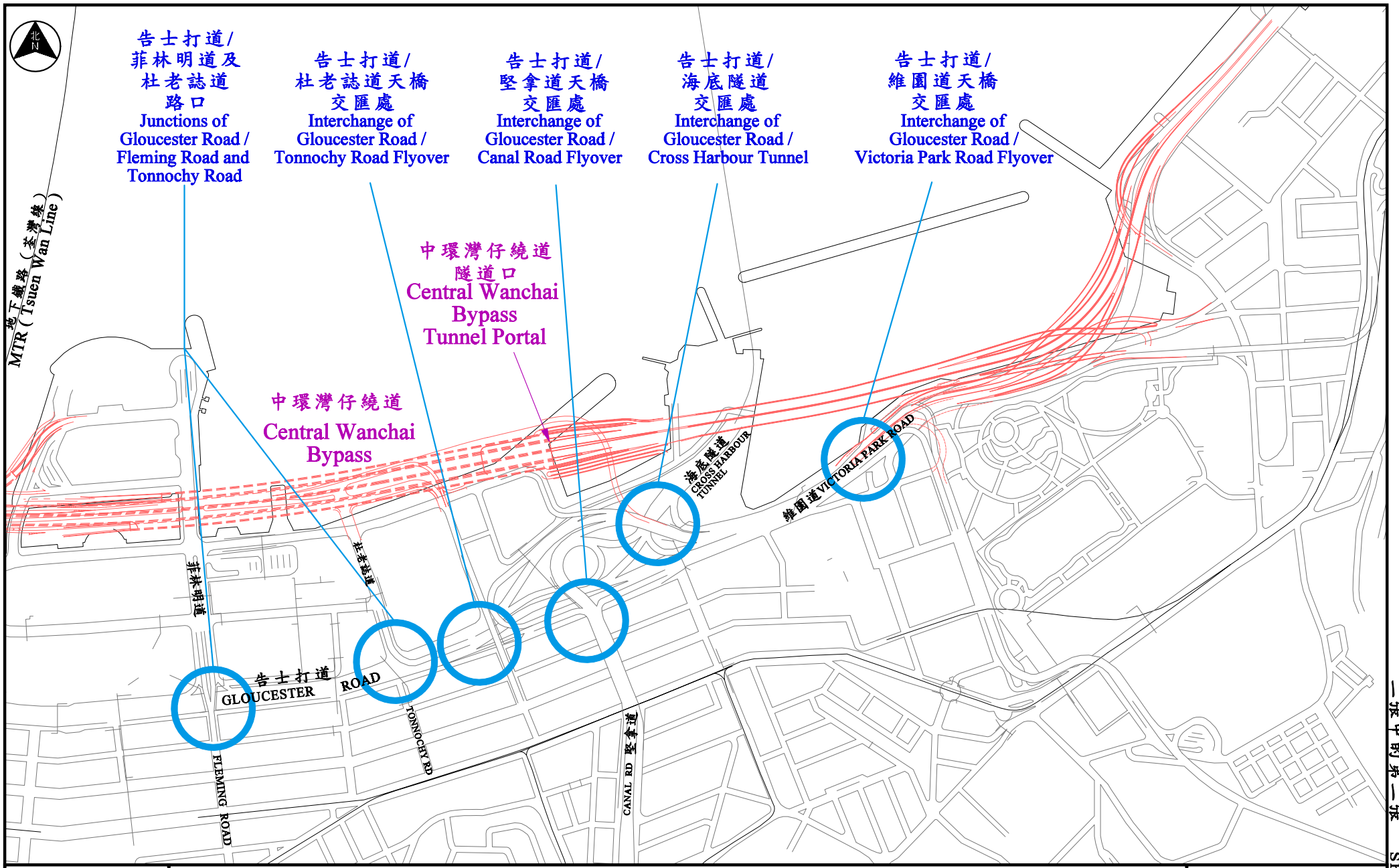

圖1.2
Figure 1.2

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Sheet 1 of 2

中環-灣仔繞道 (前方案)
Central - Wan Chai Bypass (Former Scheme)

運輸署
Transport Department

附件 1.2
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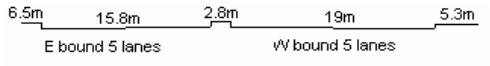
Appendix 1.2
Sheet 2 of 2

Appendix 2

YEAR	2004	**LINK**	GLOUCESTER RD (from ARSENAL ST to CROSS HARBOUR TUNNEL S. INT)
CORE STATION	1028		
ROAD NETWORK	MAJOR		
ROAD TYPE	URBAN TRUNK ROAD		



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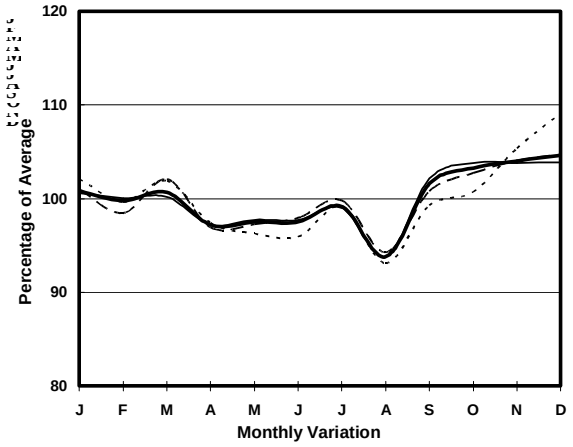

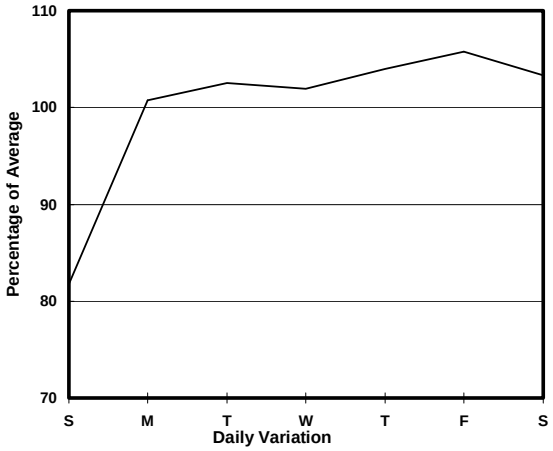

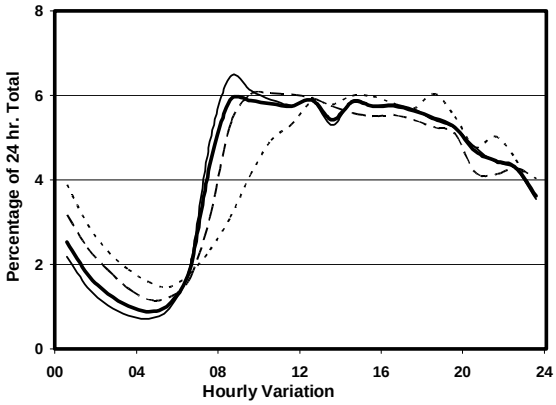

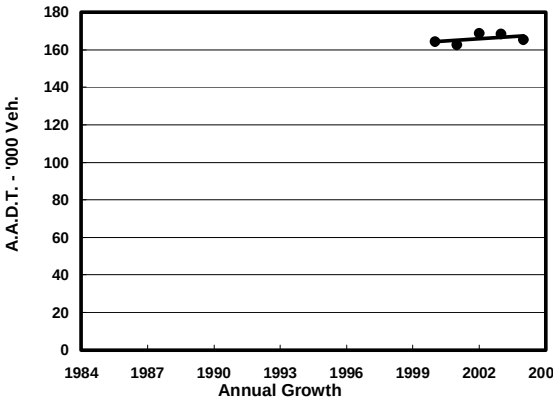

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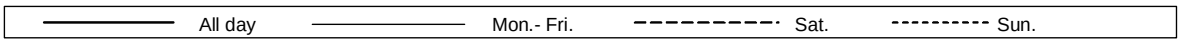
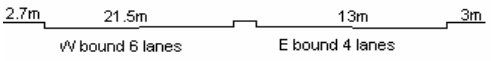


2. TRAFFIC CHARACTERISTICS (BY DIRECTION)

Parameter	All - Day	Mon. - Fri.	Sat.	Sun.
EAST BOUND				
A.A.D.T.	74030	77430	74670	61510
R 12 / 24 - %	67.4	68.8	65.2	61.4
R 16 / 24 - %	86.8	88.4	83.1	81.5
AM Peak Hour	0900-1000	0900-1000	0900-1000	0900-1000
One-way flow at AM peak hour	4420	4910	4340	2340
T - % (AM)	-	-	-	-
PM Peak Hour	1600-1700	1600-1700	1600-1700	1800-1900
One-way flow at PM peak hour	4320	4520	4210	3860
T - % (PM)	-	-	-	-
Prop.of commercial vehicles - 16 hr.	-	-	-	-
WEST BOUND				
A.A.D.T.	90990	94210	97500	74630
R 12 / 24 - %	67.3	68.8	65.7	60.5
R 16 / 24 - %	85.3	86.7	83.1	79.9
AM Peak Hour	0800-0900	0800-0900	0900-1000	0900-1000
One-way flow at AM peak hour	5450	6140	6040	3270
T - % (AM)	-	-	-	-
PM Peak Hour	1700-1800	1700-1800	1600-1700	1800-1900
One-way flow at PM peak hour	5220	5480	5300	4360
T - % (PM)	-	-	-	-

YEAR	2004	**LINK**	HARCOURT RD (from TAMAR ST to ARSENAL ST)
CORE STATION	1001		
ROAD NETWORK	MAJOR		
ROAD TYPE	URBAN TRUNK ROAD		



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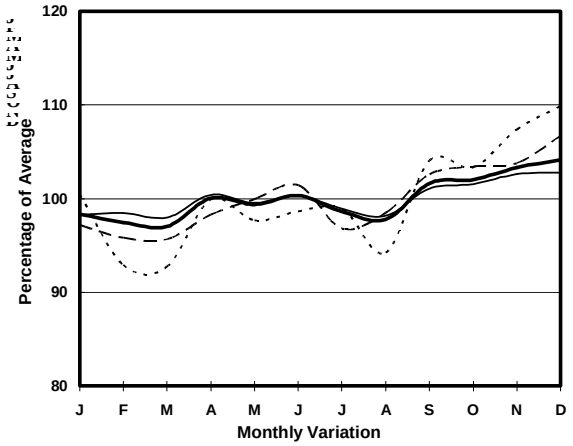

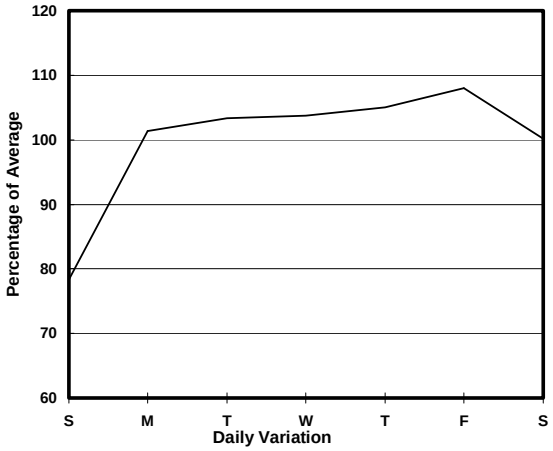

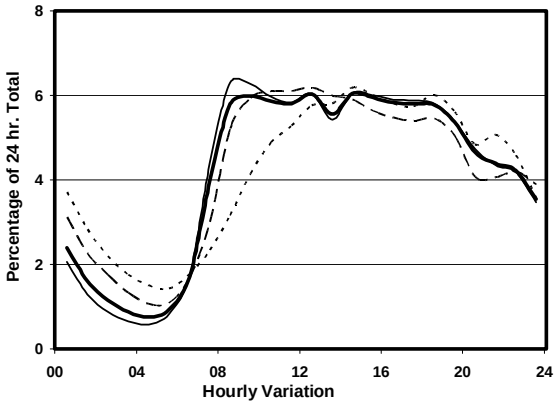

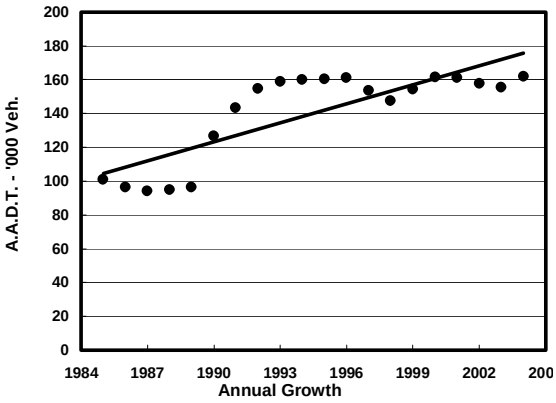

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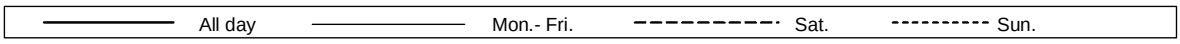
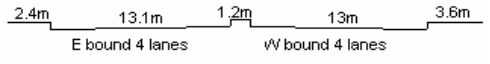


