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# **Appendix 2**

## **Traffic Impact Assessment**

**{ Ove Arup & Partners Hong Kong Ltd }**

Hong Kong Resort Company  
Limited

**Traffic Study for Proposed  
Developments in Area N1 North,  
Area 10b and 4a, Discovery Bay  
Traffic Impact Assessment**

TIA

Rev 0 | September 2022

This report takes into account the particular  
instructions and requirements of our client.

It is not intended for and should not be relied  
upon by any third party and no responsibility  
is undertaken to any third party.

Job number 286369

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**ARUP**

# Contents

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	Page
<b>1 INTRODUCTION</b>	<b>1</b>
1.1 Background	1
1.2 Scope of Study	1
1.3 Structure of Report	2
<b>2 EXISTING TRAFFIC CONDITIONS</b>	<b>3</b>
2.1 Road Network in Discovery Bay	3
2.2 Traffic Count Survey	4
2.3 Existing Traffic Performance	6
2.4 Transport Services to/from Discovery Bay	8
<b>3 PROPOSED DEVELOPMENTS IN DISCOVERY BAY</b>	<b>10</b>
3.1 Development Parameters	Error! Bookmark not defined.
<b>4 FUTURE TRAFFIC CONDITIONS</b>	<b>11</b>
4.1 Trip Generation for Residential Developments	11
4.2 Future Year Major Highway and Land Use Assumption	19
4.3 Assessment Scenarios	20
4.4 Future Traffic Performance	21
<b>5 SUMMARY AND CONCLUSION</b>	<b>24</b>
5.1 Summary	24
5.2 Conclusion	25

## Figures

- Figure 2.1 Existing Road Network in Discovery Bay
- Figure 2.2 Location of Surveyed Key Junctions
- Figure 2.3 Existing Traffic Flows (Internal Road Network)
- Figure 2.4 Existing Traffic Flows (External Road Network)
- Figure 3.1 Location of Subject Site in Discovery Bay
- Figure 4.1 Projected Year 2037 Traffic Flows – Reference Scenario (Internal Road Network)
- Figure 4.2 Projected Year 2037 Traffic Flows – Reference Scenario (External Road Network)
- Figure 4.3 Projected Year 2037 Traffic Flows – Design Scenario (Internal Road Network)
- Figure 4.4 Projected Year 2037 Traffic Flows – Design Scenario (External Road Network)



# 1 INTRODUCTION

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## 1.1 Background

- 1.1.1 The Discovery Bay development is a self-contained sub-urban residential development comprising mainly low-density private housing, situated in the eastern part of Lantau Island covering a total land area of about 650 hectares.
- 1.1.2 Discovery Bay falls within the ambit of the Discovery Bay Outline Zoning Plan (DB OZP) which was first approved on 21 March 2003. The current approved OZP limits the population to 25,000 (i.e. 10,000 nos. of residential flat), which is reflected in the latest Master Plan MP7.
- 1.1.3 There are plans to optimize the residential potential of Discovery Bay, while maintaining the low density and resort like living environment. Under the current planning proposal, a total of 858 nos. of flat would be developed in Area 10b and 4a, in addition to the current approved OZP. The developments would be conducted in 2 phases with target completion for Phase 1 in Year 2031 and Phase 2 in Year 2034.
- 1.1.4 A Traffic Impact Assessment Report for Area 6f and Area 10b had been submitted and subsequently been approved by Transport Department dated 8 June 2016 (ref. no.: NR 182/90-2). Under the approved TIA proposal, around 1,600 nos. of flat would be developed (476 nos. for Area 6f and 1,125 flats for Area 10b). The planning application was, however, subsequently withdrawn. Separated Planning Application for Area 6f have been approved on 28 January 2022.
- 1.1.5 Ove Arup and Partners (HK) Ltd was commissioned by Hong Kong Resort Co Ltd, to review and evaluate the traffic impact induced by the proposed additional residential developments in Area 10b and 4a of Discovery Bay, including ferry and road-based transport, to support the application to modify the DB OZP for better optimization of the potential of Discovery Bay. The approved developments in Area 6f of Discovery Bay for residential use have also been taken into account for the assessments under this study.

## 1.2 Scope of Study

- 1.2.1 The scope of this study is highlighted and summarised below:
- Conduct vehicle count surveys at critical links and junctions to appreciate current traffic conditions in the study area;
  - Update the inventory regarding traffic circulation patterns, traffic conditions and constraints of the existing, as well as the future committed road network and developments in the vicinity of the subject developments based on the latest information available;
  - Review and assess the available traffic data/information;

- Develop reference scenario, i.e. should there be no change on the existing land use;
- Assess the likely traffic and transport impact due to the proposed developments on existing ferry service, and the road network capacity within and outside Discovery Bay;
- Develop traffic and transport improvement schemes, where appropriate, to mitigate any traffic and transport impact; and
- Assess the existing and future ferry service demand, to ensure the ferry service is able to cope with the additional demand induced by the proposed developments.

## 1.3 Structure of Report

1.3.1 After this introductory chapter, this report is divided into the following chapters:

- Chapter 2 – presents the details of the traffic count survey and the performance of critical junctions and road links for the base year;
- Chapter 3 – presents the parameters of the proposed developments in Discovery Bay;
- Chapter 4 – presents the traffic generation from the proposed developments, performance of critical junctions, road links and ferry service with the proposed developments in place; and
- Chapter 5 – summarises and concludes the findings of the study.



## 2 EXISTING TRAFFIC CONDITIONS

### 2.1 Road Network in Discovery Bay

#### External Connection

- 2.1.1 Under the existing comprehensive traffic control management for Discovery Bay, only authorized vehicles are allowed to access Discovery Bay via Discovery Bay Tunnel such as emergency vehicles, servicing buses and goods vehicles.
- 2.1.2 The Discovery Bay Tunnel is a toll tunnel under single two-lane configuration that links Discovery Bay Road at Yi Pak in the east with Cheung Tung Road at Siu Ho Wan adjacent to North Lantau Highway in the west.
- 2.1.3 The Tunnel was built for the Discovery Bay residential development on the north-eastern coast of Lantau Island, Hong Kong, which open 24 hours every day to vehicles specified by the Commissioner for Transport. The toll charge ranges from HK\$50.00 to HK\$250.00, depending on the type of vehicle, and is chargeable one-way eastbound only (i.e. from North Lantau to Discovery Bay).
- 2.1.4 Toll levels of the Tunnel for different vehicle types are summarised in **Table 2.1.1** below.

**Table 2.1.1 Toll Levels of Discovery Bay Tunnel**

Category	Vehicle Type	Toll Payable (HK Dollars)
1	Government vehicles, ambulances or vehicles used by officers of the Fire Services Department, the Hong Kong Police Force, the Customs and Excise Department or the Correctional Services Department	50
2	Private light buses other than category 1 above	50
3	Public and private buses other than category 1 above	50
4	Light goods vehicles and special purpose vehicles other than category 1 above and of a permitted gross vehicle weight not exceeding 5.5 tonnes	120
5	Medium goods vehicles and special purpose vehicles other than category 1 above and of a permitted gross vehicle weight exceeding 5.5 tonnes but not exceeding 24 tonnes	160
6	Heavy goods vehicles and special purpose vehicles other than category 1 above and of a permitted gross vehicle weight exceeding 24 tonnes	250
7	Vehicles other than categories 1 to 6 above	250

- 2.1.5 Besides the above vehicle types, Urban Taxis, Lantau Taxis and coaches with prior bookings are allowed to access designated areas in Yi Pak (Discovery Bay North) via Discovery Bay Tunnel, since 26 October 2014. No toll is charged by the tunnel company for the passage of taxis.
- 2.1.6 The local road connects with the tunnel link is Cheung Tung Road, which is a 7.3m wide two-lane single carriageway. It runs in an east-west alignment parallel to the North Lantau Expressway. The carriageway is a key corridor to provide access for the residential bus services of Discovery Bay.

### **Internal Connection**

- 2.1.7 Discovery Bay Road is the major internal road within Discovery Bay, spanning from Discovery Bay Tunnel in the north to the Marina in the south. The road is under single two-lane configuration, serving as the spine for both internal and external connections, with access roads branch for various residential developments in Discovery Bay as well as the bus terminus at Discovery Bay Plaza for access to the Ferry Pier. Marina Drive connects Discovery Bay Road and the Marina.
- 2.1.8 The existing road network in Discovery Bay is shown in **Figure 2.1**.

## **2.2 Traffic Count Survey**

- 2.2.1 In order to appreciate the existing traffic conditions, comprehensive traffic counts were conducted during the periods of 07:00-10:00 and 17:00-20:00 hours on a typical weekday (Monday), and 13:00-18:00 hours on a typical weekend (Saturday) in March 2022. Due to COVID-2019 situation, the traffic flow in March 2022 has been reviewed and compared with the in-house traffic data surveyed in June 2019. The flow in 2019 is considered more appropriate to reflect the prevailing traffic condition on typical weekdays at the surveyed road network, therefore, the flow in 2019 is adopted for assessment purpose. Hence, the traffic flow obtained in 2022 have then been validated against the historical traffic flow obtained in 2019. Traffic flow at critical road links including Discovery Bay Road, Discovery Valley Road, Siena Avenue, Discovery Bay Tunnel, Cheung Tung Road, North Lantau Highway, Lantau Link, and key junctions in Discovery Bay, Tung Chung and Sunny Bay areas as shown in **Table 2.2.1** below were assessed.
- 2.2.2 The Area of Influence, location of the key junctions and critical road links are also shown in **Figure 2.2**.



