運輸署
Transport Department

Agreement No. TD 50/2007
Traffic Study for Mid-Levels Area

Executive Summary

August 2010

ARUP

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (CONT'D)

LIST OF FIGURES

APPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Given the busy traffic conditions in Mid-Levels, an administrative moratorium, known as the Mid-Levels Moratorium (**MM**), was introduced in 1972 to restrict developments / redevelopments in Mid-Levels to what is permissible under the existing leases. The MM, which has remained in force ever since, applies to an area bounded on the east by Glenealy, on the south by the 210-metre contour above Conduit Road and Po Shan Road, on the west by the University of Hong Kong and Kotewall Road, and on the north by Caine Road and Bonham Road (**Figure 1.1** refers). The purpose of the MM was to ease traffic congestion pending improvements to the road network.

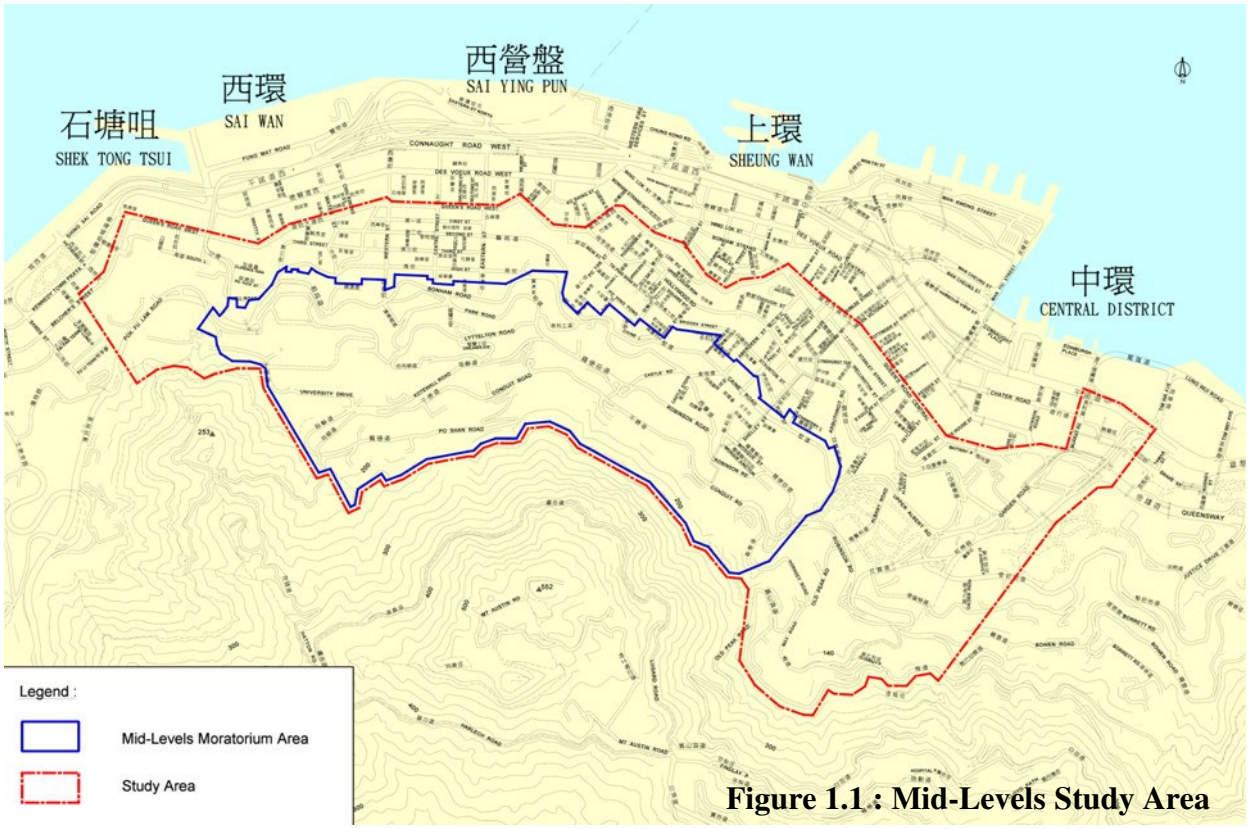


Figure 1.1 : Mid-Levels Study Area

1.1.2 Under the MM, all further lease modifications under restricted leases which would give rise to a greater intensity of development, and the sale of public land (comprising 4 Government sites), have been deferred. As for leases that are unrestricted in terms of development rights, the Government cannot unilaterally impose a limit so long as the proposed redevelopment complies with the Outline Zoning Plan (**OZP**) and the Buildings Ordinance.

1.1.3 The MM is only one of a comprehensive range of measures the Government has taken over the past four decades or so in tackling traffic congestion in Mid-Levels. Other measures include building new road infrastructure, such as the Aberdeen Tunnel, Hill Road Flyover, Central-Mid-Levels Escalator and Walkway System, Western Harbour Crossing, and Extension of Smithfield to Pok Fu Lam Road, and implementing various traffic management measures. With a view to minimising the use of private transport in Mid-Levels, the Government has also put in place a network of public transport services to encourage the use of the public transport system.

1.1.4 In addition to the MM, the Town Planning Board had imposed plot ratio (**PR**) and building height restrictions on various "Residential (Group C)" ("**R(C)**") sub-zones under the Mid-Levels West OZP since February 1986[1]. It also imposed a maximum PR of 5 for the "Residential (Group B)" ("**R(B)**") zone in September 1990, and maximum PR and building height of 5 and 12 storeys respectively for the

[1] "R(C)6" and "R(C)8" zones fall outside the MM Area.

"Residential (Group C)7" ("**R(C)7**") zone in June 1995.

1.1.5 As the administrative control has been put in place for quite some time and in response to the Ombudsman's Direct Investigation Report on the Administration of the Mid-Levels Moratorium released in September 2006, an updated traffic study needs to be carried out to review the existing and future traffic conditions in the years 2016 and 2021 for the Study Area covering the MM Area as shown in **Figure 1.1**. The study results will provide a basis for the Government to review the effectiveness of the MM in containing development-induced traffic, and serve as an input to the exercise on the review of relevant OZPs.

1.1.6 Against the above background, the Transport Department (**TD**) commissioned the Traffic Study for Mid-Levels Area ("the Study") to review the existing and future traffic conditions in the Study Area under various redevelopment scenarios. In April 2008, Ove Arup & Partners Hong Kong Limited was appointed as the Consultant to undertake the Study under Agreement No. TD 50/2007.

1.2 Study Objectives

1.2.1 The key objectives of the Study are:

- To review and assess the existing traffic conditions in the road network during peak periods within the Study Area;
- To carry out a comprehensive Traffic Impact Assessment to assess the traffic conditions of the road network during peak periods in the Study Area for the years 2016 and 2021 under various development scenarios;
- To identify practicable traffic improvement measures, including but not limited to transport infrastructure, public transport service improvement, pedestrian facilities, mechanised people movers, which can help alleviate the traffic congestion in the Study Area; and
- To review the effectiveness of the MM in containing development-induced traffic and to assess whether the MM should be retained, modified, supplemented or replaced by other appropriate measures, including reduction in development intensity.

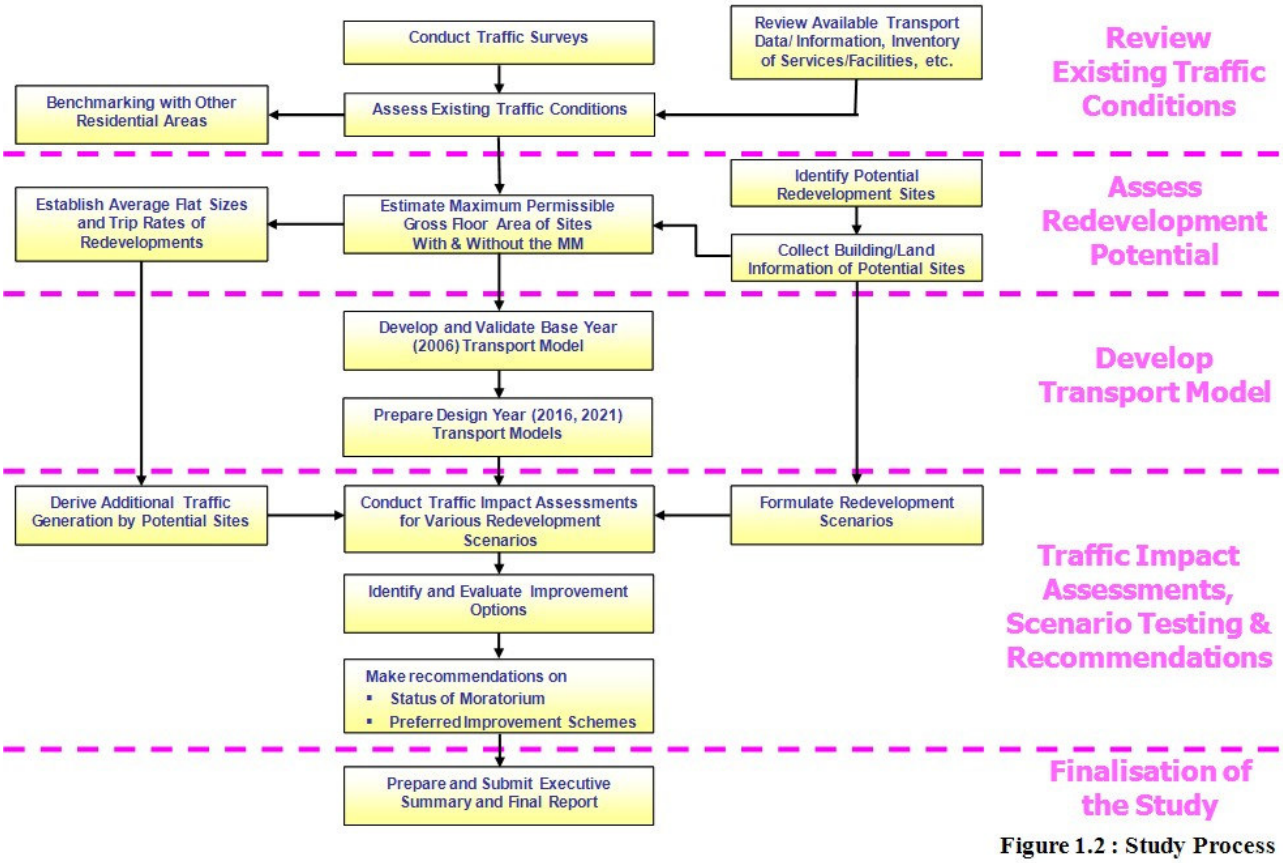


Figure 1.2 : Study Process

1.3 Study Approach and Process

1.3.1 The overall Study process is illustrated in **Figure 1.2**. In summary, the Study was carried out in 5 stages involving the following key tasks:

- Data Collection and Assessment of Existing Conditions – to prepare an inventory of existing transport services/facilities; undertake comprehensive traffic surveys; review existing traffic conditions in Mid-Levels; and conduct benchmarking comparisons with other residential areas of a similar nature.
- Assessment of Redevelopment Potential in Mid-Levels – to conduct lease searches; review building / land information of the identified sites; estimate the maximum permissible Gross Floor Area (**GFA**) of the potential redevelopment sites in Mid-Levels with the MM in force, and additional GFA that could be generated by lifting the MM.
- Development of Transport Model – to develop a local area traffic model for the Mid-Levels Study Area; validate the base year model against the observed traffic conditions; prepare design years (2016 and 2021) traffic models for projecting future traffic conditions.
- Traffic Impact Assessments and Scenario Testing – to formulate various redevelopment scenarios and assess their traffic impacts; explore potential traffic improvement measures; evaluate their effectiveness and implications; and make recommendations on whether the MM should be retained, supplemented, strengthened or replaced by other appropriate measures.
- Finalisation of the Study – to conclude the Study by preparing an Executive Summary and a Final Report.