2. TRAFFIC CHARACTERISTICS (BY DIRECTION)

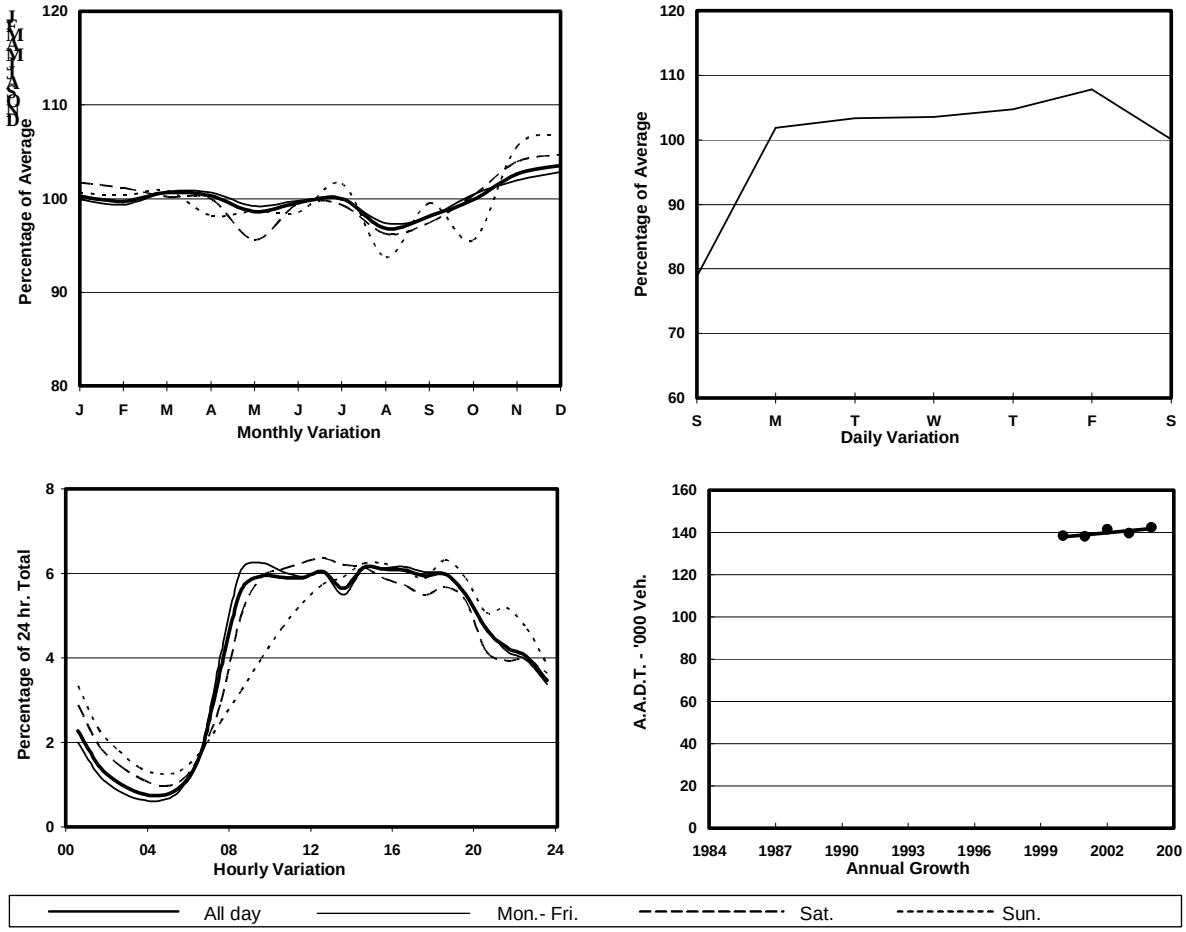
Parameter	All - Day	Mon. - Fri.	Sat.	Sun.
EAST BOUND				
A.A.D.T.	61780	64410	63480	51880
R 12 / 24 - %	67.2	68.5	65.6	60.7
R 16 / 24 - %	86.1	87.7	82.8	80.5
AM Peak Hour	0900-1000	0800-0900	0900-1000	0900-1000
One-way flow at AM peak hour	3670	4120	3650	2090
T - % (AM)	-	11.1	-	-
PM Peak Hour	1600-1700	1600-1700	1600-1700	1800-1900
One-way flow at PM peak hour	3580	3770	3490	3100
T - % (PM)	-	6.4	-	-
Prop.of commercial vehicles - 16 hr.	-	6.8	-	-
WEST BOUND				
A.A.D.T.	100260	106510	100510	76770
R 12 / 24 - %	69.2	70.8	67	61.5
R 16 / 24 - %	87.6	89.1	84.5	81.8
AM Peak Hour	0900-1000	0900-1000	0900-1000	0900-1000
One-way flow at AM peak hour	6040	6680	6100	3250
T - % (AM)	-	7	-	-
PM Peak Hour	1800-1900	1800-1900	1800-1900	1800-1900
One-way flow at PM peak hour	6060	6540	5550	4640
T - % (PM)	-	7.2	-	-

YEAR 2004 **LINK** CONNAUGHT RD C & UNDERPASS (from PEDDER ST to COTTON TREE DRIVE)

CORE STATION 1030
ROAD NETWORK MAJOR
ROAD TYPE URBAN TRUNK ROAD



1. TRAFFIC FLOW VARIATION AND GROWTH



2. TRAFFIC CHARACTERISTICS (BY DIRECTION)

Parameter	All - Day	Mon. - Fri.	Sat.	Sun.
EAST BOUND				
A.A.D.T.	79040	82600	80120	66400
R 12 / 24 - %	68.4	69.7	67	61.8
R 16 / 24 - %	87.3	88.5	84.6	82.8
AM Peak Hour	0900-1000	0900-1000	0900-1000	0900-1000
One-way flow at AM peak hour	4690	5200	4630	2530
T - % (AM)	-	-	-	-
PM Peak Hour	1600-1700	1600-1700	1600-1700	1800-1900
One-way flow at PM peak hour	4780	5020	4600	4220
T - % (PM)	-	-	-	-
Prop.of commercial vehicles - 16 hr.	-	-	-	-
WEST BOUND				
A.A.D.T.	63140	67330	63570	46740
R 12 / 24 - %	69.9	71.2	68.7	62.6
R 16 / 24 - %	87.9	88.9	85.9	83.2
AM Peak Hour	0900-1000	0900-1000	0900-1000	0900-1000
One-way flow at AM peak hour	3770	4170	3860	1980
T - % (AM)	-	-	-	-
PM Peak Hour	1600-1700	1600-1700	1800-1900	1800-1900
One-way flow at PM peak hour	3870	4210	3640	2930
T - % (PM)	-	-	-	-

Appendix 3

Modelling Technique and Input Assumptions Adopted in Recent Re-run of CTS-3 Model

1 Modelling Technique

The 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 vehicle movements in Hong Kong and identifies constraints in the road network system.

2 Population and Employment

The population and employment adopted are shown in **Table 1**.

Table 1 : Population and Employment

POPULATION (in thousands)

Year	2002	2003	2016	Average annual growth rate
District				2002-2016[1]
HK Island	1,311	1,273	1,302	0.0%
Kowloon	2,078	2,067	2,468	1.2%
New Territories	3,460	3,505	4,177	1.4%
Territory Total	**6,849**	**6,845**	**7,947**	**1.1%[2]**

EMPLOYMENT (in thousands)

Year	2002	2003	2016	Average annual growth rate
District				2002-2016[3]
HK Island	991	935	1,037	0.3%
Kowloon	1,104	1,063	1,256	1.0%
New Territories	1,078	1,009	1,362	1.7%
Territory Total	**3,172**	**3,007**	**3,655**	**1.0%[4]**

1 Year 2003 was affected by SARS and hence Year 2002 instead of Year 2003 was used as the base for the growth rate.

2 As a comparison, the average population growth rate was 0.8% per annum from 1996 to 2004 based on C&SD statistics.

3 Year 2003 was affected by SARS and hence Year 2002 instead of Year 2003 was used as the base for the growth rate.

3 Economic Growth

The Gross Domestic Product (GDP) annual growth rates are assumed to be 5% for 2005, 4% for the four-year period between 2006 – 2009, and 3.5% for from 2010 onward.[5]

4 Vehicle Fleet Sizes

The private vehicle fleet size and goods vehicle fleet sizes at end 2004 were 377,000 and 110,000 respectively. The assumed growth rates of private vehicle and goods vehicle fleet sizes are 2.2%[6] and 0.5%[7] per annum respectively from 2004 onward[8].

5 Tunnel Tolls

Tolls are assumed to remain constant in real terms over time.

6 Rail Network Assumptions for 2016

The rail network assumptions for 2016 (in addition to existing rail network) are as follows:

- Sheung Shui to Lok Ma Chau Spur Line
- Kowloon Southern Link
- Kwun Tong Line Extension
- Shatin to Central Link
- Express Rail Link and Northern Link
- West Hong Kong Island Line (from Sheung Wan to Kennedy Town)
- South Hong Kong Island Line East (from South Horizons to Admiralty)

7 Road Network Assumptions

The road network assumptions for 2016 (in addition to existing network) are as follows:

Route 6 (formerly Route 11) – Central Kowloon Route
Route 6 (formerly Route 11) – Trunk Road T2 (Kai Tak – Cha Kwo Ling Link)
Route 6 (formerly Route 11) – Western Coast Road, Tseung Kwan O
Route 8 (formerly Route 9) (Tsing Yi to Sha Tin)
Link Road connecting Hong Kong – Zhuhai – Macao Bridge and North Lantau Highway
Deep Bay Link
Hong Kong Shenzhen Western Corridor
Hong Kong – Zhuhai – Macao Bridge

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4 As a comparison, the average increase in the no. of employed persons (i.e. Labour force – Unemployed Persons) from end 1996 to end 2004 (including negative effect of SARS) was 0.8% per annum. However, from Jan.2004 to May 2005, the average increase was 2.6% per annum. Figure 1 shows the historical and predicted relationship between employed persons and GDP.

5 As a comparison, the average GDP year-on-year % change from end 1995 to end 2004 (including negative effect of SARS) was 3.5% per annum. The GDP year-on-year % change in 2004 was 8.1% per annum. Fig. 2 shows the past and predicted GDP year-on-year % changes.

6 The average growth rate for private vehicles from end 1995 to end 2004 (including negative effect of SARS) was 2.3% per annum, and from Jan. 2004 to May 2005 was in the upward trend again at 2.3% per annum.

7 The average growth rate for goods vehicles from end 1995 to end 2004 was –0.7% per annum. However, from Jan. 2004 to May 2005, the average growth rate was 0.9% per annum.

8 Figure 3 shows the historical and predicted relationship between Licensed Private Vehicle Fleet and GDP.

8 Sensitivity Tests

In order to test the effects of different growth rates of population, employment and vehicle fleet sizes, a number of sensitivity tests using growth rates different from the base case have been carried out.

Sensitivity tests	Input parameters	Assumed annual growth rate to 2016		%age change of traffic demand* in test case with respect to base case in 2016 a.m. peak along the Corridor#
		Base Case*	Test Case*	
1	Population	1.1%	0.55%	-4%
	Employment	1.0%	0.50%	
2	Vehicle fleet	2.2%	1.1%	-5%
3	Population	1.1%	0.55%	-8%
	Employment	1.0%	0.50%	
	Vehicle fleet	2.2%	1.1%	
4	Population	1.1%	1.65%	+5%
	Employment	1.0%	1.50%	
5	Vehicle fleet	2.2%	3.3%	+5%
6	Population	1.1%	1.65%	+9%
	Employment	1.0%	1.5%	
	Vehicle fleet	2.2%	3.3%	

Corridor stands for the Gloucester Road/Harcourt Road/Connaught Road Central corridor.

* Under the base case, which is the basis for comparison in respect of the percentage change in traffic demand, the increase in traffic demand from 2004 to 2016 in the Corridor[9] is 30%.

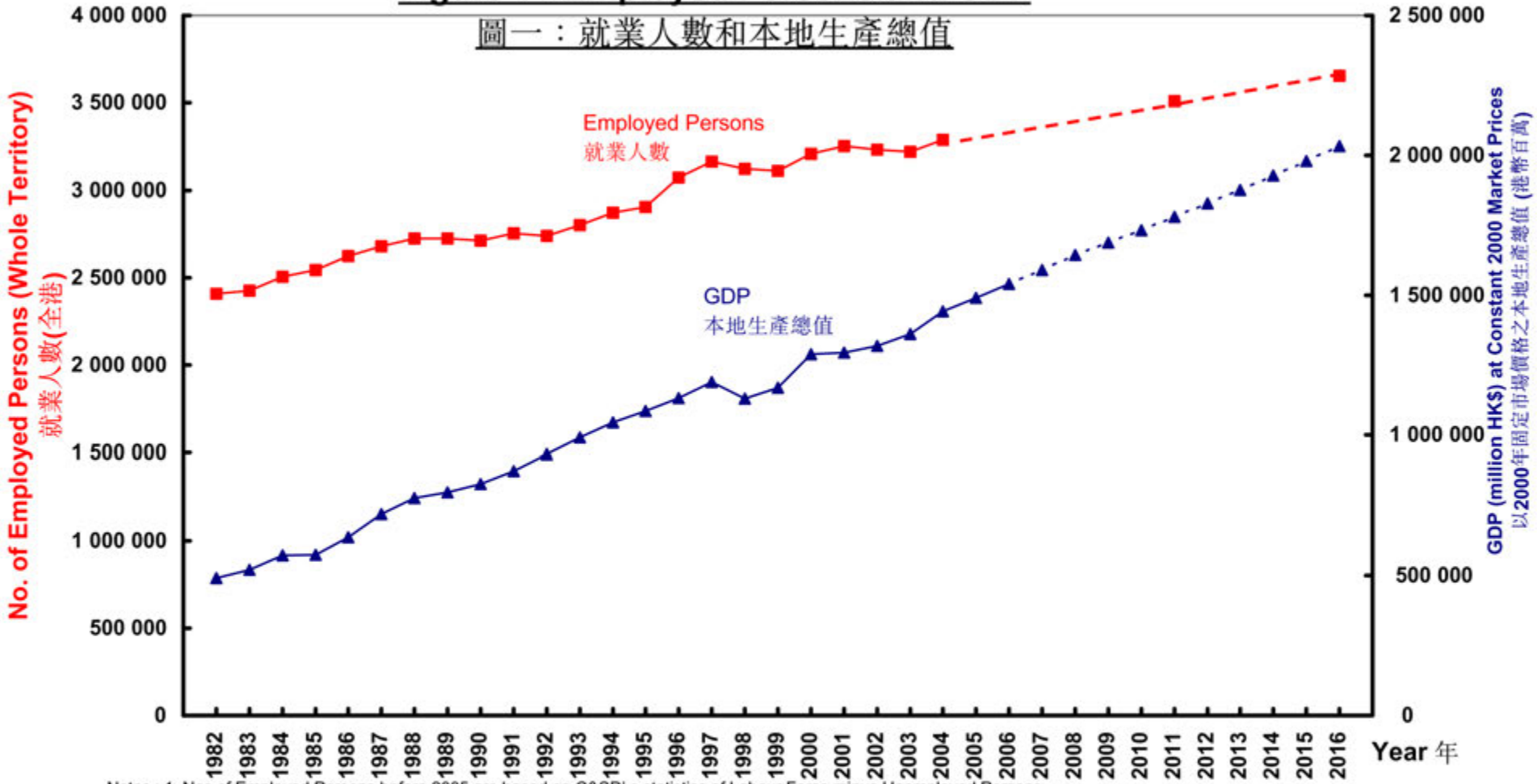
The results of the sensitivity tests show that even under a significant variation (i.e. plus or minus 50%) in the growth assumptions for the population, employment and vehicle fleet, the percentage change in demand is not significant. This reinforces the recommendation that the CWB is required and such recommendation will not be altered by a significant variation in the aforementioned input assumptions.

[9] Figure 4 shows the historical trends of population, employment and annual average daily traffic in the Corridor.

