



PROPOSED RESIDENTIAL DEVELOPMENT

149 Hansworth Street, Mulgrave

Traffic & Parking Impact Assessment Report

Prepared for: Pong Property Development Pty Ltd

A1614737V Version 1

May 2017

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1. INTRODUCTION

ML Traffic Engineers was commissioned by Pong Property Development Pty Ltd to undertake a traffic and car-parking assessment for a proposed residential development at 149 Hansworth Street, Mulgrave. It can be demonstrated that the traffic impacts associated with the proposal can be accommodated by the surrounding road network, and the vehicle access, car parking and site service layout satisfies statutory requirements.

In the course of preparing the report, the subject site and its surroundings have been inspected, plans of the development examined, and all relevant traffic and parking data collected and analysed.

2. BACKGROUND AND EXISTING CONDITIONS

2.1 Location and Land Use

The subject site, at 149 Hansworth Street, Mulgrave, is located near the corner of Hansworth Street and Police Road, Mulgrave and one side is bordered by the Monash Freeway. The site is currently a vacant triangular block site next to a Nursing Home and nearby residential homes. A large retail / commercial development, Waverley Gardens Shopping Centre is within walking distance. See Figure 1.

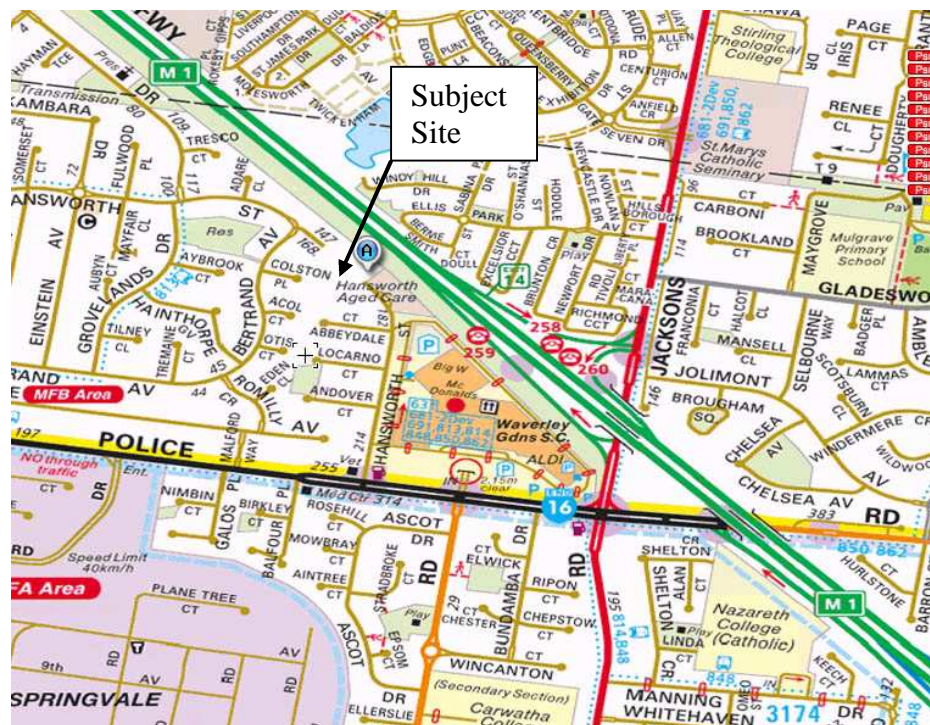


Figure 1: Location of the Subject Site

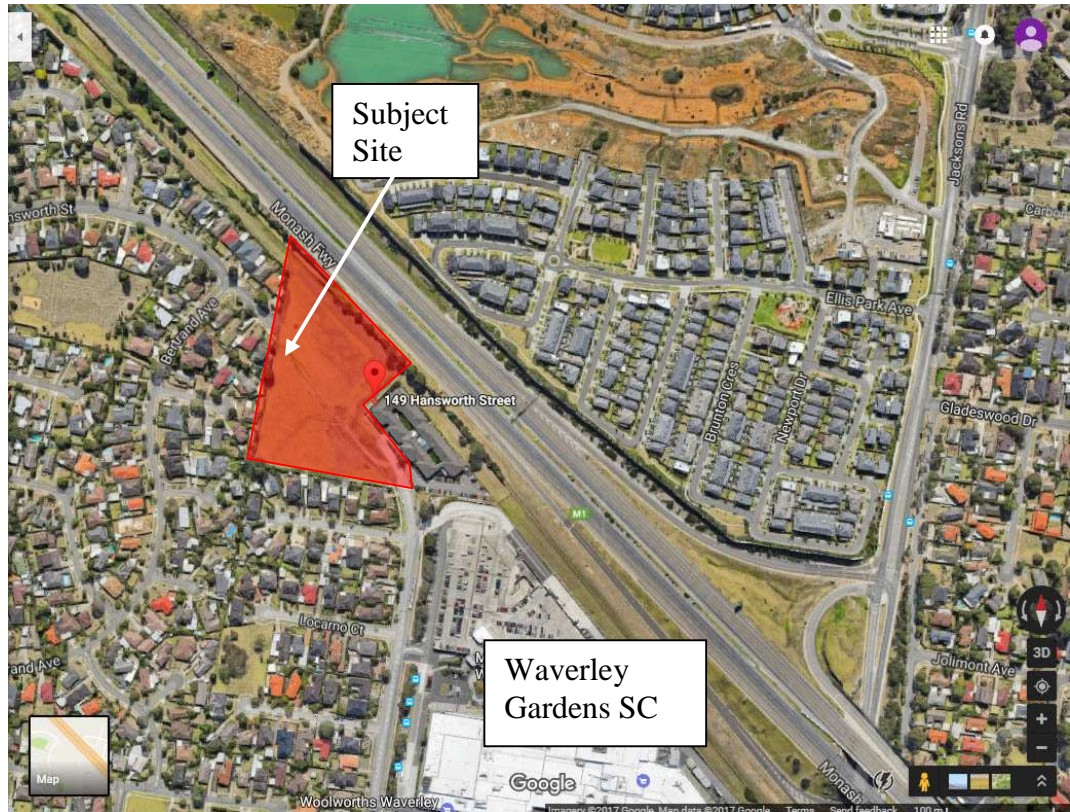


Figure 2: Aerial view of the Subject Site in the Context of its Surrounds



Figure 3: View of Site looking towards the North-West

2.2 Road Network

Hansworth Street is a local access road, with one lane each way. Hansworth Street operates with a local residential area with a speed limit of 50km/hr.



Figure 4: Hansworth Street – Looking towards the South. Subject Site in background (not shown)

2.3 Public Transport

The subject site has excellent access to public transport, namely buses. Bus Routes 631, 691, 813 and 850 all stop at the Hansworth Street end of Waverley Gardens Shopping Centre (SC), about 60m away from the site, and make it very accessible to public transport options.