1.4 Structure of this Executive Summary

1.4.1 Following this introductory section, the remainder of this Executive Summary is structured as follows:

- Section 2 gives an overview of the existing traffic environment, transport facilities and services in Mid-Levels.
- Section 3 summarises the major findings in the assessment of redevelopment potential in Mid-Levels by identifying the potential redevelopment sites in the MM Area. It estimates the maximum permissible GFA of these potential sites with and without the MM in place, and establishes various redevelopment scenarios as a basis for subsequent traffic impact assessments.
- Section 4 provides a brief summary on the development of the Mid-Levels Transport Model, followed by the presentation of the traffic generation forecasts and impact assessment results for the respective redevelopment scenarios.
- Section 5 proposes effective traffic improvement measures to alleviate future traffic congestion in the MM Area. Besides the recommended schemes, other potential improvements involving new infrastructure, demand management and traffic management measures that were examined but not pursued by the Study, are also discussed.
- Section 6 reviews and assesses the different options with respect to the MM, with recommendations made on whether the MM should be retained, modified or replaced by other planning control measures.
- Section 7 summarises the Study recommendations and sets out the way forward.

2. EXISTING TRAFFIC CONDITIONS

2.1 Review of Available Transport Data

2.1.1 Comprehensive traffic and transport data available from various independent sources were collated and reviewed. These included, among others, updated information on:

- Existing traffic management and inventory of transport facilities;
- Inventory of public transport services and facilities;
- Traffic flow data in the Annual Traffic Census; and
- Public transport passenger boarding / alighting data.

2.1.2 After a thorough review of the above data, additional traffic surveys were carried out to provide supplementary data for this Study. The supplementary traffic surveys undertaken comprised the following 4 main types:

- Traffic counts and queuing surveys;
- Car journey time surveys;
- Site surveys on kerbside activities;
- Trip generation surveys; and
- Interview-cum-counting surveys on pedestrians using the Central-Mid-Levels Escalator and Walkway System.

2.2 Supplementary Traffic Surveys

2.2.1 **Table 2.1** summarises the supplementary surveys undertaken. The survey field works were carried out from May to June 2008.

Table 2.1 : Summary of Surveys Undertaken

Survey	Methodology	Location/ Enumeration
Supplementary Traffic Counts and Queuing Surveys	➢ To carry out manual traffic counts classified by vehicle types in the Annual Traffic Census; and ➢ To record traffic queue length at the same time when traffic counts are taken at the surveyed junctions.	18 junctions + 4 screenlines involving some 40 stations
Car Journey Time Surveys	➢ To adopt the 'Moving Car (Modified)' Method as described in the Transport Planning and Design Manual.	4 routes covering Caine Road /Bonham Road, Robinson Road / Park Road, Conduit Road and Cotton Tree Drive / Garden Road
Site Surveys on Kerbside Activities	➢ To record the number and type of vehicles engaged in kerbside activities, the corresponding time duration taken as well as the disruption caused to the through traffic.	4 corridors covering Caine Road, Bonham Road, Park Road and Robinson Road
Trip Generation Surveys	➢ To carry out manual classified traffic counts to enumerate vehicles accessing/ leaving the surveyed developments; ➢ To carry out pedestrian counts, accompanied by roadside interviews with residents; and ➢ To collect necessary information on the surveyed developments for derivation of trip rates.	15 residential development sites of different characteristics
Interview-cum-Counting Surveys on Pedestrians	➢ To establish current demand and travel characteristics of pedestrians using the existing Central-Mid-Levels Escalator and Walkway System	Key locations along the Central-Mid-Levels Escalator and Walkway System

2.2.2 The main purposes of the above surveys were to establish the level of demand on existing facilities and to facilitate appreciation of existing road traffic conditions. The survey data also provided a basis for developing the Mid-Levels Transport Model.

2.3 Existing Traffic Situation

Road Network and Traffic Circulation

2.3.1 Generally speaking, the road network in Mid-Levels is characterised by narrow, steep and winding single two-lane carriageways with closely spaced intersections. The poor visibility and acute turning radii have further reduced the operational capacity of the road network. Owing to the level difference between major transport corridors, the connecting roads are mostly intersected at an acute angle without appropriate transition and adequate sightline. Vehicles therefore need to turn at relatively low speed. The closely spaced building blocks have also left little room for road widening and junction improvements.

2.3.2 The road capacity is further reduced by the frequent boarding / alighting activities of public transport. Most of the franchised bus and green minibus stops are provided on-street without proper laybys. The frequent picking up and setting down of passengers have imposed a significant restriction on the travelling speed of overall traffic. Besides, passenger pick-up / drop-off activities by school buses at the kerbside are not uncommon during the peak hours before and after school.

Traffic Management

2.3.3 Stopping restrictions are currently in place within the Study Area to limit vehicular stopping activities and to maintain traffic mobility.

2.3.4 At present, the section of Caine Road westbound from Arbuthnot Road to Bonham Road / Breezy Path is restricted to the use of buses, private light buses and authorised vehicles only during the periods of 0700 – 1900 on Monday to Friday and 0700 – 1300 on Saturday.

2.3.5 In addition, restrictions are imposed on district distributor roads that prohibit the entry of heavy vehicles with an unladen weight of 5.5 tonnes or above (i.e. medium to heavy goods vehicles) to the MM Area during the periods 0800 – 0900 and 1600 – 1900 on Monday to Saturday. Furthermore, owing to geographical constraints and a lack of climbing lanes, there are other goods vehicle prohibitions / restrictions applied locally within the MM Area for the safe and smooth operation of traffic.

Frequent bus activities causing intermittent blockage and disruptions to through traffic.

Road Network Capacity

2.3.6 To appreciate the existing traffic situation in Mid-Levels, operational performance assessments of the road network were undertaken based on the 2008 traffic flows observed during the weekday morning and evening peak periods, as well as any special critical periods for individual junctions. Based on the traffic count survey results, the busiest hours for the Mid-Levels traffic were identified to be 0800 – 0900 in the morning and 1800-1900 in the evening on a normal weekday.

2.3.7 The road network capacity is largely governed by the capacity of key junctions and kerbside activities. Performance assessments of the key junctions were carried out based on their existing layout, time plan and method of control of the signals, as well as the remaining traffic queues at the end of the green time period. In addition, local site conditions, including uphill gradient, stopping bus effect, short lane effect and actual green time allocation were taken into account in the assessments.

2.3.8 There are, however, some limitations in the assessments as the prevalent single 2-lane carriageway configuration without adequate laybys in Mid-Levels is often affected by kerbside activities, pedestrian crossings or a tailback of traffic from the adjacent downstream junction. Besides, the interruptions caused by kerbside activities could not be fully accounted for in the calculations. The traffic conditions at each junction have thus been reviewed and verified against on-site observations in order to reflect the actual traffic situation.

2.3.9 The assessment results indicate that there are 9 problematic junctions in the MM Area. Of these, 6 junctions are currently operating under critical traffic conditions (i.e. with a reserve capacity of less than –5% or junction performance frequently affected by kerbside activities, pedestrian crossings or tailing back from the adjacent downstream junction) during peak periods and they are as follows:

- Bonham Road / Pok Fu Lam Road,
- Bonham Road / Western Street / Honiton Road,
- Bonham Road / Park Road,
- Park Road / Lyttelton Road / Breezy Path,
- Caine Road / Hospital Road / Seymour Road, and
- Robinson Road / Seymour Road.

The remaining 3 junctions are currently operating close to capacity (i.e. with a reserve capacity of ±5% or junction performance occasionally affected by kerbside activities, pedestrian crossings or tailing back from the adjacent downstream junction) during peak periods and they are as follows:

- Bonham Road / Breezy Path,
- Robinson Road / Glenealy, and
- Caine Road / Arbuthnot Road/ Upper Albert Road / Glenealy.

2.3.10 Traffic queues are presently observed along Caine Road and Robinson Road during the weekday peak hours, largely attributed to the short distance between intersections and frequent boarding / alighting activities. Traffic queues recorded at the junction of Bonham Road and Park Road during both the morning peak and afternoon school peak periods are caused by school-related kerbside activities along Bonham Road.

2.3.11 Traffic queues are observed at Robinson Road as well as at Conduit Road near the junction with Glenealy. This is attributed to the heavy traffic movement from both Robinson Road and Conduit Road to the Central Business District during the morning peak period. Similarly, a noticeable traffic queue sometimes occurs along the Caine Road approach at its junction with Arbuthnot Road / Upper Albert Road / Glenealy as a result of the heavy traffic heading towards the Central Business District via Arbuthnot Road and Wyndham Street.

Traffic queue along Caine Road

Comparison of Mid-Levels and Other Residential Areas

2.3.12 The existing traffic conditions in Mid-Levels were compared against those in other residential areas of a similar nature: Happy Valley and Braemar Hill, for benchmarking. Generally, Mid-Levels has a higher population and population density than Happy Valley and Braemar Hill and therefore generates a higher traffic demand.

2.3.13 A comparison of the key demographic and general traffic characteristics in Mid-Levels, Happy Valley and Braemar Hill is given in **Table 2.2**.