Appendix 3
附件三

Figure 1 - Employed Persons and GDP

圖一：就業人數和本地生產總值



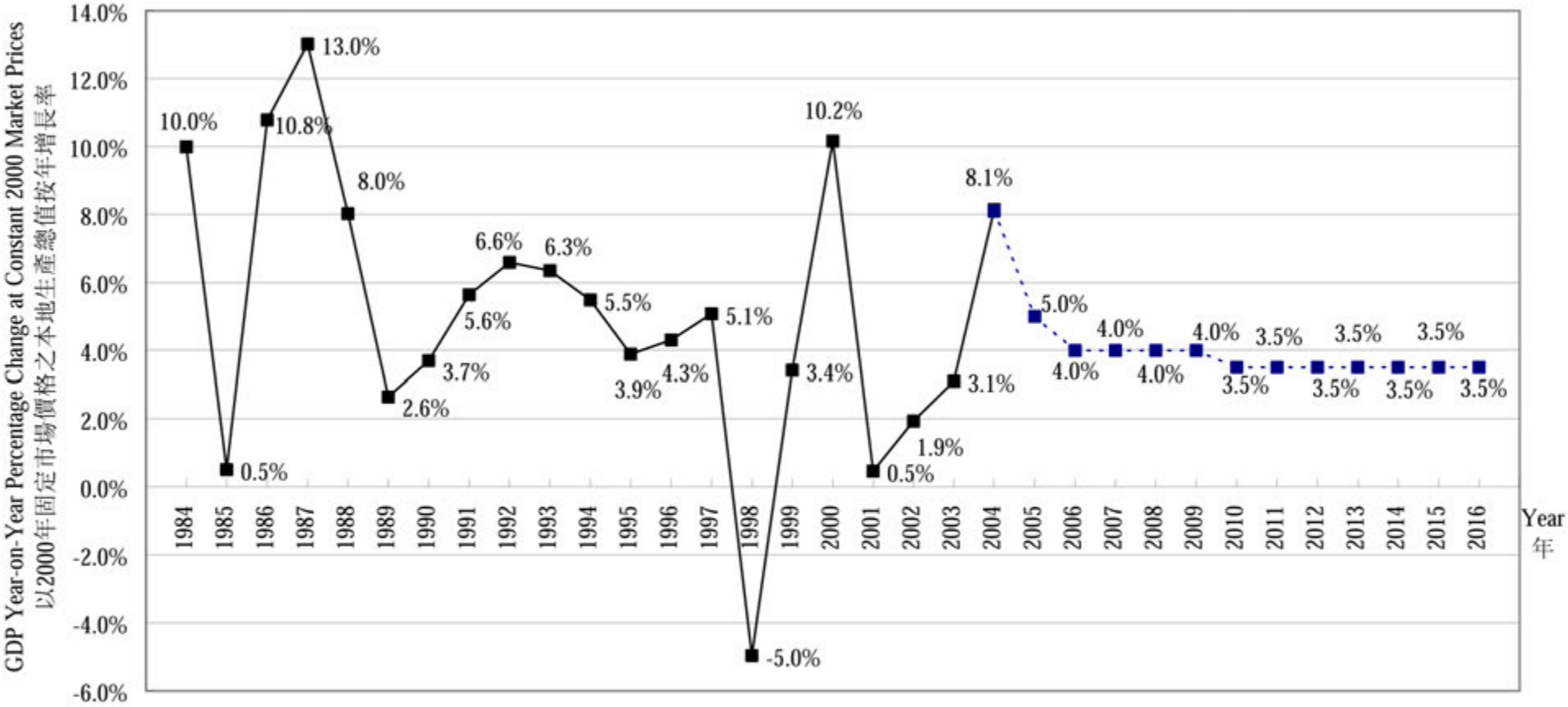
Notes : 1. Nos.of Employed Persons before 2005 are based on C&SD' s statistics of Labour Force minus Unemployed Persons.
2. Future forecasts of Employed Persons are based on PlanD' s forecast employment figures.
3. GDPs before 2005 are based on C&SD' s statistics.
4. Future forecasts of GDP were based on the following year-on-year percentage changes assumed by Transport Department in the CTS-3 model re-run : 2005=5%, 2006-09=4%, and 2010-16=3.5%.

注： (一) 2005年前之就業人數是基於政府統計處之勞動人口減去失業人數的 統計資料而得來。
(二) 就業人數的預測是基於規劃署的預計就業人數資料。
(三) 2005年以前的本地生產總值(GDP)是基於政府統計處的數據。
(四) 預測的GDP數據是基於運輸署在CTS-3更新模型中採用的以下年度變化率數據：2005年=5%,2006～2009年=4%,2010～2016年=3.5%。

Appendix 3
附件三

Figure 2 -GDP Year-on-Year Percentage Change from 1984 - 2016

圖二：由一九八四年至二零一六年，本地生產總值按年增長率的變化



Notes : 1. GDP year-on-year percentage changes before 2005 are based on C&SD's statistics.

2. GDP year-on-year percentage changes for 2005 and beyond were assumed by Transport Department in the CTS-3 model re-run.

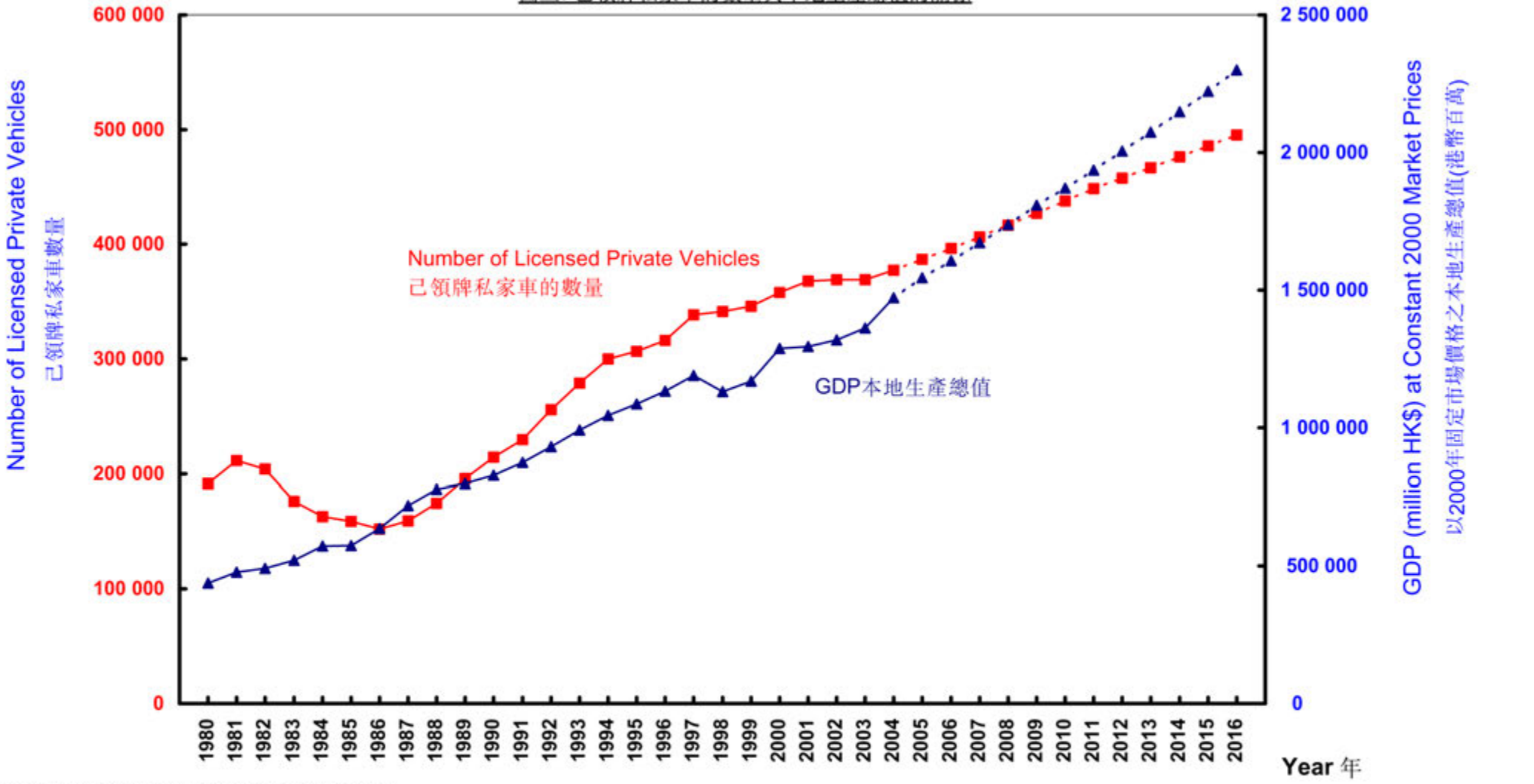
注： (一) 2005年以前本地生產總值按年增長率是基於政府統計處的統計數據。

(二) 2005年以後的本地生產總值預測是基於運輸署在CTS－3更新模型中採用的假設。

Appendix 3
附件三

Figure 3 - Number of Licensed Private Vehicles and GDP

圖三: 已領牌私家車的數量與本地生產總值的關係



Notes : 1. Private vehicles = Private Cars + Motor Cycles

2. Numbers of licensed private vehicles before 2005 are based on Transport Department' s statistics.

3. Future forecast of licensed private vehicles for 2005 and beyond are based on an assumed annual growth rate of 2.2%.

4. GDPs before 2005 are based on C&SD' s statistics.

5. Future forecasts of GDP were based on the following year-on-year percentage changes assumed by Transport Department in the CTS-3 model re-run : 2005 =5%, 2006-09 = 4%, and 2010-16 = 3.5%.