**Table 2.2.1 Surveyed Key Junctions**

Junction		Type
Internal Junctions in Discovery Bay		
J1	Discovery Bay Tunnel / Discovery Bay Road	Roundabout
J2	Siena Avenue North Roundabout	Roundabout
J3	Discovery Bay Road / Headland Drive	Priority
J4	Discovery Bay Road / Discovery Valley Road	Priority
J5	Discovery Bay Road / DB Plaza Bus Terminus	Priority
J6	Discovery Bay Road / Vista Avenue	Priority
J7	Discovery Bay Road / Plaza Lane	Priority
J8	Discovery Bay Road / Marina Drive	Priority
External Junctions in Tung Chung / Sunny Bay		
J9	Sunny Bay Road / Cheung Tung Road	Priority
J10	Cheung Tung Road / Discovery Bay Tunnel	Priority
J11	Tung Chung Waterfront Road / Slip Road to North Lantau Highway	Signal
J12	Tung Chung Waterfront Road / Slip Road from North Lantau Highway	Signal
J13	Chek Lap Kok South Road Roundabout	Roundabout
J14	Shun Tung Road / Tat Tung Road (West)	Signal
J15	Tat Tung Road / Mei Tung Street	Signal
J16	Tat Tung Road / Fu Tung Street	Priority
J17	Tat Tung Road / Hing Tung Street	Signal
J18	Shun Tung Road / Tat Tung Road (East)	Signal
J19	Shun Tung Road / Yu Tung Road	Signal
J20	Tung Chung East Interchange	Roundabout

**2.2.3**

The AM and PM peak hours were found to be 08:15-09:15 and 17:15-18:15 respectively. While for weekend, the peak hour was found to be 14:00-15:00 hours, but the flows during weekend are in general lower than that during both weekday AM and PM peak. Therefore, weekday AM and PM peak were considered as critical scenarios for assessment.



## 2.3 Existing Traffic Performance

2.3.1 The observed traffic flow during the AM and PM peak hours at the critical road links (refer to **Figure 2.3 and 2.4**), and the corresponding performance in terms of volume-to-capacity (v/c) ratio are shown in **Table 2.3.1** below.

**Table 2.3.1 Existing Link Performance**

Road Links	Direction	Link Capacity (PCU/hour)	Traffic Flow (pcu/hr)		Volume-to-Capacity (V/C)	
			AM Peak	PM Peak	AM Peak	PM Peak
Lantau Link	E/B	6,100	3,685	3,875	0.60	0.64
	W/B	6,100	4,055	3,810	0.66	0.62
North Lantau Highway	E/B	6,100	2,430	2,595	0.40	0.43
	W/B	6,100	2,830	2,680	0.46	0.44
Cheung Tung Road Western Section	E/B	1,040	200	190	0.19	0.18
	W/B	1,040	210	170	0.20	0.16
Cheung Tung Road Eastern Section	E/B	1,040	295	320	0.28	0.31
	W/B	1,040	285	260	0.27	0.25
Discovery Bay Tunnel	E/B	1,280	355	335	0.28	0.26
	W/B	1,280	375	370	0.29	0.29
Discovery Bay Road (North of Discovery Valley Road)*	N/B	1,040	215	230	0.21	0.22
	S/B	1,040	175	210	0.17	0.20
Discovery Bay Road (South of Discovery Valley Road)*	N/B	1,040	190	270	0.18	0.26
	S/B	1,040	200	255	0.19	0.25
Discovery Valley Road*	E/B	1,040	65	65	0.06	0.06
	W/B	1,040	15	60	0.01	0.06
Siena Avenue*	E/B	1,040	340	305	0.33	0.29
	W/B	1,040	315	305	0.30	0.29

\* Included Golf Cart at Discovery Bay internal roads with PCU factor of 1.

- 2.3.2 Junction capacity analyses been carried out at the key junctions. Results of the capacity assessment are summarised in **Table 2.3.2** below.

**Table 2.3.2 Existing Junction Performance**

Junction		Type	Performance*	
			AM	PM
Internal Junctions in Discovery Bay				
J1	Discovery Bay Tunnel / Discovery Bay Road	Roundabout	0.19	0.17
J2	Siena Avenue North Roundabout	Roundabout	0.27	0.24
J3	Discovery Bay Road / Headland Drive	Priority	0.02	0.07
J4	Discovery Bay Road / Discovery Valley Road	Priority	0.10	0.12
J5	Discovery Bay Road / DB Plaza Bus Terminus	Priority	0.01	0.08
J6	Discovery Bay Road / Vista Avenue	Priority	0.03	0.04
J7	Discovery Bay Road / Plaza Lane	Priority	0.29	0.43
J8	Discovery Bay Road / Marina Drive	Priority	0.05	0.09
External Junctions in Tung Chung/ Sunny Bay				
J9	Sunny Bay Road / Cheung Tung Road	Priority	0.47	0.51
J10	Cheung Tung Road / Discovery Bay Tunnel	Priority	0.65	0.64
J11	Tung Chung Waterfront Road / Slip Road to North Lantau Highway	Signal	>50%	>50%
J12	Tung Chung Waterfront Road / Slip Road from North Lantau Highway	Signal	>50%	>50%
J13	Chek Lap Kok South Road Roundabout	Roundabout	0.29	0.28
J14	Shun Tung Road / Tat Tung Road (West)	Signal	>50%	>50%
J15	Tat Tung Road / Mei Tung Street	Signal	>50%	>50%
J16	Tat Tung Road / Fu Tung Street	Priority	0.53	0.47
J17	Tat Tung Road / Hing Tung Street	Signal	>50%	>50%
J18	Shun Tung Road / Tat Tung Road (East)	Signal	>50%	>50%
J19	Shun Tung Road / Yu Tung Road	Signal	>50%	>50%
J20	Tung Chung East Interchange	Roundabout	0.23	0.20

\* Figures shown represent "Design Flow/Capacity" (DFC) ratio for roundabout and priority junctions, and "Reserve Capacity" for signal junctions

- 2.3.3 As shown in **Tables 2.3.1** and **2.3.2**, all critical road links and key junctions are currently operating with significant spare capacity during both AM and PM peak hours.



## 2.4 Transport Services to/from Discovery Bay

- 2.4.1 The two main transport modes for accessing Discovery Bay are ferry and residential bus. Since 26 October 2014, designated areas in Discovery Bay (North) are also accessible by Urban and Lantau Taxis.
- 2.4.2 The main ferry route operates from Discovery Bay to Central. There are also local ferry/kaito ferry routes operating from Discovery Bay to Mui Wo, Peng Chau and Trappist Monastery
- 2.4.3 There are two types of bus services in Discovery Bay: one serves various residential developments within Discovery Bay for connection to the ferry pier or commercial centre at Discovery Bay (North); the other serves as external connection from Discovery Bay (from pier or DB North) to Tung Chung, Sunny Bay and Hong Kong International Airport, via Discovery Bay Tunnel. **Table 2.4.1** summarises the ferry and bus services for Discovery Bay.

**Table 2.4.1 Ferry and Bus Services for Discovery Bay**

No	Origin	Destination
<b>Ferry</b>		
-	Discovery Bay Ferry Pier	Central Pier No. 3
-	Discovery Bay (Nim Shue Wan)	Mui Wo <sup>(1)</sup>
-	Discovery Bay (Nim Shue Wan)	Peng Chau / Trappist Monastery <sup>(2)</sup>
<b>External Bus</b>		
DB01R	DB Plaza Bus Terminus	Tung Chung Station Bus Terminus
DB01P	Tung Chung Station Bus Terminus	DB Plaza (through DB North Plaza)
DB02R	DB Plaza Bus Terminus	Airport Passenger Terminal Buildings
DB02A	DB North Plaza	Airport Passenger Terminal Buildings
DB03R	DB Plaza Bus Terminus	Sunny Bay Public Transport Interchange
DB03P	DB North Plaza	Sunny Bay Public Transport Interchange
DB03R	DB Plaza Bus Terminus	Sunny Bay
DB08R <sup>(3)</sup>	28 Coastline Villa	Central Pier 3 (through DB Plaza and DB North Plaza)

No	Origin	Destination
<b>Internal Bus</b>		
1	DB Plaza Bus Terminus	Headland Drive (Circular)
2	DB Plaza Bus Terminus	Midvale Village
3	DB Plaza Bus Terminus	Parkvale Village
4	Coastline Villa	DB Plaza Bus Terminus
4A	DB North Plaza	Coastline Villa
5	DB Plaza Bus Terminus	Serene Avenue
6	DB Plaza Bus Terminus	Seabee Lane (Circular)
9	Caperidge Drive	Chianti - The Pavilion
9A	Chianti (The Pavilion)	Caperidge Drive
9X	DB North Plaza	DB Plaza Bus Terminus
18	DB Plaza Bus Terminus	IL PICCO
1/6	DB Plaza Bus Terminus	Parkland Drive/ Headland Drive/ Seabee Lane
N3/2	DB Plaza Bus Terminus	Midvale Village/ Parkvale Village
N3/2/7/8	DB Plaza Bus Terminus	Midvale Village/ Parkvale Village/ Capeland Drive/ Caperidge Drive
N4	DB Plaza Bus Terminus	DB North Plaza
N5/1/6	DB Plaza Bus Terminus	Headland Drive/ Serene Avenue/ Seabee Lane
N7/8	DB Plaza Bus Terminus	Capeland Drive/ Caperidge Drive
DB04R	Discovery Bay Marina Drive	DB North Plaza
DB04R (Special)	Discovery Bay Marina Drive	Club Siena
DB05R <sup>(4)</sup>	Discovery Bay Marina Drive	DBIS
DB05R <sup>(4)</sup>	Club Siena	Discovery Bay Marina Drive
DB06R	Discovery Bay Recreation Club	Club Siena
DBGC Shuttle Bus	DB Plaza Bus Terminus	Discovery Bay Golf Club

<sup>(1)</sup> Operate on Saturdays, Sundays and Public Holidays. One departure per day per direction on Mondays to Fridays (School Days only) via Peng Chau

<sup>(2)</sup> Kaito ferry service

<sup>(3)</sup> Night service only

<sup>(4)</sup> Serve Discovery Bay Yacht Club members only



### 3 PROPOSED DEVELOPMENTS IN DISCOVERY BAY

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#### 3.1 Proposed Developments

- 3.1.1 The proposed development is located in Area 10b and 4a along the existing Marine Drive. It consists of 858 nos. of flats. Location plan of the developments is presented in **Figure 3.1**.
- 3.1.2 The approved development in Area 6f of Discovery Bay for residential use located on the western side of existing Discovery Bay Phase 3 Parkvale Village is also taken into account for assessment.