Table 2.2 : Comparison of Key Demographic and General Traffic Characteristics in Mid-Levels, Happy Valley and Braemar Hill

Item	Mid-Levels	Happy Valley	Braemar Hill
Households	30,000	11,000	5,000
Population	91,000	33,000	19,000
Population Density (Persons/sq. m.)	0.0431	0.0234	0.0234
Average Household Income	$40,900	$41,400	$48,300
Road Network Density	High (3 major East-West corridors intersected by many 1-way North-South local roads)	High (intensive road network running in grid arrangement)	Low

Table 2.2 : Comparison of Key Demographic and General Traffic Characteristics in Mid-Levels, Happy Valley and Braemar Hill (Cont'd)

Item	Mid-Levels	Happy Valley	Braemar Hill
Road Length per Unit Area (km per sq.km.)	20	17	10
Junction Control	Mainly signal-controlled with some grade-separated interchanges	Mainly priority-controlled with signalled junctions in the area north of King Kwong Street	Mainly priority-controlled
Number of Traffic Signals	26	9	2
Kerbside Traffic Activities	Frequent (13 out of 26 bus-stops w/o laybys)	Less frequent (4 out of 5 bus-stops w/o laybys)	Infrequent (4 out of 11 bus-stops w/o laybys)
Operational Performance of Key Junctions	9 junctions operating near or beyond capacity	Generally operating satisfactorily (except 1 junction operating near capacity)	Generally operating satisfactorily
Traffic Queue during Peak Hours	Traffic queues observed along major corridors (Caine Road/ Bonham Road/ Robinson Road/ Park Road)	No major traffic queues observed	No major traffic queues observed
Average Traffic Speed during Peak Hours	AM Peak E/B : 17km/hr W/B : 23km/hr PM Peak E/B : 18km/hr W/B : 21km/hr	AM Peak N/B : 23km/hr S/B : 28km/hr PM Peak N/B : 15km/hr S/B : 25km/hr	AM Peak E/B : 35km/hr W/B: 31km/hr PM Peak E/B : 29km/hr W/B: 28km/hr

E/B: Eastbound, W/B: Westbound, N/B: Northbound, S/B: Southbound

2.3.14 Generally, Mid-Levels is characterised by heavier traffic demand and correspondingly a denser road network than the Happy Valley and Braemar Hill areas. In comparison, the roads in Mid-Levels are narrower and winding. Most of the roads are of single 2-lane carriageway configuration and in particular, the road network in Mid-Levels comprises a higher density of signal-controlled junctions that makes it specially vulnerable to traffic interlocking. These, aggravated by the heavy frontage / kerbside traffic activities and lack of proper laybys, result in less satisfactory traffic conditions in Mid-Levels than the other two residential areas.

3. REDEVELOPMENT POTENTIAL IN MID-LEVELS

3.1 Identification of Potential Redevelopment Sites

3.1.1 Reference was made to the OZPs, Building (Planning) Regulations (**B(P)R**) covering the MM Area, site particulars and lease conditions of existing sites as well as other relevant building information available from the Government.

3.1.2 There are altogether 420 sites within the MM Area, comprising 347 sites held under unrestricted leases, 43 sites held under restricted leases, 4 Government sites, and 26 Government, Institution or Community (GIC) sites. Out of these 420 sites, there are 193 potential redevelopment sites identified based on the following criteria:

(i) All vacant sites or work-in-progress sites with approved building plans; or

(ii) For sites with existing buildings erected thereon, if the buildings have reached or would reach 30 years of age (in the design years of 2016 and 2021) with additional GFA generated upon redevelopment (i.e. where existing PRs are less than the maximum permissible PRs under the OZP or the B(P)R).

3.1.3 Since those sites with residential buildings constructed after 1991 (i.e. under 30 years old in the year 2021) have developed to almost the maximum permissible PRs, the additional GFA generated by these sites upon redevelopment would be insignificant. Notwithstanding, a sensitivity test for these sites has been conducted and the results are presented in paragraph 4.2.6.

3.1.4 The 193 identified sites include 4 Government sites subject to suspension of sale, and 189 sites held under private leases. The latter can be further divided into two types of leases, namely restricted leases and unrestricted leases. For those sites held under restricted leases, development restrictions are imposed to control their development intensity. The MM empowers the Government to defer all future lease modifications of these sites that would give rise to a greater intensity of development. However, lease modifications that would result in no additional GFA are still possible.

3.1.5 **Table 3.1** and **Figure 3.1** below provide a breakdown of the 193 potential redevelopment sites according to type of lease and land use zoning.

Table 3.1 : Potential Redevelopment Sites by Type of Lease and Land Use Zoning

Land Use Zoning	Sites under Unrestricted Leases	Sites under Restricted Leases	Government Sites
R(A)	97[a]	1	1
C/R	5	-	-
R(B)	37	7[b]	3
R(C)	22	20[c]	-
TOTAL	**161**	**28**	**4**

Notes: C/R - Commercial/Residential
a - Including 5 work-in-progress sites with approved building plans
b - Including 1 work-in-progress site with approved building plans
c - Including 2 work-in-progress sites with approved building plans

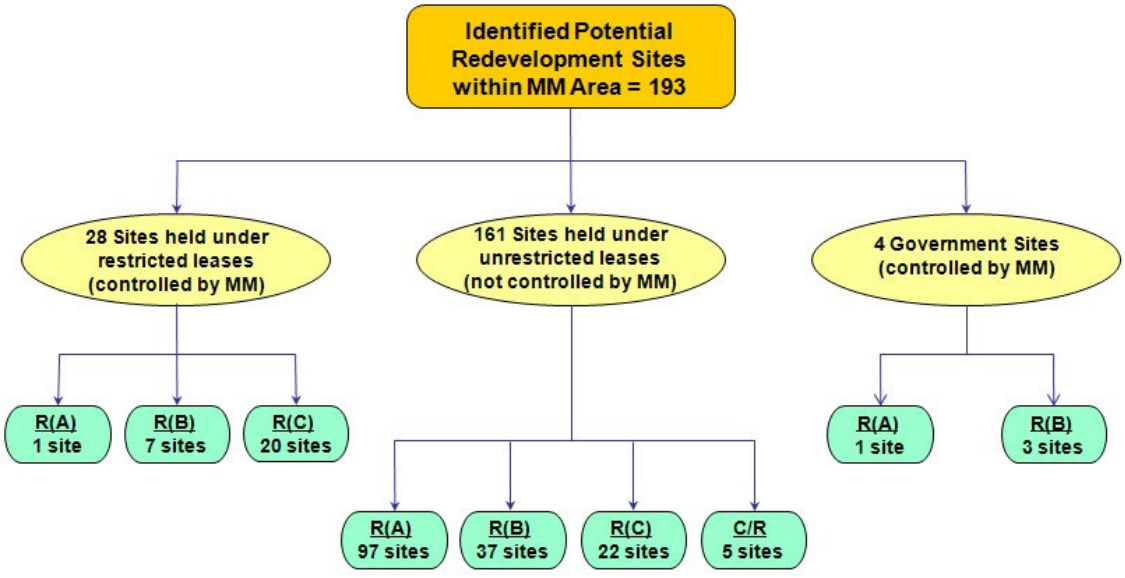


Figure 3.1 : Summary of Identified Potential Redevelopment Sites within the MM Area

3.2 Maximum Permissible GFA of the Potential Redevelopment Sites

Assessment Methodology

3.2.1 To facilitate subsequent traffic assessments and scenario testing, the following need to be established:

- the maximum permissible GFA of all the potential redevelopment sites with the MM in force;
- the maximum permissible GFA of all the potential redevelopment sites with the MM lifted; and
- the maximum permissible GFA that could be generated from the sale of the 4 Government sites with the MM lifted.

3.2.2 The maximum permissible GFA is estimated by multiplying the site area and the maximum permissible PR under the OZP or B(P)R (whichever is the smaller), i.e. maximum permissible GFA = site area x maximum permissible PR. Owing to site constraints and other unforeseen circumstances, the actual maximum GFA to be achieved on site upon redevelopment may be different from this theoretical maximum permissible GFA. In estimating the above, the following methodology is adopted :

With the MM in force

(i) For the 28 sites held under restricted leases, their maximum permissible GFA is estimated based on the development restrictions stipulated in the lease, on the OZP or in the B(P)R, whichever is the most stringent, since lease modifications would not allow additional GFA over what is permitted under existing leases.

(ii) For the 161 sites held under unrestricted leases, their maximum permissible GFA is estimated based on the development restrictions stipulated on the OZP or in the B(P)R, whichever is more stringent.

(iii) For the 4 Government sites that are subject to deferral of sale, there should be no GFA implications with the MM in force.

With the MM lifted

(i) For the 28 sites held under restricted leases, if the MM is to be lifted, the restricted leases could be modified to give rise to a greater intensity of development. Lease modifications are possible so long as the proposed developments comply with the OZP and the B(P)R. The maximum permissible GFA is estimated based on the more stringent development restrictions as stipulated on the OZP and in the B(P)R.

(ii) For the 161 sites held under unrestricted leases, their maximum permissible GFA would not be affected with the lifting of the MM.

(iii) For the 4 Government sites subject to deferral of sale, their maximum permissible GFA is estimated based on the development restrictions as stipulated on the OZP and in the B(P)R, whichever is more stringent.

3.2.3 Besides, some potential redevelopment sites may be jointly redeveloped into a single development that could cause a change in the site classification under the B(P)R and result in additional GFA. The possible effects of such merging of potential redevelopment sites were assessed and were considered to have minimal impacts on the results of the overall GFA assessments.

Assessment Results

3.2.4 The maximum permissible GFA of the 193 potential redevelopment sites estimated based on the aforementioned methodology is summarised in **Table 3.2**. The table also presents the existing GFA of these sites for comparison.

Table 3.2 : Maximum Permissible GFA of the Potential Redevelopment Sites

Land Use Zoning	Existing GFA (sq.m.)	GFA with the MM in force (189 sites) (sq.m.)	GFA with the MM lifted (193 sites) (sq.m.)
R(A)	167,200	317,200	326,200*
R(B)	276,400	369,200	465,900#
R(C)	123,800	175,100	257,900
C/R	9,500	14,300	14,300
Total GFA (sq.m.)	576,900	875,800	1,064,300

* GFA of 1 Government site = 8,100 sq. m.
# Total GFA of 3 Government sites = 64,700 sq. m.

3.3 Establishment of Redevelopment Scenarios

3.3.1 While a total of 193 sites were identified to have redevelopment potential based on the criteria discussed before, it would appear aggressive to assume all the 193 sites to be redeveloped all together in a short period of time. Eight different redevelopment scenarios were therefore established to present a more realistic picture for comparison and assessment of the impacts with the MM in force and with the MM lifted.

3.3.2 The 8 redevelopment scenarios are summarised in **Table 3.3** based on different combinations of the scale of redevelopment, status of the MM and design years (2016/2021).

Scale of Redevelopment

3.3.3 The scale of redevelopment was classified into four categories as described below.

(i) *Committed Redevelopments Only (Reference Scenarios A & C)* – These two scenarios include only the 8 work-in-progress sites with building plans approved and fenced with hoarding when surveys were conducted in March 2008. As these sites are "committed" developments and are likely to be completed by the year 2016, these two scenarios represent the reference redevelopment scenarios with none of the remaining 185 identified sites assumed to be redeveloped by the year 2021.

(ii) *Realistic Redevelopment (Scenarios B , D & E)* – Apart from the 8 committed sites, other uncommitted sites with higher redevelopment potential were selected by making reference to the past trends of redevelopment scale and intensity in the Study Area. The potential redevelopment sites were first sorted by building age and possible additional GFA for evaluating their redevelopment potential. Then, based on a research on the past 10 years' redevelopment records, it was assumed that there would be about 3 redevelopments (including merged sites) per year as a more realistic estimate. It should be noted that one redevelopment may involve more than one site.

(iii) *Full Redevelopment without Government Sites (Scenarios F & G)* – These two scenarios include all the 161 sites under unrestricted leases and 28 sites under restricted leases (i.e. 189 sites in total). The full redevelopment scenarios were assessed for the year 2021 only as it would be highly unlikely that all the potential sites could be demolished and reconstructed at the same time by the year 2016.