注： (一) 私家車輛總數等於私家車加上摩托車之總數。

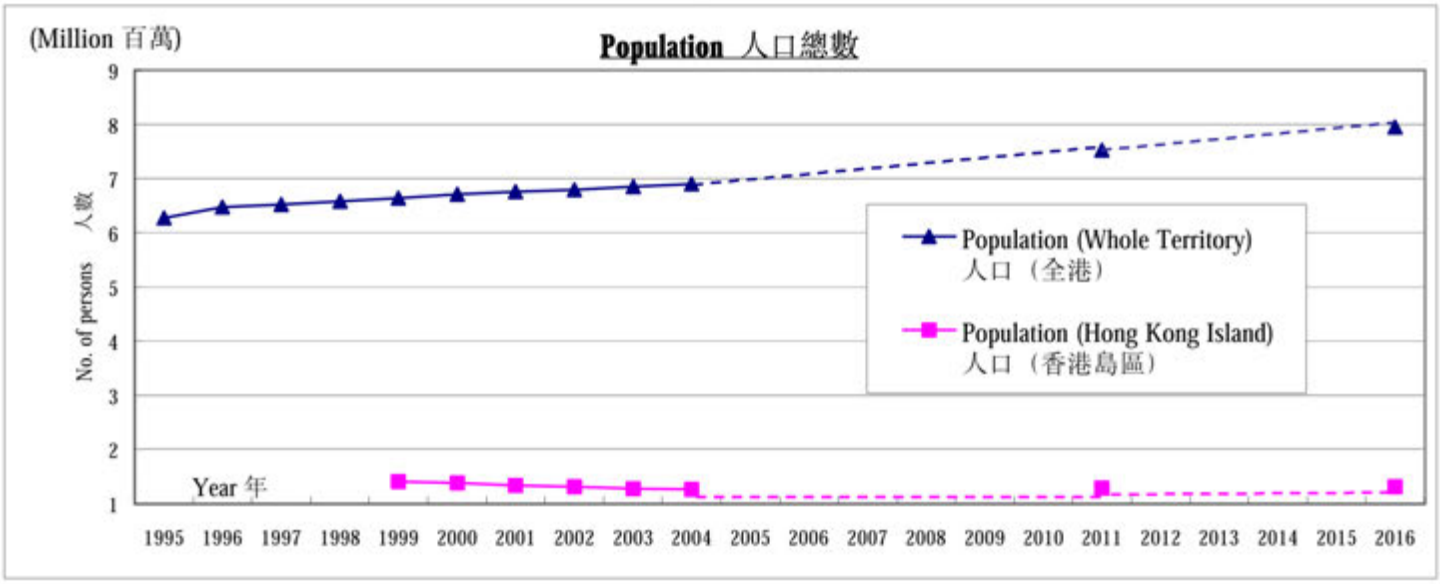
(二) 2005年以前已領牌私家車數量之數據是基於運輸署的統計數據。

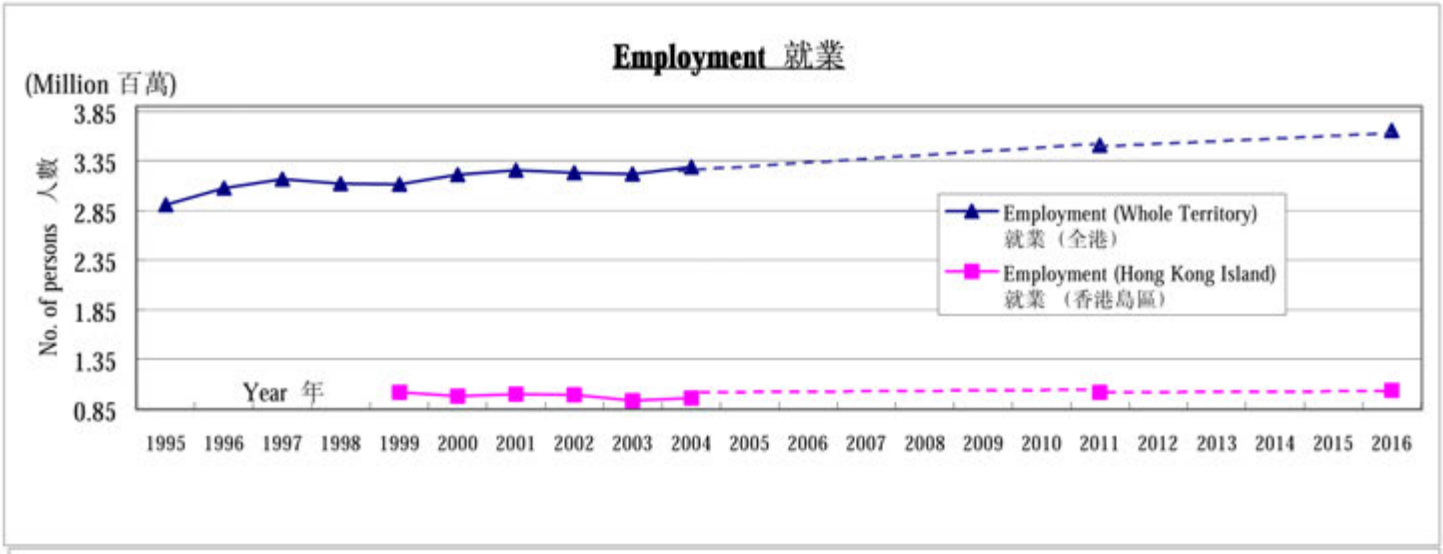
(三) 2005年或以後之已領牌私家車數量是基於每年2.2%的增長率來預計。

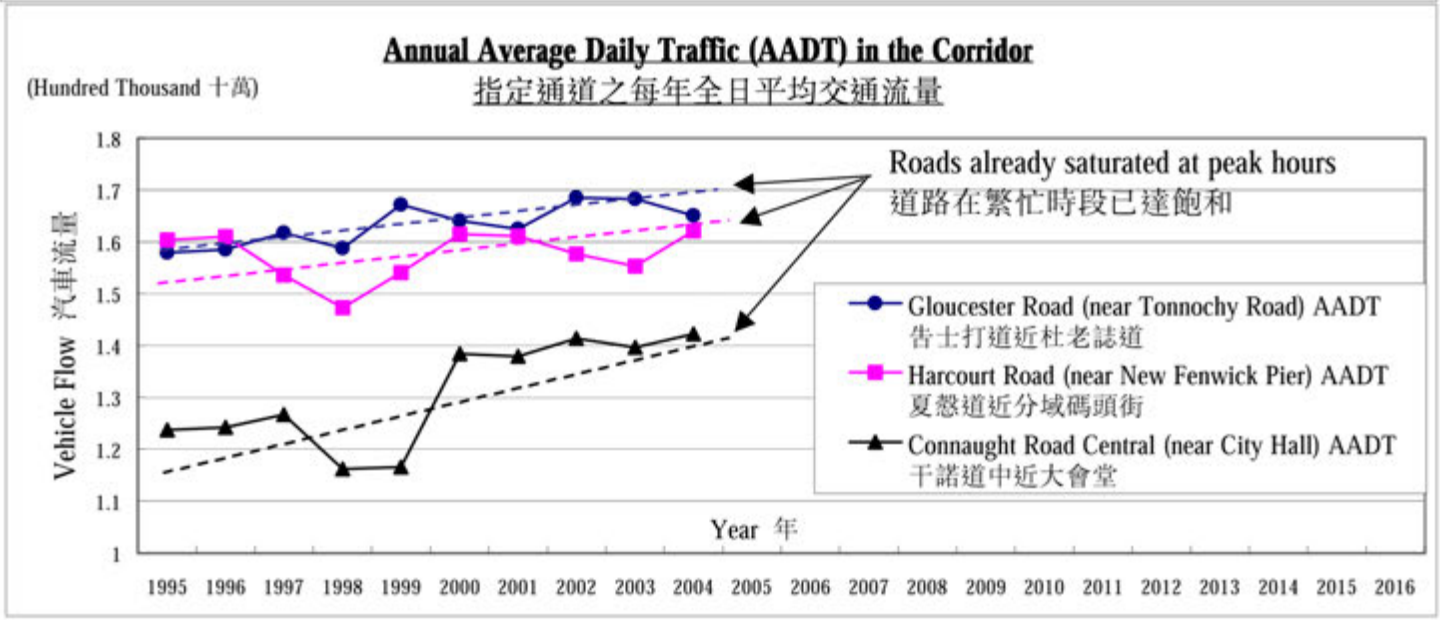
(四) 2005年以前的本地生產總值是基於政府統計處的數據

(五) 預測的GDP數據是基於運輸署在CTS－3更新模型中採用的以下年度變化率數據：2005年＝5%，2006～2009年＝4%，2010～2016年＝3.5%。

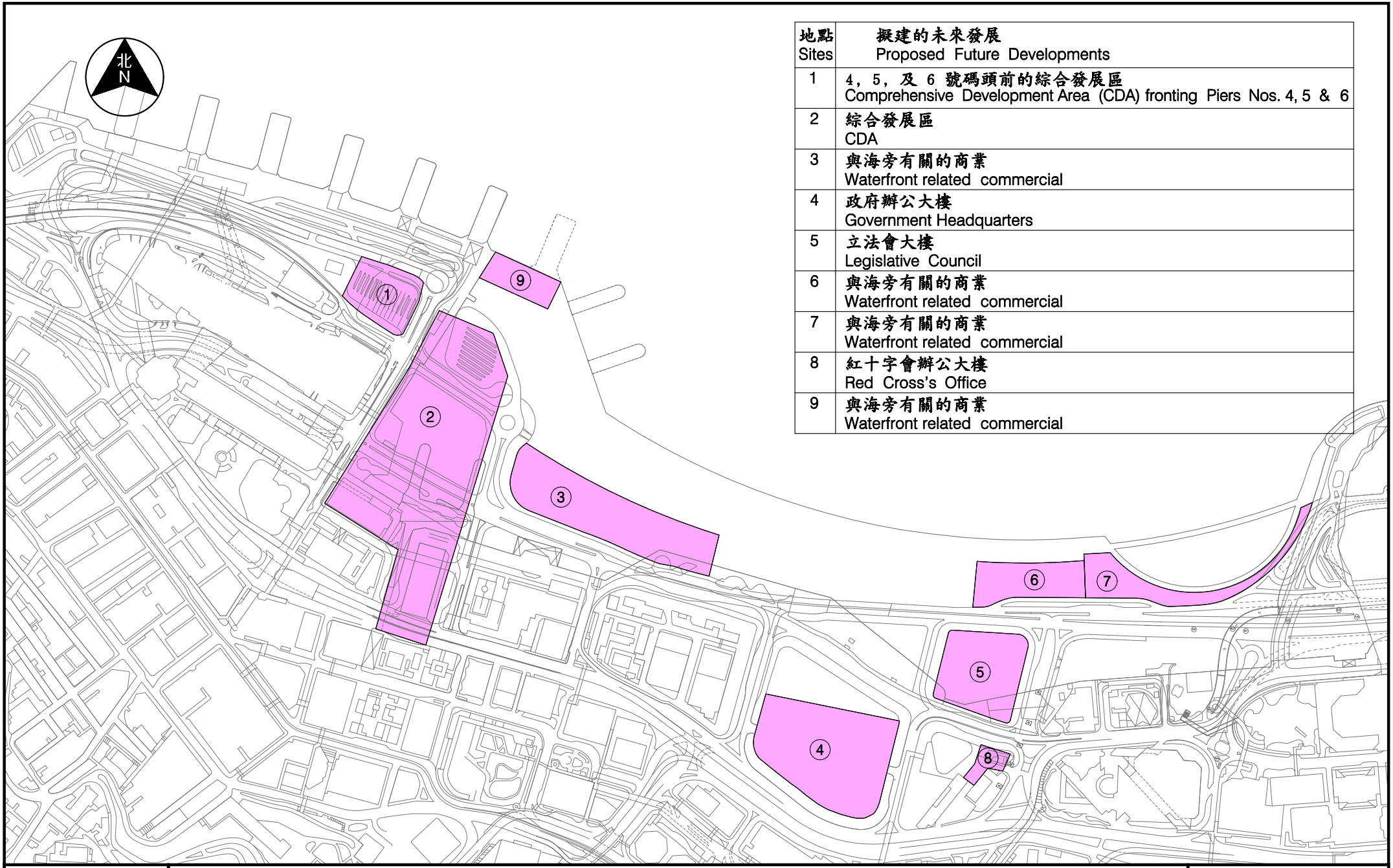
Figure 4 圖四


(Million 百萬)
Population 人口總數
No. of persons 人數
Year 年
Population (Whole Territory)
人口（全港）
Population (Hong Kong Island)
人口（香港島區）
9
8
7
6
5
4
3
2
1
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016


Employment 就業
(Million 百萬)
No. of persons 人數
Year 年
Employment (Whole Territory)
就業（全港）
Employment (Hong Kong Island)
就業（香港島區）
3.85
3.35
2.85
2.35
1.85
1.35
0.85
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016


Annual Average Daily Traffic (AADT) in the Corridor
指定通道之每年全日平均交通流量
(Hundred Thousand 十萬)
Vehicle Flow 汽車流量
Year 年
Roads already saturated at peak hours
道路在繁忙時段已達飽和
Gloucester Road (near Tonnochy Road) AADT
告士打道近杜老誌道
Harcourt Road (near New Fenwick Pier) AADT
夏慤道近分域碼頭街
Connaught Road Central (near City Hall) AADT
干諾道中近大會堂
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016

Appendix 4



地點 Sites	擬建的未來發展 Proposed Future Developments
1	4，5，及 6 號碼頭前的綜合發展區 Comprehensive Development Area (CDA) fronting Piers Nos. 4, 5 & 6
2	綜合發展區 CDA
3	與海旁有關的商業 Waterfront related commercial
4	政府辦公大樓 Government Headquarters
5	立法會大樓 Legislative Council
6	與海旁有關的商業 Waterfront related commercial
7	與海旁有關的商業 Waterfront related commercial
8	紅十字會辦公大樓 Red Cross's Office
9	與海旁有關的商業 Waterfront related commercial

圖 4.1
Figure 4.1

擬建的未來發展中環填海區
Proposed Future Developmentsat Central Reclamation Areas

運輸署
Transport Department

附件 4.1 Appendix 4.1

Appendix 4.2

Proposed Future Developments in Central Reclamation Area

Site Ref.	Intended Land Use	GFA (m^2)	Breakdowns of Land Use (GFA in m^2)
1	Comprehensive Development Area (CDA) fronting Piers Nos. 4, 5 & 6	92,465	Retail (16,315) Office (76,150)
2	CDA	190,875	Retail (106,303) Office (54,733) Commercial Parking (29,839) (850 space)
3	Waterfront related commercial	40,879	Retail (40,879)
4	Government Headquarters	342,975	Office (313,411) Parking (29,564)*
5	Legislative Council	146,087	Office (134,400) Parking (11,687)*
6	Waterfront related commercial	14,387	Retail (14,387)
7	Waterfront related commercial	10,028	Retail (10,028)
8	Red Cross's Office	19,320	Office (16,892) Parking (2,428)*
9	Waterfront related commercial	2,245	Retail (2,245)

* : Parking spaces in these buildings are for the staff only and not for commercial use and hence, will not generate additional trips.

Appendix 4.3

Trip Rates for Development Sites

Landuse	**Vehicle Type**	**AM**		**PM**	
		In	**Out**	**In**	**Out**
Office (pcu/hr/100m^2GFA)	PV+GV	0.320	0.230	0.300	0.310
Retail (pcu/hr/100m^2GFA)	PV+GV	0.270	0.180	0.250	0.230
Community Facilities (pcu/hr/100m^2GFA)	PV+GV	0.235	0.235	0.115	0.115
Government Office (pcu/hr/100m^2GFA)	PV+GV	0.252	0.164	0.141	0.173
Commercial Carpark (pcu/hr/space)	PV	0.210	0.030	0.110	0.230

(Note : PV: private vehicle; GV: goods vehicle)

Trip Generation and Attractions of Developments

Site Ref.	Intended Land Use	AM		PM	
		In	Out	In	Out
1	Comprehensive Development Area (CDA) fronting Piers Nos. 4, 5 & 6	288	204	269	274
2	CDA	641	390	555	611
3	Waterfront related commercial	110	74	102	94
4	Government Headquarters	790	514	442	542
5	Legislative Council	310	310	151	151
6	Waterfront related commercial	39	26	36	33
7	Waterfront related commercial	27	18	25	23
8	Red Cross's Office	40	40	20	20
9	Waterfront related commercial *	115*	124*	106*	109*

* : Trips from site 9 include trips generated by commercial (retail) and trips to/from "Star Ferry".

(Note : Trips are in PCU per hr.)

2016 V/C Ratios of Major Road Links (Peak Hour Flow)

(See Location Plan at Appendix 4.8)

Appendix 4.5

				Scenario A		Scenario B		Scenario C		Recently Observed Traffic Flows		
Eastbound	Near	No. of Lane	Capacity	Flow	V/C	Flow	V/C	Flow	V/C	No. of Lanes	Peak Flow	Flow Condition
Connaught Road Central	Exchange Square	5	6000	5800	0.97	7650	1.28	6150	1.03	5	5595	Over Saturate
Connaught Road Central	Jardine House	5	5300	4100	0.77	6400	1.21	4350	0.82	5	5960	Over Saturate
Harcourt Road		4	5400	3750	0.69	7250	1.34	4000	0.74	4	5440	Saturate
Gloucester Road	Immigration Tower	5	5100	4650	0.91	6550	1.28	5650	1.11		Not Available	
Gloucester Road	Marsh Road	4	4800	4400	0.92	5900	1.23	5400	1.13	4	5350	Over Saturate
Westbound												
Victoria Park Road	IEC Exit	3	3900	2250	0.58	6050	1.55	3350	0.86		Not Available	
Inner Gloucester Road	Excelsior	3	2400	2600	1.08	3200	1.33	2550	1.06	3	3000	Over Saturate
Outer Gloucester Road		4	5400	2900	0.54	6650	1.23	4150	0.77	4	5550	Saturate
Gloucester Road	Fleming Rd	4	5400	4700	0.87	7200	1.33	5200	0.96	4	6100	Saturate
Harcourt Road	Admiralty Centre	6	7300	7100	0.97	9800	1.34	7100	0.97	6	8550	Over Saturate
Connaught Road Central	Jardine House	4	5400	5200	0.96	7600	1.41	5200	0.96	4	5175	Over Saturate

Notes :

1 Flow / capacity in pcu/hr

2 V/C is the flow to capacity ratio

3 The above v/c ratios are average values taking into account the average traffic condition on different lanes towards different destinations. Many of these road sections are physically separated or have been divided by lane markings into different routes (eg. one lane to Canal Road, one lane to North Point and two lanes to CHT) and the demand for different routes are different. The v/c for individual routes could be much higher.

4 The above v/c ratios have not reflected knock-on effects from traffic queues extending from downstream bottle-necks. The knock-on effect would aggravate the traffic situation at uptream sections and as a result the congestion at upstream sections would be more serious than indicated by the v/c ratios.