Bus route 631 operates from Southland Shopping Centre (SC) to Waverley Gardens SC, in the vicinity of the site, via Clayton and Monash University. The bus route operates all day/evening services from 6.00am to 9.00pm, from Monday to Saturday at 30 minute intervals. On Sunday and public holidays, the bus operates at hourly intervals from 8.40am till 9.40pm.

Bus route 691 operates from Boronia to Waverley Gardens SC, in the vicinity of the site, via Ferntree Gully and Rowville / Stud Park. The bus route operates from 6.10am to 9.05pm from Monday to Friday at 20-30 minute intervals. On Saturday and public holidays, the route operates from 8.15am to 7.00pm at 40 minute intervals. On Sunday and public holidays, the bus operates at hourly intervals from 8.25am till 6.40pm.

Bus route 813 operates from Dandenong Railway Station to Waverley Gardens SC, in the vicinity of the site, via Keysborough (Parkmore shopping centre), Springvale Road and Springvale train station and Police Road/Noble Park. The bus route operates from 5.20am to 9.20pm from Monday to Friday at hourly intervals. On Saturday and public holidays, the route operates from 7.30am to 9.05pm at hourly intervals. On Sunday and public holidays, the bus operates at hourly intervals from 9.30am till 9.05pm.

Bus route 850 operates from Dandenong Railway Station to Glen Waverley railway station via Police road and Waverley Gardens Shopping centre, which is near the site. Intermediate stops include Brandon Park shopping centre, Waverley Park residential area, Jacksons Road at Dandenong Valley Private Hospital. The bus route operates from 6.20am to 9.20pm from Monday to Friday at 30 minute intervals. On Saturday and public holidays, the route operates from 7.15am to 9.25pm at hourly intervals. On Sunday and public holidays, the bus operates at hourly intervals from 9.25am till 9.25pm.

2.4 Year 2017 No Development Traffic Conditions

Turning movement surveys were undertaken at the intersection of Hansworth Street and Police Road, between 7.45am and 8.45am and between 4.30pm and 5.30pm on Thursday, 16th March 2017. See Figures 5 and 6.