(iv) *Full Redevelopment with Government Sites (Scenario H)* – This refers to the scenario by the year 2021 and includes redevelopment of all the identified sites comprising the 4 Government sites (i.e. a total of 193 sites).

Table 3.3 : Summary of Redevelopment Scenarios

Year	Scenario	Scale of Redevelopment *				MM in Force	MM Lifted
		Committed Only (Reference)	Realistic	Full (without Government Sites)	Full (with Government Sites)		
2016	A	✓ (8 sites)				✓	
	B		✓ (44 sites)			✓	
2021	C	✓ (8 sites)				✓	
	D		✓ (66 sites)			✓	
	E		✓ (70 sites)#				✓
	F			✓ (189 sites)		✓	
	G			✓ (189 sites)			✓
	H				✓ (193 sites)		✓

* All scenarios include eight committed sites. # Without the 4 Government sites

Additional Flat Production

3.3.4 With reference to the more recent developments in Mid-Levels, the average flat sizes for the potential redevelopment sites by land use zoning were assumed as those shown in **Table 3.4**. It should be noted that generally larger flat size is observed for developments in Mid-Levels over the past 5 years.

Table 3.4 : Assumed Average Flat Sizes for the Potential Redevelopment Sites in Mid-Levels

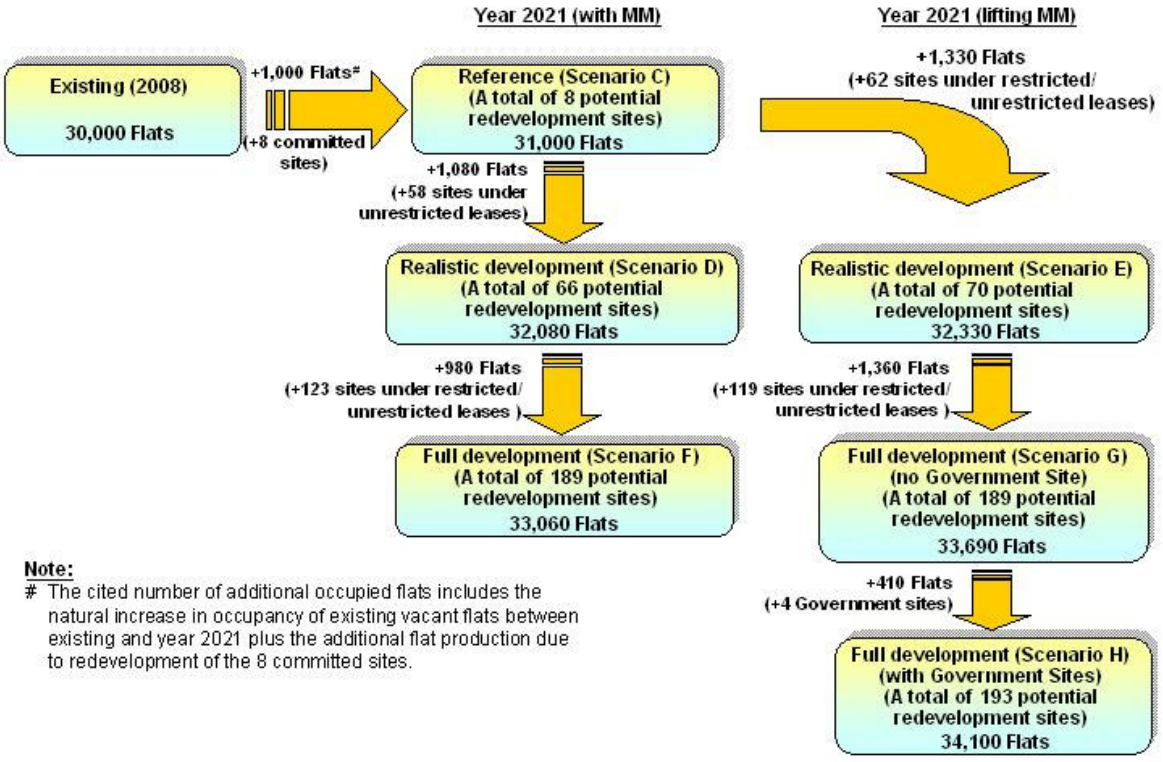
Land Use Zoning	Average Flat Size (sq.m.)
R(A), C/R	115
R(B)	145
R(C)	220

Note: If the redevelopment site area (after taking into account maximum site coverage) is smaller than the assumed average flat size, the average flat size derived from site area was adopted.

3.3.5 Based on the assessment results of the domestic GFA associated with the identified redevelopment sites, the potential additional flat production by the respective redevelopment scenarios is derived. **Figure 3.2** illustrates graphically the incremental numbers of occupied flats by redevelopment scenario for the ultimate design year 2021. For assessment purposes, the relevant redevelopments under individual scenarios are assumed to be fully occupied by the year 2021.

3.3.6 Under the realistic redevelopment Scenario D with the MM in force, the occupied residential flats in the MM Area would increase to 32,080 in 2021, representing a rise of 7% compared with the existing 30,000 occupied residential flats in 2008. If the MM is to be lifted but the sale of the 4 Government sites continues to be deferred, there would only be a further increase of 250 flats.

3.3.7 Under the full redevelopment Scenario F (with all the 189 private sites redeveloped) with the MM in force, the occupied residential flats in the MM Area would increase to 33,060 in 2021, representing an increase of 10%. If the MM is to be lifted under Scenario G, the number of residential flats would only further increase by 630. If the 4 Government sites are to be redeveloped at the same time under Scenario H, there would be an additional increase of 410 flats.



Note:
The cited number of additional occupied flats includes the natural increase in occupancy of existing vacant flats between existing and year 2021 plus the additional flat production due to redevelopment of the 8 committed sites.

Figure 3.2 : Occupied Flats by Redevelopment Scenario in 2021

4. TRAFFIC IMPACT ASSESSMENTS

4.1 Transport Model Development

4.1.1 The Mid-Levels Transport Model was developed specifically for this Study to provide robust traffic forecasts for traffic assessment and scenario testing purposes.

4.1.2 To cater for territorial demographic, socio-economic changes, the future land use and infrastructure developments that would affect the boundary conditions of the Mid-Levels Transport Model, a two-tier modelling approach was applied. The Government's strategic Comprehensive Transport Study Model was used as the upper tier model to provide input into the Mid-Levels Transport Model, a lower tier local area traffic model.

Base Year Model Validation

4.1.3 The strategic model was updated to the base year 2006 according to the latest available input data such as socio-economic, transport infrastructure, road network, the Planning Department's Territorial Population and Employment Data Matrices - 2006 Base Year Estimate (as at mid-2006) and other relevant transport policy assumptions. Refinements to the model were subsequently carried out to improve performance for better replication of the base year traffic conditions.

4.1.4 The refined 2006 strategic model provided a major input for developing the local area model. For the local area model development, the Government's Base District Traffic Model (**BDTM**) for Hong Kong Island North was cordoned to a smaller area covering the Study Area as shown in **Figure 4.1**. To provide the local area model with sufficient local details that can more accurately replicate the existing traffic conditions in Mid-Levels, the original BDTM network has been substantially refined and updated. Accordingly, the BDTM zones were further disaggregated to form a finer zoning system[2] within the Study Area.

4.1.5 The local area model was subsequently validated against the base year 2006 traffic conditions. The model validation guidelines were the same as those for the BDTM based on a combination of screenline[3], link and junction comparisons to assess the model's performance in replicating the observed traffic flows. The base year Mid-Levels Transport Model was well validated with the model output results matching the observed screenline flows, key link/junction movements as well as traffic journey time satisfactorily.

Design Year Model Development

4.1.6 The Mid-Levels Transport Model for

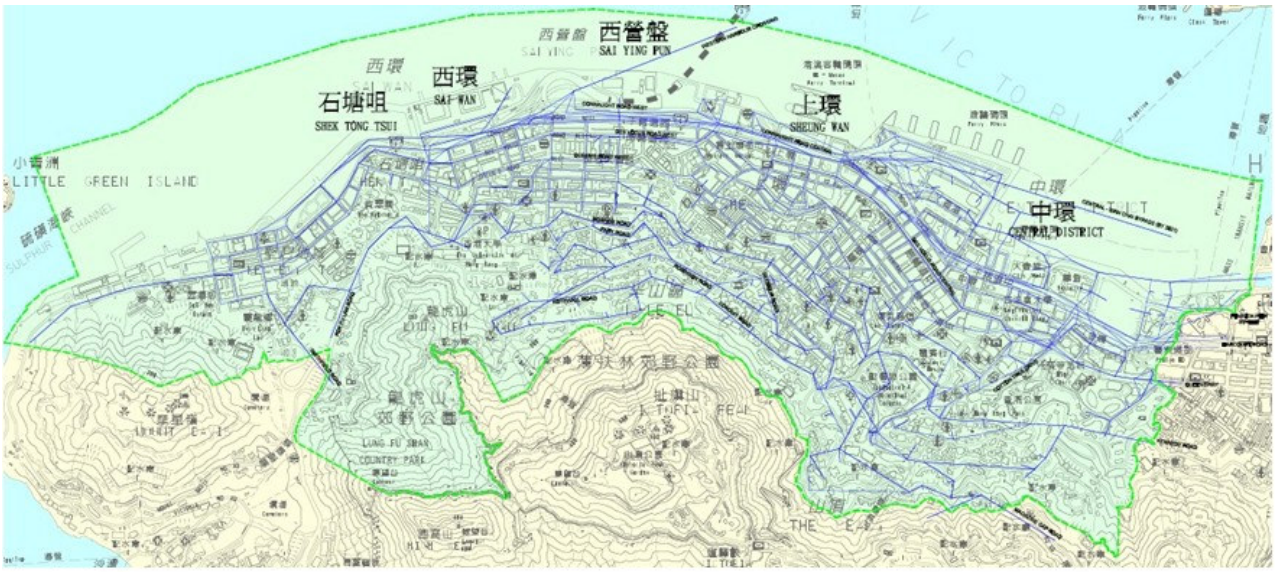


Figure 4.1 : Mid-Levels Transport Model

[2] The Mid-Levels Transport Model comprises a total of 272 internal and 13 external zones.

[3] Screenlines were drawn to cover the Study Area cordon and other major north-south and east-west traffic movements within the Study Area.

the future design years 2016 and 2021 were then developed predicated on the base year 2006 Mid-Levels Transport Model, taking into account future planning data, road and rail network assumptions and socio-economic data.

4.1.7 The Mid-Levels Transport Model was then applied to produce 2016 and 2021 traffic forecasts for traffic impact assessments and redevelopment scenario testing.

4.2 Redevelopment Traffic Generation

4.2.1 In estimating the additional traffic likely to be generated by the redevelopment sites under different redevelopment scenarios, a trip rate approach was applied by multiplying appropriate traffic generation rates by the additional flat production as derived before in Section 3.3.