## 4 FUTURE TRAFFIC CONDITIONS

### 4.1 Trip Generation for Residential Developments

#### Pedestrian Trip Generation

4.1.1 The likely volume of traffic generated by the additional residential developments is based on the current trip generation and attraction by the existing residential developments in Discovery Bay, assuming future additional residential developments would have similar characteristics of the existing residential developments.

4.1.2 Pedestrian count surveys were also conducted during weekday AM and PM peak period, at the footpaths immediately outside the typical residential developments in Discovery Bay, counting the number of pedestrians leaving and entering the residential buildings during the peak period. The survey locations are shown in **Table 4.1.1** below.

**Table 4.1.1 Pedestrian Survey Location**

Survey Location	Coverage	Total No. of Flats
Footpath at Capevale Drive	Phase 4 Peninsula Village – Jovial Court, Haven Court and Verdant Court	408 nos.
Footpath at Costa Avenue	Phase 8 La Costa – Onda Court and Costa Court	230 nos.

4.1.3 Due to impact on commutes by the fifth wave of the epidemic of COVID-19, the observed pedestrian flow in March 2022 is found significantly lower than that adopted in the previous approved TIA report. For conservative approach, pedestrian flow in the previous report is adopted for the assessment. The surveyed pedestrian flow and corresponding trip generation / attraction rates at the surveyed residential developments are then estimated. For comparison, reference has also been made to the overall pedestrian trips approaching / leaving Discovery Bay by external residential bus, ferry or taxi during the same peak period. These trip rates are tabulated in **Table 4.1.2** below.

**Table 4.1.2 Surveyed Peak Hour Pedestrian Trips and Trip Generation Rate at Capevale Drive and Costa Avenue**

	AM Peak		PM Peak	
	Generation	Attraction	Generation	Attraction
Pedestrian Count at Capevale Drive (persons/hr)	133	40	62	104
Trip Rate at Capevale Drive (persons/hr/flat)	<b>0.326</b>	0.098	0.152	<b>0.255</b>
Pedestrian Count at Costa Avenue (persons/hr)	67	25	38	57
Trip Rate at Costa Avenue (persons/hr/flat)	0.291	<b>0.109</b>	<b>0.165</b>	0.248
Total Pedestrian Trips Approaching / Leaving Discovery Bay by Bus, Ferry or Taxi (persons/hr)	2,011	788	723	1,650
Trip Rate for Overall Discovery Bay (persons/hr/flat) (1)	0.242	0.095	0.087	0.198
<b>Adopted Trip Rate for Additional Residential Development (persons/hr/flat)</b>	<b>0.326</b>	<b>0.109</b>	<b>0.165</b>	<b>0.255</b>

(1) Overall number of flats for residential developments in previous study is 8,326 nos.



- 4.1.4 As shown in **Table 4.1.2**, the surveyed pedestrian trip rates at the residential developments at Capevale Drive and Costa Avenue were in general higher than the overall trip rate for the entire Discovery Bay. For conservative approach, the higher trip rate is adopted for estimation of pedestrian generation for the proposed residential development in Area 10b and 4a. The adopted trip rate would be considered conservative as it has included part of the Discovery Bay internal trips.
- 4.1.5 Assuming that the modal split for additional residential developments would be similar to the existing travel pattern, the pedestrian trips generated are mainly trips to urban areas by ferries, or by external residential buses to Sunny Bay MTR Station or Tung Chung MTR Station. With reference to the boarding/alighting surveys and the information on the ferry ticket gate/ bus Octopus count from the operators, the modal split for bus and ferry is approximately 75% and 25% respectively. According to the latest survey, less than 5% of the total external trips are by taxi. The pedestrian trip generation with corresponding modal split of the proposed residential development is shown in **Table 4.1.3** below.

**Table 4.1.3 Estimated Pedestrian Trip Generation for the Proposed Residential Developments in Area 10b and 4a (Unit: persons/hr)**

Residential Development	No. of Flats	No. of Flats for Assessment <sup>(1)</sup>	AM Peak		PM Peak	
			Generation	Attraction	Generation	Attraction
10b & 4a	858	1,030	336	112	171	263
Estimated Pedestrian Trips to use External Bus Service (persons/hr)			252	84	128	197
Estimated Pedestrian Trips to use Ferry Service to Central (persons/hr)			84	28	42	66

<sup>(1)</sup> Includes a +20% variation in total number of flats adopted for assessment to allow for flexibility in detailed design

- 4.1.6 Also, it is anticipated that during AM and PM peak hour, trip generation from the proposed residential development are mainly work-related trips to urban areas, hence the estimated patronage for the two ferry services, Discovery Bay to Mui Wo and Peng Chau/Trappist Monastery respectively, would be considered minimal.
- 4.1.7 For those external trips by ferries to urban areas, they are assumed to take internal residential buses directly from the proposed residential development to DB Plaza Bus Terminus, then change to ferry at the ferry pier.
- 4.1.8 For those external trips to Sunny Bay or Tung Chung, they are also assumed to take internal residential buses to DB Plaza Bus Terminus or DB North Plaza, then transfer to external buses to their corresponding destinations.
- 4.1.9 Walk trips to/from the ferry pier and cycle trips are excluded, as a conservative approach for assessment of internal bus generation (i.e. assume all pedestrian trip generation would travel by internal buses).

## 4.1.10

In addition, walk trips and cycle trips would only induce minimal impact to existing footpaths and cycle tracks. According to the survey data obtained in previous approved study, which include data from interview survey and site observation conducted at the building block entrance at Phase 3 Parkvale Village and Phase 4 Peninsula Village respectively, the observed split for walking trips and cycling trips to/from ferry pier is around 10% and <0.5% respectively. The result is tabulated in **Table 4.1.4** and **Table 4.1.5** below.

**Table 4.1.4 Pedestrian Survey at Phase 3 Parkvale Village**

	AM Peak	PM Peak
Total surveyed pedestrians <b>leaving</b> residential building blocks to DB Plaza (ped/hr)	59	22
• By bus/golf cart (ped/hr)	52 (88%)	19 (86%)
• By walk (ped/hr)	7 (12%)	3 (14%)
• By Bicycle (ped/hr)	0 (0%)	0 (0%)
	AM Peak	PM Peak
Total surveyed pedestrians <b>approaching</b> residential building blocks from DB Plaza (ped/hr)	16	62
• By bus/golf cart (ped/hr)	15 (94%)	57 (92%)
• By walk (ped/hr)	1 (6%)	5 (8%)
• By Bicycle (ped/hr)	0 (0%)	0 (0%)



**Table 4.1.5 Pedestrian Survey at Phase 4 Peninsula Village**

	AM Peak	PM Peak
Total surveyed pedestrians leaving residential building blocks to DB Plaza (ped/hr)	105	43
• By bus/golf cart (ped/hr)	91 (87%)	40 (93%)
• By walk (ped/hr)	13 (12%)	3 (7%)
• By Bicycle (ped/hr)	1 (1%)	0 (0%)
	AM Peak	PM Peak
Total surveyed pedestrians approaching residential building blocks from DB Plaza (ped/hr)	23	83
• By bus/golf cart (ped/hr)	21 (91%)	76 (92%)
• By walk (ped/hr)	2 (9%)	6 (7%)
• By Bicycle (ped/hr)	0 (0%)	1 (1%)

4.1.11 The additional two-way walk trips generated from Area 10b and 4a would only contribute around 40 ped/hr during both AM and PM peak hour. While the clear width of the narrowest part of the footpath is 2.5m, assuming 0.5m lateral clearance on both sides of the footpath and LOS C performance (i.e. flow rate = 33 ped/min/m), the capacity of footpath would be  $33 \times (2.5 - 0.5 - 0.5) \times 60 = 2,970$  ped/hr.

4.1.12 With the existing footpath available capacity at the narrowest section of around 2,970 ped/hr (i.e. around 75 times the pedestrian trip generated). Majority of the residents would travel by shuttle bus immediate outside the residential developments. Hence, impact on existing pedestrian and cycle track network would be minimal.

#### **Vehicular Trip Generation – Bus**

4.1.13 Based on the above assumptions, the estimated pedestrian trips as shown in **Table 4.1.3** are converted to vehicular (bus) trip generation.

4.1.14 As a conservative approach, it is assumed that the bus trip generation due to additional residential developments would have occupancy of not more than 70% (i.e. each bus would carry not more than 56 passengers including standing passengers), hence generating a higher number of bus trips compared with the case of assuming 100% occupancy (i.e. each bus would carry 80 passengers including standing passengers).

4.1.15 The vehicular (bus) trip generation for internal trips between the additional developments and DB Plaza bus terminus is tabulated in **Table 4.1.6** below.