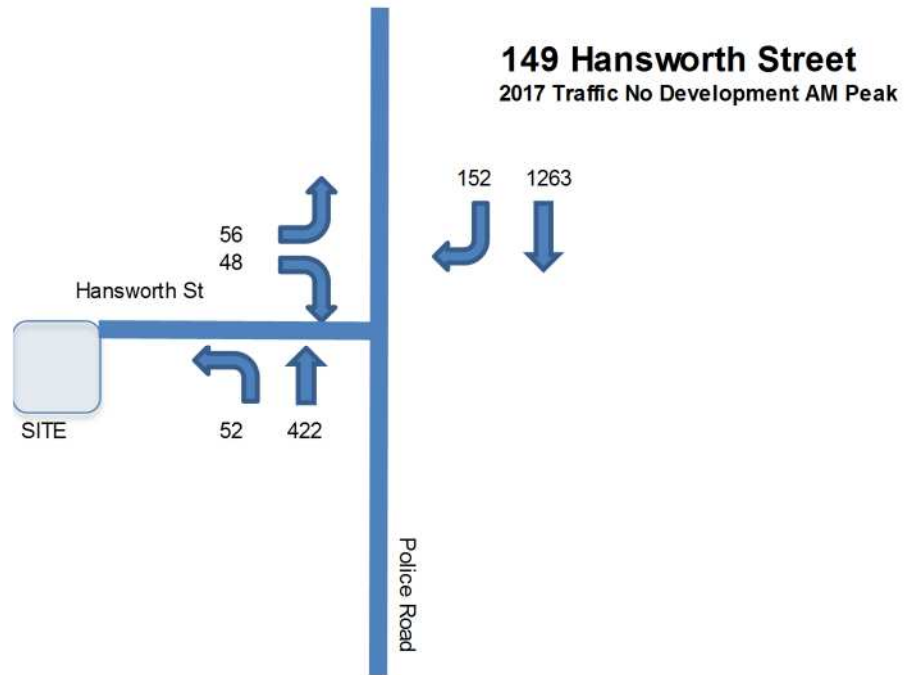


Figure 5: Year 2017 No Development 7.45am to 8.45am Morning Peak Hour Traffic

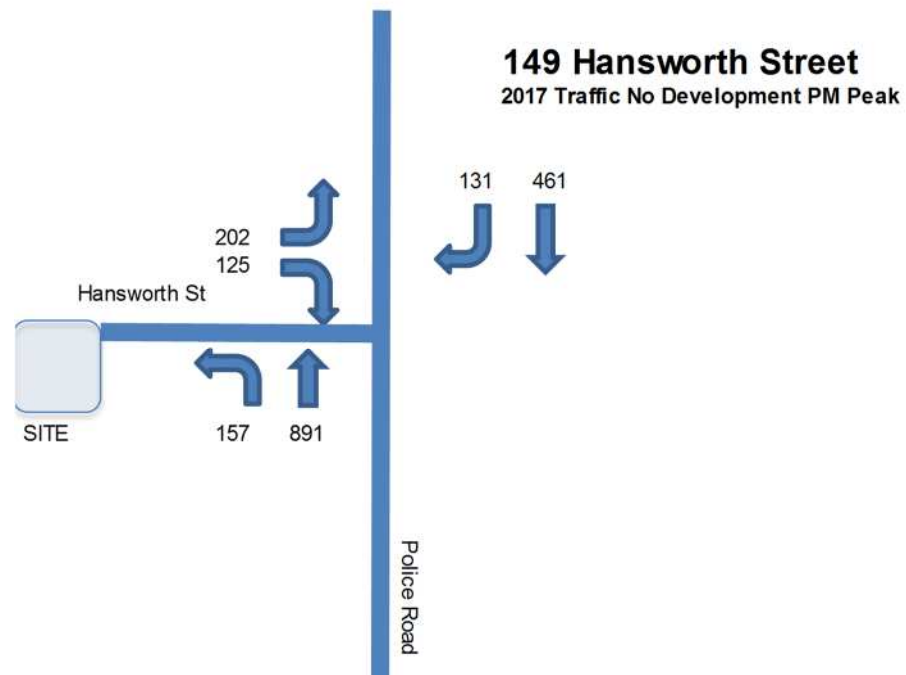


Figure 6: Year 2017 No Development 4.30pm to 5.30pm Afternoon Peak Hour Traffic

2.5 Year 2021 No Development Traffic Conditions

Year 2021 turning and through traffic volumes at the intersection of Hansworth Street and Police Road, between 7.45am and 8.45am and between 4.30pm and 5.30pm were projected based on 1.5% annual growth along Police Road and 0.5% annual growth along Hansworth Street. The nominated growth factors, being lower than the “rule of thumb” 2.5% per annual take into consideration:

- Police Road is catering to traffic in a fully built up environment.
- Low densification rate as the area is not located right over a railway corridor.
- Hansworth Street provides access to the shopping centre car parks and a number of local streets. Assuming no change to leasable area and number of dwellings, traffic growth along Hansworth Street will be minimal.

See Figures 7 and 8.