Junction Capacity Assessment Results at Central (Peak Hour Flow)

(See Location Plan at Appendix 4.8)

No.	Junction	Scenario A	Scenario B	Scenario C
1	Pedder Street / Des Voeux Road Central	6%	2%	6%
2	Harcourt Road / Cotton Tree Drive	14%	-16%	4%
3	Queen's Road Central / Ice House Street	5%	-3%	5%
4	Man Po Street / Man Yiu Street / Road P1	2%		-15%
5	Man Cheung Street / Man Yiu Street / Road P2	6%	-5%	13%
6	Man Yiu Street / Harbour View Street / Connaught Place	37%	-6%	37%
7	Connaught Road C / Pedder Street	12%	-15%	12%
8	Connaught Road C / Connaught Place	50%	-30%	50%

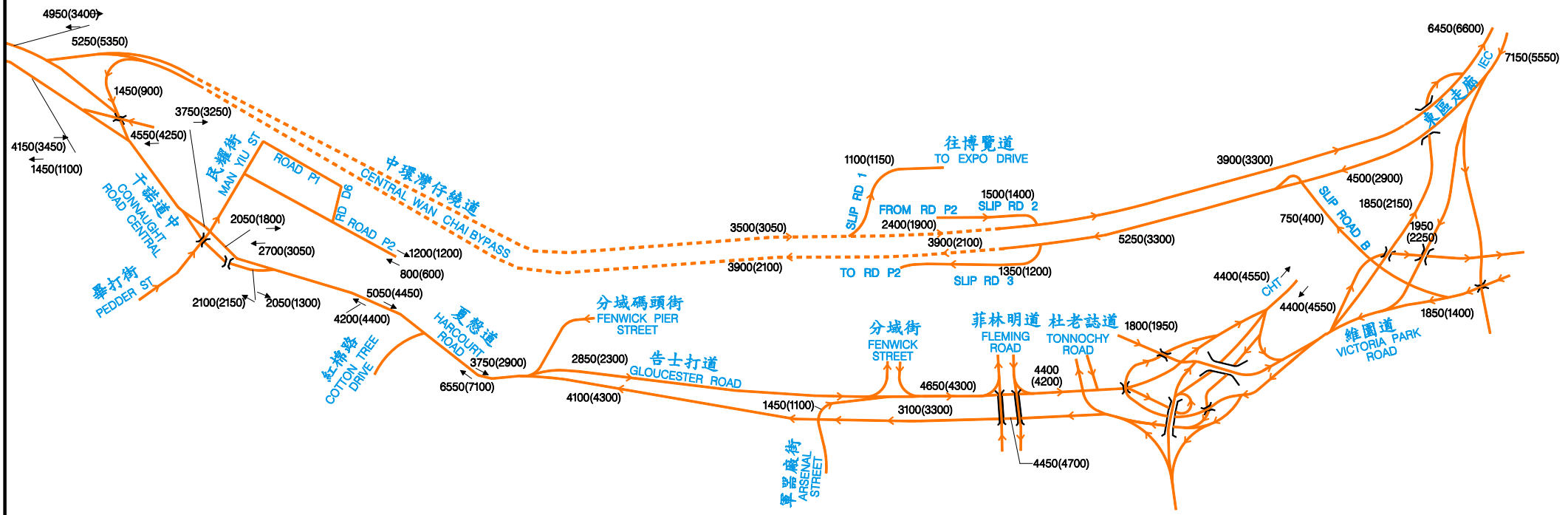
Junction Capacity Assessment Results at Wan Chai (Peak Hour Flow)

No.	Junction	Scenario A	Scenario B	Scenario C
9	Expo Drive / Expo Drive East	0.69	0.37	0.41
10	Road P2 / Fleming Road	41%	-	17%
11	Road P2 (or Hung Hing Road) / Tonnochy Road	15%	-14%	3%
12	Harbour Road / Fenwick Pier Street	0.86	-22%	0.80
13	Fleming Road / Harbour Road			-25%

Notes:

(1) The figures present in percentage term are Reserve Capacity (RC) for signal controlled junctions.

(2) The figures present in decimal points are Design Flow to Capacity (DFC) for priority junctions and roundabouts.



圖例
LEGEND

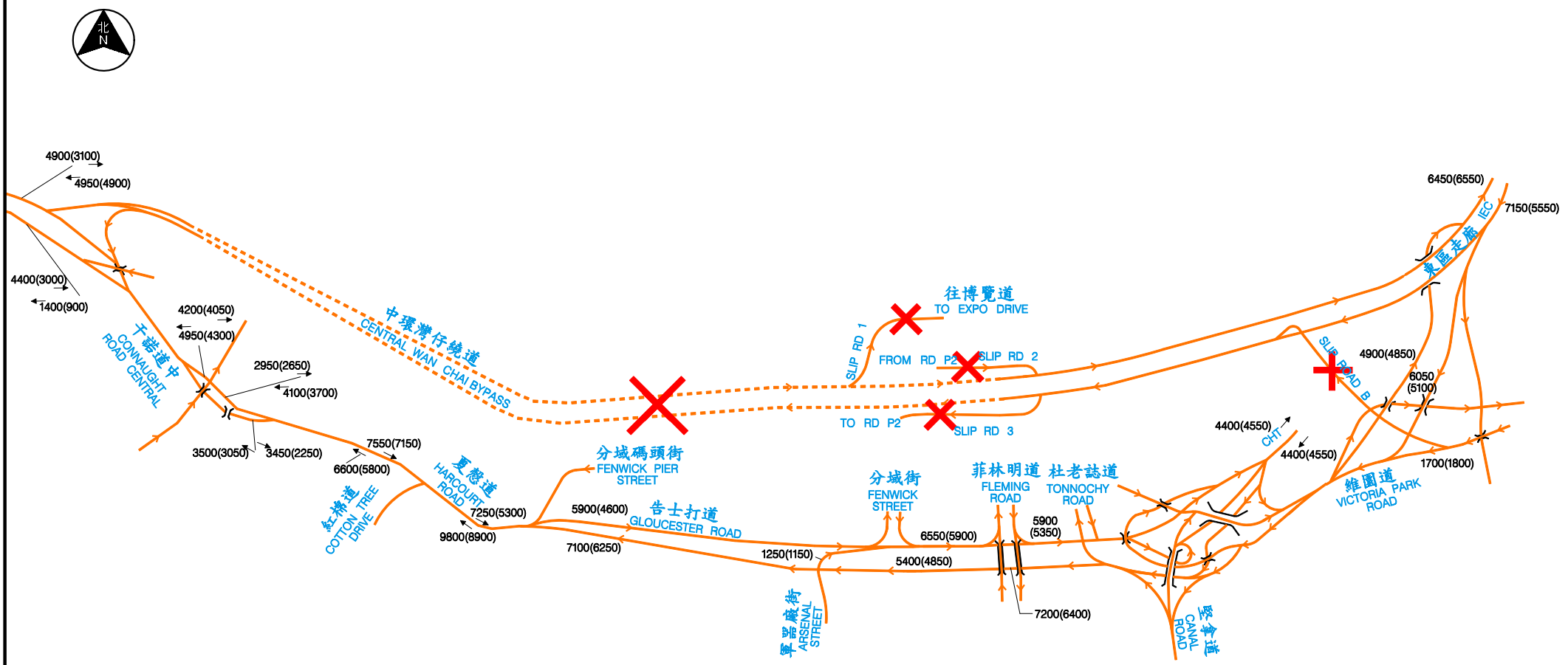
6550	上午繁忙時段的交通流量（PCU/小時） AM PEAK HOUR TRAFFIC FLOWS (PCU/HR)
(7150)	下午繁忙時段的交通流量（PCU/小時） PM PEAK HOUR TRAFFIC FLOWS (PCU/HR)

圖一
Figure 1

2016 交通預測(方案A)
2016 TRAFFIC FORECAST (SCENARIO A)

運輸署
Transport Department

附件4.7 三張中的第一張 Appendix 4.7 Sheet 1 of 3



圖例
LEGEND

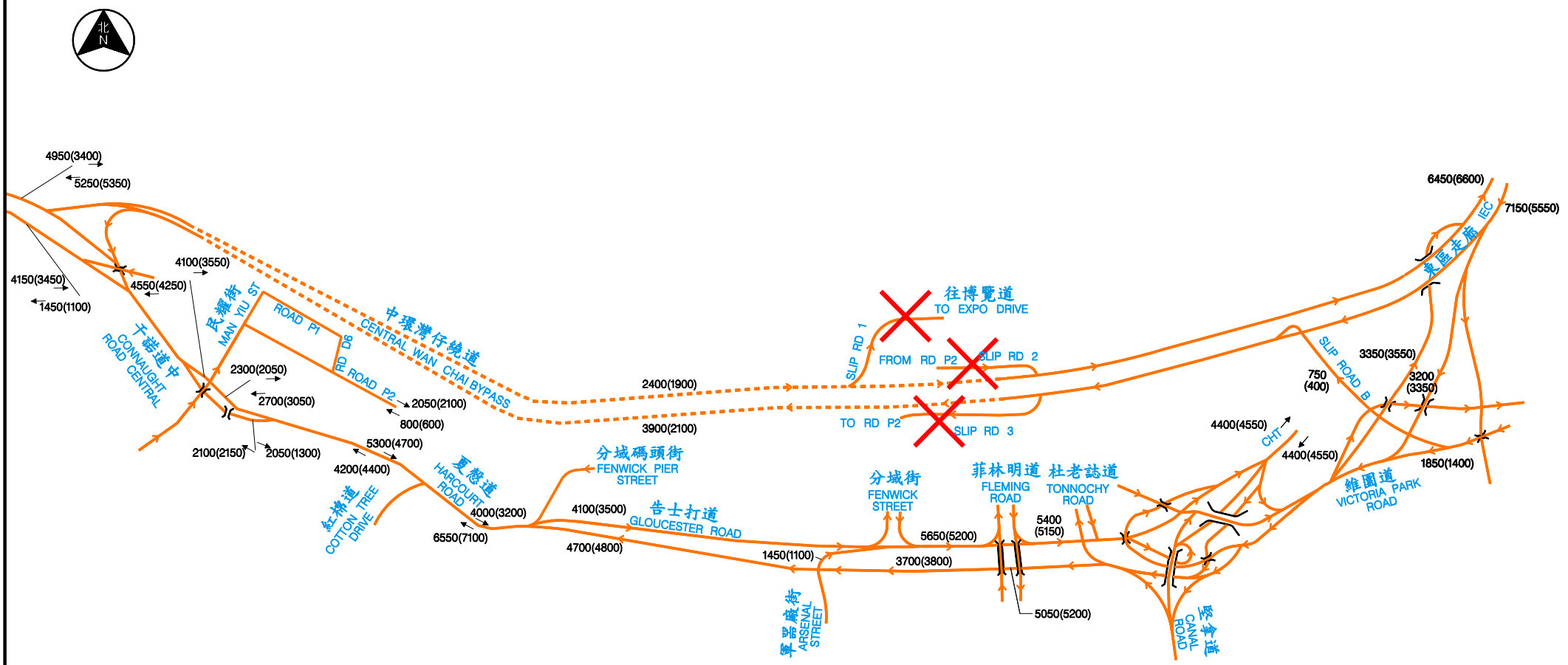
3450 上午繁忙時段的交通流量（PCU/小時）
AM PEAK HOUR TRAFFIC FLOWS (PCU/HR)

(2250) 下午繁忙時段的交通流量（PCU/小時）
PM PEAK HOUR TRAFFIC FLOWS (PCU/HR)

圖二
Figure 2

2016 交通預測(方案B)
2016 TRAFFIC FORECAST (SCENARIO B)

運輸署
Transport Department



圖例
LEGEND

2100	上午繁忙時段的交通流量（PCU/小時） AM PEAK HOUR TRAFFIC FLOWS (PCU/HR)
(2150)	下午繁忙時段的交通流量（PCU/小時） PM PEAK HOUR TRAFFIC FLOWS (PCU/HR)

圖三
Figure 3

2016 交通預測(方案C）
2016 TRAFFIC FORECAST(SCENARIO C)