4.2.2 Trip generation surveys were conducted for this Study at 15 representative residential sites of different land use zoning, namely "R(A)", "R(B)", "R(C)", and Commercial/Residential ("C/R"). After reviewing the survey results against those stipulated in Chapter 3, Volume 1 of the Transport Planning & Design Manual and considering the unique local characteristics in Mid-Levels, a set of agreed trip generation rates for the purposes of this Study is depicted in **Table 4.1**. These trip rates were adopted for use in the traffic impact assessments of this Study.

Table 4.1 : Adopted Trip Rates for the Potential Redevelopment Sites in Mid-Levels

Land Use Zoning	Average Flat Size (sq.m.)	Traffic Rates (PCUs[4]/hr/occupied flat)			
		AM Generation	AM Attraction	PM Generation	PM Attraction
R(A)	60	0.0598	0.0354	0.0238	0.0308
	70	0.0740	0.0429	0.0297	0.0400
	80	0.0882	0.0504	0.0355	0.0492
	90	0.1023	0.0579	0.0413	0.0583
	100	0.1165	0.0654	0.0472	0.0675
	110	0.1306	0.0729	0.0530	0.0767
	115	0.1377	0.0767	0.0559	0.0812
	120	0.1448	0.0804	0.0588	0.0858
R(B)	100	0.1508	0.0858	0.0735	0.1016
	120	0.1788	0.1124	0.1031	0.1278
	140	0.2068	0.1388	0.1327	0.1542
	145	0.2138	0.1455	0.1401	0.1607
R(C)	180	0.2390	0.1525	0.1409	0.2064
	220	0.2528	0.1766	0.1754	0.2547
	240	0.2597	0.1887	0.1927	0.2788
	300	0.2803	0.2249	0.2444	0.3512
C/R*	-	0.1720	0.2016	0.3811	0.4070

* Trip rate unit for C/R is PCUs/hr per 100 sq.m. GFA

4.2.3 The additional trip ends generated by the redevelopment sites under different scenarios in the ultimate design year 2021 are compared graphically in **Figure 4.2**. The figures presented are peak hour trip ends in PCUs[4]/hr (2-way).

4.2.4 With the MM in force, there would be a growth of traffic by 700 PCUs/hr (2-way) in the AM peak in 2021 under the realistic redevelopment Scenario D. This represents an 11% increase when compared with the present situation. Under the full redevelopment Scenario F, the growth in traffic would be 930 PCUs/hr in the AM peak in 2021, representing a 14% increase over the present situation.

4.2.5 Under the realistic redevelopment Scenarios D and E, the lifting of the MM would only cause an additional increase of 80 PCUs/hr in the AM peak in 2021. Similarly, under the full redevelopment Scenarios F and G and depending on whether the 4 Government sites are to be redeveloped or not (i.e. under Scenario H), an additional 230 to 370 PCUs/hr in the AM peak would be generated.

4.2.6 It should be remarked that there would be a total of 68 residential sites with buildings under 30 years of age in the year 2021. If all of these sites were also taken into account, an additional 5 sites held under restricted leases were found to have room to generate more GFA upon redevelopment if the MM is to be lifted. Without the MM, the possible maximum traffic volume these 5 sites could generate would be about 36 PCUs/hr in the AM peak in 2021. However, such a small amount of traffic would not have any adverse visible impact on the performance of the key junctions.

[4] Passenger Car Unit (PCU) is a standardised unit used for measuring traffic flows. A PCU is the equivalence of a passenger car in terms of traffic flow or impact on the road capacity. A goods vehicle, for example, would take up more capacity on roads than a passenger car and has an equivalent value of 1.75 PCUs.

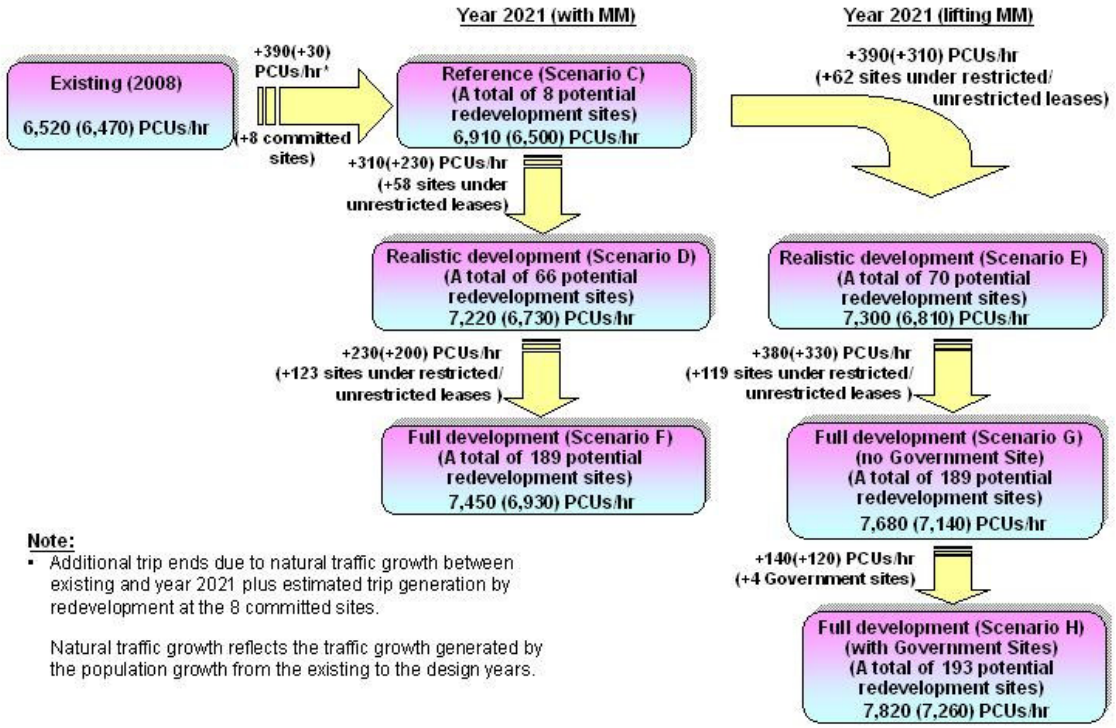


Figure 4.2 : AM (PM) Peak Hour Trip Ends by Redevelopment Scenario in 2021

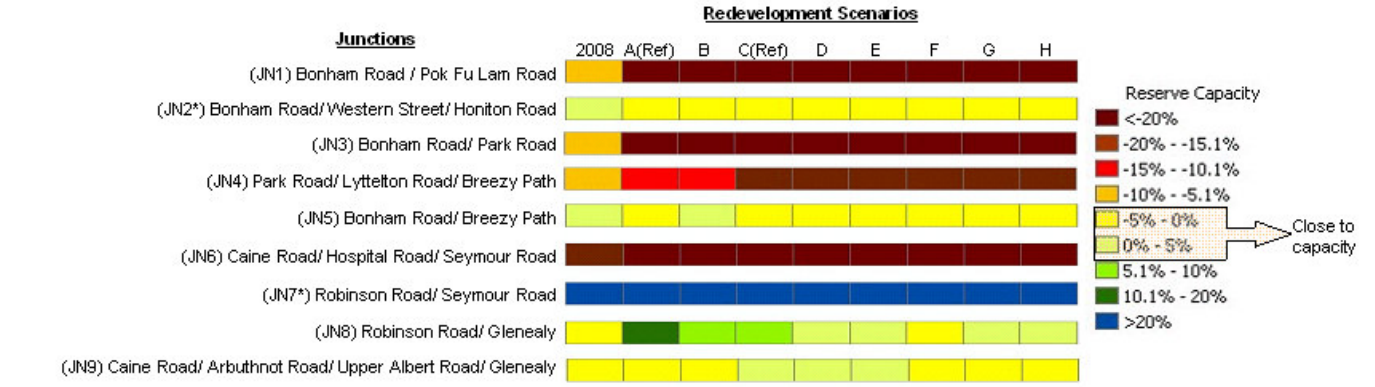
4.3 Junction Performance Assessments

4.3.1 The focus of the Study is on the effect of the MM on the traffic conditions in Mid-Levels. Since the impact of the additional traffic generated from the MM Area on the surrounding junctions would diminish gradually with increasing distance from potential traffic generators, it is logical to consider the MM Area as the area of influence. Junction performance assessments for each redevelopment scenario were conducted and the results are summarised in **Figure 4.3**.

4.3.2 Depending on the locations of the potential redevelopment sites, the amount of additional development-induced traffic is expected to be spread over the MM Area. Owing to the small difference in the additional traffic generated and the fact that the base traffic under the reference situation is far more significant than the additional traffic under various redevelopment scenarios, the attendant differential impact on the performance of individual junctions is very marginal and difficult to perceive when comparing one scenario with another in the same design year.

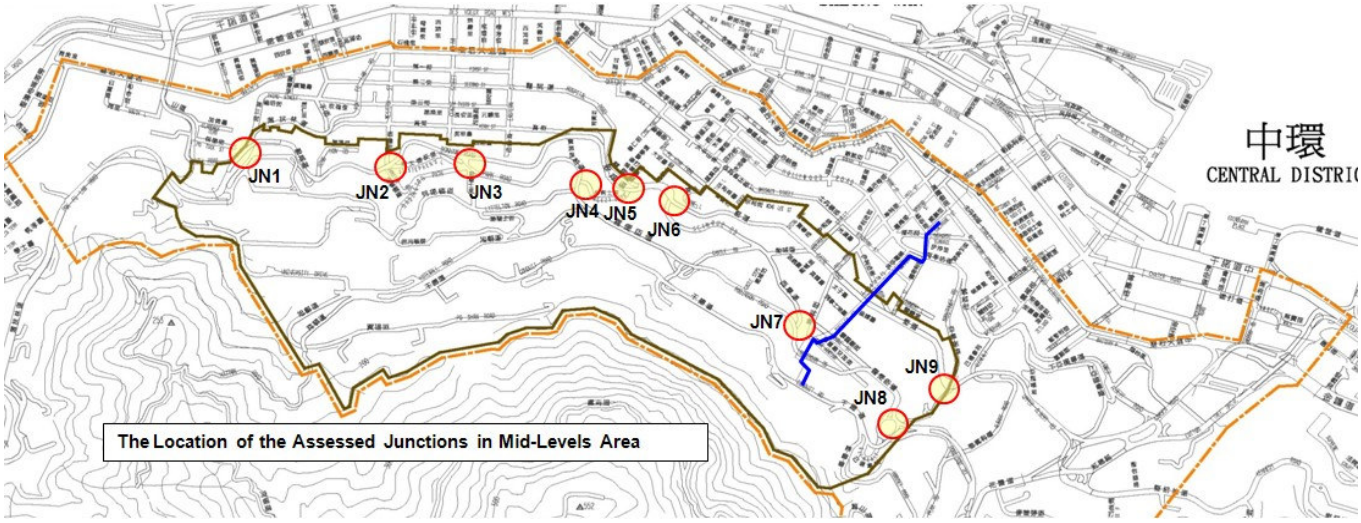
4.3.3 Among those junctions within the MM Area, 5 of them (JN1, JN3, JN4, JN6 & JN7) are anticipated to be operating under critical traffic conditions (i.e. with a reserve capacity of less than –5% or junction performance frequently affected by kerbside activities, pedestrian crossings or tailing back from the adjacent downstream junction) and another 3 (JN2, JN5 & JN9) to be operating close to capacity (i.e. with a reserve capacity of ±5% or junction performance occasionally affected by kerbside activities, pedestrian crossings or tailing back from the adjacent downstream junction) under both 2016 and 2021 reference Scenarios A and C respectively.