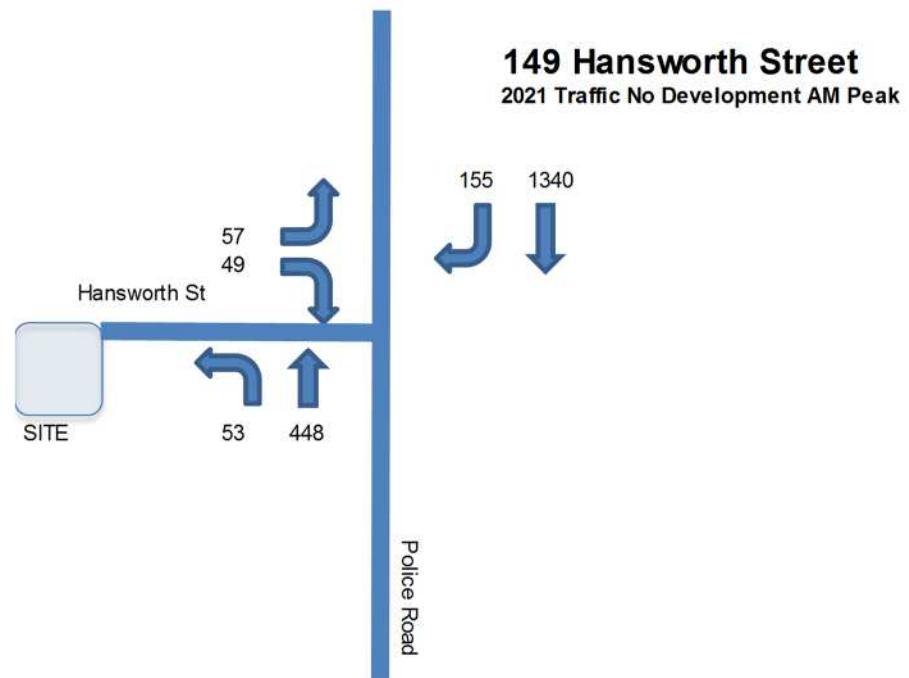


Figure 7: Year 2021 No Development 7.45am to 8.45am Morning Peak Hour Traffic

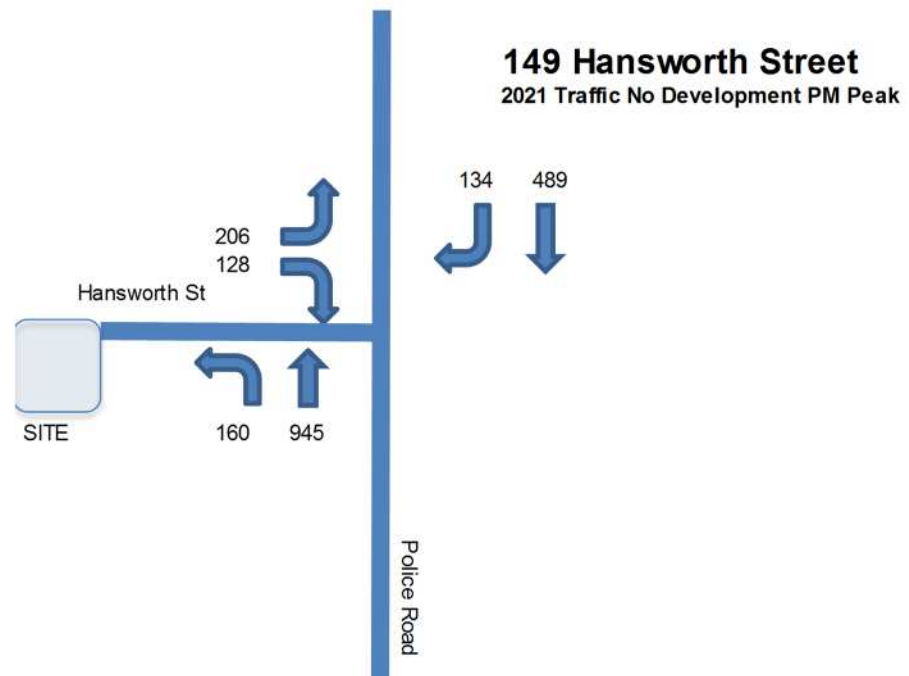


Figure 8: Year 2021 No Development 4.30pm to 5.30pm Afternoon Peak Hour Traffic

2.6 Intersection Assessment – Year No Development 2021

Figure 9 presents the configuration of the intersection of Hansworth Street and Police Road. It features 60m long double right-turn lanes on the east approach of Police Road, separate left and right turn lanes on Hansworth Street for a distance of 150m, and 2 through lanes in each direction along Police Road.

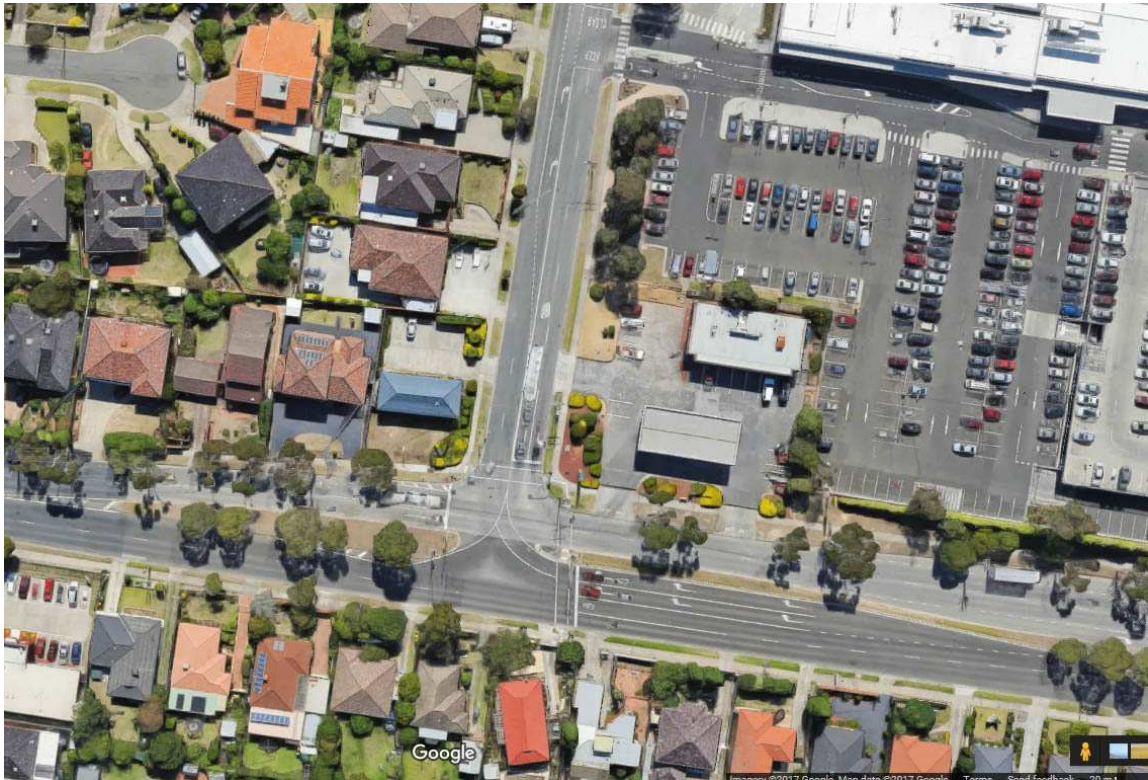


Figure 9: Intersection Configuration – Hansworth Street / Police Road Intersection

Intersection operation for Hansworth Street and Police Road was assessed using SIDRA. There are no operational issues for Year 2021 no development traffic scenario.