運輸署
Transport Department

附件 4.7
三張中的第三張
Appendix 4.7
Sheet 3 of 3

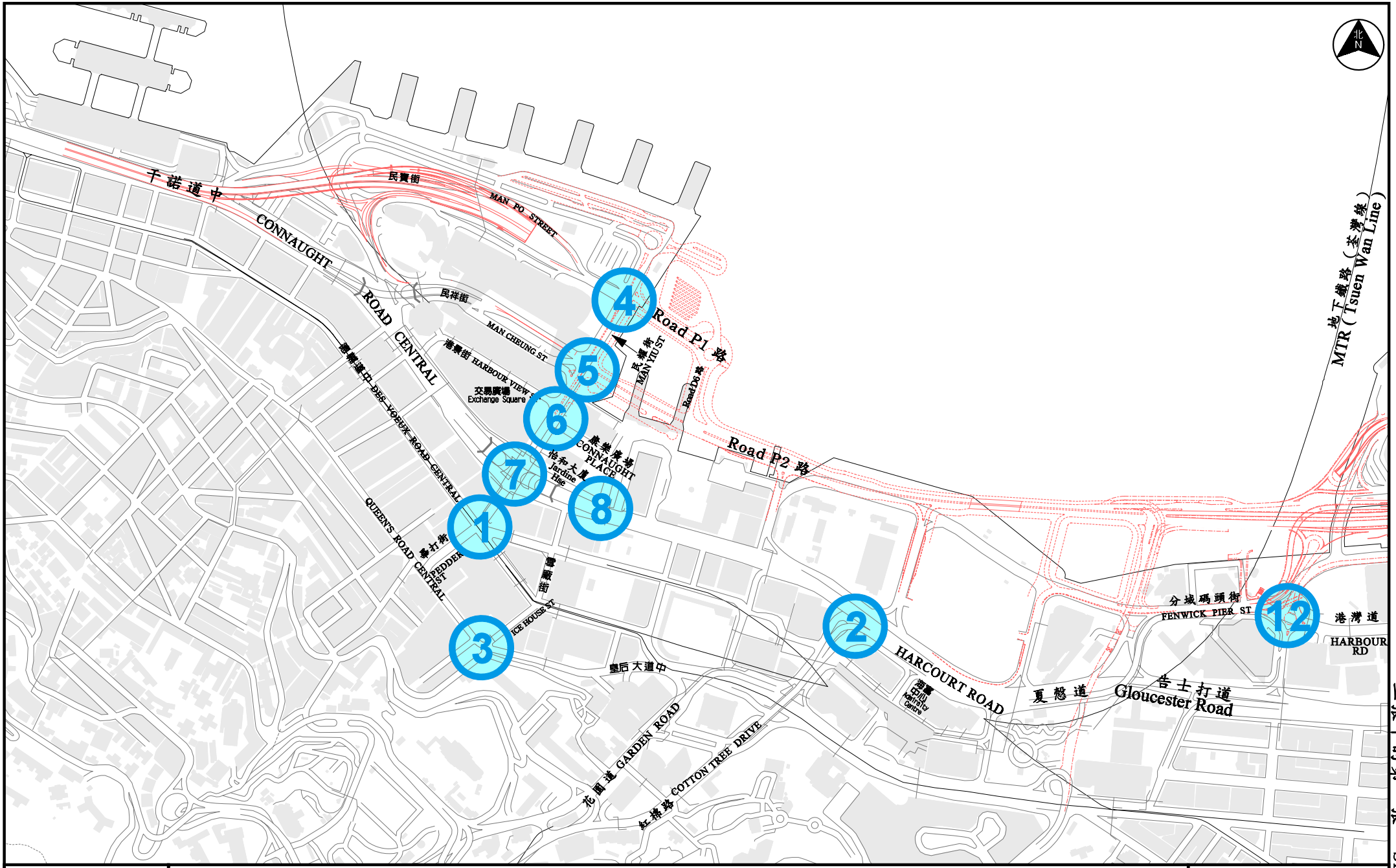


圖4.2
Figure 4.2

主要路段及路口的位置
Locations of Major Road Sections and Junctions

運輸署
Transport Department

附件4.8 二張中的第一張
Appendix 4.8 Sheet 1 of 2

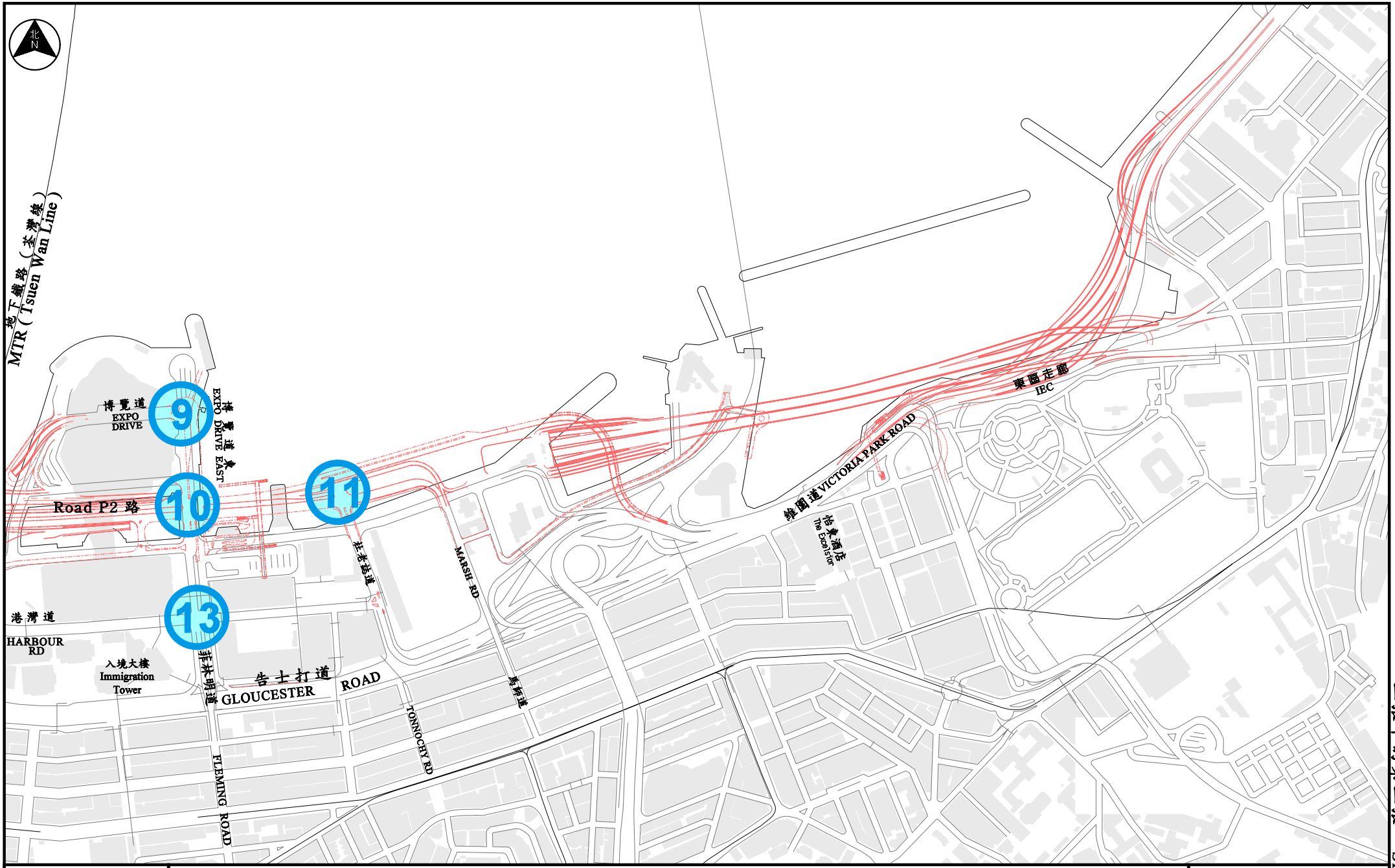


圖4.2
Figure 4.2

主要路段及路口的位置
Locations of Major Road Sections and Junctions

運輸署
Transport Department

附件4.8
二張中的第二張
Appendix 4.8
Sheet 2 of 2

CWB Expert Forum - Supplementary Note No. 1

Additional Traffic Figures

A. Historical traffic growth in the Corridor# from 1989 to 2004:

Roads	Average daily traffic (all days)		Growth % 2004/1989
	1989	2004	
Gloucester Road near Central Plaza	119,220	165,020	38%
Harcourt Road near Red Cross HQ	96,430	162,040	68%
Connaught Road Central near City Hall	89,790	142,180	58%

Corridor stands for the Gloucester Road/Harcourt Road/Connaught Road Central corridor.

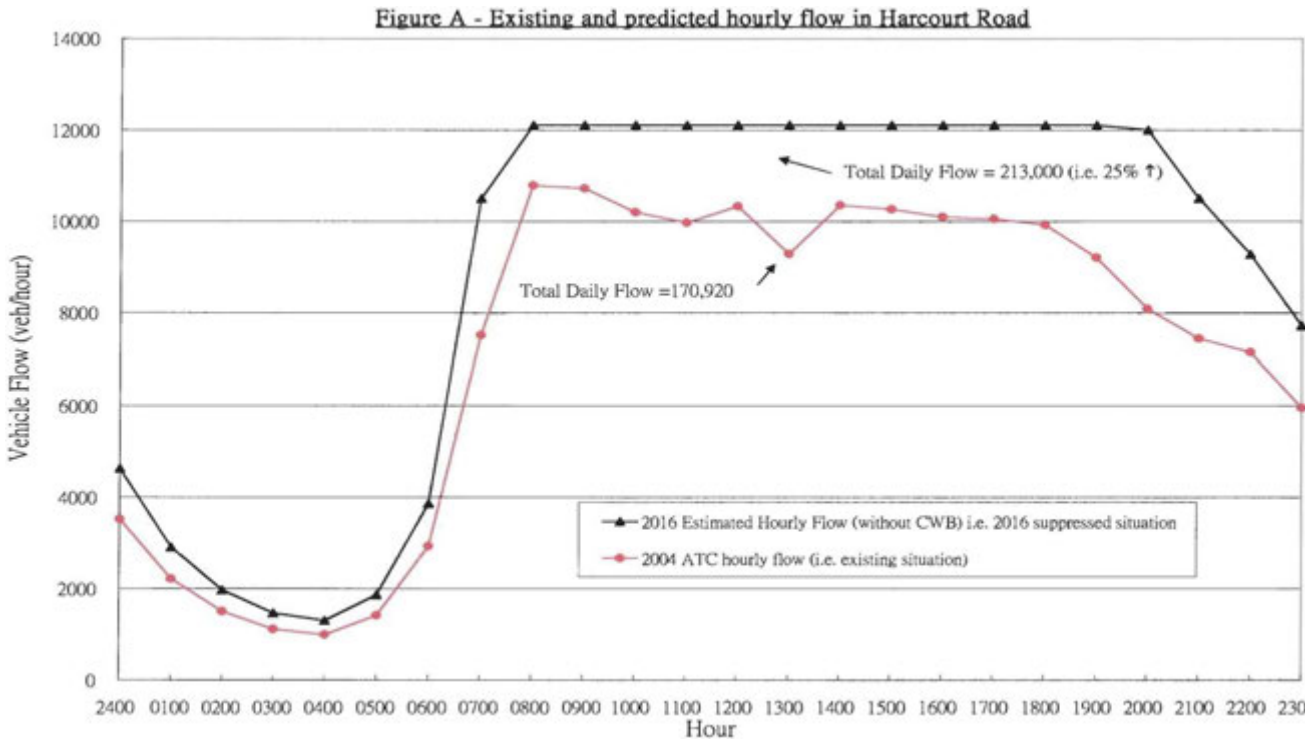
The above table shows that the traffic growth in the Corridor was about 40% to 70% in the past 15 years.

B. Predicted future traffic growth in the Corridor

Roads	2004 daily traffic (Mon-Friday)	2016 daily traffic (Mon-Friday)			
		W/o CWB		With CWB	
			Growth % 2016/04		Growth %* 2016/04
Gloucester Road near Central Plaza	172,000	215,000	26%	140,000	34%
Harcourt Road near Red Cross HQ	171,000	213,000	25%	138,000	33%
Connaught Road Central near City Hall	150,000	187,000	24%	108,000	32%
Central Wanchai Bypass (CWB)				90,000	

* Growth % is based on the Corridor combined with CWB.

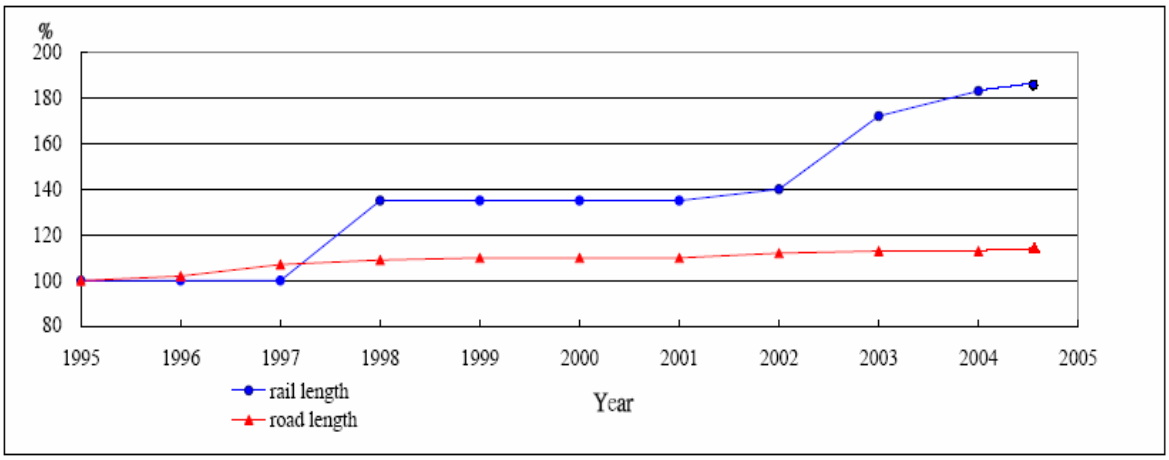
The traffic growths from 2004 to 2016 in the Corridor without CWB represent the suppressed situation due to heavy congestion. Under such suppressed situation, there will be longer queue lengths and longer periods of congestion as illustrated in Figure A below.



C. Rail/road growth comparison

Figure B below shows the total lengths of roads and rails in Hong Kong in the past 10 years. From 1995 to 2005, the total length of rails has increased by about 87% whereas the total length of roads has increased by about 13% only.

Figure B Proportional increase in rail and road lengths with reference to 1995



Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005*
Rail Length (Km)	110	110	110	148	148	148	148	154	188	201	204
Road Length (Km)	1717	1743	1831	1865	1884	1904	1911	1924	1934	1943	1948

* as at August 2005

D. <u>Passengers using the Corridor</u>

The following Table A shows an estimation of the value of time lost due to traffic congestion for the passengers using the Corridor based on the number of road users observed in 2004. It is estimated that without CWB, the average delay will become 20 minutes due to increased traffic congestion, the traffic congestion due to time lost alone will cost the passengers about $1.8 billion per year.

Table A Value of time lost based on traffic flow in 2004

	All Road Users Using Corridor (Persons)	Average Delay without CWB	Value of Time Lost (@$1/min)
Peak Hour	40,500 (80% are PT passengers)	20 minutes	$0.8 million per hour
Daily Total 8am – 8pm	299,700	20 minutes	$6.0 million per day
Yearly Total	89,920,900	20 minutes	$1.8 billion per year

-END-

CWB Expert Forum – Supplementary Note No. 2

Significance of the Strategic Road Network on Hong Kong Island

The attached plans illustrate the strategic function and location of the existing east – west corridor along the north shore of Hong Kong Island (i.e. the Connaught Road Central – Harcourt Road – Gloucester Road corridor).

Figures 1 and 2 show the extent of traffic queues when the corridor is blocked for up to 60 minutes. The predictions are based on traffic census data/flow pattern and the configuration of the affected roads.

Figure 1

After 15 minutes' blockage, traffic queues would extend to about 2 km in all directions. All eastbound traffic from Central and Midlevels areas would come to a standstill. The Cross Harbour Tunnel, Island Eastern Corridor and Aberdeen Tunnel would also be heavily congested.

After 30 minutes' blockage, traffic queues of up to 5 km would result. The traffic queues would extend to Western and Eastern Districts. The Cross Harbour Tunnel and Aberdeen Tunnel would be blocked (in one direction).

Figure 2

At 45 minutes, the whole of the east – west corridor would be paralyzed. Traffic queues would extend into the Southern District and the major roads in Kowloon. The remaining 2 nos. road tunnels crossing the Victoria Harbour would be heavily congested (in the Hong Kong Island bound direction).

After one hour's blockage, the whole of the Kowloon Peninsula would be seriously affected, and all road tunnels crossing the harbour would be blocked.

Observation

The above demonstrates the strategic importance and fragility of the existing east – west corridor along the north shore of Hong Kong Island. The reliability of the whole strategic road network can only be improved by constructing a parallel trunk road, namely the Central Wan Chai Bypass.

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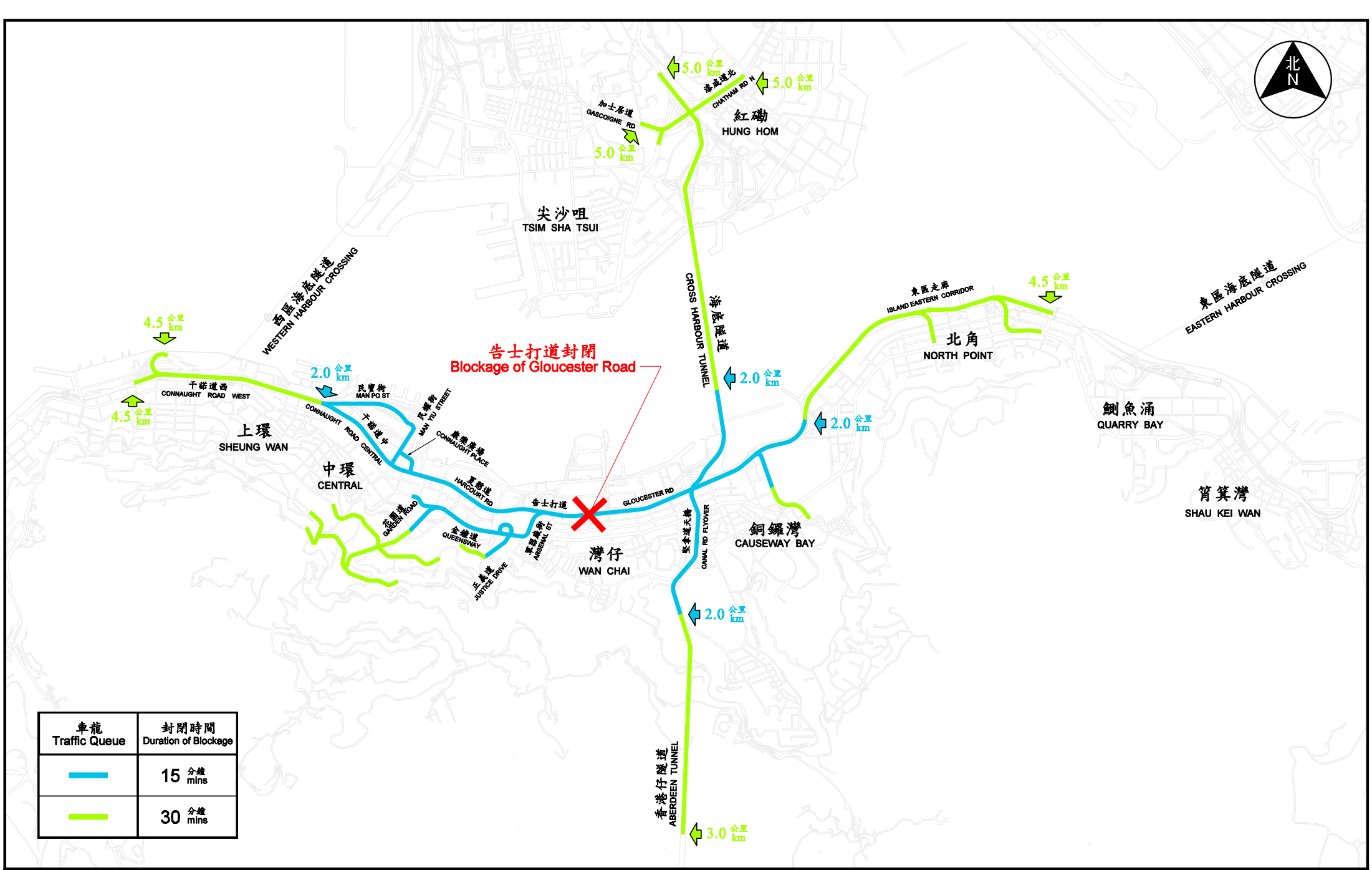
August 2005