4.3.4 Based on the assumption of full redevelopment at all the 189 private potential sites and the 4 Government sites with the lifting of the MM, the same 5 junctions (JN1, JN3, JN4, JN6 & JN7) would be operating under critical traffic conditions and another 4 junctions (JN2, JN5, JN8 & JN9) would be operating close to capacity under the 'worst-case' Scenario H in 2021. However, the performance of these junctions (except JN8 which would be slightly improved upon opening of the Central-Wan Chai Bypass) is expected to be more or less the same as that under the reference Scenario C in the same design year on account of subtle differences in development-induced traffic impact.



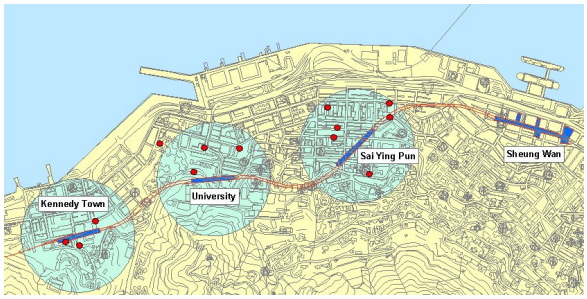
Notes : * - Junction is operating under critical traffic conditions frequently affected by kerbside activities, pedestrian crossings or tailing back from the adjacent downstream junction.

Figure 4.3 : Junction Performance Assessment Results



4.4 Effects of West Island Line

4.4.1 The West Island Line is scheduled for commissioning in the year 2014, which is an extension of the existing Mass Transit Railway (**MTR**) Island Line from Sheung Wan to Kennedy Town with intermediate stations at Sai Ying Pun and University. With the commissioning of the West Island Line, the existing catchment of the railway network will be further enlarged.



West Island Line scheduled for commissioning in 2014

4.4.2 It is envisaged that the shift from private mode (car and taxi) to public transport mode upon the opening of the West Island Line would reduce the private mode traffic generation from the West Island Line catchment area. On the other hand, the introduction of the West Island Line would also result in a shift of public transport users from road-based public transport modes to rail. The occupancy rates of the affected modes such as franchised buses and public light buses would decrease, and consequently the frequency of public transport services could be reduced. Based on the previous studies / surveys carried out in 2005 and the recent rationalisation of bus routes between 2005 and 2008, it was estimated that the reduction of road-based public transport services could be in the order of 15%. In total, the opening of West Island Line could relieve the road-based traffic by about 8-9% of the total traffic within the West Island Line catchment area.

4.4.3 In connection with the above estimated reduction in road traffic, the operating performance of a few junctions located within the West Island Line station walk-in catchment (such as the junctions of Bonham Road / Western Street / Honiton Road (JN2), Bonham Road / Pok Fu Lam Road (JN1), Bonham Road / Park Road (JN3), Park Road / Lyttelton Road / Breezy Path (JN4), and Bonham Road / Breezy Path (JN5)) is expected to be improved by 3-10% in terms of reserve capacity. As a result, the operation of the junction of Bonham Road / Western Street / Honiton Road (JN2) would be enhanced from 'critical' to 'close to capacity' conditions.

5. TRAFFIC IMPROVEMENT PROPOSALS

5.1 Overview

5.1.1 In the light of the list of capacity deficiency junctions identified earlier in Section 4.3, various improvement measures were explored and examined with a view to alleviating the traffic conditions at these locations. These improvement measures ranged from local junction modifications, pedestrian facilities to traffic demand management measures. In devising appropriate traffic improvement measures, emphasis had been given to the practical implementation of the schemes. Apart from basic transport needs and operational considerations, other key factors such as environmental concern, public acceptability, and land acquisition that would have a major bearing on whether a scheme or measure could be practically implemented were considered based on the preliminary information available.

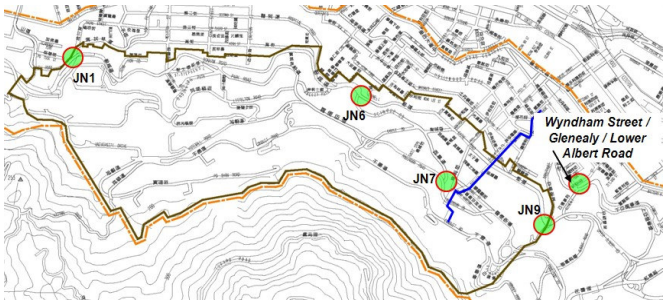
5.1.2 Besides those critical junctions identified in Section 4.3, there are other junctions within the Study Area but outside the MM Area that are currently operating under critical traffic conditions, either overloaded by demand or affected by kerbside activities leading to traffic tailing back from the adjacent downstream junction or pedestrian crossing. These include the junctions at Harcourt Road / Connaught Road Central / Cotton Tree Drive, Garden Road / Queen's Road Central / Queensway and Queensway / Cotton Tree Drive.

5.1.3 As revealed in the analysis, the root cause of the capacity problems at these junctions is mainly the regional through-traffic movements rather than the traffic generated from Mid-Levels. In view thereof, traffic relief measures at these junctions should more effectively be based on strategic and regional traffic considerations which are outside the main focus of this Study. In fact, the operating performance of these junctions would improve in the future when strategic transport infrastructure projects (e.g. the West Island Line and the Central-Wan Chai Bypass) are progressively put in place. No further improvements were considered for these junctions under this Study.

5.2 Proposed Improvement Measures

Local Junction Improvements (Appendices A1-A5)

5.2.1 Practical improvement schemes were developed for 4 individual junctions in the MM Area plus one junction outside the MM Area (i.e. the junction of Wyndham Street / Glenealy / Lower Albert Road). All the schemes identified would not require private land take or cause any major alterations to existing transport services, facilities or public utilities. However, all these proposed traffic improvement measures (which are presented below) are subject to further investigations and public consultation.



Locations of Proposed Junction Improvements

- *Robinson Road / Seymour Road (JN7)* – local widening of Seymour Road southbound approach to provide an additional traffic lane (Please see **Appendix A1**);
- *Caine Road / Arbuthnot Road / Upper Albert Road / Glenealy (JN9)* – provision of a footbridge or subway to replace the existing at-grade pedestrian crossings with associated modifications to the signal method of control, accompanied by local widening at the Arbuthnot Road and Caine Road approaches, provision of a filter left-turn lane from Arbuthnot Road southbound to Caine Road eastbound as well as right-turn pockets at the Caine Road and Upper Albert Road approach arms (Please see **Appendix A2**);
- *Wyndham Street / Glenealy / Lower Albert Road* – Although this junction lies outside the MM Area, an improvement in its traffic throughput is beneficial to the traffic entering or leaving the MM Area. The proposed scheme involves modification of traffic lane allocation at the Wyndham Street approach, revision of stopping restrictions along Lower Albert Road, and re-provision

of a passenger pick-up / drop-off point at Wyndham Street (Please see **Appendix A3**);

- *Bonham Road / Pok Fu Lam Road (JN1)* – provision of a footbridge or subway to replace the existing at-grade pedestrian crossings and associated modifications to the signal method of control (Please see **Appendix A4**);
- *Caine Road / Hospital Road / Seymour Road (JN6)* – relocation of the existing bus stop and layby on Caine Road eastbound from the west of the junction to the east with the existing bus stop converted into a green minibus stop (Please see **Appendix A5**).

5.2.2 Even with the above improvement proposals implemented, there would still be 3 junctions (JN3, JN4 & JN6) operating under critical traffic conditions and another 3 junctions (JN2, JN5 & JN8) operating close to capacity within the MM Area under the worst-case Scenario H in the year 2021. A summary of the junction performance under the worst-case Scenario H with and without the improvement proposals is shown in **Table 5.1** below.

Table 5.1 : Summary of the Junction Performance under Scenario H with and without Improvement Proposals

Junctions	Any Improvement Proposal ?	Junction Performance under Scenario H in 2021	
		Without Improvement	With Improvement
JN1 (Bonham Road / Pok Fu Lam Road)	Yes	Critical	✓
JN2 (Bonham Road / Western Street / Honiton Road)	No	Close to Capacity	Not Applicable
JN3 (Bonham Road / Park Road)	No	Critical	Not Applicable
JN4 (Park Road / Lyttelton Road / Breezy Path)	No	Critical	Not Applicable
JN5 (Bonham Road / Breezy Path)	No	Close to Capacity	Not Applicable
JN6 (Caine Road / Hospital Road / Seymour Road)	Yes	Critical	Critical
JN7 (Robinson Road / Seymour Road)	Yes	Critical	✓
JN8 (Robinson Road / Glenealy)	No	Close to Capacity	Not Applicable
JN9 (Caine Road / Arbuthnot Road / Upper Albert Road / Glenealy)	Yes	Close to Capacity	✓

Note : ✓ – Junction performance will be improved with positive reserve capacity

5.2.3 For the junction at Caine Road / Hospital Road / Seymour Road (JN6), the proposed small-scale junction modifications would improve the junction performance to some extent but still could not bring the junction operation to an acceptable level. For more significant improvement of the junction performance, further investigations should be carried out into the possible implementation of other improvement schemes.

5.2.4 As for the other 2 critical junctions (i.e. JN3 & JN4), no easy-to-implement improvement measures without involving private land acquisition or major traffic re-routing could be identified to resolve the anticipated capacity problems. Potential improvement schemes at these junctions were explored during the course of the Study but they were not pursued further on account of land acquisition and public acceptance concerns. Again, it is advisable to monitor the traffic situation closely and should the need arise, more major improvement schemes should be considered for an in-depth investigation.

Additional Pedestrian Facilities (Appendices B1-B2)

5.2.5 The steep terrain in Mid-Levels discourages residents from making walk trips to the surrounding areas. An effective way to promote walking is to provide a comprehensive escalator and walkway system for better connection between Mid-Levels and the peripheral areas and public transport network. This, in turn, would help reduce the reliance on road-based vehicular traffic, hence relieving traffic congestion. The existing Central-Mid-Levels Escalator and Walkway System linking Des Voeux Road Central with Conduit Road in Mid-Levels provides an alternative 24-hour reliable passageway in all weathers and is successful in serving some 81,000 pedestrian trips daily in 2008.

5.2.6 In connection with the committed West Island Line project, a large-scale underground pedestrian network equipped with large-capacity, high-speed passenger lifts will be provided to facilitate pedestrian access to/from the future University and Sai Ying Pun MTR Stations. A number of passenger lifts will be installed at University Station to provide a linkage between the station and Hill Road, Queen's Road West and Belcher's Street.