MOVEMENT SUMMARY

Site: 2021 AM No Development Hansworth Street and Police Road

Project - 149 Hansworth Street, Mulgrave
 Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Police Road											
5	T1	1411	5.0	0.855	26.4	LOS C	26.3	192.2	0.96	1.00	41.9
6	R2	163	0.5	0.239	12.3	LOS B	1.9	13.4	0.63	0.69	42.4
Approach		1574	4.5	0.855	24.9	LOS C	26.3	192.2	0.92	0.97	41.9
North: Hansworth Street											
7	L2	60	0.5	0.151	29.2	LOS C	1.7	12.0	0.85	0.73	37.3
9	R2	52	0.5	0.130	29.0	LOS C	1.5	10.2	0.84	0.72	37.3
Approach		112	0.5	0.151	29.1	LOS C	1.7	12.0	0.84	0.72	37.3
West: Police Road											
10	L2	56	0.5	0.316	19.0	LOS B	5.9	42.4	0.69	0.62	46.5
11	T1	472	5.0	0.316	13.7	LOS B	5.9	42.9	0.69	0.60	48.4
Approach		527	4.5	0.316	14.2	LOS B	5.9	42.9	0.69	0.60	48.2
All Vehicles		2213	4.3	0.855	22.6	LOS C	26.3	192.2	0.86	0.87	43.0

Level of Service (LOS) Method: Delay (HCM 2000).
 Vehicle movement LOS values are based on average delay per movement
 Intersection and Approach LOS values are based on average delay for all vehicle movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	29.3	LOS C	0.1	0.1	0.92	0.92	
P22	East Stage 2	53	24.9	LOS C	0.1	0.1	0.84	0.84	
P3	North Full Crossing	53	18.6	LOS B	0.1	0.1	0.73	0.73	
All Pedestrians		158	24.3	LOS C			0.83	0.83	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
 Pedestrian movement LOS values are based on average delay per pedestrian movement.
 Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Table 1: SIDRA Output for Year 2021 No Development AM Peak hour Traffic – Hansworth Street / Police Road Intersection

MOVEMENT SUMMARY

Site: 2021 PM No Development Hansworth Street and Police Road

Project - 149 Hansworth Street, Mulgrave

Signals - Fixed Time Cycle Time = 60 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Police Road											
5	T1	515	5.0	0.389	16.1	LOS B	5.8	42.3	0.80	0.67	47.5
6	R2	141	0.5	0.334	17.5	LOS B	1.6	11.4	0.91	0.74	40.0
Approach		656	4.0	0.389	16.4	LOS B	5.8	42.3	0.82	0.68	45.6
North: Hansworth Street											
7	L2	217	0.5	0.469	25.9	LOS C	5.6	39.3	0.90	0.79	38.6
9	R2	135	0.5	0.291	24.8	LOS C	3.3	23.1	0.85	0.76	39.0
Approach		352	0.5	0.469	25.5	LOS C	5.6	39.3	0.88	0.78	38.8
West: Police Road											
10	L2	168	0.5	0.882	35.9	LOS D	20.7	149.3	1.00	1.11	37.9
11	T1	995	5.0	0.882	30.6	LOS C	20.8	151.7	1.00	1.11	39.4
Approach		1163	4.3	0.882	31.4	LOS C	20.8	151.7	1.00	1.11	39.2
All Vehicles		2171	3.6	0.882	25.9	LOS C	20.8	151.7	0.93	0.93	40.9

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian	Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	24.4	LOS C	0.1	0.1	0.90	0.90	
P22	East Stage 2	53	20.1	LOS C	0.1	0.1	0.82	0.82	
P3	North Full Crossing	53	21.7	LOS C	0.1	0.1	0.85	0.85	
All Pedestrians		158	22.0	LOS C			0.86	0.86	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Table 2: SIDRA Output for Year 2021 No Development PM Peak hour Traffic – Hansworth Street / Police Road Intersection

3. PROPOSAL

The proposed development comprises 37 x 1-bedroom apartments and 62 x 2-bedroom apartments accommodated in 2 towers and 30 x 3-bedroom terrace units spread across the balance of the site. This represents a total of 129 dwellings.

121 car parking spaces will be provided for 99 apartments, comprising 99 tenant / occupier spaces and 22 visitor spaces. Site plans Revision P2 dated 19Apr17 show the following number of spaces within the apartment complex - 43 spaces at the lower ground level, 35 spaces at the upper ground level and 43 spaces at the 1st floor level. 68 spaces will be provided for 30 terrace dwellings, with each dwelling containing a double garage, and 8 visitor parking spaces provided within the internal street network.