**Table 4.1.6 Calculated Internal Bus Trip Generation for Additional Residential Developments in Area 10b & 4a (Unit: pcu/hr)**

Residential Development	No. of Flats	No. of Flats for Assessment <sup>(1)</sup>	AM Peak		PM Peak	
			Generation	Attraction	Generation	Attraction
Area 10b & 4a	858	1,030	336 / 56 = 6 veh = 15 pcu	112 / 56 = 3 veh = 8 pcu	171 / 56 = 4 veh = 10 pcu	263 / 56 = 5 veh = 13 pcu

<sup>(1)</sup> Includes a +20% variation in total number of flats adopted for assessment to allow for flexibility in detailed design

- 4.1.16 For assessment purpose on providing bus service to the residential development, the critical bound traffic during peak hour would be adopted for both generation and attraction. In the morning peak, the critical bound is generation while in the evening peak the attraction would be more critical. Also, for conservative approach, it is assumed these buses from the additional residential developments would operate with headway of around 8 minutes, similar to the existing internal bus services. The adopted vehicular (bus) trip generation for internal trips is shown in **Table 4.1.7** below.

**Table 4.1.7 Adopted Additional Internal Bus Trip Generation associated with Residential Developments in Area 10b & 4a (Unit: pcu/hr)**

Residential Development	No. of Flats	No. of Flats for Assessment <sup>(1)</sup>	AM Peak		PM Peak	
			Generation	Attraction	Generation	Attraction
Area 10b & 4a	858	1,030	20	20	20	20

<sup>(1)</sup> Includes a +20% variation in total number of flats adopted for assessment to allow for flexibility in detailed design

- 4.1.17 Similarly, the vehicular (bus) trips for external services are estimated, assuming that these buses would operate in addition to the existing services to Sunny Bay, Tung Chung and Airport. The calculated bus trip generation is shown in **Table 4.1.8**.



**Table 4.1.8 Calculated Additional External Bus Trip Generation  
associated with Residential Developments in Area 10b & 4a**

	% Split <sup>(1)</sup>	AM Peak		PM Peak	
		Generation	Attraction	Generation	Attraction
Estimated Pedestrian Trips to use External Bus Service (persons/hr)	-	252	84	128	197
Estimated Pedestrian Trips for Tung Chung (persons/hr)	25%	63	21	32	49
Estimated Pedestrian Trips for Airport (persons/hr)	5%	13	4	6	10
Estimated Pedestrian Trips for Sunny Bay (persons/hr)	70%	176	59	90	138
Calculated External Bus Trip for Tung Chung (pcu/hr)	-	63 / 56 = 2 veh = 5.0 pcu	21 / 56 = 1 veh = 2.5 pcu	32 / 56 = 1 veh = 2.5 pcu	49 / 56 = 1 veh = 2.5 pcu
Calculated External Bus Trip for Airport (pcu/hr)	-	13 / 56 = 1 veh = 2.5 pcu	4 / 56 = 1 veh = 2.5 pcu	6 / 56 = 1 veh = 2.5 pcu	10 / 56 = 1 veh = 2.5 pcu
Calculated External Bus Trip for Sunny Bay (pcu/hr)	-	176 / 56 = 4 veh = 10 pcu	59 / 56 = 2 veh = 5.0 pcu	90 / 56 = 2 veh = 5.0 pcu	138 / 56 = 3 veh = 7.5 pcu
<b>Total Additional Calculated External Bus Trip for Discovery Bay</b>	-	<b>18 pcu</b>	<b>10 pcu</b>	<b>10 pcu</b>	<b>13 pcu</b>

<sup>(1)</sup> Reference to the peak hour Octopus count provided by the operator for the three existing bus routes to Tung Chung, Airport and Sunny Bay

- 4.1.18 Critical bound traffic during peak hour would be adopted for both generation and attraction, similar to the approach for internal bus trip generation. Hence, the adopted bus trip generation is shown in Table 4.1.9.

**Table 4.1.9 Adopted Additional External Bus Trip Generation  
associated with Residential Developments in Area 10b & 4a**

	AM Peak		PM Peak	
	Generation	Attraction	Generation	Attraction
Adopted External Bus Trip for Tung Chung (pcu/hr)	5.0	5.0	5.0	5.0
Adopted External Bus Trip for Airport (pcu/hr)	2.5	2.5	2.5	2.5
Adopted External Bus Trip for Sunny Bay (pcu/hr)	7.5	7.5	7.5	7.5
<b>Total Additional Adopted External Bus Trip for Discovery Bay</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>

### **Vehicular Trip Generation – Taxi**

- 4.1.19 With reference to the taxi flow sensitivity study under no toll scenario conducted in March 2014, for peak hour taxi generation under the no



toll scenario, it is estimated that the existing residential developments in Discovery Bay would generate / attract 79 taxis one-way during the peak hour.

- 4.1.20 According to the surveys conducted for previous approved TIA study and conducted in March 2022 during the periods which taxi services have been introduced, the surveyed peak hour taxi generation are some 27 to 28 taxis one-way, including those serving the residential developments, hotel and other facilities in Yi Pak. Hence, the observed amount of taxi trip generation was lower than the estimation under previous taxi flow sensitivity study. For conservative approach, the taxi trip generation by the proposed developments in Area 10b & 4a will make reference to the estimation under previous taxi flow sensitivity study.

- 4.1.21 The one-way additional taxi trip generation would be  $79 \text{ taxis} \div 8,326 \text{ existing flats} \times 1,030 \text{ additional flats (with 20\% buffer)} = 10 \text{ taxis}$ .

#### **Vehicular Trip Generation – Summary**

- 4.1.22 **Table 4.1.10** below summarised the adopted trip generation for the proposed additional residential developments in Area 10b and 4a of Discovery Bay.

**Table 4.1.10 Adopted Additional Trip Generation associated with Residential Developments in Area 10b & 4a (Unit: pcu/hr)**

	AM Peak		PM Peak	
	Generation	Attraction	Generation	Attraction
Internal Bus Trip	20	20	20	20
External Bus Trip	15	15	15	15
External Taxi Trip	10	10	10	10
<b>Total</b>	<b>45</b>	<b>45</b>	<b>45</b>	<b>45</b>

- 4.1.23 Similarly, the trip generation for the possible trip generation for developments in Area 6f of Discovery Bay for residential use is also estimated and would be included in the “Reference Scenario” of future year traffic assessment (refer to Section 4.3). **Table 4.1.11** below summarised the adopted trip generation for the possible residential developments in Area 6f of Discovery Bay.

**Table 4.1.11 Adopted Trip Generation for Additional Residential Developments in Area 6f (Unit: pcu/hr)**

	AM Peak		PM Peak	
	Generation	Attraction	Generation	Attraction
Internal Bus Trip	20	20	20	20
External Bus Trip	10	10	10	10
External Taxi Trip	6	6	6	6
<b>Total</b>	<b>36</b>	<b>36</b>	<b>36</b>	<b>36</b>

### **Occupancy of Ferry Service**

- 4.1.24 Assessment on the existing ferry service has also been conducted, to appreciate the impact of the additional residential developments to the existing ferry service.
- 4.1.25 According to the ridership data in 2021 provided by the operator, the ridership for ferry service between Discovery Bay and Central was lower than the one in the previous TIA study. For conservative approach, the ferry ridership and occupancy of Discovery Bay ferry services obtained in previous TIA study have been adopted for assessment.
- 4.1.26 Since the pedestrian trip generation from additional residential developments are mainly work-related trips to urban areas. Hence it is assumed that all pedestrian trips generated would use the ferry service to/from Central during the AM and PM peak hour. Nonetheless, the existing occupancy of the two ferry services to Mui Wo and Peng Chau/Trappist Monastery is also shown for reference purpose.
- 4.1.27 As shown in **Table 4.1.12** below, the critical AM peak occupancy for ferry services from Discovery Bay to Central would increase from 64% to 84%, with taken into account the subject proposed additional residential development in Area 10b and 4a, and also the possible residential developments in Area 6f. Hence, the existing ferry service would still operate within capacity with the additional residential developments in place.



**Table 4.1.12 Occupancy of Ferry Service between Discovery Bay and Central**

	AM Peak		PM Peak	
	Generation	Attraction	Generation	Attraction
<b>Discovery Bay – Central</b>				
Existing Peak Hour Ferry Ridership (persons/hr) <sup>(1)</sup>	1,277	177	249	926
Capacity of Ferry Service Operated (persons/hr)	1,980	1,485	990	1,485
<b>Existing Peak Hour Occupancy</b>	<b>64%</b>	<b>12%</b>	<b>25%</b>	<b>62%</b>
<b>OVERALL OCCUPANCY OF FERRY SERVICE</b>				
Estimated Ferry Patronage to Represent 10,000 Flats under Approved OZP with Adjustment Factor of 1.2 (refer to Section 4.3) (persons/hr)	1,532	212	299	1,111
Estimated Pedestrian Trips Generated from Possible Residential Developments in Area 6f (persons/hr)	47	16	24	36
Estimated Pedestrian Trips Generated from Additional Residential Developments in Area 10b & 4a (persons/hr)	84	28	42	66
Total Ridership with Additional Residential Developments (persons/hr)	1,663	256	365	1,213
<b>Estimated Occupancy of Ferry Service</b>	<b>84%</b>	<b>17%</b>	<b>37%</b>	<b>82%</b>

<sup>(1)</sup> Reference to the peak hour ticket gate count provided by the operator

## 4.2 Future Year Major Highway and Land Use Assumption

- 4.2.1 The additional developments in Discovery Bay are targeted for completion in Year 2034 (Phase 2 Development). Year 2037 are used as the assessment years for the purpose of this study.
- 4.2.2 Year 2037 traffic forecast for the major strategic road links (eg. North Lantau Highway) and critical junctions in Tung Chung are prepared with reference to our in-house strategic transport model developed in previous TIA study.
- 4.2.3 With reference to the latest highway infrastructure assumptions, relevant key future highway infrastructures for this study are summarised in **Table 4.2.1** below.