Passenger lifts will also be provided at Sai Ying Pun Station to connect the upper and lower areas of the hilly district on Bonham Road, First Street, Second Street and Des Voeux Road West. The above pedestrian network and passenger lift system would significantly improve the pedestrian circulation in Mid-Levels. Furthermore, pedestrian connectivity between Mid-Levels and the railway network would also be enhanced that in turn would reduce residents' reliance on road-based transport.

5.2.7 In addition to the above, potential initiatives to further enhance the pedestrian linkage from Mid-Levels to the Central Business District and railway catchment areas were investigated under this Study and the following are identified:

- *Sheung Wan Walkway System* (Please see **Appendix B1**) – The potential walkway system for consideration would run between Caine Road / Bonham Road and Queen's Road Central / Hollywood Road for enhancing access to / from the areas including Hillier Street, Jervois Street and Grand Millennium Plaza, and end at Wing Lok Street where the MTR Sheung Wan Station entrance/exit is located. Since there are several historic buildings in the locality, the exact alignment has yet to be explored carefully to ensure the conservation of the built heritage there. The Central and Western District Council and the parties concerned will be consulted on the findings in due course.
- *Sai Ying Pun Walkway System* (Please see **Appendix B2**) – To supplement the planned underground pedestrian network at the future Sai Ying Pun West Island Line Station as mentioned in paragraph 5.2.6, possible extension of the walkway system to further uphill was considered. The potential walkway extension would start at Conduit Road, then downhill through Kotewall Road, Robinson Road, Lyttelton Road, Park Road and end at Bonham Road where the Sai Ying Pun Station entrance/exit is to be located.

5.2.8 Based on the findings of the pedestrian counts and interview surveys undertaken on the usage of existing Central-Mid-Levels Escalator and Walkway System, it is expected that the potential Sheung Wan and Sai Ying Pun Walkway Systems could result in about 5% reduction in road traffic generated from the respective walkway system catchment areas.

5.3 Measures Considered But Not Pursued

New Highway Infrastructure (Appendix C)

5.3.1 The Study has investigated the possibility of providing new highway infrastructure to mitigate the traffic capacity problems but they are mostly discarded on environmental and public acceptance grounds. One of the schemes identified involves an elevated highway link along Centre Street from Robinson Road (near Oaklands Avenue) to Connaught Road West. Owing to severe geographical constraints, the conceived scheme is composed of 3 levels: the lower level as an elevated pedestrian walkway with travellators, the middle and top levels for southbound and northbound vehicular traffic respectively.

5.3.2 The scheme would provide an alternative major access to/from Mid-Levels in the west, thereby diverting traffic away and relieving congestion of the road network in the east of Mid-Levels. However, the 3-level flyover would inevitably have adverse environmental impacts on the surrounding areas. In particular, there could be high social costs of visual, noise and air pollution that would offset the benefits gained. Furthermore, public acceptance would be a key issue as the residents adjacent to the highway link are very likely to oppose the scheme. In consideration of these concerns, the scheme was not pursued for further investigation.

Traffic Gyratory System (Appendix D)

5.3.3 Given the serious road space constraints and frequent kerbside activities in Mid-Levels, a traffic gyratory system could be an effective way to increase the overall capacity of the road system without the need for additional infrastructure or road widening. The feasibility of implementing a one-way gyratory system in Mid-Levels was critically examined during the course of this Study. The conceived scheme involves the conversion of Caine Road and Robinson Road from currently two-way into a pair of one-way carriageways while Castle Road and Seymour Road will provide u-turn accesses for traffic 'short-circuiting' between Caine Road and Robinson Road.

5.3.4 Under the gyratory scheme, a total of 11 road sections will be required to change direction or be converted to one-way, while 9 key junctions will need modifications. Implementation of the gyratory system will also require a number of existing bus and green minibus routes to be re-routed. Obviously, the key advantage of introducing the gyratory system would be the improvement of junction performance as most of the opposing traffic could be reduced while obstructions to traffic caused by kerbside activities would be eased. Other potential benefits include reduction in vehicle emissions (as traffic congestion at junctions is mitigated) and improved pedestrian safety at crossings (due to one-way traffic and simplified pedestrian signal phasing).

5.3.5 Despite the above potential benefits, the following issues relating to the implementation of the traffic gyratory system are worth noting:

- An inevitable detour of traffic that would lengthen journey distance and possibly time for traffic circulating within the Mid-Levels Area;
- Major re-routing of existing bus and green minibus services causing inconvenience to existing bus / green minibus passengers; and
- Boarding / alighting activities on the wrong side for some school buses.

5.3.6 After deliberation, there may not be obvious benefit to road-users by implementing the gyratory system. In fact, acceptance of the gyratory scheme by local residents and businesses will be a key deciding factor for the successful implementation of the scheme as their current travel patterns and/or arrangements would be affected to a varying extent. In view of these factors, the traffic gyratory scheme is not pursued further.

Goods Vehicle Ban

5.3.7 At present, there are already rather stringent restrictions imposed on goods vehicles accessing the MM Area during specific time periods of the day (Please refer to earlier paragraph 2.3.5). This leaves little scope to further ban goods vehicle movements in Mid-Levels.

5.3.8 Furthermore, the majority of traffic in Mid-Levels is generated by the local residential developments and hence the traffic is dominated by private vehicles. As revealed from the observed traffic flows along major road links in the area, goods vehicles only amount to less than 10% of the private vehicle traffic (in PCUs which would mean a even lower percentage in vehicle numbers) generally. This indicates that the existing restrictions on goods vehicles have been effective and all practical means of prohibiting goods vehicles in Mid-Levels have already been implemented to minimise their adverse impact on the peak hour traffic conditions. On this basis, there would be no practical scope to further reduce goods vehicle traffic in Mid-Levels without impinging on the genuine needs of the local shops and residents.

Reduction of Car Parking Provision

5.3.9 New developments are subject to the requirements on car parking provision as stipulated in the Hong Kong Planning Standards and Guidelines. As most may expect, higher car parking provision would generate more car trips from the developments. Analysis of the trip generation survey data collected by this Study in Mid-Levels did show a positive correlation between private car trip generation and car parking provision. However, considering the unique affluent nature of the residents and the locational characteristics of Mid-Levels with considerable separation both vertically and horizontally from the nearest MTR stations, the Mid-Levels residents would likely still choose other vehicular transport (taxi, private shuttle, etc.) to enter / leave Mid-Levels and taxis would be their most convenient alternative "private" mode of transport, especially under hot or inclement weather conditions. As a result, any suppressed private car trips due to the reduction of car parking provision could well be offset by a corresponding increase in taxi trips. According to the results of the same trip generation survey, when private car and taxi trips were analysed together, the overall development-induced motorised traffic indicated no strong correlation with the car parking provision.

5.3.10 In view thereof, reduction of car parking provision is not recommended.

6. REVIEW OF THE MID-LEVELS MORATORIUM

6.1 Overview

6.1.1 As indicated from the assessment results presented in the preceding sections, several junctions in Mid-Levels are currently experiencing some traffic congestion. The situation would generally worsen in the future even under the reference scenario which includes new developments at committed sites only. Despite all efforts in exploring traffic improvement opportunities to relieve the traffic congestion, there is a limitation as to what could be practically implemented to improve the traffic conditions, either through physical improvement, new highway infrastructure or traffic management measures. Based on the assessment and evaluation results of the traffic improvement schemes, short to medium term measures are not adequate to improve the road network capacity to meet future traffic demand. Large-scale infrastructure improvements, on the other hand, are not feasible because of land constraints, and environmental and visual impact issues.

6.1.2 The MM was introduced in 1972 with a view to easing traffic congestion pending improvements to the road network. It restricts those developments / redevelopments held under restricted leases, and defers the sale of 4 Government sites. As a key objective of this Study, the effectiveness of the MM in containing development-induced traffic was reviewed with recommendations made on the way forward as to whether the MM should be retained, modified or replaced by other planning control measures.

6.1.3 Primarily, four major directions for the way forward in respect of the MM were identified, namely (a) lifting the MM, (b) strengthening the MM, (c) seeking an alternative means of planning control to replace the MM, and (d) maintaining the status quo by retaining the MM. The following presents assessments of these options from a transport perspective.

6.2 Lifting the MM

6.2.1 With reference to **Figures 3.2** and **4.2** on the assessment of additional flat production and trip generation by the potential redevelopment sites within the MM Area, lifting the MM while deferring the sale of the 4 Government sites would result in an increase of 250 to 630 flats and a corresponding increase in two-way AM peak hour traffic generation by 80 to 230 PCUs/hr in 2021 when compared with the situations with the MM in force. This amount of traffic constitutes only 1 to 3% of the total traffic volume in the MM Area.

6.2.2 With the implementation of the proposed improvement measures discussed in Section 5.2, the junction performance results with and without the MM in force under the 2021 full redevelopment scenarios F and H are summarised and compared in **Table 6.1**. The lifting of the MM would not result in a considerable change in junction performance.

Table 6.1 : 2021 Junction Performance Summary With and Without the MM in Force for Full Redevelopment Scenarios – With Implementation of Proposed Junction Improvements

Description	MM Retained (Scenario F)	MM Lifted (Scenario H*)
Junctions close to capacity (with a reserve capacity of ±5%)	➢ Bonham Road / Western Street/ Honiton Road (JN2) ➢ Bonham Road / Breezy Path (JN5) ➢ Robinson Road / Glenealy (JN8)	Same junctions as those under Scenario F, but with a reserve capacity worsened by 0-1%
Critical junctions (with a reserve capacity <-5%)	➢ Bonham Road / Park Road (JN3) ➢ Park Road / Lyttelton Road/ Breezy Path (JN4) ➢ Caine Road / Hospital Road / Seymour Road (JN6)	Same junctions as those under Scenario F, but with a reserve capacity worsened by 0-1%

* Including redevelopment of the 4 Government sites.

6.2.3 The proposed improvement measures would not bring about improvements to the traffic conditions in Mid-Levels to such an extent that additional traffic generated from development/redevelopment could be adequately accommodated by the improved road network. In fact, with or without the lifting of the MM, there would still be 3 junctions (JN3, JN4 & JN6) operating under critical traffic conditions and another 3 junctions (JN2, JN5 & JN8) operating close to capacity within the MM Area.

6.2.4 Although the additional traffic of 80 to 230 PCUs/hr stemming from the lifting of the MM would not give rise to an adverse noticeable impact on the performance of the key junctions, there is no room at this stage to lift the MM prior to the commissioning of the West Island Line.

6.3 Strengthening the MM

6.3.1 Whether strengthening of the MM can be practically implemented is highly questionable. The MM is only a lease administrative measure and the Government as a landlord cannot unilaterally impose more restrictive controls in a lease, so long as the OZP and/or other statutory requirements are complied with. Even if the Government ignores private land right and proposes to do so, i.e. to reduce the intensity permitted under lease conditions upon lease modifications, owners of existing developments simply would not enter into such lease modifications that would result in a reduction of their current development intensity. Hence, there is no practical way to 'strengthen' the MM.