4. CAR PARKING AND SITE SERVICING ASSESSMENT

4.1 Clause 52.06 – Car Parking

The car parking requirements for the proposal are contained within Clause 52.06 of the City of Monash Planning Scheme. The Planning Scheme parking requirements are:

- Dwellings: 1 space to each one or two bedroom dwelling plus 2 spaces to each three or more bedroom dwelling (with studies or studios that are separate rooms counted as bedrooms) plus 1 space for visitors to every five dwellings for developments of five or more dwellings.

Based on these rates, the parking requirements are:

- 99 apartments (mix of 1-bedroom and 2-bedroom dwellings) require 99 tenant / occupier spaces and 19 visitor spaces – for a total of 118 spaces. There are 121 car parking spaces provided within 3 levels of the apartment complex. This level of provision is in excess of the requirements of Clause 52.06.
- 30 terrace dwellings (all with 3 or more bedrooms) require 60 tenant / occupier spaces and 5 visitor spaces. Each dwelling has a double garage – implying all occupier / tenant spaces are provided. There are 8 visitor spaces provided in the form of indented kerbside parallel bays. This level of provision is in excess of the requirements of Clause 52.06.

The proposed development with 129 dwellings require 183 car parking spaces. With 189 spaces provided, the proposal is fully compliant with the car parking requirements of Clause 52.06.

4.2 Car Park Layout

Parking bays and ramp grades (including transitions) are compliant with Clause 52.06. Movements between levels along the ramps can be undertaken with one vehicle at a time – at the change of direction. Given that this is a private car park, this arrangement is considered to be acceptable – with the use of convex mirrors placed at the 90-degree change of direction points. If Council requires simultaneous B99 and B85 opposing direction travel on the ramp, an alternative circular configuration involving the use of 4m inner radius and 11.8m outer radius will be needed.

4.3 Site Servicing

Waste collection for the apartment complex will be undertaken by KS Environmental, using a 9.9m long rear lift truck. Waste collection for the terrace dwellings will be undertaken by Monash Council, using a 9.4m long side lift truck. Swept paths for the two refuse collection trucks have been undertaken, and are considered to be satisfactory.

4.4 Loading / Unloading

The site is accessible by furniture removalist trucks – typically 8.8m long Medium Rigid Vehicles.

5. BICYCLE PARKING CONSIDERATIONS

5.1 Planning Scheme – Clause 52.34

The bicycle parking requirements for proposed uses are contained within Clause 52.34 – Bicycle Parking, of the Monash Planning Scheme. The bicycle parking requirements are:

Dwelling (In developments of four or more storeys)

- 1 space per 5 dwellings for residents.
- 1 space per 10 dwellings for visitors.

The apartments are located in towers that have more than 4 storeys. The bicycle requirement for 99 apartments is:

- 19 spaces and 9 visitor spaces.

The applicant will be providing storage for 28 bicycles within a secured area on the lower ground level of the tower complex.

No bicycle parking is required for the terrace dwellings.

6. TRAFFIC IMPACT CONSIDERATIONS

6.1 Traffic Generation

The NSW RTA Guide to Traffic Generating Developments 2002 sets out the following traffic generation rates for a medium density residential building:

Smaller units and flats (up to two bedrooms):

- Daily vehicle trips = 4-5 per dwelling
- Weekday peak hour vehicle trips = 0.4-0.5 per dwelling.

Larger units and town houses (three or more bedrooms):

- Daily vehicle trips = 5.0-6.5 per dwelling
- Weekday peak hour vehicle trips = 0.5-0.65 per dwelling.

For assessment purposes, we have conservatively used a peak hour rate of 0.7 trip per dwelling for the apartments (regardless of whether they have 1 bedroom or 2 bedrooms) and 1 trip per dwelling for the terrace units which have 3 or more bedrooms. Directional split of 80% outbound and 20% inbound applies to the AM peak period. Directional split of 70% inbound and 30% outbound applies to the PM peak period. Traffic Generation was carried out for the 7.45am to 8.45am peak hour and the 4.30pm to 5.30pm peak hour.

The proposed 129 dwelling residential development with will generate 99 trips during the commuter peak hour. See Table 3.

Use	AM Peak Hour		PM Peak Hour	
	In	Out	In	Out
Residential	20	79	69	30

Table 3: Peak Hourly Traffic Generation

6.2 Traffic Distribution

Traffic is expected to be evenly distributed between areas to the north, east, south and west, with 50% of trips heading towards Jacksons Road and the Monash Freeway to the east and 50% of trips heading towards Princess Highway to the west. See Figures 7 and 8.