車龍 Traffic Queue	封閉時間 Duration of Blockage
	15 分鐘 mins
	30 分鐘 mins

圖一 Figure 1

告士打道封閉造成的車龍
TRAFFIC QUEUE ARISING FROM BLOCKAGE OF GLOUCESTER ROAD

運輸署 Transport Department

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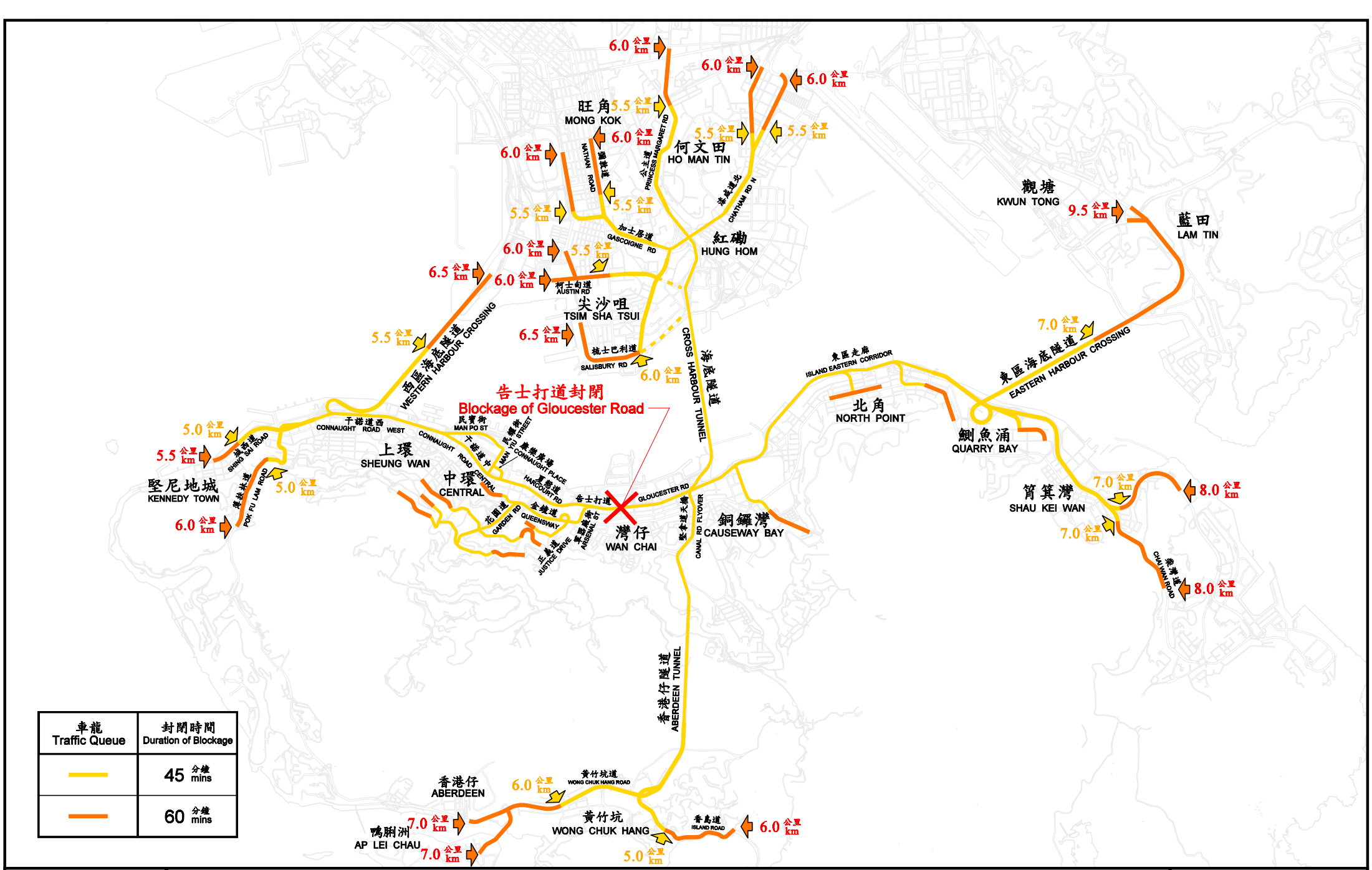

車龍 Traffic Queue	封閉時間 Duration of Blockage
	45 分鐘 mins
	60 分鐘 mins

圖二 Figure 2

告士打道封閉造成的車龍
TRAFFIC QUEUE ARISING FROM BLOCKAGE OF GLOUCESTER ROAD

運輸署 Transport Department

二張中的第二張 Sheet 2 of 2

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CWB Expert Forum - Supplementary Note No. 3

Effects of adjusting cross harbour tunnel tolls on the traffic conditions of the Corridor

This note provides more details on the effect of adjusting cross harbour tunnel tolls on the traffic conditions of the Gloucester Road(GR)/ Harcourt Road/ Connaught Road Central Corridor (the Corridor) by looking at the following toll adjusting scenarios, i.e. setting equal toll at the three cross harbour tunnels and adopting differential tolling by time of the day at Cross Harbour Tunnel (CHT) through the setting of higher toll for the tunnel at peak periods and lower toll at other periods.

Effect of having equal toll at the three cross harbour tunnels

From our surveys, CHT traffic only accounts for about 25% of all traffic along the section of GR (near Immigration Tower). It is clear therefore that while an attempt to refine the tolling strategy for the three tunnels may cause a redistribution of the approach traffic to the tunnels, it will only affect a small percentage of the overall traffic along the Corridor. Despite the redistribution of traffic, the total volume may not drop drastically and hence, there will still be congestion along the Corridor though the pattern may not be the same as that of existing.

Notwithstanding the above, we have conducted a preliminary assessment on the effect of having equal toll at $20 for private cars (with corresponding changes in toll levels for other vehicle types) for the three cross harbour tunnels on the traffic conditions at Connaught Road Central, GR (near Immigration Tower) and GR (near Excelsior) based on the current road network and traffic figures. The result is shown on the attached Figure 3.1. The key observations are summarized below:

1. Comparing the flows before and after the toll adjustment, the reduction of toll at Western Harbour Crossing (WHC) and Eastern Harbour Crossing (EHC) will increase their usage in the order of 13,000 and 4,000 veh/day respectively and there will be a decrease in the order of 7,000 veh/day at CHT due to diversion to the other two tunnels.
2. Of the 7,000 veh/day reduction, about 60% to 70% will occur at GR (near Immigration Tower). The reduction will be partly off-set by the increase in traffic attracted towards WHC and EHC. When compared to the daily traffic of 172,000 vehicles, the net reduction in traffic at this location is around 1 to 2%.
3. The toll change will result in increases in traffic on Connaught Road Central and GR (near Excelsior Hotel) by around 4 to 5% and 1 to 2% respectively.

We have also tested the situation for having a higher equal toll of $30 for private cars (with corresponding changes in toll levels for other vehicle types) for the three tunnels. We found that the difference in the percentage changes in traffic for Connaught Road

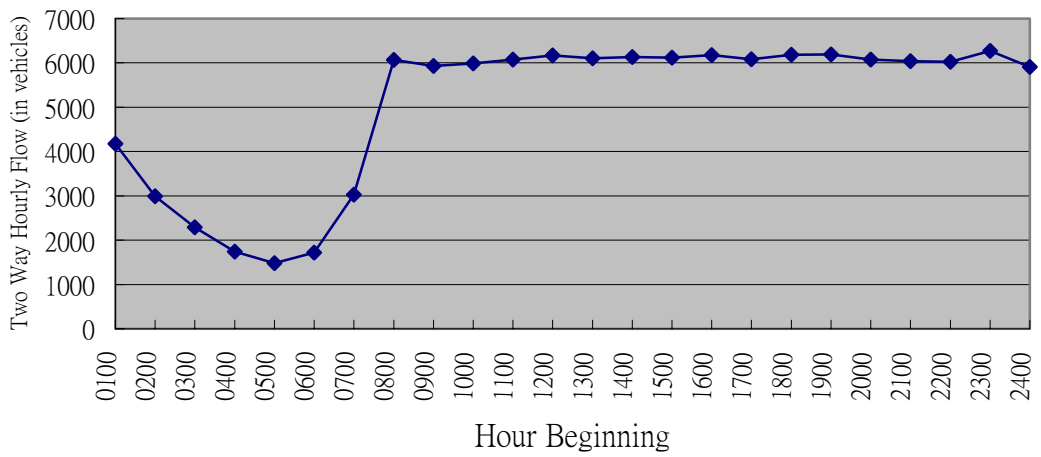
Central and GR (near Immigration Tower) is about 1%.

Effect of having differential toll by time at the Cross Harbour Tunnel

It is considered that adopting differential tolling by time at CHT, including charging a toll higher than existing for the peak periods, might reduce the public objection as the toll is increased in some periods and reduced at other periods.

The observed hourly distribution of traffic volume for CHT is plotted in Figure 3.2.

Figure 3.2 CHT Hourly Distribution 2005 (weekdays)



For the peak periods, the effect of charging higher toll for CHT will be similar to the scenario of adopting equal toll as discussed above. There is not much benefit in reducing the traffic volume at the Corridor but will bring about a redistribution of cross-harbour traffic.

For the inter-peak period, lowering the toll of CHT can't help relieving the traffic congestion at the tunnel but may worsen it because as illustrated in the above figure, there is no spare capacity for the tunnel at this period to absorb traffic diverted from the peak periods or from other cross harbour tunnels. There will be increase in traffic queue length due to the increase in demand.

If the toll for CHT is increased for the entire daytime period, the effect will be similar to having a uniform toll increase throughout the day because the period in question already covers 7:30am to midnight.

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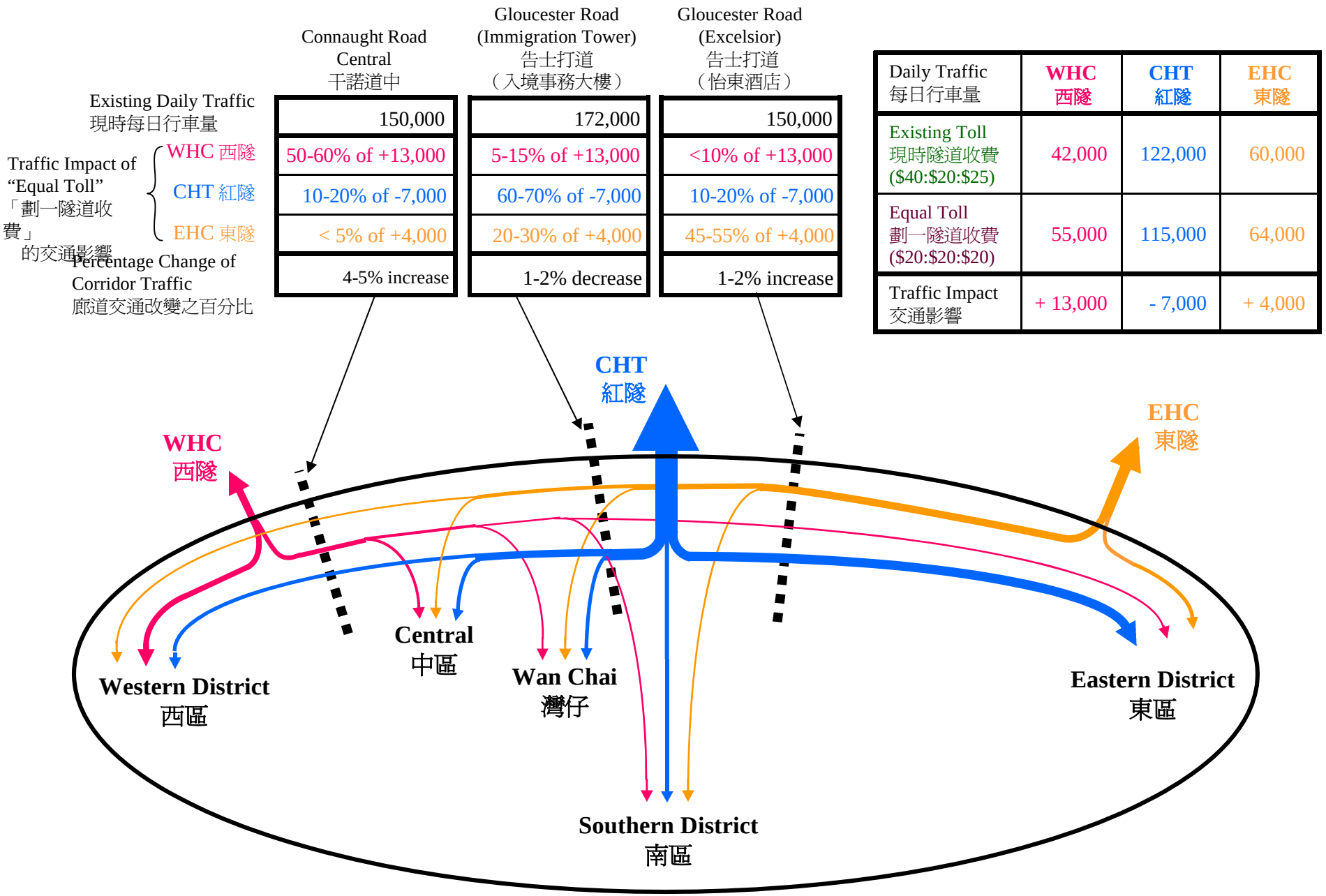

Daily Traffic 每日行車量	WHC 西隧	CHT 紅隧	EHC 東隧
Existing Toll 現時隧道收費 ($40:$20:$25)	42,000	122,000	60,000
Equal Toll 劃一隧道收費 ($20:$20:$20)	55,000	115,000	64,000
Traffic Impact 交通影響	+ 13,000	- 7,000	+ 4,000

Figure 3.1 - Traffic Impact of "Equal Toll" 「劃一隧道收費 的交通影響

Additional Sensitivity Tests

In addition to the sensitivity tests stated in Appendix 3, the following sensitivity tests have also been carried out to test the effect of zero growth of private vehicle fleet size and variations[1] in the Gross Domestic Product (GDP) growth rates:

Sensitivity tests	Input parameters	Assumed annual growth rate to 2016		%age change of traffic demand* in test case with respect to base case in 2016 a.m. peak along the Corridor#
		Base Case*	Test Case*	
7	**Vehicle fleet**	2.2%	0%	-8%
8	**GDP**	3.8%	1.9%	-2%
9	**Population**	1.1%	0.55%	-10%
	Employment	1.0%	0.50%	
	Vehicle fleet	2.2%	1.1%	
	GDP	3.8%	1.9%	
10	**GDP**	3.8%	5.7%	+3%
11	**Population**	1.1%	1.65%	+11%
	Employment	1.0%	1.5%	
	Vehicle fleet	2.2%	3.3%	
	GDP	3.8%	5.7%	

Corridor stands for the Gloucester Road/Harcourt Road/Connaught Road Central corridor.