6.4 Alternative Means of Planning Control

6.4.1 If the MM is to be lifted, an alternative means of applying planning control could be through blanket reduction of permissible PR on the OZPs. Among the 188 identified potential residential redevelopment sites (leaving aside the 5 C/R sites), 99 sites are zoned as "R(A)", 47 sites "R(B)" and 42 sites "R(C)". (Please refer to **Table 3.1**).

6.4.2 For the purpose of gauging the effectiveness of reducing PR, sensitivity tests were carried out based on the following assumptions on PR reduction:

(i) For sites zoned as "R(A)", the permissible PR for pure domestic buildings under the B(P)R generally varies from 8 to 10 depending on the class of site. A lower PR of 6 for domestic GFA of "R(A)" sites is assumed for sensitivity testing, except for those sites with an existing PR higher than 6 where the existing PR would be maintained.

(ii) For sites zoned as "R(B)", a maximum PR of 5 was imposed by the Town Planning Board in 1990. There appears little scope to further reduce it. Therefore, no PR reduction was assumed for "R(B)" sites. For sites with an existing PR higher than 5, the existing PR would be maintained.

(iii) For sites zoned as "R(C)", the permissible PR generally varies from 4 to 8 depending on the class of site. Lower PRs of 4 and 5 for domestic GFA of "R(C)" sites were tested [5], except for those sites with an existing PR higher than 4/5 where the existing PR would be maintained.

6.4.3 The changes in flat production and peak hour trip generation by the potential redevelopment sites as a result of the reduced PRs were calculated and the findings are summarised in **Table 6.2** for the 2021 realistic and full redevelopment Scenarios E and H respectively with the MM lifted.

Table 6.2 : Estimated Reductions in Flat Production and Trip Generation for Plot Ratio Test – Year 2021

Land Use Zoning	Number of Sites Affected[1]	Reduction in Flat Production	Reduction in Trip Generation[2]
Realistic Redevelopment Scenario E			
R(A)	40	-405	-85
R(B)	-	-	-
R(C)[3]	6	-52	-23
Total	**46**	**-457**	**-108**
Full Redevelopment Scenario H			
R(A)	94	-695	-125
R(B)	-	-	-
R(C)[3]	40	-235	-95
Total	**134**	**-930**	**-220**

[1] Excluding the 8 work-in-progress sites.
[2] Figures presented are 2-way trips in PCUs/hr during the more critical AM peak hour.
[3] Based on the reduction of domestic PR to 4. Another sensitivity test was conducted based on a reduced PR of 5 and the effects were rather negligible with a reduction in traffic generation by only 47 PCUs/hr even under the full redevelopment Scenario H.

6.4.4 Based on the above estimates, the reduction in two-way road traffic due to the reduced PRs for "R(A)" and "R(C)" sites would be in the order of 110 PCUs/hr in 2021 AM Peak under the realistic redevelopment Scenario E and

[5] The PR of 5 was tested since the "R(C)" sites mainly fall within Residential Density Zone 2 for which the maximum PR is 5 according to the Hong Kong Planning Standards and Guidelines. In addition, a lower PR of 4 was tested to see if the traffic reduction was significant.

220 PCUs/hr under the full redevelopment Scenario H. These estimates have assumed the MM to be lifted and replaced by reduced plot ratio control. As compared to the total of about 7,300 - 7,800 PCUs/hr into/out of the MM Area, such mild reductions (less than 3% even under Scenario H assuming full redevelopment) would not produce any noticeable traffic improvement.

6.4.5 Junction performance assessments were carried out for the reduced PR test based on the realistic redevelopment Scenario E. The junction performance results are summarised in **Table 6.3** and compared against the original results without the reduction in PRs**.**

Table 6.3 : 2021 Junction Performance Summary With and Without Reduction of Plot Ratios for Realistic Redevelopment Scenario E – With Implementation of Proposed Junction Improvements

Description	Without PR Reduction (Scenario E)	With PR Reduction (Scenario E)
Junctions close to capacity (with a reserve capacity of ±5%)	➢ Bonham Road / Western Street/ Honiton Road (JN2) ➢ Bonham Road / Breezy Path (JN5) ➢ Robinson Road / Glenealy (JN8)	Same junctions as those under Scenario E without PR reduction, but with a reserve capacity improved by 0-1%
Critical junctions (with a reserve capacity <-5%)	➢ Bonham Road / Park Road (JN3) ➢ Park Road / Lyttelton Road/ Breezy Path (JN4) ➢ Caine Road / Hospital Road / Seymour Road (JN6)	Same junctions as those under Scenario E without PR reduction, but with a reserve capacity improved by 0-1%

6.4.6 As revealed from the assessment results of the PR test, the reduction in traffic due to the reduced PRs would not bring about a notable improvement to the performance of the key junctions as the development sites are spread out with respect to the key junctions. Further reduction in PRs would certainly help to further decrease the traffic generation, but it would likely require unreasonably low PRs to resolve the traffic congestion problem in Mid-Levels that is not practical. Besides, redevelopment up to the PR of the existing building is permitted under the OZP in accordance with the established planning control mechanism. Therefore, the intended effect of lowering the development PRs could hardly realise.

6.4.7 For PR reductions to be an effective and meaningful means of relieving traffic congestion, the reduction has to be substantial. As such, restricting the development intensity by singling out some of the sites would inevitably entail fierce debates over the development right and equity issues.

6.5 Retaining the MM

6.5.1 It should be noted that out of a total of 420 sites in the MM Area, only 43 private residential sites held under restricted leases and 4 Government sites are controlled by the MM. Of these 43 private residential sites, 10 were found to have developed to their maximum permissible GFA with no potential for redevelopment even with the lifting of the MM. In reality, the MM controls only 33 private residential sites at this stage. Among the 33 private residential sites, 28 were identified to have redevelopment potential. With respect to these 28 sites, retaining the MM could only avoid generating an additional 230 PCUs/hr in the AM peak in 2021, which is just 3% of the total traffic volume in the MM Area. Thus, the effectiveness of the MM in containing development-induced traffic is rather limited.

6.5.2 In view of the underlying constraints and limitations in implementing significant improvement schemes to ensure satisfactory traffic conditions in Mid-Levels, as well as the ineffectiveness and limitations in tightening the MM or applying an alternative means of planning control, it is recommended that the building development restrictions imposed by the MM should be retained for the time being. Subject to the realisation of the forecast traffic improvements in Mid-Levels arising from the commissioning of the West Island Line and the implementation of other traffic control and improvement measures, due consideration will be given to lifting the MM.

7. CONCLUSION

7.1 Recommendations

7.1.1 The Study has explored and investigated every avenue to improve the traffic conditions in Mid-Levels. Improvement measures examined by the Study range from local junction modifications, area-wide traffic management schemes and pedestrian facilities to demand management measures, new highway infrastructure and planning control measures.

7.1.2 In formulating the final Study recommendations, emphasis has been given to the practical implementation of the schemes or measures. Apart from basic transport needs and operational considerations, other key factors such as environmental concern, public acceptability, and land acquisition were duly considered. Comprehensive assessments and scenario testing have been carried out to evaluate the need for, and effectiveness of the various proposals.

7.1.3 After thorough evaluation and deliberation, the Study makes recommendations on two main aspects, namely (a) the way forward for the MM, and (b) traffic improvement schemes for further investigation.

Mid-Levels Moratorium

7.1.4 Of the total of 420 sites in the MM Area, only 43 private residential sites held under restricted leases and 4 Government sites are controlled by the MM. Among these 43 private residential sites, 10 were found to have developed to their maximum permissible GFA with no potential for further redevelopment even with the lifting of the MM. Leaving aside the 4 Government sites which are at the disposal of the Government, the MM, in effect, controls only 33 private residential sites at this juncture.

7.1.5 As revealed from the traffic impact assessments, the forecast additional development-induced traffic volume in the AM peak in 2021 generated by the lifting of the MM (while deferring the sale of the 4 Government sites) would range from 80 to 230 PCUs/hr (depending on the pace of redevelopment) compared with the case in which the MM is in force. This amount of additional traffic, which constitutes only 1% to 3% of the total traffic volume in the MM Area, is not substantial enough to have an adverse noticeable impact on the operation of the key junctions.

7.1.6 However, there is no room at this stage to lift the MM before the West Island Line comes on stream. With the commissioning of the West Island Line and the associated high-speed, large-capacity passenger lifts cum extensive underground pedestrian walkways, the anticipated 8-9% reduction in road-based traffic within its catchment area would bring much-needed relief to the MM Area.

7.1.7 In view of the present busy traffic conditions in Mid-Levels, and the practical constraints and limitations in effecting more stringent controls on the development intensity in Mid-Levels, it is recommended to keep retaining the MM for the time being. Subject to the realisation of the forecast traffic improvements in Mid-Levels arising from the commissioning of the West Island Line and the implementation of other traffic control and improvement measures, due consideration will be given to lifting the MM.

Traffic Improvement Schemes

7.1.8 In order to boost the road network or junction capacity, traffic improvement schemes need to be implemented, even with the MM in force. The recommended traffic improvement schemes are summarised in **Table 7.1**.

Table 7.1 : Summary of Recommended Traffic Improvement Schemes

Improvement Scheme	Description	Land take required ?
Junction Improvement at Robinson Road/ Seymour Road (JN7)	Local road widening	Public amenity area near the junction
Junction Improvement at Caine Road/ Arbuthnot Road/ Upper Albert Road/ Glenealy (JN9)	Provision of footbridge / subway and local widening	Green area near Arbuthnot Road Refuse Collection Point and Public toilet underneath slope
Junction Improvement at Wyndham Street/ Glenealy/ Lower Albert Road *(Short-term)*	Traffic lane reallocation	Nil
Junction Improvement at Bonham Road / Pok Fu Lam Road (JN1)	Provision of footbridge / subway	Nil

Table 7.1 : Summary of Recommended Traffic Improvement Schemes (Cont'd)

Improvement Scheme	Description	Land take required ?
Junction Improvement at Caine Road/ Hospital Road/ Seymour Road (JN6) *(Short-term)*	Relocation of the existing bus and GMB stops	Nil
Walkway Systems between Mid-Levels and MTR Stations	Provision of pedestrian walkway systems at Sheung Wan and Sai Ying Pun	Subject to further detailed investigations and feasibility studies

7.1.9 It is suggested that the proposed improvement schemes which do not require land take should be implemented as soon as possible. Further studies / investigations should be conducted for the other proposed improvement schemes to explore their engineering feasibility.

7.2 Way Forward

7.2.1 Following this Study, the way forward is set out as follows:

- Keep retaining the MM for the time being. Subject to the realisation of the forecast traffic improvements in Mid-Levels arising from the commissioning of the West Island Line and the implementation of other traffic control and improvement measures, due consideration will be given to lifting the MM;
- Examine the implementation programme of the recommended junction improvement schemes, and carry out preparatory work and investigations into the improvement works sooner rather than later, especially for works that would require public land take; and
- Monitor closely the traffic conditions upon opening of the West Island Line and implementation of other improvement schemes, and effect appropriate modifications to the MM at an opportune moment when the prevailing traffic circumstances permit.