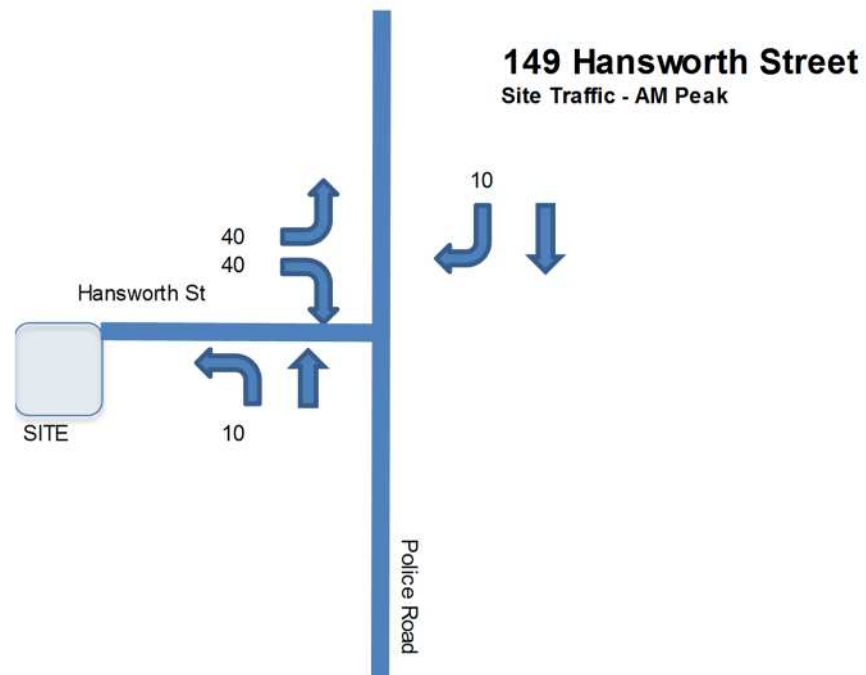


Figure 7: Development Only Traffic Volumes – AM Peak Hour (7.45am to 8.45am)

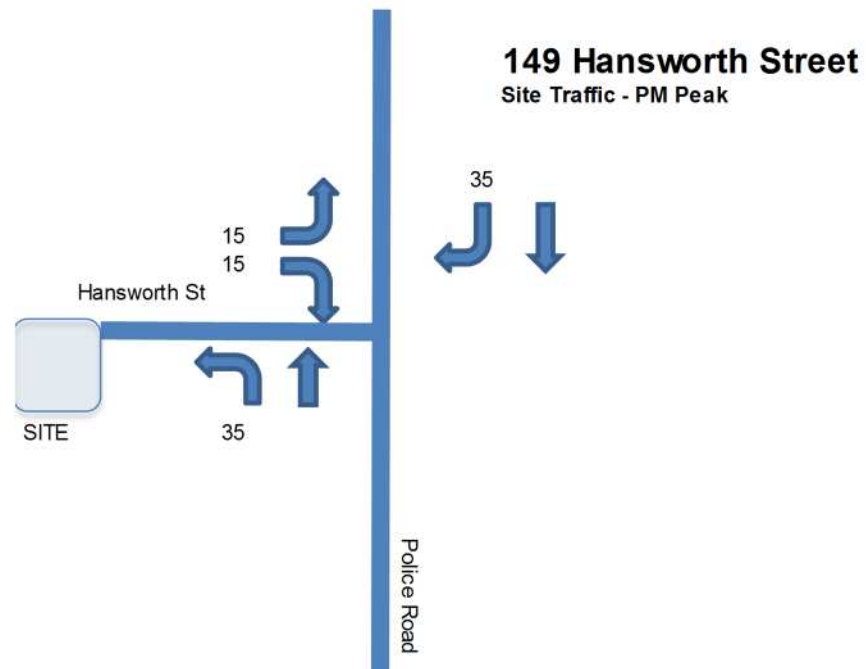


Figure 8: Development Only Traffic Volumes – PM Peak Hour (4.30pm to 5.30pm)

6.3 Projected Traffic Volumes

Year 2021 With Development AM and PM peak hourly traffic volumes are presented in Figures 9 and 10.

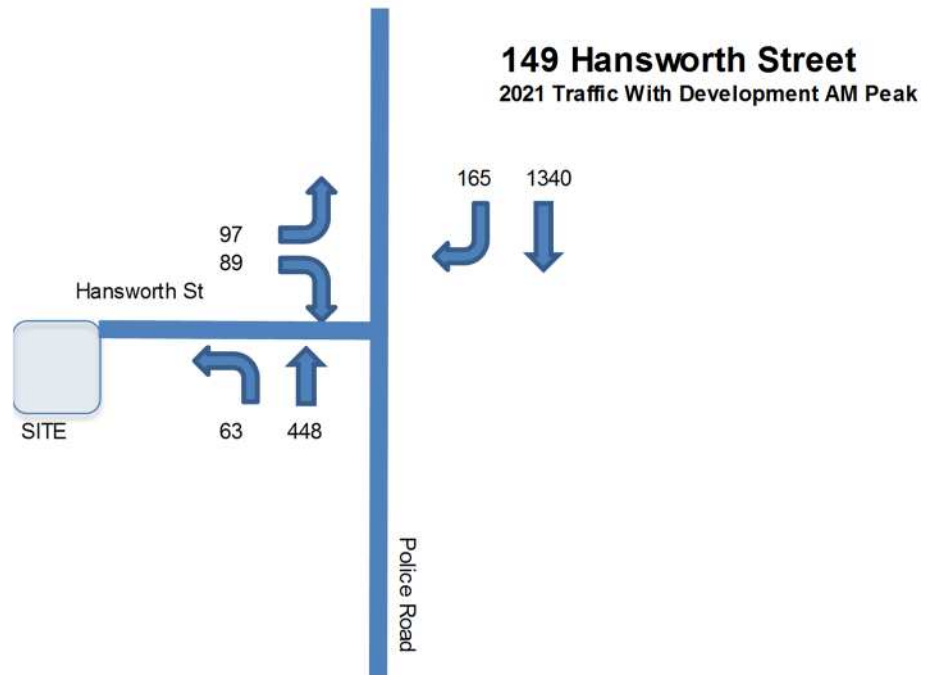


Figure 9: Year 2021 With Development Traffic Volumes – AM Peak Hour (7.45am to 8.45am)



Figure 10: Year 2021 With Development Traffic Volumes – PM Peak Hour (4.30pm to 5.30pm)

6.4 Intersection Assessment

Intersection operation for proposed traffic volumes at the intersection of Nile Street and Wellington Street priority controlled intersection was assessed using SIDRA. The modelling shows:

- No operational issues, with a Level of Service C in the AM peak hour and a Level of Service B in the PM peak hour.
- Minimal impact on intersection operation due to the proposal.