**Table 4.2.1 Highway Infrastructure Assumptions**

Year 2037 (In addition to existing Road Network)	Configuration
Lantau Road P1 between Tung Chung and Sunny Bay	Dual 2



4.2.4 A brief summary of the key land-use assumptions are also listed below:

- Tung Chung New Town Extension (by 2030)
- SkyCity developments located in the North Commercial District of Airport Island (which includes SkyPlaza), plus some additional development in the East Commercial District (by 2023-2027);
- Asia World-Expo (AWE) future expansion (Pending);
- Siu Ho Wan MTR Depot Transportation Hub (by 2030);
- Siu Ho Wan Depot Residential Development (by 2038);
- Boundary Control Facility Topside Development (Pending);
- Airport Third Runway (by 2024);

### 4.3 Assessment Scenarios

4.3.1 To evaluate the associated traffic impact likely to be induced by the additional developments in Discovery Bay, two scenarios were analysed and compared. The first scenario (i.e. "Reference Scenario") assumed that the number of residential units in Discovery Bay would be grown to 10,000 flats under the current approved OZP and the taxi generation adopted in the endorsed taxi flow sensitivity study.

4.3.2 Regarding the background traffic at critical strategic road links and junctions outside Discovery Bay under the "Reference Scenario", reference is made to our in-house strategic transport model developed in the earlier approved TIA study, of which the latest highway infrastructure and planning assumptions, as discussed in **Section 4.3** have been incorporated.

4.3.3 In addition, trip generation and attraction of the possible residential developments in Area 6f has also been included under the "Reference Scenario".

4.3.4 For the second scenario (i.e. "Design Scenario"), traffic generated by the additional residential developments in Area 10b and 4a of Discovery Bay as presented in the previous section would be included on top of the traffic flow under Reference Scenario.

4.3.5 In summary, the assessed scenarios are listed below:

- Year 2037 "Reference Scenario"
  - = Year 2037 in-house traffic model (incorporated the latest highway and planning assumptions and additional traffic flow under endorsed taxi flow sensitivity study)
  - + Trips Generation and Attraction for Possible Residential Developments in Area 6f in Discovery Bay



- Year 2037 “Design Scenario”
  - = Traffic Flow under “Reference Scenario”
  - + Trips Generation and Attraction for Additional Residential Developments in Area 10b and 4a in Discovery Bay

## 4.4 Future Traffic Performance

4.4.1 The projected Year 2037 traffic flows of internal and external road networks for the “Reference Scenario” and “Design Scenario” are shown in **Figure 4.1** and **Figure 4.2** respectively.

4.4.2 Link capacity assessments for the two scenarios are conducted and the results are tabulated in **Table 4.4.1** below, while junction capacity assessment for the key junctions are summarised in **Table 4.4.2** below.

**Table 4.4.1 Year 2037 Future Link Performance**

Road Links	Direction	Link Capacity (pcu/hour)	Traffic Flow (pcu/hr)				Volume-to-Capacity (V/C) Ratio			
			2037 Reference		2037 Design		2037 Reference		2037 Design	
			AM	PM	AM	PM	AM	PM	AM	PM
Lantau Link	E/B	6,100	5,505	5,335	5,515	5,345	0.90	0.87	0.90	0.88
	W/B	6,100	5,480	5,250	5,490	5,260	0.90	0.86	0.90	0.86
North Lantau Highway	E/B	6,100	5,310	5,675	5,320	5,685	0.87	0.93	0.87	0.93
	W/B	6,100	5,525	5,670	5,535	5,680	0.91	0.93	0.91	0.93
Cheung Tung Road Western Section	E/B	1,040	300	285	310	295	0.29	0.28	0.30	0.28
	W/B	1,040	275	230	280	240	0.27	0.22	0.27	0.23
Cheung Tung Road Eastern Section	E/B	1,040	400	425	420	435	0.39	0.41	0.40	0.42
	W/B	1,040	355	335	375	345	0.34	0.32	0.36	0.33
Discovery Bay Tunnel	E/B	1,280	370	350	390	370	0.29	0.27	0.30	0.29
	W/B	1,280	390	385	410	405	0.30	0.30	0.32	0.31
Discovery Bay Road (North of Discovery Valley Road)*	N/B	1,040	225	235	235	245	0.21	0.23	0.23	0.24
	S/B	1,040	180	220	195	230	0.17	0.21	0.19	0.22
Discovery Bay Road (South of Discovery Valley Road)*	N/B	1,040	220	295	230	305	0.21	0.28	0.22	0.29
	S/B	1,040	225	285	240	295	0.22	0.27	0.23	0.28
Discovery Valley Road*	E/B	1,040	85	85	85	85	0.08	0.08	0.08	0.08
	W/B	1,040	35	80	35	80	0.03	0.08	0.03	0.08
Siena Avenue*	E/B	1,040	345	310	355	320	0.33	0.30	0.34	0.31
	W/B	1,040	325	310	335	320	0.31	0.30	0.32	0.31

\* Included Golf Cart at Discovery Bay internal roads with PCU factor of 1.

**4.4.3**

The results in **Table 4.4.1** revealed that all identified road links would continue to have sufficient link capacity to cater for the future traffic demand with the proposed development by Year 2037. The proposed development would not induce adverse traffic impact to the surrounding road network.



Table 4.4.2 Year 2037 Junction Performance

Junction		Type	2037 Reference*		2037 Design*	
			AM	PM	AM	PM
Internal Junctions in Discovery Bay						
J1	Discovery Bay Tunnel / Discovery Bay Road	Roundabout	0.19	0.18	0.21	0.19
J2	Siena Avenue North Roundabout	Roundabout	0.27	0.24	0.28	0.25
J3	Discovery Bay Road / Headland Drive	Priority	0.02	0.07	0.03	0.07
J4	Discovery Bay Road / Discovery Valley Road	Priority	0.14	0.15	0.14	0.15
J5	Discovery Bay Road / DB Plaza Bus Terminus	Priority	0.01	0.08	0.04	0.11
J6	Discovery Bay Road / Vista Avenue	Priority	0.03	0.04	0.03	0.04
J7	Discovery Bay Road / Plaza Lane	Priority	0.33	0.48	0.38	0.53
J8	Discovery Bay Road / Marina Drive	Priority	0.05	0.09	0.07	0.12
External Junctions in Tung Chung/ Sunny Bay						
J9	Sunny Bay Road / Cheung Tung Road	Priority	0.66	0.69	0.69	0.72
J10	Cheung Tung Road / Discovery Bay Tunnel	Priority	0.71	0.70	0.76	0.74
J11	Tung Chung Waterfront Road / Slip Road to North Lantau Highway	Signal	>50%	>50%	>50%	>50%
J12	Tung Chung Waterfront Road / Slip Road from North Lantau Highway	Signal	>50%	>50%	>50%	>50%
J13	Chek Lap Kok South Road Roundabout	Roundabout	0.78	0.61	0.78	0.61
J14	Shun Tung Road / Tat Tung Road (West)	Signal	>50%	>50%	>50%	>50%
J15	Tat Tung Road / Mei Tung Street	Signal	>50%	>50%	>50%	>50%
J16	Tat Tung Road / Fu Tung Street	Priority	0.76	0.63	0.78	0.65
J17	Tat Tung Road / Hing Tung Street	Signal	>50%	>50%	>50%	>50%
J18	Shun Tung Road / Tat Tung Road (East)	Signal	47%	48%	47%	48%
J19	Shun Tung Road / Yu Tung Road	Signal	38%	38%	38%	38%
J20	Tung Chung East Interchange	Roundabout	0.51	0.62	0.51	0.62

\* Figures shown represent "Design Flow/Capacity" (DFC) ratio for roundabout and priority junctions, and "Reserve Capacity" for signal junctions

## 4.4.4

The results in **Table 4.4.2** revealed that all identified key junctions would operate within capacity under both Year 2037 Reference and Design Scenario. The proposed development would not induce adverse traffic impact to the surrounding road network.



## 5 SUMMARY AND CONCLUSION

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### 5.1 Summary

- 5.1.1 There are plans to optimize the residential potential of Discovery Bay, in particular in Area 10b and 4a with a total of 858 nos. of flats into residential development in additional to the current approved Outline Zoning Plan.
- 5.1.2 TIA Report for Area 6f and Area 10b were submitted to and approved by Transport Department dated 8 June 2016, reference was made to this approved TIA Report for assessing the traffic impact in this report.
- 5.1.3 Under the existing comprehensive traffic control management for Discovery Bay, only authorized vehicles are allowed to access Discovery Bay via Discovery Bay Tunnel such as emergency vehicles, servicing buses and goods vehicles. And coaches with prior registration could access Discovery Bay (North). Since 26 October 2014, designated areas in Discovery Bay (North) are also accessible by Urban and Lantau Taxis.
- 5.1.4 Comprehensive traffic counts were conducted at identified key road links including Discovery Bay Road, Discovery Valley Road, Siena Avenue, Discovery Bay Tunnel, Cheung Tung Road and North Lantau Highway, Lantau Link, and key junctions in Discovery Bay, Tung Chung and Sunny Bay areas. They are all currently operating with significant spare capacity during both AM and PM peak hour.
- 5.1.5 To investigate the performance and handling capacity of the identified key road links and junctions, an analysis was carried out to appraise the likely traffic impact generated by the additional developments (i.e. residential) in the Discovery Bay. Assessment on the ferry services has also been conducted.
- 5.1.6 Both Reference Scenario (full development under current approved OZP with additional taxi flow in the endorsed taxi flow sensitivity study and traffic generation from Area 6f) and Design Scenario (with traffic generation from the additional residential development 10b and 4a) have been assessed, for Year 2037.
- 5.1.7 Assessment results showed that all identified road links and key junctions would operate within capacity with the proposed residential development in Year 2037.
- 5.1.8 Existing ferry service would still operate within capacity with the additional residential developments in place.