* Under the base case, which is the basis for comparison in respect of the percentage change in traffic demand, the increase in traffic demand from 2004 to 2016 in the Corridor is 30%.

The above results show that variations in the assumed GDP growth rates alone will not cause significant changes to the traffic demand. Even if the growth rate of private vehicle fleet size were assumed to be zero as in Sensitivity Test 7 or the growth rates of all the four input parameters were assumed to be reduced by half as in Sensitivity Test 9, the percentage changes in traffic demand will be only –8% and –10% respectively. It should also be noted that based on the historical trends of the four input parameters as shown in Appendix 3, it is most unlikely that the scenarios in Sensitivity Test 7 or 9 will occur. Therefore, the recommendation that the CWB is required remains firm.

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[1] In the CTS-3 model, changes in GDP alone affect mainly income (hence, trip rates) and values of time (hence, the choice of different modes). Other effects associated with changes in GDP such as employment, vehicle ownership, tourist visitation, port activities, and other economic activities, are being accounted for separately as different model input.

CWB Expert Forum – Supplementary Note No. 5
Additional Sensitivity Tests on the Assumed Road Network and Future Developments

During routine checking of the traffic modeling results, it was found that traffic trips from the future developments in the CRIII areas had been adventitiously loaded to the traffic model under Scenario B. To rectify, a new test scenario was supplemented. Opportunity was also taken to test the future traffic situation under different road network and development assumptions, with the particulars given below.

Scenario B (Original Scenario)
Without CWB, and **without** the at-grade roads in Central Reclamation Phase III and Wan Chai Development Phase II, **with** the proposed developments in Central Reclamation Phase III

Scenario B1 (Additional Scenario)
Without CWB, and **without** the at-grade roads in Central Reclamation Phase III and Wan Chai Development Phase II, **without** the proposed developments in Central Reclamation Phase III

Scenario D (Additional Scenario)
With CWB but **without** the intermediate slip roads in Wan Chai; **without** the at-grade roads in Central Reclamation Phase III (CRIII) and Wan Chai Development Phase II (WDII) and **without** further developments in CRIII.

Scenarios B & B1

The traffic forecast results indicated that in Central area, the traffic situation under **Scenario B1** would be less critical than **Scenario B** due to the omission of developments in the CRIII area. Notwithstanding the above, both eastbound and westbound Connaught Road Central would have V/C ratios near 1.2 under **Scenario B1**, meaning that congestion would persist even with no further developments in CRIII. Under both **Scenarios B and B1**, the traffic situation along the eastern section of the Corridor (i.e., at Wan Chai and Causeway Bay areas) behaved quite similarly as the effect of developments in CRIII area has been thinned out. During peak hours, the westbound 3-lane link road between IEC and Victoria Park Road would have a V/C ratio of over 1.5 under both **Scenarios B and B1**. This bottleneck would cause extensive traffic queues along the entire length of the IEC. The critical sections of Gloucester Road would have V/C ratios of over 1.2 under **Scenario B1**. Under **Scenario B** (i.e., with developments in CRIII), and without the Road P2, Harcourt Road would be

extremely congested as most of the traffic to and from the CRIII area had to use Harcourt Road together with the Lung Wui Road / Tim Wa Avenue / Tim Mei Avenue gyratory system. The congestion along Harcourt Road would be lessened under **Scenario B1** but the V/C ratios would remain at 0.96 to 1.08, i.e., the road would still be fully saturated and operating at capacity. The junctions of Connaught Road Central / Pedder Street and Connaught Road Central / Connaught Place would have serious capacity problem under both scenarios. No improvement was observed at the junctions of Fleming Road / Harbour Road, Hung Hing Road / Tonnochy Road and Harbour Road / Fenwick Pier Street even without further developments in the CRIII area, meaning that serious congestion would occur at Wan Chai North under both scenarios.

Scenario D

The traffic forecast results indicated that under **Scenario D,** the amount of traffic utilizing the CWB would be similar to **Scenario C**. However, several sections along the eastbound Connaught Road Central and Gloucester Road Corridor would be operated at above capacity during AM peak. For instance, the critical section of Connaught Road Central would have V/C ratios of near 1.2. Since the Road P2 networks would be omitted, most of the traffic from the Central waterfront heading east would access to Connaught Road Central causing the junction of Connaught Road and Connaught Place working at negative reserve capacity. The junction of Fleming Road and Harbour Road would operate at RC of -16% during AM peak which revealed that the traffic congestion problem along Fleming Road and Harbour Road would still be unsolved under Scenario D.

The summary of results, in the form of Volume to Capacity (V/C) ratio of major road links, can be found at **Appendix 4.5B**. The summary of critical junction capacity assessment can be found at **Appendix 4.6B**.

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2016 V/C Ratios of Major Road Links (Peak Hour Flow)

(See Location Plan at Appendix 4.8)

Appendix 4.5B

				Scenario A		Scenario B		Scenario B1		Scenario C		Scenario D			Recently Observed Traffic Flows		
Eastbound	Near	No. of Lane	Capacity	Flow	V/C	Flow	V/C	Flow	V/C	Flow	V/C	Flow	V/C		No. of Lanes	Peak Flow	Flow Condition
Connaught Road Central	Exchange Square	5	6000	5800	0.97	7650	1.28	7100	1.18	6150	1.03	7150	1.19		5	5595	Over Saturate
Connaught Road Central	Jardine House	5	5300	4100	0.77	6400	1.21	6150	1.16	4350	0.82	5450	1.03		5	5960	Over Saturate
Harcourt Road		4	5400	3750	0.69	7250	1.34	5200	0.96	4000	0.74	4750	0.88		4	5440	Saturate
Gloucester Road	Immigration Tower	5	5100	4650	0.91	6550	1.28	6150	1.21	5650	1.11	5750	1.13			Not Available	
Gloucester Road	Marsh Road	4	4800	4400	0.92	5900	1.23	5600	1.17	5400	1.13	5300	1.10		4	5350	Over Saturate
Westbound																	
Victoria Park Road	IEC Exit	3	3900	2250	0.58	6050	1.55	5950	1.53	3350	0.86	3350	0.86			Not Available	
Inner Gloucester Road	Excelsior	3	2400	2600	1.08	3200	1.33	3050	1.27	2550	1.06	2650	1.10		3	3000	Over Saturate
Outer Gloucester Road		4	5400	2900	0.54	6650	1.23	6500	1.20	4150	0.77	4450	0.82		4	5550	Saturate
Gloucester Road	Fleming Rd	4	5400	4700	0.87	7200	1.33	7050	1.31	5200	0.96	5250	0.97		4	6100	Saturate
Harcourt Road	Admiralty Centre	6	7300	7100	0.97	9800	1.34	7850	1.08	7100	0.97	6650	0.91		6	8550	Over Saturate
Connaught Road Central	Jardine House	4	5400	5200	0.96	7600	1.41	6250	1.16	5200	0.96	5350	0.99		4	5175	Over Saturate

Notes :

1 Flow / capacity in pcu/hr

2 V/C is the flow to capacity ratio

3 The above v/c ratios are average values taking into account the average traffic condition on different lanes towards different destinations. Many of these road sections are physically separated or have been divided by lane markings into different routes (eg. one lane to Canal Road, one lane to North Point and two lanes to CHT) and the demand for different routes are different. The v/c for individual routes could be much higher.

4 The above v/c ratios have not reflected knock-on effects from traffic queues extending from downstream bottle-necks. The knock-on effect would aggravate the traffic situation at uptream sections and as a result the congestion at upstream sections would be more serious than indicated by the v/c ratios.

* References for capacity estimation: (i) traffic surveys by TE/HK in July 2005 and (ii) Strategic Traffic Review for the Central Business District Study July 2003.

Junction Capacity Assessment Results at Central (Peak Hour Flow)

(See Location Plan at Appendix 4.8)

No.	Junction	Scenario A	Scenario B	Scenario B1	Scenario C	Scenario D
1	Pedder Street / Des Voeux Road Central	6%	2%	5%	6%	7%
2	Harcourt Road / Cotton Tree Drive	14%	-16%	-7%	4%	16%
3	Queen's Road Central / Ice House Street	5%	-3%	6%	5%	3%
4	Man Po Street / Man Yiu Street / Road P1	2%	-14%	31%	-15%	31%
5	Man Cheung Street / Man Yiu Street / Road P2	6%	-5%	12%	13%	10%
6	Man Yiu Street / Harbour View Street / Connaught Place	37%	-6%	28%	37%	27%
7	Connaught Road C / Pedder Street	12%	-15%	-15%	12%	-5%
8	Connaught Road C / Connaught Place	50%	-30%	-13%	50%	-4%

Junction Capacity Assessment Results at Wan Chai (Peak Hour Flow)

No.	Junction	Scenario A	Scenario B	Scenario B1	Scenario C	Scenario D
9	Expo Drive / Expo Drive East	0.69	0.37	0.35%	0.41	0.31
10	Road P2 / Fleming Road	41%	-	-	17%	-
11	Road P2 (or Hung Hing Road) / Tonnochy Road	15%	-14%	-14%	3%	-1%
12	Harbour Road / Fenwick Pier Street	0.86	-22%	-19%	0.80	-6%
13	Fleming Road / Harbour Road	-11%	-29%	-26%	-25%	-16%

Notes:

(1) The figures present in percentage term are Reserve Capacity (RC) for signal controlled junctions.

(2) The figures present in decimal points are Design Flow to Capacity (DFC) for priority junctions and roundabouts.

CWB Expert Panel – Supplementary Note No. 6
The Need for an Alternative Route in ERP

From overseas experience in London and Singapore, the need for an alternative route or bypass is well proven in road charging scheme for diverting traffic generated from those not intending to enter the charging zone. Such provision of alternative routes, which has been considered during the planning stage of their road charging projects, is detailed in the ensuing paragraphs. Furthermore, the consultation results of the PRoGRESS[1] demonstration project in Europe have reinforced the need for alternative routes.

London – Inner Ring Road

Before the implementation of the London Congestion Charging (LCC) Scheme, the Director of the Government Office for London chaired an independent Working Group to assist the understanding of the contribution that road user charging and workplace parking levies could make to the Mayor's initial Transport Strategy. With the help of a team of consultants, the Working Group produced a report in late 1999 on "*Road Charging Options for London: A Technical Assessment*". Chapter 3 of the Report (p.24) states as follows:-

> *3.2.24 About a quarter of the traffic in and around Central London is passing through the area, so the availability of a peripheral route to accommodate through traffic displaced from the charging area is an important consideration.*
>
> *3.2.25 The Inner Ring Road ... would therefore be a logical boundary for a central area road user charging scheme.*

In order to displace the through traffic away from the charging zone, the Inner Ring Road serves as a bypass for the LCC Scheme.

Singapore

The Outer Ring Road System is a network of major roads that forms a "ring" along the outer areas of Singapore. It provides an alternative route for motorists to travel between the east and west of Singapore without going through the city. Hence, it helps to reduce the traffic volume on city-bound roads.

[1] PRoGRESS stands for "**P**ricing **Ro**ad use for **G**reater **R**esponsibility, **E**fficiency and **S**ustainability in citie**S**"

Moreover, gantries are installed at entry points of the Restricted Zone (RZ) in order to inform the motorists of escape routes. Thus they would not be forced unwittingly to enter the RZ and pay the ERP charge.

PRoGRESS Project

The PRoGRESS project was a major demonstration project on urban road pricing that took place over a four-year period from June 2000 to May 2004 in eight European cities[2]. It was supported and part-financed by the European Commission. After the consultation of the key stakeholders in these eight cities on their respective road pricing schemes, the Final Main Project Report published in July 2004 (p.58) states that:

> *"A final consideration brought forward by stakeholders across all cities is the need for routes around the charged area that allow traffic to by-pass it. Stakeholders as well as the general public expect to be able to move between different parts of the city, which lie outside the charged area, without having to enter it or having to make excessive detours around it."*

In Hong Kong, the through traffic accounts for 40% of the traffic flows across the Central Business District (CBD). In comparison with London, the use of ERP would not be effective in the absence of an alternative route, CWB. Without CWB, all motorists traveling in the east-west direction would be forced to pay even though they do not want to go into the CBD.

Views of ERP Ex-Consultant Reported in Newspapers

Mr Jack Opiola (Director of Intelligent Transport Systems, Hyder Consulting Ltd, the former Project Manager of the HK ERP Feasibility Study) delivered a talk at the Hong Kong General Chamber of Commerce on 25 August 2004. The newspapers reported Mr Opiola's view on an alternative route for ERP in Hong Kong.

> *"...he admitted that a successful ERP scheme would also hinge on provision of free alternative roads like London's Ring Road. It would be more equitable and fair to provide a free bypass such as the proposed Central-Wan Chai Bypass on the Central Reclamation site. He believes that a free bypass for an electronic road pricing system is necessary and the bypass will provide an east-west route from as far as the Western Tunnel all the way to the Eastern Tunnel… (SCMP 2004-08-26)" and*

[2] The eight cities include Bristol (UK), Copenhagen (Denmark), Edinburgh (UK), Genoa (Italy), Gothenburg (Sweden), Helsinki (Finland), Rome (Italy) and Trondheim (Norway)

"...Jack was an ex-consultant of the Hong Kong ERP Study in 2000. Yesterday he presented a talk on ERP experience in various cities at the luncheon meeting of the Hong Kong General Chamber of Commerce. In reply to the enquiry whether ERP would not be needed if CWB were constructed, he replied that if ERP were implemented in Hong Kong, it would be fair to provide the public with an option of a free route. Since not all traffic coming out from Aberdeen is heading for Central, motorists might complain about the ERP charge imposed. This is the same case in UK: a free route will be provided when road charging is implemented. (Translated from Ta Kung Pao 2004-08-26)"

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