MOVEMENT SUMMARY

Site: 2021 AM With Development Hansworth Street and Police Road

Project: 149 Hansworth Street, Mulgrave

Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Police Road											
5	T1	1411	5.0	0.856	26.5	LOS C	26.4	192.7	0.96	1.00	41.8
6	R2	174	0.5	0.256	12.3	LOS B	2.0	14.3	0.63	0.69	42.4
Approach		1584	4.5	0.856	24.9	LOS C	26.4	192.7	0.92	0.97	41.9
North: Hansworth Street											
7	L2	102	0.5	0.257	29.9	LOS C	3.0	21.0	0.87	0.75	37.0
9	R2	94	0.5	0.236	29.8	LOS C	2.7	19.1	0.87	0.75	37.1
Approach		196	0.5	0.257	29.8	LOS C	3.0	21.0	0.87	0.75	37.0
West: Police Road											
10	L2	66	0.5	0.322	19.0	LOS B	6.0	43.3	0.69	0.63	46.3
11	T1	472	5.0	0.322	13.7	LOS B	6.0	43.9	0.69	0.60	48.3
Approach		538	4.4	0.322	14.4	LOS B	6.0	43.9	0.69	0.61	48.0
All Vehicles		2318	4.2	0.856	22.9	LOS C	26.4	192.7	0.86	0.87	42.7

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	29.3	LOS C	0.1	0.1	0.92	0.92	
P22	East Stage 2	53	24.9	LOS C	0.1	0.1	0.84	0.84	
P3	North Full Crossing	53	18.6	LOS B	0.1	0.1	0.73	0.73	
All Pedestrians		158	24.3	LOS C			0.83	0.83	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average movement delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Table 4: SIDRA Output for Year 2021 With Development AM Peak hour Traffic – Hansworth Street / Police Road Intersection

MOVEMENT SUMMARY

Site: 2021 PM With Development Hansworth Street and Police Road

Project - 149 Hansworth Street, Mulgrave

Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Police Road											
5	T1	515	5.0	0.308	13.6	LOS B	5.7	41.6	0.69	0.58	49.1
6	R2	178	0.5	0.430	16.7	LOS B	2.1	14.7	0.85	0.75	40.4
Approach		693	3.8	0.430	14.4	LOS B	5.7	41.6	0.73	0.62	46.5
North: Hansworth Street											
7	L2	233	0.5	0.587	32.2	LOS C	7.4	52.1	0.95	0.81	36.2
9	R2	151	0.5	0.380	30.7	LOS C	4.5	31.9	0.90	0.78	36.7
Approach		383	0.5	0.587	31.6	LOS C	7.4	52.1	0.93	0.80	36.4
West: Police Road											
10	L2	205	0.5	0.720	23.1	LOS C	17.2	123.8	0.88	0.82	43.4
11	T1	995	5.0	0.720	17.8	LOS B	17.3	126.1	0.88	0.80	45.6
Approach		1200	4.2	0.720	18.8	LOS B	17.3	126.1	0.88	0.80	45.2
All Vehicles		2276	3.5	0.720	19.6	LOS B	17.3	126.1	0.84	0.75	43.8

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	29.3	LOS C	0.1	0.1	0.92	0.92	
P22	East Stage 2	53	24.9	LOS C	0.1	0.1	0.84	0.84	
P3	North Full Crossing	53	18.6	LOS B	0.1	0.1	0.73	0.73	
All Pedestrians		158	24.3	LOS C			0.83	0.83	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average movement delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Table 5: SIDRA Output for Year 2021 With Development PM Peak hour Traffic – Hansworth Street / Police Road Intersection

7. CONCLUSIONS

Based on the considerations presented in this report, it is considered that:

- The proposed development with 129 dwellings require 183 car parking spaces. With 189 spaces provided, the proposal is fully compliant with the car parking requirements of Clause 52.06.
- The 99 apartments require 28 bicycle storage spaces. Storage for 28 bicycles within a secured area on the lower ground level of the tower complex. Full compliance with Clause 52.34 is achieved.
- The proposed access, car parking and site servicing layout is satisfactory.
- All vehicles are able to enter the site, internally manoeuvre and exit the site in a forward direction.
- Waste collection swept path movements are satisfactory.
- The proposed 129 dwelling residential development with will generate 99 trips during the commuter peak hour.
- The impact on the signalised intersection of Hansworth Street and Police Road is minimal. SIDRA analyses indicate no operational issues, with minimal impact associated with the development.
- There are no traffic engineering reasons why a planning permit for a proposed residential development at 149 Hansworth Street, Mulgrave, should be refused.

Appendix A: Vehicle Swept Paths