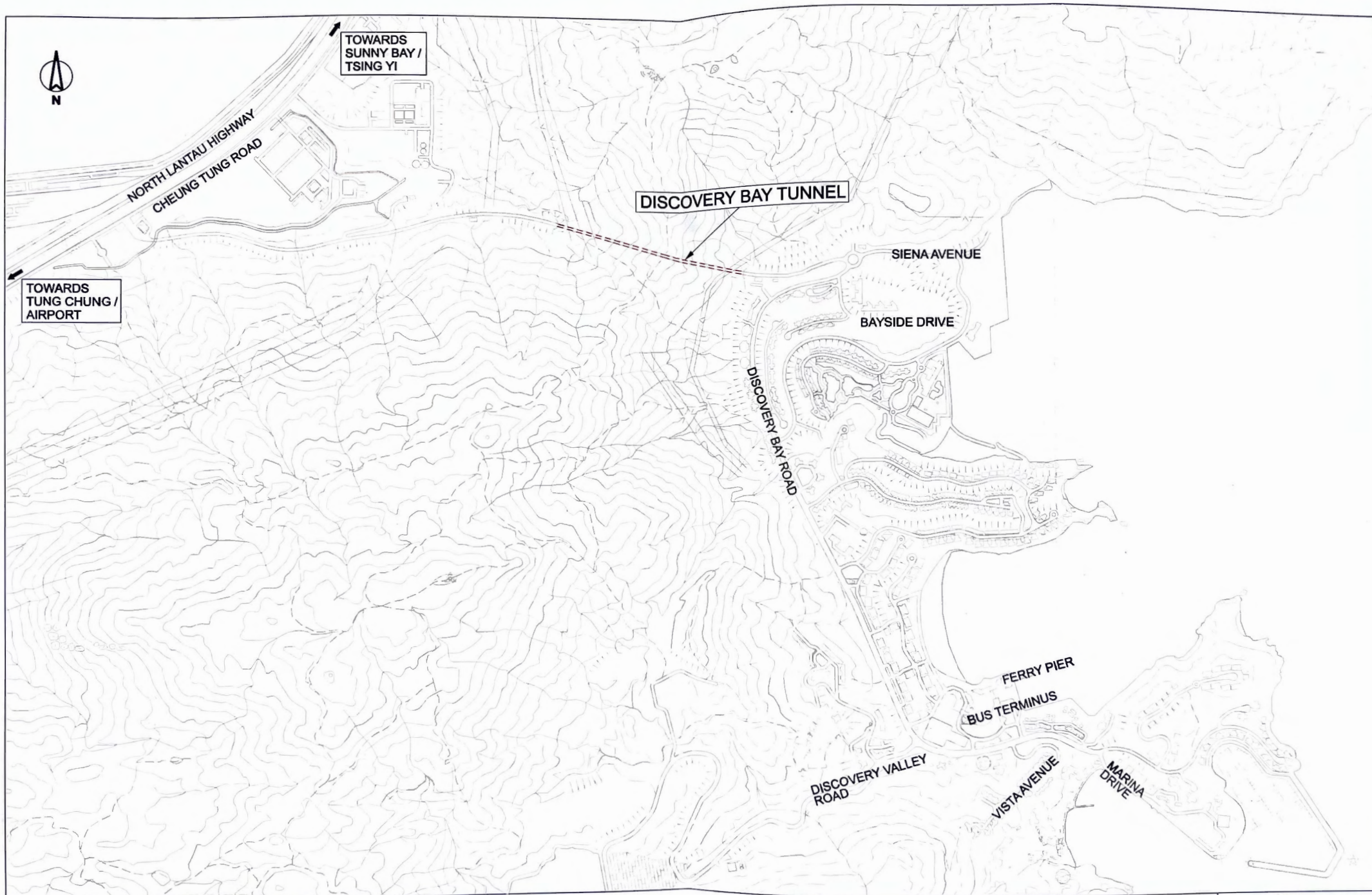
## 5.2 Conclusion

- 5.2.1 The proposed additional residential developments in Discovery Bay (i.e. Area 10b and 4a) would not generate adverse traffic impact to the critical road links, junctions and ferry services in Discovery Bay, Tung Chung and Sunny Bay areas. Therefore, the additional residential developments are considered acceptable from traffic engineering point of view.

# Figures

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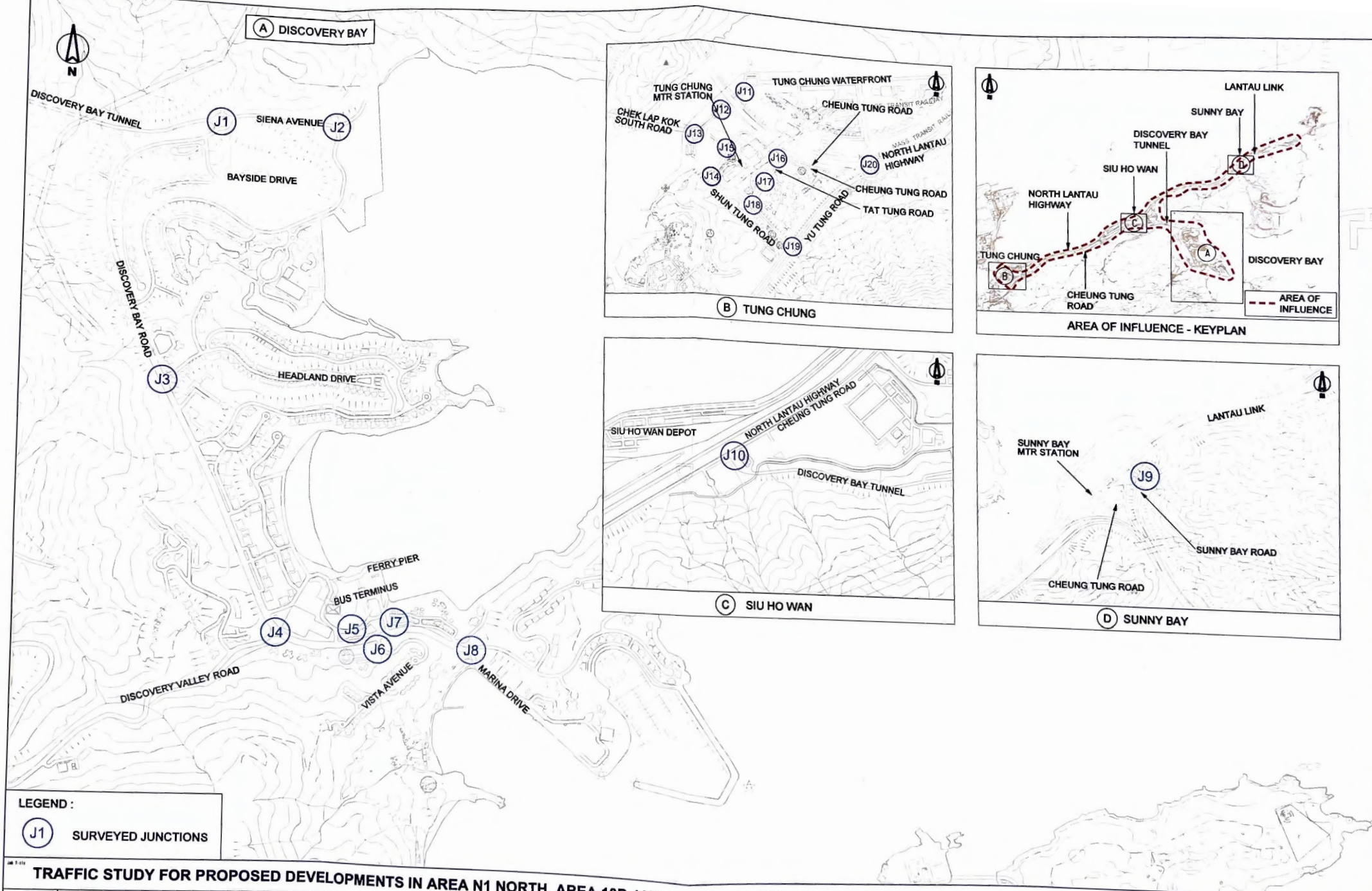
**TRAFFIC STUDY FOR PROPOSED DEVELOPMENTS IN AREA N1 NORTH, AREA 10B AND 4A, DISCOVERY BAY**

**FIGURE 2.1**

Date	Scale	Drawing Title
MAY22	1:11000	EXISTING ROAD NETWORK IN DISCOVERY BAY
Drawn CKVW	Job No. 286369	

**ARUP**



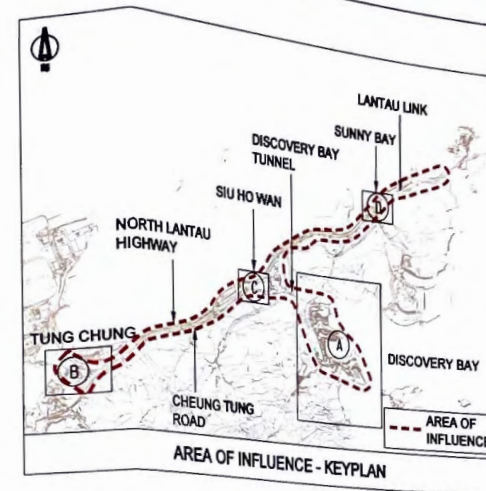
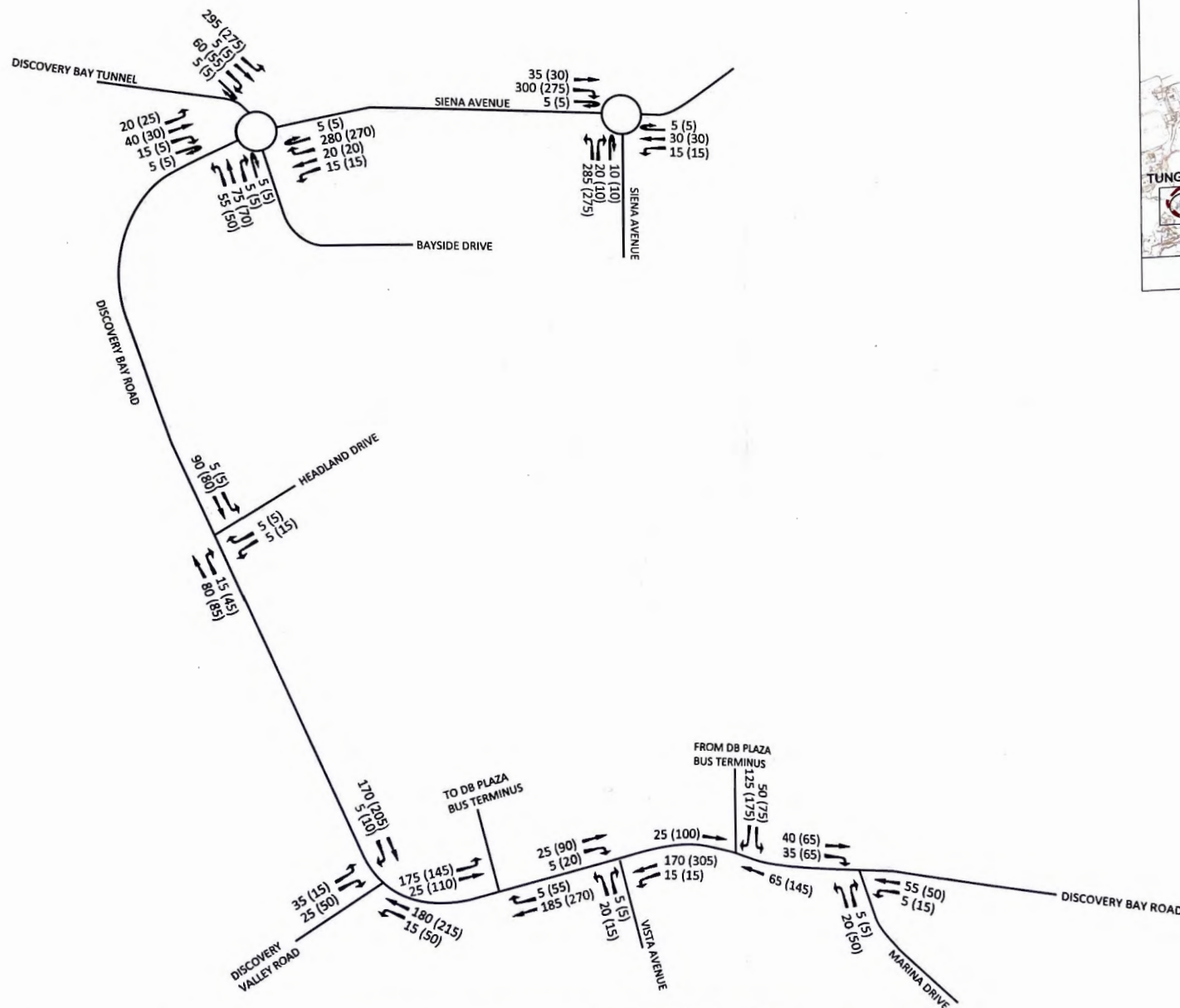


Date	May	22	N.T.S	Drawing title	LOCATION OF SURVEYED KEY JUNCTIONS
Drawn	CKVW		286369		





(A) DISCOVERY BAY



**LEGEND:**  
 556 (454) ← PM PEAK (PCU/HR)  
 ↑ AM PEAK (PCU/HR)

FIGURE 2.3

**ARUP**

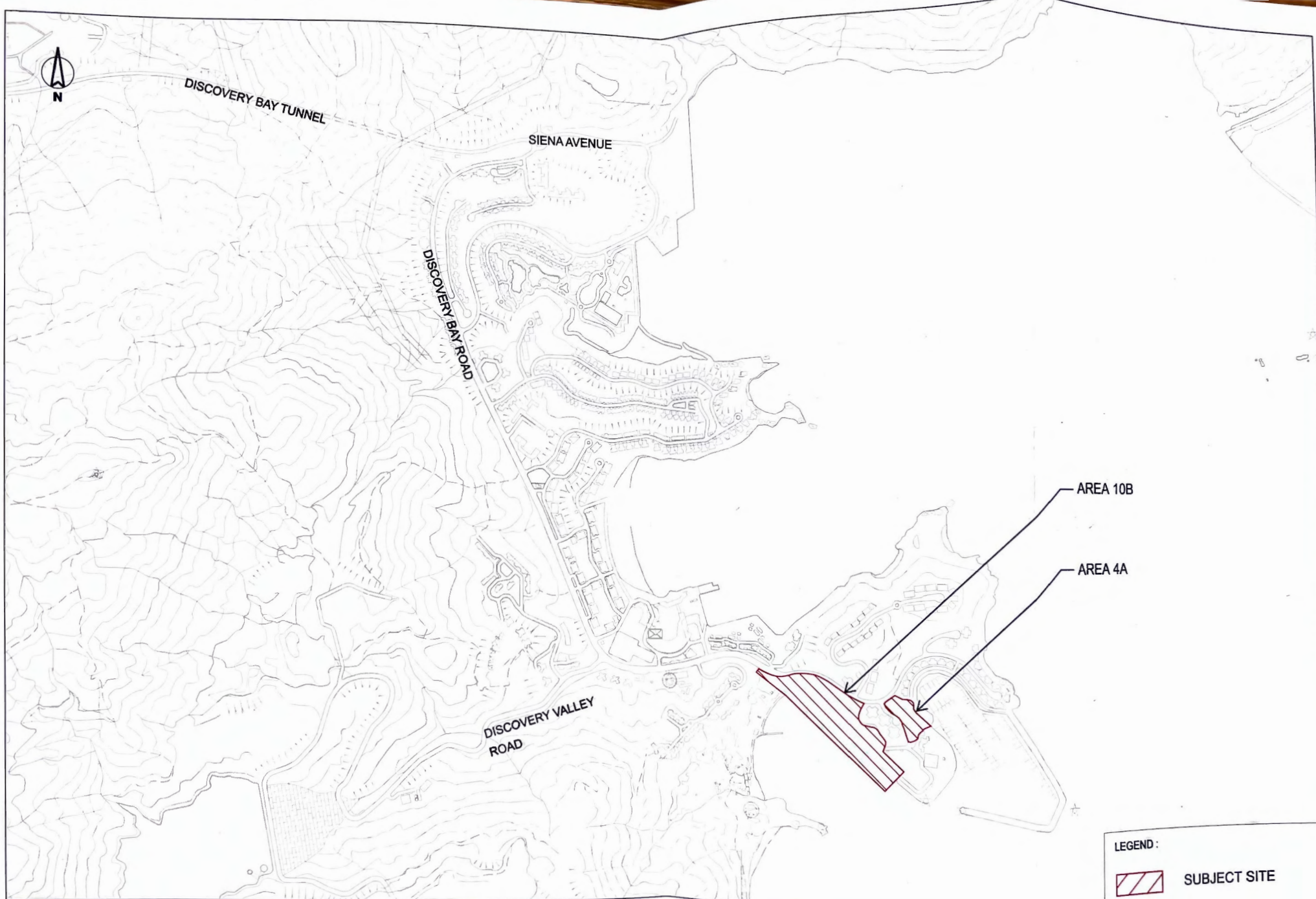
**TRAFFIC STUDY FOR PROPOSED DEVELOPMENTS IN AREA N1 NORTH, AREA 10B AND 4A, DISCOVERY BAY**

Date	May 22	Scale	N.T.S
Drawn by	CKWW	Job No.	286369

EXISTING TRAFFIC FLOWS (INTERNAL ROAD NETWORK)







**TRAFFIC STUDY FOR PROPOSED DEVELOPMENTS IN AREA N1 NORTH, AREA 10B AND 4A, DISCOVERY BAY**

Date	Rev
MAY22	N.T.S
Drawn	Rev
CKVW	286369

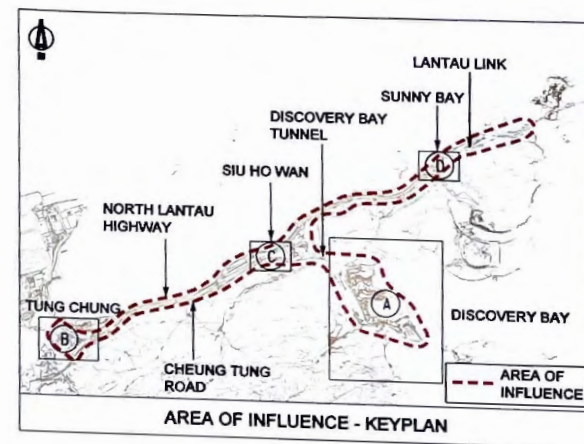
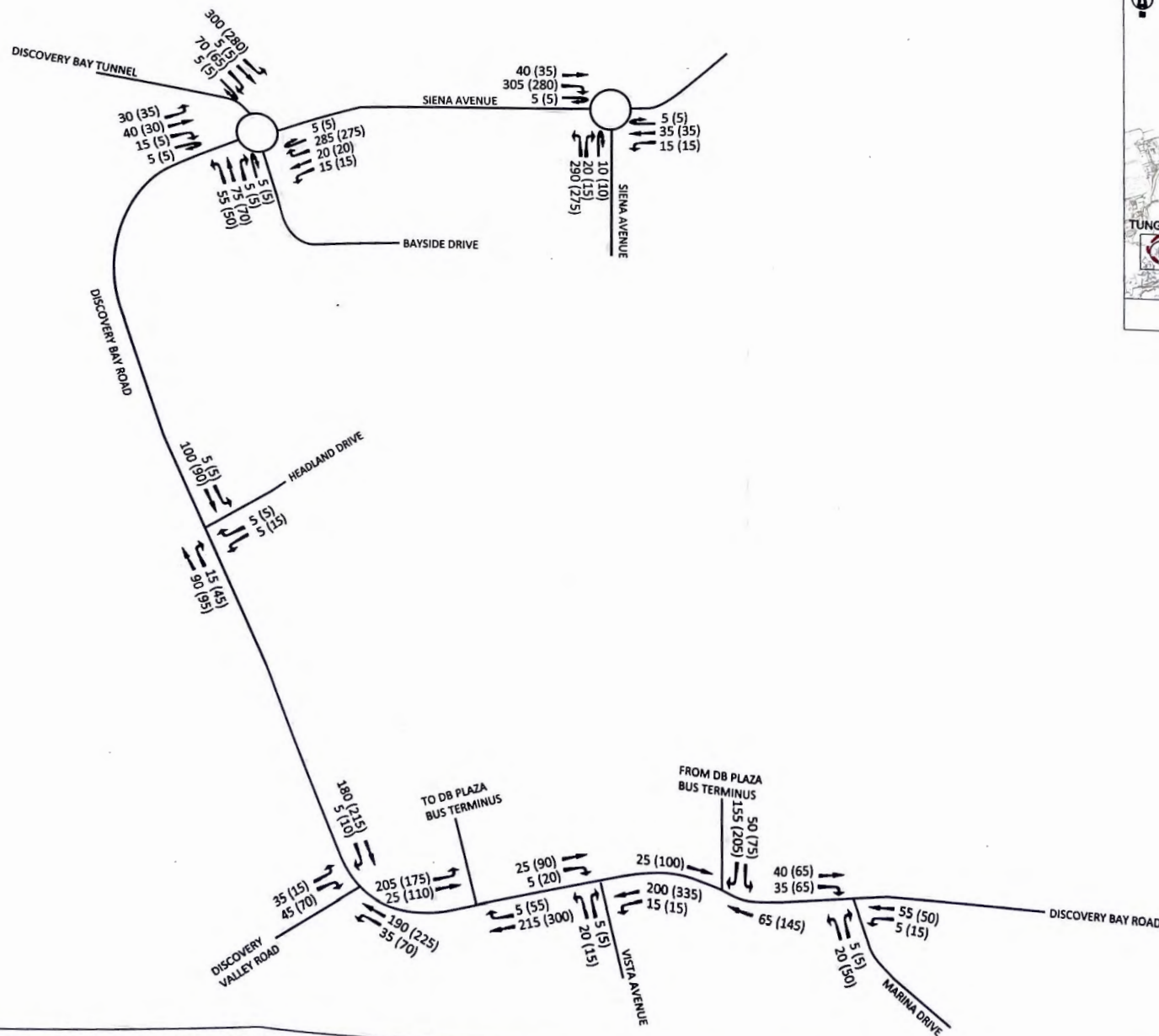
LOCATION OF SUBJECT SITE IN DISCOVERY BAY

**FIGURE 3.1**

**ARUP**



(A) DISCOVERY BAY



LEGEND :  
 556 (454) ← PM PEAK (PCU/HR)  
 ← AM PEAK (PCU/HR)

# TRAFFIC STUDY FOR PROPOSED DEVELOPMENTS IN AREA N1 NORTH, AREA 10B AND 4A, DISCOVERY BAY

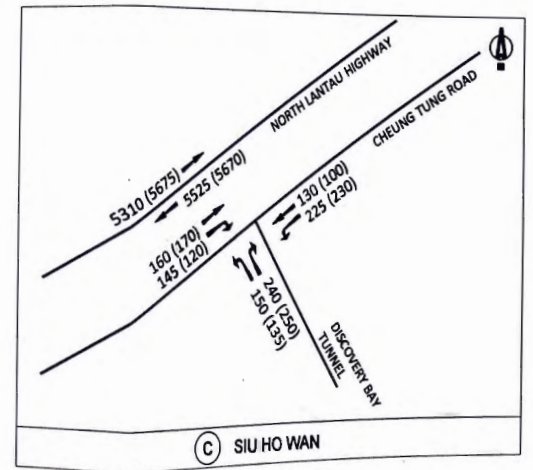
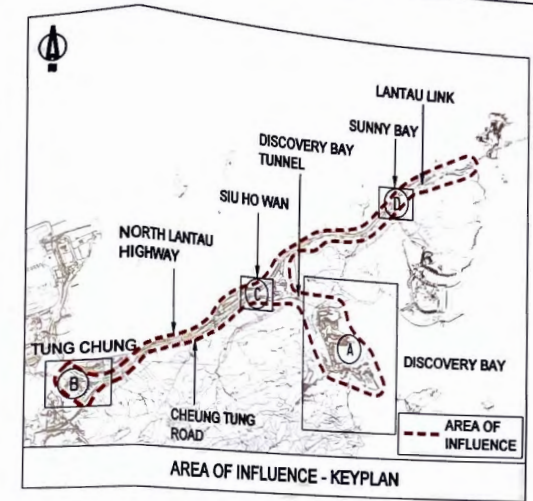
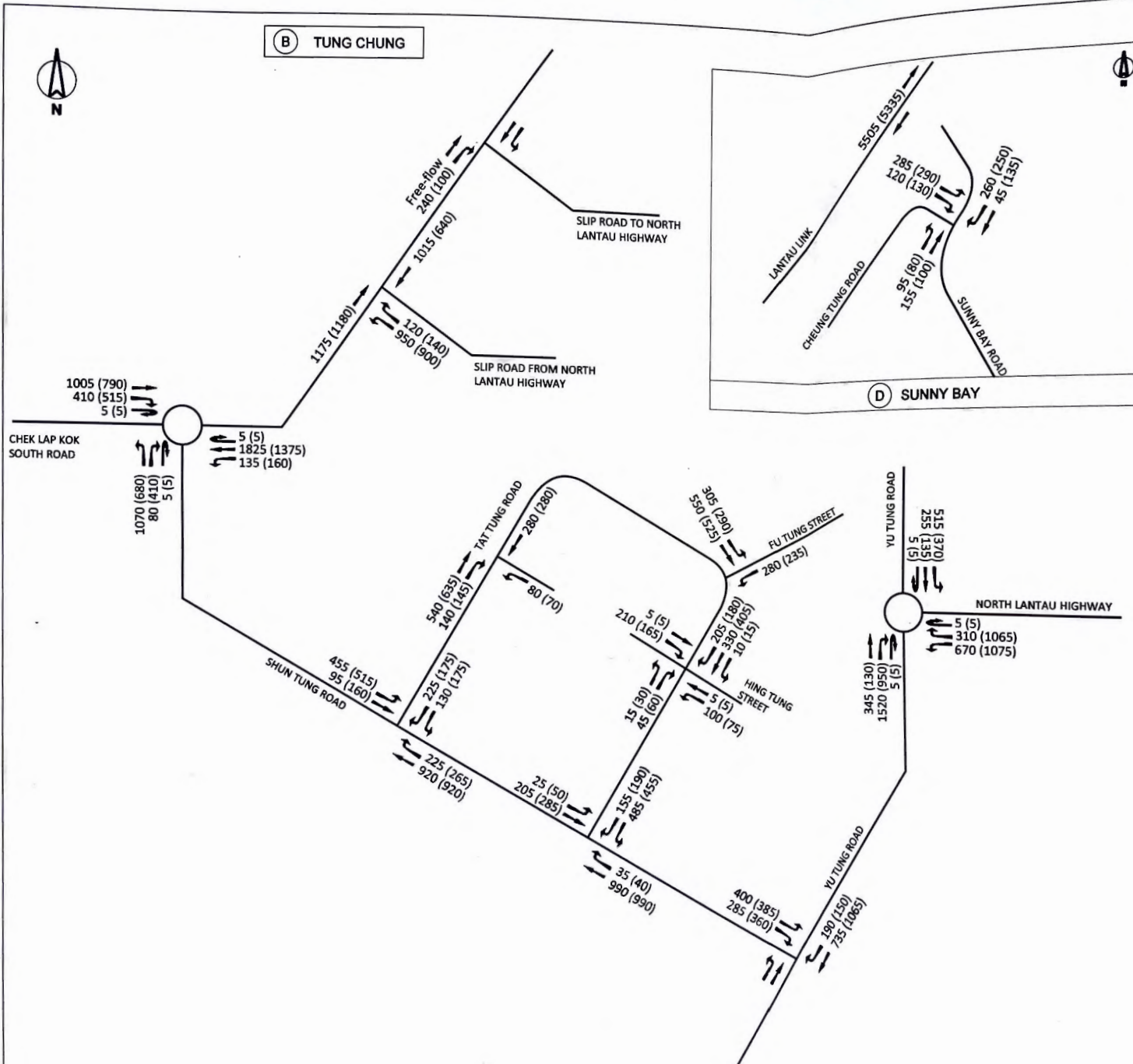
Date	MAY22	Rev	N.T.S
Drawn	CKVW	Job No.	286369

PROJECTED YEAR 2037 TRAFFIC FLOWS - REFERENCE SCENARIO (INTERNAL ROAD NETWORK)

FIGURE 4.1

ARUP





**LEGEND :**

556 (454) ← PM PEAK (PCU/HR)

← AM PEAK (PCU/HR)

TRAFFIC STUDY FOR PROPOSED DEVELOPMENTS IN AREA N1 NORTH, AREA 10B AND 4A, DISCOVERY BAY			
DATE	MAY22	SCALE	N.T.S
DRAWN BY	CKVW	PROJECT NO.	286369
PROJECTED YEAR 2037 TRAFFIC FLOWS - REFERENCE SCENARIO (EXTERNAL ROAD NETWORK)			

**FIGURE 4.2**

